Instruction manual Trans-O-Prox III

MV-DO-063542-135763

Contents

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1.   Summary

The Trans-O-Prox III represents an anti-collision device for remote controlled vehicles based on ultrasonics; it serves for obstacle recognition and for keeping a constant distance between the vehicles.

The central device comes in a plastic housing, which is suited for rail mounting according DIN EN 50022-35. All connections are made via screw terminal blocks plus a D-Sub9 plug connector (female) on the front panel.

Up to four ultrasonic sensors of the wms-series can be connected to the Trans-O-Prox III (three types suited for use with Trans-O-Prox III: wms-251/RT, wms-501/RT and wms-800/RT , a mixed operation of both sensor types is allowed). Therefore four groups of terminal blocks for connecting the sensors can be found on Trans-O-Prox III (sensor power supply+ U_0, GND, sender, echo).

Additional terminals blocks are: device supply voltage $+U_B$ and $-U_B$ (+24 V DC and GND), two (pnp)- switching stages *output A1* and *output A2*, three inputs ENABLE, MODE and EXT, one analogue input 0-20 mA with its connectors marked as +Tacho in and --Tacho for the input of a velocity signal, plus three terminal connectors for a serial RS232 interface with TxD, RxD and GND RS232. Alternatively the RS232 signals can be accessed by the D-Sub9 plug connector (female) on the front panel. In this case the screw terminals must remain unconnected. All terminal blocks are marked by the printing on the front panel label.

In addition several display and control elements are located on the the front panel: two yellow LEDs indicating the switching state of the switching outputs, two red LEDs indicating the currently active operating mode plus three pushbuttons UP, DOWN and ENTER for the manual adjustment of switching distances and selecting default values for the RS232.

All explanations refer to devices with a software version V2.0 and above.

2.   Operating modes

There are three operating modes on Trans-O-Prox III:
• transponder mode
• echo mode
• programming mode

Transponder and echo mode are the active operating modes, where ultrasonic measurements are made to determine distances towards obstacles or other vehicles in front. A signal of +24 V DC must be applied to the ENABLE terminal connector to activate Trans-O-Prox II, which will then start ultrasonic measurements. The selection of either echo or transponder mode happens by applying a correspondent signal on the MODE terminal connector. One can switch between echo and transponder mode during normal operation.

The activation of Trans-O-Prox III and the selection of the operating mode can also be achieved by setting a parameter in programming mode via the RS232 instead of the input signal.

2.1   Transponder mode

The sensor configuration for the transponder mode consists of a master sensor on sensor channel no.1 and a slave sensor *of the same type* on sensor channel no.4. The slave sensor represents an active reflector, which reacts on calling pulses of a vehicle behind by sending an answering code. The master sensor sends the calling pulses, which are answered by the active reflector of a vehicle in front. The distance towards a vehicle in front is calculated from the time of flight of the ultrasonic signals. The measurement result is then compared to the switching distances (trip points), which have been set for the transponder mode; afterwards the switching outputs are set accordingly. The transponder measurement value may be transmitted via the RS232 with each measurement cycle to a host computer.
The transponder mode is selected, when Trans-O-Prox III has been activated and when there is a +24 V DC signal on MODE. The transponder mode can also be selected by a command via the serial interface.
When Trans-O-Prox III operates in transponder mode the red LED *Transp* is illuminated.

Attention: In Echo mode (see 2.3.2.16 MD- Selection of pure Echo mode) the transponder is deactivated.
Attention: In Transponder mode the sensor wms-800/RT cannot be used.

2.2   Echo mode

In the echo mode up to three ultrasonic sensors can be operated on channel 1 to 3 (channel 4 is reserved for the slave sensor). An echo mode on all four channels can also be selected; the slave function is void in this case (-> see MD command). The emitted ultrasonic impulses are reflected at targets, which are located within the detection range of the sensors (passive reflection); they return to the sensors and are received again. The distance towards these objects is calculated from the *time of flight* of these impulses and is compared with the selected trip points for the echo mode afterwards. If the distance falls below the trip point of at least one sensor, the switching outputs are switched accordingly. The echo measurement values can be transmitted via the RS232 with each measurement cycle to a host computer.
The echo mode is selected, when Trans-O-Prox III has been activated and when there is a GND signal on MODE or when it is left open (unconnected). The echo mode can also be selected by a command via the serial interface.
When Trans-O-Prox III operates in echo mode the red LED *Echo* is illuminated.

Attention: In Echo mode the sensors wms-251/RT, wms501/RT and wms-800/RT can be connected to the Trans-O-Prox III. If sensor wms-800/RT is used, due to the twisted logic of

the echo signal the sensor chanels not in use have to be programmed with sensor type 0 (TY0).

2.3 Programming mode

2.3.1 Manual programming

During normal operation (Trans-O-Prox III activated) the switching distances (trip points) of the currently active mode (echo or transponder) can be adjusted by the buttons on the front panel. To enter manual programming press the ENTER button for 3 sec, until both yellow LEDs A1 and A2 start to blink. Release ENTER button. LED A1 blinks to signalize, that the trip point close to the sensor (-> output A1) is about to be programmed; depending on the operation mode either the LED *Echo* or *Transp*. is illuminated permanently. The trip points of all sensor channels 1 to 3 (1 to 4 in the pure echo mode) can be increased by pressing UP, decreased by pressing DOWN; the trip points of all channels are set to the value of channel 1 and are altered commonly. Pressing ENTER confirms the previous adjustment.

 If different trip points shall be selected for each sensor channel, one must place test targets in front of the sensors at the desired distances. Pressing UP and DOWN simultaneously will then take the measured distances of these target as trip points. This learning procedure must be confirmed by pressing ENTER.

Pressing the ENTER button will lead in both cases to the programming of the far trip point. Now LED A2 will start to blink to signalize, that the far trip point (-> output 2) is about to be programmed. Again UP increases, DOWN decreases, UP & DOWN learns the trip points. After another confirmation by pressing ENTER the selected distances are stored within a non volatile memory (EEPROM), the manual programming is terminated here.

If the operating mode changes during manual programming (echo <-> transponder) or if an <esc> is received on the RS232, manual programming is aborted restoring the old values, which have been valid before.

2.3.2 RS232 programming

Changing system parameters is possible by a serial communication between Trans-O-Prox III and a host. For this purpose the host has to send an <esc> (ASCII code 27_{dec}) to Trans-O-Prox II; other characters are ignored. As soon as an <esc> has been received normal operation is aborted and programming mode is initiated (both red LEDs *Echo* and *Transp* are on). When entering the programming mode both switching outputs are switched as if there were an obstacle, to prevent the vehicle from further movements (exception: see FR command). The answering function as an active reflector on channel no. 4 will be maintained even in this mode to prevent collisions from behind.

For communication purposes a command set has been defined by microsonic, which consists of a two letter ASCII code. This command code may be followed by a parameter value or a question mark, no blanks (=space, ASCII code 32_{dec}) may be inserted here. All entries

must be terminated by a <cr> (carriage return, ASCII code 13_{dec}).

If the command is directly followed by a <cr>, the current parameters associated with this command will be output. Entering a parameter value after a command overwrites the previously valid parameters, if parameters are entered in the correct format. The successful alteration of a value is confirmed by returning an ´ok´- string. When a question mark is added to the command an on-line help text related to this specific command is transferred. The function of the backspace key (ASCII code 8_{dec}) is supported to be able to correct false inputs at once. Tab (ASCII code 9_{dec}) and linefeed (ASCII code 10_{dec}) are ignored.

2.3.2.1   ?? - Command set

When a double question mark is input, the list of all available commands of a Trans-O-Prox III is transmitted:

BD baudrate

KY disable/enable

IS disable/enable inputs

IT logical state of inputs when disabled

SA echo near switching distances (EEPROM)

SB echo far switching distances (EEPROM)

TA temporary echo near switching distances (RAM only)

TB temporary echo far switching distances (RAM only)

HA hysteresis for sa or ta

HB hysteresis for sb or tb

XA transponder near switching distance (EEPROM)

XB transponder far switching distance (EEPROM)

YA temporary distance xa (RAM only)

YB temporary distance xb (RAM only)

ZA hysteresis for xa or ya

ZB hysteresis for xb or yb

PH peakhold for pnp-outputs

OD delay for switching on pnp-outputs

OM pnp-output n.o./n.c.

TY sensor type

FR freeze switching state of pnp-outputs

RN random cycle time

MD operating mode

GV preference computation

VS software version no.

DT software validation date

NR serial-no. of this device

QU quit programming - return to normal operation

RS software reset

?? this help screen

Geben Sie SPD fuer deutsche Textausgabe ein

HR Resolution in Echo mode

SI transmitted pulse length

2.3.2.2   SP - Choice of used language

Text messages and help texts can either be transmitted in English or in German language; SPE chooses English, SPD German.

2.3.2.3   SA - permanent inner switching distance for echo mode (near trip point)

By the SA command the permanent inner switching distances (near trip points) are selected for the echo mode. SA<cr> subsequently outputs all trip points of sensor channels 1 to 4 (channel 4 is irrelevant for Trans-O-Prox III however, see chap. 3).
Command format:

 SAx:y   , x = channel no. 1 to 4, y = distance value

Besides the numbers from 1 to 4 an asterisk * as wild character is allowed for *x*; *all* channels from 1 to 4 are then set to the same value specified by *y*. The distance values now caltulates to choosen value y multiplied by the set resolution (see 2.3.2.18 HR). The default resolution is 5 cm (HR0 and HR5).
The choosen switching distance allways has to be greater than the blind zone of 20 cm.
Example: with resolution 9 cm (HR9) -> SAx.3 = 27 cm is smallest trip point.
The distance values have to be lower than the correspondent distance values of the *far* trip points of the echo mode SB - Offset (see OF command). If not the text message ´*near switching distance too high, increase far switching distance first*´ appears*.*
The SA command stores the distances values within a non-volatile memory (EEPROM), so that the switching distances are memorized, when switching off the power supply.

2.3.2.4   SB - permanent outer switching distance for echo mode

By the SB command the outer switching distances (far trip points) are selected for the echo mode. SB<cr> subsequently outputs the switching distances of channel no.1 to no.4. (channel 4 is relevant only in the pure echo mode). Command format:

 SBx:y, x = channel no. 1 to 4, y = distance value

Besides numbers from 1 to 4 an asterisk * is allowed as wild character for *x*, *all* channels from 1 to 4 are set to the same value specified by *y* then. The distance values now caltulates to choosen value y multiplied by the set resolution (see 2.3.2.18 HR). The default resolution is 5 cm (HR0 and HR5).
The distance values have to be higher than the correspondent distance values of the *near* trip points of the echo mode SA + Offset (see OF command). If not the text message ´*far*

switching distance too low , decrease near switching distance first´ appears*.*
The SB command stores the distances values within a non volatile memory (EEPROM), so that switching distances are memorized, when switching off the power supply.

2.3.2.5 TA - temporary inner switching distance for echo mode

If during normal operation the inner switching distances for echo mode are altered very frequently, one should better use the TA command instead of the SA command. TA changes the inner switching distances only temporarily without storing them in the EEPROM. This speeds up the execution time of alterations, since one must not wait for the time needed for storing the value in the EEPROM. This is also advisable in order not to exceed the maximum number of write cycles of the EEPROM (10^6) in the long run. The program works with these temporary memory locations in the RAM; if the power supply is switched off, these values are lost; after switching on the power supply again these memory location are preset by the values stored in the EEPROM, which have been set by the SA command before. Command format:

  TAx:y   *,*x= channel no. 1 to 4, y=distance value

2.3.2.6 TB - temporary outer switching distance for echo mode

If during normal operation the outer switching distances for echo mode are altered very frequently, one should better use the TB command instead of the SB command. TB changes the outer switching distances only temporarily without storing them in the EEPROM. This speeds up the execution time of alterations, since one must not wait for the time needed for storing the value in the EEPROM. This is also advisable in order not to exceed the maximum number of write cycles of the EEPROM (10^6) in the long run. The program works with these temporary memory locations in the RAM; if the power supply is switched off, these values are lost; after switching on the power supply again these memory location are preset by the values stored in the EEPROM, which have been set by the SB command before. Command format:

  TBx:y   *,* x = channel no. 1 to 4, y = distance value

2.3.2.7 HA - hysteresis of switching output A1 for echo mode

A switching hysteresis of output A1 for the near trip distance may be specified by the HA command, valid for the echo mode. Allowed values are 0 to 6 (equivalent 0 to 30 cm). If an approaching object has led to a switching, the output will not be reset until the object distance has gone above TA + HA again. Command format:

  HAx   *,* x = 0 to 6 (The distance values now caltulate to choosen value x multiplied
           by the set resolution)

2.3.2.8   HB - hysteresis of switching output A2 for echo mode

A switching hysteresis of output A2 for the far trip distance may be specified by the HB command, valid for the echo mode. Allowed values are 0 to 15 (equivalent 0 to 30 cm). If the approach of an object has led to a switching, the output will not be reset until the object distance has gone above TB + HB again. Command format:

HBx   , x = 0 to 6 (The distance values now caltulate to choosen value x multiplied
                by the set resolution)

2.3.2.9   XA - permanent inner switching distance for transponder mode

By using the XA command the inner switching distance (near trip point) for the transponder mode is adjusted.   XA<cr> outputs the currently selected value. Command format:

XAy   ,y = distance value

For all sensors a value *y* of 0 to 250 in 5 cm steps is allowed (equivalent 0 to 12,5 m). The distance value must be lower than the distance value of the outer switching distance of the transponder mode XB - Offset (see OF command). If not the following text message appears: ´*near switching distance too high, increase far switching distance first´* .
The XA command stores the distances values within a non volatile memory (EEPROM), so that the switching distance is memorized, when switching off the power supply.

2.3.2.10   XB - permanent outer switching distance for transponder mode

By using the XB command the outer switching distance (far trip point) for the transponder mode is adjusted.   XB<cr> outputs the currently selected value. Command format:

XBy   ,y = distance value

For all sensors a value *y* of 0 to 250 in 5 cm steps is allowed (equivalent 0 to 12,5 m). The distance value must be higher than the distance value of the inner switching distance of the transponder mode XA + Offset (see OF command). If not the following text message appears:´*far switching distance too low, decrease near switching distance first´*.
The XB command stores the distances values within a non volatile memory (EEPROM), so that the switching distance is memorized, when switching off the power supply.

2.3.2.11   YA - temporary inner switching distance for transponder mode

If during normal operation the inner switching distance for transponder mode is altered very frequently, one should better use the YA command instead of the XA command. YA changes the inner switching distance only temporarily without storing it in the EEPROM. This speeds up the execution time of alterations, since one must not wait for the time needed for storing the value in the EEPROM. This is also advisable in order not to exceed the maximum number of write cycles of the EEPROM (10^6) in the long run. The program works with this temporary memory location in the RAM; after switching on the power supply this memory location is preset by the value stored in the EEPROM, which has been set by the XA command before. Command format:

YAy   ,y = distance value

2.3.2.12 YB - temporary outer switching distance for transponder mode

If during normal operation the outer switching distance for transponder mode is altered very frequently, one should better use the YB command instead of the XB command. YB changes the outer switching distance only temporarily without storing it in the EEPROM. This speeds up the execution time of alterations, since one must not wait for the time needed for storing the value in the EEPROM. This is also advisable in order not to exceed the maximum number of write cycles of the EEPROM (10^6) in the long run. The program works with this temporary memory location in the RAM; after switching on the power supply this memory location is preset by the value stored in the EEPROM, which has been set by the XB command before. Command format:

YBy   ,y = distance value

2.3.2.13 ZA - hysteresis of switching output A1 for transponder mode

A switching hysteresis of output A1 for the near trip distance may be specified by the ZA command, valid for the transponder mode. Allowed values are 0 to 15 (equivalent 0 to 75 cm). If the approach of an object has led to a switching, the output will not be reset until the object is again further away than the transponder trip point YA + ZA. Command format:

ZAx   , x = 0 to 15 (0 to 75 cm)

2.3.2.14 ZB - hysteresis of switching output A2 for transponder mode

A switching hysteresis of output A2 for the far trip distance may be specified by the ZB command, valid for the transponder mode. Allowed values are 0 to 15 (equivalent 0 to 75 cm). If the approach of an object has led to a switching, the output will not be reset until the object is again further away than the transponder trip point YB + ZB. Command format:

ZBx   , x = 0 to 15 (0 to 75 cm)

2.3.2.15   OF - minimum difference between both switching distances

The values for the near and far trip point may be selected as close as the a minimum offset specified by the OF command, where the far trip point must always be higher than the near trip point. This minimum difference is valid for both echo and transponder mode . When adapting the far trip point to the momentary vehicle speed (TR activated!) by an analogue tachometer signal 0 to 20 mA, the far trip point is reduced step by step to the near trip point + Offset OF. Command format:

OFx   , x = 0 to 20 (* 5 cm)

2.3.2.16 SI - transmitted pulse length

In Transponder mode one can choose between a fixed and variable transmitted pulse length.

In applications with a large number of Trans-O-Prox systems it is recommended to set this parameter to SI1. Command format:

SI*x*   , x = 0 fixed transmitted pulse length

               , x = 1 variable transmitted pulse length depending on measured distance

2.3.2.17 MD - Selection of pure echo mode

By the MD command can be determined, whether the Trans-O-Prox III should operate in a pure echo mode on all four channels, or if it should also have the transponder function with channel 4 being the active reflector. Command format:

MDx   , x = 0 or 1   (1= pure echo mode on all four channels)

2.3.2.18 GV - preferred evaluation of channel 2&3 (pure echo mode only)

If there are sensors on an AGV mounted on the lateral sides, and which do not point into the straight forward direction, a preferred evaluation of the sensors pointing forward should be selected. Thus echoes are suppressed, which evolve from the sending pulses of the lateral sensor (connected to channels 1&4) and which would be received by the front sensors on channels 2&3. The GV value should be given the same value as the SB value of the lateral sensor.. With GV0 the function is deactivated.

Attention: Connect lateral (side) sensor channel 1 $ 4, front sensor to channel 2&3!

GV*x*   , x = 0 to 255 (0=function not active)

2.3.2.19 HR - High resolution

With the command HR the value for the resolution of all internal distance values (switching distances, hystereris etc.) is set in cm . Command format:

HR*x*   , x = 0 to 9 according to the following table

HR0 = 5 cm resolution (e.g. SB88 with HR0 -> switching distance at 440 cm)
HR1 = 2 cm resolution (e.g. SB88 with HR1 -> switching distance at 176 cm)
HR2 = 2 cm resolution (e.g. SB88 with HR2 -> switching distance at 176 cm)
HR3 = 3 cm resolution (e.g. SB88 with HR3 -> switching distance at 264 cm)
HR4 = 4 cm resolution (e.g. SB88 with HR4 -> switching distance at 352 cm)
HR5 = 5 cm resolution (e.g. SB88 with HR5 -> switching distance at 440 cm)
HR6 = 6 cm resolution (e.g. SB88 with HR6 -> switching distance at 528 cm)
HR7 = 7 cm resolution (e.g. SB88 with HR7 -> switching distance at 616 cm)
HR8 = 8 cm resolution (e.g. SB88 with HR8 -> switching distance at 704 cm)
HR9 = 9 cm resolution (e.g. SB88 with HR9 -> switching distance at 792 cm)
Attention: changing the resolution sets all switching distances to its maximum.

2.3.2.20   PH - peakhold of switching outputs

If an object approach has led to a switching of output A1 or A2, the *on-state* of the switching output is maintained for a specified number of measurement cycles given by PH, after the switching criteria has vanished, i.e. the object distance is again greater than the trip point + hysteresis (peakhold function). PH is valid for both echo and transponder mode. Command format:

  PHx   , x = 0 to 99

2.3.2.21 OD - switching delay of outputs

When an obstacle approaches closer than the selected trip points, the switching of an output towards its on-state is inhibited for a number of measurement cycles specified by OD. This means, that the switching criteria must be present OD+1 times, before the output really switches. OD is valid for both echo and transponder mode. Command format:

  ODx   , x = 0 to 10

2.3.2.22 OM - function of switching outputs n.o./n.c.

By the OM command the switching function of both pnp - switching outputs can be selected .Command format:

  OMxy   , x (switching output A1) and y (switching output A2) = 0 or 1,

0 sets the switching function to normally open (n.o.) with an object below any correspondent switching distance; 1 sets the switching function to normally closed (n.c.) with an object below any correspondent switching distance.

2.3.2.23 FR - freeze switching state

Under normal circumstances both outputs are switched when entering programming mode, as if there were an object below the selected switching distance. If however the vehicle moves very slowly and if it can be granted, that the time for setting new parameters can be held very short, you can prevent the vehicle from being stopped during programming. This can be achieved by the *freeze* command FR; the outputs remain in that state, that they had before entering programming mode. A cautious use of this command is advised. Command format:

  FRx   , x = 0 or 1,

0 forces switching of outputs to their *safe* states, as if there were an object below the switching distance, 1 freezes the switching state before entering programming mode.

2.3.2.24 VS - software version no.

The VS command outputs the software version of the installed firmware.

2.3.2.25 DT - software validation date

The DT command outputs the software validation date.

2.3.2.26 NR - serial number of the Trans-O-Prox III

Every Trans-O-Prox III is identified by a serial number, when can be called by the NR command.

2.3.2.27 RS - system reset (cold boot)

A software cold boot is performed as if there were a reset impulse, when switching on the power supply. All parameters are reloaded from the EEPROM again!

2.3.2.28 QU - return from programming to normal operation

If an <esc> has been received via the serial interface, Trans-O-Prox III had entered programming mode. The programming mode can be quit by the QU command resuming normal operation. Parameters in RAM are not refreshed from the EEPROM in this case!

2.3.2.29 IS - disabling / enabling of signal inputs

Trans-O-Prox III has three input terminal blocks, which control the operating mode.
A high level (+24 V DC) applied to the ENABLE terminal connector activates Trans-O-Prox II, ultrasonic measurements are performed then. In case of a low level (GND) or if the terminal is left open Trans-O-Prox III is deactivated; the switching outputs are set to their on-states to prevent the vehicle from further movements. However calling pulses from vehicles following up are still answered by the slave sensor. To avoid ´ultrasonic pollution´ the ENABLE signal should be taken away each time, when the host computer stops the vehicle.
With an appropriate signal level on the MODE terminal connector the operation mode can be changed: a low level (GND) or an unconnected terminal connector makes the Trans-O-Prox III work in the echo mode, a high level (+24 V DC) to work in transponder mode.
The terminal block marked by EXT is reserved for future use and does not serve any function on Trans-O-Prox II.
By using the IS command these signal inputs terminals may be inhibited now; is this case the *logical state* must be given by the IT command via RS232 instead of the physical signals on the connectors (see there). Command format:

 ISxyz   ,x,y,z = 0 or 1,
´0´ means signal input inhibited, ´1´ means signal input enabled; x = connector EXT, y = connector MODE, z = connector ENABLE

Example:	IS100	EXT terminal connector enabled, MODE & ENABLE inhibited
	IS001	EXT & MODE inhibited, ENABLE active
		(EXT does not serve any function on Trans-O-Prox III however)

2.3.2.30 IT - logical signal state, when signal input disabled

If a signal input has been disabled by the IS command, the logical state must be specified by the IT command. After a reset the value for IT is undefined.
Command format:

ITxyz   , x , y, z = 0 or 1
                 x = don´t care, the connector EXT is reserved for future use
                 y = 0: echo mode, y = 1 transponder mode
                 z = 0: system disabled, z = 1 system enabled

 Example: IT010   low signal on EXT, transponder mode, however system disabled.

2.3.2.31 TR - velocity dependant adaptation of switching distance

Via the external 4 - 20 mA analogue input --Tacho, +Tacho a velocity signal may be fed into Trans-O-Prox II. If the variation of the outer trip point according to the vehicle speed is enabled by TR1, the far switching distance is adapted to the momentary velocity linearly in a way, that at maximum speed (20 mA) the whole far trip distance is valid, at minimum speed (0 mA) this trip distance for output 2 is reduced to the near trip distance plus Offset OF. Command format:

TRx   , x = 0 or 1, 0 means reduction not activated, 1 means active.

2.3.2.32 TI - invert tachogenerator signal

Under safety aspects it might be useful to feed 20 mA into the analogue input at minimum speed or if the vehicle stands still. If the analogue signal then fails (interrupted cable), this would not lead to a full reduction of the far switching distance (as it would normally be when there are 0 mA), although the vehicle probably cruises at maximum speed. For this purpose the meaning of the analogue signal can be inverted by the TI command. Command format:

TIx   , x = 0 or 1,
0 means: 0 mA minimum, 20 mA maximum speed
1 means: 20 mA minimum, 0 mA maximum speed

2.3.2.33 KY - disabling / enabling of pushbuttons

To prevent non-experts from (un)intentionally manipulating system parameters like switching distances by pressing the front panel buttons, these buttons can be blocked by the KY command. Command format:

KYx   ,x = 0 or 1; KY0 disables the push buttons, KY1 enables them.

2.3.2.34 TY - Typ of sensor

With the command TY the typ of the connected sensor has to be set. In Echo mode it is possible to combine all typs of sensors, in Transponder mode only wms-251/RT and wms-

501/RT can be used. Command format:

TYwxyz   ,w = channel 4 ... z = channel 1
            Parameter 0 = wms-251/RT or wms-501/RT, 1 = wms-800/RT

Example: TY1001, wms-800/RT at channel 4 und 1, wms-251/RT at channel 3 and 2.
Attention: A change of sensor type sets all switching distances to its maximum values!
Attention: If sensor wms-800/RT is used, due to the twisted logic of the echo signal the sensor channels not in use have to be programmed with sensor type 0 (TY0).

2.3.2.35 PC - choice of data protocol
The measured distance values of the echo and transponder mode can be transmitted with each measurement cycle to the vehicle´s host computer. Command format:

PCx   , x = 0 to 6

The possible values for x represent the following data protocols:

0 = data transmission of channel no. 1 as decimal value in ASCII plus end character EC

1 = as before, measurement data of channel no. 1 - 2 are transmitted in the order 2,1

2 = as before, measurement data of channel no. 1 - 3 are transmitted in the order 3,2,1

3 = as before, measurement data of channel no. 1 - 4 are transmitted in the order 4,3,2,1

4 = as before, only the smallest distance value of channel no.1 to 4 is transmitted

5 = the smallest values is transmitted in HEX without end characters

6 = no transmission of data

On protocols 1 to 3 the measurement data are separated by commas and terminated by a string of 3 characters max, e.g. <cr><lf> (see -> EC command).

2.3.2.36 BD - select baud rate for RS232 transmission
The transfer rate of the serial RS232 interface can be altered by the BD command.
Command format:

BDx   , x = 0 to 9

Baud rates:

0 = 75 Baud

1 = 150 Baud

2 = 300 Baud

3 = 600 Baud

4 = 1200 Baud

5 = 2400 Baud

6 = 4800 Baud

7 = 9600 Baud

8 = 19200 Baud

9 = 38400 Baud

A very slow transmission may enlarge the period for each measurement cycle, thus leading

to a worse reaction time of Trans-O-Prox III; safe value for all protocols without affecting the reaction: 9600 Baud+. To enter programming mode when it is unknown, which baud rate has been selected previously by BD, fixed baud rates can be forced by keeping the UP or DOWN button pressed, while switching on the power supply. Pressing the UP button forces the system to operate at 9600 Baud, pressing DOWN forces 1200 Baud (pressing ENTER enters programming mode at the previously selected by BD and now active baud rate).

2.3.2.37 EC - end characters for text transmission

Each transmitted text string, parameters and measurement data is terminated by up to three user selectable end characters. If for example the user´s terminal program needs a < cr>+<lf> (carriage return and linefeed), these end characters can by selected by the EC command. Command format:

ECxxxyyyzzz	xxx, yyy, zzz stand for the decimal numbers of the correspondent ASCII characters, all nine numbers must be given. Allowed value range: 001 to 255.
	000 suppresses the generation of end characters.

Examples:		
	EC013000000	only a <cr> is added
	EC000000000	generation of end characters is suppressed
	EC000013000	Error! no output of < cr>, since the program finds 000 first!

2.3.3   General information on the programming mode via RS232

If programming mode is requested by an <esc>, the Trans-O-Prox III answers by XON (ASCII code 17dec), as soon as the current measurement cycle is completed, thus enabling the device to compute an RS232 command. When changing system parameters one has to wait for the confirmation by the ´ok´ string (+end characters), before entering the next command: ´ok´ signalizes, that the new parameter was programmed successfully and that Trans-O-Prox III is ready to receive the next command. If currently selected parameters are read, one also has to wait until the parameter values have been transmitted.

The following error messages may occur during communication:

E00: not allowed	This command is a read only command; in spite of this a parameter value was given; for instance the version no. of the software cannot be overwritten.
E01: no valid command	The entered two-letter command code is not part of the command set of Trans-O-Prox III .
E02: out of range	The specified parameter value exceeds its allowed

margins.

E03: invalid parameter count The quantity of required parameters for this command is wrong.

E04: format error The parameter format for this command is wrong.

E05: wrong parameter The parameter format is o.k., but a wrong parameter was specified.

The termination of the programming mode by the QU or RS command will be acknowledged by sending an XOFF (ASCII code 19dec).

3. Further informations

Using the MD command Trans-O-Prox III can be adjusted in a way, that it operates in a pure echo mode. There is no transponder mode in this case; the function as active reflector on channel no.4 is void. However channel no. 4 is free for use in the echo mode now. Only on such a special Trans-O-Prox III it makes sense to specify switching distances for channel no. 4. For the transfer of measurement data of all four channels one should use protocol no.3 (see PC command).

4. Summary of help texts

By typing in a question mark behind the short command (example: SA?) the Trans-O-Prox III answers with a referenceto the following help texts.

H00:   not yet implemented...

H01:   OM: switching function of pnp-outputs, 0=n.o., 1=n.c., in the order far/near
        Example: OM01 far switching output n.o., near switching output n.c.

H02:   TY: sensor type, parameter 0=wms-251/RT, 1=wms-800/RT
        Format: TYwxyz, w,x,y,z =0 or =1, w= channel no.4 .. z= channel no.1
        Example: TY1001:1, wms-800/RT on channel no.4 and no.1, else wms-251/RT
        Attention: When changing types, switching distances set to maximum values!

H03:   OF: Minimum difference between near and far switching distances,
        Example: OF4; TB-TA must be > 4 (*5 cm).

H04:   PH: Peakhold of switching outputs , values from 0 to 200
        OD: Delay before switching on of switching outputs, values from 0 to 10.

H05:   Distances in transponder mode:
        XA: near switching distance EEPROM value
        XB: far switching distance EEPROM value
        YA: temporary near switching distance (RAM)
        YB: temporary far switching distance (RAM)

ZA: hysteresis near switching distance

ZB: hysteresis far switching distance

In transponder mode all values of sensor on channel no.1 *5 cm

H06:   Distances in echo mode:

SA: near switching distance (EEPROM)

SB: far switching distance (EEPROM)

TA: temporary near switching distance (RAM)

TB: temporary far switching distance (RAM)

HA: hysteresis SA/TAHB: hysteresis SB/TB

All values *5 cm (for HR1 *2 cm,a value can be specified for all channel separa

tely, Format: XA2:20, 100cm for sensor on channel no.2

H07:   GV: Preference sensors

Preferred computation of sensors 2&3, when sensors are not mounted

on in line. All values *5 cm (when HR1 *2 cm),

Above given value sensors 2&3 will be preferred

With GV=0 function is inhibited.

H08:   RS: Software-Reset of Trans-O-Prox (cold boot).

Changes become effective (new baudrate etc.)

H09:   QU: quit programming mode, resume normal operation (warm boot)

H10:   PC: protocol of data tranfer during normal operation

ASCII characters, separated by colons, with endcharacters (see EC)

0 = channel 1

1 = channel 1-2

2 = channel 1-3

3 = channel 1-4 (not Trans-O-Prox)

4 = smallest value

5 = smallest value in HEX

6 = no protocol

7 = channel 1-4 in HEX, bit 6&7=channel no., bit 0-5=measured distance

H11:   KY: Enable keyboard (buttons UP, DOWN, ENTER)

0=disabled, 1=enabled

H12:   MD: Operation mode

0 = Echo mode on channel 1-3 or transponder master on channel 1 (depen-

ding on state of signal input MODE), transponder slave on channel 4

1 = echomode only (all 4 sensor channels)

H13:   IN: reads the current input levels on signal inputs

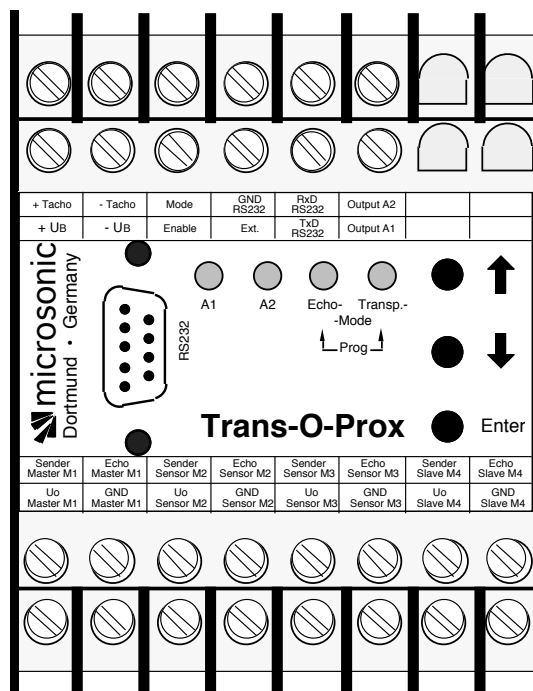IS: Enable signal inputs EXT, MODE & ENABLE 1=enabled, 0=disabled; when

disabled the logical input status set by the IL command is valid.

Example: IS100: external input on EXT signal, MODE & ENABLE inputs disabled

IT: sets logical states of EXT, MODE & ENABLE, when correspondent external inputs are disabled (by IS), 1 equals a high level, 0 equals a low level.
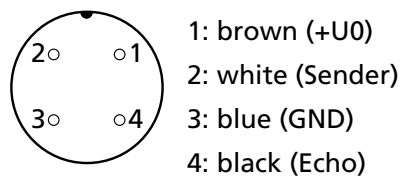
Example: IT001: as if there were low level on EXT, low level on MODE input, high level on ENABLE

H14:   TS: reads the current tacho signal (0-20 mA -> 0-255 ADC steps)

TI: inverts the tacho signal

Value = 0 -> max. distance, value = 255 -> max. reduction

TR: activate reduction of far switching distance via tacho signal

H15:   EC: The transfer of a data block will be terminated with a string of 3 charac ters max. The termination string can be selected by sending ECxxxyyyzzz (9 consecutive decimal numbers are required). xxx,yyy,zzz stand for the decimal ASCII-equivalent of the desired characters. EC000000000 suppresses a termination string.

Example: EC013000000 only a carriage return is added to the data block

H16:   FR: Freeze switching state of A1 and A2, when entering programming mode or if the ENABLE-Signal is reset; with FR0 the switching outputs are set accor ding their selected n.o./n.c. function, as if an object came closer than the specific switching distance.

CAUTION: FR1 makes the vehicle move blindly in the above situations!

H17:   -

H18:   SI: length of sending impulse

0: fixed length of sending impulse

1: variable length of sending impulse depending on measured distance

H19:   HR: Resolution

echo mode resolution of measured distances, trip points & hysteresis

parameter 0: 5cm, 1: 2cm, 2-9: equals resolution in cm

W00:   All switching distances set to maximum values!

5. Front panel and sensor connector

+ Tacho	- Tacho	Mode	GND RS232	RxD RS232	Output A2		
+ U$_B$	- U$_B$	Enable	Ext.	TxD RS232	Output A1		

microsonic Dortmund · Germany

RS232

A1 A2 Echo- Transp.--Mode

⌐Prog⌐

Trans-O-Prox

↑ ↓ Enter

Sender Master M1	Echo Master M1	Sender Sensor M2	Echo Sensor M2	Sender Sensor M3	Echo Sensor M3	Sender Slave M4	Echo Slave M4
Uo Master M1	GND Master M1	Uo Sensor M2	GND Sensor M2	Uo Sensor M3	GND Sensor M3	Uo Slave M4	GND Slave M4

View to front panel of Trans-O-Prox II

2○   ○1
3○   ○4

1: brown (+U0)
2: white (Sender)
3: blue (GND)
4: black (Echo)

View to connector of
wms-251/RT and wms-501/RT