

ZDR (INTERMEDIATE ENGINE SPEED CONTROL) INTERFACE WITH CUSTOMER SPECIFIC CONTROL MODULE (KSM) FOR EXTERNAL ENGINE SPEED CONTROL AND FLEET MANAGEMENT (FMS) INTERFACE ON TGA

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1. Areas of Application

This description of an interface will be useful to all vehicle body constructors who need an “external engine speed control system” on a MAN-commercial vehicle. The interface described here supplements and extends the standard “ZDR-Interface with FFR” and provides a much wider range of functions. Via the CAN interface of the KSM (A-CAN) it is possible to set up the Fleet Management System Interface (FMS-Interface). The interface implementation described here refers to the “Trucknology Generation” (TG) range of vehicles.

2. Terms and Abbreviations

The PIN description employs the following technical terms/abbreviations:

| Term/abbreviation | Description |
|-------------------|---|
| A-CAN | Body CAN (German “Aufbauer” = body/superstructure constructors) |
| AUS | Switch off of FGR-/FGB-/ZDR function |
| DBG | Engine speed limiting |
| DE | Digital input |
| EMV | Electromagnetic compatibility |
| FFR | Vehicle management computer |
| FGR/FGB/ZDR | Vehicle speed control/-speed limiter/Intermediate engine engine speed control |
| FIN | Vehicle identification number acc. to ISO 3779 or MAN standard 1036-7 |
| FMS | Fleet Management System |
| GETRIEBE-N | Neutral selected at gearbox |
| GMT | Greenwich Mean Time |
| HGB | Max speed limitation |
| High-side-Switch | Terminal 30 (+UBAT) output switching |
| HP | ZFautomatic transmission HP... |
| KSM | Customer specific guidance/control module |
| KS | Short circuit |
| LED | Light emitting diode |
| Low-side-Schalter | Terminal 31 (-UBAT) output switching |
| M3135 | MAN factory standard (letter M + 4-digit number) |
| MAN-cats II | Computer diagnostic system MAN-Workshops |
| MBG | Torque limitation |
| MEMORY | Memory recovery of stored function |

| Term/abbreviation | Description |
|-------------------|---|
| NA | Power take-off |
| NMV | Power take-off at front, engine-speed-dependent |
| PIN | Plug pin contact |
| PWM | Pulse width modulation |
| PTO | Power take-off |
| R-Gang | Reverse gear |
| SET- | Slow down or reduce engine speed, set value |
| SET+ | Speed up or raise engine speed |
| SG | Control unit |
| CAN T | Powertrain CAN (CAN = Controller Area Network) |
| +U _{BAT} | Battery + |
| -U _{BAT} | Battery - |
| UTC | Universal Time Code |
| VIN | Vehicle identification number ISO 3779 or MAN standard M 1036-7 |
| ZBR | Central on-board computer |
| ZDR | Intermediate engine speed control/regulator |

3. Guidelines and Standards also Applicable

- Currently valid guidelines covering the construction of trucks and articulated vehicles (semi-trailers), and here especially the manuals “Electrics” and “Trucknology Generation”, including all following supplements/ information for vehicle body constructors.
- MAN specification - Relays for commercial vehicles
- MAN standard M 3285 (EMV), also EU directives 72/245/EWG inc. 95/54/EWG
- MAN standard M 3135 (electric wiring)
- MAN standard M 1036-7 (Vehicle identification number)
- DIN 40 050
- DIN 40 839 Parts 1, 3 and 4
- DIN 57 879, Parts 3
- VDE 0879, Parts 3
- VG 95 370 to 95 377
- MIL-STO 461 to 462
- ISO 11898-24V
- SAE J1939/ff
- Bosch Specification 2.0B
- ISO 3779
- FMS Standard (www.fms-standard.com)

4. Addresses and competencies/responsibilities

Supply sources can be found in the MAN Guidelines for Body Constructors. These can be obtained from:

MAN Nutzfahrzeuge AG / Abt. ESC (Fax: +49 089 1580 4264)
Postfach 50 06 20
D-80976 München

5. GENERAL ADVICE ON THE ZDR-INTERFACE WITH KSM

- The interface is not included in the standard vehicle delivery specification and must be ordered separately.
- The desired parameters in the KSM control unit such as engine speed limiting, torque limiting etc. must be notified to the MAN sales team when placing the order. This information is passed on for factory programming.
- Preparation for the “Start-stop device” set-up is independent of the external engine speed control system interface and must be ordered separately.
The attachment necessary for external “Engine start-stop” control is supplied rolled up in the cable harness at the rear end of the frame.
- “Accidental reversing prevention” for garbage collection vehicles is not included in the interface and must be ordered separately.
- **Extreme care is necessary when wiring up the interface. This activity is critical because it involves actions that fundamentally affect the on board network and the wiring for the electronics.**
- Only use suitable electric wiring that conforms to MAN standard M 3135.
- Use only relays that meet the requirements set out in the MAN relay specification for external circuits.
- Make absolutely sure that wires are crimped strictly according to makers’ instructions.
- Any external controls incorporated by the constructor must meet enclosure standards according to IP69K DIN 40 050 and in addition be secure against external tampering.
- The power supply (+UBAT) for body equipment and control units incorporated by the constructor must be led from the batteries via a suitable separate circuit protection device or fuse. It is not permissible to take off more than 12 volts from a single battery.
- A separate cable must be used for electrical earthing and connected to the common earth point on the engine mounting (never use the vehicle frame as an earth conductor).
- Do not link together several items of externally switched equipment with different earth potentials.
- **Circuits at the interface must be decoupled from the power supply circuit to the body control systems.**
- External switching systems must meet the demands of MAN standard M 3285 for commercial vehicle systems. For example, radio systems such as radio-operated remote control devices must not have any effect on the functions described in this MAN standard.
- **Diagrams and pictures supplied by MAN to illustrate and provide examples of electrical circuits are not to be regarded as specific assembly instructions. The responsibility for the circuits at the interface rests entirely with the party carrying out the work.**

6. Notes and hints for setting up the parameters for the KSM

6.1. Fundamental functions regulating intermediate engine speed settings

- Setting of individual ZDR parameters is carried out in the FFR. Individual modes can be selected externally (outside the driver's cabin) if required via the standard ZDR interface (FFR).
- Possible parameters and also the PIN description of the "ZDR-interface with FFR" are described in the document "ZDR-interface with vehicle management computer for external intermediate engine speed control on the TG (Trucknology Generation) range".
- Using the "ZDR-interface with KSM", the functions "SET+", "SET-", "MEMORY" and "OFF/AUS" (familiar from the cruise control) are available for external use outside the driver's cabin.
- Additionally other intermediate engine speeds can be obtained by activating an engine speed limiter.

6.2. Various opportunities for setting up parameters with the KSM

Using MAN-cats II different function parameters can set up in the KSM.

- Engine speed and torque limiting:
Activating the DrzMomBgr-Pins (X1997/Pin 1 and 2) permits selection of the engine speed and torque limit parameters.

Factory settings:

| Signal | Engine speed | Torque |
|-----------------------------|--------------|--------|
| Engine speed/torque limit 0 | 4000 rev/min | 100% |
| Engine speed/torque limit 1 | 1500 rev/min | 100% |
| Engine speed/torque limit 2 | 1800 rev/min | 100% |
| Engine speed/torque limit 3 | 1200 rev/min | 100% |

- Engine speeds:
Parameters can be set for both the number of impulses per engine revolution) as well as the engine speed threshold from which the square-wave signal (50/50 sensing ratio) is transmitted.

Factory settings:

| Signal: | No. of impulses | Speed threshold |
|--------------|-----------------|-----------------|
| Engine speed | 6 | 60 rev/min |

- ZDR digital entries:
Parameters can be set to choose whether the SET+/-, MEMORY and AUS (Off) entries are supported. If these entries are supported, any corresponding parameter settings that the A-CAN calls for will be ignored. If the entries are not supported, any parameters set by the A-CAN are passed on and possible signals at the digital entries are ignored.

Factory setting:

| ZDR command: | Digital entries | A-CAN requirement |
|-------------------|-----------------|-------------------|
| SET +/-, MEM, OFF | X | |

- A-CAN interface:
For possible parameter settings, see Chapter 7.2.

- Error recognition in the following switching signal outputs:
 - High-side switch
 - Parking brake (X1997/Pin 5)
 - Brake (X1997/Pin 6)
 - Reverse gear (R_Gang) (X1997/Pin 7)
 - Clutch (X1997/Pin 8)
 - Monitor signal lamp (X1997/Pin 10) (installed by body constructor)
 - Tank warning (X1997/Pin 11) (installed by body constructor)
 - Operating readiness of KSM (X1997/Pin 12)
 - Low-side switch
 - Ls1_config (X1997/Pin 3)
 - Ls2_config (X1997/Pin 4)
 - Gearboxs-N (X1997/Pin 9)

The following error recognition variations are possible:

- No error recognition
 - Switch signal output not monitored
- With error recognition
 - ⇒ Monitoring high-side switch:
 - Signal high : short circuit to earth is monitored
 - Signal low : short circuit to +U_{BAT} and open circuit are monitored
 - ⇒ Monitoring low-side switch:
 - Signal high : short circuit to earth monitored and open circuit are monitored
 - Signal low : short circuit to +U_{BAT} is monitored
- With error recognition and test impulses (“extended error monitoring”)
 - ⇒ Test impulses during KSM system start (up to approx. 3 seconds after “terminal 15 on”)
During system start, short circuits to +U_{BAT}, short circuits to earth and open circuits are monitored; thereafter error monitoring is dependent on which -switch signal output version is used.
 - ⇒ Test impulses
Independent of the -switch signal output version, short circuits to +U_{BAT}, short circuits to earth and open circuits are monitored after “Terminal 15 on”.

Preconditions for error recognition:

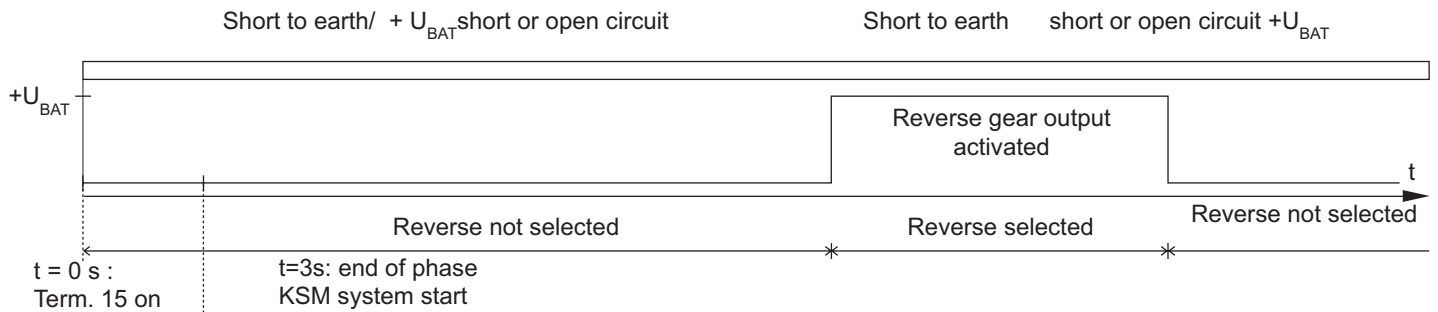
Load at output for high-side switches no greater than 400 Ω , for low-side switches no greater than 2000 Ω.

Note:

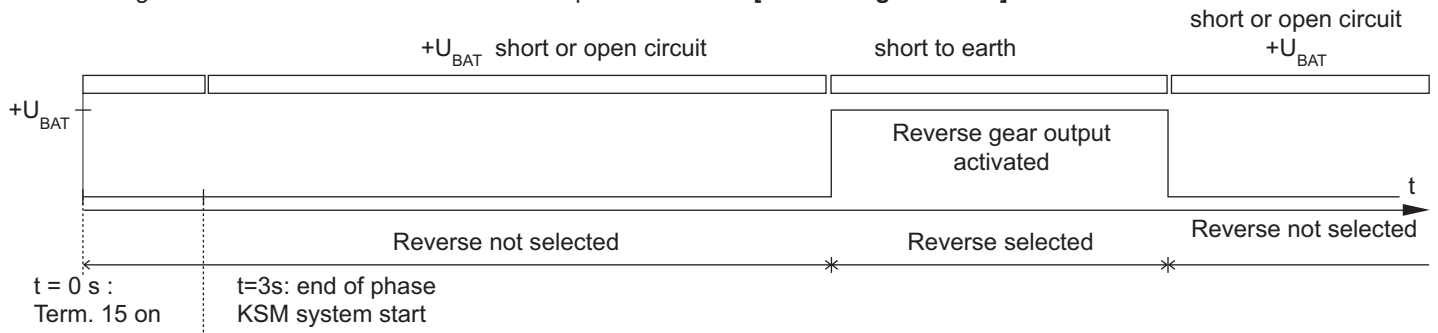
Activating error recognition greatly improves the diagnostic depth and range of components attached to the “ZDR interface with KSM”, which leads to an increase in functional reliability and the general availability of the vehicle.

Error recognition with different parameter settings, using -switch signal output "R_Gang" (reverse gear) as an example:

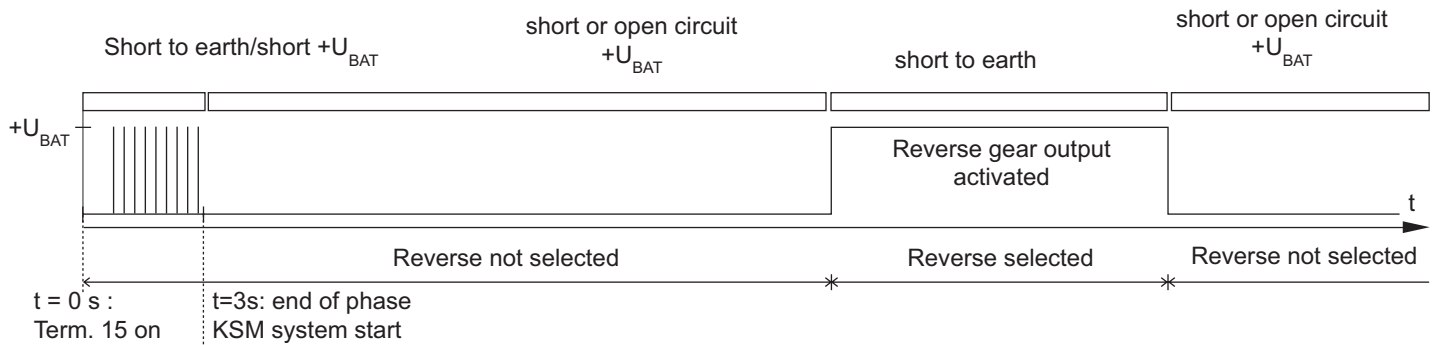
- Output not supported (load is connected):
Error recognition not active [**error recognition "0"**]



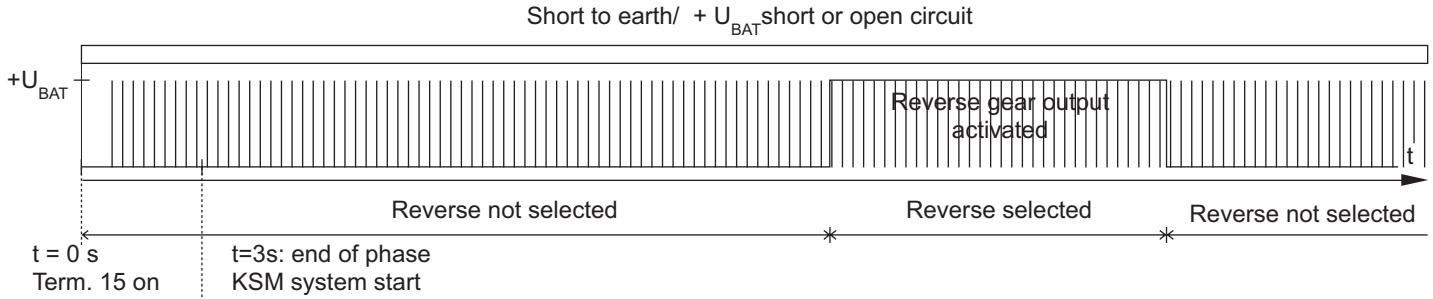
- Output supported (load must be connected!):
Error recognition active. current condition of the output is monitored [**error recognition "1"**]



- Output supported (load must be connected!):
Error recognition active: current condition of output is being monitored, test impulse only on the KSM control unit run-up.
(Test for short to earth on high-side switches and test for U_{BAT} short on low-side switches) [**error recognition "2"**]



- Output supported (load must be connected!):
Error recognition active: current condition of output is being monitored and test impulse cyclically (permanent monitoring for short to earth on high-side switches and for U_{BAT} short on low-side switches [**Error recognition “3”**])



Note:
The test impulses last for approx. 1 ms and have a repeat time of 300 ms.

Factory setting of error recognition -switch signal outputs:

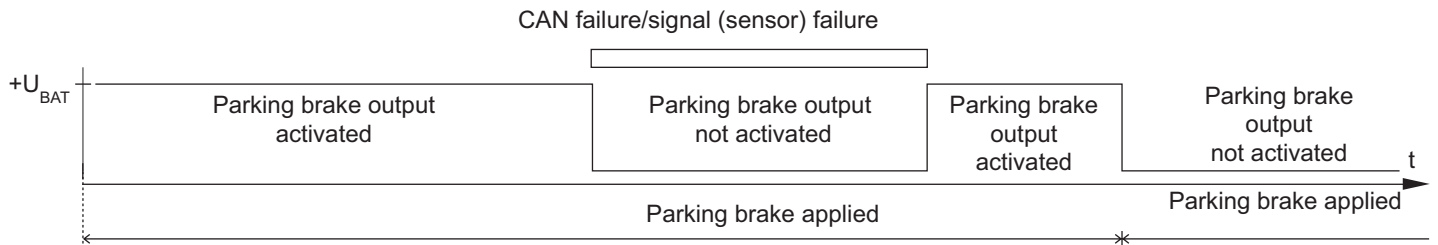
| Signal : | Error recog. “0” | Error recog. “1” | Error recog. “2” | Error recog. “3” |
|-----------------|------------------|------------------|------------------|------------------|
| Parking brake | X | | | |
| Brake | X | | | |
| R-gear | X | | | |
| Clutch | X | | | |
| Telltale lamp | X | | | |
| Tank warning | X | | | |
| Oper. readiness | X | | | |
| Ls1_konfig | X | | | |
| Ls2_konfig | X | | | |
| Gearbox N | X | | | |

- “Fail-safe” behaviour at -switch signal outputs:
Parameters for different reactions in the event of errors can be set independently for all -switch signal outputs. If the driver component is in an activated condition, the reaction required in the case of unknown/erroneous information (CAN failure/signal (sensor) failure) can be set up as a parameter:
- Switching signal output “do not freeze”
Driver component changes from active parametrised condition to passive condition in the event of CAN failure/signal (sensor) failure.
- Switching signal output “freeze”
Driver component is frozen in the active parametrised condition on CAN failure/signal (sensor) failure, until a valid signal is received again. The driver component remains passive after a Term. 15 reset if the CAN failure/signal (sensor) failure is still present.

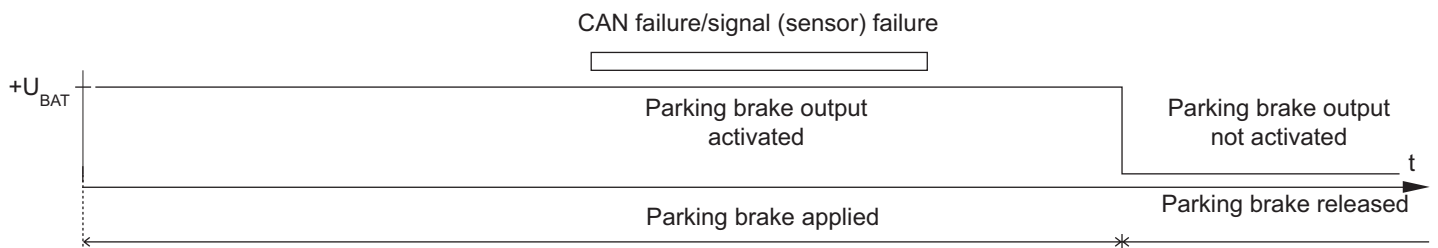
This opportunity to set parameters makes it possible to avoid a situation in which an unwanted reaction (release/block/switch off assemblies etc.) occurs and would cause external bodycomponents connected to the interface to react because of a CAN failure/signal (sensor) failure.

An example is the parametisation of “fail-safe” behaviour of the parking brake output dependent on parametisation:

- Output “do not freeze”:
Output changes to passive state in event of a CAN failure/signal (sensor) failure



- Output “freeze”:
In event of a CAN failure/signal (sensor) failure, output remains active in the activated condition.



“Fail-safe” behaviour of -switch signal outputs with factory settings:

| Signal : | “freeze” | “do not freeze” |
|---------------|----------|-----------------|
| Parking brake | | X |
| Brake | | X |
| Reverse | | X |
| Clutch | | X |
| Tank warning | X | |
| Ls1_config | | X |
| Ls2_config | | X |
| Gearbox N | | X |

7. A-CAN interface with FMS interface

7.1. General points

For communication purposes the A-CAN (body constructors' CAN) offers a High-Speed CAN-interface ISO 11898-24V and specification 2.0B. The data transmission speed is 250kbit/s.

To protect the MAN CAN-integrated net system on the vehicle against external interference/influences, the CAN is fully galvanically separated.

A 120 Ω terminal resistor is included in the KSM as A-CAN bus termination; a CAN filter choke is also provided.

The CAN-data communication lead is a 2-wire twisted lead running up to the interface (MAN part number: 07.08132.4384). The lead from the interface to the body-side control unit (e.g. telematics module) should be as short as possible – for electromagnetic reasons – and must be in twisted form (see ISO 11898-24V).

Here too, use leads with MAN article number 07.08132.4384.

For this MAN recommends leads with MAN article number 07.08132.4384 (FLRY-2x0,75-B-28-or-bror).

MAN's Definition of the A-CAN is based on SAE J1939/ff.

The identification numbers in brackets relate to SAE J1939/71 "VEHICLE APPLICATION LAYER". Implementation of the FMS interface is based on the "FMS-standard interface" commonly specified by several European truck manufacturers (www.fms-standard.com).

7.2. Setting parameters for the A-CAN

- Each message received by the KSM on the T-CAN is also transmitted on the A-CAN; however, the parameter settings can be chosen such that individual or all messages from the KSM and supplied to the A-CAN are stopped (not transmitted).
- Every A-CAN received message (KSM1_A, KSM2_A) can be parametrised regardless of whether it is ignored or further processed by the KSM.
- Reception timeout can also be parametrised, and if necessary the identifier of the reception message as well.
- For both reception messages it is possible to parametrise a "dead time" starting from Term. 15 "on". The actual timeout surveillance of messages from the body-side electronics to the KSM starts only after this preset time delay. This permits tailoring of the KSM to match the run-up time of the body-side electronics if necessary, without having to extend the actual time-out surveillance period for incoming KSM messages (KSM1_A, KSM2_A).

7.3. Vehicle condition Information on the A-CAN

Dependent on the vehicle equipment level and parametrisation of the KSM, the following information about the body electronic systems may be made available via the A-CAN:

Standard specification of A-CAN interface:

- ABS active/not active
- Axle load (depending on equipment)
- Current/previous gear
- Brake circuit 1 and 2
- Brake pedal operation
- Brake pedal position
- Cruise control active/not active
- Accelerator pedal position
- Road speed
- Parking brake and/or trailer supply air pressure
- Parking brake operation
- Gear selected
- Total distance reading
- Total engine running time
- Gearbox output speed
- Gearbox input speed
- Gearbox in neutral
- Selected gear
- Kickdown position
- Fuel temperature
- Coolant temperature
- Clutch pedal operated
- Idle position
- Air pressure (ambient)
- Air temperature (ambient)
- Engine speed
- Engine torque/injection volume
- Engine oil pressure
- Engine oil temperature
- NA1 requested/active
- NA2 requested/active
- NMV requested/active
- PTO status (According to FMS values)
- Reverse selected/not selected
- Tachograph information
- Trip distance recorder
- Powertrain open/closed
- Time/date (GMT = Greenwich Mean Time)
- Ratio of gearbox input/output speeds
- Supply pressure for optional extras/special equipment

Special equipment in connection with parametrised and activated FMS interface:

- Vehicle Ident. No.
- Total fuel consumption
- FMS standard interface info
- Fuel level in tank
- Remaining distance before next service (according to FMS values)

7.4. Possible demands on the KSM via the A-CAN

KSM can accept the following requests on the A-CAN from the body-side electronics for further processing by the FFR:

- Torque demand/limit request
- Engine speed demand/limit request
- Request from the ZDR control unit Mode S, 1-7
- Request to ZDR- control (SET+/-, MEM, AUS)
- Max speed limiting
- External engine start/stop (engine stop only is possible on engine with inline injection pump [EDC MS6.1]; engine start and stop are possible on common-rail engine [EDC7])
- NMV (power take-off) request

7.5 A-CAN output messages

Following messages can be supplied by KSM to the A-CAN:

ETC1: Electronic Transmission Controller #1 (3.3.5 = Chapter of SAE J1939/ff)

0CF00203

| Transmission repetition rate | Data length | PDU format | PDU specific | Default priority | Parameter group number | Identifier |
|------------------------------|-------------|------------|--------------|------------------|------------------------|------------|
| 10 ms | 8 bytes | 240 | 2 | 3 | 0x00F002 | 0x0CF00203 |

| Byte | Bit | Description | | |
|---------|---------|---|----------------------|-----------------------------|
| 1 | 8 to 3 | XX (non-essential information for body constructor) | | |
| | 2 and 1 | [driveline_engaged] (3.2.2.6) | | |
| | | 00 | driveline disengaged | |
| | | 01 | Driveline engaged | |
| | | 10 | Error (erreur) | |
| | 11 | not available | | |
| 2 and 3 | --- | [output_speed_TCU] (3.2.1.14) | | |
| | | rpm per bit = 0,125 | Offset [rpm] = 0 | Range [rpm] = 0 to 8031,875 |
| 4 | --- | [clutch_slip] (3.2.1.20) | | |
| | | % pro bit = 0,4 | Offset [%] = 0 | Range [%] = 0 to 100 |
| 5 | --- | XX | | |
| 6 and 7 | --- | [input_speed] (3.2.5.55) | | |
| | | rpm per bit = 0,125 | Offset [rpm] = 0 | Range [rpm] = 0 to 8031,875 |
| 8 | --- | XX | | |

ETC2: Electronic Transmission Control unit #2 (3.3.8)

18F00503

| Transmission repetition rate | Data length | PDU format | PDU specific | Default priority | Parameter group number | Identifier |
|------------------------------|-------------|------------|--------------|------------------|------------------------|------------|
| 100 ms | 8 bytes | 240 | 5 | 6 | 0x00F005 | 0x18F00503 |

| Byte | Bit | Description | | |
|---------|-----|--------------------------------|------------|----------------------|
| 1 | --- | [selected_gear] (3.2.1.23) | | |
| 2 and 3 | --- | [actual_gear_ratio] (3.2.1.25) | | |
| | | 0.001 per Bit | Offset = 0 | Range = 0 ... 64,255 |
| 4 | --- | [current_gear] (3.1.2.22) | | |
| 5 to 8 | --- | XX | | |

Note:

| Offset = -125 | Range = -125 ... 125 |
|---|----------------------|
| Positive values represent forward gears, negative values reverse gears. "0" is used for neutral in the gearbox, "126" for "Park" (automatic transmission) | |

| Transmission repetition rate | Data length | PDU format | PDU specific | Default priority | Parameter group number | Identifier |
|--|-------------|------------|--------------|------------------|------------------------|------------|
| Every second or in case of status change | 8 bytes | 254 | 199 | 7 | 0x00FEC7 | 0x1CFEC703 |

| Byte | Bit | Description | |
|---------|---------------|---|-----------|
| 1 and 2 | --- | XX | |
| 3 | 8 à 5 | XX | |
| | 4 and 3 | Engagement indicator [shift_finger_status_1] (3.2.6.20) | |
| | | 00 | off |
| | | 01 | on |
| | | 10 | error |
| | 11 | not available | |
| | 2 and 1 | Neutral indicator (3.2.6.19) | |
| | | 00 | off |
| | | 01 | on |
| | | 10 | error |
| 11 | not available | | |
| 4 to 6 | --- | XX | |
| 7 | 8 and 7 | not defined | |
| | 6 to 4 | [PTO2_state] | |
| | | 0x1 | requested |
| | | 01x | active |
| | 1xx | not defined | |
| | 3 to 1 | [PTO1_state] | |
| | | 0x1 | requested |
| | | 01x | active |
| 1xx | not defined | | |
| 8 | --- | XX | |

Note:

Status of auxiliary power take-off is not defined according to SAE 1939/71.

| Transmission repetition rate | Data length | PDU format | PDU specific | Default priority | Parameter group number | Identifier |
|------------------------------|-------------|------------|--------------|------------------|------------------------|------------|
| 100 ms | 8 bytes | 254 | 241 | 6 | 0x00FEF1 | 0x18FEF100 |

| Byte | Bit | Description | | | |
|---------|---------|-------------------------------|-----------------------------|--------------------------|--|
| 1 | 8 to 5 | XX | | | |
| | 4 and 3 | [park_brake_switch] (3.2.6.8) | | | |
| | | 00 | Parking brake not set | | |
| | | 01 | Parking brake set | | |
| | | 10 | error | | |
| | 11 | not available | | | |
| | 2 and 1 | XX | | | |
| 2 and 3 | --- | [veh_speed_FFR] (3.2.1.12) | | | |
| | | km/h per Bit = 1/256 | Offset [km/h] = 0 | Range [km/h] = 0 ... 251 | |
| 4 | 8 and 7 | [clutch_switch] (3.2.6.12) | | | |
| | | 00 | Clutch pedal released | | |
| | | 01 | Clutch pedal depressed | | |
| | | 10 | error | | |
| | | 11 | not available | | |
| | 6 and 5 | [brake_switch] (3.2.6.11) | | | |
| | | 00 | Brake pedal released | | |
| | | 01 | Brake pedal depressed | | |
| | | 10 | error | | |
| | | 11 | not available | | |
| | | 4 and 3 | XX | | |
| | 2 and 1 | [CC_active] (3.2.6.9) | | | |
| | | 00 | Cruise control switched off | | |
| 01 | | Cruise control switched on | | | |
| 10 | | error | | | |
| | 11 | not available | | | |
| 5 to 6 | --- | XX | | | |
| 7 | 8 to 6 | XX | | | |
| | 5 to 1 | PTO Status (3.2.2.19) | | | |
| | | 00000 | Off/disabled | | |
| | | 00101 | Set | | |
| | 11111 | not available | | | |
| 8 | --- | XX | | | |

EBC1: Electronic Brake Control unit #1 (3.3.4)

18F0010B

| Transmission repetition rate | Data length | PDU format | PDU specific | Default priority | Parameter group number | Identifier |
|------------------------------|-------------|------------|--------------|------------------|------------------------|------------|
| 100 ms | 8 bytes | 240 | 1 | 6 | 0x00F001 | 0x18F0010B |

| Byte | Bit | Description | | |
|--------|---------|---|---------------------------|---------------------|
| 1 | 8 and 7 | XX | | |
| | 6 and 5 | [ABS_active] (3.2.2.9) | | |
| | | 00 | ABS passive but installed | |
| | | 01 | ABS active | |
| | | 10 | reserved | |
| 4 to 1 | 11 | don't care | | |
| 2 | --- | Brake pedal position [BP_position] (3.2.1.18) | | |
| | | 0.4% per Bit | Offset = 0 % | Range = 0% ... 100% |
| 3 to 8 | --- | X | | |

| Transmission repetition rate | Data length | PDU format | PDU specific | Default priority | Parameter group number | Identifier |
|---------------------------------------|-------------|------------|-----------------------|------------------|------------------------|------------|
| Every second or with change of status | 8 bytes | 255 | 161/A1 _{hex} | 6 | 0x00FFA1 | 0x18FFA121 |

| Byte | Bit | Description | |
|--------|---------------|--|---------------|
| 1 | 8 and 7 | Reverse gear not selected (manual gearbox) | |
| | | 00 | off |
| | | 01 | on |
| | | 10 | error |
| | | 11 | not available |
| | 6 and 5 | Info: fuel level in current tank too low | |
| | | 00 | off |
| | | 01 | on |
| | | 10 | error |
| | | 11 | not available |
| 4 to 1 | XX | | |
| 2 | 8 to 3 | XX | |
| | 2 and 1 | Info NOTOFF | |
| | | 00 | off |
| | | 01 | on |
| | | 10 | error |
| 11 | not available | | |
| 3 to 8 | --- | XX | |

EEC1: Electronic engine control unit #1 (3.3.7)

OCF00400

| Transmission repetition rate | Data length | PDU format | PDU specific | Default priority | Parameter group number | Identifier |
|------------------------------|-------------|------------|--------------|------------------|------------------------|------------|
| 20 ms | 8 bytes | 240 | 4 | 3 | 0x00F004 | OCF00400 |

| Byte | Bit | Description | | |
|---------|-----|---|-----------------|----------------------------|
| 1 and 2 | --- | XX | | |
| 3 | --- | Actual engine torque [act_eng_torque] (3.2.1.5) | | |
| | | 1% per bit | Offset = -125 % | Range = -125% ... 125% |
| 4 and 5 | --- | Engine speed [engine_speed] (3.2.1.9) | | |
| | | 0,125 rpm per Bit | Offset = 0 rpm | Range = 0 rpm ... 8031.875 |
| 6 to 8 | --- | XX | | |

EEC2: Electronic engine control unit #2 (3.3.6)

OCF00300

| Transmission repetition rate | Data length | PDU format | PDU specific | Default priority | Parameter group number | Identifier |
|------------------------------|-------------|------------|--------------|------------------|------------------------|------------|
| 50 ms | 8 bytes | 240 | 3 | 3 | 0x00F003 | 0x00F00300 |

| Byte | Bit | Description | | |
|--------|---------|---|------------------------------|---------------------|
| 1 | 8 to 5 | not defined | | |
| | 4 to 3 | Accelerator pedal (AP) kickdown switch [AP_kickdown_sw] (3.2.2.5) | | |
| | | 00 | Kickdown passive | |
| | | 01 | Kickdown active | |
| | | 10 | error | |
| | | 11 | not available | |
| | 2 and 1 | Accelerator pedal (AP) low idle switch [AP_low_idle_sw] (3.2.2.4) | | |
| | | 00 | AP not in low idle condition | |
| | | 01 | AP in low idle condition | |
| | | 10 | error | |
| 11 | | not available | | |
| 2 | --- | Accelerator pedal (AP) position [AP_position] (3.2.1.8) | | |
| | | 0.4 % per Bit | Offset = 0 % | Range = 0% ... 100% |
| 3 | --- | Load at current speed [load_curr_speed] (3.2.1.7) | | |
| | | 1 % per Bit | Offset = 0 % | Range = 0% ... 100% |
| 4 to 8 | --- | XX | | |

EngFlui_LevPre: Engine fluid level/pressure (3.3.29)

18FEEF00

| Transmission repetition rate | Data length | PDU format | PDU specific | Default priority | Parameter group number | Identifier |
|------------------------------|-------------|------------|--------------|------------------|------------------------|------------|
| 500 ms | 8 bytes | 254 | 239 | 6 | 0x00FEEF | 0x00FEEF0 |

| Byte | Bit | Description | | |
|--------|-----|--|-----------------|--------------------------|
| 1 to 3 | --- | XX | | |
| 4 | --- | Engine oil pressure [eng_oil_press] (3.2.5.28) | | |
| | | 40 mbar per Bit | Offset = 0 mbar | Range = 0 bar ... 10 bar |
| 5 to 8 | --- | XX | | |

Eng_Temp: Engine temperature (3.3.28)

18FEEE00

| Transmission repetition rate | Data length | PDU format | PDU specific | Default priority | Parameter group number | Identifier |
|------------------------------|-------------|------------|--------------|------------------|------------------------|------------|
| 1 s | 8 bytes | 254 | 238 | 6 | 0x00FEEE | 0x00FEEE0 |

| Byte | Bit | Description | | |
|---------|-----|--|------------------|---------------------------|
| 1 | --- | Engine coolant temperature [eng_cool_temp] (3.2.5.5) | | |
| | | 1 °C pro Bit | Offset = -40 °C | Range = -40 °C ... 210 °C |
| 2 | --- | Fuel temperature [fuel_temp] (3.2.5.14) | | |
| | | 1 °C per Bit | Offset = -40 °C | Range = -40 °C ... 210 °C |
| 3 and 4 | --- | Engine oil temperature [eng_oil_temp] (3.2.5.15) | | |
| | | 0.03125 °C per Bit | Offset = -273 °C | Range = -273°C ... 1735°C |
| 5 to 8 | --- | XX | | |

ECAM1: Air/pneumatic supply pressure 3.3.75 (ECAM1)

18FEAE30

| Transmission repetition rate | Data length | PDU format | PDU specific | Default priority | Parameter group number | Identifier |
|------------------------------|-------------|------------|--------------|------------------|------------------------|------------|
| 1 s | 8 bytes | 254 | 174 | 6 | 65,198 | 0x18FEAE30 |

| Byte | Bit | Description |
|--------|-----|---|
| 1 | --- | SAE: Pneumatic supply pressure (not used by MAN) [pneu_supply_press] |
| 2 | --- | SAE: Parking and /or trailer air pressure (MAN: circuit 3 {23}) [park_trailer_press] |
| 3 | --- | SAE: Service brake air pressure, circuit #1 (MAN: circuit 1 {21}) [serv_brake_press1] |
| 4 | --- | SAE: Service brake air pressure, circuit #2 (MAN: circuit 2 {22}) [serv_brake_press2] |
| 5 | --- | SAE: Auxiliary equipment supply pressure (MAN: circuit 4 {24}) [aux equip_press] |
| 6 | --- | SAE: Air suspension pressure (MAN: Vorkreis) [air_susp_press] |
| 7 to 8 | --- | XX |

Note:

| | | |
|---|-----------------|--------------------------|
| MAN: Byte 6 does not show the air suspension pressure | | |
| Resolution for Byte 1 to 6 | | |
| 80 mbar pro Bit | Offset = 0 mbar | Range = 0 bar ... 20 bar |

Amb_Cond: Ambient conditions (3.3.35)

18FEF500

| Transmission repetition rate | Data length | PDU format | PDU specific | Default priority | Parameter group number | Identifier |
|------------------------------|-------------|------------|--------------|------------------|------------------------|------------|
| 1 s | 8 bytes | 254 | 245 | 6 | 0x00FEF5 | 0x00FEF500 |

| Byte | Bit | Description |
|---------|-----|---|
| 1 | --- | Barometric pressure [barometric_press] (3.2.5.43)* |
| | | 5 mbar per Bit Offset = 0 mbar Range = 0 ... 1.25 bar |
| 2 and 3 | --- | XX |
| 4 and 5 | --- | Ambient air temperature [amb_air_temp] (3.2.5.12) |
| | | 0.03125 °C per Bit Offset = -273 °C Range = -273 ... 1735.0°C |
| 6 to 8 | --- | XX |

* Warning: these values cannot be calibrated

Time_Date : Time /Date (3.3.20)

18FEE6EE

| Transmission repetition rate | Data length | PDU format | PDU specific | Default priority | Parameter group number | Identifier |
|------------------------------|-------------|------------|--------------|------------------|------------------------|------------|
| 1 s | 8 bytes | 254 | 230 | 6 | FF0A | 18FEE6EE |

| Byte | Bit | Description | | |
|------|-----|--|----------------------|------------------------------|
| 1 | --- | Seconds [seconds] (3.2.5.93) | | |
| | | 0,25 s pro bit | Offset = 0 s | Range = 0 ... 59.75 s |
| 2 | --- | Minutes [minutes] (3.2.5.94) | | |
| | | 1 min per Bit | Offset = 0 min | Range = 0 ... 59 min |
| 3 | --- | Hours [hours] (3.2.5.110) | | |
| | | 1 h per Bit | Offset = 0 h | Range = 0 ... 23 h |
| 4 | --- | Month [month] (3.2.5.112) ¹ | | |
| | | 1 Month per Bit | Offset = 0 Month | Range = 0 ... 12 Months |
| 5 | --- | Day [day] (3.2.5.111) ² | | |
| | | 0,25 Days per Bit | Offset = 0 Days | Range = 0 ... 31,75 Days |
| 6 | --- | Year [year] (3.2.5.113) | | |
| | | 1 Year per Bit | Offset = +1985 Years | Range = 1985 ... 2235 Years |
| 7 | --- | Local Minute Offset (3.2.5.296) | | |
| | | 1 min per Bit | Offset = -125 min | Range = of -59min to +59 min |
| 8 | --- | Local Hour Offset (3.2.5.297) | | |
| | | 1 h per Bit | Offset = -125 h | Range = of -23 h to +23 h |

Note:

¹ Value "0" is not used. Value "1" = "January", value "2" = "February" and so on.

² Value "0" is not used. Values 1 to 4 (0,25 days/Bit) correspond to first day of the month, values 5 to 8 correspond to the second day of the month and so on.

Veh_dist: Vehicle Distance high resolution (3.3.54)

18FEC1EE

| Transmission repetition rate | Data length | PDU format | PDU specific | Default priority | Parameter group number | Identifier |
|------------------------------|-------------|------------|--------------|------------------|------------------------|------------|
| 1 s | 8 bytes | 254 | 193 | 6 | FEC1 | 18FEC1EE |

| Byte | Bit | Description | | |
|--------|-----|---|--------------|-----------------------------|
| 1 to 4 | --- | High resolution total vehicle distance [tot_veh_dist] (3.2.5.106) | | |
| | | 5 m per Bit | Offset = 0 m | Range = 0 ... 21 055 406 km |
| 5 to 8 | --- | High resolution trip distance [trip_distance] (3.2.5.107) | | |
| | | 5 m per Bit | Offset = 0 m | Range = 0 ... 21 055 406 km |

Eng_HourRev: Engine Hours, Engine speeds (3.3.19)

18FEE527

| Transmission repetition rate | Data length | PDU format | PDU specific | Default priority | Parameter group number | Identifier |
|------------------------------|-------------|------------|--------------|------------------|------------------------|------------|
| 1 s | 8 bytes | 254 | 229 | 6 | 0x00FEE5 | 18FEE527 |

| Byte | Bit | Description | | | |
|--------|-----|---|--------------|--------------------------------|--|
| 1 to 4 | --- | Total engine hours [total_eng_hours] (3.2.5.61) | | | |
| | | 0,05 h per Bit | Offset = 0 h | Range = 0 ... 210 554 060,75 h | |
| 5 to 8 | | XX | | | |

Veh_Weight_EBS : Vehicle weight EBS

18FEEA0B

| Transmission repetition rate | Data length | PDU format | PDU specific | Default priority | Parameter group number | Identifier |
|------------------------------|-------------|------------|--------------|------------------|------------------------|------------|
| 1 s | 8 bytes | 254 | 234 | 6 | 65,258 | 18FEEA0B |

| Byte | Bit | Description | | | |
|---------|--------|--|---------------|------------------------------|--|
| 1 | 8 to 5 | Axle location [axle_location] (3.2.5.95) | | | |
| | | 0000 | Axle 1 | | |
| | | 0001 | Axle 2 | | |
| | | 0010 | Axle 3 | | |
| | | 0011 | Axle 4 | | |
| | | 0100 | Axle 5 | | |
| | | 0101 | Axle 6 | | |
| | | 0110 | Axle 7 | | |
| | | 0111 | Axle 8 | | |
| | | 1000 | Axle 9 | | |
| | | 1001 | Axle 10 | | |
| | | 1010 | Axle 11 | | |
| | | 1011 | Axle 12 | | |
| | | 1100 | Axle 13 | | |
| | | 1101 | Axle 14 | | |
| | | 1110 | Axle 15 | | |
| | | 1111 | Axle 16 | | |
| | 4 to 1 | --- | not available | | |
| 2 and 3 | --- | Axle weight [axle_weight] (3.2.5.80) | | | |
| | | 0,5 kg per Bit | Offset = 0 kg | Range = 0 kg ... 32 127,5 kg | |
| 4 to 8 | --- | XX | | | |

Warning:

The axle weights shown here cannot be calibrated; a deviation of up to several hundred kilograms is normal.

The information shown is not a standard part of the instrument functions.

The functions shown here depend on the vehicle equipment and are limited to this interface.

| Transmission repetition rate | Data length | PDU format | PDU specific | Default priority | Parameter group number | Identifier |
|------------------------------|-------------|------------|--------------|------------------|------------------------|------------|
| 1 s | 8 bytes | 254 | 234 | 6 | 00FEEA | 18FEEA2F |

| Byte | Bit | Description | | |
|---------|--------|--|---------------|-----------------------------|
| 1 | 8 to 5 | Axle location [axle_location] (3.2.5.95) | | |
| | | 0000 | Axle 1 | |
| | | 0001 | Axle 2 | |
| | | 0010 | Axle 3 | |
| | | 0011 | Axle 4 | |
| | | 0100 | Axle 5 | |
| | | 0101 | Axle 6 | |
| | | 0110 | Axle 7 | |
| | | 0111 | Axle 8 | |
| | | 1000 | Axle 9 | |
| | | 1001 | Axle 10 | |
| | | 1010 | Axle 11 | |
| | | 1011 | Axle 12 | |
| | | 1100 | Axle 13 | |
| | | 1101 | Axle 14 | |
| | | 1110 | Axle 15 | |
| | 1111 | Axle 16 | | |
| | 4 to 1 | --- | not available | |
| 2 and 3 | --- | Axle weight [axle_weight] (3.2.5.80) | | |
| | | 0,5 kg per Bit | Offset = 0 kg | Range = 0 kg ... 32127.5 kg |
| 4 to 8 | --- | XX | | |

TCO1 : Tachograph

0CFE6CEE

| Transmission repetition rate | Data length | PDU format | PDU specific | Default priority | Parameter group number | Identifier |
|------------------------------|-------------|------------|--------------|------------------|------------------------|------------|
| 50 ms | 8 bytes | 254d | 108d | 3 | FE6C | 0CFE6CEE |

| Byte | Bit | Description | |
|------|---------|------------------------------------|---------------------------------|
| 1 | 8 and 7 | Drive recognition (3.2.6.78) | |
| | | 00 | Off/vehicle motion not detected |
| | | 01 | On/vehicle motion detected |
| | | 10 | error |
| | | 11 | not available |
| | 6 to 4 | Driver 2 working status (3.2.6.77) | |
| | | 000 | rest |
| | | 001 | available |
| | | 010 | work |
| | | 011 | drive |
| | | 100 | reserved |
| | | 101 | reserved |
| | | 110 | reserved |
| | 111 | not available | |
| | 3 to 1 | Driver 1 working status (3.2.6.78) | |
| | | 000 | rest |
| | | 001 | available |
| | | 010 | work |
| | | 011 | drive |
| | | 100 | reserved |
| | | 101 | reserved |
| | | 110 | reserved |
| | 111 | not available | |

| Transmission repetition rate | Data length | PDU format | PDU specific | Default priority | Parameter group number | Identifier |
|------------------------------|-------------|------------|--------------|------------------|------------------------|------------|
| 50 ms | 8 bytes | 254d | 108d | 3 | FE6C | 0CFE6CEE |

| Byte | Bit | Description | |
|------|-------------------------|---|-------------------------|
| 2 | --- | Not used for MTCO | |
| | 8 and 7 | overspeed (3.2.6.81) | |
| | | 00 | no overspeed |
| | | 01 | overspeed |
| | | 10 | error |
| | 6 and 5 | 11 | not available |
| | | driver card 1 (3.2.6.80) | |
| | | 00 | no card present |
| | | 01 | card present |
| | 4 to 1 | 10 | driver card malfunction |
| | | 11 | not available |
| | | driver 1 time related states (3.2.6.79) | |
| | | 0000 | No warning |
| | | 0001 | warning #1 |
| | | 0010 | warning #2 |
| | | 0011 | warning #3 |
| | | 0100 | warning #4 |
| | | 0101 | warning #5 |
| | | 0110 | reserved for future use |
| | | 0111 | reserved for future use |
| 1000 | | reserved for future use | |
| 1001 | | reserved for future use | |
| 1010 | | reserved for future use | |
| 1011 | | reserved for future use | |
| 1100 | reserved for future use | | |
| 1101 | reserved for future use | | |
| 1110 | error | | |
| 1111 | not available | | |

TCO1: Tachograph

0CFE6CEE

| Transmission repetition rate | Data length | PDU format | PDU specific | Default priority | Parameter group number | Identifier |
|------------------------------|-------------|------------|--------------|------------------|------------------------|------------|
| 50 ms | 8 bytes | 254d | 108d | 3 | FE6C | 0CFE6CEE |

| Byte | Bit | Description | |
|------|---------------|---|-------------------------|
| 3 | --- | Not used for MTCO | |
| | 8 and 7 | not defined | |
| | 6 and 5 | driver card 2 (3.2.6.80) | |
| | | 00 | no card present |
| | | 01 | card present |
| | | 10 | driver card malfunction |
| | | 11 | not available |
| | 4 to 1 | driver 2 time related states (3.2.6.79) | |
| | | 0000 | No warning |
| | | 0001 | warning #1 |
| | | 0010 | warning #2 |
| | | 0011 | warning #3 |
| | | 0100 | warning #4 |
| | | 0101 | warning #5 (|
| | | 0110 | reserved for future use |
| | | 0111 | reserved for future use |
| | | 1000 | reserved for future use |
| | | 1001 | reserved for future use |
| | | 1010 | reserved for future use |
| | | 1011 | reserved for future use |
| 1100 | | reserved for future use | |
| 1101 | | reserved for future use | |
| 1110 | error | | |
| 1111 | not available | | |

Table to identify the warnings in parameter driver x time related states
Type: European Community regulation

| | | |
|------|------------|--------------------|
| 0000 | no warning | [0h .. 4 1/4h] |
| 0001 | warning #1 | [4 1/4h .. 4 1/2h] |
| 0010 | warning #2 | [4 1/2h .. 8 3/4h] |
| 0011 | warning #3 | [8 3/4h .. 9h] |
| 0100 | warning #4 | [9h .. 15 3/4h] |
| 0101 | warning #5 | [15 3/4h .. 16h] |

TCO1: Tachograph

0CFE6CEE

| Transmission repetition rate | Data length | PDU format | PDU specific | Default priority | Parameter group number | Identifier |
|------------------------------|-------------|------------|--------------|------------------|------------------------|------------|
| 50 ms | 8 bytes | 254d | 108d | 3 | FE6C | 0CFE6CEE |

| Byte | Bit | Description | | |
|---------|---------|--|---------------------------|---------------------------------|
| 4 | 8 to 7 | not defined | | |
| | 6 to 5 | system performance (3.2.6.84) | | |
| | | 00 | system performance o.k. | |
| | | 01 | faulty system performance | |
| | | 10 | error | |
| | 4 to 3 | 11 | not available | |
| | | handling information e.g. no record sheet (3.2.6.83) | | |
| | | 00 | no handling info | |
| | | 01 | handling info | |
| | 2 to 1 | 10 | error | |
| | | 11 | not available | |
| | | system event (3.2.6.82) | | |
| | | 00 | no system event | |
| | 5 and 6 | 01 | system event | |
| | | 10 | error | |
| | | 11 | not available | |
| --- | | XX | | |
| 7 and 8 | --- | Tachograph vehicle speed [veh_speed_MTCO] (3.2.1.12) | | |
| | | 1/256 km/h per Bit | Offset = 0 km/h | Range = 0 km/h ... 250,996 km/h |

ERC1_RX: Electronic retarder control unit retarder exhaust (5.3.3)

18F00029

| Transmission repetition rate | Data length | PDU format | PDU specific | Default priority | Parameter group number | Identifier |
|------------------------------|-------------|------------|--------------|------------------|------------------------|------------|
| 100 s | 8 bytes | 240 | 0 | 6 | 0x00F000 | 0x18F00029 |

| Byte | Bit | Description | | |
|--------|-----|--|---------------|----------------------|
| 1 | --- | XX | | |
| 2 | --- | Actual retarder torque ¹ [act_rx_torque] (3.2.1.17) | | |
| | | 1% per Bit | Offset = 125% | Range = -125% ... 0% |
| 3 to 8 | --- | XX | | |

¹ Only transmitted, if engine brake is installed (parametrised FFR)

Warning:
Deactivation of any ERC1 message that may be present is not allowed.

FMS-standard interface

1CFDD1FD

| Transmission repetition rate | Data length | PDU format | PDU specific | Default priority | Parameter group number | Identifier |
|------------------------------|-------------|------------|--------------|------------------|------------------------|------------|
| 10 ms | 8 bytes | 253 | 109 | 7 | FDD1 | 1CFDD1FD |

| Byte | Bit | Description | |
|------------|---------|---|------------------------------|
| 1 | 8 to 5 | Reserved for FMS-standard | |
| | 4 and 3 | requests supported | |
| | | 00 | request is not supported |
| | | 01 | request is supported |
| | | 10 | reserved |
| | 2 and 1 | 11 | don't care |
| | | diagnostics supported | |
| | | 00 | diagnostics is not supported |
| | | 01 | diagnostics is supported |
| | 2 to 5 | 10 | reserved |
| | | 11 | don't care |
| | | software version supported | |
| Byte 2 = a | | The software version is represented in ASCII code in the following format: ab.cd (Software version number represented in the ab.cd format (ASCII)) | |
| Byte 3 = b | | | |
| Byte 4 = c | | | |
| Byte 5 = d | | | |
| 5 and 6 | --- | XX | |
| 6 to 8 | --- | Reserved for FMS standard | |

Service_information (3.3.055)

18FEC027

| Transmission repetition rate | Data length | PDU format | PDU specific | Default priority | Parameter group number | Identifier |
|------------------------------|-------------|------------|--------------|------------------|------------------------|------------|
| 1 s | 8 bytes | 254 | 192 | 6 | FECO | 18FEC027 |

| Byte | Bit | Description | | |
|---------|-----|---|---------------------|----------------------------------|
| 1 | --- | XX | | |
| 2 and 3 | --- | Service distance [service_distance] (3.2.5.103) | | |
| | | 5 km per Bit | Offset = -160635 km | Range = -160635 km ... 160640 km |
| 3 to 8 | --- | XX | | |

Fuel_cons : Fuel consumption (3.3.23)

18FEE927

| Transmission repetition rate | Data length | PDU format | PDU specific | Default priority | Parameter group number | Identifier |
|------------------------------|-------------|------------|--------------|------------------|------------------------|------------|
| 1 s | 8 bytes | 254 | 233 | 6 | FEE9 | 18FEE927 |

| Byte | Bit | Description | | | |
|--------|-----|--|--------------|--------------------------------|--|
| 1 to 4 | --- | XX | | | |
| 5 to 8 | --- | Total fuel used [total:fuel_used] (3.2.5.66) | | | |
| | | 0,5 l per Bit | Offset = 0 l | Range = 0 l ... 2105540607.5 l | |

VIN : Vehicle identification number (3.3.26)

18FEECEE

| Transmission repetition rate | Data length | PDU format | PDU specific | Default priority | Parameter group number | Identifier |
|------------------------------|-------------|------------|--------------|------------------|------------------------|------------|
| 10 s | variable | 254 | 236 | 6 | FEEC | 18FEECEE |

MAN VIN contains more than 8 Bytes, therefore the VIN is translated according to SAE1939/21 (Multipacket – transport mechanism):

18ECFFEE (TP.BAM = transport protocol_broadcast announce message)

18EBFFEE (TP.DT = transport protocol_data transfer)

TP.BAM:

| | | |
|------------------|---------------------------------------|---------|
| Byte 1: | Control Byte | 20h |
| Byte 2 and 3: | Total message size, number of packets | 0011h |
| Byte 4: | Total number of packets | 03h |
| Byte 5: | Reserved | FFh |
| Byte 6 to 8: | PGN of requested information (VIN) | 00FEEC |
| TP.DT: Packet 1: | | |
| Byte 1: | Sequence number | 01h |
| Byte 2 to 8: | Bytes 1-7 of VIN | ASCII |
| TP.DT: Packet 2: | | |
| Byte 1: | Sequence number | 02h |
| Byte 2 to 8: | Bytes 8-14 of VIN | ASCII |
| TP.DT: Packet 3: | | |
| Byte 1: | Sequence number | 03h |
| Byte 2 to 4: | Bytes 15-17 of VIN | ASCII |
| Byte 5: | * = Delimiter | 2Ah |
| Byte 6 to 8: | Filler bytes | FFFFFFh |

Dash Display (3.3.042)

18FEFC21

| Transmission repetition rate | Data length | PDU format | PDU specific | Defaultpriority | Parameter group number | Identifier |
|------------------------------|-------------|------------|--------------|-----------------|------------------------|------------|
| 1 s | 8 bytes | 254 | 252 | 6 | FEFC | 18FEFC21 |

| Byte | Bit | Description | | | |
|--------|-----|------------------------------------|--------------|----------------------|--|
| 1 | --- | XX | | | |
| 2 | --- | Fuel level [fuel_level] (3.2.5.71) | | | |
| | | 0,4% per Bit | Offset = 0 % | Range = 0 % ... 100% | |
| 3 to 8 | --- | XX | | | |

7.6 A-CAN input messages

The following input messages can be processed by KSM and passed to the FFR:

KSM1_A : Customer specific control module #1– Body

0CEFFD55

| Transmission repetition rate | Data length | PDU format | PDU specific | Default priority | Parameter group number | Identifier |
|------------------------------|-------------|------------|--|------------------|------------------------|------------|
| 10 ms | 8 bytes | 1 | Destination address KSM = FD _{hex} | 3 | Proprietary A: EF00 | 0CEFFD55 |

| Byte | Bit | Description | | |
|---------|----------------------------------|---|-------------------|-----------------------------|
| 1 | 8 and 7 | not defined | | |
| | 6 and 5 | Override control mode priority [ksma_ocmp] (3.2.3.3) not supported | | |
| | 4 and 3 | Requested speed control conditions [ksma_rsc] (3.2.3.2) not supported | | |
| | 2 and 1 | Override control mode [ksma_ocr] (3.2.3.1) | | |
| | | 00 | override disabled | |
| | | 01 | speed control | |
| | | 10 | torque control | |
| | 11 | Speed/torque control | | |
| 2 and 3 | --- | Requested speed/Speed limit [ksma_req_speed] (3.2.1.19) | | |
| | | 0,125 rpm per Bit | Offset = 0 rpm | Range = 0 ... 8031.875 rpm |
| 4 | --- | Requested torque/Torque limit [ksma_req_torque] (3.2.1.15) | | |
| | | 1 % per Bit | Offset = -125 % | Range = -125% ... 0% |
| 5 | --- | Requested road speed limit [ksma_HGB] | | |
| | | 1 km/h per Bit | Offset = 0 km/h | Range = 0 km/h ... 250 km/h |
| 6 | ZDR-control [ksma_sw_status] | | | |
| | in SAE J1939/ff described values | | | |
| | 8 and 7 | Cruise control accelerate switch (3.2.6.17) | | |
| | 6 and 5 | Cruise control resume switch (3.2.6.16) | | |
| | 4 and 3 | Cruise control coast switch (3.2.6.15) | | |
| | 2 and 1 | Cruise control set switch (3.2.6.14) | | |
| | MAN describes as follows | | | |
| | | 00000000 | Neutral | |
| | | 00000001 | Off | |
| | | 00000100 | Set - | |
| | 00010000 | restart | | |
| | 01000000 | Set+ (| | |
| | 10101010 | failed | | |

| Byte | Bit | Description | |
|------|--------|---------------------------------|-----------------------------|
| 7 | 8 to 5 | ZDR Mode request [ZDR_mode_req] | |
| | | 0000 | Mode S |
| | | 0001 | Mode 1 |
| | | 0010 | Mode 2 |
| | | 0011 | Mode 3 |
| | | 0100 | Mode 4 |
| | | 0101 | Mode 5 |
| | | 0110 | Mode 6 |
| | | 0111 | Mode 7 |
| | | 1000 | ZDR switch off |
| | | 1001 | reserved |
| | | 1010 | reserved |
| | | 1011 | reserved |
| | | 1100 | reserved |
| | | 1101 | reserved |
| | | 1110 | reserved |
| | | 1111 | not available |
| | | 4 and 3 | Motor Stop [ksma_MotorStop] |
| | 00 | | no request |
| | 01 | | motor Stop |
| | 10 | | reserved |
| | 11 | | don't care/take no action |
| | 2 to 1 | Motor Start [ksma_MotorStart] | |
| | | 00 | no request |
| | | 01 | motor Stop |
| | | 10 | reserved |
| | | 11 | don't care/take no action |
| | 8 | --- | XX |

Warning:
ZDR mode 7 is reserved for MAN's internal use; its setting cannot be changed.

| Transmission repetition rate | Data length | PDU format | PDU specific | Default priority | Parameter group number | Identifier |
|------------------------------|-------------|------------|--|------------------|-------------------------|------------|
| 50 ms | 8 bytes | 2 | destination address KSM = FD _{hex} | 202 | Proprietary A : FFCA | 0CFFCA55 |

| Byte | Bit | Description |
|--------|--------|----------------------------------|
| 1 to 6 | --- | XX |
| 7 | 8 to 5 | not defined |
| | 4 to 1 | Request PTO 3 NMV [ksm_PTO3_req] |
| | | xxx0 |
| | xxx1 | request |
| 8 | --- | XX |

7.7. KSM/FFR information processing if defined by KSM1_A message

The “override control mode” (ocm) KSM1_A-message (KSM1_A_ocm) is absolutely critical for the processing of engine speed and torque information. The following description (Case 1-4) explains how the relevant KSM1_ocm is generated from the KSM1_A_ocm. KSM1 is the T-CAN message from the KSM to the FFR. The ocm=11 (speed/torque limit control) of the KSM1 message is supported by the FFR. Processing of the ocm=01 (speed control) and ocm=10 (torque control) modes of the KSM1 message is not active in the FFR, but can be switched on in the FFR if needed after suitable examination and approval by Dept. ESC.

1. KSM1_A_ocm=11 → KSM1_ocm=11 (speed/torque limit control):
 - Limitations in KSM1_A are linked with the digital inputs (torque and engine speed) in such a way that the smallest value in each case is used as a KSM1 message.
 - Requirement ZDR S, 1-7 is transmitted via KSM1:
Activation in the FFR is dependent on the parametrised switch programming already set in the FFR.
 - Requirement ZDR control (SET+/-, MEM, AUS(Off)) via KSM1_A or the KSM digital inputs – depending on KSM parametrisation – is passed on via KSM1 and executed in the FFR.
2. KSM1_A_ocm=01 → KSM1_ocm=01 (speed control):
 - It is possible to set a “must do” command for engine speeds; limiting in the KSM1 through the digital “Engine speed limits” inputs is possible.
 - Torque limits (KSM1_A) are linked to the digital “Torque limits” inputs in such a way that the smallest value in each case is used as a KSM1 message.
 - Requirement ZDR S, 1-7 is transmitted via KSM1:
In this case the FFR processes only the switching and rule parameters programmed into the currently selected ZDR mode. The upper and lower engine speed limits parametrised in the currently selected ZDR mode as well as the “must do” value parameter in the FFR are ignored.
3. KSM1_A_ocm=10 → KSM1_ocm=10 (Torque control):
 - It is possible to set a “must do” command for engine torque; limiting in the KSM1 through the digital “Engine torque limits” inputs is possible.
 - Engine speed limits (KSM1_A) are linked to the digital “Engine speed limits” inputs in such a way that the smallest value in each case is used as a KSM1 message.

4. KSM1_A_ocm=00 → KSM1_ocm=11(Speed/torque limit control):

- No processing/passing forward from KSM1_A/Byte 2, 3, 4
- Torque limits via digital “torque limit” inputs possible at the KSM.
- Engine speed limits via digital “Engine speed limit” inputs possible at the KSM.
- Request ZDR S, 1-7 passed on via KSM1:
activation in the FFR dependent on the switching parameters already programmed into the FFR.
- Request ZDR-control (SET+/-, MEM, AUS(Off)) via KSMA or via digital KSM inputs
– according to the parameters set in the KSM – passed on via KSM1: executed in the FFR.

The following apply in all cases:

- ZDR mode selection via CAN takes precedence over ZDR pins of FFR
- ZDR control via CAN takes precedence over cruise control inputs.
- Limits in the KSM and FFR are linked in such a way that the smallest value in each case is used as a KSM1 message.
- Commands can only be set within the permitted limits.
- KSM1_A message is parametrised to “not received” → KSM1_ocm=11

Note:

If an A-CAN input (A-CAN Bus-off, failure KSM1_A message) is invalid, the limits are frozen (engine speed/torque/max. speed limit) until A-CAN comes back into service or valid values are detected. (e.g. previously demanded limits are frozen, depending on circumstances until Term. 15 “Reset”).

If at the moment of A-CAN failure (A-CAN Bus off, failed KSM1_A message) an engine speed or torque demand is present (KSM1_A_ocm=01/10), the T-CAN switches to KSM1_ocm=11; the engine speed or torque demands become limits and the engine drops to idle speed.

If at the moment of A-CAN failure (A-CAN Bus off, failed KSM1_A message) an NMV (power take-off) is present, it is frozen until A-CAN comes back into service or valid values are detected (or depending on circumstances until Term. 15 “Reset”).

Execution of SET+ / SET – via the KSM interface is only possible in ZDR modes under conditions in which “Steering column lever active” is set. A safety system must be installed that guarantees protection of the control lever against undesired activation in the driver’s cabin during, for example, external remote control operation.

8. Pin Description and Switching Schemes

DrzMomBgr (Engine speed/Torque/Road speed limits) 1+3 (Plug connection X1997/Pin 1)

+U_{Bat} –Switch signal input for engine/road speed limiting command 1 and 3

Function:

If the input is switched with +U_{Bat} (Service readiness; X1997/Pin 12), the engine speed is limited to “Engine speed/torque limit 1” programmable via MAN-cats II.

If +U_{Bat} is removed, the chosen “Engine speed/torque limit 1” is cancelled.

If at the same time the “Engine speed/torque limit 2+3” input (X1997/Pin 2) is switched with +U_{Bat} (Service readiness, X1997/Pin 12) the engine is limited to the “Engine speed/torque limit 3” programmable via MAN-cats II.

If +U_{Bat} is removed from both inputs, the selected “Engine speed/torque limit 3” is cancelled.

This function is also useful as an extra intermediate engine-speed setting, to limit an initially higher setting.

Function availability:

As soon as +U_{Bat} (Service readiness or Term. 15 FFR) is set up.

Factory setting:

see Engine speed/torque limit 2+3 (DrzMomBgr 2+3) table (Plug connection X1997/Pin 2)

DrzMomBgr (Engine speed/Torque/Road speed limits) 2+3 (Plug connection X1997/Pin 2)

+U_{Bat} –Switch signal input controlling “Engine speed/torque limit 2 and 3”

Function:

If the input is switched with +U_{Bat} (Service readiness; X1997/Pin 12), engine speed is limited to the “Engine speed/torque limit 2” programmable via MAN-cats II.

If +U_{Bat} is removed, the chosen “Engine speed/torque limit 2” is cancelled..

If at the same time the “Engine speed/torque limit 1+3” input (X1997/Pin 1) is switched with +U_{Bat} (Service readiness, X1997/Pin 12), the engine is limited to the “Engine speed/torque limit 3” programmable via MAN-cats II.

If +U_{Bat} is removed from both inputs, the selected “Engine speed/torque limit 3” is cancelled.

This function is also useful as an extra intermediate engine-speed setting, to limit an initially higher setting.

Function availability:

As soon as +U_{Bat} (Service readiness or Term. 15 FFR) is set up.

Factory settings:

| | Engine speed/torque limit 1+3(Stv. X1997/Pin 1) | Engine speed/torque limit 1+3(Stv. X1997/Pin1) | Engine speed | Torque |
|-----------------------------|--|---|--------------|--------|
| Engine speed/torque limit 0 | ----- | ----- | 4000 rev/min | 100 % |
| Engine speed/torque limit 1 | +U _{Bat} | ----- | 1500 rev/min | 100 % |
| Engine speed/torque limit 2 | ----- | +U _{Bat} | 1800 rev/min | 100 % |
| Engine speed/torque limit 3 | +U _{Bat} | +U _{Bat} | 1200 rev/min | 100 % |

A value pair made up of engine speed/torque limits is allocated to each of the 4 possible input combinations.

LS1_KONFIG (Plug connection X1997/Pin 3)

-U_{Bat} -switch signal output. In the passive/non-programmed condition the “high” level (approx. +U_{Bat}) switches itself on.

Load:
max. 300 mA

Function:
Signal output, dependent on the relevant parameters.

Possible parameters:

- Output active, accelerator pedal “idle”
- Output active, accelerator pedal “Kickdown”
- Engine speed threshold “on”: output active, if engine speed \geq parametrised upper engine speed threshold. The output also remains active if the engine speed falls below the set threshold.
- Engine speed threshold “on-off”: output active if engine speed \geq parametrised upper engine speed threshold. Output inactive if engine speed \leq parametrised lower threshold.
- Speed threshold “on”: output active if vehicle speed \geq parametrised upper speed threshold. Output remains active if speed falls below the set threshold.
- Speed threshold “on-off”: output active if vehicle speed \geq parametrised upper speed threshold. Output inactive if vehicle speed \leq parametrised lower speed threshold.

Factory setting:

| |
|----------------|
| Signal: |
| Output passive |

Warning:
To ensure that short and open circuits are properly identified with a connected load and activated error recognition, the connected load must be $< 2 \text{ k}\Omega$. . In the case of activated error recognition the load must be connected after Term. 15 FFR (X1996/Pin 1). Do not use “Service readiness” (X1997/Pin 12)! If “Service readiness” is used instead of Term. 15 FFR, this will, if error recognition is active, cause error memory entries during the system start (surveillance already active during system start phase but Service readiness only active on connection of system start phase).

Warning:
To avoid “dither” in the threshold value area (lower or upper engine speed/road speed thresholds), a margin of at least 10 rpm (engine speed threshold) or 2 km/h (road speed threshold) must be parametrised between the two values.

LS2_KONFIG (Plug connection X1997/Pin 4)

-U_{Bat} -switch signal output. In passive/non-programmed condition the “high” level (+U_{Bat}) switches itself on.

Load:
max. 300 mA

Function:
This function is not implemented in KSM 81.25816.7004.

Warning:
To ensure that short and open circuits are properly identified with a connected load and activated error recognition, the connected load must be < 2 kΩ. In the case of activated error recognition the load must be connected after Term. 15 FFR (X1996/Pin 1). Do not use “Service readiness” (X1997/Pin 12)! If “Service readiness” is used instead of Term. 15 FFR, this will, if error recognition is active, cause error memory entries during the system start (surveillance already active during system start phase but Service readiness only active on connection of system start phase).

PARKING BRAKE (Plug connection X1997/Pin 5)

+U_{Bat} -switch signal output. When the load is connected and the parking brake is not applied the “low” level (U_{low} < 2 V) switches itself on.

Load:
max. 500 mA

Function:
Information that the parking brake is engaged.

Warning:
To ensure that short and open circuits are properly identified with a connected load and activated error recognition, the connected load must be < 400 Ω.

BRAKE (Plug connection X1997/Pin 6)

+U_{Bat} -switch signal output. When the load is connected and the brake is not applied the “low” level (U_{low} < 2 V) switches itself on.

Load:
max. 500 mA

Function:
Information that the brake is applied.

Warning:
To ensure that short and open circuits are properly identified with a connected load and activated error recognition, the connected load must be < 400 Ω. This function is controlled only by the action of the brake pedal.

REVERSE (Plug connection X1997/Pin 7)

+U_{Bat}-switch signal output. When the load is connected and reverse gear is not engaged, the “low” level switches itself on ($U_{low} < 2\text{ V}$).

Load:
max. 500 mA

Function:
Information that reverse gear is engaged.

Warning:
To ensure that short and open circuits are properly identified with a connected load and activated error recognition, the connected load must be $< 400\ \Omega$.

CLUTCH (Plug connection X1997/Pin 8)

+U_{Bat}-switch signal output. When the load is connected and clutch is not operated, the “low” level switches itself on ($U_{low} < 2\text{ V}$).

Load:
max. 500 mA

Function:
Information that the clutch is engaged.

Warning:
To ensure that short and open circuits are properly identified with a connected load and activated error recognition, the connected load must be $< 400\ \Omega$.

GEAR-N (gearbox in neutral) (Plug connection X1997/Pin 9)

-U_{Bat}-switch signal output. When a gear is engaged the “high” level (app. +U_{Bat}) switches itself on.

Load:
max. 300 mA

Function:
Information that the gearbox is in Neutral.

Warning:
To ensure that short and open circuits are properly identified with a connected load and activated error recognition, the connected load must be $< 2\text{ k}\Omega$. With activated error recognition the load must be connected after Term. 15 FFR (X1996/Pin 1). Do not use “Service readiness” (X1997/Pin 12)! If “Service readiness” is used instead of Term. 15 FFR, this will, if error recognition is active, cause error memory entries during a system start (surveillance already active during system start phase, but Service readiness active only on connection of the system start phase).

TELLTALE LIGHT (Plug connection X1997/Pin 10)

+U_{Bat}-switch signal output. When the load is connected and the KSM-SG or the connected auxiliaries are in error-free condition, the low level switches itself on ($U_{low} < 2 \text{ V}$).

Load:
max. 600 mA

Function:
Information that there is a malfunction at the KSM control unit or the auxiliaries connected to it.

Warning:
This telltale light is not included in the vehicle instruments. This information cannot be shown via the A-CAN. To ensure that short and open circuits are properly identified with a connected load and activated error recognition, the connected load must be $< 400 \Omega$. During control unit warm-up, the output is run automatically for approx. 3 seconds (bulb test).

TANK WARNING (Plug connection X1997/Pin 11)

+U_{Bat}-switch signal output. When the load is connected and there is sufficient fuel in the tank, the low level switches itself on ($U_{low} < 2 \text{ V}$).

Load:
max. 600 mA

Function:
Information (set by the factory) that the tank is still about 20% full. This information is also flashed up on the instrument panel with the message "REFUEL" ("TANKEN"). Via MAN-cats II this value can be lowered to a minimum of 11,2 %. This information applies at the moment only to vehicles with a single fuel tank level sensor.

Warning:
To ensure that short and open circuits are properly identified with a connected load and activated error recognition, the connected load must be $< 400 \Omega$. During control unit warm-up, the output is run automatically for approx. 3 seconds (bulb test).

SERVICE READINESS (Plug connection X1997/Pin 12)

+U_{Bat}-switch signal output. The output stage switches to "high" approx. 3 seconds after Term. 15 "on". If the load is connected and the KSM control unit is (still) in a "not ready for service" condition, the low level switches itself on ($U_{low} < 2 \text{ V}$).

Load:
max. 2 A

Function:
Information that the KSM control unit is ready for service. This is useful for authorising a function. The signal is issued approx. 2 seconds after Term. 15 "off" (X1996/Pin1, see FFR interface description), to enable additional body electronic equipment control units to run down if necessary.

Warning:
To ensure that short and open circuits are properly identified with a connected load and activated error recognition, the connected load must be $< 400 \Omega$. After a system start (approx. 3 sec.) the output is energised.

SET+ (Plug connection X1997/Pin 13)

+U_{Bat} –switch signal input to energise the function “Increase engine speed”.

Function:
Increasing engine speed.

If the input is switched with +U_{Bat} (Service readiness; X1997/Pin 12), the engine speed will run up to the upper engine speed limit: if this activation is interrupted/cancelled, engine management sets the engine speed as it is at that moment.

The upper engine speed limit can be:

- The maximum permissible engine speed limit.
- The upper engine speed limit at ZDR S,ZDR 1, . . . , ZDR 7 that can be parameterised via MAN-cats II.
- The engine speed limit that can be parameterised and activated via MAN-cats II in the FFR or KSM.

The set engine speed is switched off – that is to say, the engine is returned to idle speed (ZDR S) or the lowest engine speed setting (ZDR1,.....,ZDR7) by means of the “Open” command for the bridge between “Service readiness” (X1997/Pin 12) and “Off” (X1997/Pin 15).

Description:

Activating SET + for a period shorter than 200 ms is recognised as “Tippen” (“Quick Enter”) and increases the desired engine speed setting by a parameterised amount. (ex factory, depending on the chosen ZDR mode (see FFR-interface description) this is set at 50 rpm or 10 rpm). If SET + is switched for longer than 200 ms , the current nominal engine speed setting is raised every 100 ms by a parameterised value (this is set ex factory at 15 rpm).

In the case where SET + must be controlled by clocking in order to reach the normal engine working speed, we recommend using a square wave signal with a duty ratio of 50:50, t_{high} = approx. 100 ms and t_{low} = approx. 100 ms.

High level is recognised at the SET+ digital input of the KSM at $U > 16$ V, low level at $U < 3$ V (digital input, 4,75 k Ω pull-down).

Function release:

Approx. 3.5 secs. after the availability of Term. 15 “on”, the function can be activated by energising with +U_{Bat} (Service readiness or Term. 15 FFR).

SET- (Plug connection X1997/Pin 14)

+U_{Bat} -switch signal input to energise the function “Reduce engine speed”.

Function:
Reduce engine speed.

If the input is switched with +U_{Bat} (Service readiness; X1997/Pin 12), the set engine speed is reduced steplessly to idle speed level (ZDR S) or as appropriate down to the lower set engine speed level (ZDR 1, . . . , ZDR 7). If activation is interrupted, the engine management unit adopts the current engine speed.

The set engine speed is switched off, i.e. the engine returns to Idle speed (ZDR S) or to the “Engine speed lower limit” setting (ZDR 1, . . . , ZDR 7)) by means of the “Open” command for the standard bridge between “Service readiness” (X1997/Pin 12) and “Off” (X1997/Pin 15).

Description:

Activating SET + for a period shorter than 200 ms is recognised as “Tippen” (“Quick Enter”) and reduces the nominal engine speed setting by a parameterised amount (ex factory; depending on the chosen ZDR mode (see FFR interface description) this is set at 50 rpm or 10 rpm). If SET + is switched for longer than 200 ms , the current nominal engine speed setting is reduced every 100 ms by a parameterised value (this is set ex factory at 15 rpm).

In the case where SET + must be controlled by clocking in order to reach the normal engine working speed, we recommend using a square wave signal with a duty ratio of 50:50, t_{high} = approx. 100 ms and t_{low} = approx. 100 ms.

High level is recognised at the SET+ digital input of the KSM at $U > 16$ V, low level at $U < 3$ V (digital input, 4,75 k Ω pull-down).

Function permitted:

Approx. 3.5 secs. after energising of Term. 15 “on”, the function can be activated by energising with +U_{Bat} (Service readiness or Term. 15 FFR).

OFF (Plug connection X1997/Pin 15)

+U_{Bat} -switch signal input to enable/switch off the ZDR functions.

Function:

If the entry is switched with +U_{Bat} (Service readiness; X1997/Pin 12), the ZDR functions are enabled. By means of the "Open" command for the external bridge between "Service readiness" (X1997/Pin 12) and "OFF" (X1997/Pin 15), the ZDR and cruise control functions are switched off.

Warning:

If the external bridge between X1997/Pin 12 and X1997/Pin 15 fails, the "OFF" function is permanently activated and it is then impossible to activate the ZDR functions.

MEMORY (Plug connection X1997/Pin 16)

+U_{Bat} -switch signal input to resume/store an engine speed.

Function:

If the input is switched with +U_{Bat} after the manual switch signal ($t_{max} \leq 1 \text{sec.}$) the engine runs up to the ZDR S, ZDR 1, , ZDR 7 programmable parameters set via MAN-cats II ZDR S, ZDR 1, , ZDR 7 and regulates them. The new engine speed can be stored in the memory by energising the input with +U_{Bat} ($t \geq 2 \text{s}$) after changing it through "SET+" or "SET-". The set engine speed will be switched off, i.e. the engine reverts to idle speed or the lower engine speed (ZDR 1, , ZDR 7), by means of the "Open" command for the external bridge between X1997/Pin 12 and X1997/Pin 15; by using the "OFF" on the controls in the driver's cabin or in the presence of a set condition that demands a shutdown.

Function permitted:

Approx. 3.5 sec. after energising Term. 15 "on", the function can be activated by switching with +U_{Bat} (Service readiness or Term. 15 FFR), taking into account the above-mentioned time t.

Warning:

The MEM function only becomes effective when the control button is released (change of flank from "high" to "low" at input). Storing a nominal engine speed that has been altered by using SET+/- is only possible in the currently operational ZDR mode, if the user function "active with storage" is parametrised in the FFR and the control button is pressed for at least 2 seconds.

A-CAN-H (Plug connection X1997/Pin 17)

CAN-high wire from the body A-CAN interface.

A-CAN-L (Plug connection X1997/Pin 18)

CAN-low wire from the body A-CAN interface.

NMV (Plug connection X3311/Pin 1)

+U_{Bat} -switch signal input. If the NMV switch (contact opened) has not been operated, the low level setting of the KSM pin (digital input, 4,75 k Ω , pull-down, switch level: $U_{low} < 3 / U_{high} > 16 \text{V}$) "NMV demand" is active.

The NMV can also be requested with this pin.

This of course only applies if an NMV circuit is installed.

Load:

max. 500 mA

Function:

Information that the NMV has been requested or can be used to call for the NMV.

NMV switching only takes place if the parametrised conditions have been set in the KSM;

these are:

- NMV switched on only with gearbox-N: "active"/"not active"
- NMV switched on only if parking brake is applied: "active"/"not active"
- NMV switched on only if vehicle is standing still: "active"/"not active"

Note:

If the switch conditions gearbox-N, parking brake, clutch or speed signal are parametrised to “active”, they must be fulfilled at the moment the power take-off is requested, so that the valve is correctly controlled. If the auxiliary power take-off is then energised, it remains so even if the switch-on conditions are later no longer fulfilled. The switch-on conditions are “AND-linked”.

- NMV parametrised “Engine speed threshold on”: “active”/“not active”

Note:

Regarding the switch condition “Engine speed threshold on”: Provided that the switch conditions (gearbox-N, parking brake, vehicle stopped) are fulfilled (if they are parametrised as “active”) and the power take-off is requested, the valve will be energised immediately the speed exceeds the threshold set in the relevant parameter. The valve remains under control even if the speed drops back later to a lower level.

- NMV parametrised “Engine speed threshold off”: “active”/“not active”

Note:

Regarding the on-off-switch condition “Engine speed threshold off”: Provided that the switch conditions (gearbox-N, parking brake, vehicle stopped) are fulfilled (if they are parametrised as “active”) and the power take-off is requested, the valve will be energised immediately the speed exceeds the threshold set in the relevant parameters. It drops off again if the lower parameter threshold is not reached. The precondition for renewed energising of the valve when the upper threshold is exceeded is as follows: the demand must still be active and the switching conditions must still be fulfilled.

- NMV request:

Note:

Parameters can be set to indicate whether or not the switch is supported (KSM digital input). If the input is supported, any equivalent requirement from the A-CAN is ignored. If the input is not supported, any demand from the A-CAN will be processed and the switch (KSM digital input) ignored.

This is useful in permitting engine speed or power take-off functions, in order to prevent undesired influences on the control elements from outside the driver’s cabin.

Function permitted:

Approx. 3sec. After energising Term. 15 “On”, the function can be activated by switching with +U_{Bat} (Service readiness or Term. 15 FFR).

Factory settings:

| | |
|--------------------------------------|---------------|
| Switching condition: gearbox N | “active” |
| Switching condition: parking brake | “active” |
| Switching condition: vehicle stopped | “active” |
| Engine speed threshold “On” | “not active” |
| Engine speed threshold “On-Off” | “not active” |
| Upper engine speed threshold | 790 rpm |
| Lower engine speed threshold | 400 rpm |
| NMV demand (digital input or A-CAN) | Digital input |

Warning:

NMV switching is not a standard fitting on the vehicle and must be ordered separately.

NMV COMPRESSED AIR SWITCHING (Plug connection X3311/Pin 2)

-U_{Bat}-switch signal output, same potential as at the LED switch from the NMV compressed air switch when the NMV unit is switched on. If the NMV is not switched, the "high" level (approx. +U_{Bat}) from the compressed air switch signal output is available.

This applies only when an NMV switching circuit is installed.

Load:

max. 500 mA

Function:

Information that the NMV is switched on.

This is useful in permitting engine speed or power take-off functions, in order to prevent/avoid undesired influences on the controls from outside the driver's cabin.

Warning:

NMV switching is not a standard fitting on the vehicle and must be ordered separately.

PWM_KONFIG (Plug connection X3311/Pin 4)

PWM signal output. The following specification applies to the signal:

- Maximum output current: 10mA
- Output potential "low" less than 20% +U_{Bat}
- Output potential "high" greater than 80% +U_{Bat}
- The internal pull-up resistance is 15 kΩ ; the basic condition on the pin is therefore also "high"
- Transmission frequency parameter can be reset

Function:

Signal output dependent on the parametrised setting.

Possible parameters:

Output active with

- "Driver's desired torque" signal (SAE J1939/71: "driver's demand engine torque") or
- "Actual torque" signal (SAE J1939/71: "actual engine torque") or
- "Degree of engine load" (SAE J1939/71: „load at current speed“)
Transmission frequency parameter can be set between 100 ... 400Hz

Note:

The duty cycle of the PWM signal refers to the "high" phase, e.g. 10%: 10% "high", 90% "low".

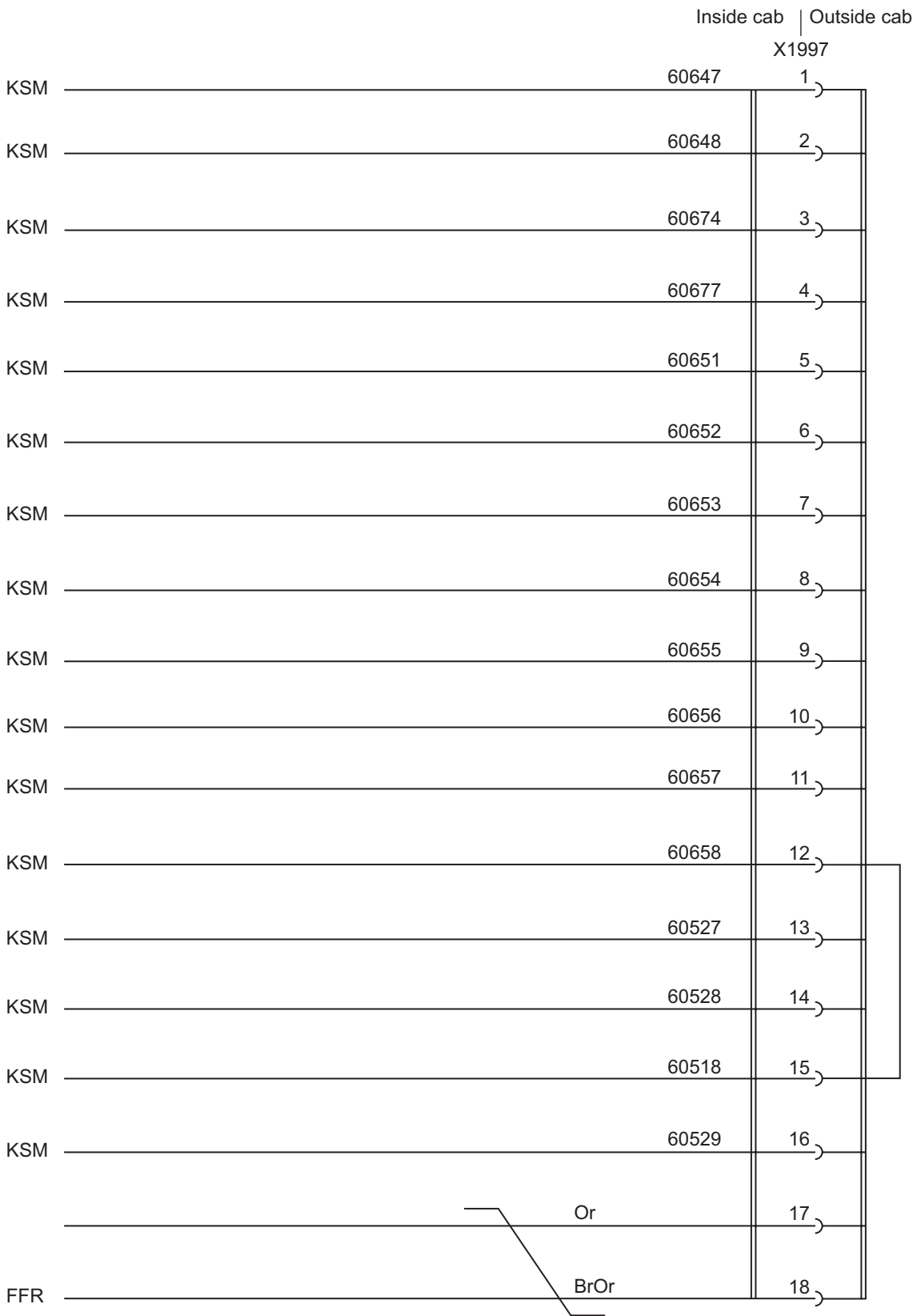
E.g.: Torque 0 % : duty cycle 10 %
Torque 50 % : duty cycle 50 %
Torque 100 % : duty cycle 100 %

Factory setting:

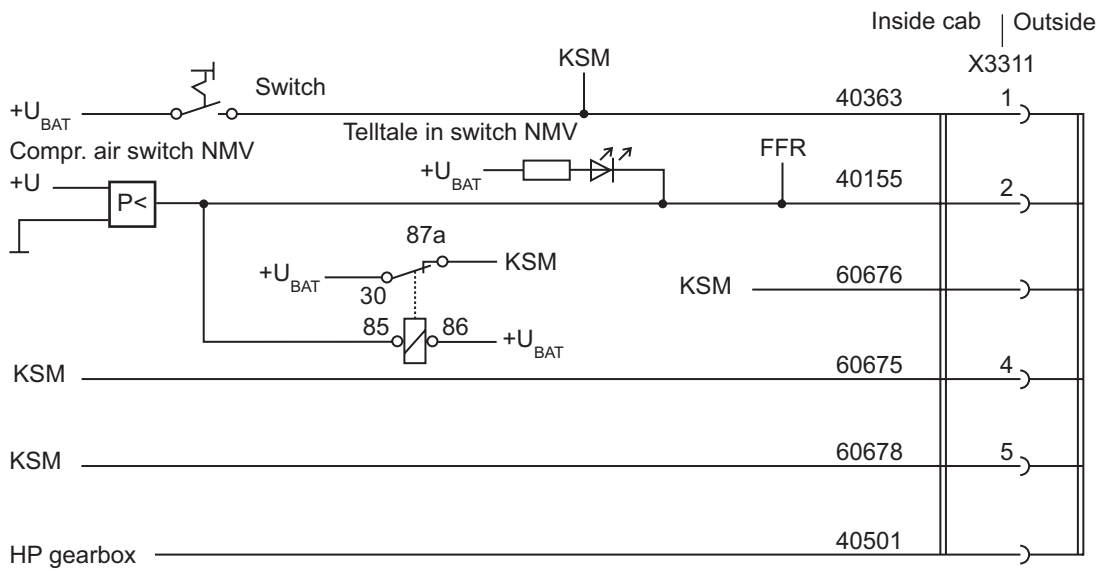
| | |
|-----------------------|------------|
| Signal: | Frequency: |
| Degree of engine load | 200Hz |



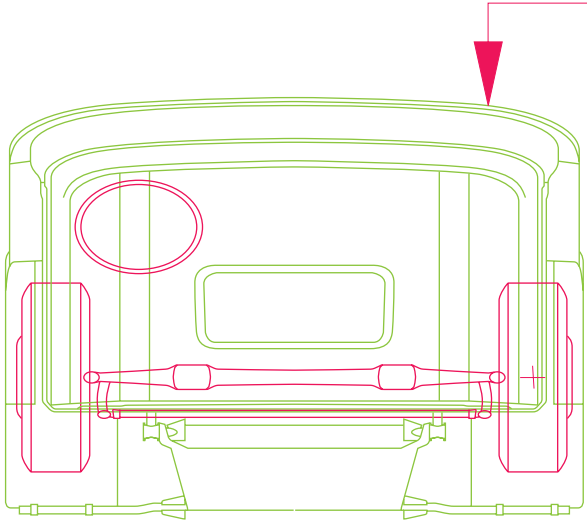
Switching diagram for X1997



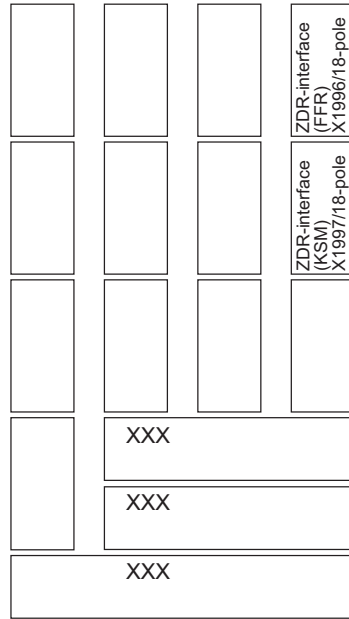
Switching diagram for X3311



9. INTERFACE VERSION AND INSTALLATION POINT



View after removing cover:



The complete interface consists of 18-pole plug connection **X1997** and 6-pole plug connection **X3311**. This plug designation is used on all switch diagrams; the plug on the vehicle is colour-keyed appropriately. Accessible from outside after removal of cover.
 XXX: area in which X3311 and X2334/X679 are installed

| Plug connection | Colour and coding: | MAN article number | |
|---------------------------------|--------------------|--------------------|----------------|
| | | Plug housing | Socket housing |
| 18-pole: X1997 | natural/6 | 81.25475.0046 | 81.25435.0927 |
| Secondary interlock for housing | | 81.25475.0065 | 81.25435.0913 |

| Contacts (single units/strip) | MAN article number |
|--|-------------------------------|
| Flat plug with detent 2.8'1/0.5-1 | 07.91202.0848 / 07.91202.0858 |
| Flat plug with detent 2.8'2.5/1.5-2.5 | 07.91202.0849 / 07.91202.0859 |
| Spring contact with detent 2.8'1/0.5-1 | 07.91201.0222 / 07.91201.0221 |
| Spring contact with detent 2.8'2.5/1.5-2.5 | 07.91201.0224 / 07.91201.0223 |

| Plug-connection 6-pole: | Colour and coding: | MAN article number | |
|---------------------------------|--------------------|--------------------|----------------|
| | | Plug housing | Socket housing |
| X3311 | blue/3 | 81.25475.0789 | 81.25435.0739 |
| Secondary interlock for housing | | 81.25435.0698 | 81.25435.0698 |

| Contacts (single units/strip) | MAN article number |
|--|-------------------------------|
| Flat plug with detent 2.8'1/0.5-1 | 07.91202.0610 / 07.91202.0830 |
| Flat plug with detent 2.8'2.5/1.5-2.5 | 07.91202.0611 / 07.91202.0831 |
| Spring contact with detent 2.8'1/0.5-1 | 07.91201.0222 / 07.91201.0221 |
| Spring contact with detent 2.8'2.5/1.5-2.5 | 07.91201.0224 / 07.91201.0223 |

The “ZDR-Interface with vehicle management computer for external engine speed control on TG” consists of the 18-pole plug connection **X1996** and is included in the vehicle’s standard equipment e.

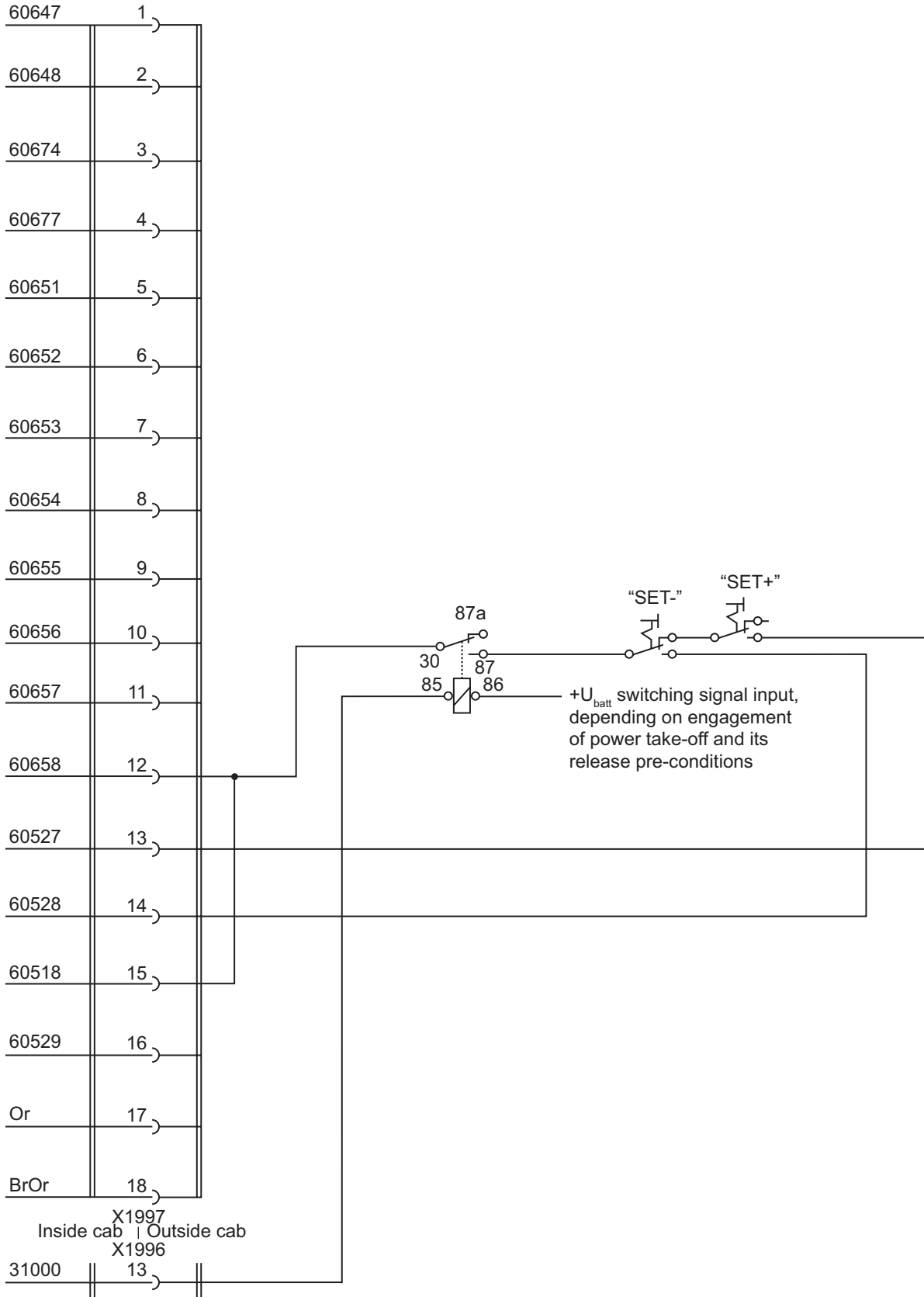
The preparation for „Accidental Reverse Prevention in garbage collection vehicles“ is a 6-pole Plug connection **X2334** or **X679**. This plug designation is used on all switch diagrams, and the plug inside the vehicle is correspondingly colour-keyed. It is accessible from outside by removing the cover.

| Plug connection | Colour and Coding: | MAN article number | |
|-------------------------------|--------------------|--------------------|----------------|
| | | Plug housing | Socket housing |
| 6-pole: X2334 or X679 | blue/4 | 81.25435.0794 | 81.25435.0744 |
| Secondary locking for housing | | 81.25435.0698 | 81.25435.0698 |

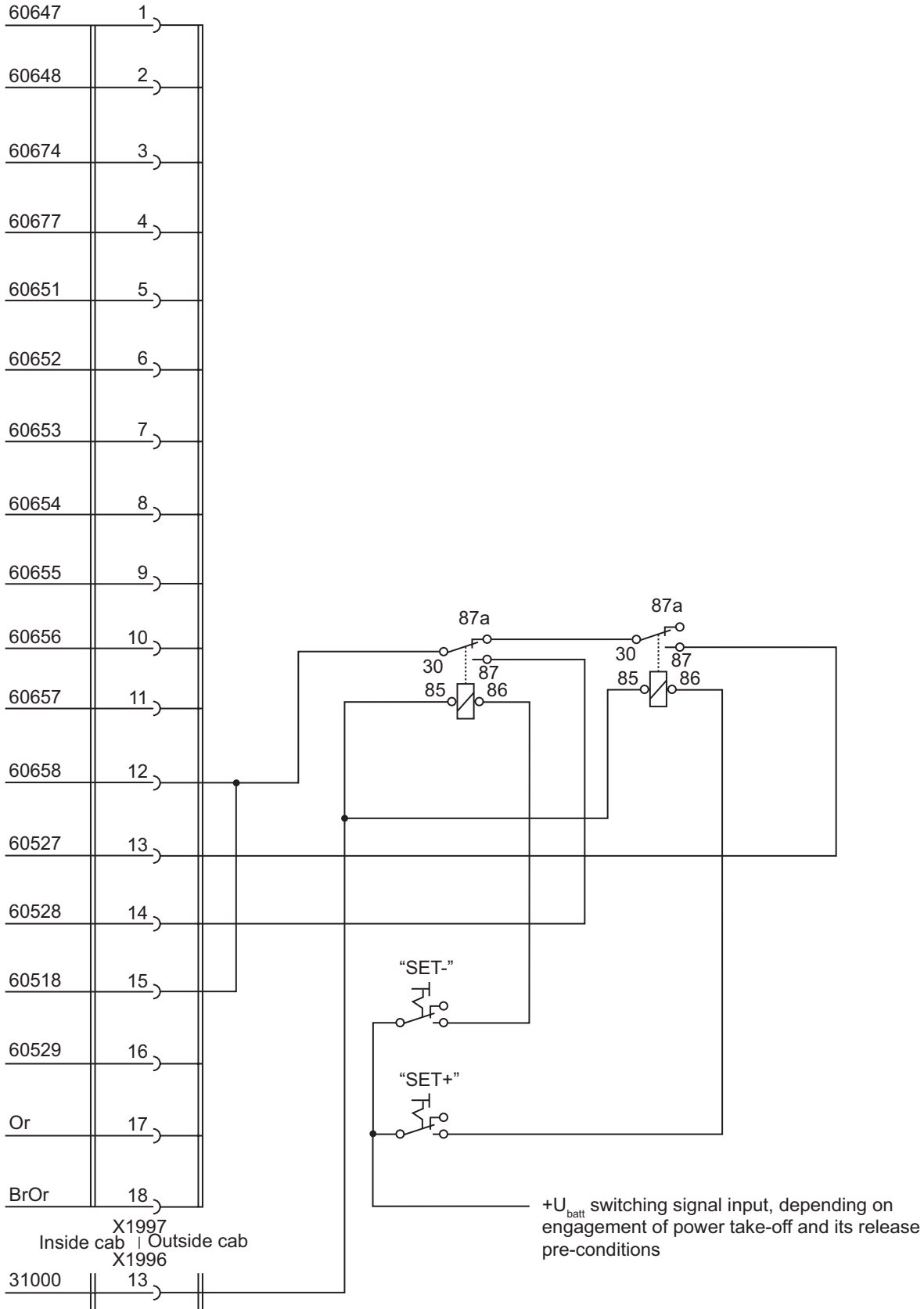
| Contacts (single units/tapes) | MAN article number |
|--|-------------------------------|
| Flat plug with detent 2.8'1/0.5-1 | 07.91202.0610 / 07.91202.0830 |
| Flat plug with detent 2.8'2.5/1.5-2.5 | 07.91202.0611 / 07.91202.0831 |
| Spring contact with detent 2.8'1/0.5-1 | 07.91201.0222 / 07.91201.0221 |
| Spring contact with detent 2.8'2.5/1.5-2.5 | 07.91201.0224 / 07.91201.0223 |

10. Sample circuits

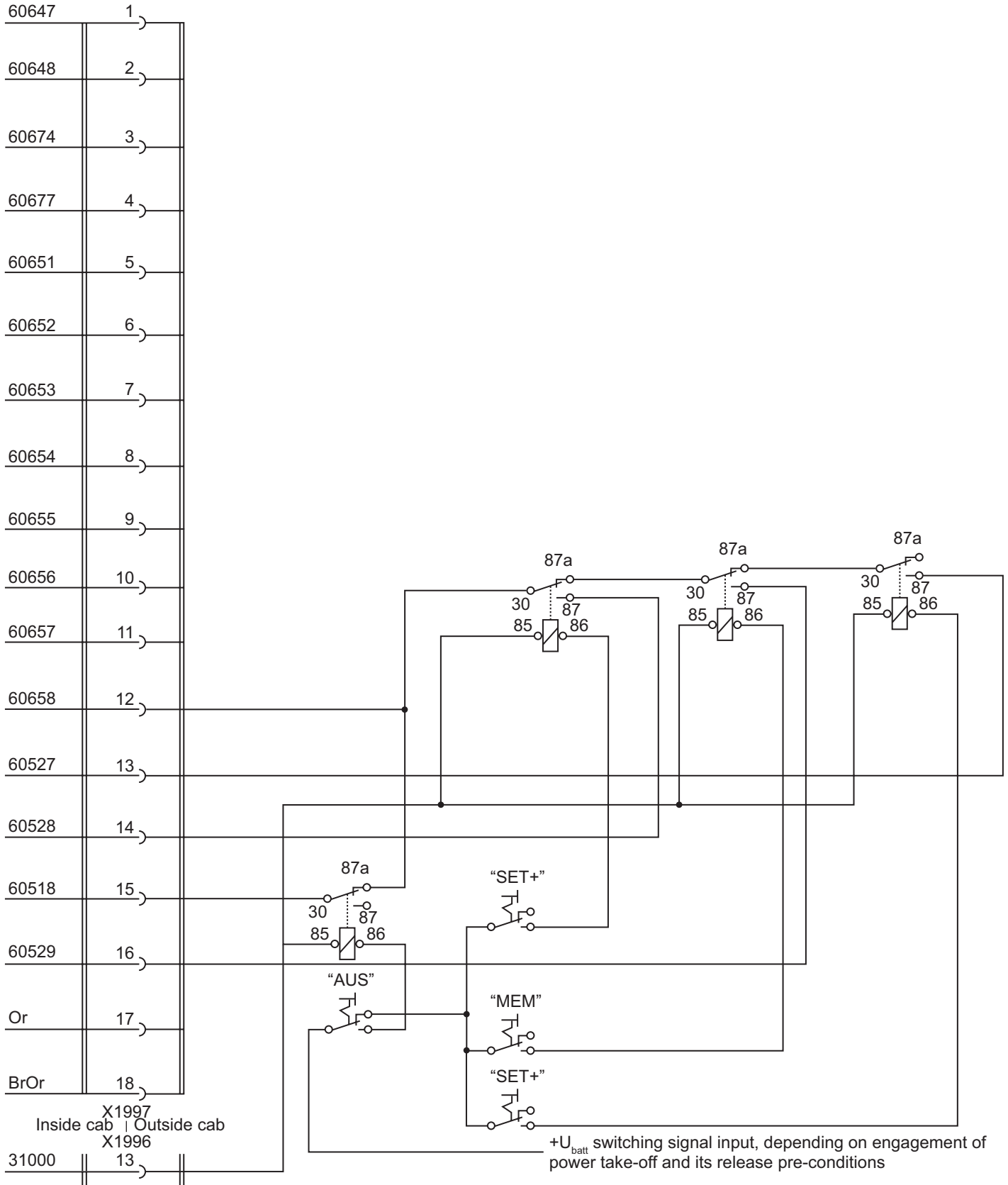
Sample circuit for external control of engine speed with the functions "SET+" and "SET-"



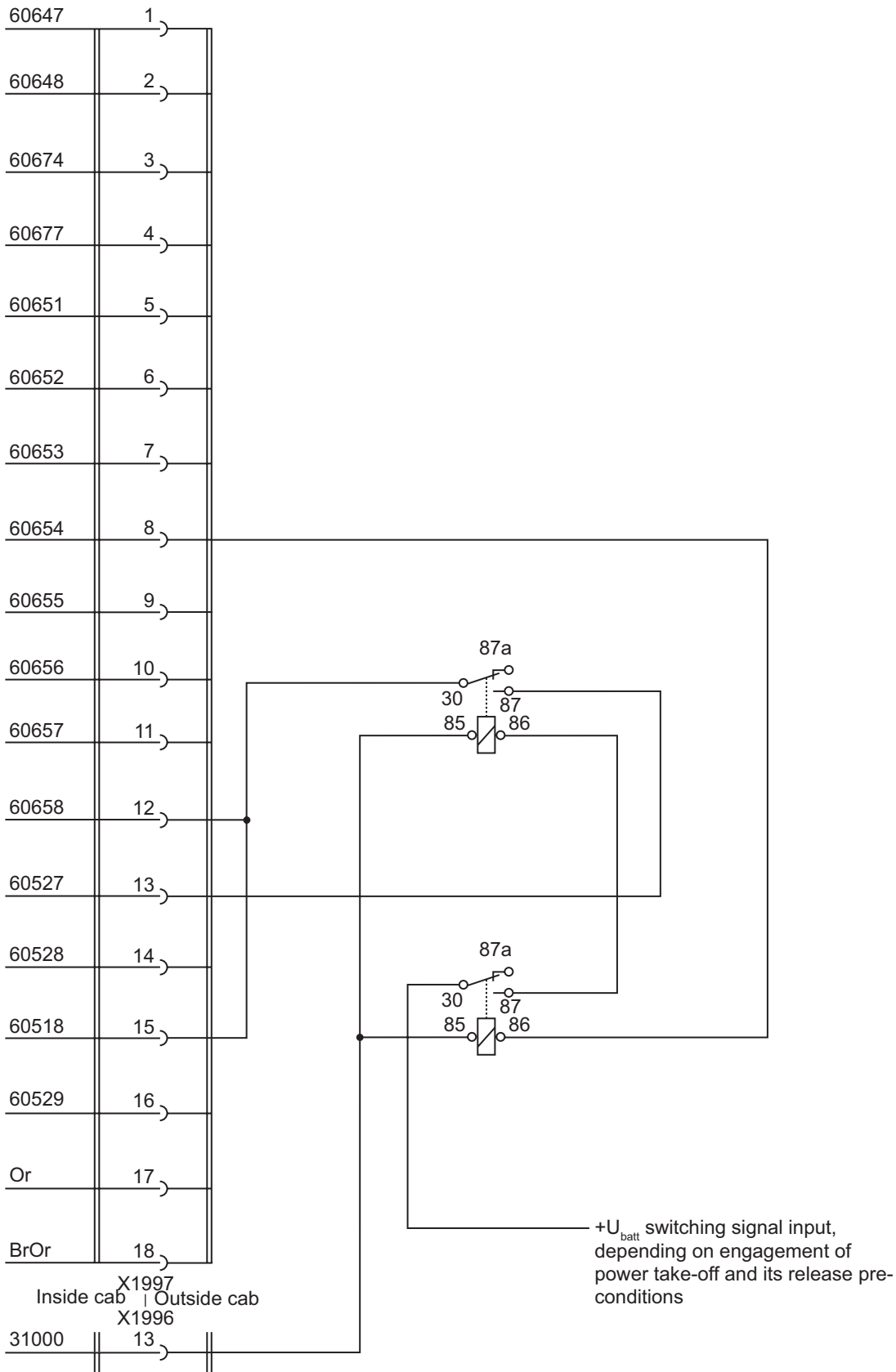
Sample circuit for external control of engine speed with the functions "SET+" and "SET-"



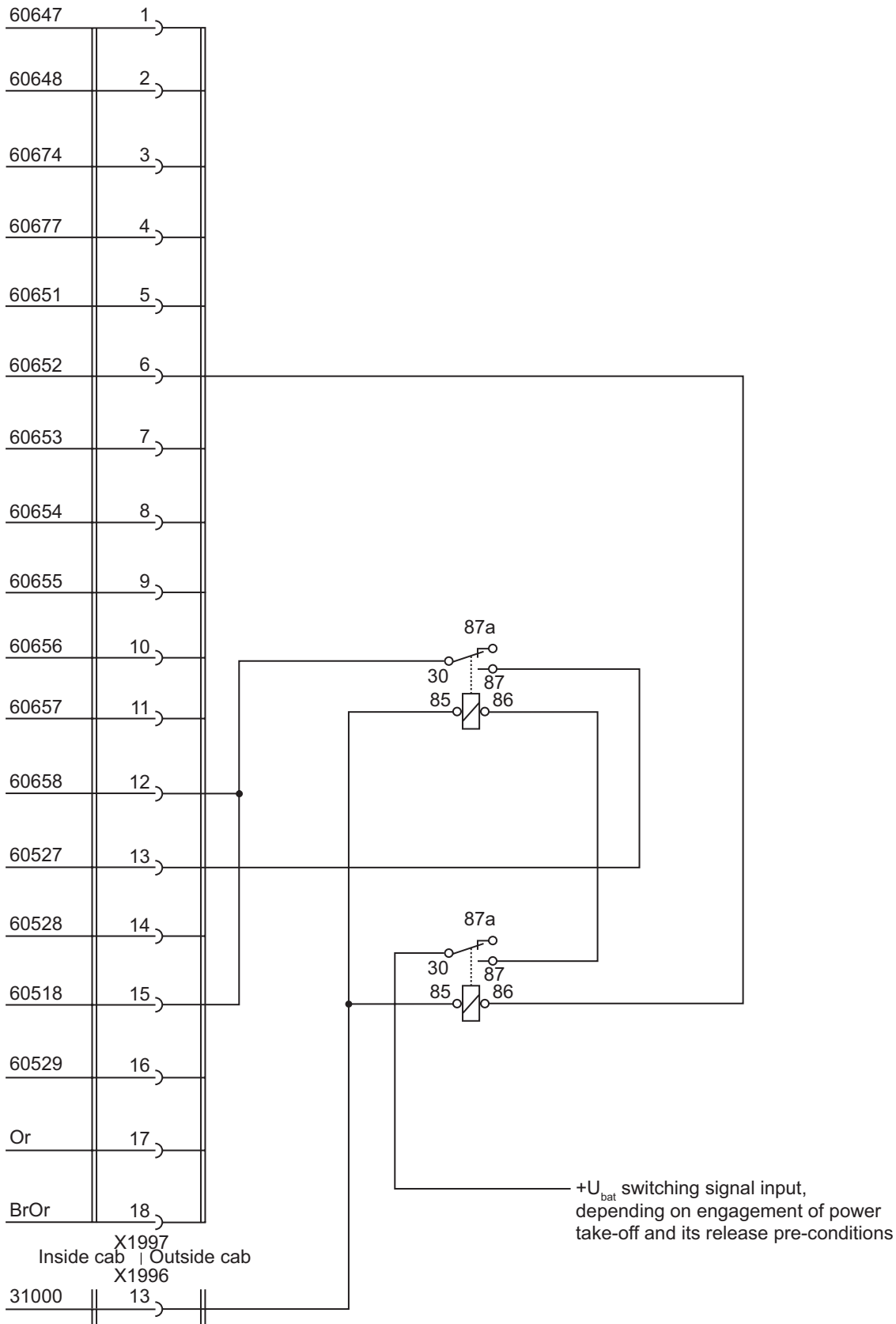
Sample circuit for external control of engine speed with functions
 “OFF”, “SET-”, “MEM” and “SET+ according to switching priorities”



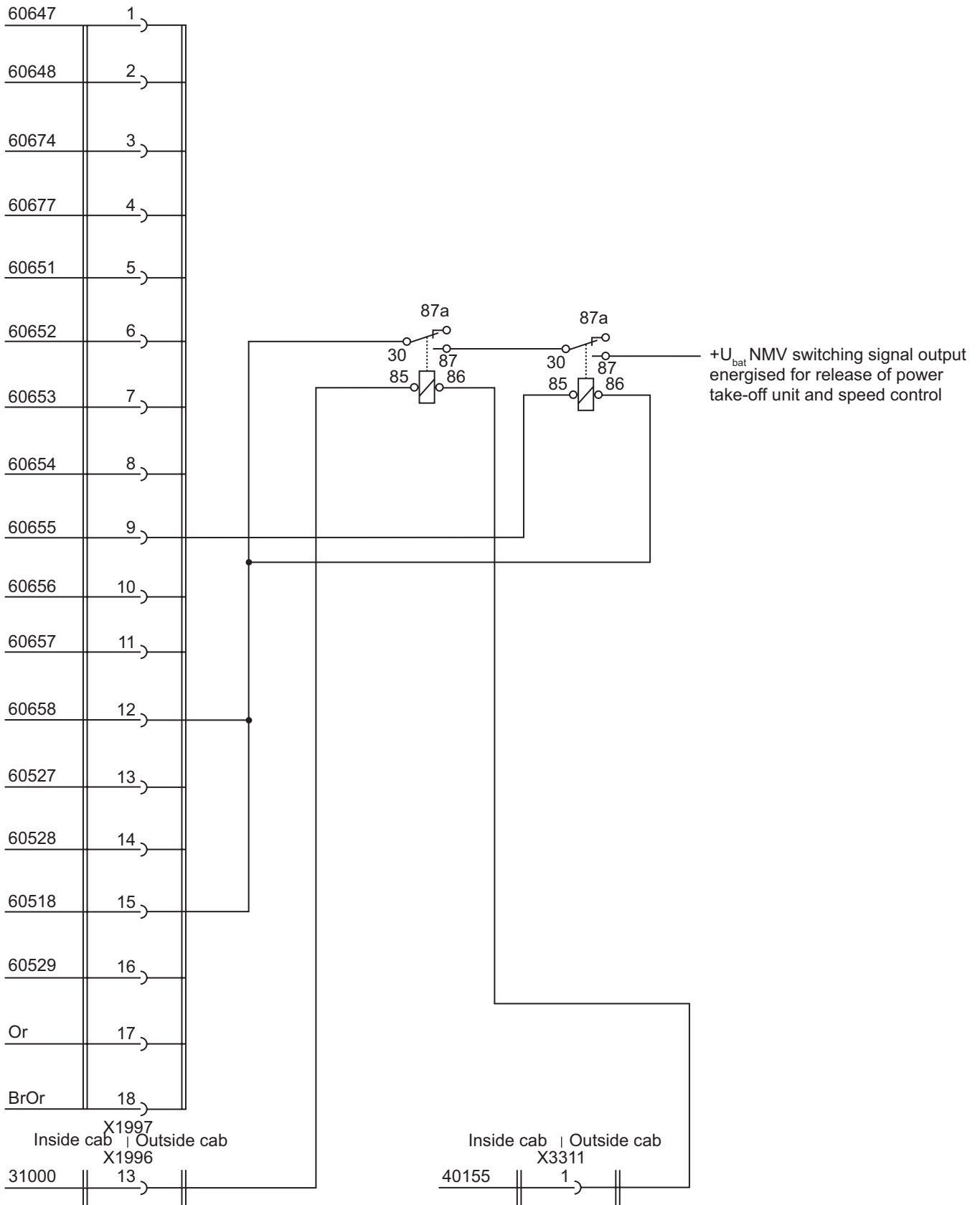
Sample circuit for control of an intermediate engine speed via the function "SET+", depending on clutch function release and engagement of the powertake-off



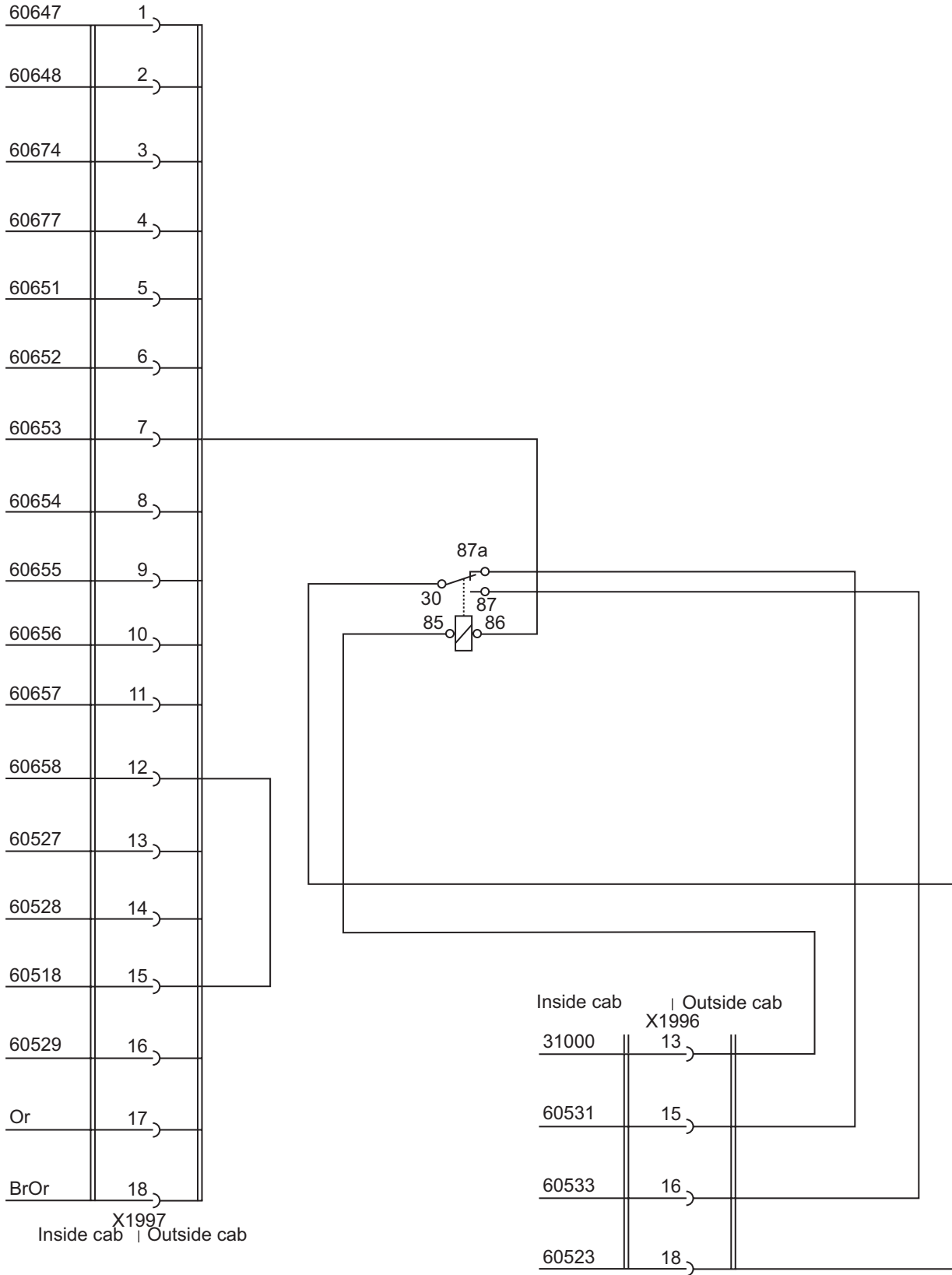
Sample circuit for control of an intermediate engine speed via the function "SET+", depending on brake function release and engagement of the powertake-off



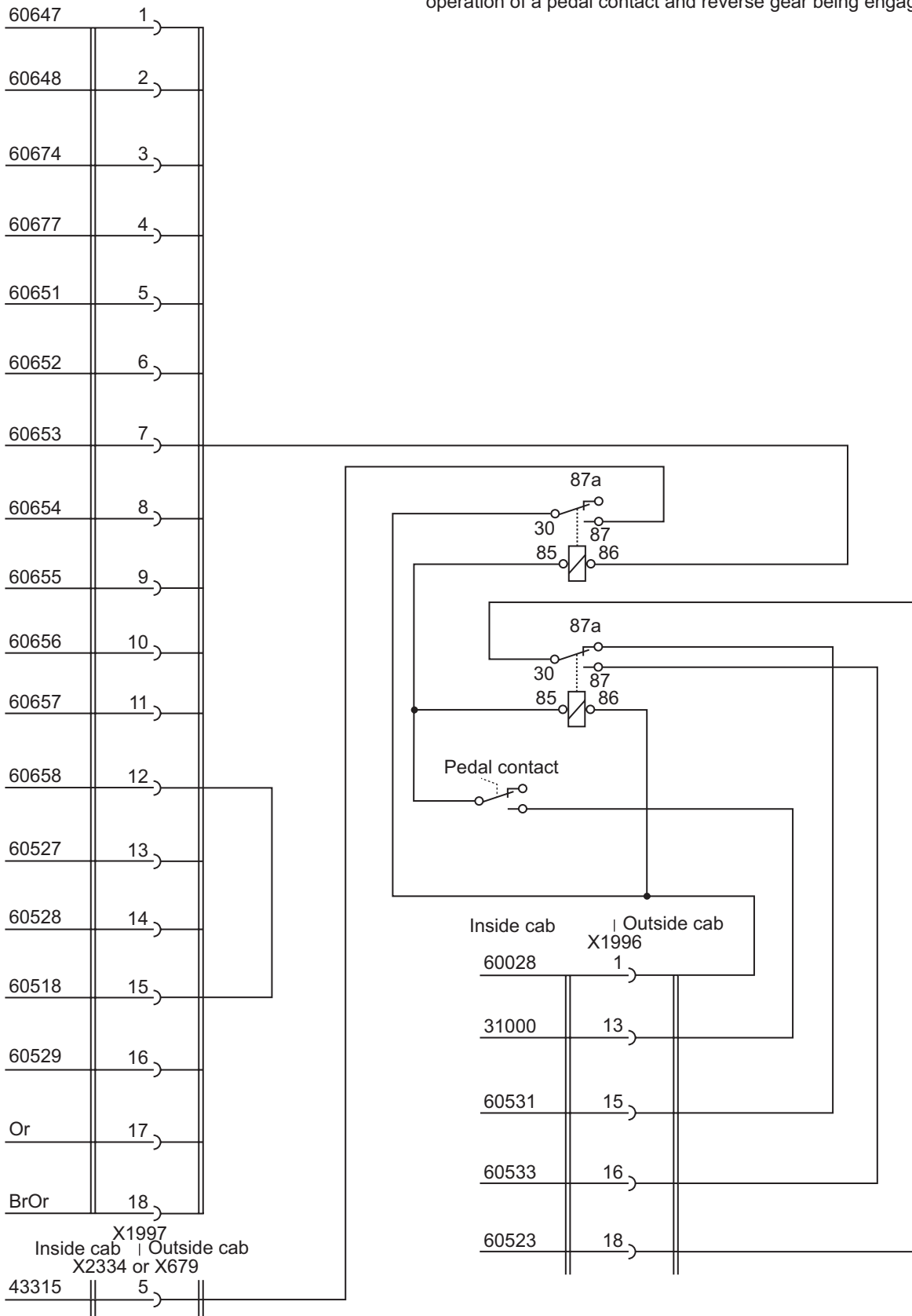
Sample circuit for release of engine-dependent power take-off (NMV), depending on application of parking brake and gearbox in neutral



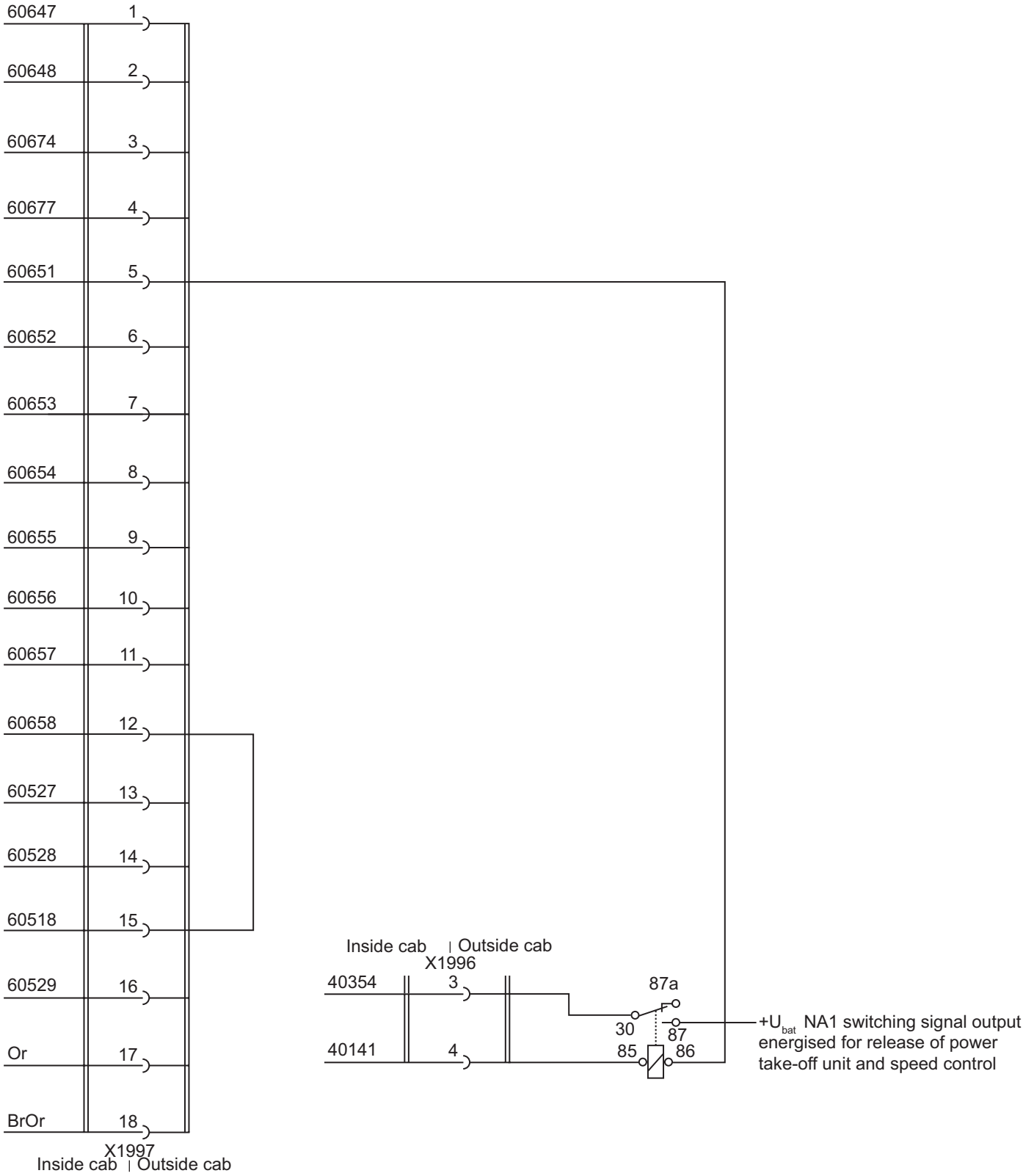
Sample circuit for high speed limiting 2, depending on reverse gear being engaged



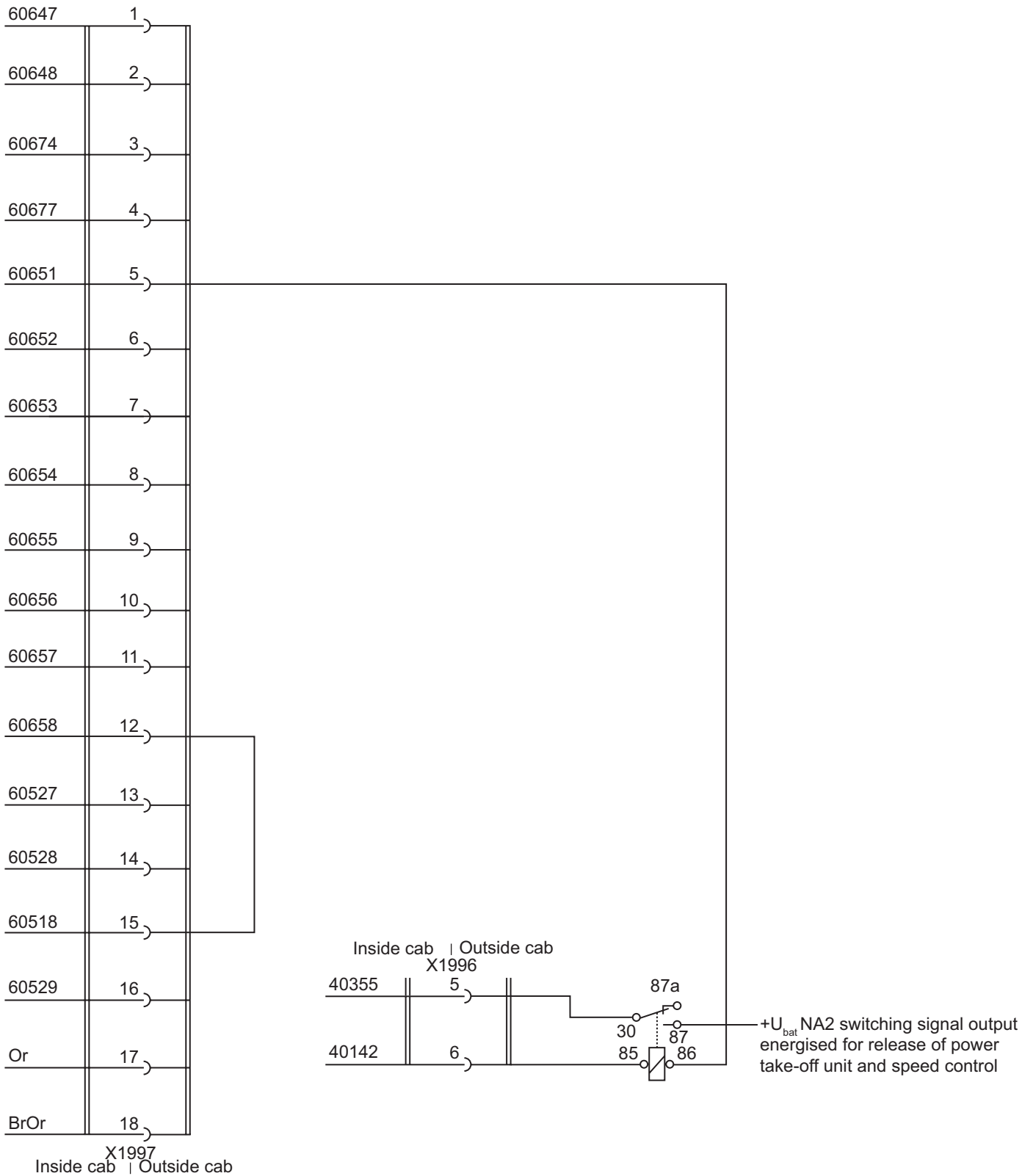
Sample circuit for high-speed limiting 2, depending on operation of a pedal contact, and actuation of the reverse gear interlock depending on operation of a pedal contact and reverse gear being engaged



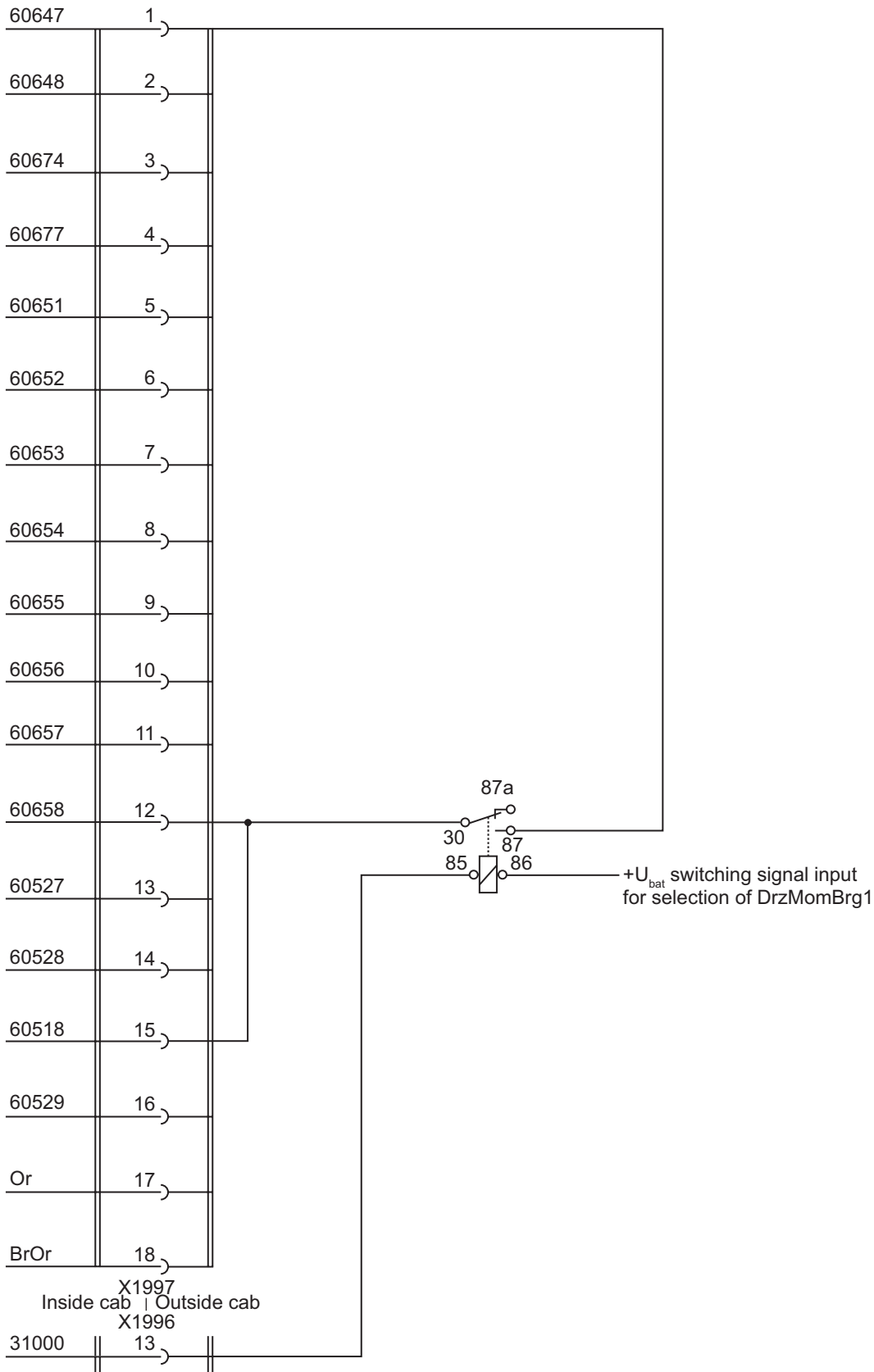
Sample circuit for release of power take-off, depending on application of parking brake and NA 1 being engaged



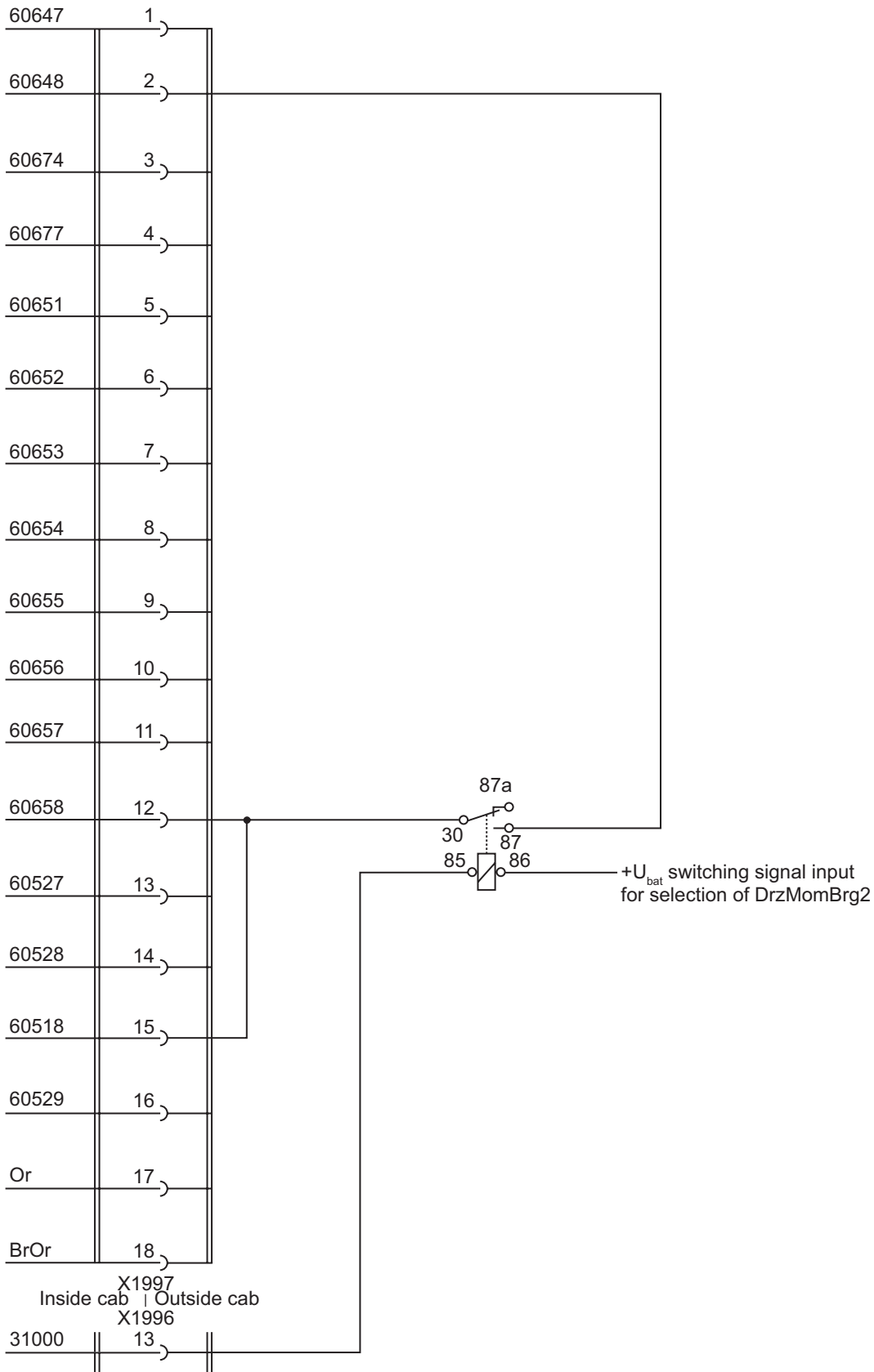
Sample circuit for release of power take-off, depending on application of parking brake and NA 2 being engaged



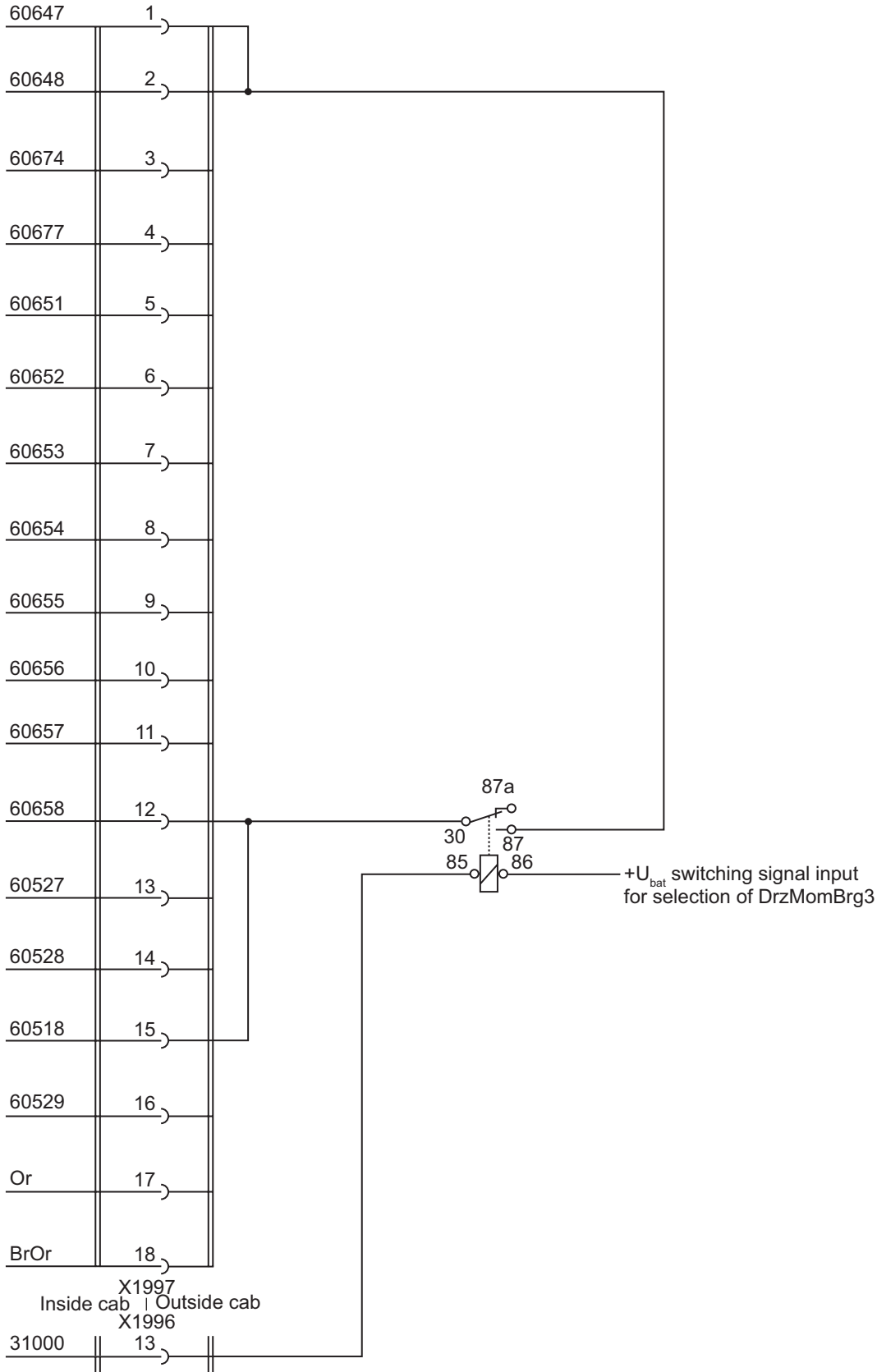
Sample circuit for activation of engine speed/torque limiting 1



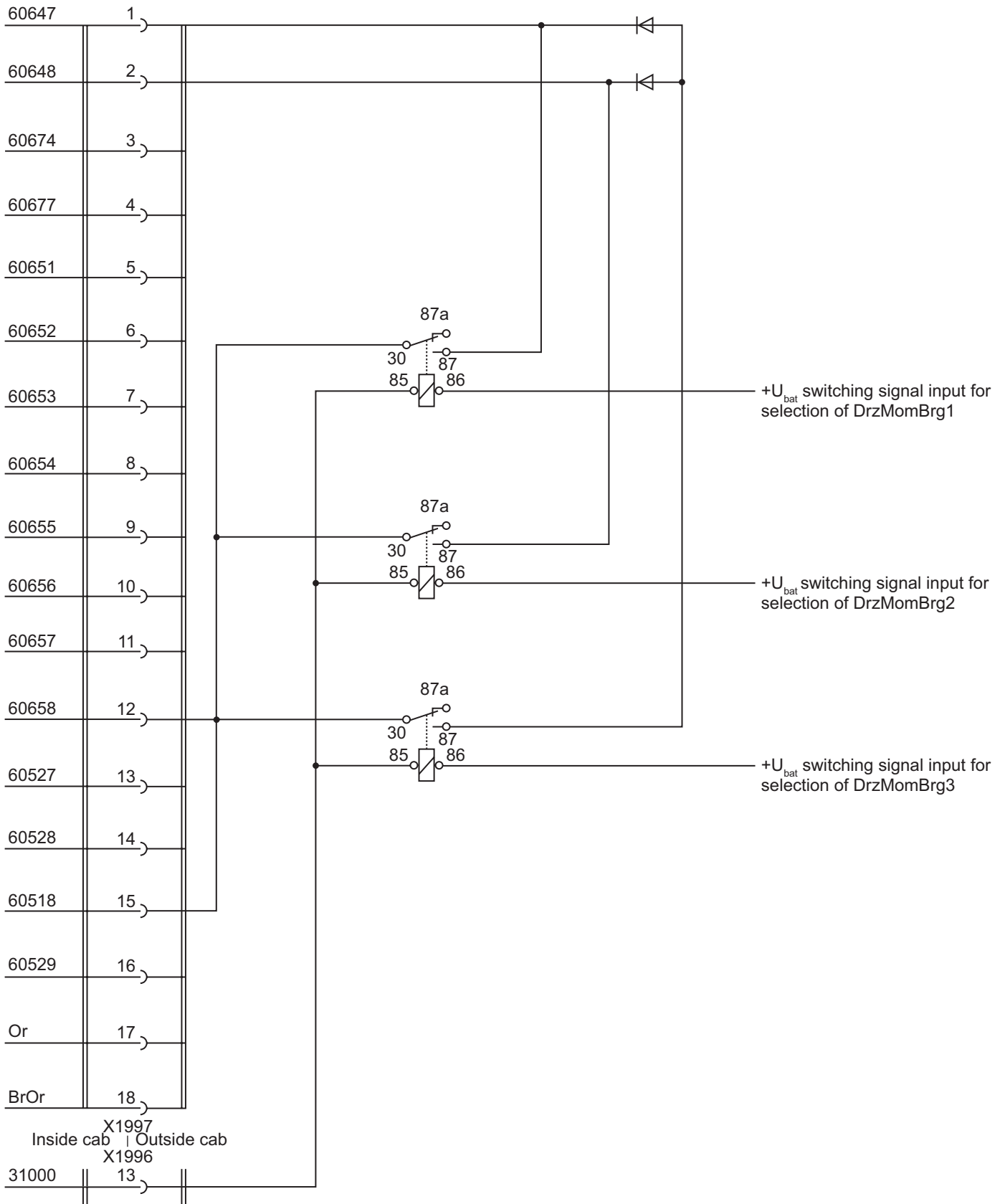
Sample circuit for activation of engine speed/torque limiting 2



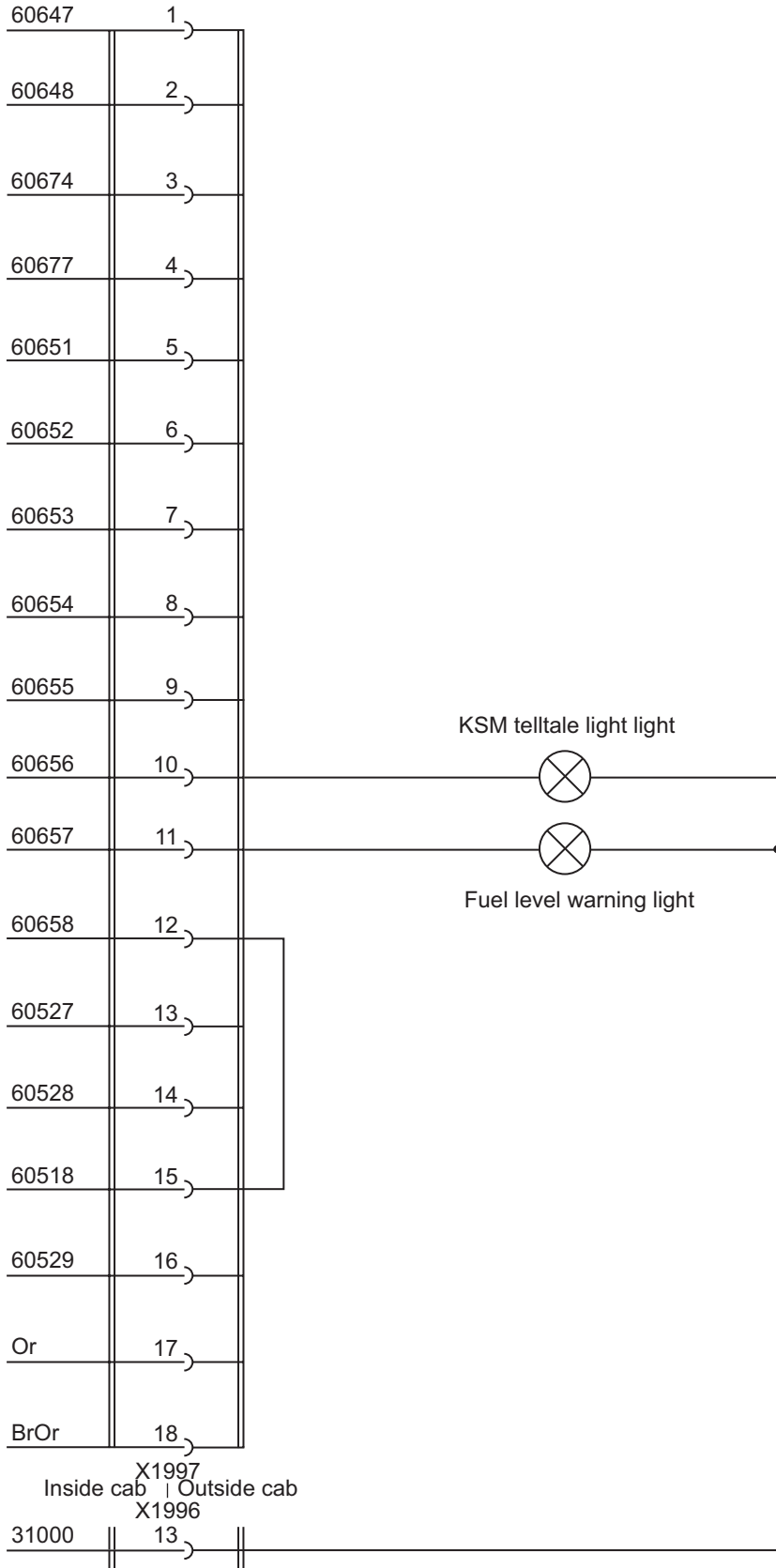
Sample circuit for activation of engine speed/torque limiting 3



Sample circuit for activation of engine speed/torque limiting 1, 2 and 3



Sample circuit for connecting the KSM and fuel level warning lights



Sample circuit for connecting body electronics with CAN interface

