Target: ECU555-80 (DEV)

Floating Point: single (32 bits)
Stacks - FGND: 4096 BGND: 2048
IDLE: 1024 IRQ: 1280
Heap Size: 4096
DLL Filename: BaseEngin_002
SRZ Filename: BaseEngineController_LS_002

Total FLASH:	373552
Total EEPROM:	1254
Total RAM:	26040
App FLASH:	154160
App EEPROM:	1080
App RAM:	7766

MotoHawk Function Trigger
FGND_RTI_PERIODIC
Priority Order: 0

f()

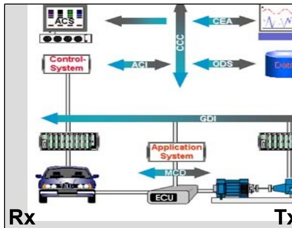
Foreground

Main Power Relay
On Delay: 100 ms
Off Delay: 250 ms

Main Power Relay

MotoHawk Trigger Definition

FGND_RTI Period: 5 ms
BGND_BASE Period: 50 ms (FGND x 10)



CCP Handler
Instance: CCP1
Station Addr: 0x0031
DAQs: 10
ODTs: 8
ODT Storage: CAL

Rx
Chan : CAN_1
Rx ID : 0x18ef0231 (ext)
ID Adj: 0x00000000

Tx
Chan : CAN_1
Tx ID : 0x18ef3102 (ext)

CCP CAN Protocol

MotoHawk (RTW)
Fault Manager Definition

Storage: FLASH
X/Y Data Type: uint16
Read Access: 1
Write Access: 1
Clear Access: 1

MotoHawk CAN Definition

Name: CAN_1
Bus: CAN1
Bit Timing: 500 kbaud
TX Queue: 16 messages
RX Queue: 16 messages

MotoTune Protocol Enabled
City ID: 0x0B (PCM-1)

MotoHawk CAN Definition

Name: CAN_2
Bus: CAN2
Bit Timing: 500 kbaud
TX Queue: 16 messages
RX Queue: 16 messages

MotoTune Protocol Enabled
City ID: 0x0B (PCM-1)

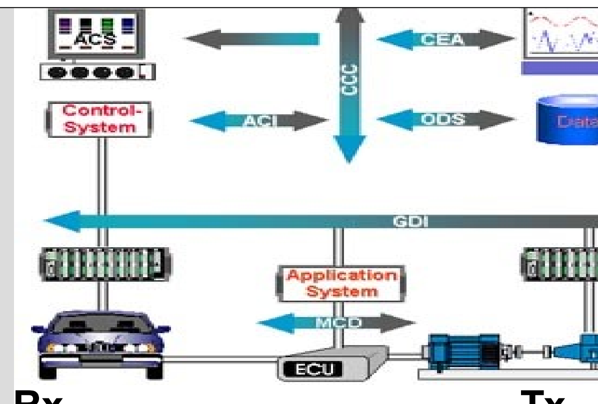
MotoHawk CCP DAQ Triggers:

- **FGND_RTI_PERIODIC**
- **FGND_5XRTI_PERIODIC**
- **FGND_MID_TDC_EVENT**
- **FGND_20XRTI_PERIODIC**
- **BGND_BASE_PERIODIC**

MotoHawk Function Trigger
IDLE_EVENT
Priority Order: 255
(Used in triggered subsystem)
(Runs even when App Monitor stops)

Command trig

DAQ trig(s)

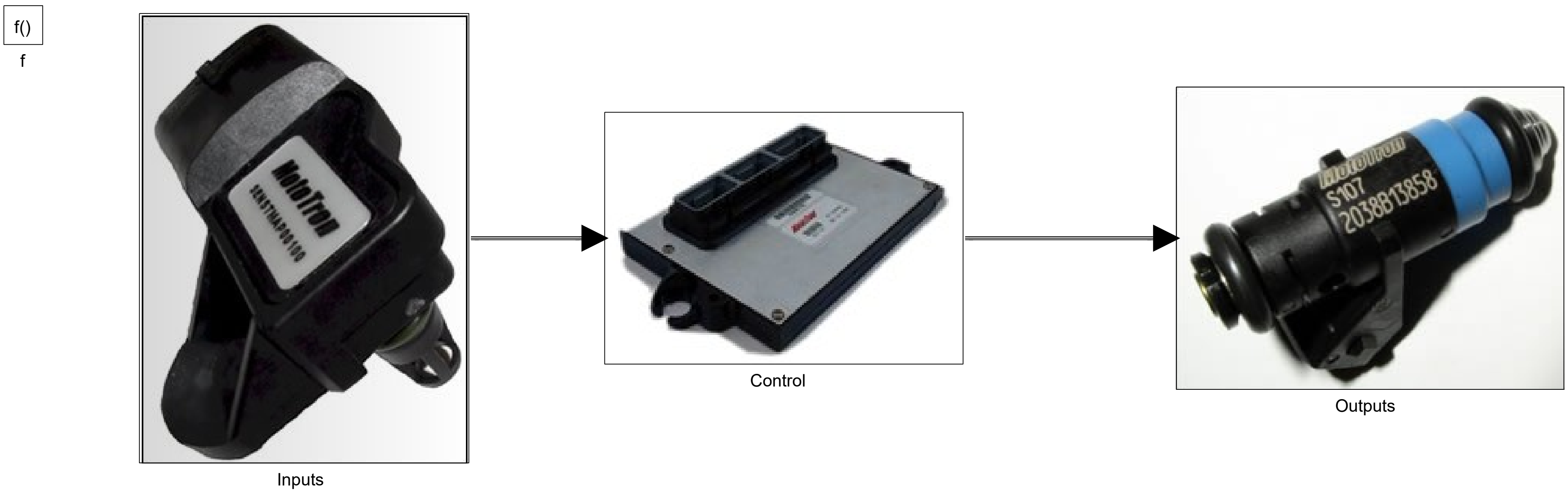


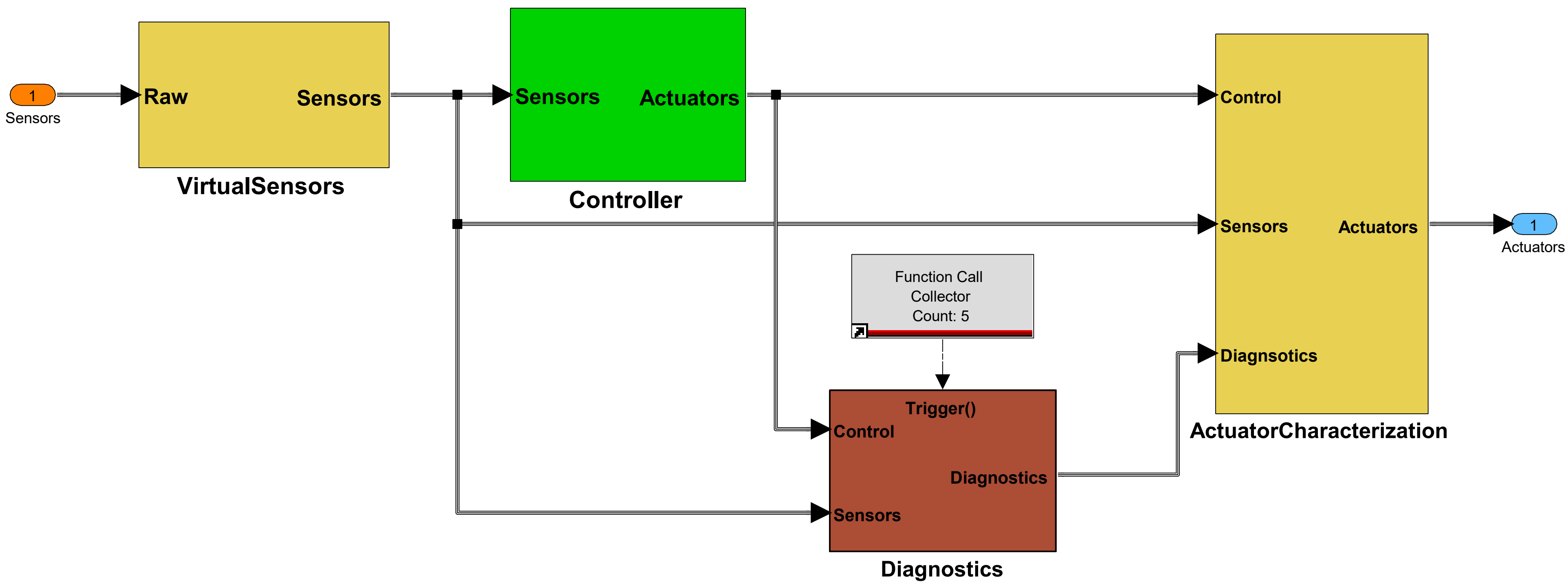
CCP Handler
Instance: CCP1
Station Addr: 0x0031
DAQs: 10
ODTs: 8
ODT Storage: CAL

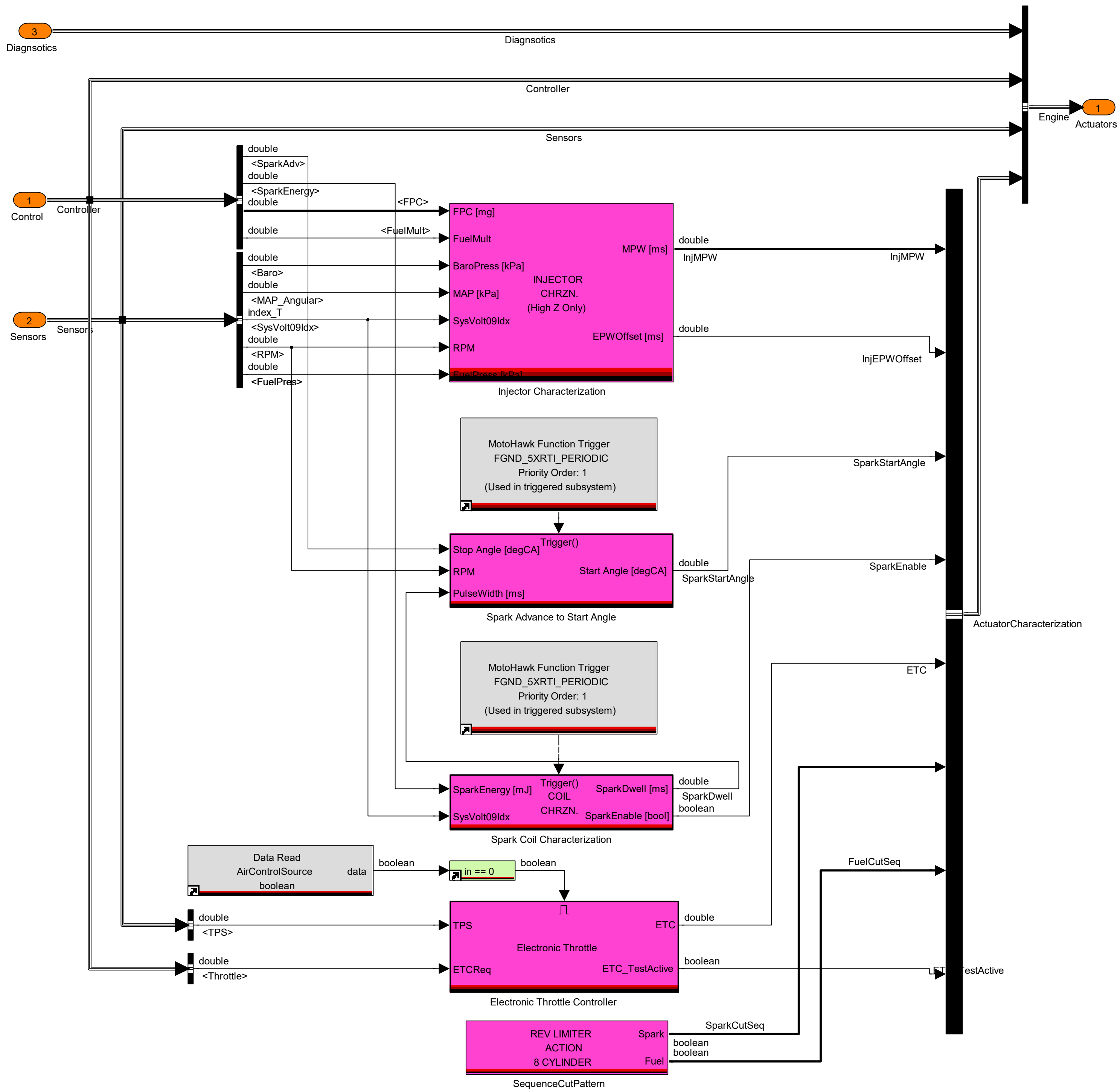
Rx
```
Chan   : CAN_1
Rx ID  : 0x18ef0231 (ext)
ID Adj: 0x00000000
```

Tx
```
Chan   : CAN_1
Tx ID  : 0x18ef3102 (ext)
```

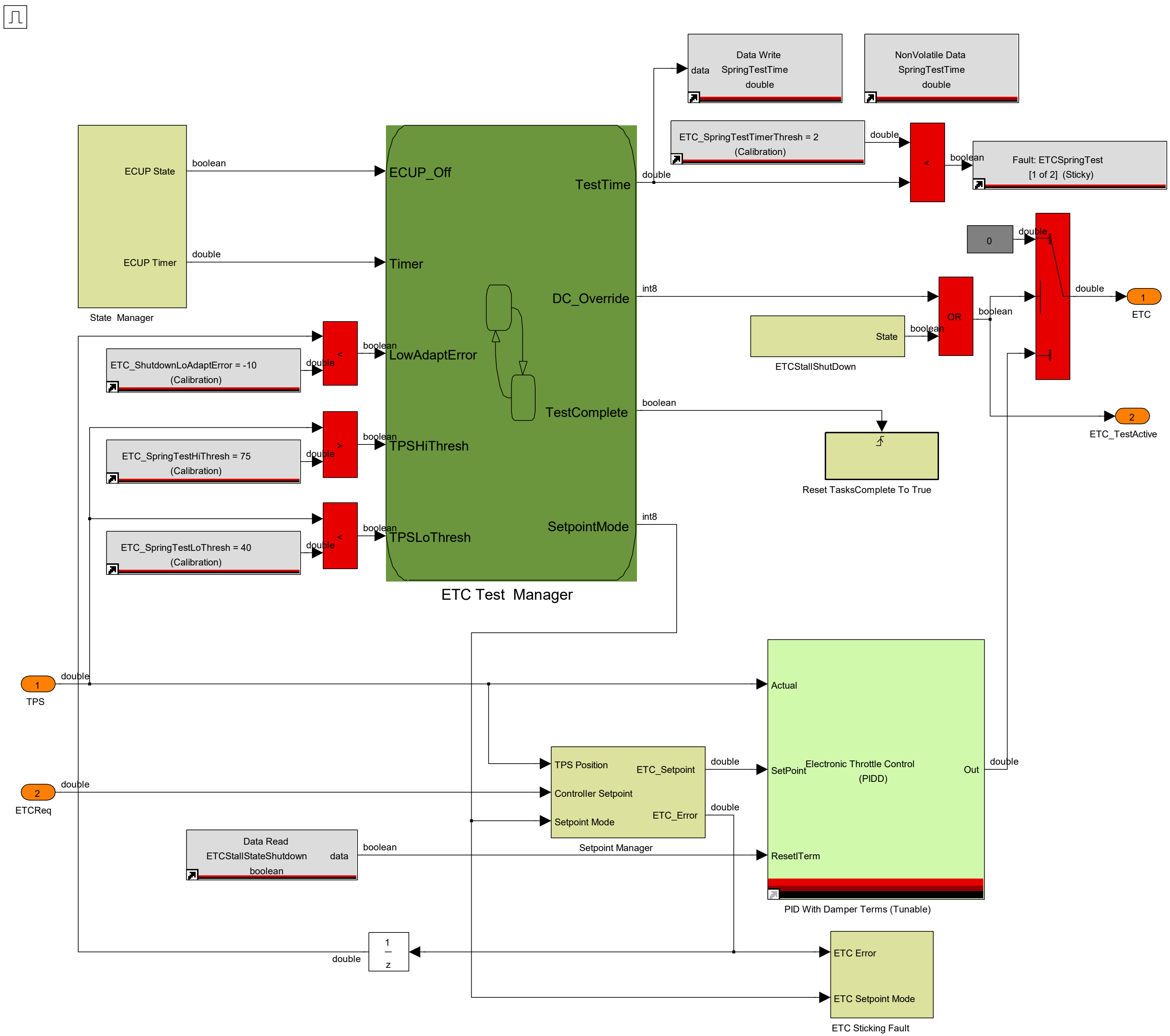
CCP CAN Protocol External Trig1

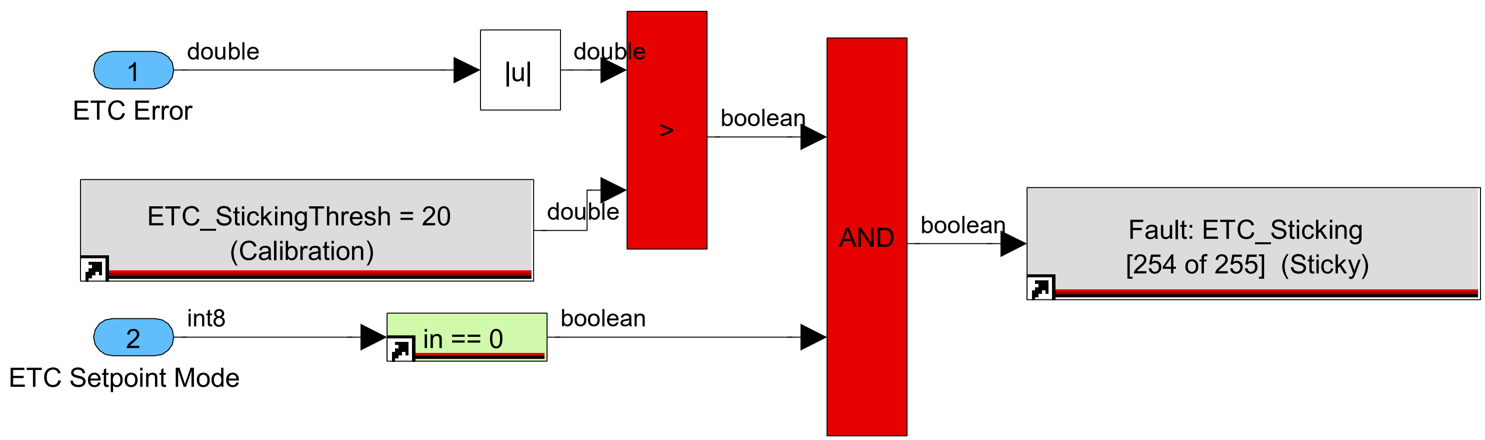

f()
f
Inputs
Control
Outputs


1
Sensors
Raw
Sensors
VirtualSensors
Sensors
Actuators
Controller
Control
Sensors
Actuators
Diagnsotics
ActuatorCharacterization
1
Actuators
Function Call
Collector
Count: 5
Trigger()
Control
Diagnostics
Sensors
Diagnostics

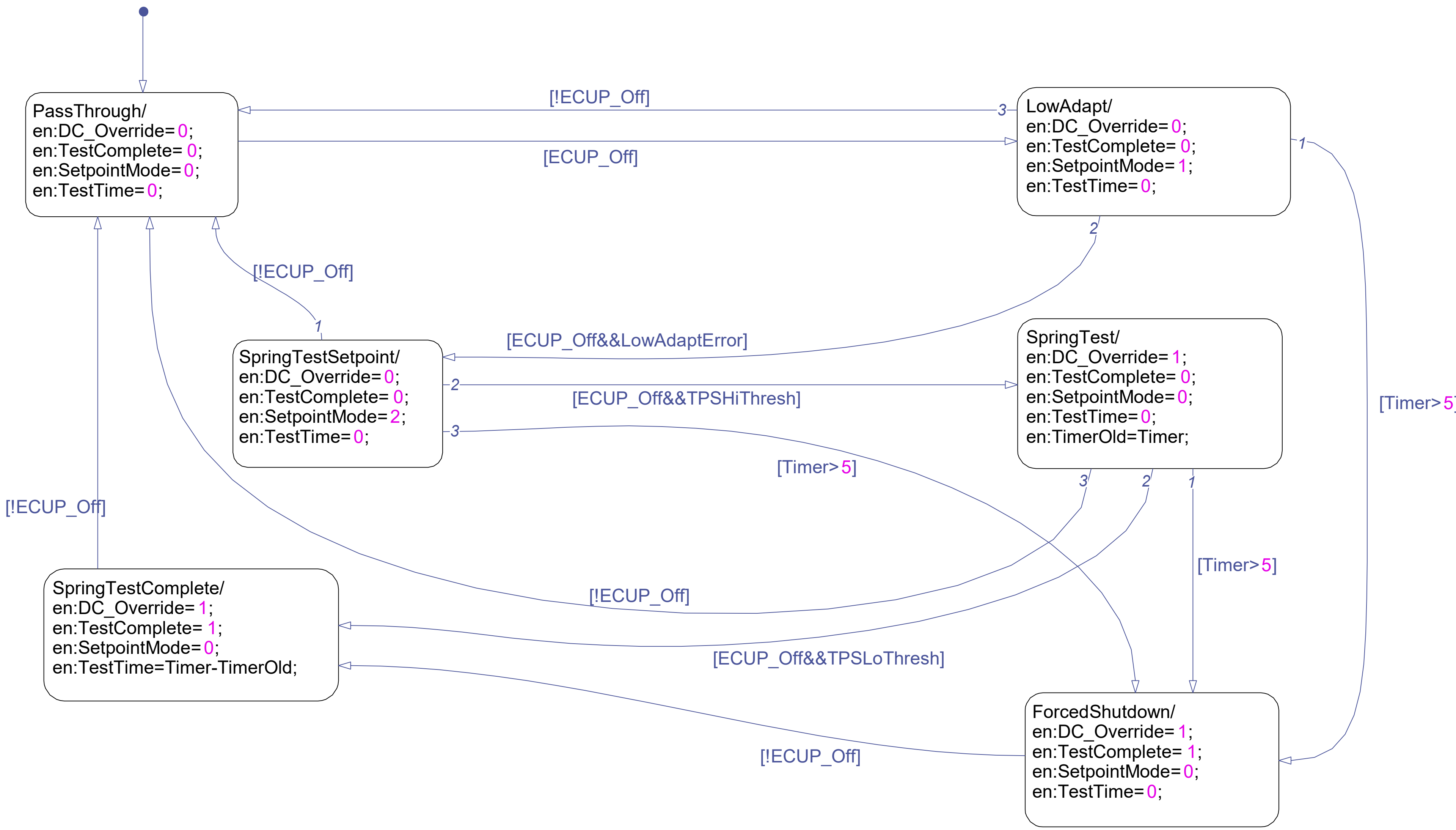


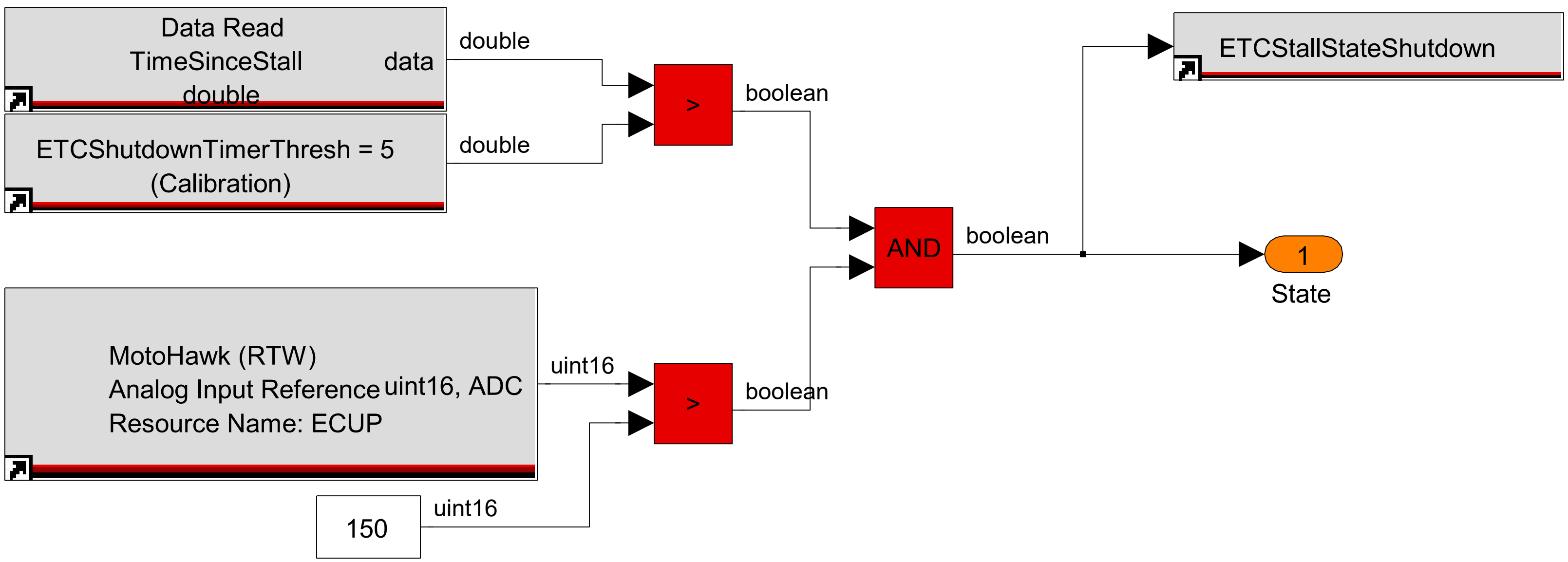
3
Diagnsotics
Diagnsotics
Controller
Sensors
Engine
1
Actuators
1
Control
Controller
2
Sensors
Sensors
double
<SparkAdv>
double
<SparkEnergy>
double
<FPC>
double
<FuelMult>
double
<Baro>
double
<MAP_Angular>
index_T
<SysVolt09Idx>
double
<RPM>
double
<FuelPres>
FPC [mg]
FuelMult
BaroPress [kPa]
MAP [kPa]
SysVolt09Idx
RPM
FuelPress [kPa]
INJECTOR
CHRZN.
(High Z Only)
MPW [ms]
EPWOffset [ms]
Injector Characterization
double
InjMPW
InjMPW
double
InjEPWOffset
MotoHawk Function Trigger
FGND_5XRTI_PERIODIC
Priority Order: 1
(Used in triggered subsystem)
Trigger()
Stop Angle [degCA]
RPM
PulseWidth [ms]
Start Angle [degCA]
Spark Advance to Start Angle
double
SparkStartAngle
SparkStartAngle
SparkEnable
ActuatorCharacterization
MotoHawk Function Trigger
FGND_5XRTI_PERIODIC
Priority Order: 1
(Used in triggered subsystem)
ETC
SparkEnergy [mJ]
SysVolt09Idx
Trigger()
COIL
CHRZN.
SparkDwell [ms]
SparkEnable [bool]
double
SparkDwell
boolean
Spark Coil Characterization
Data Read
AirControlSource
boolean
data
boolean
in == 0
boolean
FuelCutSeq
double
<TPS>
TPS
Electronic Throttle
ETC
double
double
<Throttle>
ETCReq
ETC_TestActive
boolean
ETC_TestActive
Electronic Throttle Controller
REV LIMITER
ACTION
8 CYLINDER
Spark
Fuel
SparkCutSeq
boolean
boolean
SequenceCutPattern

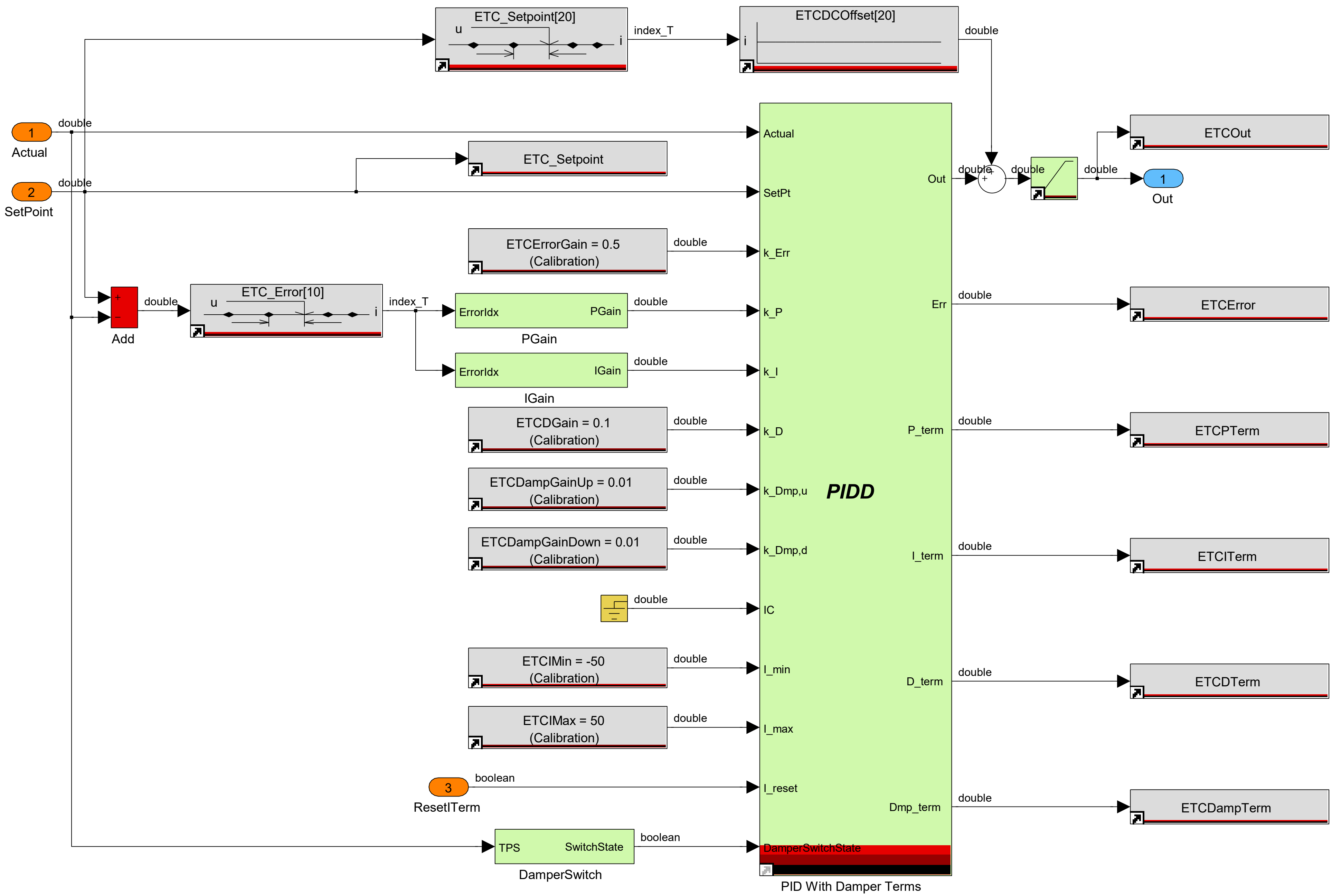

Data Write
data SpringTestTime
double
NonVolatile Data
SpringTestTime
double
ETC_SpringTestTimerThresh = 2
(Calibration)
Fault: ETCSpringTest
[1 of 2] (Sticky)
ECUP State
ECUP Timer
State Manager
ECUP_Off
Timer
LowAdaptError
TPSHiThresh
TPSLoThresh
TestTime
DC_Override
TestComplete
SetpointMode
ETC Test Manager
ETC_ShutdownLoAdaptError = -10
(Calibration)
ETC_SpringTestHiThresh = 75
(Calibration)
ETC_SpringTestLoThresh = 40
(Calibration)
0
OR
State
ETCStallShutDown
ETC
ETC_TestActive
Reset TasksComplete To True
TPS
ETCReq
Actual
SetPoint
Electronic Throttle Control
(PIDD)
Out
ResetITerm
PID With Damper Terms (Tunable)
TPS Position
Controller Setpoint
Setpoint Mode
ETC_Setpoint
ETC_Error
Setpoint Manager
Data Read
ETCStallStateShutdown data
boolean
ETC Error
ETC Setpoint Mode
ETC Sticking Fault
boolean
double
int8



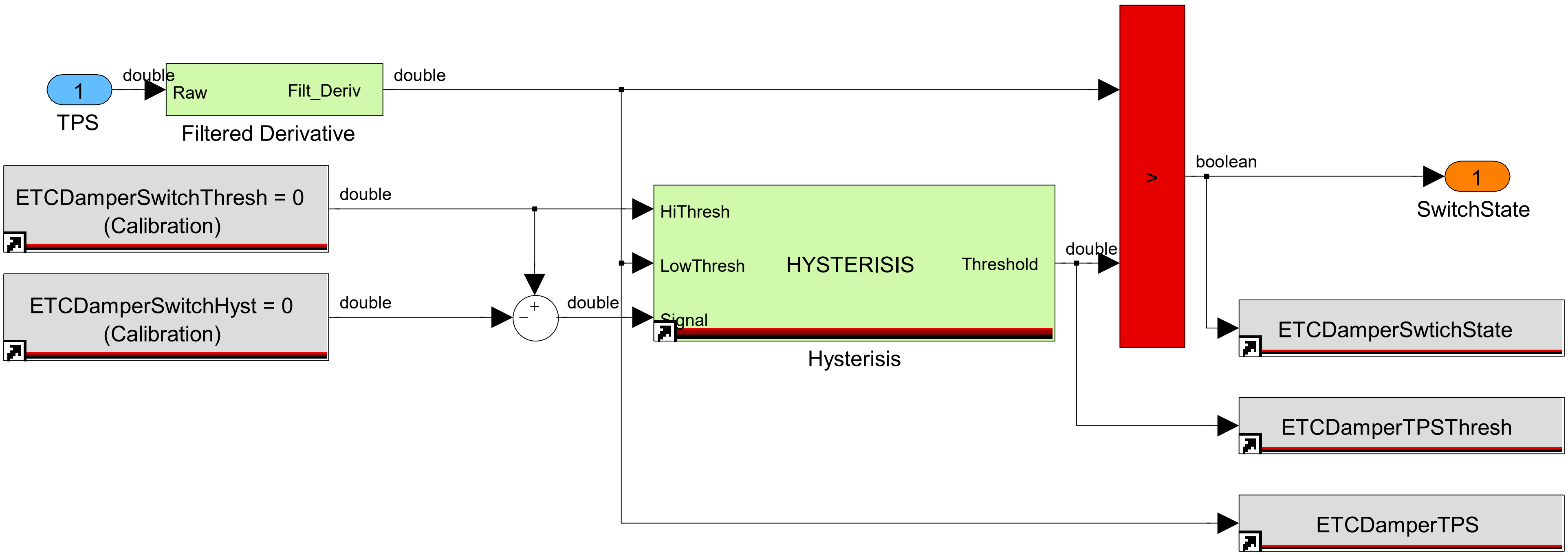
double
1
ETC Error
|u|
double
>
boolean
ETC_StickingThresh = 20
(Calibration)
double
AND
boolean
Fault: ETC_Sticking
[254 of 255] (Sticky)
int8
2
ETC Setpoint Mode
in == 0
boolean

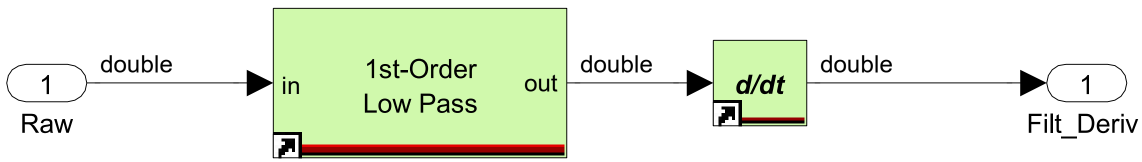

PassThrough/
en:DC_Override=0;
en:TestComplete= 0;
en:SetpointMode=0;
en:TestTime=0;
LowAdapt/
en:DC_Override=0;
en:TestComplete= 0;
en:SetpointMode=1;
en:TestTime=0;
SpringTestSetpoint/
en:DC_Override=0;
en:TestComplete= 0;
en:SetpointMode=2;
en:TestTime=0;
SpringTest/
en:DC_Override=1;
en:TestComplete= 0;
en:SetpointMode=0;
en:TestTime=0;
en:TimerOld=Timer;
SpringTestComplete/
en:DC_Override=1;
en:TestComplete= 1;
en:SetpointMode=0;
en:TestTime=Timer-TimerOld;
ForcedShutdown/
en:DC_Override=1;
en:TestComplete= 1;
en:SetpointMode=0;
en:TestTime=0;
[!ECUP_Off]
[ECUP_Off]
[!ECUP_Off]
[ECUP_Off&&LowAdaptError]
[ECUP_Off&&TPSHiThresh]
[Timer>5]
[Timer>5]
[Timer>5]
[!ECUP_Off]
[!ECUP_Off]
[ECUP_Off&&TPSLoThresh]
[!ECUP_Off]

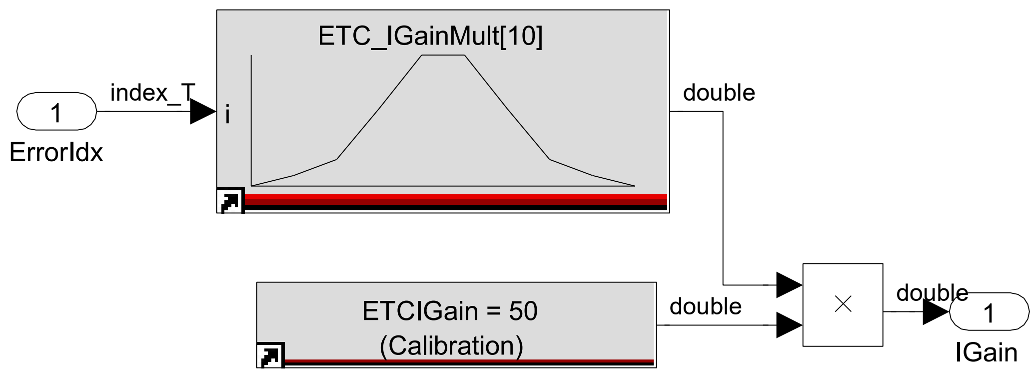

Data Read
TimeSinceStall
data
double
double
ETCShutdownTimerThresh = 5
(Calibration)
double
>
boolean
AND
boolean
ETCStallStateShutdown
1
State
MotoHawk (RTW)
Analog Input Reference
Resource Name: ECUP
uint16, ADC
uint16
>
boolean
150
uint16

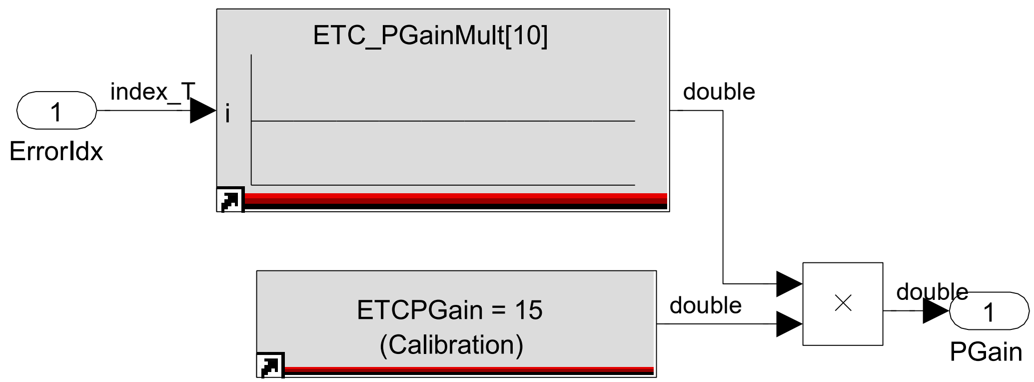


ETC_Setpoint[20]
u
i
index_T
ETCDCOffset[20]
i
double
1
Actual
double
2
SetPoint
double
ETC_Setpoint
ETCErrorGain = 0.5
(Calibration)
double
Add
double
ETC_Error[10]
u
i
index_T
ErrorIdx
PGain
double
PGain
ErrorIdx
IGain
double
IGain
ETCDGain = 0.1
(Calibration)
double
ETCDampGainUp = 0.01
(Calibration)
double
ETCDampGainDown = 0.01
(Calibration)
double
double
ETCIMin = -50
(Calibration)
double
ETCIMax = 50
(Calibration)
double
3
ResetITerm
boolean
TPS
SwitchState
boolean
DamperSwitch
Actual
SetPt
k_Err
k_P
k_I
k_D
k_Dmp,u
k_Dmp,d
IC
I_min
I_max
I_reset
DamperSwitchState
PIDD
Out
Err
P_term
I_term
D_term
Dmp_term
PID With Damper Terms
double
double
double
ETCOut
1
Out
double
ETCError
double
ETCPTerm
double
ETCITerm
double
ETCDTerm
double
ETCDampTerm


1
TPS
double
Raw
Filt_Deriv
Filtered Derivative
double
ETCDamperSwitchThresh = 0
(Calibration)
double
ETCDamperSwitchHyst = 0
(Calibration)
double
+
−
double
HiThresh
LowThresh
HYSTERISIS
Threshold
Signal
Hysterisis
double
>
boolean
1
SwitchState
ETCDamperSwtichState
ETCDamperTPSThresh
ETCDamperTPS


1
Raw
double
in
1st-Order
Low Pass
out
double
d/dt
double
1
Filt_Deriv

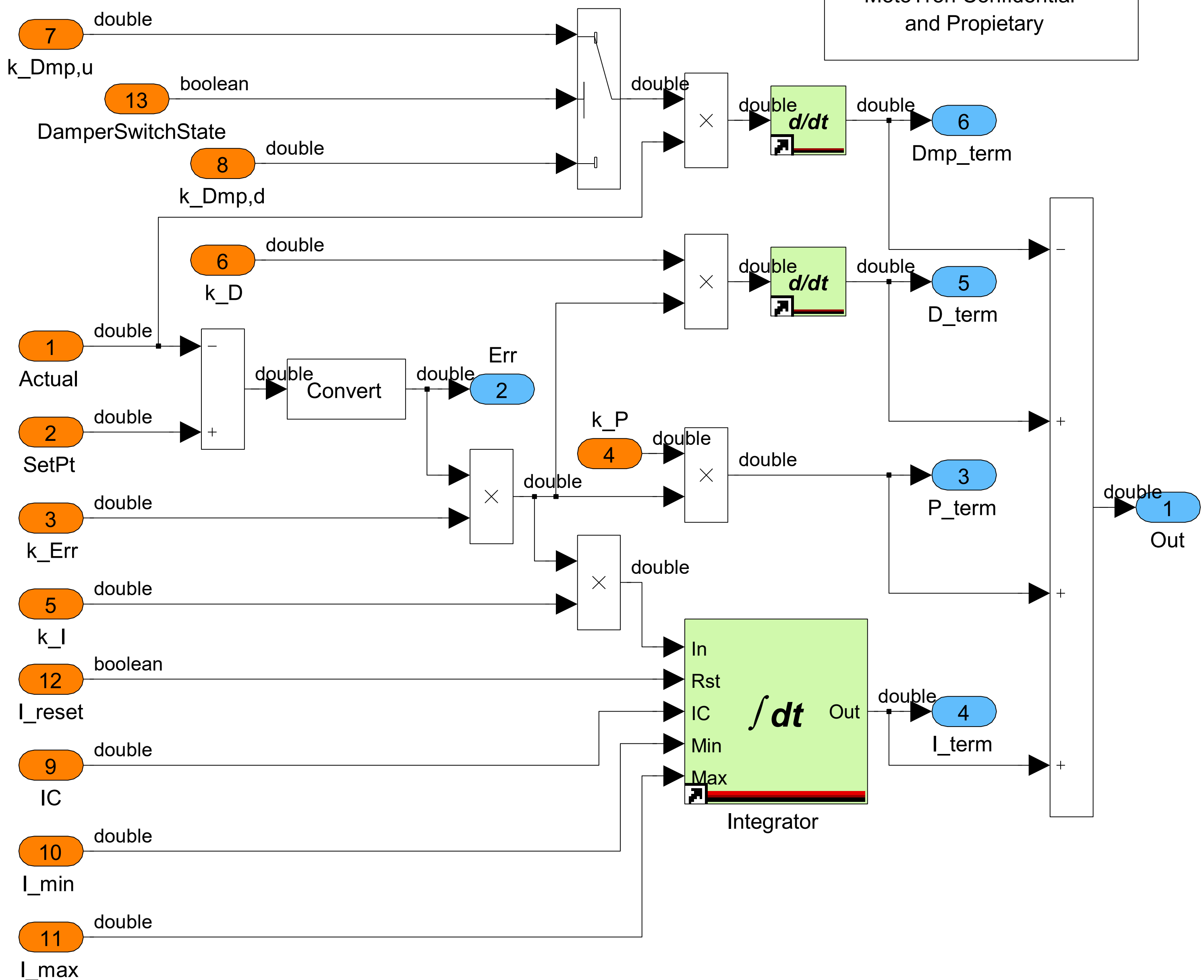

ETC_IGainMult[10]
1
index_T
i
ErrorIdx
double
ETCIGain = 50
(Calibration)
double
double
1
IGain

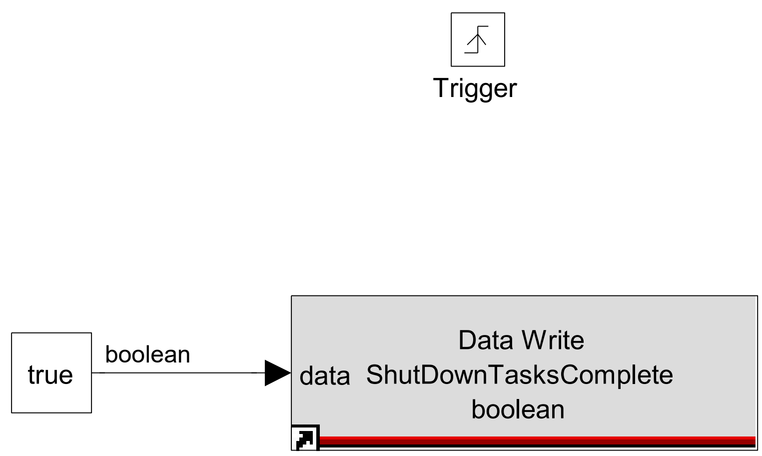


ETC_PGainMult[10]
1
ErrorIdx
index_T
i
double
ETCPGain = 15
(Calibration)
double
double
1
PGain

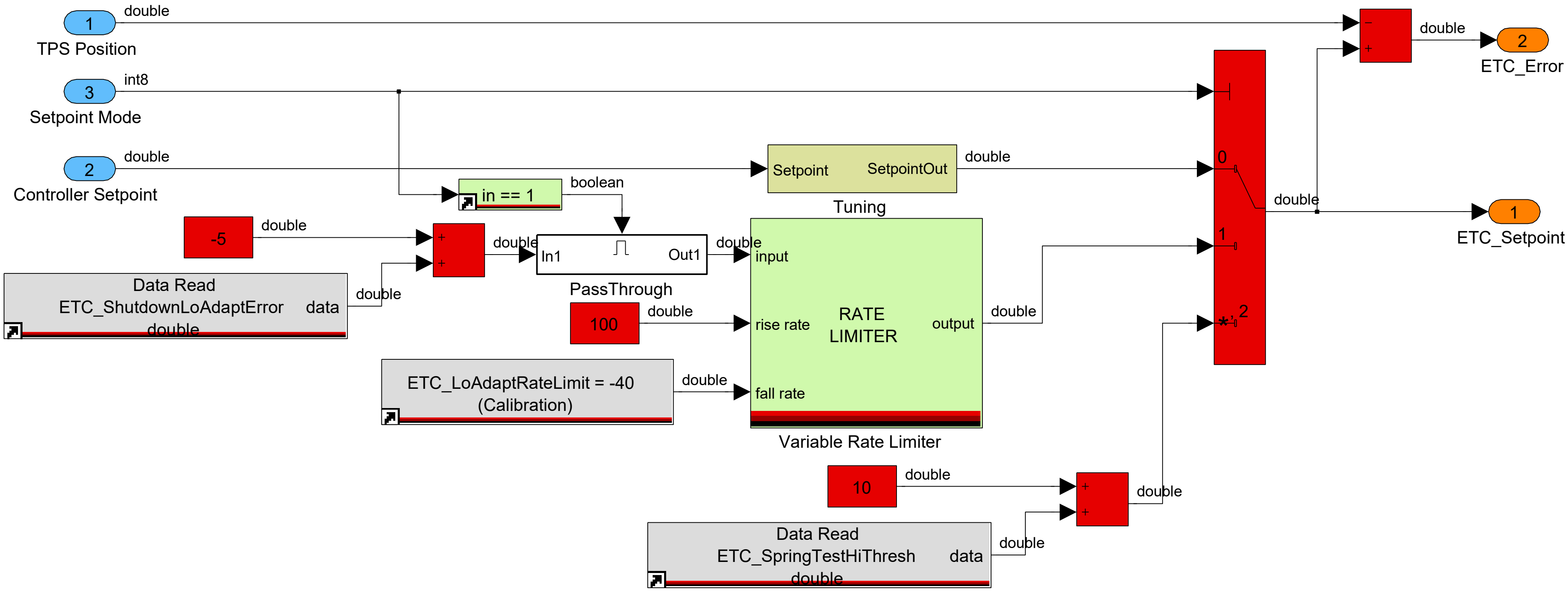
Universal PID Controller with Dampers

Model Info:
Author: Suhre, Poorman
Mon May 16 15:00:08 2005
Sun Nov 17 04:24:00 2019
Version: 1.1787
MotoTron Confidential
and Propietary

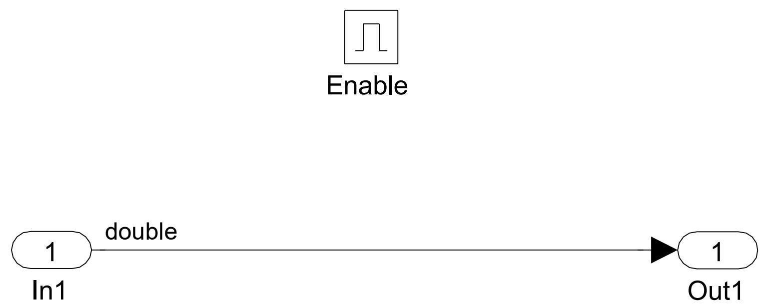


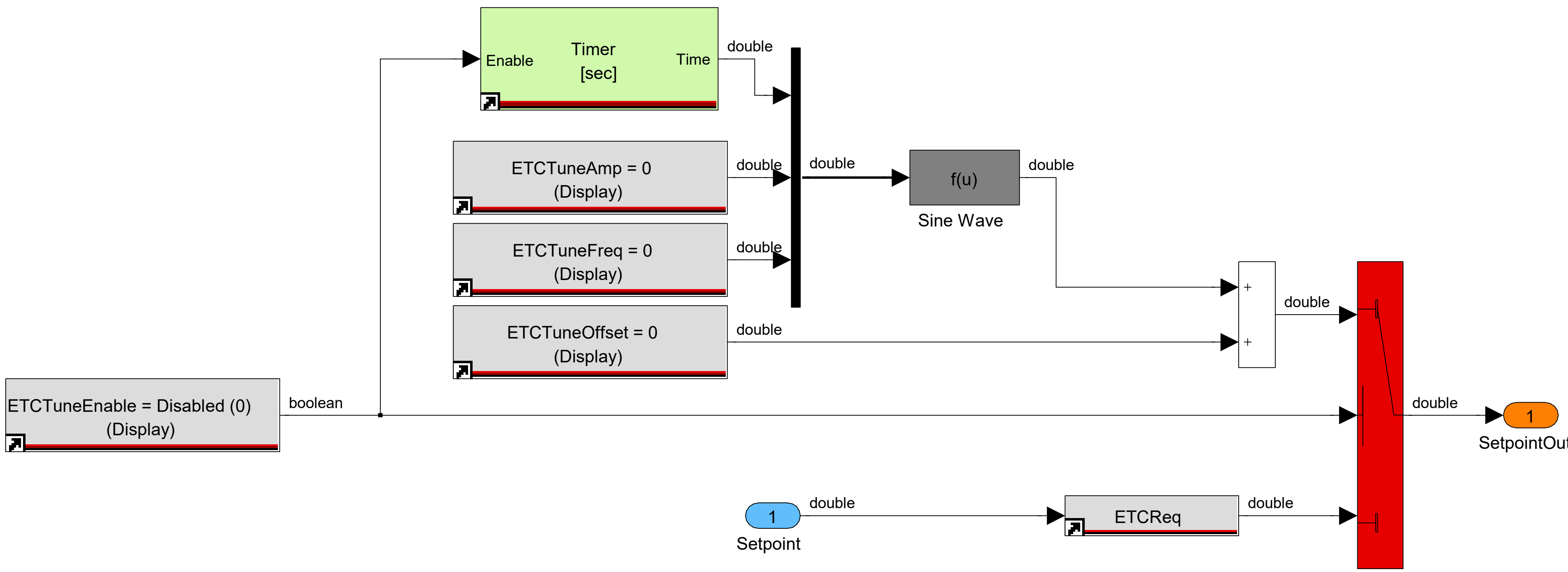


Trigger
true
boolean
data
Data Write
ShutDownTasksComplete
boolean



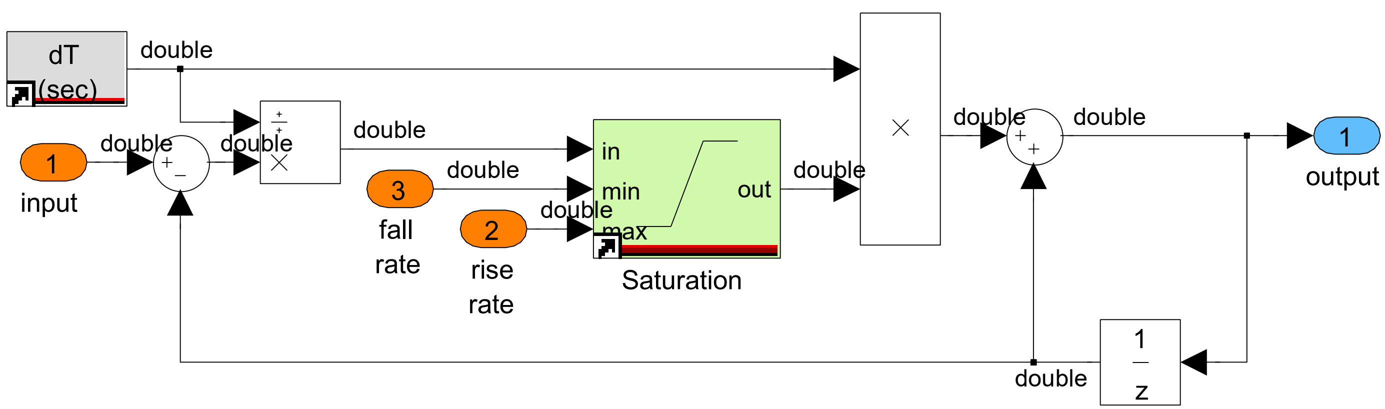
1
TPS Position
double
3
Setpoint Mode
int8
2
Controller Setpoint
double
Setpoint
SetpointOut
Tuning
double
in == 1
boolean
-5
double
Data Read
ETC_ShutdownLoAdaptError
data
double
In1
Out1
PassThrough
100
double
ETC_LoAdaptRateLimit = -40
(Calibration)
input
rise rate
fall rate
RATE LIMITER
output
Variable Rate Limiter
10
Data Read
ETC_SpringTestHiThresh
data
double
0
1
2
2
ETC_Error
1
ETC_Setpoint

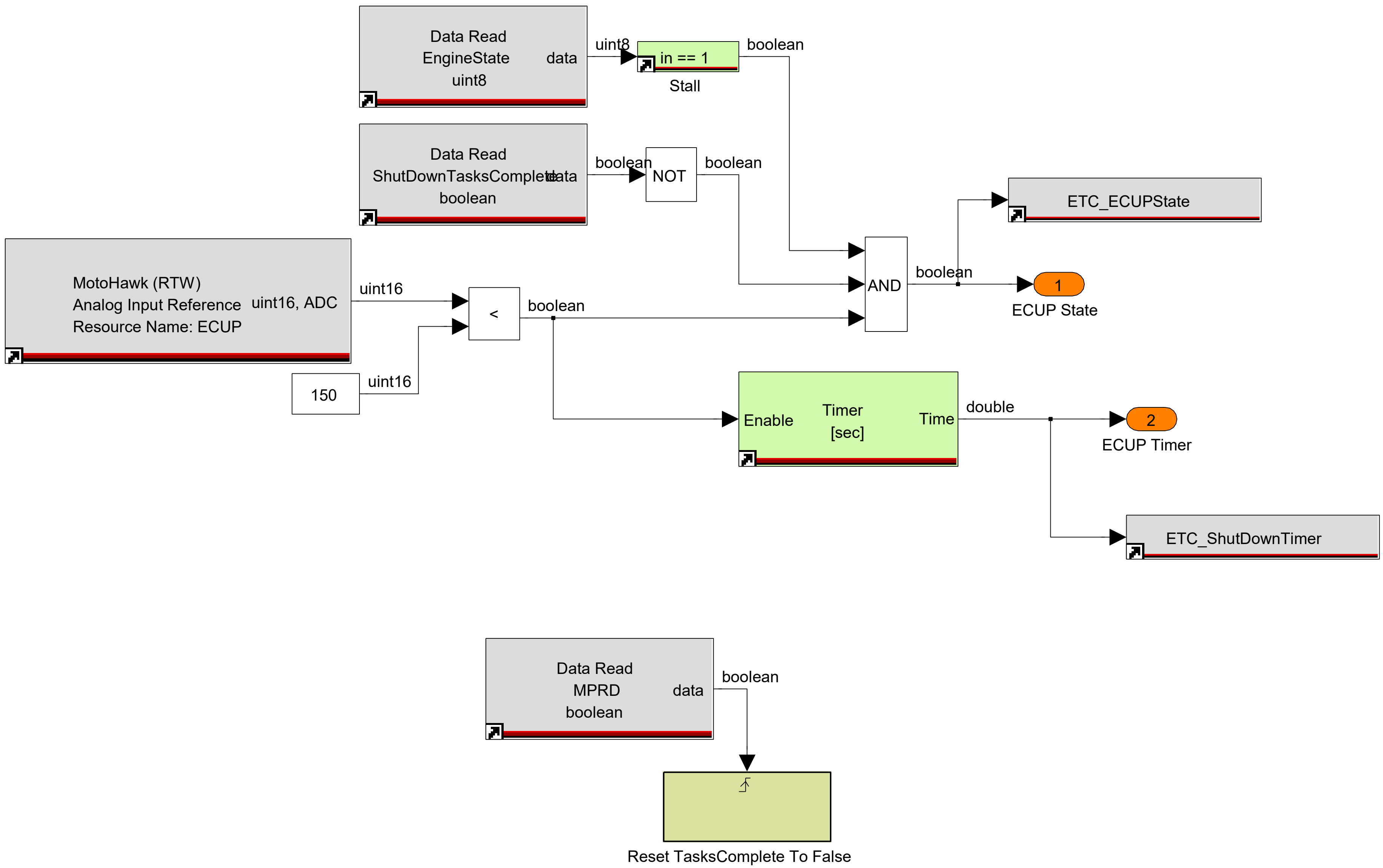

Enable
double
1
In1
1
Out1



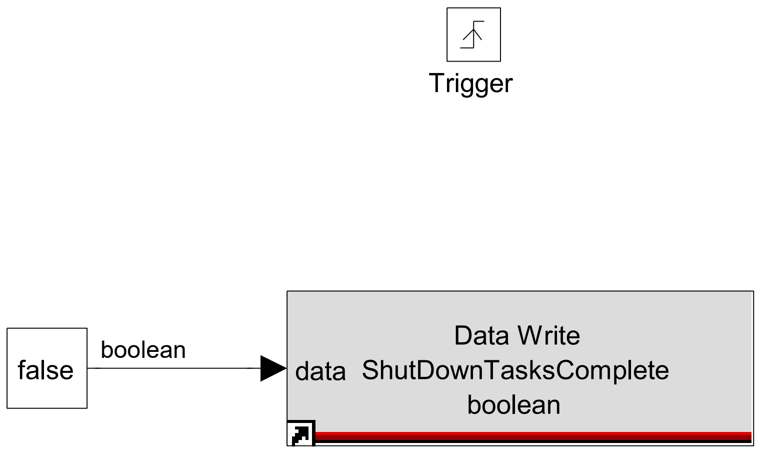
Timer
[sec]
Enable
Time
double
ETCTuneAmp = 0
(Display)
ETCTuneFreq = 0
(Display)
ETCTuneOffset = 0
(Display)
f(u)
Sine Wave
+
+
ETCTuneEnable = Disabled (0)
(Display)
boolean
1
SetpointOut
1
Setpoint
ETCReq

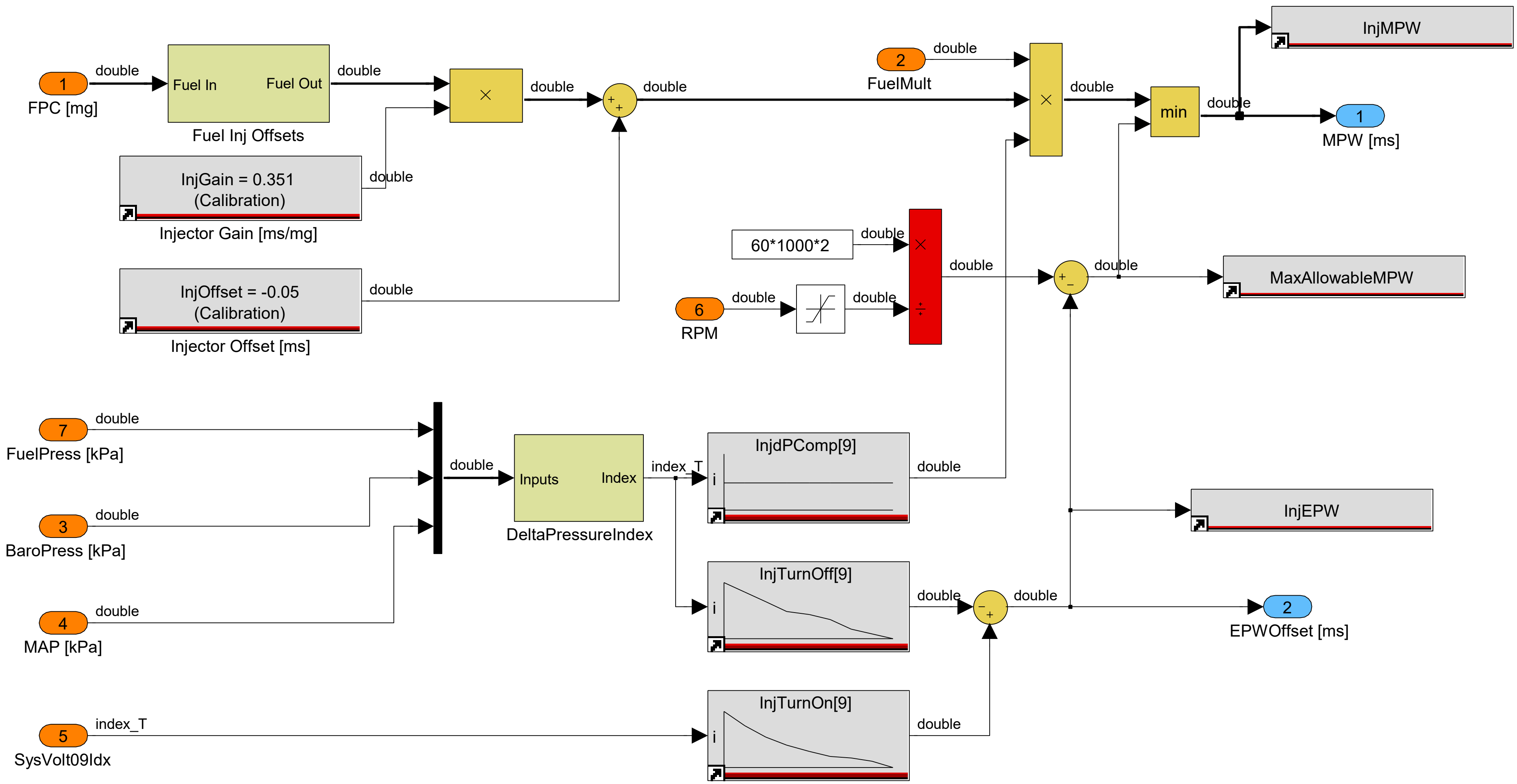
Rate Limiter - Limit allowable change in signal per timestep



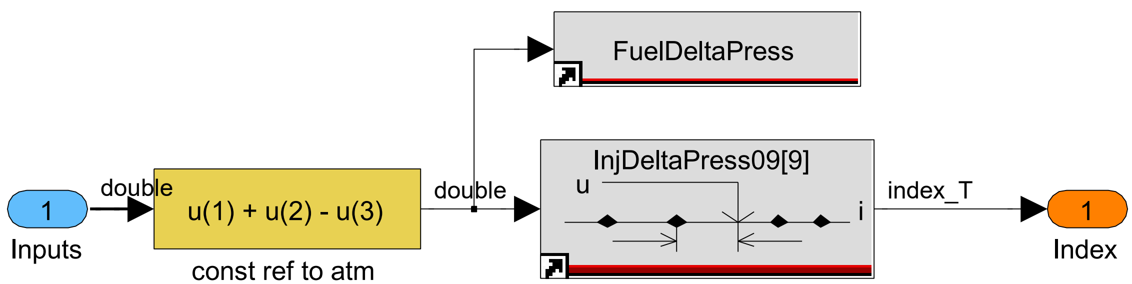


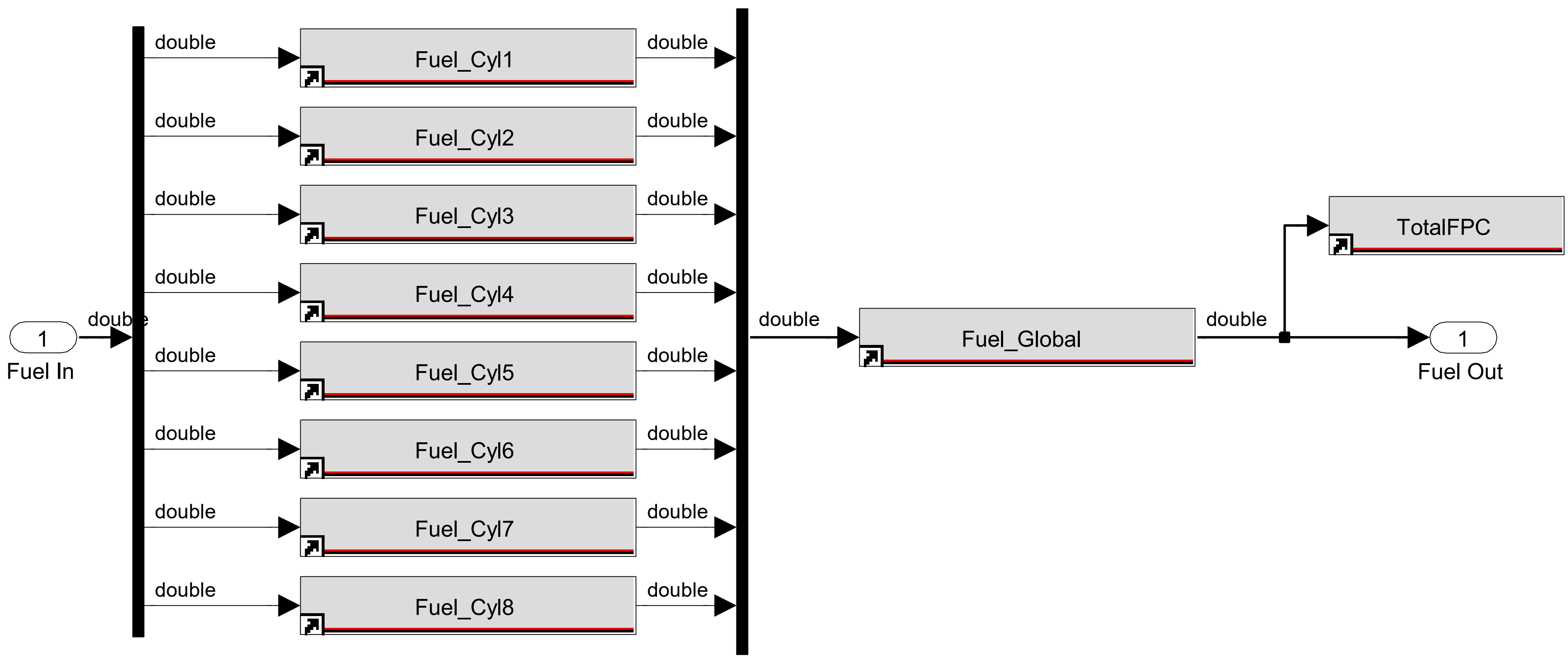
Data Read
EngineState
uint8
data
uint8
in == 1
Stall
boolean
Data Read
ShutDownTasksComplete
boolean
data
boolean
NOT
boolean
ETC_ECUPState
MotoHawk (RTW)
Analog Input Reference
Resource Name: ECUP
uint16, ADC
uint16
<
boolean
AND
boolean
1
ECUP State
150
uint16
Enable
Timer
[sec]
Time
double
2
ECUP Timer
ETC_ShutDownTimer
Data Read
MPRD
boolean
data
boolean
Reset TasksComplete To False

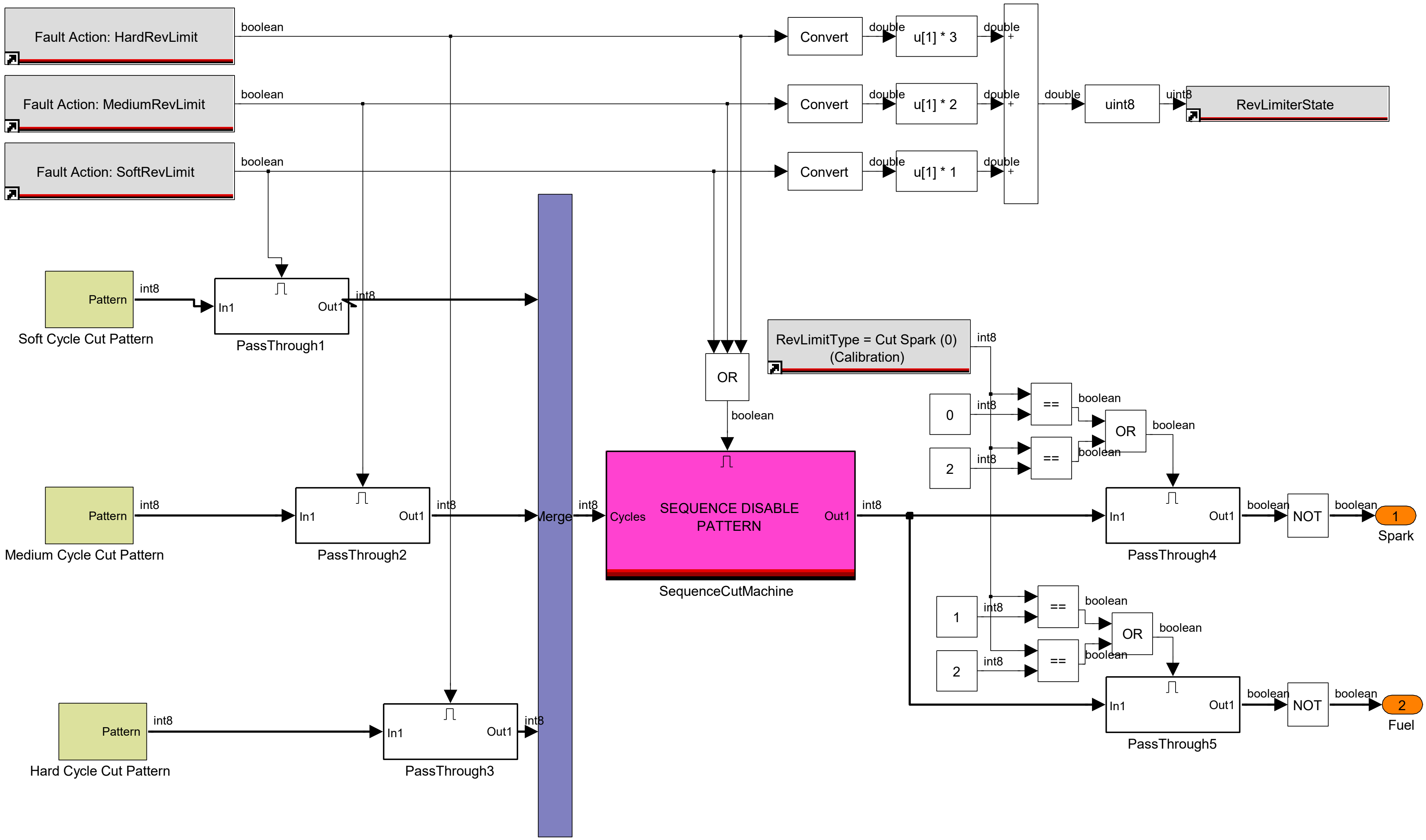

Trigger
false
boolean
Data Write
data
ShutDownTasksComplete
boolean

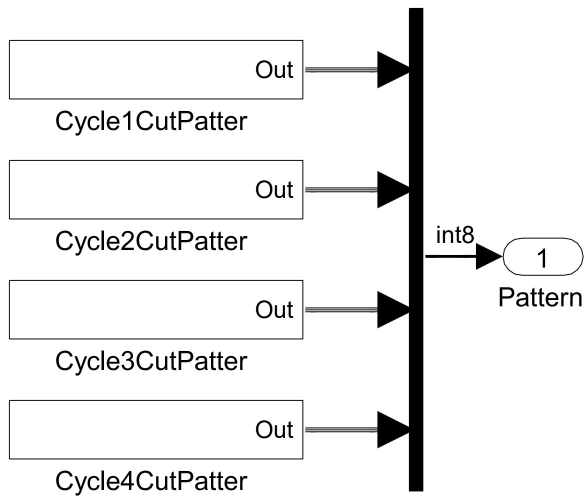


1
FPC [mg]
double
Fuel In
Fuel Out
Fuel Inj Offsets
double
InjGain = 0.351
(Calibration)
Injector Gain [ms/mg]
double
InjOffset = -0.05
(Calibration)
Injector Offset [ms]
double
double
double
2
FuelMult
double
double
min
double
InjMPW
1
MPW [ms]
60*1000*2
double
6
RPM
double
double
double
double
MaxAllowableMPW
7
FuelPress [kPa]
double
3
BaroPress [kPa]
double
4
MAP [kPa]
double
double
Inputs
Index
DeltaPressureIndex
index_T
InjdPComp[9]
i
double
InjTurnOff[9]
i
double
double
InjEPW
2
EPWOffset [ms]
5
SysVolt09Idx
index_T
InjTurnOn[9]
i
double

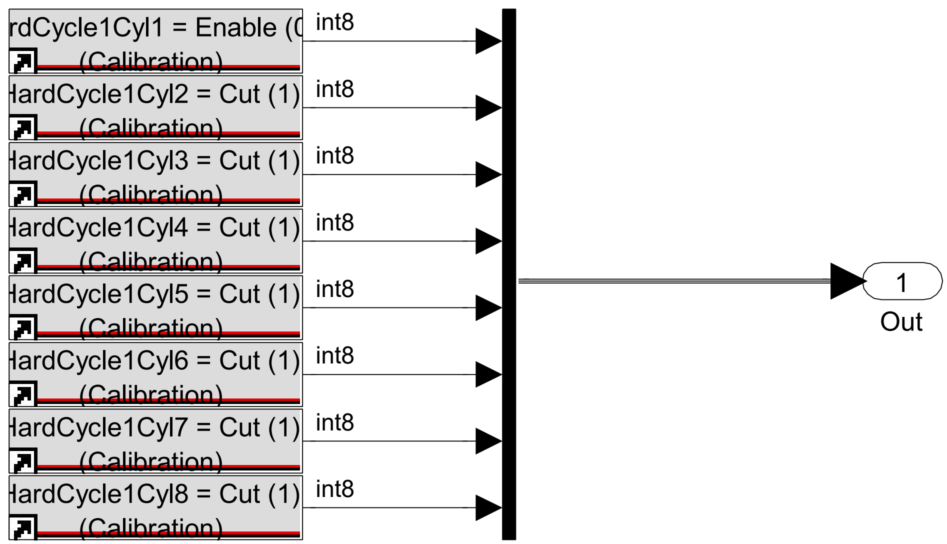

1
Inputs
double
u(1) + u(2) - u(3)
const ref to atm
double
FuelDeltaPress
InjDeltaPress09[9]
u
i
index_T
1
Index


1
Fuel In
double
Fuel_Cyl1
Fuel_Cyl2
Fuel_Cyl3
Fuel_Cyl4
Fuel_Cyl5
Fuel_Cyl6
Fuel_Cyl7
Fuel_Cyl8
Fuel_Global
TotalFPC
1
Fuel Out

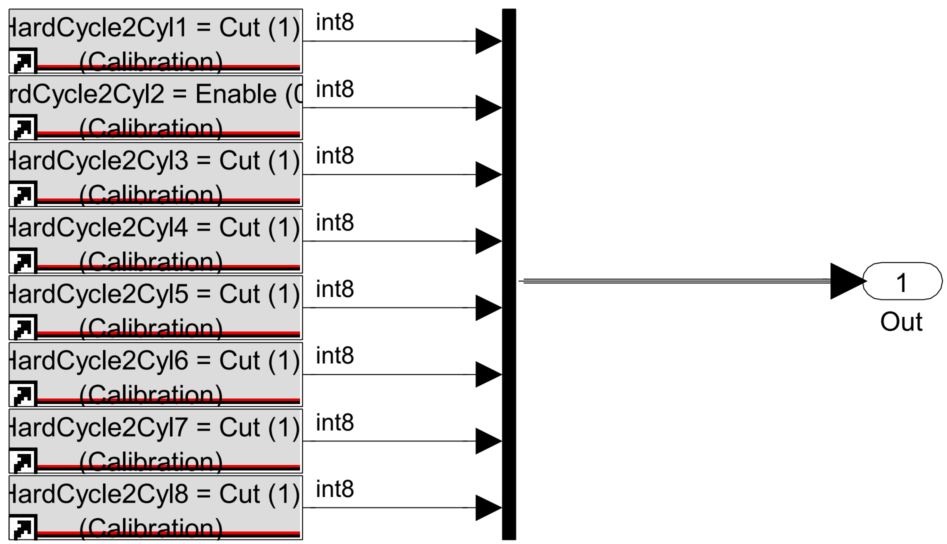

Fault Action: HardRevLimit
Fault Action: MediumRevLimit
Fault Action: SoftRevLimit
boolean
Convert
double
u[1] * 3
u[1] * 2
u[1] * 1
uint8
RevLimiterState
Pattern
int8
Soft Cycle Cut Pattern
In1
Out1
PassThrough1
OR
RevLimitType = Cut Spark (0)
(Calibration)
==
0
2
1
Medium Cycle Cut Pattern
PassThrough2
Merge
Cycles
SEQUENCE DISABLE PATTERN
SequenceCutMachine
PassThrough4
NOT
Spark
Fuel
PassThrough5
Hard Cycle Cut Pattern
PassThrough3



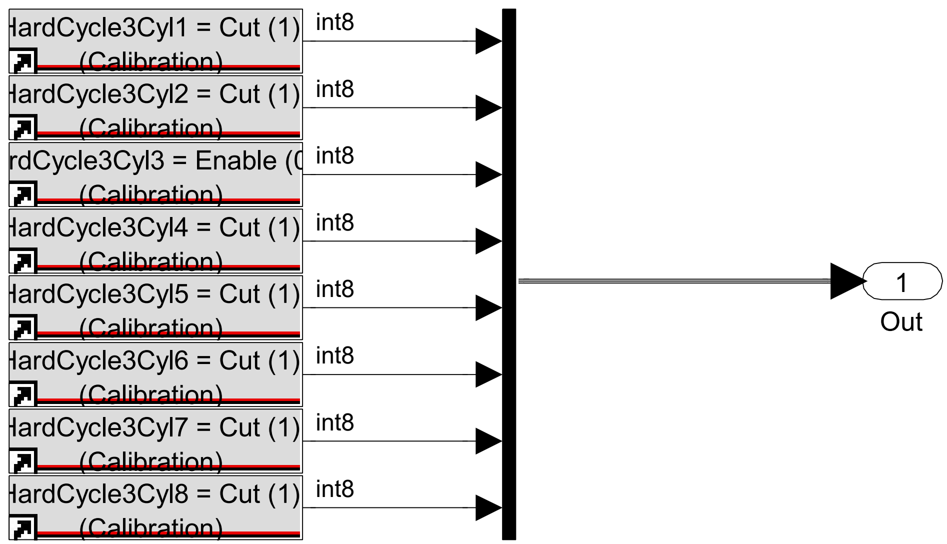
Out
Cycle1CutPatter
Out
Cycle2CutPatter
Out
Cycle3CutPatter
Out
Cycle4CutPatter
int8
1
Pattern



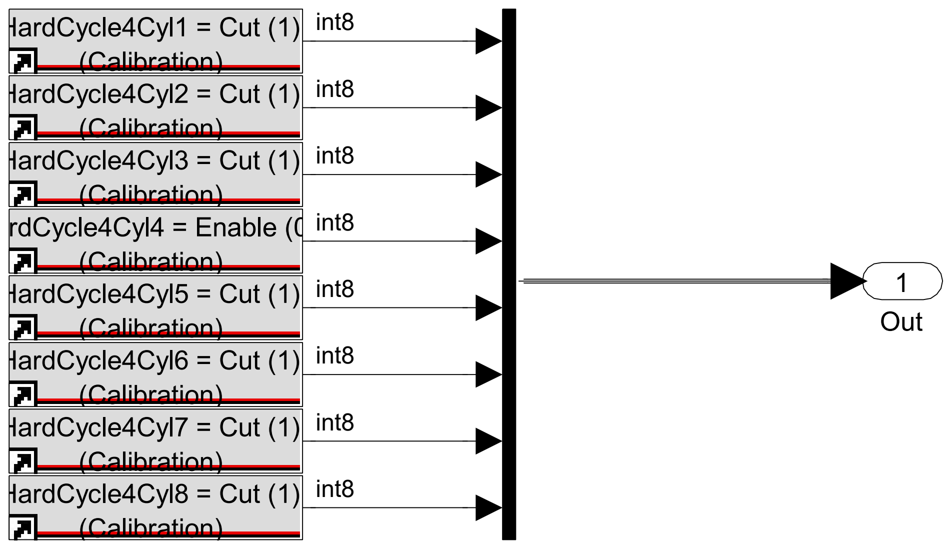
rdCycle1Cyl1 = Enable (0
(Calibration)
HardCycle1Cyl2 = Cut (1)
(Calibration)
HardCycle1Cyl3 = Cut (1)
(Calibration)
HardCycle1Cyl4 = Cut (1)
(Calibration)
HardCycle1Cyl5 = Cut (1)
(Calibration)
HardCycle1Cyl6 = Cut (1)
(Calibration)
HardCycle1Cyl7 = Cut (1)
(Calibration)
HardCycle1Cyl8 = Cut (1)
(Calibration)
int8
int8
int8
int8
int8
int8
int8
int8
1
Out



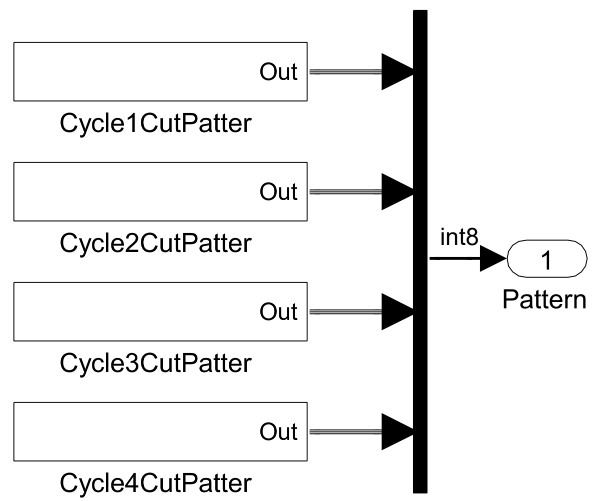
HardCycle2Cyl1 = Cut (1)
(Calibration)
rdCycle2Cyl2 = Enable (0
(Calibration)
HardCycle2Cyl3 = Cut (1)
(Calibration)
HardCycle2Cyl4 = Cut (1)
(Calibration)
HardCycle2Cyl5 = Cut (1)
(Calibration)
HardCycle2Cyl6 = Cut (1)
(Calibration)
HardCycle2Cyl7 = Cut (1)
(Calibration)
HardCycle2Cyl8 = Cut (1)
(Calibration)
int8
int8
int8
int8
int8
int8
int8
int8
1
Out



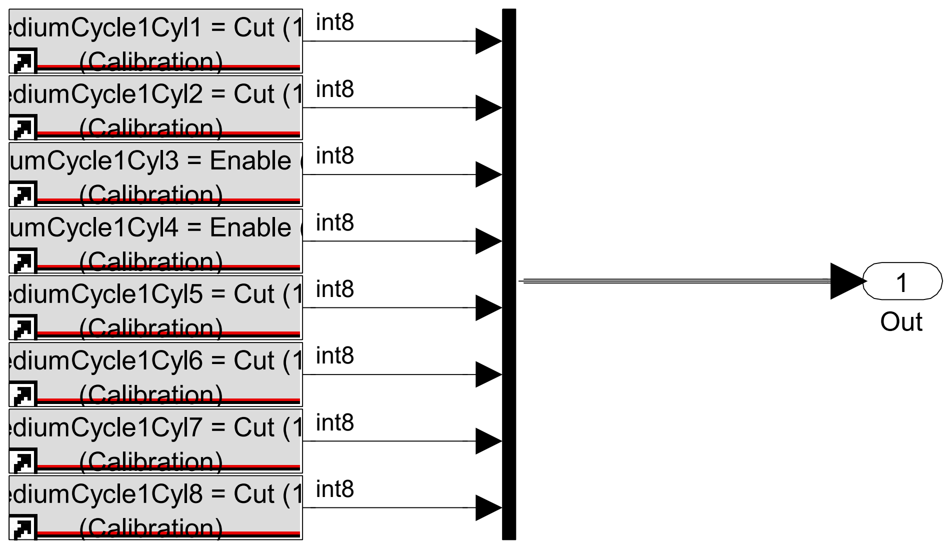
HardCycle3Cyl1 = Cut (1)
(Calibration)
HardCycle3Cyl2 = Cut (1)
(Calibration)
rdCycle3Cyl3 = Enable (0
(Calibration)
HardCycle3Cyl4 = Cut (1)
(Calibration)
HardCycle3Cyl5 = Cut (1)
(Calibration)
HardCycle3Cyl6 = Cut (1)
(Calibration)
HardCycle3Cyl7 = Cut (1)
(Calibration)
HardCycle3Cyl8 = Cut (1)
(Calibration)
int8
1
Out



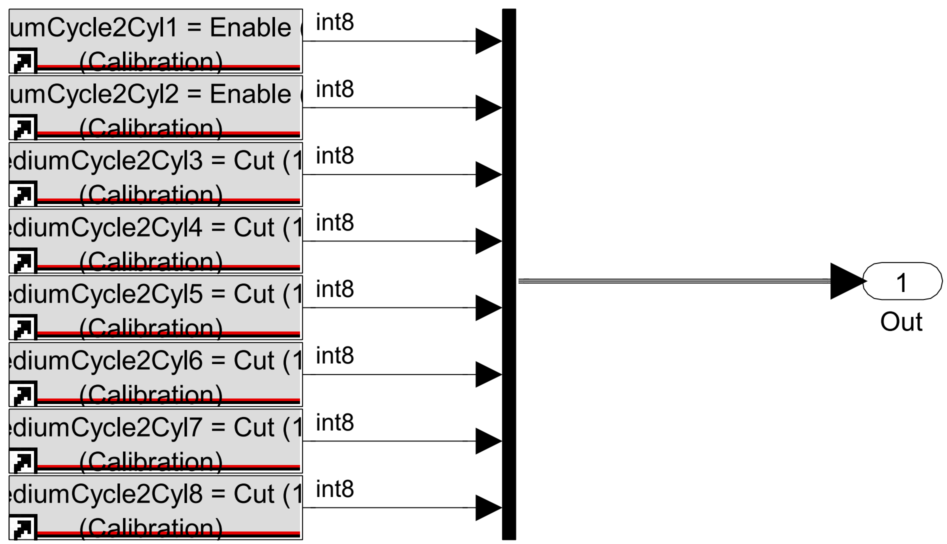
ardCycle4Cyl1 = Cut (1)
(Calibration)
ardCycle4Cyl2 = Cut (1)
(Calibration)
ardCycle4Cyl3 = Cut (1)
(Calibration)
rdCycle4Cyl4 = Enable (0
(Calibration)
ardCycle4Cyl5 = Cut (1)
(Calibration)
ardCycle4Cyl6 = Cut (1)
(Calibration)
ardCycle4Cyl7 = Cut (1)
(Calibration)
ardCycle4Cyl8 = Cut (1)
(Calibration)
int8
1
Out



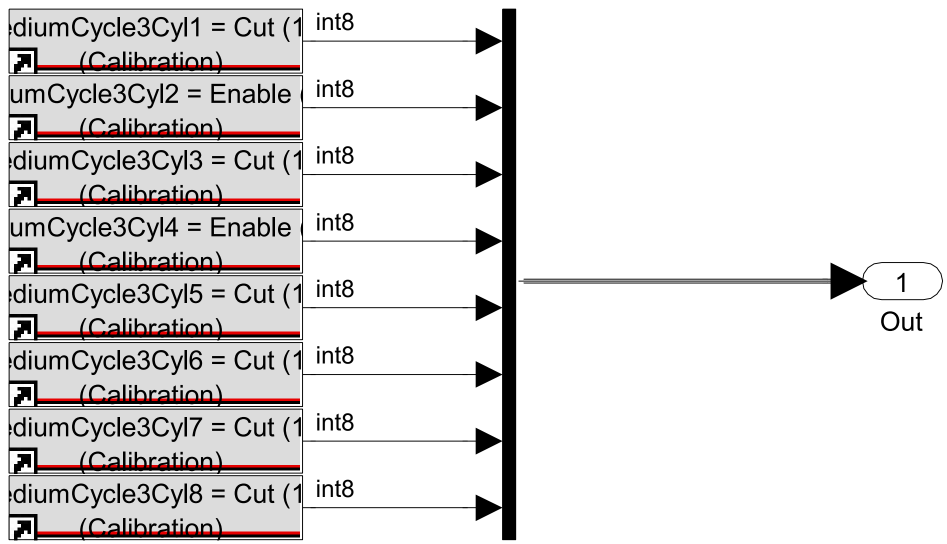
Out
Cycle1CutPatter
Out
Cycle2CutPatter
Out
Cycle3CutPatter
Out
Cycle4CutPatter
int8
1
Pattern



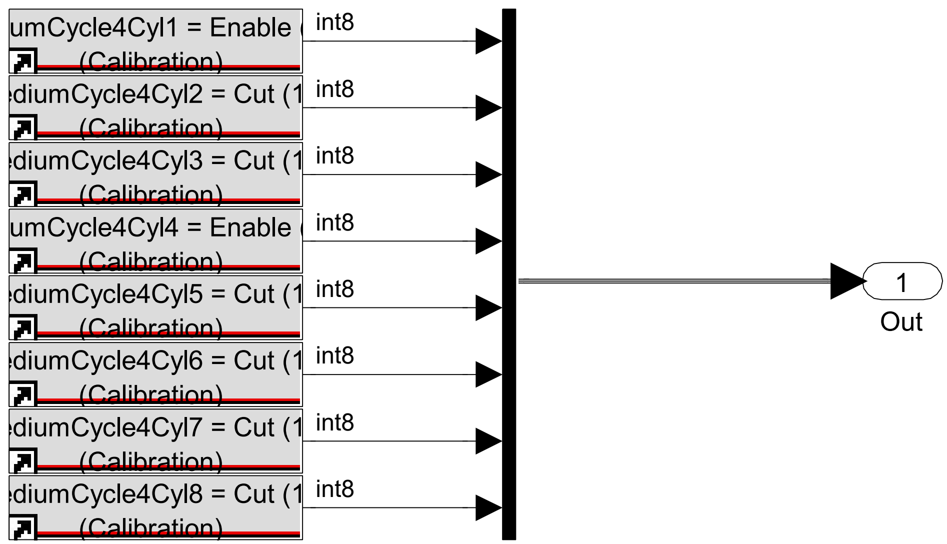
dediumCycle1Cyl1 = Cut (1
(Calibration)
dediumCycle1Cyl2 = Cut (1
(Calibration)
umCycle1Cyl3 = Enable (
(Calibration)
umCycle1Cyl4 = Enable (
(Calibration)
dediumCycle1Cyl5 = Cut (1
(Calibration)
dediumCycle1Cyl6 = Cut (1
(Calibration)
dediumCycle1Cyl7 = Cut (1
(Calibration)
dediumCycle1Cyl8 = Cut (1
(Calibration)
int8
int8
int8
int8
int8
int8
int8
int8
1
Out



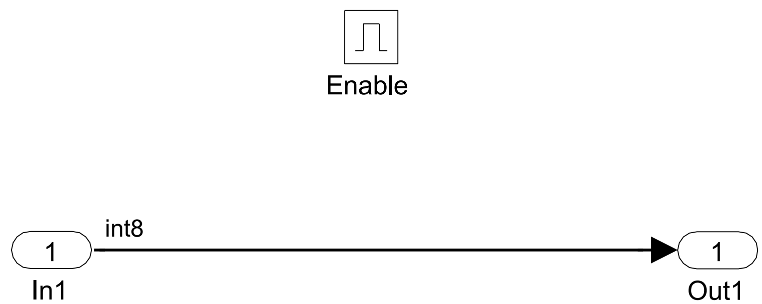
umCycle2Cyl1 = Enable (
(Calibration)
umCycle2Cyl2 = Enable (
(Calibration)
ediumCycle2Cyl3 = Cut (1
(Calibration)
ediumCycle2Cyl4 = Cut (1
(Calibration)
ediumCycle2Cyl5 = Cut (1
(Calibration)
ediumCycle2Cyl6 = Cut (1
(Calibration)
ediumCycle2Cyl7 = Cut (1
(Calibration)
ediumCycle2Cyl8 = Cut (1
(Calibration)
int8
int8
int8
int8
int8
int8
int8
int8
1
Out

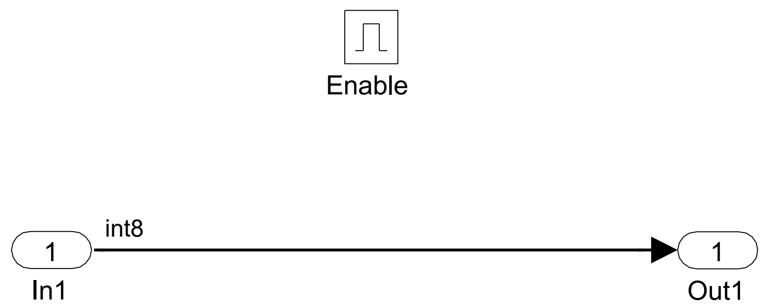


diumCycle3Cyl1 = Cut (1
(Calibration)
umCycle3Cyl2 = Enable (
(Calibration)
diumCycle3Cyl3 = Cut (1
(Calibration)
umCycle3Cyl4 = Enable (
(Calibration)
diumCycle3Cyl5 = Cut (1
(Calibration)
diumCycle3Cyl6 = Cut (1
(Calibration)
diumCycle3Cyl7 = Cut (1
(Calibration)
diumCycle3Cyl8 = Cut (1
(Calibration)
int8
int8
int8
int8
int8
int8
int8
int8
1
Out

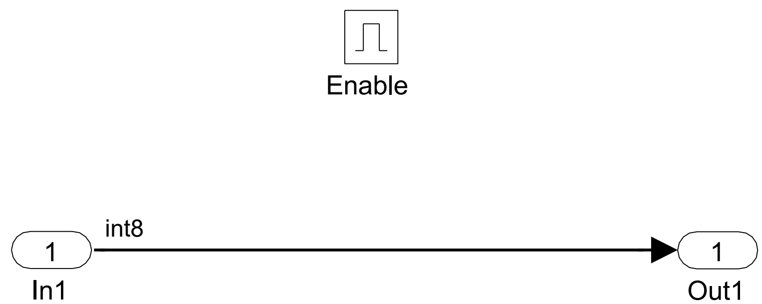


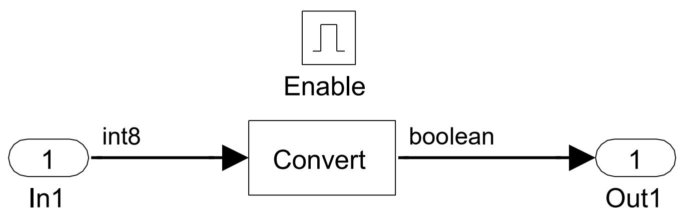
umCycle4Cyl1 = Enable (
(Calibration)
diumCycle4Cyl2 = Cut (1
(Calibration)
diumCycle4Cyl3 = Cut (1
(Calibration)
umCycle4Cyl4 = Enable (
(Calibration)
diumCycle4Cyl5 = Cut (1
(Calibration)
diumCycle4Cyl6 = Cut (1
(Calibration)
diumCycle4Cyl7 = Cut (1
(Calibration)
diumCycle4Cyl8 = Cut (1
(Calibration)
int8
int8
int8
int8
int8
int8
int8
int8
1
Out


Enable
int8
1
In1
1
Out1

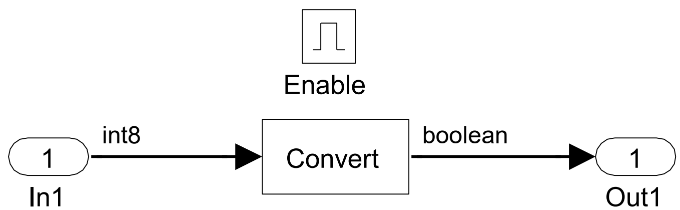


Enable
int8
1
In1
1
Out1

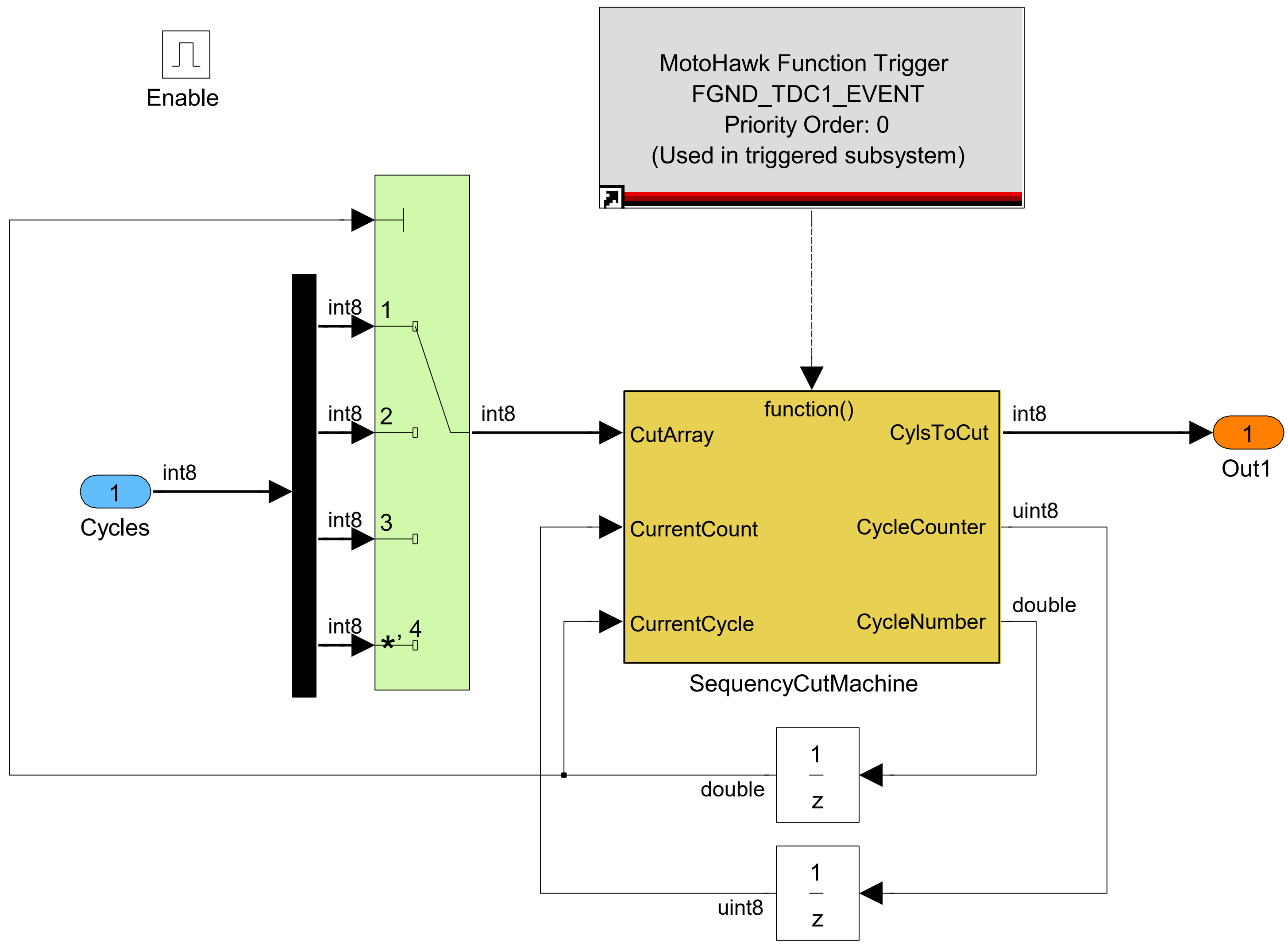

Enable
1
int8
In1
1
Out1



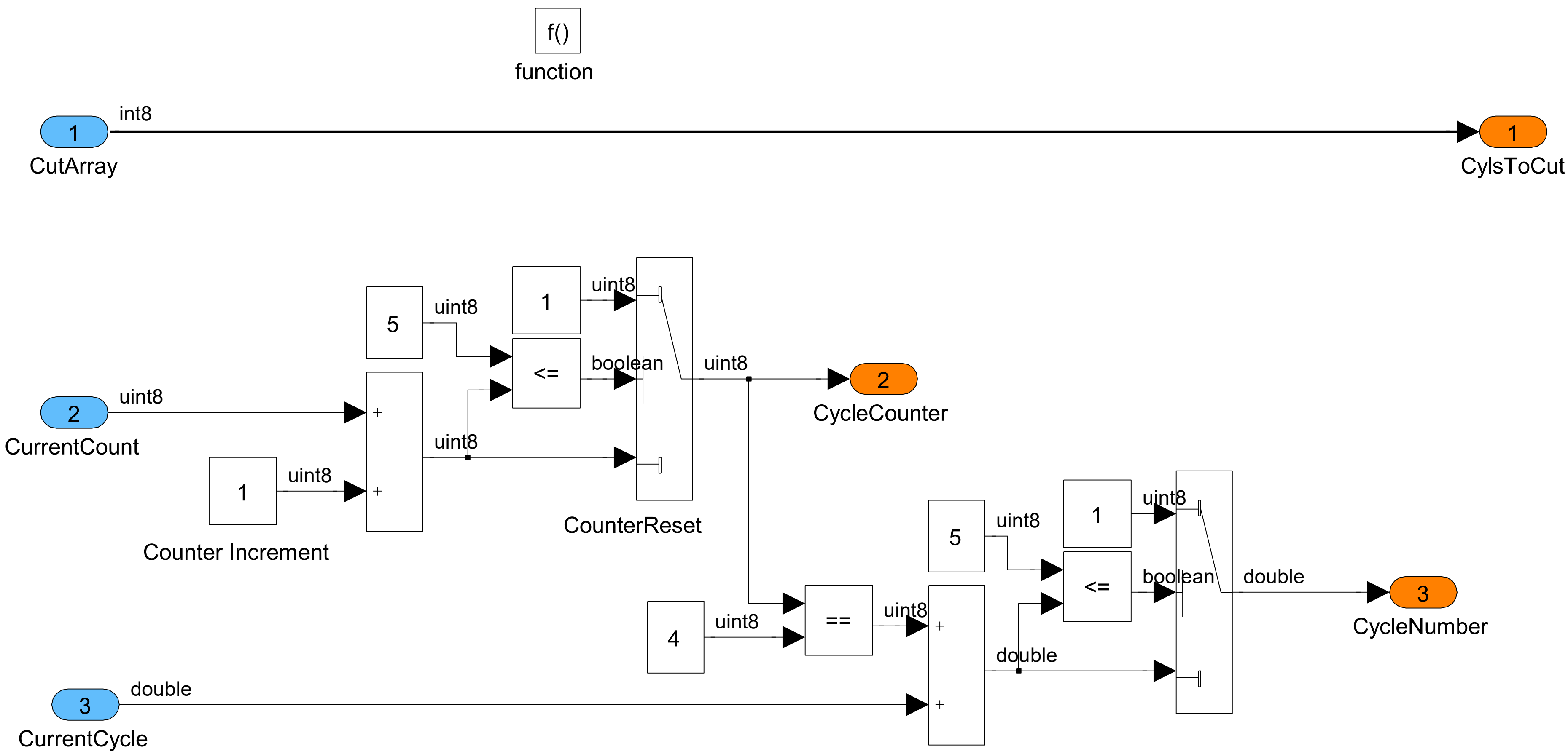
Enable
1
In1
int8
Convert
boolean
1
Out1



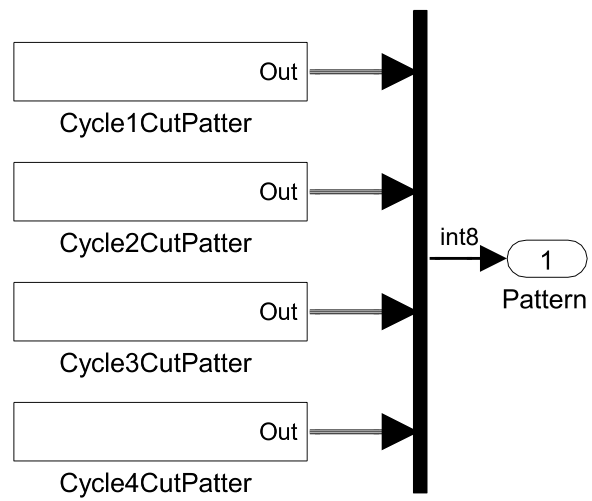
Enable
int8
1
In1
Convert
boolean
1
Out1

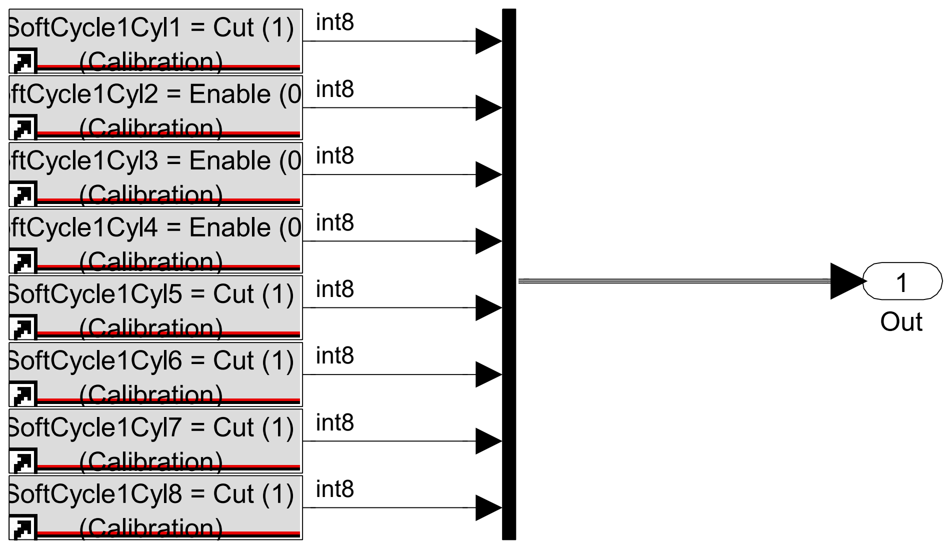


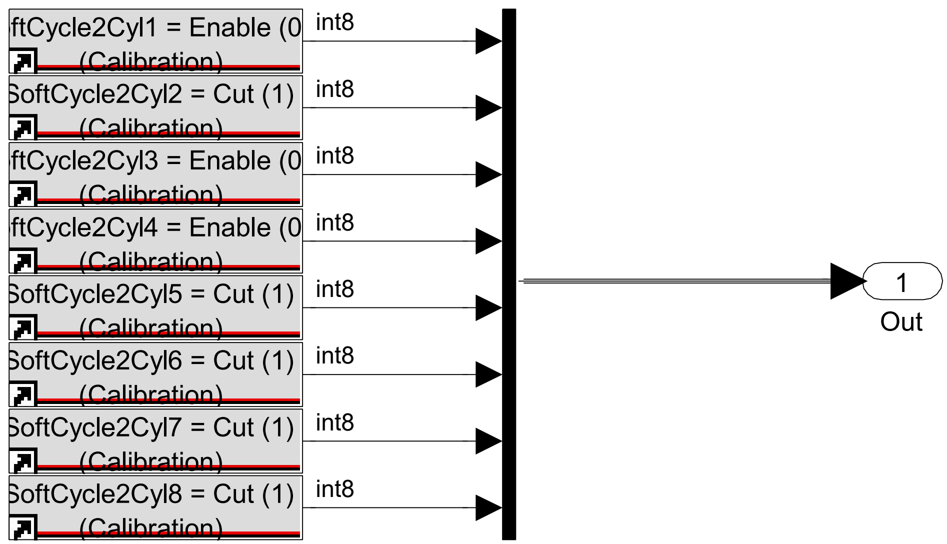
Enable
MotoHawk Function Trigger
FGND_TDC1_EVENT
Priority Order: 0
(Used in triggered subsystem)
int8
1
2
3
4
1
Cycles
function()
CutArray
CylsToCut
CurrentCount
CycleCounter
CurrentCycle
CycleNumber
uint8
double
SequencyCutMachine
1
Out1
1
z



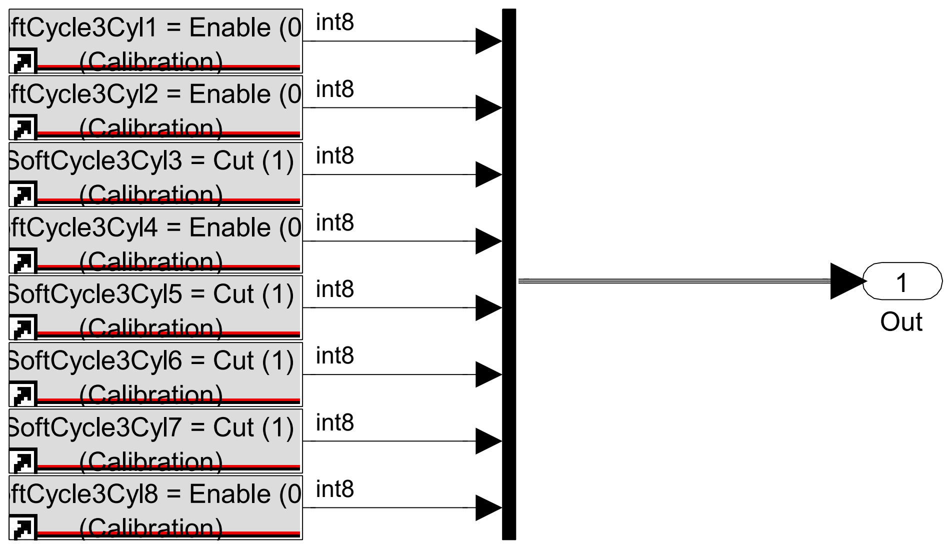
f()
function
int8
1
CutArray
1
CylsToCut
5
uint8
1
uint8
<=
boolean
uint8
2
CycleCounter
2
uint8
CurrentCount
1
uint8
uint8
Counter Increment
CounterReset
5
uint8
1
uint8
<=
boolean
double
3
CycleNumber
4
uint8
==
uint8
double
3
double
CurrentCycle


Out
Cycle1CutPatter
Out
Cycle2CutPatter
Out
Cycle3CutPatter
Out
Cycle4CutPatter
int8
1
Pattern

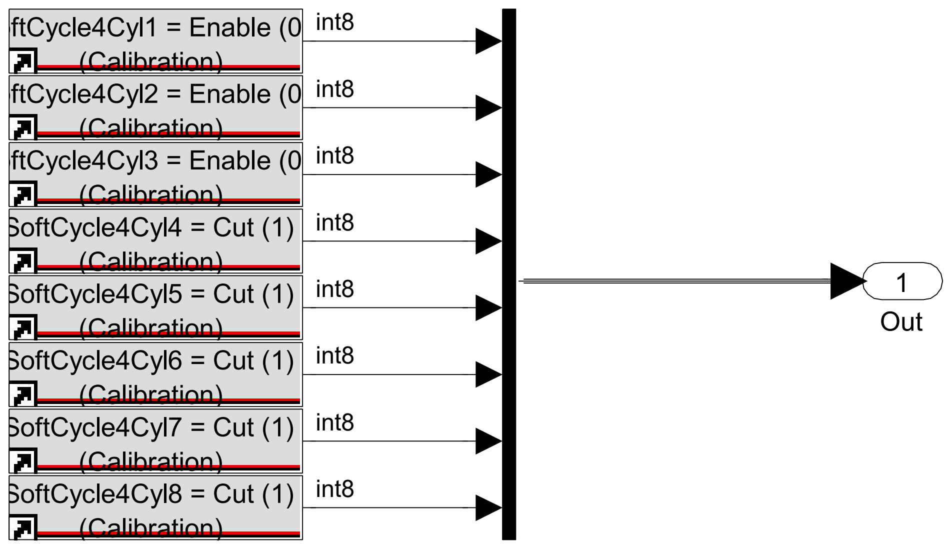

SoftCycle1Cyl1 = Cut (1)
(Calibration)
ftCycle1Cyl2 = Enable (0
(Calibration)
ftCycle1Cyl3 = Enable (0
(Calibration)
ftCycle1Cyl4 = Enable (0
(Calibration)
SoftCycle1Cyl5 = Cut (1)
(Calibration)
SoftCycle1Cyl6 = Cut (1)
(Calibration)
SoftCycle1Cyl7 = Cut (1)
(Calibration)
SoftCycle1Cyl8 = Cut (1)
(Calibration)
int8
int8
int8
int8
int8
int8
int8
int8
1
Out



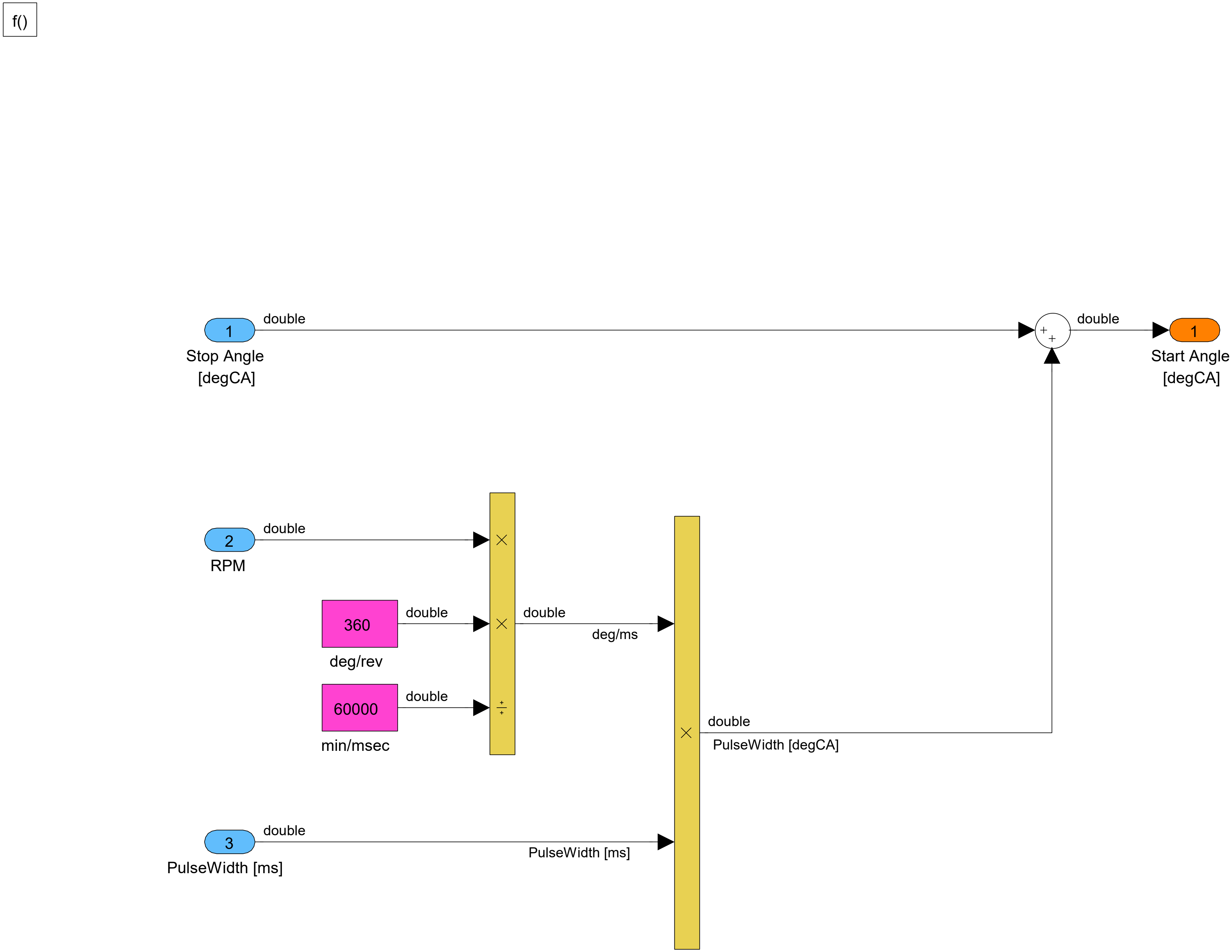
ftCycle2Cyl1 = Enable (0
(Calibration)
SoftCycle2Cyl2 = Cut (1)
(Calibration)
ftCycle2Cyl3 = Enable (0
(Calibration)
ftCycle2Cyl4 = Enable (0
(Calibration)
SoftCycle2Cyl5 = Cut (1)
(Calibration)
SoftCycle2Cyl6 = Cut (1)
(Calibration)
SoftCycle2Cyl7 = Cut (1)
(Calibration)
SoftCycle2Cyl8 = Cut (1)
(Calibration)
int8
int8
int8
int8
int8
int8
int8
int8
1
Out



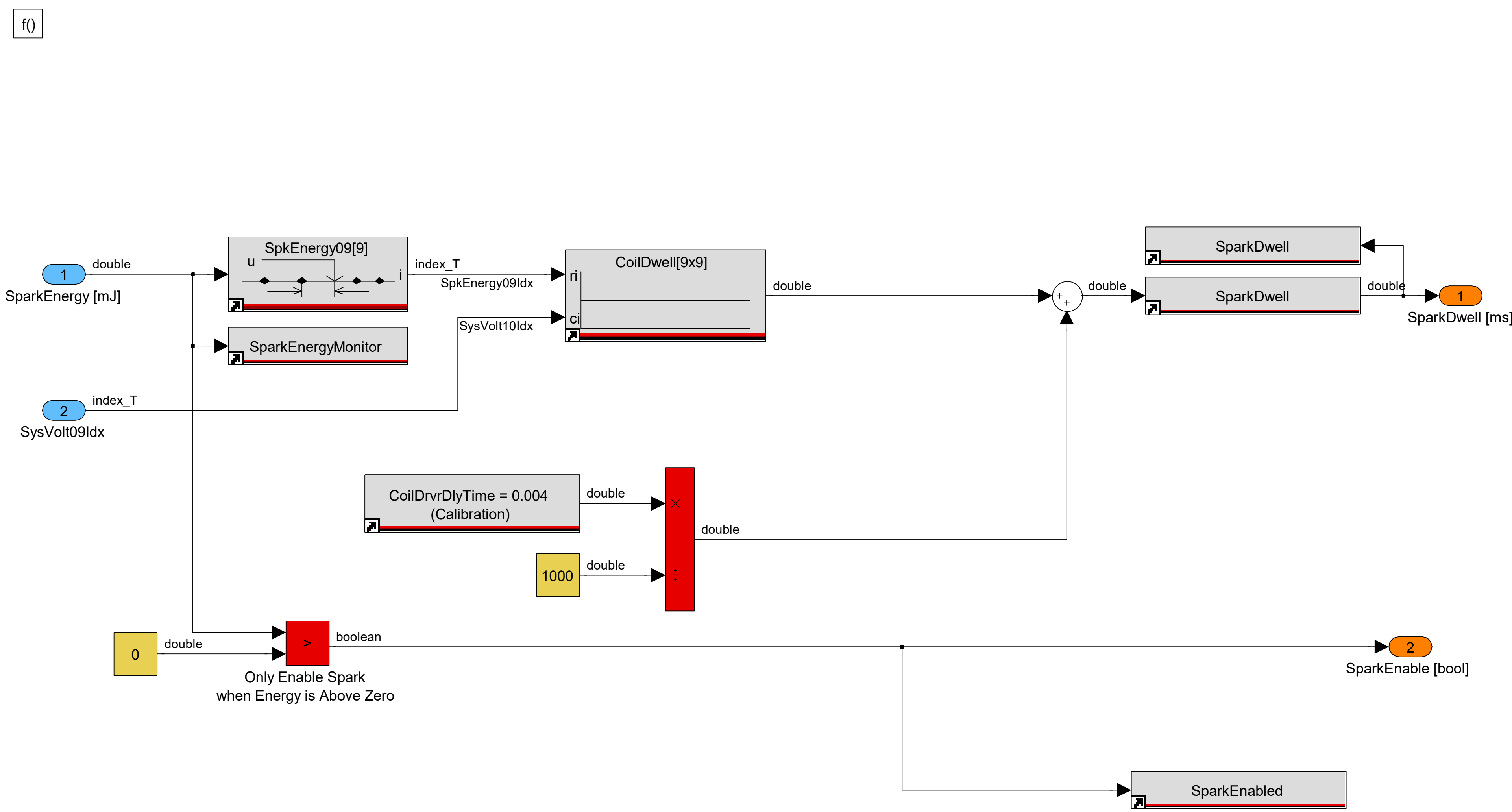
ftCycle3Cyl1 = Enable (0
(Calibration)
ftCycle3Cyl2 = Enable (0
(Calibration)
SoftCycle3Cyl3 = Cut (1)
(Calibration)
ftCycle3Cyl4 = Enable (0
(Calibration)
SoftCycle3Cyl5 = Cut (1)
(Calibration)
SoftCycle3Cyl6 = Cut (1)
(Calibration)
SoftCycle3Cyl7 = Cut (1)
(Calibration)
ftCycle3Cyl8 = Enable (0
(Calibration)
int8
int8
int8
int8
int8
int8
int8
int8
1
Out

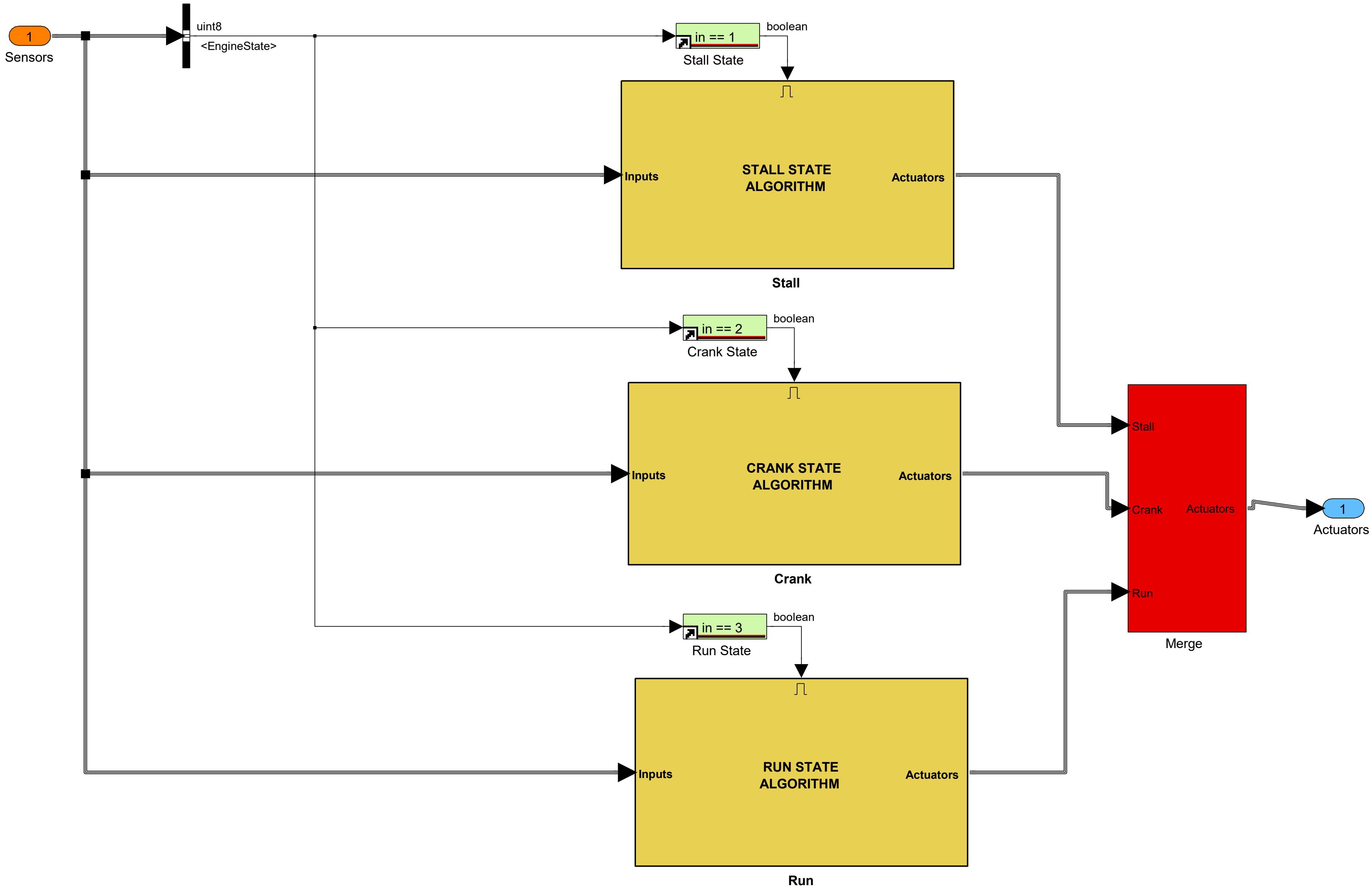


ftCycle4Cyl1 = Enable (0
(Calibration)
ftCycle4Cyl2 = Enable (0
(Calibration)
ftCycle4Cyl3 = Enable (0
(Calibration)
SoftCycle4Cyl4 = Cut (1)
(Calibration)
SoftCycle4Cyl5 = Cut (1)
(Calibration)
SoftCycle4Cyl6 = Cut (1)
(Calibration)
SoftCycle4Cyl7 = Cut (1)
(Calibration)
SoftCycle4Cyl8 = Cut (1)
(Calibration)
int8
int8
int8
int8
int8
int8
int8
int8
1
Out

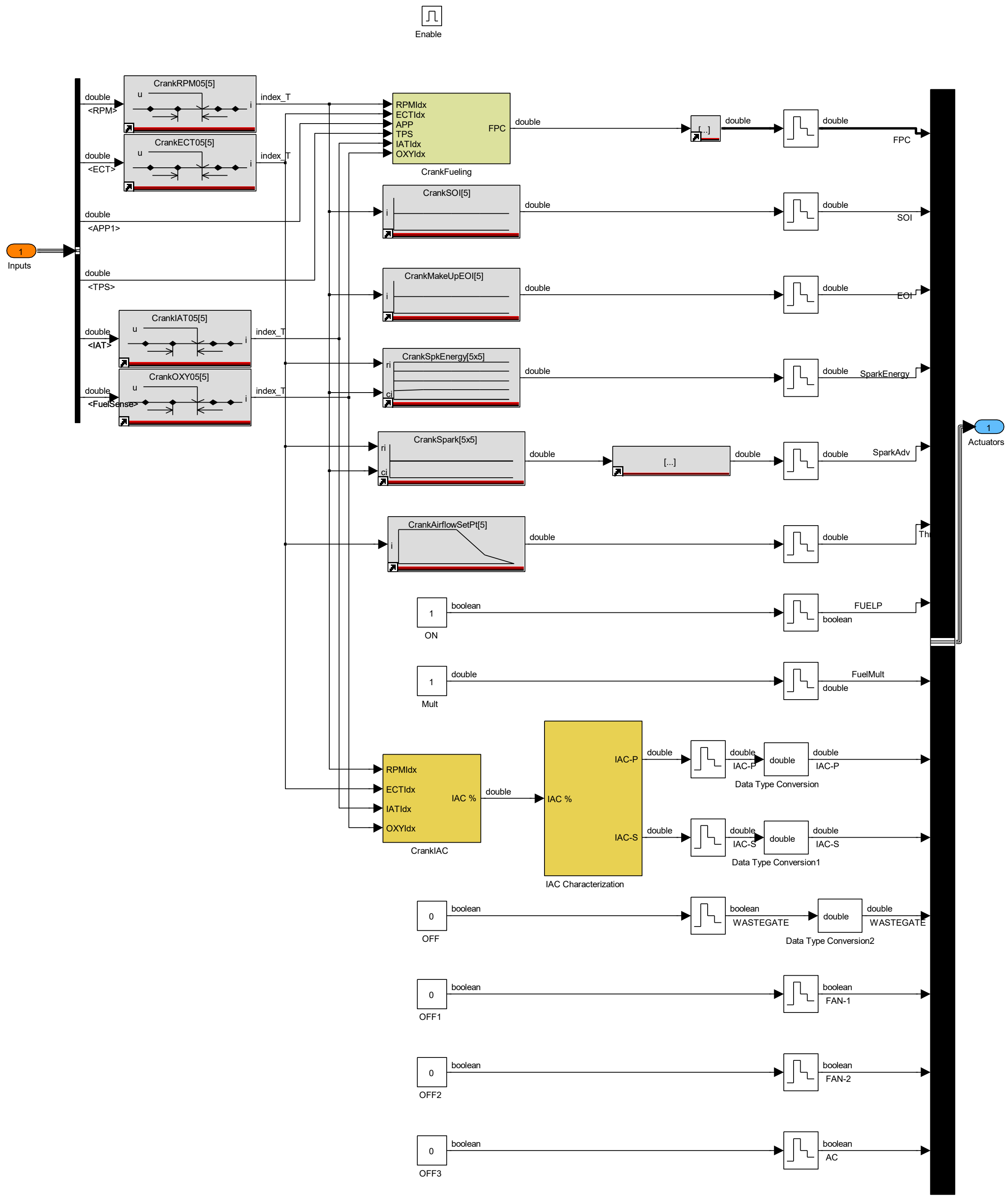


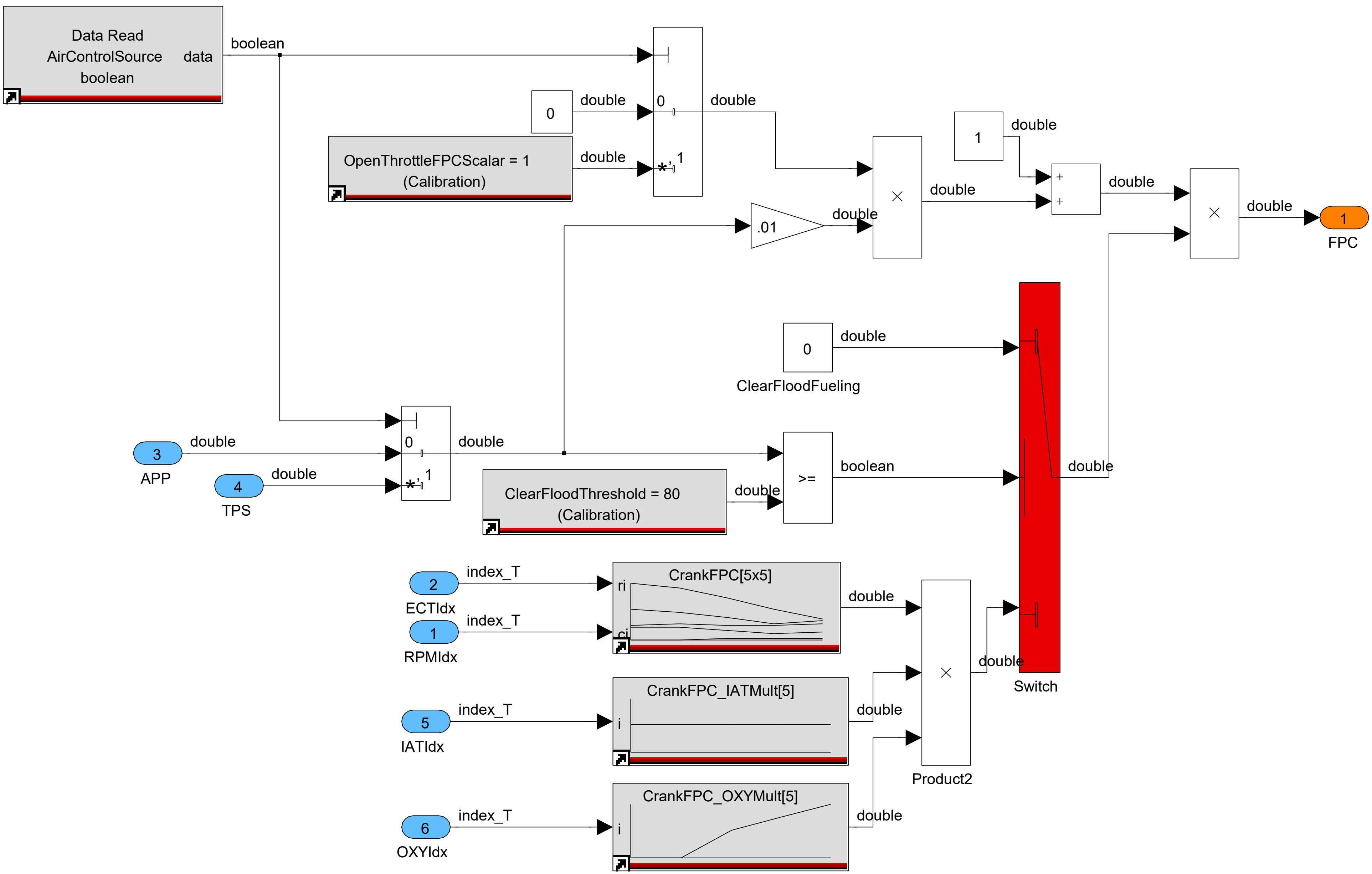
f()
1
Stop Angle [degCA]
double
+
+
double
1
Start Angle [degCA]
2
RPM
double
360
deg/rev
double
60000
min/msec
double
double
deg/ms
double
PulseWidth [degCA]
3
PulseWidth [ms]
double
PulseWidth [ms]


f()
1
SparkEnergy [mJ]
double
SpkEnergy09[9]
u
i
index_T
SpkEnergy09Idx
CoilDwell[9x9]
ri
ci
SysVolt10Idx
double
SparkEnergyMonitor
2
SysVolt09Idx
index_T
double
SparkDwell
SparkDwell
double
1
SparkDwell [ms]
CoilDrvrDlyTime = 0.004
(Calibration)
double
1000
double
double
0
double
>
boolean
Only Enable Spark
when Energy is Above Zero
2
SparkEnable [bool]
SparkEnabled

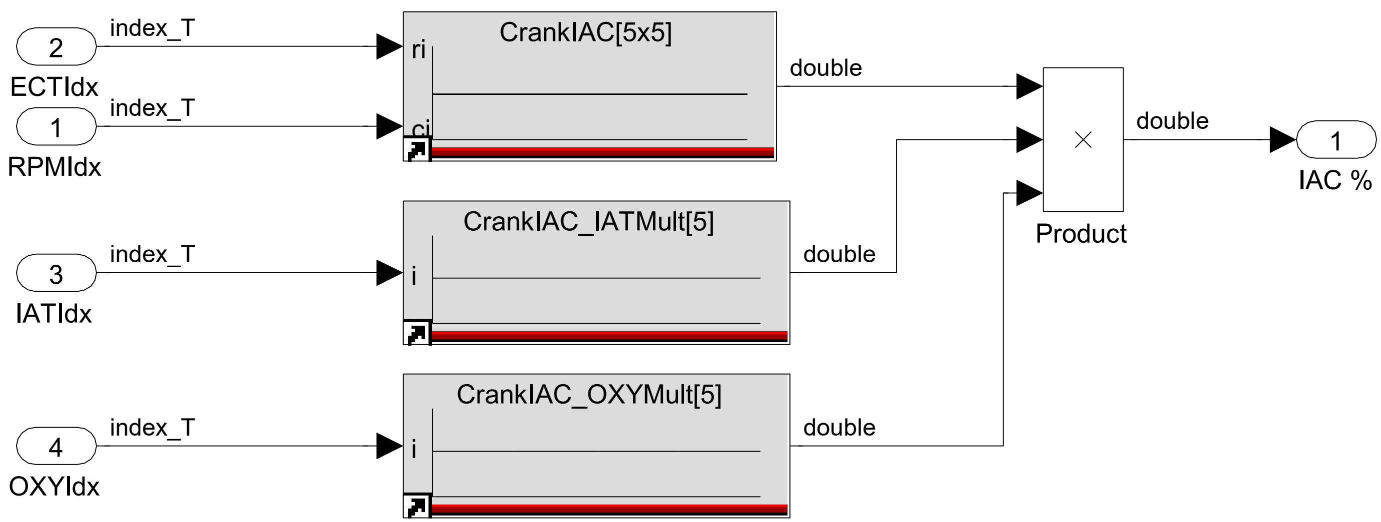


1
Sensors
uint8
<EngineState>
in == 1
boolean
Stall State
Inputs
STALL STATE
ALGORITHM
Actuators
Stall
in == 2
boolean
Crank State
Inputs
CRANK STATE
ALGORITHM
Actuators
Crank
in == 3
boolean
Run State
Inputs
RUN STATE
ALGORITHM
Actuators
Run
Stall
Crank
Actuators
Run
Merge
1
Actuators

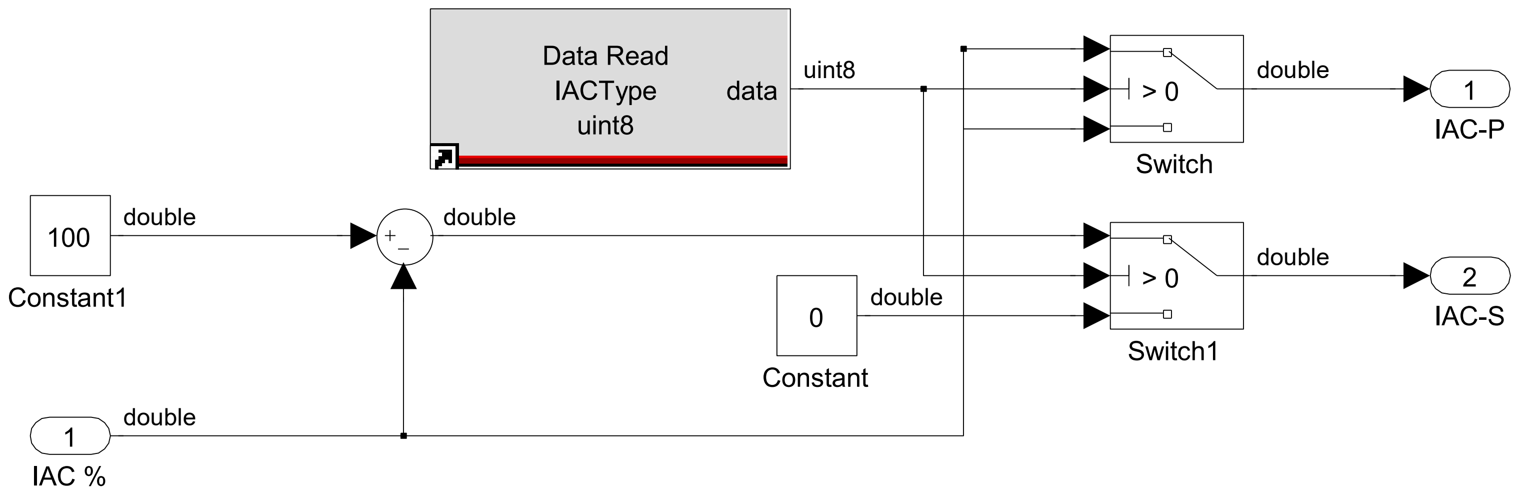

Enable
Inputs
CrankRPM05[5]
CrankECT05[5]
CrankIAT05[5]
CrankOXY05[5]
<RPM>
<ECT>
<APP1>
<TPS>
<IAT>
<FuelSense>
index_T
RPMIdx
ECTIdx
APP
TPS
IATIdx
OXYIdx
FPC
CrankFueling
CrankSOI[5]
CrankMakeUpEOI[5]
CrankSpkEnergy[5x5]
CrankSpark[5x5]
CrankAirflowSetPt[5]
SOI
EOI
SparkEnergy
SparkAdv
FUELP
FuelMult
ON
Mult
CrankIAC
IAC %
IAC Characterization
IAC-P
IAC-S
Data Type Conversion
Data Type Conversion1
Data Type Conversion2
WASTEGATE
OFF
OFF1
OFF2
OFF3
FAN-1
FAN-2
AC
Actuators
double
boolean



Data Read
AirControlSource
data
boolean
boolean
0
double
double
OpenThrottleFPCScalar = 1
(Calibration)
double
*
1
1
double
double
.01
double
double
double
double
FPC
0
double
ClearFloodFueling
APP
double
TPS
double
double
ClearFloodThreshold = 80
(Calibration)
double
>=
boolean
double
Switch
ECTIdx
index_T
RPMIdx
index_T
CrankFPC[5x5]
ri
ci
double
IATIdx
index_T
CrankFPC_IATMult[5]
i
double
Product2
double
OXYIdx
index_T
CrankFPC_OXYMult[5]
i
double

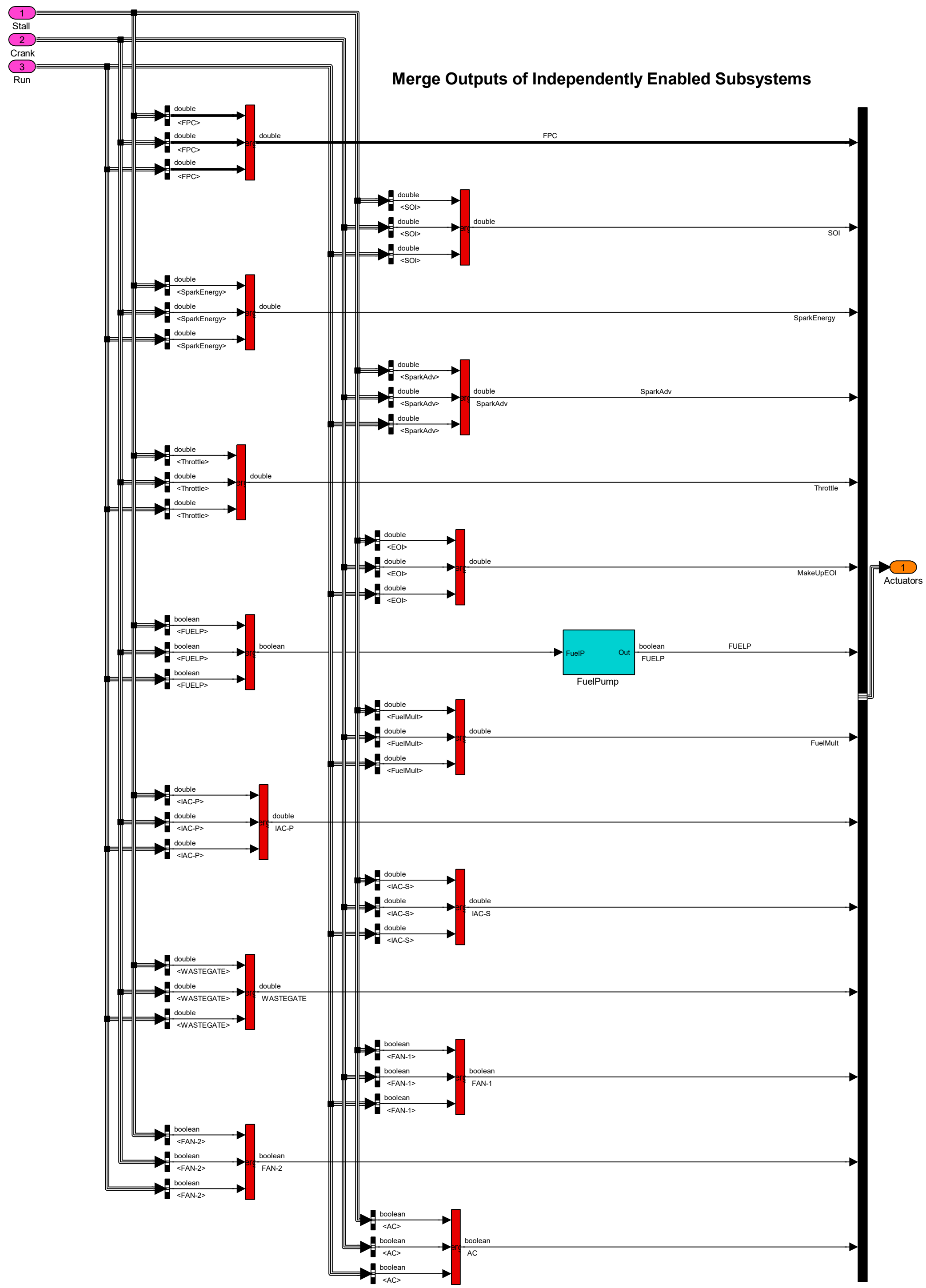


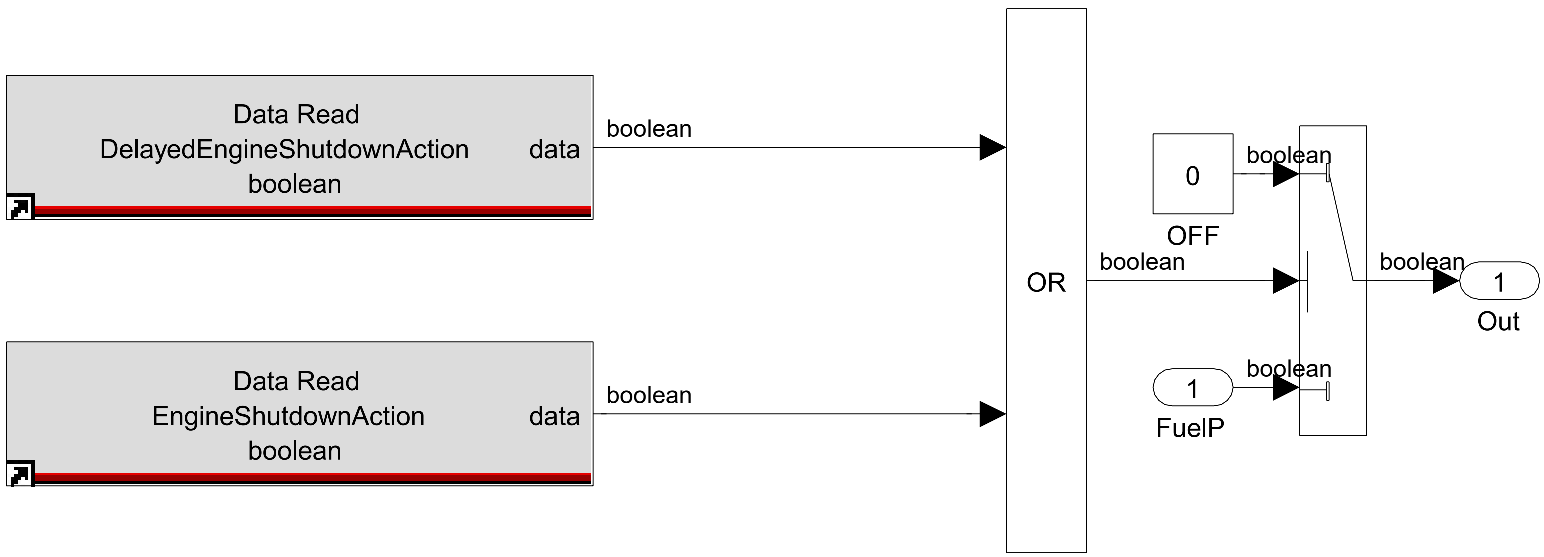
2
ECTIdx
1
RPMIdx
3
IATIdx
4
OXYIdx
index_T
index_T
index_T
index_T
CrankIAC[5x5]
ri
ci
CrankIAC_IATMult[5]
i
CrankIAC_OXYMult[5]
i
double
double
double
Product
double
1
IAC %

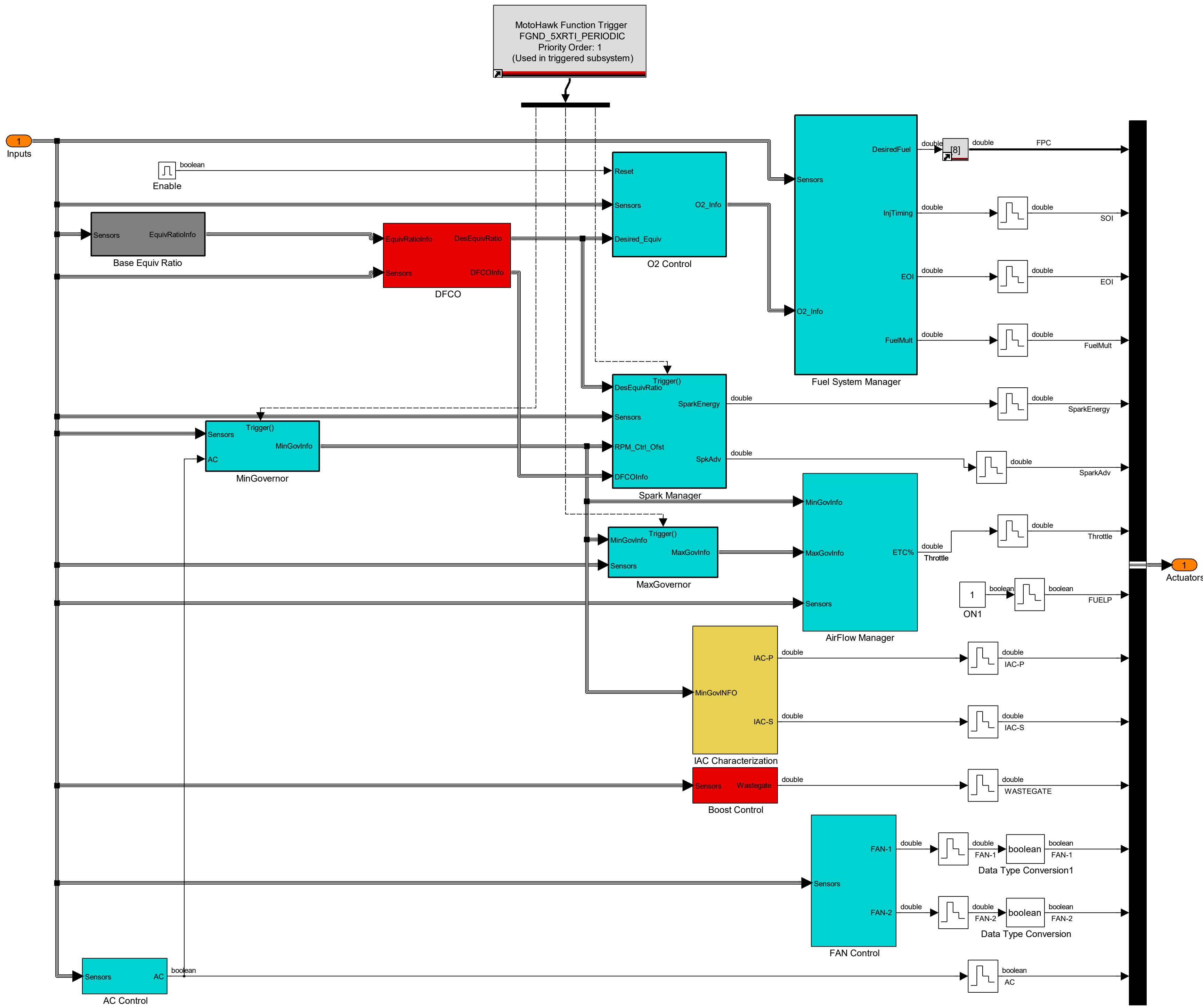


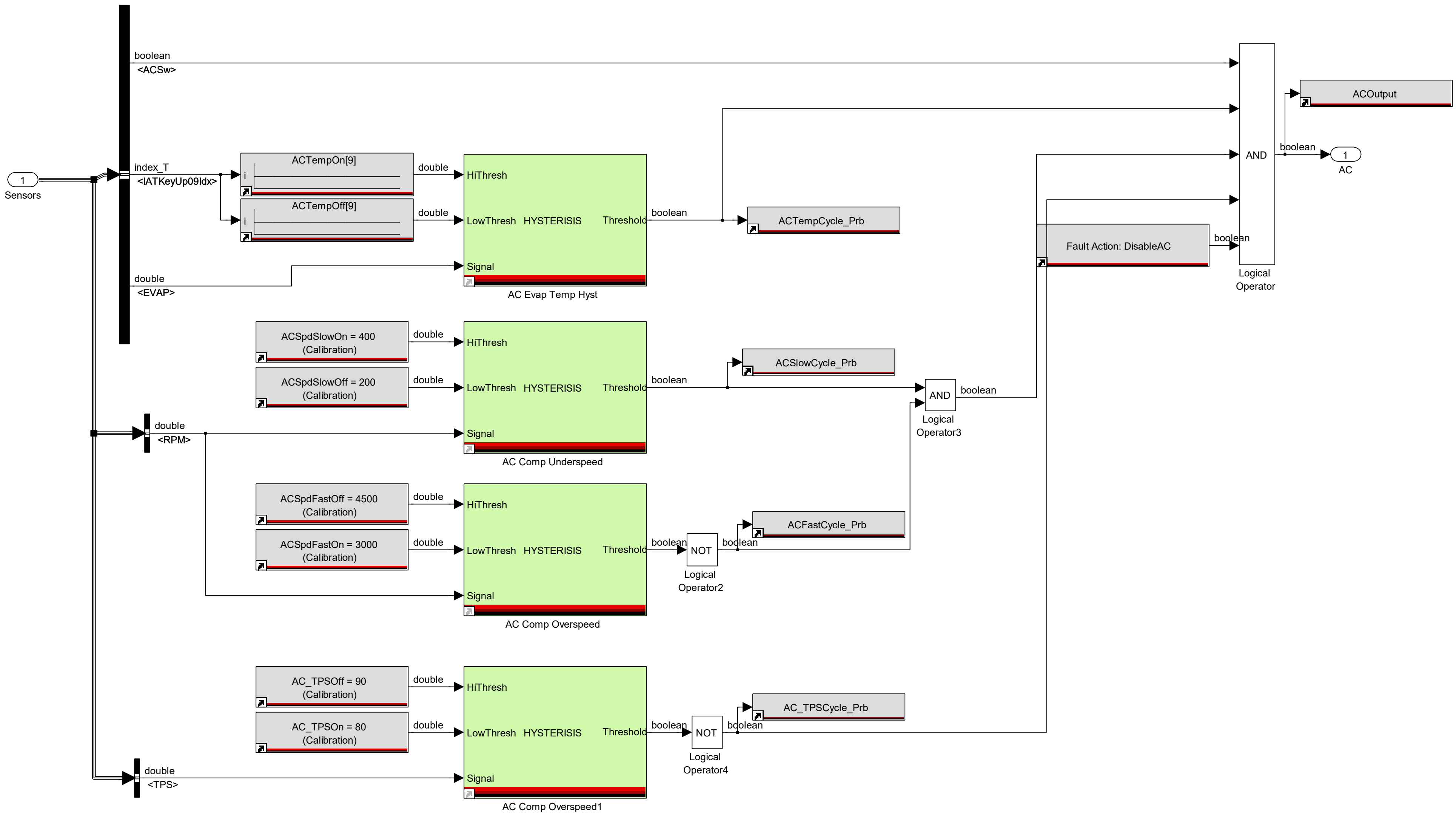
Data Read
IACType
uint8
data
uint8
100
Constant1
double
double
double
1
IAC %
0
Constant
double
> 0
Switch
> 0
Switch1
double
double
1
IAC-P
2
IAC-S

Merge Outputs of Independently Enabled Subsystems

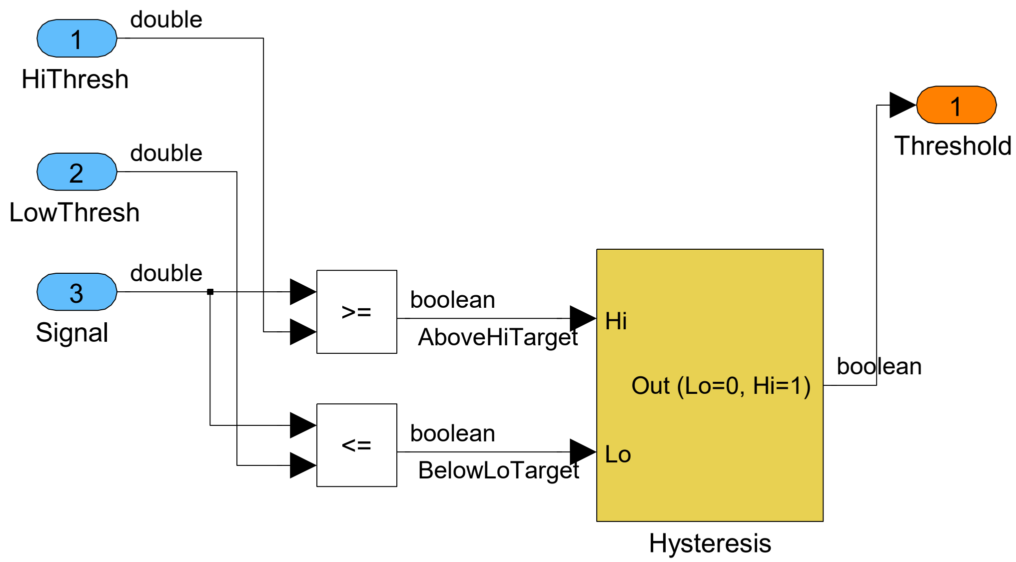


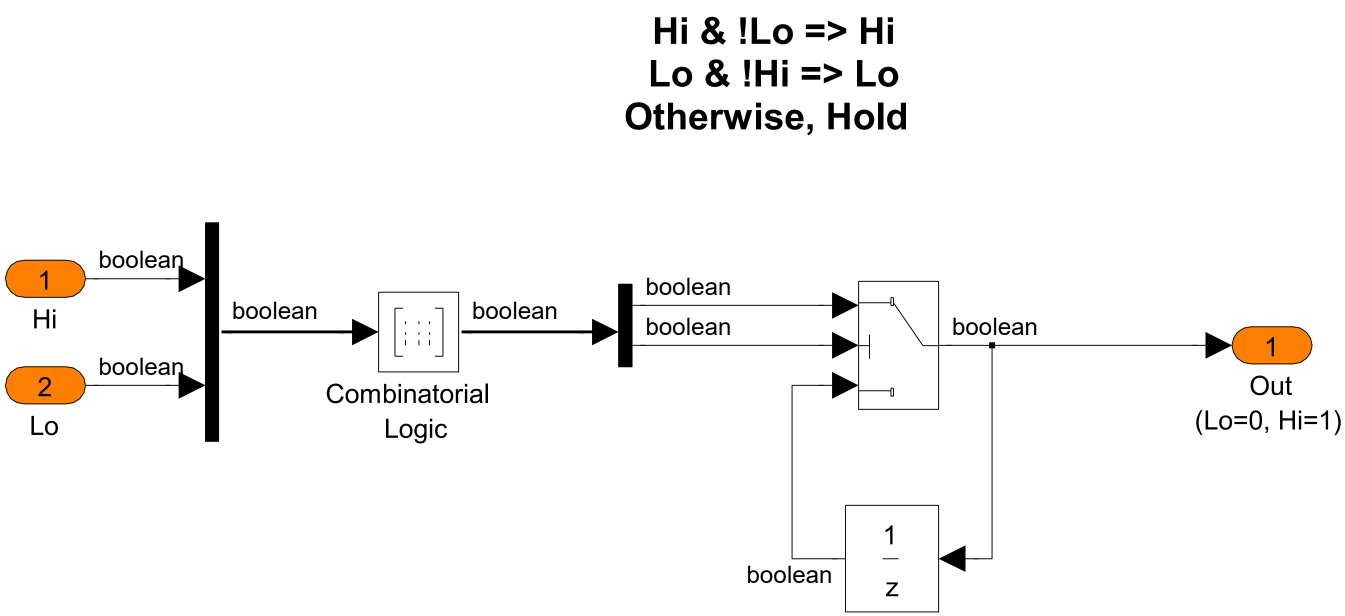

Data Read
DelayedEngineShutdownAction
boolean
data
boolean
Data Read
EngineShutdownAction
boolean
data
boolean
OR
0
OFF
boolean
boolean
boolean
1
FuelP
boolean
1
Out

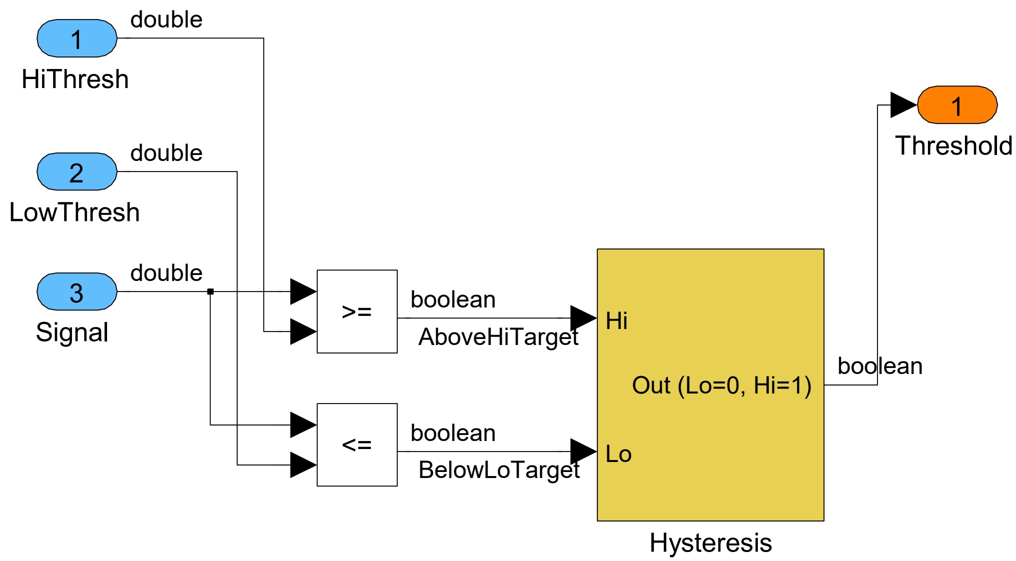

MotoHawk Function Trigger
FGND_5XRTI_PERIODIC
Priority Order: 1
(Used in triggered subsystem)
Inputs
Enable
boolean
Base Equiv Ratio
Sensors
EquivRatioInfo
DFCO
EquivRatioInfo
DesEquivRatio
DFCOInfo
O2 Control
Reset
Sensors
O2_Info
Desired_Equiv
Fuel System Manager
DesiredFuel
InjTiming
EOI
FuelMult
[8]
FPC
SOI
Spark Manager
Trigger()
DesEquivRatio
SparkEnergy
RPM_Ctrl_Ofst
SpkAdv
DFCOInfo
SparkAdv
MinGovernor
MinGovInfo
AC
MaxGovernor
MaxGovInfo
AirFlow Manager
MaxGovInfo
ETC%
Throttle
ON1
FUELP
Actuators
IAC Characterization
IAC-P
MinGovINFO
IAC-S
Boost Control
Wastegate
WASTEGATE
FAN Control
FAN-1
FAN-2
Data Type Conversion1
Data Type Conversion
AC Control
double



Sensors
boolean
<ACSw>
index_T
<IATKeyUp09Idx>
ACTempOn[9]
ACTempOff[9]
double
HiThresh
LowThresh HYSTERISIS
Threshold
Signal
<EVAP>
AC Evap Temp Hyst
ACTempCycle_Prb
ACOutput
AND
AC
Fault Action: DisableAC
Logical Operator
ACSpdSlowOn = 400 (Calibration)
ACSpdSlowOff = 200 (Calibration)
<RPM>
AC Comp Underspeed
ACSlowCycle_Prb
Logical Operator3
ACSpdFastOff = 4500 (Calibration)
ACSpdFastOn = 3000 (Calibration)
AC Comp Overspeed
NOT
Logical Operator2
ACFastCycle_Prb
AC_TPSOff = 90 (Calibration)
AC_TPSOn = 80 (Calibration)
<TPS>
AC Comp Overspeed1
Logical Operator4
AC_TPSCycle_Prb

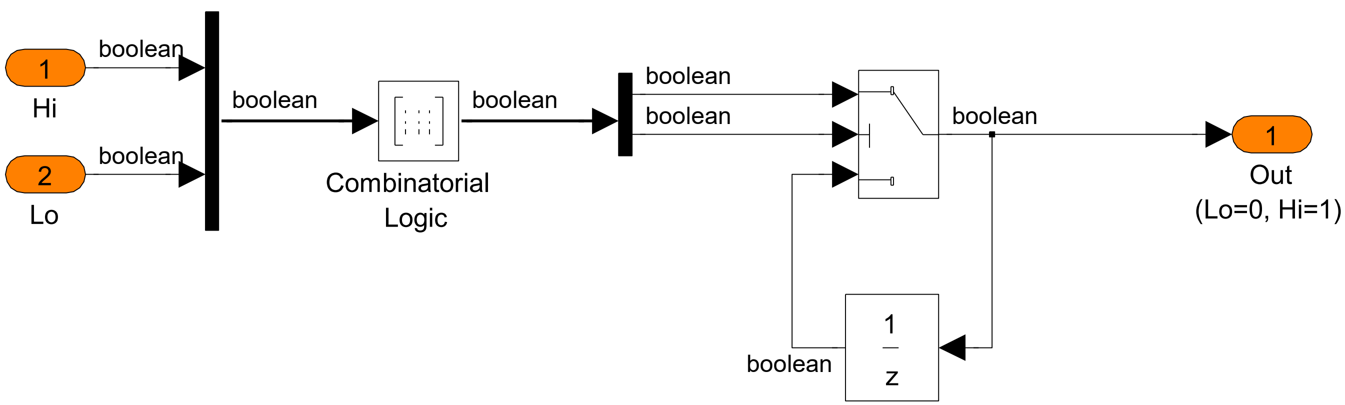

double
1
HiThresh
double
2
LowThresh
double
3
Signal
>=
boolean
AboveHiTarget
<=
boolean
BelowLoTarget
Hi
Out (Lo=0, Hi=1)
Lo
Hysteresis
boolean
1
Threshold

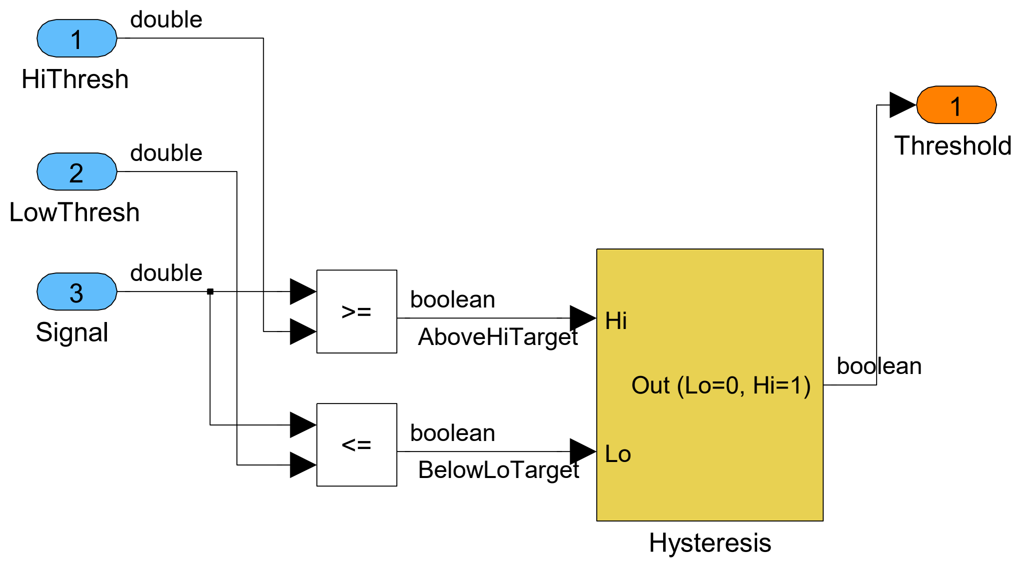

Hi & !Lo => Hi
Lo & !Hi => Lo
Otherwise, Hold
1
Hi
2
Lo
boolean
boolean
boolean
Combinatorial Logic
boolean
boolean
boolean
boolean
boolean
1
z
1
Out
(Lo=0, Hi=1)



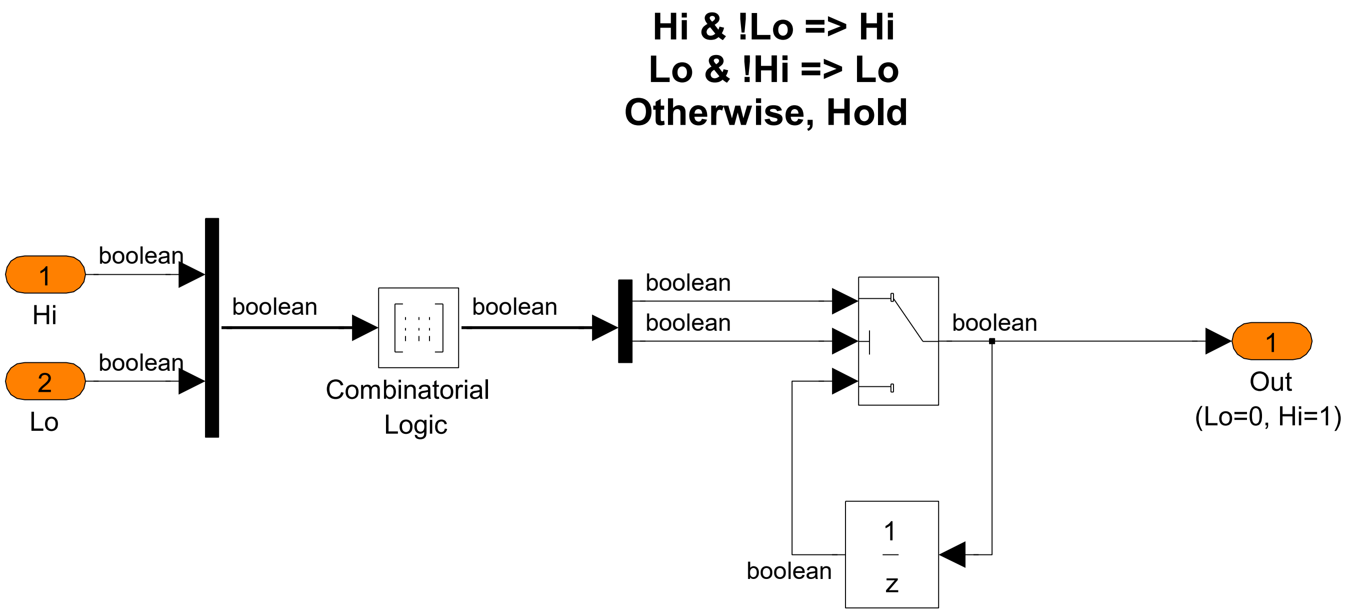
double
1
HiThresh
double
2
LowThresh
double
3
Signal
>=
boolean
AboveHiTarget
<=
boolean
BelowLoTarget
Hi
Out (Lo=0, Hi=1)
Lo
Hysteresis
boolean
1
Threshold

Hi & !Lo => Hi
Lo & !Hi => Lo
Otherwise, Hold

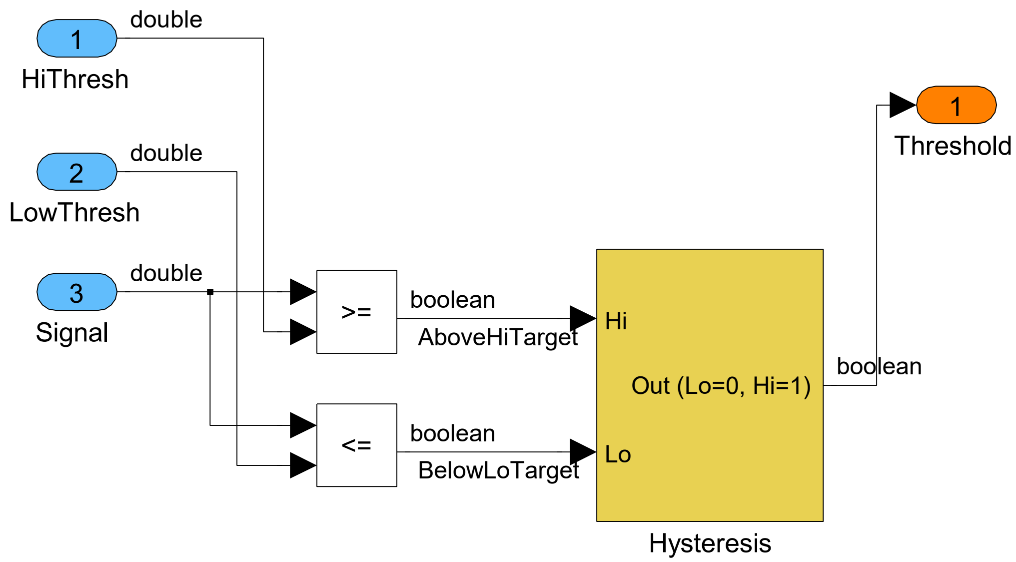




1
HiThresh
double
2
LowThresh
double
3
Signal
double
>=
boolean
AboveHiTarget
<=
boolean
BelowLoTarget
Hi
Lo
Out (Lo=0, Hi=1)
Hysteresis
boolean
1
Threshold

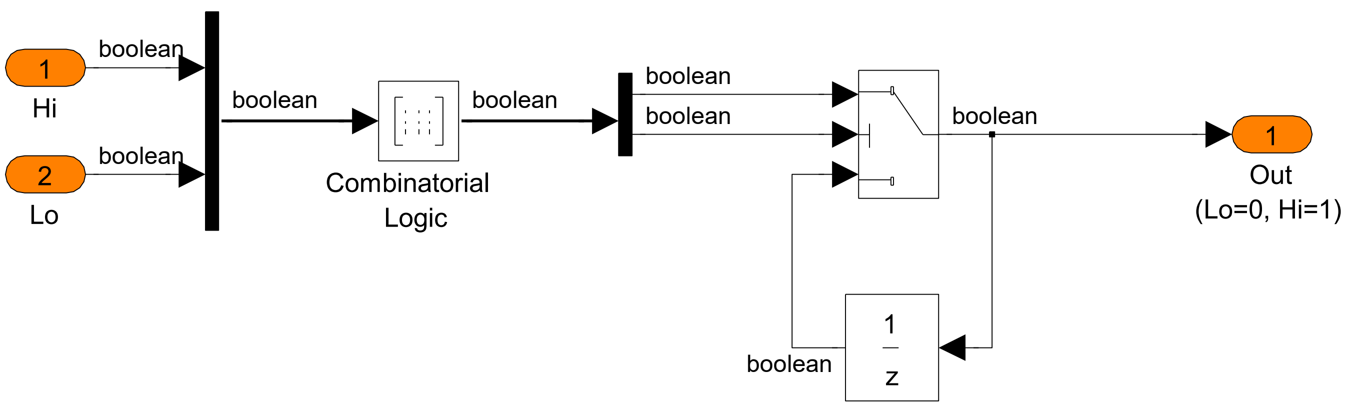


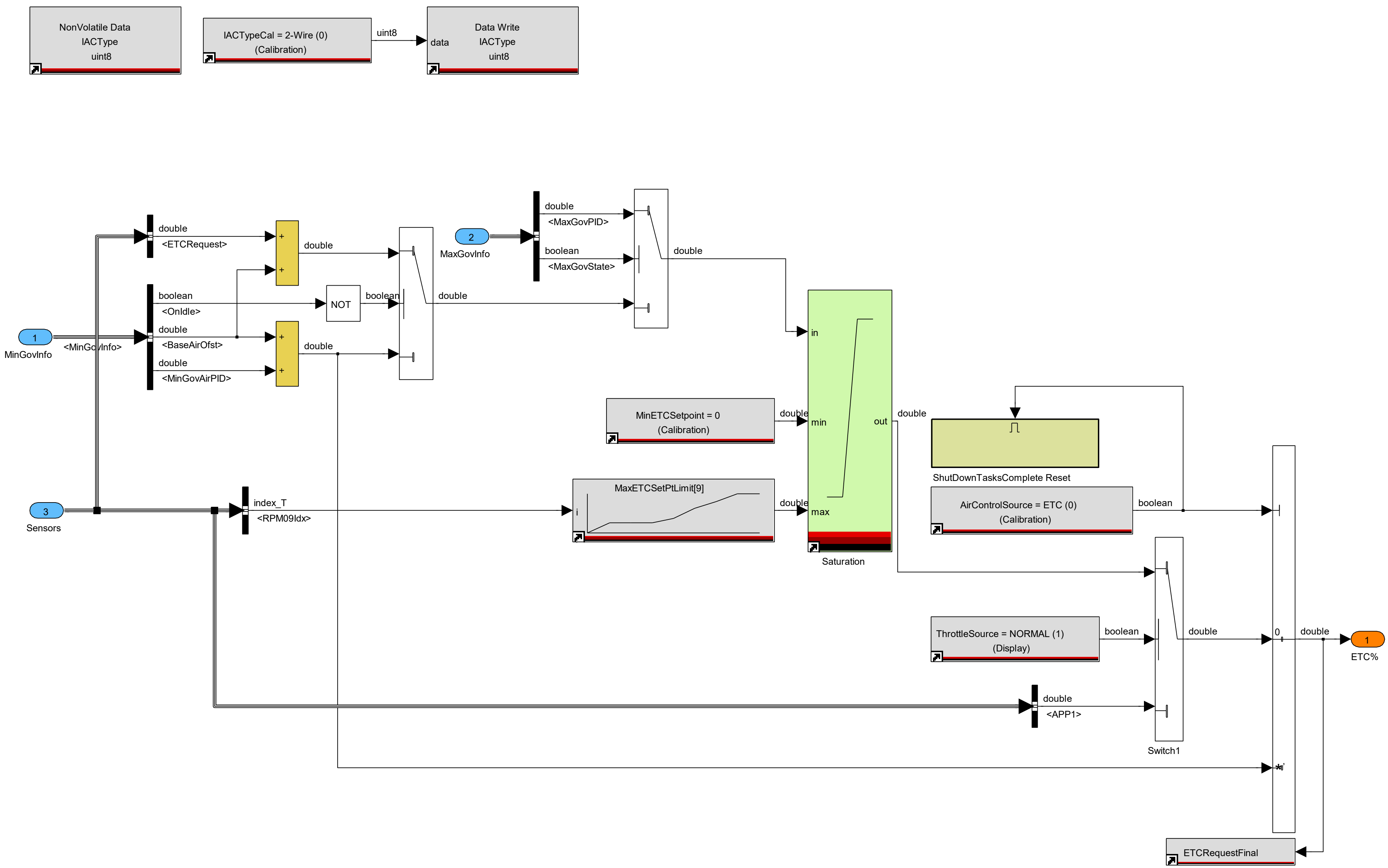
Hi & !Lo => Hi
Lo & !Hi => Lo
Otherwise, Hold
1
Hi
2
Lo
boolean
boolean
boolean
Combinatorial
Logic
boolean
boolean
boolean
boolean
1
z
boolean
1
Out
(Lo=0, Hi=1)



double
1
HiThresh
double
2
LowThresh
double
3
Signal
>=
boolean
AboveHiTarget
<=
boolean
BelowLoTarget
Hi
Out (Lo=0, Hi=1)
Lo
Hysteresis
boolean
1
Threshold

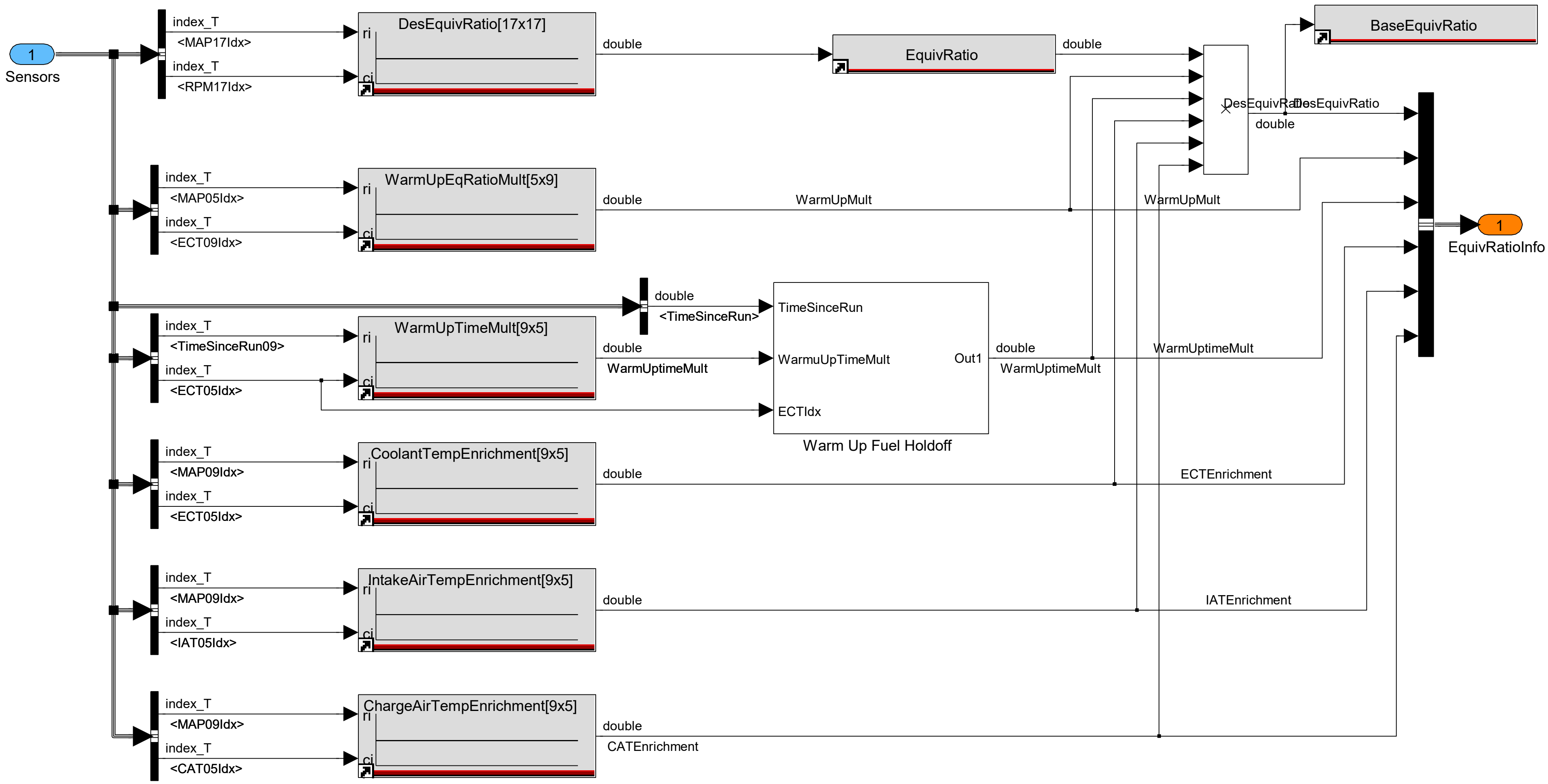
Hi & !Lo => Hi
Lo & !Hi => Lo
Otherwise, Hold

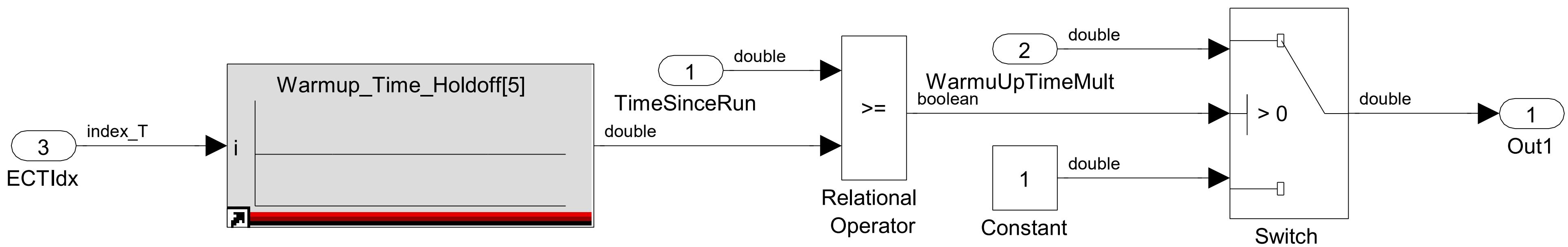




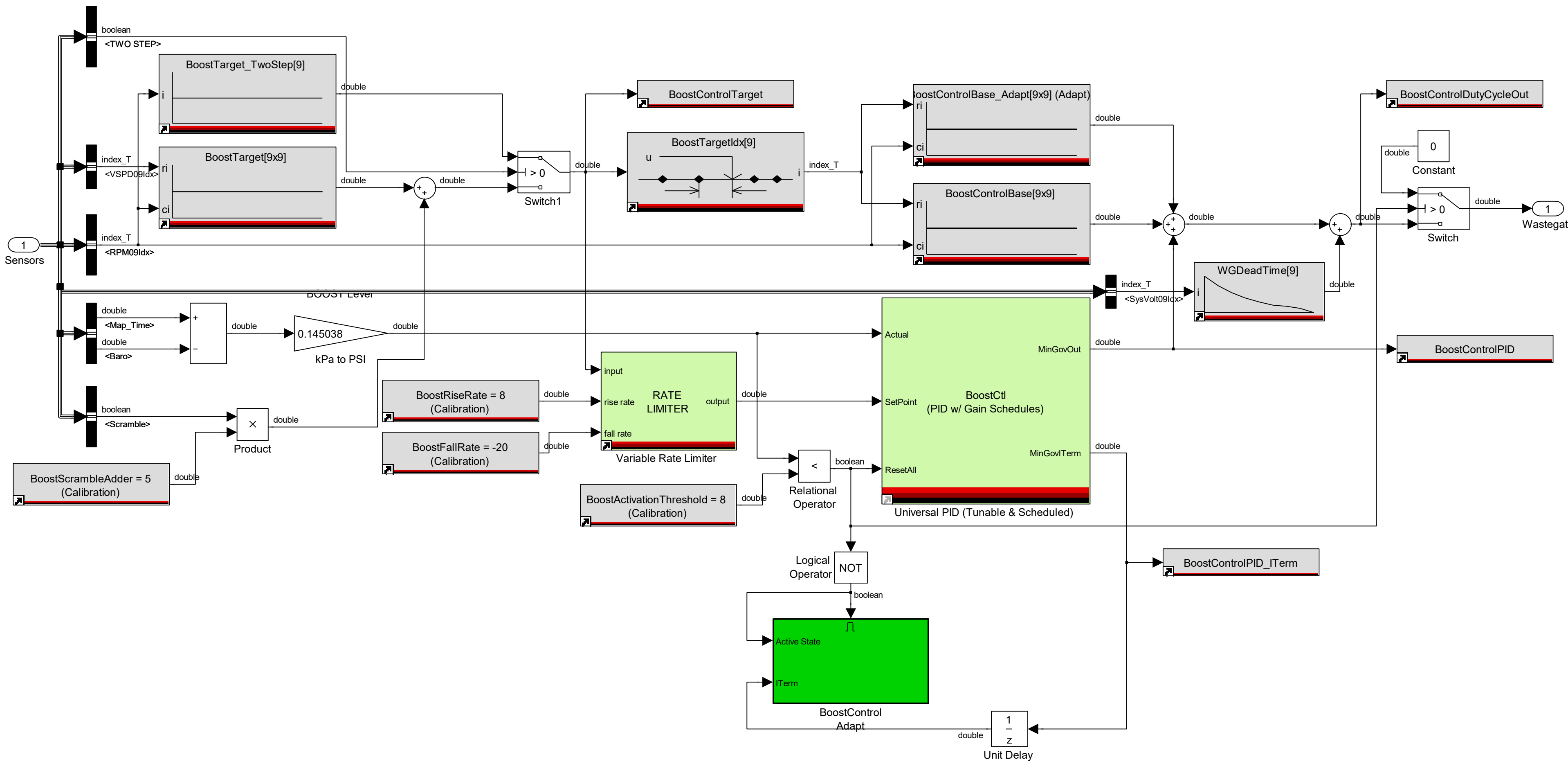
NonVolatile Data
IACType
uint8
IACTypeCal = 2-Wire (0)
(Calibration)
uint8
Data Write
data
IACType
uint8
double
<ETCRequest>
double
boolean
<OnIdle>
NOT
boolean
double
double
<BaseAirOfst>
double
double
<MinGovAirPID>
1
MinGovInfo
<MinGovInfo>
2
MaxGovInfo
double
<MaxGovPID>
boolean
<MaxGovState>
double
in
MinETCSetpoint = 0
(Calibration)
double
min
out
double
ShutDownTasksComplete Reset
3
Sensors
index_T
<RPM09Idx>
MaxETCSetPtLimit[9]
i
double
max
Saturation
AirControlSource = ETC (0)
(Calibration)
boolean
ThrottleSource = NORMAL (1)
(Display)
boolean
double
0
double
1
ETC%
double
<APP1>
Switch1
ETCRequestFinal


boolean(1)
boolean
data
Data Write
ShutDownTasksComplete
boolean

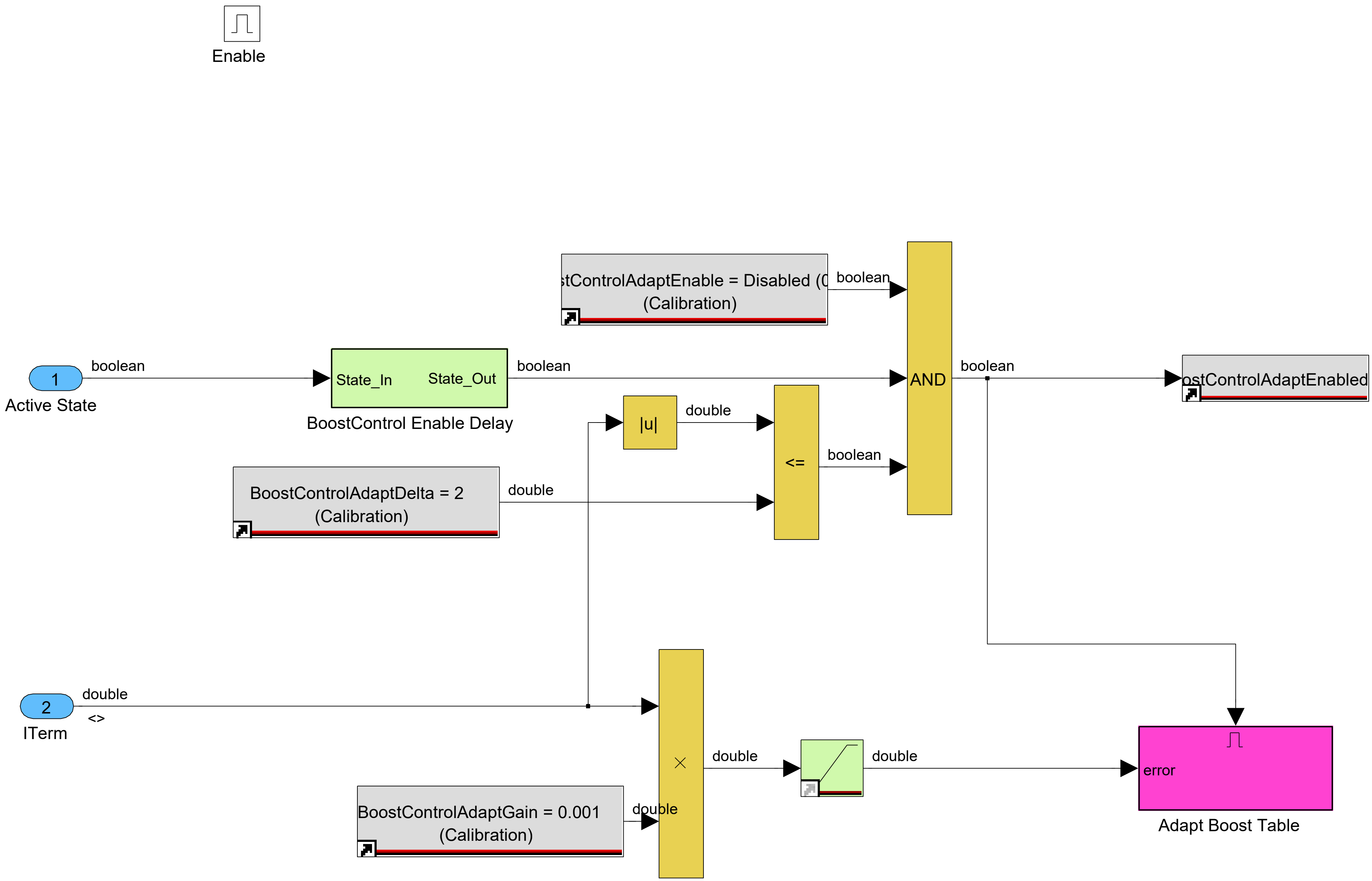

1
Sensors
index_T
<MAP17Idx>
index_T
<RPM17Idx>
DesEquivRatio[17x17]
ri
ci
double
EquivRatio
double
BaseEquivRatio
DesEquivRatio
DesEquivRatio
double
index_T
<MAP05Idx>
index_T
<ECT09Idx>
WarmUpEqRatioMult[5x9]
double
WarmUpMult
WarmUpMult
1
EquivRatioInfo
double
<TimeSinceRun>
TimeSinceRun
WarmuUpTimeMult
ECTIdx
Out1
Warm Up Fuel Holdoff
index_T
<TimeSinceRun09>
index_T
<ECT05Idx>
WarmUpTimeMult[9x5]
double
WarmUptimeMult
double
WarmUptimeMult
WarmUptimeMult
index_T
<MAP09Idx>
index_T
<ECT05Idx>
CoolantTempEnrichment[9x5]
double
ECTEnrichment
index_T
<MAP09Idx>
index_T
<IAT05Idx>
IntakeAirTempEnrichment[9x5]
double
IATEnrichment
index_T
<MAP09Idx>
index_T
<CAT05Idx>
ChargeAirTempEnrichment[9x5]
double
CATEnrichment



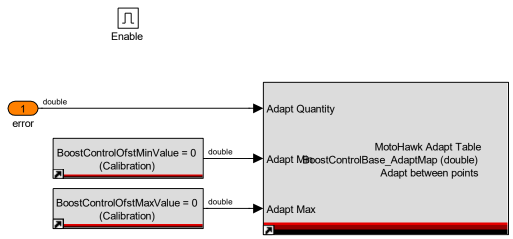
3
ECTIdx
index_T
Warmup_Time_Holdoff[5]
i
double
1
TimeSinceRun
double
>=
Relational Operator
boolean
2
WarmuUpTimeMult
double
> 0
1
Constant
double
Switch
double
1
Out1



Sensors
boolean
<TWO STEP>
index_T
<VSPD09Idx>
index_T
<RPM09Idx>
BOOST Level
double
<Map_Time>
double
<Baro>
boolean
<Scramble>
BoostTarget_TwoStep[9]
BoostTarget[9x9]
Switch1
BoostControlTarget
BoostTargetIdx[9]
BoostControlBase_Adapt[9x9] (Adapt)
BoostControlBase[9x9]
BoostControlDutyCycleOut
Constant
Switch
Wastegate
index_T
<SysVolt09Idx>
WGDeadTime[9]
kPa to PSI
0.145038
Product
BoostScrambleAdder = 5 (Calibration)
BoostRiseRate = 8 (Calibration)
BoostFallRate = -20 (Calibration)
RATE LIMITER
Variable Rate Limiter
BoostActivationThreshold = 8 (Calibration)
Relational Operator
BoostCtl (PID w/ Gain Schedules)
Actual
SetPoint
ResetAll
MinGovOut
MinGovITerm
Universal PID (Tunable & Scheduled)
BoostControlPID
BoostControlPID_ITerm
Logical Operator
NOT
Active State
ITerm
BoostControl Adapt
Unit Delay

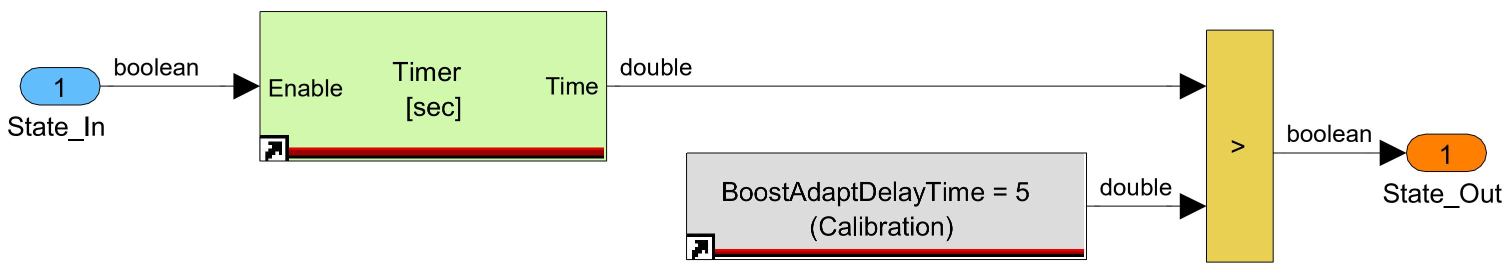


Enable
stControlAdaptEnable = Disabled (0
(Calibration)
boolean
1
Active State
boolean
State_In
State_Out
BoostControl Enable Delay
boolean
AND
boolean
ostControlAdaptEnabled
|u|
double
<=
boolean
BoostControlAdaptDelta = 2
(Calibration)
double
2
ITerm
double
<>
×
double
double
error
Adapt Boost Table
BoostControlAdaptGain = 0.001
(Calibration)
double

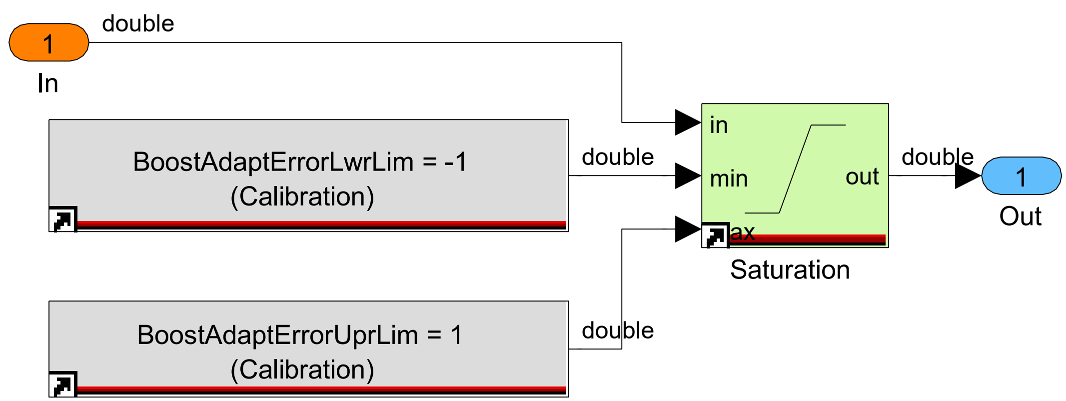


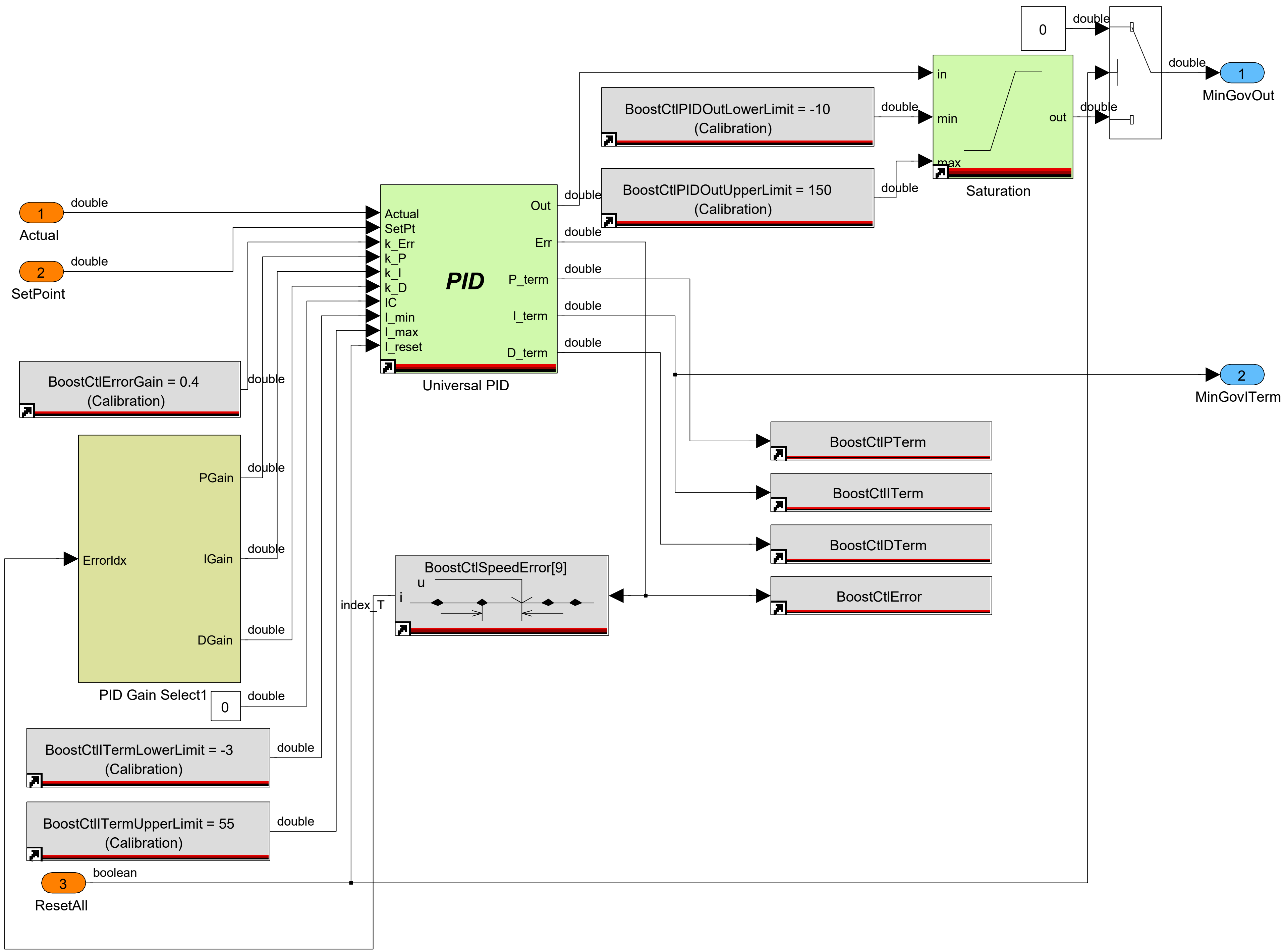
Calibrations

BaseAirflowOfstMaxValue	%	Maximum value that can be adapted into the BaseAirflowOfst table. MotoTune Path: Engine Control | Run | RPM Control | Min Gov | Min Gov Config
BaseAirflowOfstMinValue	%	Minimum value that can be adapted into the BaseAirflowOfst table. MotoTune Path: Engine Control | Run | RPM Control | Min Gov | Min Gov Config

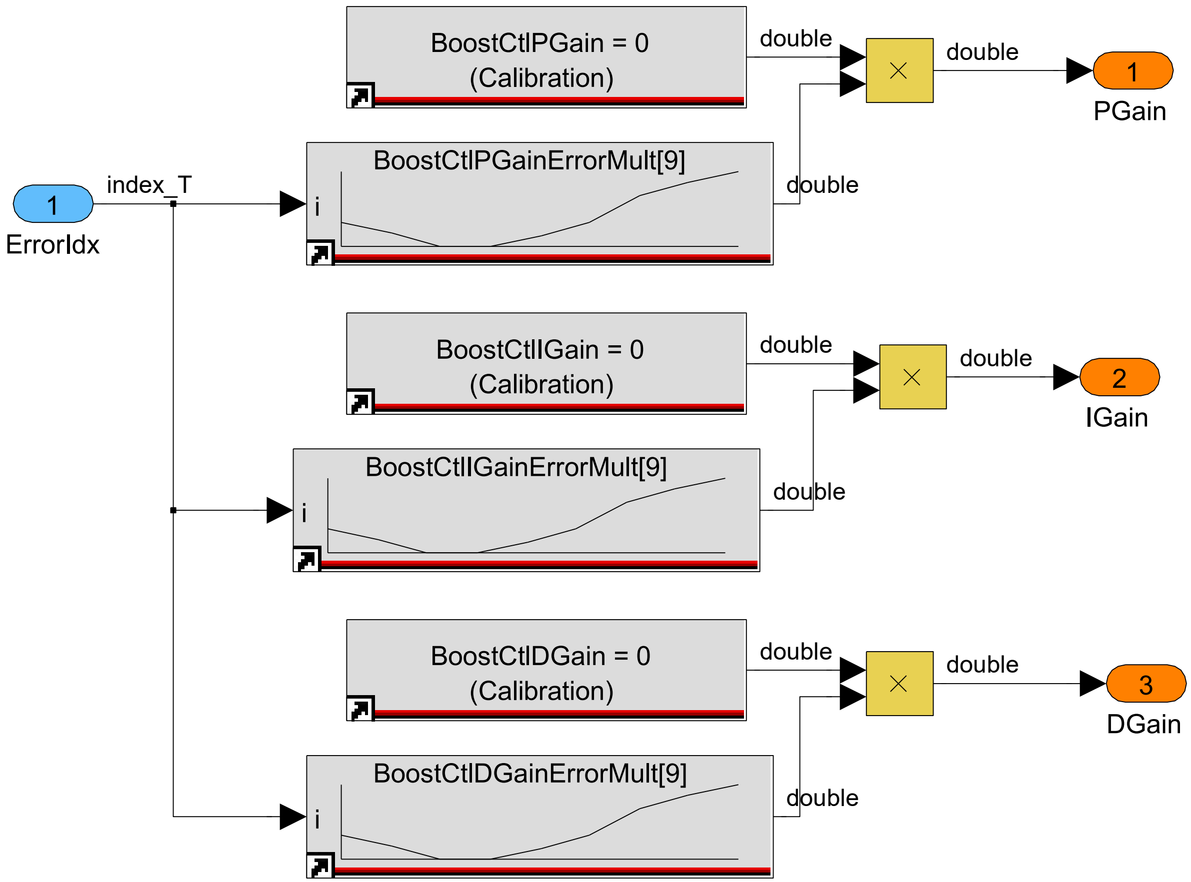

1
State_In
boolean
Enable
Timer
[sec]
Time
double
BoostAdaptDelayTime = 5
(Calibration)
double
>
boolean
1
State_Out

Calibratable wrapper around the Saturation block

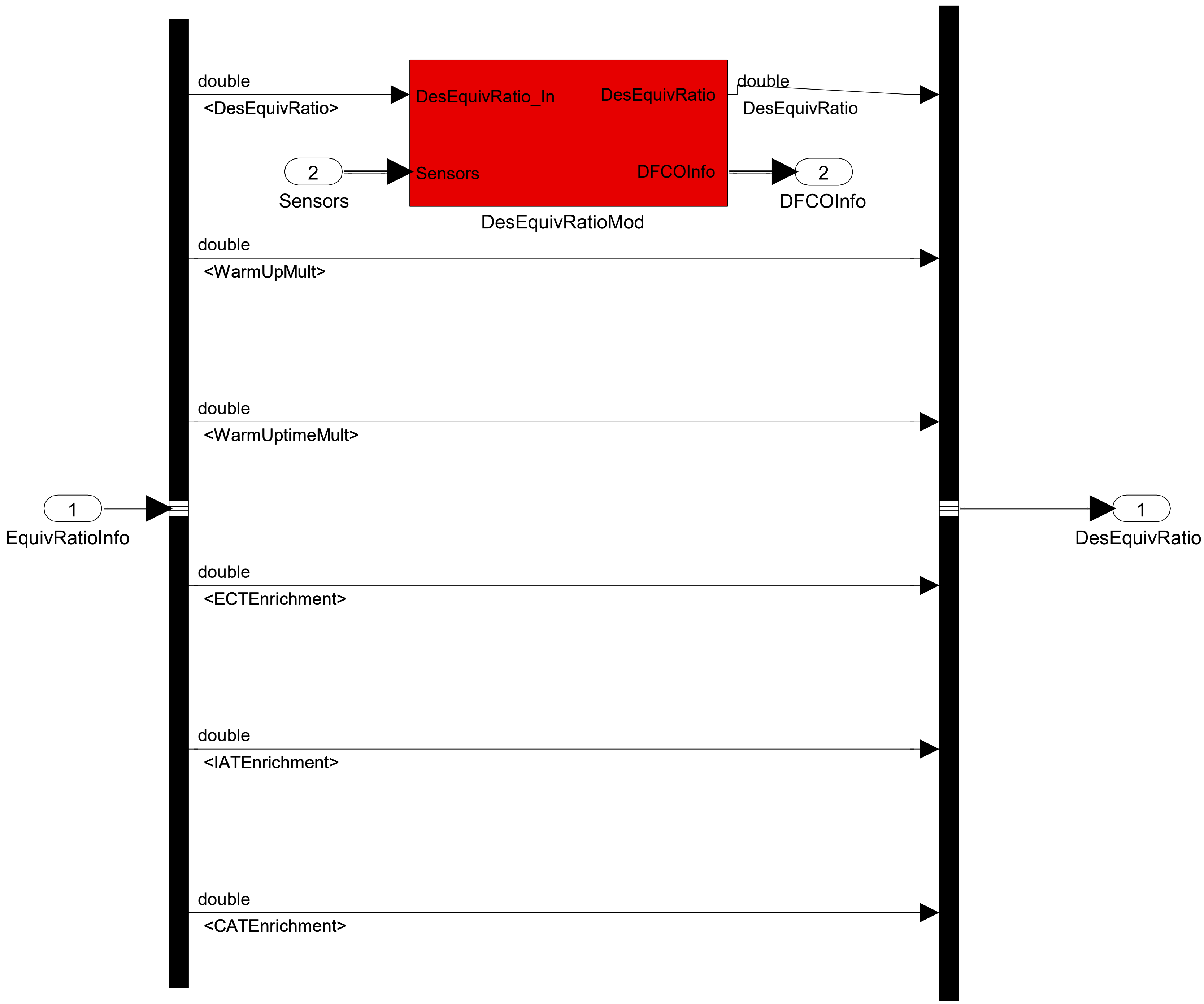




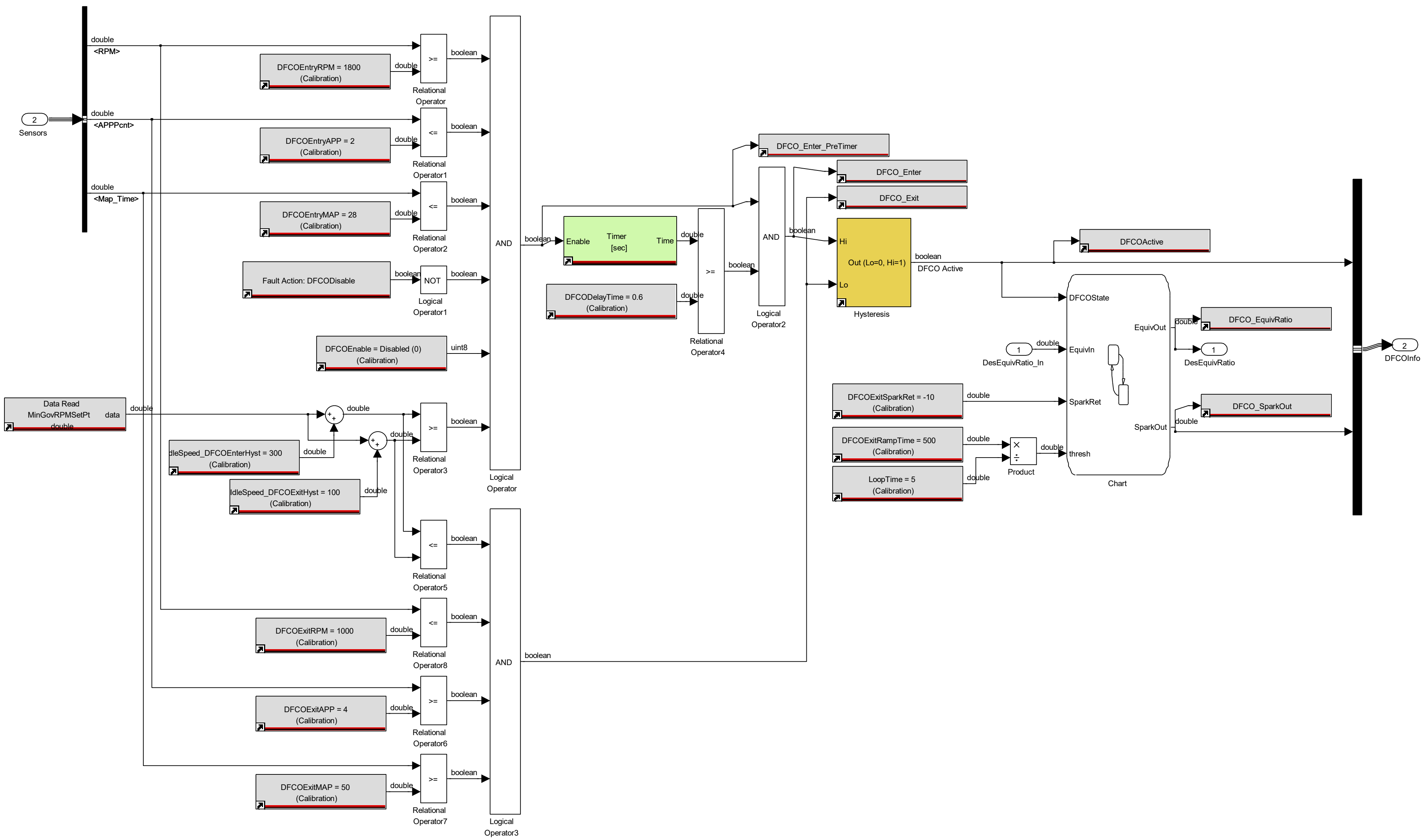
0
double
MinGovOut
in
BoostCtlPIDOutLowerLimit = -10
(Calibration)
min
out
max
BoostCtlPIDOutUpperLimit = 150
(Calibration)
Saturation
Actual
SetPoint
Actual
SetPt
k_Err
k_P
k_I
k_D
IC
I_min
I_max
I_reset
PID
Out
Err
P_term
I_term
D_term
Universal PID
BoostCtlErrorGain = 0.4
(Calibration)
MinGovITerm
BoostCtlPTerm
BoostCtlITerm
BoostCtlDTerm
BoostCtlError
ErrorIdx
PGain
IGain
DGain
PID Gain Select1
BoostCtlSpeedError[9]
u
i
index_T
BoostCtlITermLowerLimit = -3
(Calibration)
BoostCtlITermUpperLimit = 55
(Calibration)
boolean
ResetAll



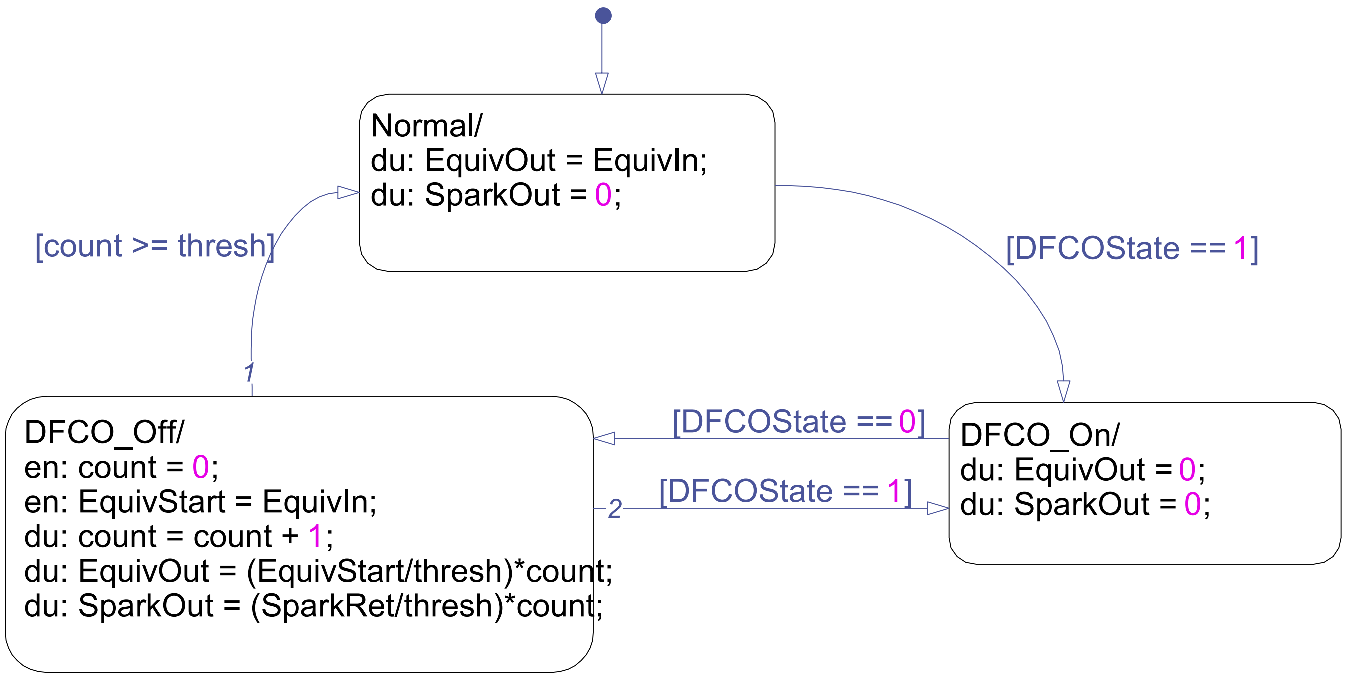
1
ErrorIdx
index_T
BoostCtlPGain = 0
(Calibration)
double
BoostCtlPGainErrorMult[9]
i
double
double
1
PGain
BoostCtlIGain = 0
(Calibration)
double
BoostCtlIGainErrorMult[9]
i
double
double
2
IGain
BoostCtlDGain = 0
(Calibration)
double
BoostCtlDGainErrorMult[9]
i
double
double
3
DGain

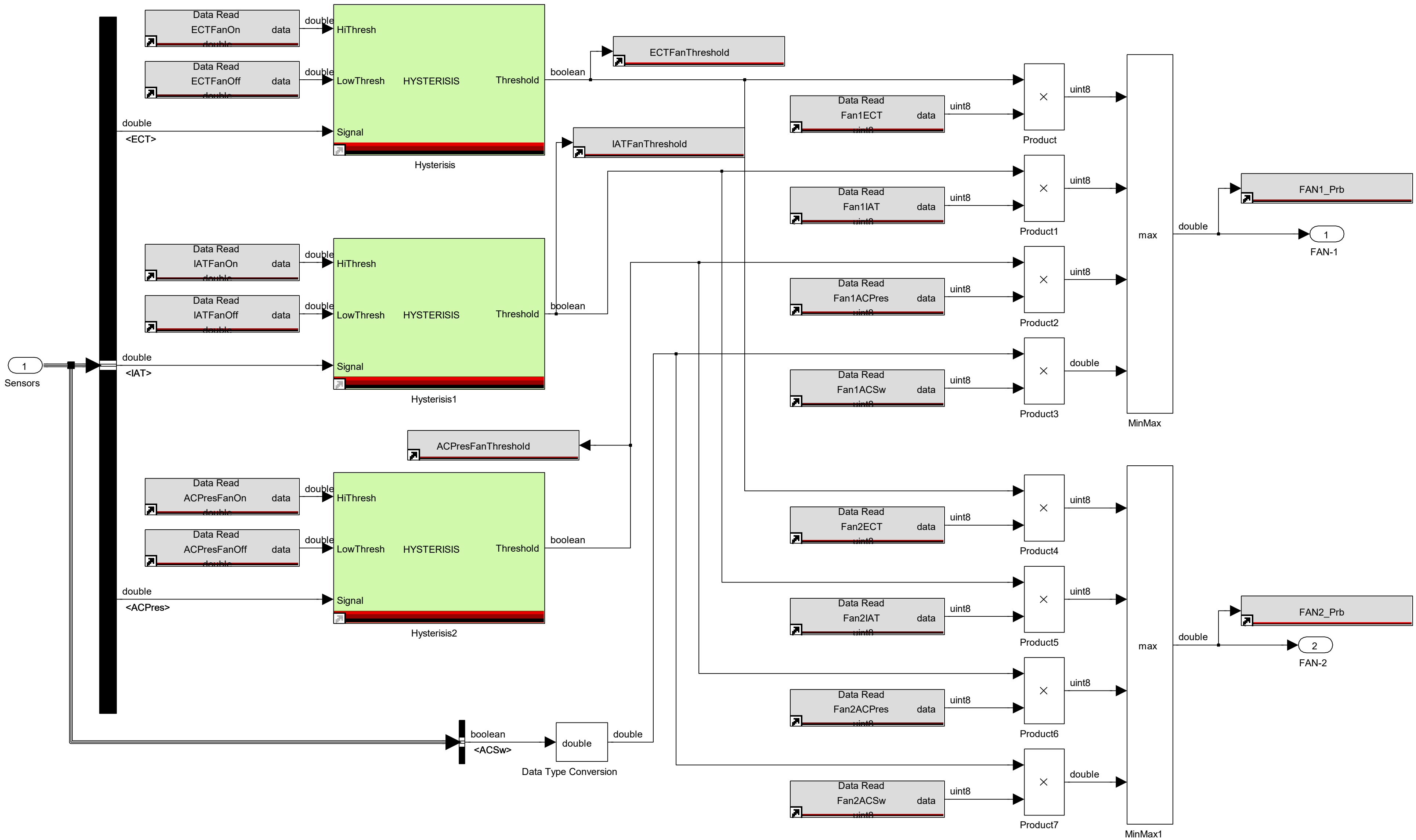


double
<DesEquivRatio>
DesEquivRatio_In
DesEquivRatio
double
DesEquivRatio
2
Sensors
Sensors
DFCOInfo
2
DFCOInfo
DesEquivRatioMod
double
<WarmUpMult>
double
<WarmUptimeMult>
1
EquivRatioInfo
1
DesEquivRatio
double
<ECTEnrichment>
double
<IATEnrichment>
double
<CATEnrichment>

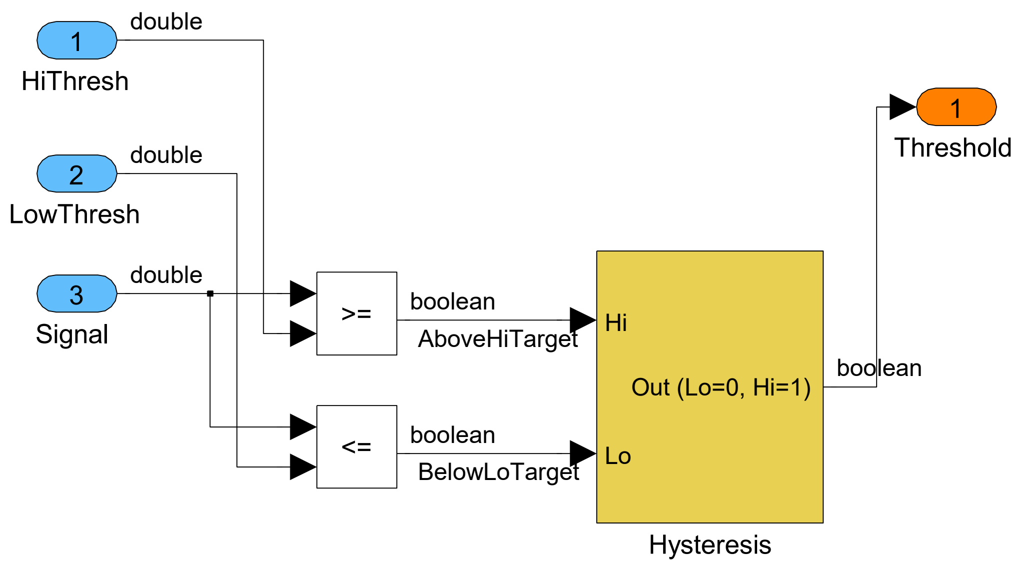


2
Sensors
double
<RPM>
double
<APPPcnt>
double
<Map_Time>
DFCOEntryRPM = 1800
(Calibration)
DFCOEntryAPP = 2
(Calibration)
DFCOEntryMAP = 28
(Calibration)
Fault Action: DFCODisable
DFCOEnable = Disabled (0)
(Calibration)
uint8
NOT
Logical Operator1
Relational Operator
Relational Operator1
Relational Operator2
boolean
AND
Logical Operator
Data Read
MinGovRPMSetPt
data
double
IdleSpeed_DFCOEnterHyst = 300
(Calibration)
IdleSpeed_DFCOExitHyst = 100
(Calibration)
Relational Operator3
Relational Operator5
DFCOExitRPM = 1000
(Calibration)
Relational Operator8
DFCOExitAPP = 4
(Calibration)
Relational Operator6
DFCOExitMAP = 50
(Calibration)
Relational Operator7
Logical Operator3
Enable
Timer
[sec]
Time
DFCODelayTime = 0.6
(Calibration)
Relational Operator4
DFCO_Enter_PreTimer
Logical Operator2
DFCO_Enter
DFCO_Exit
Hi
Out (Lo=0, Hi=1)
Lo
Hysteresis
DFCO Active
DFCOActive
DFCOState
EquivIn
SparkRet
thresh
EquivOut
SparkOut
Chart
1
DesEquivRatio_In
DFCO_EquivRatio
DesEquivRatio
DFCO_SparkOut
DFCOExitSparkRet = -10
(Calibration)
DFCOExitRampTime = 500
(Calibration)
LoopTime = 5
(Calibration)
Product
DFCOInfo

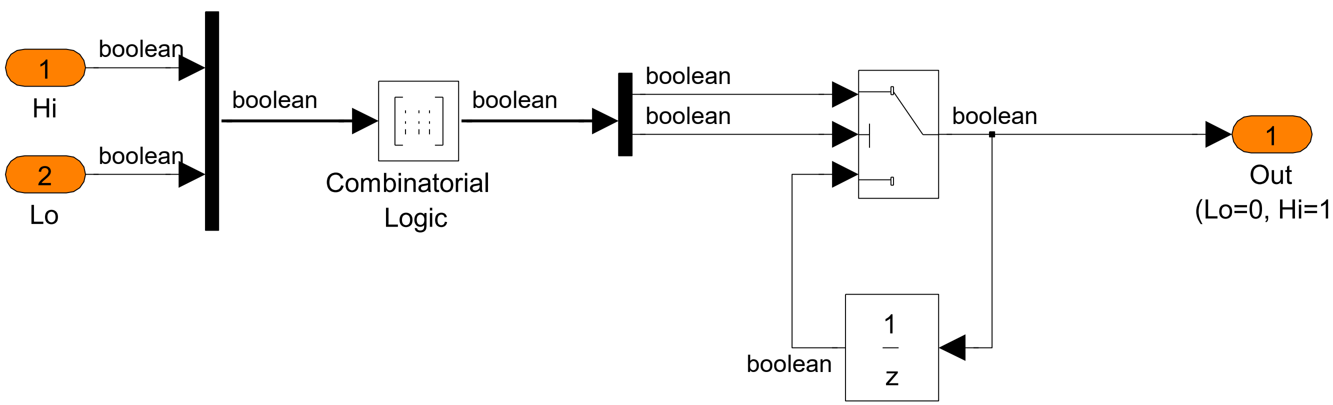

Normal/
du: EquivOut = EquivIn;
du: SparkOut = 0;
[DFCOState == 1]
[count >= thresh]
1
DFCO_Off/
en: count = 0;
en: EquivStart = EquivIn;
du: count = count + 1;
du: EquivOut = (EquivStart/thresh)*count;
du: SparkOut = (SparkRet/thresh)*count;
[DFCOState == 0]
2
[DFCOState == 1]
DFCO_On/
du: EquivOut = 0;
du: SparkOut = 0;

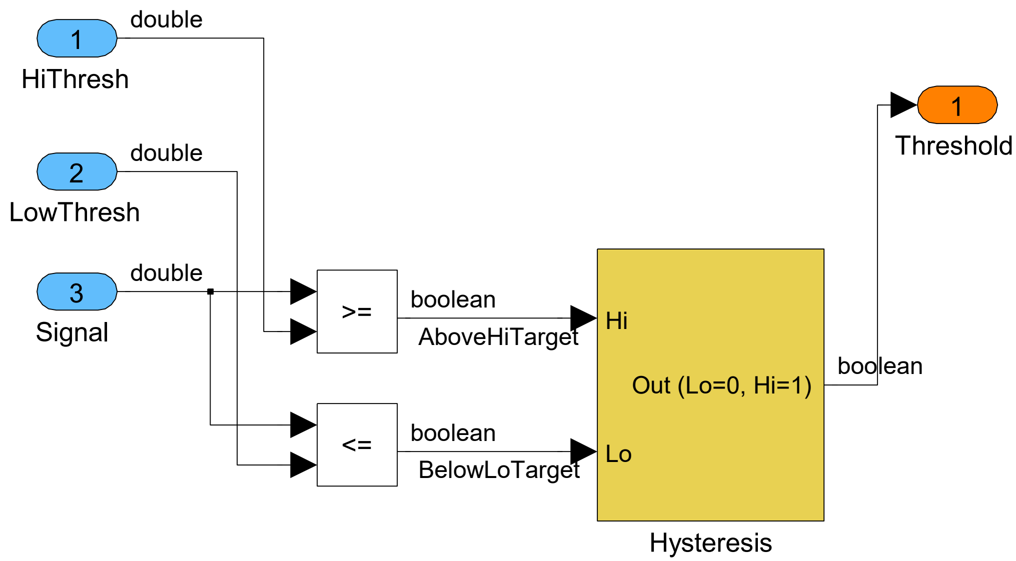


Data Read ECTFanOn data
Data Read ECTFanOff data
double
HiThresh
LowThresh
HYSTERISIS
Threshold
Signal
Hysterisis
<ECT>
boolean
ECTFanThreshold
IATFanThreshold
Data Read IATFanOn data
Data Read IATFanOff data
Hysterisis1
<IAT>
Sensors
1
ACPresFanThreshold
Data Read ACPresFanOn data
Data Read ACPresFanOff data
Hysterisis2
<ACPres>
<ACSw>
Data Type Conversion
Data Read Fan1ECT data
Data Read Fan1IAT data
Data Read Fan1ACPres data
Data Read Fan1ACSw data
Data Read Fan2ECT data
Data Read Fan2IAT data
Data Read Fan2ACPres data
Data Read Fan2ACSw data
uint8
Product
Product1
Product2
Product3
Product4
Product5
Product6
Product7
max
MinMax
MinMax1
FAN1_Prb
FAN2_Prb
FAN-1
FAN-2
2


double
1
HiThresh
double
2
LowThresh
double
3
Signal
>=
boolean
AboveHiTarget
<=
boolean
BelowLoTarget
Hi
Out (Lo=0, Hi=1)
Lo
Hysteresis
boolean
1
Threshold

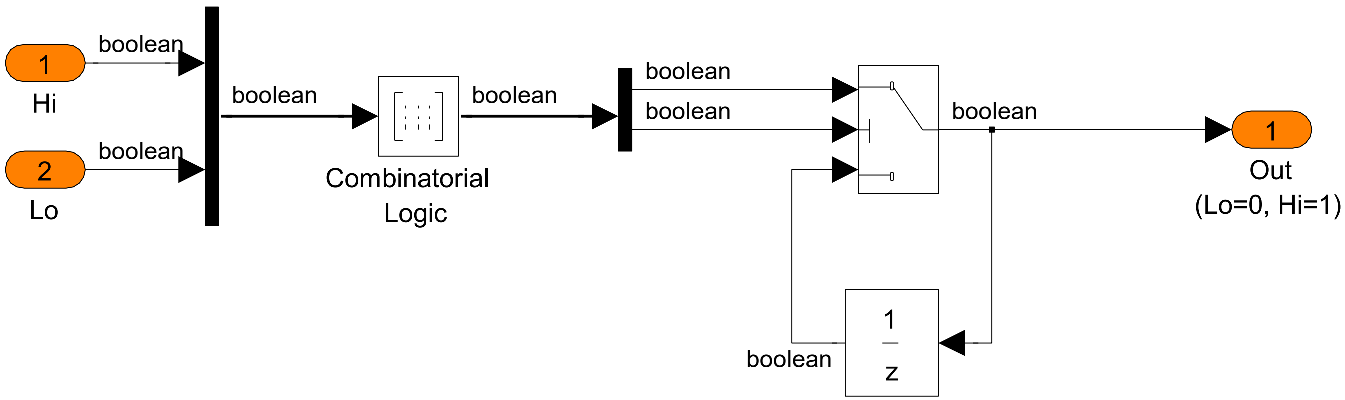
Hi & !Lo => Hi
Lo & !Hi => Lo
Otherwise, Hold

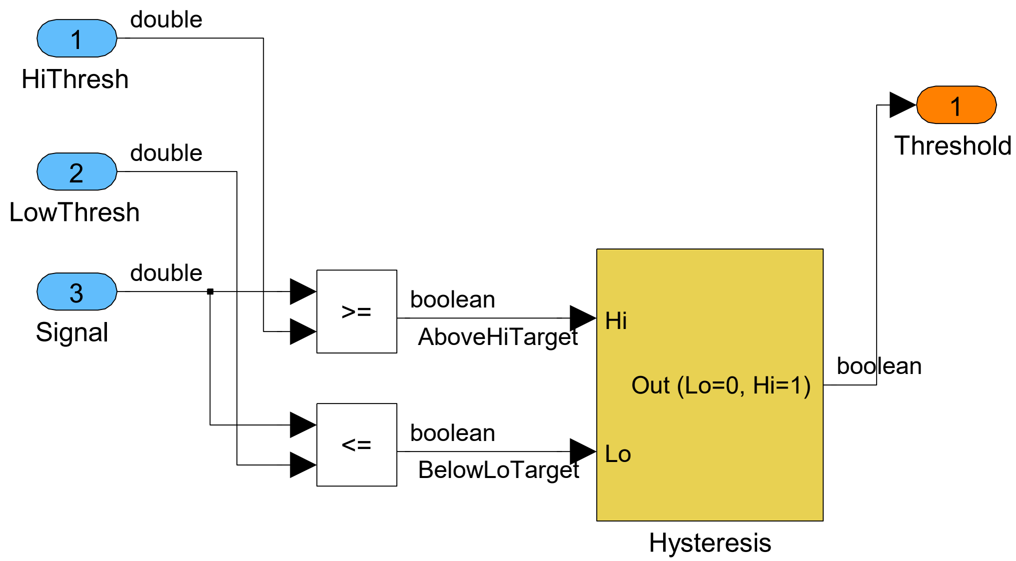




double
1
HiThresh
double
2
LowThresh
double
3
Signal
>=
boolean
AboveHiTarget
<=
boolean
BelowLoTarget
Hi
Lo
Out (Lo=0, Hi=1)
Hysteresis
boolean
1
Threshold

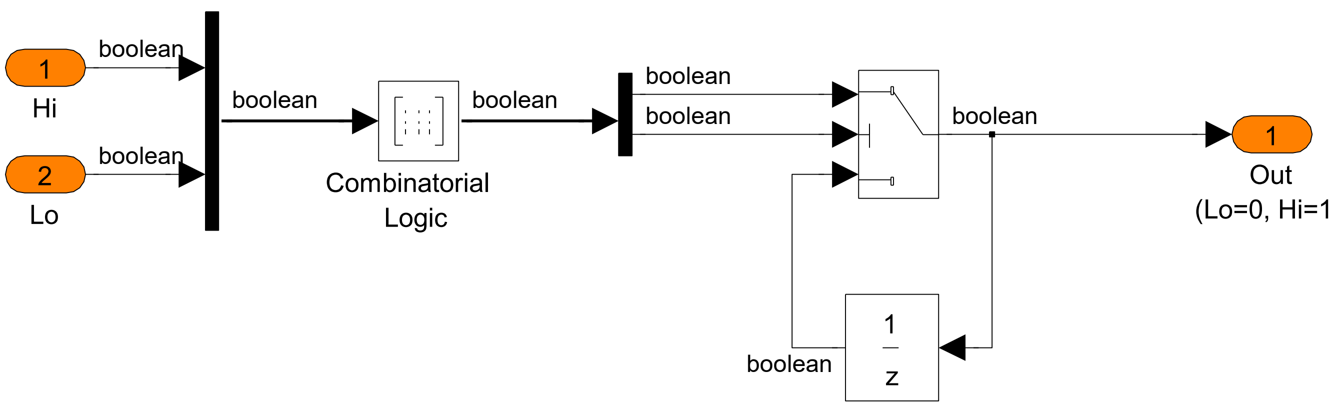
Hi & !Lo => Hi
Lo & !Hi => Lo
Otherwise, Hold

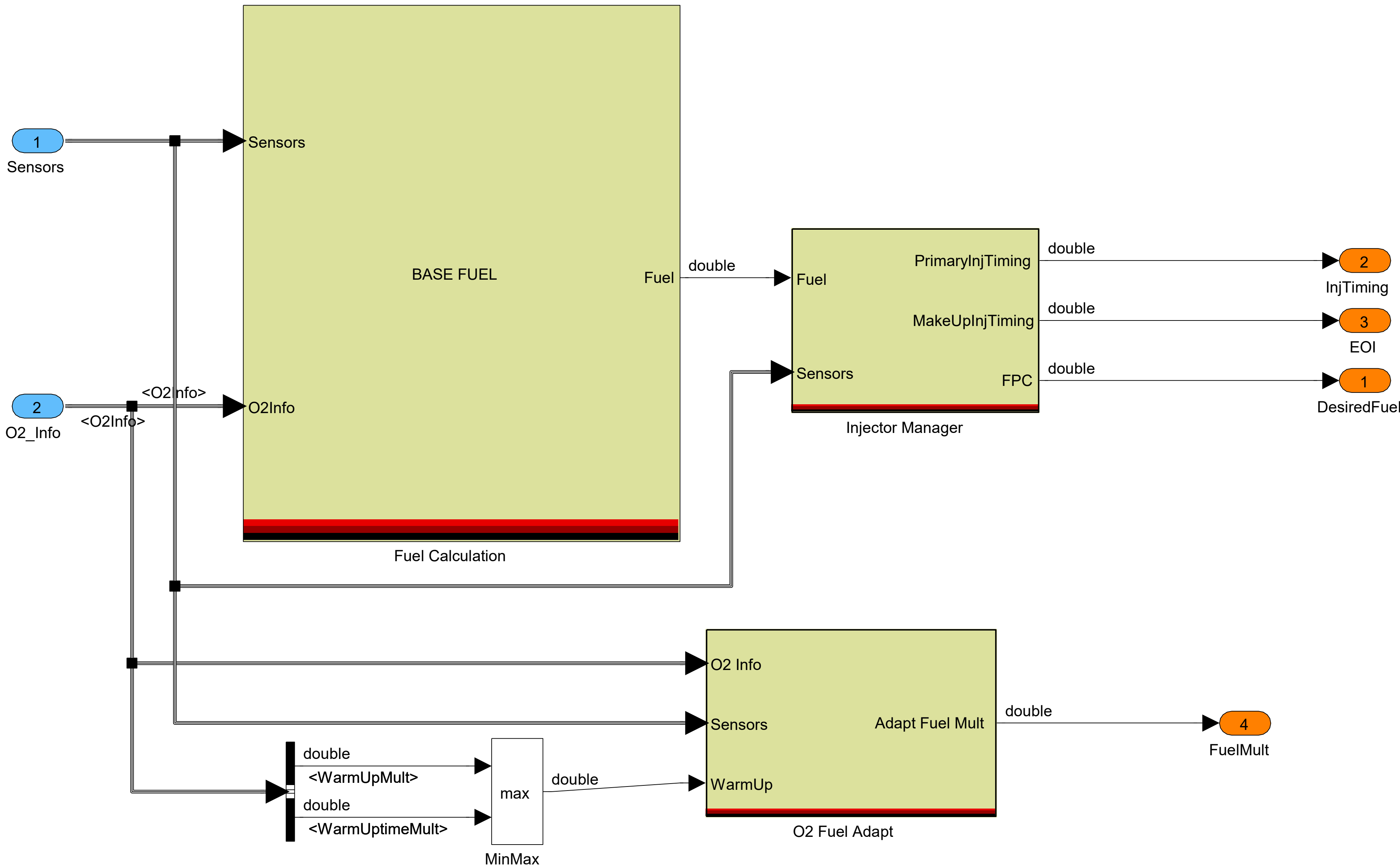


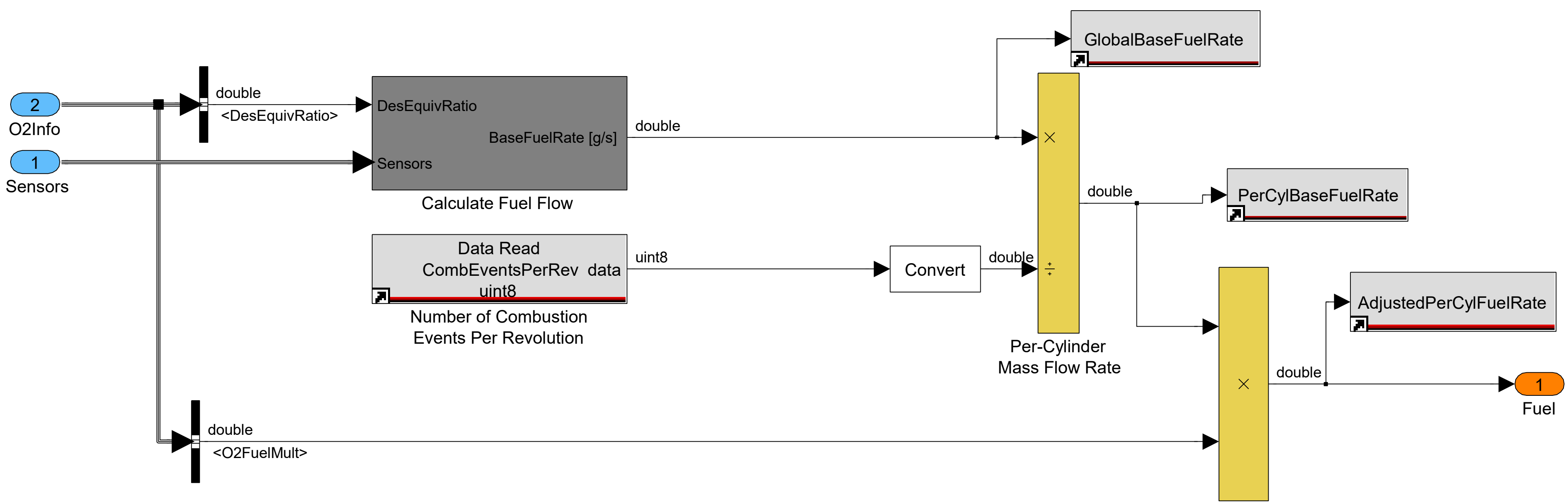


1
HiThresh
double
2
LowThresh
double
3
Signal
double
>=
boolean
AboveHiTarget
<=
boolean
BelowLoTarget
Hi
Out (Lo=0, Hi=1)
Lo
Hysteresis
boolean
1
Threshold

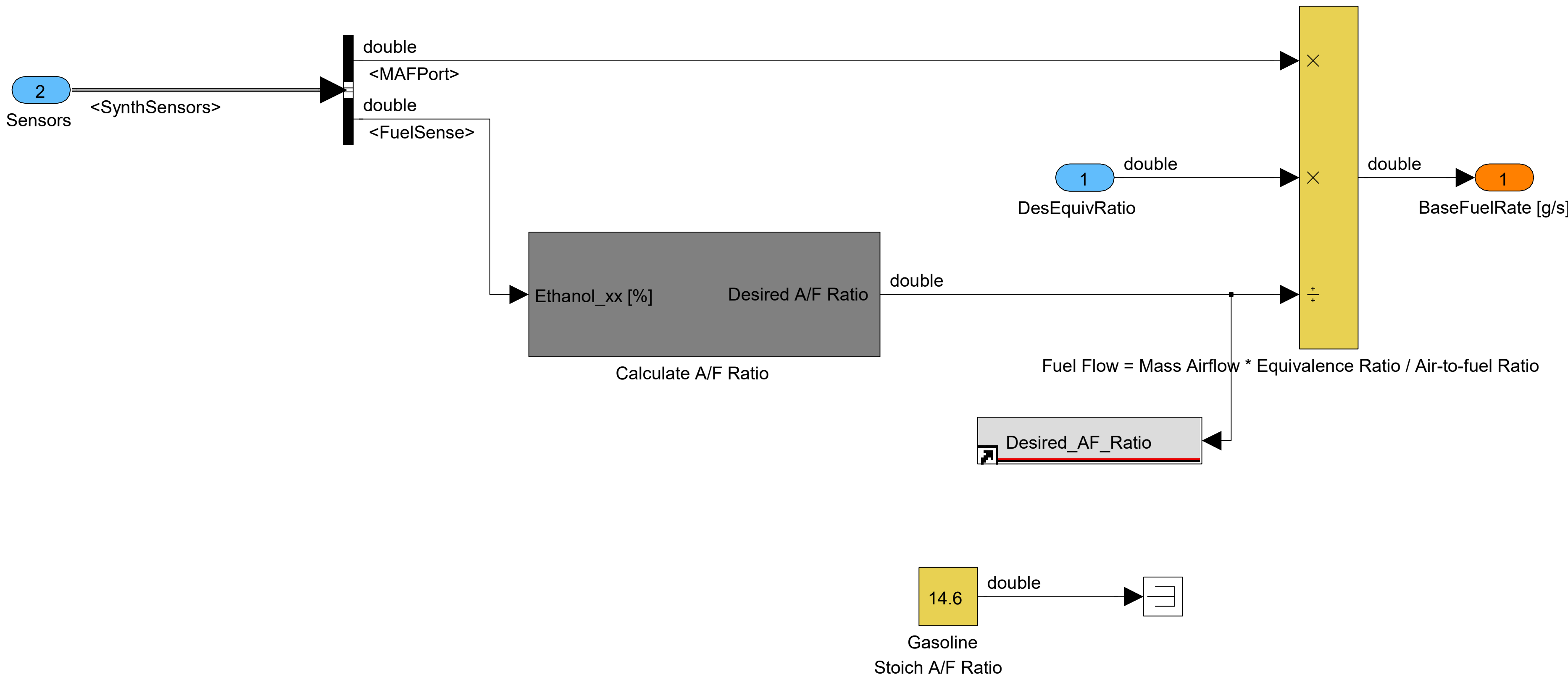
Hi & !Lo => Hi
Lo & !Hi => Lo
Otherwise, Hold



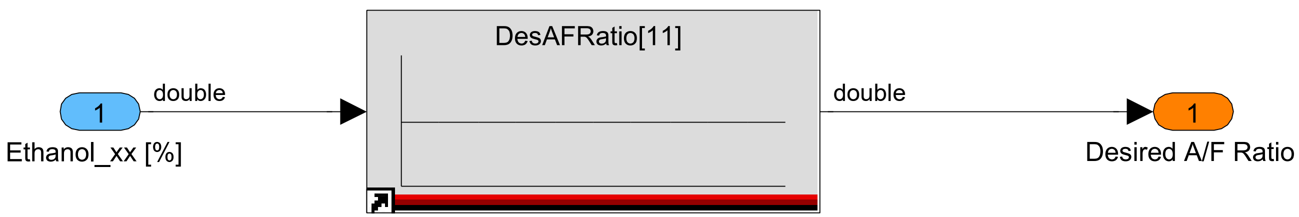

1
Sensors
2
O2_Info
<O2Info>
<O2Info>
Sensors
O2Info
BASE FUEL
Fuel
Fuel Calculation
double
Fuel
Sensors
PrimaryInjTiming
MakeUpInjTiming
FPC
Injector Manager
double
double
double
2
InjTiming
3
EOI
1
DesiredFuel
double
<WarmUpMult>
double
<WarmUptimeMult>
max
MinMax
double
O2 Info
Sensors
WarmUp
Adapt Fuel Mult
O2 Fuel Adapt
double
4
FuelMult

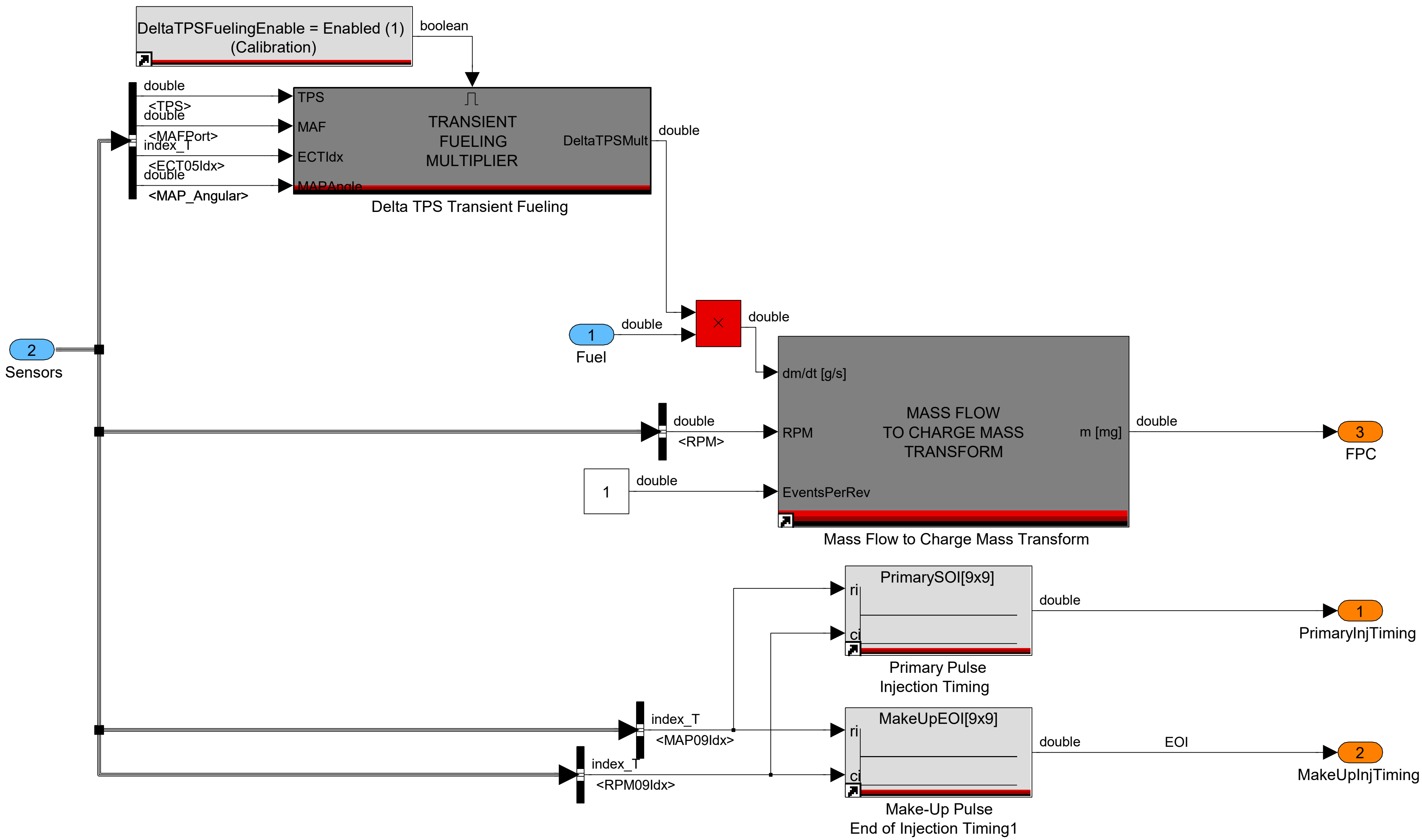


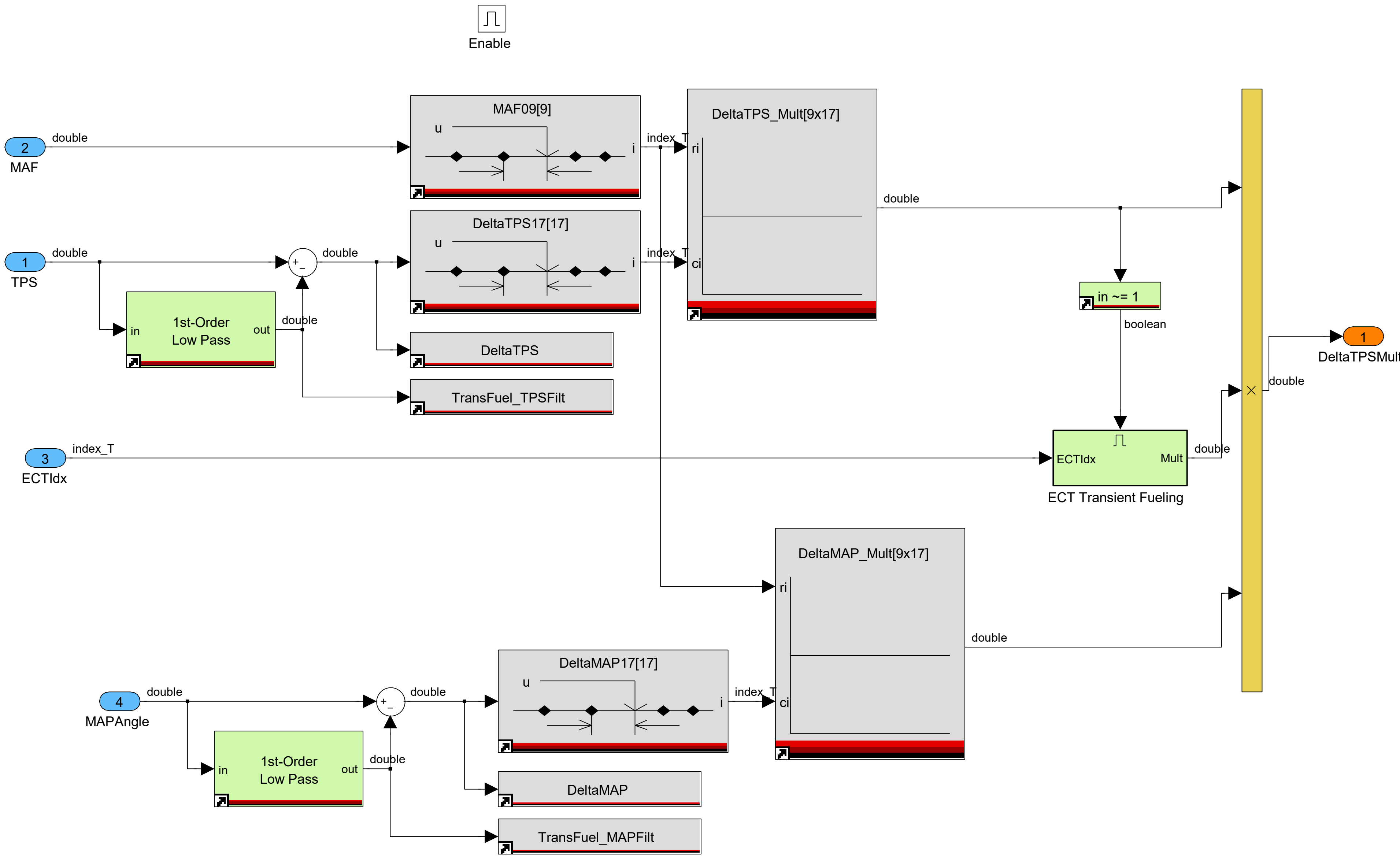
2
O2Info
1
Sensors
double
<DesEquivRatio>
DesEquivRatio
Sensors
BaseFuelRate [g/s]
Calculate Fuel Flow
double
Data Read
CombEventsPerRev data
uint8
Number of Combustion
Events Per Revolution
uint8
Convert
double
GlobalBaseFuelRate
Per-Cylinder
Mass Flow Rate
double
PerCylBaseFuelRate
AdjustedPerCylFuelRate
double
1
Fuel
double
<O2FuelMult>



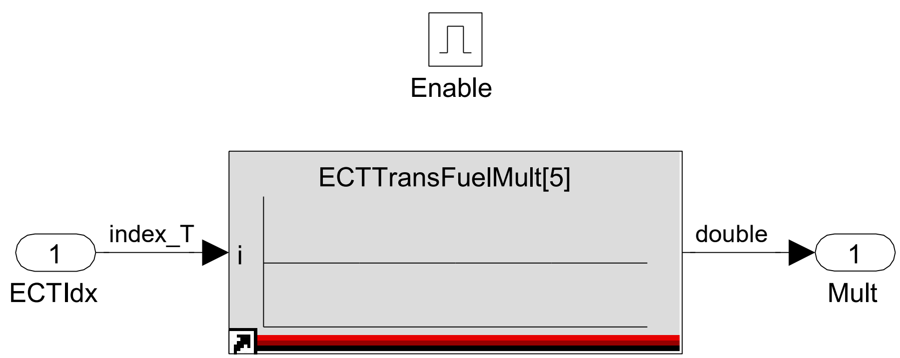
2
Sensors
<SynthSensors>
double
<MAFPort>
double
<FuelSense>
Ethanol_xx [%]
Desired A/F Ratio
Calculate A/F Ratio
double
1
DesEquivRatio
double
double
1
BaseFuelRate [g/s]
Fuel Flow = Mass Airflow * Equivalence Ratio / Air-to-fuel Ratio
Desired_AF_Ratio
14.6
double
Gasoline
Stoich A/F Ratio


double
1
Ethanol_xx [%]
DesAFRatio[11]
double
1
Desired A/F Ratio

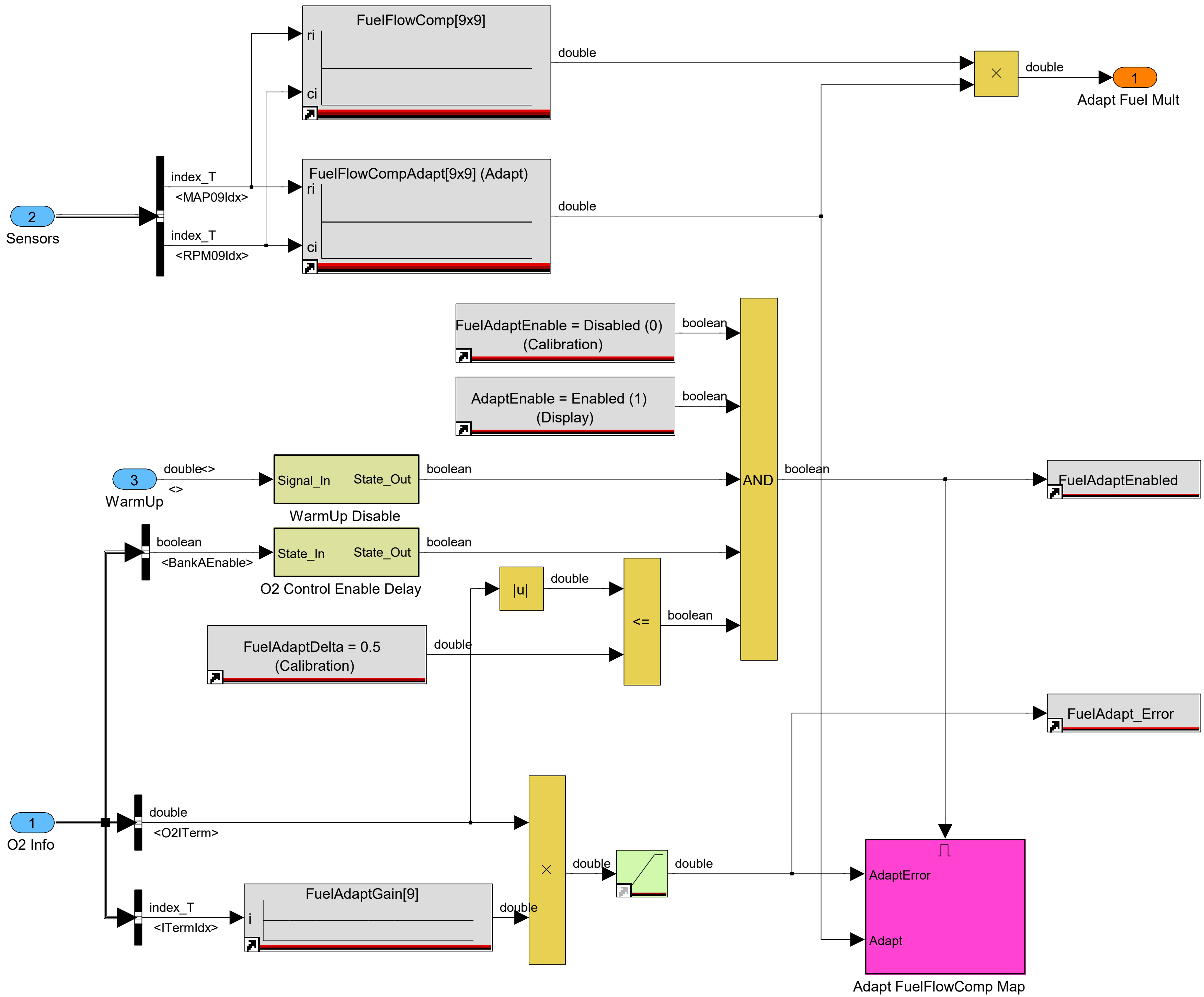

DeltaTPSFuelingEnable = Enabled (1)
(Calibration)
boolean
double
<TPS>
double
<MAFPort>
index_T
<ECT05Idx>
double
<MAP_Angular>
TPS
MAF
ECTIdx
MAPAngle
TRANSIENT
FUELING
MULTIPLIER
DeltaTPSMult
double
Delta TPS Transient Fueling
2
Sensors
1
Fuel
double
double
dm/dt [g/s]
RPM
EventsPerRev
MASS FLOW
TO CHARGE MASS
TRANSFORM
m [mg]
double
3
FPC
double
<RPM>
1
double
Mass Flow to Charge Mass Transform
PrimarySOI[9x9]
double
1
PrimaryInjTiming
Primary Pulse
Injection Timing
index_T
<MAP09Idx>
index_T
<RPM09Idx>
MakeUpEOI[9x9]
double
EOI
2
MakeUpInjTiming
Make-Up Pulse
End of Injection Timing1



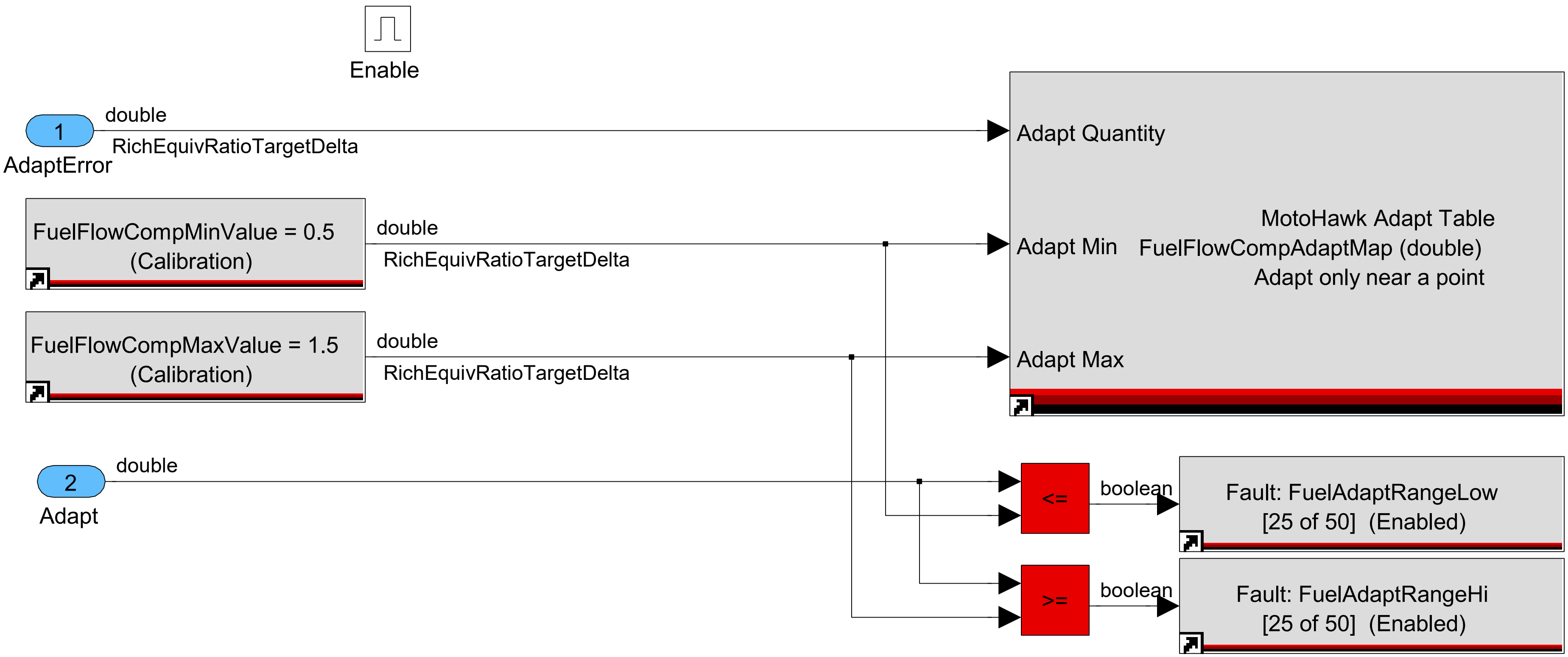
Enable
2
MAF
double
MAF09[9]
u
i
index_T
DeltaTPS_Mult[9x17]
ri
ci
double
1
TPS
double
double
DeltaTPS17[17]
u
i
index_T
1st-Order
Low Pass
in
out
double
DeltaTPS
TransFuel_TPSFilt
in ~= 1
boolean
1
DeltaTPSMult
double
3
ECTIdx
index_T
ECTIdx
Mult
double
ECT Transient Fueling
DeltaMAP_Mult[9x17]
ri
ci
double
4
MAPAngle
double
double
DeltaMAP17[17]
u
i
index_T
1st-Order
Low Pass
in
out
double
DeltaMAP
TransFuel_MAPFilt

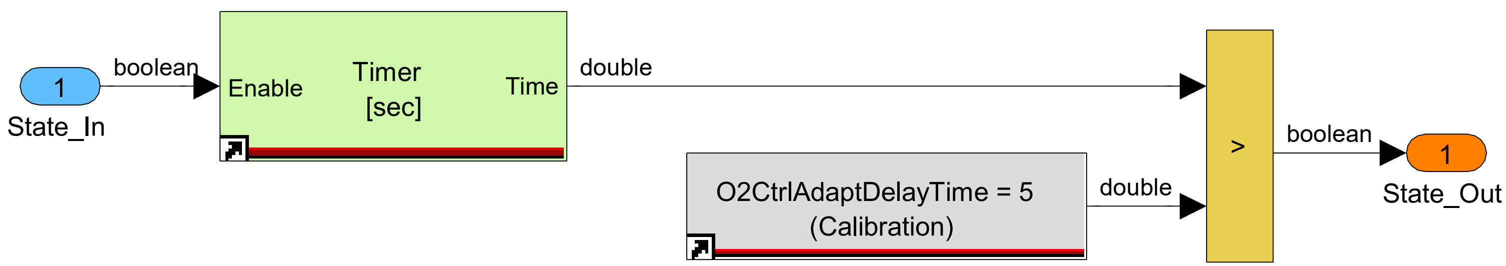


Enable
ECTTransFuelMult[5]
1
ECTIdx
index_T
i
double
1
Mult

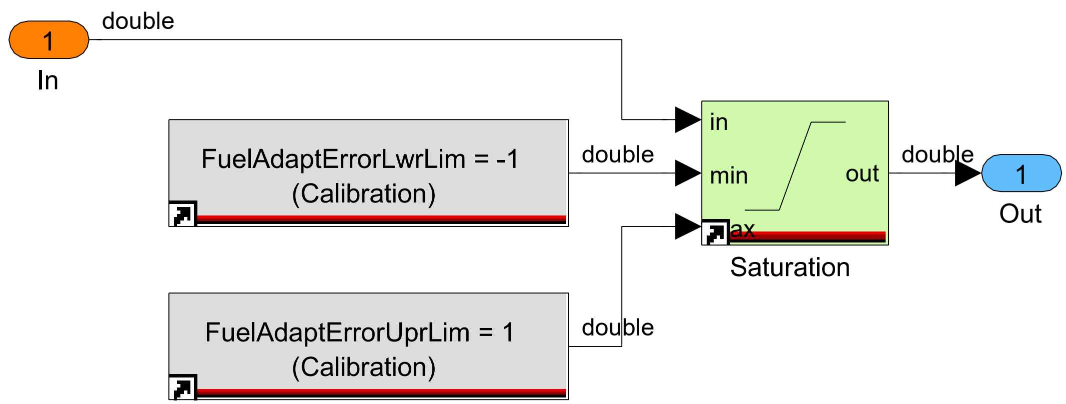


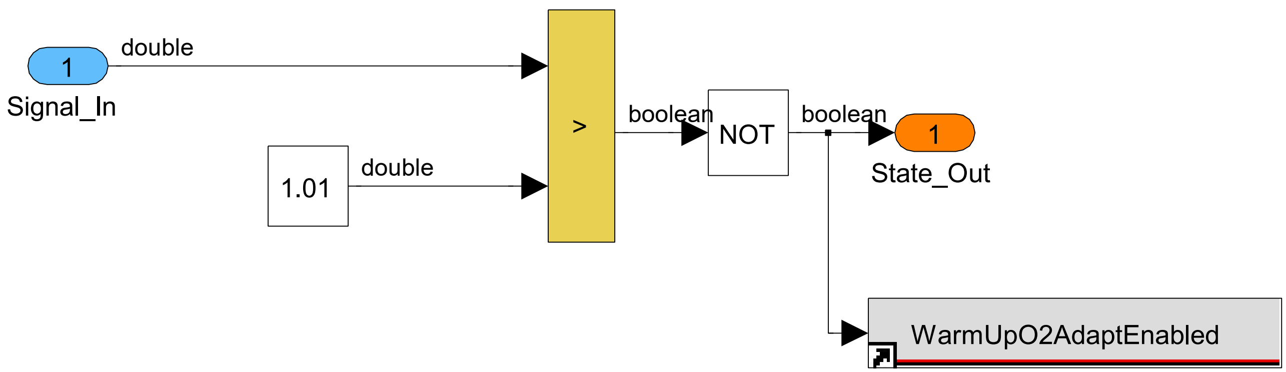
FuelFlowComp[9x9]
ri
ci
double
Adapt Fuel Mult
1
FuelFlowCompAdapt[9x9] (Adapt)
index_T
<MAP09Idx>
index_T
<RPM09Idx>
2
Sensors
FuelAdaptEnable = Disabled (0)
(Calibration)
boolean
AdaptEnable = Enabled (1)
(Display)
3
WarmUp
double<>
<>
Signal_In
State_Out
WarmUp Disable
AND
FuelAdaptEnabled
<BankAEnable>
State_In
O2 Control Enable Delay
|u|
<=
FuelAdaptDelta = 0.5
(Calibration)
FuelAdapt_Error
1
O2 Info
<O2ITerm>
<ITermIdx>
FuelAdaptGain[9]
i
AdaptError
Adapt
Adapt FuelFlowComp Map


Enable
1
AdaptError
double
RichEquivRatioTargetDelta
FuelFlowCompMinValue = 0.5
(Calibration)
double
RichEquivRatioTargetDelta
FuelFlowCompMaxValue = 1.5
(Calibration)
double
RichEquivRatioTargetDelta
Adapt Quantity
Adapt Min
Adapt Max
MotoHawk Adapt Table
FuelFlowCompAdaptMap (double)
Adapt only near a point
2
Adapt
double
<=
>=
boolean
boolean
Fault: FuelAdaptRangeLow
[25 of 50] (Enabled)
Fault: FuelAdaptRangeHi
[25 of 50] (Enabled)

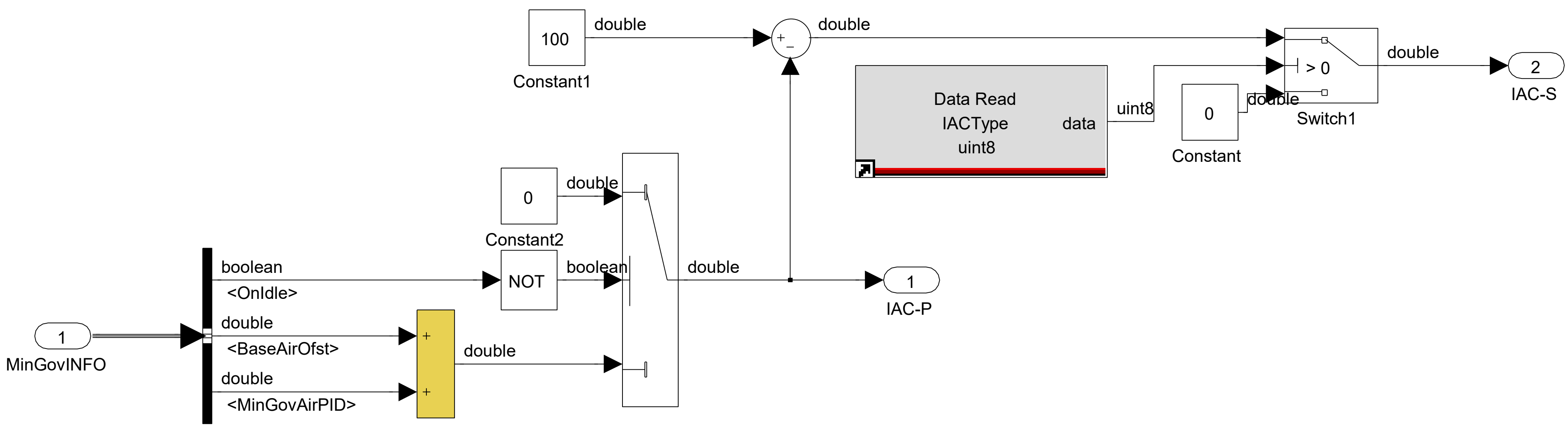

1
State_In
boolean
Enable
Timer
[sec]
Time
double
O2CtrlAdaptDelayTime = 5
(Calibration)
double
>
boolean
1
State_Out

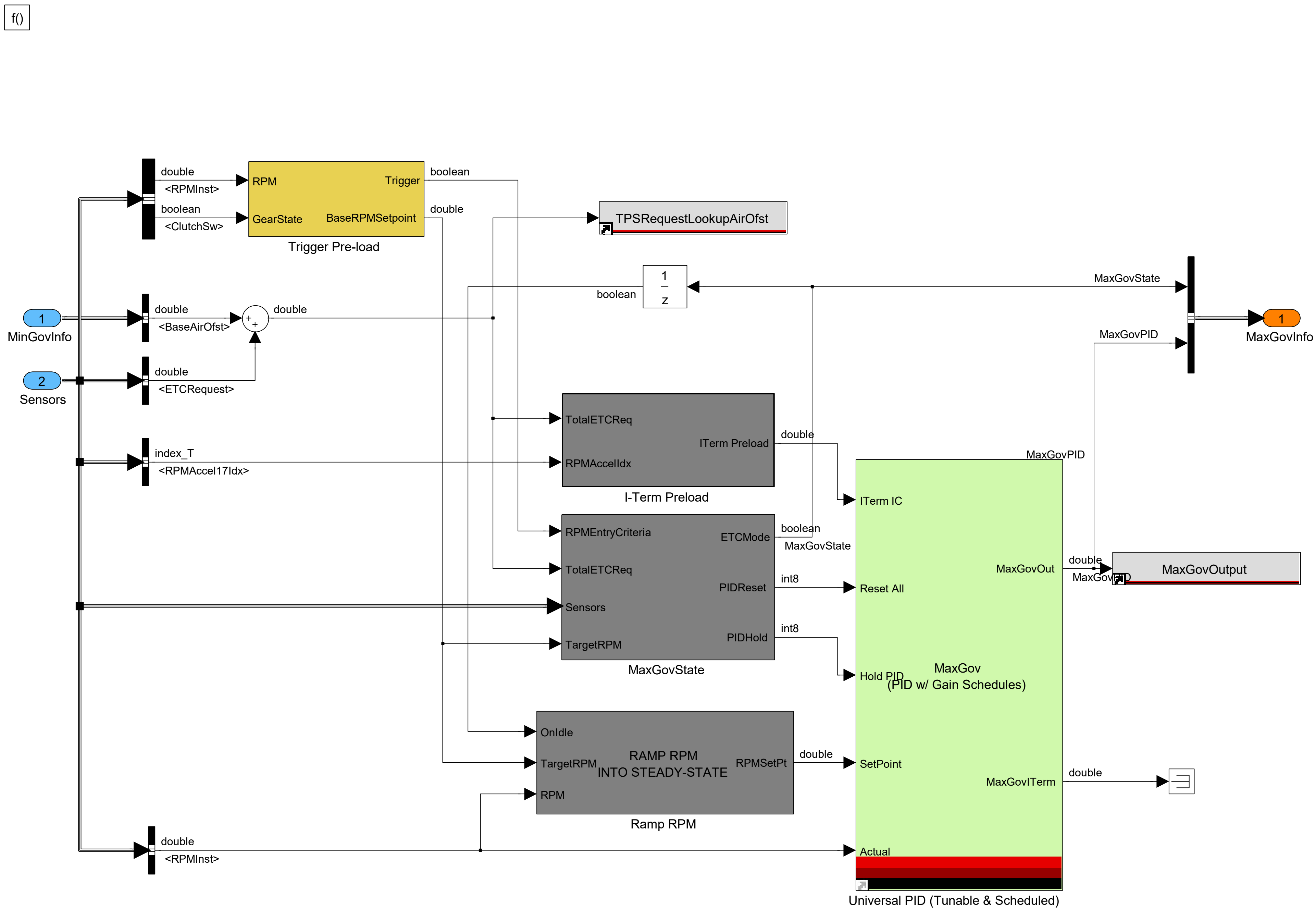
Calibratable wrapper around the Saturation block



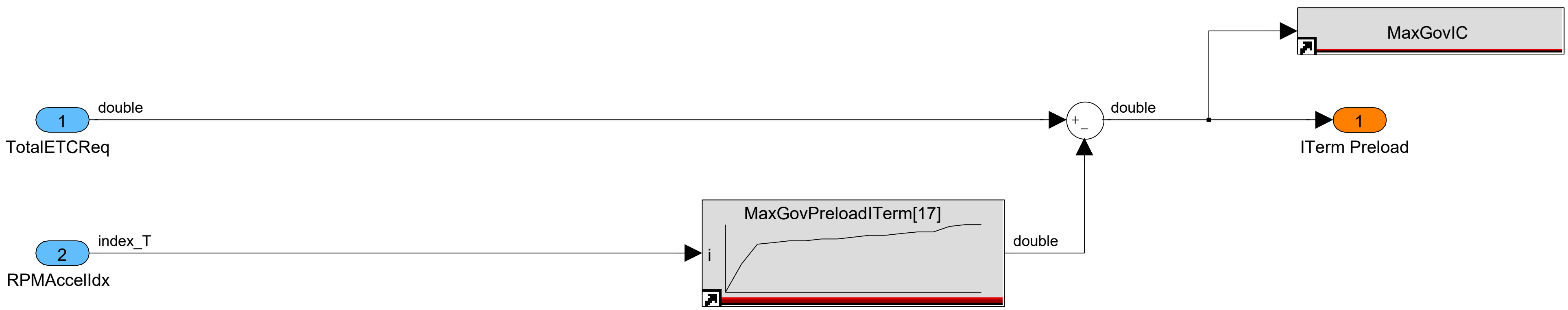


1
Signal_In
double
1.01
double
>
boolean
NOT
boolean
1
State_Out
WarmUpO2AdaptEnabled

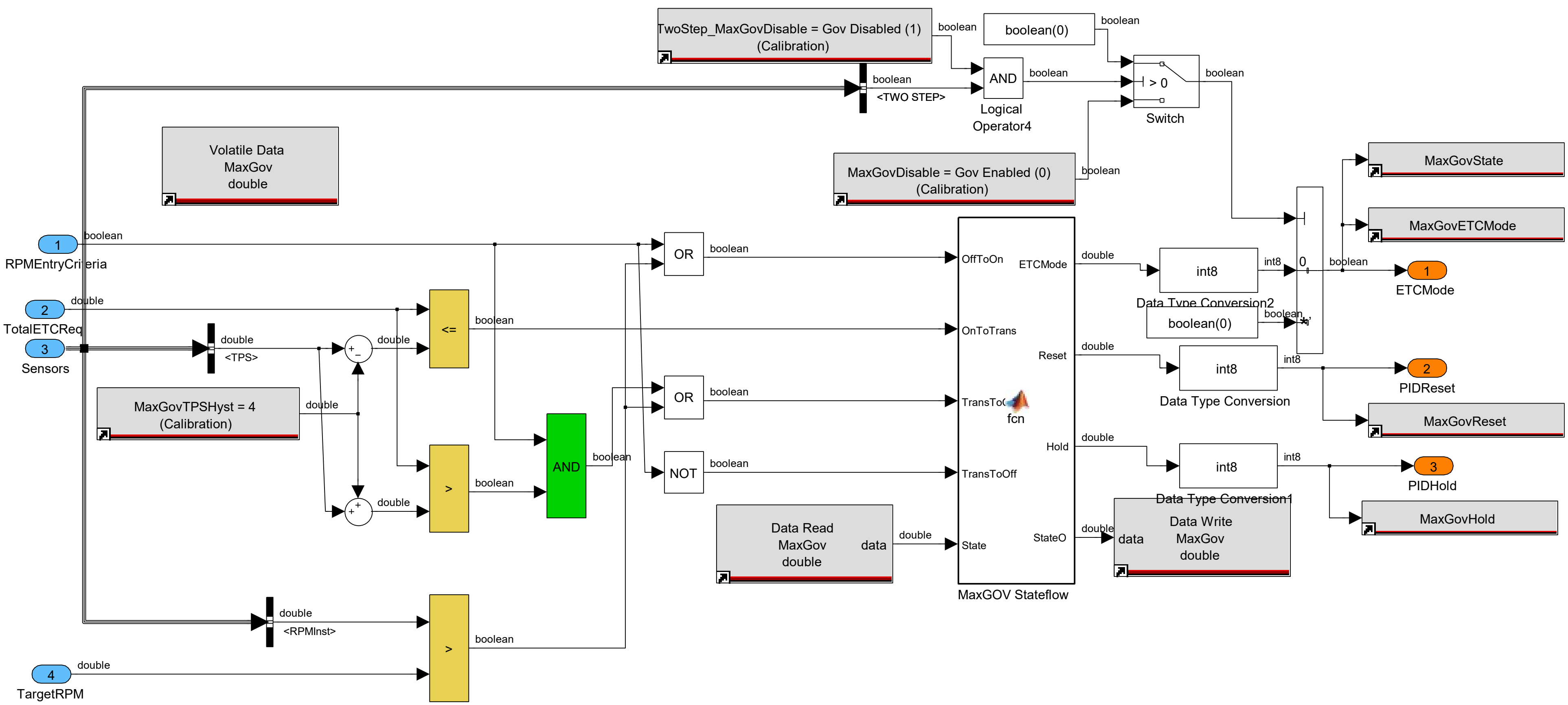

100
double
Constant1
double
Data Read
IACType
uint8
data
uint8
> 0
0
double
Constant
Switch1
double
2
IAC-S
0
double
Constant2
boolean
<OnIdle>
NOT
boolean
double
1
IAC-P
1
MinGovINFO
double
<BaseAirOfst>
double
<MinGovAirPID>
double



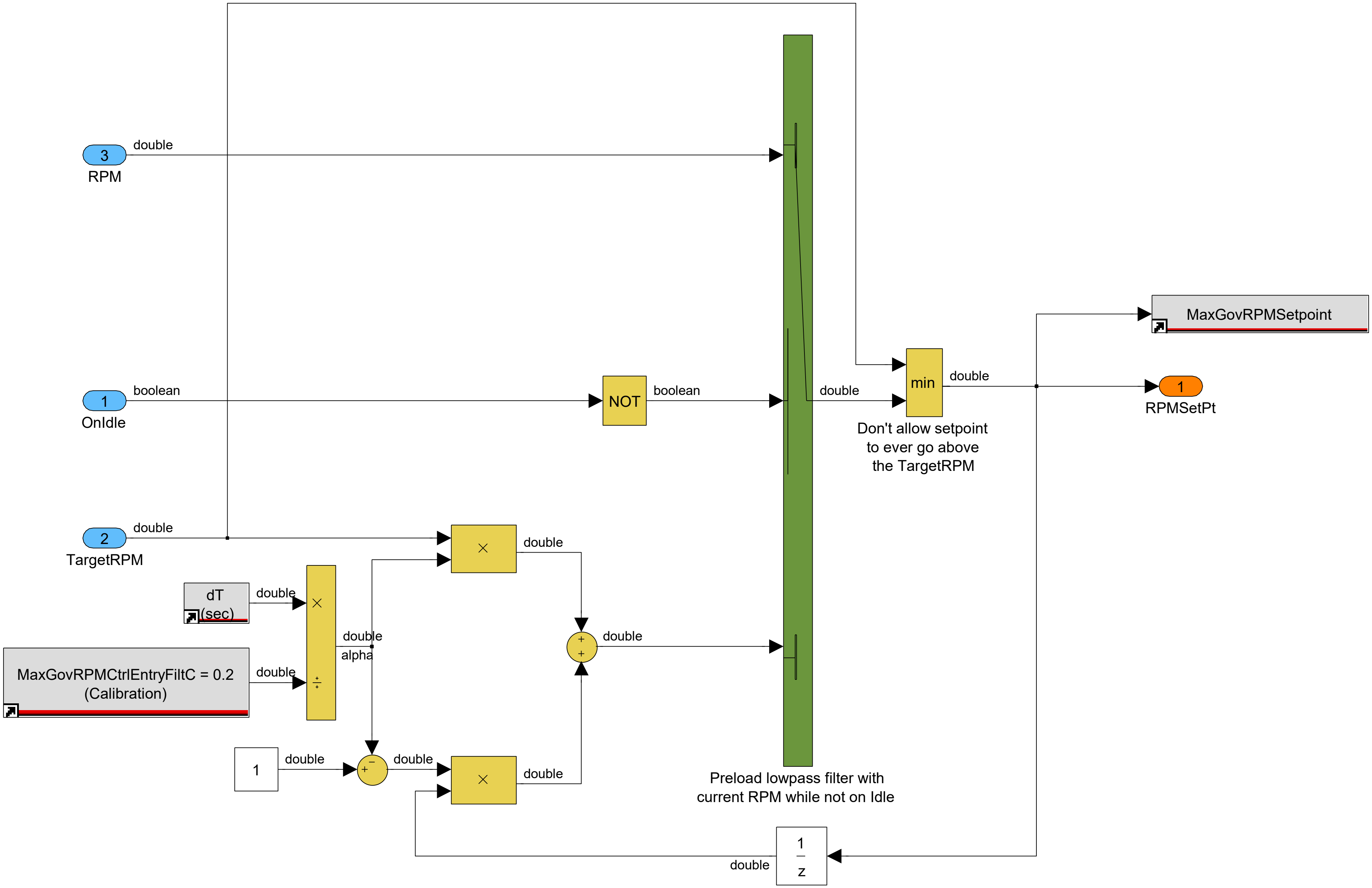
f()
double
<RPMInst>
boolean
<ClutchSw>
RPM
GearState
Trigger
BaseRPMSetpoint
Trigger Pre-load
boolean
double
TPSRequestLookupAirOfst
1
MinGovInfo
double
<BaseAirOfst>
double
2
Sensors
double
<ETCRequest>
1/z
boolean
MaxGovState
MaxGovPID
1
MaxGovInfo
index_T
<RPMAccel17Idx>
TotalETCReq
RPMAccelIdx
ITerm Preload
I-Term Preload
double
RPMEntryCriteria
TotalETCReq
Sensors
TargetRPM
ETCMode
PIDReset
PIDHold
MaxGovState
boolean
MaxGovState
int8
int8
MaxGovPID
ITerm IC
Reset All
Hold PID
SetPoint
Actual
MaxGovOut
MaxGovITerm
MaxGov
(PID w/ Gain Schedules)
Universal PID (Tunable & Scheduled)
double
MaxGovPID
MaxGovOutput
double
OnIdle
TargetRPM
RPM
RAMP RPM
INTO STEADY-STATE
RPMSetPt
Ramp RPM
double
double
<RPMInst>



1
TotalETCReq
double
2
RPMAccelIdx
index_T
MaxGovPreloadITerm[17]
i
double
+
_
double
MaxGovIC
1
ITerm Preload



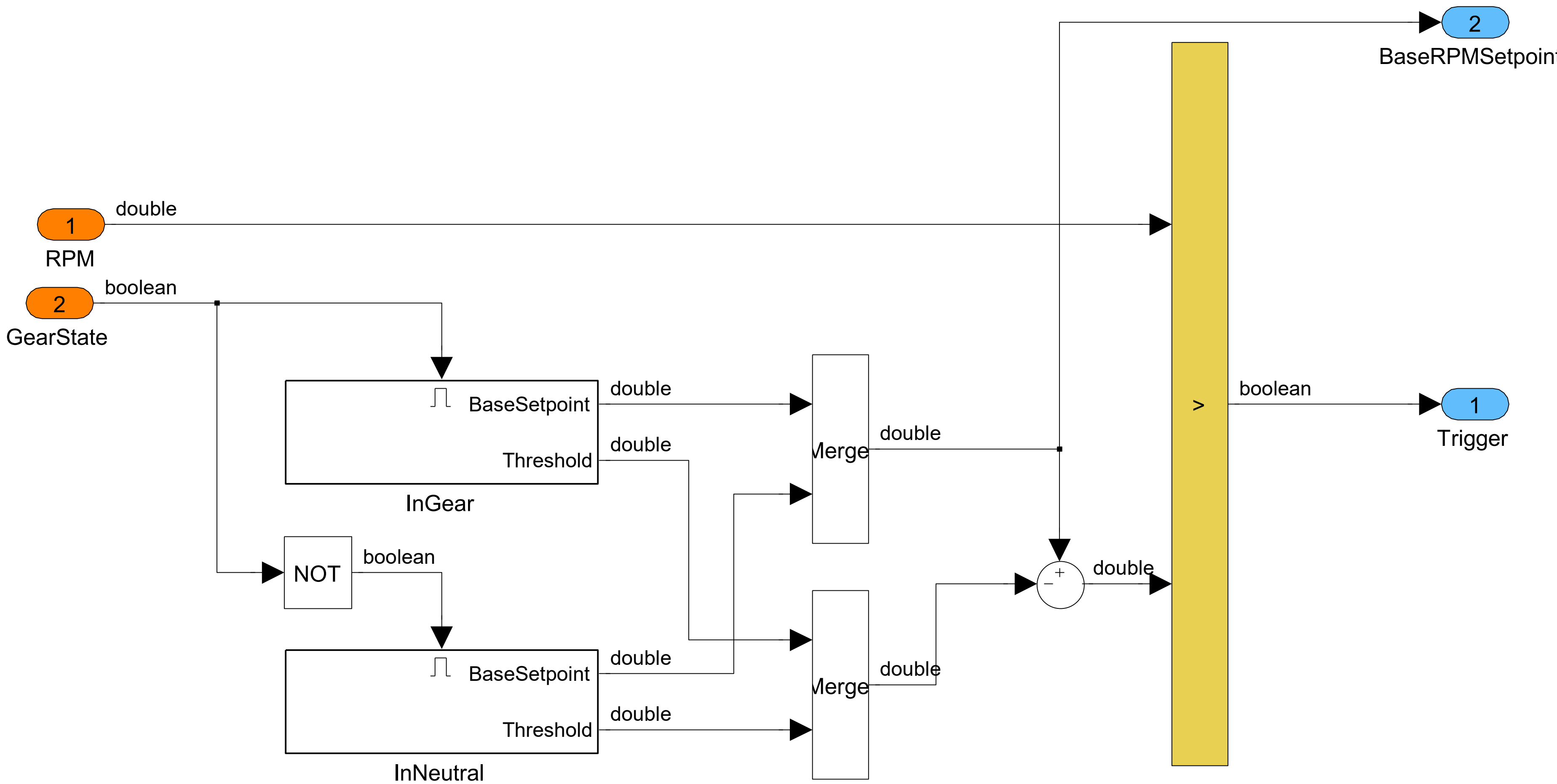
Move into On State if RPM > EntryCriteria or Target.
Move into Trans State if APP falls below TPS, PID controller is frozen during Trans State, but output is based on APP.
When in AllSpeedGov mode, switch to Trans if AllSpeedGov setpoint is less than MaxGov setpoint minus hyst.
Move from Trans State back to On State if RPM > Target.
Move from Trans State to Off if RPM < Entry Criteria.



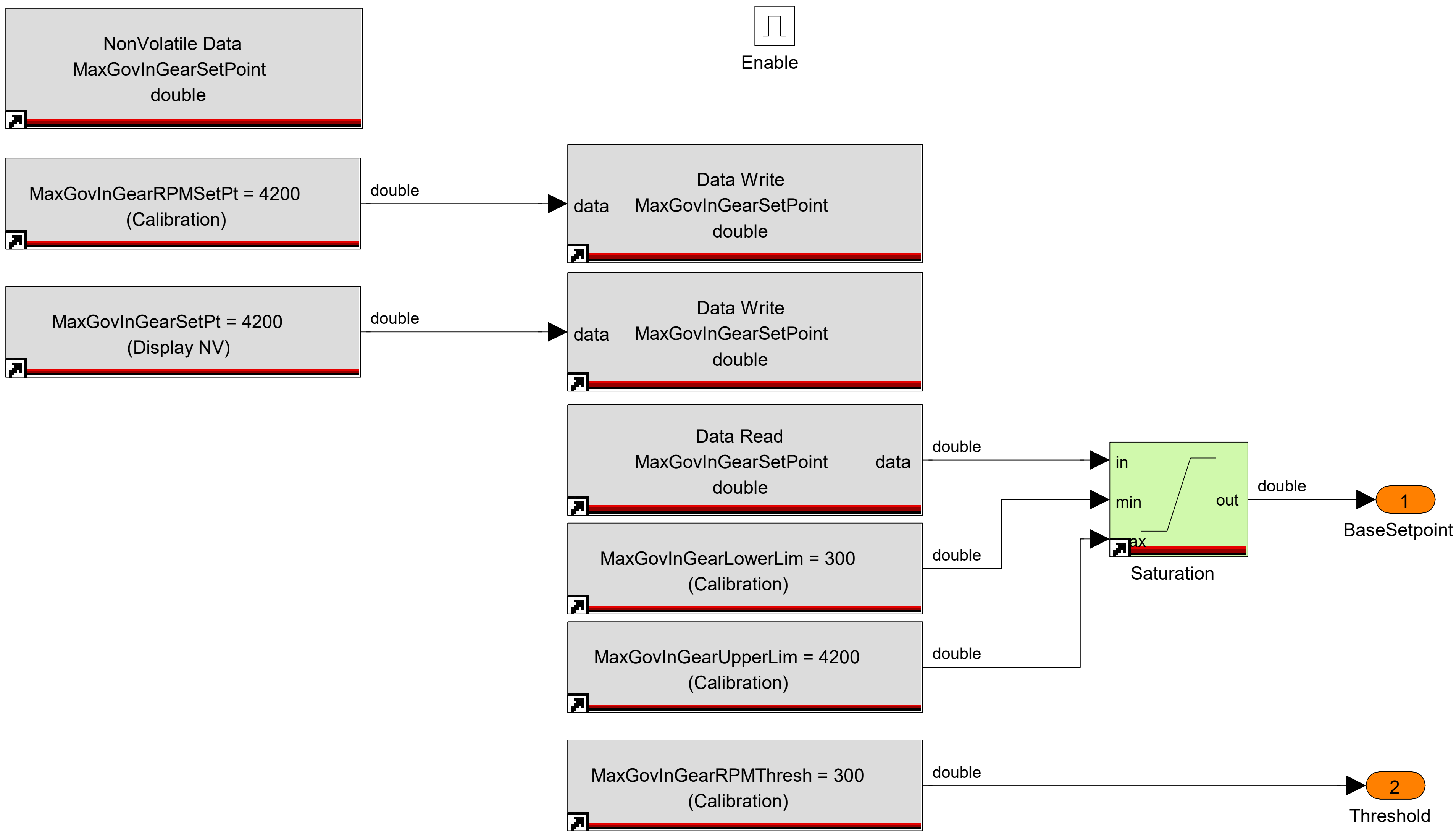
1st-Order Ramp Up

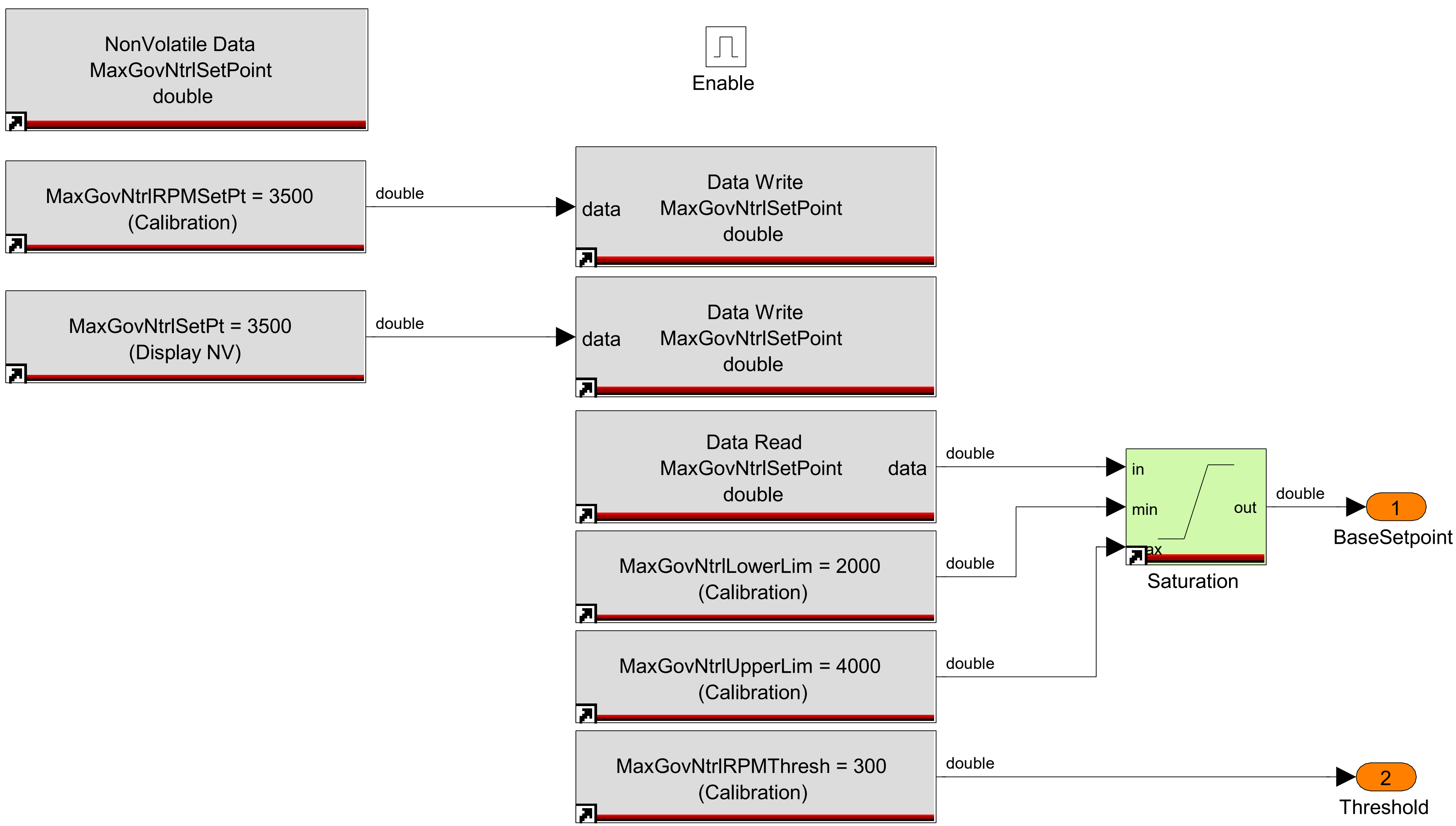
y[k] = a*x[k] + (1-a)*y[k-1]

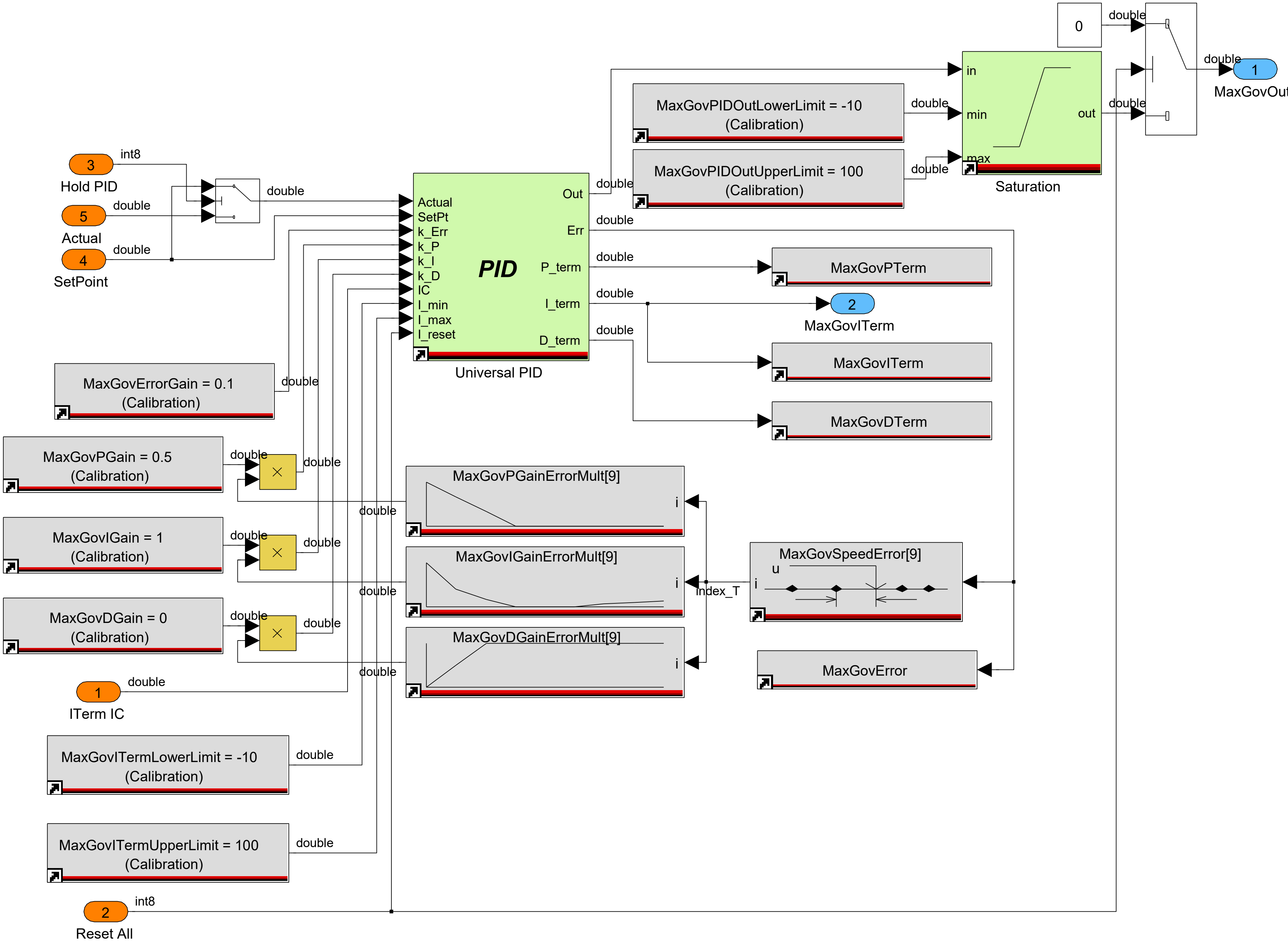
where a = t/T



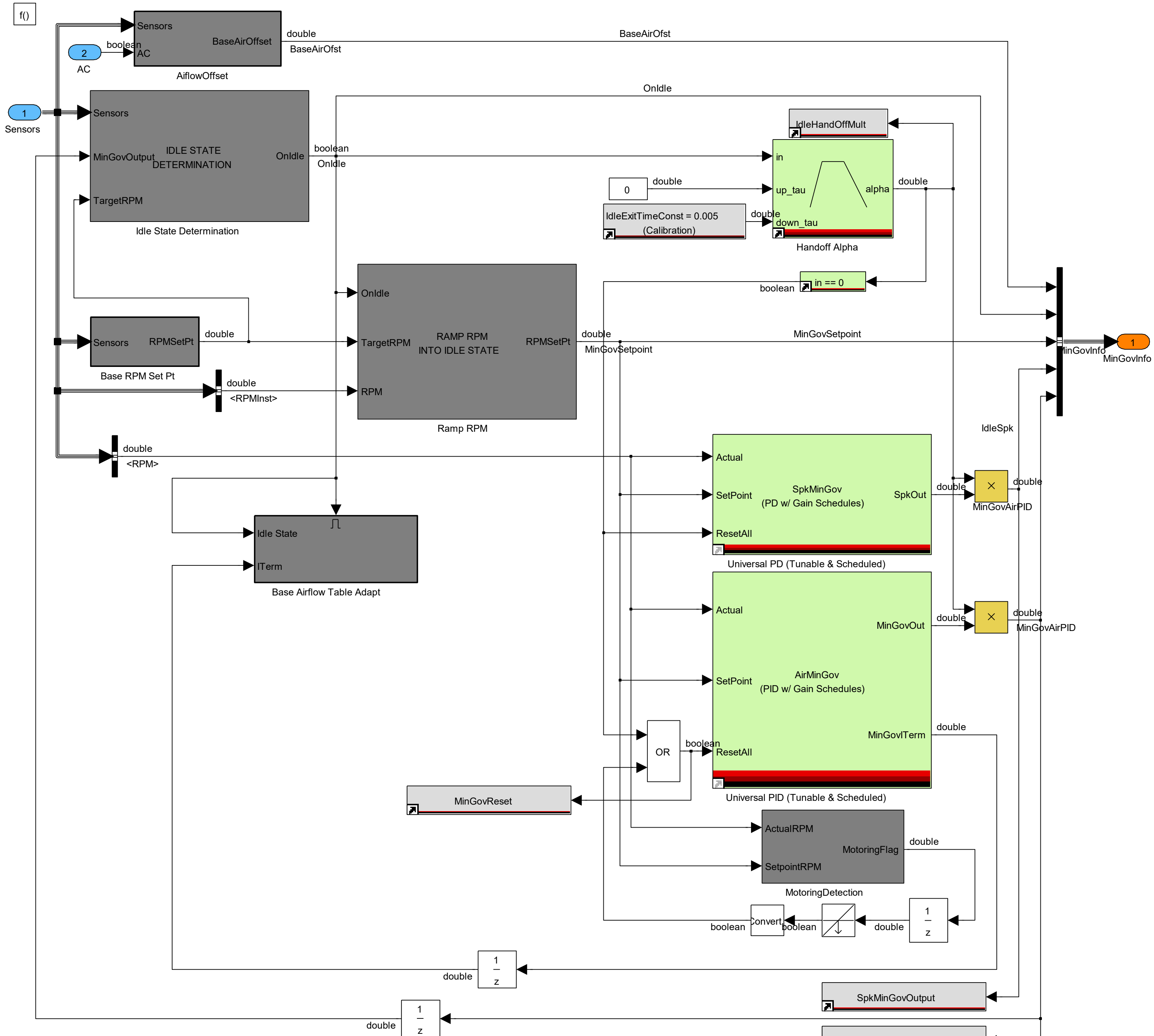
double
1
RPM
boolean
2
GearState
BaseSetpoint
double
Threshold
double
InGear
NOT
boolean
BaseSetpoint
double
Threshold
double
InNeutral
Merge
double
Merge
double
+
−
double
>
boolean
2
BaseRPMSetpoint
1
Trigger


NonVolatile Data
MaxGovInGearSetPoint
double
Enable
MaxGovInGearRPMSetPt = 4200
(Calibration)
double
Data Write
data
MaxGovInGearSetPoint
double
MaxGovInGearSetPt = 4200
(Display NV)
double
Data Write
data
MaxGovInGearSetPoint
double
Data Read
MaxGovInGearSetPoint
data
double
double
in
min
out
Saturation
double
1
BaseSetpoint
MaxGovInGearLowerLim = 300
(Calibration)
double
MaxGovInGearUpperLim = 4200
(Calibration)
double
MaxGovInGearRPMThresh = 300
(Calibration)
double
2
Threshold

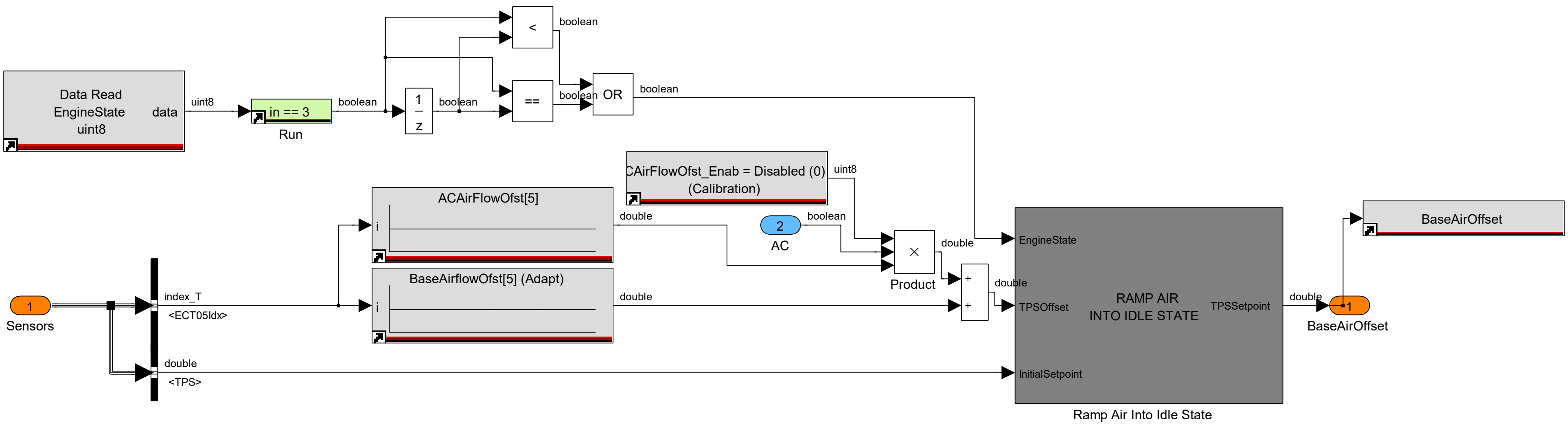

NonVolatile Data
MaxGovNtrlSetPoint
double
Enable
MaxGovNtrlRPMSetPt = 3500
(Calibration)
double
data
Data Write
MaxGovNtrlSetPoint
double
MaxGovNtrlSetPt = 3500
(Display NV)
double
data
Data Write
MaxGovNtrlSetPoint
double
Data Read
MaxGovNtrlSetPoint
double
data
double
in
min
out
double
1
BaseSetpoint
Saturation
MaxGovNtrlLowerLim = 2000
(Calibration)
double
MaxGovNtrlUpperLim = 4000
(Calibration)
double
MaxGovNtrlRPMThresh = 300
(Calibration)
double
2
Threshold



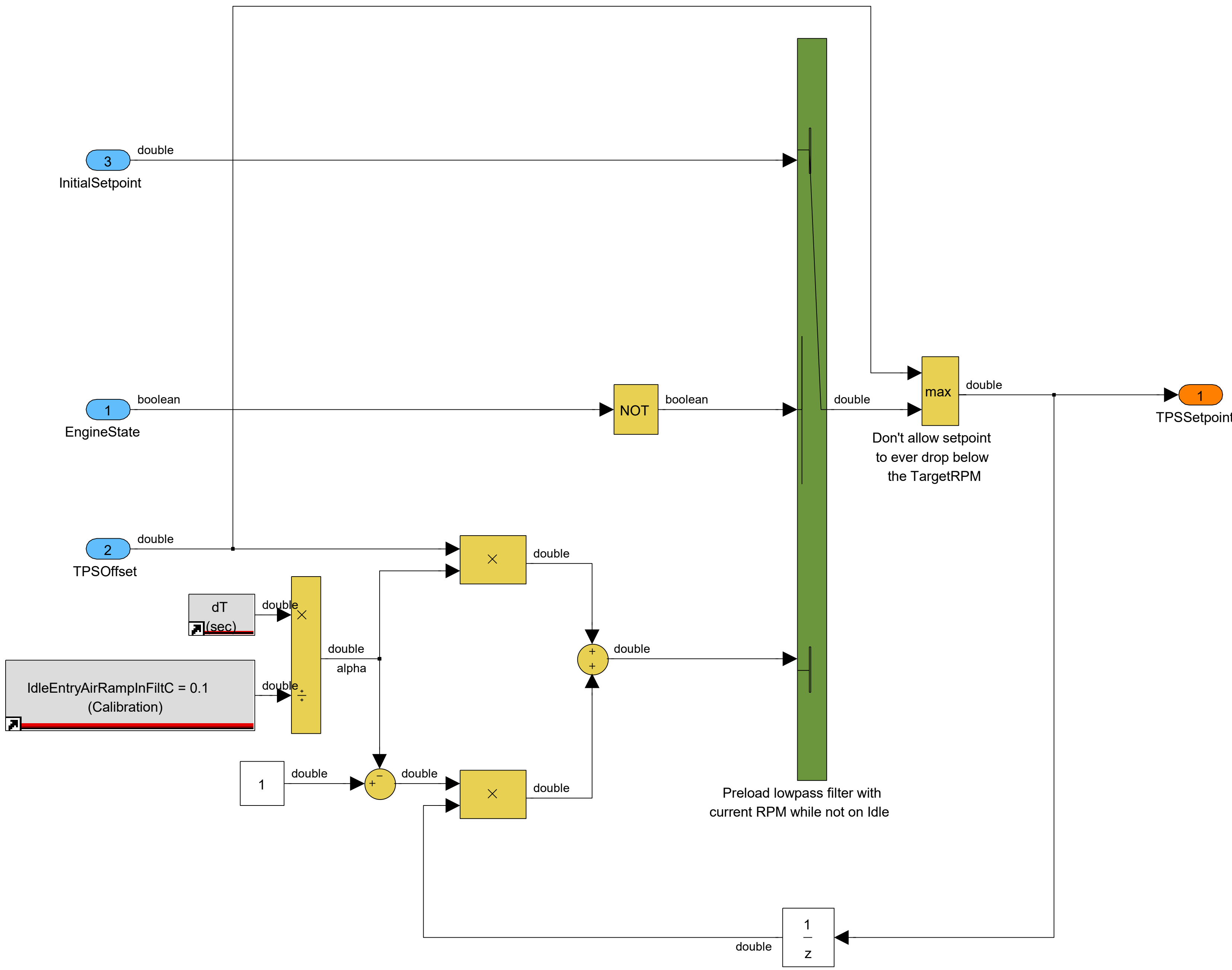
0
double
1
MaxGovOut
in
min
out
max
Saturation
MaxGovPIDOutLowerLimit = -10
(Calibration)
MaxGovPIDOutUpperLimit = 100
(Calibration)
3
Hold PID
int8
5
Actual
4
SetPoint
Actual
SetPt
k_Err
k_P
k_I
k_D
IC
I_min
I_max
I_reset
PID
Out
Err
P_term
I_term
D_term
Universal PID
MaxGovPTerm
2
MaxGovITerm
MaxGovITerm
MaxGovDTerm
MaxGovErrorGain = 0.1
(Calibration)
MaxGovPGain = 0.5
(Calibration)
MaxGovIGain = 1
(Calibration)
MaxGovDGain = 0
(Calibration)
MaxGovPGainErrorMult[9]
MaxGovIGainErrorMult[9]
MaxGovDGainErrorMult[9]
i
MaxGovSpeedError[9]
u
index_T
MaxGovError
1
ITerm IC
MaxGovITermLowerLimit = -10
(Calibration)
MaxGovITermUpperLimit = 100
(Calibration)
2
Reset All



f()
Sensors
AC
BaseAirOffset
AiflowOffset
BaseAirOfst
OnIdle
IDLE STATE DETERMINATION
MinGovOutput
TargetRPM
Idle State Determination
IdleHandOffMult
in
up_tau
down_tau
alpha
Handoff Alpha
IdleExitTimeConst = 0.005
(Calibration)
in == 0
RPMSetPt
Base RPM Set Pt
RAMP RPM INTO IDLE STATE
RPM
Ramp RPM
MinGovSetpoint
<RPMInst>
<RPM>
MinGovInfo
IdleSpk
Actual
SetPoint
ResetAll
SpkMinGov
(PD w/ Gain Schedules)
SpkOut
Universal PD (Tunable & Scheduled)
MinGovAirPID
Idle State
ITerm
Base Airflow Table Adapt
AirMinGov
(PID w/ Gain Schedules)
MinGovOut
MinGovITerm
Universal PID (Tunable & Scheduled)
OR
MinGovReset
ActualRPM
SetpointRPM
MotoringFlag
MotoringDetection
Convert
SpkMinGovOutput
AirMinGovOutput
double
boolean



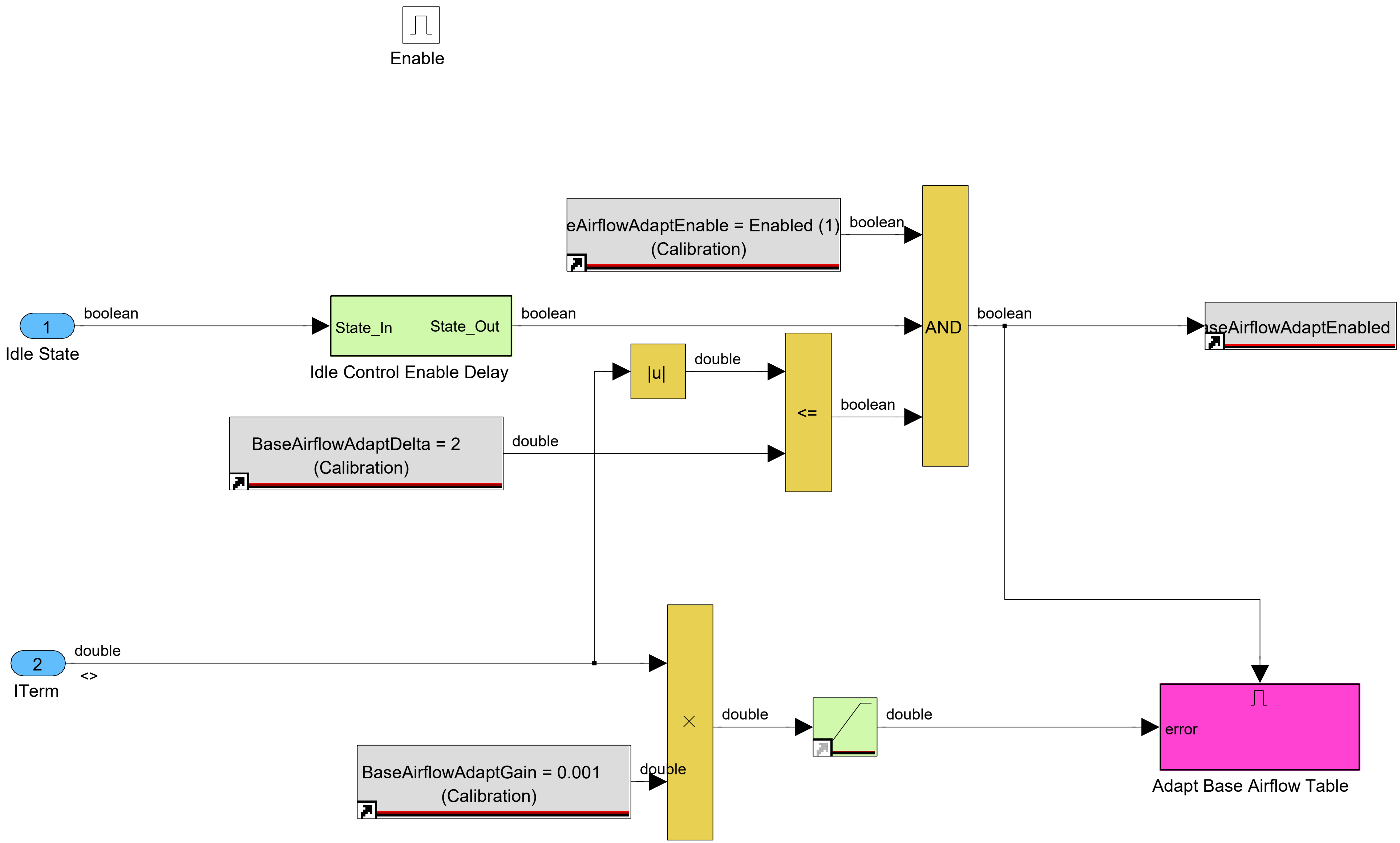
Data Read
EngineState
uint8
data
uint8
in == 3
Run
boolean
1
z
boolean
<
boolean
==
boolean
OR
boolean
CAirFlowOfst_Enab = Disabled (0)
(Calibration)
uint8
ACAirFlowOfst[5]
i
double
2
AC
boolean
Product
double
+
+
double
1
Sensors
index_T
<ECT05Idx>
BaseAirflowOfst[5] (Adapt)
i
double
double
<TPS>
EngineState
TPSOffset
InitialSetpoint
RAMP AIR
INTO IDLE STATE
TPSSetpoint
Ramp Air Into Idle State
double
1
BaseAirOffset
BaseAirOffset



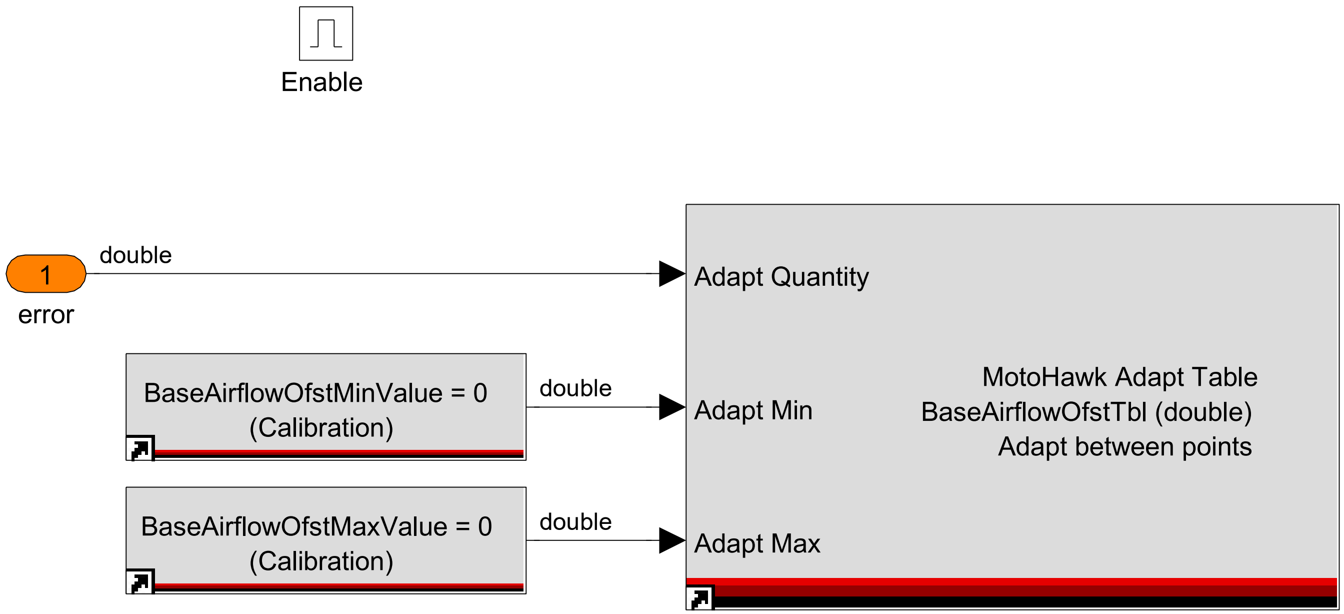
1st-Order Ramp Down

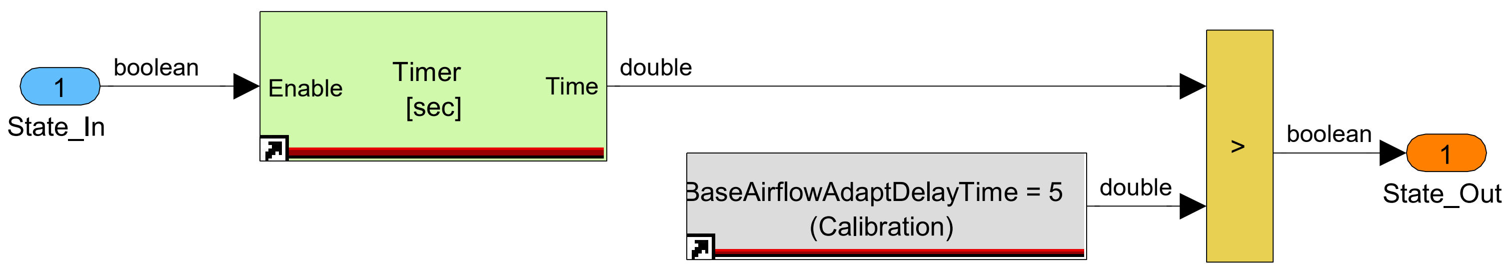
y[k] = a*x[k] + (1-a)*y[k-1]

where a = t/T



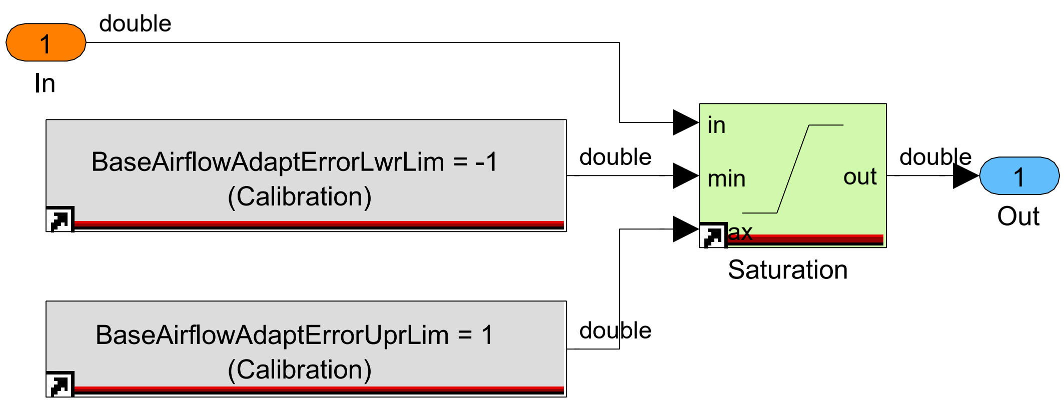
Enable
eAirflowAdaptEnable = Enabled (1)
(Calibration)
boolean
1
Idle State
boolean
State_In
State_Out
Idle Control Enable Delay
boolean
AND
boolean
aseAirflowAdaptEnabled
|u|
double
<=
boolean
BaseAirflowAdaptDelta = 2
(Calibration)
double
2
ITerm
double
<>
double
double
BaseAirflowAdaptGain = 0.001
(Calibration)
double
error
Adapt Base Airflow Table


Enable
1
error
double
Adapt Quantity
BaseAirflowOfstMinValue = 0
(Calibration)
double
Adapt Min
BaseAirflowOfstMaxValue = 0
(Calibration)
double
Adapt Max
MotoHawk Adapt Table
BaseAirflowOfstTbl (double)
Adapt between points

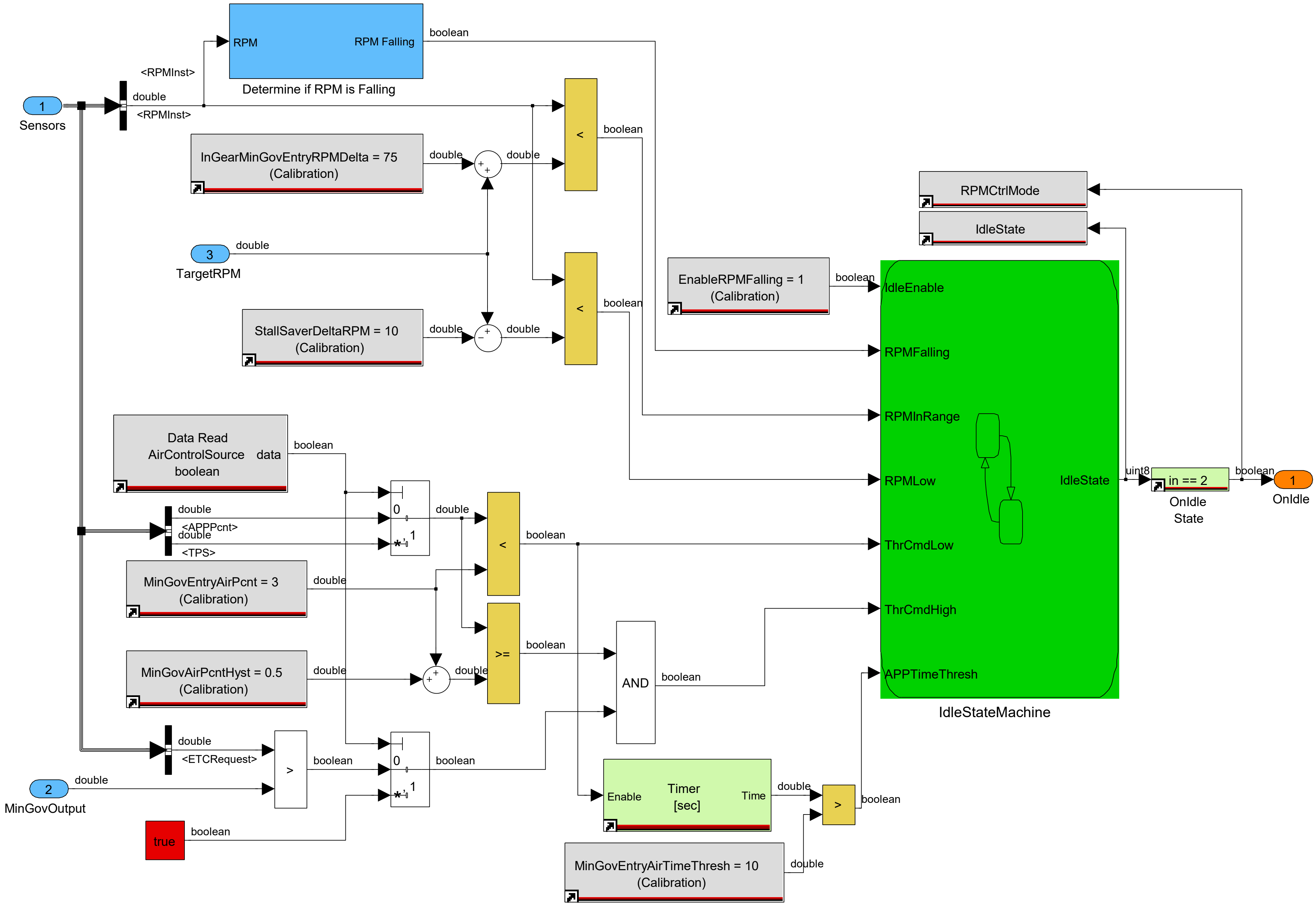


1
State_In
boolean
Enable
Timer
[sec]
Time
double
BaseAirflowAdaptDelayTime = 5
(Calibration)
double
>
boolean
1
State_Out

Calibratable wrapper around the Saturation block

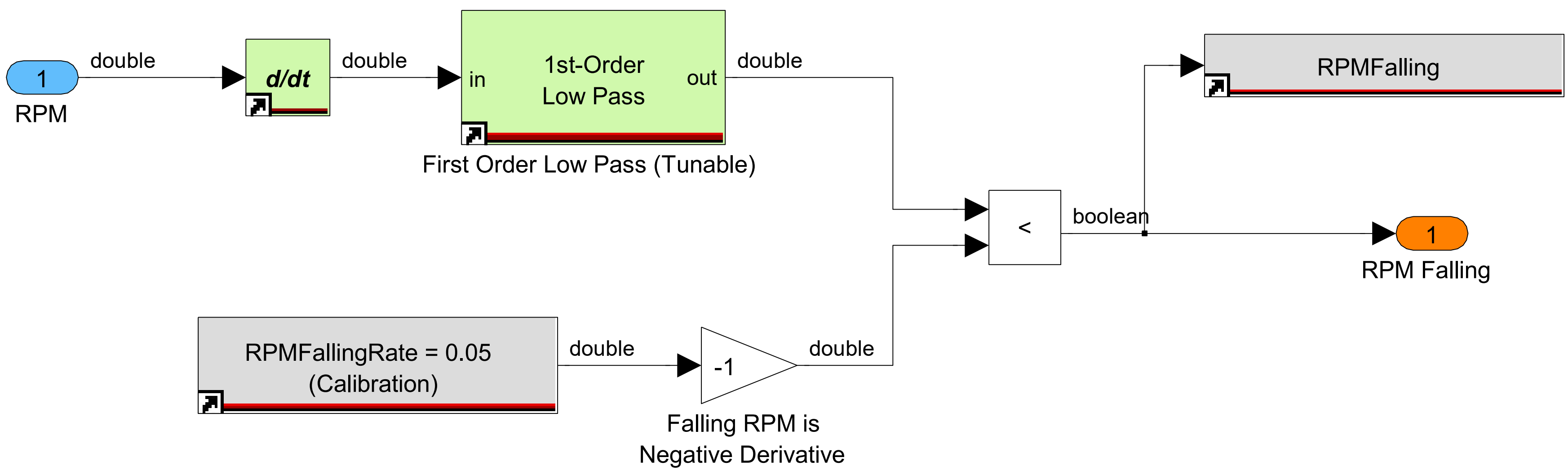


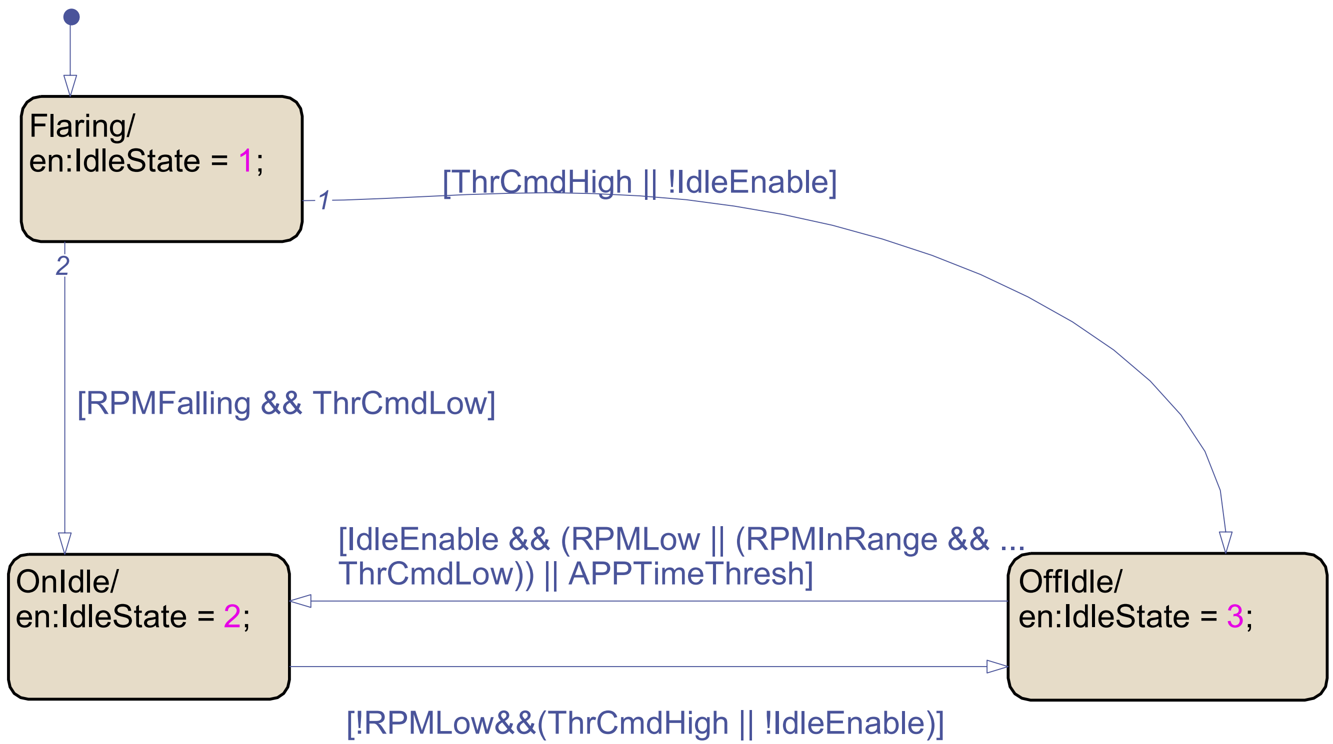

1
Sensors
index_T
<ECT05Idx>
MinGovClntRPMSetPt[5]
i
double
1
RPMSetPt

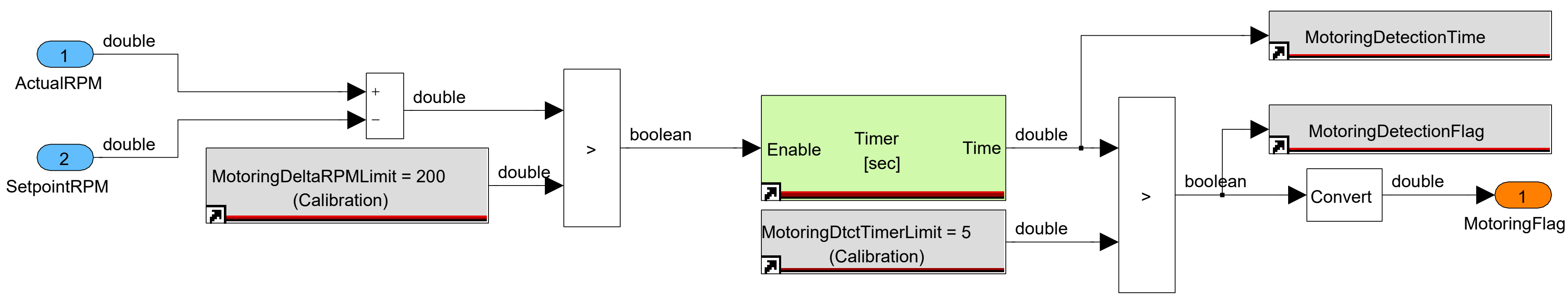


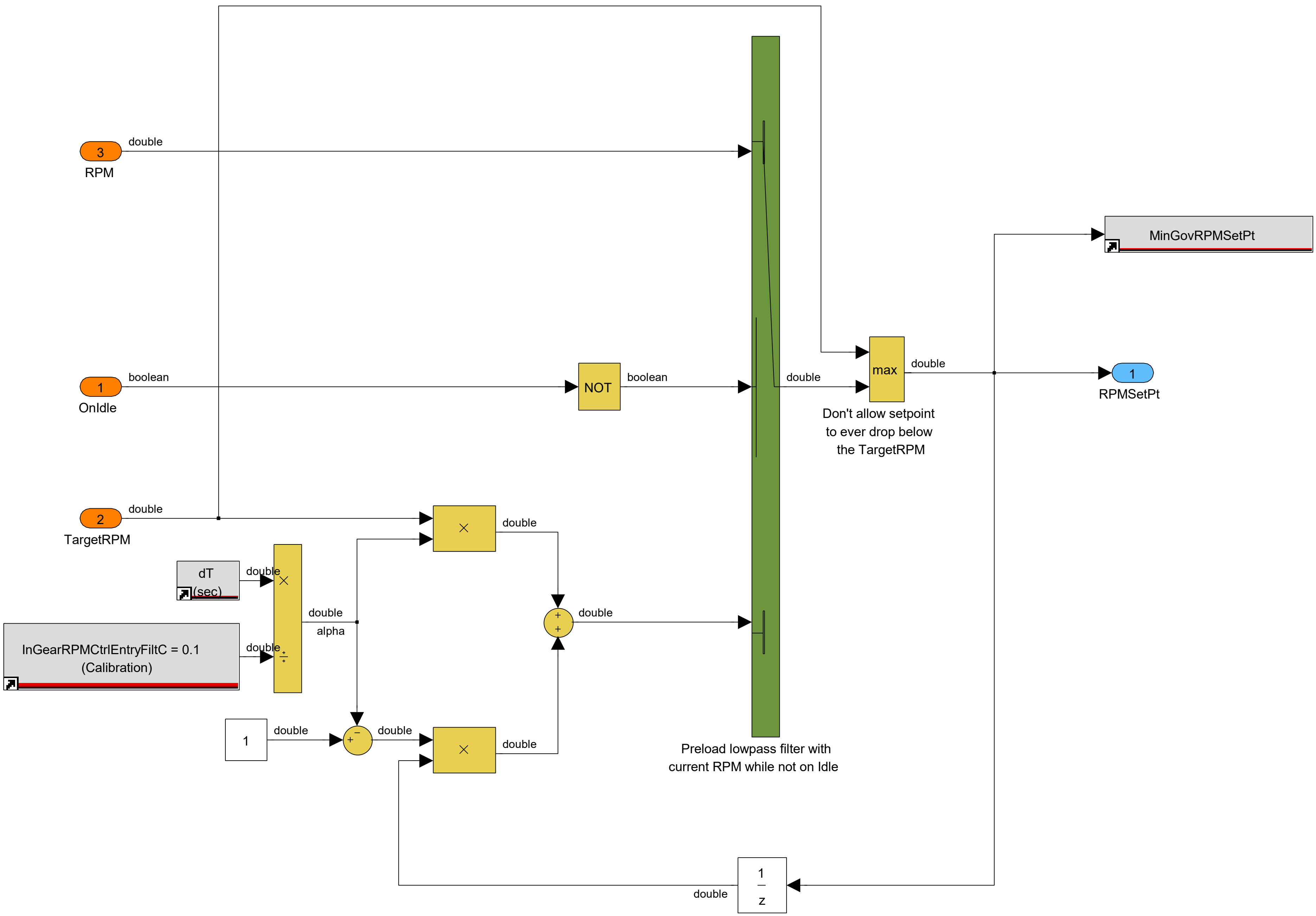
RPM
RPM Falling
boolean
Determine if RPM is Falling
<RPMInst>
double
<RPMInst>
1
Sensors
<
boolean
InGearMinGovEntryRPMDelta = 75
(Calibration)
double
double
3
TargetRPM
double
StallSaverDeltaRPM = 10
(Calibration)
double
double
<
boolean
RPMCtrlMode
IdleState
EnableRPMFalling = 1
(Calibration)
boolean
IdleEnable
RPMFalling
RPMInRange
RPMLow
IdleState
ThrCmdLow
ThrCmdHigh
APPTimeThresh
IdleStateMachine
uint8
in == 2
OnIdle
State
boolean
1
OnIdle
Data Read
AirControlSource
boolean
data
boolean
double
<APPPcnt>
double
<TPS>
double
<
boolean
MinGovEntryAirPcnt = 3
(Calibration)
double
>=
boolean
AND
boolean
MinGovAirPcntHyst = 0.5
(Calibration)
double
double
double
<ETCRequest>
>
boolean
boolean
2
MinGovOutput
double
true
boolean
Enable
Timer
[sec]
Time
double
>
boolean
MinGovEntryAirTimeThresh = 10
(Calibration)
double

Determine if RPM is falling




Flaring/
en:IdleState = 1;
1
[ThrCmdHigh || !IdleEnable]
2
[RPMFalling && ThrCmdLow]
[IdleEnable && (RPMLow || (RPMInRange && ...
ThrCmdLow)) || APPTimeThresh]
OnIdle/
en:IdleState = 2;
OffIdle/
en:IdleState = 3;
[!RPMLow&&(ThrCmdHigh || !IdleEnable)]

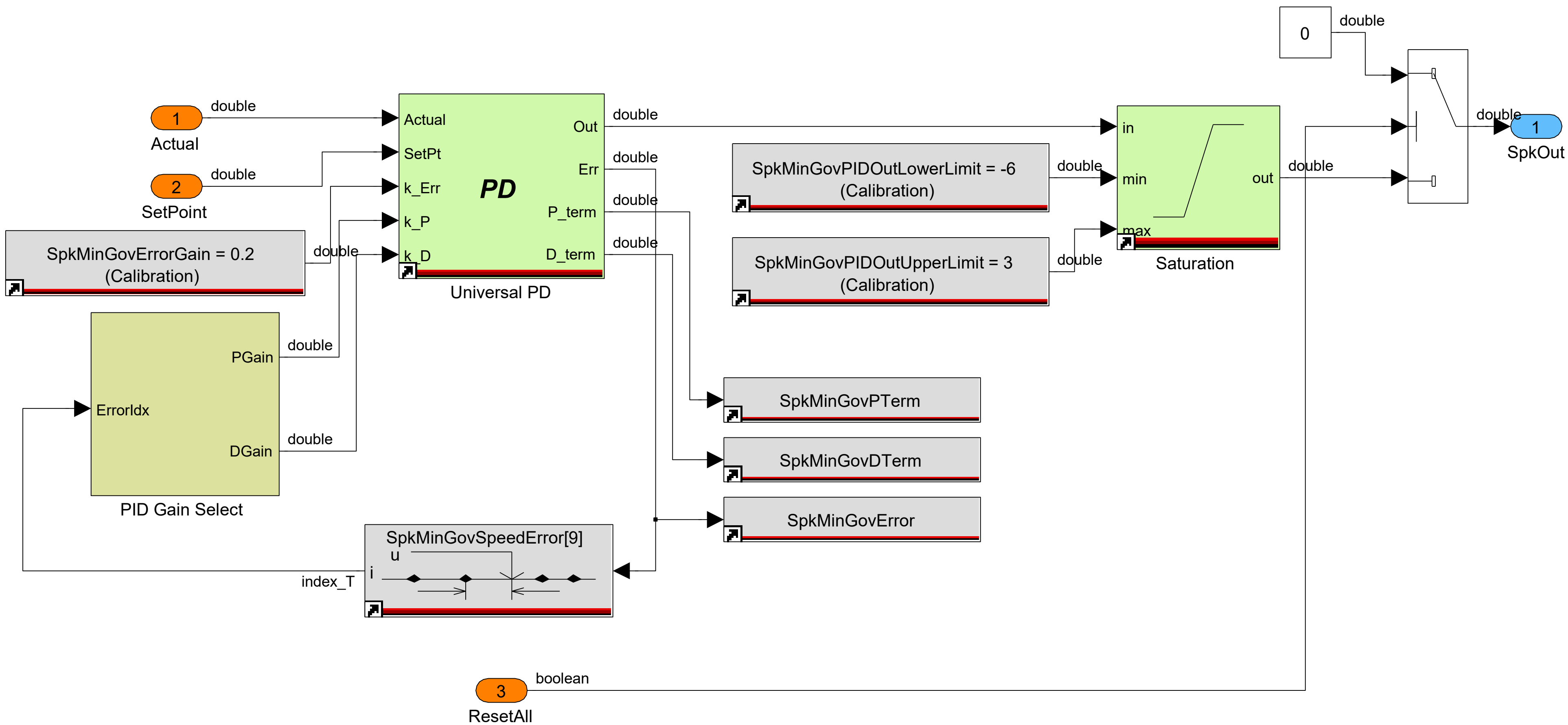

1
ActualRPM
double
2
SetpointRPM
double
+
−
double
MotoringDeltaRPMLimit = 200
(Calibration)
double
>
boolean
Enable
Timer
[sec]
Time
double
MotoringDtctTimerLimit = 5
(Calibration)
double
>
boolean
MotoringDetectionTime
MotoringDetectionFlag
Convert
double
1
MotoringFlag



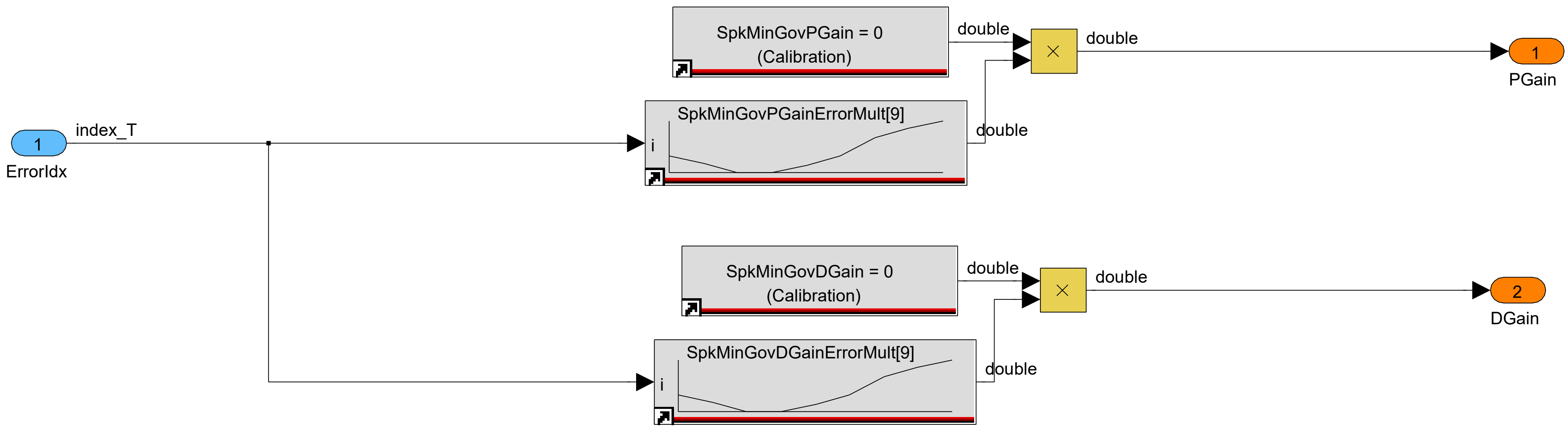
1st-Order Ramp Down

y[k] = a*x[k] + (1-a)*y[k-1]

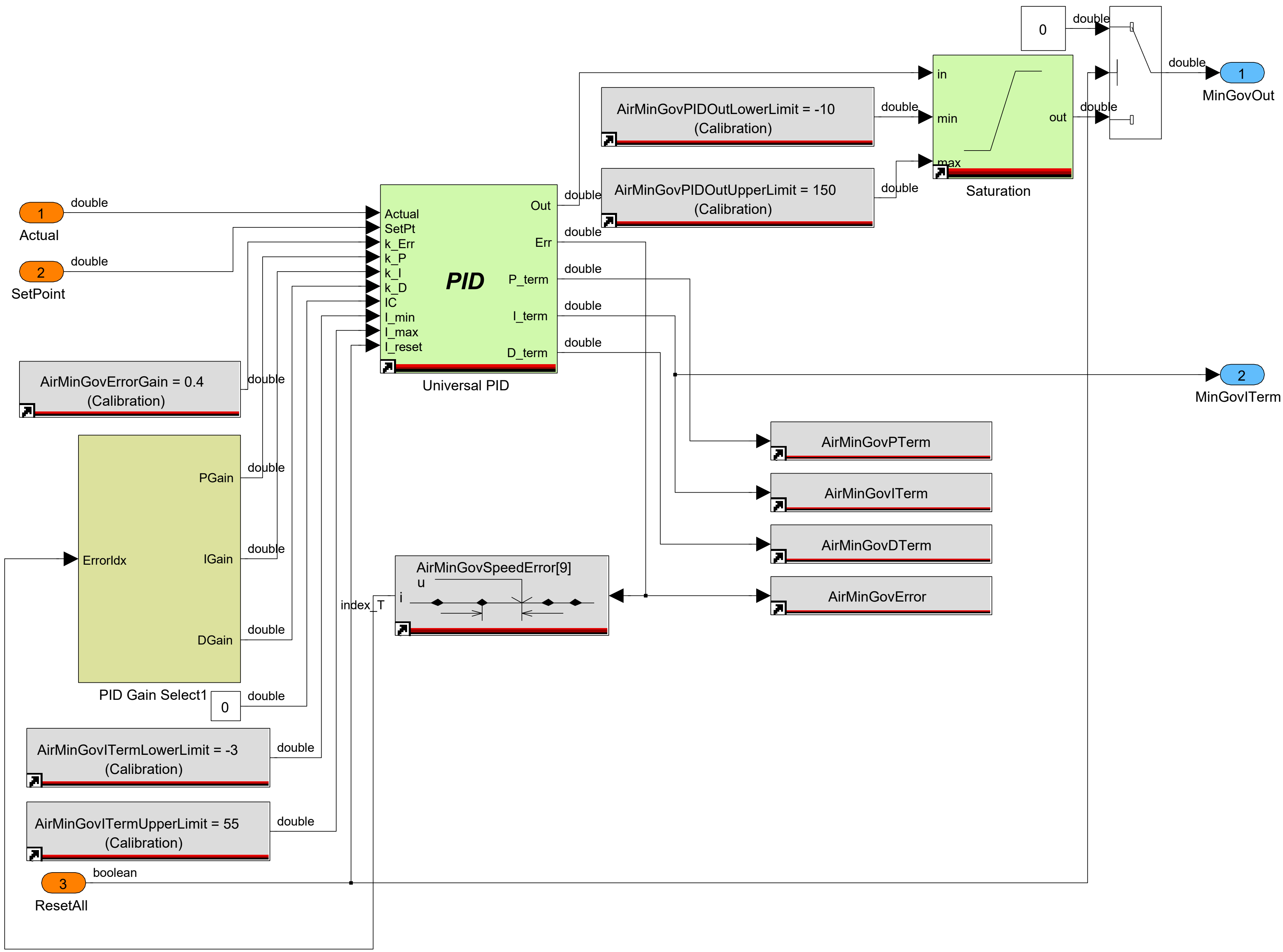
where a = t/T



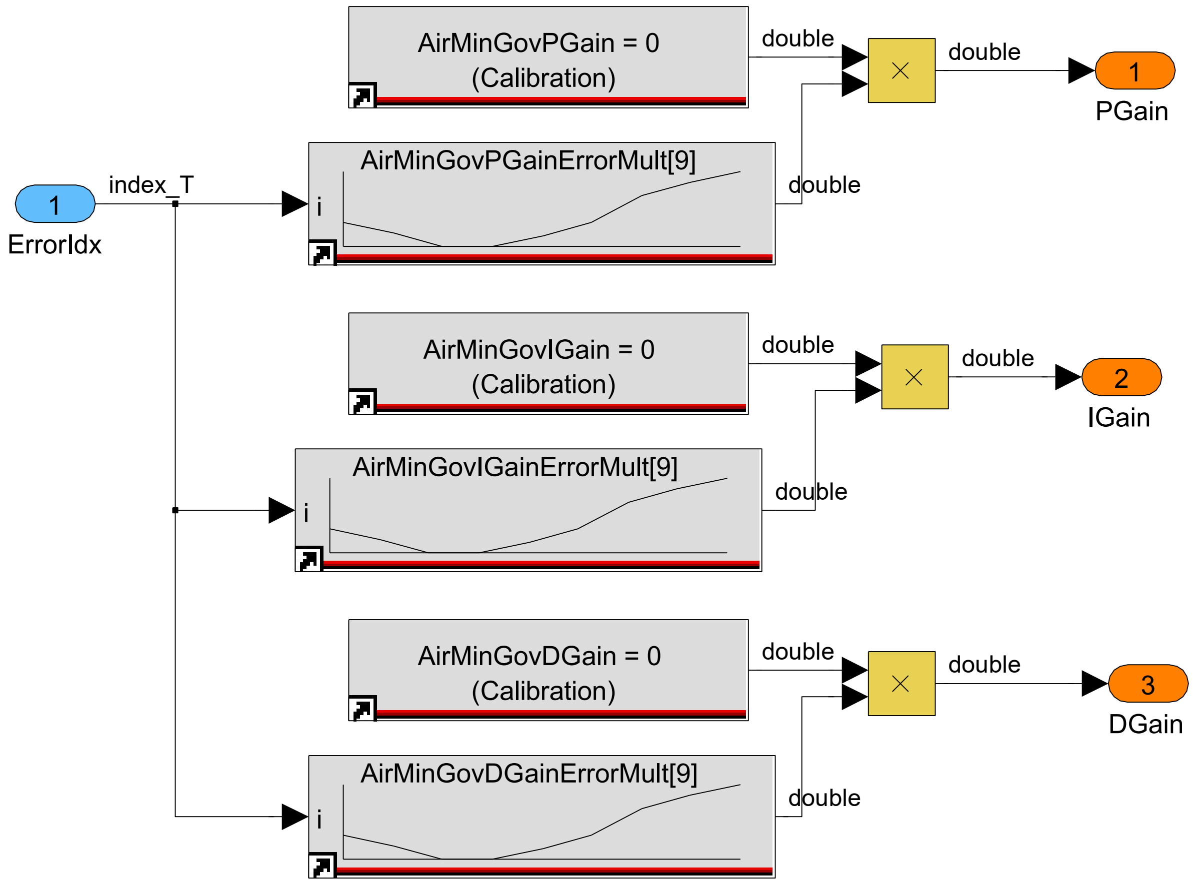
1
Actual
double
2
SetPoint
double
SpkMinGovErrorGain = 0.2
(Calibration)
double
Actual
SetPt
k_Err
k_P
k_D
PD
Out
Err
P_term
D_term
Universal PD
double
double
double
double
PGain
ErrorIdx
DGain
PID Gain Select
double
double
SpkMinGovSpeedError[9]
u
i
index_T
SpkMinGovPIDOutLowerLimit = -6
(Calibration)
SpkMinGovPIDOutUpperLimit = 3
(Calibration)
double
double
in
min
max
out
Saturation
double
SpkMinGovPTerm
SpkMinGovDTerm
SpkMinGovError
0
double
double
1
SpkOut
3
ResetAll
boolean



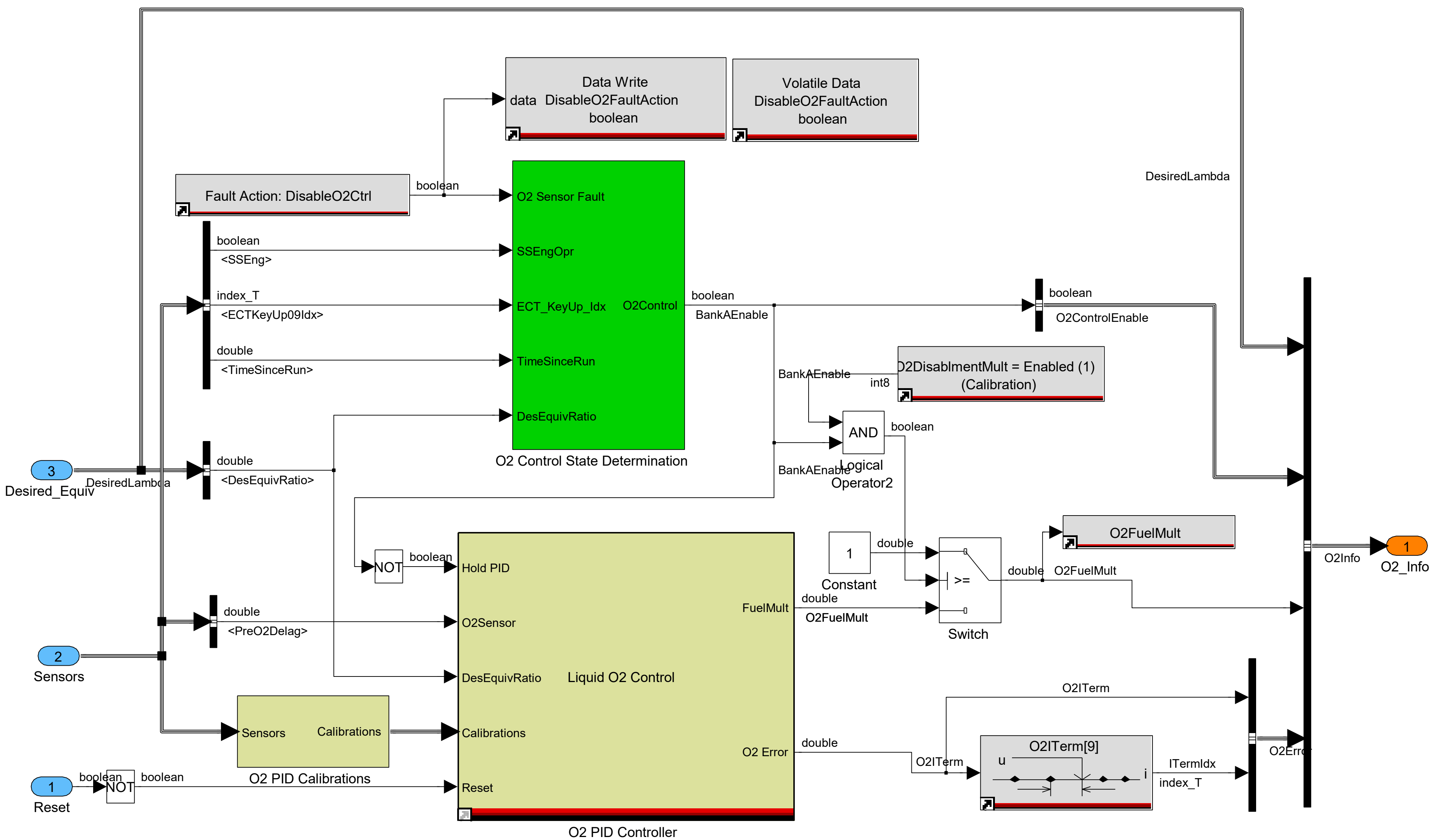
1
ErrorIdx
index_T
SpkMinGovPGain = 0
(Calibration)
double
SpkMinGovPGainErrorMult[9]
i
double
double
1
PGain
SpkMinGovDGain = 0
(Calibration)
double
SpkMinGovDGainErrorMult[9]
i
double
double
2
DGain



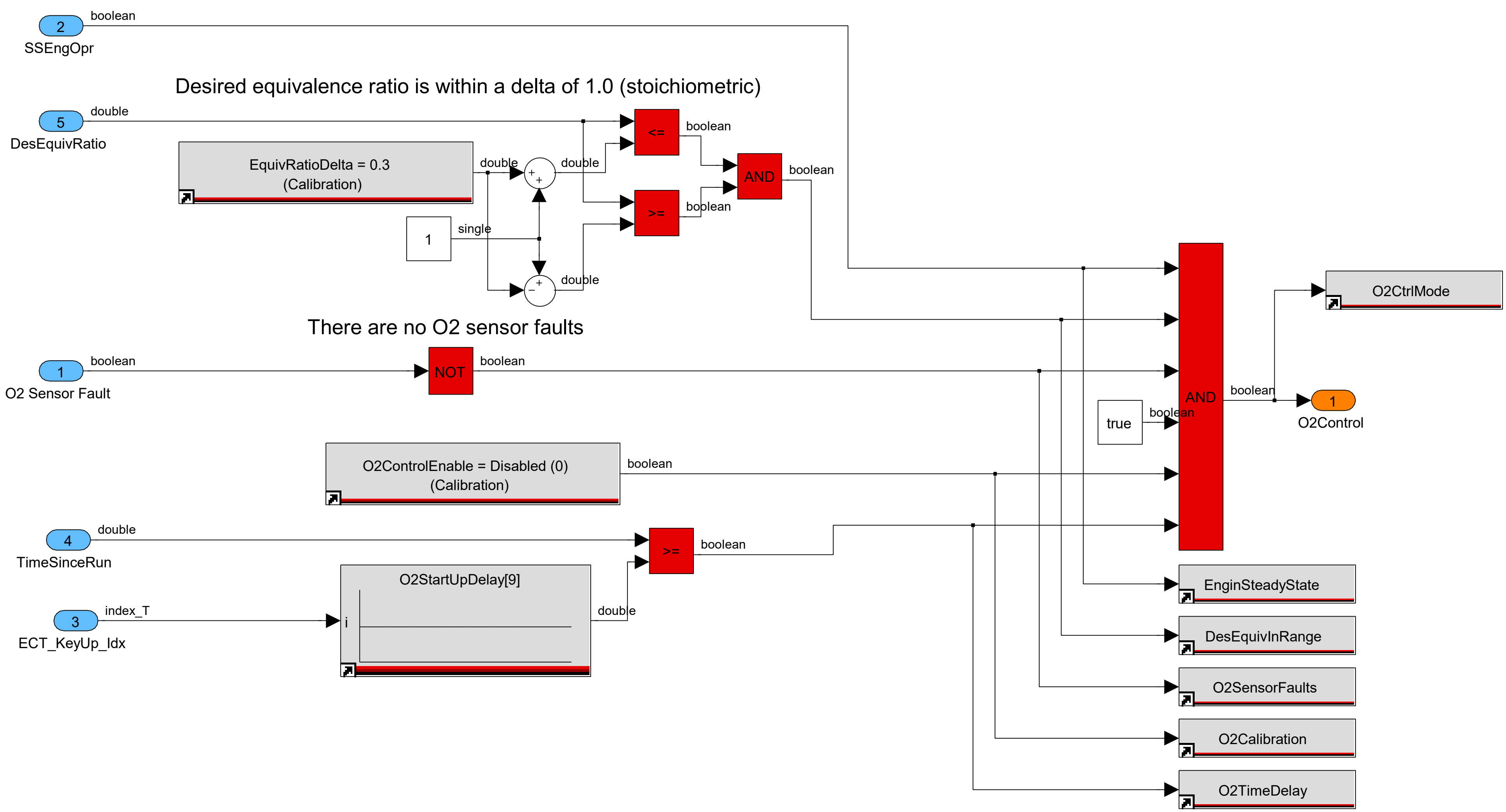
1
Actual
2
SetPoint
3
ResetAll
double
boolean
AirMinGovErrorGain = 0.4
(Calibration)
PID Gain Select1
ErrorIdx
PGain
IGain
DGain
0
AirMinGovITermLowerLimit = -3
(Calibration)
AirMinGovITermUpperLimit = 55
(Calibration)
PID
Actual
SetPt
k_Err
k_P
k_I
k_D
IC
I_min
I_max
I_reset
Out
Err
P_term
I_term
D_term
Universal PID
AirMinGovPIDOutLowerLimit = -10
(Calibration)
AirMinGovPIDOutUpperLimit = 150
(Calibration)
in
min
max
out
Saturation
MinGovOut
MinGovITerm
AirMinGovPTerm
AirMinGovITerm
AirMinGovDTerm
AirMinGovError
AirMinGovSpeedError[9]
u
i
index_T



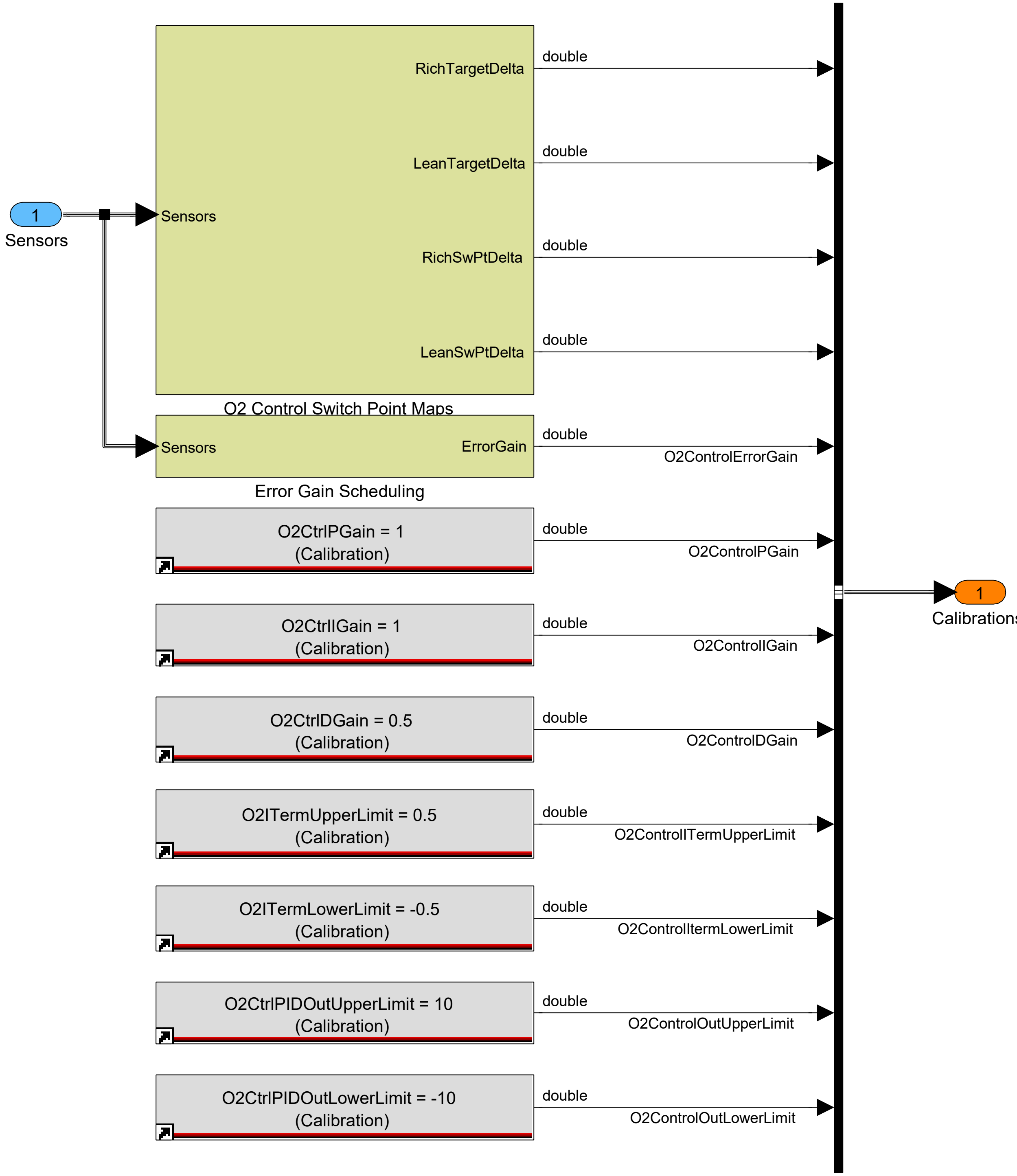
AirMinGovPGain = 0
(Calibration)
double
double
1
PGain
AirMinGovPGainErrorMult[9]
1
ErrorIdx
index_T
i
double
AirMinGovIGain = 0
(Calibration)
double
double
2
IGain
AirMinGovIGainErrorMult[9]
i
double
AirMinGovDGain = 0
(Calibration)
double
double
3
DGain
AirMinGovDGainErrorMult[9]
i
double



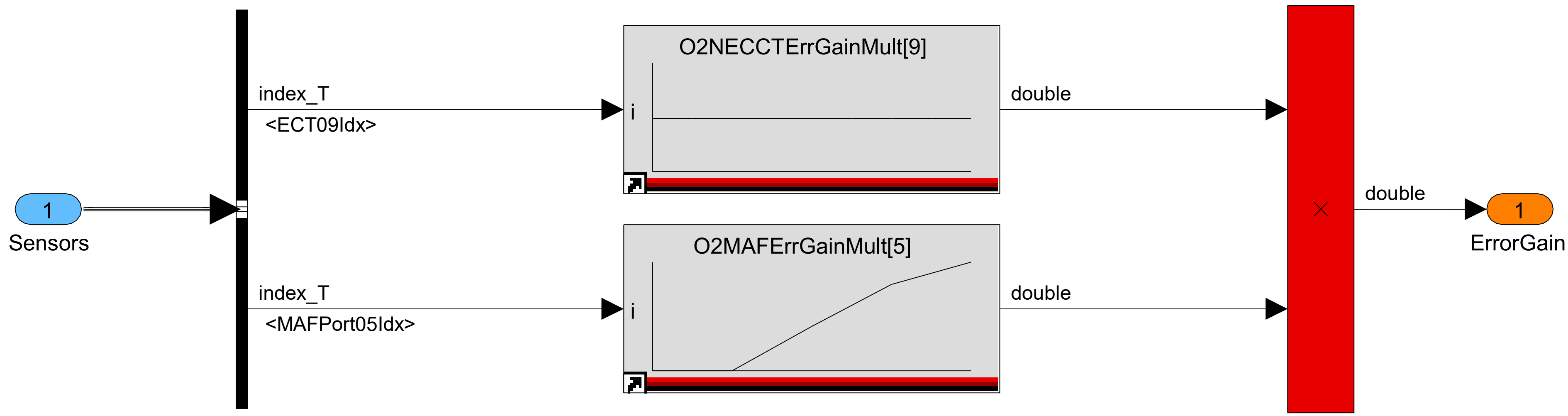
Data Write
data DisableO2FaultAction
boolean
Volatile Data
DisableO2FaultAction
boolean
Fault Action: DisableO2Ctrl
boolean
O2 Sensor Fault
SSEngOpr
ECT_KeyUp_Idx
TimeSinceRun
DesEquivRatio
O2Control
O2 Control State Determination
<SSEng>
index_T
<ECTKeyUp09Idx>
double
<TimeSinceRun>
<DesEquivRatio>
<PreO2Delag>
BankAEnable
O2ControlEnable
DesiredLambda
O2DisablmentMult = Enabled (1)
(Calibration)
int8
AND
Logical
Operator2
3
Desired_Equiv
2
Sensors
1
Reset
NOT
Hold PID
O2Sensor
Calibrations
Reset
FuelMult
O2 Error
Liquid O2 Control
O2 PID Controller
O2 PID Calibrations
1
Constant
>=
Switch
O2FuelMult
O2ITerm
O2ITerm[9]
u
i
ITermIdx
O2Info
1
O2_Info



Desired equivalence ratio is within a delta of 1.0 (stoichiometric)
There are no O2 sensor faults
2
SSEngOpr
boolean
5
DesEquivRatio
double
EquivRatioDelta = 0.3
(Calibration)
double
single
1
<=
>=
AND
NOT
1
O2 Sensor Fault
O2ControlEnable = Disabled (0)
(Calibration)
4
TimeSinceRun
3
ECT_KeyUp_Idx
index_T
O2StartUpDelay[9]
i
true
O2CtrlMode
1
O2Control
EnginSteadyState
DesEquivInRange
O2SensorFaults
O2Calibration
O2TimeDelay

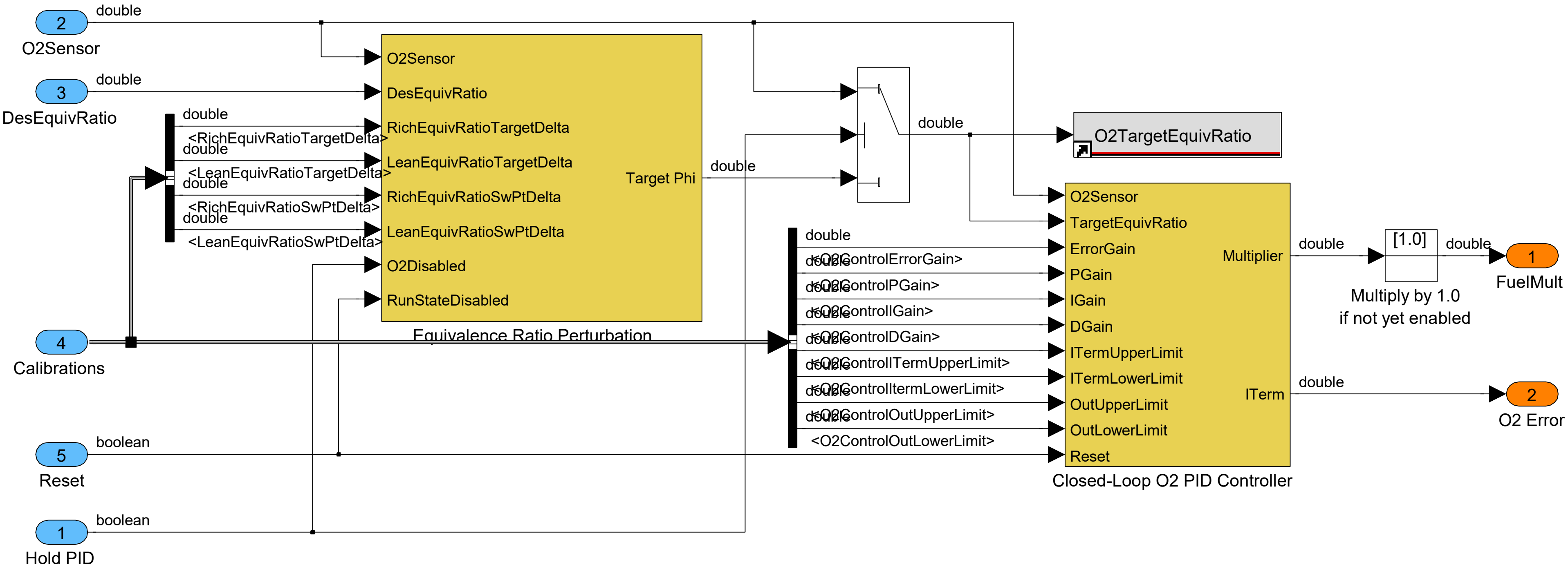


1
Sensors
Sensors
RichTargetDelta
LeanTargetDelta
RichSwPtDelta
LeanSwPtDelta
O2 Control Switch Point Maps
Sensors
ErrorGain
Error Gain Scheduling
O2CtrlPGain = 1
(Calibration)
O2CtrlIGain = 1
(Calibration)
O2CtrlDGain = 0.5
(Calibration)
O2ITermUpperLimit = 0.5
(Calibration)
O2ITermLowerLimit = -0.5
(Calibration)
O2CtrlPIDOutUpperLimit = 10
(Calibration)
O2CtrlPIDOutLowerLimit = -10
(Calibration)
double
O2ControlErrorGain
O2ControlPGain
O2ControlIGain
O2ControlDGain
O2ControlITermUpperLimit
O2ControlItermLowerLimit
O2ControlOutUpperLimit
O2ControlOutLowerLimit
1
Calibrations

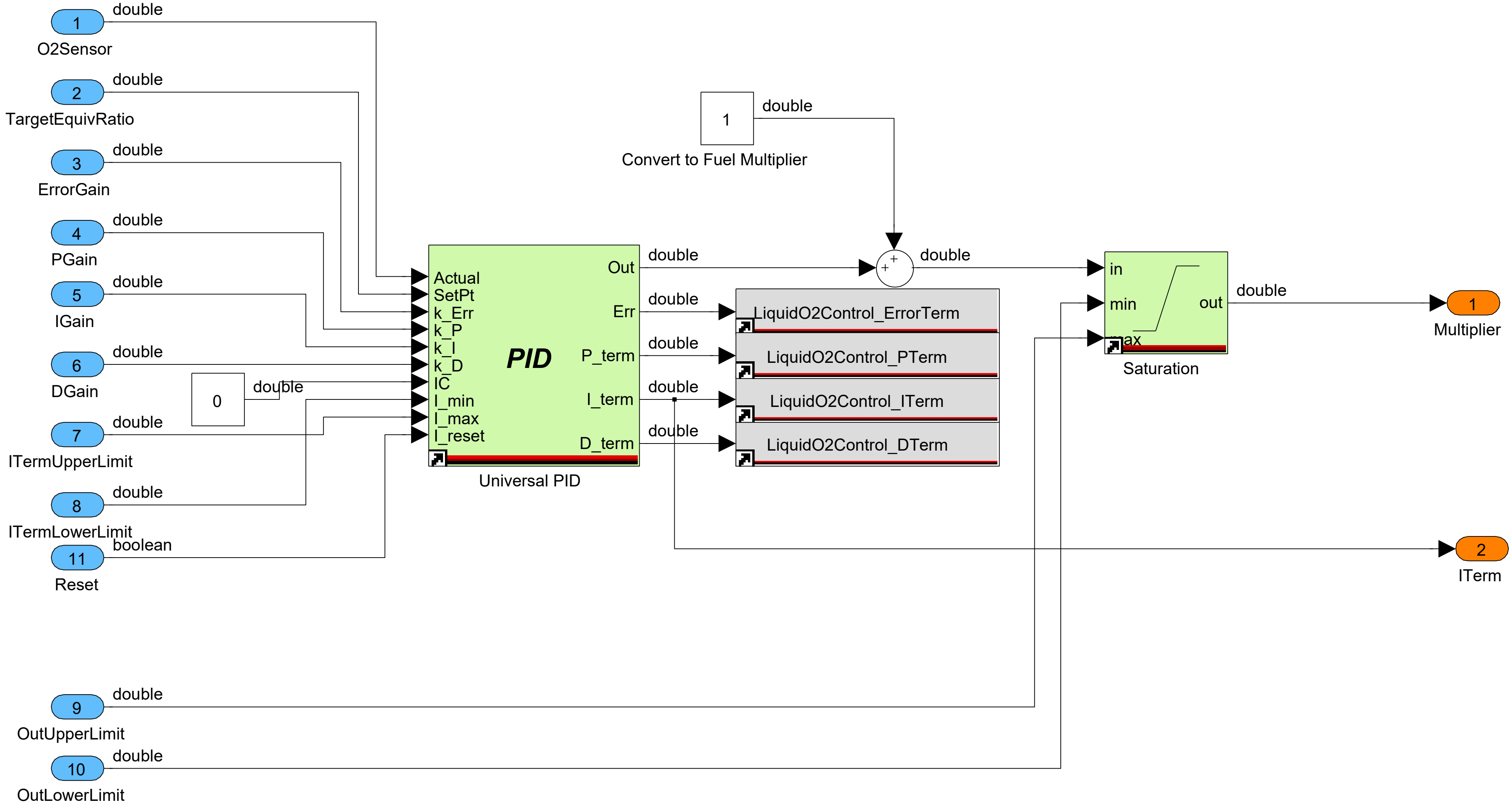


1
Sensors
index_T
<ECT09Idx>
index_T
<MAFPort05Idx>
O2NECCTErrGainMult[9]
i
O2MAFErrGainMult[5]
i
double
double
double
1
ErrorGain

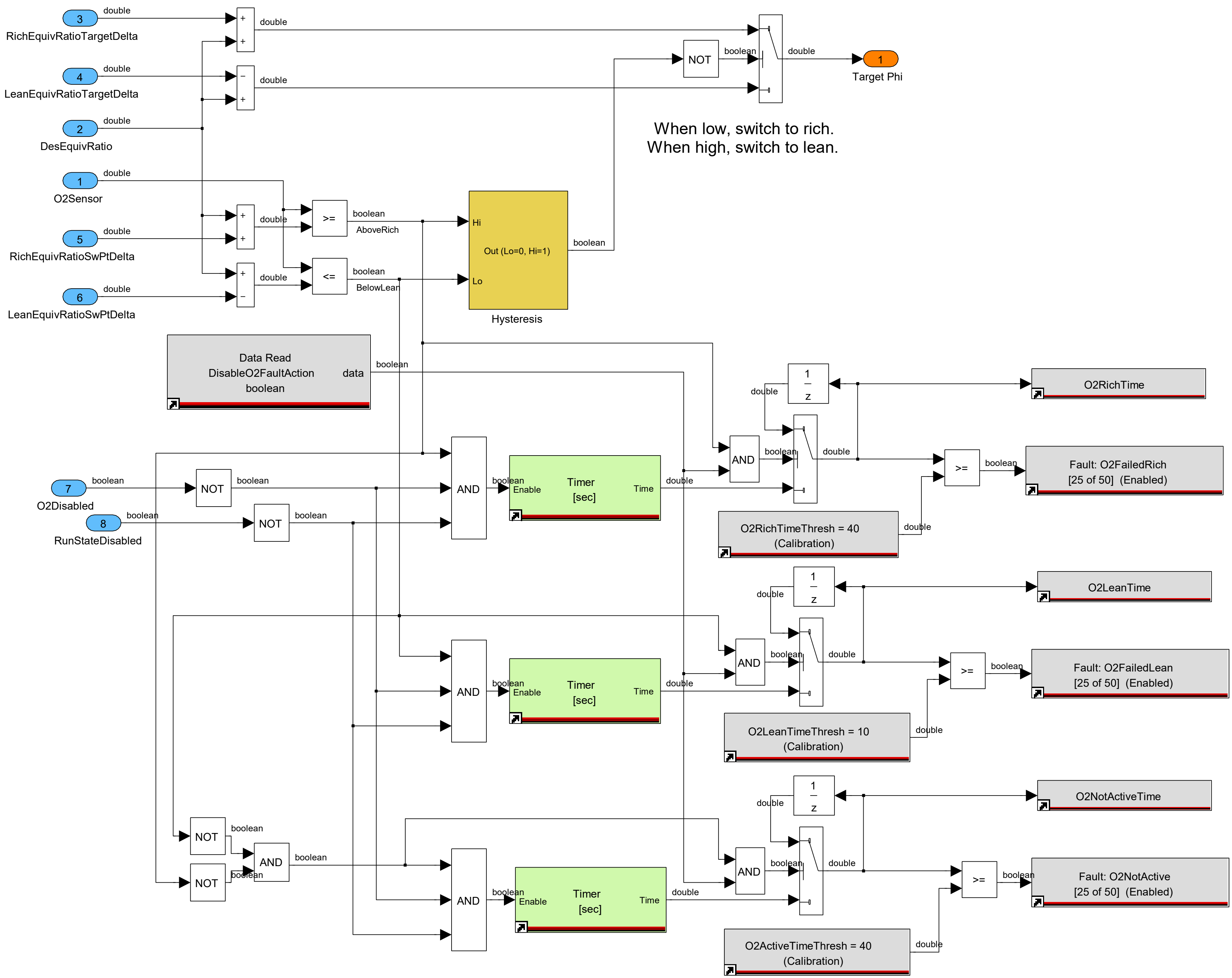
1
Sensors
index_T
<MAP09Idx>
index_T
<RPM09Idx>
RichTargetDelta[9x9]
ri
ci
LeanTargetDelta[9x9]
ri
ci
RichSwPtDelta[9x9]
ri
ci
LeanSwPtDelta[9x9]
ri
ci
double
RichEquivRatioTargetDelta
double
LeanEquivRatioTargetDelta
double
RichEquivRatioSwPtDelta
double
LeanEquivRatioSwPtDelta
1
RichTargetDelta
2
LeanTargetDelta
3
RichSwPtDelta
4
LeanSwPtDelta



2
O2Sensor
3
DesEquivRatio
4
Calibrations
5
Reset
1
Hold PID
double
boolean
<RichEquivRatioTargetDelta>
<LeanEquivRatioTargetDelta>
<RichEquivRatioSwPtDelta>
<LeanEquivRatioSwPtDelta>
O2Sensor
DesEquivRatio
RichEquivRatioTargetDelta
LeanEquivRatioTargetDelta
RichEquivRatioSwPtDelta
LeanEquivRatioSwPtDelta
O2Disabled
RunStateDisabled
Target Phi
Equivalence Ratio Perturbation
O2TargetEquivRatio
<O2ControlErrorGain>
<O2ControlPGain>
<O2ControlIGain>
<O2ControlDGain>
<O2ControlITermUpperLimit>
<O2ControlItermLowerLimit>
<O2ControlOutUpperLimit>
<O2ControlOutLowerLimit>
O2Sensor
TargetEquivRatio
ErrorGain
PGain
IGain
DGain
ITermUpperLimit
ITermLowerLimit
OutUpperLimit
OutLowerLimit
Reset
Multiplier
ITerm
Closed-Loop O2 PID Controller
[1.0]
Multiply by 1.0
if not yet enabled
1
FuelMult
2
O2 Error

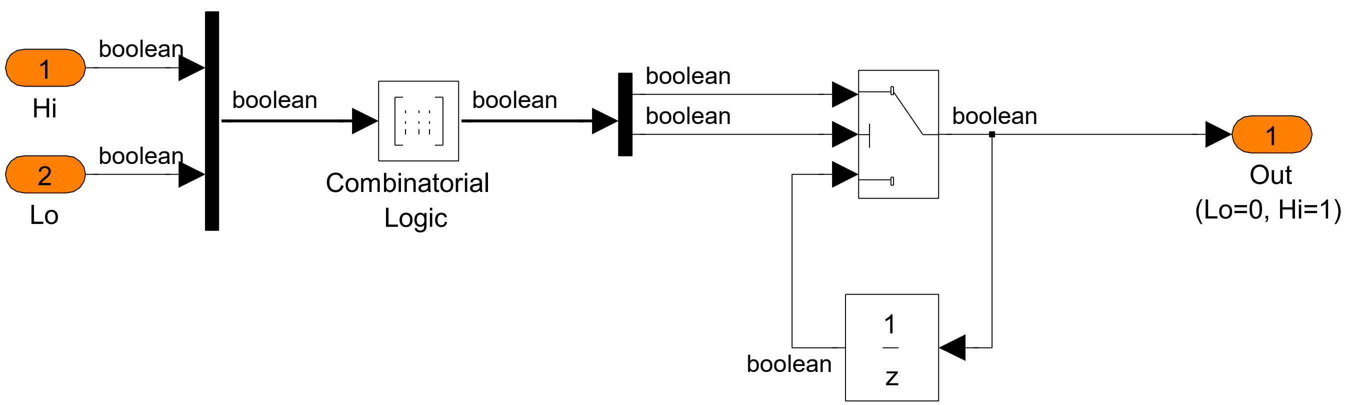


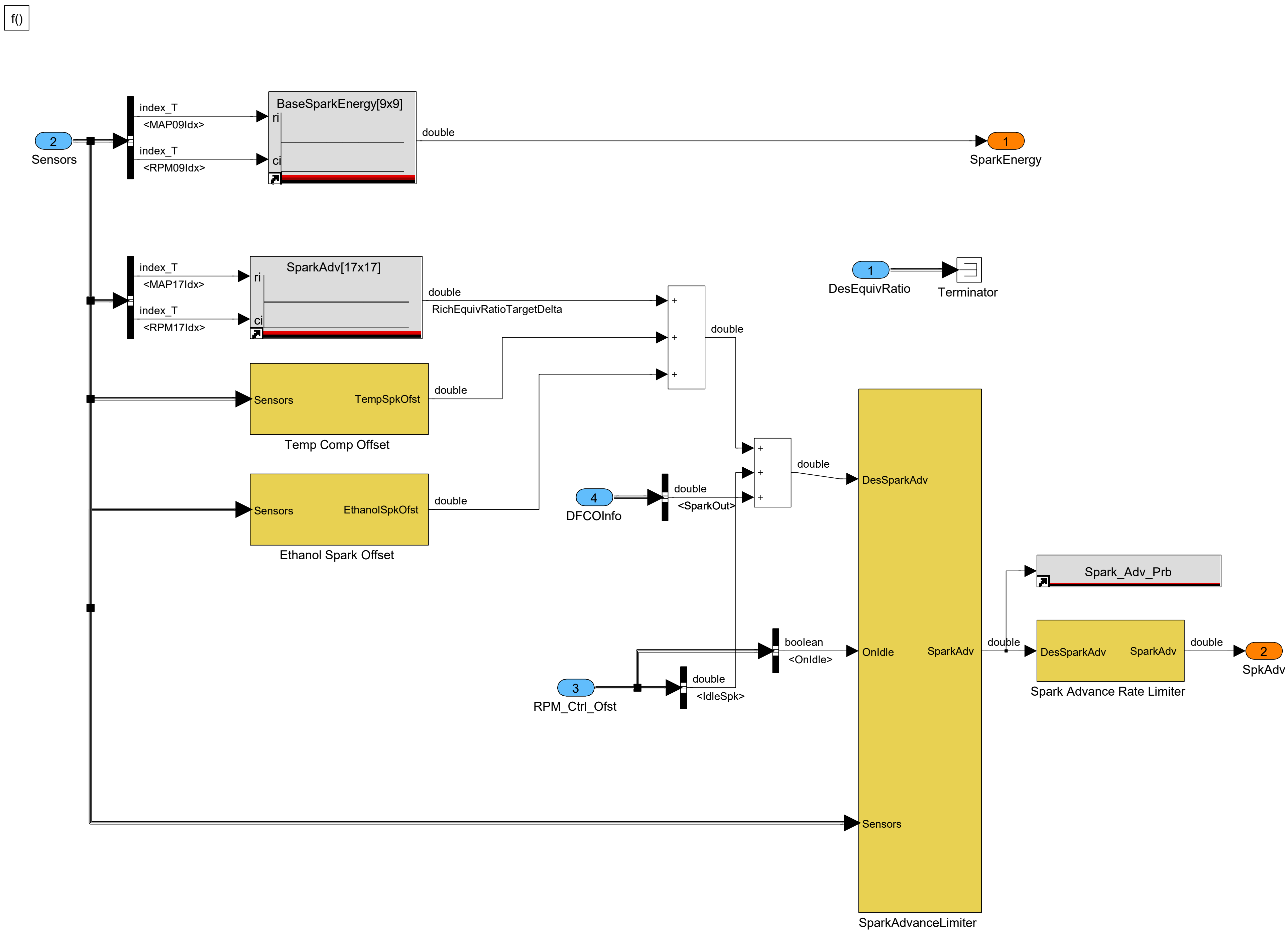
1
O2Sensor
2
TargetEquivRatio
3
ErrorGain
4
PGain
5
IGain
6
DGain
7
ITermUpperLimit
8
ITermLowerLimit
11
Reset
9
OutUpperLimit
10
OutLowerLimit
double
boolean
0
1
Convert to Fuel Multiplier
Actual
SetPt
k_Err
k_P
k_I
k_D
IC
I_min
I_max
I_reset
PID
Out
Err
P_term
I_term
D_term
Universal PID
LiquidO2Control_ErrorTerm
LiquidO2Control_PTerm
LiquidO2Control_ITerm
LiquidO2Control_DTerm
in
min
max
out
Saturation
1
Multiplier
2
ITerm



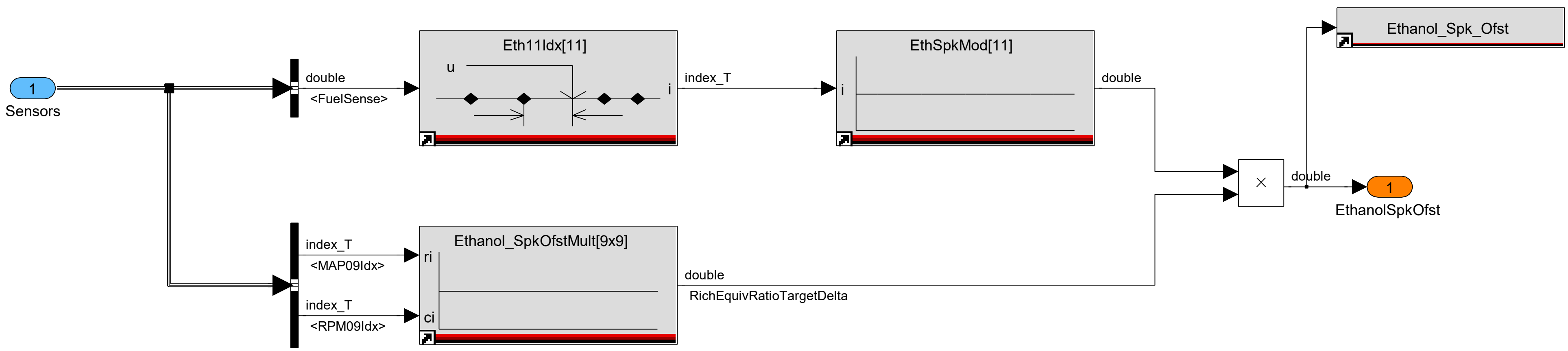
3
RichEquivRatioTargetDelta
4
LeanEquivRatioTargetDelta
2
DesEquivRatio
1
O2Sensor
5
RichEquivRatioSwPtDelta
6
LeanEquivRatioSwPtDelta
double
boolean
NOT
1
Target Phi
When low, switch to rich.
When high, switch to lean.
>=
<=
AboveRich
BelowLean
Hi
Out (Lo=0, Hi=1)
Lo
Hysteresis
Data Read
DisableO2FaultAction
boolean
data
1
z
O2RichTime
AND
Fault: O2FailedRich
[25 of 50] (Enabled)
7
O2Disabled
8
RunStateDisabled
Enable
Timer
[sec]
Time
O2RichTimeThresh = 40
(Calibration)
O2LeanTime
Fault: O2FailedLean
[25 of 50] (Enabled)
O2LeanTimeThresh = 10
(Calibration)
O2NotActiveTime
Fault: O2NotActive
[25 of 50] (Enabled)
O2ActiveTimeThresh = 40
(Calibration)

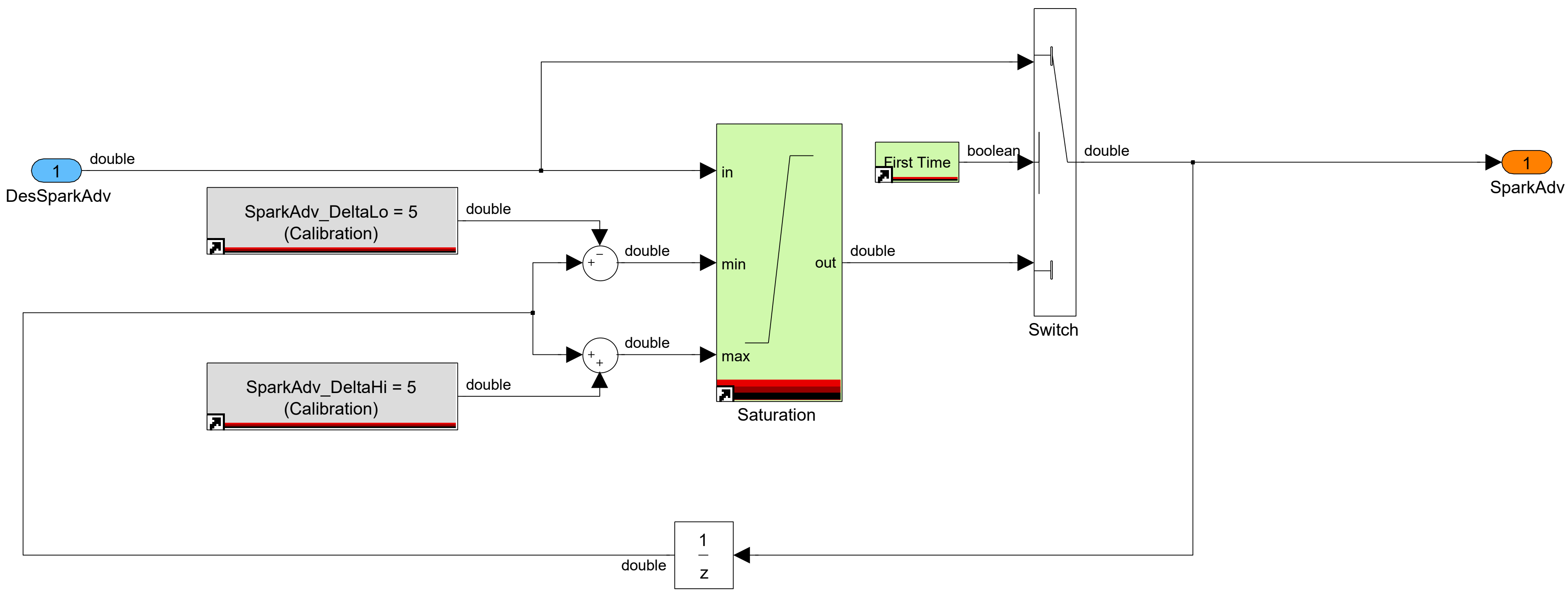
Hi & !Lo => Hi
Lo & !Hi => Lo
Otherwise, Hold

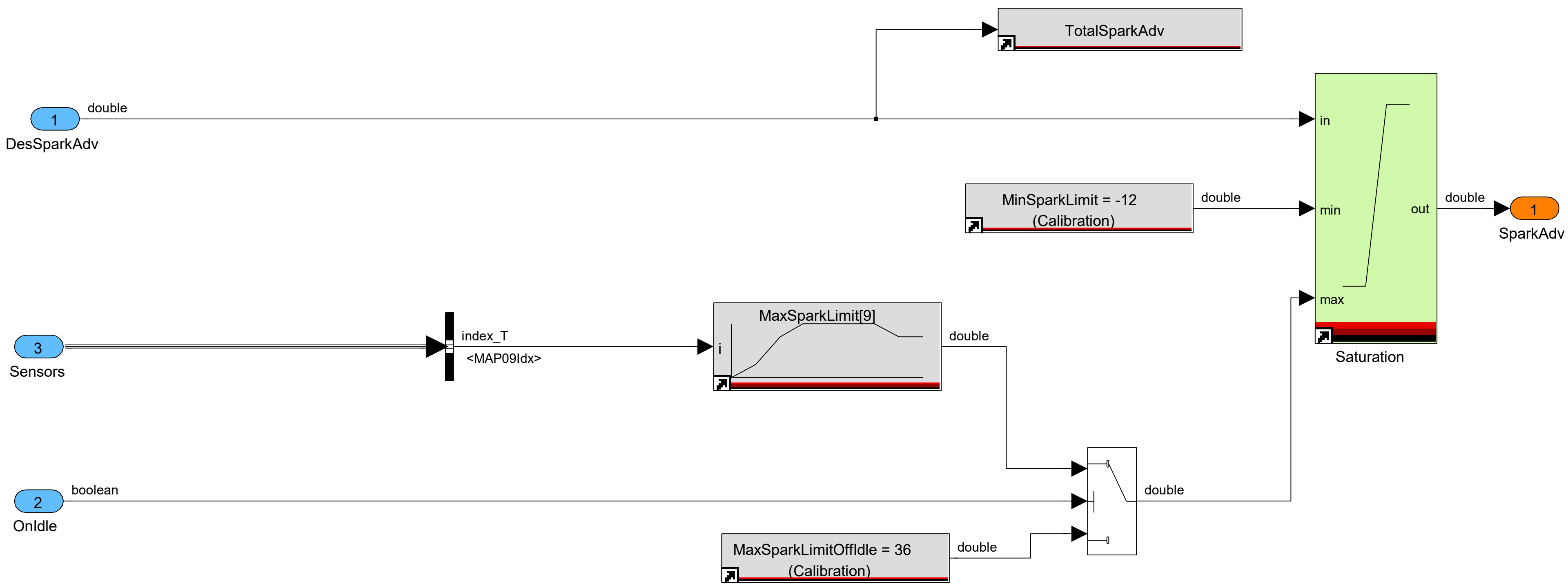




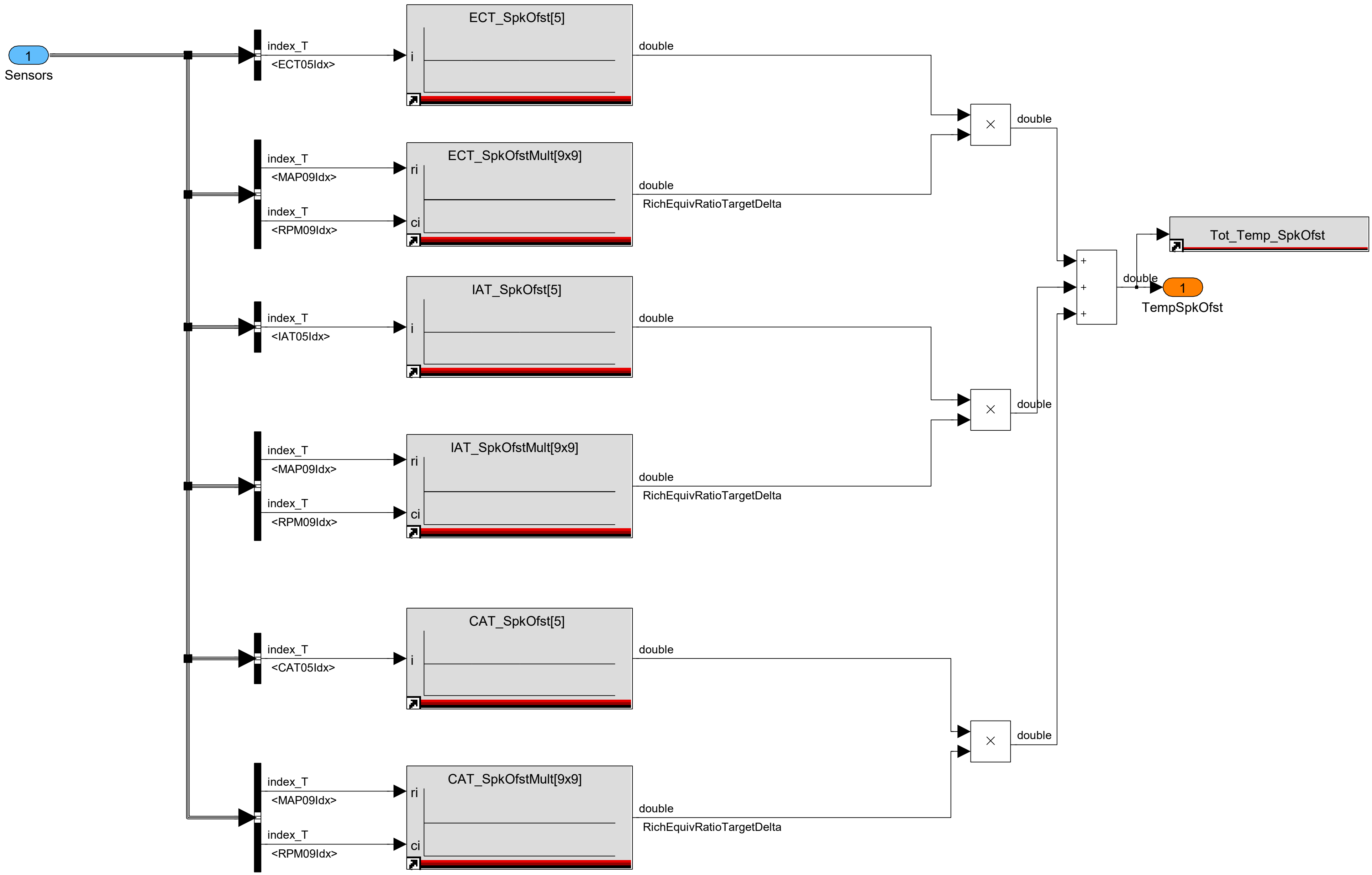
f()
2
Sensors
index_T
<MAP09Idx>
index_T
<RPM09Idx>
BaseSparkEnergy[9x9]
double
1
SparkEnergy
index_T
<MAP17Idx>
index_T
<RPM17Idx>
SparkAdv[17x17]
double
RichEquivRatioTargetDelta
1
DesEquivRatio
Terminator
Sensors
TempSpkOfst
double
Temp Comp Offset
Sensors
EthanolSpkOfst
double
Ethanol Spark Offset
double
double
4
DFCOInfo
double
<SparkOut>
DesSparkAdv
Spark_Adv_Prb
boolean
<OnIdle>
OnIdle
SparkAdv
double
DesSparkAdv
SparkAdv
double
2
SpkAdv
Spark Advance Rate Limiter
3
RPM_Ctrl_Ofst
double
<IdleSpk>
Sensors
SparkAdvanceLimiter

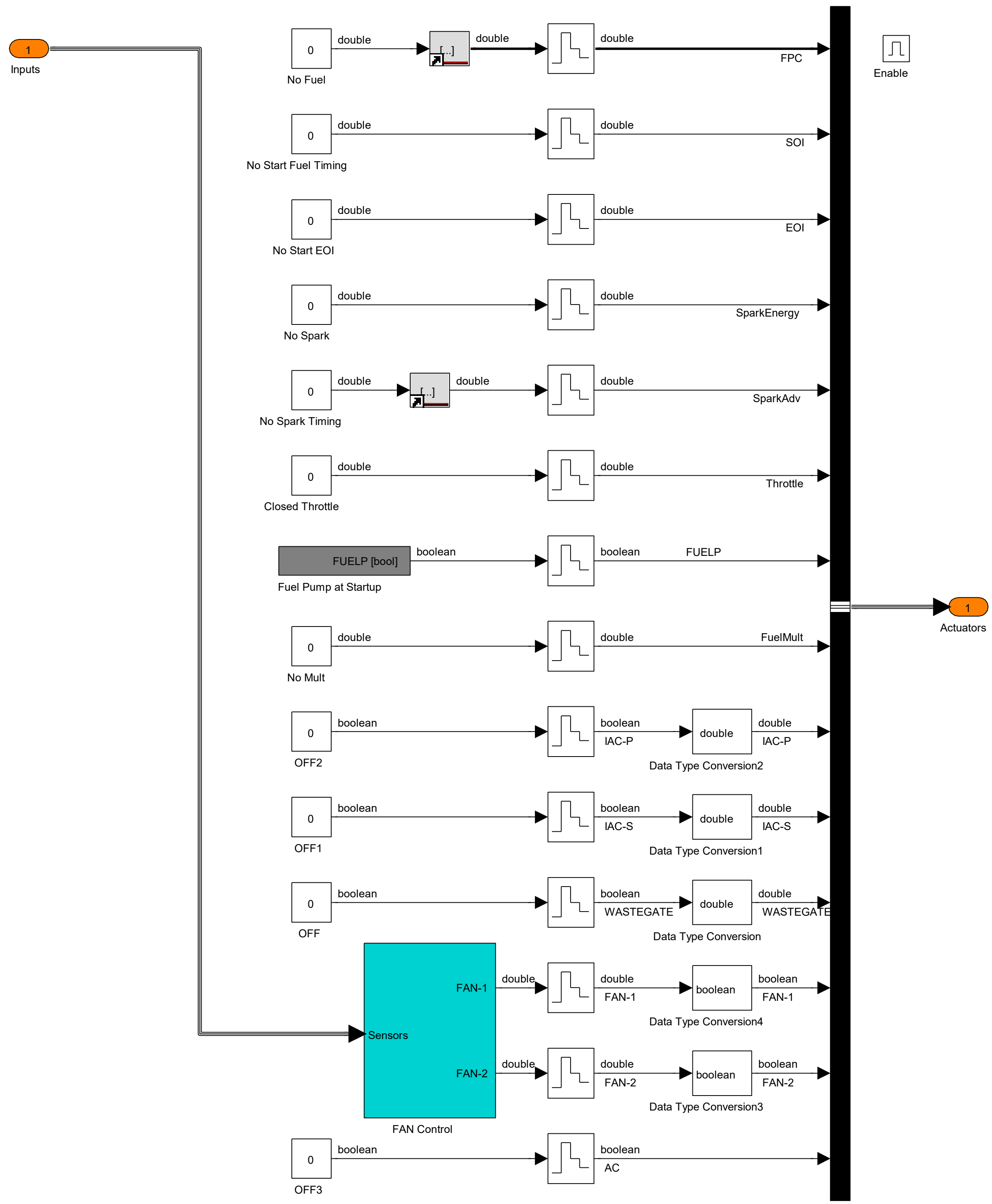

1
Sensors
double
<FuelSense>
Eth11Idx[11]
u
i
index_T
EthSpkMod[11]
i
double
index_T
<MAP09Idx>
index_T
<RPM09Idx>
Ethanol_SpkOfstMult[9x9]
ri
ci
double
RichEquivRatioTargetDelta
×
double
Ethanol_Spk_Ofst
1
EthanolSpkOfst


1
DesSparkAdv
double
SparkAdv_DeltaLo = 5
(Calibration)
double
SparkAdv_DeltaHi = 5
(Calibration)
double
double
double
in
min
max
out
Saturation
double
First Time
boolean
Switch
double
1
SparkAdv
1
z
double

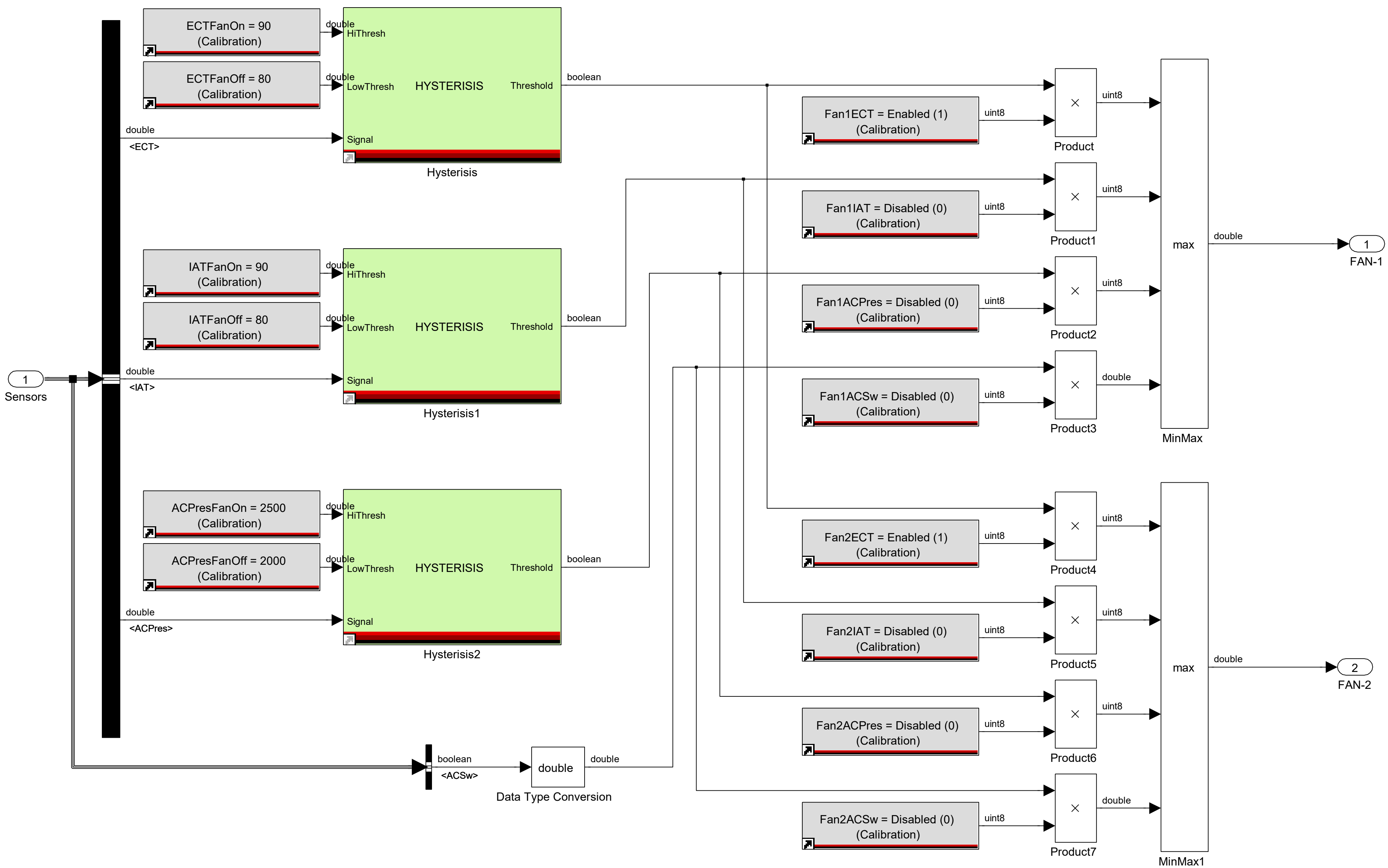


TotalSparkAdv
1
double
DesSparkAdv
in
min
out
max
Saturation
MinSparkLimit = -12
(Calibration)
double
double
1
SparkAdv
3
Sensors
index_T
<MAP09Idx>
MaxSparkLimit[9]
i
double
2
OnIdle
boolean
double
MaxSparkLimitOffIdle = 36
(Calibration)
double

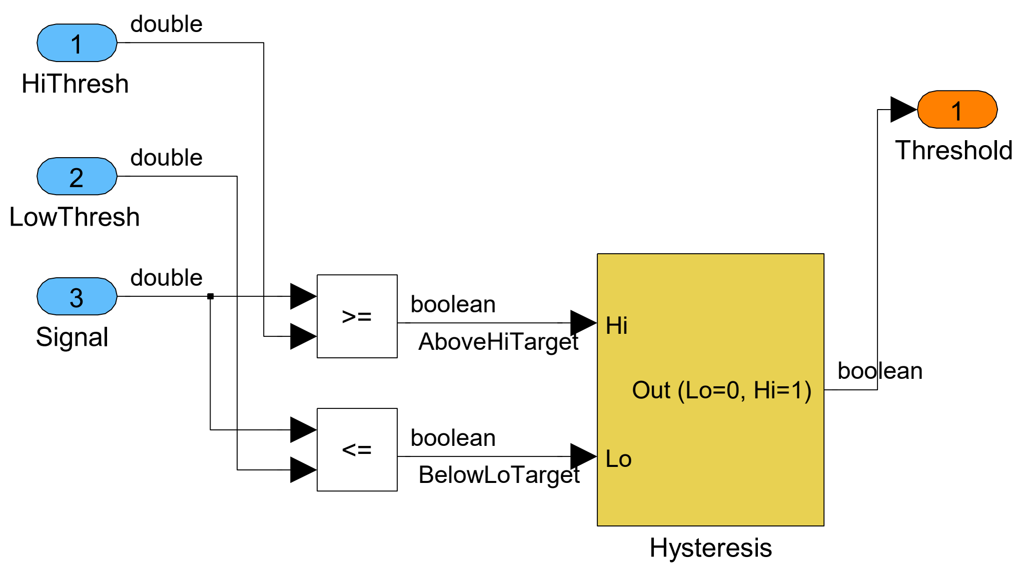

1
Sensors
index_T
<ECT05Idx>
ECT_SpkOfst[5]
i
double
index_T
<MAP09Idx>
index_T
<RPM09Idx>
ECT_SpkOfstMult[9x9]
ri
ci
double
RichEquivRatioTargetDelta
index_T
<IAT05Idx>
IAT_SpkOfst[5]
i
double
index_T
<MAP09Idx>
index_T
<RPM09Idx>
IAT_SpkOfstMult[9x9]
ri
ci
double
RichEquivRatioTargetDelta
index_T
<CAT05Idx>
CAT_SpkOfst[5]
i
double
index_T
<MAP09Idx>
index_T
<RPM09Idx>
CAT_SpkOfstMult[9x9]
ri
ci
double
RichEquivRatioTargetDelta
double
double
double
Tot_Temp_SpkOfst
double
1
TempSpkOfst



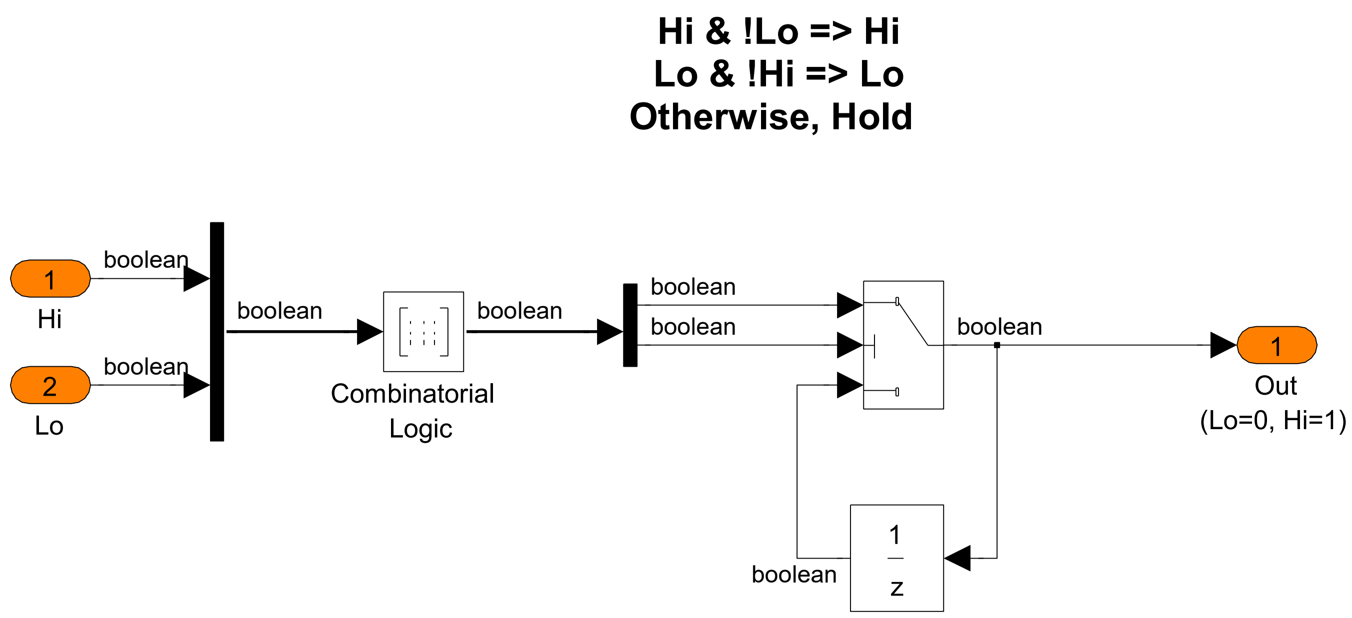
1
Inputs
0
No Fuel
double
[..]
FPC
Enable
No Start Fuel Timing
SOI
No Start EOI
EOI
No Spark
SparkEnergy
No Spark Timing
SparkAdv
Closed Throttle
Throttle
FUELP [bool]
Fuel Pump at Startup
boolean
FUELP
Actuators
No Mult
FuelMult
OFF2
IAC-P
Data Type Conversion2
OFF1
IAC-S
Data Type Conversion1
OFF
WASTEGATE
Data Type Conversion
Sensors
FAN-1
FAN-2
FAN Control
Data Type Conversion4
Data Type Conversion3
OFF3
AC



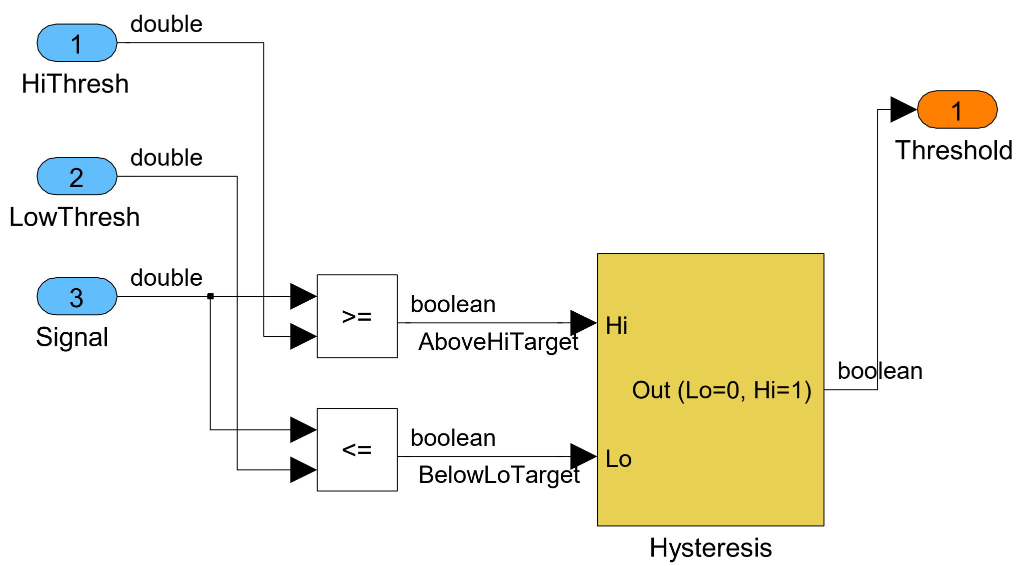
ECTFanOn = 90 (Calibration)
ECTFanOff = 80 (Calibration)
double
HiThresh
LowThresh
HYSTERISIS
Threshold
Signal
boolean
<ECT>
Hysterisis
IATFanOn = 90 (Calibration)
IATFanOff = 80 (Calibration)
<IAT>
Hysterisis1
ACPresFanOn = 2500 (Calibration)
ACPresFanOff = 2000 (Calibration)
<ACPres>
Hysterisis2
1
Sensors
<ACSw>
Data Type Conversion
Fan1ECT = Enabled (1) (Calibration)
Fan1IAT = Disabled (0) (Calibration)
Fan1ACPres = Disabled (0) (Calibration)
Fan1ACSw = Disabled (0) (Calibration)
Fan2ECT = Enabled (1) (Calibration)
Fan2IAT = Disabled (0) (Calibration)
Fan2ACPres = Disabled (0) (Calibration)
Fan2ACSw = Disabled (0) (Calibration)
uint8
Product
Product1
Product2
Product3
Product4
Product5
Product6
Product7
max
MinMax
MinMax1
FAN-1
2
FAN-2



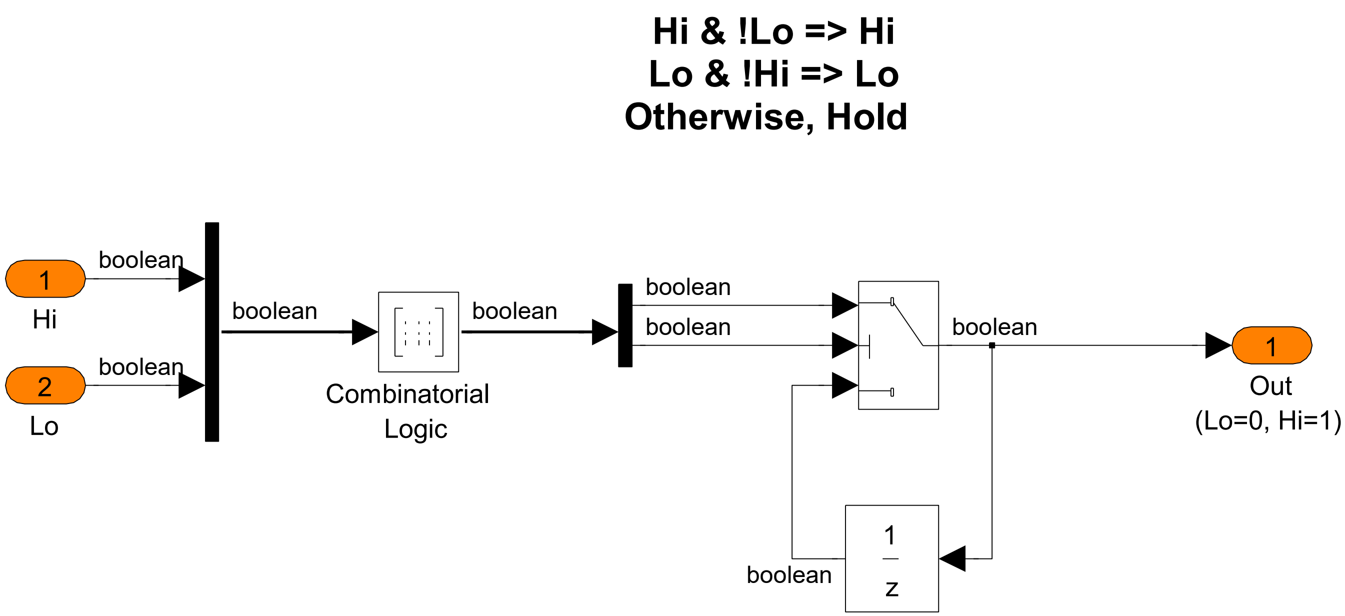
double
1
HiThresh
double
2
LowThresh
double
3
Signal
>=
<=
boolean
AboveHiTarget
boolean
BelowLoTarget
Hi
Out (Lo=0, Hi=1)
Lo
Hysteresis
boolean
1
Threshold

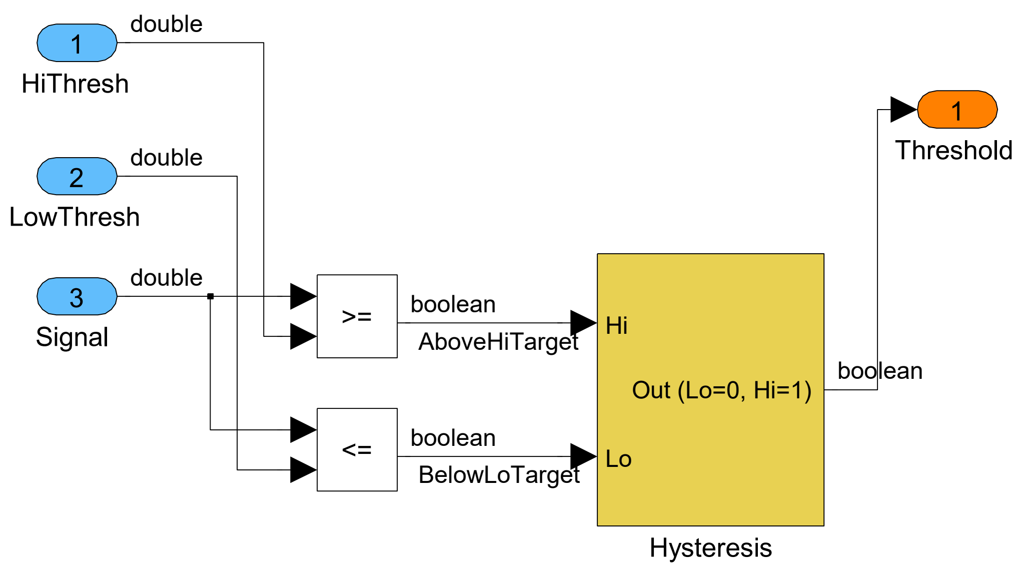


Hi & !Lo => Hi
Lo & !Hi => Lo
Otherwise, Hold
1
Hi
2
Lo
boolean
boolean
boolean
Combinatorial
Logic
boolean
boolean
boolean
boolean
1
z
boolean
1
Out
(Lo=0, Hi=1)



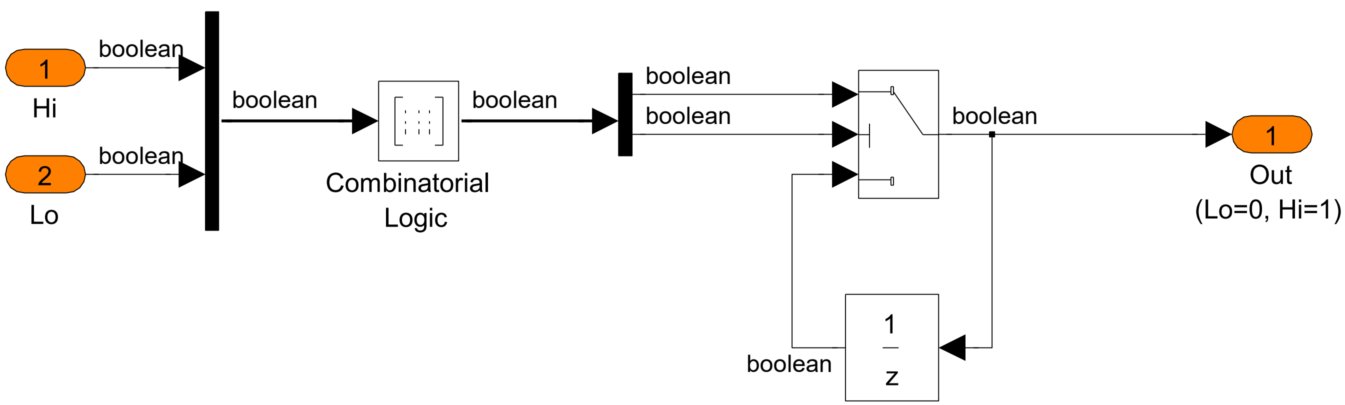
1
HiThresh
double
2
LowThresh
double
3
Signal
double
>=
<=
boolean
AboveHiTarget
boolean
BelowLoTarget
Hi
Lo
Out (Lo=0, Hi=1)
Hysteresis
boolean
1
Threshold

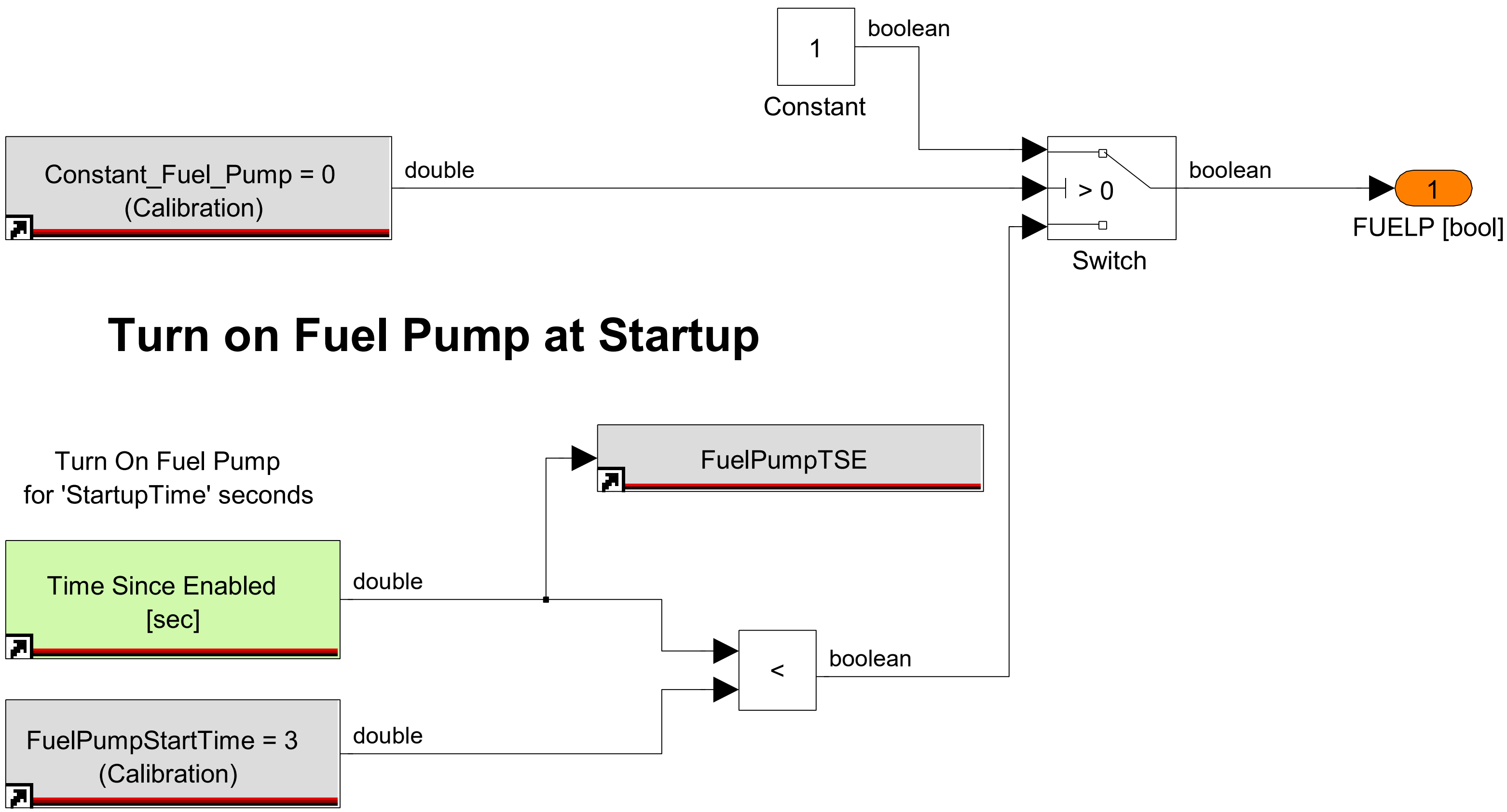

Hi & !Lo => Hi
Lo & !Hi => Lo
Otherwise, Hold
1
Hi
2
Lo
boolean
boolean
boolean
Combinatorial
Logic
boolean
boolean
boolean
boolean
boolean
1
z
1
Out
(Lo=0, Hi=1)

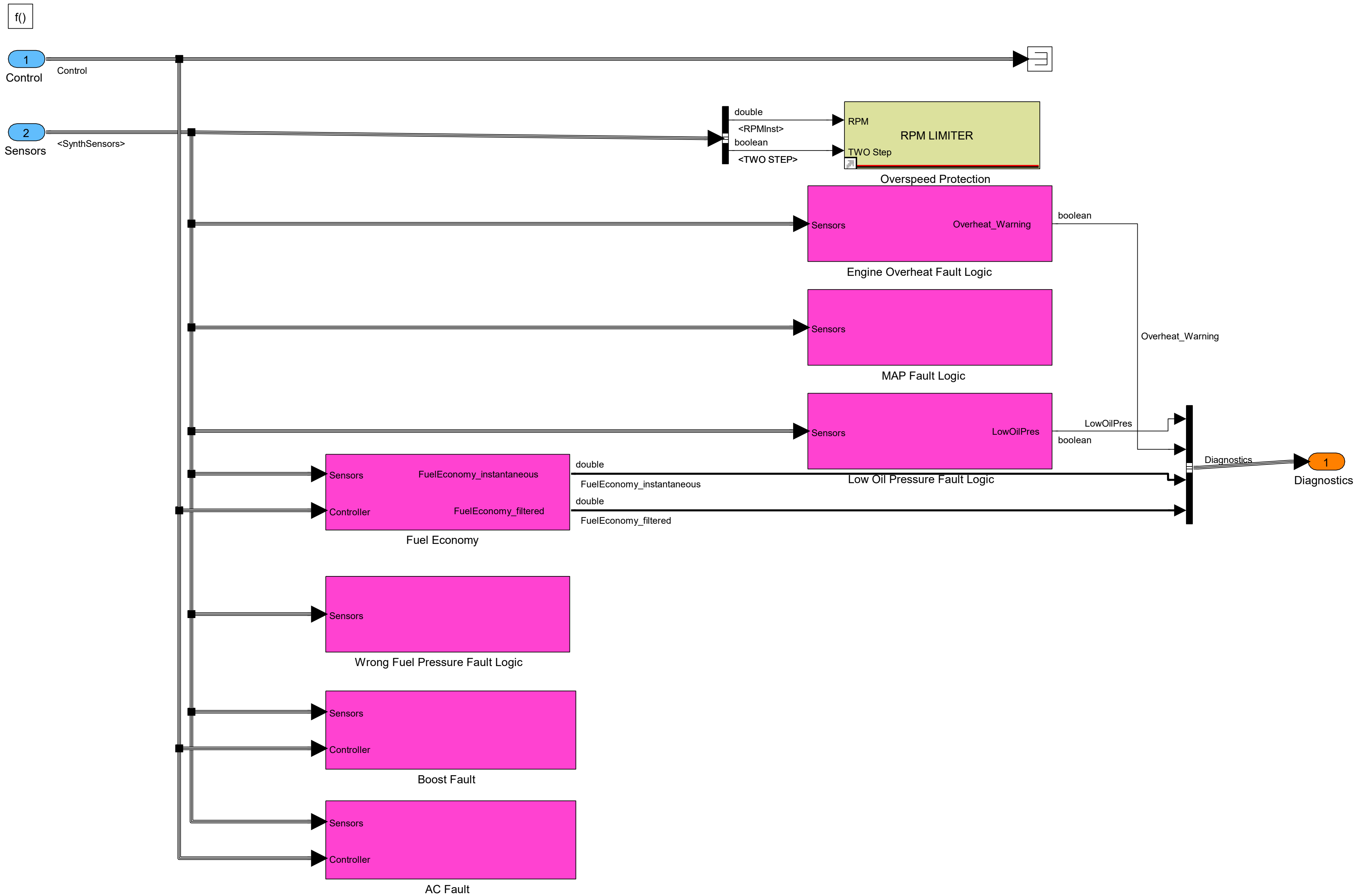


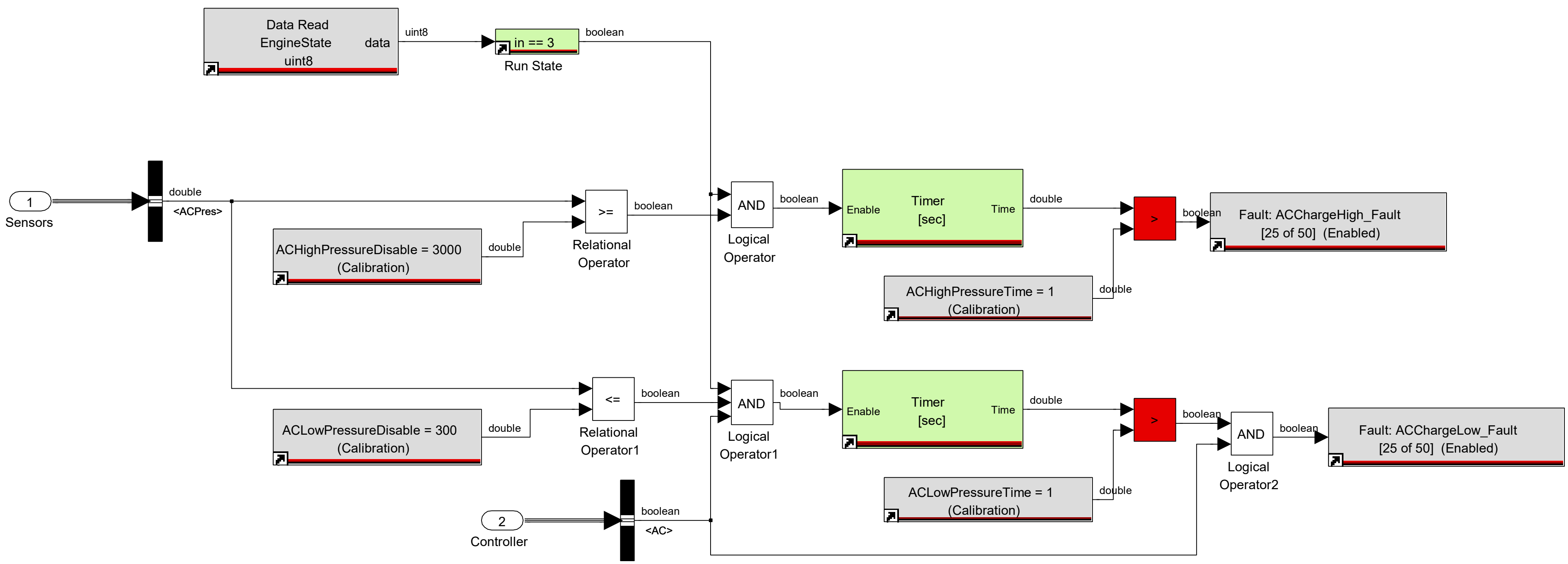
1
HiThresh
double
2
LowThresh
double
3
Signal
double
>=
<=
boolean
AboveHiTarget
boolean
BelowLoTarget
Hi
Lo
Out (Lo=0, Hi=1)
Hysteresis
boolean
1
Threshold

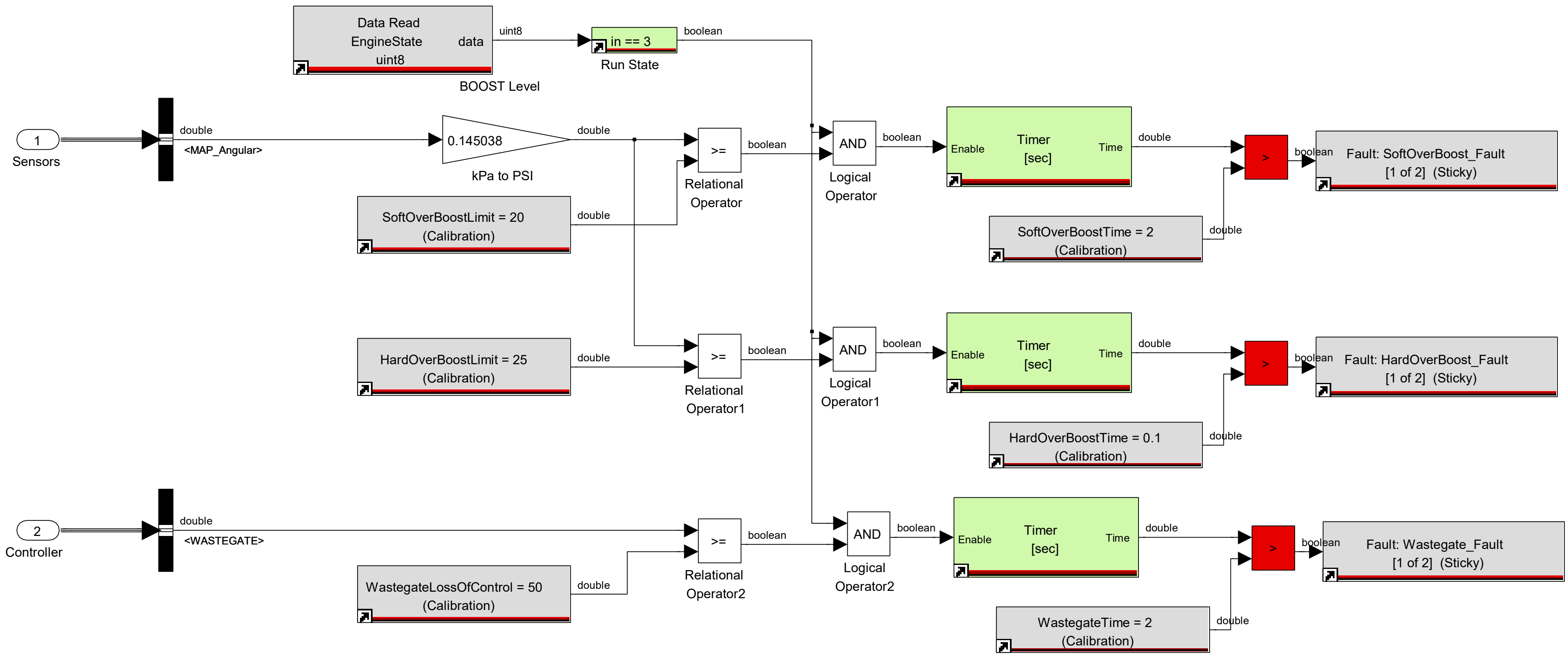
Hi & !Lo => Hi
Lo & !Hi => Lo
Otherwise, Hold



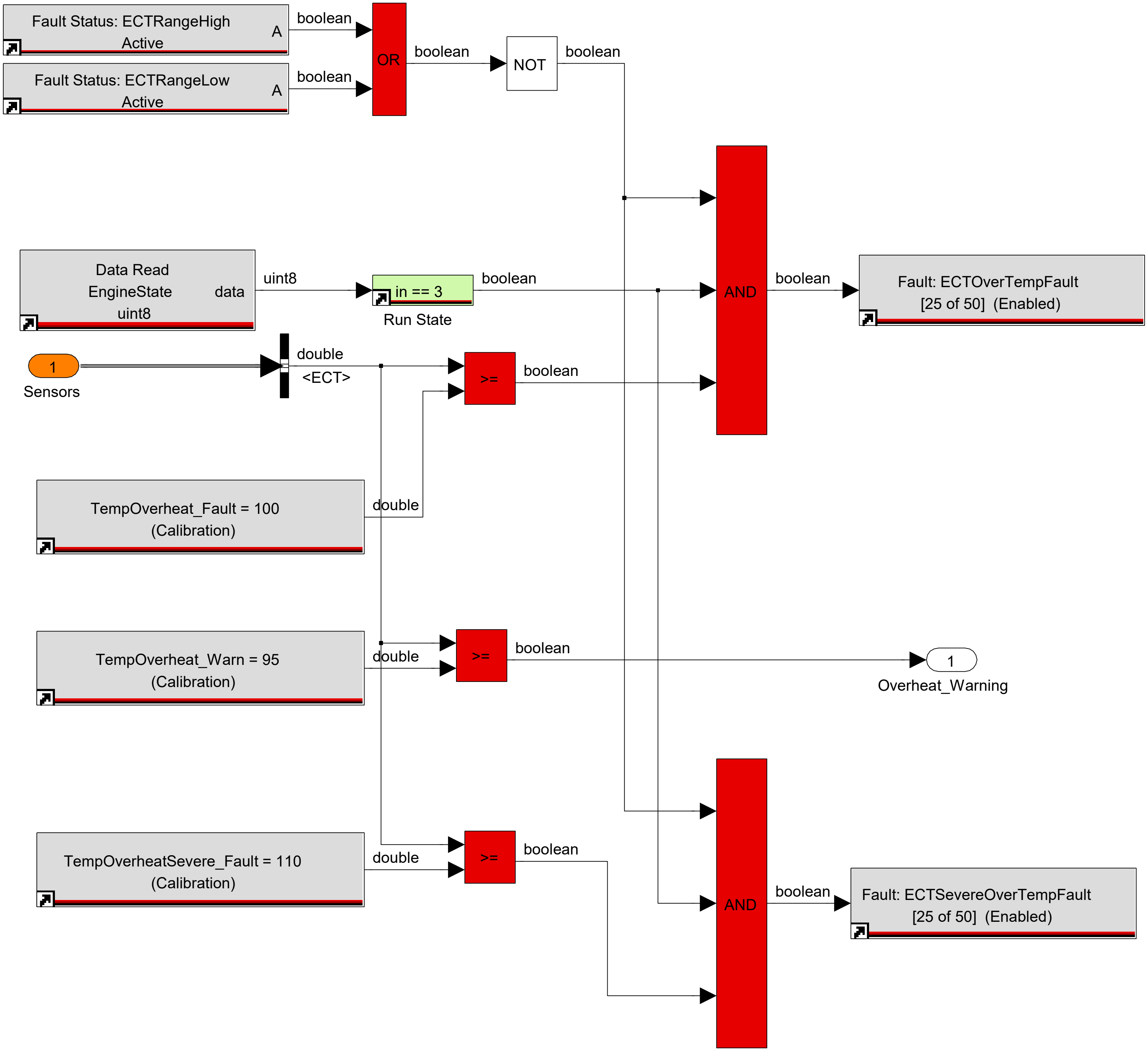

1
boolean
Constant
Constant_Fuel_Pump = 0
(Calibration)
double
> 0
boolean
1
FUELP [bool]
Switch
Turn on Fuel Pump at Startup
Turn On Fuel Pump
for 'StartupTime' seconds
FuelPumpTSE
Time Since Enabled
[sec]
double
<
boolean
FuelPumpStartTime = 3
(Calibration)
double


f()
1
Control
Control
2
Sensors
<SynthSensors>
double
<RPMInst>
boolean
<TWO STEP>
RPM
RPM LIMITER
TWO Step
Overspeed Protection
Sensors
Overheat_Warning
boolean
Engine Overheat Fault Logic
Sensors
MAP Fault Logic
Overheat_Warning
Sensors
LowOilPres
LowOilPres
boolean
Low Oil Pressure Fault Logic
Sensors
FuelEconomy_instantaneous
Controller
FuelEconomy_filtered
double
FuelEconomy_instantaneous
double
FuelEconomy_filtered
Fuel Economy
Diagnostics
1
Diagnostics
Sensors
Wrong Fuel Pressure Fault Logic
Sensors
Controller
Boost Fault
Sensors
Controller
AC Fault

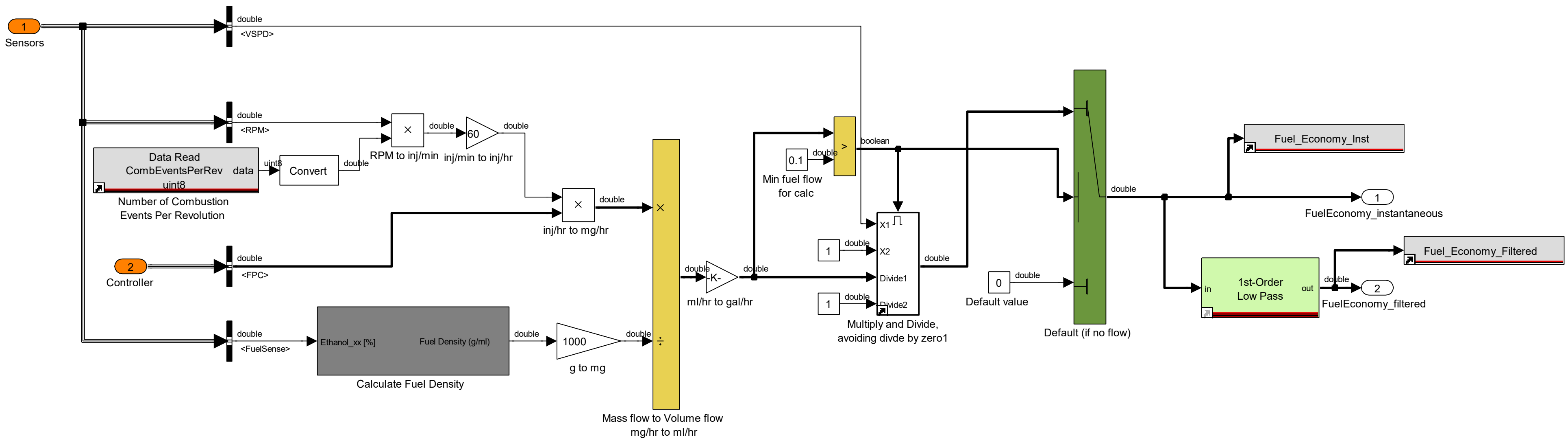

Data Read
EngineState
uint8
data
uint8
in == 3
Run State
boolean
1
Sensors
double
<ACPres>
>=
boolean
Relational
Operator
ACHighPressureDisable = 3000
(Calibration)
double
AND
Logical
Operator
boolean
Enable
Timer
[sec]
Time
double
>
boolean
Fault: ACChargeHigh_Fault
[25 of 50] (Enabled)
ACHighPressureTime = 1
(Calibration)
double
<=
boolean
Relational
Operator1
ACLowPressureDisable = 300
(Calibration)
double
AND
Logical
Operator1
boolean
Enable
Timer
[sec]
Time
double
>
boolean
AND
Logical
Operator2
boolean
Fault: ACChargeLow_Fault
[25 of 50] (Enabled)
ACLowPressureTime = 1
(Calibration)
double
2
Controller
boolean
<AC>



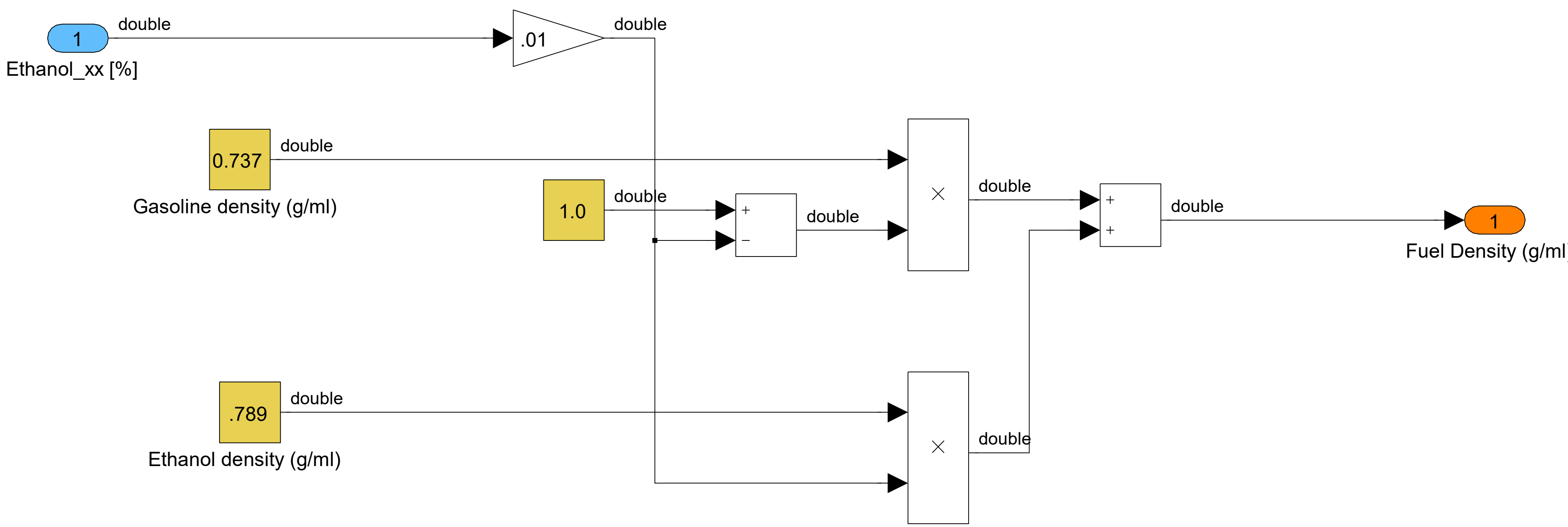
Data Read
EngineState
uint8
data
uint8
BOOST Level
in == 3
Run State
boolean
1
Sensors
double
<MAP_Angular>
0.145038
kPa to PSI
double
SoftOverBoostLimit = 20
(Calibration)
double
>=
Relational
Operator
boolean
AND
Logical
Operator
boolean
Enable
Timer
[sec]
Time
double
>
boolean
Fault: SoftOverBoost_Fault
[1 of 2] (Sticky)
SoftOverBoostTime = 2
(Calibration)
double
HardOverBoostLimit = 25
(Calibration)
double
>=
Relational
Operator1
boolean
AND
Logical
Operator1
boolean
Enable
Timer
[sec]
Time
double
>
boolean
Fault: HardOverBoost_Fault
[1 of 2] (Sticky)
HardOverBoostTime = 0.1
(Calibration)
double
2
Controller
double
<WASTEGATE>
WastegateLossOfControl = 50
(Calibration)
double
>=
Relational
Operator2
boolean
AND
Logical
Operator2
boolean
Enable
Timer
[sec]
Time
double
>
boolean
Fault: Wastegate_Fault
[1 of 2] (Sticky)
WastegateTime = 2
(Calibration)
double



Fault Status: ECTRangeHigh Active
A
Fault Status: ECTRangeLow Active
A
boolean
boolean
OR
boolean
NOT
boolean
AND
boolean
Fault: ECTOverTempFault [25 of 50] (Enabled)
Data Read EngineState uint8
data
uint8
in == 3
Run State
boolean
1
Sensors
double
<ECT>
>=
boolean
TempOverheat_Fault = 100 (Calibration)
double
TempOverheat_Warn = 95 (Calibration)
double
>=
boolean
1
Overheat_Warning
TempOverheatSevere_Fault = 110 (Calibration)
double
>=
boolean
AND
boolean
Fault: ECTSevereOverTempFault [25 of 50] (Enabled)

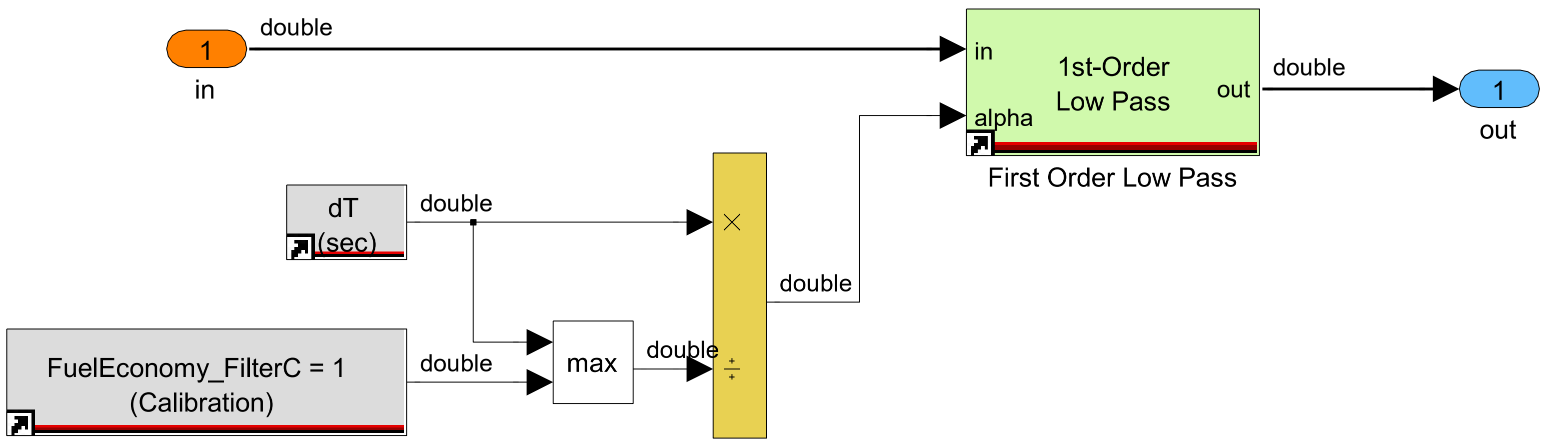


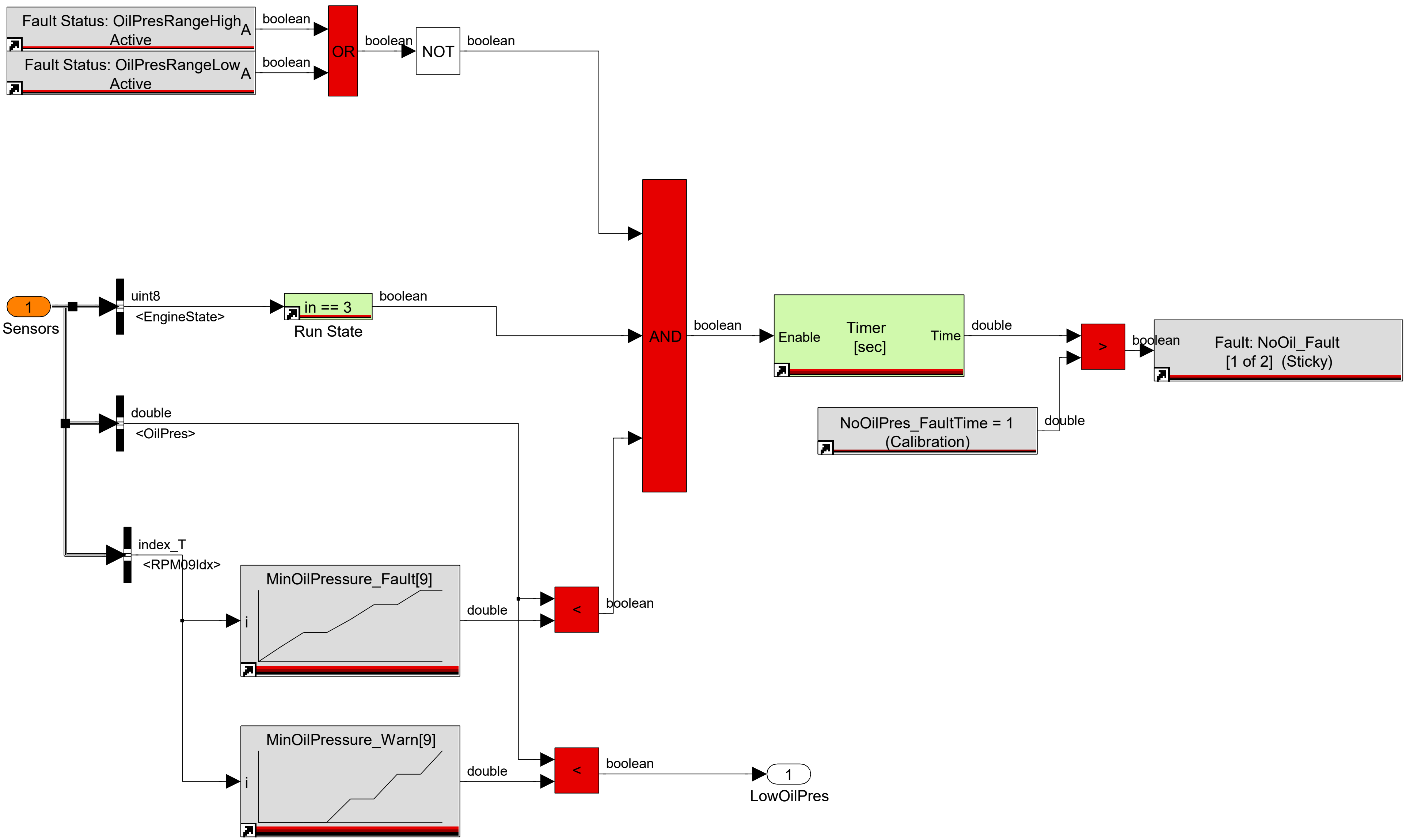
1
Sensors
double
<VSPD>
double
<RPM>
Data Read
CombEventsPerRev
data
uint8
Number of Combustion
Events Per Revolution
uint8
Convert
double
×
double
RPM to inj/min
60
double
inj/min to inj/hr
×
double
inj/hr to mg/hr
2
Controller
double
<FPC>
double
<FuelSense>
Ethanol_xx [%]
Fuel Density (g/ml)
Calculate Fuel Density
double
1000
g to mg
double
×
÷
Mass flow to Volume flow
mg/hr to ml/hr
double
-K-
ml/hr to gal/hr
double
0.1
double
Min fuel flow
for calc
>
boolean
X1
X2
Divide1
Divide2
1
double
1
double
Multiply and Divide,
avoiding divde by zero1
double
0
double
Default value
Default (if no flow)
double
Fuel_Economy_Inst
1
FuelEconomy_instantaneous
1st-Order
Low Pass
in
out
double
2
FuelEconomy_filtered
Fuel_Economy_Filtered



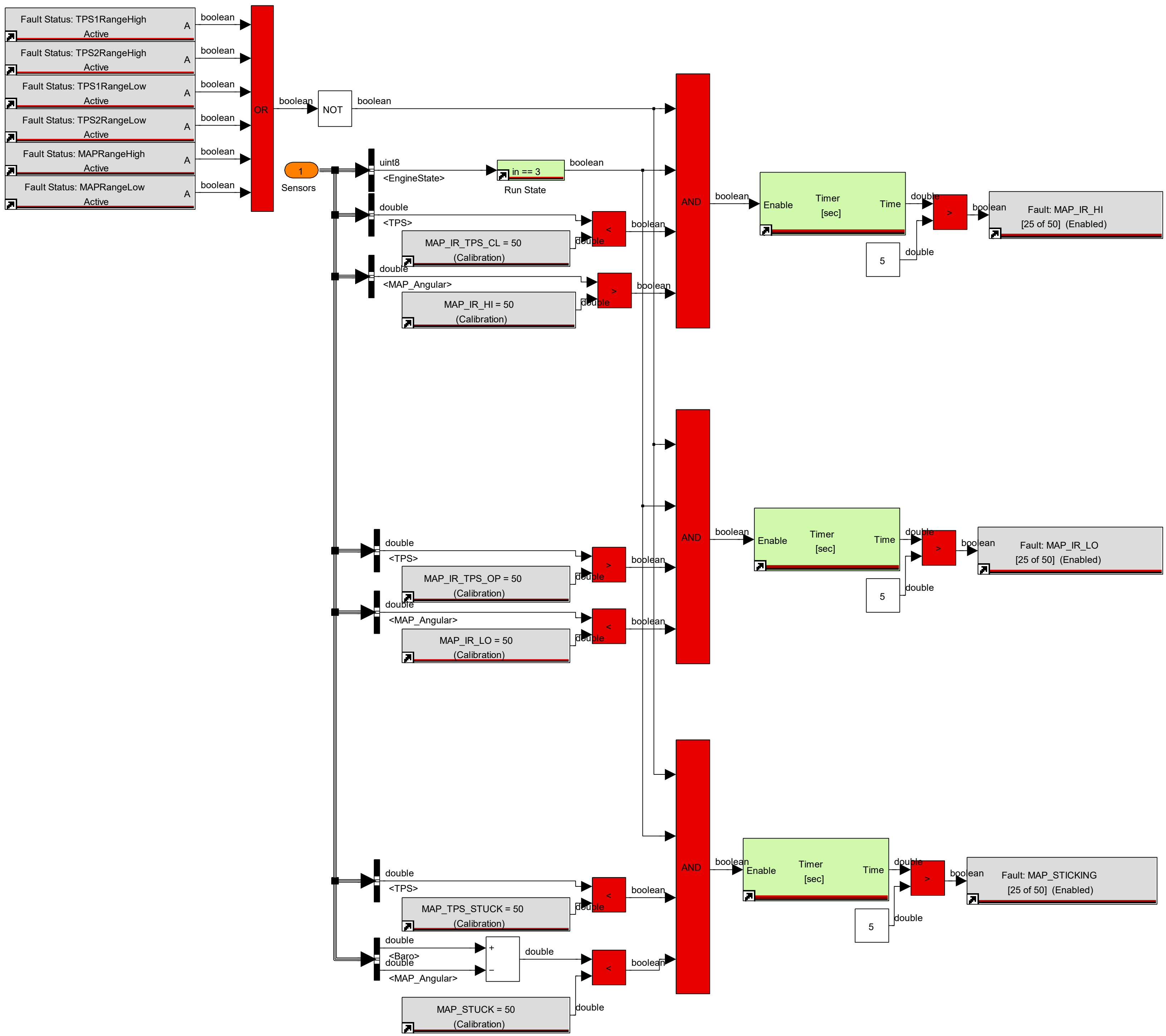
1
double
Ethanol_xx [%]
.01
double
0.737
double
Gasoline density (g/ml)
1.0
double
+
−
double
×
double
+
+
double
1
Fuel Density (g/ml)
.789
double
Ethanol density (g/ml)
×
double

Tunable 1st-Order Low-Pass Filter

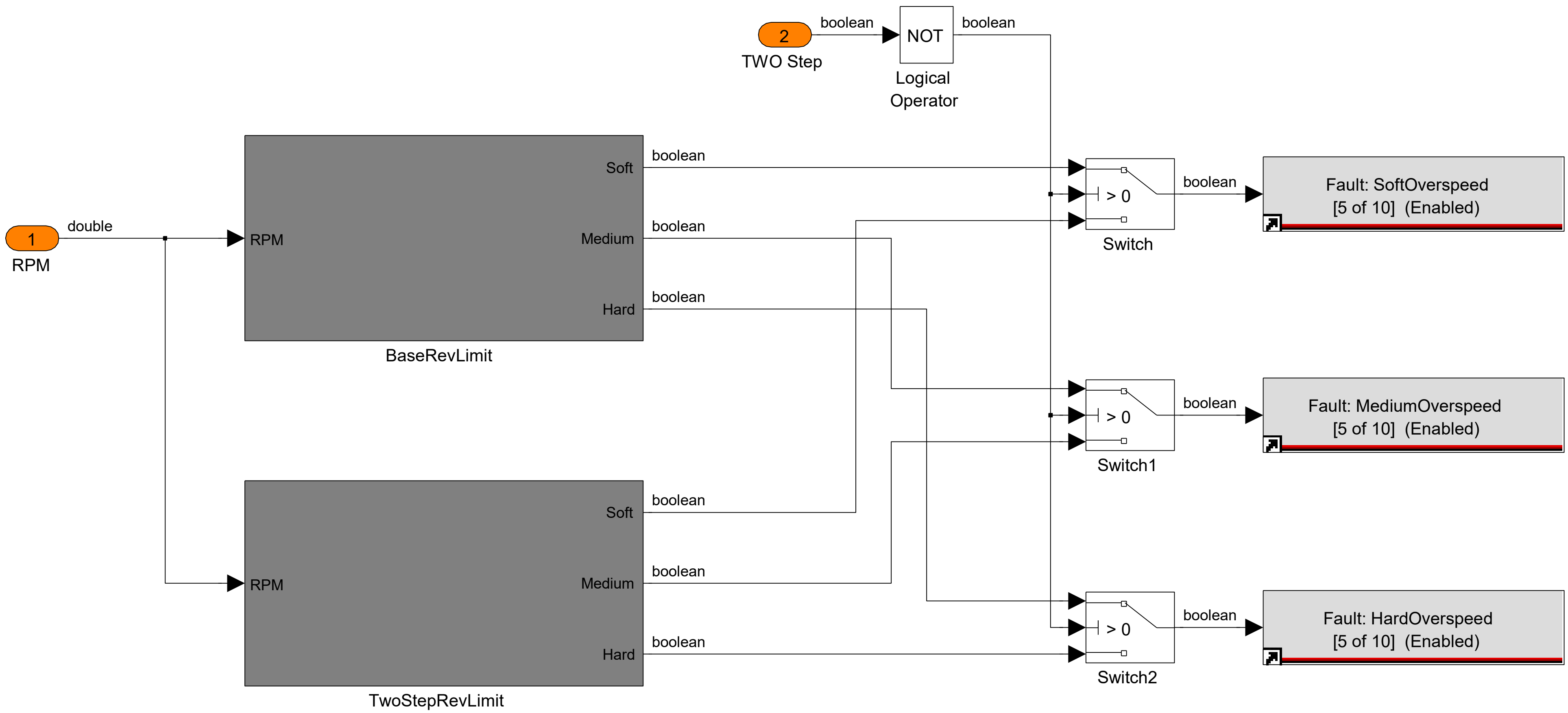


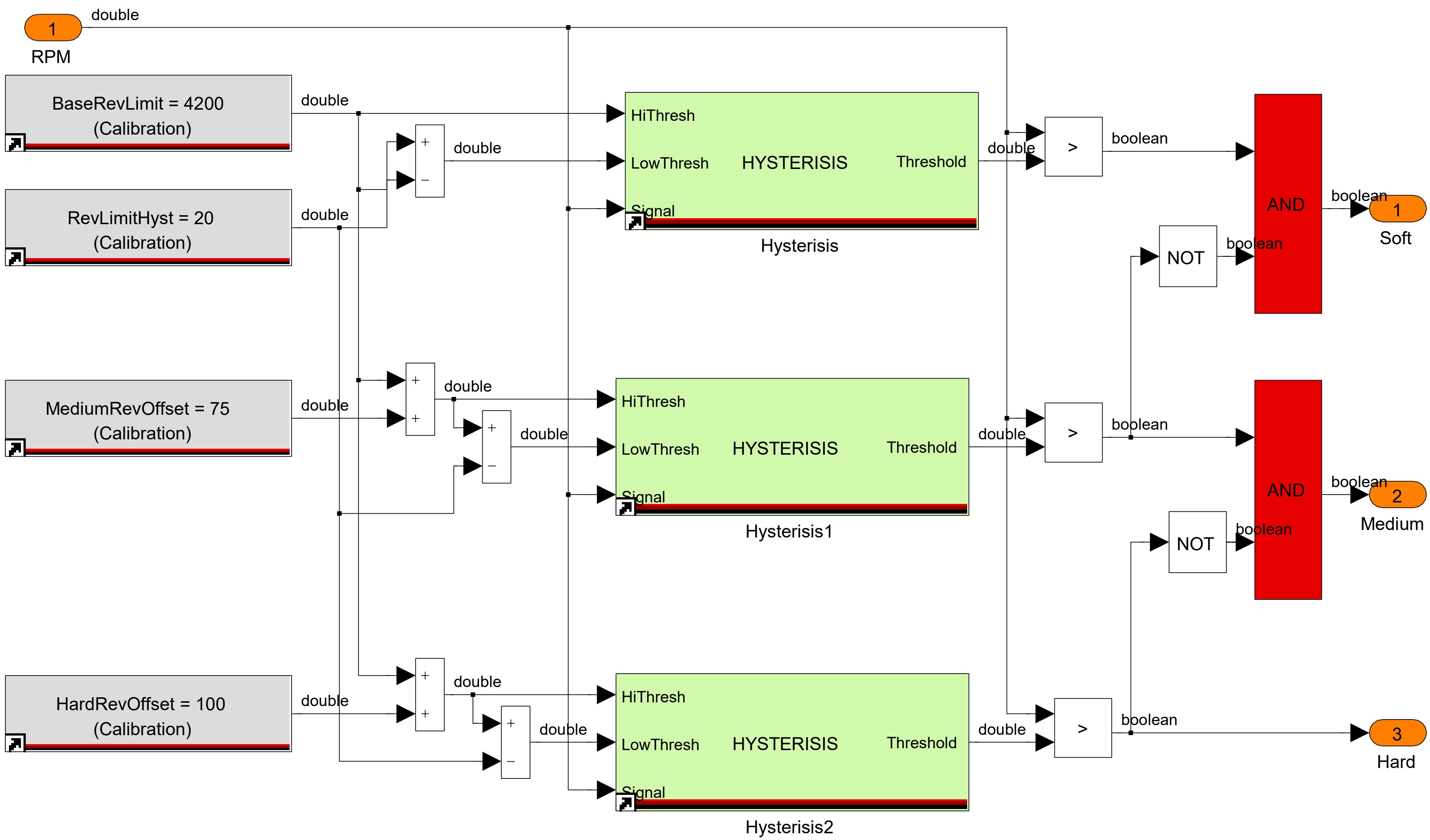


Fault Status: OilPresRangeHigh Active
A
Fault Status: OilPresRangeLow Active
A
boolean
boolean
OR
boolean
NOT
boolean
1
Sensors
uint8
<EngineState>
in == 3
Run State
boolean
AND
boolean
Enable
Timer [sec]
Time
double
>
boolean
Fault: NoOil_Fault [1 of 2] (Sticky)
NoOilPres_FaultTime = 1 (Calibration)
double
double
<OilPres>
index_T
<RPM09Idx>
MinOilPressure_Fault[9]
i
double
<
boolean
MinOilPressure_Warn[9]
i
double
<
boolean
1
LowOilPres

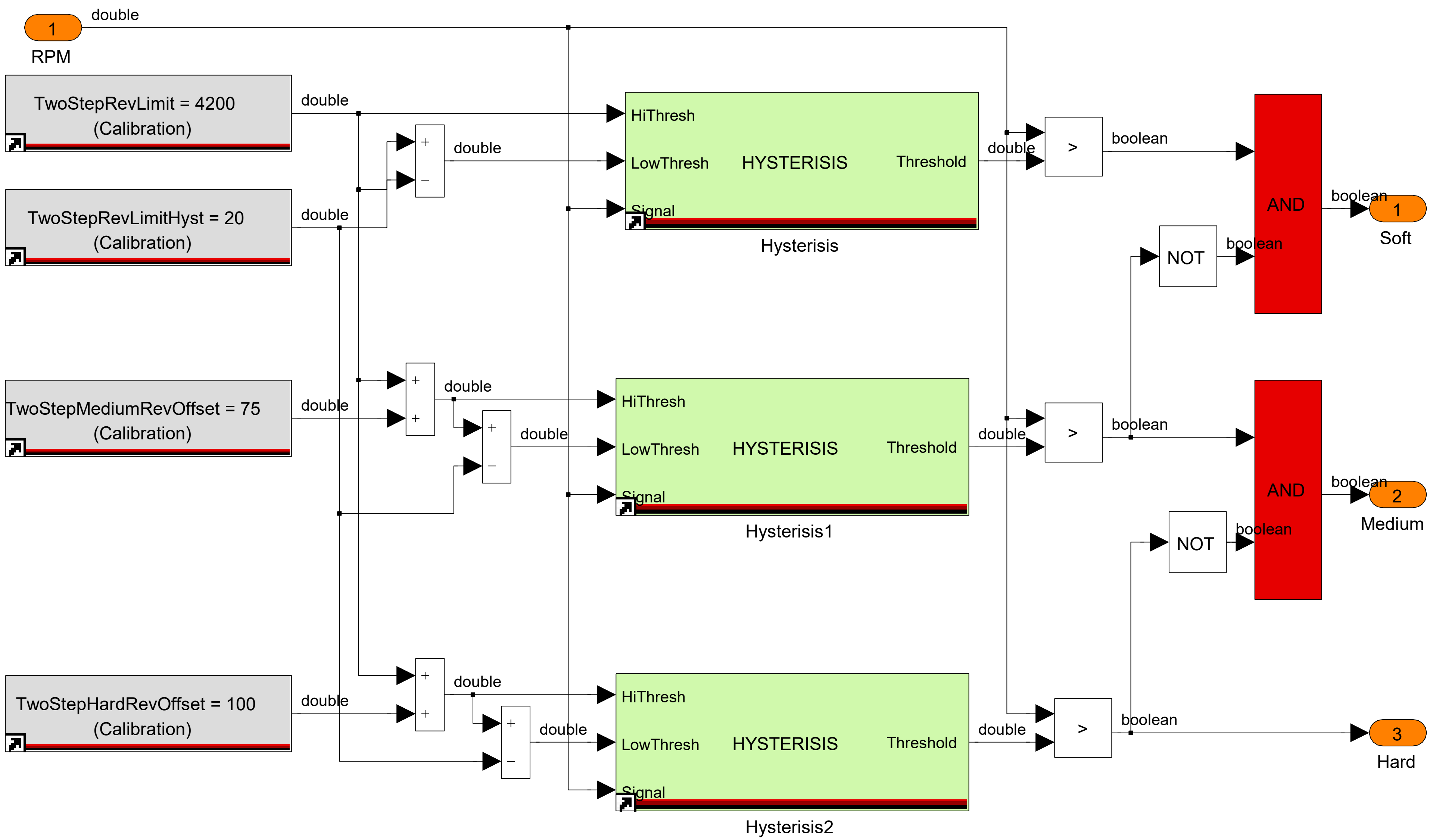


Fault Status: TPS1RangeHigh Active
Fault Status: TPS2RangeHigh Active
Fault Status: TPS1RangeLow Active
Fault Status: TPS2RangeLow Active
Fault Status: MAPRangeHigh Active
Fault Status: MAPRangeLow Active
A
boolean
OR
NOT
AND
1
Sensors
uint8
<EngineState>
in == 3
Run State
double
<TPS>
<MAP_Angular>
<Baro>
MAP_IR_TPS_CL = 50 (Calibration)
MAP_IR_HI = 50 (Calibration)
MAP_IR_TPS_OP = 50 (Calibration)
MAP_IR_LO = 50 (Calibration)
MAP_TPS_STUCK = 50 (Calibration)
MAP_STUCK = 50 (Calibration)
Enable
Timer [sec]
Time
5
Fault: MAP_IR_HI [25 of 50] (Enabled)
Fault: MAP_IR_LO [25 of 50] (Enabled)
Fault: MAP_STICKING [25 of 50] (Enabled)

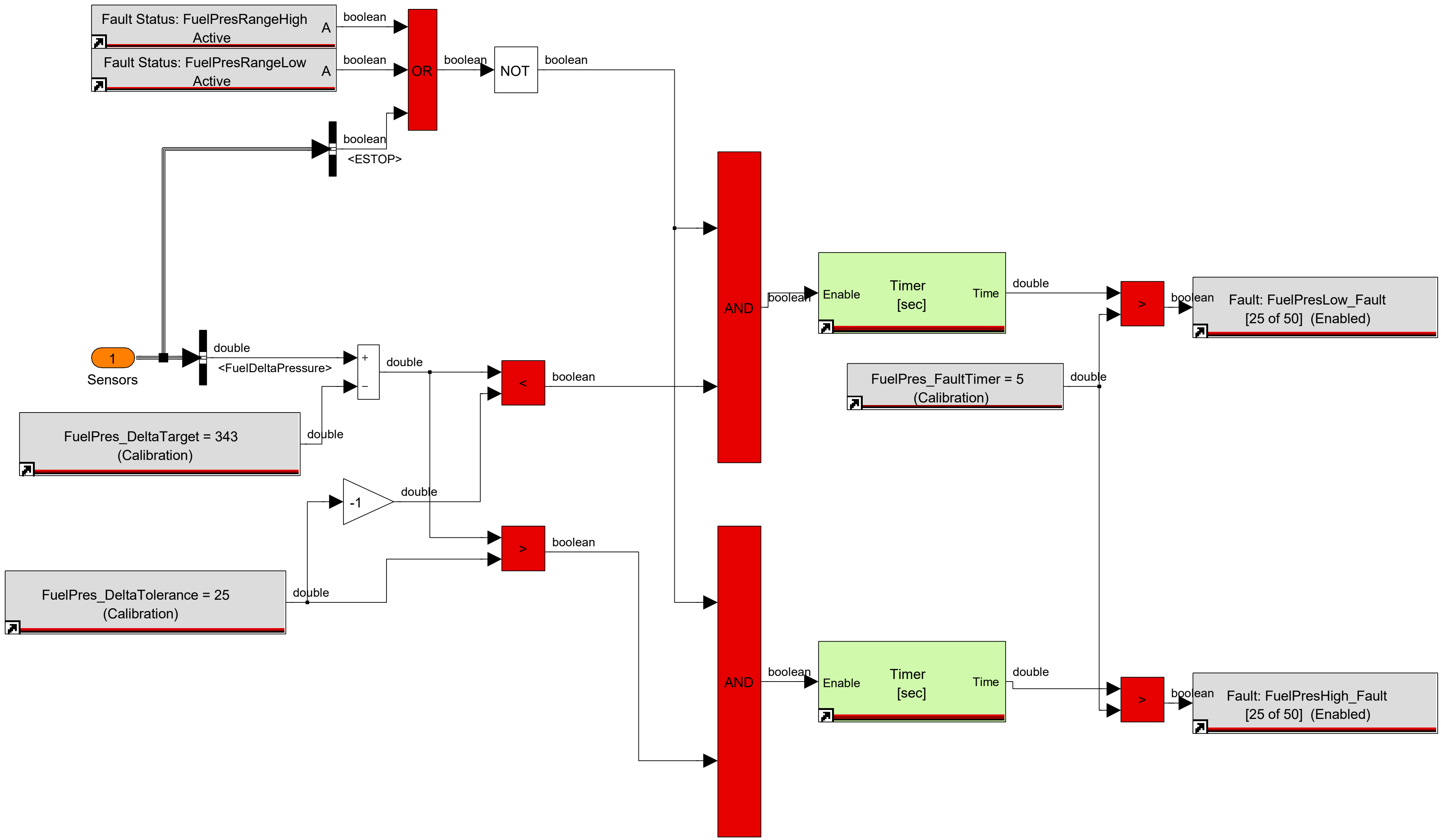

2
TWO Step
boolean
NOT
Logical Operator
boolean
1
RPM
double
RPM
Soft
Medium
Hard
BaseRevLimit
RPM
Soft
Medium
Hard
TwoStepRevLimit
boolean
> 0
Switch
Switch1
Switch2
Fault: SoftOverspeed
[5 of 10] (Enabled)
Fault: MediumOverspeed
[5 of 10] (Enabled)
Fault: HardOverspeed
[5 of 10] (Enabled)

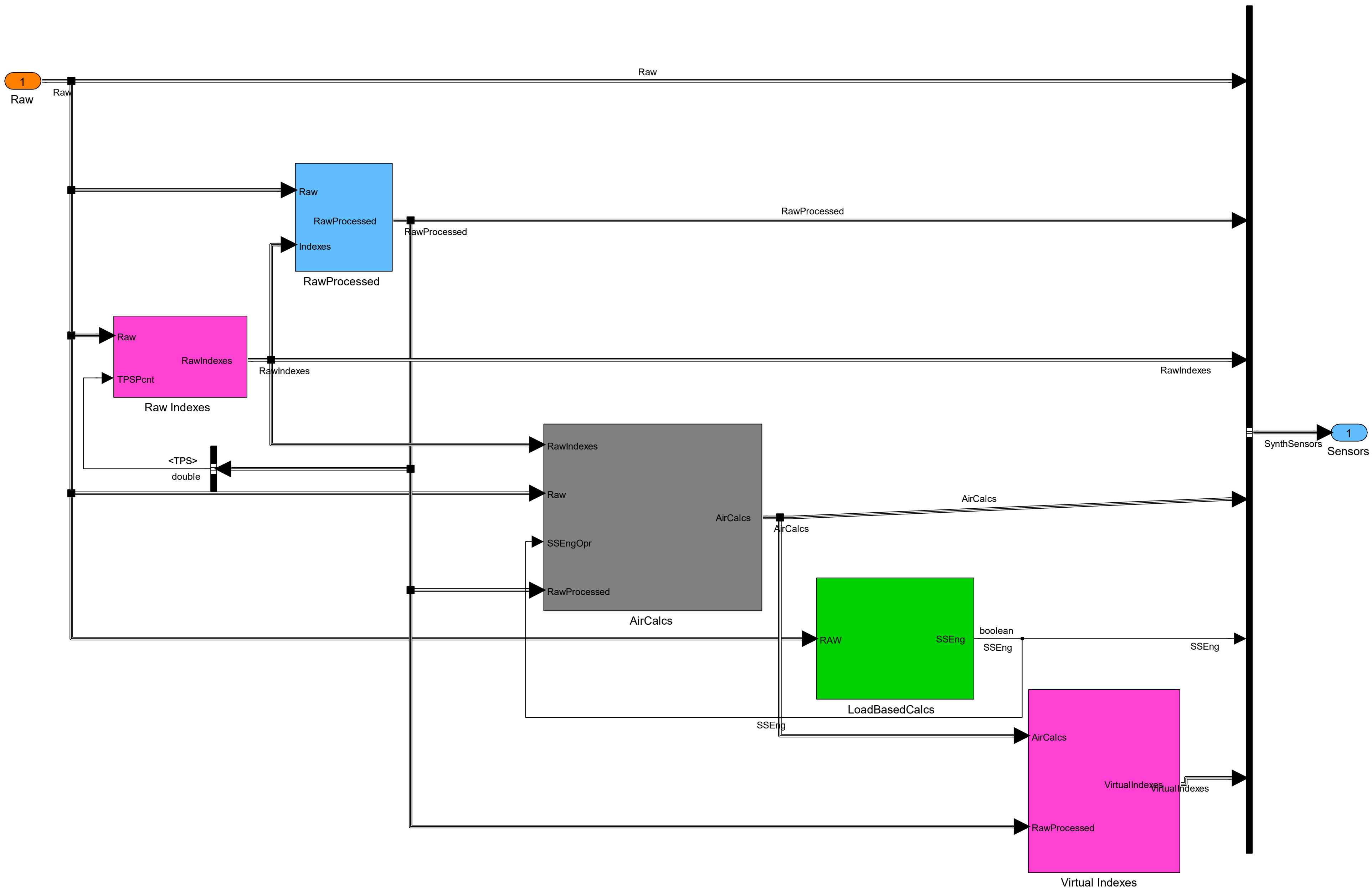


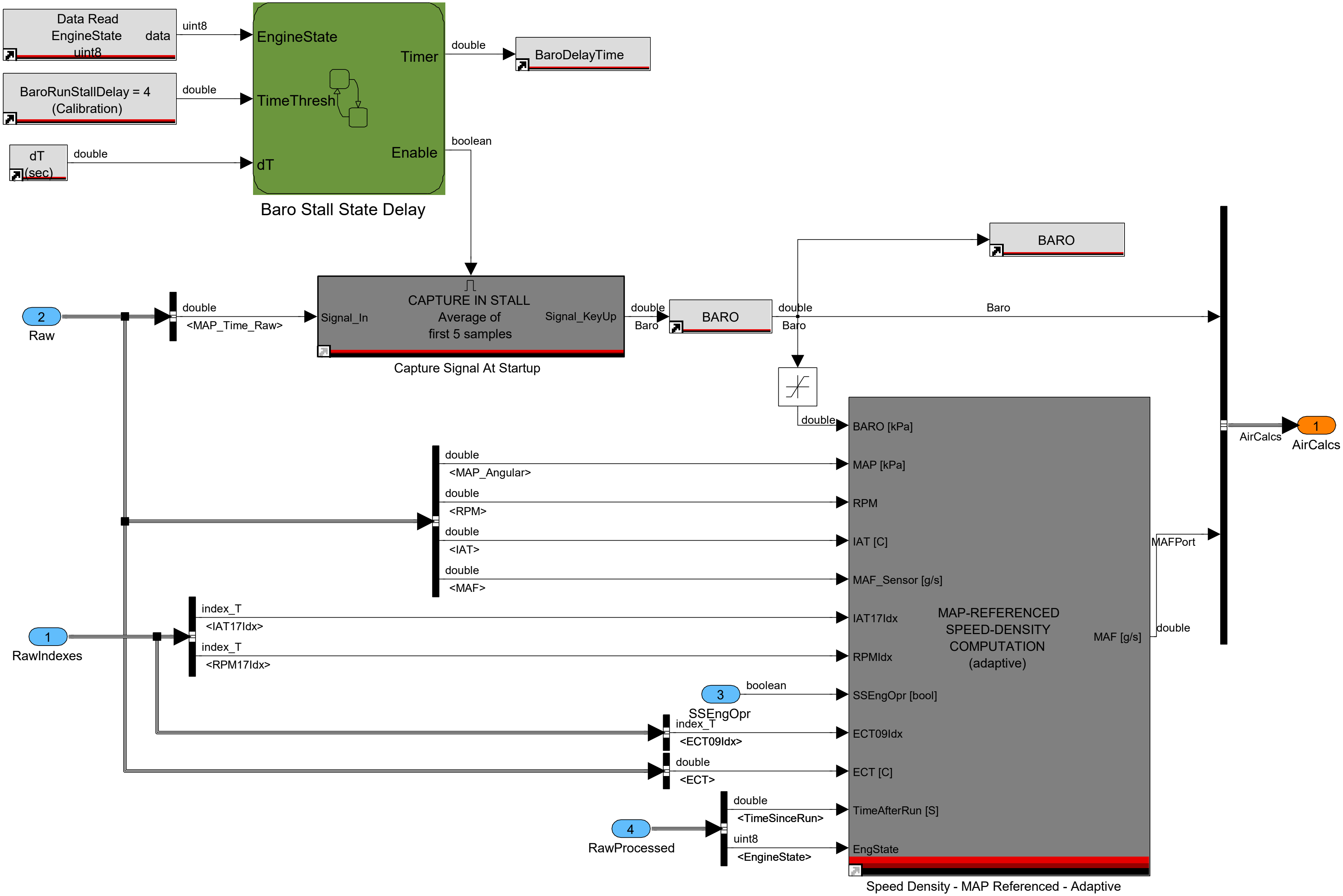
1
RPM
double
BaseRevLimit = 4200
(Calibration)
RevLimitHyst = 20
(Calibration)
MediumRevOffset = 75
(Calibration)
HardRevOffset = 100
(Calibration)
HiThresh
LowThresh
HYSTERISIS
Threshold
Signal
Hysterisis
Hysterisis1
Hysterisis2
boolean
AND
NOT
1
Soft
2
Medium
3
Hard

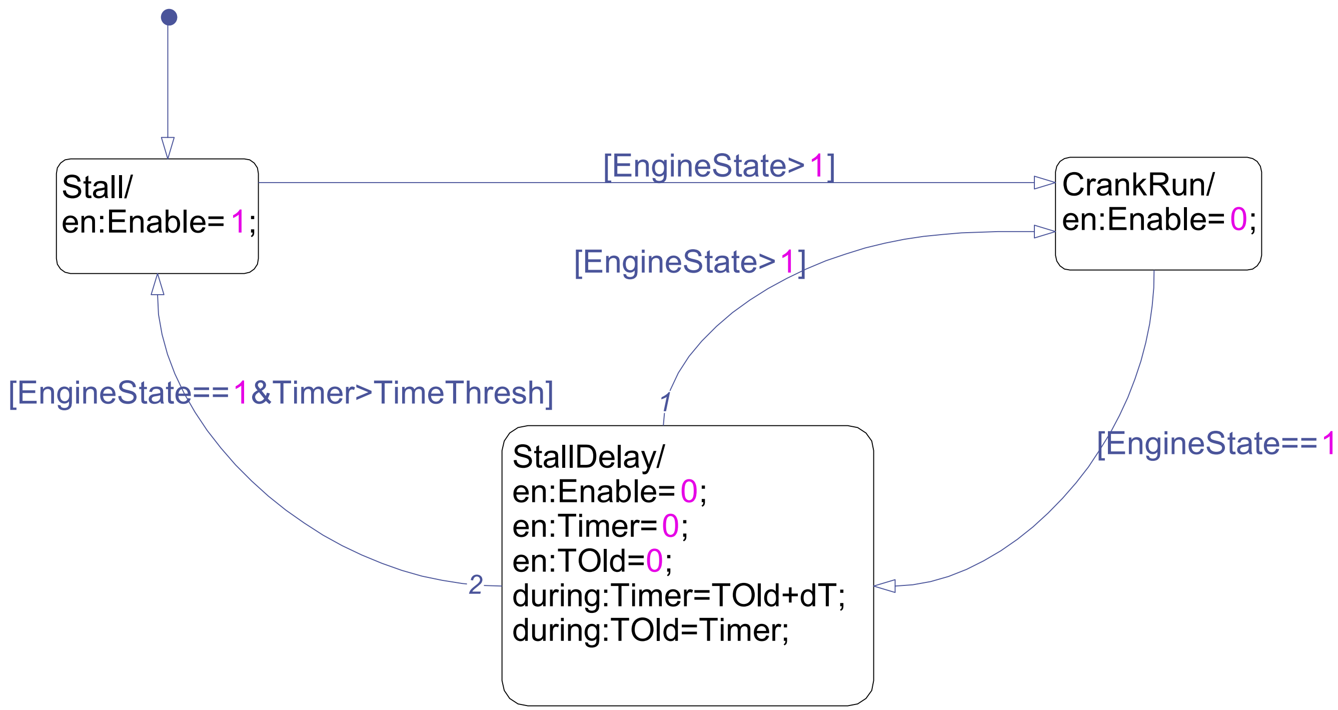


1
RPM
double
TwoStepRevLimit = 4200
(Calibration)
TwoStepRevLimitHyst = 20
(Calibration)
TwoStepMediumRevOffset = 75
(Calibration)
TwoStepHardRevOffset = 100
(Calibration)
HiThresh
LowThresh
HYSTERISIS
Threshold
Signal
Hysterisis
Hysterisis1
Hysterisis2
boolean
NOT
AND
1
Soft
2
Medium
3
Hard

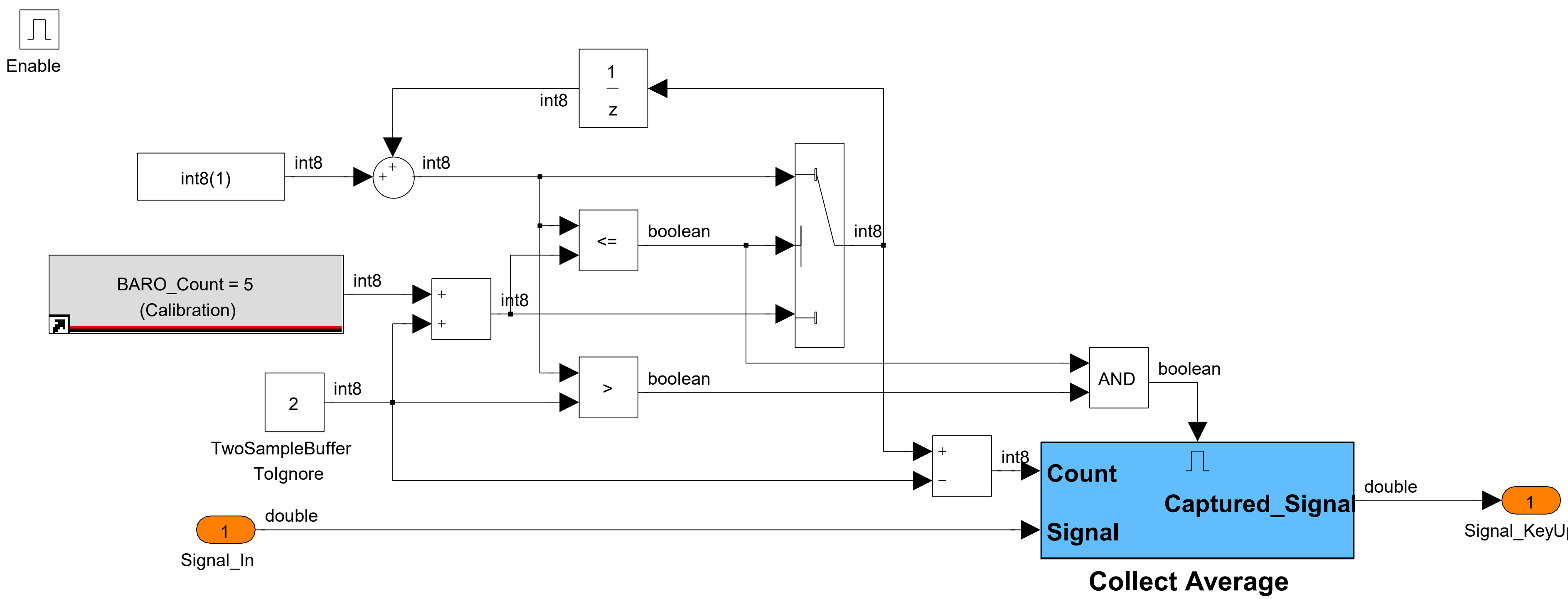

Fault Status: FuelPresRangeHigh Active
A
Fault Status: FuelPresRangeLow Active
A
boolean
OR
NOT
<ESTOP>
1
Sensors
double
<FuelDeltaPressure>
+
-
FuelPres_DeltaTarget = 343 (Calibration)
-1
FuelPres_DeltaTolerance = 25 (Calibration)
<
>
AND
Enable
Timer [sec]
Time
FuelPres_FaultTimer = 5 (Calibration)
Fault: FuelPresLow_Fault [25 of 50] (Enabled)
Fault: FuelPresHigh_Fault [25 of 50] (Enabled)


1
Raw
Raw
Raw
RawProcessed
Raw
RawProcessed
Indexes
RawProcessed
RawProcessed
Raw Indexes
Raw
RawIndexes
TPSPcnt
RawIndexes
RawIndexes
<TPS>
double
AirCalcs
RawIndexes
Raw
SSEngOpr
RawProcessed
AirCalcs
AirCalcs
AirCalcs
LoadBasedCalcs
RAW
SSEng
boolean
SSEng
SSEng
SSEng
Virtual Indexes
AirCalcs
VirtualIndexes
VirtualIndexes
RawProcessed
SynthSensors
1
Sensors

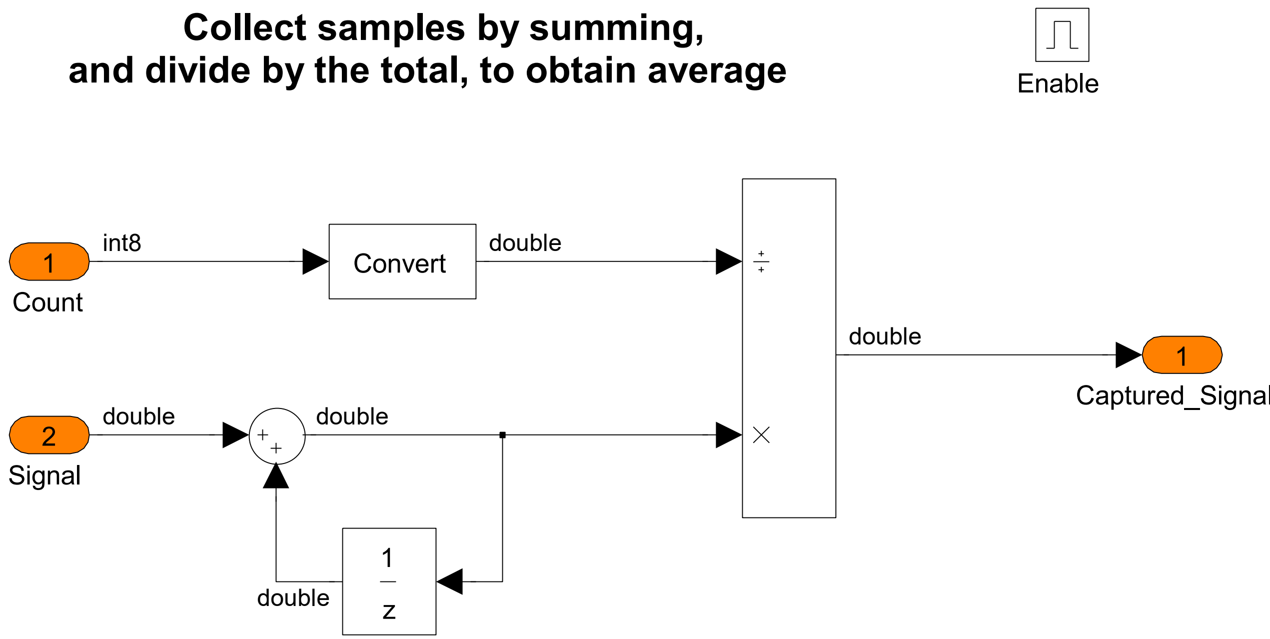

Data Read
EngineState data
uint8
BaroRunStallDelay = 4
(Calibration)
dT
(sec)
EngineState
TimeThresh
dT
Timer
Enable
Baro Stall State Delay
BaroDelayTime
BARO
CAPTURE IN STALL
Average of
first 5 samples
Signal_In
Signal_KeyUp
Capture Signal At Startup
BARO
Baro
2
Raw
<MAP_Time_Raw>
<MAP_Angular>
<RPM>
<IAT>
<MAF>
1
RawIndexes
index_T
<IAT17Idx>
<RPM17Idx>
3
SSEngOpr
<ECT09Idx>
<ECT>
4
RawProcessed
<TimeSinceRun>
<EngineState>
BARO [kPa]
MAP [kPa]
RPM
IAT [C]
MAF_Sensor [g/s]
IAT17Idx
RPMIdx
SSEngOpr [bool]
ECT09Idx
ECT [C]
TimeAfterRun [S]
EngState
MAP-REFERENCED
SPEED-DENSITY
COMPUTATION
(adaptive)
MAF [g/s]
MAFPort
AirCalcs
1
AirCalcs
Speed Density - MAP Referenced - Adaptive

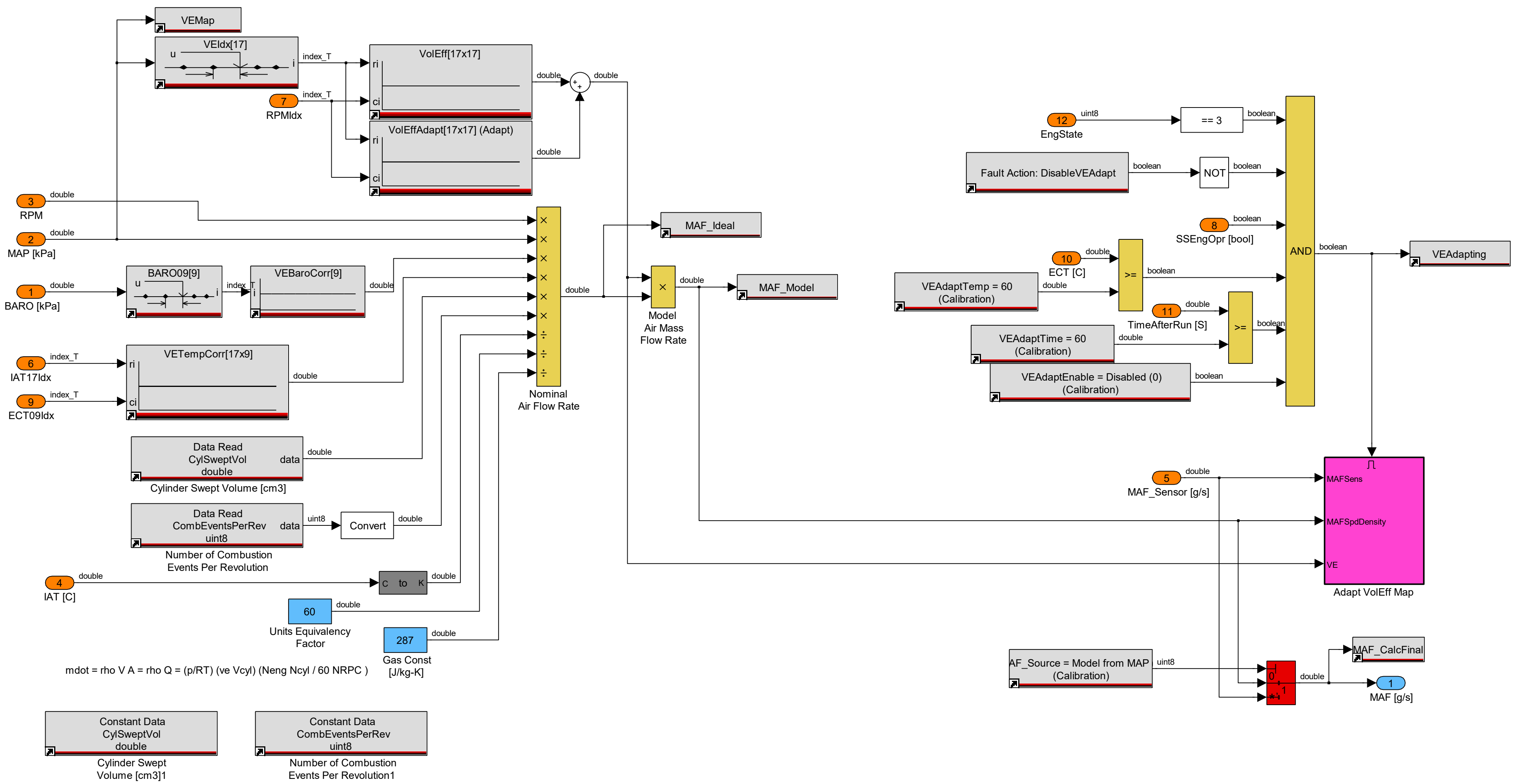

Stall/
en:Enable=1;
[EngineState>1]
CrankRun/
en:Enable=0;
[EngineState>1]
[EngineState==1&Timer>TimeThresh]
1
[EngineState==1]
StallDelay/
en:Enable=0;
en:Timer=0;
en:TOld=0;
during:Timer=TOld+dT;
during:TOld=Timer;
2

Count up to "BARO_Count" samples

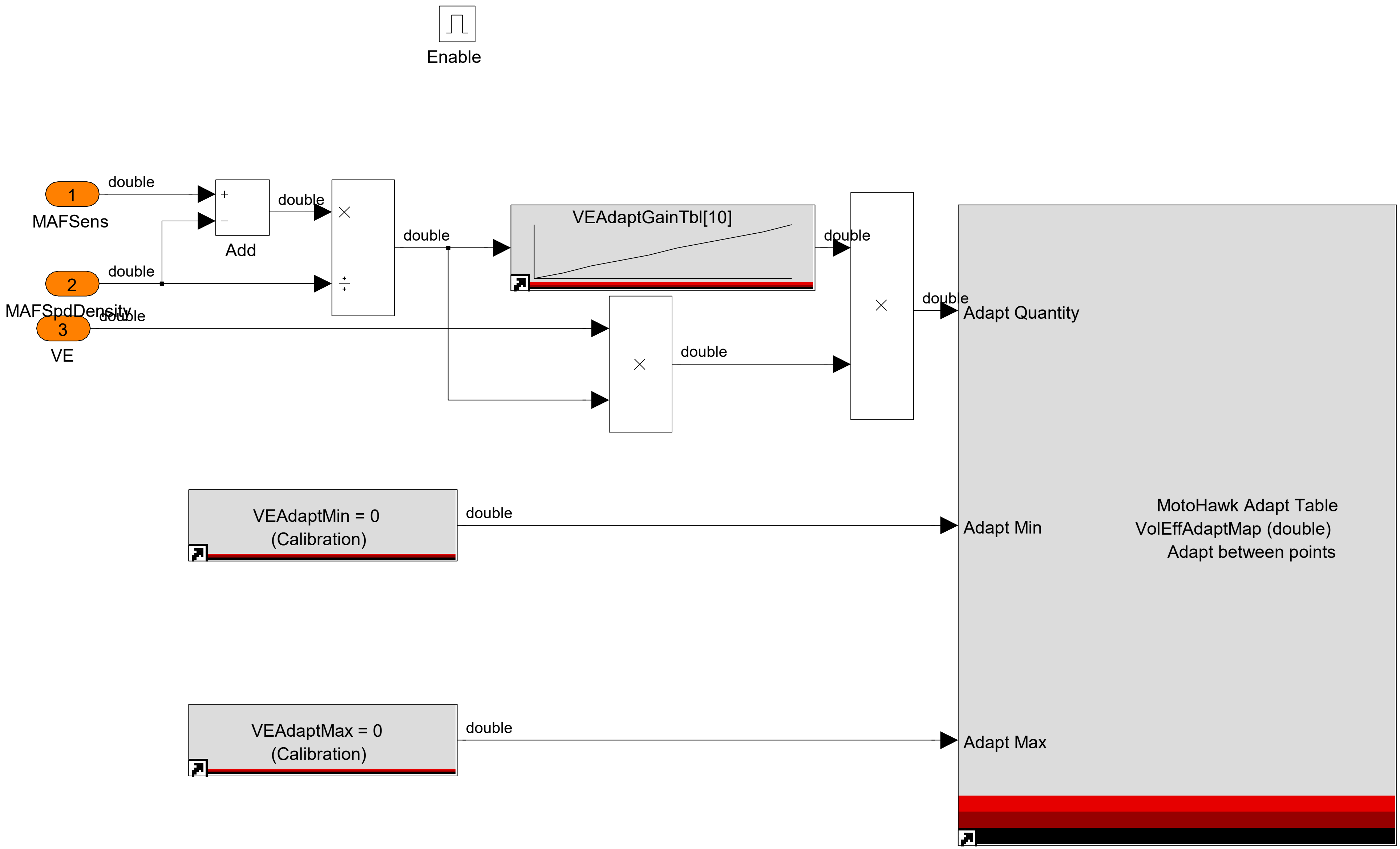


**Collect samples by summing,
and divide by the total, to obtain average**

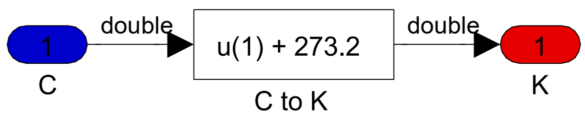


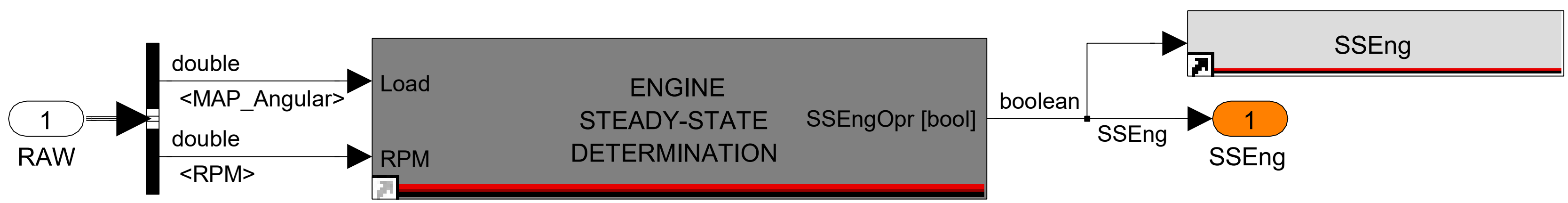


VEMap
VEIdx[17]
index_T
VolEff[17x17]
VolEffAdapt[17x17] (Adapt)
RPMIdx
RPM
MAP [kPa]
BARO [kPa]
BARO09[9]
VEBaroCorr[9]
IAT17Idx
ECT09Idx
VETempCorr[17x9]
Data Read CylSweptVol double
Cylinder Swept Volume [cm3]
Data Read CombEventsPerRev uint8
Convert
Number of Combustion Events Per Revolution
IAT [C]
c to K
Units Equivalency Factor
Gas Const [J/kg-K]
mdot = rho V A = rho Q = (p/RT) (ve Vcyl) (Neng Ncyl / 60 NRPC)
Constant Data CylSweptVol double
Cylinder Swept Volume [cm3]1
Constant Data CombEventsPerRev uint8
Number of Combustion Events Per Revolution1
Nominal Air Flow Rate
MAF_Ideal
MAF_Model
Model Air Mass Flow Rate
EngState
== 3
Fault Action: DisableVEAdapt
NOT
SSEngOpr [bool]
ECT [C]
VEAdaptTemp = 60 (Calibration)
TimeAfterRun [S]
VEAdaptTime = 60 (Calibration)
VEAdaptEnable = Disabled (0) (Calibration)
AND
VEAdapting
MAF_Sensor [g/s]
MAFSens
MAFSpdDensity
VE
Adapt VolEff Map
AF_Source = Model from MAP (Calibration)
MAF_CalcFinal
MAF [g/s]

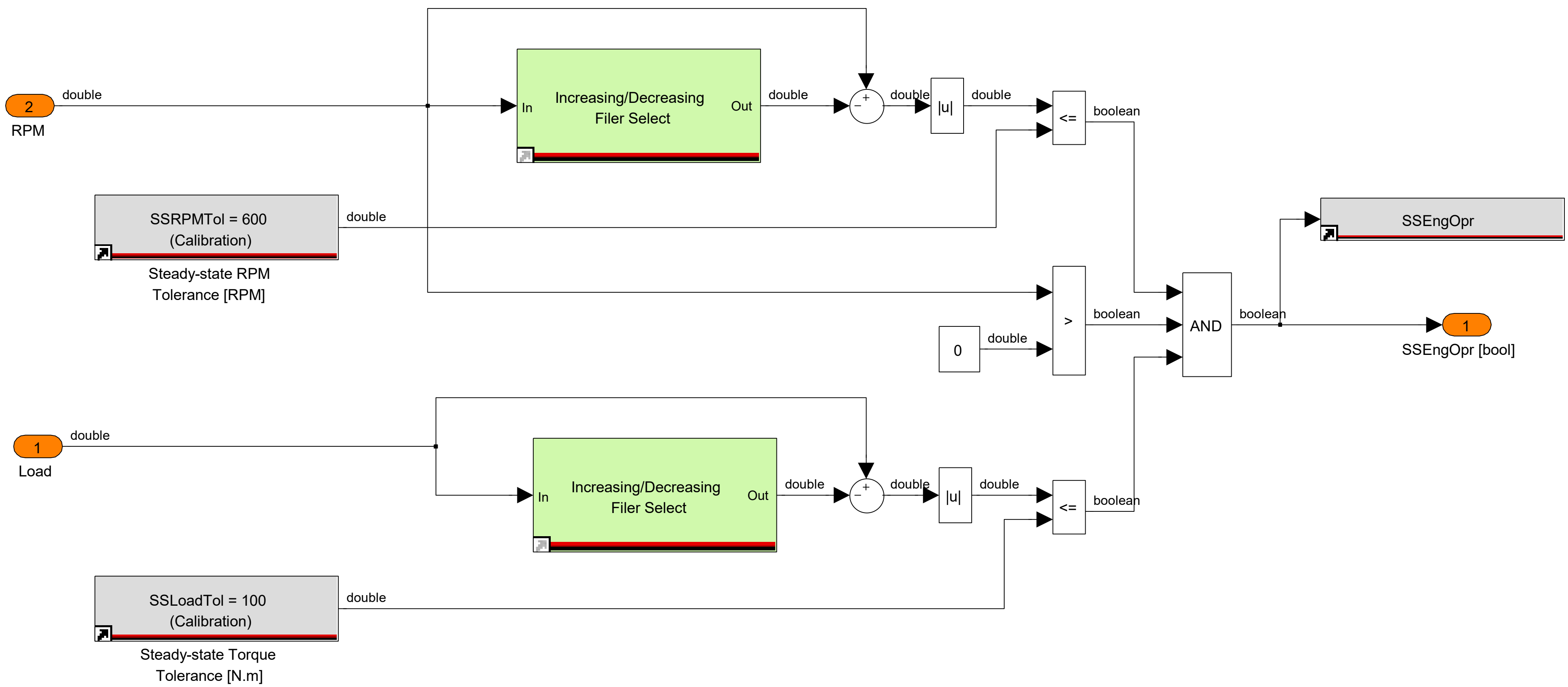


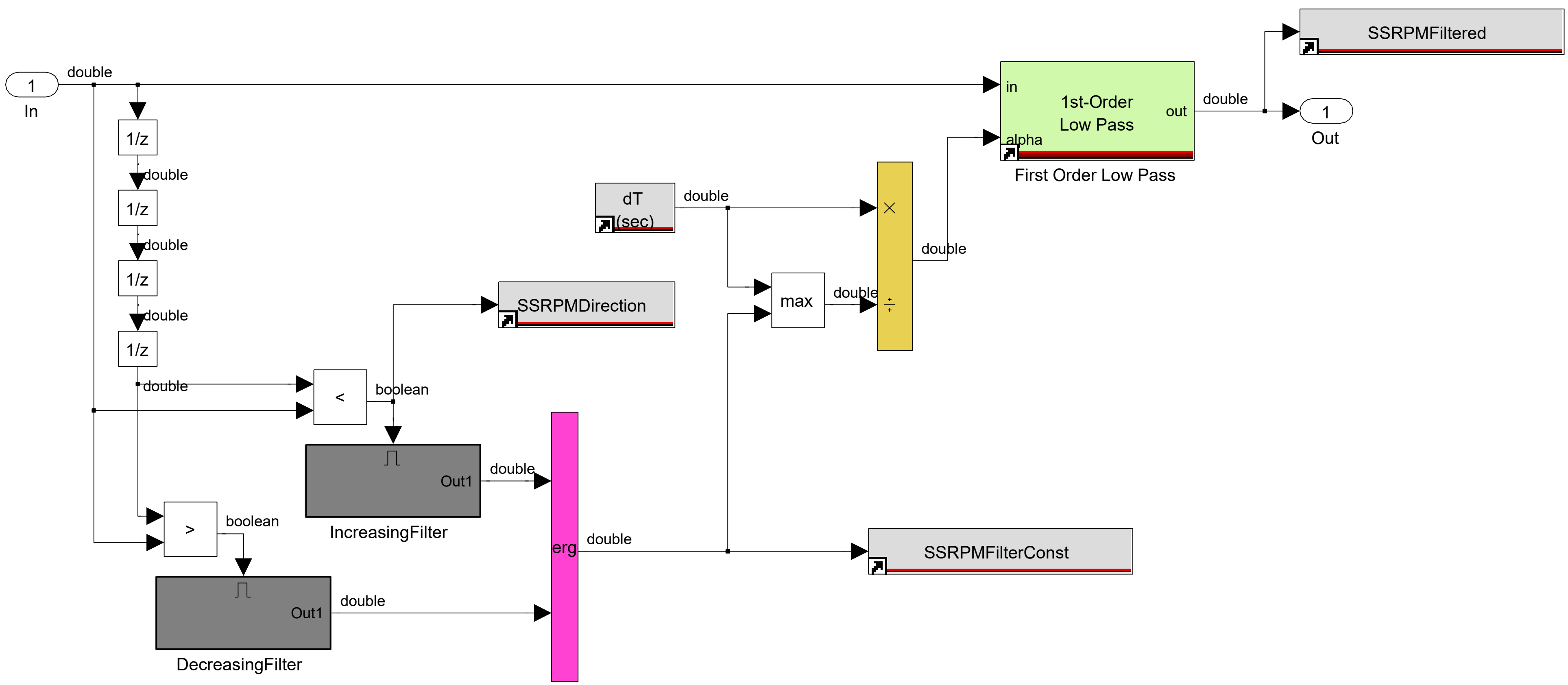
Enable
1
MAFSens
double
2
MAFSpdDensity
double
3
VE
double
Add
double
double
VEAdaptGainTbl[10]
double
double
double
Adapt Quantity
VEAdaptMin = 0
(Calibration)
double
Adapt Min
VEAdaptMax = 0
(Calibration)
double
Adapt Max
MotoHawk Adapt Table
VolEffAdaptMap (double)
Adapt between points


1
C
double
u(1) + 273.2
C to K
double
1
K

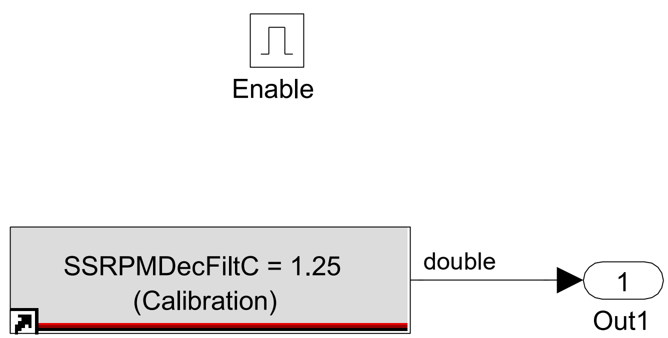


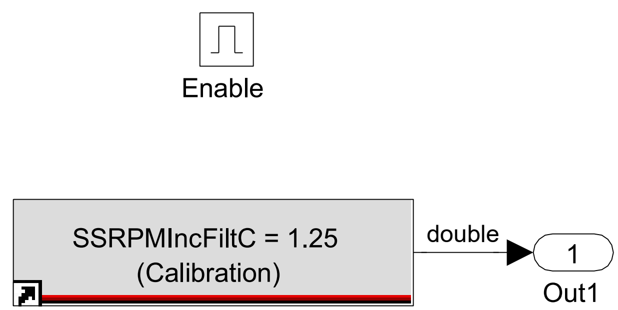
Engine Steady-State Flag

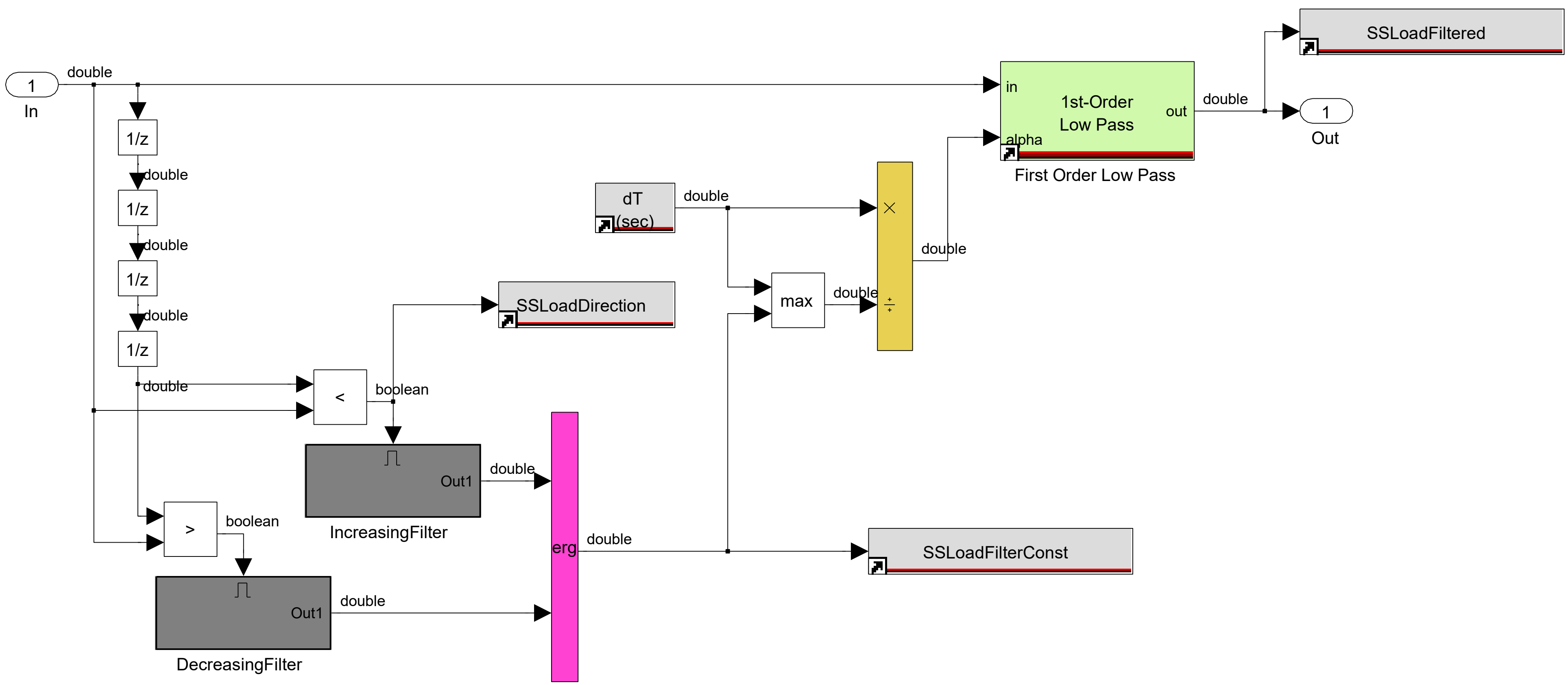

2
RPM
double
Increasing/Decreasing
Filer Select
In
Out
double
+
−
double
|u|
double
<=
boolean
SSRPMTol = 600
(Calibration)
double
Steady-state RPM
Tolerance [RPM]
SSEngOpr
>
boolean
AND
boolean
1
SSEngOpr [bool]
0
double
1
Load
double
Increasing/Decreasing
Filer Select
In
Out
double
double
|u|
double
<=
boolean
SSLoadTol = 100
(Calibration)
double
Steady-state Torque
Tolerance [N.m]



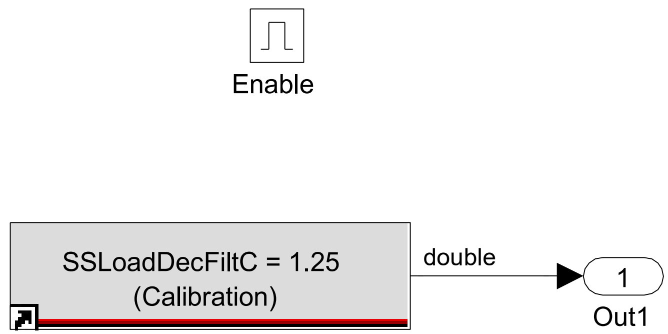
1
In
double
1/z
double
1/z
double
1/z
double
1/z
double
<
boolean
>
boolean
IncreasingFilter
Out1
double
DecreasingFilter
Out1
double
erg
double
SSRPMDirection
dT
(sec)
double
max
double
×
÷
double
SSRPMFilterConst
in
1st-Order
Low Pass
out
alpha
First Order Low Pass
double
SSRPMFiltered
1
Out

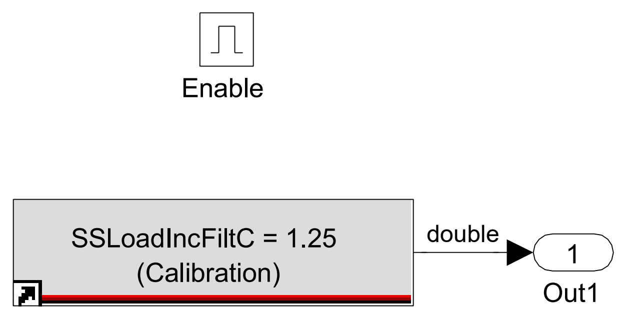

Enable
SSRPMDecFiltC = 1.25
(Calibration)
double
1
Out1

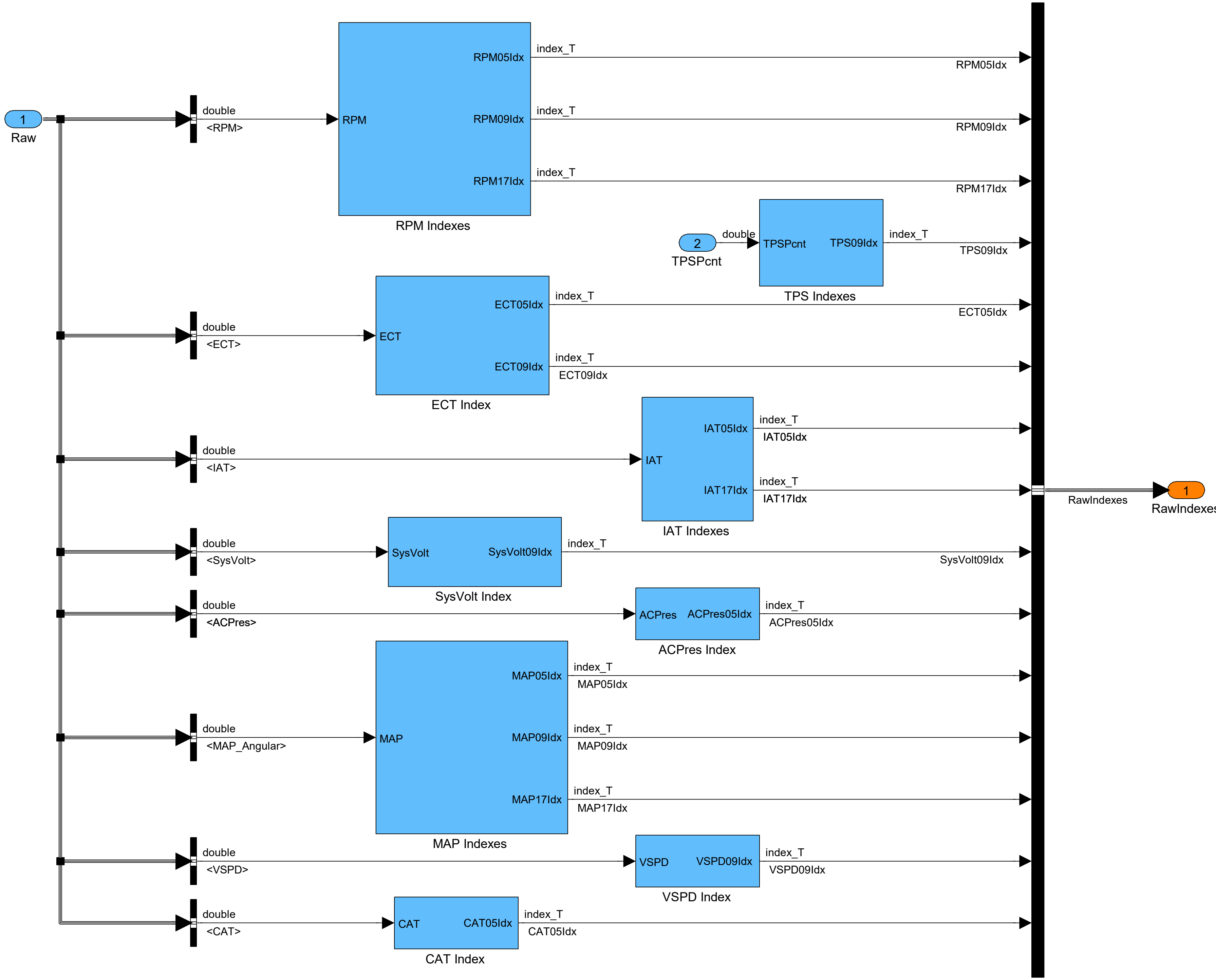

Enable
SSRPMIncFiltC = 1.25
(Calibration)
double
1
Out1



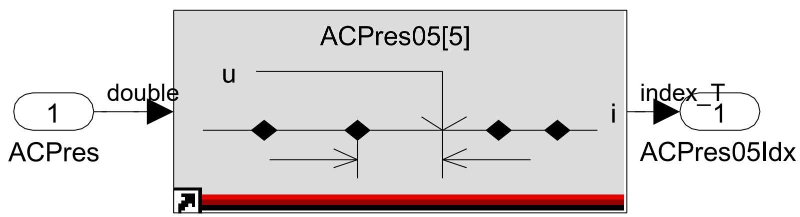
1
In
double
1/z
double
1/z
double
1/z
double
1/z
double
<
boolean
SSLoadDirection
>
boolean
Out1
IncreasingFilter
double
Out1
DecreasingFilter
double
erg
double
dT
(sec)
double
max
double
double
SSLoadFilterConst
in
1st-Order
Low Pass
out
alpha
First Order Low Pass
double
SSLoadFiltered
1
Out


Enable
SSLoadDecFiltC = 1.25
(Calibration)
double
1
Out1

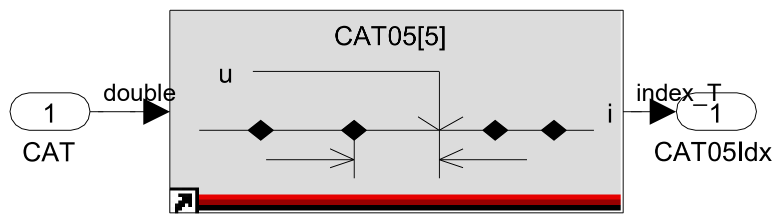

Enable
SSLoadIncFiltC = 1.25
(Calibration)
double
1
Out1



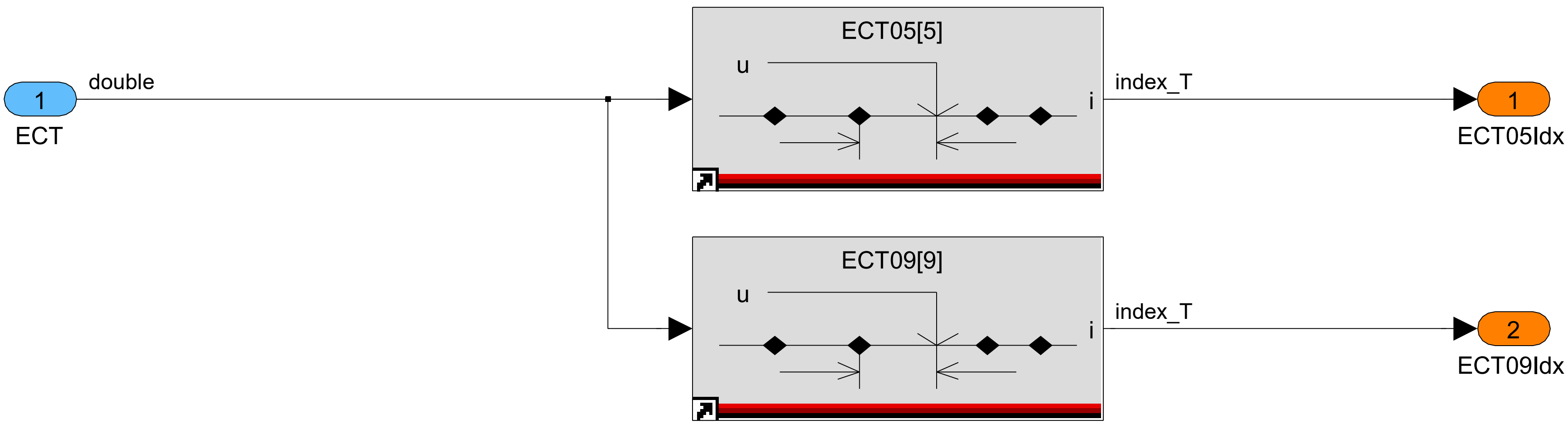
1
Raw
double
<RPM>
RPM
RPM05Idx
RPM09Idx
RPM17Idx
RPM Indexes
index_T
2
TPSPcnt
TPSPcnt
TPS09Idx
TPS Indexes
double
<ECT>
ECT
ECT05Idx
ECT09Idx
ECT Index
double
<IAT>
IAT
IAT05Idx
IAT17Idx
IAT Indexes
double
<SysVolt>
SysVolt
SysVolt09Idx
SysVolt Index
double
<ACPres>
ACPres
ACPres05Idx
ACPres Index
double
<MAP_Angular>
MAP
MAP05Idx
MAP09Idx
MAP17Idx
MAP Indexes
double
<VSPD>
VSPD
VSPD09Idx
VSPD Index
double
<CAT>
CAT
CAT05Idx
CAT Index
RawIndexes
1
RawIndexes

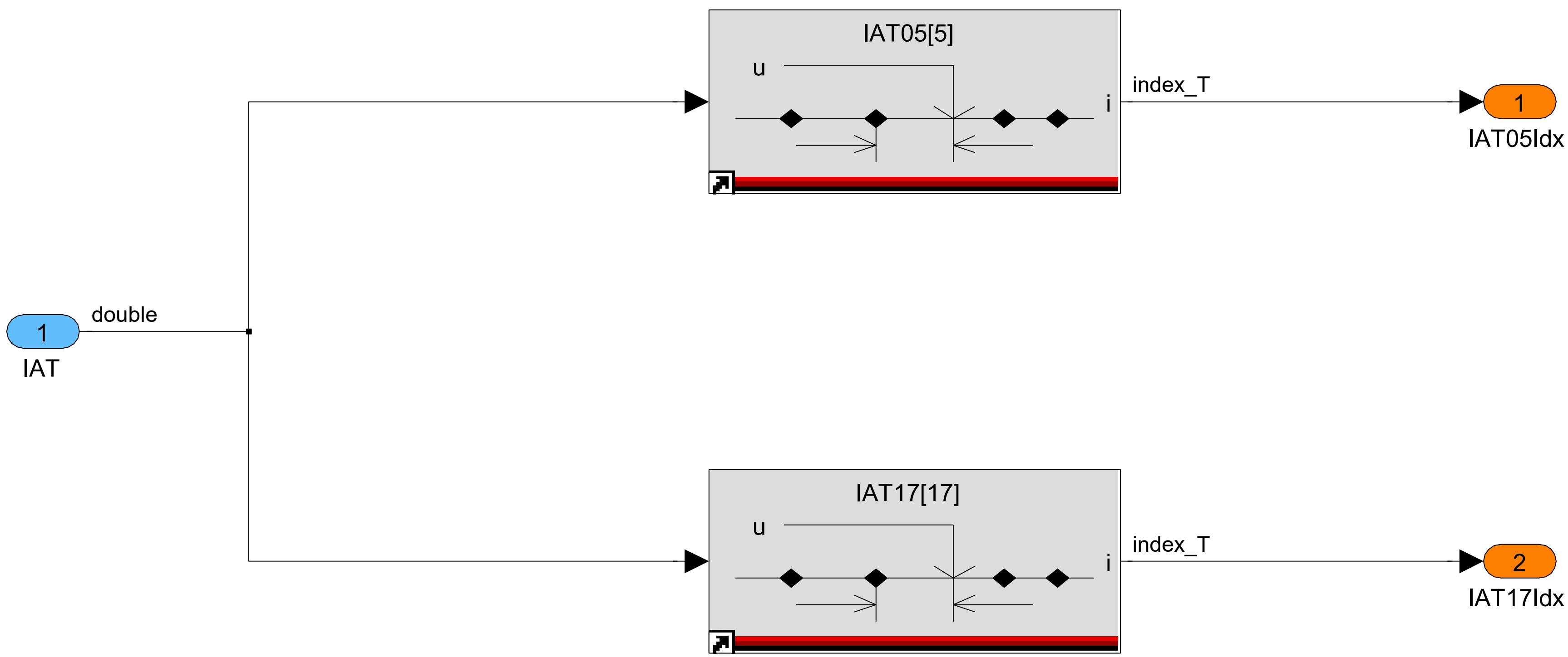


ACPres05[5]
1
ACPres
double
u
i
index_T
1
ACPres05Idx

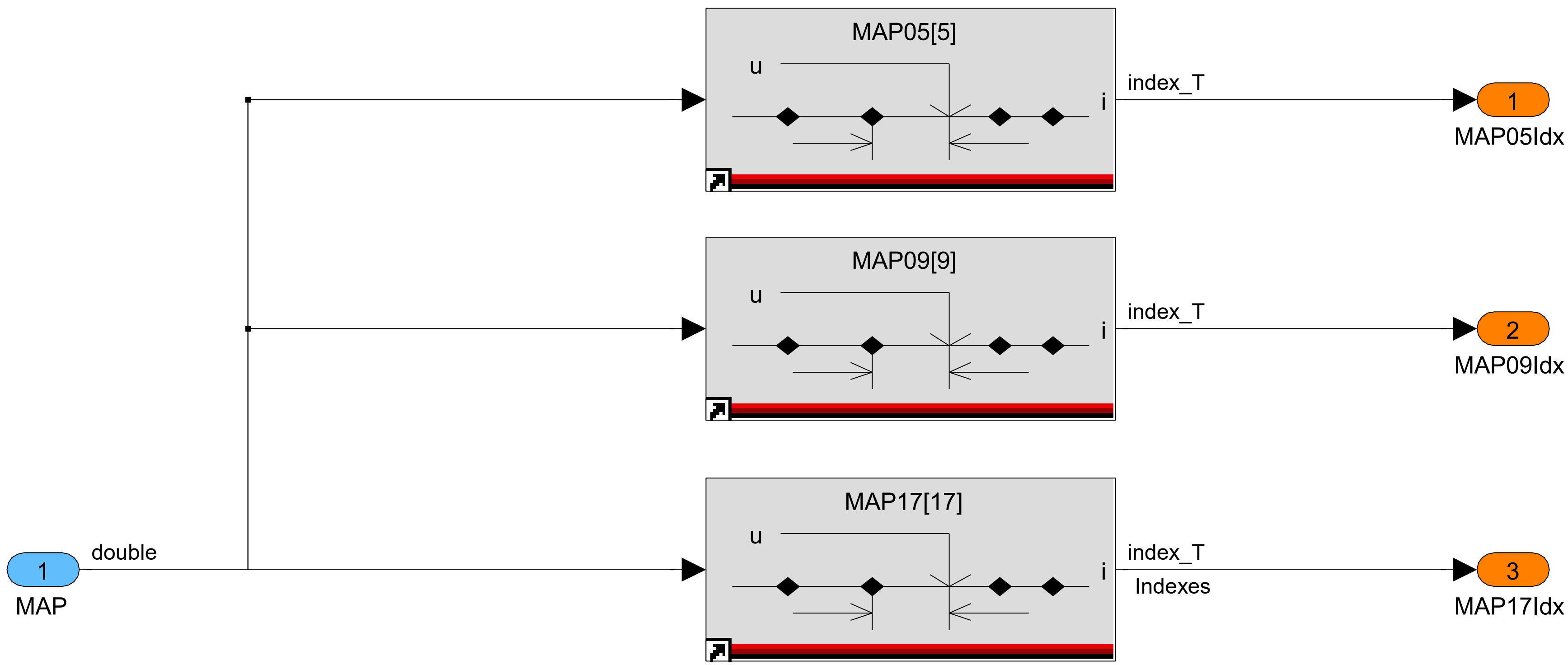


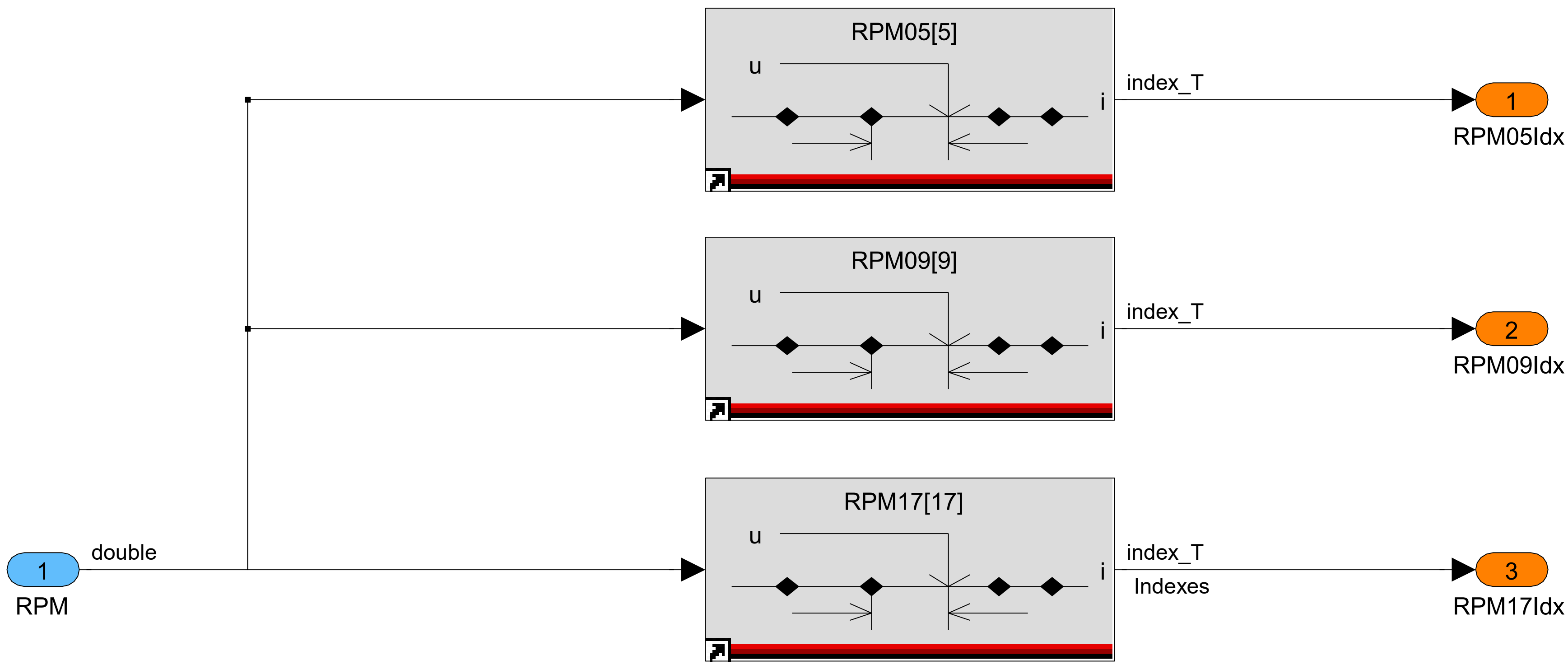
1
CAT
double
CAT05[5]
u
i
index_T
1
CAT05Idx

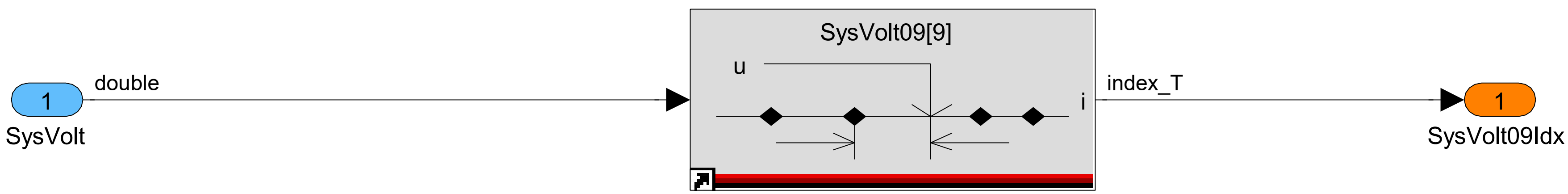

1
ECT
double
ECT05[5]
u
i
index_T
1
ECT05Idx
ECT09[9]
u
i
index_T
2
ECT09Idx

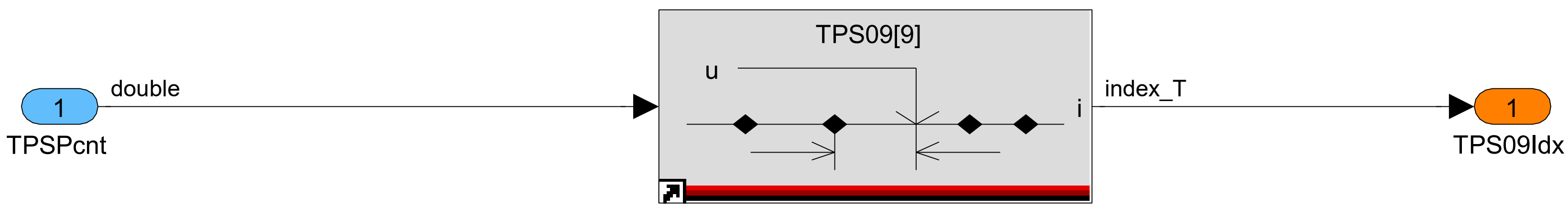


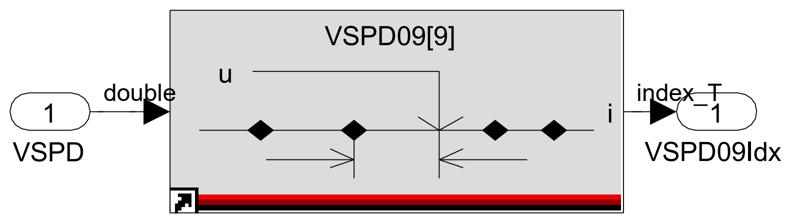
1
IAT
double
IAT05[5]
u
i
index_T
IAT17[17]
u
i
index_T
1
IAT05Idx
2
IAT17Idx

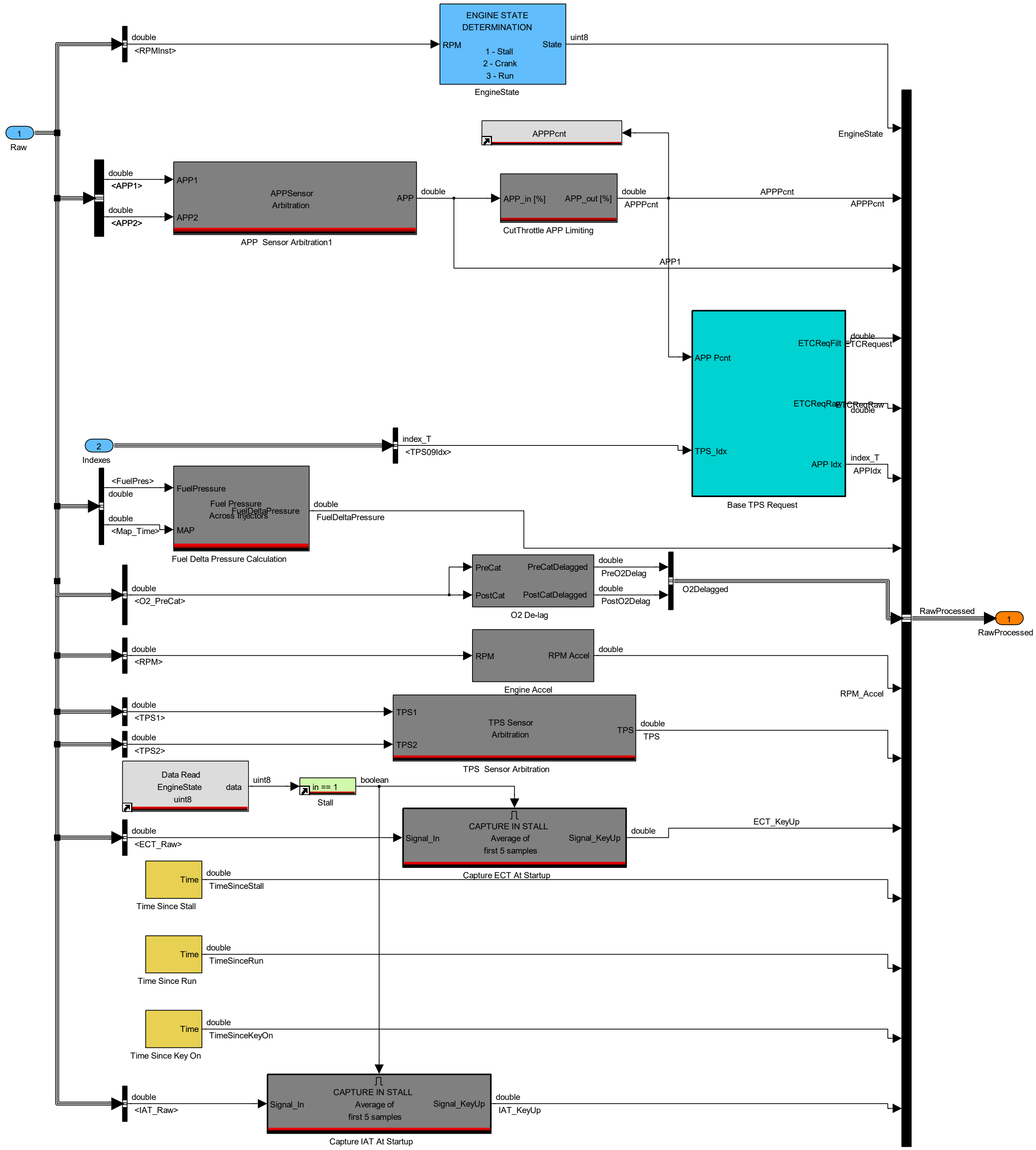

MAP05[5]
u
i
index_T
1
MAP05Idx
MAP09[9]
u
i
index_T
2
MAP09Idx
MAP17[17]
u
i
index_T
Indexes
3
MAP17Idx
1
MAP
double


RPM05[5]
u
i
index_T
1
RPM05Idx
RPM09[9]
u
i
index_T
2
RPM09Idx
RPM17[17]
u
i
index_T
Indexes
3
RPM17Idx
1
RPM
double

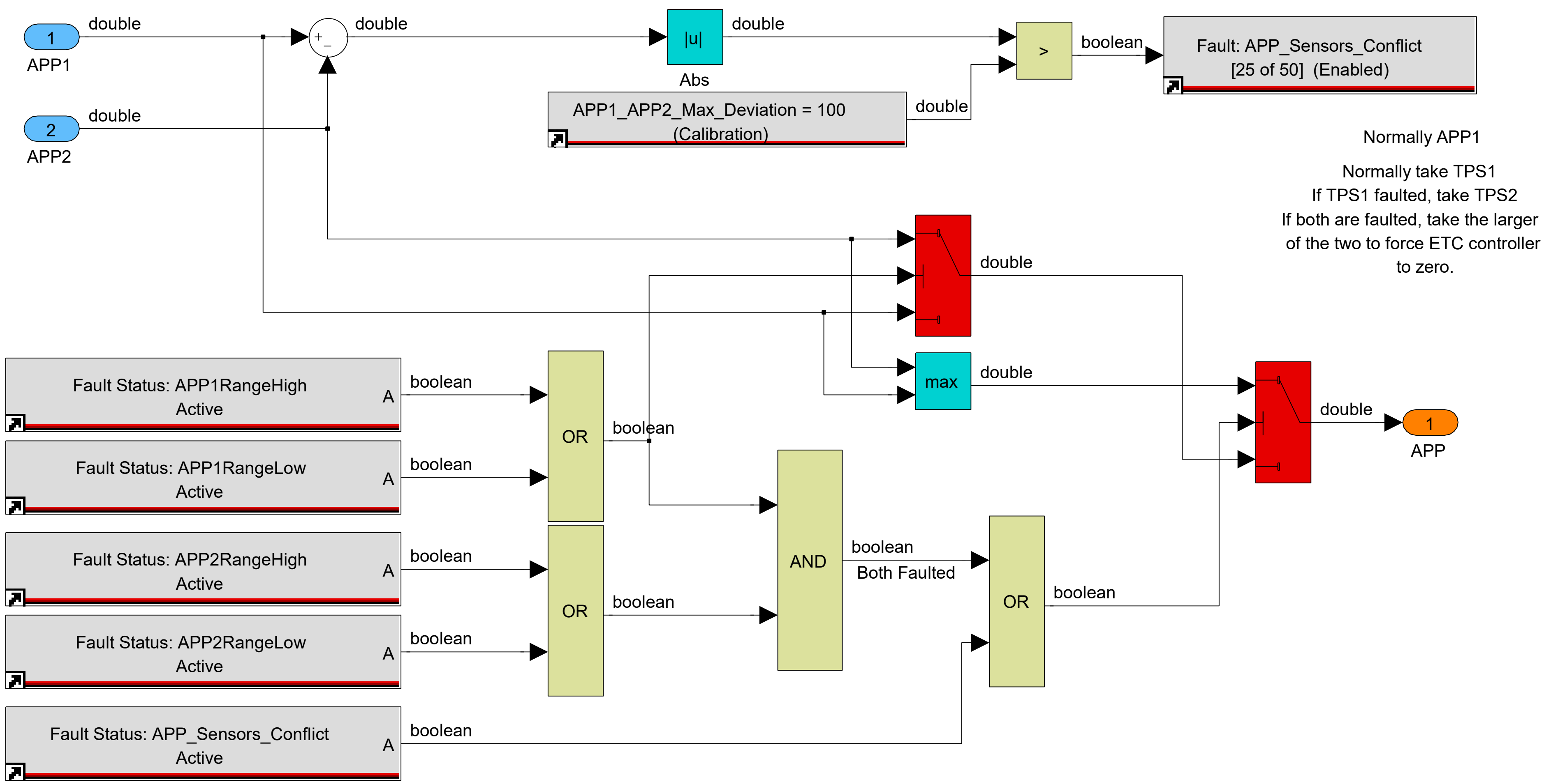

double
1
SysVolt
SysVolt09[9]
u
i
index_T
1
SysVolt09Idx

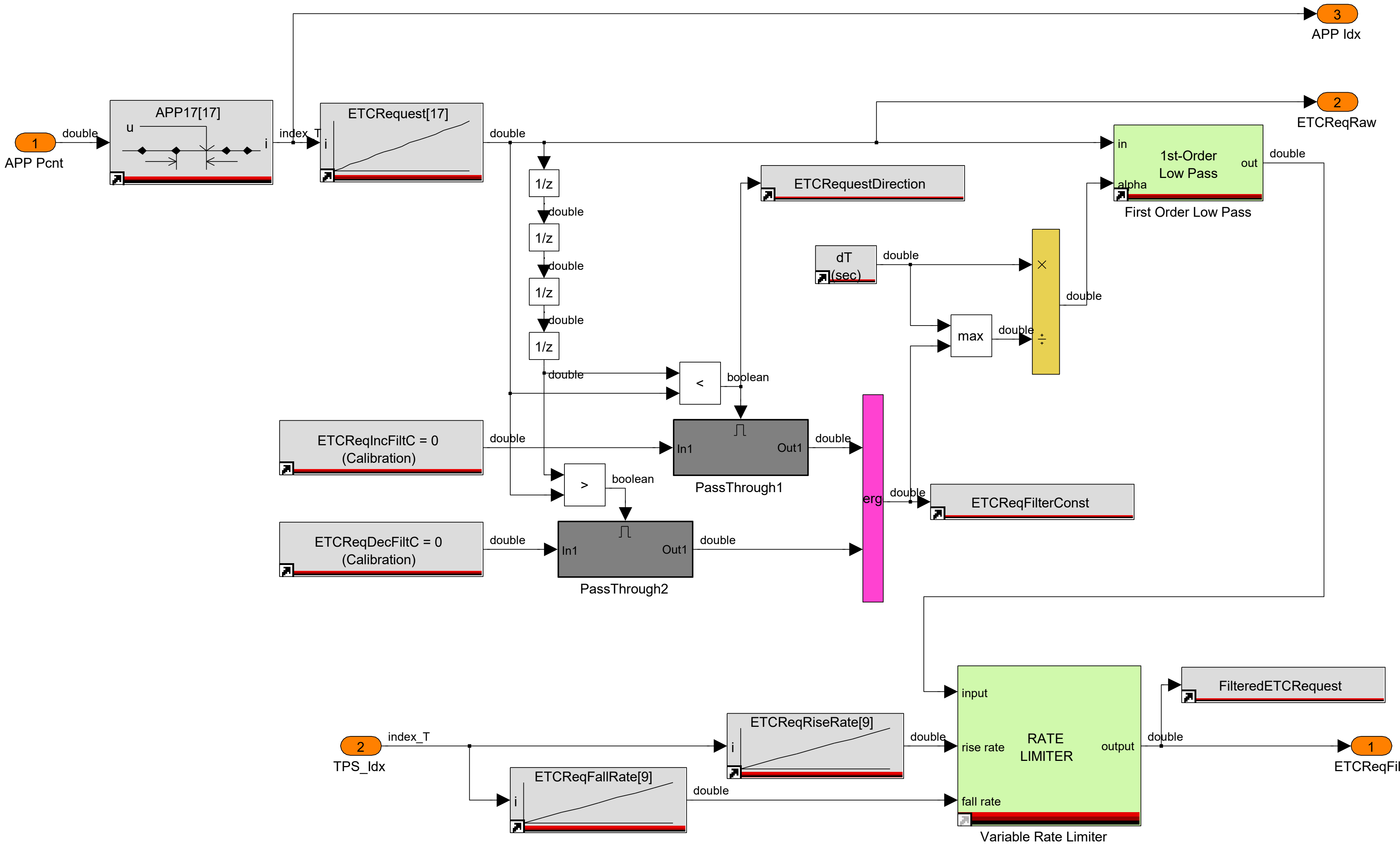

1
TPSPcnt
double
TPS09[9]
u
i
index_T
1
TPS09Idx


VSPD09[9]
u
1
VSPD
double
i
index_T
1
VSPD09Idx

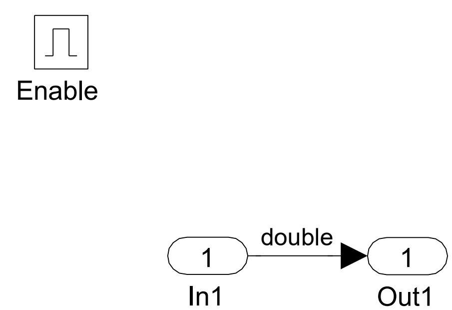


ENGINE STATE DETERMINATION
RPM
State
1 - Stall
2 - Crank
3 - Run
EngineState
double
<RPMInst>
uint8
1
Raw
APPPcnt
EngineState
double
<APP1>
double
<APP2>
APP1
APP2
APPSensor Arbitration
APP
APP Sensor Arbitration1
double
APP_in [%]
APP_out [%]
CutThrottle APP Limiting
double
APPPcnt
APPPcnt
APPPcnt
APP1
APP Pcnt
ETCReqFilt
double
ETCRequest
ETCReqRaw
ETCReqRaw
double
2
Indexes
index_T
<TPS09Idx>
TPS_Idx
APP Idx
index_T
APPIdx
Base TPS Request
<FuelPres>
double
FuelPressure
Fuel Pressure Across Injectors
FuelDeltaPressure
double
<Map_Time>
MAP
double
FuelDeltaPressure
Fuel Delta Pressure Calculation
PreCat
PreCatDelagged
double
PreO2Delag
PostCat
PostCatDelagged
double
PostO2Delag
O2 De-lag
O2Delagged
double
<O2_PreCat>
RawProcessed
1
RawProcessed
double
<RPM>
RPM
RPM Accel
double
Engine Accel
RPM_Accel
double
<TPS1>
TPS1
TPS Sensor Arbitration
TPS
double
TPS
double
<TPS2>
TPS2
TPS Sensor Arbitration
Data Read EngineState uint8
data
uint8
in == 1
Stall
boolean
CAPTURE IN STALL
Average of first 5 samples
Signal_In
Signal_KeyUp
double
ECT_KeyUp
double
<ECT_Raw>
Capture ECT At Startup
Time
double
TimeSinceStall
Time Since Stall
Time
double
TimeSinceRun
Time Since Run
Time
double
TimeSinceKeyOn
Time Since Key On
double
<IAT_Raw>
CAPTURE IN STALL
Average of first 5 samples
Signal_In
Signal_KeyUp
double
IAT_KeyUp
Capture IAT At Startup

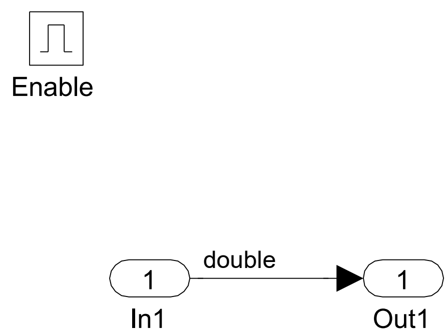

1
APP1
2
APP2
double
double
double
|u|
Abs
double
>
boolean
Fault: APP_Sensors_Conflict
[25 of 50] (Enabled)
APP1_APP2_Max_Deviation = 100
(Calibration)
double
Normally APP1
Normally take TPS1
If TPS1 faulted, take TPS2
If both are faulted, take the larger
of the two to force ETC controller
to zero.
double
max
double
double
1
APP
Fault Status: APP1RangeHigh
Active
A
Fault Status: APP1RangeLow
Active
A
Fault Status: APP2RangeHigh
Active
A
Fault Status: APP2RangeLow
Active
A
Fault Status: APP_Sensors_Conflict
Active
A
boolean
OR
OR
AND
boolean
Both Faulted
OR
boolean



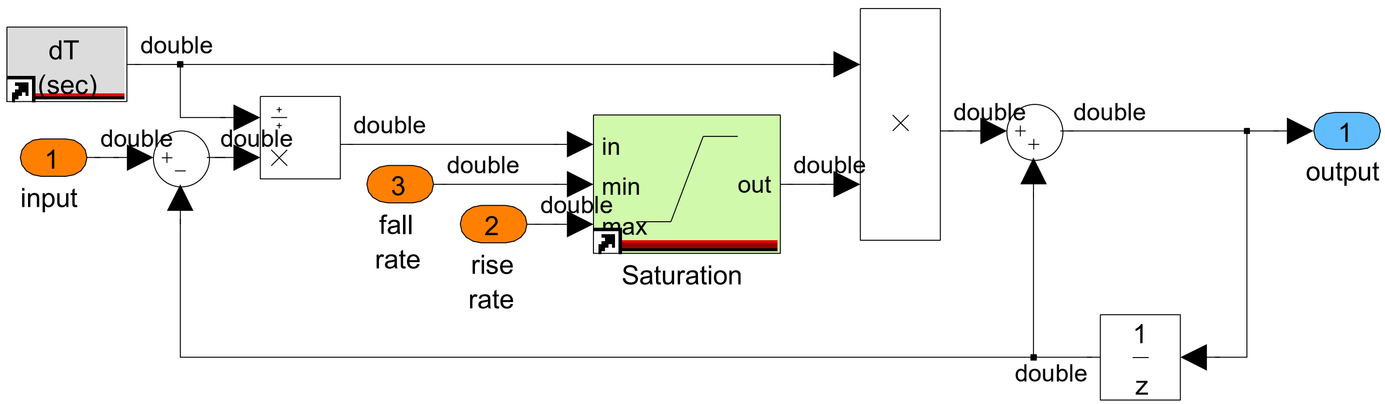
APP Pcnt
double
APP17[17]
u
i
index_T
ETCRequest[17]
i
double
3
APP Idx
2
ETCReqRaw
1st-Order
Low Pass
in
out
alpha
double
First Order Low Pass
1/z
double
ETCRequestDirection
dT
(sec)
max
<
boolean
ETCReqIncFiltC = 0
(Calibration)
In1
Out1
PassThrough1
>
erg
ETCReqFilterConst
ETCReqDecFiltC = 0
(Calibration)
PassThrough2
2
TPS_Idx
ETCReqRiseRate[9]
ETCReqFallRate[9]
input
rise rate
fall rate
RATE
LIMITER
output
Variable Rate Limiter
FilteredETCRequest
1
ETCReqFilt

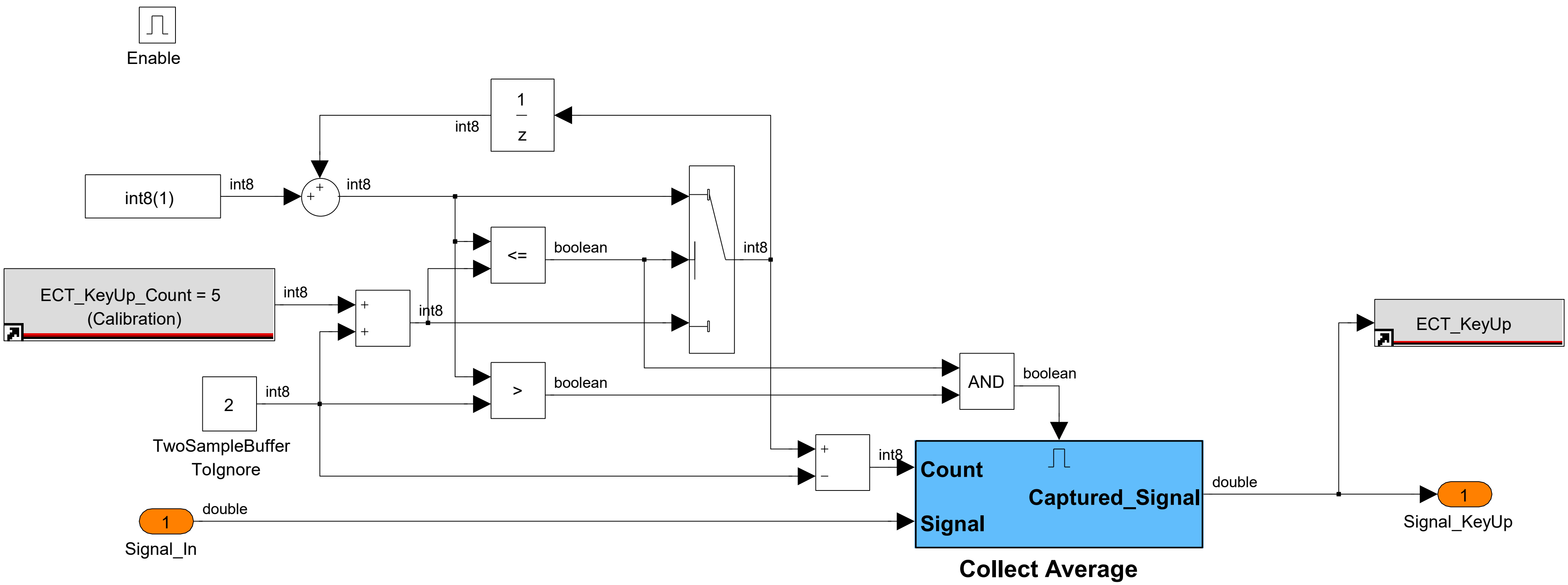


Enable
1
double
1
In1
Out1


Enable
1
double
1
In1
Out1

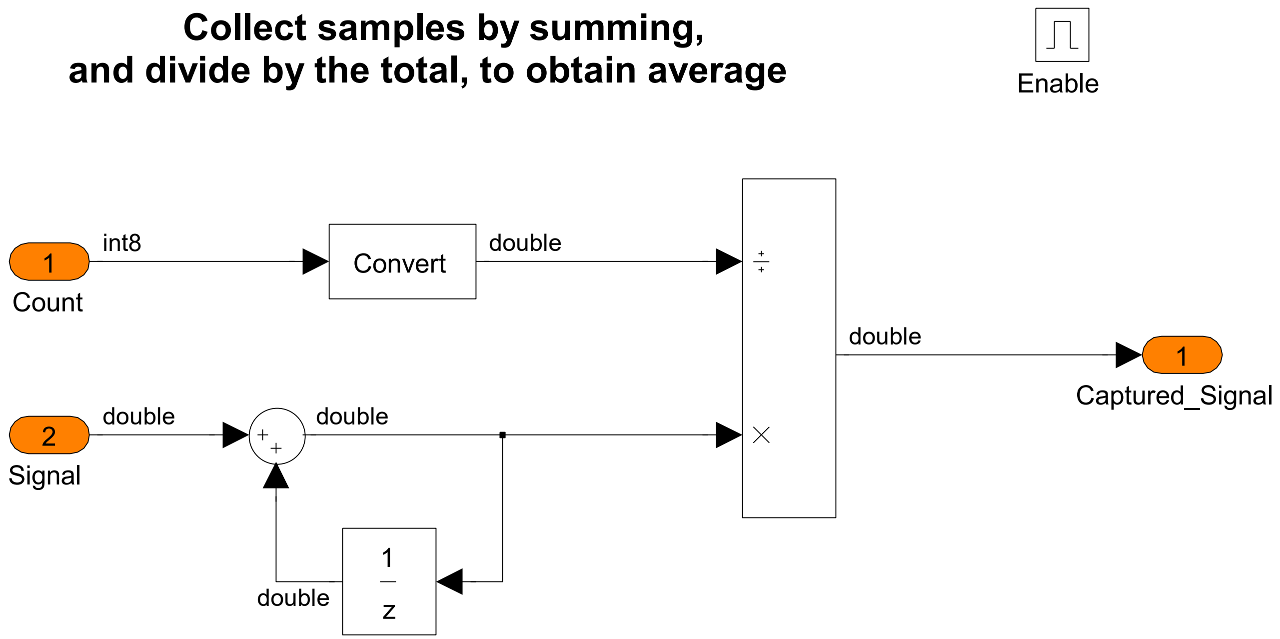
Rate Limiter - Limit allowable change in signal per timestep

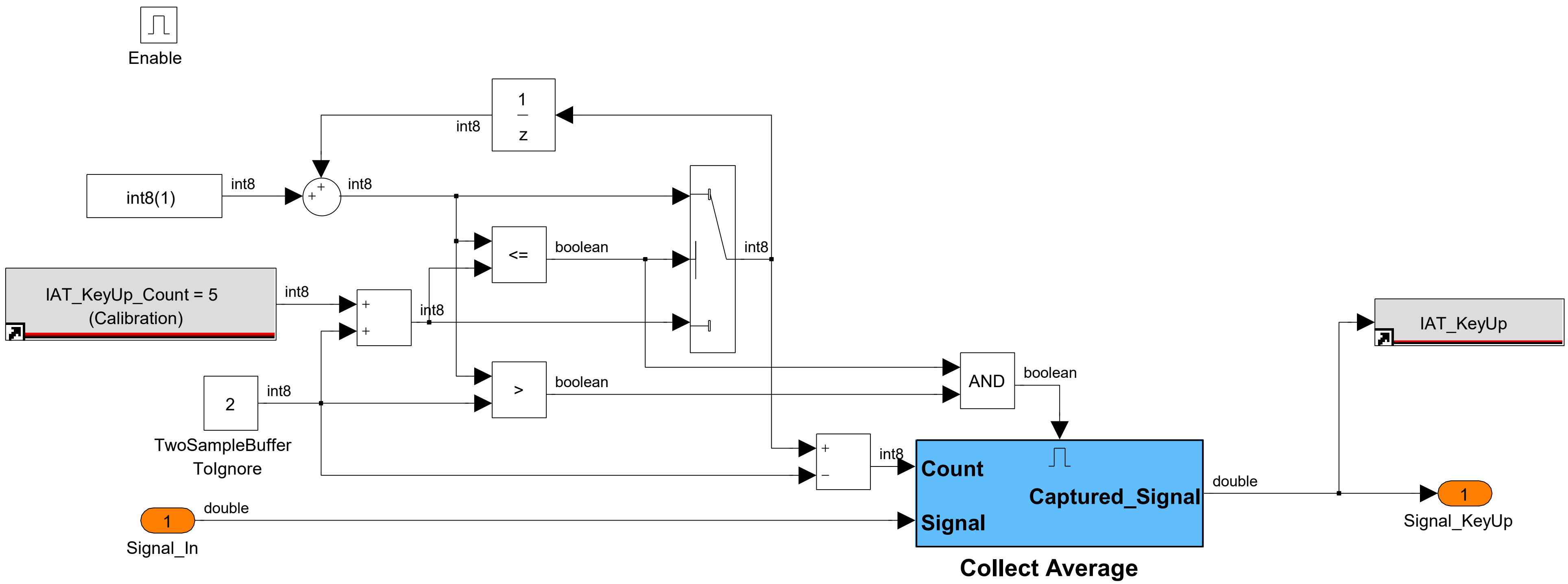




Enable
1
z
int8
int8(1)
int8
int8
<=
boolean
int8
ECT_KeyUp_Count = 5
(Calibration)
int8
int8
ECT_KeyUp
>
boolean
AND
boolean
2
int8
TwoSampleBuffer
ToIgnore
int8
Count
Captured_Signal
Signal
double
1
Signal_KeyUp
1
double
Signal_In
Collect Average

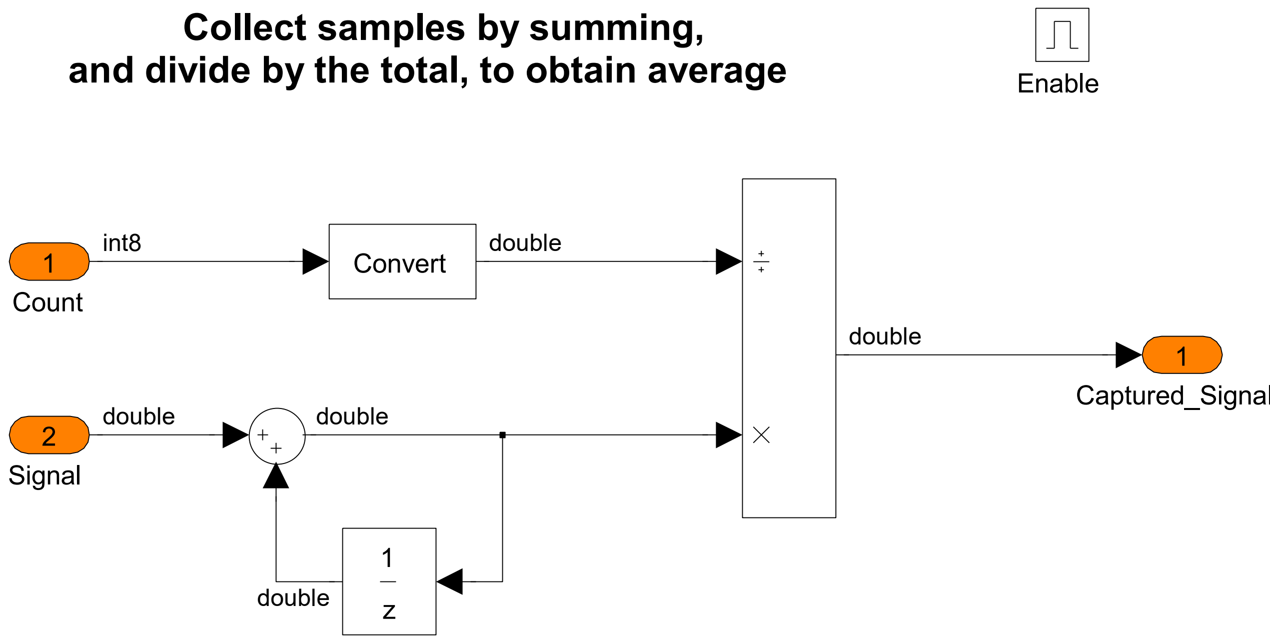
**Collect samples by summing,
and divide by the total, to obtain average**

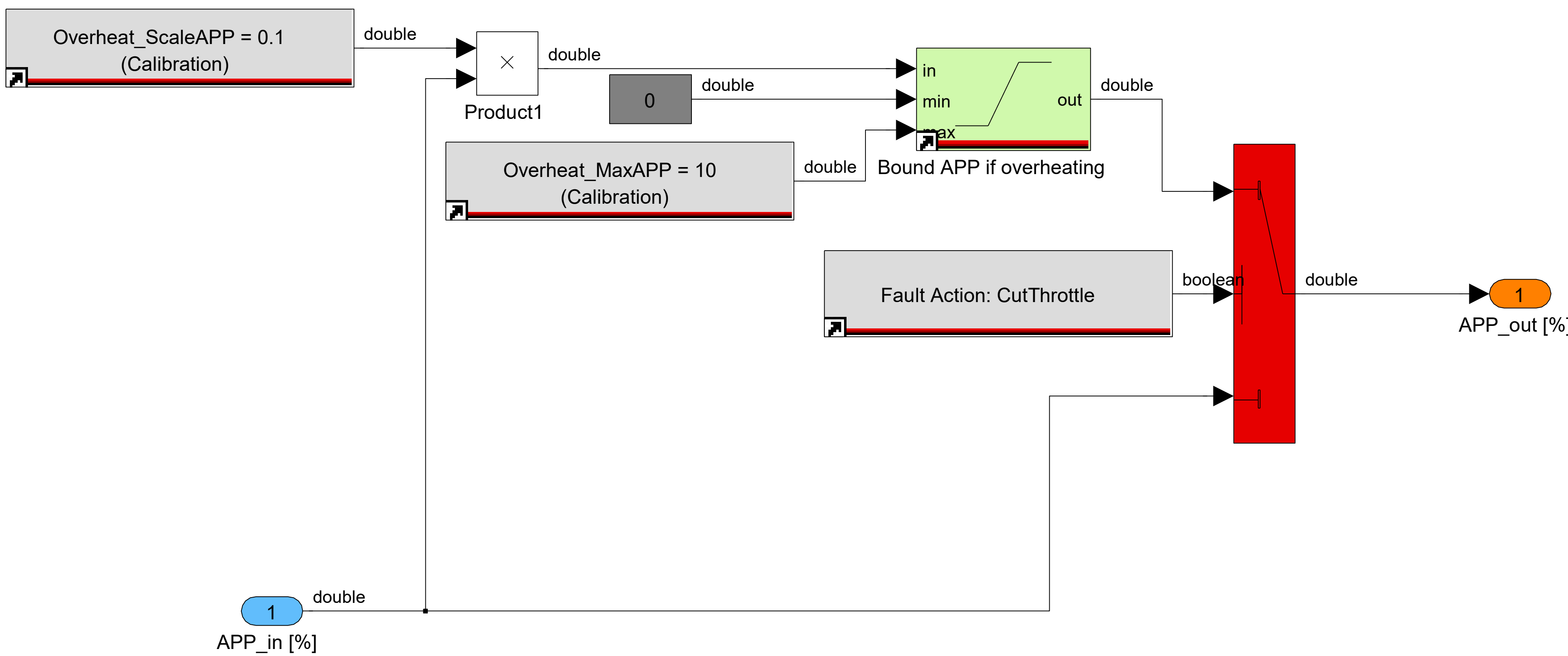


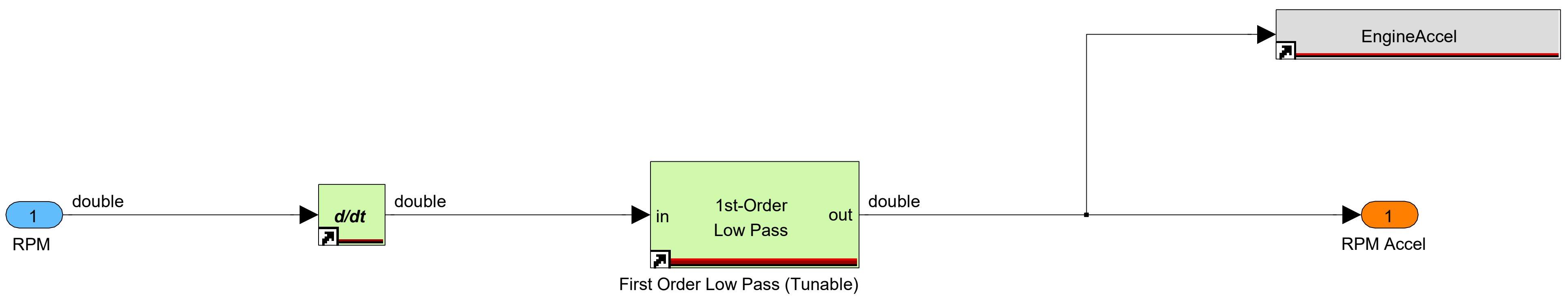


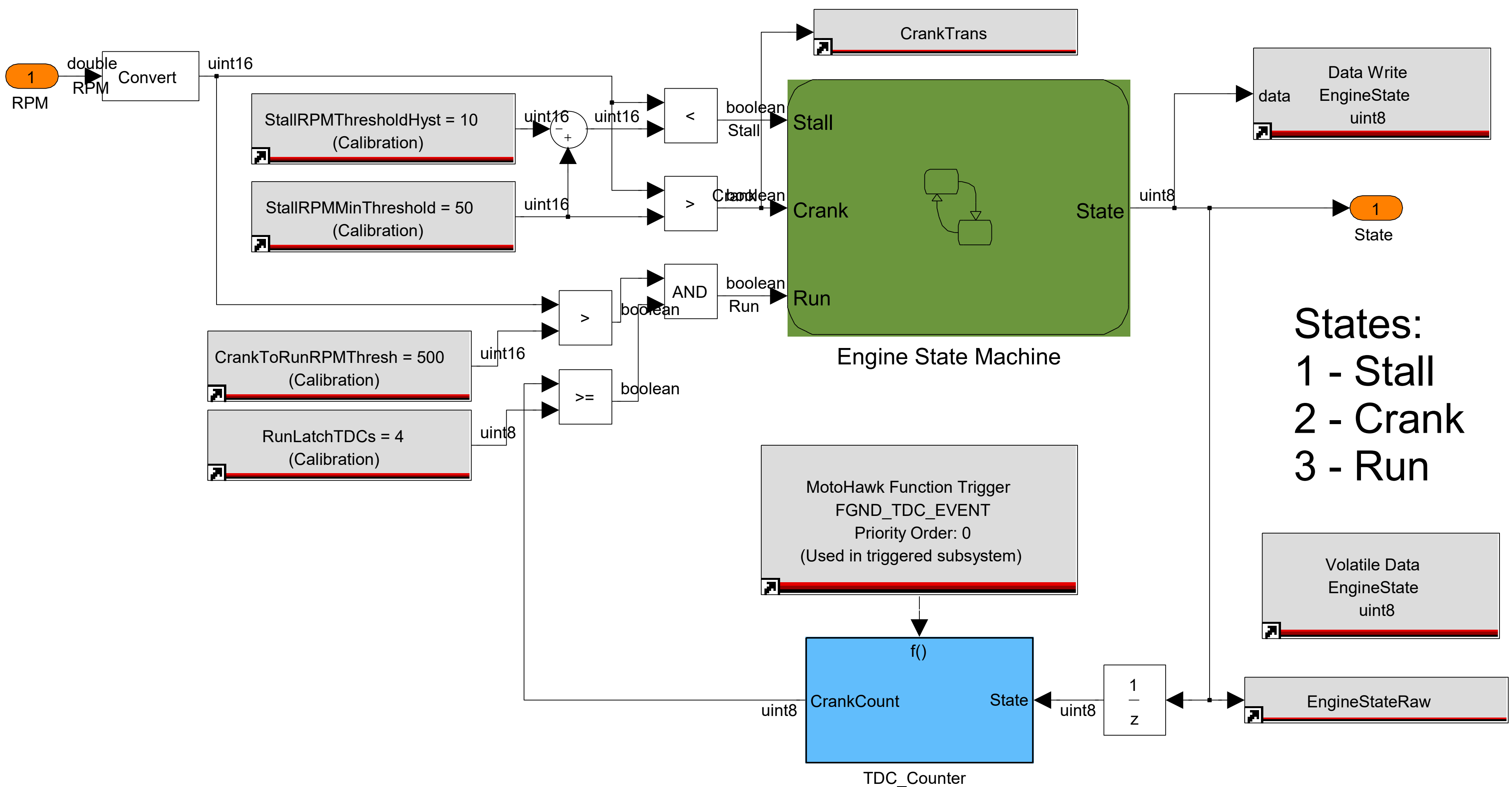
Enable
1
z
int8
int8(1)
int8
int8
<=
boolean
int8
IAT_KeyUp_Count = 5
(Calibration)
int8
int8
IAT_KeyUp
AND
boolean
>
boolean
2
int8
TwoSampleBuffer
ToIgnore
int8
Count
Captured_Signal
double
1
Signal_KeyUp
1
double
Signal
Signal_In
Collect Average

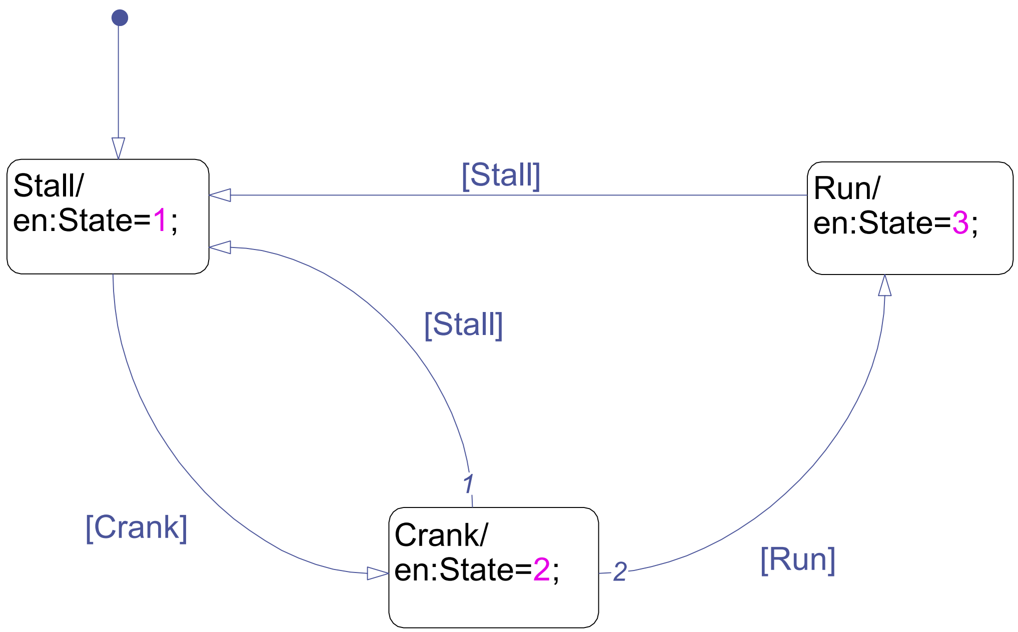
**Collect samples by summing,
and divide by the total, to obtain average**



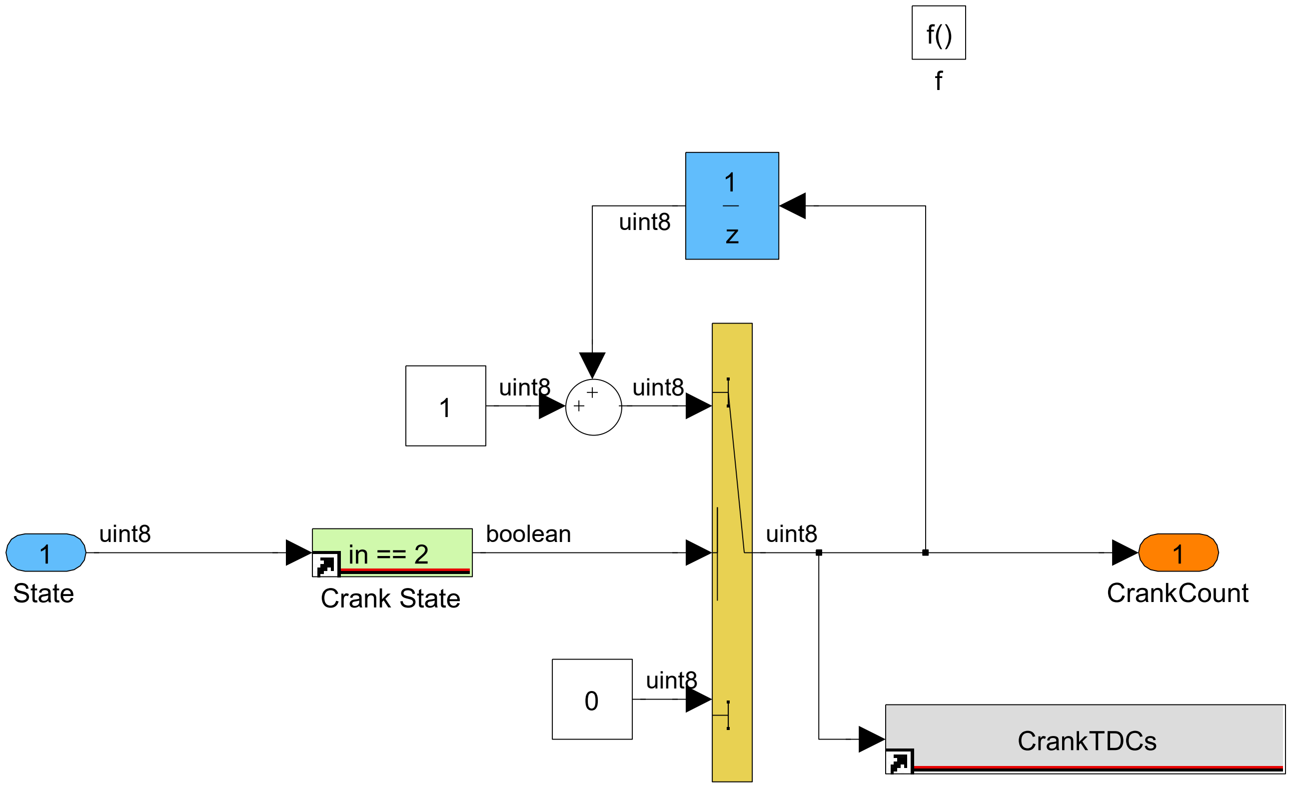

Overheat_ScaleAPP = 0.1
(Calibration)
double
Product1
double
0
double
in
min
max
out
Bound APP if overheating
double
Overheat_MaxAPP = 10
(Calibration)
double
Fault Action: CutThrottle
boolean
double
1
APP_out [%]
1
double
APP_in [%]

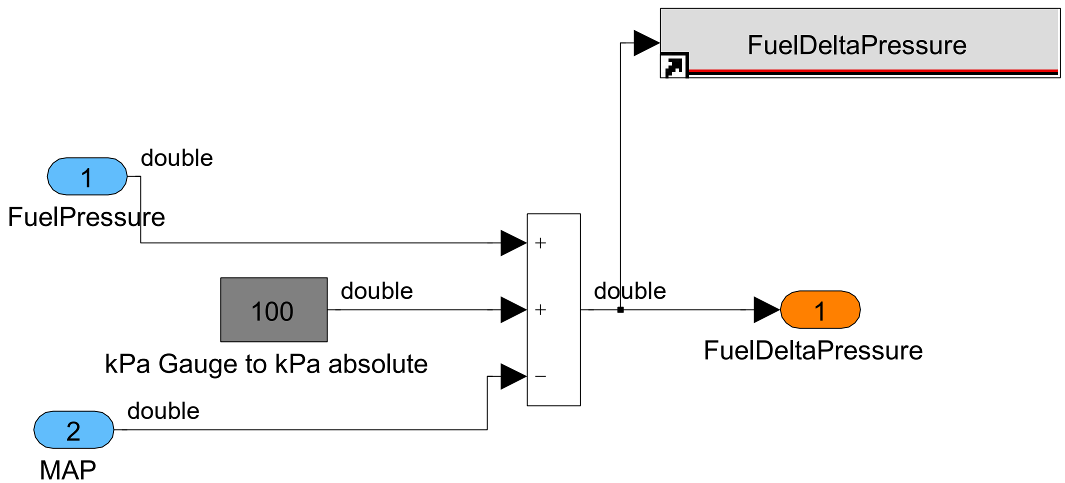

1
RPM
double
d/dt
double
in
1st-Order
Low Pass
out
First Order Low Pass (Tunable)
double
EngineAccel
1
RPM Accel


1
RPM
double
RPM
Convert
uint16
StallRPMThresholdHyst = 10
(Calibration)
StallRPMMinThreshold = 50
(Calibration)
uint16
uint16
uint16
<
>
boolean
Stall
Crank
boolean
AND
boolean
Run
CrankTrans
Stall
Crank
Run
State
Engine State Machine
>
>=
boolean
boolean
CrankToRunRPMThresh = 500
(Calibration)
uint16
RunLatchTDCs = 4
(Calibration)
uint8
Data Write
data
EngineState
uint8
uint8
1
State
States:
1 - Stall
2 - Crank
3 - Run
MotoHawk Function Trigger
FGND_TDC_EVENT
Priority Order: 0
(Used in triggered subsystem)
Volatile Data
EngineState
uint8
f()
CrankCount
State
uint8
uint8
1
z
EngineStateRaw
TDC_Counter

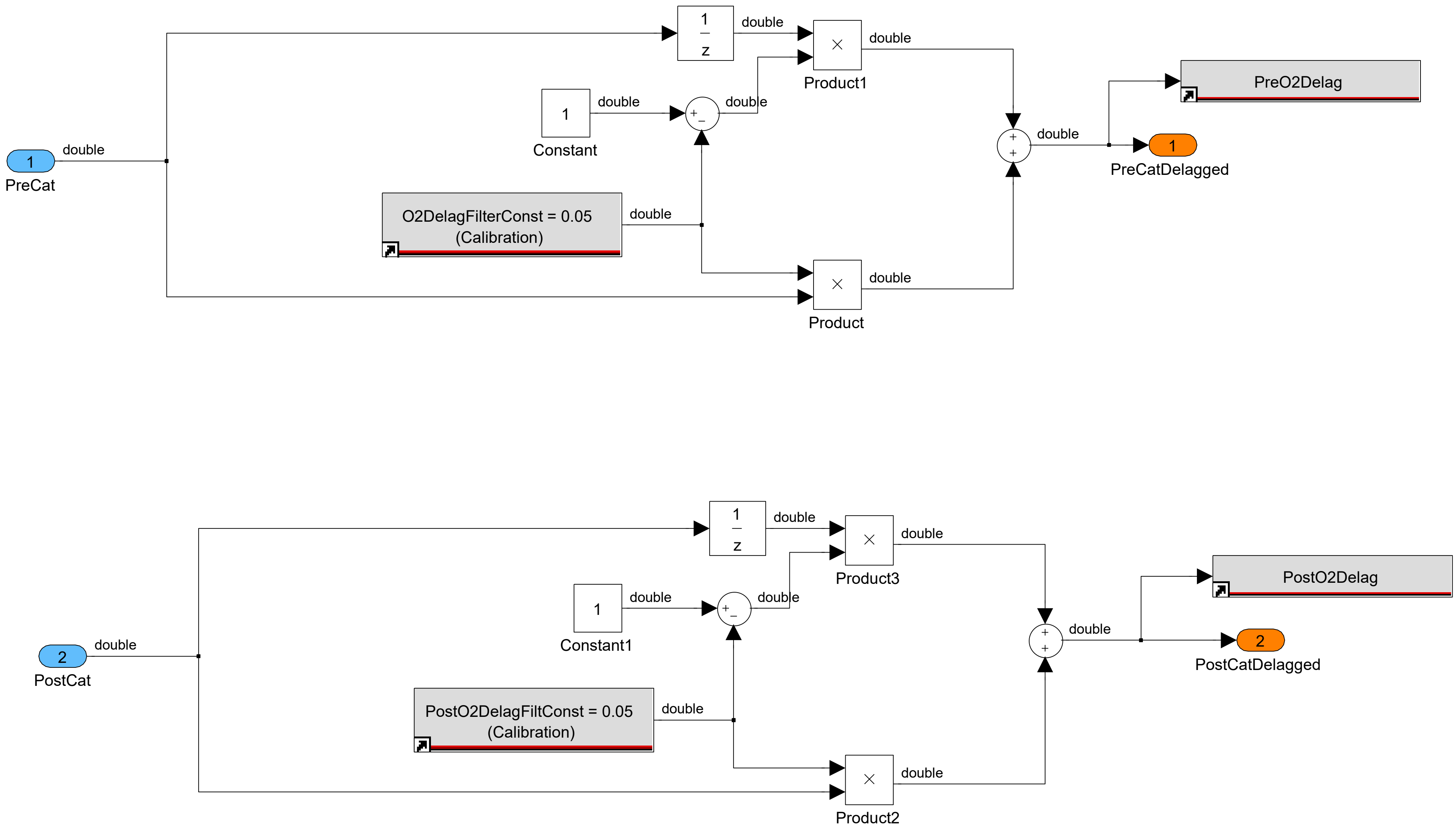


Stall/
en:State=1;
[Stall]
Run/
en:State=3;
[Stall]
1
[Crank]
Crank/
en:State=2;
2
[Run]

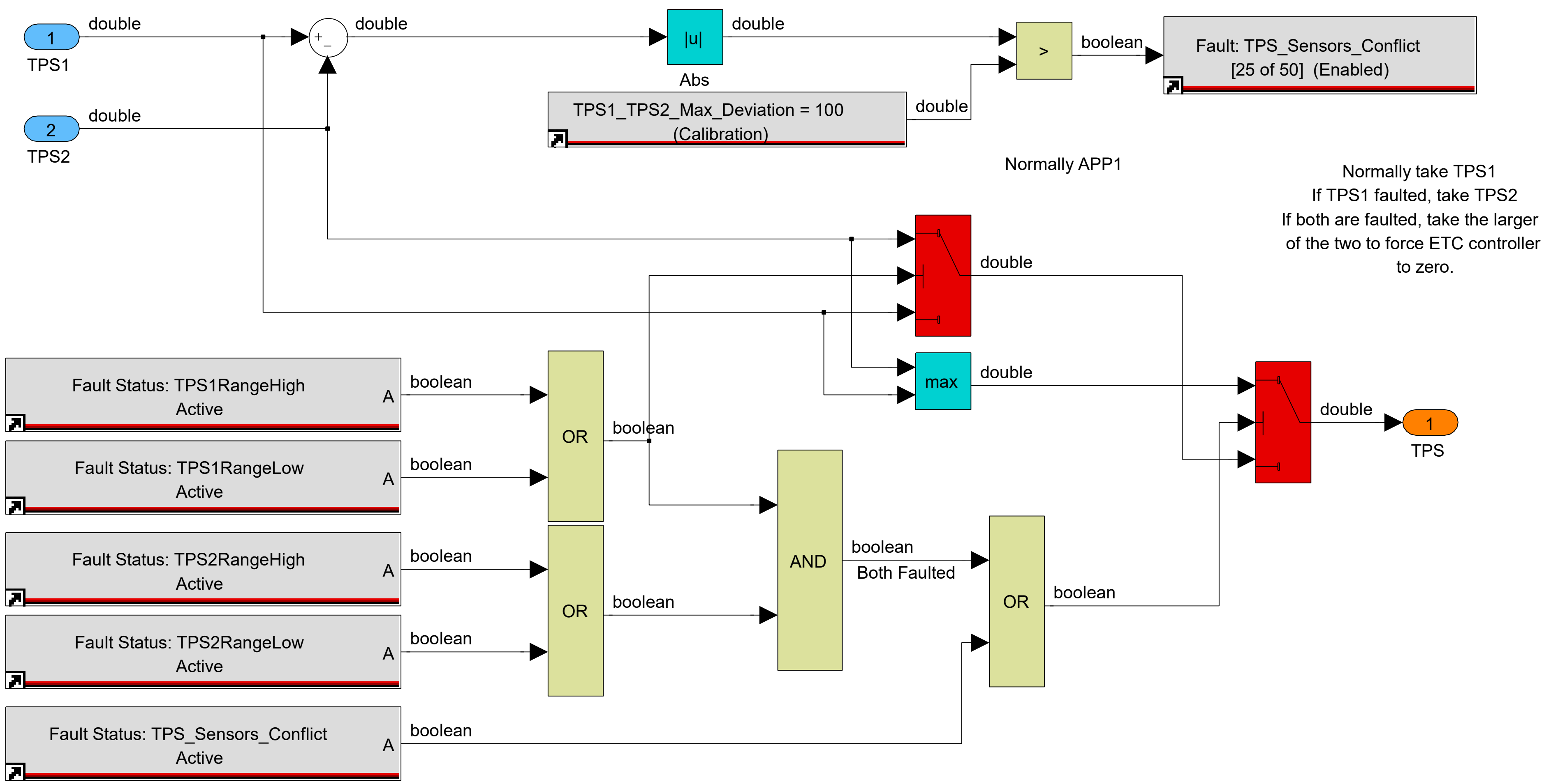

f()
f
1
z
uint8
1
uint8
uint8
1
State
uint8
in == 2
Crank State
boolean
uint8
1
CrankCount
0
uint8
CrankTDCs



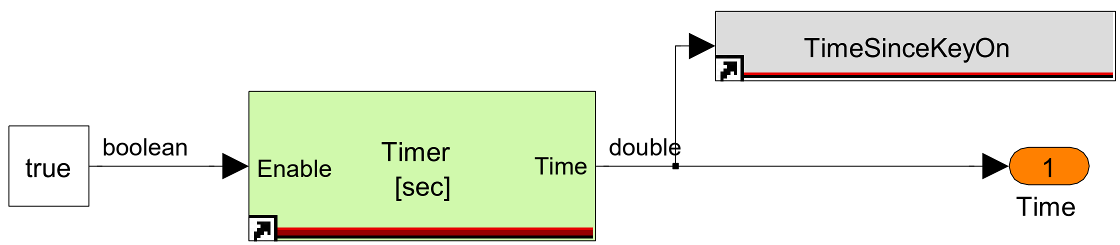
FuelDeltaPressure
1
double
FuelPressure
+
100
double
+
double
1
kPa Gauge to kPa absolute
FuelDeltaPressure
−
2
double
MAP

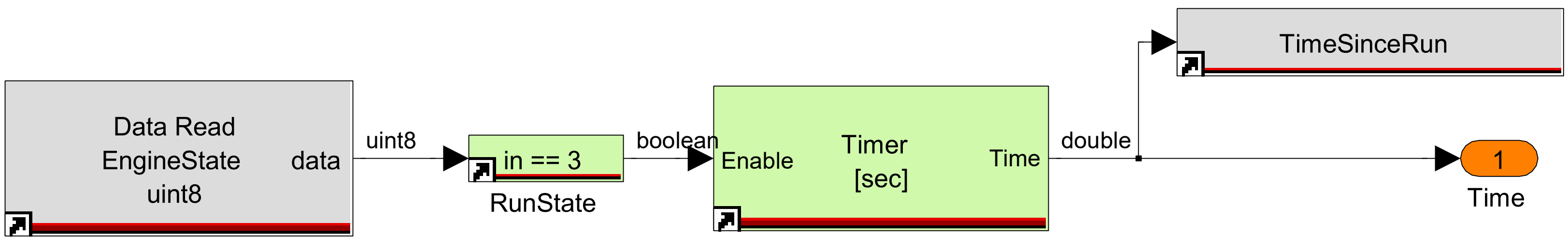


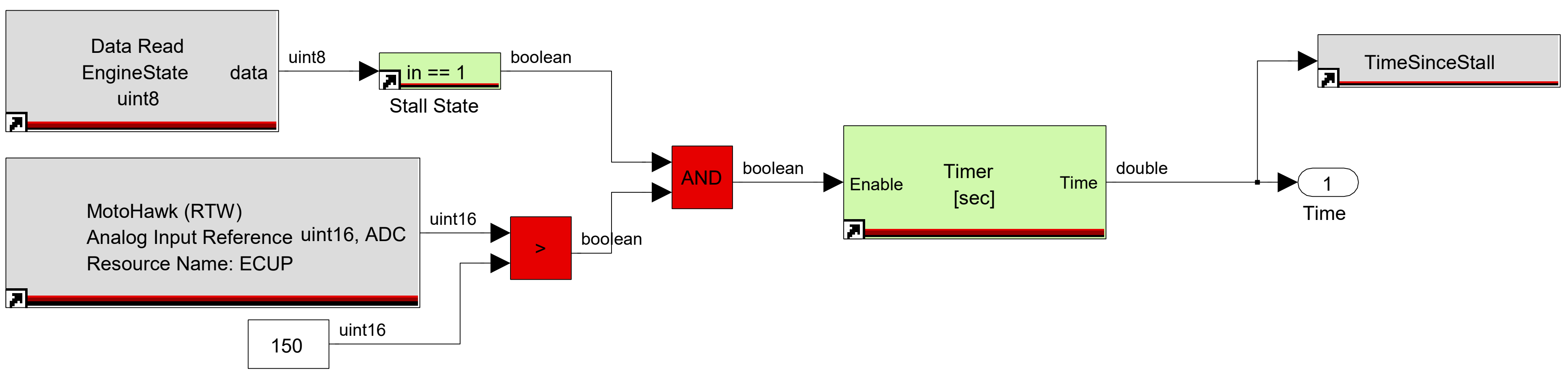
1
z
double
double
Product1
double
PreO2Delag
1
double
double
Constant
double
1
PreCat
double
1
PreCatDelagged
O2DelagFilterConst = 0.05
(Calibration)
double
double
Product
1
z
double
double
Product3
double
PostO2Delag
1
double
double
Constant1
double
2
PostCat
double
2
PostCatDelagged
PostO2DelagFiltConst = 0.05
(Calibration)
double
double
Product2



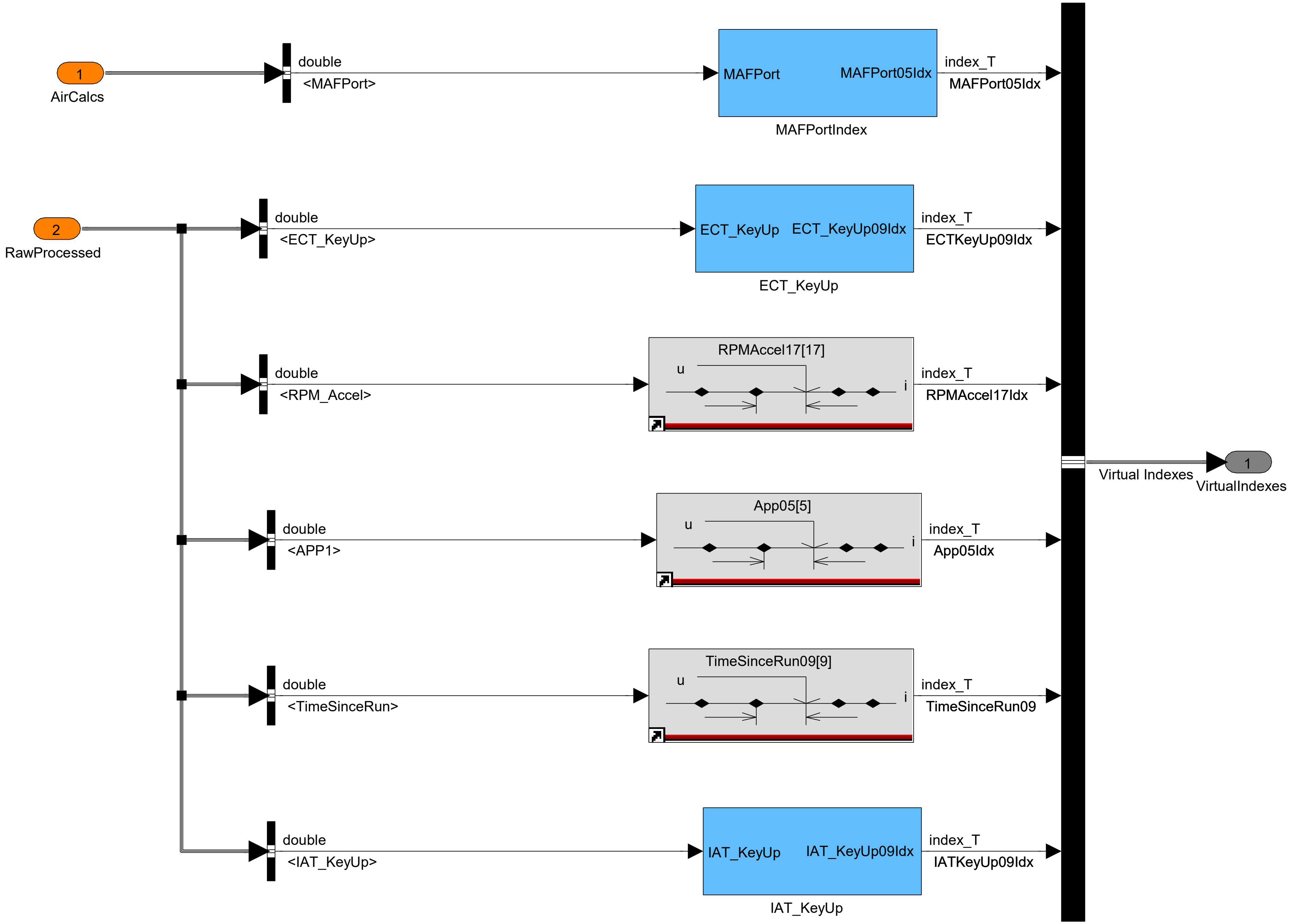
1
TPS1
double
2
TPS2
double
double
|u|
Abs
double
TPS1_TPS2_Max_Deviation = 100
(Calibration)
double
>
boolean
Fault: TPS_Sensors_Conflict
[25 of 50] (Enabled)
Normally APP1
Normally take TPS1
If TPS1 faulted, take TPS2
If both are faulted, take the larger
of the two to force ETC controller
to zero.
double
max
double
double
1
TPS
Fault Status: TPS1RangeHigh
Active
A
boolean
Fault Status: TPS1RangeLow
Active
A
boolean
OR
boolean
Fault Status: TPS2RangeHigh
Active
A
boolean
Fault Status: TPS2RangeLow
Active
A
boolean
OR
boolean
AND
boolean
Both Faulted
OR
boolean
Fault Status: TPS_Sensors_Conflict
Active
A
boolean


true
boolean
Enable
Timer
[sec]
Time
double
TimeSinceKeyOn
1
Time

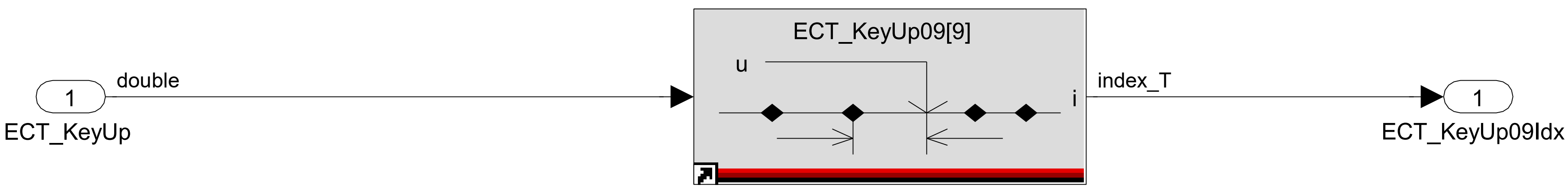

Data Read
EngineState
uint8
data
uint8
in == 3
RunState
boolean
Enable
Timer
[sec]
Time
double
TimeSinceRun
1
Time



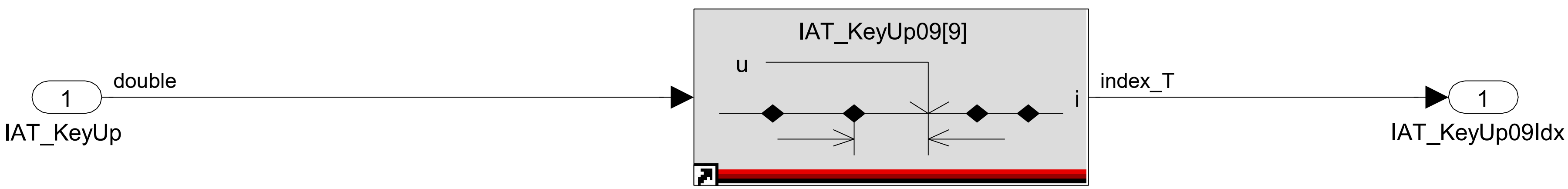
Data Read
EngineState
uint8
data
uint8
in == 1
Stall State
boolean
MotoHawk (RTW)
Analog Input Reference
Resource Name: ECUP
uint16, ADC
uint16
>
boolean
150
uint16
AND
boolean
Enable
Timer
[sec]
Time
double
TimeSinceStall
1
Time

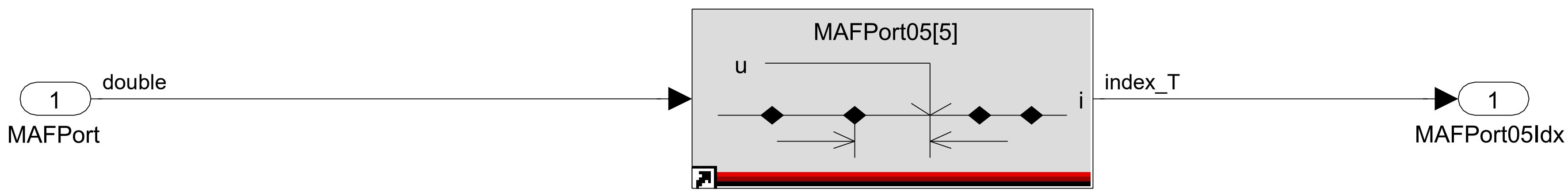


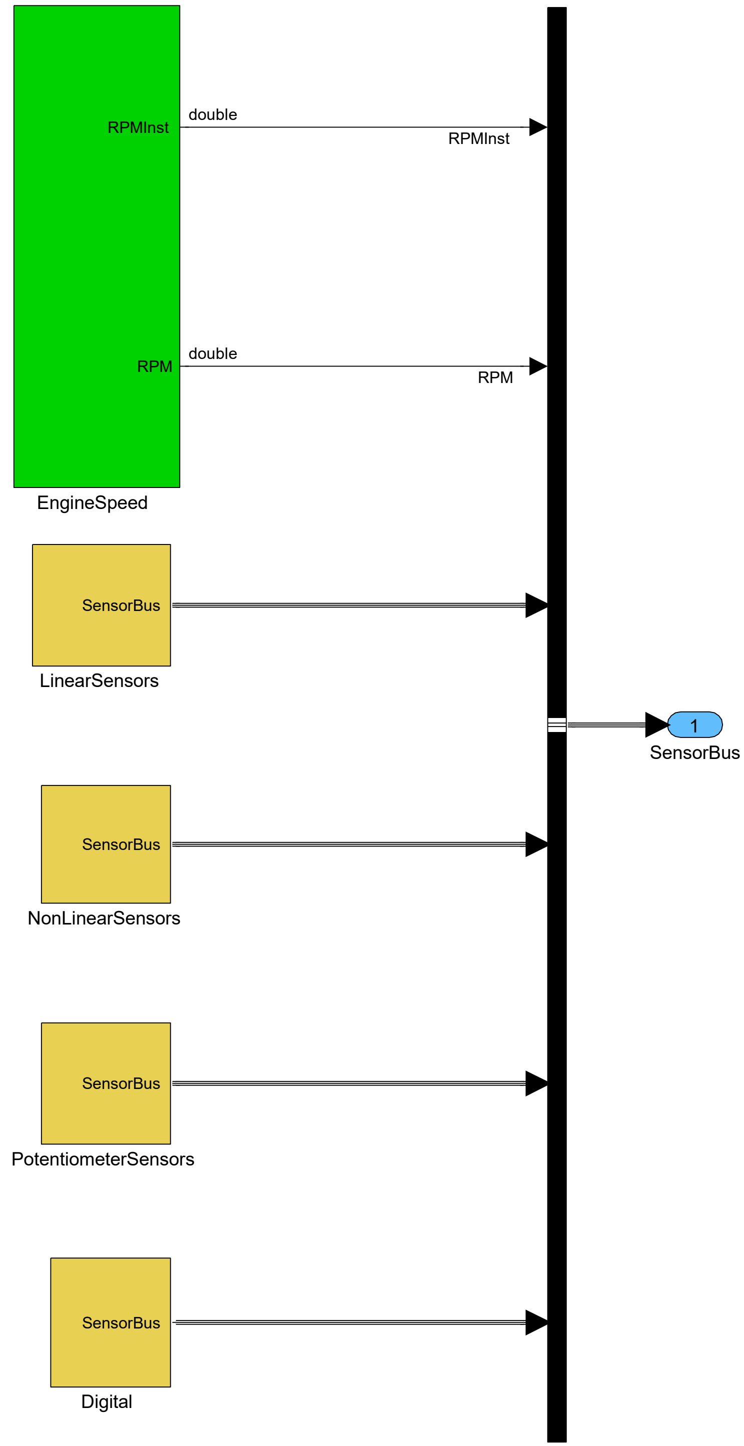
1
AirCalcs
double
<MAFPort>
MAFPort
MAFPort05Idx
MAFPortIndex
index_T
MAFPort05Idx
2
RawProcessed
double
<ECT_KeyUp>
ECT_KeyUp
ECT_KeyUp09Idx
ECT_KeyUp
index_T
ECTKeyUp09Idx
double
<RPM_Accel>
RPMAccel17[17]
u
i
index_T
RPMAccel17Idx
double
<APP1>
App05[5]
u
i
index_T
App05Idx
double
<TimeSinceRun>
TimeSinceRun09[9]
u
i
index_T
TimeSinceRun09
double
<IAT_KeyUp>
IAT_KeyUp
IAT_KeyUp09Idx
IAT_KeyUp
index_T
IATKeyUp09Idx
Virtual Indexes
1
VirtualIndexes

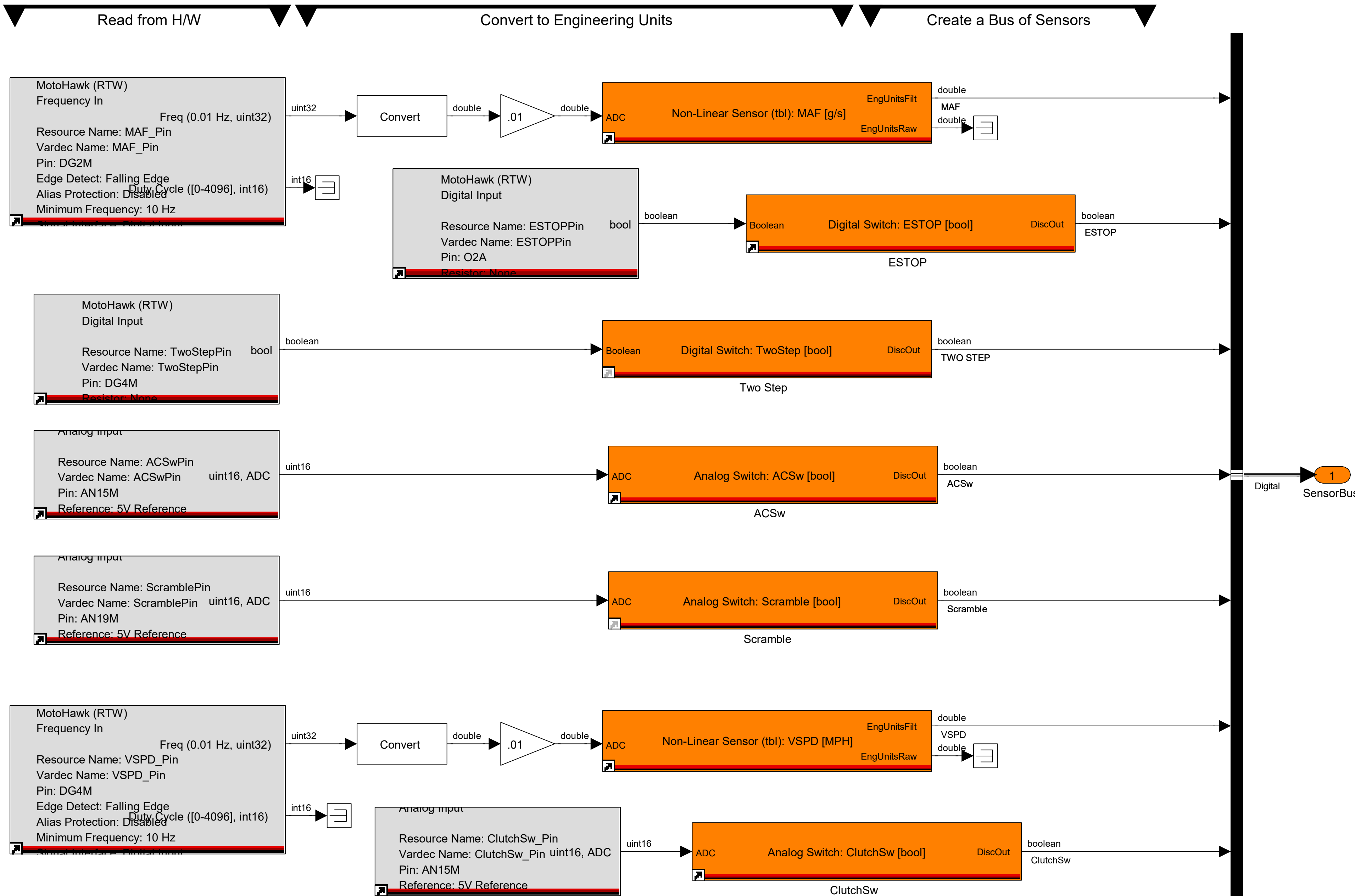


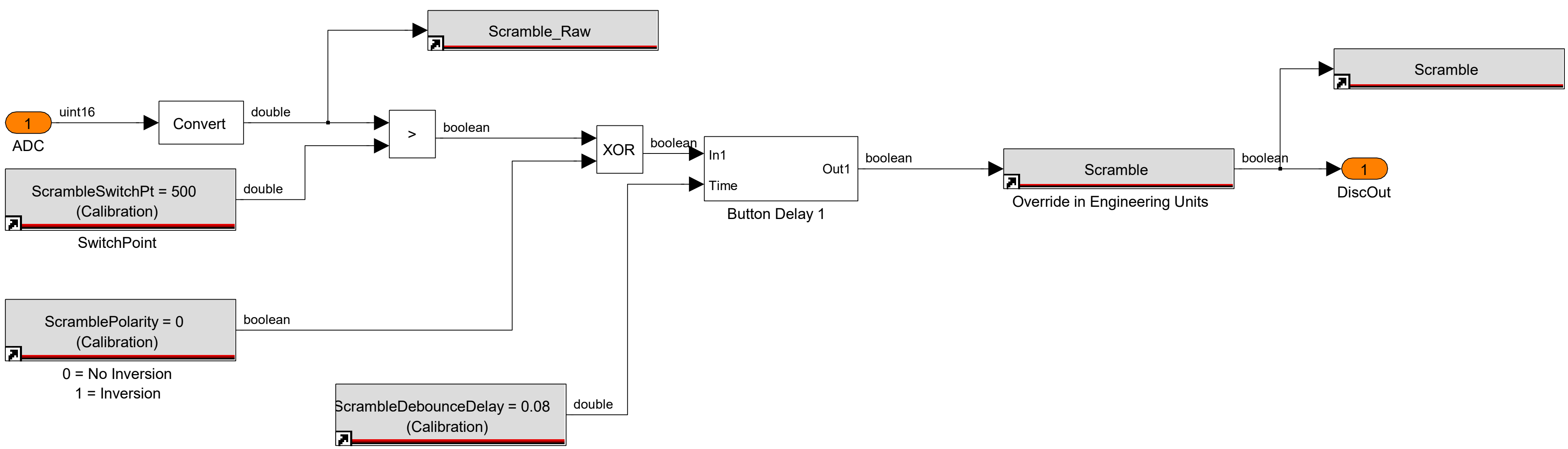
1
double
ECT_KeyUp
ECT_KeyUp09[9]
u
i
index_T
1
ECT_KeyUp09Idx

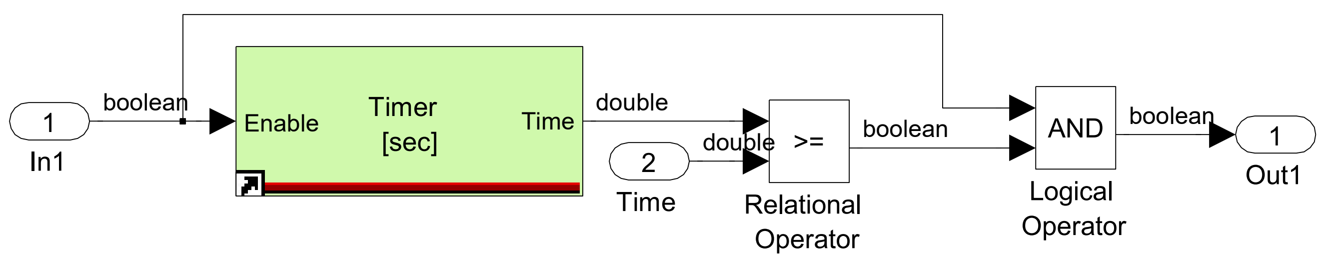

1
double
IAT_KeyUp
IAT_KeyUp09[9]
u
i
index_T
1
IAT_KeyUp09Idx

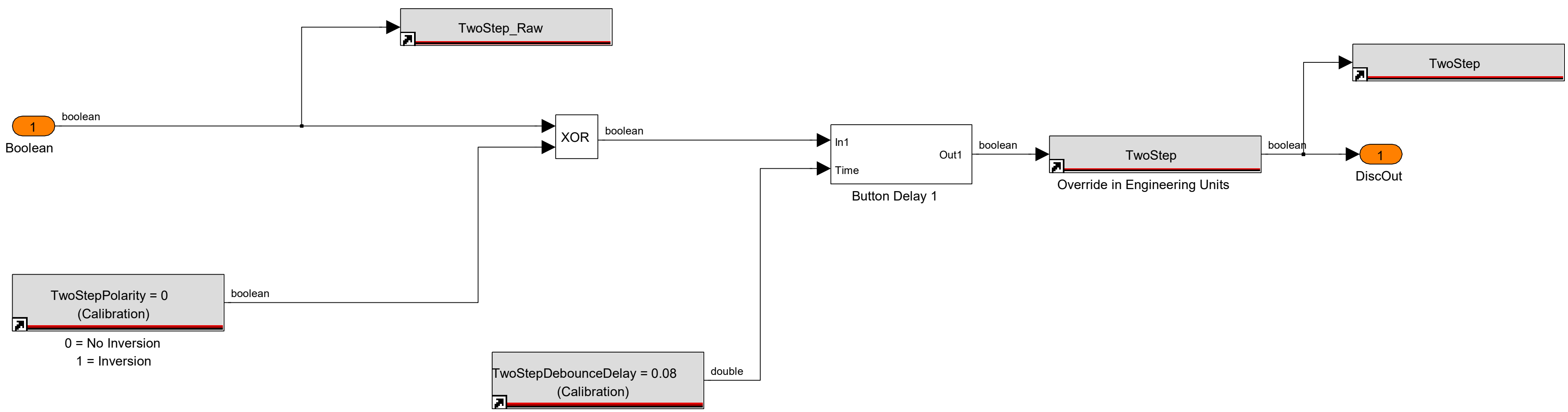

1
double
MAFPort
MAFPort05[5]
u
i
index_T
1
MAFPort05Idx

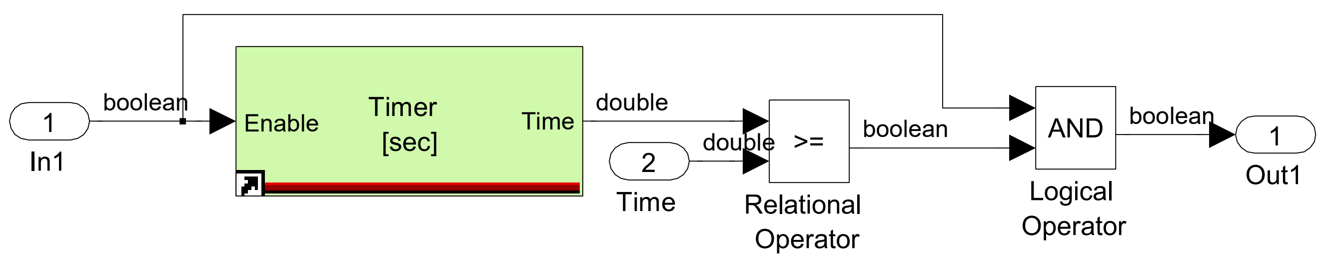

RPMInst
double
RPMInst
RPM
double
RPM
EngineSpeed
SensorBus
LinearSensors
1
SensorBus
SensorBus
NonLinearSensors
SensorBus
PotentiometerSensors
SensorBus
Digital


Read from H/W
Convert to Engineering Units
Create a Bus of Sensors
MotoHawk (RTW)
Frequency In
Freq (0.01 Hz, uint32)
Resource Name: MAF_Pin
Vardec Name: MAF_Pin
Pin: DG2M
Edge Detect: Falling Edge
Alias Protection: Disabled
Duty Cycle ([0-4096], int16)
Minimum Frequency: 10 Hz
uint32
Convert
double
.01
double
ADC
Non-Linear Sensor (tbl): MAF [g/s]
EngUnitsFilt
EngUnitsRaw
double
MAF
double
int16
MotoHawk (RTW)
Digital Input
Resource Name: ESTOPPin
Vardec Name: ESTOPPin
Pin: O2A
bool
boolean
Boolean
Digital Switch: ESTOP [bool]
DiscOut
boolean
ESTOP
ESTOP
MotoHawk (RTW)
Digital Input
Resource Name: TwoStepPin
Vardec Name: TwoStepPin
Pin: DG4M
bool
boolean
Boolean
Digital Switch: TwoStep [bool]
DiscOut
boolean
TWO STEP
Two Step
Resource Name: ACSwPin
Vardec Name: ACSwPin
Pin: AN15M
Reference: 5V Reference
uint16, ADC
uint16
ADC
Analog Switch: ACSw [bool]
DiscOut
boolean
ACSw
ACSw
Digital
1
SensorBus
Resource Name: ScramblePin
Vardec Name: ScramblePin
Pin: AN19M
Reference: 5V Reference
uint16, ADC
uint16
ADC
Analog Switch: Scramble [bool]
DiscOut
boolean
Scramble
Scramble
MotoHawk (RTW)
Frequency In
Freq (0.01 Hz, uint32)
Resource Name: VSPD_Pin
Vardec Name: VSPD_Pin
Pin: DG4M
Edge Detect: Falling Edge
Alias Protection: Disabled
Duty Cycle ([0-4096], int16)
Minimum Frequency: 10 Hz
uint32
Convert
double
.01
double
ADC
Non-Linear Sensor (tbl): VSPD [MPH]
EngUnitsFilt
EngUnitsRaw
double
VSPD
double
int16
Resource Name: ClutchSw_Pin
Vardec Name: ClutchSw_Pin
Pin: AN15M
Reference: 5V Reference
uint16, ADC
uint16
ADC
Analog Switch: ClutchSw [bool]
DiscOut
boolean
ClutchSw
ClutchSw

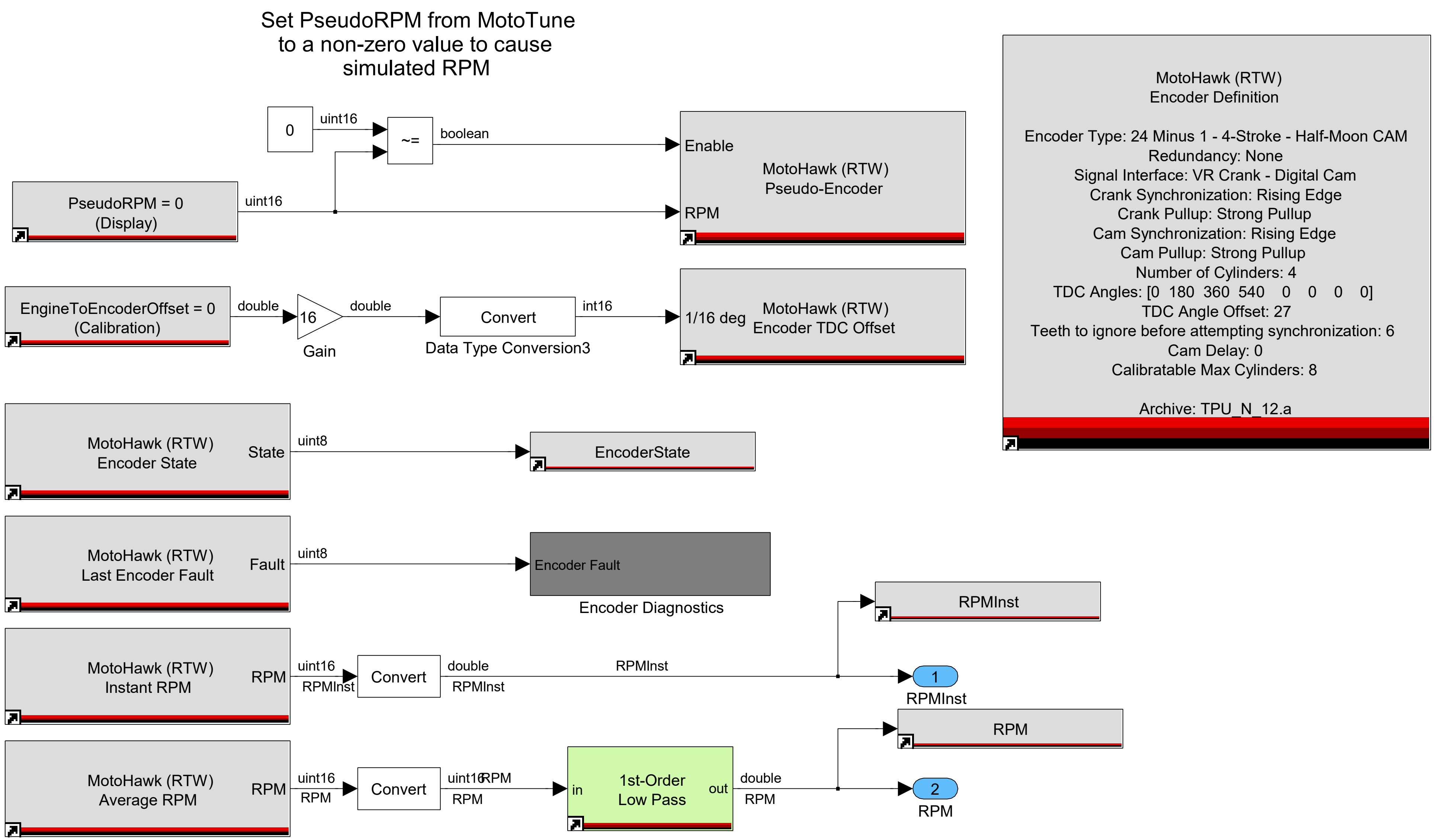

Scramble_Raw
1
ADC
uint16
Convert
double
>
boolean
ScrambleSwitchPt = 500
(Calibration)
double
SwitchPoint
XOR
boolean
In1
Time
Out1
Button Delay 1
boolean
Scramble
Override in Engineering Units
boolean
Scramble
1
DiscOut
ScramblePolarity = 0
(Calibration)
boolean
0 = No Inversion
1 = Inversion
ScrambleDebounceDelay = 0.08
(Calibration)
double


1
In1
boolean
Enable
Timer
[sec]
Time
double
2
Time
double
>=
Relational
Operator
boolean
AND
Logical
Operator
boolean
1
Out1

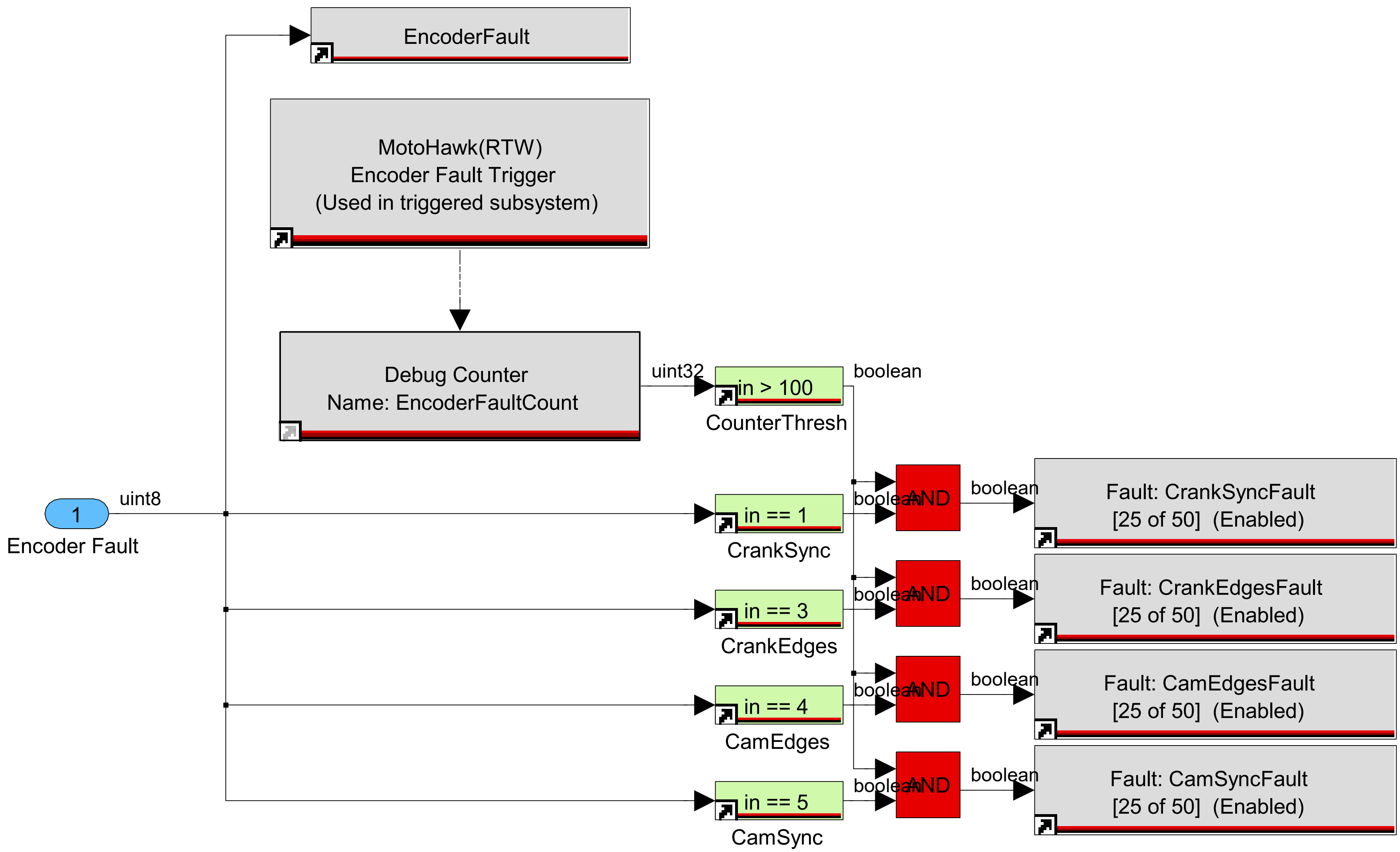

TwoStep_Raw
1
boolean
Boolean
XOR
boolean
In1
Out1
Time
Button Delay 1
boolean
TwoStep
Override in Engineering Units
boolean
TwoStep
1
DiscOut
TwoStepPolarity = 0
(Calibration)
boolean
0 = No Inversion
1 = Inversion
TwoStepDebounceDelay = 0.08
(Calibration)
double



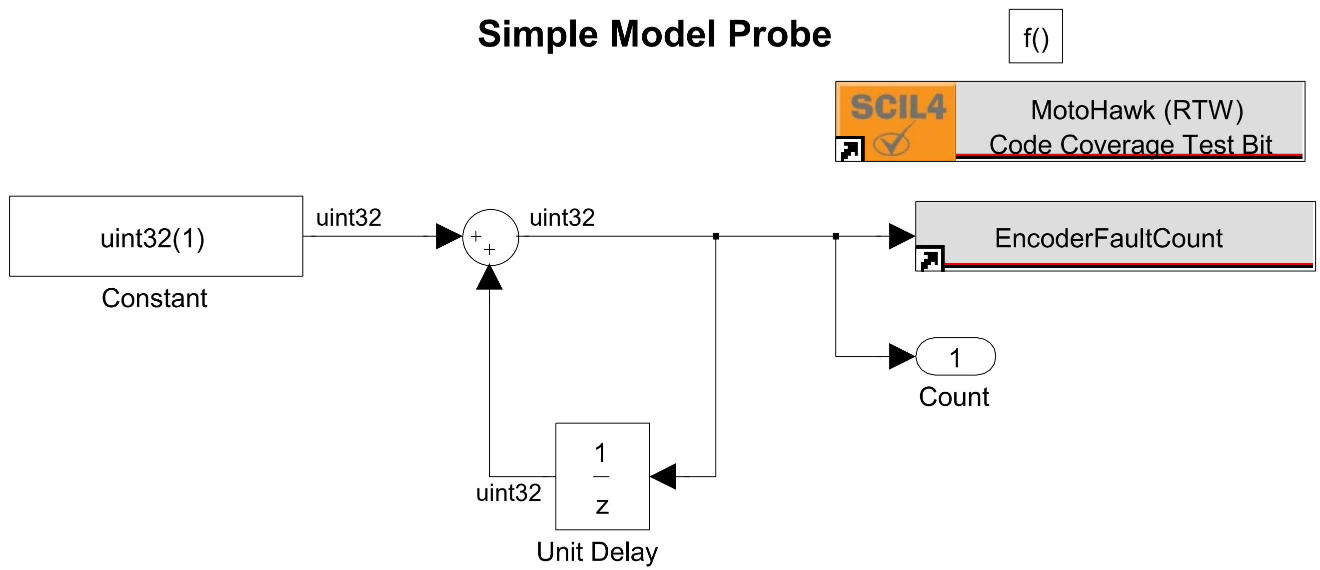
1
In1
boolean
Enable
Timer
[sec]
Time
double
2
Time
double
>=
Relational
Operator
boolean
AND
Logical
Operator
boolean
1
Out1



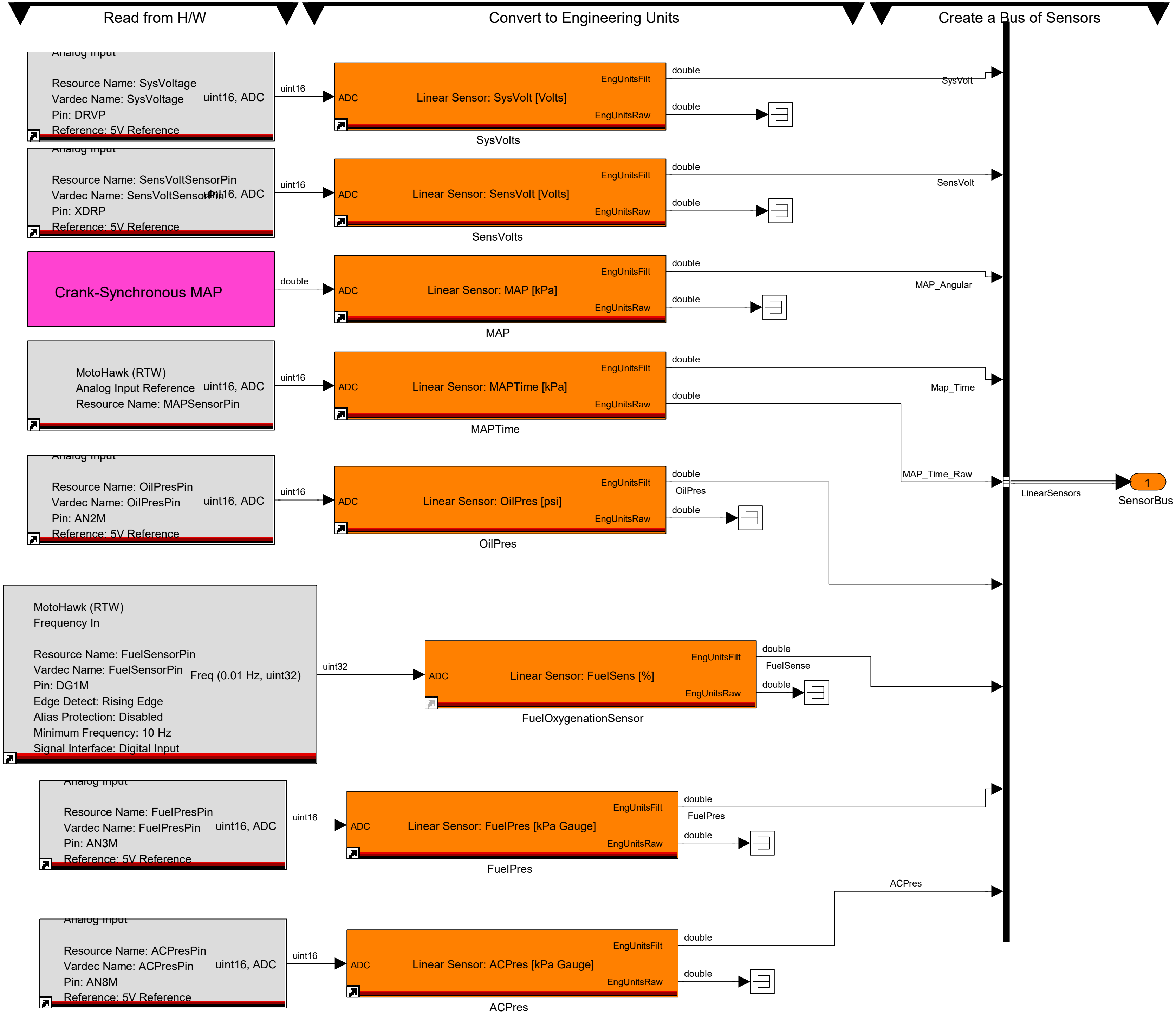
Set PseudoRPM from MotoTune
to a non-zero value to cause
simulated RPM
0
uint16
~=
boolean
Enable
MotoHawk (RTW)
Pseudo-Encoder
RPM
PseudoRPM = 0
(Display)
uint16
EngineToEncoderOffset = 0
(Calibration)
double
16
Gain
double
Convert
Data Type Conversion3
int16
1/16 deg
MotoHawk (RTW)
Encoder TDC Offset
MotoHawk (RTW)
Encoder Definition
Encoder Type: 24 Minus 1 - 4-Stroke - Half-Moon CAM
Redundancy: None
Signal Interface: VR Crank - Digital Cam
Crank Synchronization: Rising Edge
Crank Pullup: Strong Pullup
Cam Synchronization: Rising Edge
Cam Pullup: Strong Pullup
Number of Cylinders: 4
TDC Angles: [0 180 360 540 0 0 0 0]
TDC Angle Offset: 27
Teeth to ignore before attempting synchronization: 6
Cam Delay: 0
Calibratable Max Cylinders: 8
Archive: TPU_N_12.a
MotoHawk (RTW)
Encoder State
State
uint8
EncoderState
MotoHawk (RTW)
Last Encoder Fault
Fault
uint8
Encoder Fault
Encoder Diagnostics
RPMInst
MotoHawk (RTW)
Instant RPM
RPM
uint16
RPMInst
Convert
double
RPMInst
RPMInst
1
RPMInst
RPM
MotoHawk (RTW)
Average RPM
RPM
uint16
RPM
Convert
uint16RPM
RPM
in
1st-Order
Low Pass
out
double
RPM
2
RPM

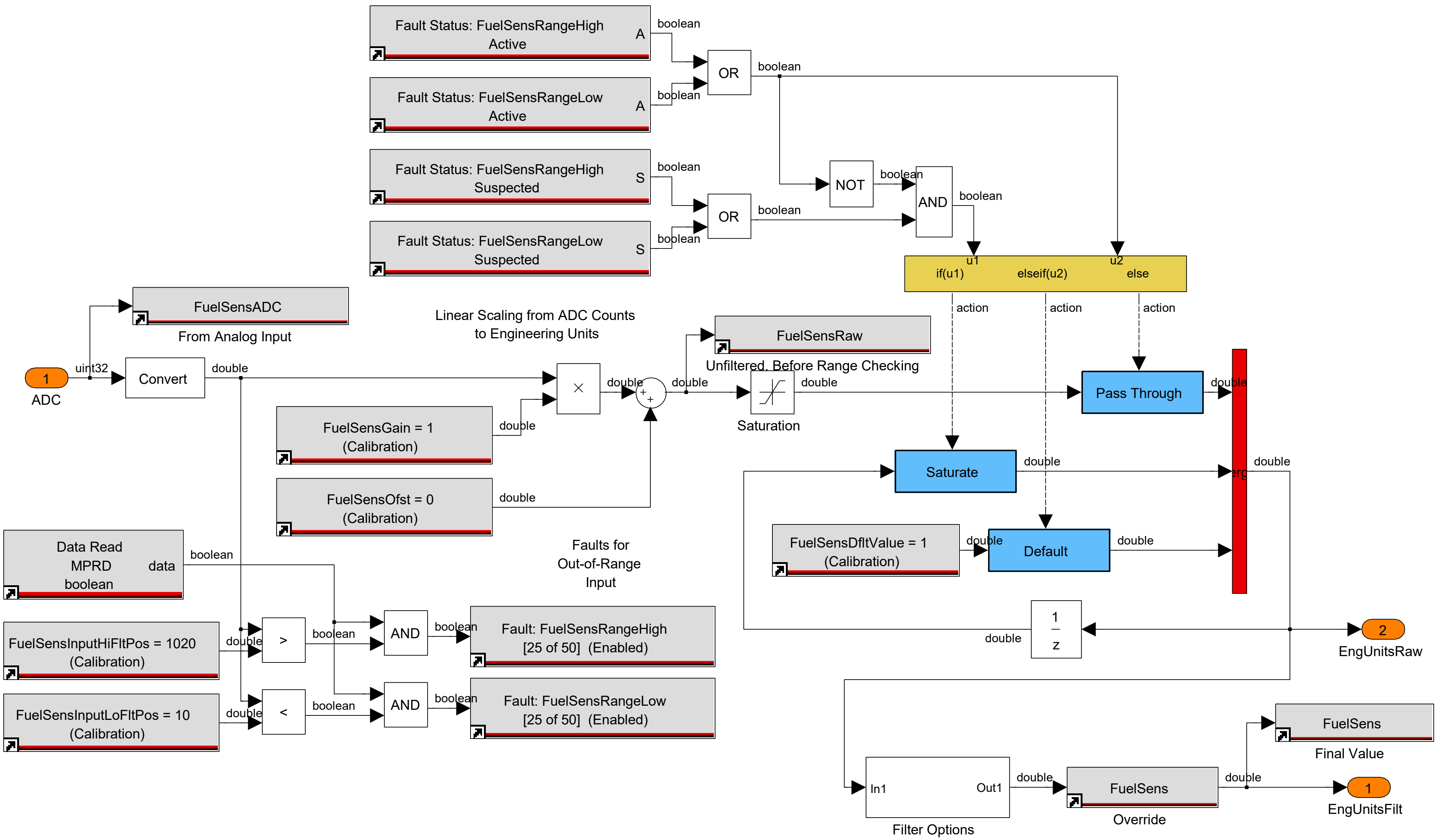


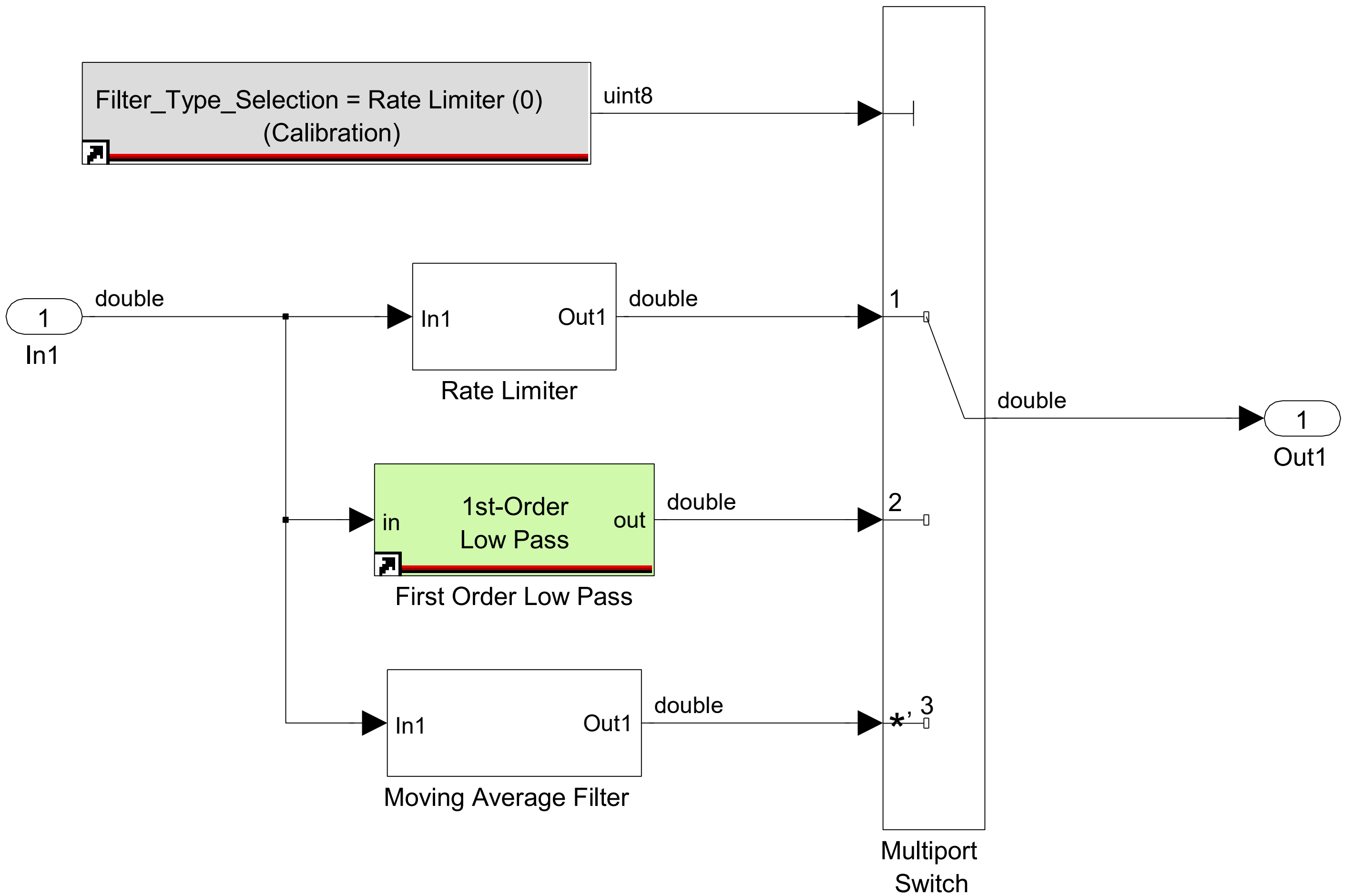
EncoderFault
MotoHawk(RTW)
Encoder Fault Trigger
(Used in triggered subsystem)
Debug Counter
Name: EncoderFaultCount
uint32
in > 100
CounterThresh
boolean
1
Encoder Fault
uint8
in == 1
CrankSync
in == 3
CrankEdges
in == 4
CamEdges
in == 5
CamSync
AND
boolean
Fault: CrankSyncFault
[25 of 50] (Enabled)
Fault: CrankEdgesFault
[25 of 50] (Enabled)
Fault: CamEdgesFault
[25 of 50] (Enabled)
Fault: CamSyncFault
[25 of 50] (Enabled)



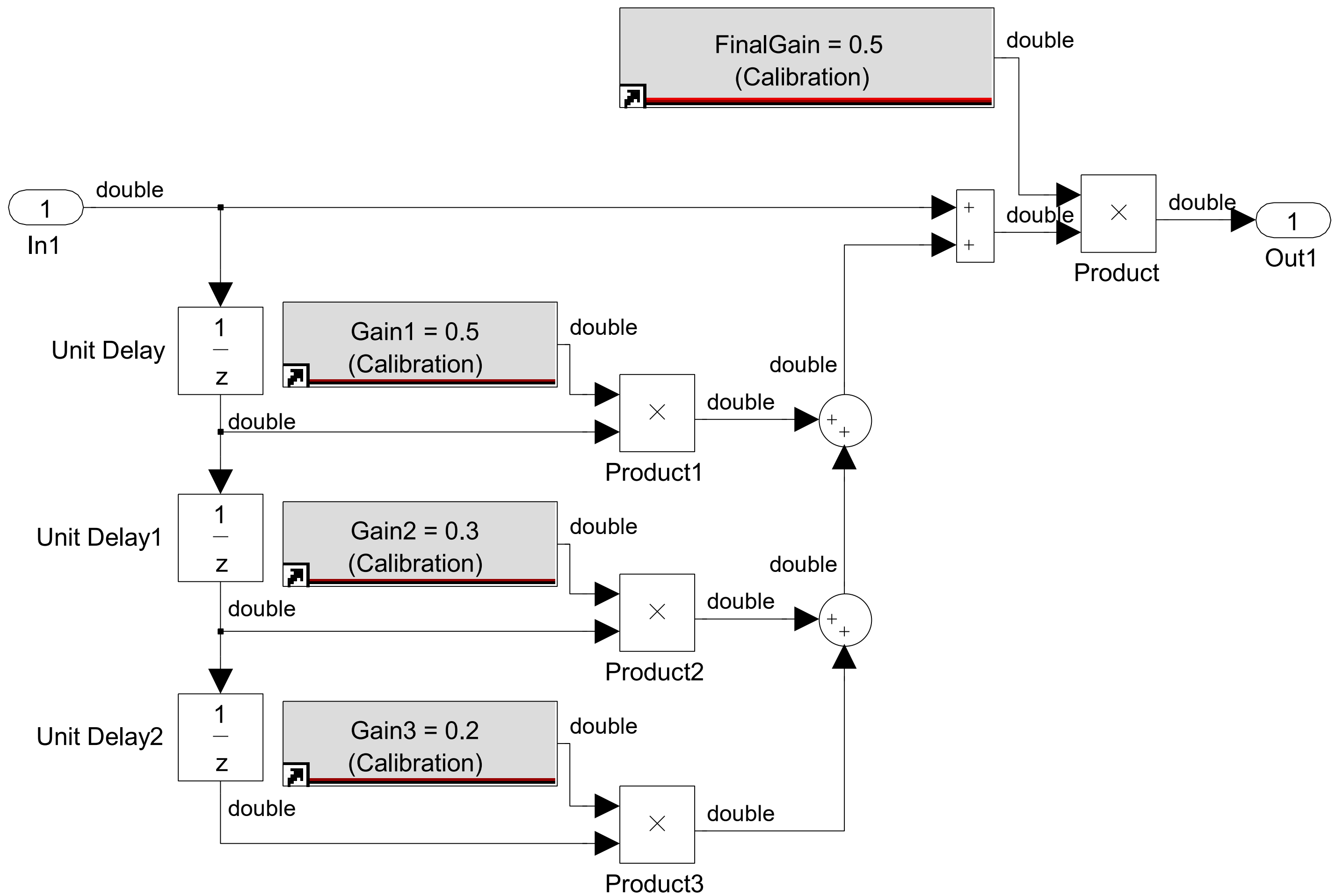
Simple Model Probe
f()
SCIL4
MotoHawk (RTW)
Code Coverage Test Bit
uint32(1)
Constant
uint32
+
+
uint32
EncoderFaultCount
1
Count
1
z
uint32
Unit Delay

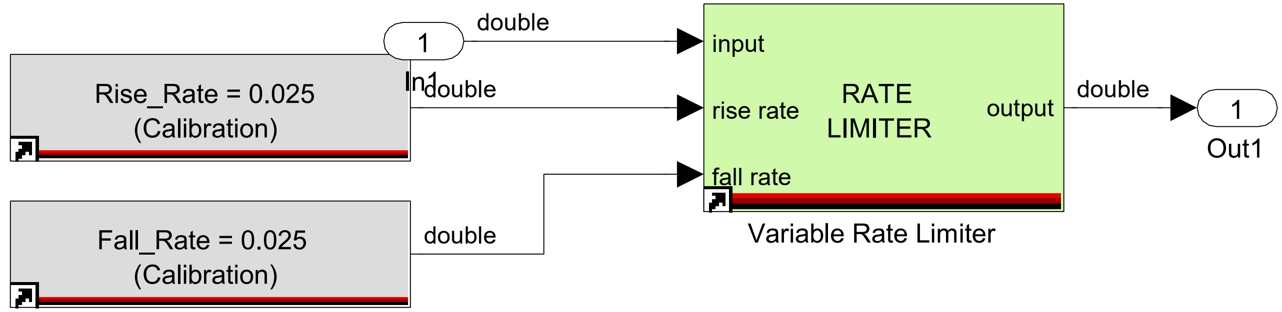

Read from H/W
Convert to Engineering Units
Create a Bus of Sensors
Analog Input
Resource Name: SysVoltage
Vardec Name: SysVoltage
Pin: DRVP
Reference: 5V Reference
uint16, ADC
uint16
ADC
Linear Sensor: SysVolt [Volts]
EngUnitsFilt
EngUnitsRaw
SysVolts
double
SysVolt
Analog Input
Resource Name: SensVoltSensorPin
Vardec Name: SensVoltSensorPin
Pin: XDRP
Reference: 5V Reference
Linear Sensor: SensVolt [Volts]
SensVolts
SensVolt
Crank-Synchronous MAP
Linear Sensor: MAP [kPa]
MAP
MAP_Angular
MotoHawk (RTW)
Analog Input Reference
Resource Name: MAPSensorPin
Linear Sensor: MAPTime [kPa]
MAPTime
Map_Time
MAP_Time_Raw
Analog Input
Resource Name: OilPresPin
Vardec Name: OilPresPin
Pin: AN2M
Reference: 5V Reference
Linear Sensor: OilPres [psi]
OilPres
LinearSensors
1
SensorBus
MotoHawk (RTW)
Frequency In
Resource Name: FuelSensorPin
Vardec Name: FuelSensorPin
Pin: DG1M
Edge Detect: Rising Edge
Alias Protection: Disabled
Minimum Frequency: 10 Hz
Signal Interface: Digital Input
Freq (0.01 Hz, uint32)
uint32
Linear Sensor: FuelSens [%]
FuelOxygenationSensor
FuelSense
Analog Input
Resource Name: FuelPresPin
Vardec Name: FuelPresPin
Pin: AN3M
Reference: 5V Reference
Linear Sensor: FuelPres [kPa Gauge]
FuelPres
Analog Input
Resource Name: ACPresPin
Vardec Name: ACPresPin
Pin: AN8M
Reference: 5V Reference
Linear Sensor: ACPres [kPa Gauge]
ACPres


Fault Status: FuelSensRangeHigh Active
Fault Status: FuelSensRangeLow Active
Fault Status: FuelSensRangeHigh Suspected
Fault Status: FuelSensRangeLow Suspected
OR
NOT
AND
if(u1)
elseif(u2)
else
action
FuelSensADC
From Analog Input
Linear Scaling from ADC Counts to Engineering Units
FuelSensRaw
Unfiltered, Before Range Checking
ADC
Convert
Saturation
Pass Through
FuelSensGain = 1 (Calibration)
FuelSensOfst = 0 (Calibration)
Saturate
FuelSensDfltValue = 1 (Calibration)
Default
Data Read MPRD boolean
data
Faults for Out-of-Range Input
FuelSensInputHiFltPos = 1020 (Calibration)
FuelSensInputLoFltPos = 10 (Calibration)
Fault: FuelSensRangeHigh [25 of 50] (Enabled)
Fault: FuelSensRangeLow [25 of 50] (Enabled)
EngUnitsRaw
FuelSens
Final Value
In1
Out1
Filter Options
FuelSens
Override
EngUnitsFilt

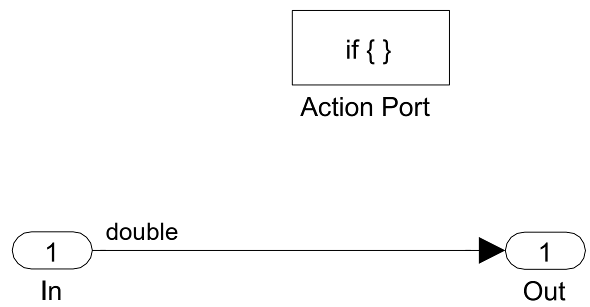


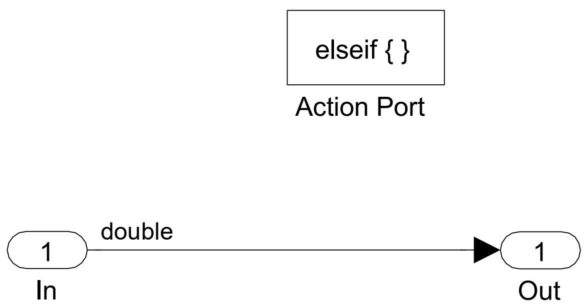
Filter_Type_Selection = Rate Limiter (0)
(Calibration)
uint8
1
In1
double
In1
Out1
Rate Limiter
double
1
in
1st-Order
Low Pass
out
First Order Low Pass
double
2
In1
Out1
Moving Average Filter
double
*, 3
Multiport
Switch
double
1
Out1

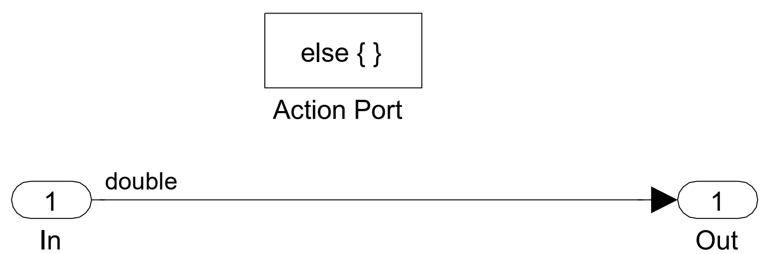

FinalGain = 0.5
(Calibration)
double
1
In1
double
double
double
Product
double
1
Out1
Unit Delay
1
z
Gain1 = 0.5
(Calibration)
double
double
double
double
Product1
Unit Delay1
1
z
Gain2 = 0.3
(Calibration)
double
double
double
double
Product2
Unit Delay2
1
z
Gain3 = 0.2
(Calibration)
double
double
double
Product3



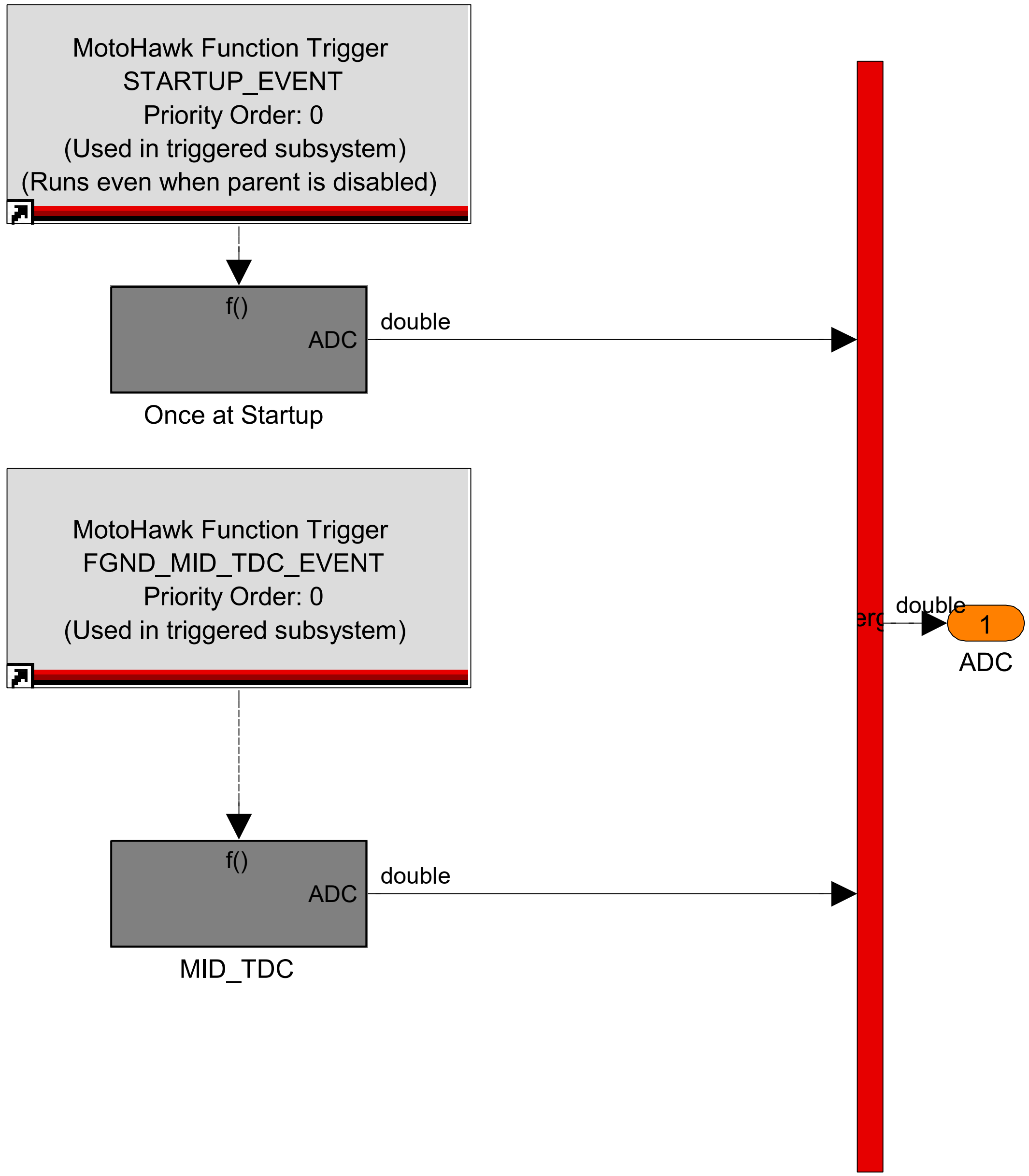
Rise_Rate = 0.025
(Calibration)
Fall_Rate = 0.025
(Calibration)
1
In1
double
double
double
input
rise rate
fall rate
RATE
LIMITER
output
double
1
Out1
Variable Rate Limiter


if { }
Action Port
double
1
In
1
Out

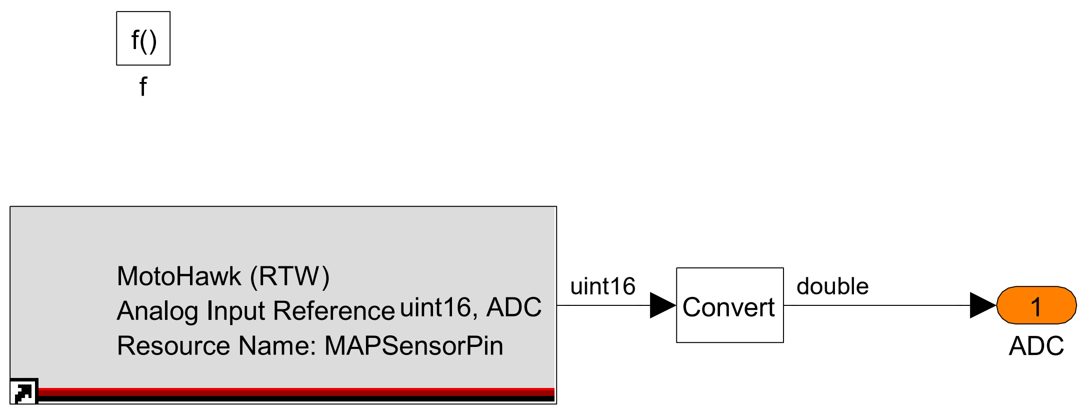

elseif { }
Action Port
double
1
In
1
Out



else { }
Action Port
1
double
1
In
Out

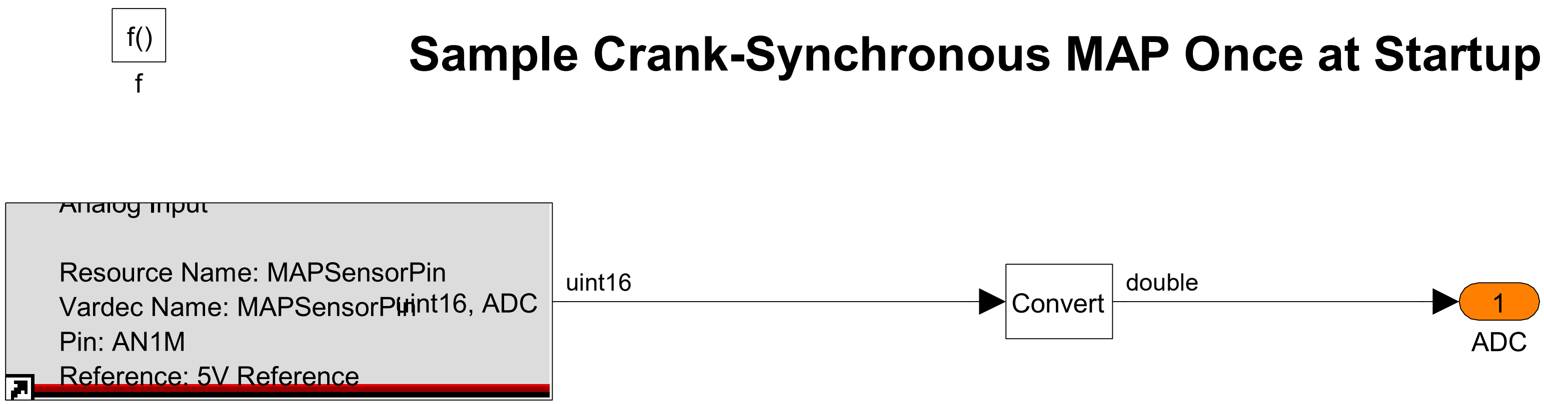


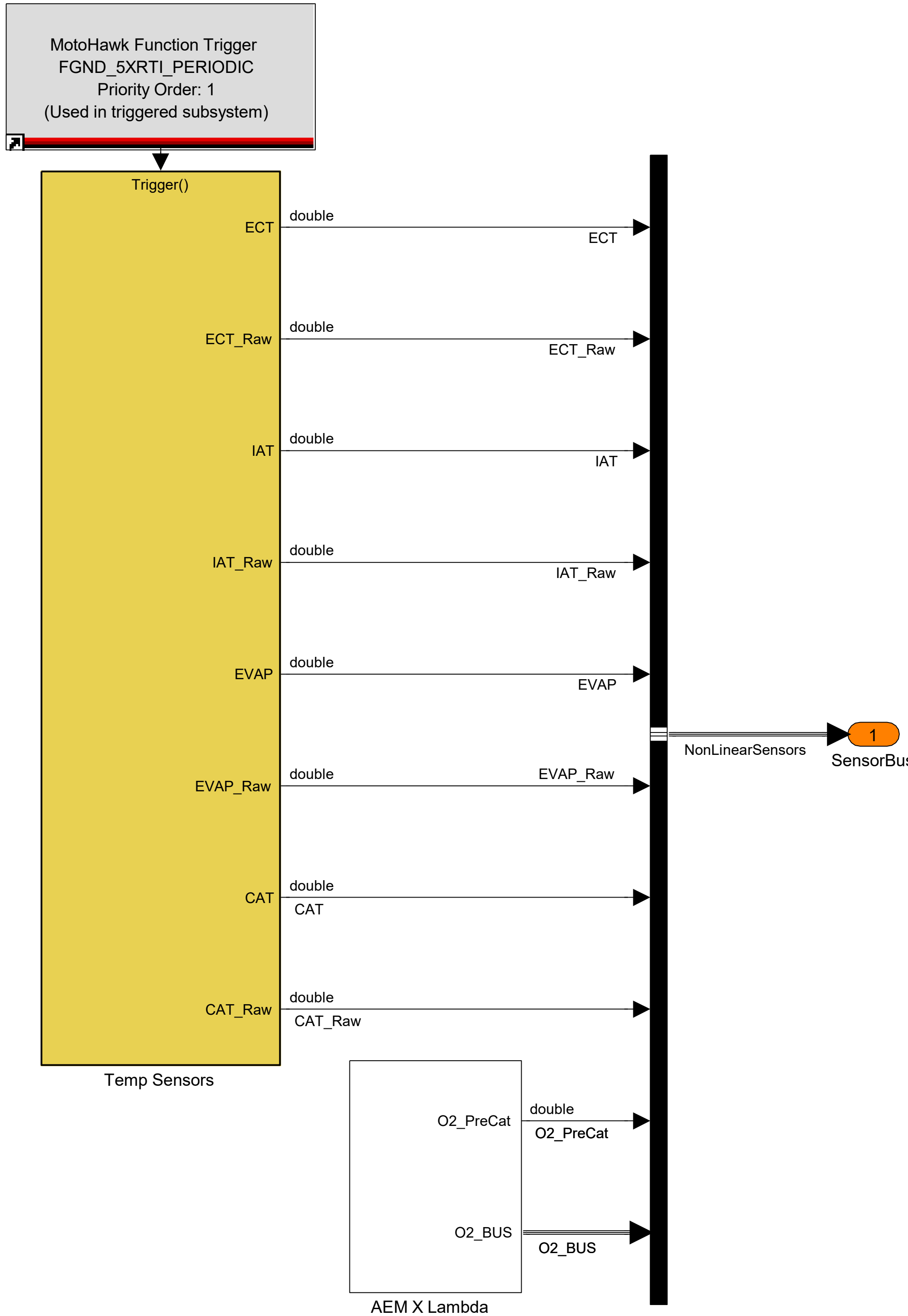
MotoHawk Function Trigger
STARTUP_EVENT
Priority Order: 0
(Used in triggered subsystem)
(Runs even when parent is disabled)
f()
ADC
double
Once at Startup
MotoHawk Function Trigger
FGND_MID_TDC_EVENT
Priority Order: 0
(Used in triggered subsystem)
f()
ADC
double
MID_TDC
double
1
ADC

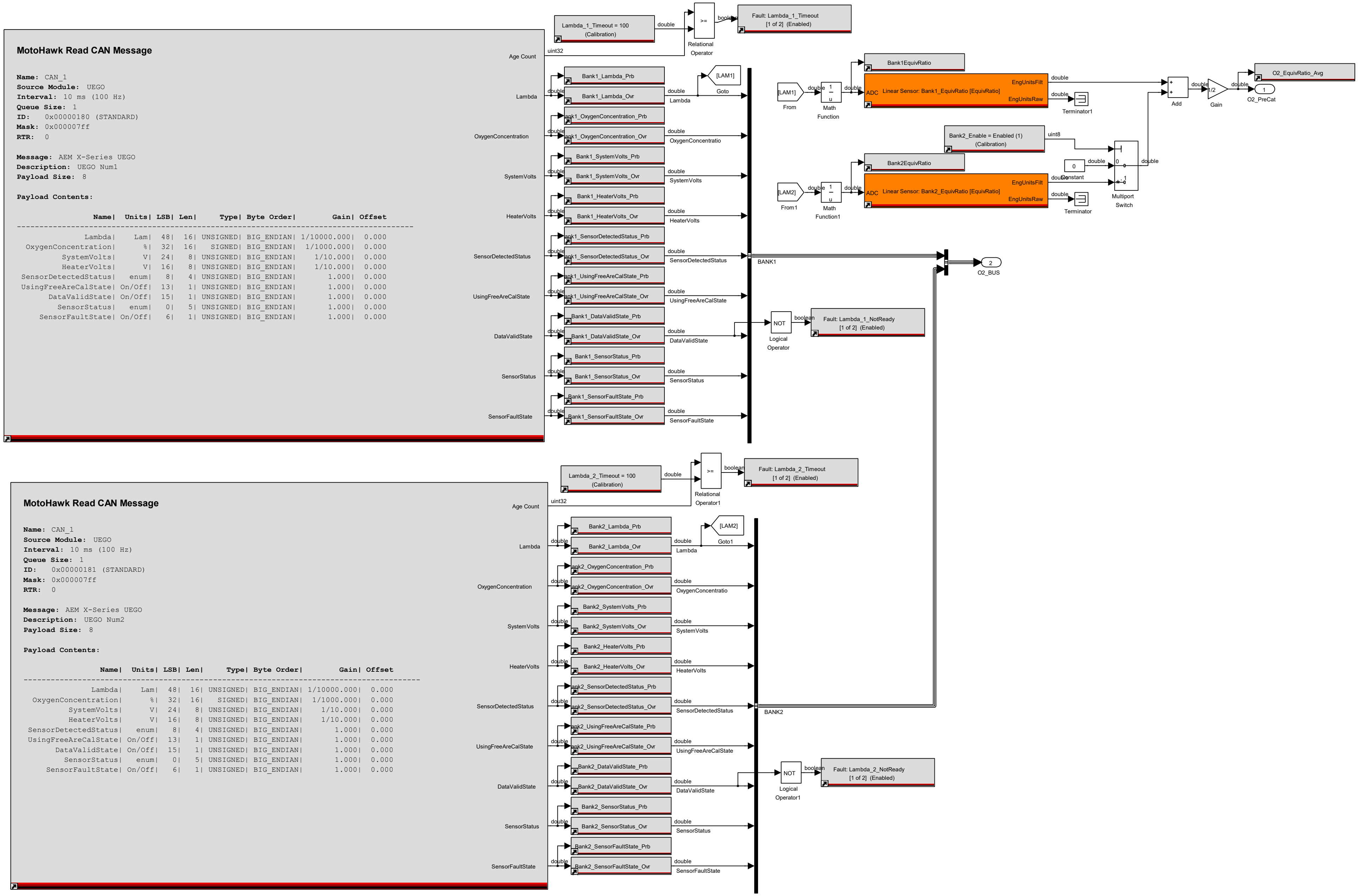


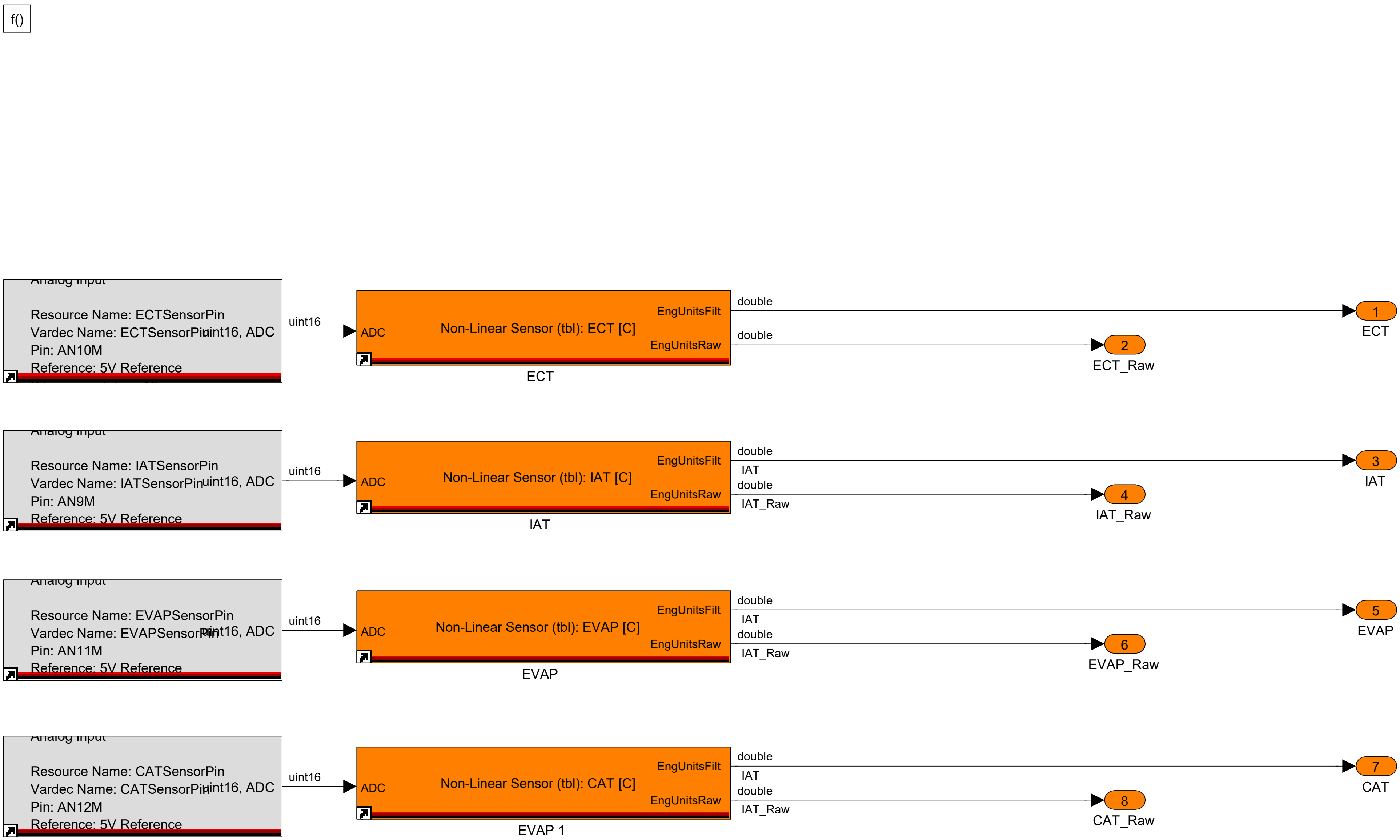
f()
f
MotoHawk (RTW)
Analog Input Reference
Resource Name: MAPSensorPin
uint16, ADC
uint16
Convert
double
1
ADC

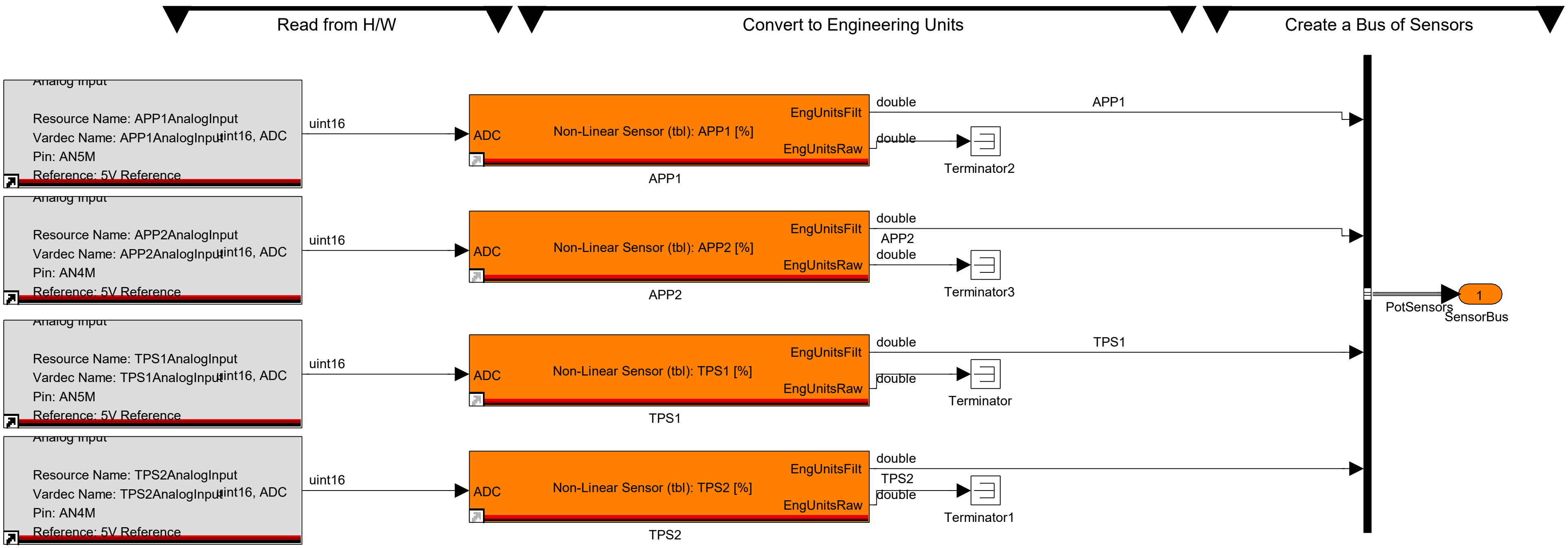
Sample Crank-Synchronous MAP Once at Startup

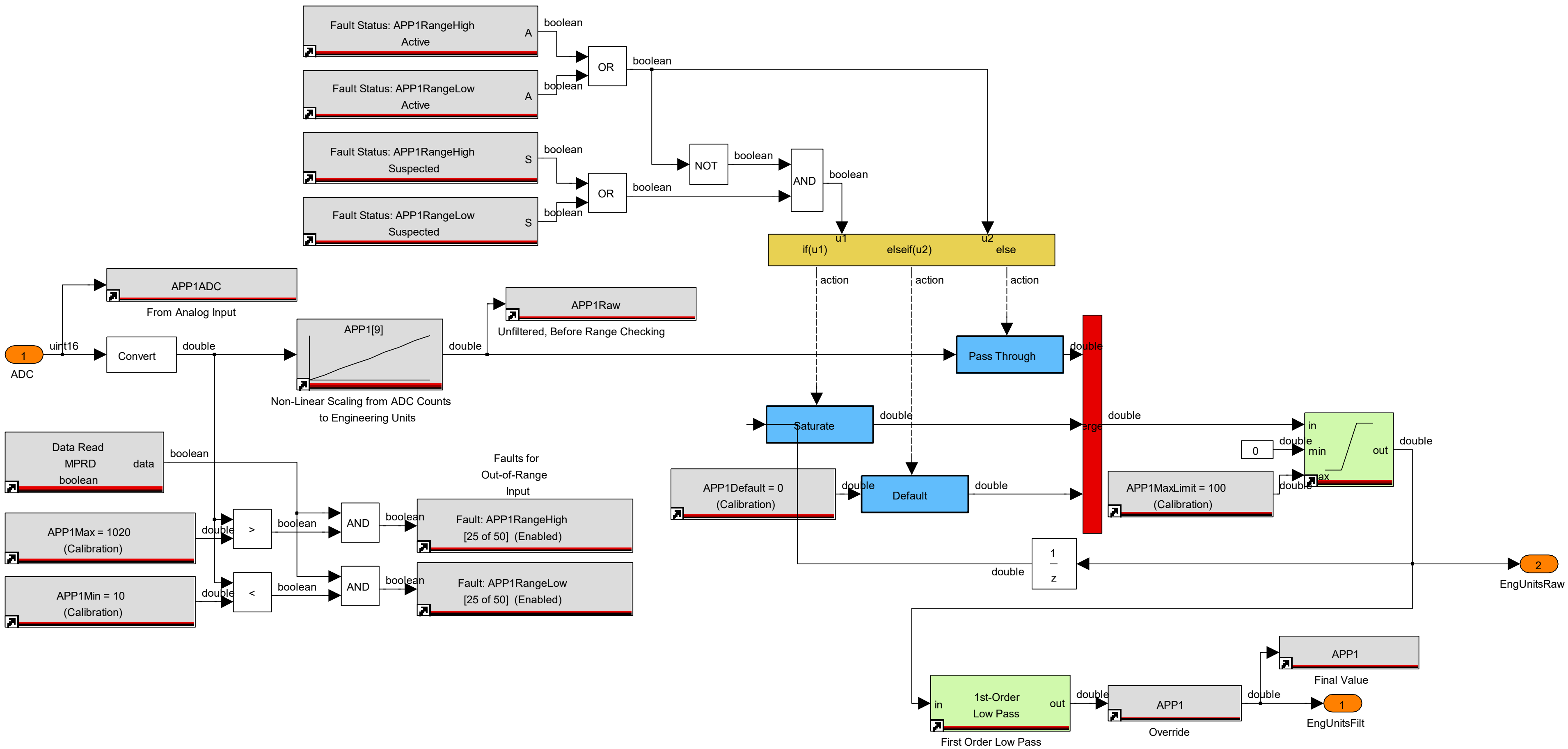



MotoHawk Function Trigger
FGND_5XRTI_PERIODIC
Priority Order: 1
(Used in triggered subsystem)
Trigger()
ECT
double
ECT
ECT_Raw
double
ECT_Raw
IAT
double
IAT
IAT_Raw
double
IAT_Raw
EVAP
double
EVAP
EVAP_Raw
double
EVAP_Raw
CAT
double
CAT
CAT_Raw
double
CAT_Raw
Temp Sensors
O2_PreCat
double
O2_PreCat
O2_BUS
O2_BUS
AEM X Lambda
NonLinearSensors
1
SensorBus

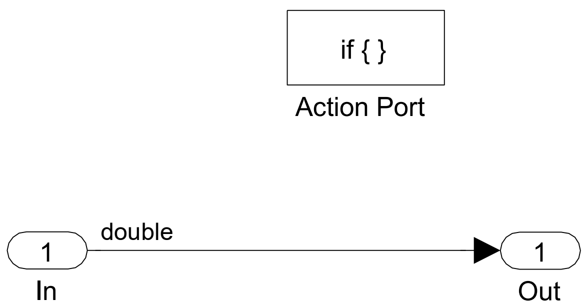

MotoHawk Read CAN Message
Name: CAN_1
Source Module: UEGO
Interval: 10 ms (100 Hz)
Queue Size: 1
ID: 0x00000180 (STANDARD)
Mask: 0x000007ff
RTR: 0
Message: AEM X-Series UEGO
Description: UEGO Num1
Payload Size: 8
Payload Contents:
Name| Units| LSB| Len| Type| Byte Order| Gain| Offset
Lambda| Lam| 48| 16| UNSIGNED| BIG_ENDIAN| 1/10000.000| 0.000
OxygenConcentration| %| 32| 16| SIGNED| BIG_ENDIAN| 1/1000.000| 0.000
SystemVolts| V| 24| 8| UNSIGNED| BIG_ENDIAN| 1/10.000| 0.000
HeaterVolts| V| 16| 8| UNSIGNED| BIG_ENDIAN| 1/10.000| 0.000
SensorDetectedStatus| enum| 8| 4| UNSIGNED| BIG_ENDIAN| 1.000| 0.000
UsingFreeAreCalState| On/Off| 13| 1| UNSIGNED| BIG_ENDIAN| 1.000| 0.000
DataValidState| On/Off| 15| 1| UNSIGNED| BIG_ENDIAN| 1.000| 0.000
SensorStatus| enum| 0| 5| UNSIGNED| BIG_ENDIAN| 1.000| 0.000
SensorFaultState| On/Off| 6| 1| UNSIGNED| BIG_ENDIAN| 1.000| 0.000
Age Count
Lambda
OxygenConcentration
SystemVolts
HeaterVolts
SensorDetectedStatus
UsingFreeAreCalState
DataValidState
SensorStatus
SensorFaultState
Lambda_1_Timeout = 100 (Calibration)
Relational Operator
Fault: Lambda_1_Timeout [1 of 2] (Enabled)
Bank1_Lambda_Prb
Bank1_Lambda_Ovr
[LAM1]
Goto
Bank1_OxygenConcentration_Prb
Bank1_OxygenConcentration_Ovr
Bank1_SystemVolts_Prb
Bank1_SystemVolts_Ovr
Bank1_HeaterVolts_Prb
Bank1_HeaterVolts_Ovr
Bank1_SensorDetectedStatus_Prb
Bank1_SensorDetectedStatus_Ovr
Bank1_UsingFreeAreCalState_Prb
Bank1_UsingFreeAreCalState_Ovr
Bank1_DataValidState_Prb
Bank1_DataValidState_Ovr
Bank1_SensorStatus_Prb
Bank1_SensorStatus_Ovr
Bank1_SensorFaultState_Prb
Bank1_SensorFaultState_Ovr
BANK1
NOT
Logical Operator
Fault: Lambda_1_NotReady [1 of 2] (Enabled)
[LAM1]
From
Math Function
Bank1EquivRatio
Linear Sensor: Bank1_EquivRatio [EquivRatio]
EngUnitsFilt
EngUnitsRaw
Terminator1
Bank2_Enable = Enabled (1) (Calibration)
Bank2EquivRatio
[LAM2]
From1
Math Function1
Linear Sensor: Bank2_EquivRatio [EquivRatio]
Constant
Terminator
Multiport Switch
Add
Gain
O2_EquivRatio_Avg
1
O2_PreCat
2
O2_BUS
MotoHawk Read CAN Message
Name: CAN_1
Source Module: UEGO
Interval: 10 ms (100 Hz)
Queue Size: 1
ID: 0x00000181 (STANDARD)
Mask: 0x000007ff
RTR: 0
Message: AEM X-Series UEGO
Description: UEGO Num2
Payload Size: 8
Payload Contents:
Name| Units| LSB| Len| Type| Byte Order| Gain| Offset
Lambda| Lam| 48| 16| UNSIGNED| BIG_ENDIAN| 1/10000.000| 0.000
OxygenConcentration| %| 32| 16| SIGNED| BIG_ENDIAN| 1/1000.000| 0.000
SystemVolts| V| 24| 8| UNSIGNED| BIG_ENDIAN| 1/10.000| 0.000
HeaterVolts| V| 16| 8| UNSIGNED| BIG_ENDIAN| 1/10.000| 0.000
SensorDetectedStatus| enum| 8| 4| UNSIGNED| BIG_ENDIAN| 1.000| 0.000
UsingFreeAreCalState| On/Off| 13| 1| UNSIGNED| BIG_ENDIAN| 1.000| 0.000
DataValidState| On/Off| 15| 1| UNSIGNED| BIG_ENDIAN| 1.000| 0.000
SensorStatus| enum| 0| 5| UNSIGNED| BIG_ENDIAN| 1.000| 0.000
SensorFaultState| On/Off| 6| 1| UNSIGNED| BIG_ENDIAN| 1.000| 0.000
Lambda_2_Timeout = 100 (Calibration)
Relational Operator1
Fault: Lambda_2_Timeout [1 of 2] (Enabled)
Bank2_Lambda_Prb
Bank2_Lambda_Ovr
[LAM2]
Goto1
Bank2_OxygenConcentration_Prb
Bank2_OxygenConcentration_Ovr
Bank2_SystemVolts_Prb
Bank2_SystemVolts_Ovr
Bank2_HeaterVolts_Prb
Bank2_HeaterVolts_Ovr
Bank2_SensorDetectedStatus_Prb
Bank2_SensorDetectedStatus_Ovr
Bank2_UsingFreeAreCalState_Prb
Bank2_UsingFreeAreCalState_Ovr
Bank2_DataValidState_Prb
Bank2_DataValidState_Ovr
Bank2_SensorStatus_Prb
Bank2_SensorStatus_Ovr
Bank2_SensorFaultState_Prb
Bank2_SensorFaultState_Ovr
BANK2
Logical Operator1
Fault: Lambda_2_NotReady [1 of 2] (Enabled)

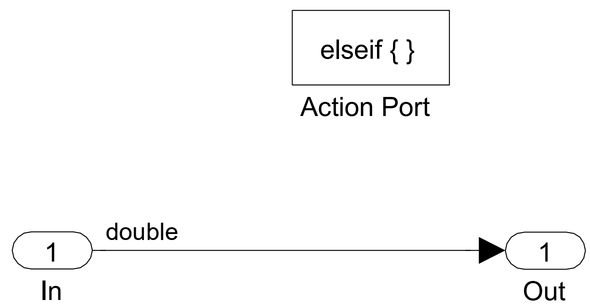

f()
Analog Input
Resource Name: ECTSensorPin
Vardec Name: ECTSensorPin
Pin: AN10M
Reference: 5V Reference
uint16, ADC
uint16
ADC
Non-Linear Sensor (tbl): ECT [C]
EngUnitsFilt
EngUnitsRaw
ECT
double
double
1
ECT
2
ECT_Raw
Analog Input
Resource Name: IATSensorPin
Vardec Name: IATSensorPin
Pin: AN9M
Reference: 5V Reference
uint16, ADC
uint16
ADC
Non-Linear Sensor (tbl): IAT [C]
EngUnitsFilt
EngUnitsRaw
IAT
double
IAT
double
IAT_Raw
3
IAT
4
IAT_Raw
Analog Input
Resource Name: EVAPSensorPin
Vardec Name: EVAPSensorPin
Pin: AN11M
Reference: 5V Reference
uint16, ADC
uint16
ADC
Non-Linear Sensor (tbl): EVAP [C]
EngUnitsFilt
EngUnitsRaw
EVAP
double
IAT
double
IAT_Raw
5
EVAP
6
EVAP_Raw
Analog Input
Resource Name: CATSensorPin
Vardec Name: CATSensorPin
Pin: AN12M
Reference: 5V Reference
uint16, ADC
uint16
ADC
Non-Linear Sensor (tbl): CAT [C]
EngUnitsFilt
EngUnitsRaw
EVAP 1
double
IAT
double
IAT_Raw
7
CAT
8
CAT_Raw

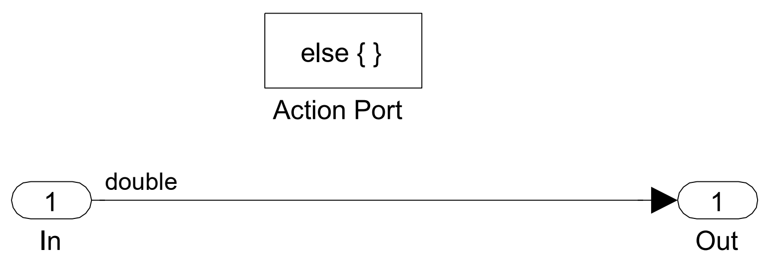

Read from H/W
Convert to Engineering Units
Create a Bus of Sensors
Analog Input
Resource Name: APP1AnalogInput
Vardec Name: APP1AnalogInput
Pin: AN5M
Reference: 5V Reference
uint16, ADC
uint16
Analog Input
Resource Name: APP2AnalogInput
Vardec Name: APP2AnalogInput
Pin: AN4M
Reference: 5V Reference
uint16, ADC
uint16
Analog Input
Resource Name: TPS1AnalogInput
Vardec Name: TPS1AnalogInput
Pin: AN5M
Reference: 5V Reference
uint16, ADC
uint16
Analog Input
Resource Name: TPS2AnalogInput
Vardec Name: TPS2AnalogInput
Pin: AN4M
Reference: 5V Reference
uint16, ADC
uint16
ADC
Non-Linear Sensor (tbl): APP1 [%]
EngUnitsFilt
EngUnitsRaw
APP1
ADC
Non-Linear Sensor (tbl): APP2 [%]
EngUnitsFilt
EngUnitsRaw
APP2
ADC
Non-Linear Sensor (tbl): TPS1 [%]
EngUnitsFilt
EngUnitsRaw
TPS1
ADC
Non-Linear Sensor (tbl): TPS2 [%]
EngUnitsFilt
EngUnitsRaw
TPS2
double
APP1
double
Terminator2
double
APP2
double
Terminator3
double
TPS1
double
Terminator
double
TPS2
double
Terminator1
PotSensors
1
SensorBus



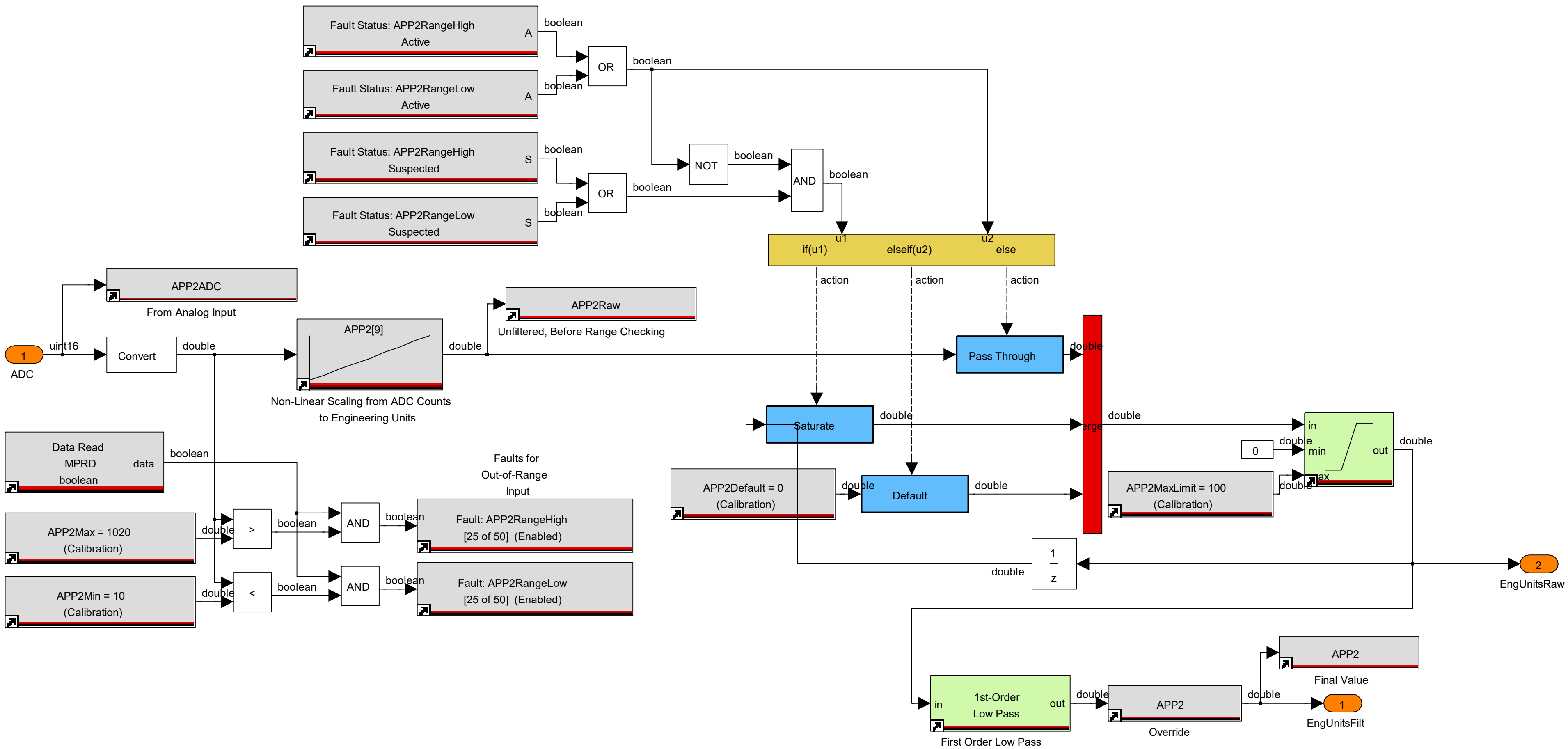
Fault Status: APP1RangeHigh Active
Fault Status: APP1RangeLow Active
Fault Status: APP1RangeHigh Suspected
Fault Status: APP1RangeLow Suspected
A
S
boolean
OR
NOT
AND
if(u1)
elseif(u2)
else
u1
u2
action
APP1ADC
From Analog Input
1
ADC
uint16
Convert
double
APP1[9]
Non-Linear Scaling from ADC Counts to Engineering Units
APP1Raw
Unfiltered, Before Range Checking
Pass Through
Saturate
Default
Merge
Data Read MPRD boolean
data
APP1Max = 1020 (Calibration)
APP1Min = 10 (Calibration)
>
<
Faults for Out-of-Range Input
Fault: APP1RangeHigh [25 of 50] (Enabled)
Fault: APP1RangeLow [25 of 50] (Enabled)
APP1Default = 0 (Calibration)
APP1MaxLimit = 100 (Calibration)
0
in
min
max
out
1
z
2
EngUnitsRaw
1st-Order Low Pass
First Order Low Pass
APP1
Override
APP1
Final Value
1
EngUnitsFilt

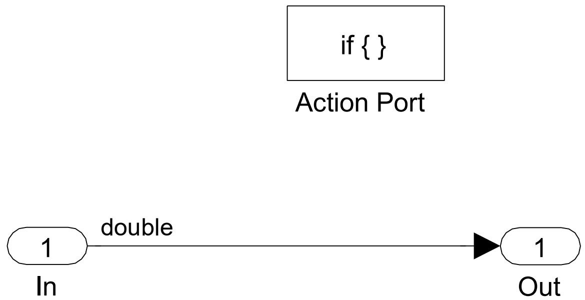

if { }
Action Port
double
1
In
1
Out


elseif { }
Action Port
double
1
In
1
Out

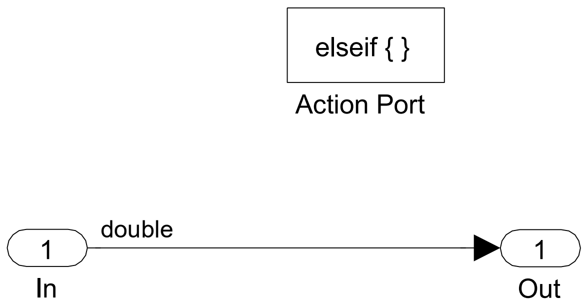


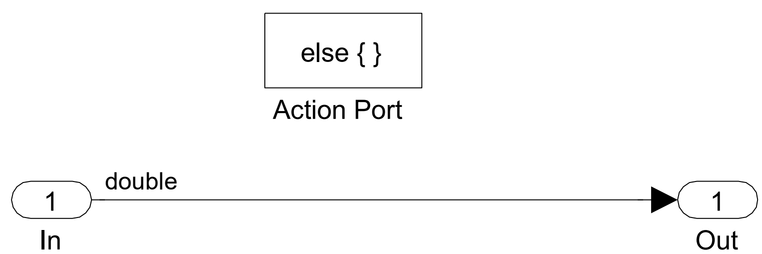
else { }
Action Port
double
1
In
1
Out

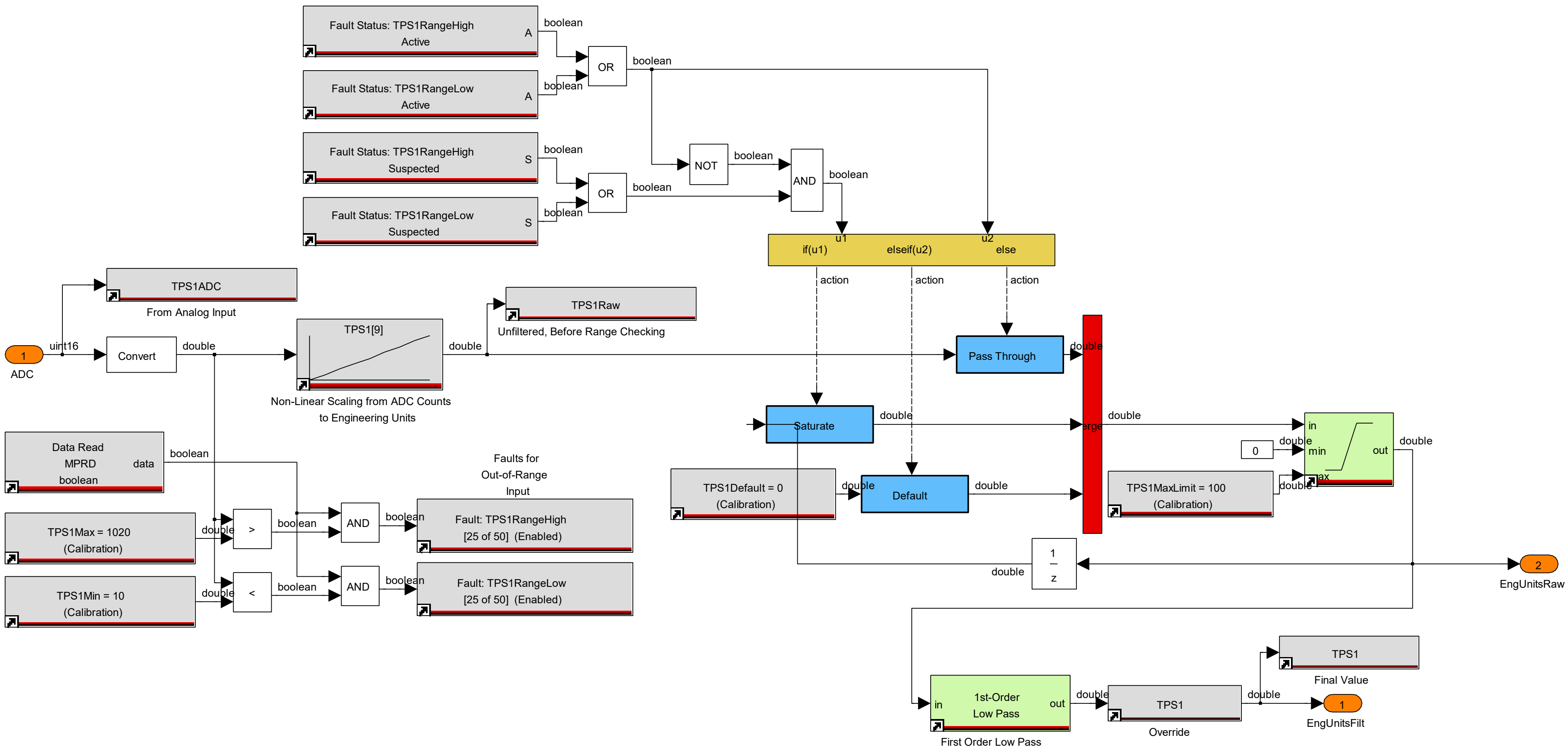

Fault Status: APP2RangeHigh Active
Fault Status: APP2RangeLow Active
Fault Status: APP2RangeHigh Suspected
Fault Status: APP2RangeLow Suspected
A
S
boolean
OR
NOT
AND
if(u1)
elseif(u2)
else
u1
u2
action
APP2ADC
From Analog Input
ADC
uint16
Convert
double
APP2[9]
Non-Linear Scaling from ADC Counts to Engineering Units
APP2Raw
Unfiltered, Before Range Checking
Pass Through
Saturate
Default
APP2Default = 0 (Calibration)
APP2MaxLimit = 100 (Calibration)
Data Read MPRD boolean
data
APP2Max = 1020 (Calibration)
APP2Min = 10 (Calibration)
>
<
Faults for Out-of-Range Input
Fault: APP2RangeHigh [25 of 50] (Enabled)
Fault: APP2RangeLow [25 of 50] (Enabled)
in
min
max
out
0
1
z
EngUnitsRaw
2
1st-Order Low Pass
First Order Low Pass
APP2
Override
APP2
Final Value
EngUnitsFilt



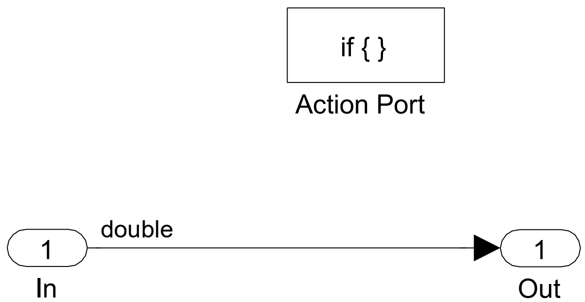
if { }
Action Port
double
1
In
1
Out

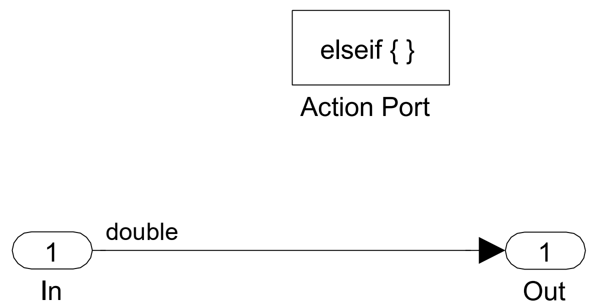

elseif { }
Action Port
double
1
In
1
Out


else { }
Action Port
double
1
In
1
Out

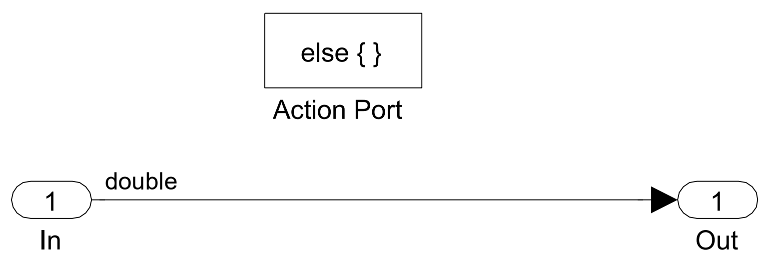


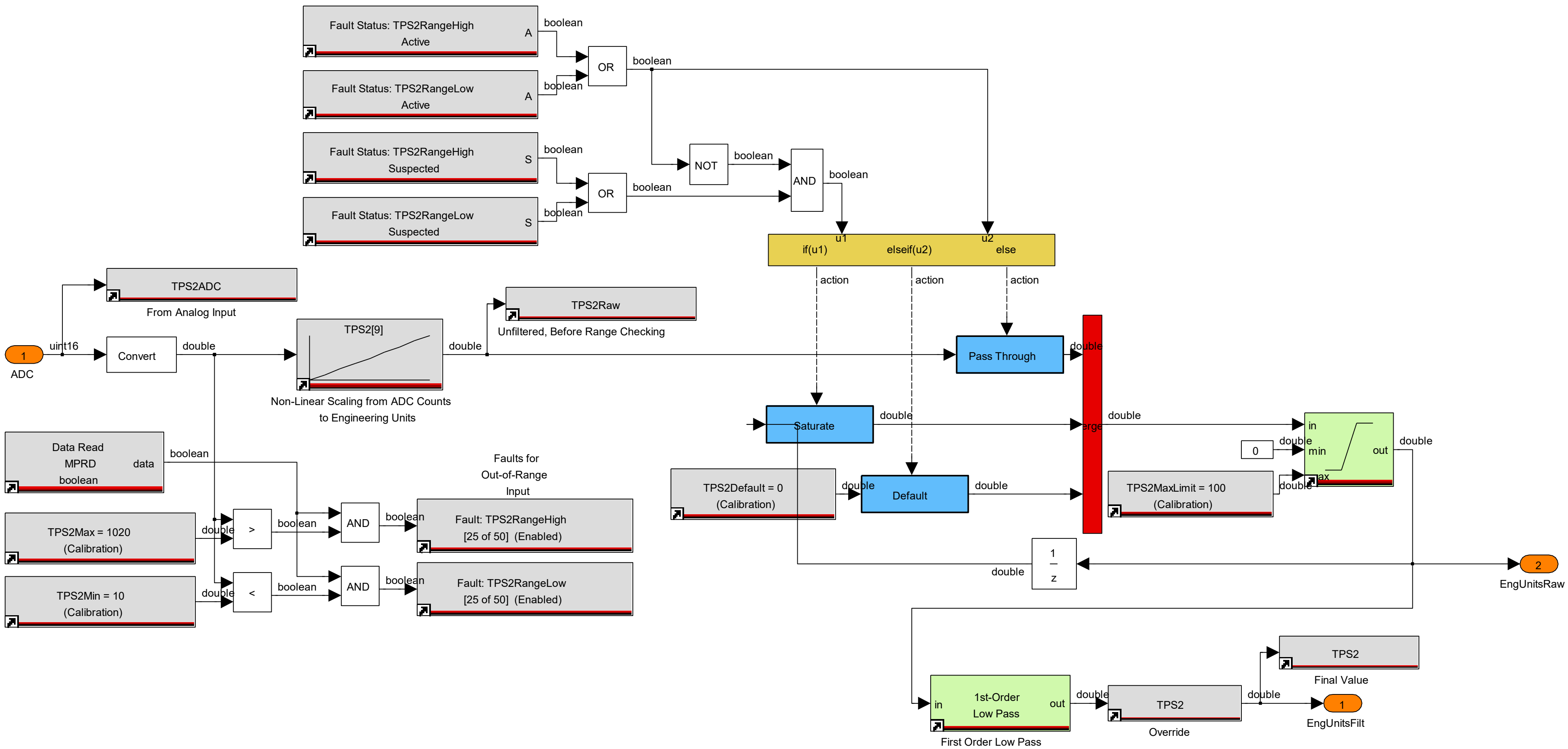
Fault Status: TPS1RangeHigh Active
Fault Status: TPS1RangeLow Active
Fault Status: TPS1RangeHigh Suspected
Fault Status: TPS1RangeLow Suspected
A
S
OR
NOT
AND
boolean
if(u1)
elseif(u2)
else
u1
u2
action
TPS1ADC
From Analog Input
1
ADC
uint16
Convert
double
TPS1[9]
Non-Linear Scaling from ADC Counts to Engineering Units
TPS1Raw
Unfiltered, Before Range Checking
Pass Through
Saturate
Default
TPS1Default = 0 (Calibration)
TPS1MaxLimit = 100 (Calibration)
Data Read MPRD boolean
data
TPS1Max = 1020 (Calibration)
TPS1Min = 10 (Calibration)
Faults for Out-of-Range Input
Fault: TPS1RangeHigh [25 of 50] (Enabled)
Fault: TPS1RangeLow [25 of 50] (Enabled)
in
min
out
0
1
z
2
EngUnitsRaw
1st-Order Low Pass
First Order Low Pass
TPS1
Override
TPS1
Final Value
1
EngUnitsFilt


if { }
Action Port
1
double
1
In
Out

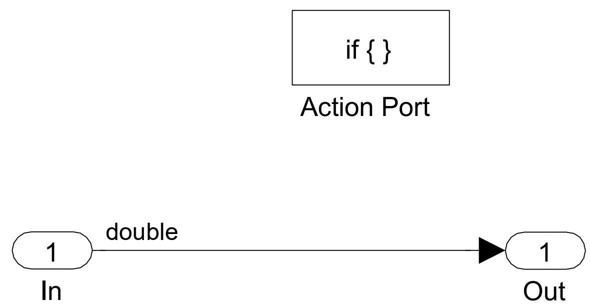


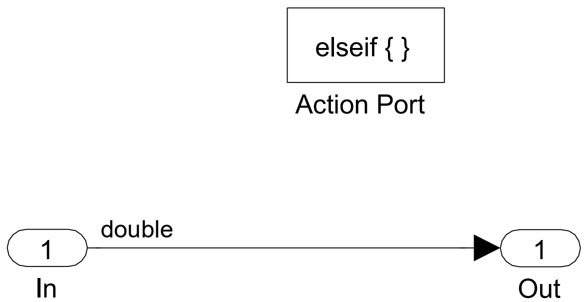
elseif { }
Action Port
double
1
In
1
Out

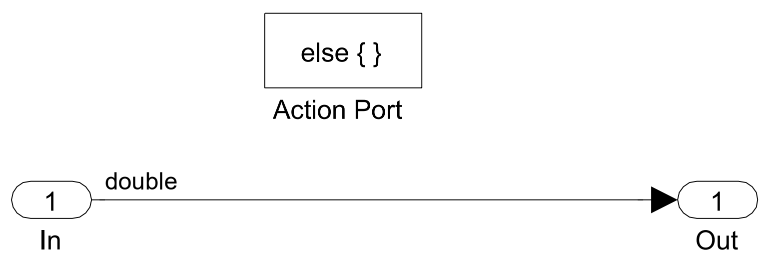

else { }
Action Port
double
1
In
1
Out

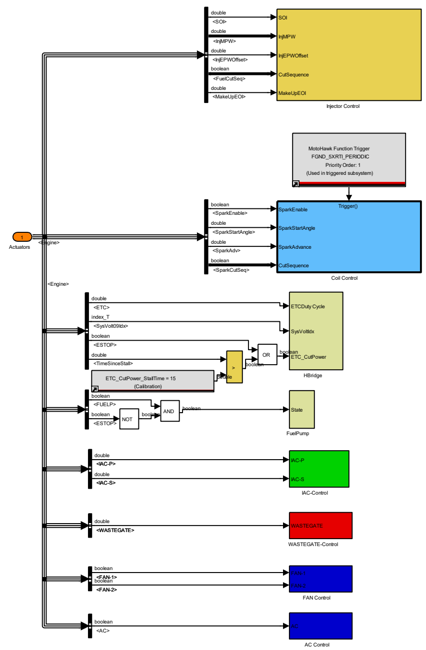


Fault Status: TPS2RangeHigh
Active
Fault Status: TPS2RangeLow
Active
Fault Status: TPS2RangeHigh
Suspected
Fault Status: TPS2RangeLow
Suspected
A
S
boolean
OR
NOT
AND
if(u1)
elseif(u2)
else
u1
u2
action
TPS2ADC
From Analog Input
ADC
uint16
Convert
double
TPS2[9]
Non-Linear Scaling from ADC Counts
to Engineering Units
TPS2Raw
Unfiltered, Before Range Checking
Pass Through
Saturate
Default
TPS2Default = 0
(Calibration)
TPS2MaxLimit = 100
(Calibration)
Data Read
MPRD
data
TPS2Max = 1020
(Calibration)
TPS2Min = 10
(Calibration)
Faults for
Out-of-Range
Input
Fault: TPS2RangeHigh
[25 of 50] (Enabled)
Fault: TPS2RangeLow
[25 of 50] (Enabled)
in
min
max
out
0
1
z
2
EngUnitsRaw
1st-Order
Low Pass
First Order Low Pass
TPS2
Override
Final Value
EngUnitsFilt

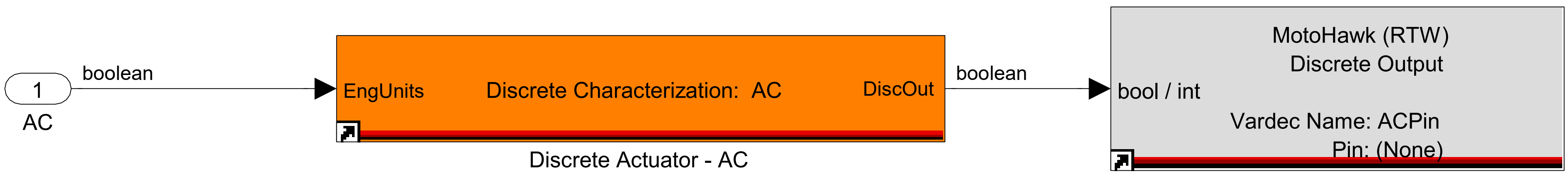

if { }
Action Port
1
In
double
1
Out


elseif { }
Action Port
double
1
In
1
Out

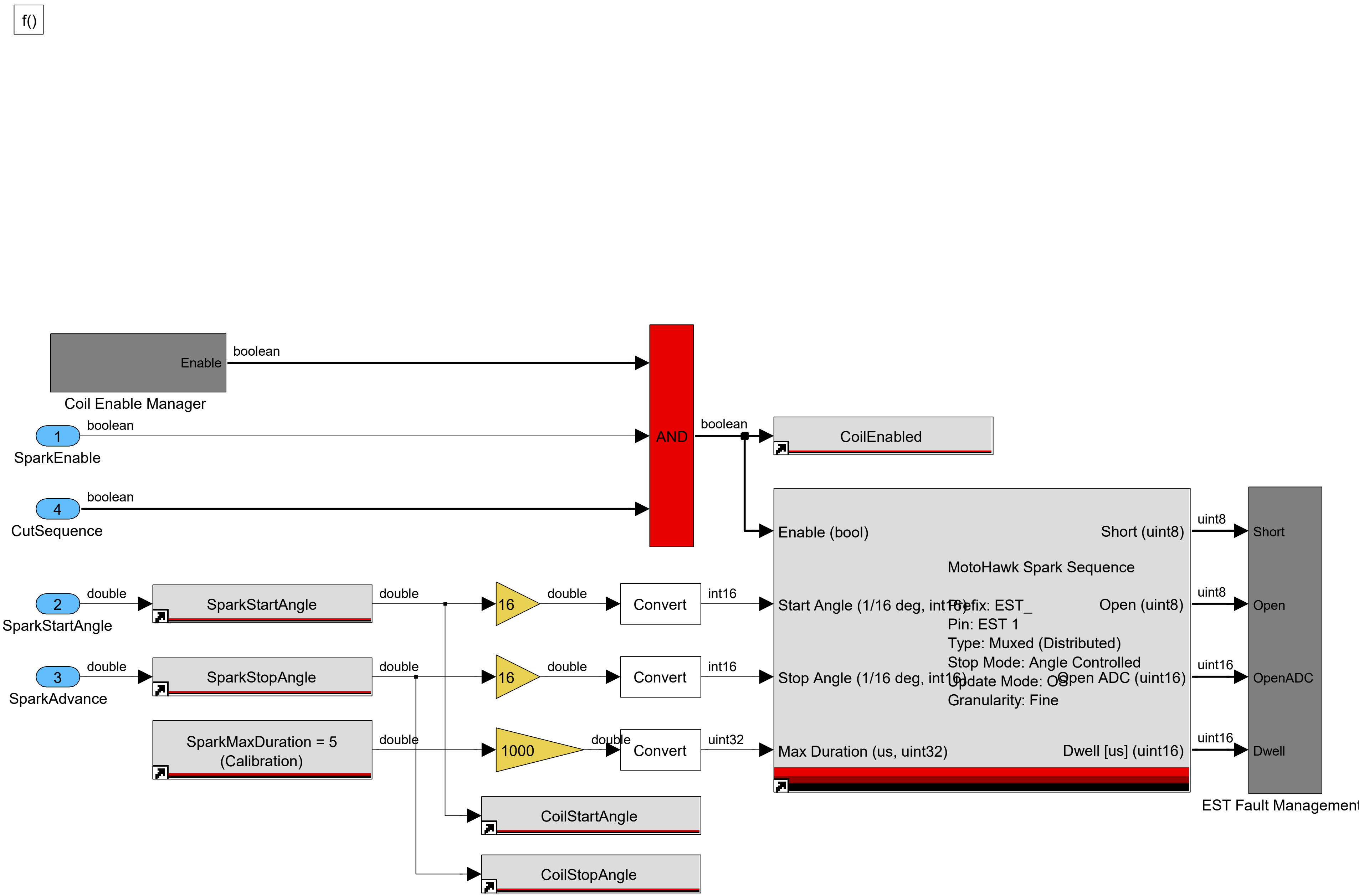

else { }
Action Port
double
1
In
1
Out

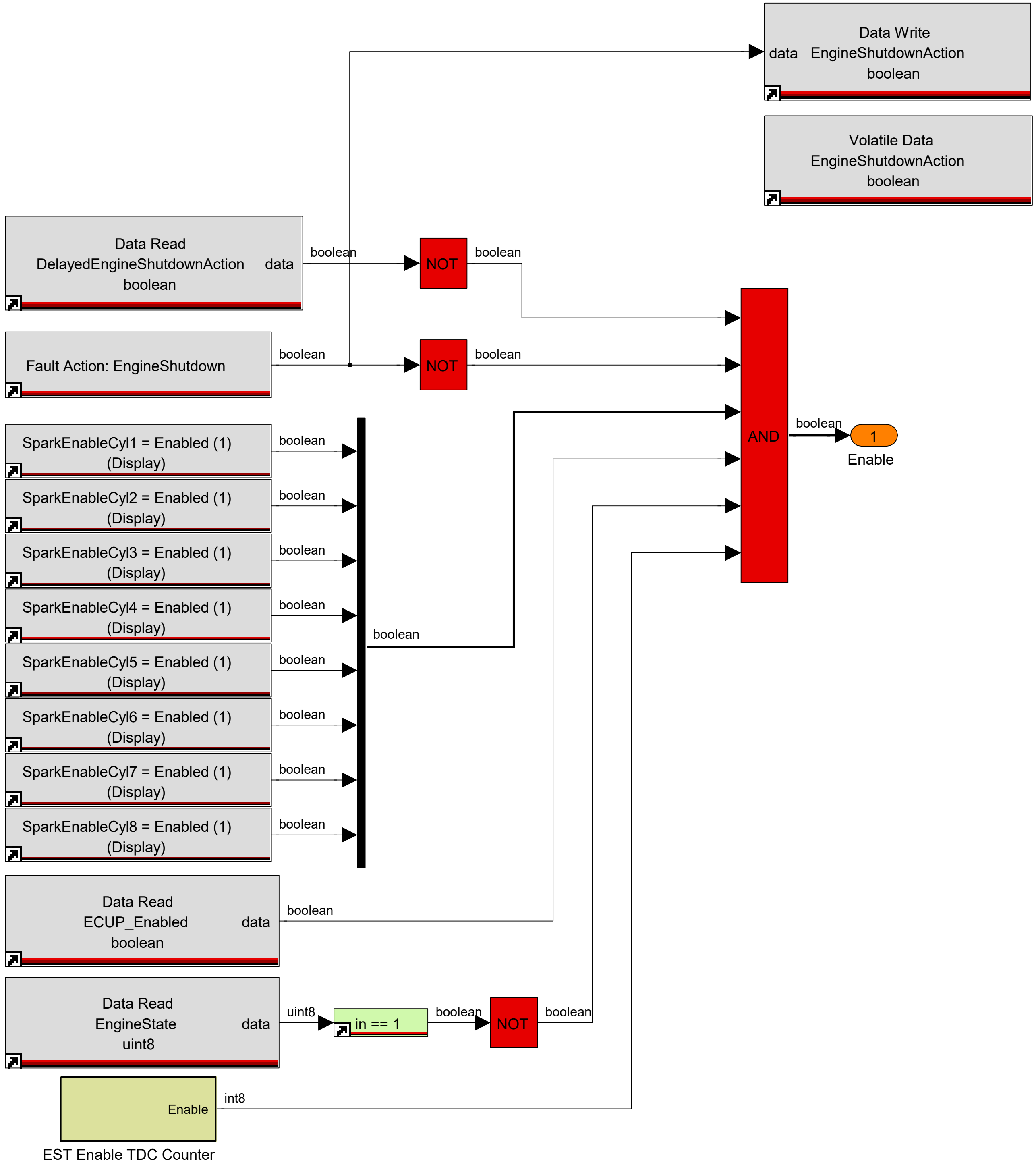


double
<SOI>
double
<InjMPW>
double
<InjEPWOffset>
boolean
<FuelCutSeq>
double
<MakeUpEOI>
SOI
InjMPW
InjEPWOffset
CutSequence
MakeUpEOI
Injector Control
MotoHawk Function Trigger
FGND_5XRTI_PERIODIC
Priority Order: 1
(Used in triggered subsystem)
Trigger()
boolean
<SparkEnable>
double
<SparkStartAngle>
double
<SparkAdv>
boolean
<SparkCutSeq>
SparkEnable
SparkStartAngle
SparkAdvance
CutSequence
Coil Control
1
Actuators
<Engine>
<Engine>
double
<ETC>
index_T
<SysVolt09Idx>
boolean
<ESTOP>
double
<TimeSinceStall>
ETC_CutPower_StallTime = 15
(Calibration)
double
>
boolean
OR
boolean
ETCDuty Cycle
SysVoltIdx
ETC_CutPower
HBridge
boolean
<FUELP>
boolean
<ESTOP>
NOT
boolean
AND
boolean
State
FuelPump
double
<IAC-P>
double
<IAC-S>
IAC-P
IAC-S
IAC-Control
double
<WASTEGATE>
WASTEGATE
WASTEGATE-Control
boolean
<FAN-1>
boolean
<FAN-2>
FAN-1
FAN-2
FAN Control
boolean
<AC>
AC
AC Control

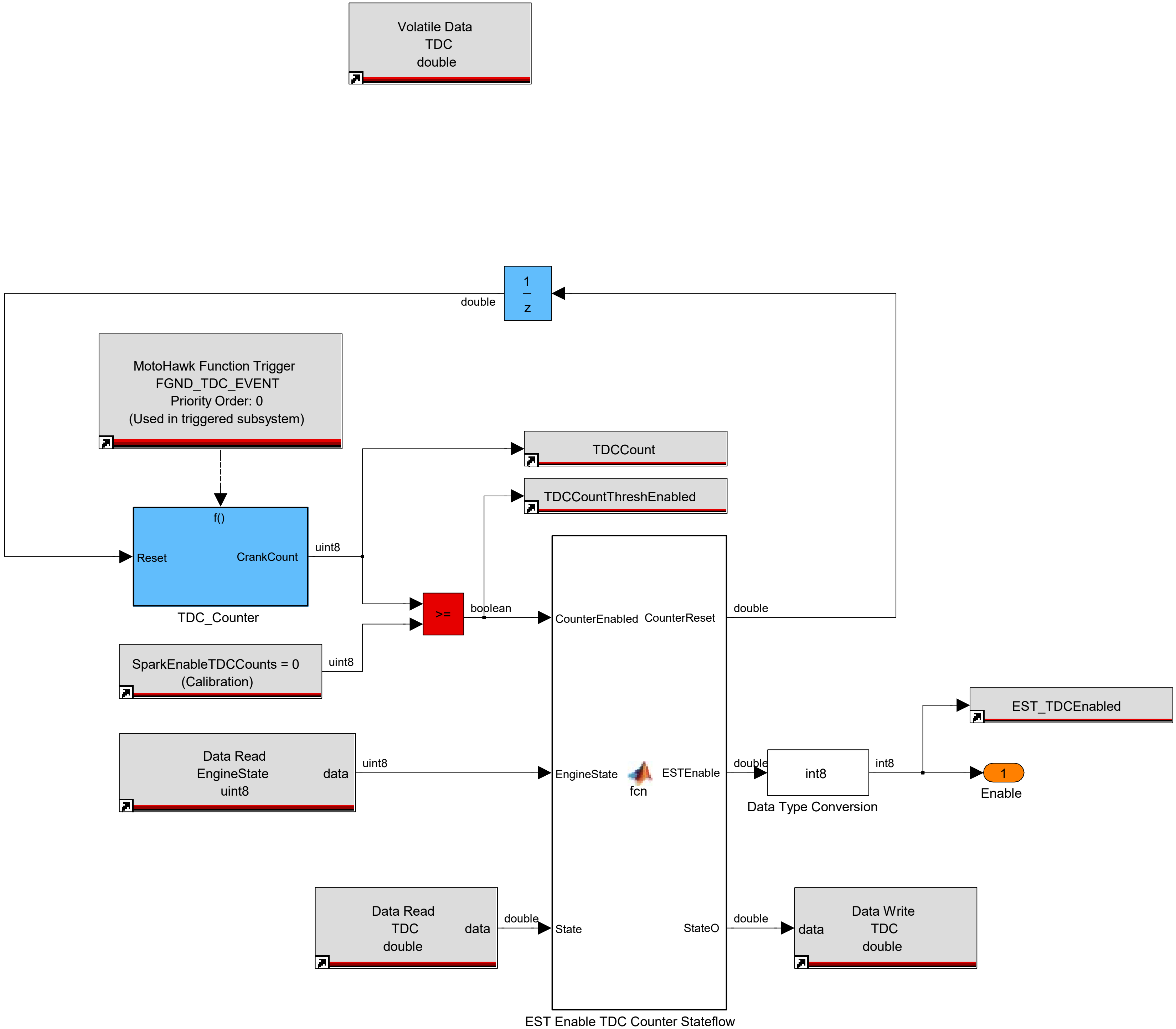


1
AC
boolean
EngUnits
Discrete Characterization: AC
DiscOut
Discrete Actuator - AC
boolean
MotoHawk (RTW)
Discrete Output
bool / int
Vardec Name: ACPin
Pin: (None)

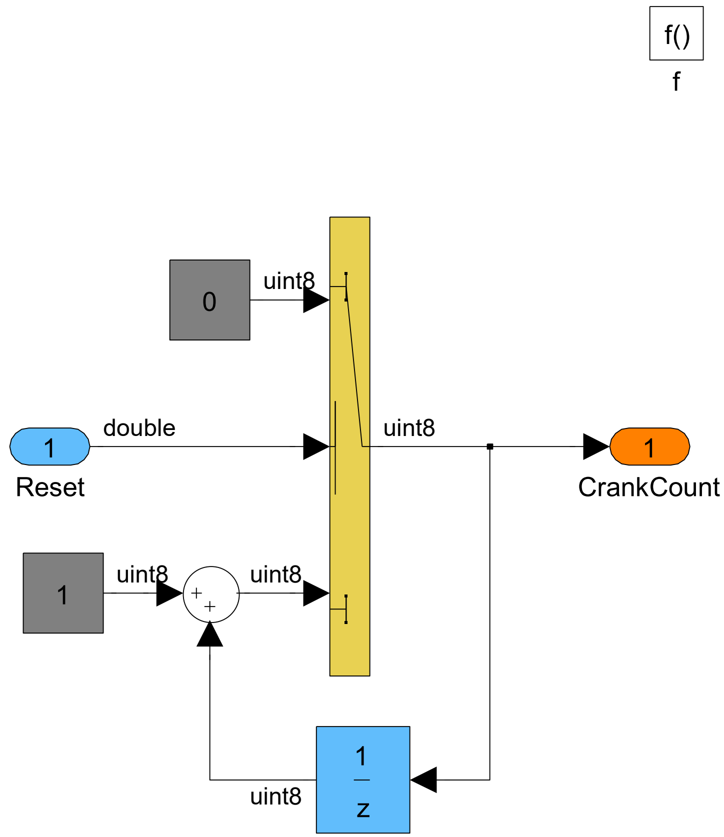

f()
Enable
Coil Enable Manager
boolean
1
SparkEnable
boolean
4
CutSequence
boolean
AND
boolean
CoilEnabled
Enable (bool)
Short (uint8)
MotoHawk Spark Sequence
Start Angle (1/16 deg, int16)
Prefix: EST_
Pin: EST 1
Type: Muxed (Distributed)
Stop Mode: Angle Controlled
Update Mode: OS
Granularity: Fine
Open (uint8)
Stop Angle (1/16 deg, int16)
Open ADC (uint16)
Max Duration (us, uint32)
Dwell [us] (uint16)
uint8
uint8
uint16
uint16
Short
Open
OpenADC
Dwell
EST Fault Management
2
SparkStartAngle
double
SparkStartAngle
double
16
double
Convert
int16
3
SparkAdvance
double
SparkStopAngle
double
16
double
Convert
int16
SparkMaxDuration = 5
(Calibration)
double
1000
double
Convert
uint32
CoilStartAngle
CoilStopAngle



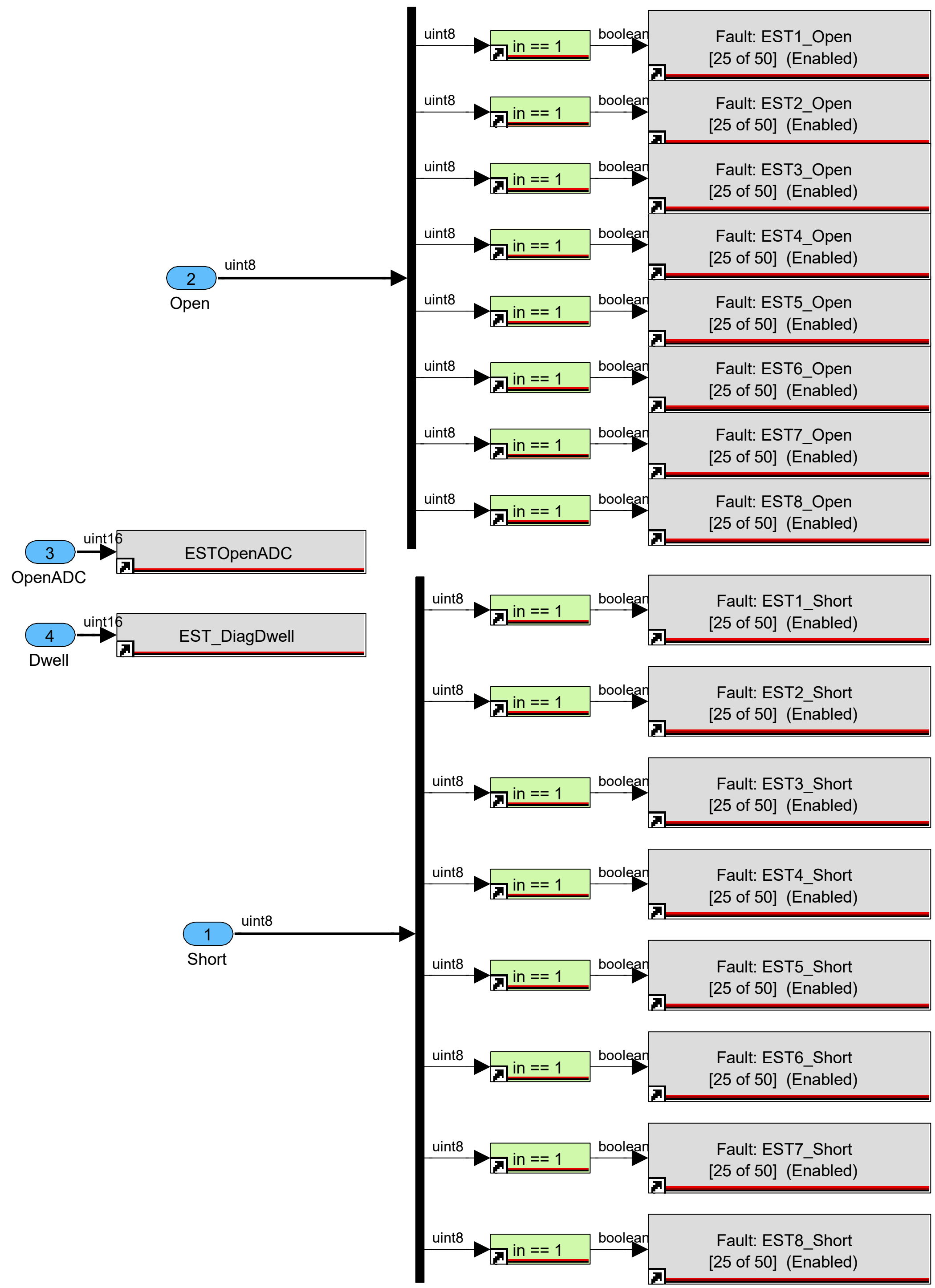
Data Write
data EngineShutdownAction
boolean
Volatile Data
EngineShutdownAction
boolean
Data Read
DelayedEngineShutdownAction data
boolean
boolean
NOT
boolean
Fault Action: EngineShutdown
boolean
NOT
boolean
AND
boolean
1
Enable
SparkEnableCyl1 = Enabled (1)
(Display)
boolean
SparkEnableCyl2 = Enabled (1)
(Display)
boolean
SparkEnableCyl3 = Enabled (1)
(Display)
boolean
SparkEnableCyl4 = Enabled (1)
(Display)
boolean
SparkEnableCyl5 = Enabled (1)
(Display)
boolean
SparkEnableCyl6 = Enabled (1)
(Display)
boolean
SparkEnableCyl7 = Enabled (1)
(Display)
boolean
SparkEnableCyl8 = Enabled (1)
(Display)
boolean
boolean
Data Read
ECUP_Enabled data
boolean
boolean
Data Read
EngineState data
uint8
uint8
in == 1
boolean
NOT
boolean
Enable
int8
EST Enable TDC Counter



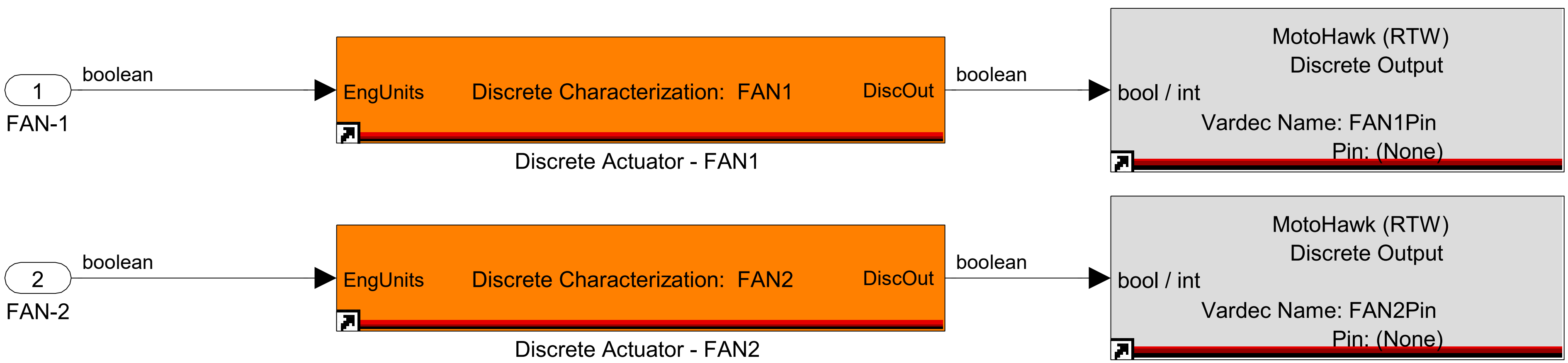
Volatile Data
TDC
double
1
z
double
MotoHawk Function Trigger
FGND_TDC_EVENT
Priority Order: 0
(Used in triggered subsystem)
TDCCount
TDCCountThreshEnabled
f()
Reset
CrankCount
uint8
TDC_Counter
>=
boolean
CounterEnabled
CounterReset
double
SparkEnableTDCCounts = 0
(Calibration)
uint8
EST_TDCEnabled
Data Read
EngineState
uint8
data
uint8
EngineState
fcn
ESTEnable
double
int8
int8
Data Type Conversion
1
Enable
Data Read
TDC
double
data
double
State
StateO
double
Data Write
data
TDC
double
EST Enable TDC Counter Stateflow

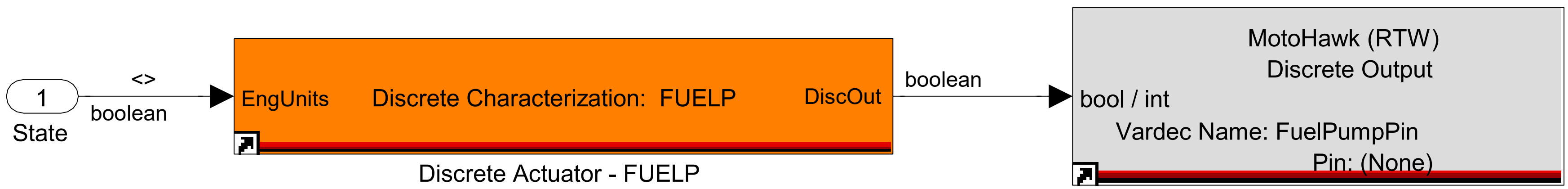


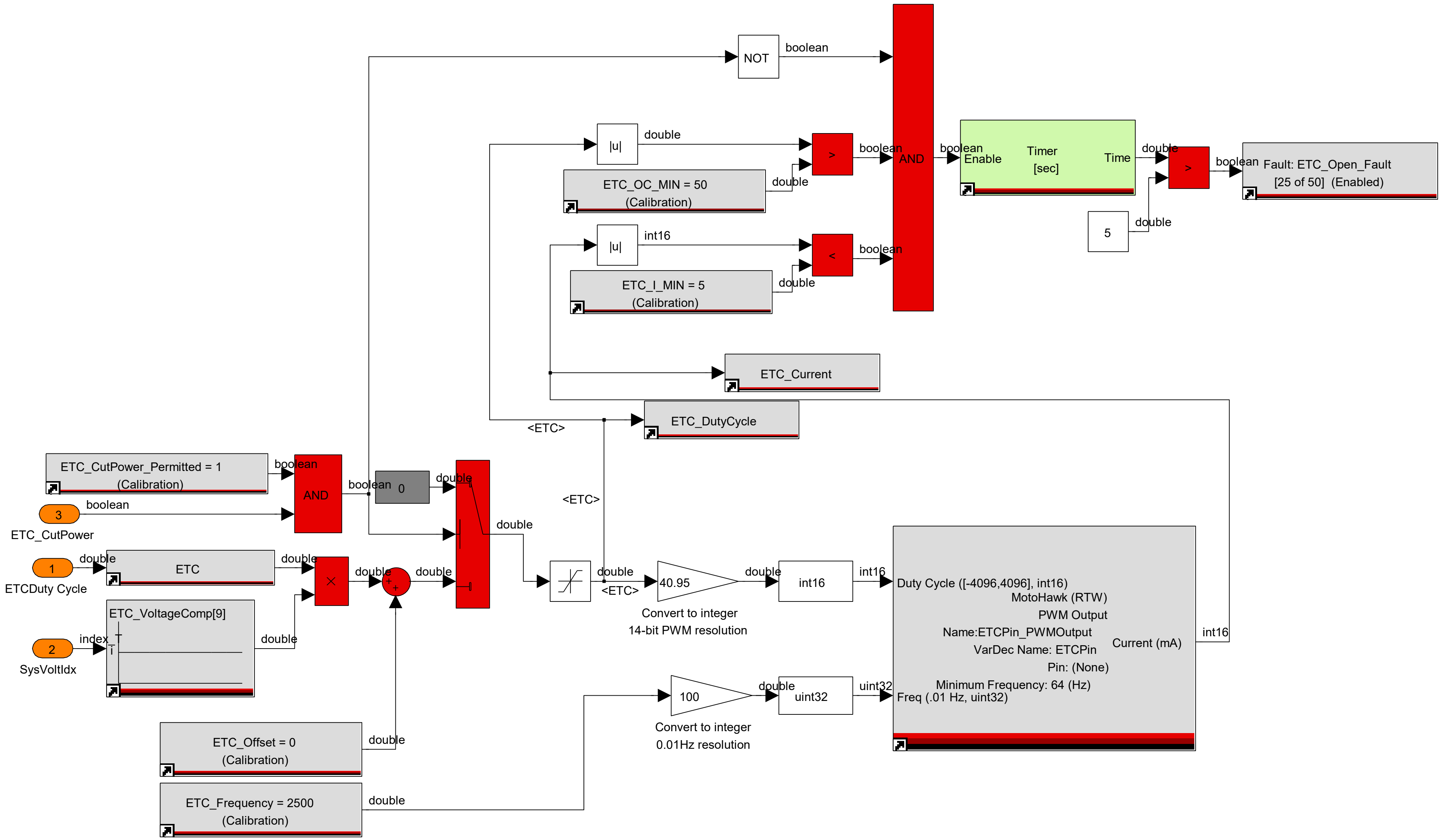
f()
f
0
uint8
1
Reset
double
uint8
1
CrankCount
1
uint8
uint8
1
z
uint8

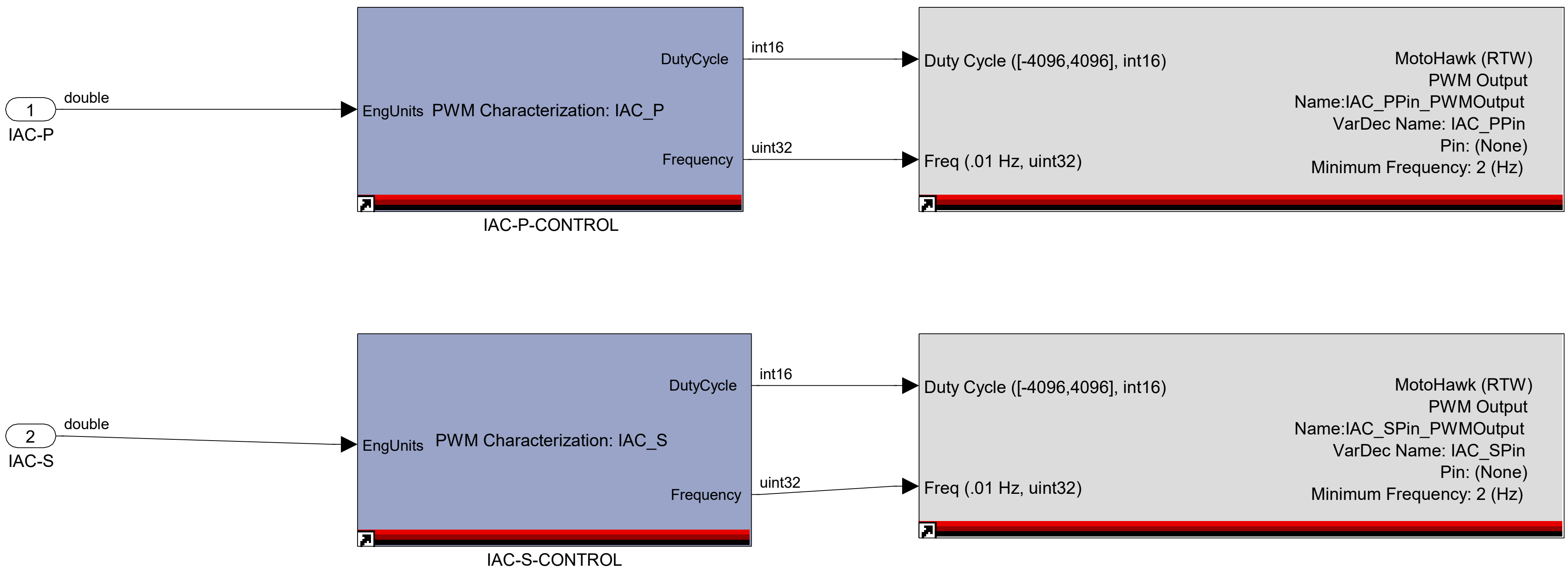


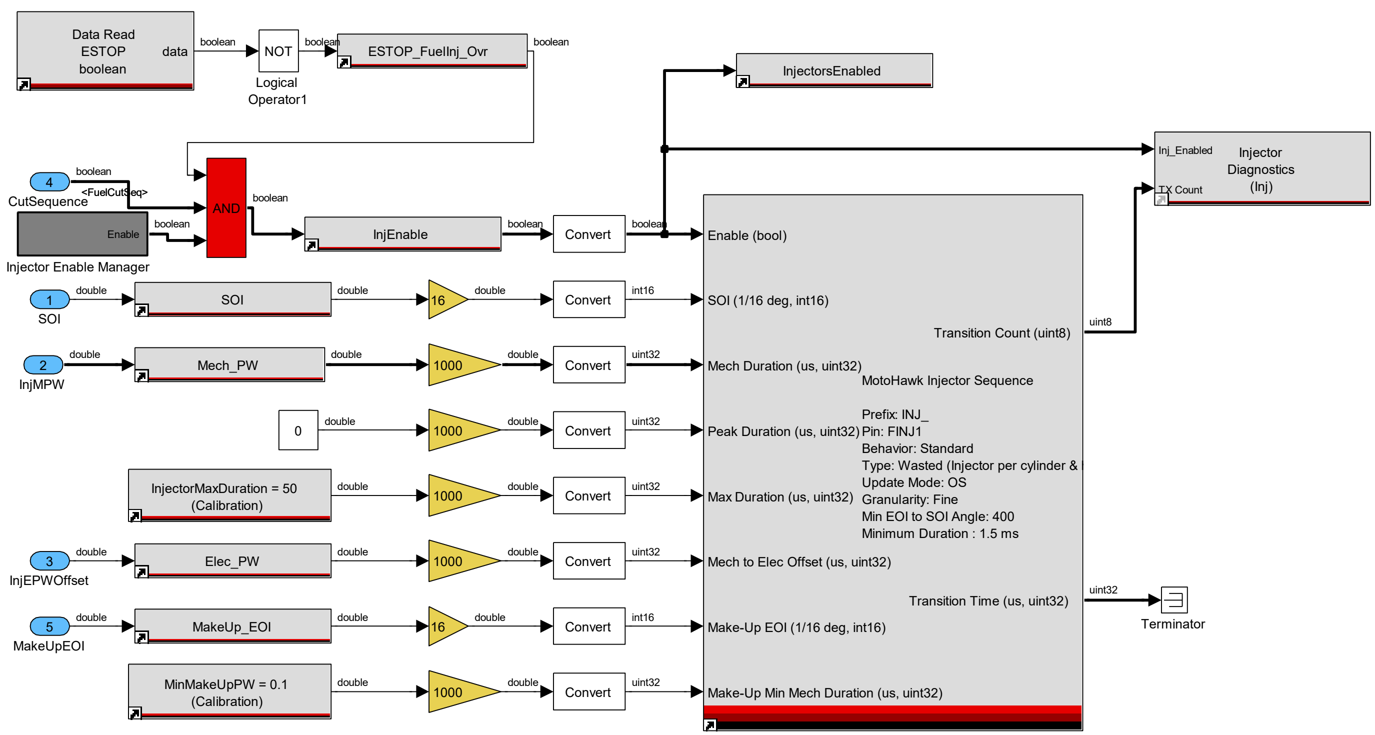
2
Open
uint8
3
OpenADC
uint16
ESTOpenADC
4
Dwell
uint16
EST_DiagDwell
1
Short
uint8
uint8
in == 1
boolean
Fault: EST1_Open
[25 of 50] (Enabled)
Fault: EST2_Open
[25 of 50] (Enabled)
Fault: EST3_Open
[25 of 50] (Enabled)
Fault: EST4_Open
[25 of 50] (Enabled)
Fault: EST5_Open
[25 of 50] (Enabled)
Fault: EST6_Open
[25 of 50] (Enabled)
Fault: EST7_Open
[25 of 50] (Enabled)
Fault: EST8_Open
[25 of 50] (Enabled)
Fault: EST1_Short
[25 of 50] (Enabled)
Fault: EST2_Short
[25 of 50] (Enabled)
Fault: EST3_Short
[25 of 50] (Enabled)
Fault: EST4_Short
[25 of 50] (Enabled)
Fault: EST5_Short
[25 of 50] (Enabled)
Fault: EST6_Short
[25 of 50] (Enabled)
Fault: EST7_Short
[25 of 50] (Enabled)
Fault: EST8_Short
[25 of 50] (Enabled)


1
FAN-1
boolean
EngUnits
Discrete Characterization: FAN1
DiscOut
Discrete Actuator - FAN1
boolean
MotoHawk (RTW)
Discrete Output
bool / int
Vardec Name: FAN1Pin
Pin: (None)
2
FAN-2
boolean
EngUnits
Discrete Characterization: FAN2
DiscOut
Discrete Actuator - FAN2
boolean
MotoHawk (RTW)
Discrete Output
bool / int
Vardec Name: FAN2Pin
Pin: (None)

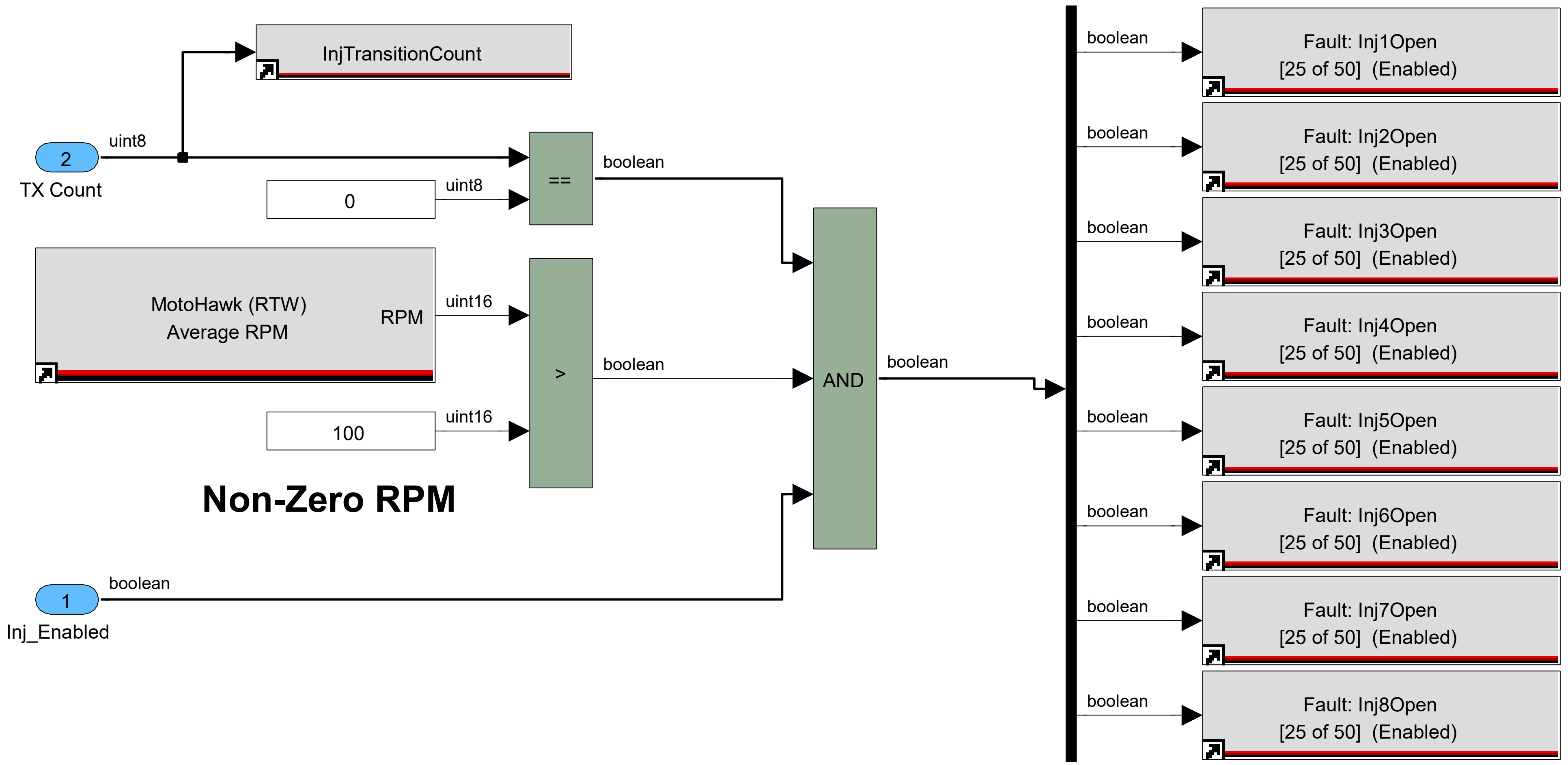

1
State
<>
boolean
EngUnits
Discrete Characterization: FUELP
DiscOut
Discrete Actuator - FUELP
boolean
MotoHawk (RTW)
Discrete Output
bool / int
Vardec Name: FuelPumpPin
Pin: (None)

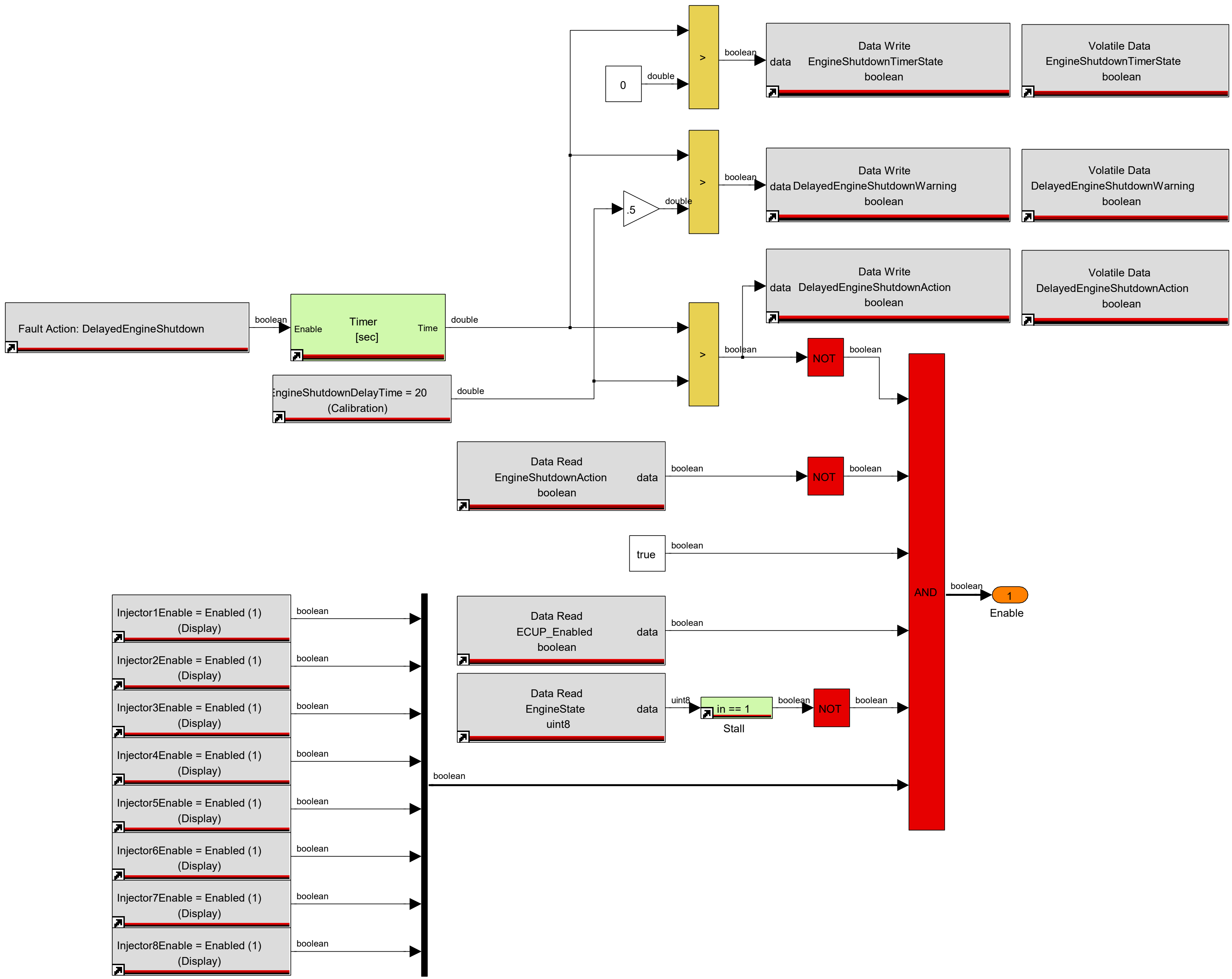

NOT
boolean
|u|
double
ETC_OC_MIN = 50
(Calibration)
int16
ETC_I_MIN = 5
(Calibration)
AND
Enable
Timer
[sec]
Time
5
Fault: ETC_Open_Fault
[25 of 50] (Enabled)
ETC_Current
ETC_DutyCycle
<ETC>
ETC_CutPower_Permitted = 1
(Calibration)
3
ETC_CutPower
1
ETCDuty Cycle
ETC
2
SysVoltIdx
ETC_VoltageComp[9]
index
0
40.95
Convert to integer
14-bit PWM resolution
int16
Duty Cycle ([-4096,4096], int16)
MotoHawk (RTW)
PWM Output
Name:ETCPin_PWMOutput
VarDec Name: ETCPin
Pin: (None)
Minimum Frequency: 64 (Hz)
Freq (.01 Hz, uint32)
Current (mA)
100
uint32
Convert to integer
0.01Hz resolution
ETC_Offset = 0
(Calibration)
ETC_Frequency = 2500
(Calibration)


1
double
IAC-P
EngUnits
PWM Characterization: IAC_P
DutyCycle
Frequency
IAC-P-CONTROL
int16
uint32
Duty Cycle ([-4096,4096], int16)
Freq (.01 Hz, uint32)
MotoHawk (RTW)
PWM Output
Name:IAC_PPin_PWMOutput
VarDec Name: IAC_PPin
Pin: (None)
Minimum Frequency: 2 (Hz)
2
double
IAC-S
EngUnits
PWM Characterization: IAC_S
DutyCycle
Frequency
IAC-S-CONTROL
int16
uint32
Duty Cycle ([-4096,4096], int16)
Freq (.01 Hz, uint32)
MotoHawk (RTW)
PWM Output
Name:IAC_SPin_PWMOutput
VarDec Name: IAC_SPin
Pin: (None)
Minimum Frequency: 2 (Hz)

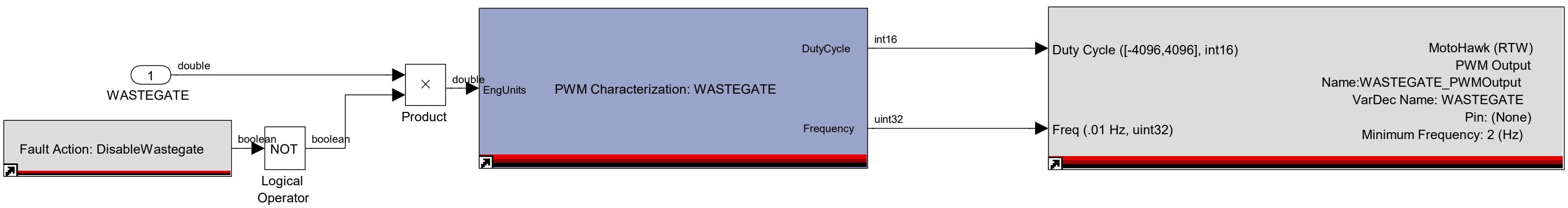

Data Read
ESTOP
boolean
data
boolean
NOT
Logical
Operator1
boolean
ESTOP_FuelInj_Ovr
boolean
InjectorsEnabled
Injector
Diagnostics
(Inj)
Inj_Enabled
TX Count
4
CutSequence
boolean
<FuelCutSeq>
Enable
Injector Enable Manager
boolean
AND
boolean
InjEnable
boolean
Convert
boolean
Enable (bool)
1
SOI
double
SOI
double
16
double
Convert
int16
SOI (1/16 deg, int16)
Transition Count (uint8)
uint8
2
InjMPW
double
Mech_PW
double
1000
double
Convert
uint32
Mech Duration (us, uint32)
MotoHawk Injector Sequence
0
double
1000
double
Convert
uint32
Peak Duration (us, uint32)
Prefix: INJ_
Pin: FINJ1
Behavior: Standard
Type: Wasted (Injector per cylinder &
Update Mode: OS
Granularity: Fine
Min EOI to SOI Angle: 400
Minimum Duration : 1.5 ms
InjectorMaxDuration = 50
(Calibration)
double
1000
double
Convert
uint32
Max Duration (us, uint32)
3
InjEPWOffset
double
Elec_PW
double
1000
double
Convert
uint32
Mech to Elec Offset (us, uint32)
Transition Time (us, uint32)
uint32
Terminator
5
MakeUpEOI
double
MakeUp_EOI
double
16
double
Convert
int16
Make-Up EOI (1/16 deg, int16)
MinMakeUpPW = 0.1
(Calibration)
double
1000
double
Convert
uint32
Make-Up Min Mech Duration (us, uint32)

rrr


InjTransitionCount
uint8
2
TX Count
0
uint8
==
boolean
MotoHawk (RTW)
Average RPM
RPM
uint16
>
boolean
100
uint16
AND
boolean
Non-Zero RPM
1
boolean
Inj_Enabled
boolean
Fault: Inj1Open
[25 of 50] (Enabled)
boolean
Fault: Inj2Open
[25 of 50] (Enabled)
boolean
Fault: Inj3Open
[25 of 50] (Enabled)
boolean
Fault: Inj4Open
[25 of 50] (Enabled)
boolean
Fault: Inj5Open
[25 of 50] (Enabled)
boolean
Fault: Inj6Open
[25 of 50] (Enabled)
boolean
Fault: Inj7Open
[25 of 50] (Enabled)
boolean
Fault: Inj8Open
[25 of 50] (Enabled)

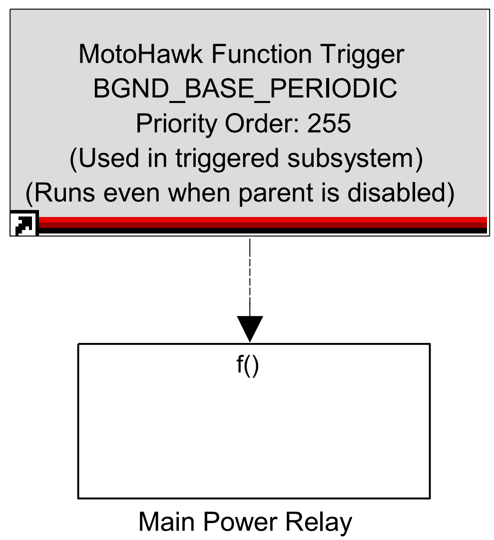


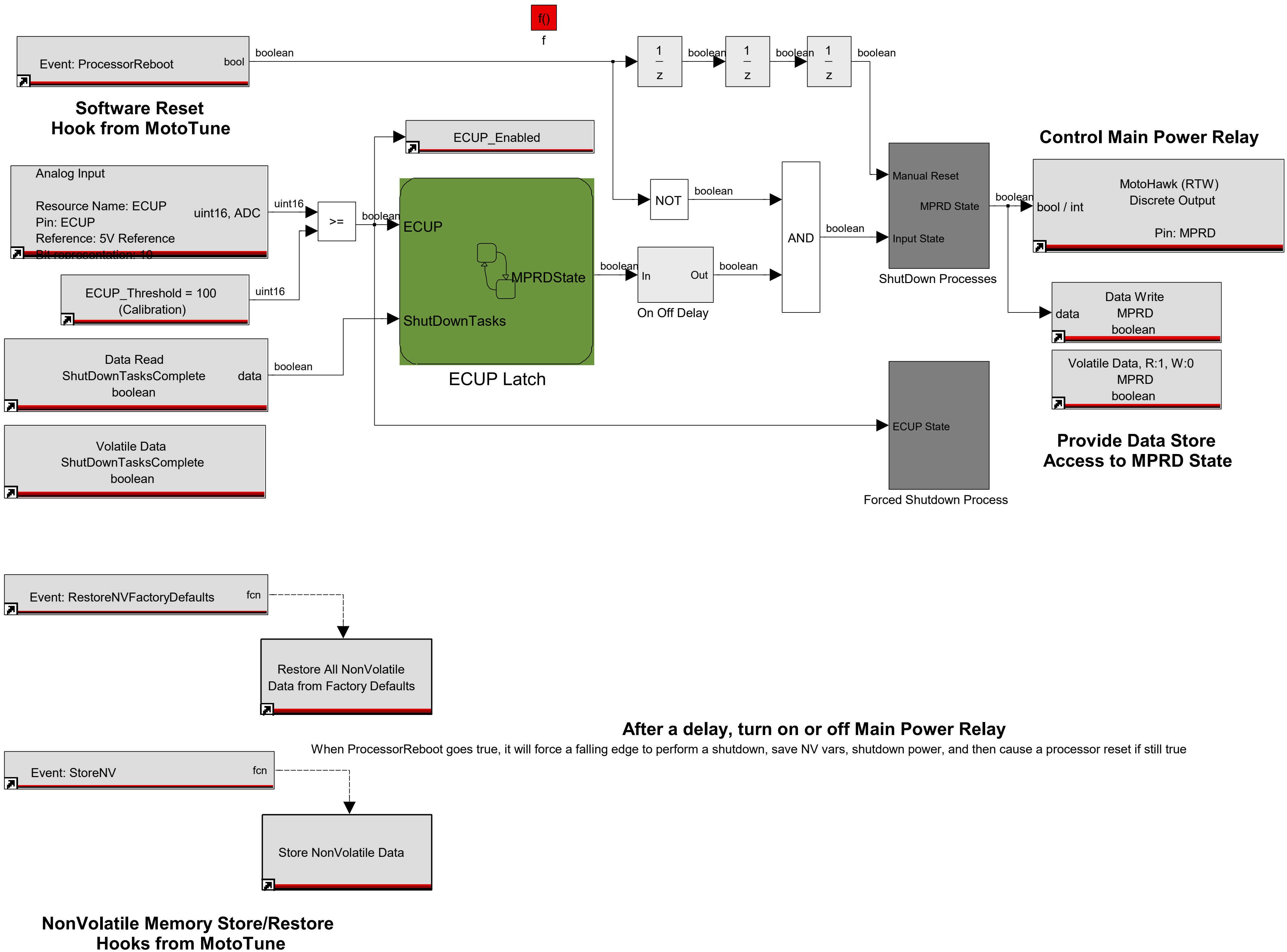
Data Write
data EngineShutdownTimerState
boolean
Volatile Data
EngineShutdownTimerState
boolean
0
double
boolean
>
Data Write
data DelayedEngineShutdownWarning
boolean
Volatile Data
DelayedEngineShutdownWarning
boolean
.5
Data Write
data DelayedEngineShutdownAction
boolean
Volatile Data
DelayedEngineShutdownAction
boolean
Fault Action: DelayedEngineShutdown
Timer
[sec]
Enable
Time
EngineShutdownDelayTime = 20
(Calibration)
NOT
Data Read
EngineShutdownAction
data
true
AND
1
Enable
Data Read
ECUP_Enabled
Data Read
EngineState
uint8
in == 1
Stall
Injector1Enable = Enabled (1)
(Display)
Injector2Enable = Enabled (1)
(Display)
Injector3Enable = Enabled (1)
(Display)
Injector4Enable = Enabled (1)
(Display)
Injector5Enable = Enabled (1)
(Display)
Injector6Enable = Enabled (1)
(Display)
Injector7Enable = Enabled (1)
(Display)
Injector8Enable = Enabled (1)
(Display)


1
WASTEGATE
double
Fault Action: DisableWastegate
boolean
NOT
Logical
Operator
boolean
×
Product
double
EngUnits
PWM Characterization: WASTEGATE
DutyCycle
Frequency
int16
uint32
Duty Cycle ([-4096,4096], int16)
Freq (.01 Hz, uint32)
MotoHawk (RTW)
PWM Output
Name:WASTEGATE_PWMOutput
VarDec Name: WASTEGATE
Pin: (None)
Minimum Frequency: 2 (Hz)

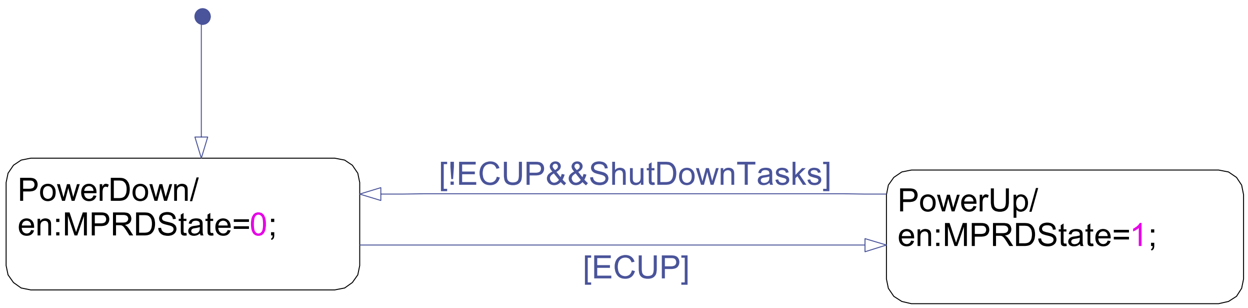
Always execute Main Power Relay control in the background.

The saving and restoring of non-volatile variables
must be called from a background priority task.

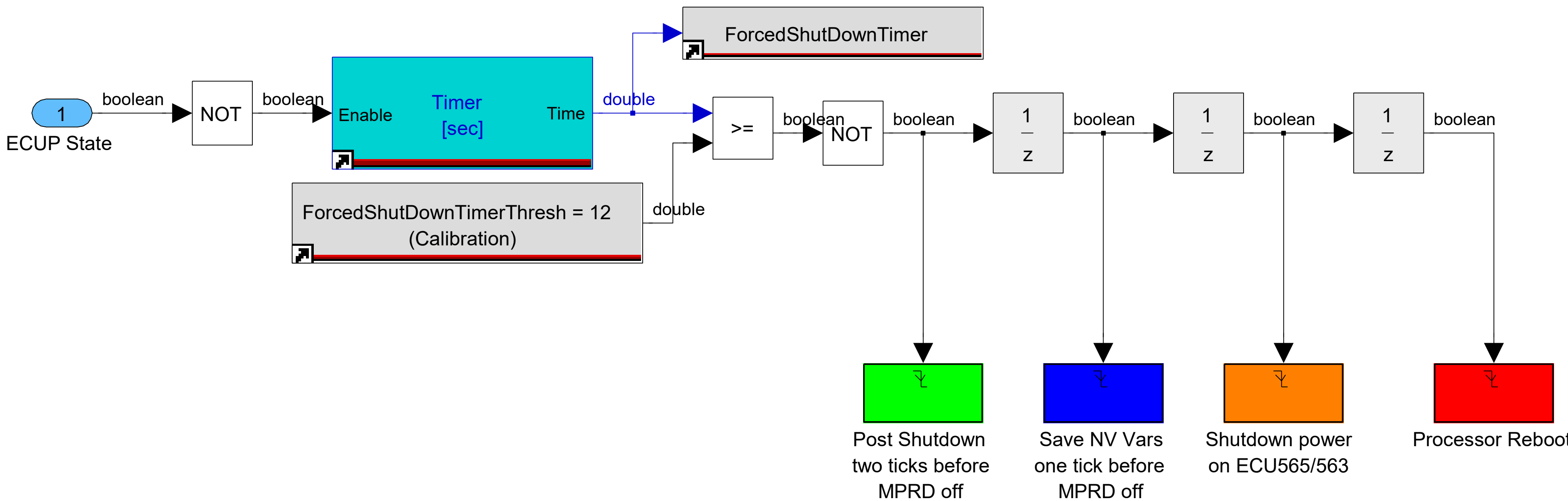


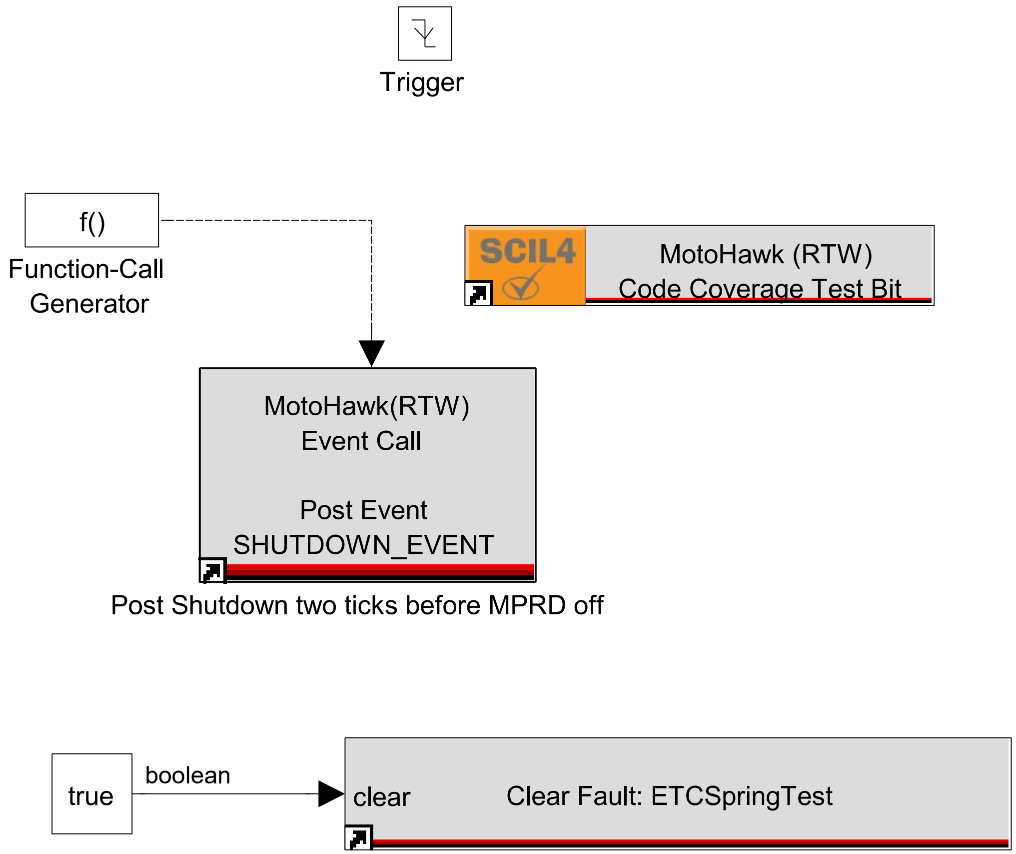


Event: ProcessorReboot
bool
boolean
Software Reset
Hook from MotoTune
f()
f
1
z
boolean
1
z
boolean
1
z
boolean
ECUP_Enabled
Analog Input
Resource Name: ECUP
Pin: ECUP
Reference: 5V Reference
Bit representation: 10
uint16, ADC
uint16
>=
boolean
ECUP
MPRDState
ShutDownTasks
ECUP Latch
ECUP_Threshold = 100
(Calibration)
uint16
Data Read
ShutDownTasksComplete
boolean
data
boolean
Volatile Data
ShutDownTasksComplete
boolean
NOT
boolean
boolean
In
Out
boolean
On Off Delay
AND
boolean
Manual Reset
MPRD State
Input State
ShutDown Processes
Control Main Power Relay
boolean
bool / int
MotoHawk (RTW)
Discrete Output
Pin: MPRD
Data Write
data
MPRD
boolean
Volatile Data, R:1, W:0
MPRD
boolean
Provide Data Store
Access to MPRD State
ECUP State
Forced Shutdown Process
Event: RestoreNVFactoryDefaults
fcn
Restore All NonVolatile
Data from Factory Defaults
After a delay, turn on or off Main Power Relay
When ProcessorReboot goes true, it will force a falling edge to perform a shutdown, save NV vars, shutdown power, and then cause a processor reset if still true
Event: StoreNV
fcn
Store NonVolatile Data
NonVolatile Memory Store/Restore
Hooks from MotoTune

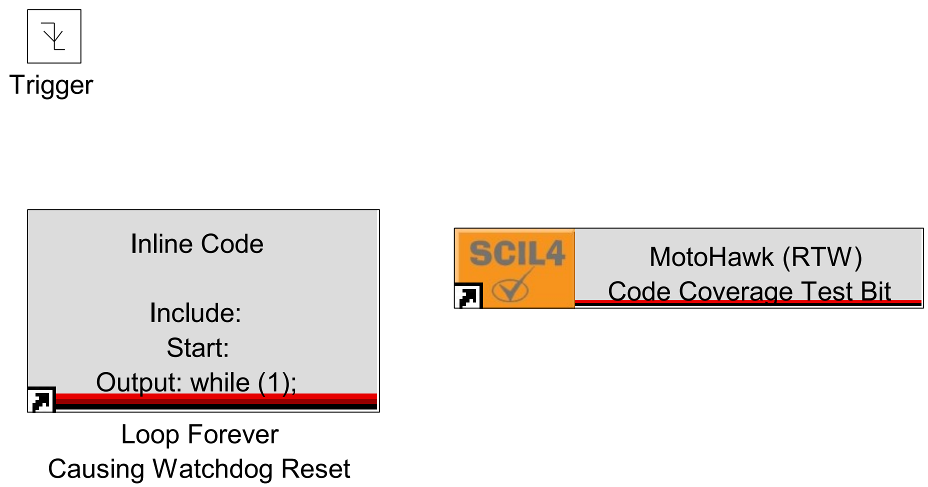


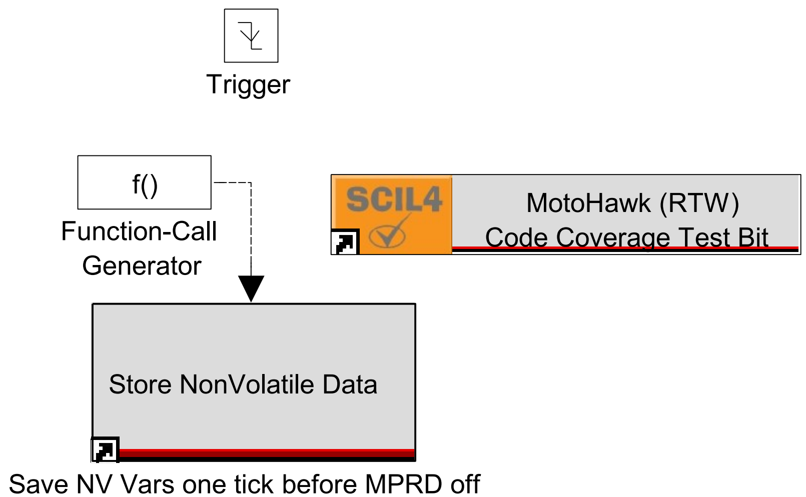
PowerDown/
en:MPRDState=0;
[!ECUP&&ShutDownTasks]
[ECUP]
PowerUp/
en:MPRDState=1;

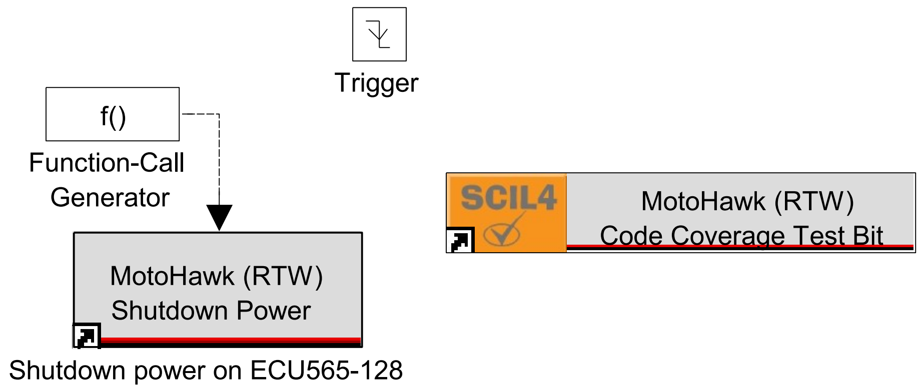

1
ECUP State
boolean
NOT
boolean
Enable
Timer
[sec]
Time
double
ForcedShutDownTimer
ForcedShutDownTimerThresh = 12
(Calibration)
double
>=
boolean
NOT
boolean
1
z
boolean
1
z
boolean
1
z
boolean
Post Shutdown
two ticks before
MPRD off
Save NV Vars
one tick before
MPRD off
Shutdown power
on ECU565/563
Processor Reboot



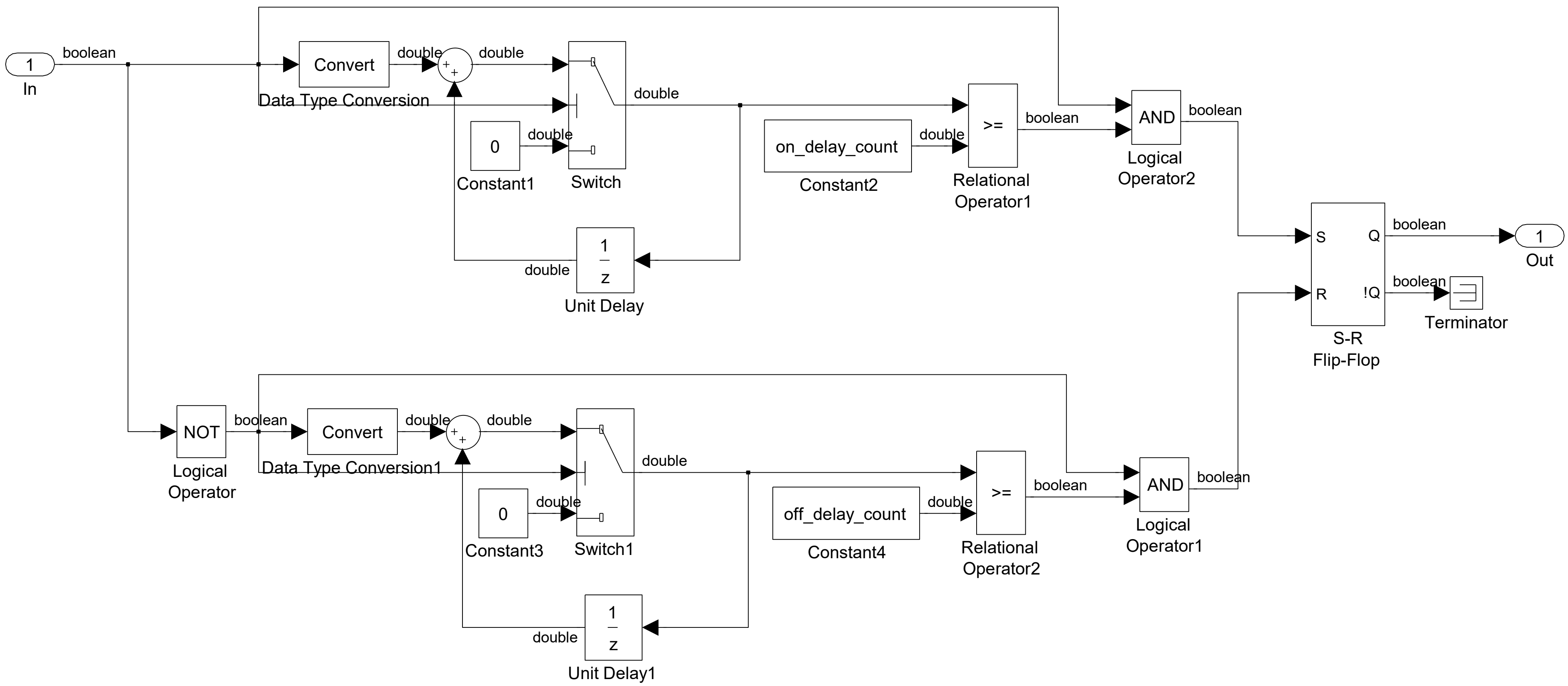
Trigger
f()
Function-Call
Generator
SCIL4
MotoHawk (RTW)
Code Coverage Test Bit
MotoHawk(RTW)
Event Call
Post Event
SHUTDOWN_EVENT
Post Shutdown two ticks before MPRD off
true
boolean
clear
Clear Fault: ETCSpringTest

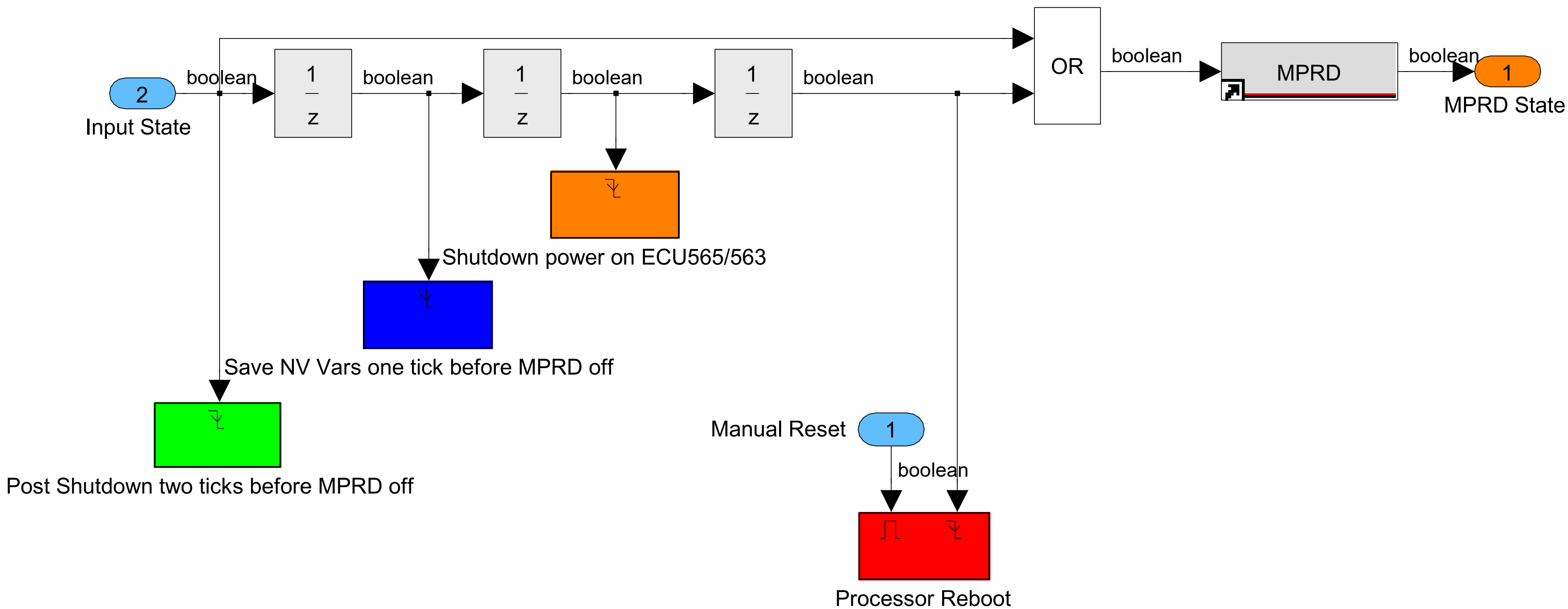

Trigger
Inline Code
Include:
Start:
Output: while (1);
Loop Forever
Causing Watchdog Reset
SCIL4
MotoHawk (RTW)
Code Coverage Test Bit


Trigger
f()
Function-Call
Generator
SCIL4
MotoHawk (RTW)
Code Coverage Test Bit
Store NonVolatile Data
Save NV Vars one tick before MPRD off

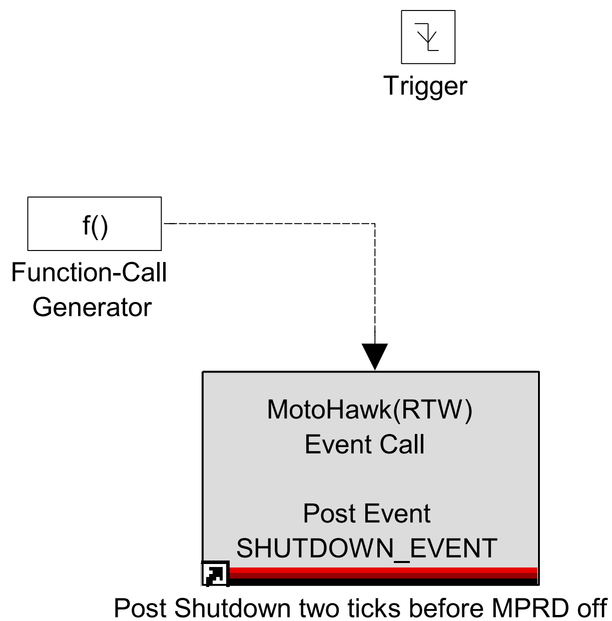

Trigger
f()
Function-Call
Generator
MotoHawk (RTW)
Shutdown Power
Shutdown power on ECU565-128
SCIL4
MotoHawk (RTW)
Code Coverage Test Bit

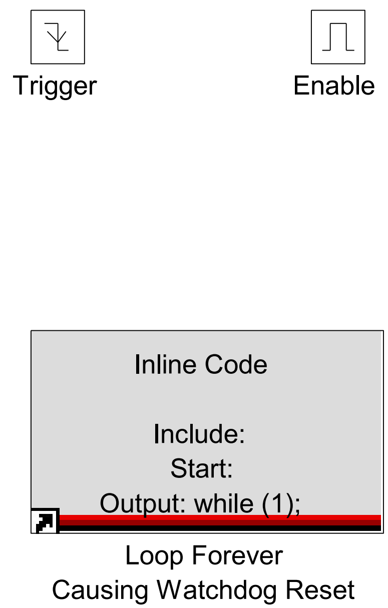
Delay the rising and falling of a boolean signal

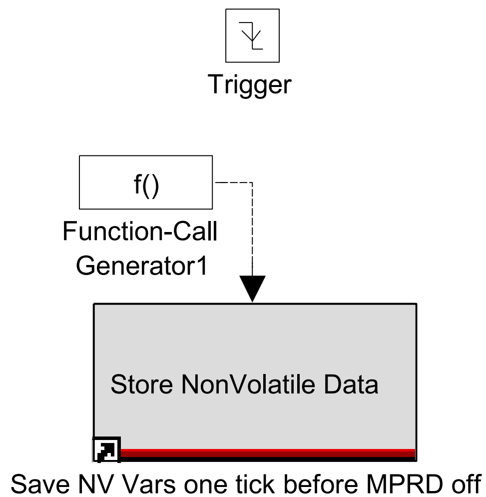


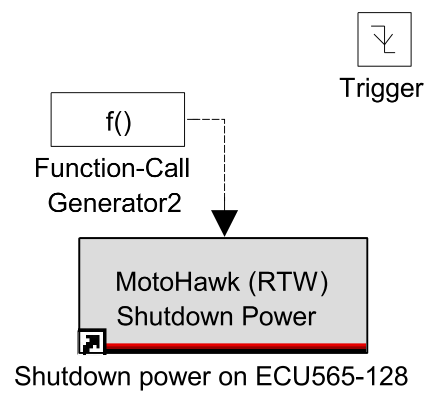


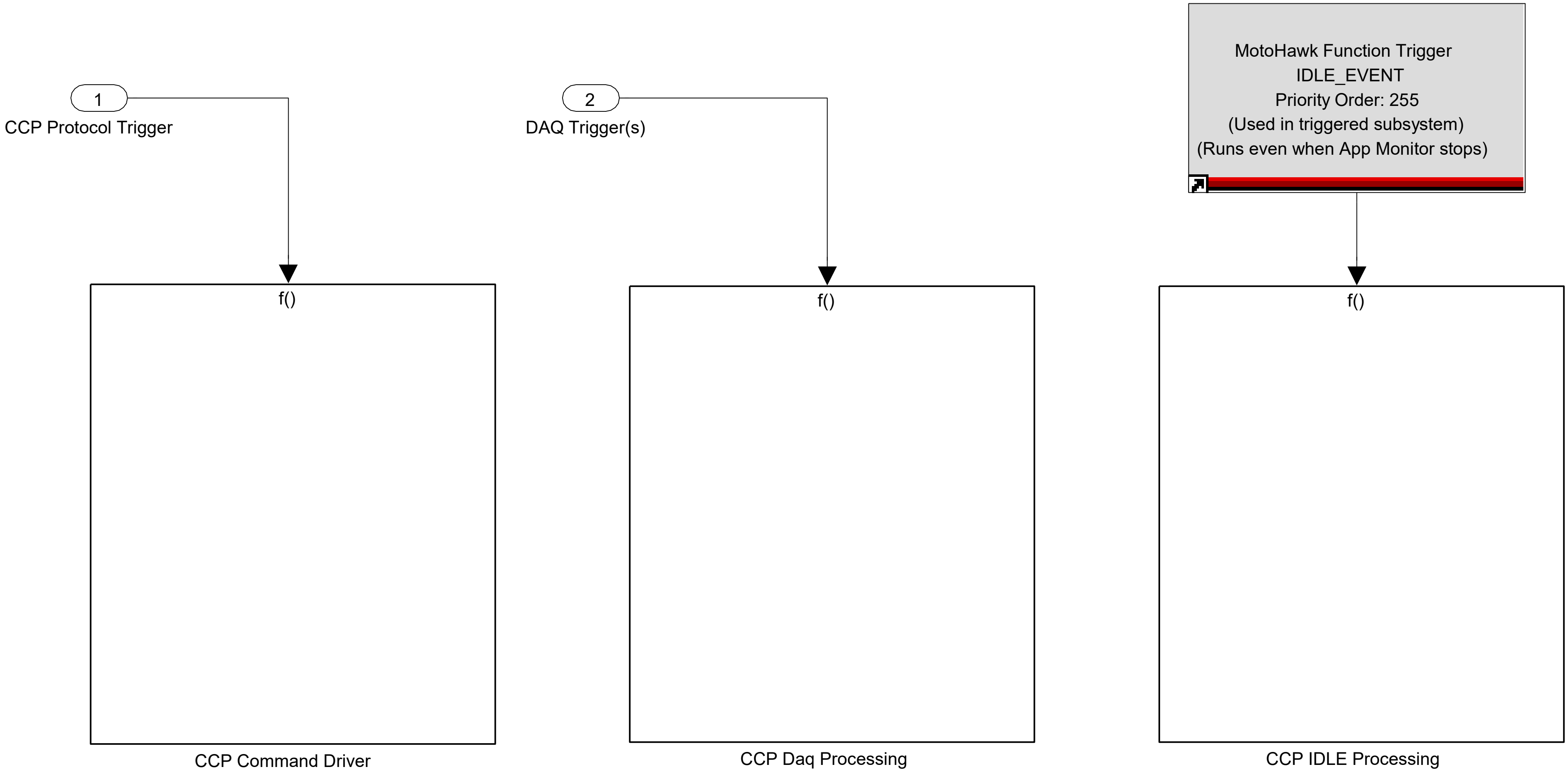
2
Input State
boolean
1
z
boolean
1
z
boolean
1
z
boolean
OR
boolean
MPRD
boolean
1
MPRD State
Shutdown power on ECU565/563
Save NV Vars one tick before MPRD off
Post Shutdown two ticks before MPRD off
Manual Reset
1
boolean
Processor Reboot


Trigger
f()
Function-Call
Generator
MotoHawk(RTW)
Event Call
Post Event
SHUTDOWN_EVENT
Post Shutdown two ticks before MPRD off


Trigger
Enable
Inline Code
Include:
Start:
Output: while (1);
Loop Forever
Causing Watchdog Reset


Trigger
f()
Function-Call
Generator1
Store NonVolatile Data
Save NV Vars one tick before MPRD off


Trigger
f()
Function-Call
Generator2
MotoHawk (RTW)
Shutdown Power
Shutdown power on ECU565-128



Reference:	Version:
Specification of ASAP CAN Calibration Protocol	***2.1 18.02.1999***
http://www.asam.net/doc_int/getfile/getfile.php?id=34&memberlogin=	
Section:	
6 Protocol definition	

SCIL4

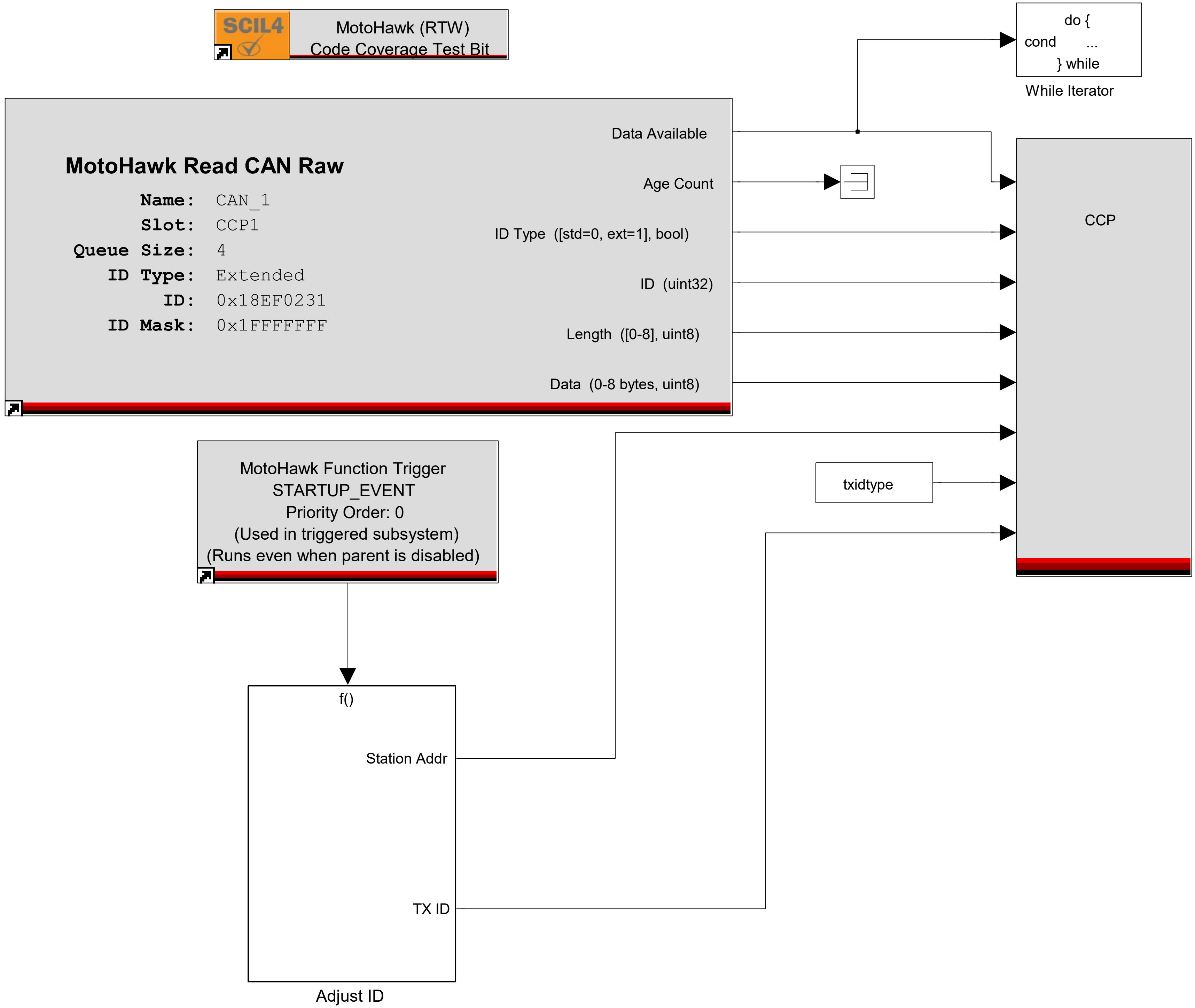
MotoHawk (RTW)
Code Coverage Test Bit

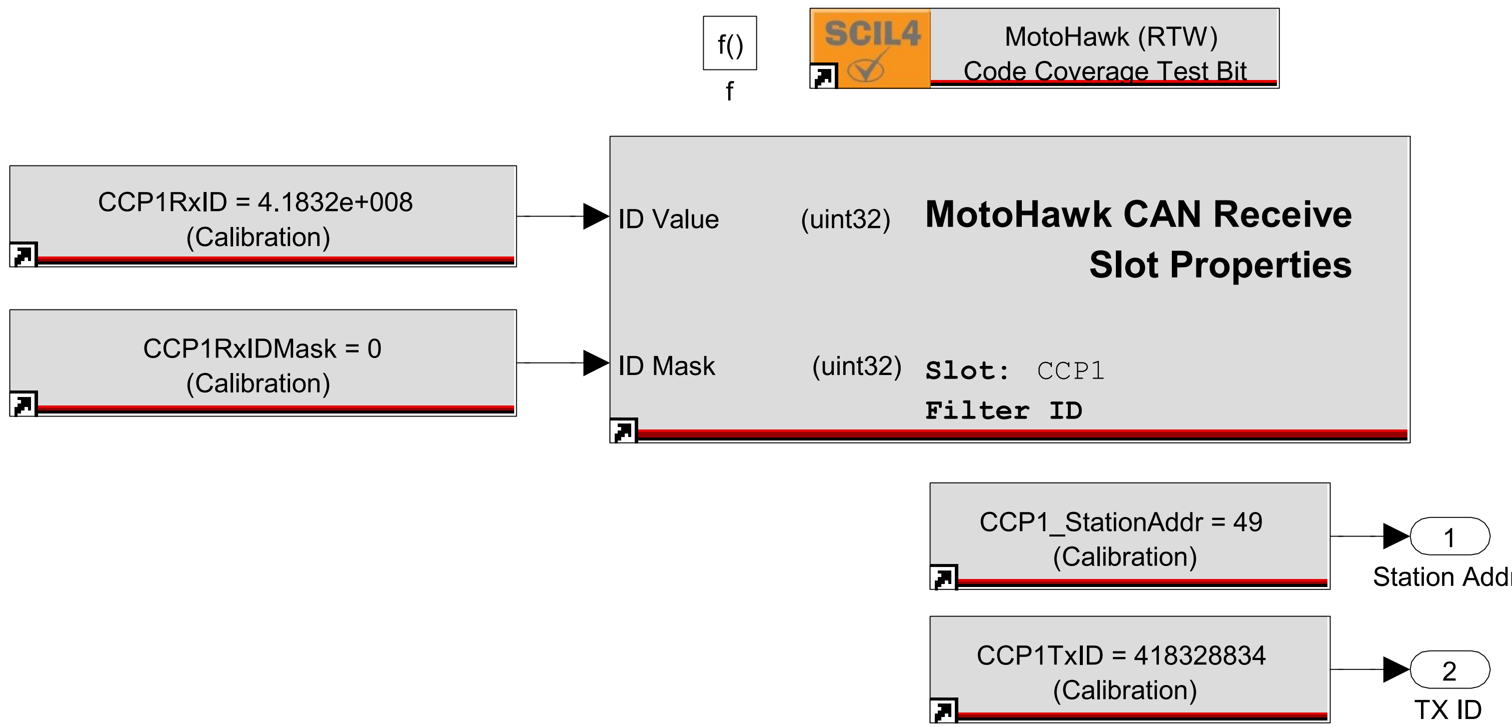
f()

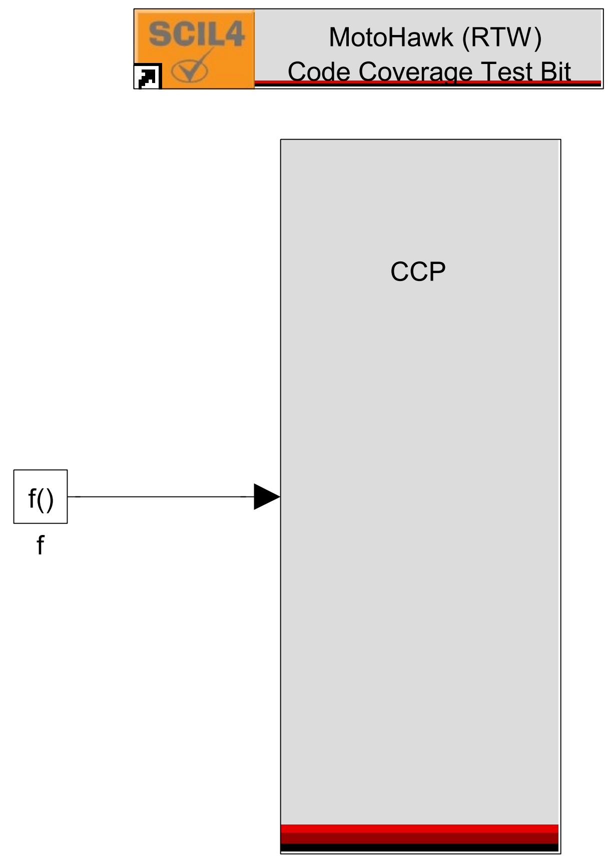
f

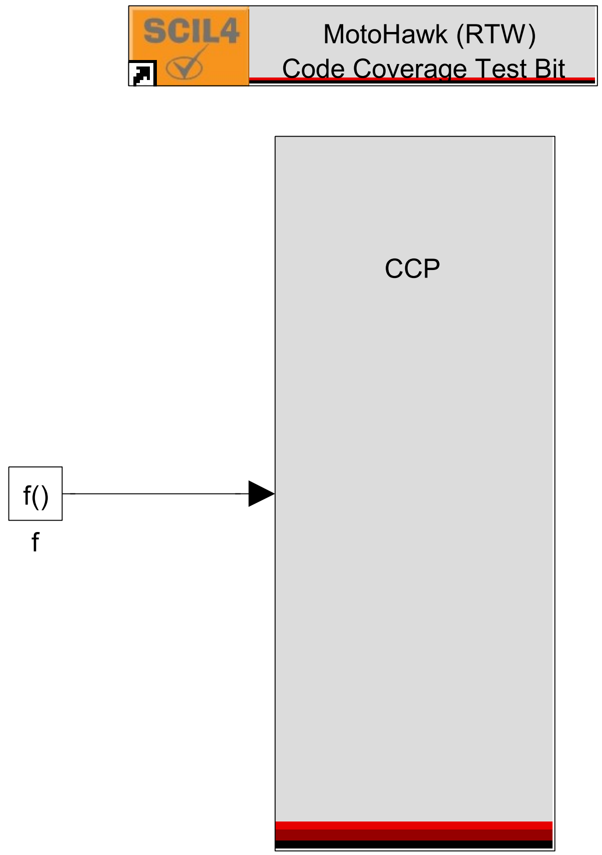
do { ... } while

While new CCP Command

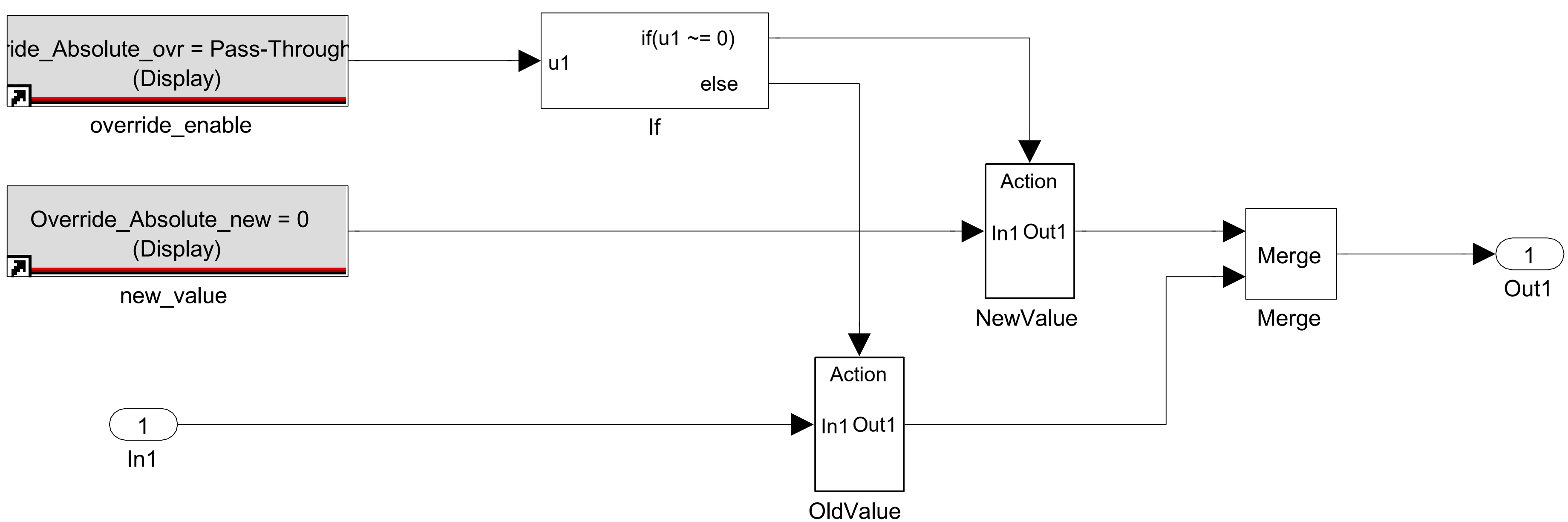

SCIL4
MotoHawk (RTW)
Code Coverage Test Bit
do {
cond ...
} while
While Iterator
MotoHawk Read CAN Raw
Name: CAN_1
Slot: CCP1
Queue Size: 4
ID Type: Extended
ID: 0x18EF0231
ID Mask: 0x1FFFFFFF
Data Available
Age Count
ID Type ([std=0, ext=1], bool)
ID (uint32)
Length ([0-8], uint8)
Data (0-8 bytes, uint8)
CCP
txidtype
MotoHawk Function Trigger
STARTUP_EVENT
Priority Order: 0
(Used in triggered subsystem)
(Runs even when parent is disabled)
f()
Station Addr
TX ID
Adjust ID

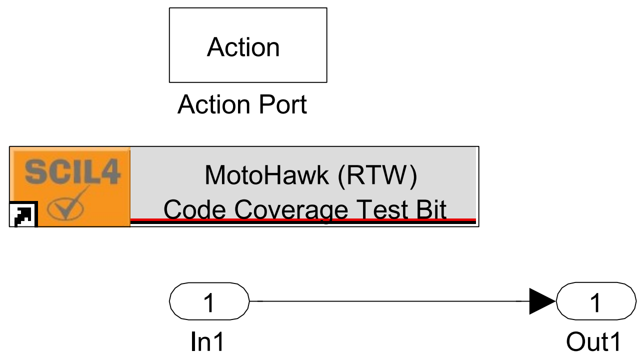

f()
f
SCIL4
MotoHawk (RTW)
Code Coverage Test Bit
CCP1RxID = 4.1832e+008
(Calibration)
CCP1RxIDMask = 0
(Calibration)
ID Value
(uint32)
MotoHawk CAN Receive
Slot Properties
ID Mask
(uint32)
Slot: CCP1
Filter ID
CCP1_StationAddr = 49
(Calibration)
1
Station Addr
CCP1TxID = 418328834
(Calibration)
2
TX ID

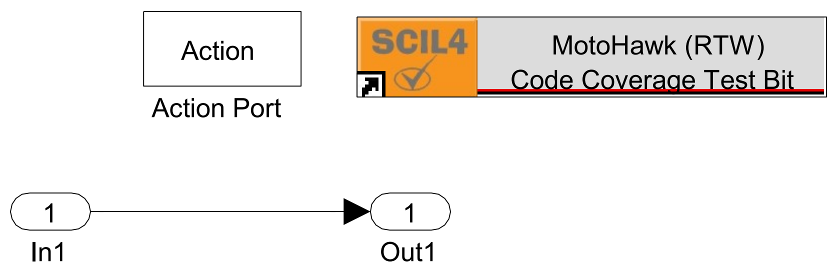

SCIL4
MotoHawk (RTW)
Code Coverage Test Bit
CCP
f()
f


SCIL4
MotoHawk (RTW)
Code Coverage Test Bit
CCP
f()
f

MotoHawk Absolute Override

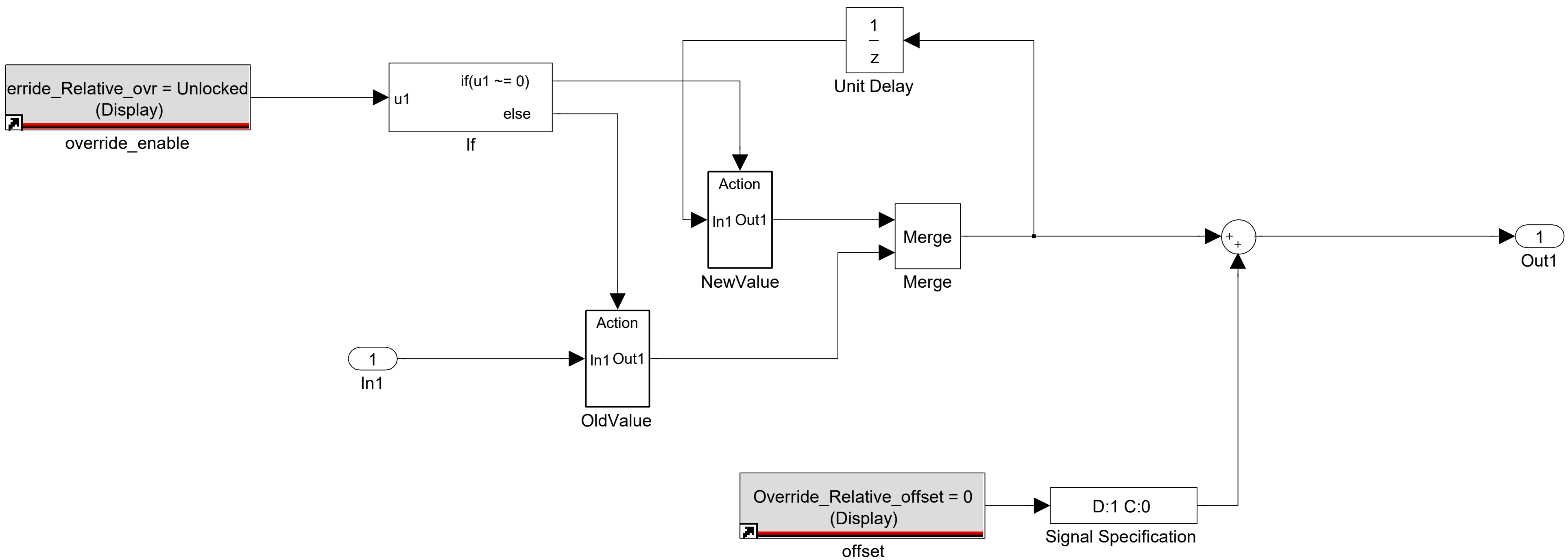


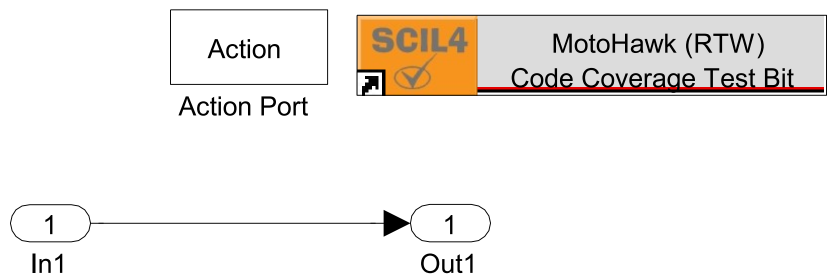

Action
Action Port
SCIL4
MotoHawk (RTW)
Code Coverage Test Bit
1
In1
1
Out1

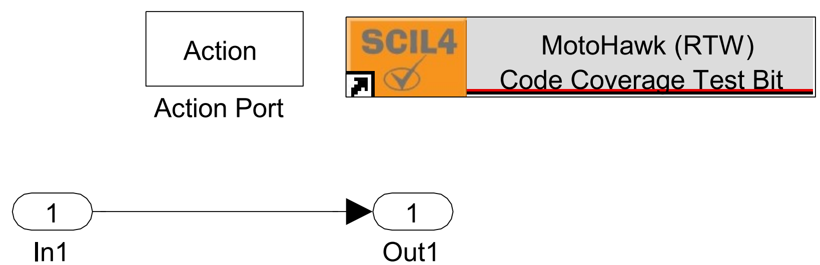


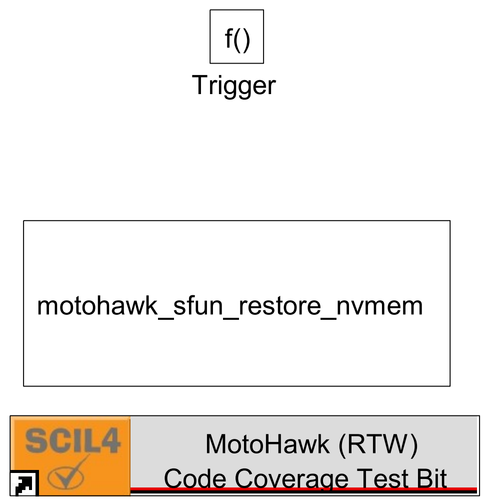
Action
Action Port
SCIL4
MotoHawk (RTW)
Code Coverage Test Bit
1
In1
1
Out1

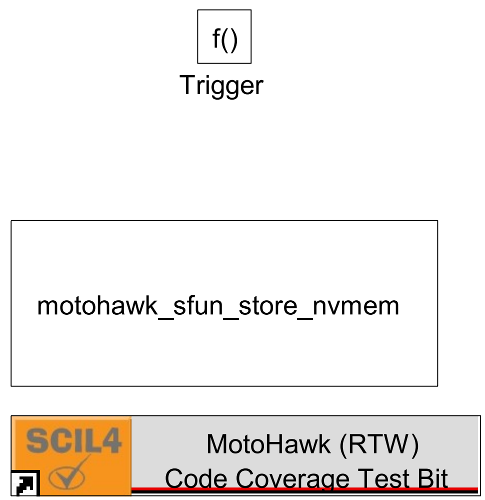
MotoHawk Relative Override

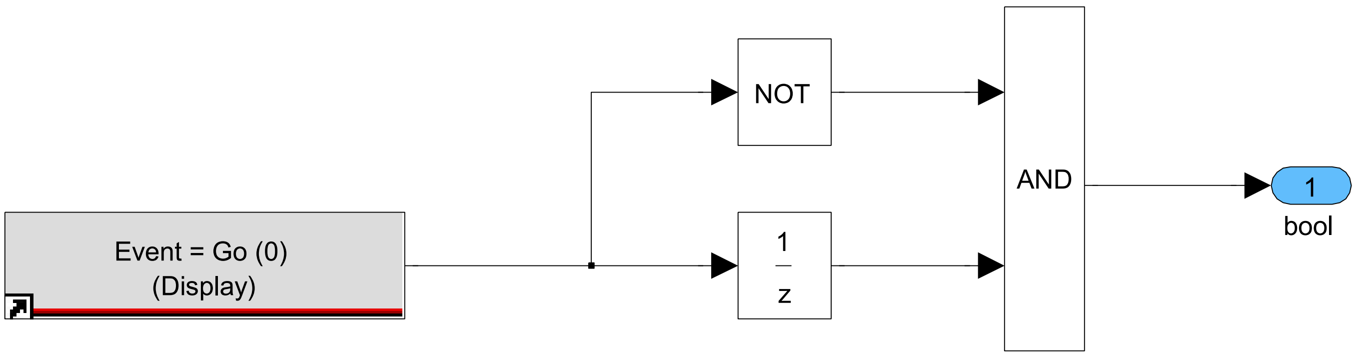



Action
Action Port
SCIL4
MotoHawk (RTW)
Code Coverage Test Bit
1
In1
1
Out1

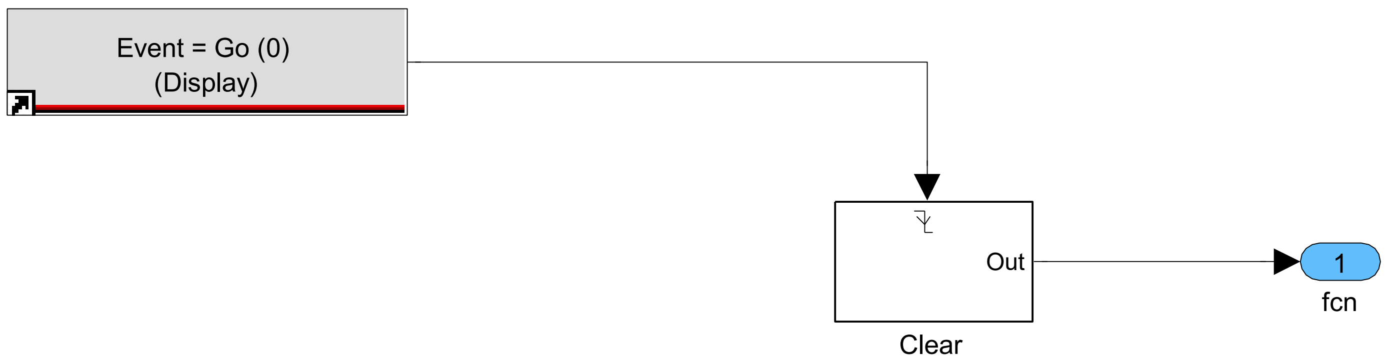

Action
Action Port
SCIL4
MotoHawk (RTW)
Code Coverage Test Bit
1
In1
1
Out1


f()
Trigger
motohawk_sfun_restore_nvmem
SCIL4
MotoHawk (RTW)
Code Coverage Test Bit

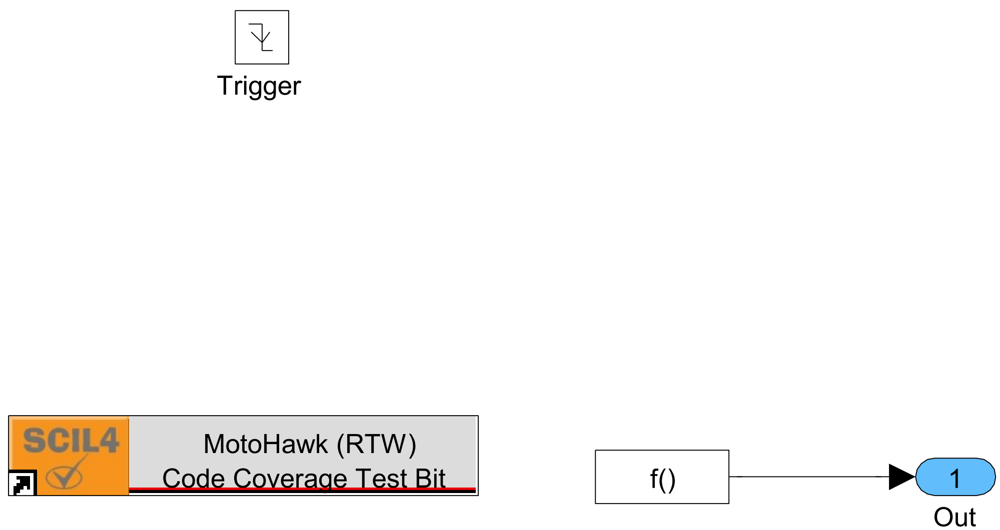

f()
Trigger
motohawk_sfun_store_nvmem
SCIL4
MotoHawk (RTW)
Code Coverage Test Bit

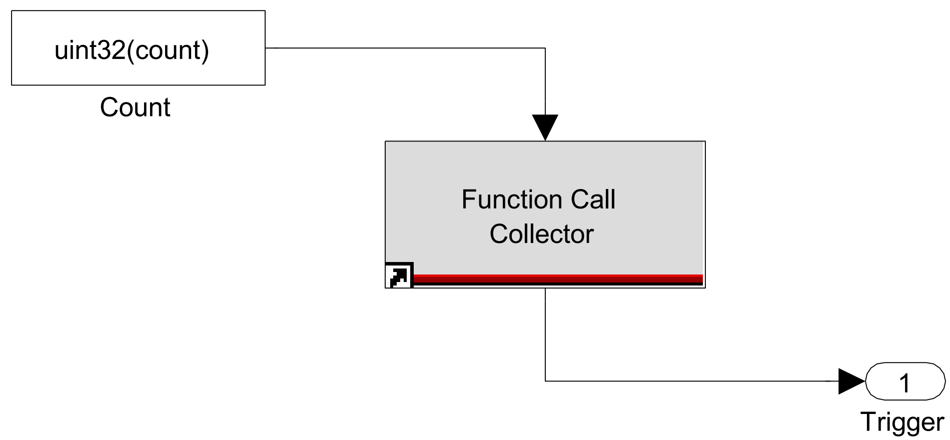


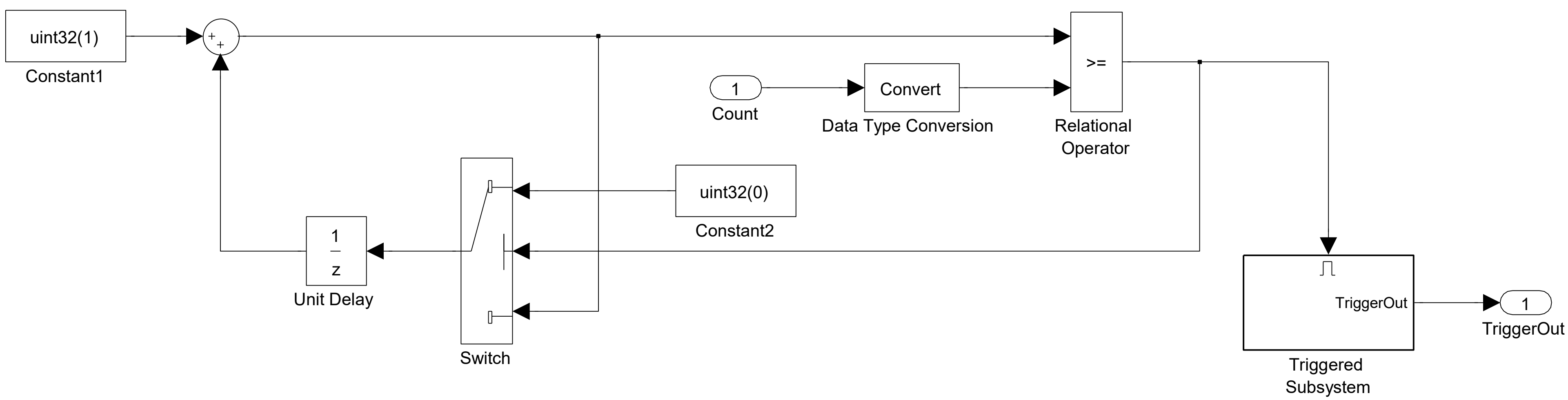
Output true once on falling edge of event display variable

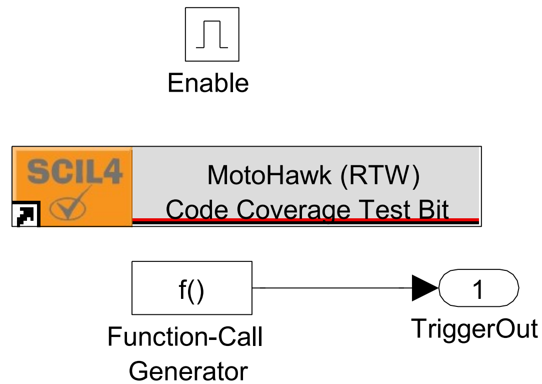


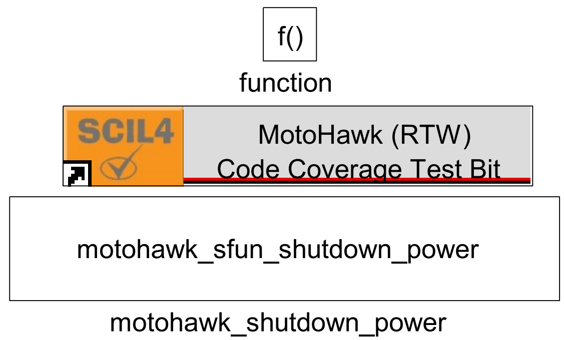
Output function-call once on falling edge of event display variable

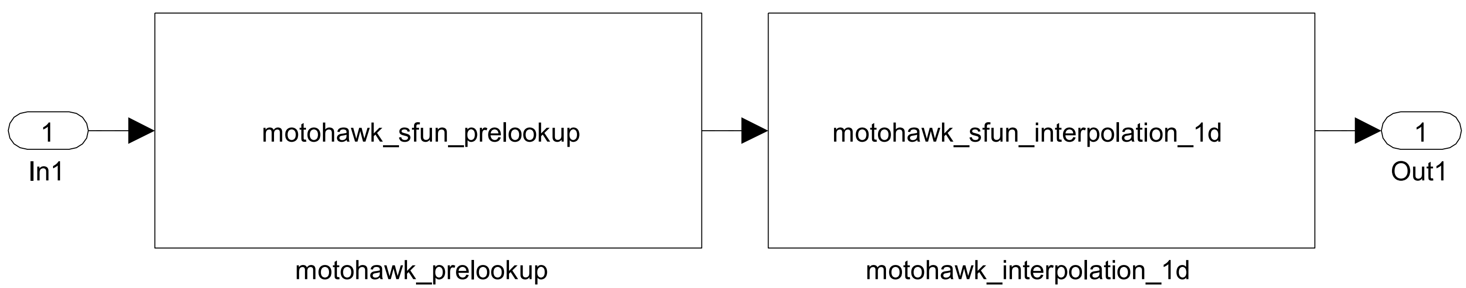

Trigger
SCIL4
MotoHawk (RTW)
Code Coverage Test Bit
f()
1
Out

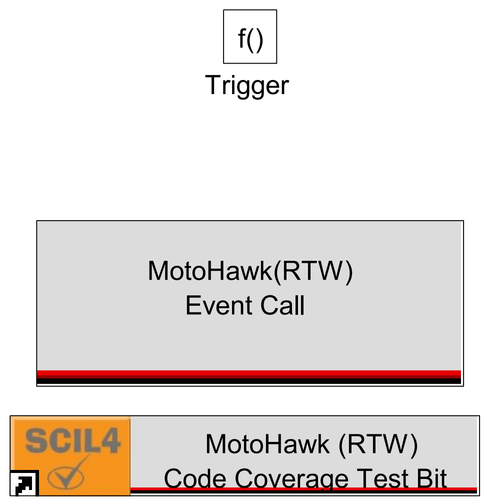

uint32(count)
Count
Function Call
Collector
1
Trigger

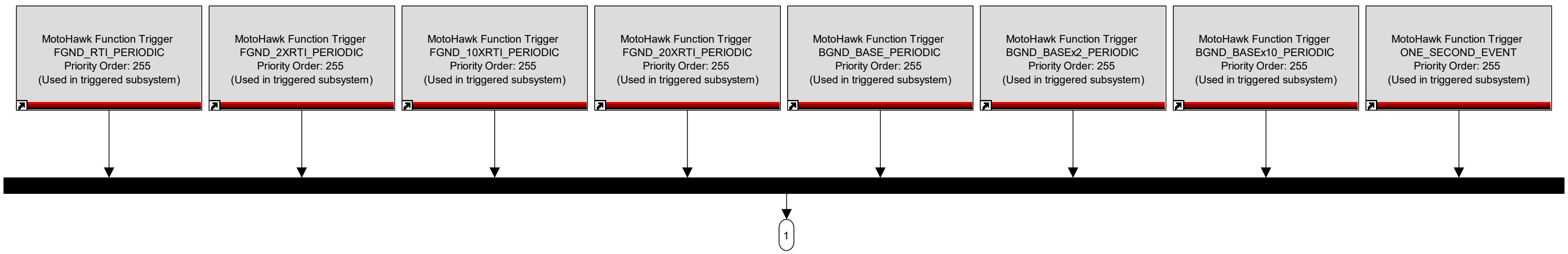

uint32(1)
Constant1
>=
1
Count
Convert
Data Type Conversion
Relational
Operator
uint32(0)
Constant2
1
z
Unit Delay
Switch
TriggerOut
Triggered
Subsystem
1
TriggerOut


Enable
SCIL4
MotoHawk (RTW)
Code Coverage Test Bit
f()
Function-Call
Generator
1
TriggerOut

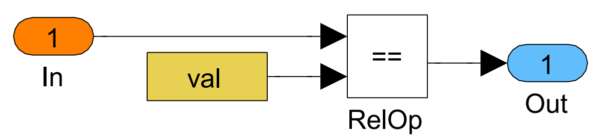

f()
function
SCIL4
MotoHawk (RTW)
Code Coverage Test Bit
motohawk_sfun_shutdown_power
motohawk_shutdown_power


1
In1
motohawk_sfun_prelookup
motohawk_prelookup
motohawk_sfun_interpolation_1d
motohawk_interpolation_1d
1
Out1

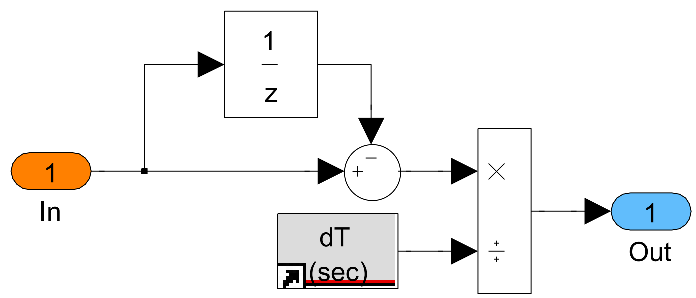

f()
Trigger
MotoHawk(RTW)
Event Call
SCIL4
MotoHawk (RTW)
Code Coverage Test Bit


MotoHawk Function Trigger
FGND_RTI_PERIODIC
Priority Order: 255
(Used in triggered subsystem)
MotoHawk Function Trigger
FGND_2XRTI_PERIODIC
Priority Order: 255
(Used in triggered subsystem)
MotoHawk Function Trigger
FGND_10XRTI_PERIODIC
Priority Order: 255
(Used in triggered subsystem)
MotoHawk Function Trigger
FGND_20XRTI_PERIODIC
Priority Order: 255
(Used in triggered subsystem)
MotoHawk Function Trigger
BGND_BASE_PERIODIC
Priority Order: 255
(Used in triggered subsystem)
MotoHawk Function Trigger
BGND_BASEx2_PERIODIC
Priority Order: 255
(Used in triggered subsystem)
MotoHawk Function Trigger
BGND_BASEx10_PERIODIC
Priority Order: 255
(Used in triggered subsystem)
MotoHawk Function Trigger
ONE_SECOND_EVENT
Priority Order: 255
(Used in triggered subsystem)
1

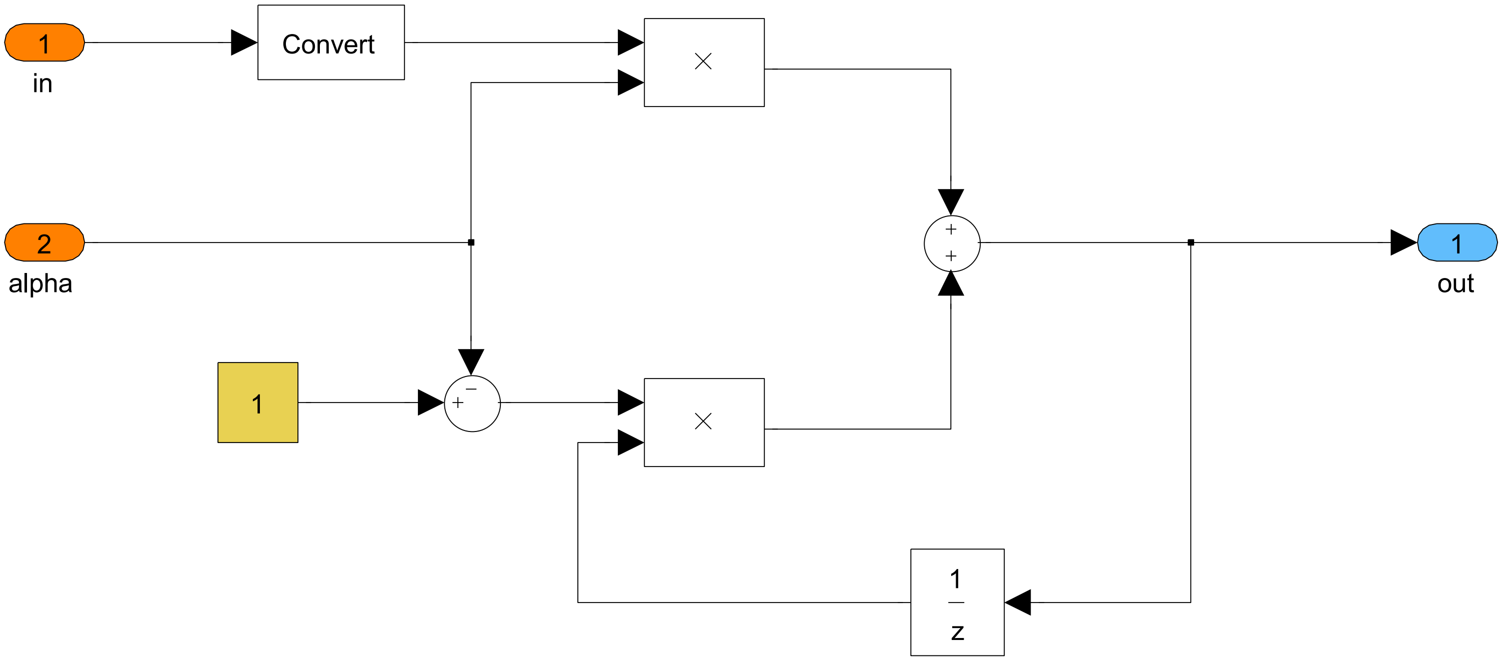
Check how input compares to 'val'



Discrete Derivative



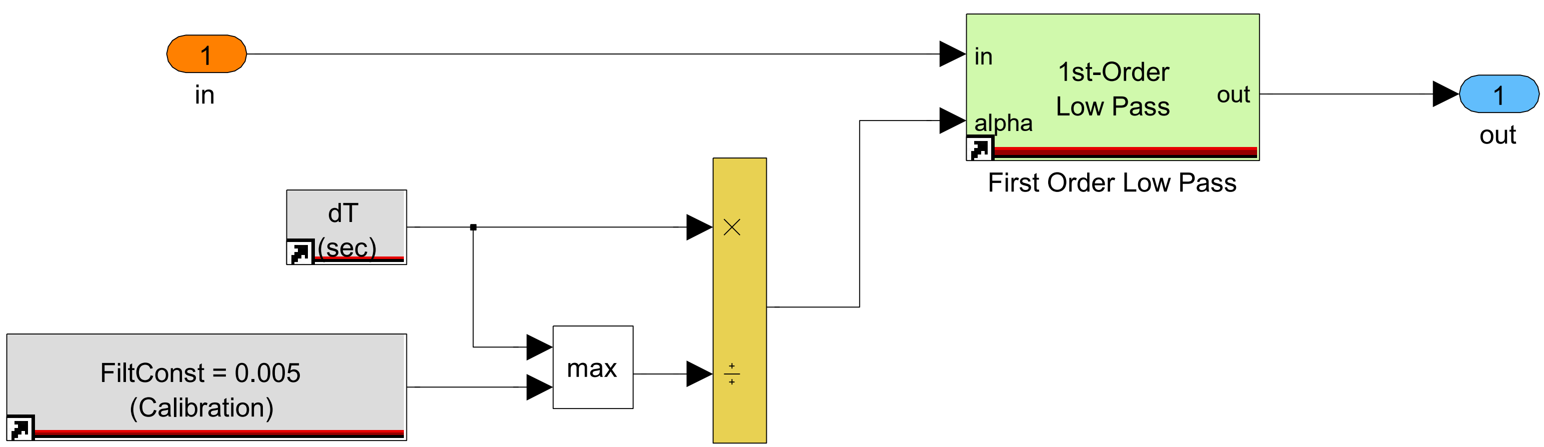
1st-Order Low-Pass Filter

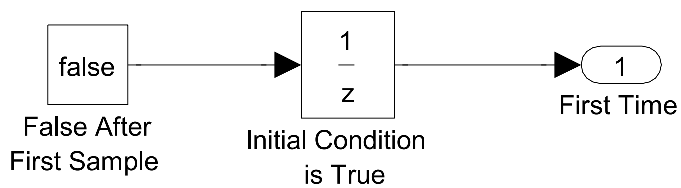


$y[k] = a*x[k] + (1-a)*y[k-1]$

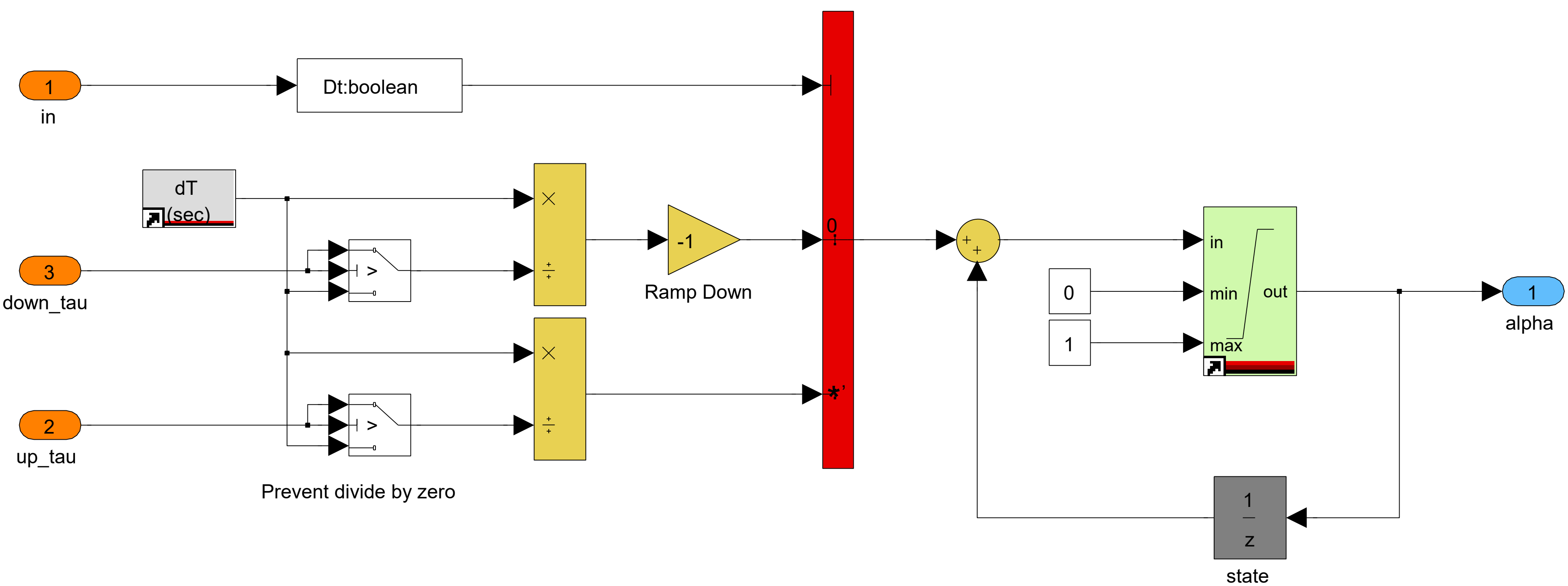
where $a = t/T$

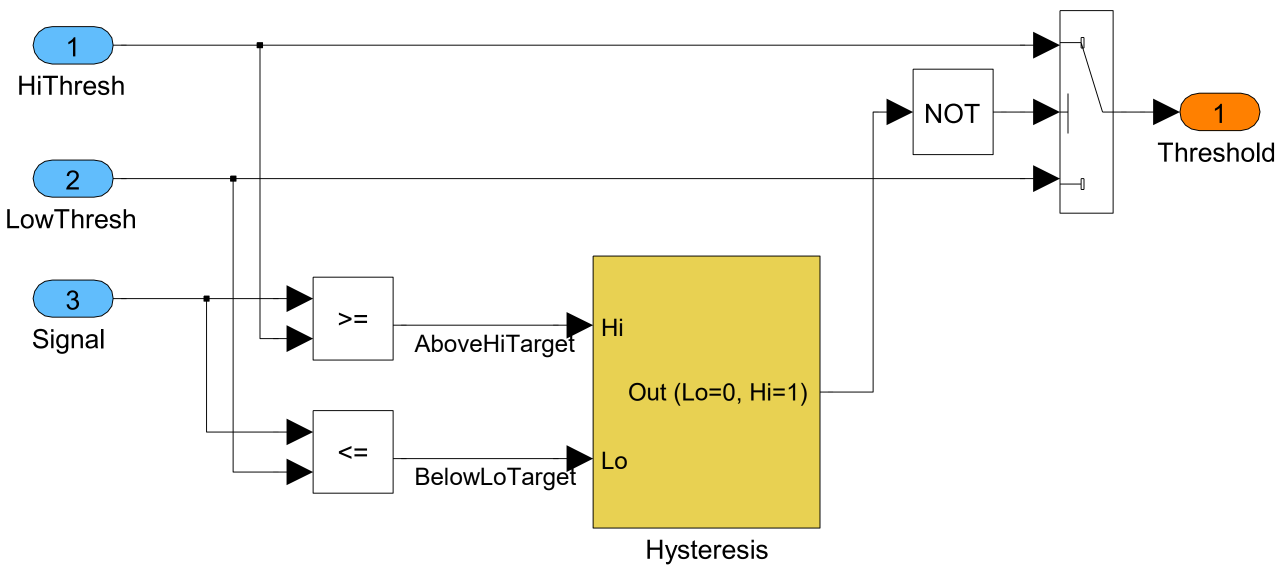
Tunable 1st-Order Low-Pass Filter



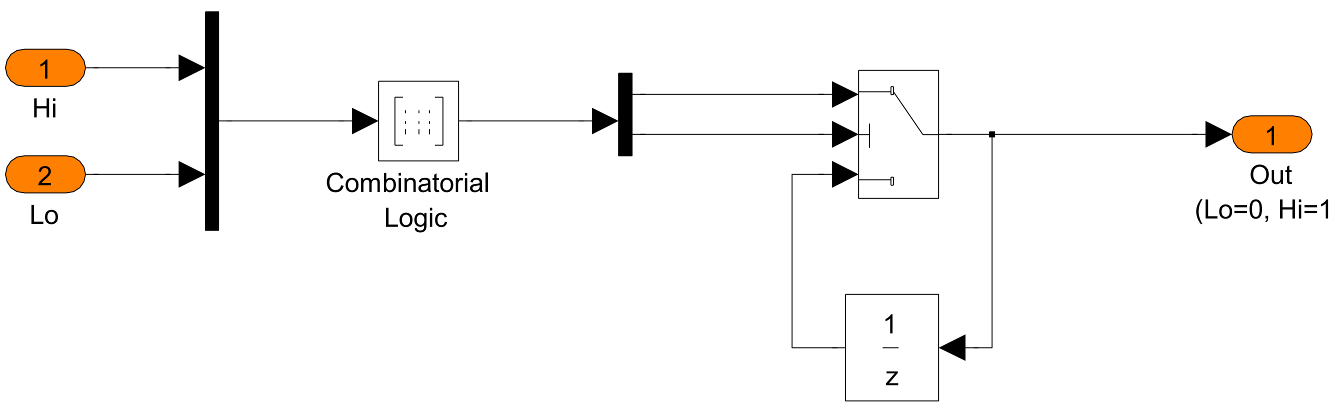

false
False After
First Sample
1
z
Initial Condition
is True
1
First Time

Convert a boolean input signal
to a more slowly ramping 'alpha' from 0 to 1

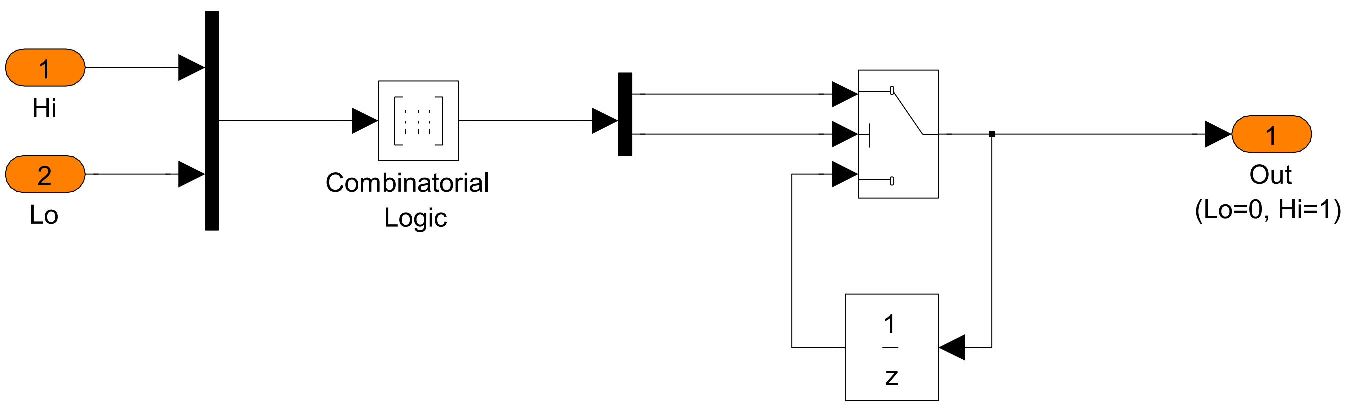



1
HiThresh
2
LowThresh
3
Signal
>=
AboveHiTarget
<=
BelowLoTarget
Hi
Out (Lo=0, Hi=1)
Lo
Hysteresis
NOT
1
Threshold

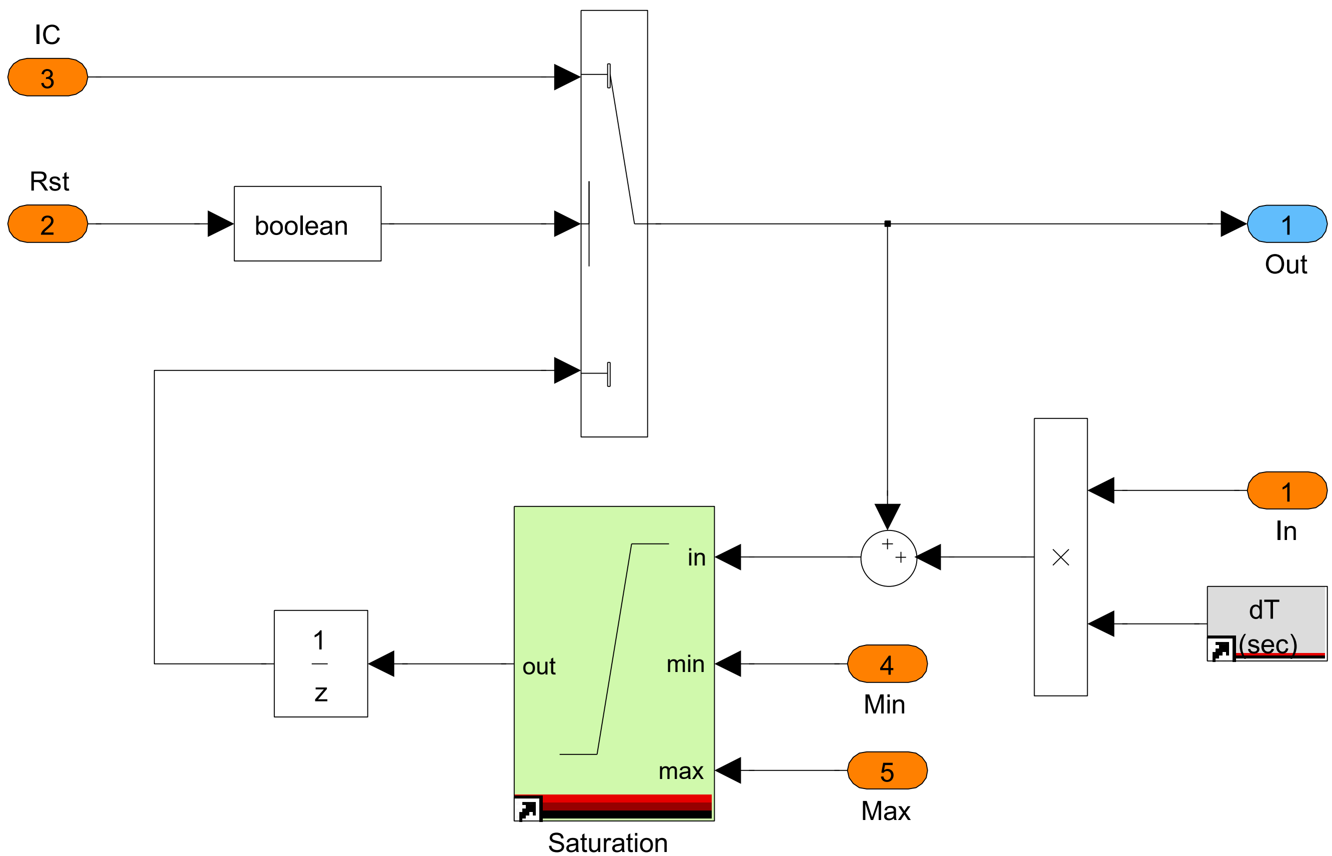
Hi & !Lo => Hi
Lo & !Hi => Lo
Otherwise, Hold



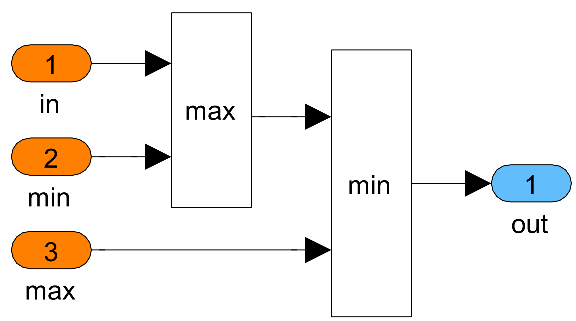
Hi & !Lo => Hi
Lo & !Hi => Lo
Otherwise, Hold



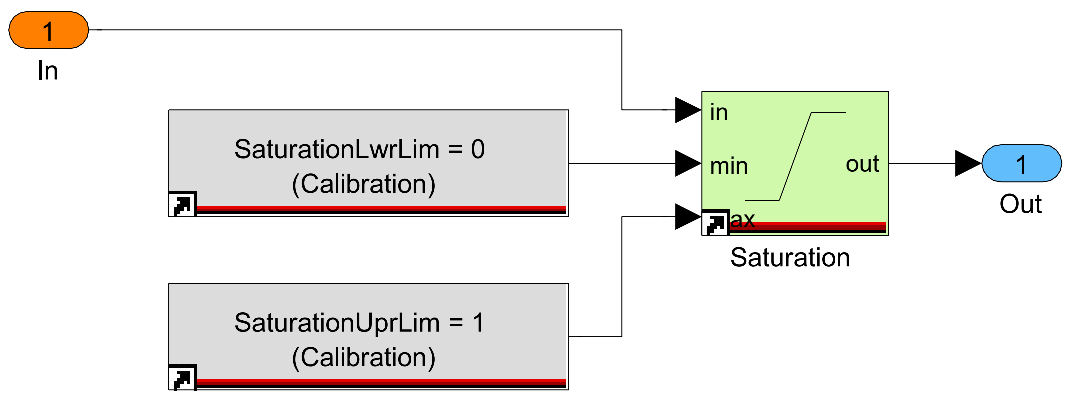
Discrete Integrator,
with output and state saturation.



**Output 'In' when between Min and Max,
and saturate against limits otherwise.**



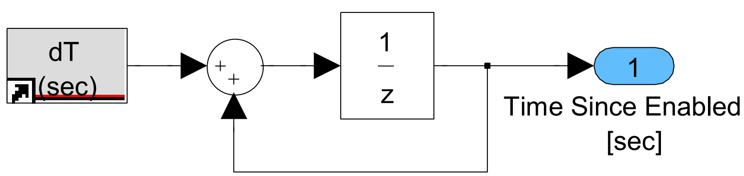
Calibratable wrapper around the Saturation block

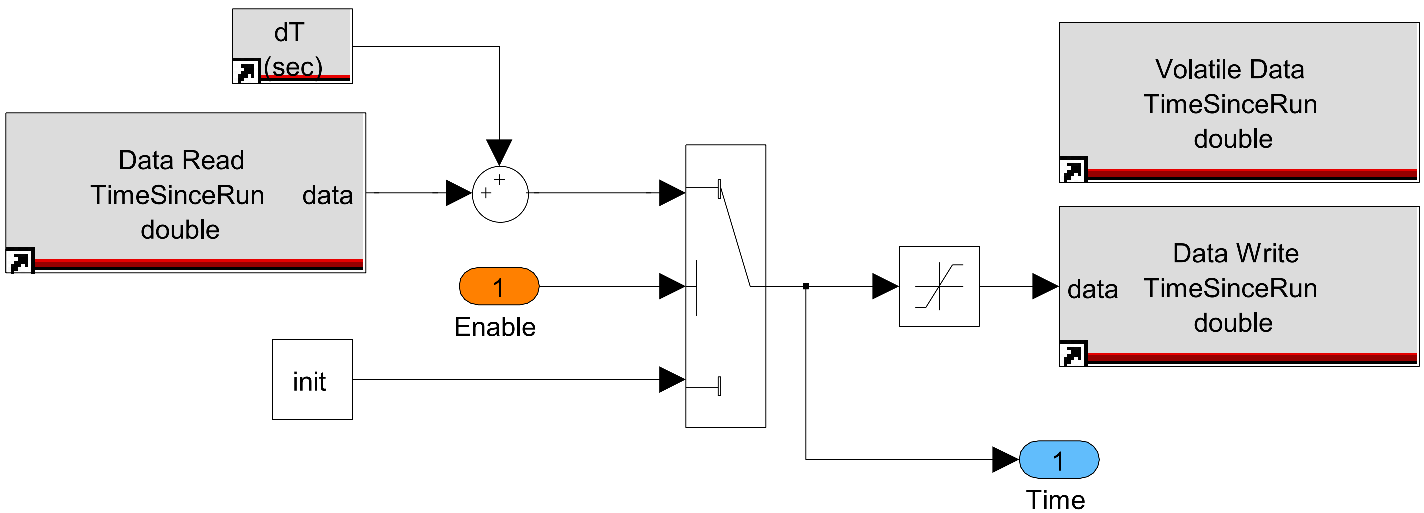


Output the time since enabled, by summing up 'dt'.

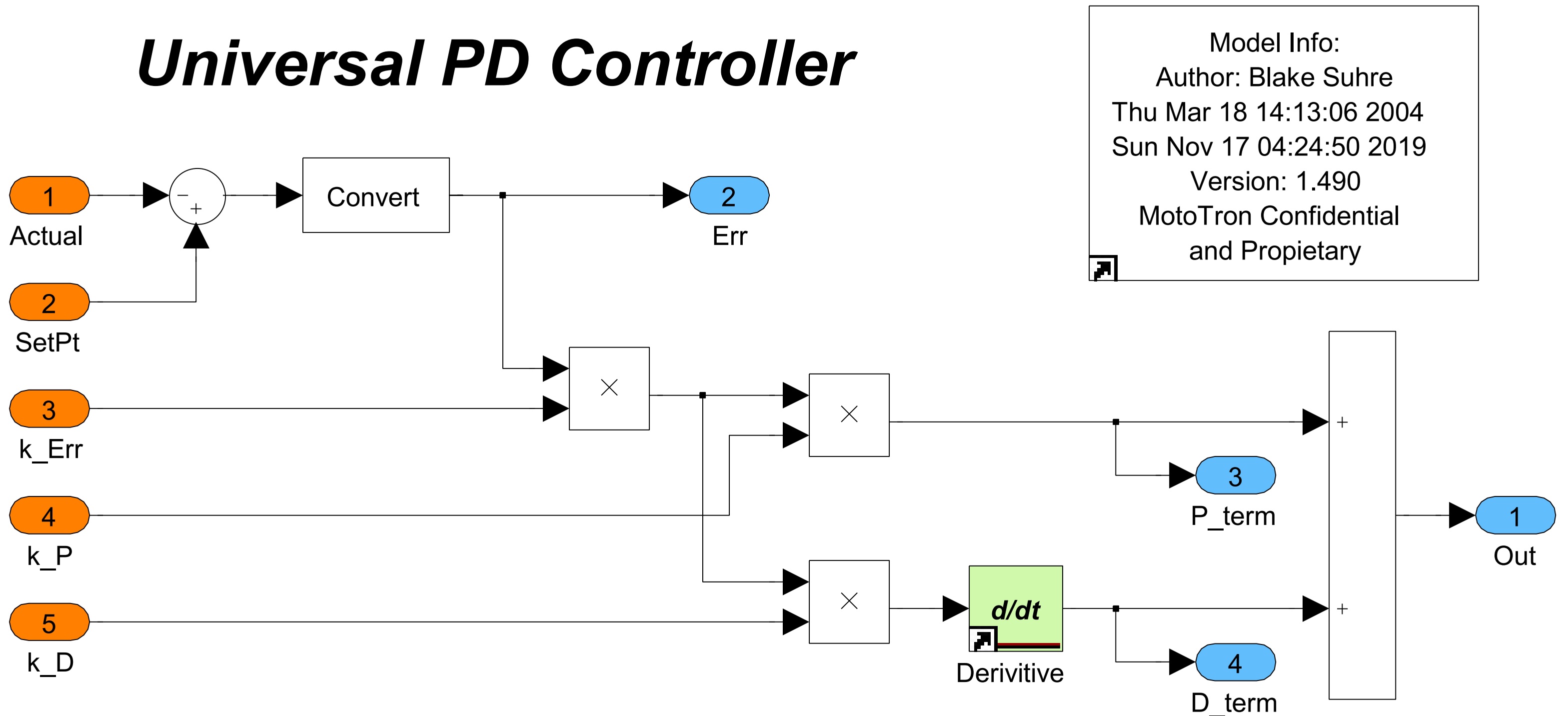
If this block is in an enabled subsystem that
resets its states, then the count will reset as well.
Otherwise, the count will resume from where it left off.

Note that when the Sample Time of the the 'dt' is non-positive,
the block will only output its Initial Value if the enabled subsystem
is set to reset its state. This means that the count will immediately
'catch up' if the enabled subsystem holds its states.

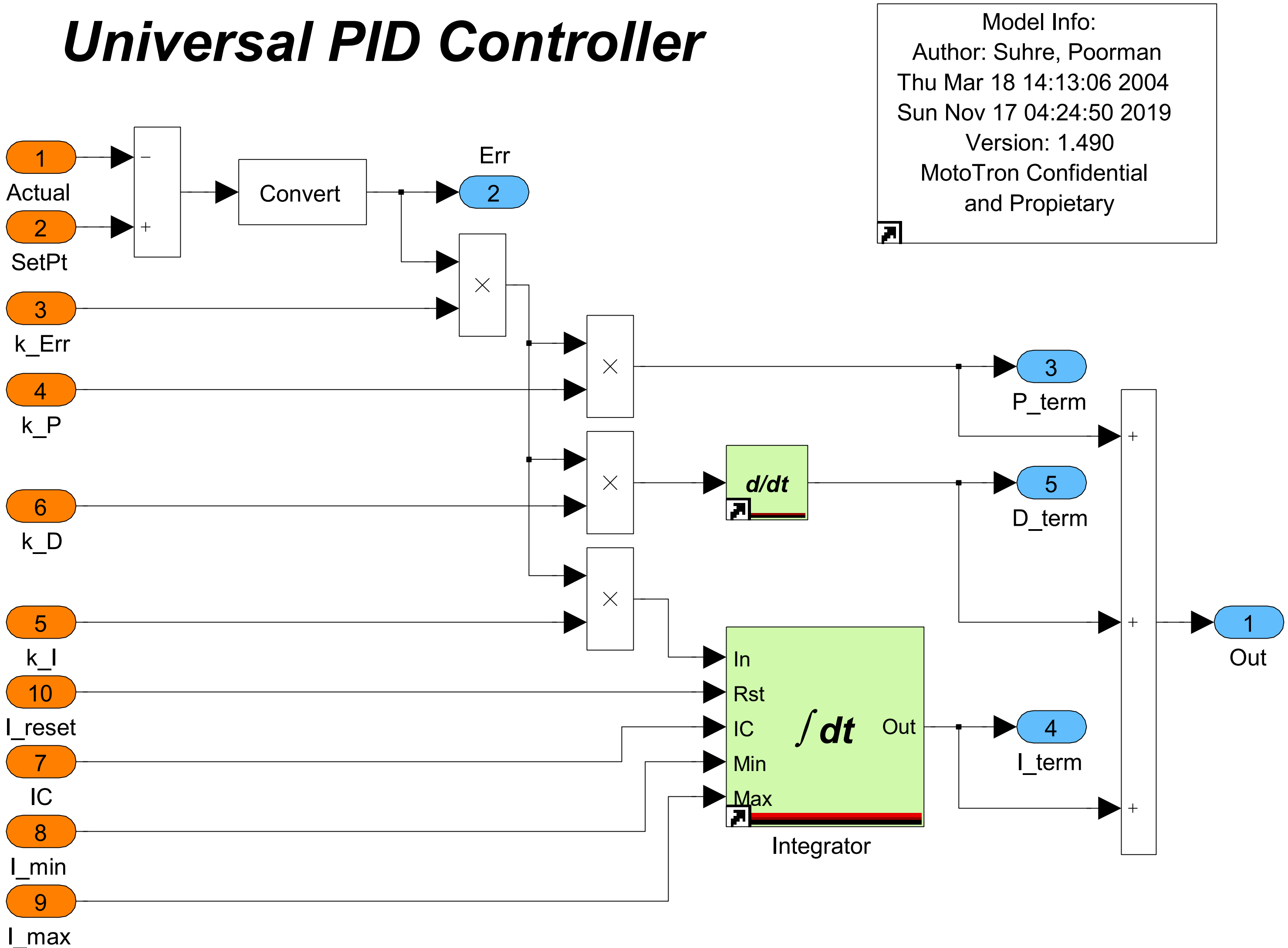



dT
(sec)
Data Read
TimeSinceRun
double
data
+
+
1
Enable
init
Volatile Data
TimeSinceRun
double
Data Write
data
TimeSinceRun
double
1
Time

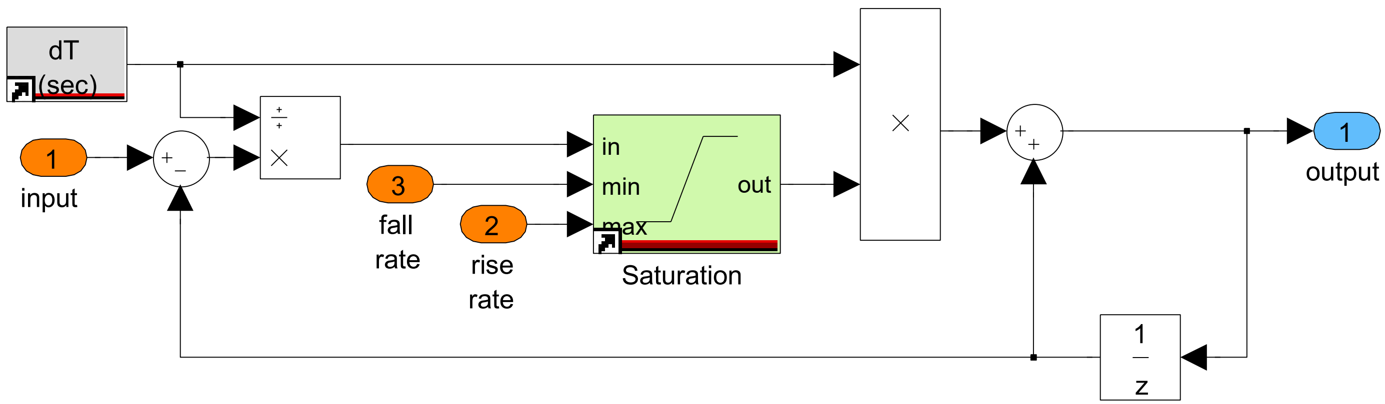
Universal PD Controller



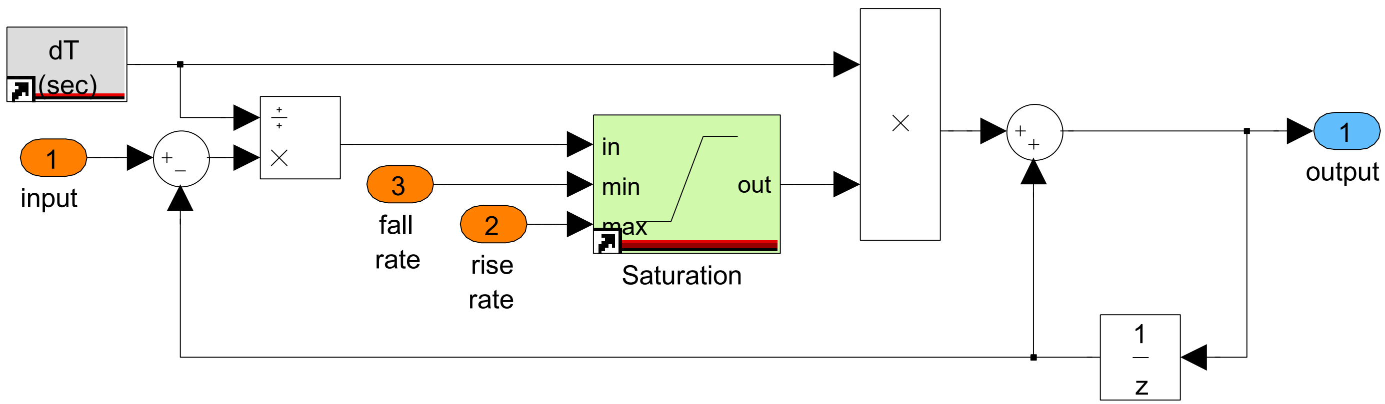
Universal PID Controller

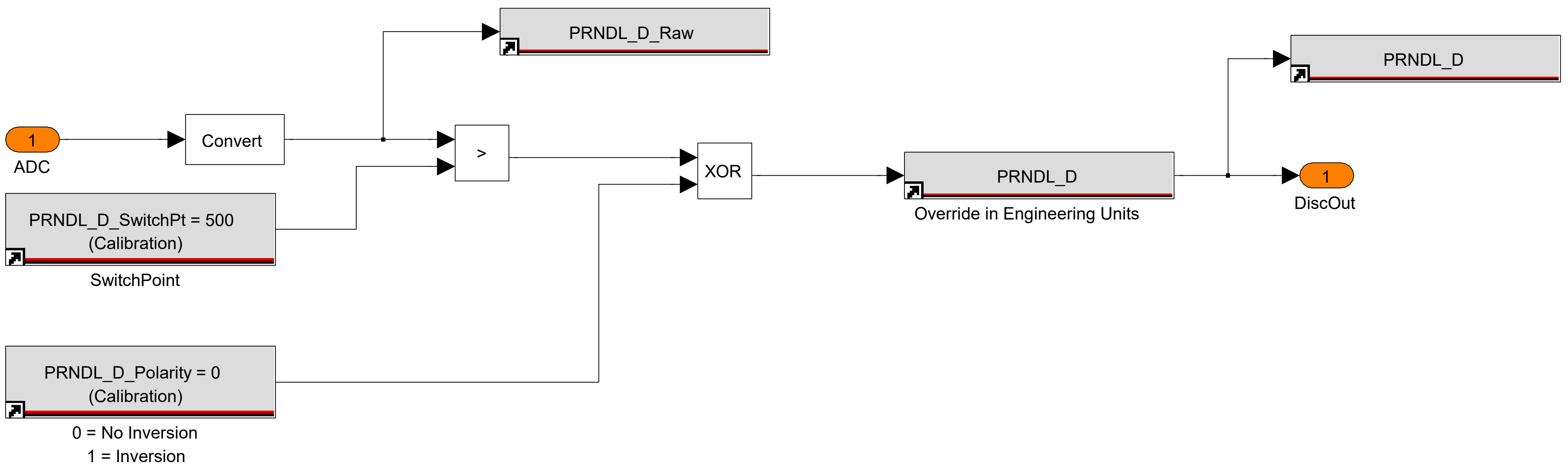


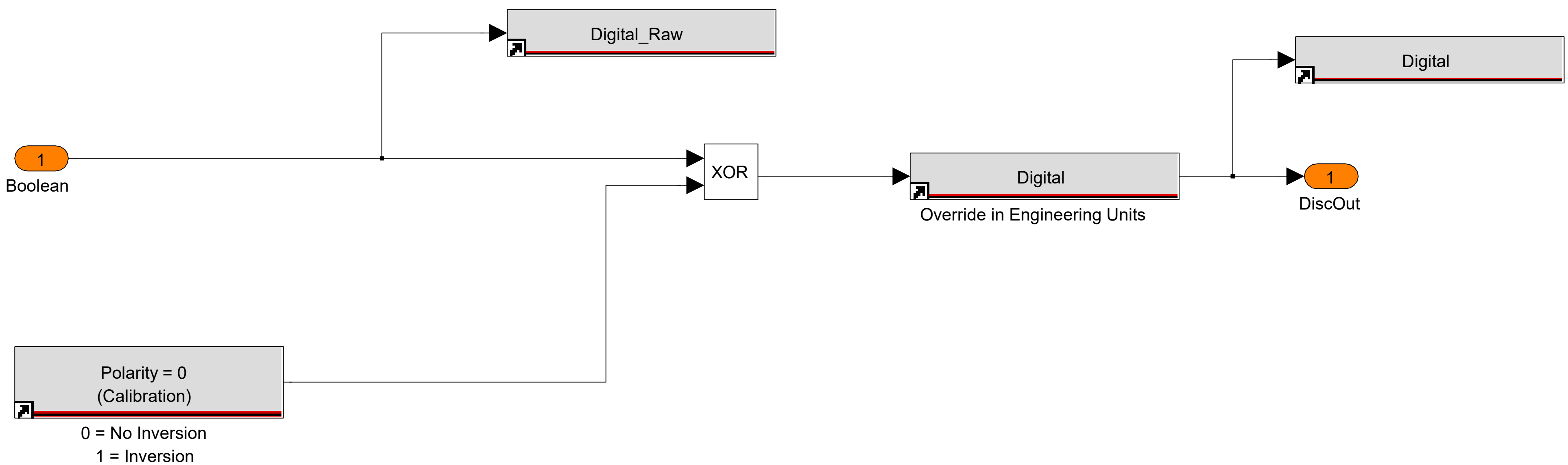
Rate Limiter - Limit allowable change in signal per timestep



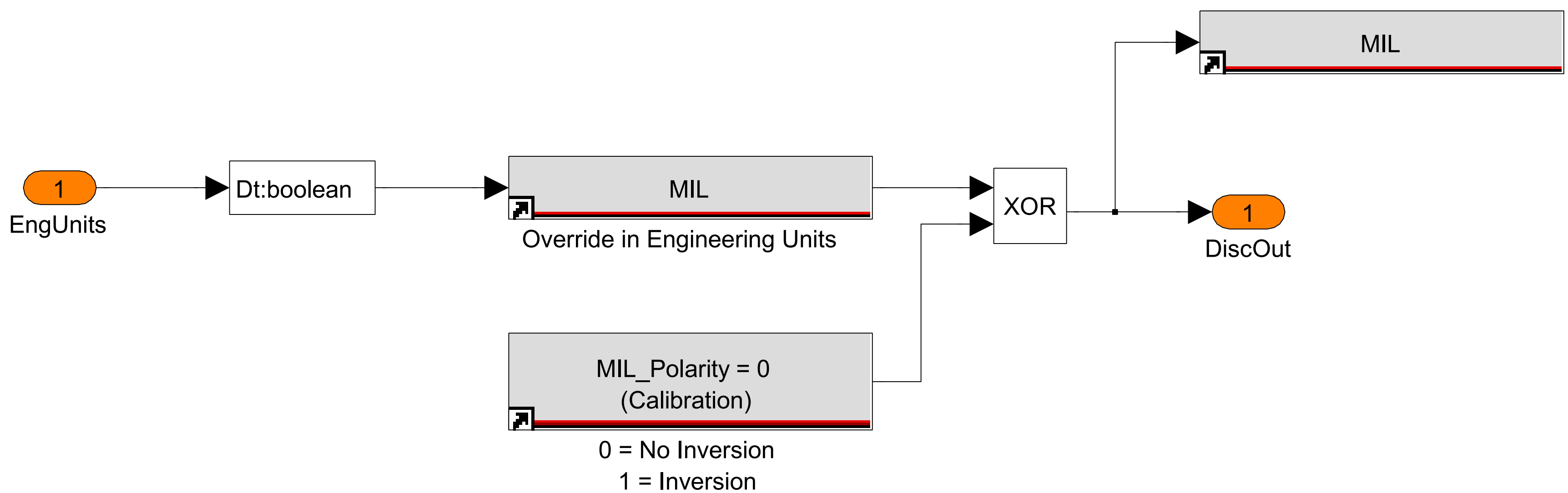
Rate Limiter - Limit allowable change in signal per timestep



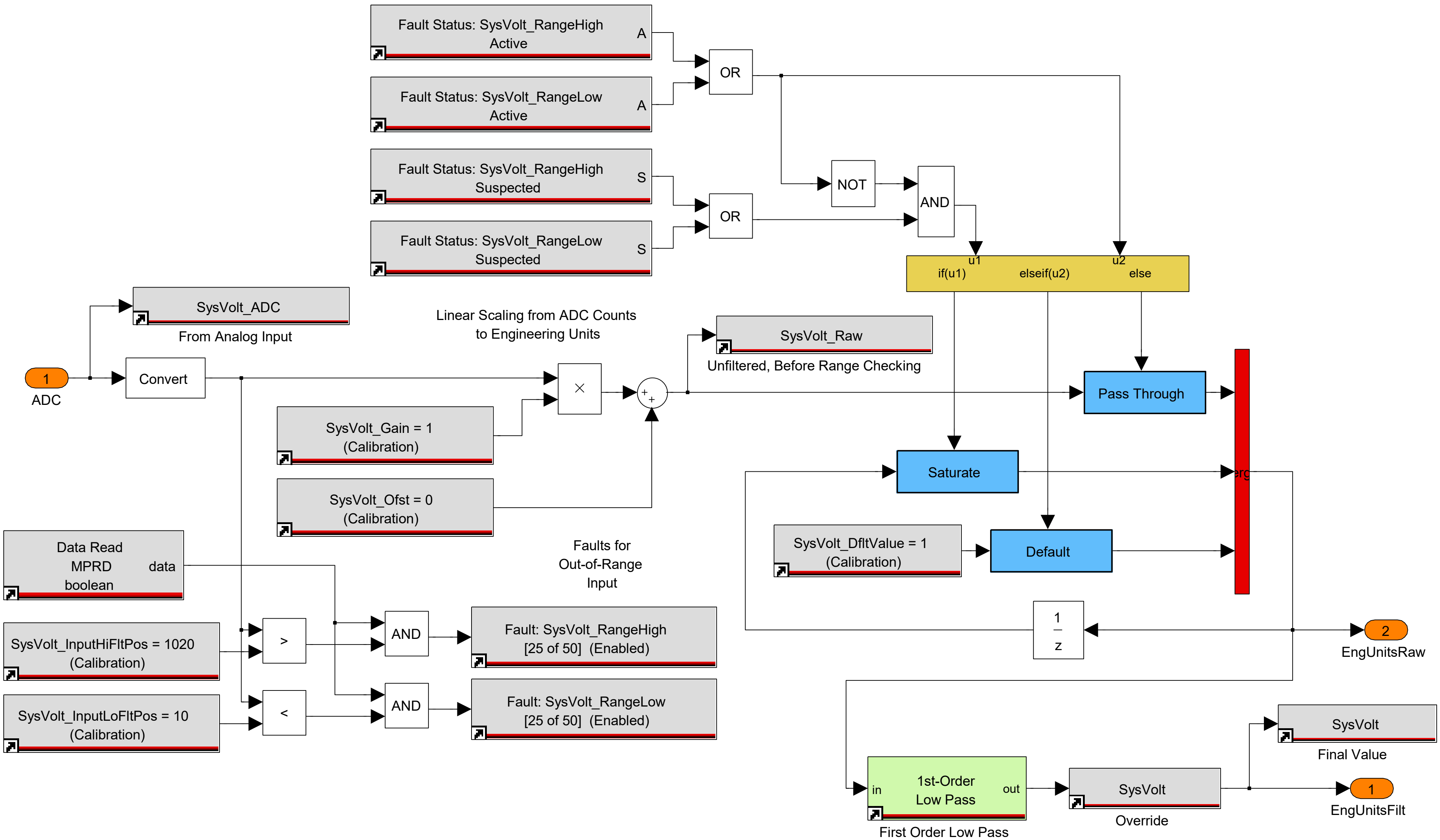

1
ADC
Convert
PRNDL_D_Raw
PRNDL_D_SwitchPt = 500
(Calibration)
SwitchPoint
>
PRNDL_D_Polarity = 0
(Calibration)
0 = No Inversion
1 = Inversion
XOR
PRNDL_D
Override in Engineering Units
PRNDL_D
1
DiscOut

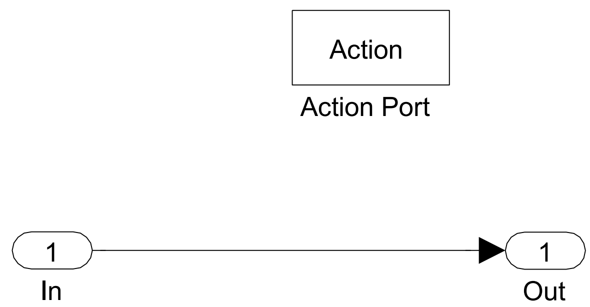


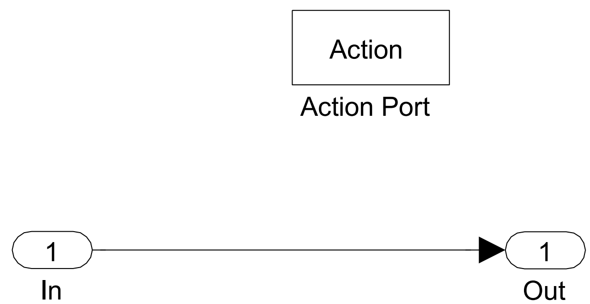
Digital_Raw
1
Boolean
XOR
Digital
Override in Engineering Units
Digital
1
DiscOut
Polarity = 0
(Calibration)
0 = No Inversion
1 = Inversion

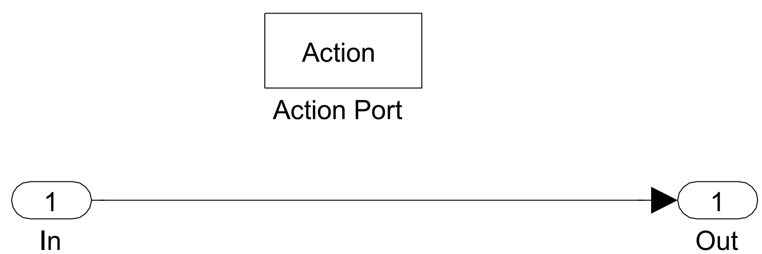


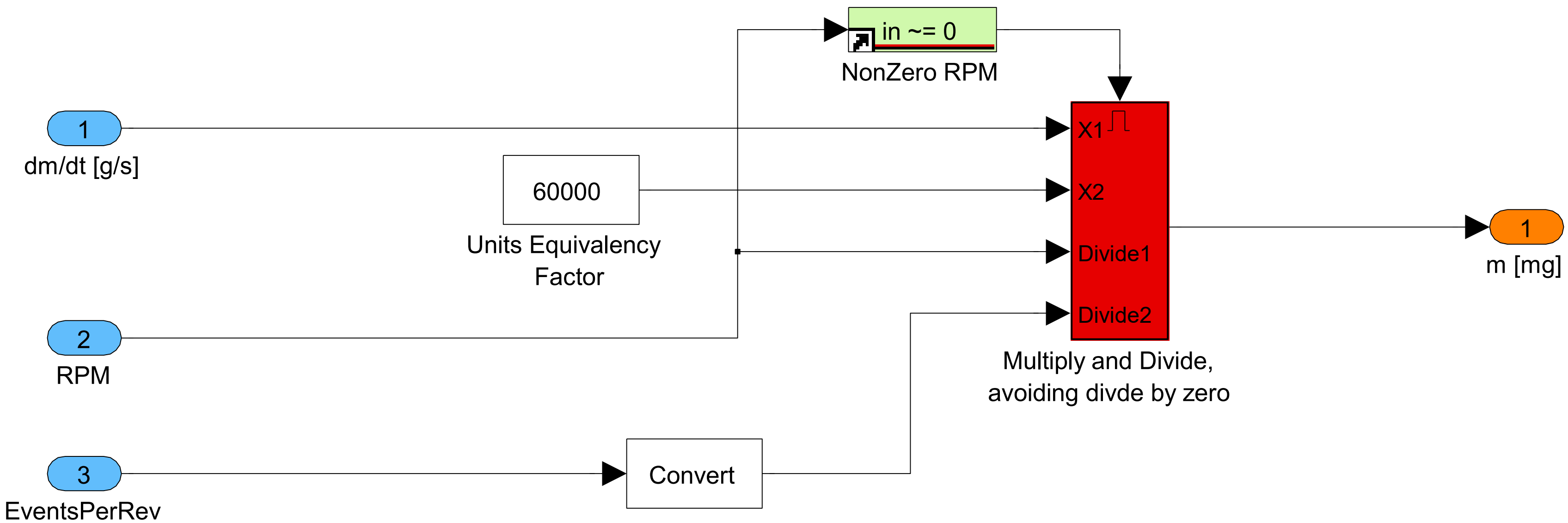
1
EngUnits
Dt:boolean
MIL
Override in Engineering Units
MIL_Polarity = 0
(Calibration)
0 = No Inversion
1 = Inversion
XOR
MIL
1
DiscOut

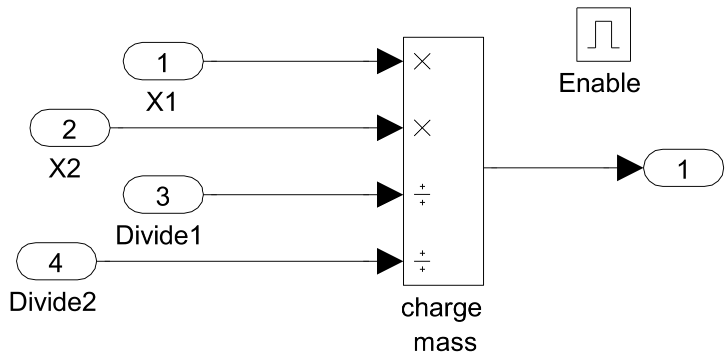

Fault Status: SysVolt_RangeHigh Active
A
Fault Status: SysVolt_RangeLow Active
A
Fault Status: SysVolt_RangeHigh Suspected
S
Fault Status: SysVolt_RangeLow Suspected
S
OR
OR
NOT
AND
u1
u2
if(u1)
elseif(u2)
else
SysVolt_ADC
From Analog Input
Linear Scaling from ADC Counts to Engineering Units
SysVolt_Raw
Unfiltered, Before Range Checking
1
ADC
Convert
×
+
+
Pass Through
SysVolt_Gain = 1 (Calibration)
SysVolt_Ofst = 0 (Calibration)
Saturate
SysVolt_DfltValue = 1 (Calibration)
Default
Data Read MPRD boolean
data
Faults for Out-of-Range Input
SysVolt_InputHiFltPos = 1020 (Calibration)
SysVolt_InputLoFltPos = 10 (Calibration)
>
<
AND
AND
Fault: SysVolt_RangeHigh [25 of 50] (Enabled)
Fault: SysVolt_RangeLow [25 of 50] (Enabled)
1
z
2
EngUnitsRaw
SysVolt
Final Value
in
1st-Order Low Pass
out
First Order Low Pass
SysVolt
Override
1
EngUnitsFilt


Action
Action Port
1
In
1
Out

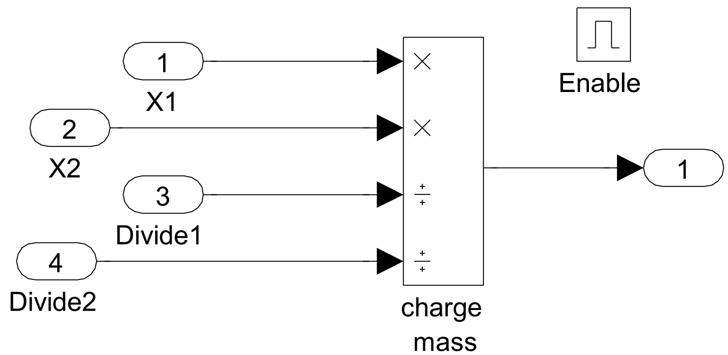

Action
Action Port
1
In
1
Out

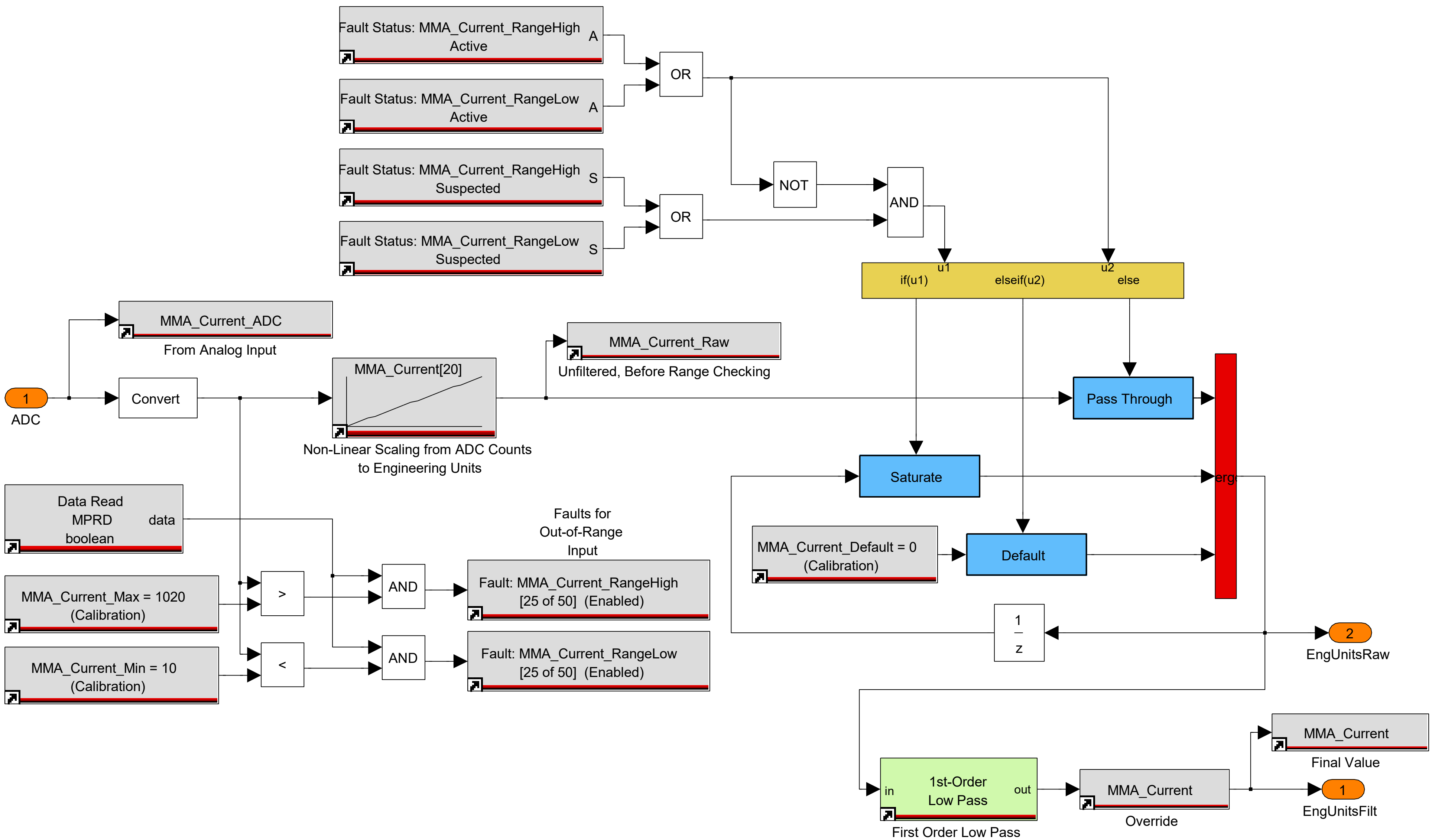

Action
Action Port
1
In
1
Out


in ~= 0
NonZero RPM
1
dm/dt [g/s]
60000
Units Equivalency Factor
2
RPM
3
EventsPerRev
Convert
X1
X2
Divide1
Divide2
Multiply and Divide, avoiding divde by zero
1
m [mg]

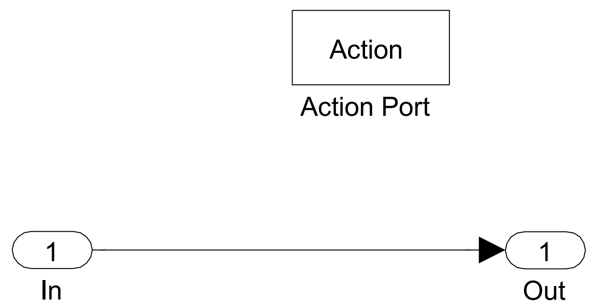


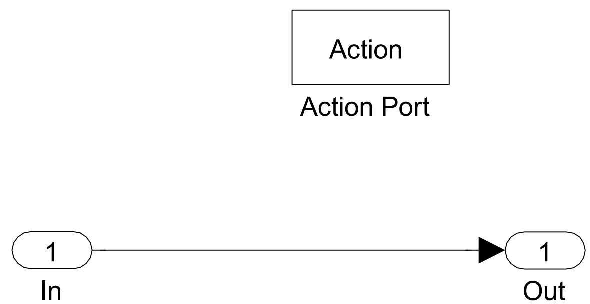
1
X1
2
X2
3
Divide1
4
Divide2
charge
mass
Enable
1

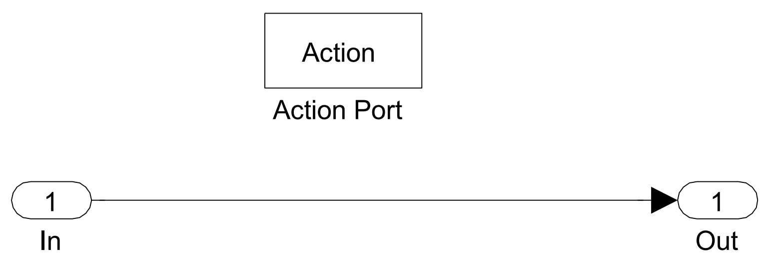

1
X1
2
X2
3
Divide1
4
Divide2
charge
mass
Enable
1

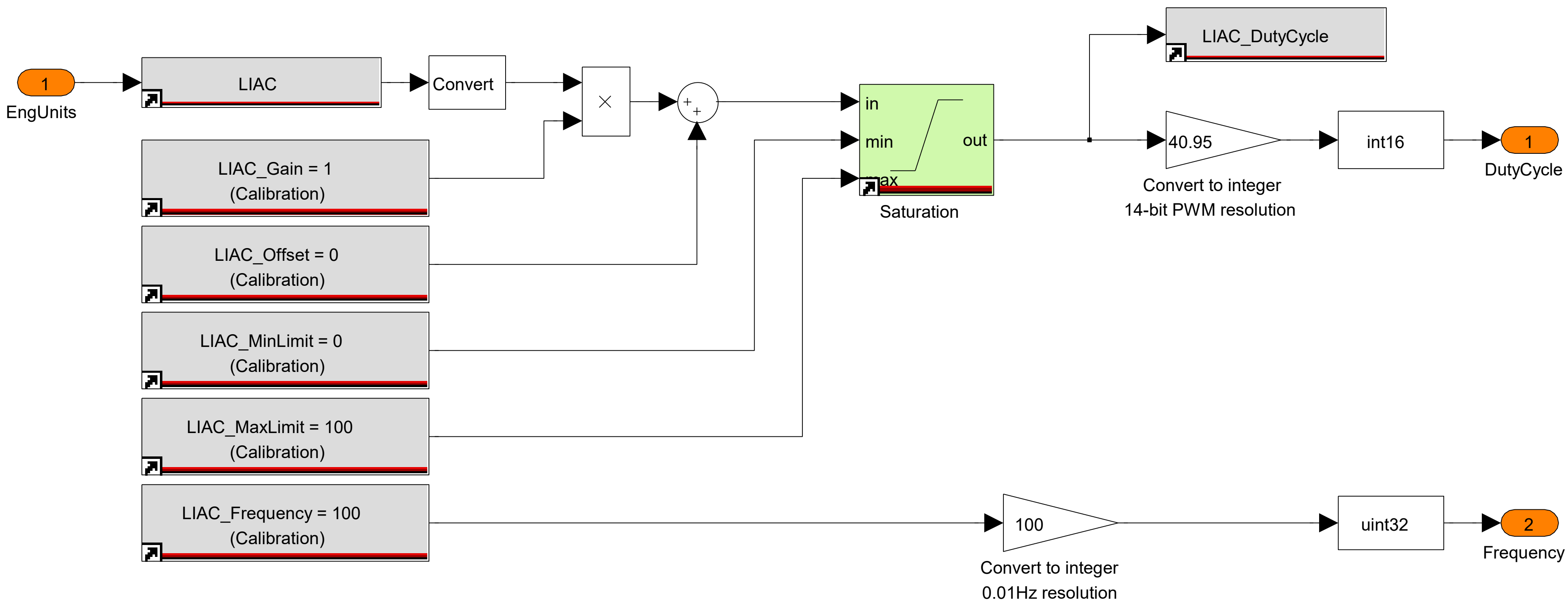


Fault Status: MMA_Current_RangeHigh Active
A
Fault Status: MMA_Current_RangeLow Active
A
Fault Status: MMA_Current_RangeHigh Suspected
S
Fault Status: MMA_Current_RangeLow Suspected
S
OR
OR
NOT
AND
u1
u2
if(u1)
elseif(u2)
else
MMA_Current_ADC
From Analog Input
1
ADC
Convert
MMA_Current[20]
Non-Linear Scaling from ADC Counts to Engineering Units
MMA_Current_Raw
Unfiltered, Before Range Checking
Pass Through
Saturate
Default
MMA_Current_Default = 0 (Calibration)
Data Read MPRD boolean
data
MMA_Current_Max = 1020 (Calibration)
MMA_Current_Min = 10 (Calibration)
>
<
AND
AND
Faults for Out-of-Range Input
Fault: MMA_Current_RangeHigh [25 of 50] (Enabled)
Fault: MMA_Current_RangeLow [25 of 50] (Enabled)
1
z
2
EngUnitsRaw
1st-Order Low Pass
in
out
First Order Low Pass
MMA_Current
Override
MMA_Current
Final Value
1
EngUnitsFilt

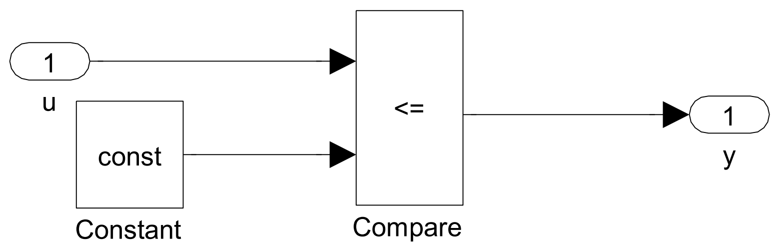

Action
Action Port
1
In
1
Out

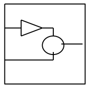

Action
Action Port
1
In
1
Out


Action
Action Port
1
In
1
Out

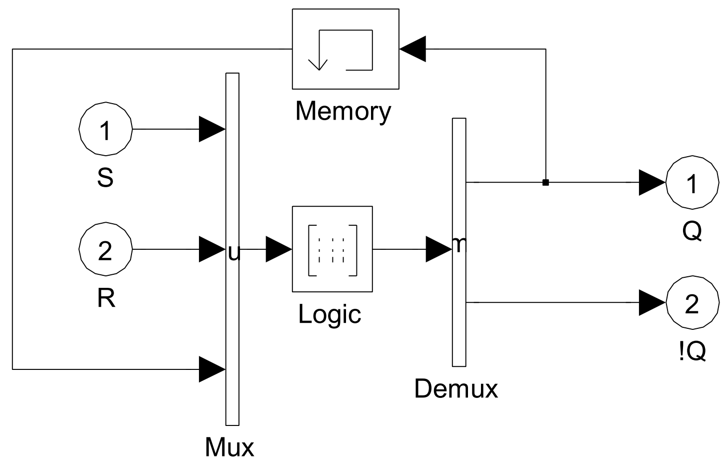


The outputs of this block are designed to be
directly connected to a MotoHawk PWM block.


1
u
const
Constant
<=
Compare
1
y



EmptySubsystem



Memory
1
S
2
R
Mux
Logic
Demux
1
Q
2
!Q