

BACKGROUND

Pectel Traction Control has a potential of up to seven user-selectable, user-defined, traction control strategies which can be activated by two user selectable controls:

1. **Switch:** Switch selection is typically momentary which allows scrolling through up to seven strategies displayed on a motorsport dash display. We are not using this.
2. **TCSPOT :** Rotary Potentiometer selected by the operator. We are using this. There is an option in TCSPOT for four of the seven control strategies to be assigned to the four CAL_POT positions.

There are three calculation methods for traction control:

- a. DERIVED WHEEL SPEED: Where there is no sensor on the un-driven wheel. Not used
- b. DIFFERENCE-BASED: Not used.
- c. PERCENTAGE BASED. We will use this method.

CalTool 3.4 Traction Control related data is located in four areas:

1. Groups/STANDARD MAPPING/TRACTION CONTROL
2. Groups/INPUT FUNCTIONS/ TRACTION CONTROL SWITCH
3. Groups/ANALOG SENSOR SETUP/CONTROL SENSORS/TRACTION CONTROL ADJUSTMENT POT (TCSPOT)
4. Groups/INPUT FUNCTIONS/ WHEEL DIAMETER SWITCH and WHEEL SPEED INPUTS

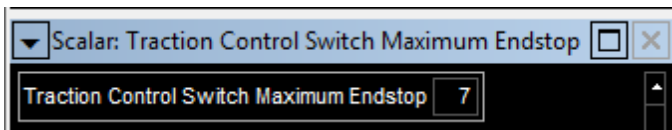
CALTOOL 3.4 ENTRIES:

TRACTION CONTROL SWITCH

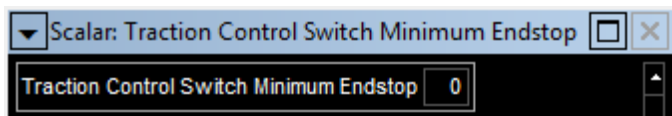
GROUPS / INPUT FUNCTIONS / TRACTION CONTROL SWITCH : (Alternative to Traction Control Pot):

Typically a momentary switch on your Cosworth Intelligent Color Display (ICD) that allows you to scroll through and select your traction control maps.

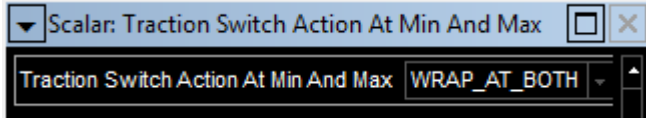
Traction Control Maximum Endstop: : 0 to 7; highest position 7



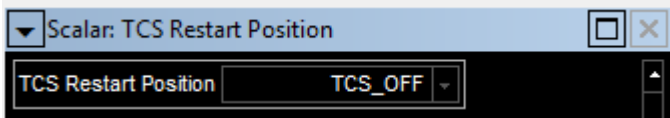
Traction Control Minimum Endstop: 0 to 7; lowest position; 0



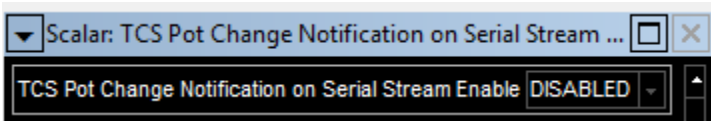
Traction Switch Action at Min Max: Four Choices; DONT_WRAP



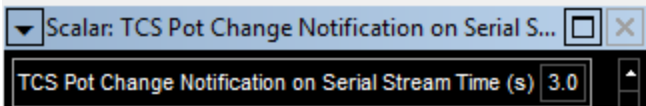
TCS Restart Position: Nine possible positions in software; TCS_OFF



TCS Pot Change Notification on Serial Stream Enable: ENABLED or DISABLED; DISABLED

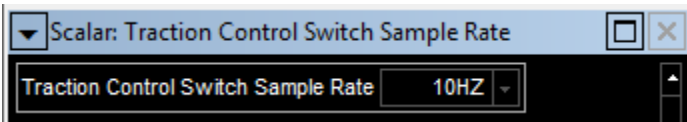


TCS Pot Change Notification on Serial Stream Time: 0.1 to 5.0 seconds; 1.0

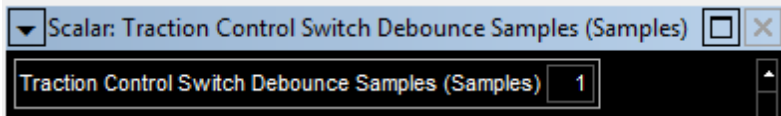


GROUPS / INPUT FUNCTIONS / TRACTION CONTROL SWITCH / SAMPLING:

Traction Control Switch Sample Rate: Five Choices: 10Hz



Traction Control Switch Debounce Samples: 0 to 100; 1

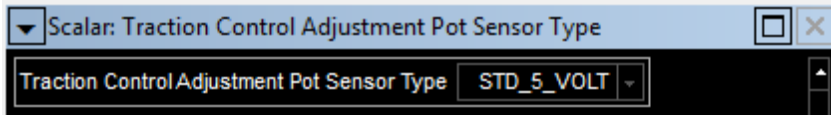


TRACTION CONTROL POT:

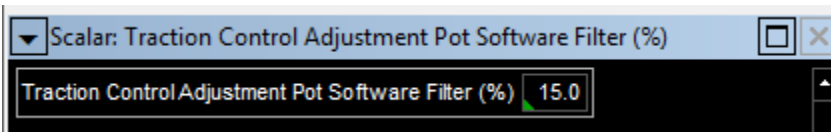
Groups / ANALOGUE SENSOR SETUP / CONTROL SENSORS/

TRACTION CONTROL ADJUSTMENT POT (TCSPOT):

Traction Control Adjustment Pot Sensor Type: STD_5_VOLT



Traction Control Adjustment Pot Software Filter: Percent 0.0 to 100.0; 15

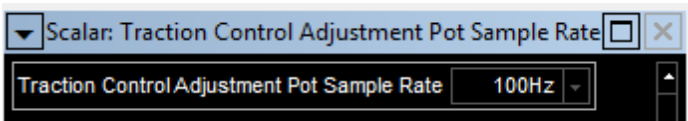


Traction Control Adjustment Pot Sensor Curve

A screenshot of a software interface showing a table titled "Matrix: Traction Control Adjustment Pot Sensor Curve (V)". The table has two rows and 16 columns. The first row is labeled "V_TCSPOT (V)".

	0.000	0.313	0.625	0.938	1.250	1.563	1.875	2.188	2.500	2.813	3.125	3.438	3.750	4.063	4.375	4.688	5.000
	0.000	0.313	0.625	0.938	1.250	1.563	1.875	2.188	2.500	2.813	3.125	3.438	3.750	4.063	4.375	4.688	5.000

Traction Control Adjustment Post Sample Rate: Ten choices; 100Hz



Traction Control Adjustment Pot Voltage Thresholds: Eight Equal divisions 0-5VDC. 0 VDC is Traction Control Off (TC_OFF). The next 7 positions are varying traction strategies.

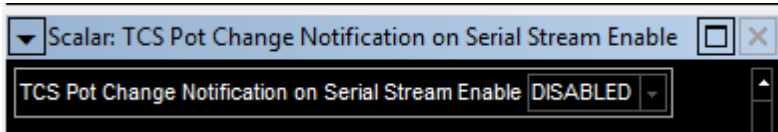
A screenshot of a software interface showing a table titled "Matrix: Traction Control Adjustment Pot Voltage Thresholds (V)". The table has two rows and 8 columns. The first row is labeled "Switch_Position".

	TCS_OFF	TCS_POS_1	TCS_POS_2	TCS_POS_3	TCS_POS_4	TCS_POS_5	TCS_POS_6	TCS_POS_7
	0.000	0.720	1.420	2.140	2.850	3.560	4.280	5.000

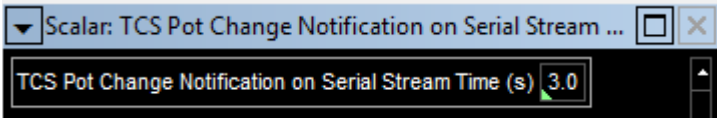
TCS Restart Position: Nine choices; TCS_OFF



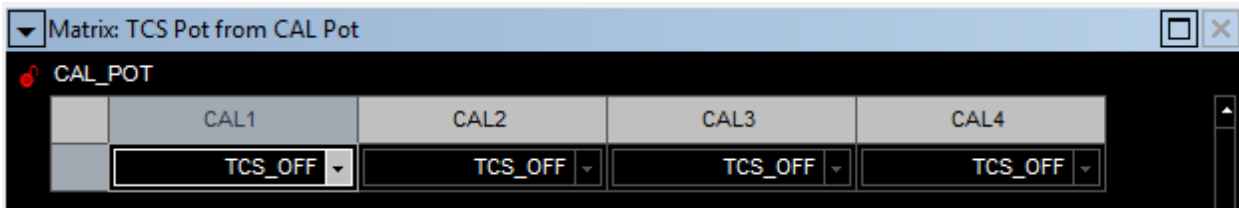
TCS Pot Change Notification on Serial Stream Enable: ENABLED or DISABLED; DISABLED



TCS Pot Change Notification on Serial Stream Time: 3.0

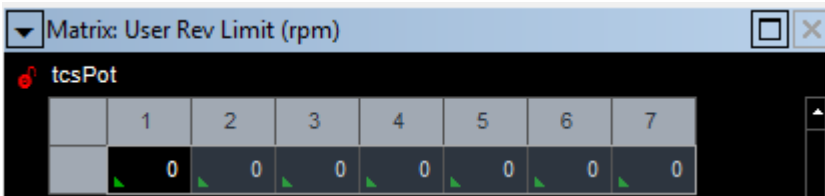


TCS Pot from CAL Pot: CAL_POT not used for traction control



Groups/STANDARD MAPPING/TRACTION CONTROL:

User Rev Limit: Zeros mean use normal rev limit



Slip Control Enable: **ENABLED**

Slip Calculation Mode Threshold (kph): **0.0** Above this speed Percentage-Based traction control mode will be used.

Minimum Vehicle Speed for Distance Multiplier (kph): **20.0** (related to lap beacons...i.e. not relevant)

BRAKING MODE:

Slip Control Braking Mode Pressure Threshold (bar): **0.00** (see software description)

Slip Control Braking Mode Pressure Hysteresis (bar): **5.00** (see software description)

DERIVED WHEEL SPEED: (Not used on Road Glide/Bullett)

Enable Derived Wheel Speed: **DISABLED**

Derived Wheel Speed Maximum Rate of Change f(Gear Position): Only if above is ENABLED

Matrix: Derived Wheel Speed Maximum Rate of Change f(Gear Position) (m/s ²)								
gear_pos	FIRST	SECOND	THIRD	FOURTH	FIFTH	SIXTH	SEVENTH	EIGHTH
	482.8	482.8	482.8	482.8	482.8	482.8	482.8	482.8

Groups / STANDARD MAPPING / TRACTION CONTROL / DIFFERENCE-BASED: (Not used)

Base Goal Slip Difference:

Matrix: Base Goal Slip Difference (kph)												
TPS (%)	car_speed (kph)											
	40.0	80.0	120.0	160.0	200.0	240.0	280.0	320.0	360.0	400.0	440.0	480.0
80.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
70.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
60.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
40.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Goal Slip Gear Correction

Matrix: Goal Slip Gear Correction (kph)										
gear_pos	REVERSE	NEUTRAL	FIRST	SECOND	THIRD	FOURTH	FIFTH	SIXTH	SEVENTH	EIGHTH
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Goal Slip User Multiplier:

Matrix: Goal Slip User Correction (kph)							
tcsPot	1	2	3	4	5	6	7
	0.0	0.0	0.0	0.0	0.0	0.0	0.0

PERCENTAGE-BASED: (Used On Road Glide and Bullett)

Base Goal Slip Percentage: 0.0 to 200.0;

Matrix: Base Goal Slip Percentage (%)

car_speed (kph)

TPS (%)	40.0	80.0	120.0	160.0	200.0	240.0	280.0	320.0	360.0	400.0	440.0	480.0
80.0	100.0	100.0	75.0	50.0	32.0	15.0	12.5	10.0	10.0	10.0	10.0	10.0
70.0	100.0	100.0	75.0	50.0	32.0	15.0	12.5	10.0	10.0	10.0	10.0	10.0
60.0	100.0	100.0	75.0	50.0	32.0	15.0	12.5	10.0	10.0	10.0	10.0	10.0
50.0	100.0	100.0	75.0	50.0	32.0	15.0	12.5	10.0	10.0	10.0	10.0	10.0
40.0	100.0	100.0	75.0	50.0	32.0	15.0	12.5	10.0	10.0	10.0	10.0	10.0
30.0	100.0	100.0	75.0	50.0	32.0	15.0	12.5	10.0	10.0	10.0	10.0	10.0
20.0	100.0	100.0	75.0	50.0	32.0	15.0	12.5	10.0	10.0	10.0	10.0	10.0
10.0	100.0	100.0	75.0	50.0	32.0	15.0	12.5	10.0	10.0	10.0	10.0	10.0

Goal Slip Gear Multiplier: Percentage 0.000 to 5.000

Matrix: Goal Slip Gear Multiplier (%)

gear_pos

	REVERSE	NEUTRAL	FIRST	SECOND	THIRD	FOURTH	FIFTH	SIXTH	SEVENTH	EIGHTH
	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Goal Slip User Multiplier: Percentage 0.000 to 5.000; Position 7 doubles the allowed slip. There are actually 8 positions so the first position is traction control off.

Matrix: Goal Slip User Multiplier (%)

tcsPot

	1	2	3	4	5	6	7
	1.000	1.100	1.200	1.400	1.600	1.800	2.000

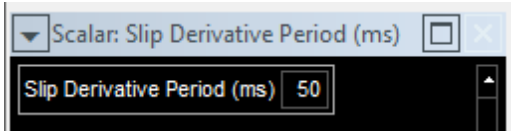
Slip Control Derivative Multiplier: If not required set to 1.00

Matrix: Slip Control Derivative Multiplier (%)

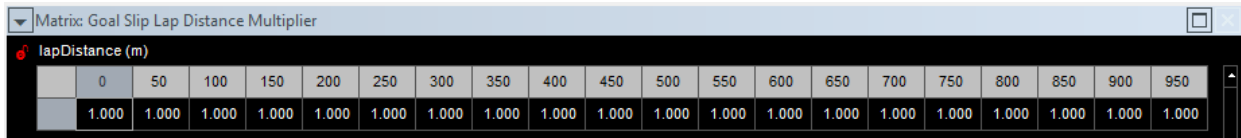
tcsSlipDerivPcPerSec (%/s)

	-50.0	-43.8	-37.5	-31.3	-25.0	-18.8	-12.5	-6.3	0.0	6.3	12.5	18.8	25.0	31.3	37.5	43.8	50.0
	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Slip Derivative Period (Calculation Time to derive %/sec value)

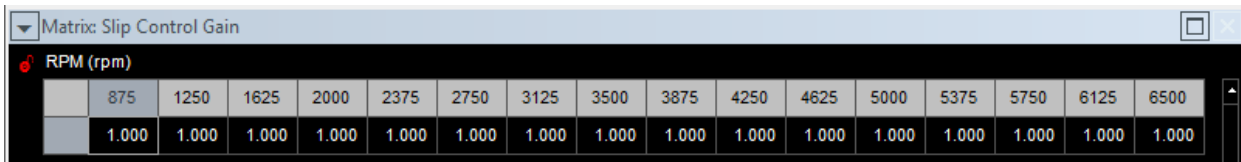


Goal Slip Lap Distance Multiplier: (not used)

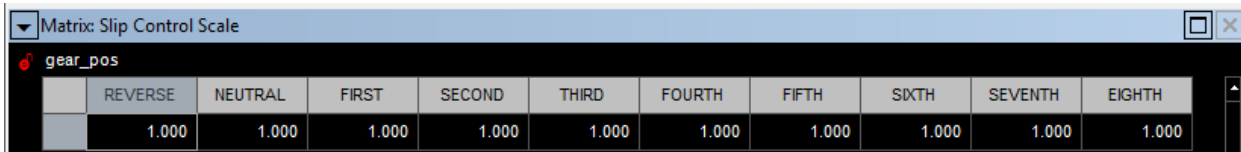


Groups/STANDARD MAPPING / TRACTION CONTROL:

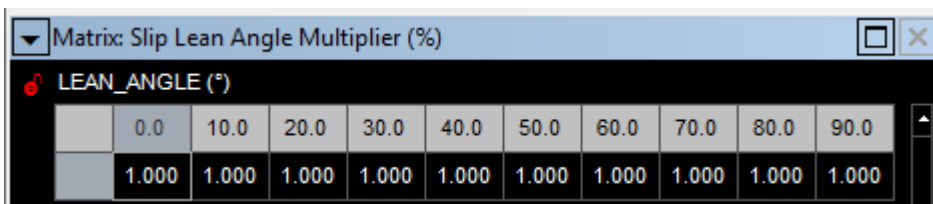
Slip Control Gain: (not used)



Slip Control Scale:



Slip Lean Angle Multiplier:



Slip Derivative Engine Speed Multiplier

Matrix: Slip Derivative Engine Speed Multiplier												
TPS (°)												
deltaRpm (rpm)	0.0	10.0	20.0	30.0	40.0	50.0	60.0	70.0	80.0	90.0	100.0	
20000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	
19000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	
18000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	
17000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	
16000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	
15000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	
14000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	
13000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	
12000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	
11000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	
10000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	

Slip Control Clamp: max torque reduction permitted after all calculations.

Matrix: Slip Control Clamp																
RPM (rpm)																
	875	1250	1625	2000	2375	2750	3125	3500	3875	4250	4625	5000	5375	5750	6125	6500
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Slip Control Throttle Demand: If not required set to 100.0

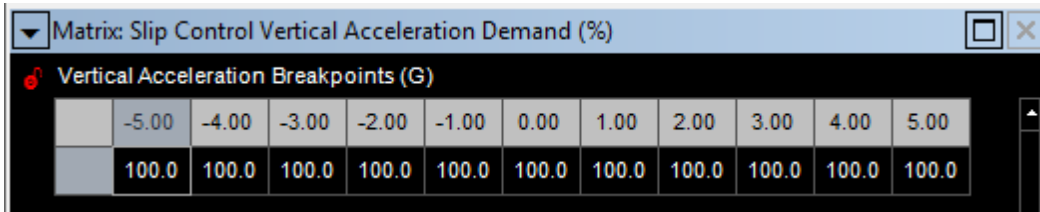
Matrix: Slip Control Throttle Demand (%)								
TPS (°)								
	10.0	20.0	30.0	40.0	50.0	60.0	70.0	80.0
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Slip Control Steering Demand: : If not required set to 100.0

Matrix: Slip Control Steering Demand (%)											
STEER (°)											
	-8.0	-5.0	-3.0	-2.0	-1.0	-0.0	1.0	2.0	3.0	5.0	8.0
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Slip Control Vertical Acceleration Source: **SENSOR**

Slip Control Vertical Acceleration Demand (%): If not required set to 100.0

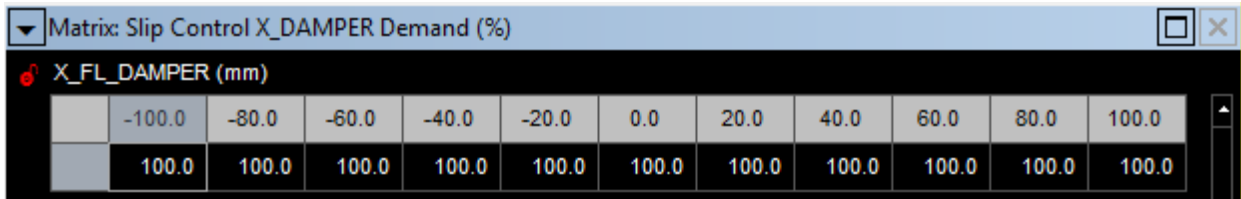


Matrix: Slip Control Vertical Acceleration Demand (%)

Vertical Acceleration Breakpoints (G)

	-5.00	-4.00	-3.00	-2.00	-1.00	0.00	1.00	2.00	3.00	4.00	5.00
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Slip Control X_DAMPER Demand (%): If not required set to 100.0

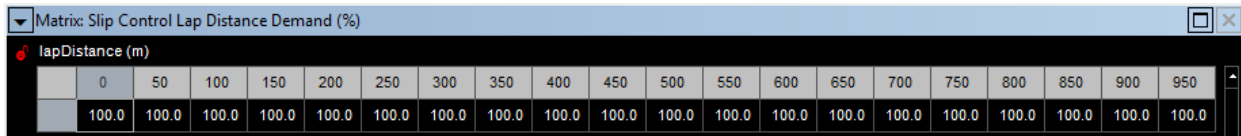


Matrix: Slip Control X_DAMPER Demand (%)

X_FL_DAMPER (mm)

	-100.0	-80.0	-60.0	-40.0	-20.0	0.0	20.0	40.0	60.0	80.0	100.0
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Slip Control Lap Distance Demand (%): If not required set to 100.0

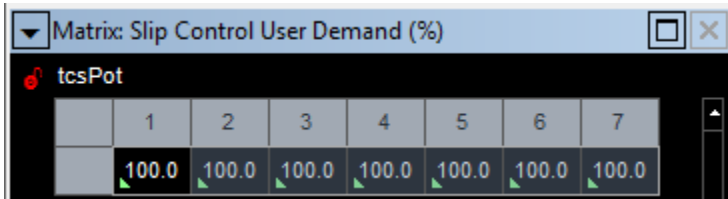


Matrix: Slip Control Lap Distance Demand (%)

lapDistance (m)

	0	50	100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Slip Control User Demand (%): If not required set to 100.0

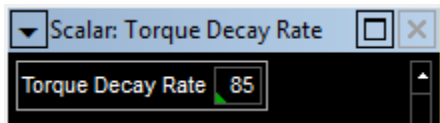


Matrix: Slip Control User Demand (%)

tcsPot

	1	2	3	4	5	6	7
	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Torque Decay Rate: 1 to 255: 85 means 100% restoration from full cut in 0.03 seconds.



Scalar: Torque Decay Rate

Torque Decay Rate 85

Groups/STANDARD MAPPING/TRACTION CONTROL/ANTI-WHEELIE:

Anti-Wheelie Enable: **DISABLED**

Groups/STANDARD MAPPING/TRACTION CONTROL/DRIVETRAIN BACKLASH:

Drivetrain Backlash Strategy Enable: **DISABLED**

Groups/STANDARD MAPPING/TRACTION CONTROL/TORQUE TRANSFER FUNCTIONS:

Cylinder Cut: Entry of 50.0 means half cylinders cut

Matrix: Cylinder Cut (%)

TCS_trq (%)

	0.0	6.7	13.3	20.0	26.7	33.3	40.0	46.7	53.3	60.0	66.7	73.3	80.0	82.4	86.7	93.3	100.0	
	0.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0

Was (?)

Matrix: Cylinder Cut (%)

TCS_trq (%)

	0.0	6.7	13.3	20.0	26.7	33.3	40.0	46.7	53.3	60.0	66.7	73.3	80.0	82.4	86.7	93.3	100.0
	0.0	6.0	12.5	18.5	25.0	31.5	37.5	44.0	50.0	56.0	62.5	68.5	75.0	81.0	87.5	93.5	100.0

Ignition Retard:

Matrix: Ignition Retard (°)

TCS_trq (%)

	0.0	6.7	13.3	20.0	26.7	33.3	40.0	46.7	53.3	60.0	66.7	73.3	80.0	82.4	86.7	93.3	100.0
	0.00	2.00	3.00	4.00	5.25	6.25	7.00	8.75	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Injection Multiplier:

Matrix: Injection Multiplier (%)

TCS_trq (%)

	0.0	6.7	13.3	20.0	26.7	33.3	40.0	46.7	53.3	60.0	66.7	73.3	80.0	82.4	86.7	93.3	100.0
	1.00	1.00	1.00	1.00	1.05	1.06	1.07	1.09	1.10	1.11	1.13	1.14	1.15	1.16	1.18	1.19	1.20

Lambda Target Reduction (Lambda): Not used

Scalar: Lambda Target Reduction (Lambda)

Lambda Target Reduction (Lambda)	0.000
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Groups/INPUT FUNCTIONS/WHEEL DIAMETER SWITCH:

Wheel Diameter Switch Sample Rate: 10Hz (entry greyed out)

Wheel Diameter Switch Debounce Samples: 10

Groups/INPUT FUNCTIONS/WHEEL SPEED INPUTS:

Vehicle Speed Wheel Select: Six (6) choices; FRONT_SPEED

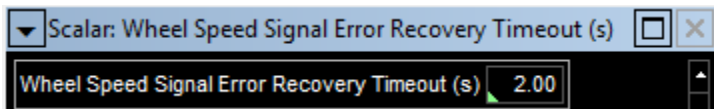
Front Speed Wheel Select: Three (3) choices; USE_MAX_L_R

Rear Speed Wheel Select: Three (3) Choices; USE_MAX-L_R

Wheel Stop Timeout: 0.00 to 600.00 seconds; 3.00

Wheel Speed Signal Error Timeout: 0.00 to 600.00 seconds; 10.00

Wheel Speed Signal Error Recovery Timeout: 0.00 to 600.00 seconds; 2.00

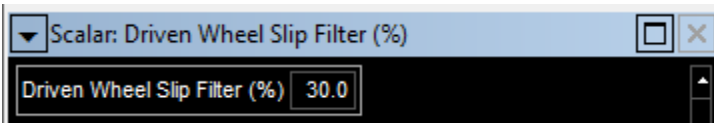


Dash Speed Channel Multiplier: 0.0000 to 7.9999; 1.0000

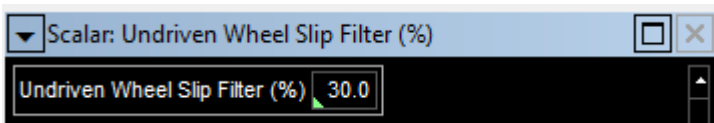
Groups/INPUT FUNCTIONS/WHEEL SPEED INPUTS/TRACTION CONTROL:

Driven Wheels Select: Two (2) choices; REAR_WHEELS

Driven Wheel Slip Filter (%): 30.0



Undriven Wheel Slip Filter: Percentage 0.0 to 100.0; 30.0



Driven Speed Wheel Method: Five (5) choices; USE_MAX_L_R

Driven Wheel Diff Scaling: 0.0 to 100.0; 0.0 There is no differential on a motorcycle.

Groups/INPUT FUNCTIONS/WHEEL SPEED INPUTS/FRONT:

Front Wheel Number of Teeth to Average Axis Breakpoints: 100 200

Front Wheels Outside Diameter A: Millimeters 654

Front Wheels Outside Diameter B: Millimeters 654

Front Wheels Number of Teeth: Road Glide 60 teeth.

Front Wheels Number of Teeth to Average: 1

Front Wheels Dynamic Measurement Change Speed: Four (4) entries all 4.8 kph

Front Speed Lean Angle Compensation: Seventeen (17) entries; all 1.000

Groups/INPUT FUNCTIONS/WHEEL SPEED INPUTS/REAR:

Rear Speed Lean Angle Compensation: Seventeen (17) entries; all 1.000

Groups/INPUT FUNCTIONS/WHEEL SPEED INPUTS/REAR/REAR LEFT:

Rear Left Wheel Number of Teeth to Average Axis Breakpoints: 100 200

Rear Left Wheel Outside Diameter A: Millimeters 654

Rear Left Wheel Outside Diameter B: Millimeters 654

Rear Left Wheel Number of Teeth: 68

Rear Left Wheel Number of Teeth to Average: 1

Rear Left Wheel Dynamic Measurement Change Speed: Four (4) entries; all 4.8 kph

Groups/INPUT FUNCTIONS/WHEEL SPEED INPUTS/REAR/REAR RIGHT:

Rear Right Wheel Number of Teeth to Average Axis Breakpoints: 100 200

Rear Right Wheel Outside Diameter A: Millimeters 654

Rear Right Wheel Outside Diameter B: Millimeters 654

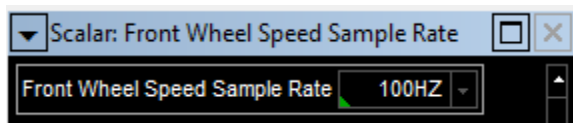
Rear Right Wheel Number of Teeth: 68

Rear Right Wheel Number of Teeth to Average: 1

Rear Right Wheel Dynamic Measurement Change Speed: Four (4) entries; all 4.8 kph

Groups/INPUT FUNCTIONS/WHEEL SPEED INPUTS/SAMPLING:

Front Wheel Speed Sample Rate: 100Hz



Front Right Wheel Speed Sample Rate: 100Hz

Rear Wheel Speed Sample Rate: 100Hz

Rear Right Wheel Speed Sample Rate: 100Hz

Groups/INPUT FUNCTIONS/WHEEL SPEED INPUTS/SAMPLING/DYNAMIC SAMPLING:

Dynamic Teeth to Average Enable: DISABLED

Number of Teeth to Average Axis Size: 2