GPA/GPR PACKAGE – VERSION MIGRATION

Updates to this document since the initial vesion have a light yellow background.

GPA/GPR Package Version Migration November 2013 to December 2014

➡ Migration to the new package requires a new licence for the December 2014 version (GPA Part # 23061, GPR Part # 23060). There is no charge for the new licence.

Many improvements have been made to the GPA and GPR Packages since November 2013.

This Technical Note details the improvements, added features and the strategy to migrate to the December 2014 version.

Legend

Name in November 2013 version …… Name in December 2014 version …… Parameter value

IMPROVED FEATURES

The new package provides the following improved features:

- Support of 2 Injectors per cylinder ('high/low' configuration), called 'primary' and 'secondary' injector. The split is defined by the Fuel Injector Secondary Contribution Main table.
- Injector characteristics are defined in Fuel Injector Primary/Fuel Injector Secondary and used for all injectors (previously the injector characteristic had to be defined individually for each injector).
- Added configuration possibilities improve performance where the following may exist: cable throttle, individual throttle bodies, no inlet manifold pressure sensor or throttle position based calibration.
- **Airbox Mass Flow**
  This value can now also be sourced from a digital input.
- **Ambient Pressure**
  Can additionally use Airbox Pressure to obtain an estimated value.
- **Boost**
  Provides an additional (inverted) output and a test mode.
- **Clutch State**
  Has been added (for information and logging, no effect on other systems).
- **Coolant Fan 1, Coolant Fan 2**
  These offer the possibility of a low or high side drive selection or an inverted output.
- **Driver Switch 5, Driver Switch 6, Driver CAN Switch 5, Driver CAN Switch 6**
  These have been added.
- **E8XX CAN ID Base**
  Can be calibrated (was fixed at 240/0xF0 before).
- **Engine Efficiency Mode**
  Airbox Pressure can now be selected for Engine Load calculation.

- **Engine Speed Limit Fuel Margin**

  Can be set to a negative value for fuel cut before ignition cut. In addition, it is possible to define an Engine Speed Limit Fuel Range . This affects all subsystems that set an engine speed limit; some of which now also have a separate Fuel Range parameter. See the help for Engine Speed Limit Default Fuel Margin for more information.

- **Engine Run Switch**

  Can now use any input from Driver , therefore also a CAN input.

- **Engine Crank Idle Mass Flow**

  This works on Idle Mass Flow and therefore defines an Idle Actuator Solenoid position and a Throttle Aim (Idle Actuator Throttle Aim) during cranking, whereas the previous Engine Crank Throttle Aim only defined a Throttle Aim.

- **Engine Oil Pressure Warning**

  Delay Enable , Delay Activate , Delay Reset are now exposed parameters that can be calibrated.

- **Engine Overrun**

  Now has an additional enable condition based on Vehicle Speed .

- **Exhaust Lambda Warning**

  This has been introduced to provide a warning and potentially an engine speed limit if the value is outside calibrated boundaries.

- **Exhaust Temperature Warning**

  This has been introduced to provide a warning and potentially an engine speed limit if the value is outside calibrated boundaries.

- **Fuel Molar Mass**

  This has been introduced to improve Engine Load calculation with varying fuels.

- **Fuel Pressure Warning**

  Delay Enable , Delay Activate , Delay Reset are now exposed parameters that can be calibrated.

- **Fuel Injector**

  In a defined combination of settings the Differential Pressures can use the Inlet Manifold Pressure Sensor even when the Inlet Manifold Pressure is derived from the estimated value.

- **Gear Lever Up Shift Switch (GPR only)**

  This can now use any input from Driver , therefore also a CAN input.

- **Gear Lever Down Shift Switch (GPR only)**

  This can now use any input from Driver , therefore also a CAN input.

- **Gear Shift (GPR only)**

  Strategy has been modified, see Gear Shift section.

- **Idle Mode**

  This has been introduced to allow for the possibility of deactivating the idle system.

- **Idle Activate Engine Speed Margin**

  This has been introduced to only enable the idle system below a certain engine speed threshold.

- **Idle Ignition Timing Limit Advance Target**

  This is now a table and can be calibrated dependent on Coolant Temperature .

- **Ignition Mode**

  This has been introduced to selectively disable cylinders or banks.

- **Ignition outputs**

  These have pin voltage measurements added.

- **Inlet Manifold Pressure Correction**

  This has been introduced to allow for faster reaction in dynamic conditions.

- **Inlet Manifold Pressure Estimate Mode**

  This has been introduced. The reference for Inlet Manifold Pressure Estimate can be selected between Airbox/Ambient Pressure , 100kPa and Boost Pressure .

- **Inlet Manifold Pressure Estimate Filter**

  This has been introduced so that the estimated value coincides better with the real manifold pressure characteristic.

- **Knock**

  The highest level of all activated frequencies provides the knock level for each cylinder (previously only Frequency A was used)

- **Throttle Position**

  A dedicated sensor is now provided for usage with a cable throttle.

- **Throttle Test**

  An additional static test mode has been added to set a constant throttle aim value (Throttle Test Aim) to facilitate engine tuning.

- **Traction Aim**

  This now has an additional gear dependent compensation.

GEAR SHIFT CHANGES (GPR ONLY)

The Gear Shift strategy has been modified to include extended and improved possibilities. If the data migration is done as described in the Data Migration section of this Technical Note, and all other new parameters are kept at their initial default value of 0 (zero), the gear shifts will behave as in the previous package.

The changes to Gear Shift are:

- Gear Shift State

  Now provides additional Pre Shift and Post Shift phases for all shift types except Upshift Power On . See the package help on Gear Shift State for all details.

- Gear Shift Engine Speed Limit

  This now ramps out in the Recovery phase using the new parameter Gear Shift Engine Speed Limit Ramp .

- Gear Shift Engine Speed Limit

  This can now set separate values for fuel range, ignition range and fuel margin.

- Gear Shift Debounce

  This has been introduced to debounce gear shifts.

- Gear Shift Engine Speed Minimum

  This has been introduced as an additional condition to allow for gear shift requests.

- Gear Shift Throttle Aim Blip Duration

  This has been introduced to limit the length of the throttle blip independently from the length of the Pre Shift or Shift phase.

- The strategy now also allows for fuel cuts to reverse torque. See Gear Shift Fuel Cut .
- The tables for fuel cut, ignition cut and ignition timing retard now use Engine Speed and Engine Load Normalised as axis values instead of Gear Shift Current .
- Gear Shift Ignition Throttle Aim table now uses Engine Speed as axis value instead of Gear Shift Current .
- During the throttle blip in the Shift phase, the Ignition Timing will be Ignition Timing Normal instead of the ignition timing from engine overrun or the idle system. Also, engine overrun and idle control will be disabled when a gear shift is processed.

BEHAVIOURAL CHANGES

The following list shows where the new package behaves differently compared to the old package. The respective systems should be checked for consistency.

- **Airbox Mass Flow**

  CAN input is not longer supported.

- **Coolant Fan 1 Duty Cycle Coolant Temperature**

  When Coolant Temperature is invalid, the maximum Coolant Temperature value used on the table axis is used to determine the table value.

- **Coolant Fan 2 Duty Cycle Coolant Temperature**

  When Coolant Temperature is invalid, the maximum Coolant Temperature value used on the table axis is used to determine the table value.

- **Driver CAN Switch N**

  Falls back to Default in case of a CAN timeout (previously the last valid value was kept).

- **Engine Speed Limit (GPR only)**

  Anti Lag Engine Speed Limit is only considered when Anti Lag Mode is Enabled .

- **Exhaust Lambda Bank 2**

  Only Exhaust Lambda Bank 1 can fall back to Exhaust Lambda Collector , not Exhaust Lambda Bank 2 .

- **Fuel Film State**

  Fuel Film State and therefore the fuel film compensation can become Enabled without Engine Post Start Fuel Volume being 0% trim.

- **Fuel Pump**

  If Hold is zero the pump will switch off when Engine Run Switch is Off (previously the pump kept operating).

- **Gear**

  Gear will report Default when no Wheel Speed source and no GPS Vehicle Speed is available (previously Neutral was reported).

- **Gear Lever (GPR only)**

  Gear Lever will go to Lockout and requires the lever to go to Idle before resuming operation after a diagnostic error was fixed.

- **Idle**

  Idle control can only be enabled when Engine State is Run , so the transition between cranking into idle control might be affected.

- **Ignition Timing**

  Influence from Race Time, Auxiliary Output 1, Auxiliary Time is now added in Ignition Timing Trim instead of Ignition Timing Compensation .

- **Intercooler Temperature, Intercooler Temperature Delta**

  Uses Inlet Manifold Temperature as fall back when Intercooler Temperature Sensor is faulty.

- **Launch (GPR only)**

  The previous parameter Launch Entry Vehicle Speed was deleted and its functionality was integrated into the use of the table Launch Engine Speed . See the help on Launch for more information.

- **Race Time**

  Activation and Reset will now only work if at least one condition is defined (could previously work when both conditions were not defined).

- **Throttle Servo Position**

  If the sensors are faulty, the Default position is reported (which may need to be calibrated). Previously the last valid value was kept.

- **Throttle Position**

  The value is set to 0 if the if sensor is not configured or faulty and Throttle Servo is also not configured.

- **Warning**

  The priority order of the warnings has been changed so in case of two or more warnings active at the same time this may affect which warning is displayed.

DATA MIGRATION

In addition to auto-migration (Tools->Migrate package) the following manual adjustments are necessary to achieve the same behaviour as with the old version.

New parameters that are not mentioned in this list have to remain at their initial value (0).

- **Airbox**
  - Migrate Airbox Mass Flow Calibration to Airbox Mass Flow Sensor Calibration
  - Migrate Airbox Mass Flow Default to Airbox Mass Flow Sensor Default
  - Migrate Airbox Mass Flow Diagnostic Delay to Airbox Mass Flow Sensor Diagnostic Delay
  - Migrate Airbox Mass Flow Diagnostic High to Airbox Mass Flow Sensor Diagnostic High
  - Migrate Airbox Mass Flow Diagnostic Low to Airbox Mass Flow Sensor Diagnostic Low
- **Anti Lag** **(GPR only)**
  Calibrate Anti Lag Engine Speed Limit Fuel Margin with the same value as Engine Speed Limit Default Fuel Margin
- **Auxiliary Output 1 Ignition Timing Trim**
  Migrate values fromAuxiliary Output 1 Ignition Timing Compensation
- **Auxiliary Time Ignition Timing Trim**
  Migrate values from Auxiliary Time Ignition Timing Compensation
- **Coolant Temperature Warning Minimum**
  The table size has been reduced from 11 to 5 sites.

  ➪ If more than 5 sites have been used in the previous package this table needs adjustment.
- **Coolant Temperature Warning Delay Limit**
  Migrate value from Coolant Temperature Warning Engine Speed Limit Delay
- **Coolant Pressure Warning Minimum**
  Copy the previous parameter value into the table.
- **Coolant Pressure Warning Maximum**
  The table size has been reduced from 11 to 5 sites.

  ➪ If more than 5 sites have been used in the previous package this table needs adjustment.
- **Coolant Pressure Warning Delay Limit**
  Migrate value from Coolant Pressure Warning Engine Speed Limit Delay
- **Coolant Fan 1**
  Migrate Coolant Fan 1 Frequency to Coolant Fan 1 Frequency

  Due to internal changes this does not happen automatically.
- **Coolant Fan 2**
  Migrate Coolant Fan 2 Frequency to Coolant Fan 2 Frequency

  Due to internal changes this does not happen automatically.
- **E8XX CAN ID Base**
  This new parameter needs to be set to 240 (0xF0)
- **Engine Charge Cooling**
  Copy Engine Charge Cooling Gain to Engine Charge Cooling Gain Primary .
- **Engine Speed Warning Delay Limit**
  Migrate value from Engine Speed Warning Engine Speed Limit Delay .

- **Engine Run Switch**

  If the previous Engine Run Switch was not used, nothing needs to be configured (make sure Engine Run Switch Index is Not in use). Otherwise:

  1. Choose an unused switch from Driver Switch 1 to 6 .
  2. Migrate Pullup Control, Active Edge, Threshold, Hysteresis, Debounce and Resource from the previous Engine Run Switch to that Driver Switch N .
  3. Select the chosen switch in Engine Run Switch Index .
  4. Engine Run Switch Mapping Zero must be Off and Engine Run Switch Mapping One must be On .

- **Engine Crank Idle Mass Flow**

  Calibrate with the result of the previous Engine Crank Throttle Aim divided by Idle Actuator Throttle Aim Maximum .

  If Idle Actuator Throttle Aim Maximum is smaller than the previous Engine Crank Throttle Aim , Idle Actuator Throttle Aim Maximum must be set to a value that is the same or higher than the previous Engine Crank Throttle Aim . In this case Idle Mass Flow Feed Forward Main must also be adjusted (multiplied with the old value of Idle Actuator Throttle Aim Maximum divided through the new value of Idle Actuator Throttle Aim Maximum).

- **Engine Oil Temperature Warning Minimum**

  The table size has been reduced from 11 to 5 sites.

  ➪ If more than 5 sites have been used in the previous package this table needs adjustment.

- **Engine Oil Temperature Warning Delay Limit**

  Migrate value from Engine Oil Temperature Warning Engine Speed Limit Delay .

- **Engine Oil Pressure Warning**

  Migrate value from Engine Oil Pressure Warning Engine Speed Limit Delay to Engine Oil Pressure Warning Delay Limit and set Engine Oil Pressure Warning Delay Reset to 1s.

- **Engine Overrun**

  The previous parameters Engine Overrun Throttle Position Threshold and Engine Overrun Throttle Position Hysteresis have been omitted. Engine Overrun now uses Idle Activate Throttle Pedal Threshold and Idle Activate Throttle Pedal Hysteresis jointly with the Idle system. Make sure the values from the idle system are consistent with the previously used values.

- **Engine Crankcase Pressure Warning Delay Limit**

  Migrate value from Engine Crankcase Pressure Warning Engine Speed Limit Delay .

- **Fuel Molar Mass**

  Set to 98.51 g/mol.

  The value of 98.51 g/mol is a fixed value in the old package for gasoline. Therefore, this value must be used regardless of the fuel used. Only use another value as stated in the help (for fuel type) if you are prepared to also retune the Engine Efficiency .

- **Fuel Timing**

  Copy all data from Fuel Timing to Fuel Timing Primary .

- **Fuel Film**

  Migrate all data from Fuel Film Volume to Fuel Film Primary . Set Fuel Film Primary Trim Contribution to 0% trim.

- **Fuel Film Primary Reference Engine Speed**

  Migrate the value from Fuel Film Reference Engine Speed .

- **Fuel Film Primary Reference Mixture Aim**

  Migrate the value from Fuel Film Reference Mixture Aim .

- **Fuel Pressure Warning**

  Migrate value from Fuel Pressure Warning Engine Speed Limit Delay to Fuel Pressure Warning Delay Limit and set Fuel Pressure Warning Delay Reset to 1s.

  Decide on a Fuel Pressure Warning Minimum parameter derived from the previous Fuel Pressure Warning Minimum table.

- **Fuel Injector**

  Copy all data from Fuel Injector to Fuel Injector Primary . Also copy all data from Fuel Cylinder 1 Injector to Fuel Injector Primary .

  It is assumed that the injector characteristics of the other cylinders are the same as for cylinder 1.

- **Fuel Cylinder N**

  Copy Fuel Cylinder N Output Resource (N= 1 to the number of used cylinders) to Fuel Cylinder N Primary Output Resource .

- **Gear Lever Up Shift Switch (GPR only)**

  If the previous Gear Lever Up Shift Switch was not used, nothing needs to be configured (make sure Gear Lever Up Shift Switch Index is Not in use). Otherwise:

  1. Choose an unused switch from Driver Switch 1 to 6 .
  2. Migrate Pullup Control, Active Edge, Threshold, Hysteresis, Debounce and Resource from the previous Gear Lever Up Shift Switch to that Driver Switch N .
  3. Select the chosen switch in Gear Lever Up Shift Switch Index .
  4. Gear Lever Up Shift Switch Mapping Zero must be Off and Gear Lever Up Shift Switch Mapping One must be On .

- **Gear Lever Down Shift Switch (GPR only)**

  If the previous Gear Lever Down Shift Switch was not used, nothing needs to be configured (make sure Gear Lever Down Shift Switch Index is Not in use). Otherwise:

  1. Choose an unused switch from Driver Switch 1 to 6 .
  2. Migrate Pullup Control, Active Edge, Threshold, Hysteresis, Debounce and Resource from the previous Gear Lever Down Shift Switch to that Driver Switch N .
  3. Select the chosen switch in Gear Lever Down Shift Switch Index .
  4. Gear Lever Down Shift Switch Mapping Zero must be Off and Gear Lever Down Shift Switch Mapping One must be On .

- **Gear Shift Timing (GPR only)**

  For a Gear Shift Type of Downshift Power On the times assigned to a Gear Shift Timing State of Torque Reversal now have to be assigned to Pre Blip .

  ➪ Note that the gear shift strategy was changed in other places as well, as described below.

- **Gear Shift Throttle Aim Calibration (GPR only)**

  The axis on this table has changed, the table does not use Gear Shift Current on the axis any more but provides an Engine Speed axis instead. If the previous package (November version) did not use the Gear Shift Current axis or had the same value used for all forward gears, the value can be copied into the new table.

  ➪ If different throttle aims have been used for different gears, this table must be newly calibrated.

- **Gear Shift Throttle Aim Blip Duration (GPR only)**

  For the power off shift types to retain the gear shift behaviour of the previous package (November 2013 version), this new parameter must be set to a value that is higher than the times in Gear Shift Timing for Torque Reversal when Gear Shift Type is Down Shift Power Off .

- **Gear Shift Ignition Cut Calibration** **(GPR only)**

  The axis on this table has changed, the table does not use Gear Shift Current on the axis any more but provides an Engine Speed axis and an Engine Load Normalised axis instead. If the previous package (November version) did not use the Gear Shift Current axis or had the same value used for all forward gears, the value can be copied into the new table.

  ➪ If different cut values have been used for different gears, this table must be newly calibrated.

- **Gear Shift Ignition Timing Retard** **(GPR only)**

  The axis on this table has changed, the table does not use Gear Shift Current on the axis any more but provides an Engine Speed axis and an Engine Load Normalised axis instead. If the previous package (November version) did not use the Gear Shift Current axis or had the same value used for all forward gears, the value can be copied into the new table.

  ➪ If different retard values have been used for different gears, this table must be newly calibrated.

- **Gear Shift Engine Speed Limit Mode** **(GPR only)**

  Migrate the value from Gear Shift Engine Speed Mode .

- **Gear Shift Engine Speed Limit Ramp** **(GPR only)**

  This new parameter has to be set to a high value (for example 100000rpm/s) to keep the gear shift behaviour of the GPR November version.

- **Gear Shift Engine Speed Limit Ignition Range, Gear Shift Engine Speed Limit Fuel Range, Gear Shift Engine Speed Limit Fuel Margin** **(GPR only)**

  These new parameters must be set to the same values as the respective parameters in Engine Speed Limit Default .

- **Idle Mode**

  Set to Enabled .

- **Idle Ignition Timing Advance Target**

  Copy the previous parameter value into the table.

- **Inlet Manifold Temperature Warning Delay Limit**

  Migrate value from Inlet Manifold Temperature Warning Engine Speed Limit Delay .

- **Race Time Ignition Timing Trim**

  Migrate values from Race Time Ignition Timing Compensation .

- **Throttle Servo**

  Migrate all calibration from Throttle Servo Bank 1 Position to the respective data of Throttle Servo Bank 1 Position Sensor .

  Migrate all calibration from Throttle Servo Bank 2 Position to the respective data of Throttle Servo Bank 2 Position Sensor .

  Calibrate Throttle Servo Bank 1 Position Default and Throttle Servo Bank 2 Position Default with the reported rest position when the throttle is not driven.

- **Traction Aim Compensation Vehicle Acceleration Lateral**

  Migrate the value from Traction Aim Compensation or set the table to 0% trim.

- **Traction Aim Compensation Gear**

  Set the table to 0% trim.

- **Vehicle Speed Moving Throttle**

  Migrate the value from Vehicle Speed Diagnostic Throttle .

- **Vehicle Speed Stationary Throttle**

  Migrate the value from Vehicle Speed Stopped Throttle .

- **Vehicle Speed Stationary Engine Speed**

  Migrate the value from Vehicle Speed Stopped Engine Speed .

- **Warning Mode Fuel Cylinder N**

  Migrate the values from Warning Mode Fuel Cylinder N Pin Diagnostic (N= 1 to the number of used cylinders) to the respective Warning Mode Fuel Cylinder N Primary Pin Diagnostic .

- **Warning Mode Throttle Servo Bank 1 Position Sensor Diagnostic**

  Migrate the value from Warning Mode Throttle Servo Bank 1 Position Diagnostic .

- **Warning Mode Throttle Servo Bank 2 Position Sensor Diagnostic**

  Migrate the value from Warning Mode Throttle Servo Bank 2 Position Diagnostic .

- **Wheel Speed Front Left CAN Scale**

  Migrate Wheel Speed Front Left CAN Scale to Wheel Speed Front Left CAN Scale (due to a change in the unit name this does not happen automatically).

- **Wheel Speed Front Right CAN Scale**

  Migrate Wheel Speed Front Left CAN Scale to Wheel Speed Front Right CAN Scale (due to a change in the unit name this does not happen automatically).

- **Wheel Speed Rear Left CAN Scale**

  Migrate Wheel Speed Rear Left CAN Scale to Wheel Speed Rear Left CAN Scale (due to a change in the unit name this does not happen automatically).

- **Wheel Speed Rear Right CAN Scale**

  Migrate Wheel Speed Rear Left CAN Scale to Wheel Speed Rear Right CAN Scale (due to a change in the unit name this does not happen automatically)