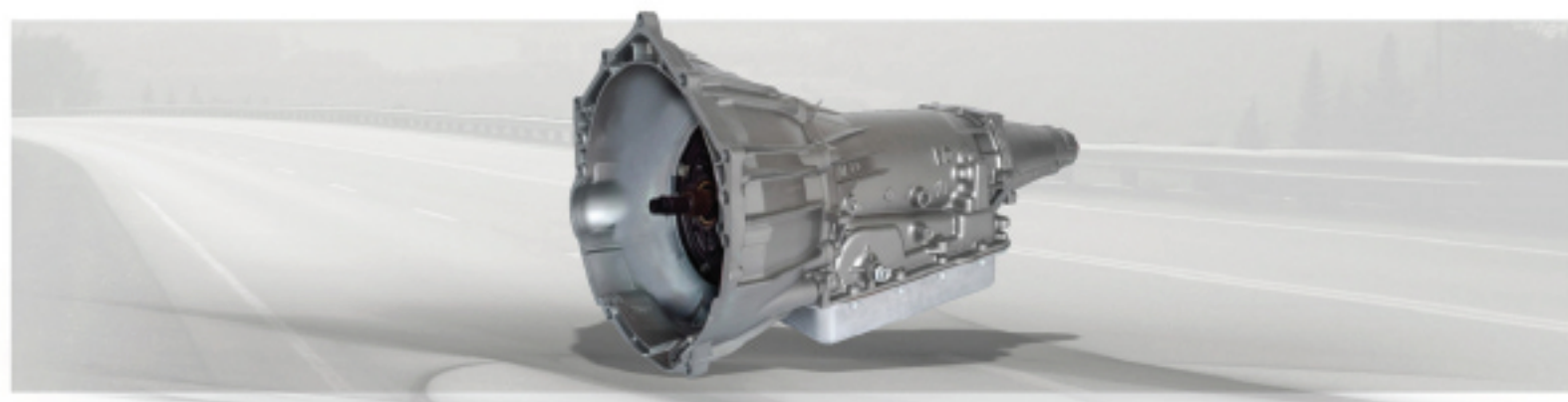


MoTeC**M1 GP AUTO TRANSMISSION PACKAGE**

MoTeC's GP Auto Transmission Package is a versatile and adaptable platform for the operation of an automatic transmission (with up to 5 gears), independent of any engine control systems.

This Package allows for the operational control of an automatic transmission's line pressure solenoids, gear shift solenoids, torque converter lockup clutch solenoids and manual range selector. It also gives users full control of the gear shift points, torque converter lockup clutch and line pressure. Refer to the **Transmission Compatibility** section for a full list of capabilities.

The product fully integrates with other MoTeC devices, and provides pre-defined CAN messaging for all current Display Loggers, Loggers, E888 Expanders, Video Systems, GPS, ADR, BR2, PDM and SLM modules. A Vector database (.dbc) file is available on request.

► **LICENSING**

To load the Package onto an M1 ECU, MoTeC's **M1 GP Automatic Transmission Licence** (part number 23393) is required.

► **ECU VARIANTS**

This Package is available for use with MoTeC M130, M150, M170 or M190 ECUs. A pinout example for the M130 follows.

► **FEATURES**

- Support for Manual or Automatic shift modes, selectable via a driver switch.
- The Automatic shift mode automatically shifts gears based on a user definable vehicle speed and throttle pedal position. A

multi-position switch (up to 10 positions) can also be configured to vary the gear shift points.

- The Manual shift mode allows the driver to shift up and down at any time via up and down gear shift switches.
- Configurable gear shift engine speed settings that automatically shift gears when the engine speed is outside the user definable range (e.g. above maximum engine speed).
- Support for a switching and/or proportional torque converter lockup clutch solenoid.
- Fully configurable torque converter lockup clutch control that can be based on vehicle speed, gear, throttle pedal, transmission temperature, range selector position and torque converter slip. The proportional solenoid can also be ramped in and out as the torque converter lockup clutch is applied and released, delivering smoother transitions.
- Support for a line pressure control solenoid to vary the pressure of the transmission's hydraulic fluid. This line pressure solenoid's output can be set to be dependent on many variables, including: gear, gear shift state, throttle pedal position, torque converter lockup clutch state and transmission temperature to give the ideal transmission pressure under all conditions.
- Support for up to 3 other pressure control solenoids that can be used to vary the line pressure within the transmission (e.g. 3-2 Control Solenoid on a GM 4L60E transmission). These solenoid outputs can be set to be dependent on numerous variables, including: gear, gear shift state, throttle pedal position, torque converter lockup clutch state, transmission temperature and vehicle speed. Also included are a wide variety of settings that can be used to ramp in and out these solenoids during gear shifts and range selector position changes.

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- Support for up to 4 gear shift solenoids. These shift solenoids can be set to any user defined combination, enabling many transmissions to be run from this single Package.
- Support for a manual range selector whose position (Park, Neutral, Drive etc.) can be configured from any combination of up to 8 individual switch inputs. This range selector can then be used to limit the gears selectable in each position.
- Supports input and output shaft speed sensors with calculations for torque converter, as well as internal clutch and band slip (Gear Slip).
- Warnings to alert the user of excessive torque converter and gear slip.
- Support for a transmission temperature sensor with overrides and trims for the torque converter lockup clutch, pressure control solenoids and gear shift points.
- Support for a transmission pressure sensor.
- Warnings to alert the user of undesired transmission pressures and temperatures.
- Support for a transmission cooler fan along with an additional temperature and pressure sensor.
- Support for a transfer case with selector and position switches, allowing the output ratio to be set based on the transfer case selector position.
- Support for a shift solenoid to restrict movement of the range selector under certain conditions.
- CAN transmit of the most common transmission channels using standard MoTeC CAN templates that can easily import into MoTeC displays and other devices.
- Configurable engine synchronisation modes to measure engine speed for many common engine types. Refer to the **Engine Speed Modes** section for current details.
- Configurable engine synchronisation ignore mode allows for manifold pressure synchronisation.
- Sensor calibrations available for many common automotive sensors.
- Support for analogue and digital (frequency or duty cycle) sensors.
- Support for single wire digital (SENT) sensors.
- Test settings for most outputs, including injection and ignition outputs, for easier setup.
- Configurable security for multiple users with differing access options.
- Configuration of brake state using a switch or pressure sensor.

- ECU-internal G-force (acceleration) – longitudinal, lateral and vertical.
- ECU CAN receive from a defined CAN ID for data reception from MoTeC devices. Support for one (M130/M170) or three (M150/M190) CAN buses.
- ECU CAN transmit of the most common channels using standard MoTeC CAN templates that easily import into MoTeC displays and other devices.
- 8 configurable switches and 8 rotary switches (wired or CAN input), each with up to 10 positions.
- Throttle Pedal.
- Vehicle speed measurement using wheel speed sensors, estimation or GPS.
- Configurable warning system with light and CAN output.

► **TRANSMISSION COMPATIBILITY**

This product is a generic, versatile solution that has been designed for adaptability to a wide range of automatic transmissions. It can control any transmission that has the following electrical requirements and features:

- Up to 5 forward gears. Automatic transmission control Packages with more than 5 gears are in development.
- Up to 5 forward drive gear ranges (e.g. Drive, Drive 3, Drive Low etc.) and 1 Park, Neutral and Reverse range.
- A line pressure control solenoid (Proportional).
- Up to 3 other pressure control solenoids (Proportional or Switched), e.g. 3-2 Solenoid found in GM 4L60E transmission.
- Proportional and/or Switching torque converter lockup clutch solenoid.
- Up to 4 gear shift solenoids (Proportional or Switched).
- Input and/or output shaft speed sensor. (A driven wheel speed sensor can also be used to determine the output shaft speed).
- Transmission fluid temperature sensor and warning light output.
- Manual range selector position detection using up to 8 position indication switches.
- Gear shift pattern switch.
- Manual up and down gear shift switches.
- Manual/Automatic gear shift mode selection switch.
- Shift lock solenoid.
- Transmission brake solenoid output (Switched).

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► **TRANSMISSION OPERATION IN M1**

The following section describes the basics of Gathering Information, Wiring, Initial Setup and Tuning required to get an automatic transmission running on this Package. Preconfigured start files for common automatic transmissions can be found on [MoTeC Online](#). These files have been fully configured to match the OE behaviour. If your transmission matches one of these, the **Gathering Information** and **Initial Setup** sections are not required.

Gathering Information

When running a new transmission it is imperative to gather as much information as possible about its behaviour and operation.

This includes:

- Wiring schematics
- Gear Ratios
- Solenoid operation
- Power flow charts
- Gear shift speeds
- Operating pressure range

This information can normally be found in service and workshop manuals.

It is also highly recommended to log the OE behaviour over a 30-50 minute drive. This data can then be used to populate the various parameters and tables within the Package. An M1 ECU can be used to log this data, provided it has Level 2 or 3 Logging. The following process describes how to log the OE behaviour in MoTeC M1 hardware that is running this Package firmware:

1. **Setup**

- Splice into every wire that is connected between the automatic transmission and the OE TCM (or ECU if no TCM is fitted).
- Also splice into the engine speed reference sensor, engine synchronisation position sensor (if required), throttle pedal (or position) sensor, brake switch and a wheel speed sensor.
- Run wires from these splices into the M1 UDIG or DIG input pins. AVs can also be used for switches and analogue sensors. This can be documented in Table 1.
- With the Package open in M1 Tune, select the **Auto Trans | OE Measurements Worksheet**. Set up the **Auxiliary Measurement** resources and parameters with the pins from Step 1c.
- Calibrate the engine speed reference, throttle pedal, brake switch and wheel speed sensors using the appropriate inputs within the Package.

- Ensure all **Auxiliary Measurements** are added to logging, with the Voltage, Frequency and Duty Cycle channels logged at 100Hz.

- The sensor values from Step 1e should also be logged at 100Hz.

- It is also highly recommended to fit a pressure sensor. Most transmissions will have an external test port that can be used to measure the transmission's hydraulic fluid pressure. This sensor should have a range of at least 0-300psi gauge pressure. Absolute pressure sensors can also be used. The information from this sensor will be very useful when tuning the line pressure.

2. **Logging**

- Starting with a cold engine and transmission, drive at various speeds and engine loads. This should include:
 - Accelerating through all gears at 20, 40, 60, 80, 100% approximate throttle pedal positions.
 - Gradually accelerating and decelerating at vehicle speeds which apply/release the lockup clutch.
 - Driving in all range selector positions, including revving the engine in Park and Neutral.
 - Holding constant speed (20, 30, 40, 50, 60, 70, 80, 90, 100km/h) and then quickly applying the throttle to cause a downshift.

Analysis of this data in MoTeC's i2 Data Analysis application can determine the information required in the following sections.