
ZDR INTERFACE WITH VEHICLE MANAGEMENT COMPUTERS FOR EXTERNAL SPEED CONTROLS WITH THE TRUCKNOLOGY® GENERATION

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1. Area of application

This interface description is applicable for all body structure manufacturers who require 'external speed control' on MAN commercial vehicles. The standard interface design described here concerns 'Trucknology® Generation' (TG) vehicles.

2. Terms and abbreviations used

The following specialist terms and abbreviations are used in the PIN description:

Term/abbreviation	Explanation
AUS (in English: OFF)	Disengages FGR/FGB/ZDR functions
EMV	Electromagnetic compatibility (in German: elektromagnetische Verträglichkeit)
FGR/FGB/ZDR	Speed control/speed restriction/intermediate speed control (in German: Fahrgeschwindigkeitsregelung/Fahrgeschwindigkeitsbegrenzung/Zwischendrehzahlregelung)
FFR	Vehicle management computer (in German: Fahrzeugführungsrechner)
GETRIEBE-N (in English: GEARBOX N)	Gearbox in neutral position
HP	ZF automatic gearbox HP..
HGB	Top speed restriction (in German: Höchstgeschwindigkeitsbegrenzung)
KSM	Customer-specific control module (in German: Kundenspezifisches Steuermodul)
LED	Light emitting diode
MDB	Torque/speed restriction (in German: Moment-/Drehzahlbegrenzung)
M3135	MAN company standard (letter M + 4-digit number)
MAN-CATS II®	Computer diagnosis system of MAN workshops
MEMORY	Resumption of a stored function
NA	Power take-off (in German: Nebenabtrieb)
PIN	Plug-in contact
R-Gang	Reverse gear (in German: Rückwärtsgang)
SET+	Accelerate or increase the number of revs and set
SET-	Slow down or decrease the number of revs and set
SG	Control unit
+UBAT	Plus voltage of the batteries
-UBAT	Minus voltage of the batteries
ZDR	Intermediate speed regulation/regulator (in German: Zwischendrehzahlregelung/-regler)

3. Reference directives and standards

- Currently valid MAN guide to fitting bodies, released on the internet at www.manted.de, here in particular the booklets ,Elektrik' (in English: Electrics), 'Trucknology® Generation' and ,Schnittstellen TGA' (in English: TGA interfaces) including all supplementary information from the body manufacturers.
- MAN performance specifications – relays for commercial vehicles
- MAN standard M 3285 (EMV) as well as EU directive 72/245/EEC incl. 95/54/EEC
- MAN standard M 3135 (electrical lines)
- DIN 40 050
- DIN 40 839 Sections 1, 3 and 4
- DIN 57 879, Section 3
- VDE 0879, Section 3
- VG 95 370 to 95 377
- MIL-STO 461 and 462

4. Addresses and competencies

Sources of supply are indicated in the MAN guide to fitting HGV bodies. These are as available from:

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

MAN guides to fitting bodies are released on the internet at www.manted.de in order to ensure the latest version.

5. General information on the ZDR interface with FFR

- The interface is already included in the vehicle's standard delivery specifications.
- The required parameters in the FFR-SG such as speeds, etc. must be notified to MAN Sales on placing the order for programming at the factory. In particular, the type of body (e.g. crane, set-down system, cement pump...) must be indicated, as branch-specific designs are available ex-factory for these.
- The 'Start-Stop' facility is independent of the interface for external speed control and has to be ordered separately. The lines for an external control unit (engine start-stop) may lie rolled-up in the end of the frame, depending on the version.
- The reverse lock facility for refuse vehicles is not part of the interface and must be ordered separately.
- **The utmost care must be taken when connecting the interface, as it involves major intervention into the electrical system and into the wiring of the electronic system.**
- Only use electrical lines which conform to MAN standard M 3135.
- Only use relays which are in accordance with MAN relay performance specifications for external connection.
- Proper crimping of contacts according to contact manufacturers' instructions must be guaranteed.
- External control elements of the body must comply with protection type IP69K according to DIN 40 050 and must also be safeguarded against any inadvertent outside intervention.
- The power supply ($+U_{BAT}$) of any units and controls belonging to the body must be tapped from the batteries using separate and suitable line protection. Tapping +12 Volt at just one battery is inadmissible.
- As a ground supply, a separate cable must be laid to the common grounding point on the engine bearing (the vehicle frame should not be used as a grounding conductor!).
- Different ground potentials of the external wiring should not be connected with each other.
- **The interface wiring must be isolated from the load circuit of the control unit for the body.**
- The external wiring must meet the requirements of MAN M 3285 for commercial vehicle systems. Similarly, any radio technology systems (e.g. belonging to a radio control) of the functions described in the performance specifications should not affect commercial vehicle functions.
- If, in the case of vehicles with power take-off (German abbreviation NA), power take-off is requested via the ZDR interface, power take-off can only be deactivated by removing the switch-on signal and not by actuating the power take-off switch in the driver's cab.
- **Any examples of typical circuits issued by MAN for illustration purposes must never be taken as construction instructions. Anyone doing the interface wiring must also accept liability in this respect.**

6. Information on the intermediate speed regulator

6.1. Basic functions

The intermediate speed regulator (German abbreviation ZDR) is used to set a constantly regulated engine speed. Up to 8 different intermediate speeds can be set directly using MAN-cats II®.

- ZDR 1, ZDR 2, , ZDR 7:

These intermediate speeds are engaged by activating corresponding ZDR pins e.g. on engaging power take-off.

- ZDR S:

This intermediate speed is engaged by pressing the ‚MEMORY‘ button when none of the ZDR pins are activated. Other intermediate speeds are possible up to the ‚top speed limit‘ in the respective ZDR by engaging with ‚SET+‘ or by activating a restriction.

All intermediate speeds can – if they are activated – be manually corrected up or down within a framework determined by MAN-cats II® using the control unit. If the corresponding function is released using MAN-cats II®, the corrected speeds may be stored. If not, the value that was programmed originally is engaged again when the ZDR is engaged again.

6.2. Programming possibilities

- Within the ZDR S, 1, 2, , ZDR 7, the following functions can be programmed using MAN-cats II®:
 - Intermediate speed:
 - On activating the corresponding ZDR pins (X1996/Pin 2, 7 and 8), automatically engaged set-point speed.
 - Lower speed limit (with ZDR S, 1, 2, , ZDR 7) is set:
 - reached by actuating the ‚SET‘ button
 - Upper speed limit (with ZDR S, ZDR 1, ZDR 2, , ZDR 7) is set:
 - reached by actuating the accelerator pedal
 - reached by actuating the ‚SET+‘ button
- Control element functions
- Disengage preconditions
- Control parameter set
- Pedal movement sensor
- Maximum torque
- Automatic resumption

If engage preconditions are fulfilled and the mode is requested, the mode with the speed programmed using the memory is taken up. If a precondition is no longer met, the mode goes to the lower speed limit. If engage preconditions are fulfilled again, the mode with the speed programmed using MEMORY is engaged again automatically.

Note:

This function is only active in ZDR modes 1 to 7. In ZDR mode S, the function is inactive.

- Automatic resumption - cement pump

This function can also be requested when the engine is switched off.

After the engine has started, the mode with the lower speed limit is engaged.

Note:

This function is only active in ZDR modes 1 to 7. In ZDR mode S, the function is inactive.

- The control unit functions are ‚SET+‘, ‚SET-‘, ‚MEMORY‘ and ‚AUS‘
 - ‚SET+‘ and ‚SET-‘ allow the intermediate speed to be continually increased or reduced during actuation or gradually increased or reduced by the respectively programmed increment (standard 10rpm) by entering ($t \leq 200\text{ms}$).
 - With ‚MEMORY‘
 - with ZDR S, ZDR 1, ZDR 2, , ZDR 7 engaged after manual change, the original set-point value of the ZDR that has just been engaged is engaged again.
 - with ZDR S, ZDR 1, ZDR 2, , ZDR 7 not engaged, ZDR S is engaged, i.e. the programmed set-point value ZDR S is engaged.

- With ‚AUS‘
on vehicles produced up to 04/2001
 - with ZDR S, ZDR 1, ZDR 2, , ZDR 7 engaged, ZDR is switched off and idle speed engaged.
- on vehicles with anticipated production from 05/2001
 - with ZDR S engaged, ZDR switched off and idle speed is engaged.
 - with ZDR 1, 2 or ZDR 7 engaged, the lower speed limit of the ZDR that has just been engaged is engaged using MAN-cats II®. The ZDR is only switched off completely by removing the signal necessary for engaging, e.g. by engaging power take-off. The upper speed limit continues to remain active.
- Control unit functions ‚non-active‘, ‚active without saving‘ and ‚active with saving‘ (settable using MAN-cats II®)
 - With control unit function ‚active without saving‘, the originally programmed intermediate speed is engaged again after disengaging the ZDR and engaging it again.
 - With control unit function ‚active with saving‘, an arbitrary value within the programmed lower and upper speed limit can be selected for the set-point speed. This is saved when the ZDR is engaged, by pressing the ‚MEMORY‘ button ($t \geq 2000\text{ms}$). By hitting the ‚MEMORY‘ button or engaging the ZDR again, the saved intermediate speed is engaged.
- Disengage preconditions:
Different disengage preconditions can be parameterised for the ZDR using MAN-cats II®.
 - Disengage preconditions can be parameterised for the different functions in each case. If there is one (or several) function(s) with the correspondingly configured disengage precondition, this leads to the same status as activating the ‚AUS‘ (in English OFF) key.
Functions with programmable disengage preconditions are:
 - brake (service brake/engine brake/retarder): ‚active‘ or ‚non-active‘
 - Parking brake: ‚neutral‘ or ‚actuated‘ or ‚not actuated‘
 - Exceeding ‚speed threshold for disengaging ZDR‘
 - Gear N: ‚neutral‘ or ‚gear in neutral position‘ or ‚gear not in neutral position‘
 - Clutch: ‚neutral‘ or ‚disengaged‘ or ‚engaged‘
 - Ramp steepness for intermediate speed at ‚standard value‘ or ‚fast power-up‘
If the standard value (‚fast power-up‘) for the power-up speed (intermediate speed) is too low (high), this can be increased (reduced) by programming to ‚fast power-up‘ (‚standard value‘). Ramp steepness can also be parameterised to ‚standard‘ or ‚fast power-up‘ when the ZDR is disengaged.
 - Ramp steepness for ‚SET+‘/‚SET-‘ at ‚standard‘ or ‚fast power-up‘
If the ‚standard value‘ (‚fast power-up‘) for the power-up speed (‚SET+‘) is too low (high), this can be increased (reduced) by programming to ‚fast power-up‘ (‚standard value‘). Ramp steepness for ‚SET-‘ can also be parameterised to ‚standard‘ or ‚fast power-up‘.
- Control parameter set:
The ‚standard‘ or ‚cement pumps‘ control parameter sets can be selected for each ZDR using MAN-cats II®. If the deviation is too great in the event of load changes, this can be reduced with the ‚cement pumps‘ setting.
- Pedal movement sensor:
MAN-cats II® allows the pedal movement sensor function (with ZDR S, ZDR 1, , ZDR 7) to be programmed to ‚active‘ or ‚non-active‘ (impossible to overstep the ZDR that has been engaged using the accelerator).
- Speed thresholds for disengaging ZDR modes (with ZDR S, ZDR 1, , ZDR 7):
MAN-cats II® allows speed thresholds ‚up to 5 km/h‘ or ‚over 5 km/h‘ to be selected.
 - Speed threshold ‚up to 5 km/h‘:
is the basic setting (no preconditions)
 - Speed threshold ‚over 5 km/h‘:
can only be selected if the following precondition is fulfilled:
Disengage precondition ‚gear N‘ is programmed to ‚gear in neutral position‘. Activation of the corresponding ZDR is then only possible when the gear is in neutral position.

7. Pin description and circuit diagrams

+U_{Bat} (connector X1996/pin 1)

+U_{Bat} -switching signal outlet, same potential as FFR control unit supply (Cl.15)

Load:

max. 1.5A

Function:

Information that the FFR is supplied with Cl.15 (,ignition on').

Useful, for example, for releasing speed or power take-off functions.

ZDR 1+3+5+7 (connector X1996/pin 2)

+U_{Bat} -switch-on signal input for controlling intermediate speed 1, 3, 5 and 7.

Function:

If the input is connected with +U_{Bat}, the ,intermediate speed 1' that has been programmed using MAN-cats II® is engaged and regulated as long as +U_{Bat} is connected.

If +U_{Bat} is removed, ZDR 1 disengages and the engine returns to idling speed.

If, at the same time as ZDR 1+3+5+7, the input ZDR 2+3+6+7 (X1996/Pin 7) is also connected, the ,intermediate speed 3' that is programmable using MAN-cats II® is engaged and regulated for as long as +U_{Bat} is applied at both inputs (X1996/Pin 2 and 7).

If +U_{Bat} is removed from both inputs, ZDR 3 disengages and the engine returns to idling speed.

If, at the same time as ZDR 1+3+5+7, the input ZDR 4+5+6+7 (X1996/Pin 8) is also connected, the ,intermediate speed 5' that is programmable using MAN-cats II® is engaged and regulated for as long as +U_{Bat} is applied at both inputs (X1996/Pin 2 and 8).

If +U_{Bat} is removed from both inputs, ZDR 5 disengages and the engine returns to idling speed.

If, at the same time as ZDR 1+3+5+7, inputs ZDR 2+3+6+7 (X1996/Pin 7) and ZDR 4+5+6+7 (X1996/Pin 8) are also connected, the ,intermediate speed 7' that is programmable using MAN-cats II® is engaged and regulated for as long as +U_{Bat} is applied to the three inputs (X1996/Pin 2, 7 and 8).

If +U_{Bat} is removed from all 3 inputs, ZDR 7 disengages and the engine returns to idling speed.

Function release:

As soon as +U_{Bat} is applied after the engine has started.

NA1 (plug-in connector X1996/pin 3)

- Manual gearbox, automated gearbox or automatic gearbox (ZF-HP):
+U_{Bat} switch-on signal output. If the NA1 switch is not activated (contact open), the FFR pin is at ,low' level (digital input, 4,75kΩ pull-down, switching level $U_{low} < 2V / U_{high} > 12V$) ,NA1 request'. This pin also allows NA1 to be requested with automated gearboxes or automatic gearboxes (ZF-HP).
Only if NA1 gearshift mechanism is installed.

Load:

max. 500mA

Function:

Information that NA1 was requested or can be used for the NA1 request.

NA1 is only connected, however, if the preconditions exist that were parameterised in the FFR (using vehicle data file or MAN-cats II®), namely:

- NA1 connection only with gear N ,active'/'non-active'
- NA1 connection only with clutch engaged ,active'/'non-active'
- NA1 connection only with parking brake engaged ,active'/'non-active'
- NA1 connection only with vehicle standstill ,active'/'non-active'

Note:

- With manual gearbox, NA1 connection is only ever possible with vehicle standstill and disengaged clutch; it is not possible to alter these connection preconditions.
- With automated gearbox, NA1 connection is only ever possible with vehicle standstill and gear N; it is not possible to alter these connection preconditions.
- With automatic gearbox (ZF-HP), NA 1 connection is only ever possible at an engine = 900 rpm. Connection is not possible at a higher speed.

Useful for releasing speed functions or power take-off functions in order to prevent any undesirable outside intervention in control elements outside the driver's cab.

Note:

The NA1 gearshift mechanism is not included in the vehicle's standard delivery specification and has to be ordered separately.

NA1 LIMIT SWITCH (plug-in connector X1996/pin 4)

- Manual gearbox, automated gearbox or automatic gearbox (ZF-HP):
-U_{Bat} switch-on signal output, same potential as at the LED in switch NA1 of the limit switch with NA1 engaged.
If NA1 is not activated (contact open), the FFR pin is at ,high' level (ca. +U_{Bat}) (digital input, 4,75kΩ pull-up, switching level U_{low} <2V / U_{high} >12V), ,NA1 limit switch'.
Only if NA1 gearshift mechanism is installed.

Load:

max. 500mA

Function:

Information that the NA1 is engaged.

Useful for releasing speed functions or power take-off functions in order to prevent any undesirable outside intervention in control elements outside the driver's cab.

Note:

The NA1 gearshift mechanism is not included in the vehicle's standard delivery specification and has to be ordered separately.

NA2 (plug-in connector X1996/pin 5)

- Manual gearbox, automated gearbox or automatic gearbox (ZF-HP):
+U_{Bat} switch-on signal output. If the NA2 switch is not activated (contact open), the FFR pin is at ,low' level (digital input, 4,75kΩ pull-down, switching level U_{low} <2V / U_{high} >12V), ,NA2 request'. This pin also allows NA2 to be requested with automated gearboxes or automatic gearboxes (ZF-HP).
Only if NA2 gearshift mechanism is installed.

Load:

max. 500mA

Function:

Information that NA2 was requested or can be used for the NA2 request.

NA2 is only connected, however, if the preconditions exist that were parameterised in the FFR (using vehicle data file or MAN-cats II®), namely:

- NA2 connection only with gear N ,active'/'non-active'
- NA2 connection only with clutch engaged ,active'/'non-active'
- NA2 connection only with parking brake engaged ,active'/'non-active'
- NA2 connection only with vehicle standstill ,active'/'non-active'

Note:

- With a manual gearbox, NA1 connection is only ever possible with vehicle standstill and disengaged clutch; it is not possible to alter these connection preconditions.
- With an automated gearbox, NA1 connection is only ever possible with vehicle standstill and gear N; it is not possible to alter these connection preconditions.
- With an automatic gearbox (ZF-HP), NA 1 connection is only ever possible at an engine 900 rpm. Connection is not possible at a higher speed.

Useful for releasing speed functions or power take-off functions in order to prevent any undesirable outside intervention in control elements outside the driver's cab.

Note:

The NA2 gearshift mechanism is not included in the vehicle's standard delivery specification and has to be ordered separately.

NA2 LIMIT SWITCH (plug-in connector X1996/pin 6)

- Manual gearbox, automated gearbox or automatic gearbox (ZF-HP):
-U_{Bat} switch-on signal output, same potential as at the LED in switch NA2 of the limit switch with NA2 engaged. If NA2 is not activated (contact open), the FFR pin is at ,high' level (ca. +U_{Bat}) (digital input, 4,75kΩ pull-up, switching level U_{low} <2V / U_{high} >12V), ,NA2 limit switch'.
Only if NA2 gearshift mechanism is installed.

Load:

max. 500mA

Function:

Information that the NA2 is engaged.

Useful for releasing speed functions or power take-off functions in order to prevent any undesirable outside intervention in control elements outside the driver's cab.

Note:

The NA2 gearshift mechanism is not included in the vehicle's standard delivery specification and has to be ordered separately.

ZDR 2+3+6+7 (plug-in connector X1996/pin 7)

+U_{Bat} switch-on signal input for controlling intermediate speed 2, 3, 6 and 7.

Function:

If the input is connected with +U_{Bat}, the ,intermediate speed 2' that has been programmed using MAN-cats II® is engaged and regulated as long as +U_{Bat} is connected.

If +U_{Bat} is removed, ZDR 2 disengages and the engine returns to idling speed.

If, at the same time as ZDR 2+3+6+7, the input ZDR 1+3+5+7 (X1996/Pin 2) is also connected, the ,intermediate speed 3' that is programmable using MAN-cats II® is engaged and regulated for as long as +U_{Bat} is applied at both inputs (X1996/Pin 2 and 7).

If +U_{Bat} is removed from both inputs, ZDR 3 disengages and the engine returns to idling speed.

If, at the same time as ZDR 2+3+6+7, the input ZDR 4+5+6+7 (X1996/Pin 8) is also connected, the ,intermediate speed 6' that is programmable using MAN-cats II® is engaged and regulated for as long as +U_{Bat} is applied at both inputs (X1996/Pin 7 and 8).

If +U_{Bat} is removed from both inputs, ZDR 6 disengages and the engine returns to idling speed.

If, at the same time as ZDR 2+3+6+7, inputs ZDR 1+3+5+7 (X1996/Pin 2) and ZDR 4+5+6+7 (X1996/Pin 8) are also connected, the ,intermediate speed 7' that is programmable using MAN-cats II® is engaged and regulated for as long as +U_{Bat} is applied to the three inputs (X1996/Pin 2, 7 and 8).

If +U_{Bat} is removed from all inputs, ZDR 7 disengages and the engine returns to idling speed.

Function release:

As soon as +U_{Bat} is applied after the engine has started.

ZDR 4+5+6+7 (plug-in connector X1996/pin 8)

+U_{Bat} switch-on signal input for controlling intermediate speed 4, 5, 6 and 7.

Function:

If the input is connected with +U_{Bat}, the 'intermediate speed 4' that has been programmed using MAN-cats II® is engaged and regulated as long as +U_{Bat} is connected.

If +U_{Bat} is removed, ZDR 4 disengages and the engine returns to idling speed.

If, at the same time as ZDR 4+5+6+7, the input ZDR 1+3+5+7 (X1996/Pin 2) is also connected, the 'intermediate speed 5' that is programmable using MAN-cats II® is engaged and regulated for as long as +U_{Bat} is applied at both inputs (X1996/Pin 2 and 8).

If +U_{Bat} is removed from both inputs, ZDR 5 disengages and the engine returns to idling speed.

If, at the same time as ZDR 4+5+6+7, the input ZDR 2+3+6+7 (X1996/Pin 7) is also connected, the 'intermediate speed 6' that is programmable using MAN-cats II® is engaged and regulated for as long as +U_{Bat} is applied at both inputs (X1996/Pin 7 and 8).

If +U_{Bat} is removed from both inputs, ZDR 6 disengages and the engine returns to idling speed.

If, at the same time as ZDR 4+5+6+7, inputs ZDR 1+3+5+7 (X1996/Pin 2) and ZDR 4+5+6+7 (X1996/Pin 7) are also connected, the 'intermediate speed 7' that is programmable using MAN-cats II® is engaged and regulated for as long as +U_{Bat} is applied to the three inputs (X1996/Pin 2, 7 and 8).

If +U_{Bat} is removed from all 3 inputs, ZDR 7 disengages and the engine returns to idling speed.

Function release:

As soon as +U_{Bat} is applied after the engine has started.

MDB INPUT (plug-in connector X1996/pin 9)

Resistance-coded switching signal input for connecting different torque/speed characteristics.

Function:

Through connecting the input with the standard external bridge (between X1996/Pin9 and 12), the torque/speed characteristic 0' (drive characteristic) is activated.

If the 'torque/speed characteristic 1' (limited drive characteristic 1) is required, this must be activated by switching (switches, relays, etc.) from MDB switching signal output 0 (X1996/Pin 12) to MDB-switching signal output 1 (X1996/Pin 11).

If the 'torque/speed characteristic 2' (limited drive characteristic 2) is required, this must be activated by switching (switches, relays, etc.) from MDB switching signal output 0 (X1996/Pin 12) to MDB-switching signal output 2 (X1996/Pin 10).

Function release:

Immediately after activation

Note:

If the input remains unused for longer than 1 second or if a false or implausible signal is applied, this leads to an error entry in the FFR control unit.

MDB 2 (plug-in connector X1996/pin 10)

Resistance-coded switching signal output for switching ,torque/speed characteristic 2' (limited drive characteristic 2; standard: speed restriction of the drive characteristic).

Function:

If the MDB switching signal input (X1996/Pin 9) is connected with this signal, ,torque/speed characteristic 2' (limited drive characteristic 2) is activated. By activating the restricted drive characteristic 2, the drive characteristic is limited to speed restriction 2 which is programmable using MAN-cats II®.

Factory setting:

1350 rpm at 100% torque

MDB 1 (plug-in connector X1996/pin 11)

Resistance-coded switching signal output for connecting ,torque/speed characteristic 1' (restricted drive characteristic 1; standard: speed restriction of the drive characteristic).

Function:

If the MDB switching signal input (X1996/Pin 9) is connected with this signal, ,torque/speed characteristic 1' (limited drive characteristic 1) is activated. By activating the restricted drive characteristic 1, the drive characteristic is limited to speed restriction 1 which is programmable using MAN-cats II®.

Factory setting:

1650 rpm at 100% torque

MDB 0 (plug-in connector X1996/pin 12)

Resistance-coded switching signal output for connecting ,torque/speed characteristic 0' (drive characteristic).

Function:

If the MDB switching signal input (X1996/Pin 9) is connected with this signal, ,torque/speed characteristic 0' (drive characteristic) is activated.

Factory setting:

No restriction

EARTH (plug-in connector X1996/pin 13)

-U_{Bat} (earth) signal output, vehicle earth, same potential as the earth interpolation point on the central electrics system in the driver's cab.

Load:

max. 1.5 A

Function:

Earth supply for the required relays of the external connection

SPEED SIGNAL (plug-in connector X1996/pin 14)

Square-wave pulses with pulse duty factor 50:50. The angular momentum (number of pulses per revolution), the pulse duty factor as well as a speed threshold from which the signal is output are programmable using MAN-cats II®.

Load:

200mA; low-side driver

Function:

Speed information.

Useful for external control in order, for example, to be able to set a specific speed ,SET+' or ,SET-' or for use as a release signal for a unit belonging to the body.

Note:

The engine speed signal is not included in the standard delivery scope of the interface. Only possible with built-in KSM!

HGB 1 (plug-in connector X1996/pin 15)

Resistance-coded switching signal output for connecting ,maximum speed limit 1‘.

Function:

If the HGB switching signal input (X1996/Pin 18) is connected with this signal, the maximum speed is limited to the ,maximum speed limit 1‘ that is programmable using MAN-cats II®.

HGB 2 (plug-in connector X1996/pin 16)

Resistance-coded switching signal output for connecting ,maximum speed limit 2‘.

Function:

If the HGB switching signal input (X1996/Pin 18) is connected with this signal, the maximum speed is limited to the ,maximum speed limit 2‘ that is programmable using MAN-cats II®.

HGB 3 (plug-in connector X1996/pin 17)

Resistance-coded switching signal output for connecting ,maximum speed limit 3‘.

Function:

If the HGB switching signal input (X1996/Pin 18) is connected with this signal, the maximum speed is limited to the ,maximum speed limit 3‘ that is programmable using MAN-cats II®.

HGB INPUT (plug-in connector X1996/pin 18)

Resistance-coded switching signal input for connecting different maximum speed limits.

Function:

By connecting the input with the standard external bridge (between X1996/Pin18 and 15), the ,maximum speed limit 1‘ (programmable using MAN-cats II®) is activated.

If ,maximum speed limit 2‘ (programmable using MAN-cats II®) is required, this must be activated by switching (switches, relays, etc.) from HGB switching signal output 1 (X1996/Pin 15) to HGB-switching signal output 2 (X1996/Pin 16).

If ,maximum speed limit 3‘ (programmable using MAN-cats II®) is required, this must be activated by switching (switches, relays, etc.) from HGB switching signal output 1 (X1996/Pin 15) to HGB-switching signal output 3 (X1996/Pin 17).

Function release:

Immediately after activation

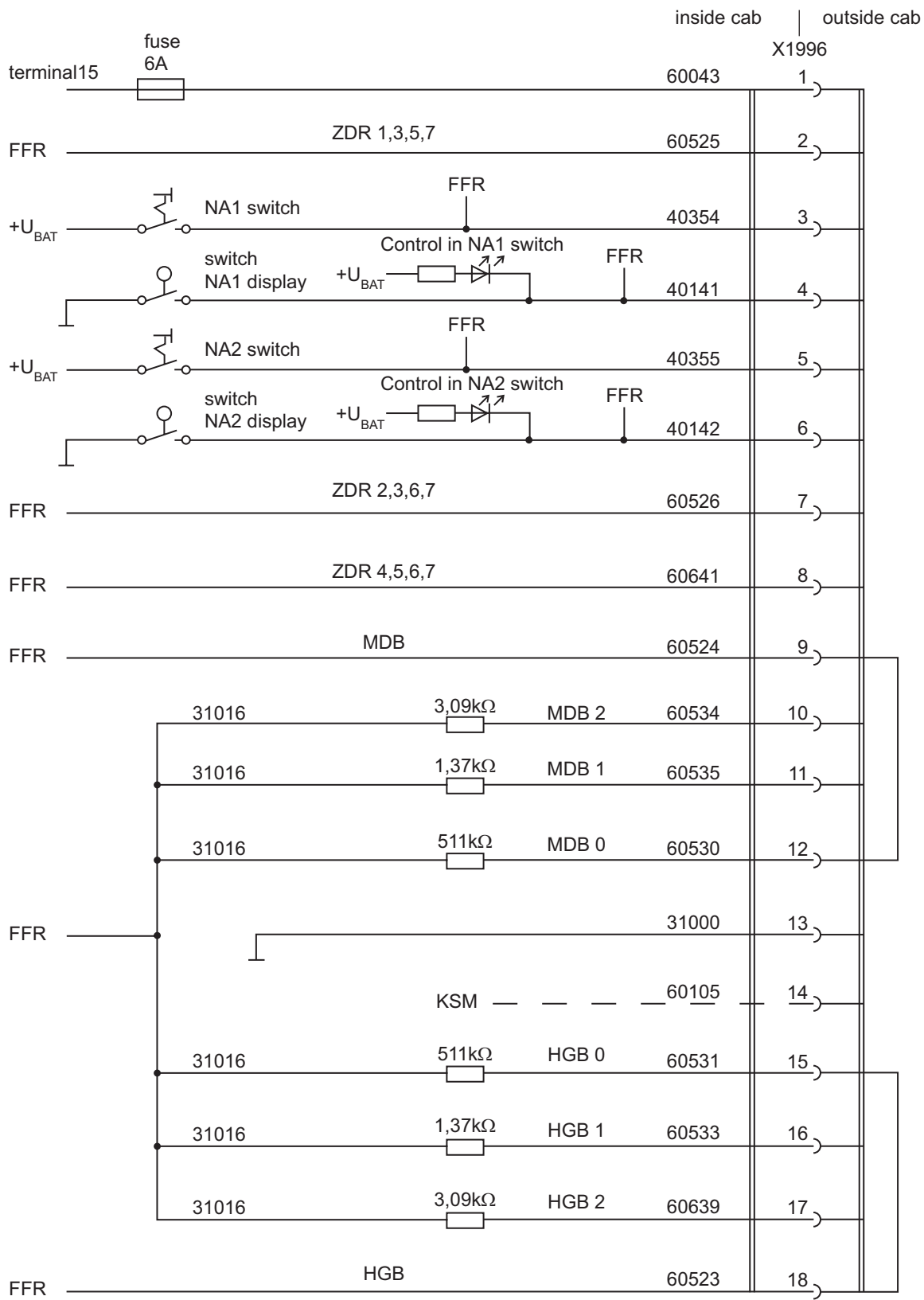
Note:

If the input remains unused for longer than 1 second or if a false or implausible signal is applied, this leads to an error entry in the FFR control unit.

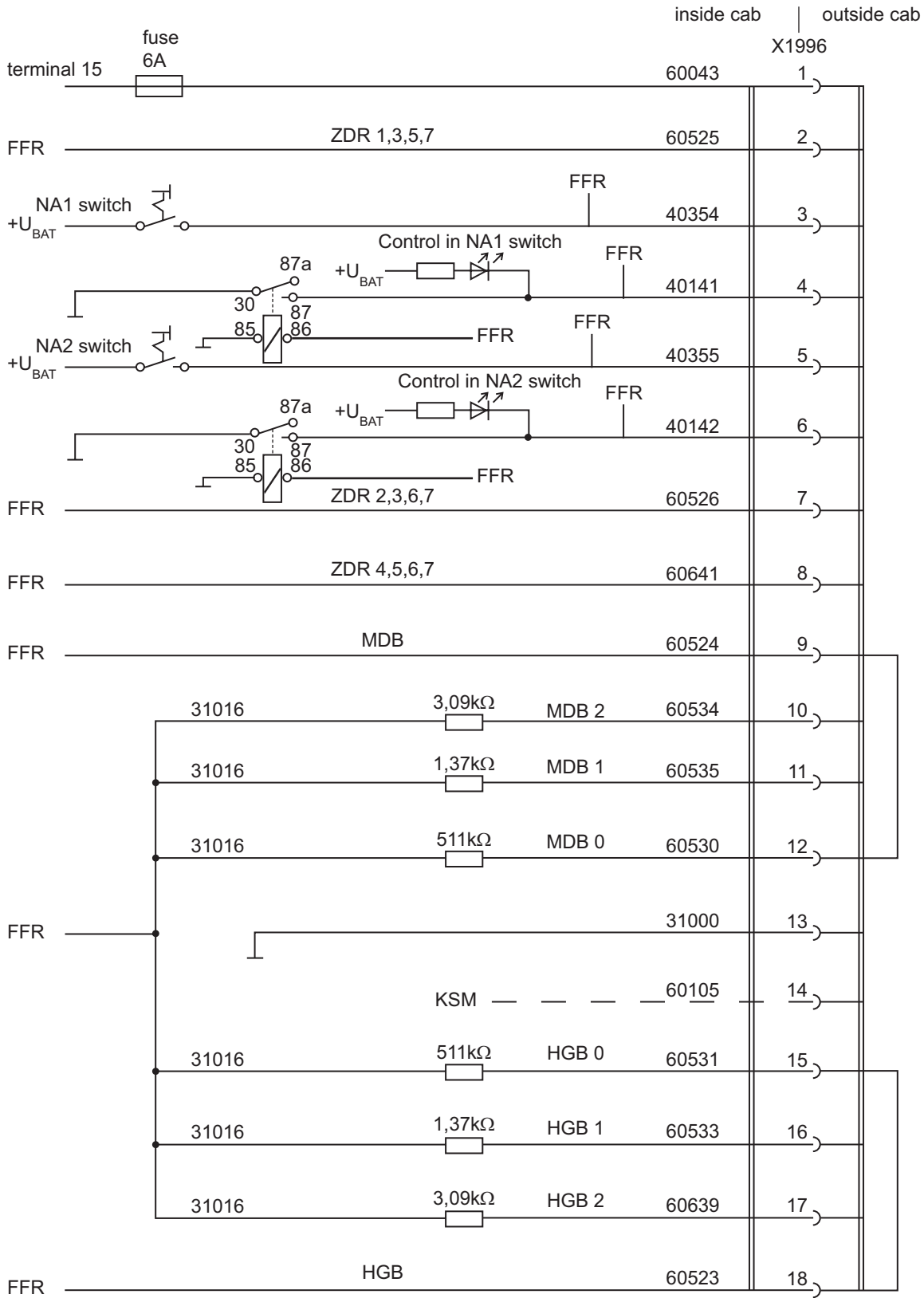
The HGB limits described here do not relate to the statutorily prescribed maximum speed limit for vehicles but to restrictions that are technically necessary, for example, in connection with controlling the body, e.g. using power take-up.

HGB 1, 2 or 3 are only active with forward drive.

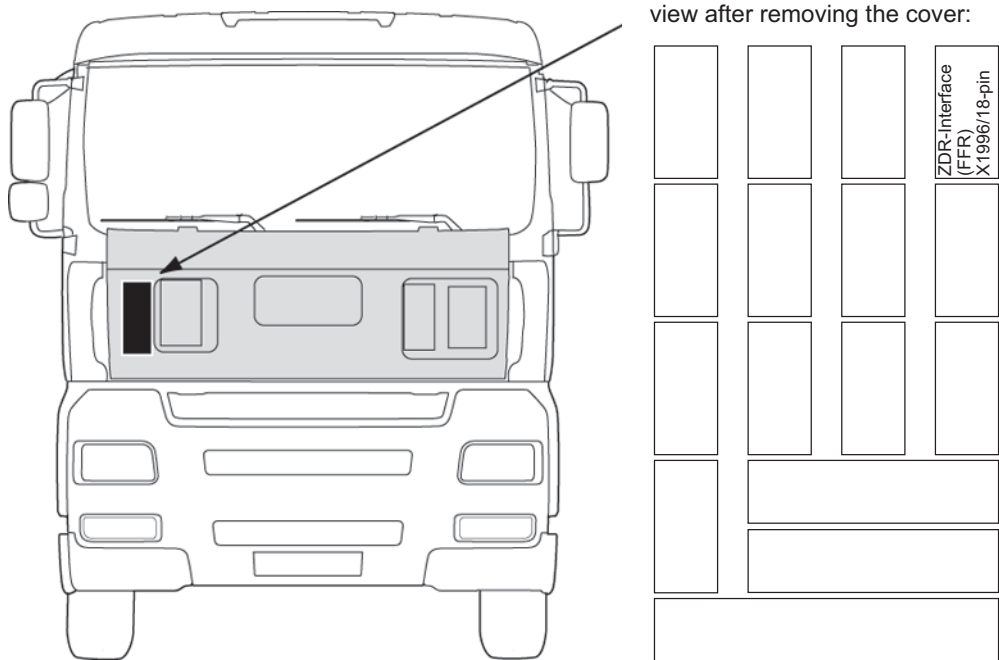
Circuit diagram for X1996 with manual gearbox or automated gearbox



Circuit diagram for X1996 with automatic gearbox (ZF-HP)



8. List of interfaces and sites



The complete interface consists of the 18-pin plug-in connector **X1996**.

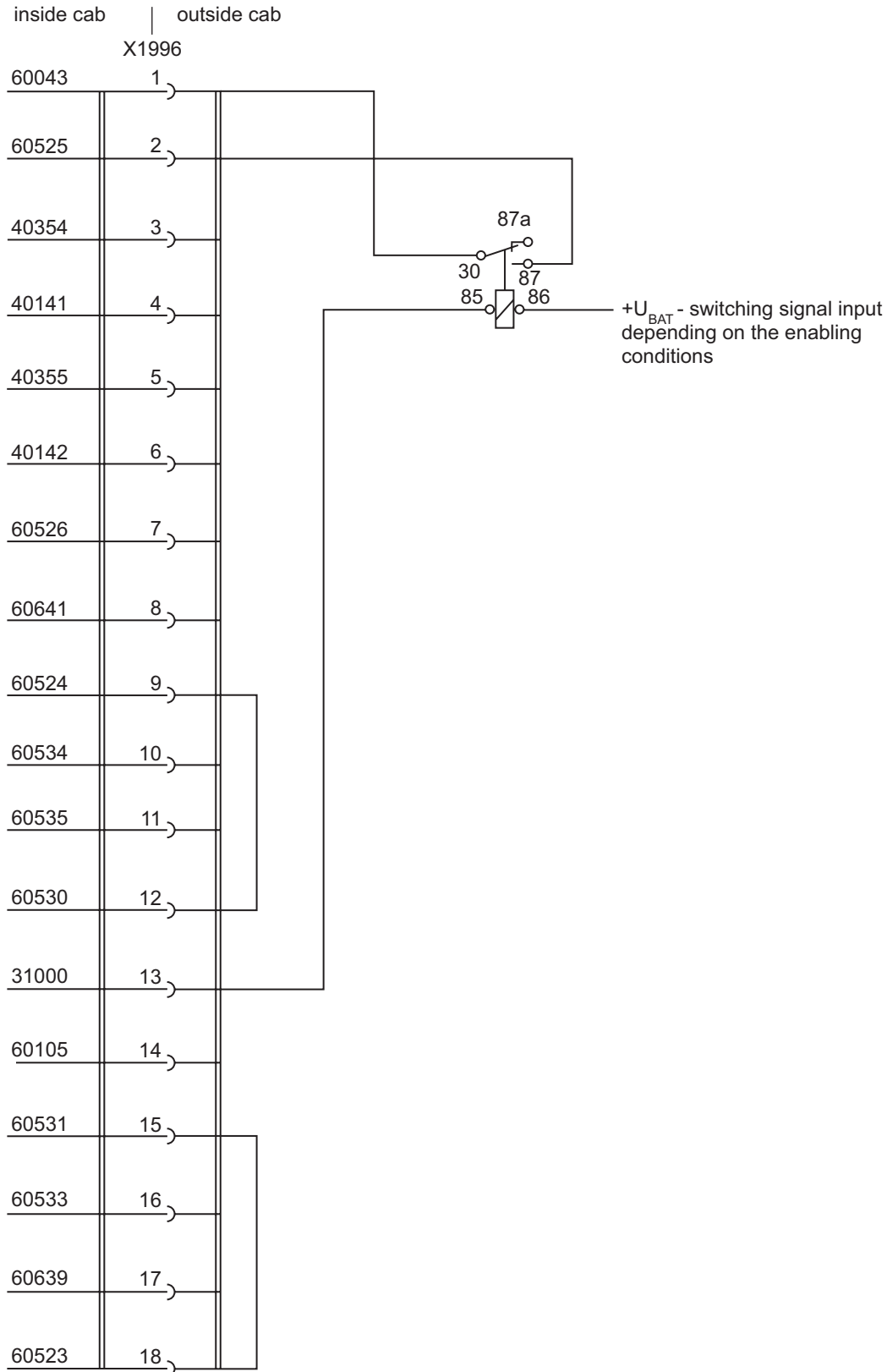
This connector description is used on all circuit diagrams, the connector in the driver's cab is colour-coded accordingly. Access from outside by removing the cover.

Plug-in connection	Colour and coding	MAN part no.	
		Connector housing	Bushing housing
18-pin	natural/4	81.25475.0044	81.25435.0925
X1996			
Secondary locking for housing		81.25475.0065	81.25435.0913

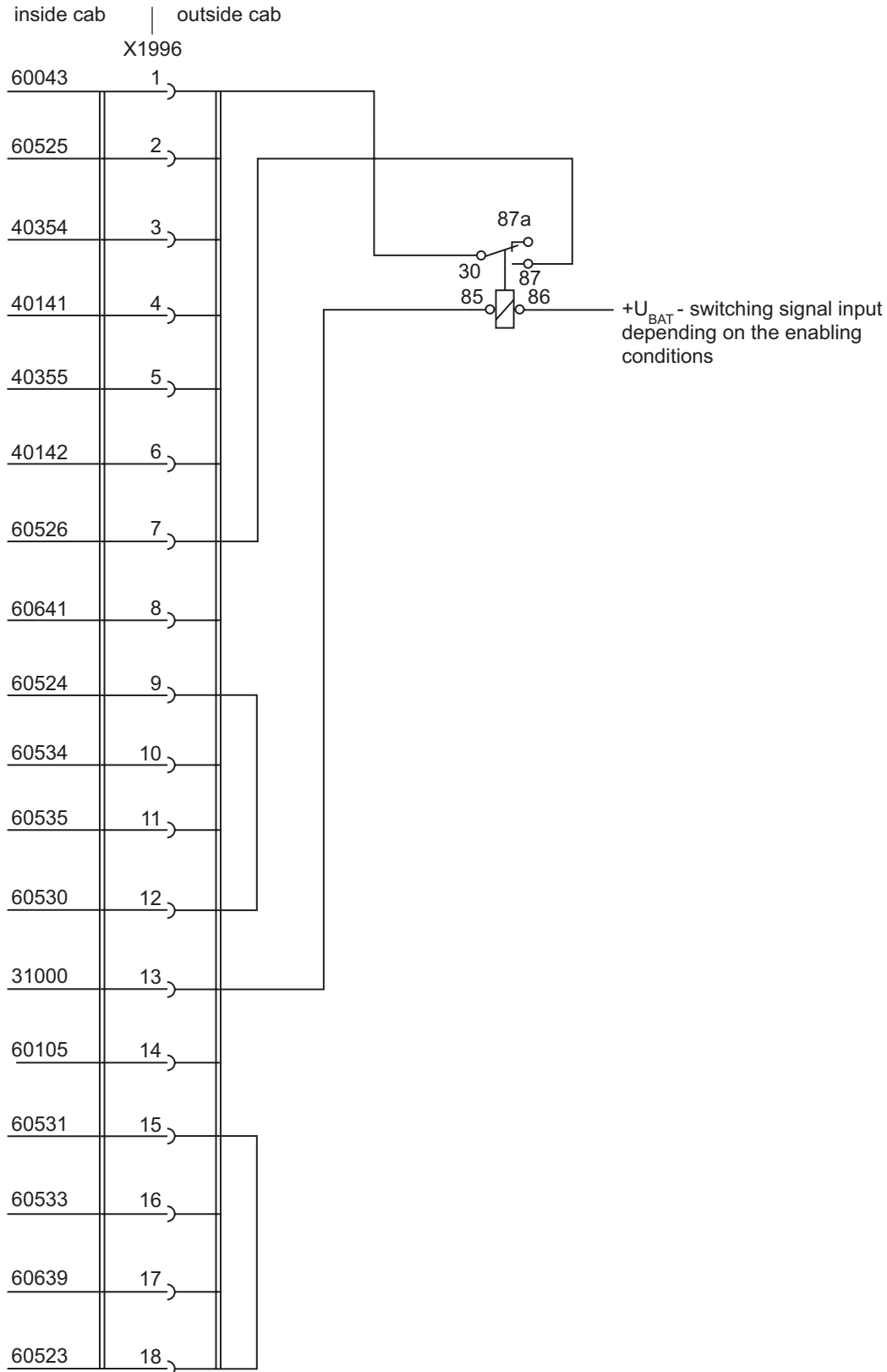
Contacts (single goods / strip goods)	MAN part no.
Flat plug with notch 2.8 x 1/0.5-1	07.91202.0848 / 07.91202.0858
Flat plug with notch 2.8 x 2.5/1.5-2.5	07.91202.0849 / 07.91202.0859
Spring contact with notch 2.8 x 1/0.5-1	07.91201.0222 / 07.91201.0221
Spring contact with notch 2.8 x 2.5/1.5-2.5	07.91201.0224 / 07.91201.0223

9. Typical circuits

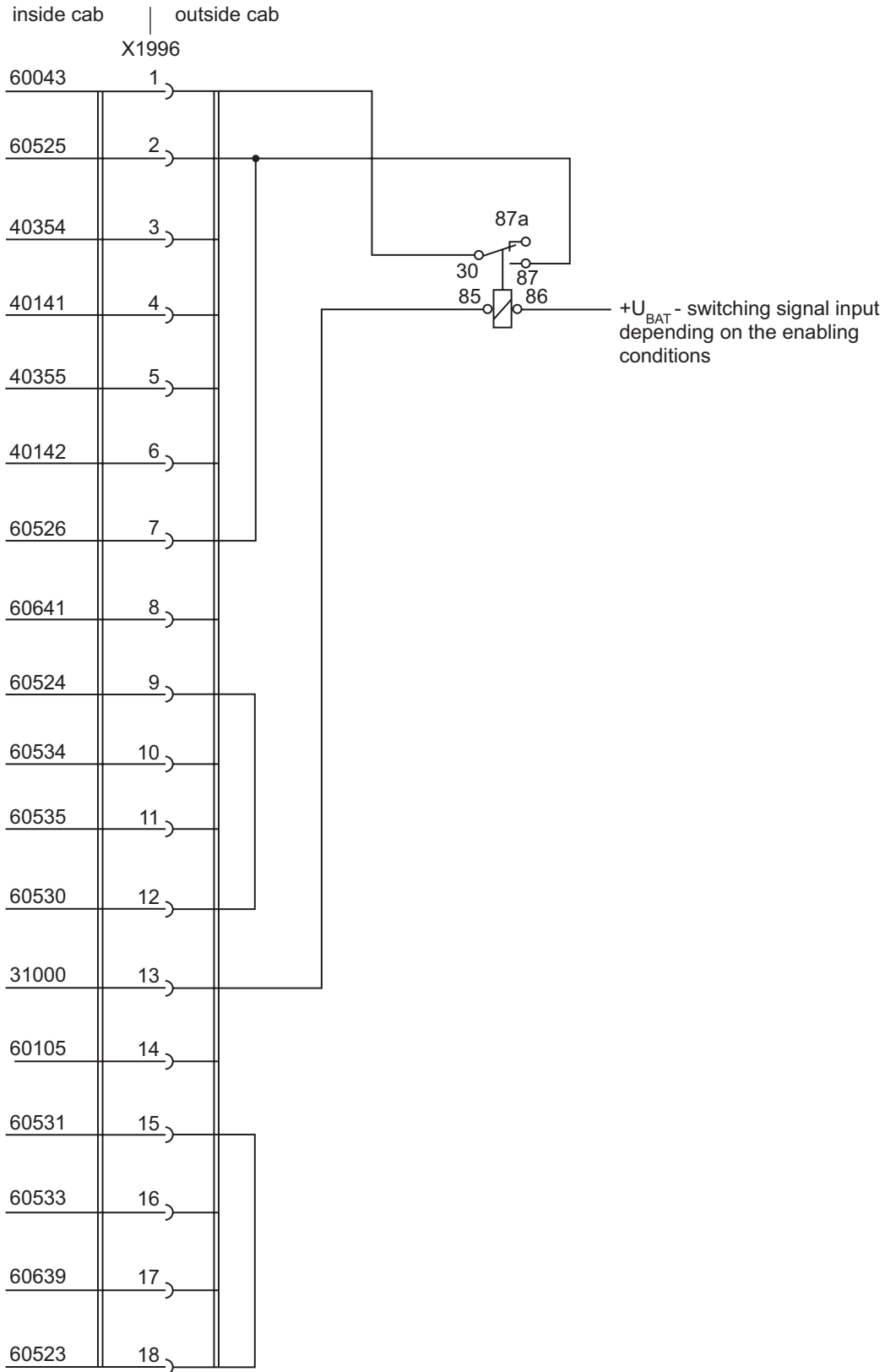
Typical circuit for triggering "intermediate speed control 1"



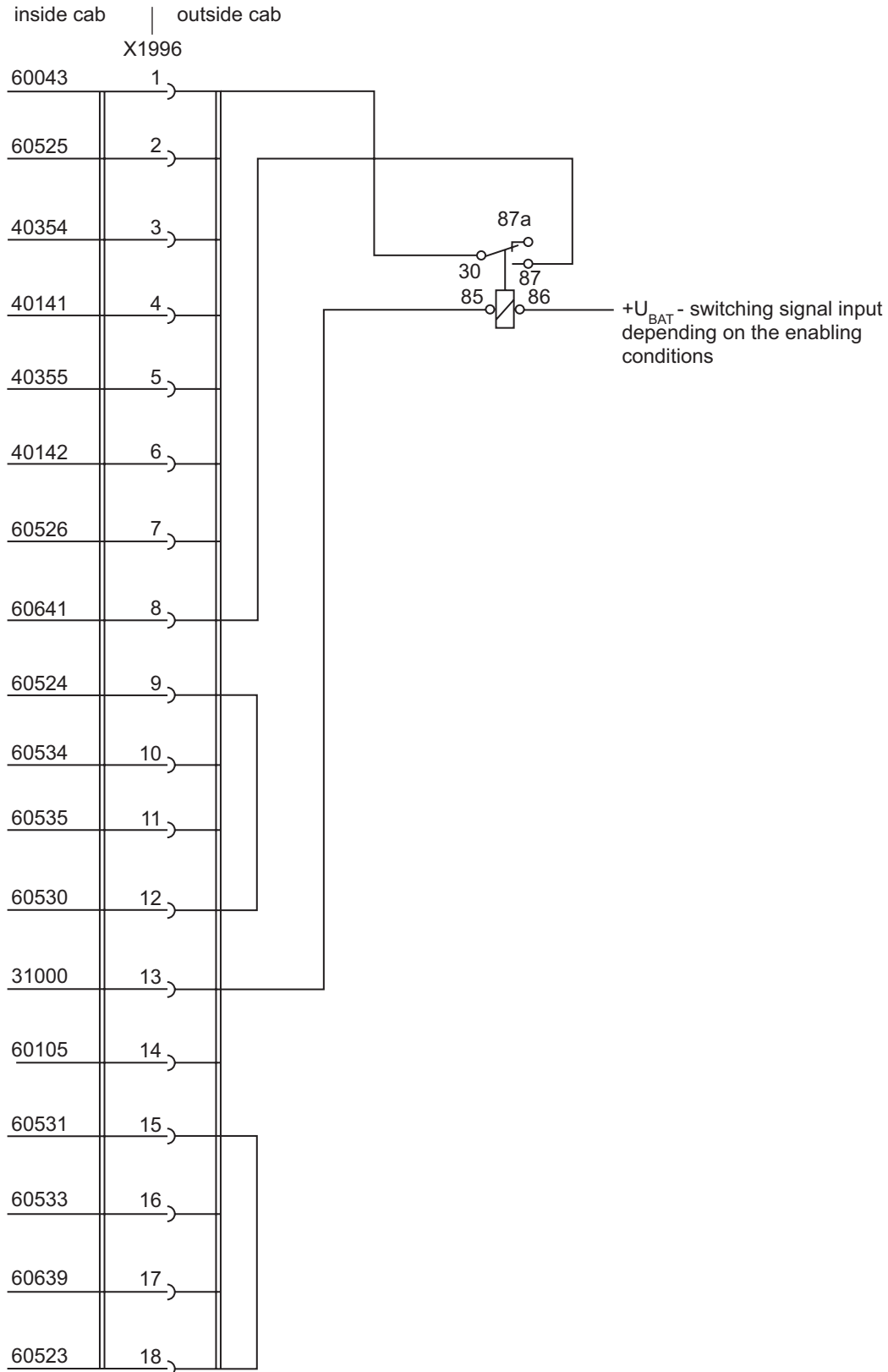
Typical circuit for triggering "intermediate speed control 2"



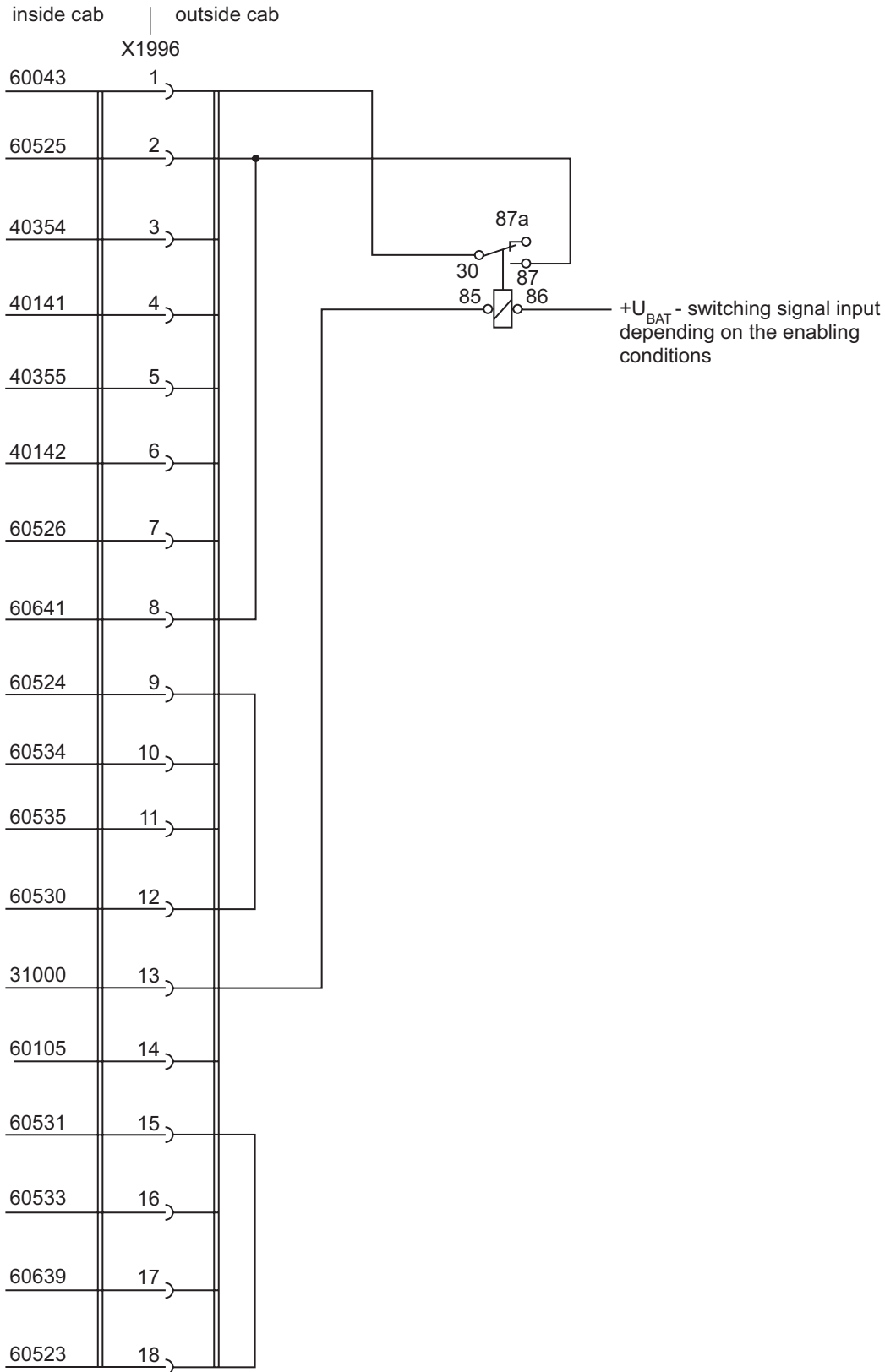
Typical circuit for triggering "intermediate speed control 3"



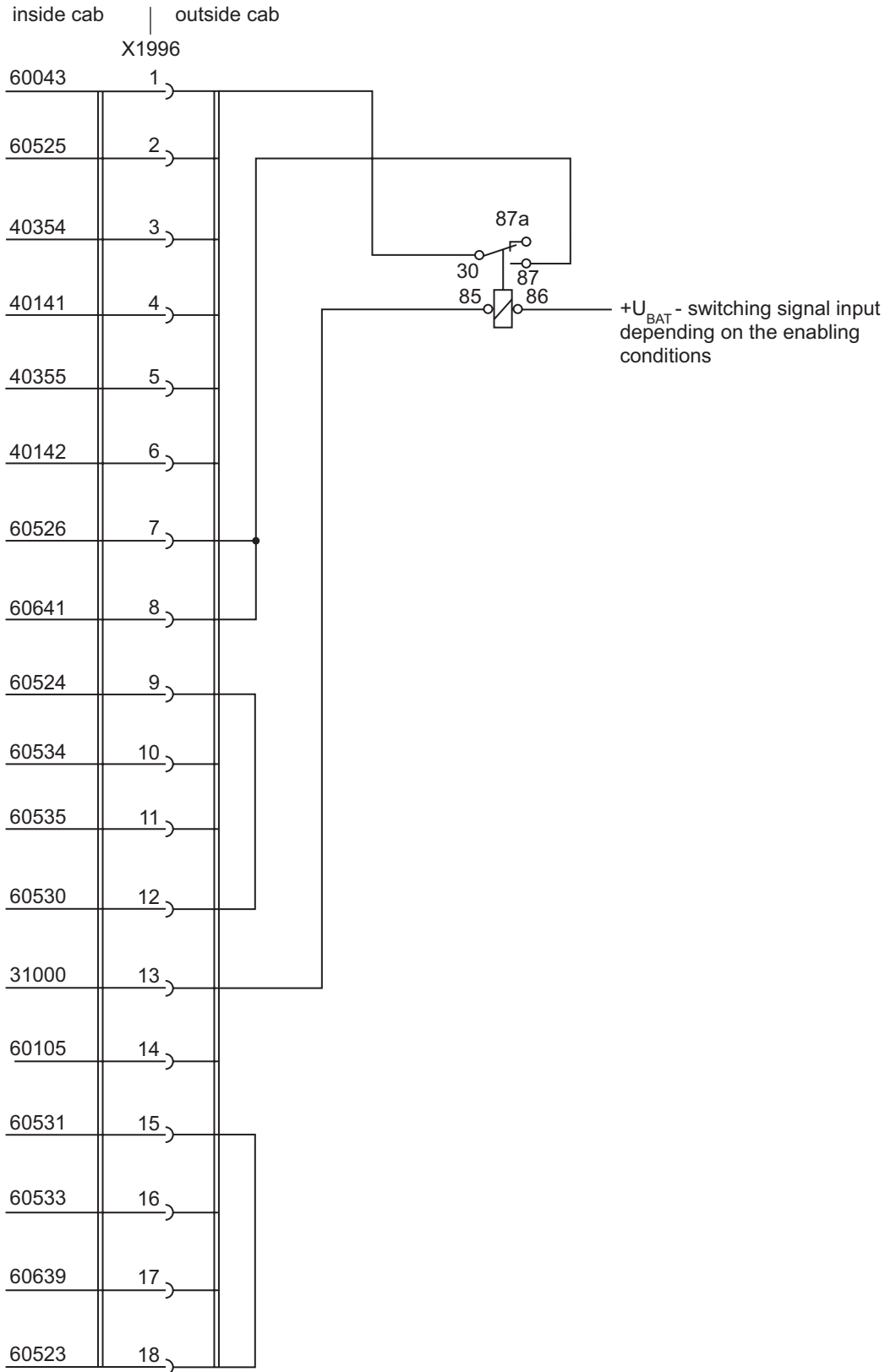
Typical circuit for triggering "intermediate speed control 4"



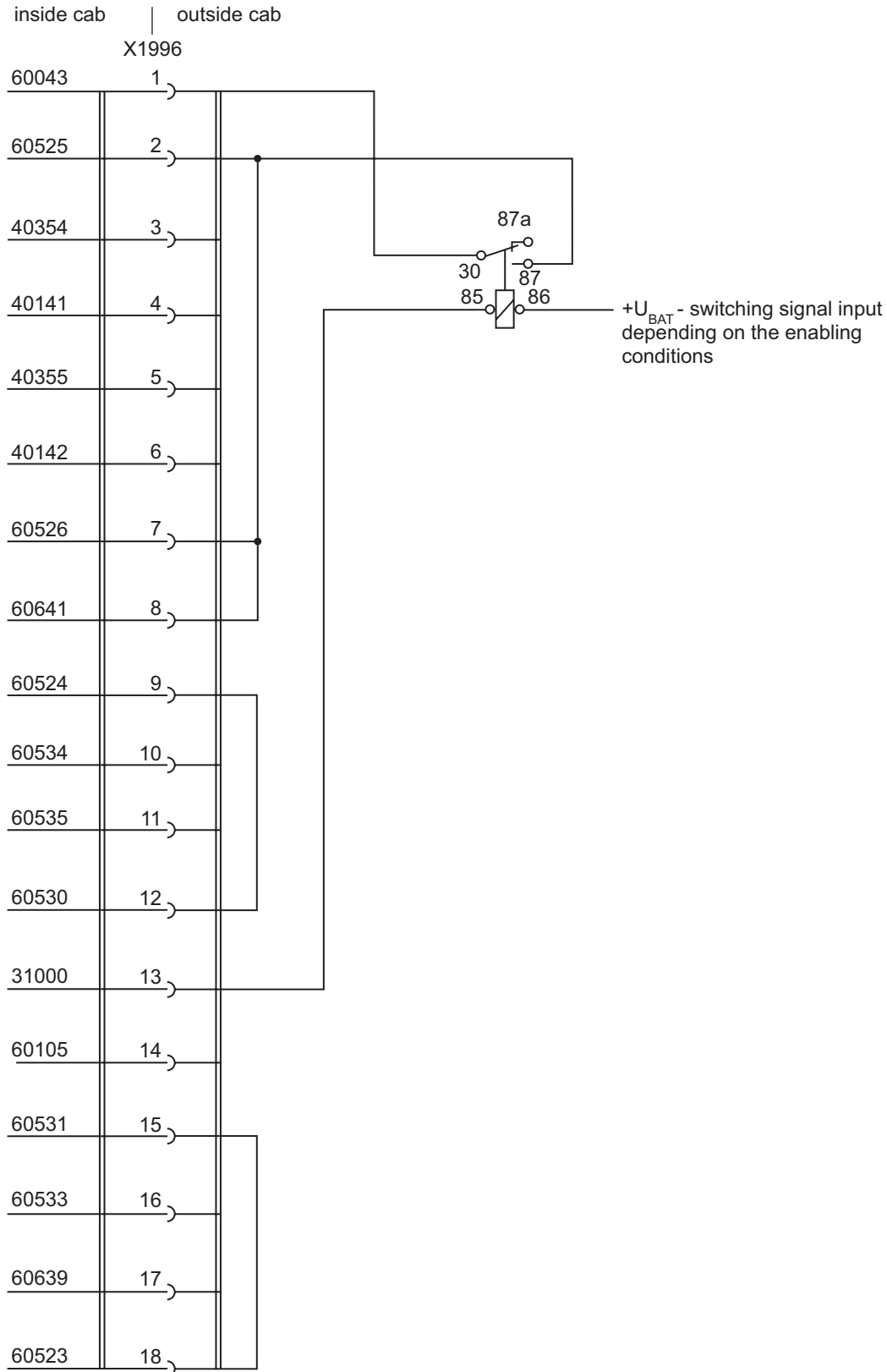
Typical circuit for triggering "intermediate speed control 5"



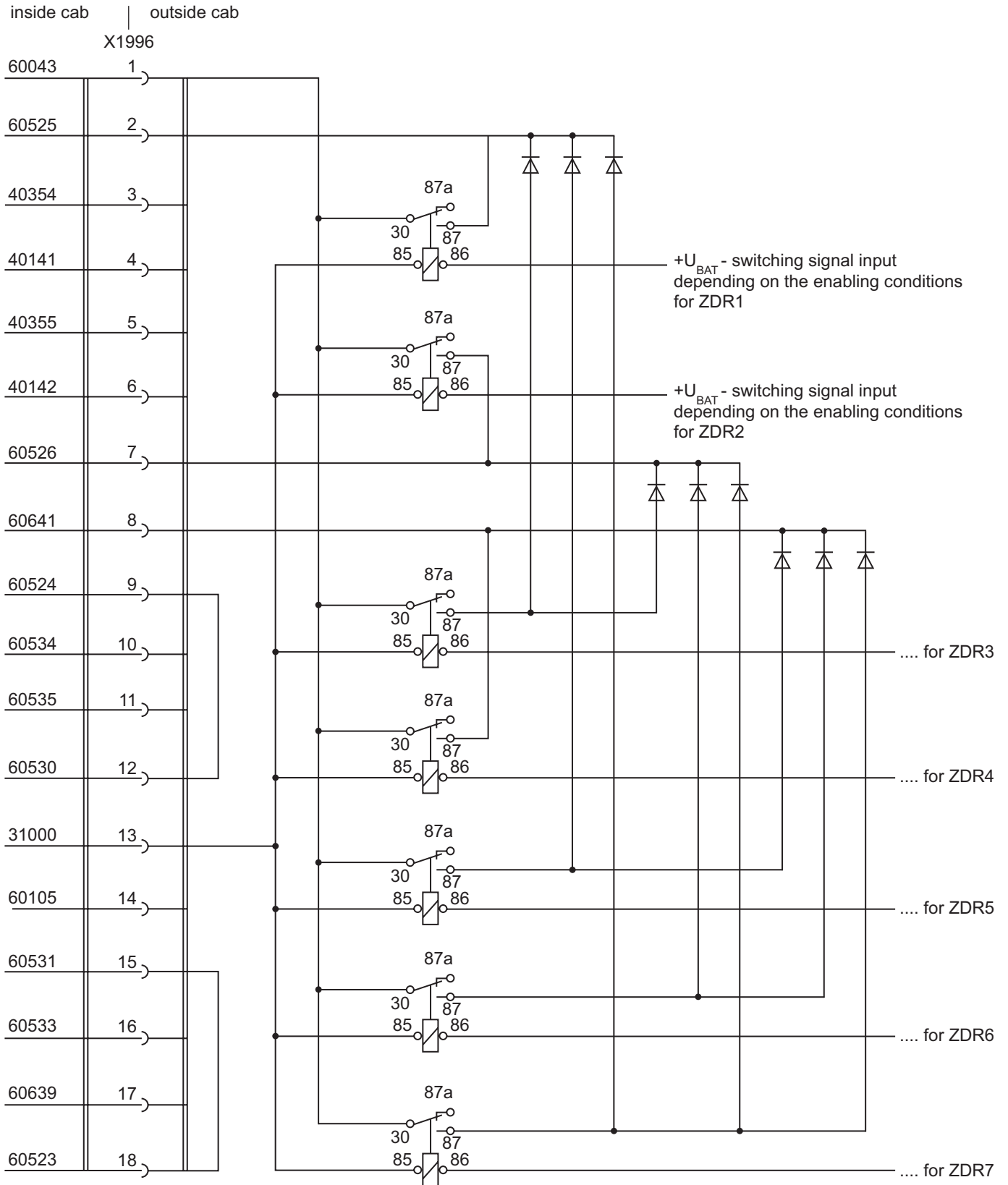
Typical circuit for triggering "intermediate speed control 6"



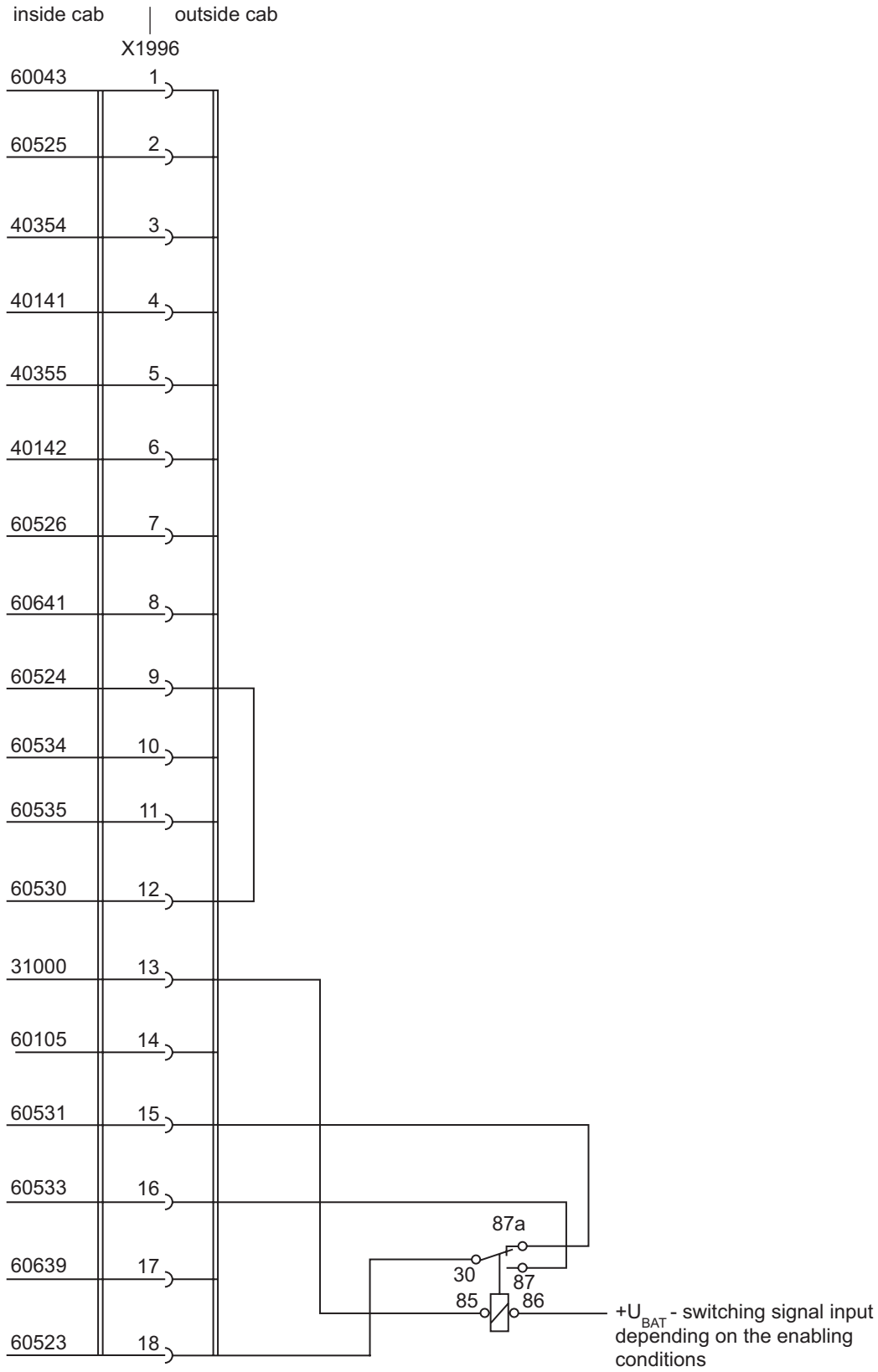
Typical circuit for triggering "intermediate speed control 7"



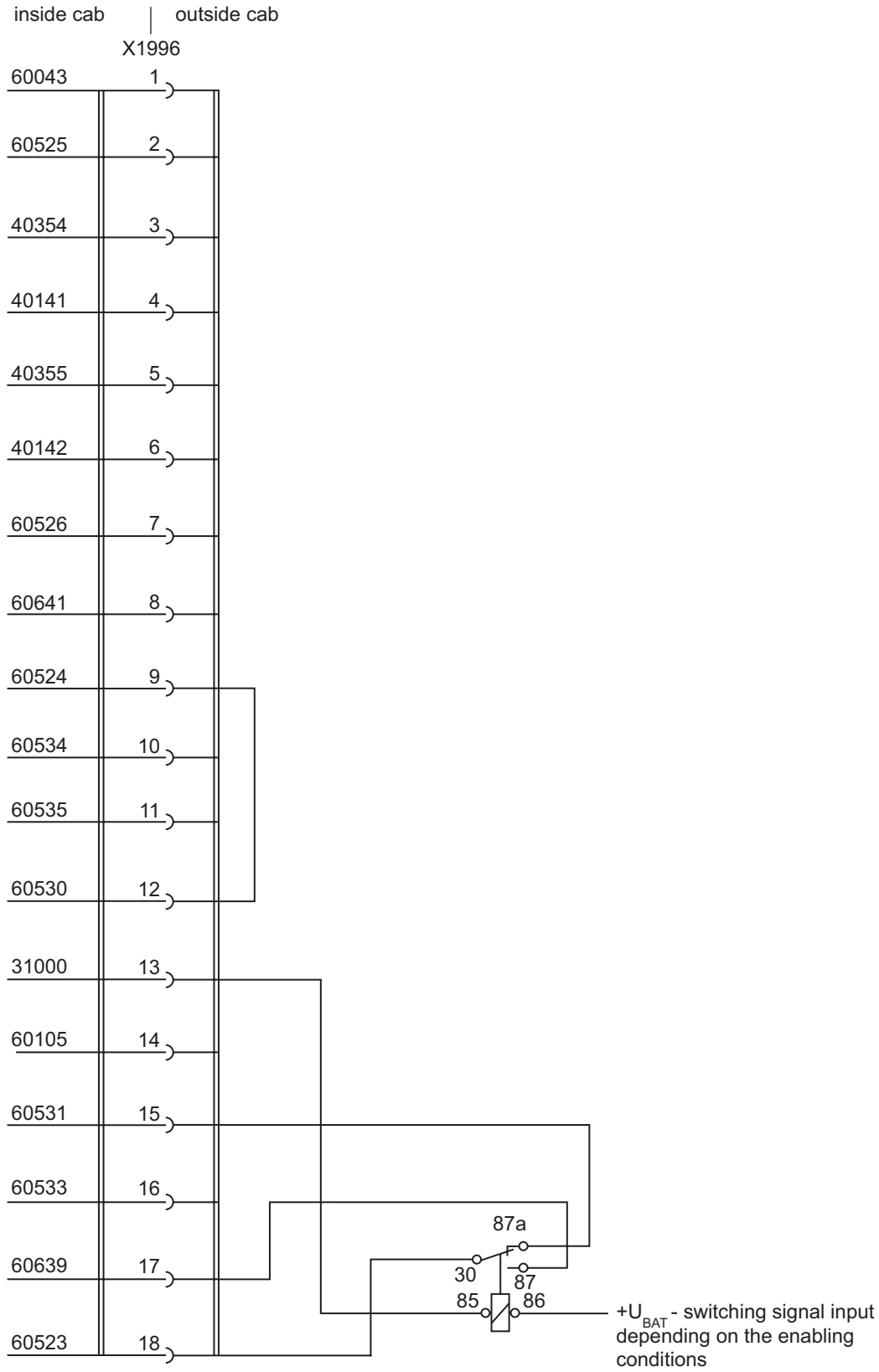
Typical circuit for triggering "intermediate speed control 1, 2, ..., 7"



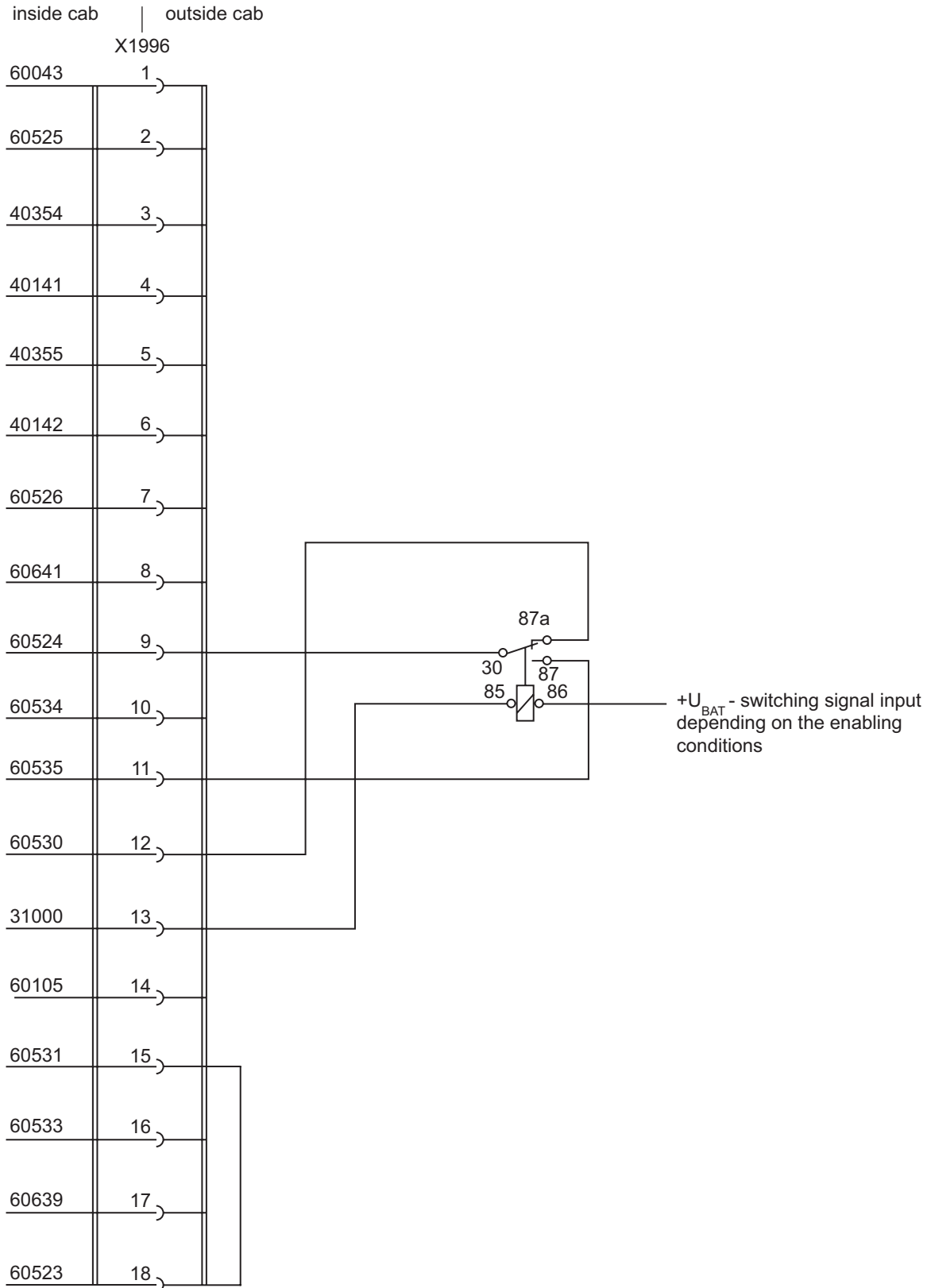
Typical circuit for triggering "maximum speed control 2"



Typical circuit for triggering "maximum speed control 3"



Typical circuit for triggering "limited drive characteristic 1"



Typical circuit for triggering "limited drive characteristic 2"

