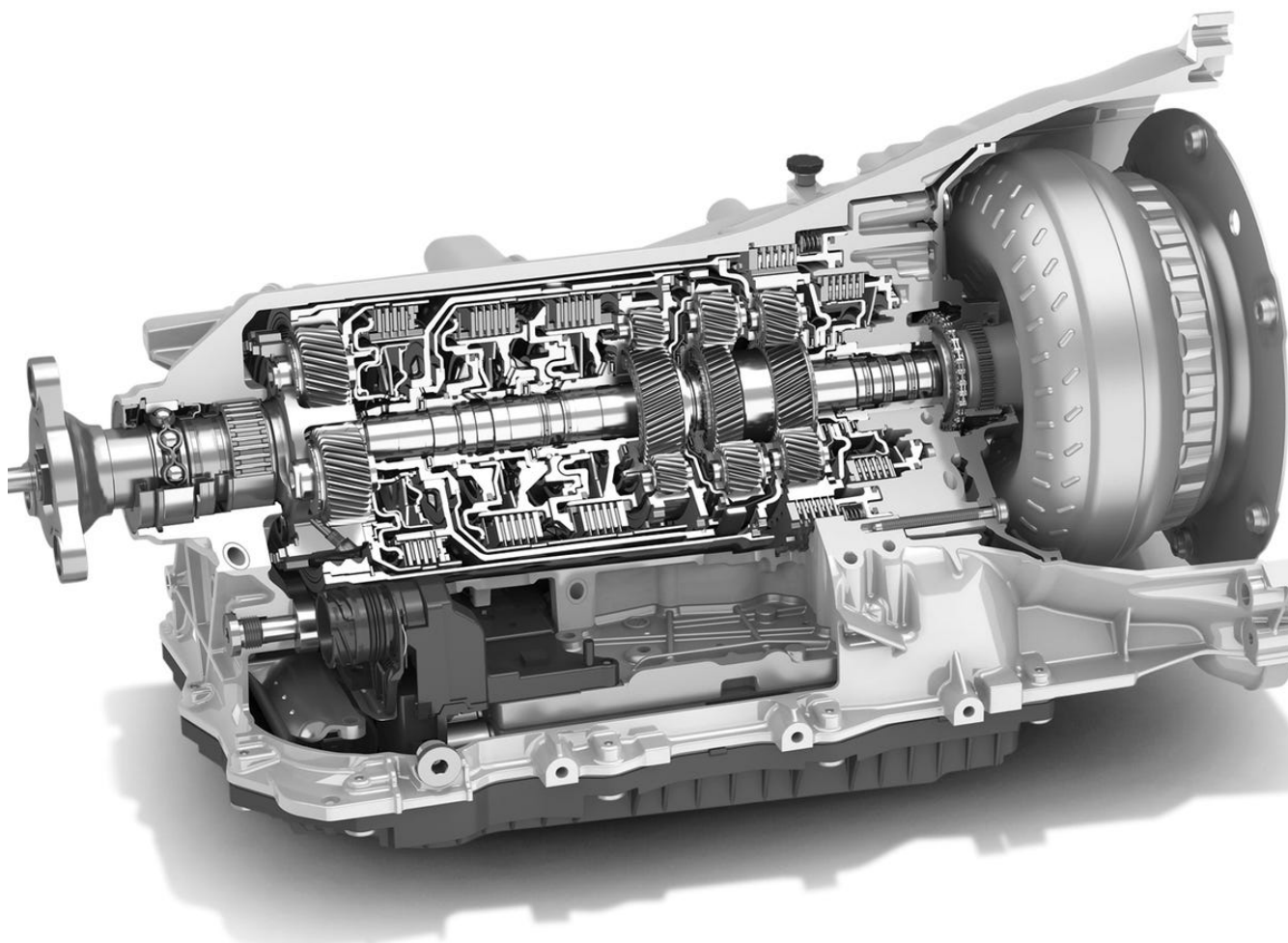




ZF 8HP Gearbox Control

SyvTCM Quick Start Manual

Installation, flashing, calibration and data logging

Version 2 | September 2026

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Introduction

Standalone control for engine conversions, restomods and motorsport

The Syvecs SyvTCM provides standalone control of supported ZF 8HP45 and 8HP70 Gen1 rear-wheel-drive transmissions. Designed for custom installations, it allows the ZF eight-speed gearbox to be integrated into vehicles that were never originally equipped with it, from classic road cars and engine conversions to track, drag and off-road builds.



A complete transmission-control system

The SyvTCM exchanges data with the original ZF transmission controller, retaining the gearbox hydraulic and clutch-control system while supplying the engine, vehicle and driver inputs it needs. The installation uses a SyvTCM module, a compatible mechatronic unit reflashed with Syvecs-approved files, and a supported shifter, keypad or paddle-control arrangement.

Flexible engine and vehicle integration

Connect to a Syvecs ECU, a supported aftermarket or OEM engine controller, or configure Generic CAN Receive and Transmit for a custom installation. Physical inputs support applications with limited CAN data. When the engine ECU cannot supply torque values, configurable internal torque tables provide estimated actual, potential and demanded torque. Compatible engine controllers can also act on gearbox torque-reduction requests during shifts.

Control tailored to the application

Automatic shift scheduling, manual and paddle shifting, multiple transmission modes and downshift over-rev protection allow gearbox behaviour to be calibrated for the vehicle. Driver controls include supported BMW, Dodge, Supra A90 and VAG electronic shifters, CAN keypads and paddle-only operation. Launch-control integration, transbrake and staging-bump functions support competition applications.

Calibration, diagnostics and logging

Syvecs SCal provides live calibration, transmission DTC reading and clearing, adaptation reset and monitoring of gear position, shaft speeds, oil temperature, shift state, torque requests and fault or limp status. PC and compatible USB memory-stick logging allow recorded gearbox and engine data to be reviewed in Syvecs SView.

Compatibility must be confirmed using the Bosch TCU identification number. Not every Gen1 mechatronic unit is supported, and the larger 2048 KB memory variants are excluded. Check the supported-TCU table before purchasing or flashing a transmission.

Supported ZF 8HP Gearboxes

Only GEN1 8HP RWD gearboxes are supported and must have the smaller memory area, 2048kb Memory is not supported.

The gearbox must be paired with one of the following TCU ID's

Supported Bosch GEN1 TCUs.

Bosch TCU ID	Bosch Part Number(s)	Gearbox(s)	Example Vehicles
1034420219	0260550073	8HP70 (RWD)	BMW 530D N57 (2012)
1034402221	0260550075	8HP70 (RWD)	BMW E70 X5 4.4 (2013)
1034402235	0260550074	8HP45 (RWD)	BMW 335i N55
1034420236	0260550074	8HP30 (RWD), 8HP45 (RWD), 8HP70 (RWD)	BMW F10/F11, BMW M135i (2019), F30 N26 (2013), BMW M235i (F22, 2015/2016)
1034420237	0260550076	8HP70 (RWD)	Jaguar XF CC9 2.2 Diesel (2015)
1034420267		8HP70 (RWD), 8HP90 (RWD)	Dodge Charger (2018), Dodge Challenger Hellcat (2016)
1034420285		8HP70 (RWD)	VW Amarok (2016)
1034420288	0260550074	8HP70 (RWD)	Dodge Ram Classic 5.7 (2020, RWD), Dodge Charger (2021)

NOT Supported GEN1 TCU

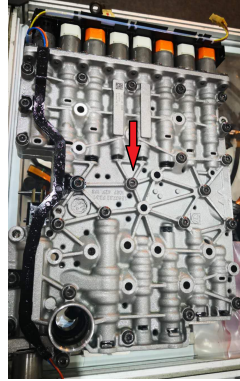
Bosch TCU ID	Bosch Part Number(s)	Gearbox(s)	Example Vehicles
1034402203	0260550046, Unknown	8HP45 (RWD), 8HP70 (RWD)	BMW F11 535i (2012), BMW F01 520D (2012), BMW F13 650 (2013)
1034420203	0260550046, 0260550030	8HP70 (RWD)	BMW 530D (2011), BMW 550i (F10/F11, 2011), BMW F07 540i (2013)
1034420209	0260550051	8HP70 (RWD)	BMW X5 N57 (2013), BMW X6 40D (2013)
1034402210	Unknown	8HP70 (RWD)	Jaguar XF 3.0 V6 Diesel (2014)

How to find the Bosch TCU ID and Part number

The Bosch TCU part number is located on the mechatronic unit of the ZF 8HP gearbox, which is mounted internally within the transmission.

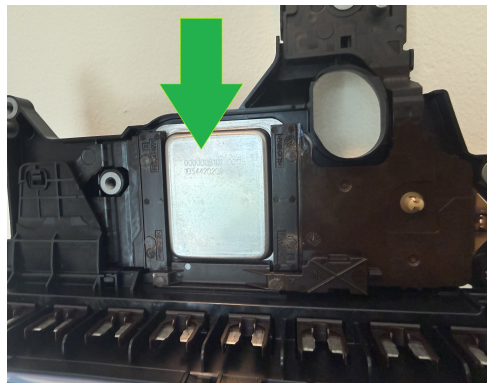
To access the mechatronic unit, the gearbox must first be drained of transmission fluid, followed by removal of the sump pan.

Once the sump pan has been removed, all retaining hex bolts securing the mechatronic must be removed.



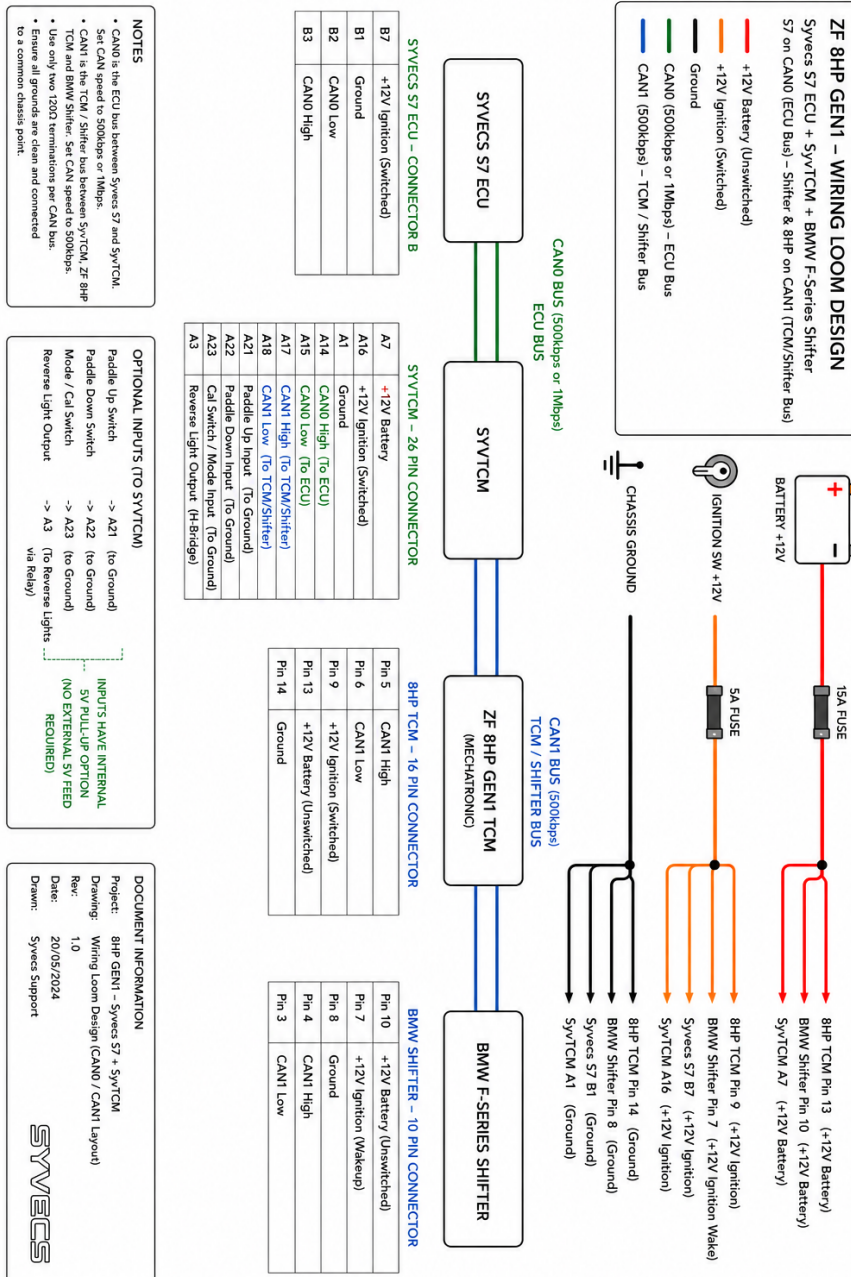
This allows the mechatronic unit to be carefully lowered, enabling inspection of the Bosch part number and ID.

The Bosch TCU ID is located here on the protective cover.



The Bosch Part number is located here on the side of the mechatronic.

Example Wiring



8HP Wiring



Dodge 8HP GEN1 main connector (16pin)
Mating Connector - 420973716

Pin	Description	Usage / note
5	CAN H	SyvTCMCAN1 High
6	CAN L	SyvTcmCAN1 Low
9	+12V	12V Ignition Switched
13	+12V	Main power supply
14	GND	Ground

SyvTCM Pinout

Mating Connector - TE 3-1437290-7

CANTCM Pinout	Description	Notes
A1	PWRGND	Ground
A2	PWRGND	Ground
A3	H-Bridge1	Reverse Light
A4	H-Bridge2	Spare Output
A5	H-Bridge3	Spare Output
A6	H-Bridge4	Spare Output
A7	12V HC	12V Supply - High Current
A8	Kline/LinBus	Kline/LinBus
A9	MagnetoResistive 1	Connects to ABS +Wire
A10	MagnetoResistive 2	Connects to ABS +Wire
A11	MagnetoResistive 3	Connects to ABS +Wire
A12	MagnetoResistive 4	Connects to ABS +Wire
A13	12V HC	12V Supply - High Current
A14	Can0 H	ECU/OEM Bus
A15	Can0 L	ECU/OEM Bus
A16	12V IG SW	12V Ignition Switch
A17	Can1 H	Gearbox / Shifter CAN
A18	Can1 L	Gearbox / Shifter CAN
A19	12V HC	12V Supply - High Current
A20	5V Out	5V Output Supply
A21	AN1	Paddle Up Or Spare Input
A22	AN2	Paddle Down or Spare Input
A23	AN3	Cal Switch (Mode) or Spare Input
A24	AN4	Spare Input
A25	PWRGND	Ground
A26	PWRGND	Ground

Shifter Wiring and Options

The shifter is normally best wired to the CAN0 bus, as this helps prevent any potential CAN frame conflicts with the OEM TCM traffic on CAN1. However, the BMW shifter has been tested on CAN1 alongside the 8HP CAN frames and operates correctly. All of the shifters listed below communicate at 500 kbps, so it is important to ensure that any other devices connected to the same CAN bus are also configured to operate at 500 kbps.

Multiple shifter options are listed below and instruction on wiring can be found in follow up pages.

Dodge electronic shifter

Mating connector: 9132571-02 / 1-929423-2



Pin	Description	Usage / note
1 (top left from back)	+12V (wakeup)	12V Ignition Switched
4	CAN H	CAN1 High
5	CAN L	CAN1 Low
10	GND	Ground

BMW F-Series electronic shifter

10-pin connector | Mating connector: 9132571-02 / 1-929423-2



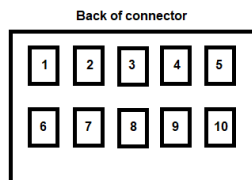
Pin	Description	Usage / note
3	CAN L	CAN1 Low
4	CAN H	CAN1 High
7	+12V (wakeup)	12V Ignition Switched
8	GND	Ground
10	+12V	Main power supply

Shifter wiring - VAG and Toyota Supra

VAG 2008-2014 - MK4 / MK5 / MK6

Mating connector: 1K0 972 776 A

Example shifter part number: 7P1 713 041



Pin	Description	Usage / note
1	GND	Ground
5	Dimmer	Reduces Shifter Lights
7	CAN H	CAN1High
8	CAN L	CAN1Low
9	+12V Ignition	12V Ignition Switched
10	+12V	Main power supply

Toyota Supra A90 electronic shifter

10-pin connector | Mating connector: 9132571-02 / 1-929423-2



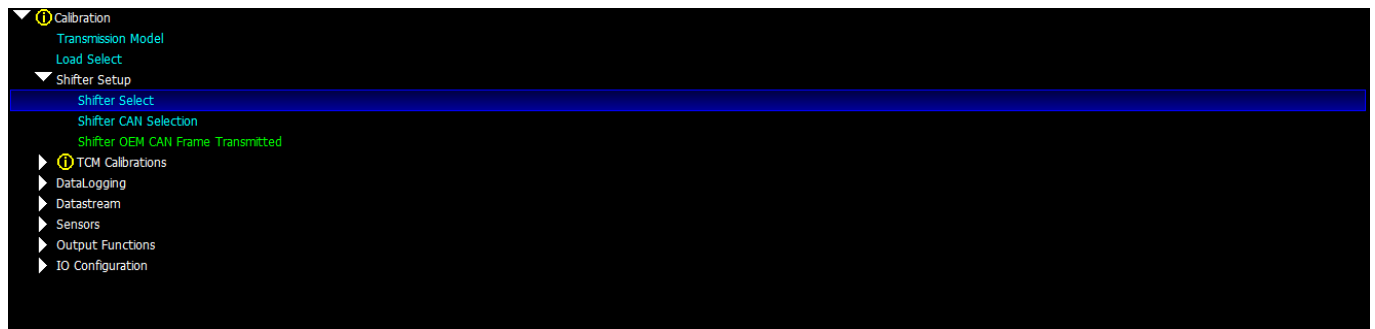
Pin	Description	Usage / note
3	CAN L	CAN1 Low
4	CAN H	CAN1 High
8	GND	Ground
10	+12V	Main power supply

Keypad - Generic



Shifter Selection

Once the selected shifter of choice is wired in, users can select the shifter type and CAN used here in SCAL. For the 8HP control ensure the option for Shifter OEM CAN Frame Transmitted is enabled.



System Overview

When the Shifter Selection is set on Keypad, the calibrator can use the Generic CAN Receive logic to pickup keypad buttons for enabling drive shift selections from a CANbus source.

The following buttons can then be assigned to CAN Items to allow a keypad unit or other external CAN device control the gearbox.

parkButton
neutralButton
driveButton
reverseButton
manual/auto Switch
sportButton

The usual shift options apply with the keypad selections for Park/Reverse Speed lockouts etc.

Paddles can also be wired or assign if a Manual/Auto Switch is setup

KeyPad - GrayHill / Motec (CANOPEN)

CONNECTION

4 pin Deutsch DT Connector.

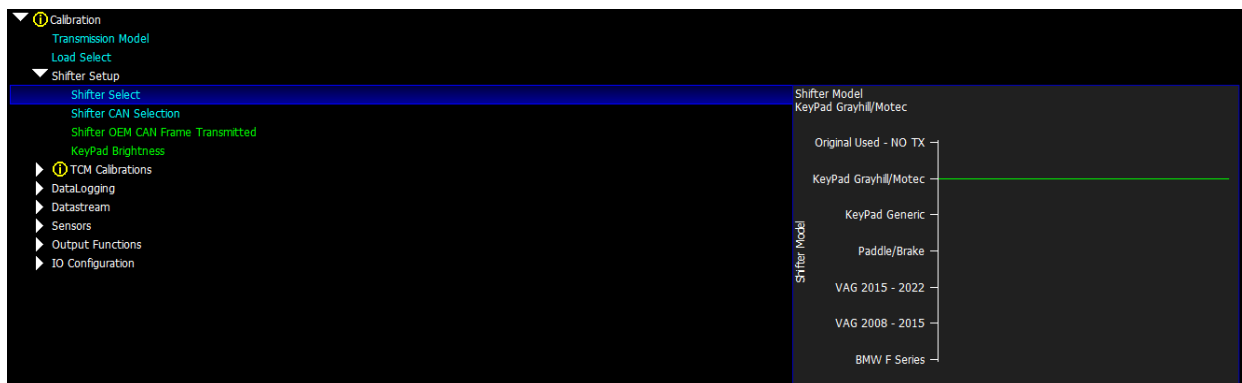
Power with 8V to 32V vehicle type inputs.



Recommended Part number : 3K208-2RN3AG

System Overview

When the Shifter Selection is set on GrayhillKeypad, the Keypad buttons will be setup like the above image automatically. Paddles can also be assigned into the physical inputs on the SyvTCM or via CAN to provide the paddle option when in Manual Mode.



The following items are then assigned as per the image above.

- parkButton
- neutralButton
- driveButton
- reverseButton
- manual/auto Switch
- sportButton
- calupSwitch
- transBrake

The usual shift options apply with the keypad selections for Park/Reverse Speed lockouts etc.

Paddles can also be wired or assign if a Manual/Auto Switch is setup

The Keypad Brightness can also be adjusted when Grayhill Keypad is selected

Grayhill Panel Reprogramming for SyvTcm

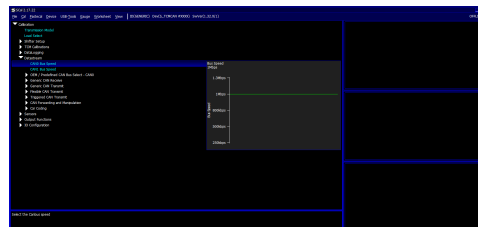
A GrayhillCANOpen keypad must be programmed once from new so that its CAN messages match the SyvTCM shifter control system. This can be done directly from the SyvTCM firmware using the built-in programming routine.

- First connect the keypad to desired CANbus on the SyvTcm, generally this is CAN0 as CAN1 is used for Vehicle TCM Communications.

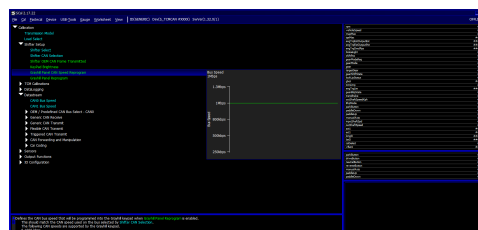
IMPORTANT MAKE SURE NO OTHER CAN DEVICES ARE CONNECTED AND ACTIVE ON THE BUS DURING PROGRAMMING and the CANbus is TERMINATED at BOTH ENDS.



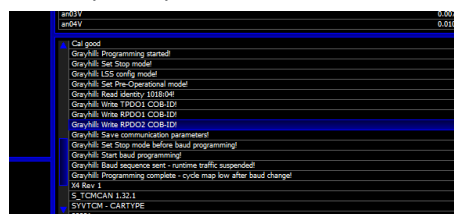
- As standard, the Grayhill panels come with the baud rate set at 250kb, in order to program them you need to set the CAN used speed at that rate to allow the messages to update the panel. This can be done using the SyvecsSCal program. A device - Program is required after this change.



- Select KEYPADGRAYHILL in Shifter Selector Map followed by selection of the desired keypad CAN speed so it matches the CAN bus which is planned to be used for communication to the Engine controller on CAN0.



To program the keypad simply set the Grayhill Reprogram map to Enabled; the SyvTCM will automatically transmit the required CANOpen configuration messages and the process will complete in approximately two seconds. In the bottom right of scal a message service will show the update process.



During programming the keypad LEDs may briefly flicker. The keypad will then store the configuration internally in its EEPROM and begin using the SyvTCM CAN IDs for button transmission and LED/brightness control. After programming is complete set the Grayhill reprogramming map back to disabled to prevent the routine from running again.

This procedure normally only needs to be performed once when installing a new keypad or if the keypad has been reset to factory defaults.

Paddles - Up and Down



Paddle Switches		
Pin	Description	Usage / note
1	Up Wire	SyvTCM Pin 21
2	GND	GND
3	Down Wire	SyvTCM Pin 22

System Overview

Paddles can be used with a Shifter block for Manual mode shifting OR the paddles and a brake signal can be used for emulating the shifter block on its own.

You can control the gearbox using the two paddles behind the steering wheel and the brake pedal:

- Left Paddle (–) → Downshift
- Right Paddle (+) → Upshift
- Both Paddles Together → Neutral
- Brake Pedal → Required for Park / Reverse selection
- Manual / Auto Button → Toggles between automatic and manual modes (needs to be setup from CAN via Generic RX)

Starting & Parking

- On startup, the gearbox automatically enters Neutral.
- To select Drive or Reverse, press the brake pedal first.
- Press Right Paddle (+) once → moves to Drive
- Press Left Paddle (–) once → moves to Reverse (only when stopped or below the safety speed limit)

Paddle control - driving modes

Neutral Mode

- Pull both paddles together → shifts to Neutral.
- You must release both paddles fully before any further action.
- After a short delay (approx. 0.3s), the system will automatically move to Drive when you press the brake and the right paddle.

Drive Mode

- Standard automatic drive (if Manual/Auto button is off).
- Tap the Right Paddle (+) or Left Paddle (–) at any time to manually upshift or downshift.
- Using a paddle temporarily switches you to Manual Mode - the gearbox will stay manual for 10 seconds of inactivity, then automatically return to Drive.

Manual Mode

- Enabled automatically when you use the paddles while in Drive.
- Can also be enabled permanently by pressing the Manual/Auto button.
- Shifting:
 - Right Paddle (+) → Upshift
 - Left Paddle (–) → Downshift
- After 10 seconds of no paddle activity (if button is off), it will return to Drive automatically.

Switching Between Modes

Current Mode	Action	Result
Park	Hold both paddles (with brake)	Neutral
Neutral	Brake + Right Paddle	Drive
Neutral	Brake + Left Paddle	Reverse
Drive	Both Paddles	Neutral
Drive	Right Paddle	Upshift / Manual Mode
Drive	Left Paddle	Downshift / Manual Mode
Manual	Both Paddles	Neutral
Manual	Idle 10s (Manual button off)	Return to Drive

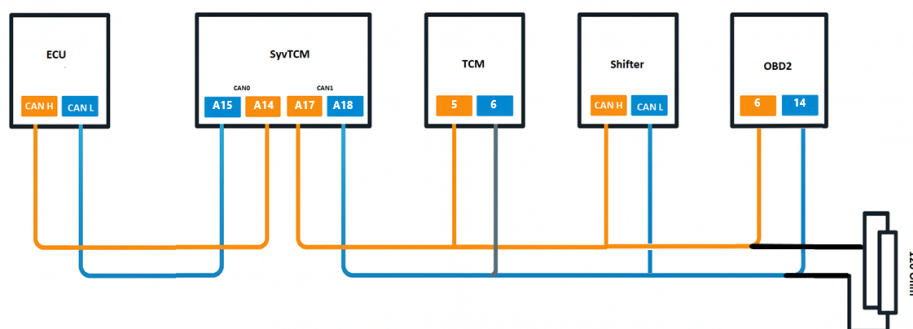
TCM Integrated Data Handling

In addition to receiving CAN data from ECUs, the SyvTcm also picks up data directly from the original gearbox ECU. This data is presented to end-users through the SCAL software. Users can then configure the Syvecs CAN transmit function in the Data Stream section, allowing them to send relevant data back out over CAN. This data can be directed to a Syvecs ECU, the original OEM powertrain CAN bus, or even an aftermarket ECU bus.

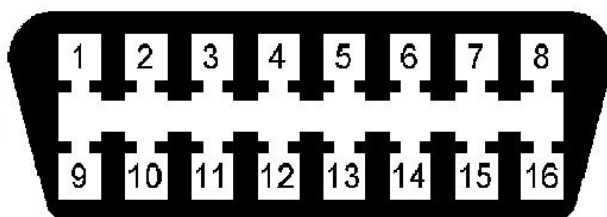
Critical parameters such as gear position, engine torque limitation, blip requests, and more. This ensures smooth communication between the transmission, engine control, and other powertrain elements-whether OEM or aftermarket-enhancing overall drivetrain coordination.

The gearbox control data is sent over CAN1 from the SYVTM. CAN0 can be used for additional CAN modules, such as OEM vehicle data, keypads or Syvecs ECU communication.

Example CAN Wiring



OBD2 Connector - Diagnostics



Pin	Description	Usage / note
4	GND	Ground
6	CANH	CAN1 High
14	CANL	CAN1Low
16	12V	12V Switched

Setup and Calibration

Once the SyvecsSYVTCM unit is installed, load the default calibration file and proceed to select the transmission model and shifter installed. As these are blue items it requires the module to be programmed to take effect. This is done by pressing Device - Program

After the desired transmission model is selected, a valid Licence code will need to be obtained before the module can be calibrated.



Obtaining Licence codes

For valid licence codes, please email support@syvecs.com with the following details:

Module serial number - A*****

Transmission model -

Licence invoice number -

Required Signals / Data

The following inputs must be configured for correct 8HP gearbox operation:

- RPM
- Vehicle Speed (optional, can be derived from output shaft) MUST input Tyre size and Final Drive
- Manifold Pressure (MAP)
- Throttle Position Sensor (TPS)
- Pedal Position
- Torque Actual, Torque Potential and Torque Demand (Can be calculated internally if ECU does not have Torque control)
- Brake Pressure or Brake Light Input
- Engine Coolant and Air Temperatures
- Paddles

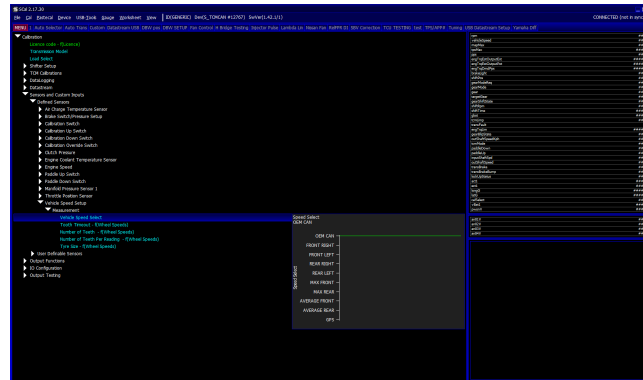
IMPORTANT: CHECK ALL THE ABOVE VALUES ARE READING CORRECTLY in SCAL BEFORE CONNECTING THE TCM TO GEARBOX

Engine Speed (RPM)

RPM is a vital input for the SyvTCM and can be obtained from CAN or a Physical Pulsed Engine speed signal with older cars like an Injector negative signal which can be T'd into and wired to any Hall / Freq Input on the SyvTCM

Vehicle Speed (vehicleSpeed)

Speed is another vital input for the SyvTCM and can be obtained multiple ways, the easiest way is from the Output Shaft Speed on the 8HP but can also be picked up from an external CAN frame or physical input. Important to select the Vehicle Speed source here if not using Output Shaft Speed option.



Manifold Pressure (MAP)

MAP can be used for the Internal Torque Table and feed into the SyvTCM via a CAN signal or from a physical pin.

Throttle Position Sensor (TPS)

TPS can be used for the Internal Torque Table and feed into the SyvTCM via a CAN signal or from a physical pin.

Pedal Position Sensor (PPS)

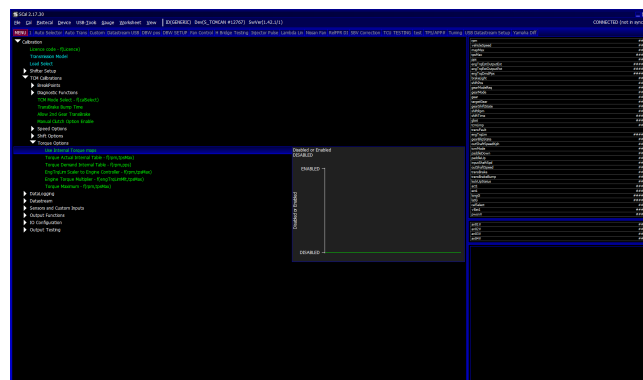
PPS is needed for internal Torque Demand tables and feed into the SyvTCM via a CAN signal

Torque Actual, Torque Potential and Torque Demand

The Torque values are important items for providing estimated Torque Actual, Torque potential and demanded torque. These values are sent to the TCM to change how the clutch packs are applied and pressures. If using the SyvTCM with a Syvecs ECU these can be picked up via CAN from the Engine ECU or any other ECU which has Torque values.

If the engine controller doesn't have onboard Torque control then users can use the Internal torque option of the SyvTcm to provide torque values.

Please Note: The values may seem higher than the actual engine torque to apply more pressure and faster shifts. The Maximum Torque which can be sent is 1200nm.



Brake Light Input Handling

In the 8HP gearbox control logic, the brake light signal plays a crucial role in determining when the brake pedal is pressed. This input can be sourced either through the generic CAN receive function or directly from predefined vehicle profiles that tap into the original vehicle CAN bus for the brake signal.

In cases where the brake light signal isn't available on the CAN bus, but brake pressure data is, the logic can rely on brake pressure readings. There is an adjustable mapping table that allows you to set a specific brake pressure threshold at which the system will consider the brake light "on." Once this threshold is met, a brake light flag is sent to the 8HP gearbox, ensuring that the control logic accurately recognizes braking events.

Engine Coolant and Air Temp (ECT and ACT)

These value are used for warm up and ambient adjustments of the tcm logic. They can be wired into the SyvTCM direct or picked up via CAN.

Paddles

Can be wired to the SyvTCM or picked up via CAN data, See Paddle up and down page for more info

0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	OFF	0.0	0.0	OFF	OFF
rpm	vehicleSpeed	mapMax	tpsMax	pps	engTrqEstOutput	engTrqEstOutputPot	engTrqDmdPps	brakeLight	ect1	act1	paddleDown	paddleUp	

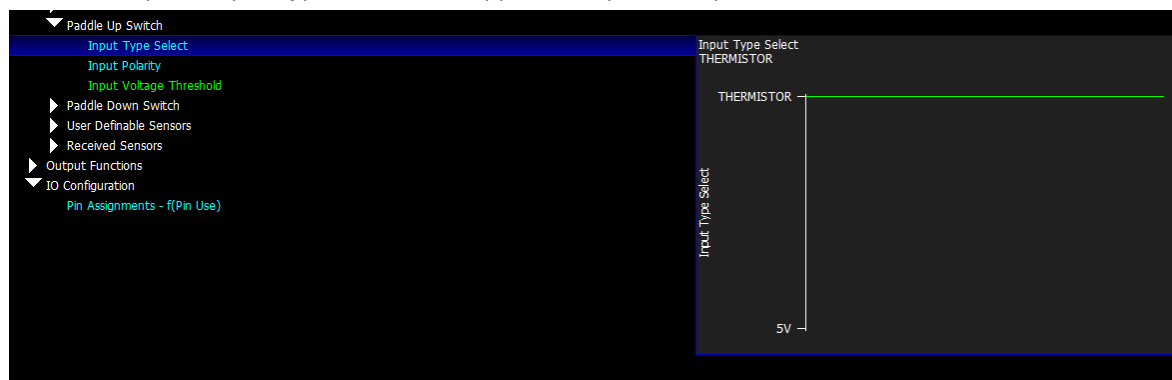
Paddle Switches

Paddle switches can be wired directly to the SyvTCM analog inputs or sent via CAN and setup in generic receive CAN. Any of the inputs can be assigned to the paddles. The SyvTCM has internal pull-up capability on the 4 inputs.

Assign in pin assignments

A) Inputs : Paddle Down Switch	NOT CONNECTED
A) Inputs : Paddle Up Switch	NOT CONNECTED
A) Inputs : U01 [Custom Item 1]	NOT CONNECTED
A) Inputs : U02 [Custom Item 2]	NOT CONNECTED
A) Inputs : U03 [Custom Item 3]	NOT CONNECTED

Then in sensors setup the Input Type (thermistor applies 3k Input Pull-up to 5v)



Set the polarity and threshold for the input to be classed as ON, then can open gauges for PaddleUp and PaddleDown to check. Gauge - Add - Paddleup

8HP TCM Reflash Procedure

Overview

This guide explains the process for reflashing a supported ZF 8HP Gen1 TCM for use with the Syvecs 8HP control system. The reflash converts the TCM to the required Syvecs-compatible firmware/calibration package. Always confirm the TCM hardware number is supported before writing any files. See Supported ZF 8HP Gearboxes

Important:

Only use the approved ACDP2 flashing tool and Syvecs-supplied firmware files. Do not use files from another ECU platform or vehicle application.

Required Equipment

You will need:

- ACDP2 programming tool - https://yhacdp.com/product/acdp-2-programming-module/?wcb2bsa_affiliate=YWxpY2VAYXV0b2VtYXN0ZXluY29tfDM2
- 8HP Tools - https://yhacdp.com/product/acdp-2-module-19-sh725xx-gearbox-clone/?wcb2bsa_affiliate=YWxpY2VAYXV0b2VtYXN0ZXluY29tfDM2
- Syvecs 8HP firmware - Available from Support@Syvecs.com



1. Hardware Connection

- Connect the DB15/LAN cable to the ACDP2 tool.
- Ensure the tool switch is set to the correct CAN position.
- Connect the 8HP adapter cable to the ACDP2 tool.
- Connect the TCM adapter carefully to the gearbox/mechatronic connector.
- Make sure the adapter is fully seated and aligned correctly.
- Power the ACDP2 tool using the supplied power adapter.

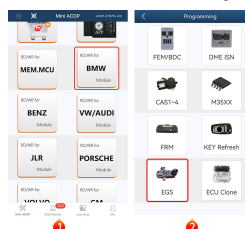
Do not force the connector. The 8HP TCM connector only fits correctly in one orientation.

2. Software Setup

The ACDP2 tool can be operated using either the Mobile app or the PC software. For workshop use, Syvecs recommends the PC software where possible, as it is generally easier for file handling and avoids mobile permission issues. Software available below.

<https://www.yanhuaacdp.com/info/download/>

Install the ACDP software and confirm that the tool connects correctly before proceeding.



3. Module Registration

Before first use, the 8HP programming module may need to be authorised inside the ACDP software.

- Open the ACDP software.
- Go to the user/account section.
- Open the module list.
- Confirm the 8HP/EGS module is active.
- If not active, enter the authorisation code supplied with the module.

Once authorised, this step normally does not need to be repeated.

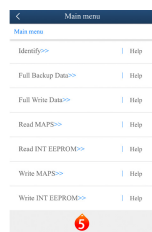
4. Identify the TCM

Before reading or writing anything, always perform an identification read.

In the ACDP software:

- Select BMW.
- Select EGS.
- Select 8HP Clone.
- Run Identify.

The Bosch hardware number and software details are used to confirm compatibility in Supported ZF 8HP Gearboxes.



5. Backup the Original TCM

Before writing Syvecs files, read and save the original TCM data.

Read and save:

- Internal Flash
- EEPROM

Keep these files with the vehicle record. They may be needed for recovery or support.

Important:

Do not skip the backup stage. If the TCM is an unknown variant, Syvecs may request these files before supplying or confirming the correct firmware package.

6. Prepare the Syvecs Firmware Files

Place the Syvecs-supplied firmware files in the folder accessible by the ACDP software.

8HP70_90_GEN1_Syvecs_V4_InternalFlashwithMaps.bin

8HP70_90_GEN1_eeprom

Only use the files supplied or approved by Syvecs for the exact TCM/gearbox application.

TCM flashing - write and verify

7. Flashing Order

Follow the flashing order supplied with the Syvecs firmware package.

Typical order:

Identify TCM

↓

Read & Save Original Files

↓

Write Syvecs Internal Flash

↓

Write Syvecs EEPROM

↓

Power Cycle

↓

Identify Again

8. Writing the Files

In the ACDP software:

- Select the BMW - EGS - 8HP RD/WR SH725
- Choose Write Internal Flash.
- Select the Syvecs internal flash file.
- Follow the on-screen prompts until complete.
- Repeat for EEPROM

Do not disconnect power, USB, CAN, or the TCM connector during flashing.

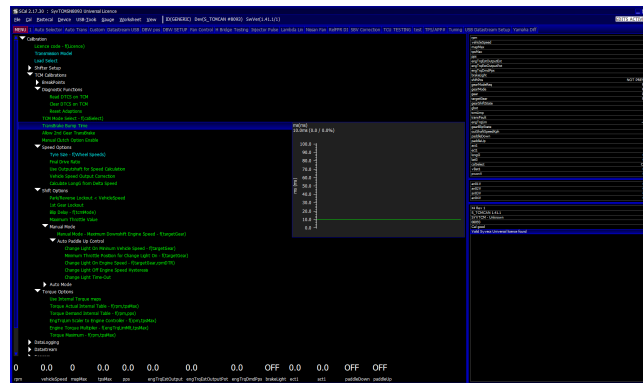
After writing, power cycle the tool and TCM, then run identification again.

9. Final Checks

After flashing:

- Confirm the TCM still identifies correctly.
- Check that no write errors were reported.
- Save a screenshot of the completed process.
- Fit the gearbox/TCM to the vehicle.
- Connect to the Syvecs 8HP controller.
- Confirm CAN communication.
- Clear any stored DTCs if required.
- Check selector position, input shaft speed, output speed, engine temperatures, and gear status.

TCM Calibration maps



TCM Calibration Parameters Overview

This section provides configuration options used to control gearbox behaviour, shift strategy, torque arbitration and diagnostic overrides for the ZF 8HP transmission. These parameters influence clutch control, shift scheduling, protection strategies, and limits used during manual and automatic operation modes.

Diagnostic Functions

Read DTCs on TCM

Reads all active and stored Diagnostic Trouble Codes currently logged within the transmission controller. DTCs Shown in bottom right-hand corner of SCAL

Clear DTCs on TCM

Clears all stored and active fault codes from the transmission controller memory when enabled and wise to Leave enabled constantly so it clears all the DTC at each power on.

Reset Adaptions

Resets learned clutch fill times, pressure adaptations and shift corrections back to factory defaults. After performing a reset, the transmission may require a relearn period before optimal shift quality is restored.

TCM Calibrations

TCM Mode Select - f(calSelect)

Maps calibration selection inputs to gearbox operational modes. Allows different driving profiles or tuning strategies selectable via a switch, calibration rotary, or CAN command.

Typical modes may include:

- Street
- Sport
- Track
- Drag
- Dynamic - Mix of Street and Track, smooth driving low down with fast shifts above 500nm

Each mode can have independent shift schedules, torque reduction settings and paddle behaviour.

TransBrake Bump Time

Defines the duration that clutch pressure is momentarily reduced during transbrake release. This feature is primarily used in drag racing applications to improve launch consistency and reaction time.

Higher values generally produce a more aggressive bump distance

Allow 2nd Gear TransBrake

Enables transbrake operation while second gear is selected.

Useful for:

- High power vehicles
- Poor traction surfaces
- Roll racing applications

When disabled, transbrake operation is restricted to first gear only.

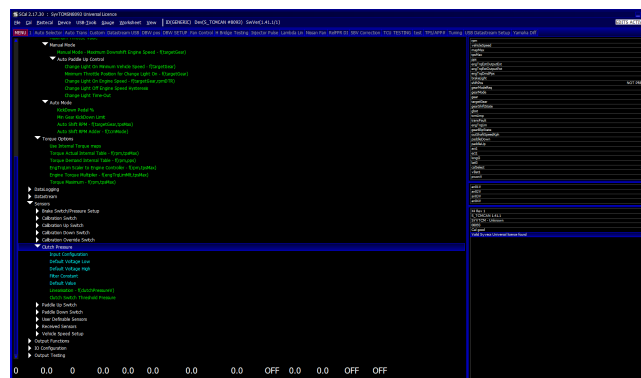
Manual Clutch Option Enable

Allows manual clutch control functions to be enabled so the transmission clutches will open when the item ClutchSwitch is ON.

Typically used for:

- Calibration work
- Dyno testing
- Drift applications
- Diagnostic purposes

Not normally required for standard operation.



Speed Options

Tyre Size - f(Wheel Speeds)

Enter the tyre circumference used for vehicle speed calculations.

Important:

- Incorrect values will affect vehicle speed calculations.
 - Automatic shift schedules may be affected.
 - Traction control and torque calculations may become inaccurate.
- Enter the rolling circumference of the driven tyre.

Final Drive Ratio

Defines the differential/final drive ratio fitted to the vehicle.

Important:

- Used when calculating vehicle speed from transmission output speed.
- Incorrect values will affect displayed vehicle speed and shift scheduling.

Use Outputshaft for Speed Calculation

Determines the source of vehicle speed.

Disabled:

- Uses Vehicle Speed received via CAN or Pin assignments

Enabled:

- Calculates Vehicle Speed from transmission output shaft speed, tyre size and final drive ratio.

For most installations this option should be enabled.

Vehicle Speed Output Correction

Additional correction factor applied to calculated vehicle speed.

Useful when:

- Using non-standard tyre sizes.
- Using custom differential ratios.
- Fine tuning displayed speed.

Calculate LongG from Delta Speed

Calculates longitudinal acceleration (LongG) from the rate of change of vehicle speed.

Useful when:

- No accelerometer is fitted.
- Launch and traction strategies require acceleration information.

An external accelerometer will generally provide greater accuracy.

Shift Options

Park/Reverse Lockout < Vehicle Speed

Defines the maximum vehicle speed at which the TCM will allow engagement of Park (P) or Reverse (R).

Above this speed:

- Park requests are ignored.
- Reverse requests are ignored.

This prevents drivetrain damage and accidental engagement.

Lower values provide greater protection.

1st Gear Lockout

Prevents the transmission from selecting 1st gear while operating in Drive.

Vehicle will pull away in 2nd gear when in Drive Mode.... An override function is available when the speed is below 5kph, brake pressed and by pulling a down paddle or selecting a manual downshift on the shifter block. It will allow 1st gear temporarily until out of 2nd gear or come out of Drive mode. Off- Road TCM Mode also allows 1st gear. See TCM Mode Options section.

Common uses:

- Wet weather driving
- High torque vehicles

Blip Delay - f(tcmMode)

Defines the delay before throttle blipping occurs during a commanded downshift.

Allows different drive modes to have unique rev-matching characteristics.

Typical usage:

- Comfort Mode = Longer delay
- Sport Mode = Short delay
- Track Mode = Immediate response

Maximum Throttle Value

Sets the maximum throttle value recognised by the TCM.

Any throttle value above this threshold is treated as 100%.

Used for:

- Shift scheduling
- Torque calculations
- Kickdown behaviour

Particularly useful when TPS scaling differs between ECUs.

Manual Mode

Maximum Downshift Engine Speed - f(targetGear)

Defines the maximum allowable engine speed after a requested manual downshift.

If the calculated engine RPM would exceed this limit:

- The downshift request is rejected.

Prevents:

- Engine over-speed conditions.
- Mechanical damage.
- Excessive drivetrain shock.

Auto Paddle Up Control

The Auto Paddle Up Control strategy can be used either as a visual shift indicator or as an automatic virtual paddle upshift request in Manual Mode. This is particularly useful for drag racing, roll racing, or applications where consistent and repeatable shift points are required.

When all configured conditions are met, the Change Light output becomes active. If the gearbox is operating in Manual Mode, the strategy can also automatically generate a virtual paddle upshift request (paddleUp), allowing the gearbox to upshift without driver input.

The shift point is determined using a gear-based RPM target table, allowing each gear to have its own independent activation point.

The Change Light will only activate when ALL of the following conditions are satisfied:

- Engine RPM exceeds the configured Change Light On Engine Speed threshold.
- Vehicle speed exceeds the configured Change Light On Minimum Vehicle Speed threshold.
- Throttle position exceeds the configured Minimum Throttle Position for Change Light On threshold.

Once activated, the Change Light and virtual paddle request remain active until any of the following conditions occur:

- Engine speed falls below the configured hysteresis threshold.
- Vehicle speed drops below the minimum speed threshold.
- Throttle position drops below the minimum throttle threshold.
- The configured Change Light Time-Out period expires.

When the Change Light turns off, any virtual paddle upshift request generated by the strategy is also removed.

A re-arm condition is required before the Change Light can activate again, preventing repeated triggering while engine speed remains near the shift point.

This strategy provides consistent and repeatable upshift behaviour while maintaining full flexibility for different gears, driving styles, and gearbox modes.

Change Light On Minimum Vehicle Speed - $f(\text{targetGear})$

Defines the minimum vehicle speed required before the Change Light strategy is allowed to activate for each gear. This prevents shift indication or automatic upshift requests from occurring while the vehicle is stationary, wheel-spinning, or operating at very low speeds.

Typical Uses:

- Prevent false activation during launch control.
- Prevent shift requests during burnouts.
- Ensure the strategy only becomes active once the vehicle is moving.

Higher values delay activation until greater vehicle speed is reached.

Minimum Throttle Position for Change Light On - $f(\text{targetGear})$

Defines the minimum throttle position required before the Change Light strategy becomes active.

This allows the strategy to be restricted to high-load or performance driving situations.

Typical Uses:

- Disable shift indication during normal cruising.
- Only activate during aggressive acceleration.
- Prevent unnecessary shift light activity during light throttle operation.

Higher values require more throttle before activation.

Change Light On Engine Speed - $f(\text{targetGear}, \text{rpmDTR})$

Defines the engine speed threshold where the Change Light activates.

This is the primary shift point table used by the strategy.

The table is indexed by:

- Target Gear
- Engine RPM Rate of Change (rpmDTR)

Using RPM rate-of-change allows the shift point to be dynamically adjusted based on how quickly the engine is accelerating.

Typical Uses:

- Lower shift RPM during rapid acceleration.
- Optimise shift timing for drag racing.
- Improve consistency between gears.

For virtual paddle shifting, this table effectively determines the automatic upshift RPM.

Change Light Off Engine Speed Hysteresis

Defines the RPM drop required before the Change Light turns off after activation.

This prevents rapid on/off oscillation when engine speed hovers around the activation threshold.

Typical Uses:

- Stabilise shift light operation.
- Prevent repeated virtual paddle requests.
- Improve driver feedback.

Larger values increase stability but require a greater RPM reduction before reset.

Change Light Time-Out

Defines the maximum time the Change Light and virtual paddle request are allowed to remain active.

Once this timer expires, the Change Light is automatically cancelled regardless of engine speed.

Typical Uses:

- Prevent prolonged shift requests.
- Prevent repeated upshift commands.
- Provide predictable operation during missed shifts.

A value of zero typically disables the timeout function.

Auto Mode

KickDown Pedal %

Defines the throttle position percentage required to activate KickDown.

When exceeded:

- A lower gear may be selected.
- Engine RPM is increased.
- Maximum acceleration is requested.

Min Gear KickDown Limit

Defines the lowest gear that KickDown is permitted to select.

Used to prevent:

- Excessive RPM
- Multiple gear downshifts
- Harsh transmission behaviour

Auto Shift RPM - $f(\text{targetGear}, \text{tpsMax})$

Primary automatic upshift schedule.

Defines the engine speed where an upshift occurs based on:

- Current gear
- Throttle position

Higher throttle values typically produce higher shift RPM.

This is the main automatic shift calibration table.

Auto Shift RPM Adder - $f(\text{tcmMode})$

Applies an RPM offset to the Auto Shift RPM table depending on the selected drive mode.

Example:

Mode	RPM Adder
Comfort	0
Sport	+500
Track	+1000

Allows each mode to have a unique shift character without duplicating the main shift table.

Torque Options

Use Internal Torque Maps

When enabled, the TCM calculates engine torque and potential Torque internally using the torque tables below.

When disabled, torque values are expected from an external ECU via CAN.

Enable when:

- ECU does not broadcast torque.
- Torque messages are unavailable.
- Custom torque modelling is desired.

Torque Actual / Potential Internal Table - $f(\text{rpm}, \text{tpsMax})$

Lookup table defining estimated actual engine torque.

Used for:

- Clutch pressure control
- Shift quality optimisation
- Gearbox protection calculations

Values should represent actual measured engine torque.

Torque Demand Internal Table - $f(\text{rpm}, \text{pps})$

Defines requested engine torque based on pedal position and engine speed.

Used during:

- Torque intervention
- Launch control
- Shift planning

Typically represents driver torque demand.

EngTrqLim Scaler to Engine Controller - $f(\text{rpm}, \text{tpsMax})$

Scaling table applied to the torque reduction request sent to the engine ECU.

Allows the amount of torque reduction during shifts to be increased or decreased.

Typical usage:

- Low load = Less torque reduction
- High load = More torque reduction

Engine Torque Multiplier - $f(\text{engTrqLimMlt}, \text{tpsMax})$

Multiplier applied to calculated engine torque values.

Used to compensate for:

- ECU torque model inaccuracies
- Modified engines
- Different engine combinations

Useful when clutch pressure calculations require adjusted torque values.

Torque Maximum - $f(\text{rpm}, \text{tpsMax})$

Defines the maximum engine torque the transmission is allowed to assume.

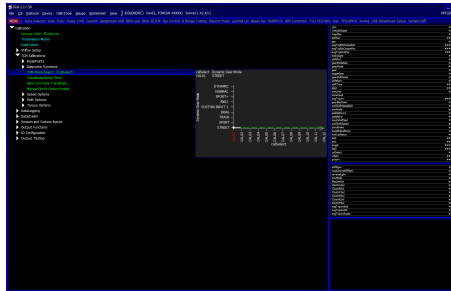
Acts as an upper torque limit for:

- Clutch pressure modelling
- Gearbox protection
- Torque arbitration

This table should reflect the maximum torque capability of the engine.

Transmission Modes

Select a transmission mode to suit the driving conditions and the desired shift response.



STREET

Everyday road use

Slower shift times with softer application of the oncoming clutch for smooth daily driving.

SPORT

Faster, more responsive shifts

Faster shift times with medium oncoming-clutch application rates and increased clutch pressures.

TRACK

Maximum shift performance

The fastest shift times, rapid oncoming-clutch application and maximum clutch pressures.

DYNAMIC

Smooth at low load, fast at high load

Slow, smooth shifts at low torque and very fast shifts above 400 Nm, with maximum clutch pressures at high load. Suited to fast road driving.

OFF-ROAD

Flexible low-gear operation

Smooth shifts at low torque and very fast shifts above 400 Nm. Overrides the 1st-gear lockout so the vehicle can pull away in 1st gear.

Selecting a mode with Custom Input 1 or RX01

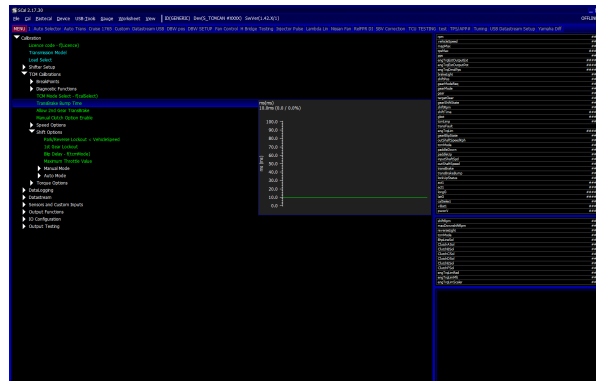
For Custom Input 1, set the value through View > Customising. Alternatively, assign RX01 to a CAN Receive item. Both methods use the following decimal values:

Mode	Decimal value
Street	1
Sport	3
Track	5
Drag	10

Transbrake and Launch Control

The system supports transbrake and bump functionality for drag-race applications:

- Activate transbrake by holding Manual/Sport Shift-Up for more than 2 seconds while below 10 km/h if using the BMW Shifter. If via buttons its active as soon as the transbrake item is ON from button press.
- Releasing the Shift-Up button with the BMW Shifter disengages the transbrake.
- While active, pressing Park button on the BMW Shifter it initiates a controlled bump forward.
- Bump timing and behaviour are configurable via calibration.
- A CAN-based launch request signal is sent to the ECU, enabling engine-side launch control synchronisation.
- 1st or 2nd Gear Launch Option available



Transmission Fault / Limp

The SyvTcm picks up any TCM Limps or Faults from the gearbox control unit, these are then updated in tcmLimp and tcmFault items in Scal which is recommended to be transmitted to the Engine Control module via CAN to limit Engine Torque in the event there is a fault in the Transmission.

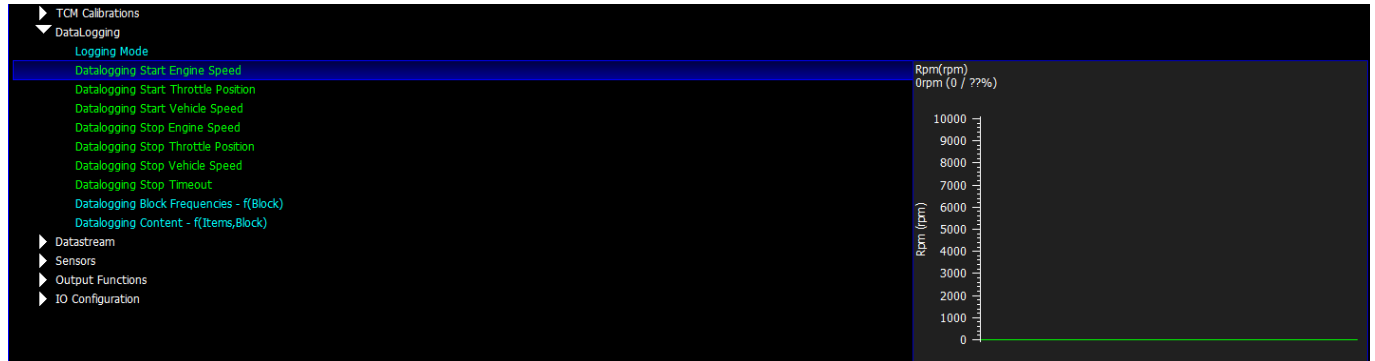
The tcmLimp item will become temporarily active if the user is trying to enter Launch mode and the Transmission control is not up to temperate or in the correct mode.

Data-logging

Internal memory logging

The TCM unit supports logging direct to a laptop internal memory or to an external memory stick allowing data rates up to 4000 times a second to ensure nothing is missed.

Logging start and stop trigger points can be setup in Scal which both internal and external logging logics will follow.

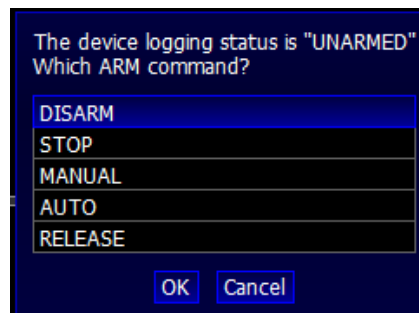


Details on setting up the items that are logged and the frequency they are logged at can be found by pressing F1 in the logging section or following instructions below.

Data is logged in blocks of 6 monitoring items. Each block will be logged at the frequency selected in DataloggingFreq. If a speed above 100Hz is required, log the same item in more than one block, with each block set to 100Hz, but with a separation of $4000/(\text{rate})$ blocks, so for example for 400Hz, put the same item in Block 1, 11, 21, and 31.

Datalogging must be Armed in Scal via USB-Tools - ARM Logging.

DISARM - Does not allow datalogging, regardless of if the start conditions are met.



STOP - Stops datalogging, regardless of if the start conditions are still met.

MANUAL - Starts datalogging, regardless of if the start conditions are met.

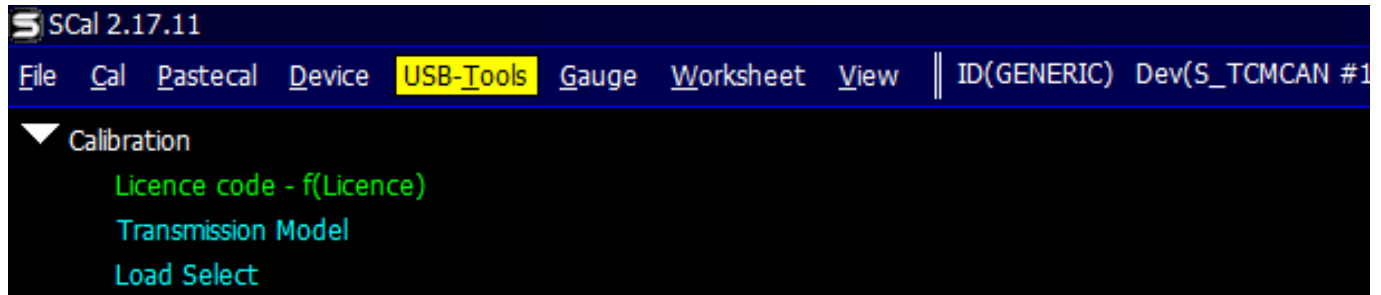
AUTO - Arms datalogging, but will not start logging until start conditions are met.

RELEASE - Transfers current log to downloadable cache. Used after a datalog is recorded ('USB-Tools' flashes red to signify datalogging stopped and data ready for release).

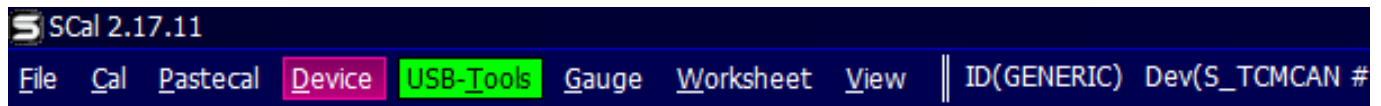
Once Auto is selected the USB-Tools will flash yellow to signal the logging system is ARMED but not logging.

Data logging - triggers and download

Logging will then begin when:



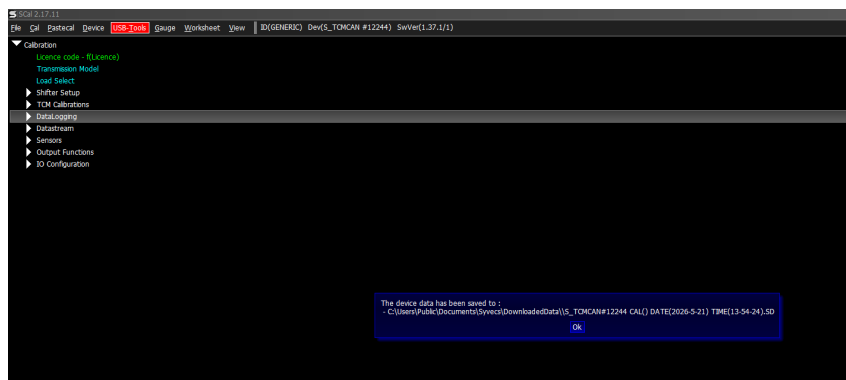
- Rpm is at or above DataloggingRpmStart and
 - TpsMax is at or above DataloggingTpsStart and
 - VehicleSpeed is at or above DataloggingSpeedStart
- The USB-Tools will turn Green when the logging has started



Once logging, it will cease under any of these conditions:

- Commanded to Stop by SCal - USBTools - ArmLogging - STOP
- Rpm remains below DataloggingRpmStop and
- TpsMax remains below DataloggingTpsStop and
- VehicleSpeed remains below DataloggingSpeedStop for DataloggingTimeOut milliseconds.

When the logging stops it causes USB-Tools to change to RED and will automatically store the log into the unit's cache. To save the logs locally, 'Download Logging' will need to be used. This will save as an .SD file under the unit's serial number, as shown below.



External memory stick logging

The SyvecsTCMunit allows for external memory stick logging with speeds up to 4000hz per item. To achieve this a good quality USB Stick with low latency and fast read/write speeds is required, we suggest the Kingston DataTraveler Max with a Male USBC to Female USB Adaptor.

<https://www.kingston.com/unitedkingdom/en/usb-flash-drives/datatraveler-max>

The Drive must be programmed in FAT32 format, as standard FAT32 is only supported to 32gb in windows but a program called FAT32 Formatter can do larger. This can be downloaded here www.syvecs.com/downloads/FAT32_Format.zip

The USB Memory stick can then be plugged into the USB port on the TCM to allow easy logging for end users.

When using a USB Memory stickfor logging, arming in SCal is not necessary as it will automatically engage 'AUTO', meaning it will start logging when start conditions are met.

Logging will then begin when:

- Rpm is at or above DataloggingRpmStart and
- TpsMax is at or above DataloggingTpsStart and
- VehicleSpeed is at or above DataloggingSpeedStart

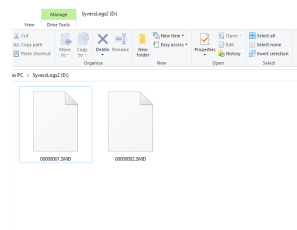
Users are then able to remove the USB Stick when logging has been disabled or the power is turned off to the TCM.

Logging will cease under any of these conditions:

- Rpm remains below DataloggingRpmStop and
- TpsMax remains below DataloggingTpsStop and
- VehicleSpeed remains below DataloggingSpeedStop for DataloggingTimeOut milliseconds.
- USB Stick removed

USB Memory stick .SMD file conversion to .SD

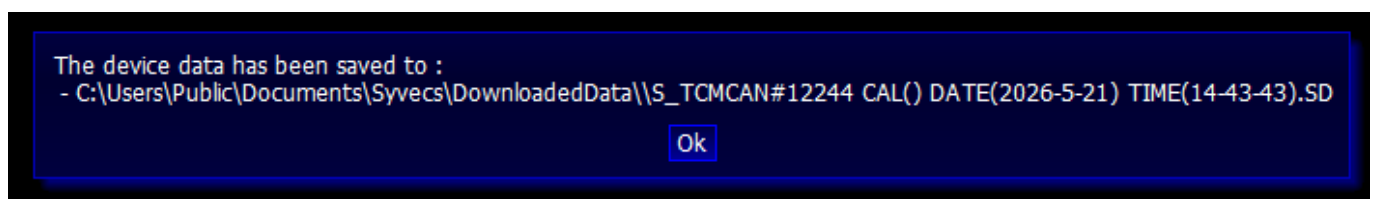
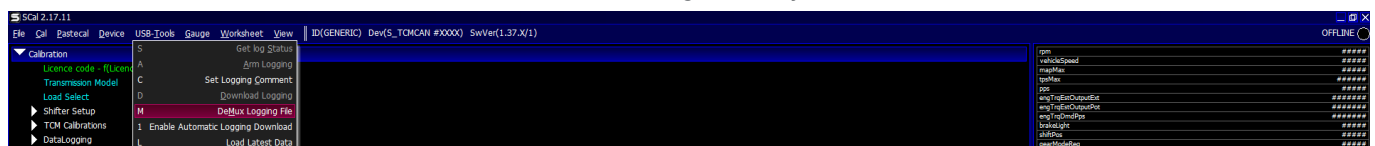
The log files saved on the USB Memory stick will be in .SMD format, these can be zipped up to a much smaller size to transfer to your dealer or support.



To convert the .SMD files to .SD files which are used with Syvecs logging program Sview, users need to open SCal and click USB-Tools - Demux Logging File (This cannot be done while connected to a Syvecs unit in SCal)

Select the USB Drive or location of the .SMD files and click OK

The files will then be converted and saved under the working directory of the TCM Serial number.



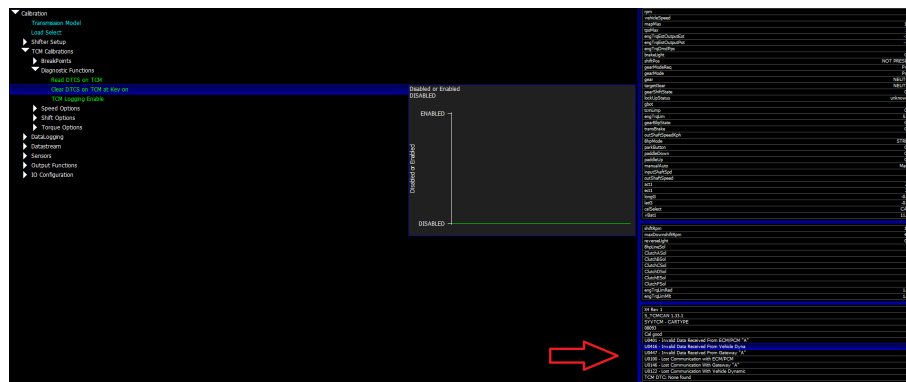
Advanced Features and Configuration

TCM Calibrations - Diagnostic Functions

These settings allow control of diagnostic behaviour and troubleshooting:

- Manual or Automatic clearing of stored Diagnostic Trouble Codes (DTCs).
- Reset Gearbox Adaption's, useful when clutches or gearbox changed
- Read DTC's from the TCM

When the Read DTCs on TCM map is enabled under the Diagnostic Functions tab, the stored DTC will be shown in the bottom right of SCAL, as shown below.



Onboard Data Logging and Calibration

The module includes an internal high-speed data logging engine capable of capturing gearbox activity and system parameters at rates of up to 1,000 samples per second. Logged channels may include:

- Internal gearbox sensor data
- Torque, shift, and clutch control parameters
- External inputs received over CAN

All logs are streamed directly to the PC's cache for efficient storage and post-run analysis.

Using the SCAL software, you can configure:

- Which parameters to log
- Trigger events (RPM, throttle, speed, time, or logic conditions)
- Start/stop behaviour
- Manual override logging

This level of flexibility enables detailed transmission analysis, tuning refinement, and validation during development or performance optimisation.

Monitoring Parameters Available

Parameter	Description
Bpf	Base shift profile state used for internal mode logic (debug variable).
InputShaftSpd	Input shaft speed (RPM).
OutputShaftSpd	Output shaft speed (RPM).
OutputShaftSpdKph	Output shaft interpreted as vehicle road speed (KPH).
TargetGear	Gear currently commanded by shift strategy or driver request.
GearBlipState	Indicates throttle blip activity during downshifts (active/inactive).
ShiftState	Current shift phase (idle, initiating, synchronizing, clutch handover, complete).
LockupStatus	Status of torque converter lockup clutch (open, slipping, locked).
EngTrqLim	Gearbox-commanded engine torque limit request.
EngTrqLimRed	Active torque reduction value applied based on gearbox request.
EngTrqLimMlt	Torque reduction multiplier determining reduction aggressiveness.
TtcmMode	Current operating mode (e.g., Comfort, Sport, Race, Drag).
GearboxPos	Actual gearbox state detected (P/R/N/D/M).
GearboxPosReq	Requested gearbox position from shifter input.
ShifterPos	Real-time physical shifter hardware position feedback.
ParkButton	Park command switch status (pressed/released).
ReverseButton	Reverse command switch status.
DriveButton	Drive command switch status.
NeutralButton	Neutral command switch status.
ManualAutoButton	Manual/Auto mode toggle switch status.
PaddleUp	Upshift paddle status.
PaddleDown	Downshift paddle status.
TransBrake	Indicates whether transbrake mode is currently engaged.
TransBrakeBump	Status of bump/staging request while in transbrake.
Gbot	Internal gearbox fluid temperature
ShiftRpm	Current calculated RPM threshold for the next upshift (auto mode).
MaxDownshiftRpm	RPM limit above which downshifts are prevented.
ReverseLight	Output state flag for reverse light activation.
EngTrqEstOutputExt	Estimated actual torque delivered into the gearbox after limiters and multipliers
EngTrqEstOutputPot	Estimated potential torque before torque interventions.
EngTrqDmdPps	Engine torque request used during shifts, launch, or mode changes.
8HPClutchA-F	Individual clutch activation states (0-100%).
8HPLineP	Measured hydraulic line pressure (bar).
TargetRpm	Target engine RPM used during rev-matching and launch control.
TcmLimp	Indicates if the control system is in limp or fallback mode.
TransFault	Fault Number set from TCM