
ZDR INTERFACE WITH CUSTOMER-SPECIFIC CONTROL MODULE (KSM) FOR EXTERNAL SPEED CONTROL IN TG-A

1.	Area of application	2
2.	terms and abbreviations used	2
3.	applicable directives and standards	3
4.	Addresses and responsibilities	3
5.	general notes ON the ZDR interface with KSM	3
6.	notes for the parameterisation of the KSM	4
6.1.	Basic function for intermediate speed control	4
6.2.	Parameterisation possibilities in the KSM	4
7.	A-CAN interface	7
7.1.	General	7
7.2.	Parameterisation of the A-CAN	7
7.3.	Information about the operational state of the vehicle on the A-CAN	7
7.4.	Possible requirements for KSM via A-CAN	7
7.5.	A-CAN transmission messages	8
7.6.	A-CAN receipt messages	17
7.7.	Processing KSM/FFR information if defined by the KSMA message	19
8.	Pin description and circuit diagrams	20
9.	description of interfaces and installation location	27
10.	circuit examples	28

1. Area of application

This interface description applies to all body manufacturers which require an “external speed control device” for a MAN commercial vehicle. The standard interface designs described here concern vehicle models in the “Trucknology Generation” (TG) series.

2. Terms and abbreviations used

In the PIN description the following technical terms and abbreviations are used:

Term/Abbreviation	Explanation
A-CAN	Bodymaker CAN
OFF	Switching off the FGR/FGB/ZDR function
DBG	Speed limitation
DE	Digital input
EMC	Electromagnetic compatibility
FFR	Vehicle management computer
FGR/FGB/ZDR	Driving speed control/driving speed limitation/intermediate speed control
GETRIEBE-N	Neutral position of the gearbox
HGB	Maximum speed limitation
HP	ZF HP automatic gearbox..
KSM	Customer-specific control module
KS	Short circuit
LED	Light emitting diode
M3135	MAN works standard (letter M + 4-digit number)
MAN-cats II	Computer diagnostic system of MAN workshops
MBG	Torque limitation
MEMORY	Resumption of a stored function
NA	Power take-off
PIN	Plug contact
R-Gang	Reverse gear
SET-	Retardation or lowering and setting speed
SET+	Acceleration or increasing and setting speed
SG	Control unit
T-CAN	Driveline CAN (CAN = Controller Area Network)
+U _{BAT}	Plus voltage of the batteries
-U _{BAT}	Minus voltage of the batteries
ZDR	Intermediate speed control

3. Applicable directives and standards

- The relevant guides to fitting bodies for trucks and semitrailer tractors, here in particular the “Electrics” and “Trucknology Generation” booklets; incl. all supplements in the bodymaker information sheets
- MAN specifications - relays for commercial vehicles
- MAN standard M 3285 (EMV) and EG Directive 72/245/EEC incl. 95/54/EEC
- MAN standard M 3135 (electric cables)
- DIN 40 050
- DIN 40 839, parts 1, 3 and 4
- DIN 57 879, part 3
- VDE 0879, part 3
- VG 95 370 to 95 377
- MIL-STO 461 and 462
- ISO 11898-24V
- SAE J1939/ff

4. Addresses and areas of responsibility

Procurement sources can be found in the MAN body guidelines for lorries. These can be obtained from:

MAN Nutzfahrzeuge AG / Dept. ESC (fax: +49 089 1580 4264)
P O Box 50 06 20
D-80976 Munich

5. General notes on the ZDR interface with KSM

- The interface is not a standard feature of the vehicle and must be ordered separately.
- MAN Sales must be informed of the desired parameters in the KSM control unit such as speed limitation, torque limitation etc. for the programming in the plant when the order is placed.
- The preparation for “Start-Stop device” is independent from the interface for external speed control and must be ordered separately.
The lines for an external control (engine start-stop) are in a coil in the frame end.
- The “backup locking for refuse trucks” is not a part of the interface and must be ordered separately.
- **The interface wiring must be treated with extreme care since it involves major intervention in the on-board network and in the wiring of the electronics.**
- Only electric lines corresponding with MAN's M 3135 standard may be used.
- Only relays corresponding with MAN's relay specifications for external wiring may be used.
- Care must be taken that the contacts are properly crimped in accordance with the instructions of the contact manufacturer.
- External control elements of the bodymaker must comply with the protective system IP69K in accordance with DIN 40 050 and must additionally be secured against unauthorised intervention by third parties.
- The electricity supply (+UBAT) for units and controls on the body is to be fed from the battery via a separate and suitable line fuse protection system. The feeding of just +12 volt to just one battery is not permissible.
- For the ground a separate cable is to be laid to the joint ground point on the engine bearing (the vehicle frame must not be misused as a ground lead!).
- Different ground potentials of the external wiring must not be connected to each other.
- **The wiring of the interface must be decoupled from the load current circuit of the body control.**
- The external wiring must comply with the requirements of MAN's M 3285 standard for the commercial vehicle system. For example, radio devices such as radio remote control must not influence any functions described in the specifications.
- **The wiring examples issued by MAN as illustrations are under no circumstances to be used as design instructions. Whoever wires the interface is fully liable in this respect.**

6. Notes for the parameterisation of the KSM

6.1. Basic function for intermediate speed control

- The parameterisation of the individual ZDR modes is carried out in the FFR. The individual modes can be selected externally (outside the cab) via the standard ZDR interface (FFR).
- The parameterisation possibilities of the FFR and the pin description of the “ZDR interface with FFR” are described in the document “ZDR interface with the vehicle management computer for external speed control in TG”.
- With the “ZDR interface with KSM” the “SET+”, “SET-”, “MEMORY” and “OFF” functions already known from the cruise control system are made available externally (outside the cab).
- In addition further intermediate speeds can be realised - by means of the activation of the speed limitation.

6.2. Parameterisation possibilities in the KSM

Various functions can be parameterised in the KSM with the aid of MAN-cats II:

- Speed limitation:
When the corresponding DBG pins (X1997/pin 1 and 2) are activated the parameterised speed limitation is selected.
- Torque limitation:
When the corresponding MBG pins (X1997/pin 3 and 4) are activated the parameterised torque limitation is selected.
- Engine speed:
That angular impulse figure (number of impulses per engine revolution) and the speed threshold from which the rectangular signal (duty cycle 50/50) is given can be parameterised.
- ZDR digital inputs:
Parameterisation is possible if the inputs (SET+/-, MEMORY and OFF) are supported. If the inputs are supported any corresponding specification by A-CAN is ignored. If the inputs are not supported any specification by A-CAN is passed on and a possible wiring of the digital inputs ignored.
- A-CAN interface:
For parameterisation possibilities see chapter 7.2.

• Fault recognition at the following switch signal outputs:

- High-side switches
 - Parking brake (X1997/Pin 5)
 - Brake (X1997/Pin 6)
 - R_gear (X1997/Pin 7)
 - Clutch (X1997/Pin 8)
 - Check lamp (X1997/Pin 10)
 - Tank warning (X1997/Pin 11)
 - Readiness for operation (X1997/Pin 12)
- Low-side switch
 - Gearbox N (X1997/Pin 9)

The following variants are possible in the fault recognition:

- Without fault recognition
 - Switch signal output is not monitored
- With fault recognition
 - ⇒ Monitoring of high-side switches:
 - Signal high: short circuit to ground is monitored
 - Signal low: short circuit to $+U_{Bat}$ and line interruption are monitored
 - ⇒ Monitoring of low-side switches:
 - Signal high: short circuit to ground and line interruption are monitored
 - Signal low: short circuit to $+U_{Bat}$ is monitored
- With fault recognition and test impulses (“extended fault monitoring”)
 - ⇒ Test impulses during KSM system start (up to approx. 3 seconds after “terminal 15 on”)
 - During the system start short circuit to $+U_{Bat}$, short circuit to ground and line interruption are monitored following which faults are monitored depending on the version of the switch signal output
 - ⇒ Test impulses
 - Independent of the version of the switch signal output, from “terminal 15 on” short circuit to $+U_{Bat}$, short circuit to ground and line interruption are monitored.

Condition for fault recognition:

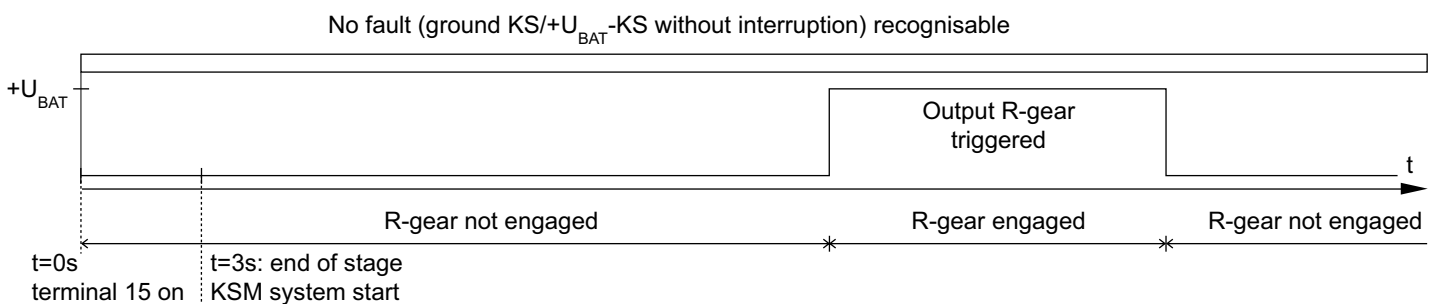
Load at output for high-side switches not higher than 400 Ω and at low-side switches not higher than 2000 Ω .

Note:

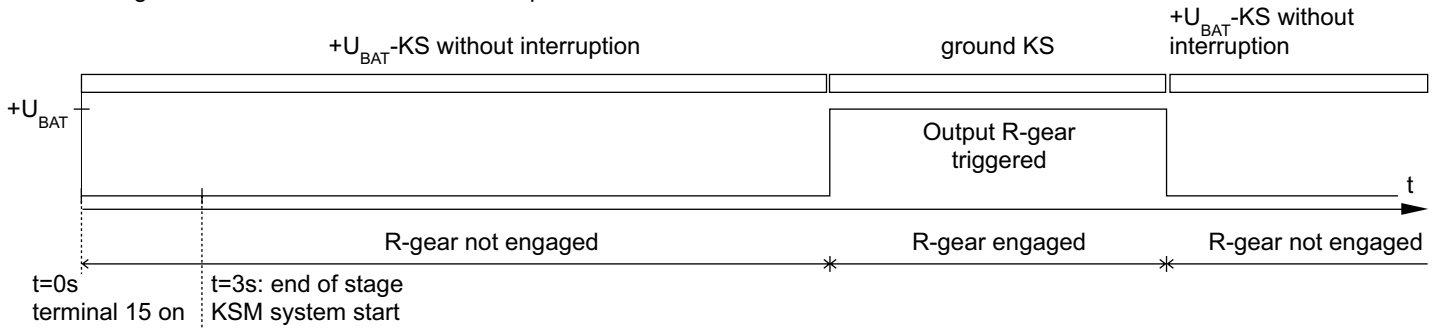
If the fault recognition is activated the diagnostic depth of the components connected to the “ZDR interface with the KSM” is considerably improved and hence the functional safety and vehicle availability are increased.

Fault recognition with differing parameterisation using the “R-gear” switch signal output as an example:

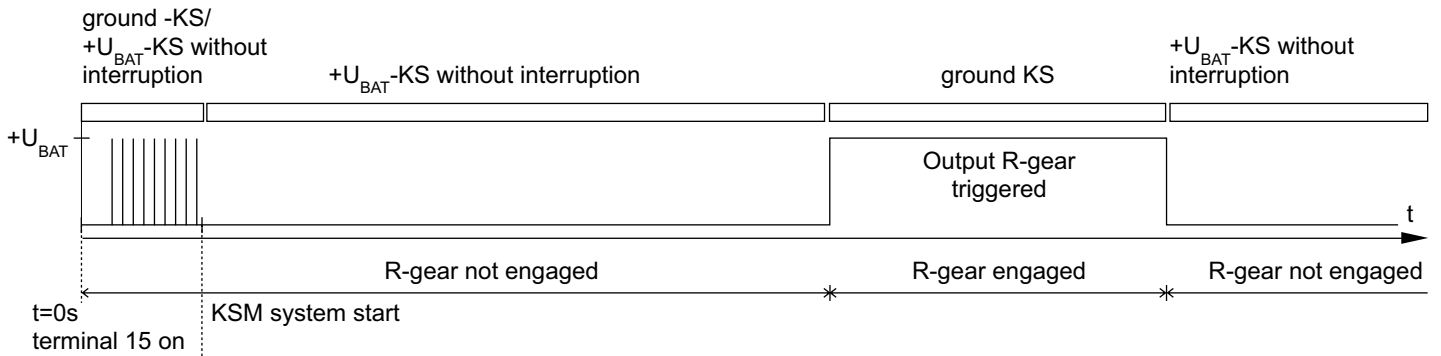
- Output not supported (load is connected):
 - Fault recognition not active



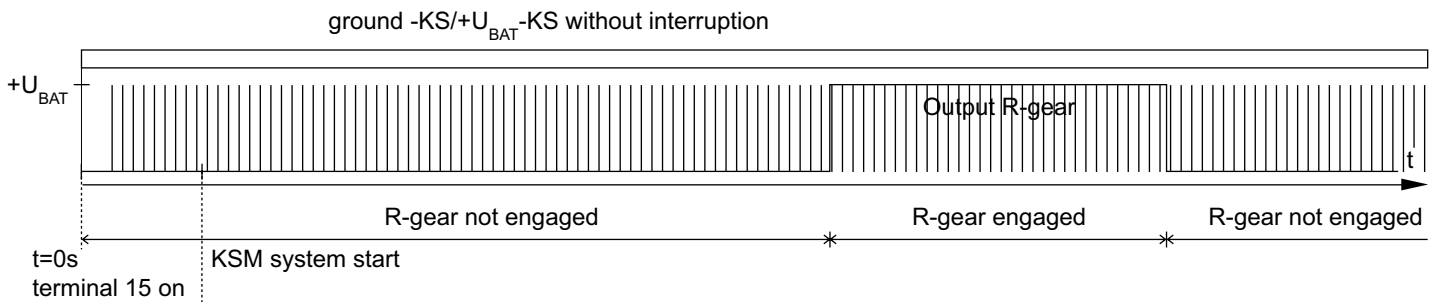
- Output supported (load must be connected!):
Fault recognition active: current state of the output is monitored



- Output is supported (load must be connected!):
Fault recognition active: current state of the output is monitored and test impulses only during at KSM control unit run up (test of ground short circuit with high-side switches and test of Ubat short circuit on low-side switches)



- Output supported (load must be connected!):
Fault recognition active: current state of the output is monitored and test impulses cyclical (permanent monitoring on ground short circuit with high-side switches and permanent monitoring on Ubat short circuit with low-side switches)



Note:

The test impulses have a duration of approx. 1 ms and a repetition time of approx. 300 ms.

Caution:

The switch signal outputs of the KSM are activated by CAN messages which are transmitted on the T-CAN to the KSM. If there is no CAN message the related signal output of the KSM switches into a defined condition:

High-side switch: low
Low-side switch: high

7. A-CAN interface

7.1. General

A high-speed CAN interface to ISO 11898-24V and specification 2.0B is available for the communication to the bodymaker CAN. The transmission speed is 250kbit/s.

The A_CAN is completely galvanically separated to protect the MAN CAN network in the vehicle from external influences/interference.

A 120Ω terminating resistor is permanently connected. There is a CAN filter reactor.

The CAN data line is designed as a 2-core twisted line up to the interface (MAN parts number: 07.08132.4384). For EMC reasons the line from the interface to the control unit on the body should be as short as possible and twisted (see ISO 11898-24V). MAN recommends the line with the MAN item number 07.08132.4384 (FLRY-2x0,75-B-28-or-bror) for this.

MAN bases its definition of the A-CAN on the SAE J1939/ff.

The numbers in brackets beside the identification number refer to SAE J1939/71 "VEHICLE APPLICATION LAYER".

7.2. Parameterisation of the A-CAN

Each message which the KSM receives on the T-CAN is also transmitted to the A-CAN. It can be parameterised so that individual or all A-CAN messages are not transmitted.

It can be parameterised whether a message which is received (KSMA) is ignored by the body electronics in the KSM or processed. The receiving timeout can also be parameterised; if applicable also the identifier of the message received.

7.3. Information on the operational state of the vehicle on the A-CAN

The following information with regard to the body electronics can be made available via the A-CAN – depending on the fittings of the vehicle and the parameterisation in the KSM:

- Driveline open/closed
- Gearbox output speed
- Gearbox input speed
- Clutch slip
- Gear selected
- Ratio of gearbox input - to gearbox output speed
- Current/last gear
- Gear engaged
- Gearbox neutral position
- NA1 requested/active
- NA2 requested/active
- Parking brake activation
- Vehicle speed
- Clutch pedal activation
- Brake pedal activation
- ABS active/not active
- Brake pedal position
- Reverse gear engaged/not engaged
- Engine torque/injection quantity
- Engine speed
- Kickdown position
- Idle position
- Degree of engine utilisation
- Accelerator position
- Engine oil pressure
- Coolant temperature
- Fuel temperature
- Engine oil temperature
- Parking brake and/or trailer supply air pressure
- Brake circuit 1 and 2
- Supply pressure for auxiliary (special) equipment
- Air pressure (surroundings)
- Air temperature (surroundings)
- Time/date (GMT = "General Mean Time")
- Total kilometrage
- Daily kilometre recorder

7.4. Possible requirements for KSM via A-CAN

KSM can receive the following requirements from the body electronics on the A-CAN for further processing by the FFR:

- Torque requirement/torque limitation
- Speed requirement/speed limitation
- Request for the intermediate speed control ZDR mode S, 1-7
- Request for ZDR operation (SET +/-, MEM, AUS)
- Maximum speed limitation
- External engine start/stop (currently [2/01] only engine stop possible!)

7.5 A-CAN transmission messages

The following transmission messages can be provided by KSM on 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 (information insignificant for bodymaker)		
	2 and 1	Driveline status status ETC1 [driveline_engaged] (3.2.2.6)		
		00	Driveline open (driveline disengaged)	
		01	Driveline closed (driveline engaged)	
		10	Error signal	
	11	Signal not available		
2 and 3	---	Gearbox output speed [output_speed_TCU] (3.2.1.14)		
		rpm per bit = 0.125	Offset [rpm] = 0	Range [rpm] = 0 to 8031,875
4	---	Clutch slip [clutch_slip] (3.2.1.20)		
		% per bit = 0,4	Offset [%] = 0	Range [%] = 0 to 100
5	---	XX		
6 and 7	---	Gearbox input speed [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 Controller #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 [selected_gear] (3.2.1.23)		
2 and 3	---	Ratio gearbox input to gearbox output speed [actual_gear_ratio] (3.2.1.25)		
		0.001 per Bit	Offset = 0	Range = 0 ... 64.255
4	---	Current/last gear [current_gear] (3.1.2.22)		
5 to 8	---	XX		

Note:

Offset = -125	Range = -125 ... 125
Values with positive prefixes are forward gears; values with negative prefixes are reverse gears. The value „0“ is used for the neutral position of the gearbox, the value „126“ for the parking position (automatic gearbox)	

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
Each second or in the event of changed status	8 bytes	254	199	7	0x00FEC7	0x1CFEC703

Byte	Bit	Description	
1 and 2	---	XX	
3	8 to 5	XX	
	4 and 3	Gear engaged (engagement indicator) [shift_finger_status_1]	
		00	Off
		01	On
		10	Error signal
	11	Signal not available	
	2 and 1	Gearbox neutral position (neutral indicator) (3.2.6.19)	
		00	Off
		01	On
		10	Error signal
11	Signal not available		
4 to 6	---	XX	
7	8 and 7	Not defined	
	6 to 4	Power takeoff status NA1 [PTO2_state]	
		0x1	Requested
		01x	Switched on (active)
	1xx	Not defined	
	3 to 1	Power takeoff status NA2 [PTO1_state]	
		0x1	Requested
		01x	Switched on (active)
	1xx	Not defined	
	8	---	XX

Note:
The power takeoff status is not defined in accordance with 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	Parking brake activation [park_brake_switch] (3.2.6.8)		
		00	Parking brake not set	
		01	Parking brake set	
		10	CAN message error	
	11	CAN message not available		
2 and 1	XX			
2 and 3	---	Vehicle speed [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 [clutch_switch] (3.2.6.12)		
		00	Clutch pedal released	
		01	Clutch pedal depressed	
		10	Error signal	
		11	Error signal not available	
	6 and 5	Brake pedal activation [brake_switch] (3.2.6.11)		
		00	Brake pedal released	
		01	Brake pedal depressed	
		10	Error signal	
	11	Signal not available		
4 to 1	XX			
5 to 8	---	XX		

EBC1: Electronic brake controller #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 [ABS_active] (3.2.2.9)	
		00	ABS not active (ABS passive but installed)
		01	ABS active
		10	Reserved
	11	Does not have any reaction (don't care)	
4 to 1	XX		
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
Each second or in the event of changed status	8 bytes	255	161/A1 _{hex}	6	0x00FFA1	0x18FFA121

Byte	Bit	Description	
1	8 and 7	Reverse gear engaged (in manual gearbox)	
		00	Off
		01	On
		10	Error signal
		11	Signal not available
	6 and 5	Info fuel level in current tank too low	
		00	Off
		01	On
		10	Error signal
	11	Signal not available	
	4 to 1	XX	
	2	8 to 3	XX
	2 and 1	Info EMERGENCY OFF	
		00	Off
		01	On
		10	Error signal
		11	Signal not available
3 to 8	---	XX	

ETC1: Electronic engine controller #1 (3.3.7)

OCF00400

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
The FFR sends the EEC1 every 10 ms. SAE 12-50 ms	8 bytes	240	4	3	0x00F004	OCF00400
Byte	Bit	Description				
1 and 2	---	XX				
3	---	Engine torque/injection quantity (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 rpm		
6 to 8	---	XX				

ETC2: Electronic engine controller #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	Kickdown position (AP kickdown switch) [AP_kickdown_sw] (3.2.2.5)				
		00	Kickdown not activated (Kickdown passive)			
		01	Kickdown activated (Kickdown active)			
		10	Error signal			
	11	Signal not available				
	2 and 1	Idle position (AP low idle switch) [AP_low_idle_sw] (3.2.2.4)				
		00	Pedal not in idle position (AP not in low idle condition)			
		01	Pedal in idle position (AP in low idle condition)			
		10	Error signal			
11	Signal not available					
2	---	Accelerator pedal position (Accelerator pedal (AP) position) [AP_position] (3.2.1.8)				
		0.4 % per Bit	Offset = 0 %	Range = 0% ... 100%		
3	---	Degree of engine utilisation (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	---	Oil pressure (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	---	Coolant temperature (Engine coolant temperature) [eng_cool_temp] (3.2.5.5)		
		1 °C per bit	Offset = -40 °C	Range = -40 °C ... 210 °C
2	---	Fuel temperature (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 (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: 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 (is not used at 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: initial circuit) [air_susp_press]
7 to 8	---	XX

Note:

At MAN byte 6 does not reflect the pressure of the air suspension		
Resolution for byte 1 to 6		
80 mbar per 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	---	Ambient air pressure (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

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 per 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 months	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 = from-59min to +59 min
8	---	(Local Hour Offset) (3.2.5.297)		
		1 h per bit	Offset = -125 h	Range = from -23 h to +23 h

Note:

¹ The value "0" is not used. The value "1" corresponds with month "January", the value "2" with the month "February" etc.

² The value "0" is not used. The value 1 to 4 (0.25 days/bit) correspond with the first day of the month, the values 5 to 8 with the second day of the month etc.

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	---	Total kilometrage (high resolution total vehicle distance) [tot_veh_dist] (3.2.5.106)		
		5 m pro Bit	Offset = 0 m	Range = 0 ... 21 055 406 km
5 to 8	---	Daily kilometre counter (high resolution trip distance) [trip_distance] (3.2.5.107)		
		5 m per bit	Offset = 0 m	Range = 0 ... 21 055 406 km

7.6 A-CAN receipt messages

The following receipt message can be processed by KSM and passed on to the FFR:

KSMA: Customer-specific control module – 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	0C EF FD 55

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) processing mode for speed/torque	
			00	No processing (override disabled)
			01	Speed definition/torque limitation (speed control)
			10	Torque definition/speed limitation (torque control)
	11	Speed/torque limitation (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 operation [ksma_sw_status]		
		in accordance with SAE J1939/ff		
	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)		
		At MAN		
		00000000	Neutral	
		00000001	Off	
		00000100	Set -	
		00010000	Resumption	
	01000000	Set +		
	10101010	Defective		

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	Engine stop [ksma_MotorStop]	
		00	No request
		01	Engine stop
		10	Reserved
		11	Doesn't cause a reaction (doesn't care/takes no action)
	2 to 1	Engine start [ksma_MotorStart]	
		00	No request
		01	Engine start
		10	Reserved
		11	Doesn't cause a reaction (doesn't care/takes no action)
	8	---	XX

7.7. Processing KSM/FFR information if the KSMA message is defined

The override control mode (ocm) of the KSMA message (KSMA_ocm) is crucial for the processing of speed and torque. The following description (case 1-4) explains how the KSMA_ocm is generated from the KSMA_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 as standard. The processing of the modes ocm=01 (speed control) and ocm=10 (torque control) of the KSM1 message is not active in the FFR but can if required be released in the FFR.

1. KSMA_ocm=11 → KSM1_ocm=11 (speed/torque limit control):
 - Limitations (KSMA) are linked with the digital inputs (torque and speed) so that in each case the smallest value can be used as the KSM1 message
 - ZDR S request, 1-7 is passed on via KSM1:
Activation in the FFR in dependence on the switch-off conditions parameterised in the FFR
 - ZDR operation request (SET+/-, MEM, AUS) via KSMA or via the digital inputs of the KSM
– depending on the parameterisation in the KSM – is passed on via KSM1: version in the FFR
2. KSMA_ocm=01 → KSM1_ocm=01 (Speed control):
 - Speed target value definition possible, limitation in KSM1 by digital inputs “speed limitation” KSM possible
 - Torque limitations (KSMA) are linked with the digital inputs “torque limitation” so that in each case the smallest value are used as the KSM1 message
 - ZDR S request, 1-7 is passed on via KSM1:
Only the switch-off conditions parameterised in the relevant ZDR mode and the parameterised standard parameter kit is then processed by FFR. The upper/lower speed limit parameterised in the relevant ZFR mode and the speed target value parameterised in the FFR are then ignored.
3. KSMA_ocm=10 → KSM1_ocm=10 (torque control):
 - Torque target value definition possible, limitation in KSM1 by digital inputs “torque limitation” KSM possible
 - Speed limitations (KSMA) are linked with the digital inputs “speed limitation” so that in each case the smallest value is used as the KSM1 message
4. KSMA_ocm=00 → KSM1_ocm=11(speed/torque limit control):
 - No processing/forwarding of KSMA/Byte 2, 3, 4
 - Torque limitation via the digital inputs “torque limitation” to KSM possible
 - Speed limitations via the digital input “speed limitation” to KSM possible
 - ZDR S request, 1-7 is passed on via KSM1:
Activation in the FFR in dependence on the switch-off conditions parameterised in the FFR
 - ZDR operation request (SET+/-, MEM, AUS) via KSMA or via the digital inputs of the KSM
– depending on the parameterisation in the KSM – is passed on via KSM1: implemented in the FFR

The general rule is:

- ZDR mode selection via CAN has priority over the ZDR pins of the FFR
- ZDR operation via CAN has priority over cruise control controls
- Limitations are linked in the KSM and FFR so that in each case the smallest value is used as the KSM1 message
- Definitions are limited to limitations
- KSMA message parameterised to “not receiving” → KSM1_ocm=11

Caution:

If an input value of the A-CAN is not valid (e.g. in event of bus-off, failure of KSMA message), this has a direct effect, i.e. no “old” A CAN information is frozen (example: previously requested limitations are no longer active or effective).

8. Pin description and circuit diagrams

DBG 1+3 (plug connection X1997/pin 1)

+U_{Bat} switch signal input for the triggering of speed limitation 1 and 3

Function:

If the input is wired with +U_{Bat} (ready for operation; X1997/pin 12) the engine speed is limited to “speed limitation 1” which can be parameterised with the aid of MAN cats II.

If +U_{Bat} is taken away the selected “speed limitation 1” is cancelled again.

If at the same time the input DBG 2+3 (X1997/pin 2) is wired with +U_{Bat} (ready for operation; X1997/pin 12) the engine speed is limited to “speed limit 3” parameterised with the aid of MAN-cats II.

If +U_{Bat} is taken away from both inputs the selected “speed limitation 3” is cancelled again.

This function is also useful as a further intermediate speed with which an initially higher set speed is limited.

Function release:

As soon as +U_{Bat} (ready for operation or terminal 15 FFR) is applied.

DBG 2+3 (plug connection X1997/pin 2)

+U_{Bat} switch signal input for the triggering of the speed limitation 2 and 3

Function:

If the input is wired with +U_{Bat} (ready for operation; X1997/Pin 12) the engine speed is limited to “speed limitation 2” which can be parameterised with the aid of MAN-cats II.

If +U_{Bat} is taken away the selected “speed limitation 2” is cancelled again.

If at the same time the input DBG 1+3 (X1997/pin 1) is wired with +U_{Bat} (ready for operation; X1997/pin 12) the engine speed is limited to “speed limitation 3” which can be parameterised with the aid of MAN-cats II.

If +U_{Bat} is taken away from both inputs the selected “speed limitation 3” is cancelled again.

This function is also useful as a further intermediate speed with which an initially higher set speed is limited.

Function release:

As soon as +U_{Bat} (ready for operation or terminal 15 FFR) is applied.

MBG 1+3 (plug connection X1997/pin 3)

+U_{Bat} switch signal input for the triggering of torque limitation 1 and 3

Function:

If the input is wired with +U_{Bat} (ready for operation; X1997/pin 12) the torque of the engine is limited to “torque 1” which can be parameterised with the aid of MAN-cats II.

If +U_{Bat} is taken away the selected “torque limitation 1” is cancelled again.

If at the same time the input MBG 2+3 (X1997/pin 4) is wired with +U_{Bat} (ready for service; X1997/pin 12) the torque of the engine is limited to “torque limitation 3” which can be parameterised with the aid of MAN-cats II.

If +U_{Bat} is taken away from both inputs the selected “torque limitation 3” is cancelled again.

This function is useful to protect units connected with the body from too high a torque from the engine.

Function release:

As soon as +U_{Bat} (ready for operation or terminal 15 FFR) is applied.

MBG 2+3 (plug connection X1997/pin 4)

+U_{Bat} -switch signal input for the triggering of the torque limitation 2 and 3

Function:

If the input is wired with +U_{Bat} (ready for operation; X1997/pin 12) the torque of the engine is limited to “torque limitation 2” which can be parameterised with the aid of MAN-cats II.

If +U_{Bat} is taken away the selected “torque limitation 2” is cancelled again.

If at the same time the input MBG 1+3 (X1997/pin 3) is wired with +U_{Bat} (ready for operation; X1997/pin 12) the torque of the engine is limited to "torque limitation 3" which can be parameterised with the aid of MAN cats II.

If +U_{Bat} is taken away from both inputs the selected "torque limitation 3" is cancelled again.

This function is useful to protect units connected with the body from too high a torque from the engine.

Function release:

As soon as +U_{Bat} (ready for operation or terminal 15 FFR) is applied.

PARKING BRAKE (plug connection X1997/pin 5)

+U_{Bat} -switch signal output. If a load is connected and the parking brake is not activated a low level of U_{low} <2V sets itself.

Load:

max. 500mA

Function:

Information that the parking brake is engaged. Useful for the release of a function to prevent undesirable outside intervention on controls outside the cab.

Caution:

To ensure that short circuits and line interruption are reliably recognised if loads are connected and fault recognition is activated the connected load must be <400Ω.

BRAKE (plug connection X1997/pin 6)

+U_{Bat} -switch signal output. If a load is connected and the brake is not activated a low level of U_{low} <2V sets itself.

Load:

max. 500mA

Function:

Information that the brake is activated. Useful for the release of a function to prevent undesirable outside intervention on controls outside the cab.

Caution:

To ensure that short circuits and line interruption are reliably recognised if loads are connected and fault recognition is activated the connected load must be <400Ω.

R-gear (plug connection X1997/pin 7)

+U_{Bat} switch signal output. If a load is connected and the parking brake is not activated a low level of U_{low} < 2V sets itself.

Load:
max. 500mA

Function:
Information, that the reverse gear is engaged. Useful for example for shifting to a lower maximum speed limitation (HGB2) in reverse gear or also for reversing lock for refuse trucks.

Caution:
To ensure that short circuits and line interruption are reliably recognised if loads are connected and fault recognition is activated the connected load must be < 400Ω.

CLUTCH (plug connection X1997/pin 8)

+U_{Bat} switch signal output. If a load is connected and the clutch is not activated a low level of U_{low} < 2V sets itself.

Load:
max. 500mA

Function:
Information that the clutch is engaged. Useful for the release of a function to prevent unwelcome outside intervention on controls outside the cab.

Caution:
To ensure that short circuits and line interruption are reliably recognised if loads are connected and fault recognition is activated the connected load must be < 400Ω.

GEARBOX N (plug connection X1997/pin 9)

-U_{Bat} switch signal output. If the gear is engaged the high level (approx. +U_{Bat}) sets itself.

Load:
max. 300mA

Function:
Information that the gearbox is in neutral position. Useful for the release of a function in dependence of the gearbox neutral position (no gear engaged).

Caution:
To ensure that short circuits and line interruption are reliably recognised if loads are connected and fault recognition is activated the connected load must be < 2kΩ. If the fault recognition is activated the connected load must be connected after terminal 15 FFR (X1996/pin 1). "Ready for operation" (X1997/pin 12) must not be used if "ready for operation" is used instead of terminal 15. If "ready for operation" is used instead of terminal 15 FFR and in this way if the fault recognition is activated fault memory entries are already made during the system start (monitoring already active during the system start stage but not ready for operation until active following the system start stage).

CHECK LAMP (plug connection X1997/pin 10)

+U_{Bat} switch signal output. If a load is connected and the KSM-SG or the connected periphery is in a faultfree condition a low level of U_{low} <2V sets itself.

Load:
max. 600mA

Function:
Information that interference has arisen in the KSM-SG or in its connected periphery.

Caution:
To ensure that short circuits and line interruption are reliably recognised if loads are connected and fault recognition is activated the connected load must be <400Ω. When the control unit is running up the output will then be automatically triggered for approx. 3 seconds (light bulb test).

TANK WARNING (plug connection X1997/pin 11)

+U_{Bat} switch signal output. If a load is connected and the tank is full enough a low level of U_{low} <2V sets itself.

Load:
max. 600mA

Function:
Information that there is still approx. 20% of the maximum fuel content of the tank. This information is also displayed at the same time on the instruments with the information "FILL UP".

Caution:
To ensure that short circuits and line interruption are reliably recognised if loads are connected and fault recognition is activated the connected load must be <400Ω. When the control unit is running up the output will then be automatically triggered for approx. 3 seconds (light bulb test).

READY FOR OPERATION (plug connection X1997/pPin 12)

+U_{Bat} switch signal output. The final stage switches to high approx. 3 sec after terminal 15 is "on". If a load is connected and KSM-SG is not (yet) in a ready-for-operation state a low level of U_{low} <2V sets itself.

Load:
max. 2A

Function:
Information that the KSM-SG is ready for operation. Useful for the release of a function. The signal is still issued approx. 2 secs after terminal 15 "OFF" to permit any run up of a control unit which may be necessary with a connected body electronics.

Caution:
To ensure that short circuits and line interruption are reliably recognised if loads are connected and fault recognition is activated the connected load must be <400Ω. After the system start (approx. 3sec.) the output is then triggered.

SET+ (plug connection X1997/pin 13)

+U_{Bat} switch signal input for the triggering of the function "increase speed"

Function:

Increase speed.

If the input is wired with +U_{Bat} (ready for operation; X1997/pin 12) the engine speed runs continuously towards the upper speed limit. If the activation is interrupted the engine control controls the current speed.

The upper speed limit can be:

- the final speed of the engine,
- the upper speed limit in ZDR S, ZDR 1, . . . , ZDR 7 which can be parameterised with the aid of MAN-cats II.
- the speed limitation which can be parameterised and activated with the aid of MAN-cats II in the FFR or KSM.

The set speed is switched off, i. e. the engine goes to idle speed (ZDR S) or the "lower speed limit" (ZDR 1, . . . , ZDR 7) by "opening" the standard bridge between "ready for operation" (X1997/pin 12) and "OFF" (X1997/pin 15).

Function release:

Approx. 3.5secs after terminal 15 is "on" the function can be activated by wiring with +U_{Bat} (ready for operation or terminal 15 FFR).

SET- (plug connection X1997/pin 14)

+U_{Bat} switch signal input for the triggering of the function "lower speed".

Function:

Lower speed.

If the input is wired with +U_{Bat} (ready for operation; X1997/pin 12) the set engine speed runs continuously up to the idle speed (ZDR S) or the lower speed limit (ZDR 1, . . . , ZDR 7). If the activation is interrupted the engine control controls the current speed.

The set speed is switched off, i. e. the engine goes to idle speed (ZDR S) or the "lower speed" (ZDR 1, . . . , ZDR 7) by "opening" the external bridge between "ready for operation" (X1997/pin 12) and "OFF" (X1997/pin 15).

Function release:

Approx. 3.5secs after terminal 15 is "on" the function can be activated by wiring with +U_{Bat} (ready for operation or terminal 15 FFR).

OFF (plug connection X1997/pin 15)

+U_{Bat} switch signal input for the release/switch off of the ZDR functions.

Function:

If the input is wired with +U_{Bat} (ready for operation; X1997/pin 12) the ZDR functions are released. The ZDR functions are switched off by "opening" the external bridge between "ready for operation" (X1997/pin 12) and "OFF" (X1997/pin 15).

Caution:

If there is no external bridge between X1997/pin 12 and X1997/pin 15 the "OFF" function is permanently activated, i.e. activation of the ZDR functions is not possible.

MEMORY (plug connection X1997/pin 16)

+U_{Bat} -switch signal input for the resumption/storing of a speed.

Function:

If the input is wired with +U_{Bat} after the end of the pulse signal the engine runs on the ZDR S, ZDR 1, ..., ZDR 7 which can be programmed with the aid of MAN-cats II and regulates this. After changing this by e. g. "SET+" or "SET-" the new speed can be stored by wiring the input with +U_{Bat} (t≥2sec.).

The set speed is switched off, i.e. the engine goes to the idle speed (ZDR S) or the lower speed limit (ZDR 1, , ZDR 7) by "opening" the external bridge between X1997/pin 12 and X1997/pin 15; by activating the "OFF button" on the controls in the cab or in the event of switch-off conditions.

Function release:

Approx. 3.5sec. after the terminal 15 is "on" the function can be activated by wiring with +U_{Bat} (ready for operation or terminal 15 FFR) taking the above time t into account.

Caution:

The memory function is not effective until the button is "released" (edge change from "high" to "low"). The storage of a target speed changed with SET+/- is only possible in the relevant ZDR mode if the control function "active with storage" is parameterised and the FFR and the button is activated for at least 2 seconds.

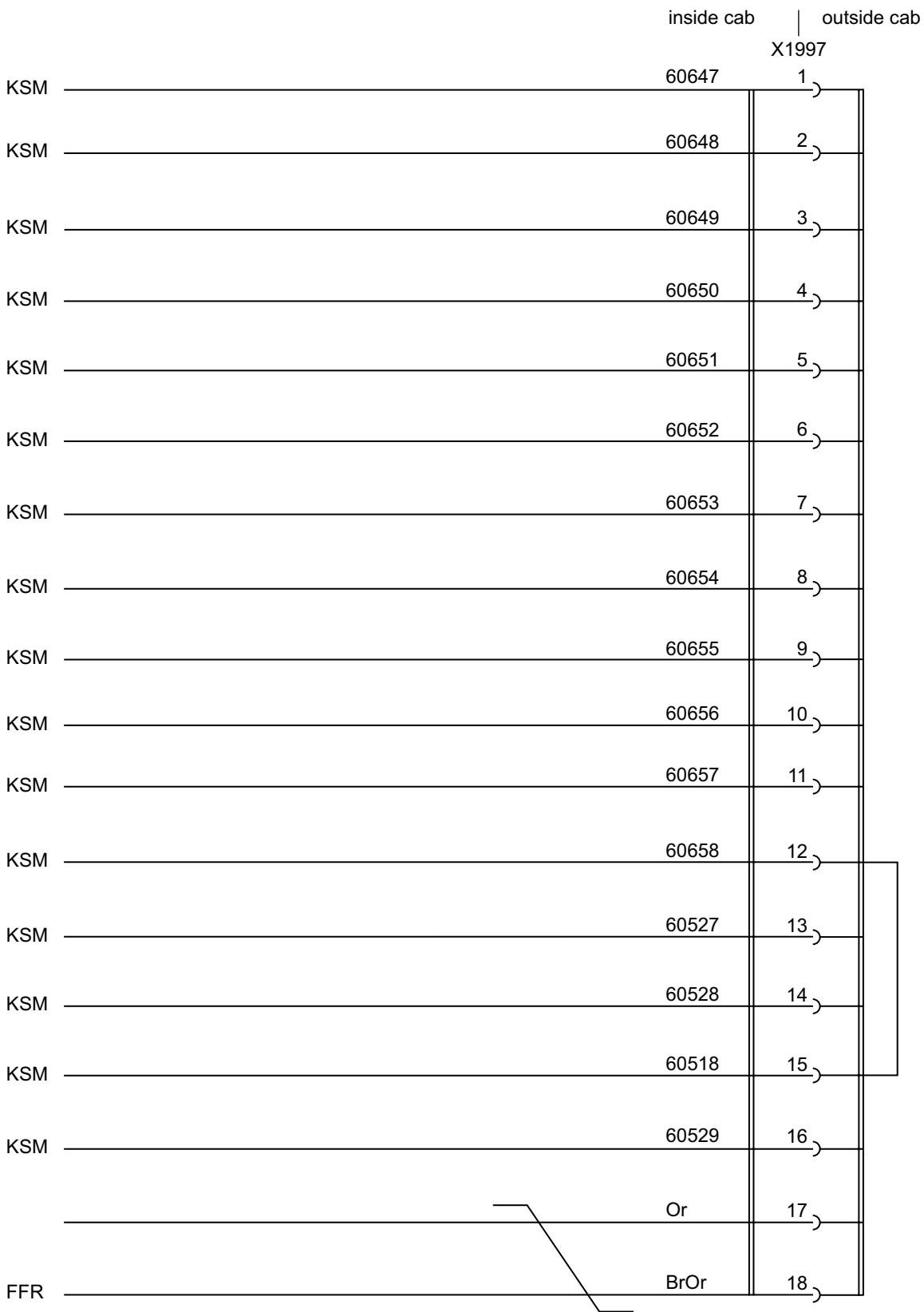
A-CAN-H (plug connection X1997/pin 17)

CAN-high line of the body-CAN interface.

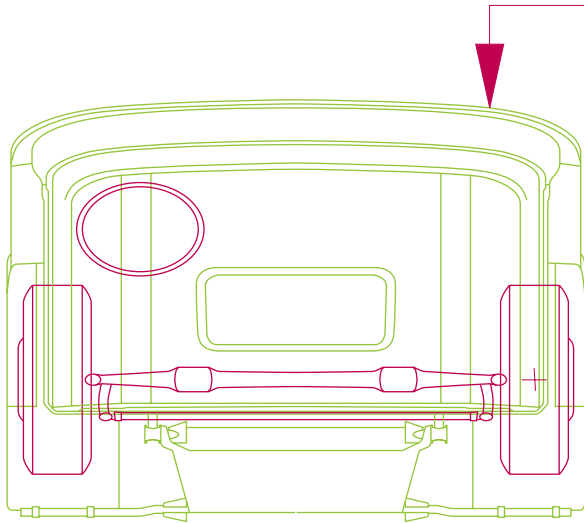
A-CAN-L (plug connection X1997/pin 18)

CAN-low line of the body-CAN interface.

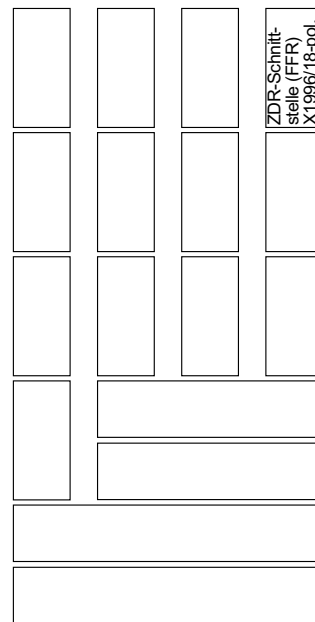
Circuit diagram on X1997



9. Interface design an installation location



view after removing the cover:



The complete interface consists of the 18-pole plug connection **X1997**. This plug designation is used on all circuit diagrams; the plug in the vehicle is marked with an appropriate colour. Access from outside by removing the cover.

Plug connection	Colour and coding:	MAN item number	
		Plug housing	Socket housing
18-pole: X1996	beige/6	81.25475.0046	81.25435.0927
Secondary lock for housing		81.25475.0065	81.25435.0913

Contacts (single items/strips)	MAN item number
Blade terminal with notch 2.8×1/0.5-1	07.91202.0848 / 07.91202.0858
Blade terminal with notch 2.8×2.5/1.5-2.5	07.91202.0849 / 07.91202.0859
Spring contact with notch 2.8×1/0.5-1	07.91201.0222 / 07.91201.0221
Spring contact with notch 2.8×2.5/1.5-2.5	07.91201.0224 / 07.91201.0223

The interface „ZDR interface with the vehicle management computer for external speed control in TG“ consists of the 18-pole plug connection **X1996** and is included in the standard extent of the vehicle.

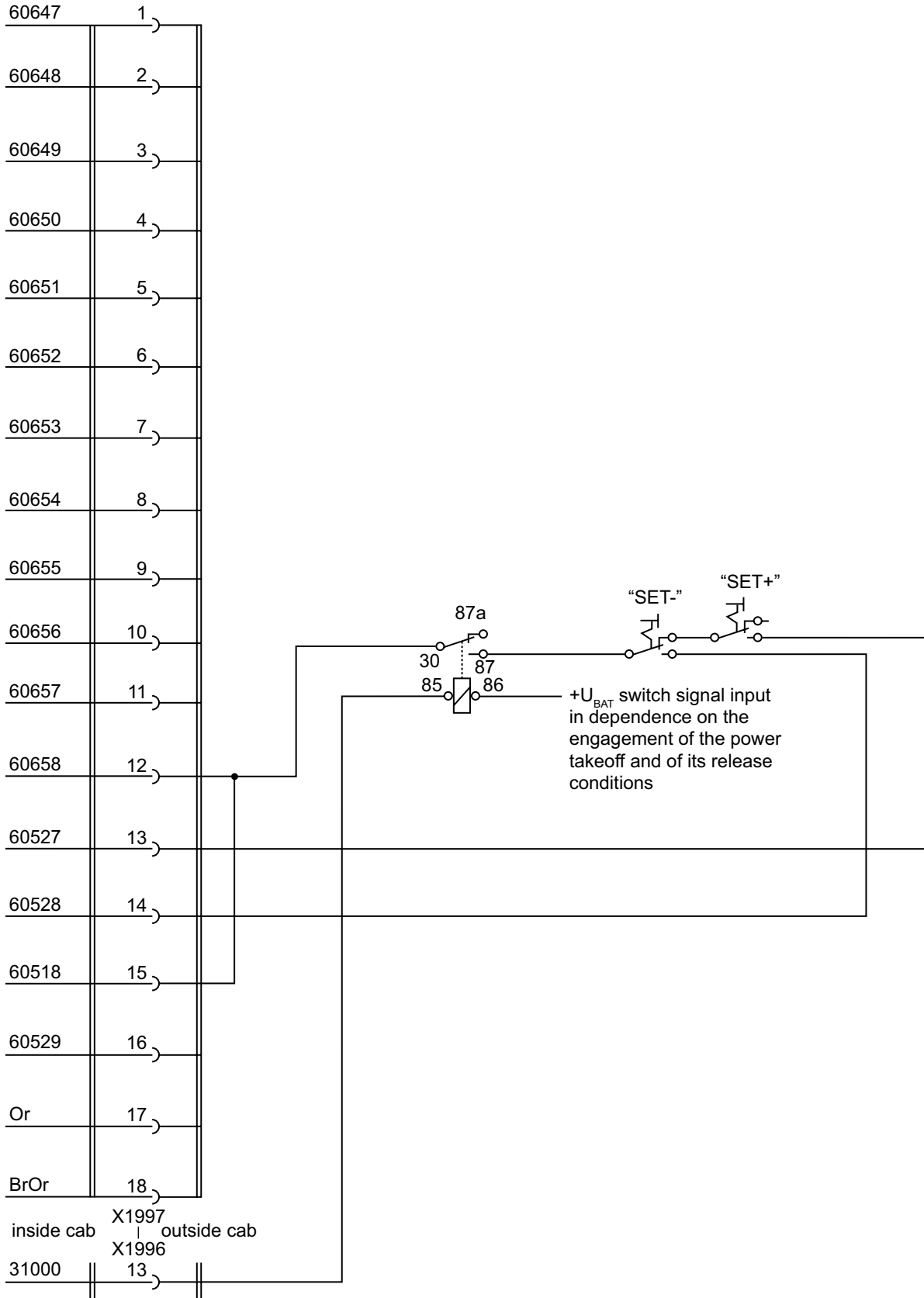
The preparation “reverse locking for refuse trucks” consists of the 6-pole plug connection **X2334** or **X679**. This plug designation is used on all circuit diagrams the plug in the vehicle is marked in the appropriate colour. Access from outside by removing the cover.

Plug connection	Colour and coding:	MAN item number	
		Plug housing	Socket housing
6-pole: X2334 or X679	blue/4	81.25435.0794	81.25435.0744
Secondary lock for housing		81.25435.0698	81.25435.0698

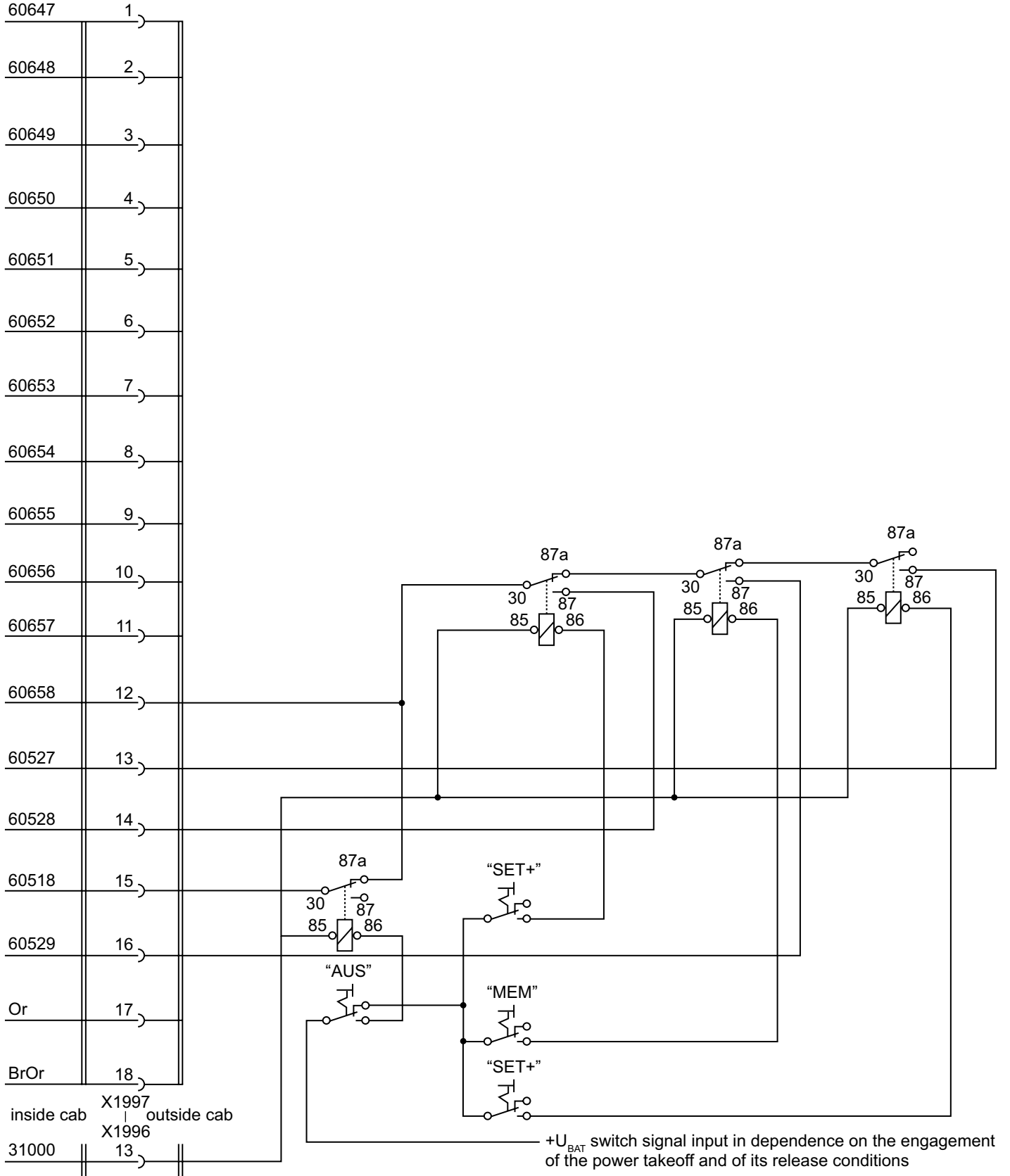
Contacts (individual ware / line ware)	MAN item number
Blade terminal with notch 2.8×1/0.5-1	07.91202.0610 / 07.91202.0830
Blade terminal with notch 2.8×2.5/1.5-2.5	07.91202.0611 / 07.91202.0831
Spring contact with notch 2.8×1/0.5-1	07.91201.0222 / 07.91201.0221
Spring contact with notch 2.8×2.5/1.5-2.5	07.91201.0224 / 07.91201.0223

10. Circuit examples

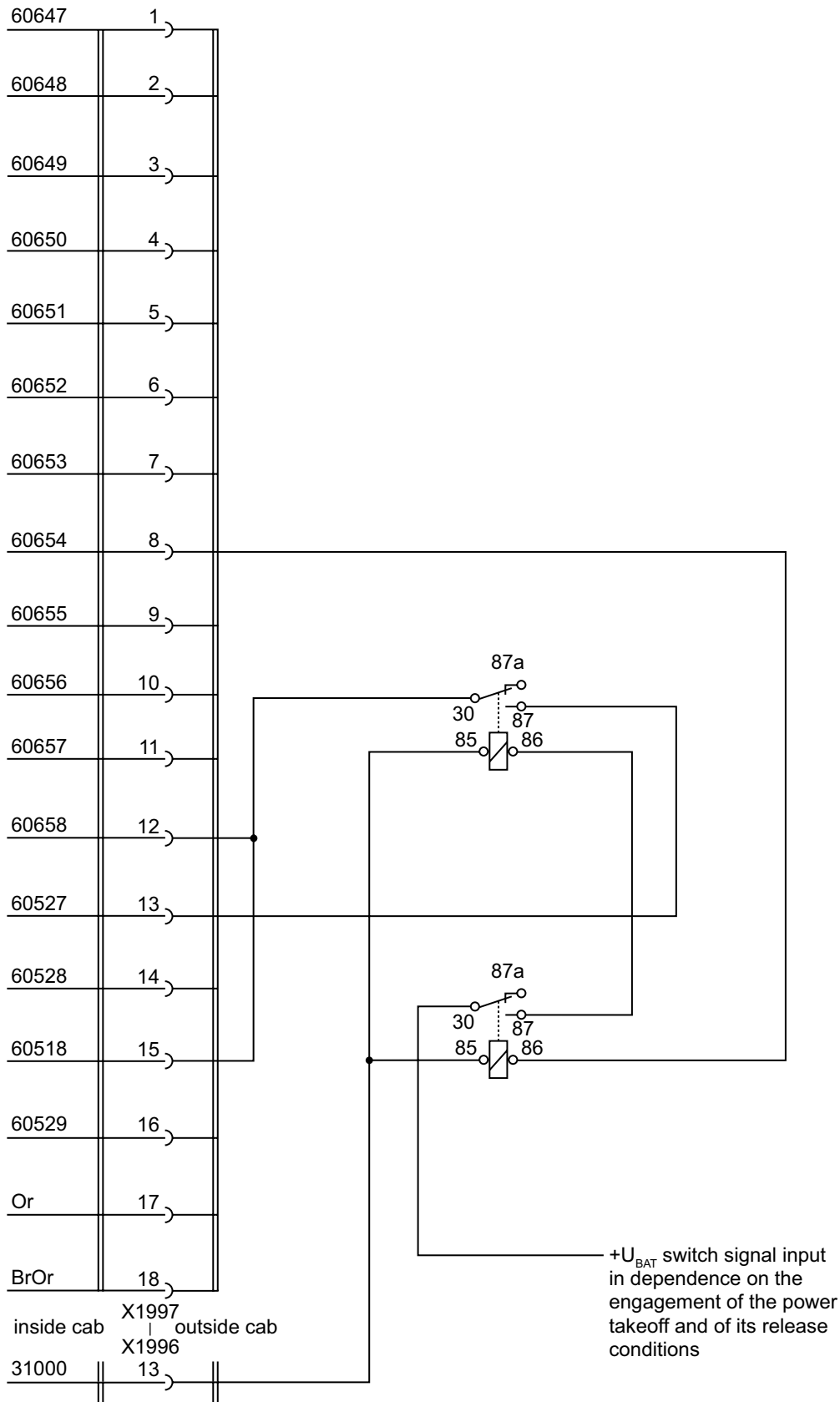
Circuit example for the speed triggering via an external control element with the functions "SET+" and "SET-"



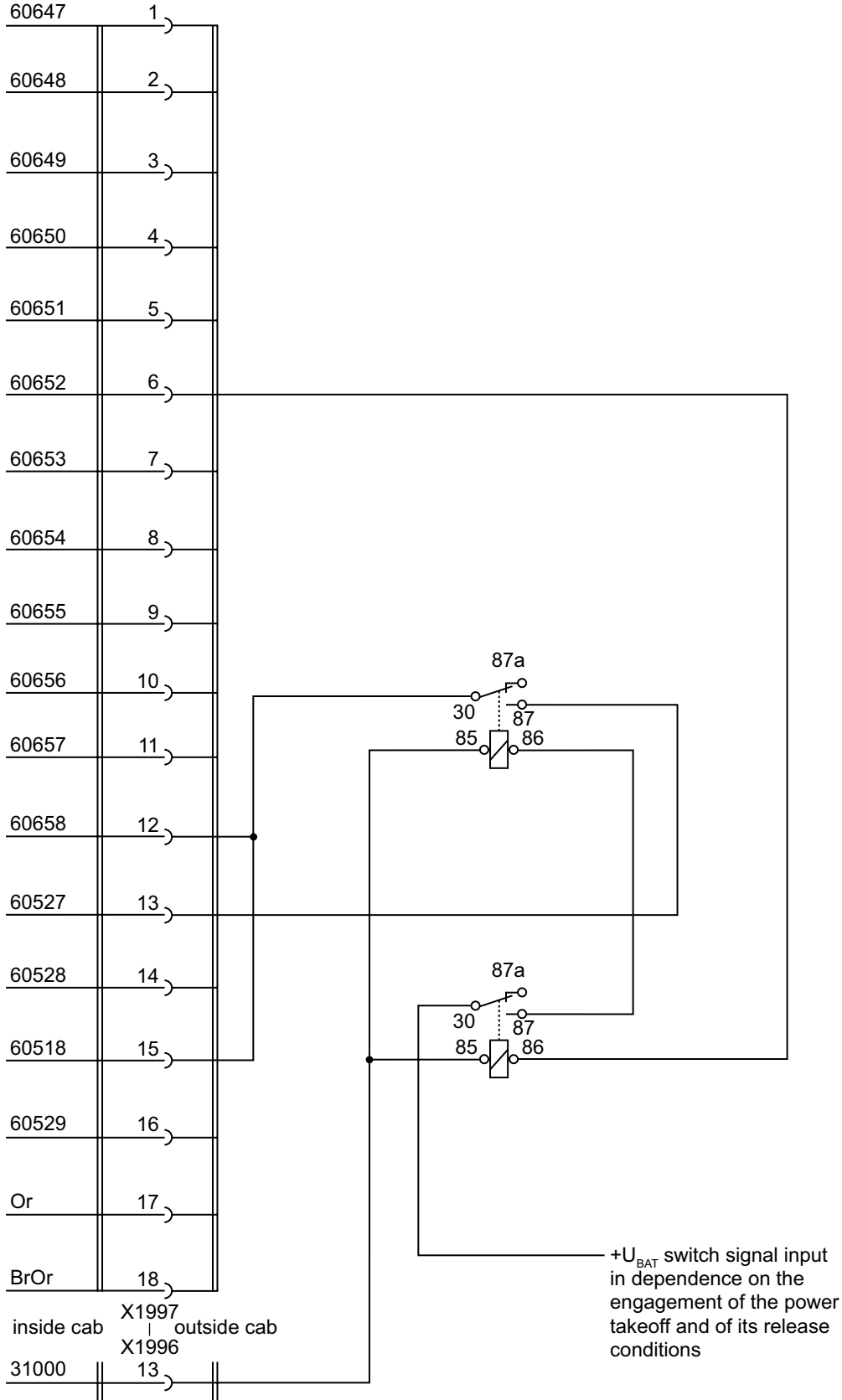
Circuit example for the speed triggering via an external control element with the functions „OFF“, „SET-“ „MEM“, and „SET+“ allocated according to priority



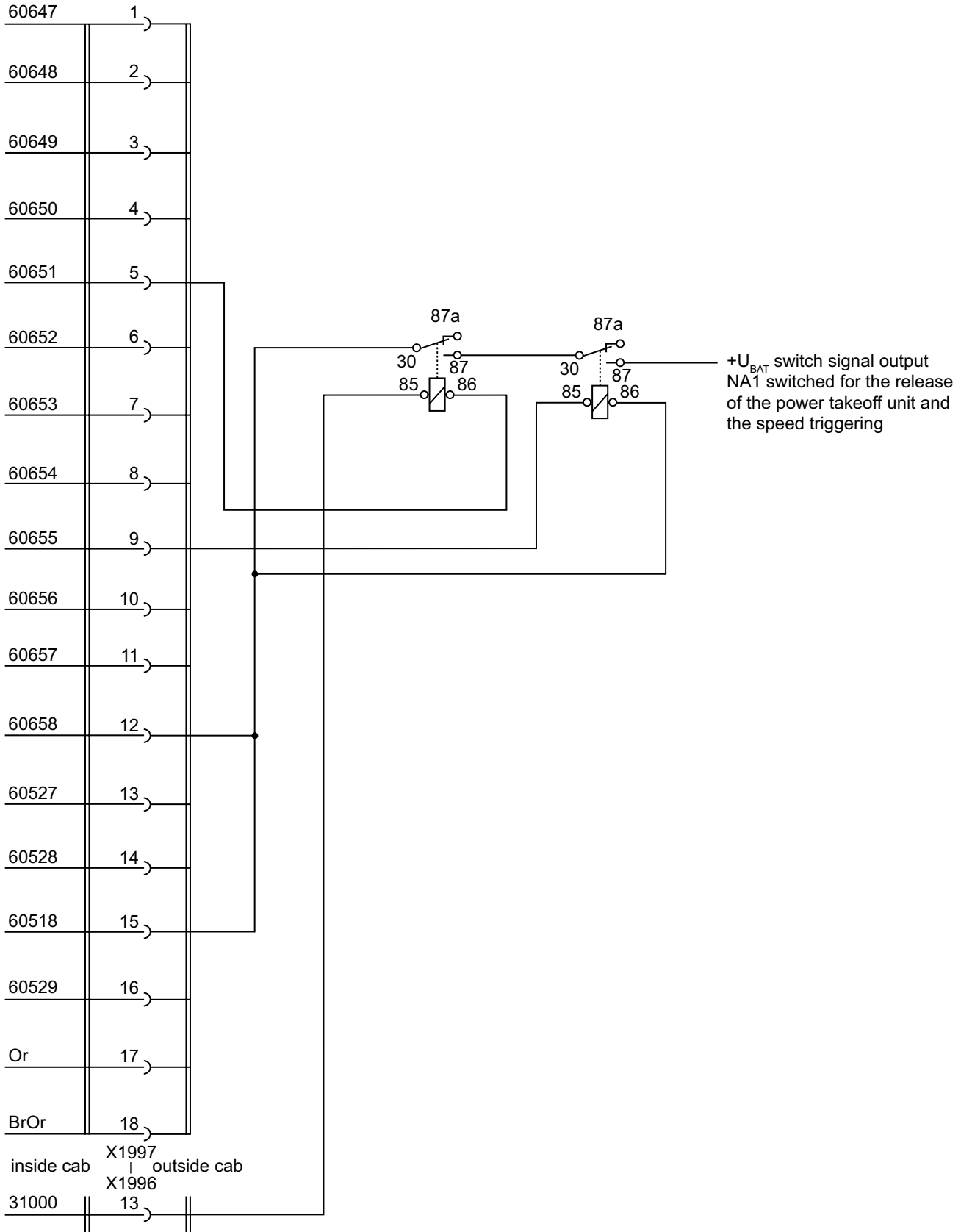
Circuit example for the triggering of an intermediate speed via the function „SET+“ in dependence on the clutch (function release) and the engagement of the power takeoff



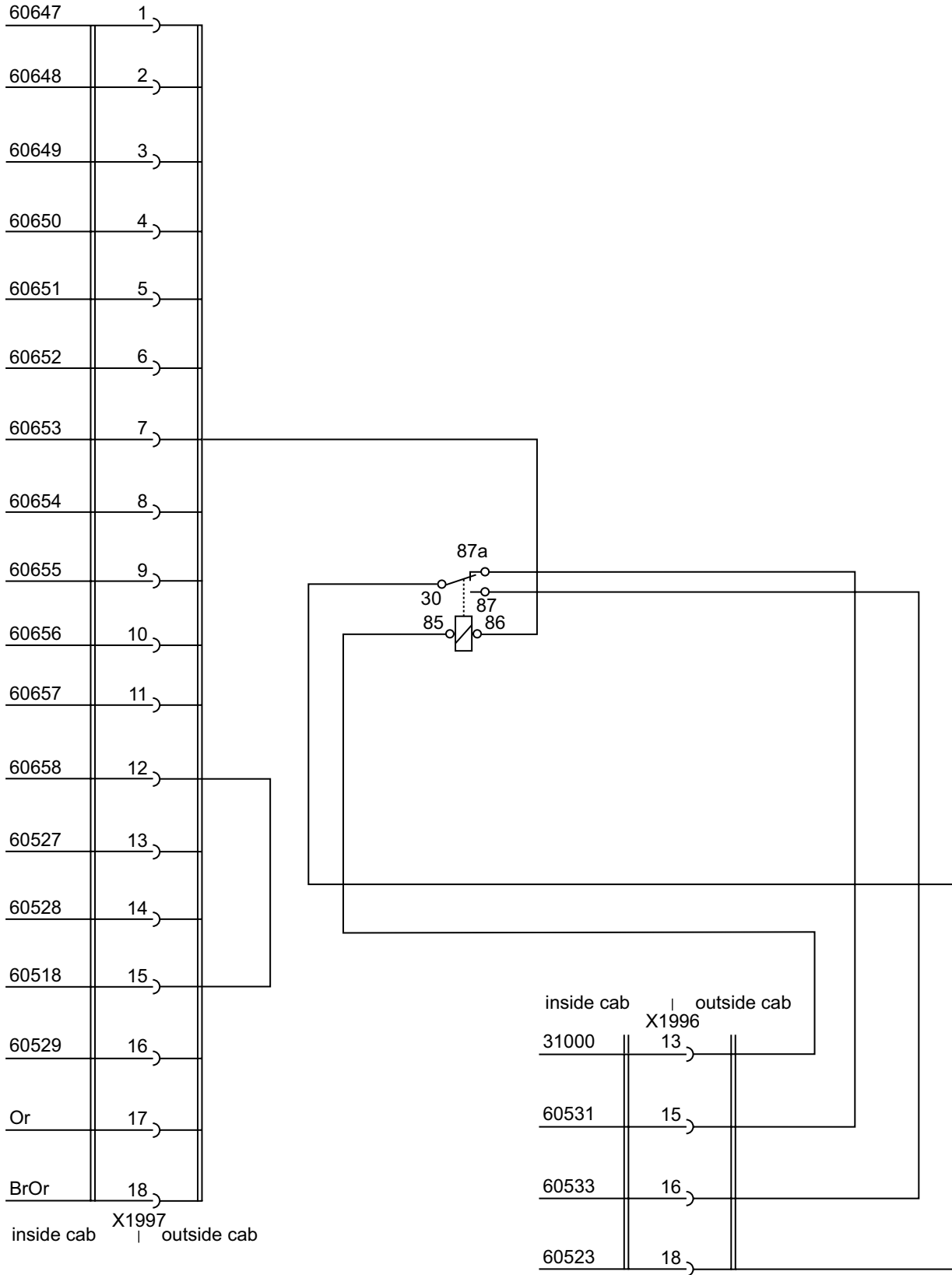
Circuit example for the triggering of an intermediate speed via the function „SET+“ in dependence on the brake (function release) and the engagement of the power takeoff



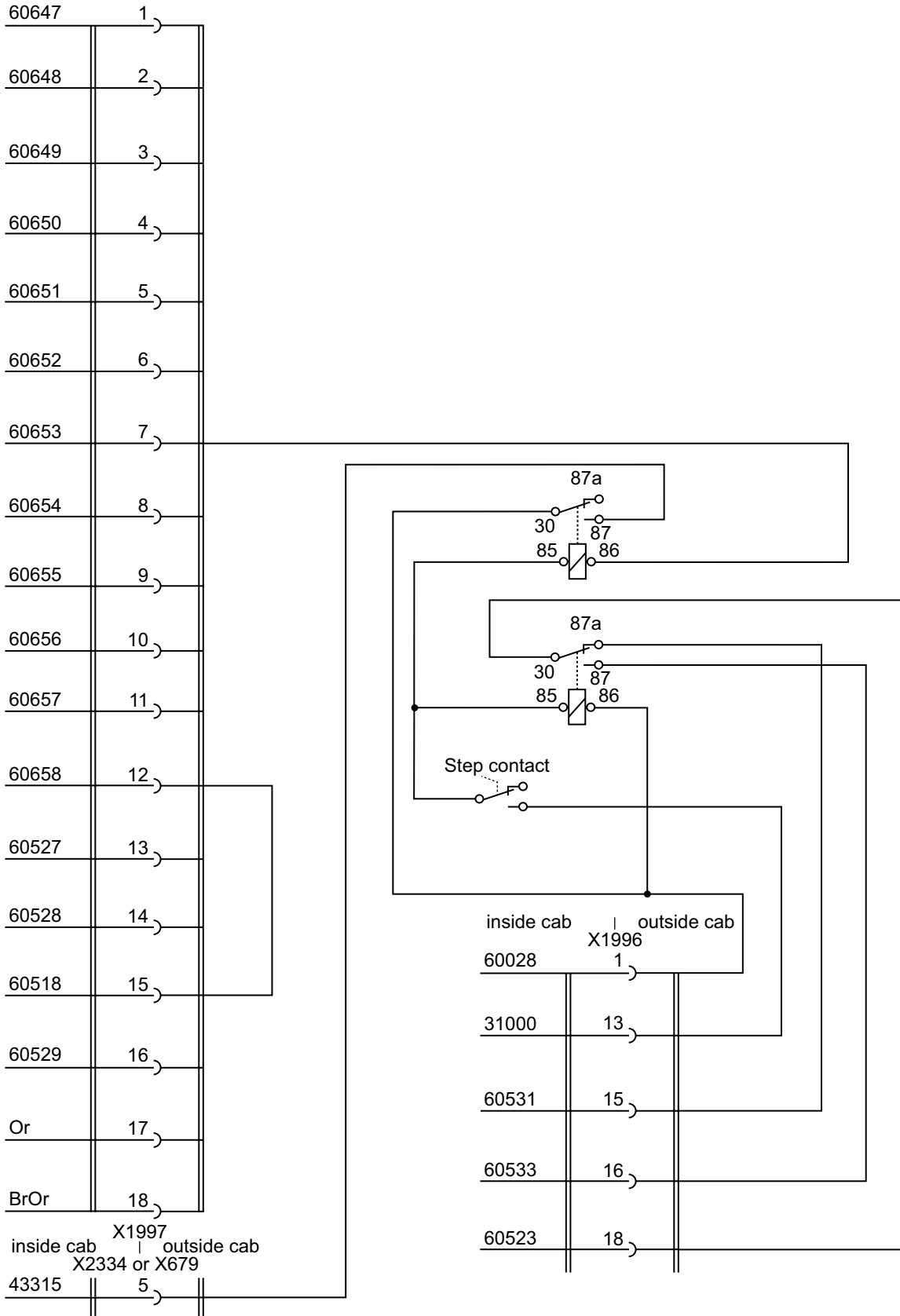
Circuit example for the release of the power take-off unit with an engine-dependent power takeoff in dependence on the engaged parking brake and the gearbox neutral position.



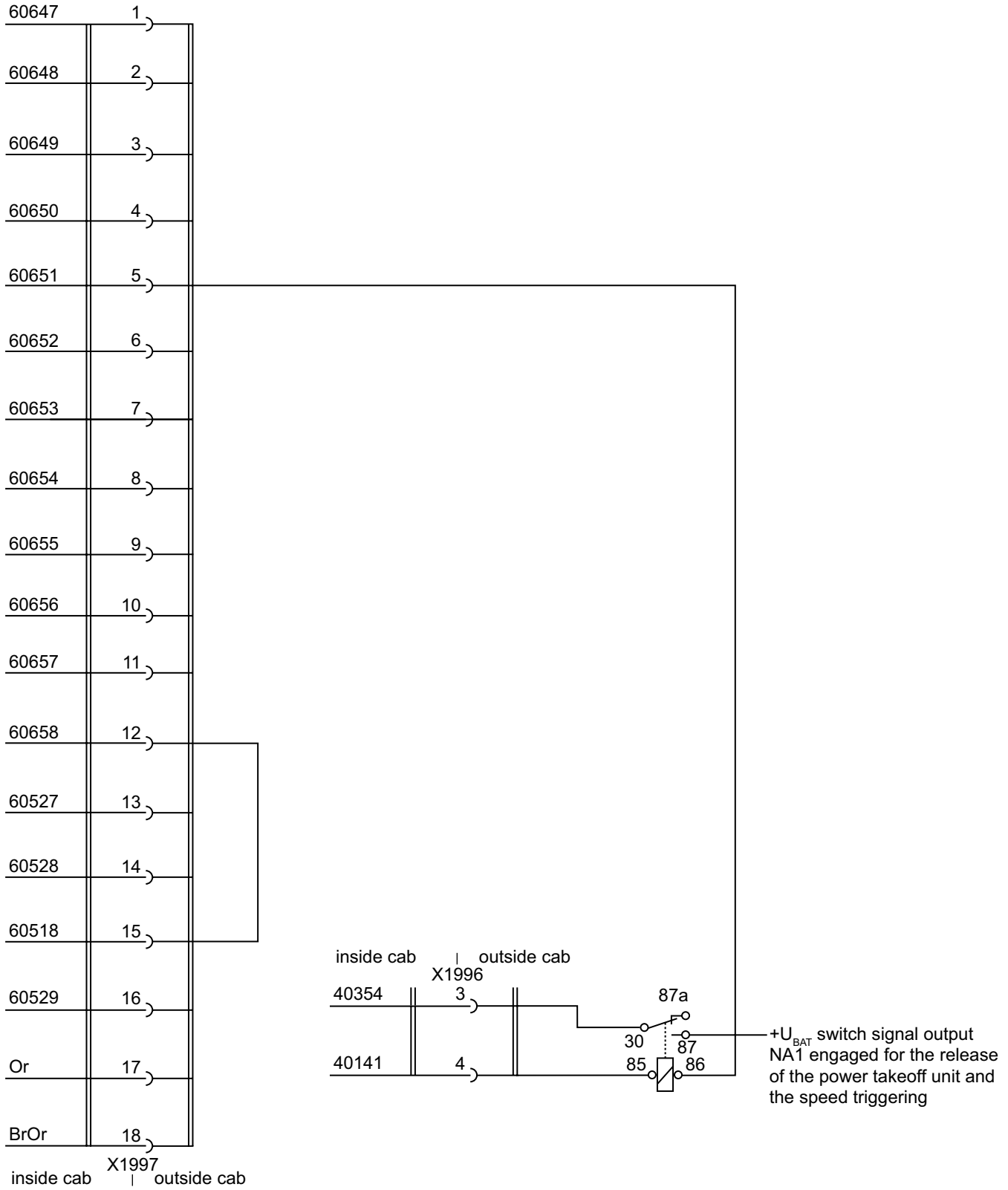
Circuit example for the maximum speed limitation 2 in dependence on the engaged reverse gear



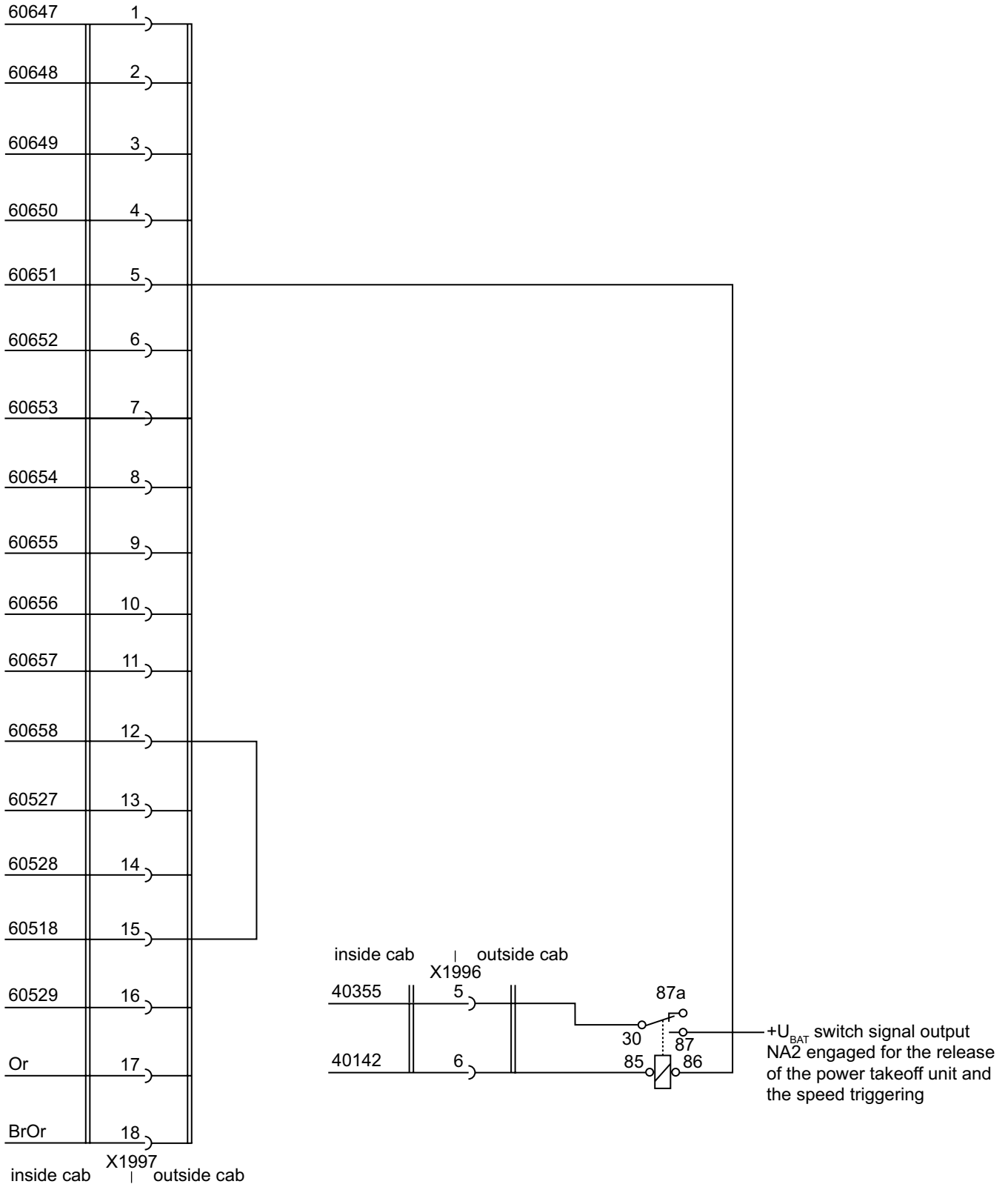
Circuit example for the maximum speed limitation 2 in dependence on an activated step contact and the activation of the reversing lock in dependence on an activated step contact and the engaged reverse gear



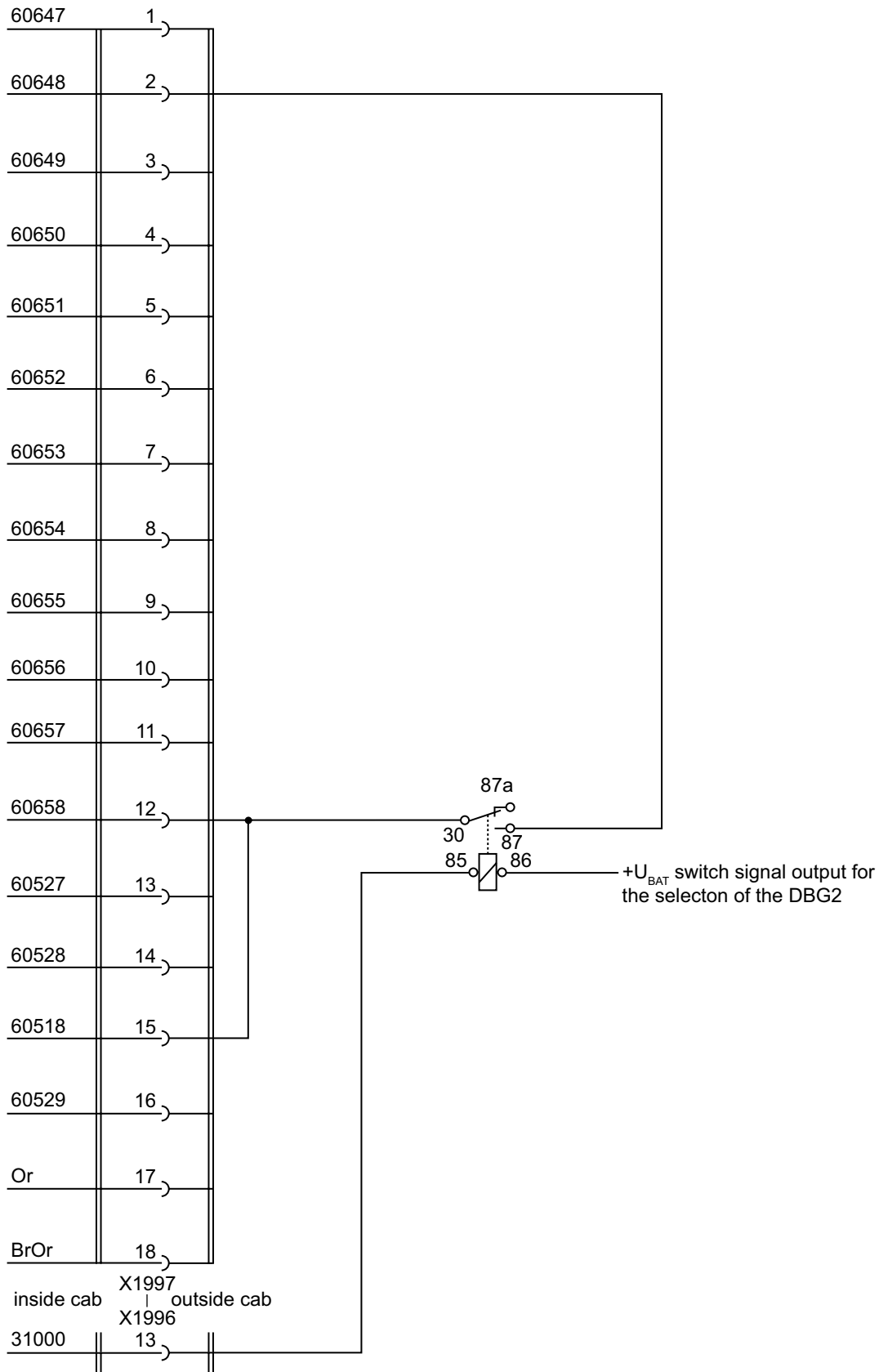
Circuit example for the release of the power takeoff unit in dependence on the engaged parking brake and the engaged NA1



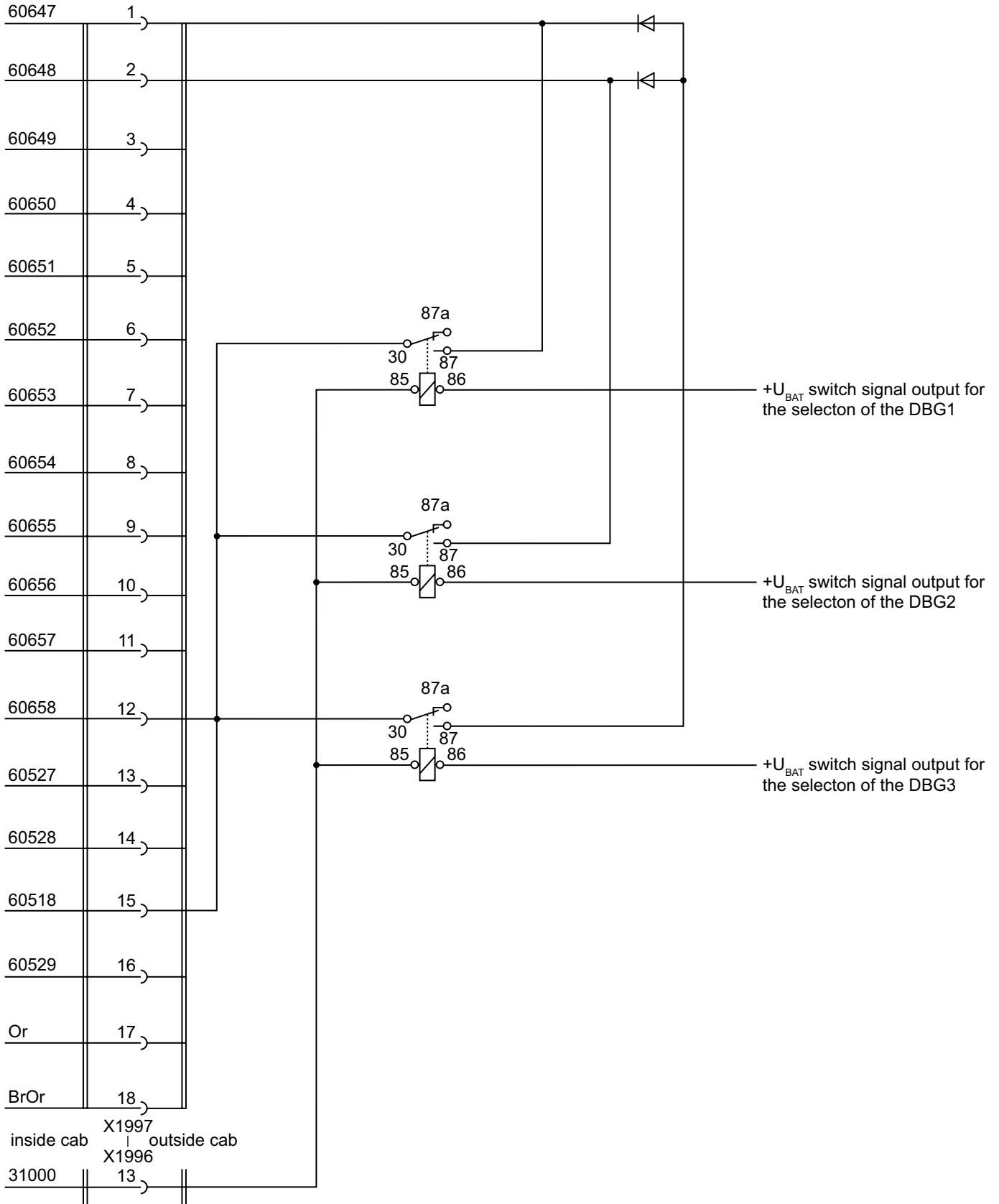
Circuit example for the release of the power takeoff unit in dependence on the engaged parking brake and the engaged NA2



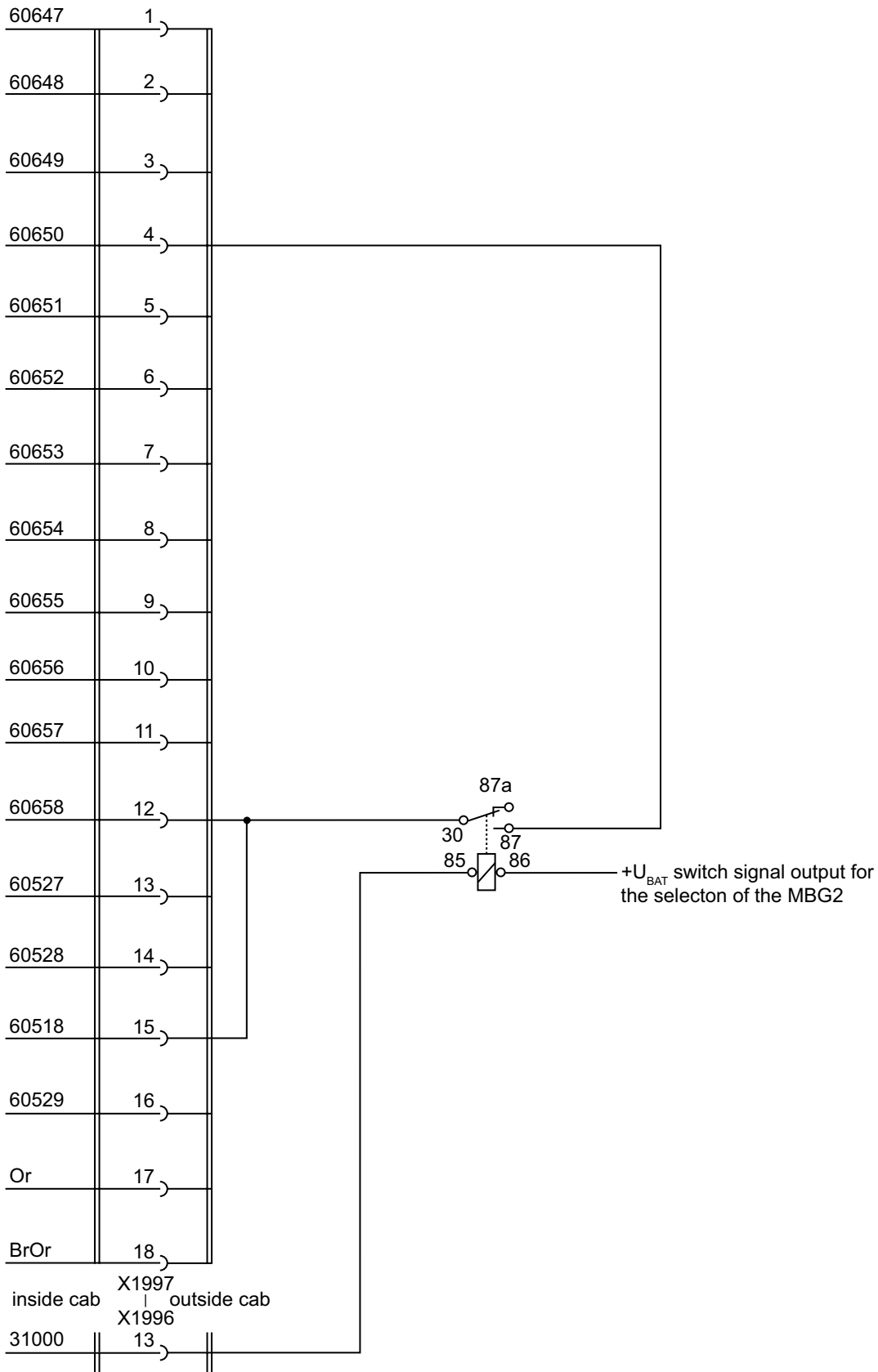
Circuit example for the activation of the speed limitation 2



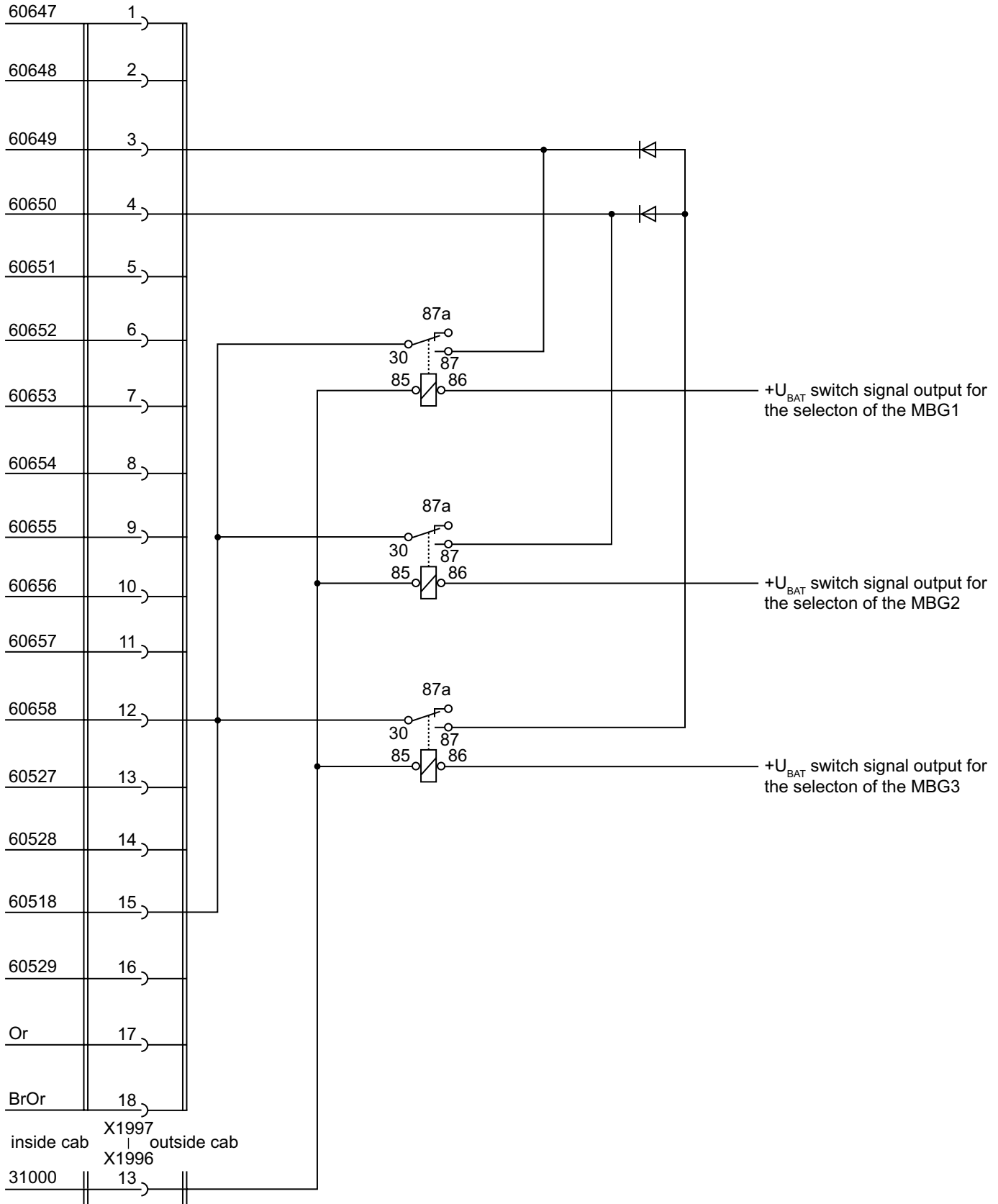
Circuit example for the activation of the speed limitations 1, 2 and 3



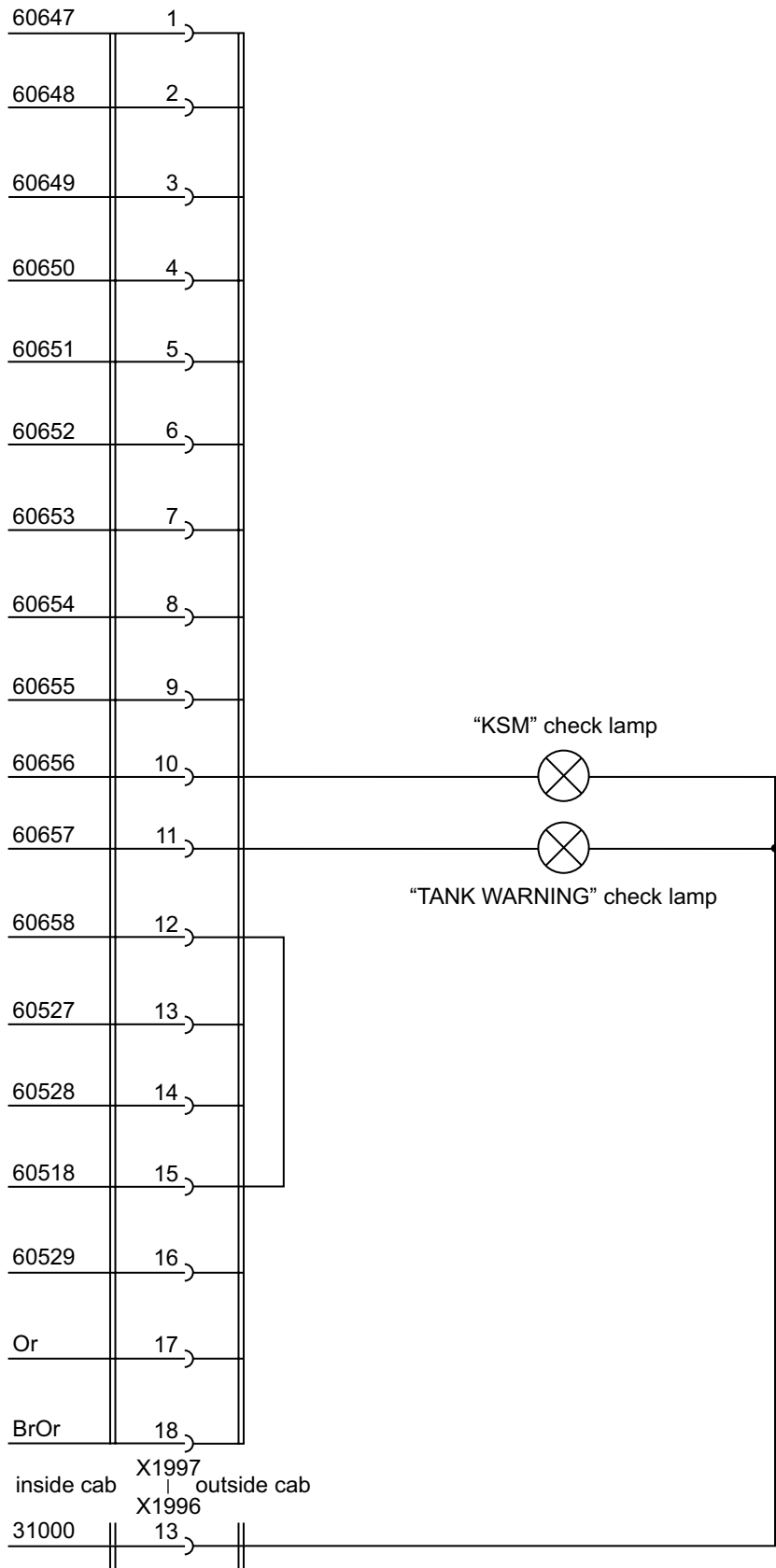
Circuit example for the activation of the torque limitation 2



Circuit example for the activation of the torque limitations 1, 2 and 3



Circuit example for the connection of the "KSM" and "TANK WARNING" check lamps



Circuit example for the connection of a body electronics with CAN interface

