Document Number		DAD0001	
Title		Drive by Wire / Electronic Throttle Setup	
Approved By		*JA*	
Revision	**Date**	**Prepared By**	**Change History**
1.0	22/02/08	MM	
2.0	15/5/09	MM	changes to reflect new application drawings

Contents

Introduction

MoTeC's Electronic Throttle (ET) or Drive by Wire (DBW) function is available on the 'hundred series' ECUs - M400, M600, M800 and M880 with the DBW upgrade enabled.

This document explains the Drive by Wire throttle control function in ECU Manager software and is intended to help with configuring and troubleshooting a DBW installation.

Scope

The document is based on Version 3 ECU Manager software (release version 3.41G) but is applicable to most versions before this. Differences for Version 2 software will be listed in the appendix. Most of the information is the same or similar in both versions.

The explanation of DBW Idle Control is not included in this document. CAN DBW systems are not covered in this document.

DBW Throttle System

All current DBW systems consist of a throttle body with inbuilt servo motor, at least two throttle position sensors and a driver pedal system including at least two pedal position sensors.

Two sensors are required on the throttle body and two on the pedal to check the validity of any position, i.e. the requested pedal position will only be accepted if the two pedal positions 'agree with each other'. Some systems will have more than two sensors.

The MoTeC DBW system requires two position sensors on both the throttle and driver pedal. The software will prevent the use of one position sensor, connected to two inputs.

Drive by Wire Response

Factory fitted DBW throttle systems are designed to meet a set of requirements involving drive train durability and emissions. Throttle response is generally slowed to help with all these requirements resulting in a dull feel.

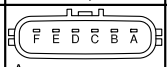
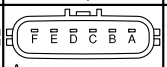
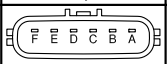
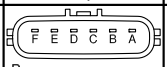
The MoTeC DBW system is designed to a different set of requirements aimed at motorsport systems where throttle response time has the highest priority to achieve minimal delay between request and movement.

The benefit of the MoTeC DBW system is that there is no mechanical compliance in the system. A requested position will always be met. The Throttle Position Translation Table can be used to improve the feel and response of the throttle pedal by altering the relationship between the driver's foot pedal position and the actual requested throttle position, for example having a lower maximum throttle butterfly position when the engine is cold.

Installation

Each DBW installation requires two application drawings; one for the particular throttle body and one for the driver pedal assembly. These drawings contain the connector and calibration details. Throttle bodies and driver pots are identified by their part numbers. For throttle bodies they are generally cast on the body or on a decal.

Please contact MoTeC to acquire the relevant drawing numbers for the system you are installing.

Part No.s	GMB2A J10000094140	GMD1A 70323 1974 3J14			
Applications	Unknown	Unknown			
Part No.s	GMA4A V20356041658	GMD0A 70523 5J12	GMD5C T11000054004 1410 7K28H 02497	16119 7S001 5B11 00971	
Applications	Honda Civic 1.8	Ariel Atom	Honda City/Jazz 2008	Nissan VQ40	
Part No.s	GMB1A H10000077940 40126	GMD0A 61124 1171 11H15	GMB6A U20656003674 339.21.RRA	16119 7S000 4J03 00052	
Applications	Honda CRV	Civic Type R MY07	Honda Civic Si 2006	Nissan Titan	
Comments	Electronic Hybrid	Electronic Hybrid	Electronic Hybrid	Electronic Hybrid	
Pin Function					
Motor-	A	A	A	B	
Motor+	B	B	B	A	
Throttle Position1	F	F	F	F	
Throttle Position2	D	D	D	D	
0V (TP1/TP2)	C	C	C	C	
5V (TP1/TP2)	E	E	E	E	
Calibration					
Proportional Gain	100	100	115	120	
Integral Gain	60	80	65	80	
Derivative Gain	140	160	160	170	
Period	1	1	1	1	
Dead Band	0.3	0.3	0.3	0.3	
Feed Forward	5	0	0	5	
Neg. Integral Clamp	-20	-25	-25	-20	
Frequency	8000	8000	8000	8000	
Motor Volts	14	14	14	14	
					
Notes					

Note, refer to:-
"DAD0001 Electronic Throttle Setup for MoTeC 'hundred series' ECUs" or
"DAD0002 Electronic Throttle Setup for MoTeC 'M1 series' ECUs"
for additional information.

MoTeC

Title	Keihin Electronic Throttle Motors			Sheet No	Drawing No
Date 14.5.2009	Drawn KMH	App	Rev B	1 of 2	DAD0027

Example of an Electronic Throttle Application drawing

Throttle Body Calibration

All DBW throttle bodies and pedals need to be calibrated at MoTeC's Research Centre. Calibrations will be made available as an application drawing based on the part number on the side of the throttle body housing or pedal.

If there is no calibration available for a particular throttle body, the DBW assembly must be sent to MoTeC* to have a calibration determined.

WARNING: Similar part numbers are in no way an indication for a similar calibration. Never use an existing calibration as a 'best guess' to by-pass the need for proper calibration as the results could be potentially dangerous+.

Wiring and Mechanical Installation

Most modern DBW pedal assemblies are quite mechanically flexible and generally not suitable for motor sport use. Minimum compliance or flex in the pedal system is essential. A mechanical stop behind the foot piece will reduce the flex in the pedal. Alternatively it is possible to use two high quality linear or rotary potentiometers rigidly connected to the pedal arm.

* Please contact MoTeC Research Centre in Melbourne Australia, MoTeC Europe in the UK or MoTeC USA for details.

+ DBW Upgrades will only be issued for systems that have been calibrated. Your MoTeC dealer will be able to check the DBW part numbers against a list of calibrated systems.

Good power and ground wiring to the ECU is essential for proper DBW throttle operation as the ECU supplies the current to run the DBW throttle. All position sensors need to wire directly to the MoTeC ECU with a steady 5 volt supply and 0 volt reference.

The DBW system will need four Analogue Voltage (AV) inputs and two Auxiliary Outputs.

Piggy back installations

When installing a MoTeC ECU as a piggy-back to the factory standard ECU, it is recommended that all 5 V and 0 V connections for sensors be supplied by the MoTeC ECU and not the factory ECU.

Pinout

For a particular style of throttle body there can be more than one connector type. The application drawing will describe the connector types and their pin numbering. Some connectors use a separate 0 V and 5 V for TP1 and TP2. If necessary they can be spliced from the MoTeC ECU pins. For driver throttle position sensors (TPD) independent 0 V and 5 V connections are recommended.

The throttle position and driver throttle position signals can be wired to any Analogue Voltage input on the ECU.

The Motor+ and Motor– must be wired in the correct polarity to Auxiliary Outputs 1 and 2 as described by the application drawing. No other outputs can be used. When Motor+ and Motor- are wired in the opposite way to the application drawing, the throttle body will work in the wrong direction and the ECU will turn the function off.

DBW pin function	ECU pin function	MoTeC 'hundred series' ECUs	
		M400/M600/M800 pin no	M880 pin no
Motor-	**AUX1**	A_18	9
Motor+	**AUX2**	A_1	8
Throttle Position 1	**Any AV input**	A_14	6
		A_15	7
		A_16	12
		A_17	18
Throttle Position 2		A_25	26
		B_20	35
		B_21	36
		B_22	44
0V (TP1/TP2)	**0V**	B_15	11
		B_16	27
5V (TP1/TP2)	**5V**	A_2	16
		A_9	34
Alternative pinout (refer to relevant application drawing)			
0V (TP1)	**0V**	B_15	11
		B_16	27
5V (TP1)	**5V**	A_2	16
		A_9	34
0V (TP2)	**0V**	B_15	11
		B_16	27
5V (TP2)	**5V**	A_2	16
		A_9	34

WARNING: Some throttle and pedal sensors are non-contact types and incorrect wiring can result in almost instant failure.

Configuration

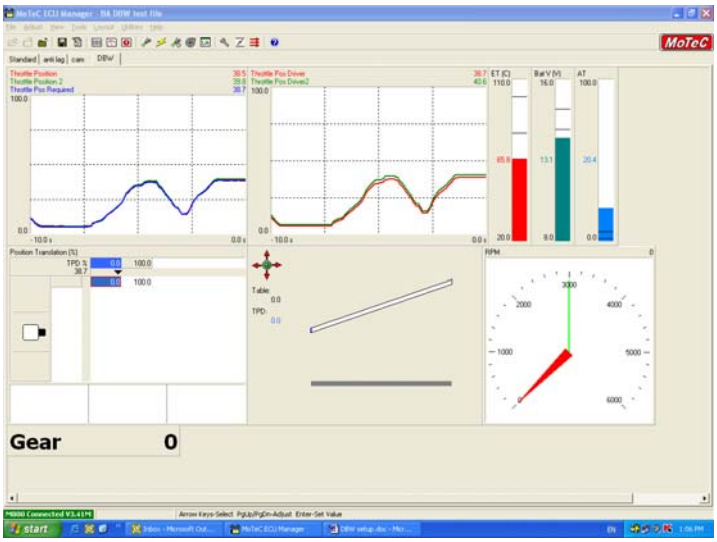
ECU Manager Layout

MoTeC recommends creating a new layout page for each major function of the ECU to ensure all relevant information is available and to avoid confusion.

A separate ECU Manager layout will be very helpful during the setup procedure for a DBW system.

To set up a DBW ECU Manager layout

1. Open a new layout.
2. Add a chart recorder showing the *Throttle Position Driver* and *Throttle Position Driver2* channels.
3. Add a second chart recorder showing the *Throttle Position*, *Throttle Position2* and *Throttle Position Required* channels.
   The first two channels show the throttle butterfly movement. The *Throttle Position Required* channel shows the butterfly position the ECU is aiming for.

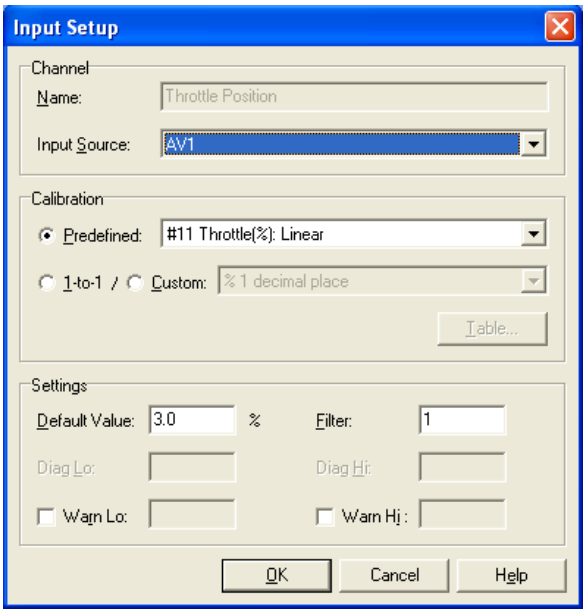


Setup Sensor Inputs and Aux Outputs

To set up the throttle position inputs

1. On the *Adjust* menu, click *Sensor Setup.*
2. Click *Input Setup.*
3. *On the Engine* tab double click *Throttle Position*.
4. In the input source list, click AV#, where # is the correct AV input pin number to match the actual wiring loom.

5. In the *Calibration* area, select *Predefined* and in the list click *#11 Throttle (%): Linear.*



6. Do not change the values in the *Default Value* and *Filter* boxes.
7. Click *OK.*
8. Click the *DBW/Servo* tab and double click *Throttle Position 2.*
9. Repeat steps 4 to 7 to set up the second Throttle Position.
10. Click Throttle Pos Driver and repeat steps 4 to 7 to set up the first Driver Throttle Position.
11. Click Throttle Pos Driver2 and repeat steps 4 to 7 to set up the second Driver Throttle Position.

Note: For a number of throttle bodies, TP2 does not have a full 0–100% range, but stops reading at a fixed percentage. In this case a custom calibration table for TP2 is needed to alter its effective range as the ECU interprets it. The relevant application drawing for your DBW throttle body will indicate the TP2 Linear Limit and step 5 will be replaced by:

5.1 In the *Calibration* area, select *Custom.*
This will automatically select calibration units in percentage to one decimal place.

5.2 Click *Table* and enter following the values:

Input %	0	100
%	0	fixed percentage as indicated in the application drawing

For examples see the appendix.

To set up the auxiliary outputs

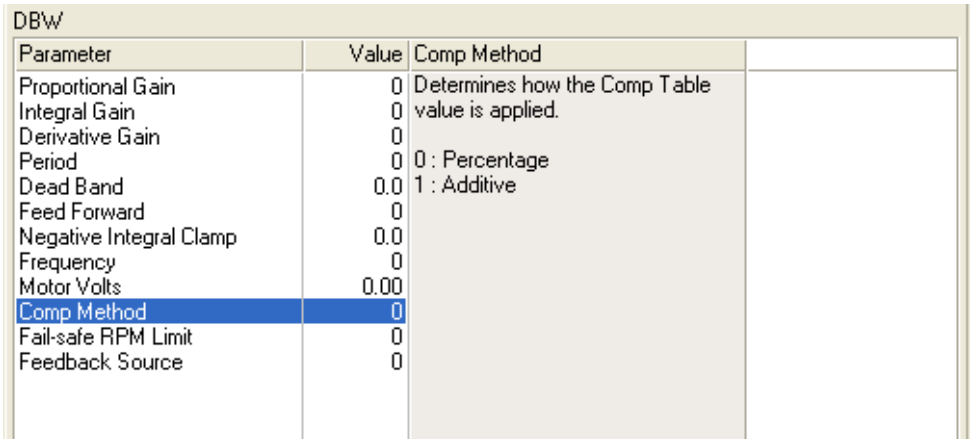
1. On the Adjust menu, click *Auxiliary Output Functions.*
2. Click *Auxiliary Out 1* and then click *Function.*
3. Enter **5: Drive by Wire.**
The DBW function will automatically take control of Auxiliary 2, there no need for any function assignment on this output for normal DBW use.
Note: If using the Drive by Wire Idle function, this will be setup on Auxiliary 2. This should **not** be set until the DBW throttle system is working correctly.
4. Do not set any other parameters or tables in the Auxiliary Output Function.

DBW Parameters

WARNING: At least one of the motor wires MUST now be disconnected. Serious injury can result if any mistakes are made in the setup phase.

To set up the parameters for the DBW throttle

1. On the *Adjust* menu, click *Functions.*
2. Click *Drive by Wire* and then click *Setup.*
3. Enter the parameters exactly as they appear on the relevant application drawing.



4. *Comp Method* is not specified on the DBW application drawing. This value determines how the compensation table value is applied. Enter either ***0: Percentage*** (e.g. 10% compensation on current position) or ***1: Additive*** (e.g. current position +10).
5. *Fail safe RPM* is the low RPM limit that activate any time there is a failure of the DBW system. It can be entered optionally. When no value is entered, a default value of 1/3 of the main RPM limit is used.
6. Enter the *Feedback Source* when indicated on the application drawing.
   Note: when no value is given, *Feedback Source* must remain 0.

Position Translation and Compensation Table

The Position Translation table can be either 2D or 3D and sets the relation between the Throttle Position Driver (TPD%) and the Throttle Position Request.

This table must be filled in for the DBW throttle function to operate; if the table is left as a single point (0), the ECU will assume that the user always wants the throttle position to be 0.

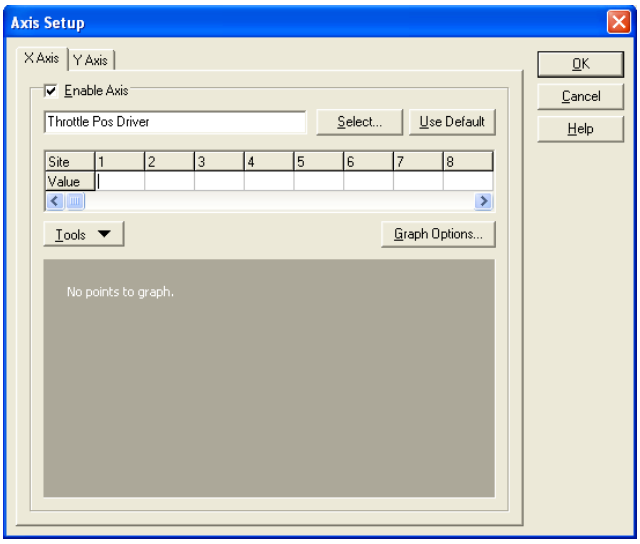
Generally the X-axis parameter will be Throttle Position Driver (TPD %) and the table values entered are the requested throttle butterfly position for that particular driver pedal position. As an example, in the first third or half of the driver pedal range, most engines will have an actual throttle butterfly position of half the driver pedal position i.e. 20% pedal position equals 10% throttle position. In the last half of the range, after 50% pedal position, the relationship becomes 1:1, i.e. 50% pedal position equals 50% throttle position. A non-linear relationship can make the engine much easier to control at light loads and low speed.

The Y-axis can be used for another related channel like gear.

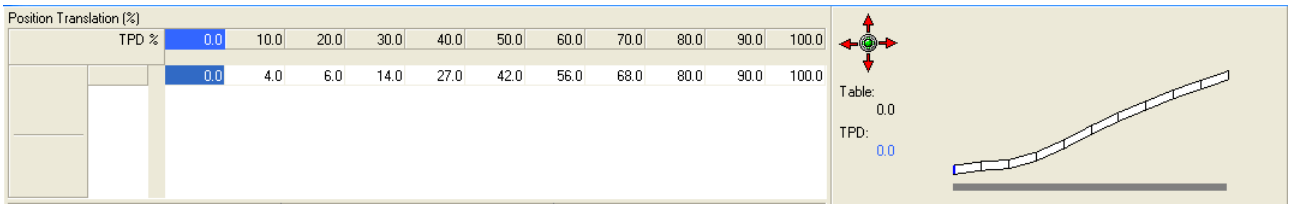
To set up the Position Translation table

1. On *Adjust* menu click *Functions.*
2. Click *Drive by Wire* and then click *Position Translation.*

3. Press A to open the *Axis Setup*.



4. On the *X Axis* tab, select *Enable Axis*. The default is *Throttle Pos Driver*.
   The X-axis values can be chosen as desired, but it is recommended to have an axis point at least every 10%.
5. Click *OK* to send the table axis to the ECU.
6. Enter the translation values in the Position Translation table.



To set up a 4D Translation table

Optional procedure: This step is only required to enable a fourth dimension axis for a 4D table setup.

1. On the *Adjust* menu, click *General Setup.*
2. Click *Main Setup* and enter the required number (for more information press F1).

To set up the Compensation table

The Compensation table is a 3D table that allows the user to compensate the Position Translation table similar to a fuel or ignition compensation. This allows for two extra channels to be used to alter the requested throttle position.

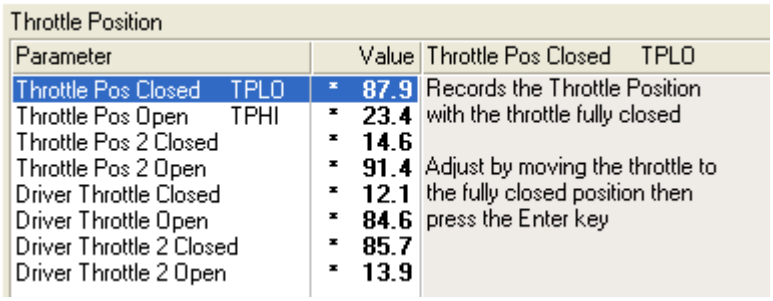
The compensation table is setup in the same way as the Translation table. In step 2 click *Comp* and use the *Axis Setup* to choose the channel that is to be used as a compensation axis.

Throttle Position High/Low

The Throttle High and Low settings are the ECU's reference voltage for the fully closed and fully open positions of the butterfly. Because of manufacturing tolerances on factory position sensors, the user must set all of the High and Low parameters with the system installed in the vehicle.

Most factory DBW systems will have the two sensors starting at opposite ends of their 5 volt ranges. For example, Driver Throttle Closed signal will be at 0 V while Driver Throttle 2 Closed signal will be at 5 V. Over the range of pedal movement the voltages will move in opposite directions. It is also possible that the two sensors' voltages both rise with throttle position, but start at different levels. The relevant application drawing will show this with a small graph.

Note: Throttle position values are not in voltage or percentage but in analogue to digital (A/D) counts divided by 10. 5 volt equals 1024 A/D counts.
For example TP Closed is 87.9 equals ((87.9 x 10)/1024) x 5 = 4.29 volt.
Tip: To view the raw voltage into the Analogue Voltage pin: on the *View* menu, click *Raw Input Values*.



To open the Throttle Position Hi/Lo screen

1. On the *Adjust* menu, click *Sensor Setup.*
2. Click *Throttle Position Hi/Lo.*

Driver Throttle Positions

When setting driver throttle positions, ensure all TPD raw values are between 3 and 99.

To set the Driver Throttle Closed positions

1. Select *Driver Throttle Closed.*
2. Leave the driver pedal in the closed position and press ENTER.
   This will set the first driver closed position.
3. Select *Driver Throttle 2 Closed.*
4. Ensure there has been no movement in the pedal position and press ENTER.
   Both Driver Throttle Closed positions are now set.

To set the Driver Throttle Open positions

1. Push the pedal to its full travel position.
   Important: Be sure to press the throttle pedal all the way to the end of its travel taking up any small flex in soft carpet or compliance in the pedal itself. Once in use, if the driver presses the throttle pedal past the set open positions it can result in a DBW error and the DBW system will be shut down.
2. Select *Driver Throttle Open.*
3. Hold the pedal in its open position and press ENTER.
4. Select *Driver Throttle 2 Open.*
5. Ensure there has been no movement in the pedal position and press ENTER.
   Both Driver Throttle Open positions are now set.

To lock in the Driver Throttle positions

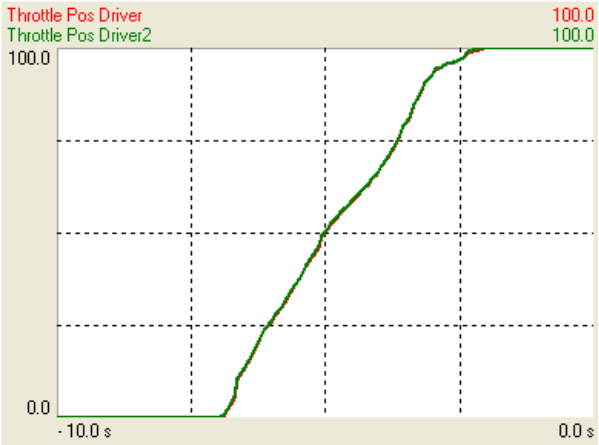
A change to a different setup screen is required because while in the Throttle Position Hi/Low window the ECU is expecting the user to set the Open and Closed parameter settings.

- Press *R* to reset the ECU and click *Yes* to confirm, to ensure the parameter settings are locked in correctly.

To check the pedal channels

1. Using the chart recorder check that the two pedal positions start at 0%.

2. Move the pedal slowly. The two channels should track each other with virtually no difference. See DBW Errors section for allowable tolerances.



Throttle Butterfly Positions

WARNING At least one of the motor wires MUST be disconnected. Serious injury can result if any mistakes are made in the setup phase.

To set the Throttle Position Closed (Butterfly position)

All factory DBW systems will have a throttle butterfly resting position that can be around 10% and is set with an internal spring. This is the position the butterfly will sit at with no power to the DBW throttle.

1. Select *Throttle Pos Closed.*
2. Hold the throttle butterfly closed by hand and press ENTER.
   Tip: close the throttle butterfly onto a feeler gauge of approximately 0.2--0.5 mm. This will depend on the engine. See the section in this document on base idle for more details.
3. Select *Throttle Pos 2 Closed.*
4. Ensure there has been no movement in the throttle position and press ENTER.

To set the Throttle Positions Open (Butterfly position)

1. Push the throttle to its open position.
   Important: All factory DBW throttles will have a hard, mechanical stop built in and it allows the butterfly to be moved, by hand, to just past 90 degrees. **NEVER** set the Open parameters with the butterfly held firmly against the mechanical stop. Try to get the butterfly angle to 90 degrees.
   Some DBW throttle bodies actually have the mechanical stop at 90 degrees of butterfly movement. This may be an indication that from factory the butterfly position never went as high as 90 degrees. The rule of never setting the Open position parameters firmly against the stop still applies.
2. Select *Throttle Pos Open.*
3. Hold the throttle in its open position and press ENTER.
4. Select *Throttle Pos 2 Open.*
5. Ensure there has been no movement in the throttle position and press ENTER.

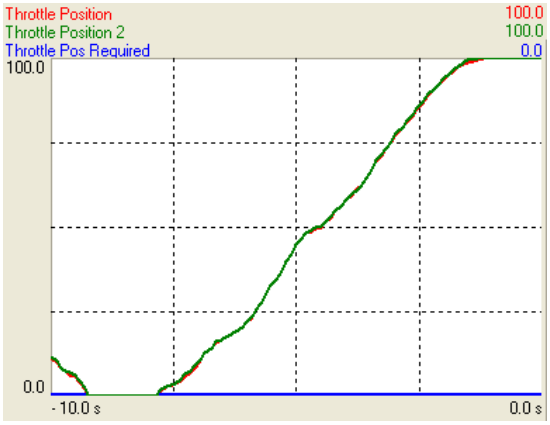
To lock in the Throttle Positions

A change to a different setup screen is required because while in the Throttle Position Hi/Low window the ECU is expecting the user to set the Open and Closed parameter settings.

- Press *R* to reset the ECU and click *Yes* to confirm to ensure the parameter settings are locked in correctly.

To check the validity of the Throttle Position settings

1. Ensure both throttle positions start at 0. Use the same feeler gauge as when setting the throttle closed positions.
2. Move the throttle by hand and check the two throttle positions using the chart recorder. The Throttle Position Required channel will remain at 0.



Note: If the throttle butterfly is moved to a position below the set closed or open positions for too long the sensor channels will go into error and they will need to be reset.
Tip: Remember that with no power to the motor, the throttle positions will sit at the spring position.

Clutch Setup

A small number of DBW systems still employ a cable from the throttle pedal which in the event of a DBW failure the cable can be directly connected to the throttle butterfly. An example is the 2UZ-FE Toyota Land Cruiser throttle body. In this case a clutch setup is required, which is indicated on the relevant application drawing.

The clutch can be setup to be either active when the DBW is working or active when the DBW is in error. Which method to use will be stated on the application drawing.

Clutch Pinout

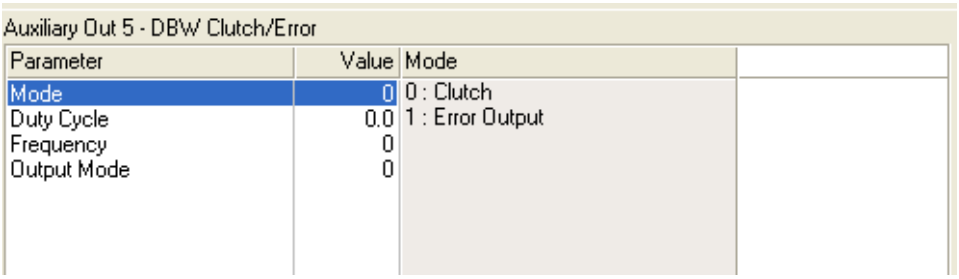
		MoTeC 'hundred series' ECUs	
Clutch pin function	**ECU pin function**	**M400/M600/M800 pin no**	**M880 pin no**
Clutch+	**VBat**	A_26	23 32 41
Clutch-	**AUX5 – AUX8**	A_31 A_32 A_33 A_34	59 65 58 64

Note: When another AUX output is used, this requires a recirculation diode.

To setup the clutch

1. On the A*djust* menu, click *Aux Output Functions.*
2. Select the output onto which the clutch is wired (AUX5, AUX6 ,AUX7 or AUX8).

3. Click *Function* and enter **125: DBW Clutch/Error.**
4. Press ESC, and click *Parameters.*
5. Enter the clutch parameters as on the application drawing.



Note: Output mode for Version 3 software only.

Testing the DBW System

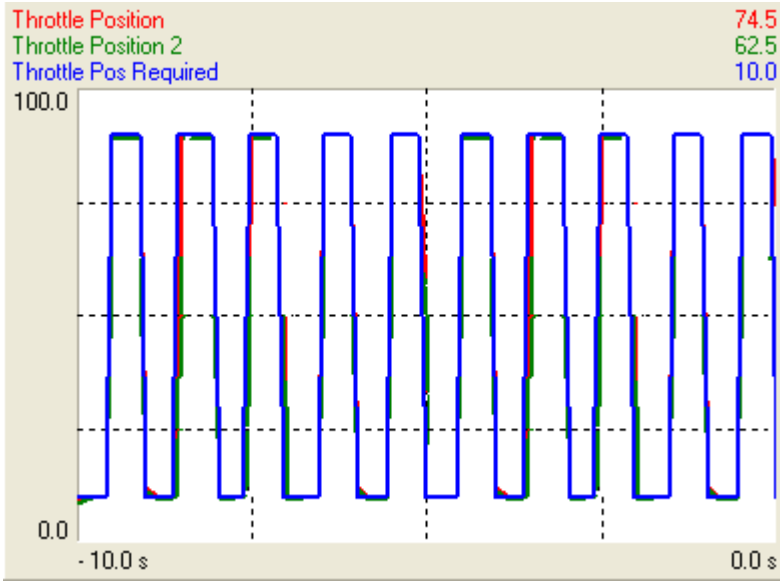
Note: At this point the DBW motor can be reconnected to the ECU. Care must still be taken.

When the DBW motor is reconnected the ECU will be able to test the system. In testing mode the ECU will alternate the throttle request (TP required) between 10-90% at one cycle per second. This mode will ignore the driver pedal input. The test is used to ensure the DBW throttle body is correctly controlled. The ECU will only test the control of the throttle body while in the Setup screen.

1. Ensure the ECU power is OFF.
2. Reconnect the DBW motor.
3. Turn the ECU power ON.
4. On the *Adjust* menu click *Functions.*
5. Click *Drive by Wire* and then click *Setup.*

Acceptable Installation

The diagram below shows an acceptable DBW system installation and setup when the ECU is controlling the throttle body in the test mode. The throttle butterfly follows the required throttle position.

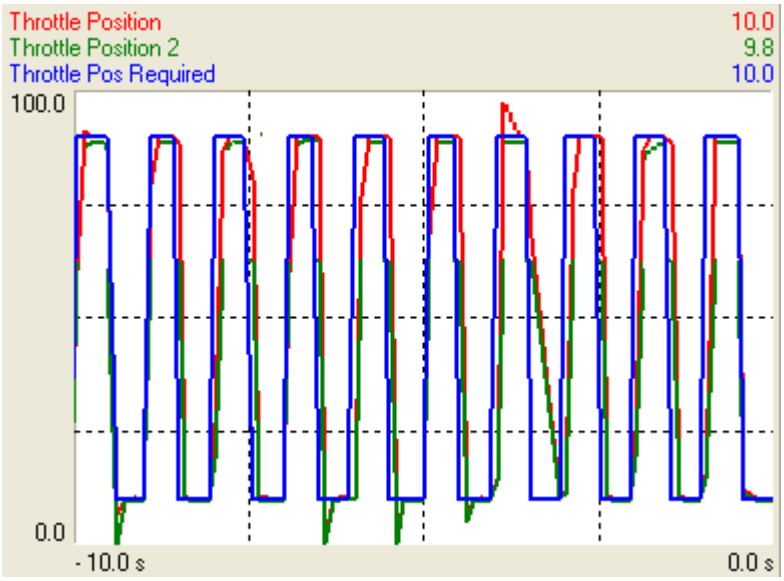


Unacceptable Installation

Below is an example of unacceptable DBW performance. The throttle positions don't follow the requested position and there is some overshoot and undershoot.

Causes

- Poor ECU power supply or earth; the current is not available quickly enough to control the throttle correctly.
- The DBW Setup parameters have been set incorrectly.



Normal Operation

On exit of the Setup window the test mode will automatically stop and the DBW system will be in normal operating condition, i.e. the pedal controls the throttle butterfly via the Position Translation table.

If there is no RPM and there has been no requested position from the driver pedal for 8 seconds the ECU will turn off the throttle to save power. This will not cause an error. As soon as the engine starts to turn over on the starter motor or the driver pedal is moved the ECU will turn the throttle back on.

Base Idle Speed

To set the base idle speed the engine needs to be started and tuned well enough to idle smoothly when warm. As a rule of thumb, if closed loop Idle Control is to be used, the base idle speed should be set to 100 RPM below the desired idle speed. If no closed loop Idle Control is to be used the base idle can be set at the desired warm idle speed.

There are two methods to set the base idle throttle position.

First method to set base idle throttle position

1. Start the engine and make a judgment on whether it needs a faster or slower idle.
2. Stop the engine.
3. Reset *Throttle Pos Closed* and *Throttle Pos 2 Closed* using a slightly smaller or larger feeler gauge.

The disadvantage of this method is that 0-100% throttle is now over a smaller or larger range. If the engine tuning is based on throttle position and the base idle 0% position needs to be changed, some tuning will need to be redone.

Second method to set base idle throttle position

1. Reset T*hrottle Pos Closed* and *Throttle Position 2 Closed* with the throttle butterfly completely closed and lightly held against the closed mechanical stop.
2. Use the *Position Translation* table to find the correct base idle position. For example, when driver pedal is at 0% the *Position Translation* table asks for 3% throttle butterfly position.

The second method is the technically correct way to set the base idle but may not suit the practical nature of many tuners because completely lifting of the throttle pedal will not give a 0% throttle position. This method does allow the engine to be tuned based on true throttle position where 0% is closed. If the fuel and ignition maps are based on throttle position and for any reason the base throttle position needs to be changed, the tuning will still be correct.

DBW Errors

To ensure the DBW system is working correctly the ECU performs many checks. At any time when an error is detected, the ECU will automatically shut down the DBW system and limit the engine RPM to the Fail-safe RPM Limit.

Error Code	Error Description	Cause
DBW Err	Combination of all DBW Errors	A number of necessary parameters or settings are causing multiple errors.
DBWTPx	One of the feedback sensors (TP or TP2) has gone more than 80 A/D counts above the Hi limit or more than 40 A/D counts below the Lo limit.	One or both of the sensors on the throttle body have gone outside the range set by the Throttle Open and Closed settings
DBWTPDx	One of the driver sensors (TPD or TPD2) has gone more than 80 A/D counts above the Hi limit or more than 40 A/D counts below the Lo limit.	One or both of the pedal position sensors has gone outside the range set by the Driver Throttle Open or Closed settings
DBW TPT	Feed-back sensors (TP & TP2) do not track each other. Triggered by a DBWTPx error or by a difference of more than 20% for 400 ms.	The difference between the TP and TP2 sensors on the throttle body is more than 20% for 400ms.
DBWTPDT	Driver Sensors (TPD & TPD2) do not track each other. Triggered by a DBWTPDx error or by a difference of more than 10% for 400 ms.	The difference between the TPD and TPD2 sensors on the throttle pedal is more than 10% for 400ms
DBW SP	Control loop failure. Triggered when the difference between TP and TP Required is more than 20% for 800 ms.	Drive to motor is lost or motor jammed.
DBWSUp	TPD and TPD2 have been assigned to the same Input Source	The installer has used only one sensor spliced to two inputs for the pedal position

Most DBW errors can be linked to incorrect setup or wiring; if an error occurs, check that all of the preceding steps have been followed and check the wiring.

A common DBW problem is the flex or compliance in the throttle pedal assembly. Out on the track, the driver might push the pedal much further than when the Open positions were set in the ECU – See Mechanical Installation.

Any sensor problems may be difficult to detect in the chart recorders of a laptop screen. The update rate of the display is relatively slow compared to how often the ECU is looking at the sensor inputs. Initial logging of all data on the relevant channels at a high rate, will help especially when the errors occur on the track.

Always include the Throttle Position Required parameter in the display or logging. This allows checking that the position at the butterfly is what the ECU is actually asking for. Any undesired DBW behaviour can be a result of another function, connected to the DBW system that is not setup correctly. For example, when the DBW position request table for Anti-Lag has Throttle Position as an axis input, the throttle body will try to request its own position. This will result in a fast "fluttering" of the throttle butterfly.

Appendix

Setup Differences in Version 2 Software

Setup Sensor Inputs and Aux Outputs

- The channel assignment is located in:
  Adjust > Sensor Setup > Channel Assignments.
- The sensor calibration is located in:
  Adjust > Sensor Setup > Sensor Calibrations.
- The custom calibration tables are located in:
  Adjust > Sensor Setup > Sensor Cal Tables.
  Note: A sensor calibration preceded by a minus sign (–) needs to be entered in the *Sensor Calibration* before the table can be accessed.

DBW Parameters

- The setup parameters from the application drawing are entered in:
  Adjust > Auxiliary Output Functions > Auxiliary Out 1 > Parameters.
  Note: Auxiliary 1 must already have been assigned as the DBW output.

Position Translation and Compensation Table

- The translation table is the table attached to *Auxiliary Output 1*.

Throttle Position High/Low

- The Throttle High and Low parameters are located in:
  Adjust > Sensor Setup > Throttle Position Hi/Low.

Example of TP2 Linear Limit Setup

Version 3 Software

TP2 Linear Limit as on application drawing	Enter the Custom calibration table as follows:
55%	Input % 0 100 % 0 55
57.5%	Input % 0 100 % 0 57.5
60%	Input % 0 100 % 0 60
62.5%	Input % 0 100 % 0 62.5
65%	Input % 0 100 % 0 65
78%	Input % 0 100 % 0 78
87%	Input % 0 100 % 0 87

Version 2 Software

TP2 Linear Limit as on application drawing	Enter the Custom calibration table as follows:

55%

Input%	0	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80	84	88	92	96	100
%	0	22	44	66	88	110	132	154	176	198	220	242	264	286	308	330	352	374	396	428	450	472	494	516	538	550

57.5%

Input%	0	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80	84	88	92	96	100
%	0	23	46	69	92	115	138	161	184	207	230	253	276	299	322	345	368	391	414	437	460	483	506	529	552	575

60%

Input%	0	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80	84	88	92	96	100
%	0	24	48	72	96	120	144	168	192	216	240	264	288	312	336	360	384	408	432	456	480	504	528	552	576	600

62.5%

Input%	0	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80	84	88	92	96	100
%	0	25	50	75	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475	500	525	550	575	600	625

65%

Input%	0	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80	84	88	92	96	100
%	0	26	52	78	104	130	156	182	208	234	260	286	312	338	364	390	416	442	468	494	520	546	572	598	624	650

78%

Input%	0	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80	84	88	92	96	100
%	0	31	62	94	125	156	187	218	250	281	312	343	374	406	437	468	499	530	562	593	624	655	686	718	749	780

87%

Input%	0	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80	84	88	92	96	100
%	0	35	70	104	139	174	209	244	278	313	348	383	418	452	487	522	557	592	626	661	696	731	766	800	835	870