Littfinski **D**aten**T**echnik (**LDT**)
Bühler electronic GmbH • Ulmenstraße 43 • 15370 Fredersdorf / Germany • Phone: +49 (0) 33439 / 867-0

RS 232 Interface-Protocol for the Interface INTER-10

(Applicable for the Transponder-Reading-System TrainDetect (Train number identification) and common RFID-mode application)

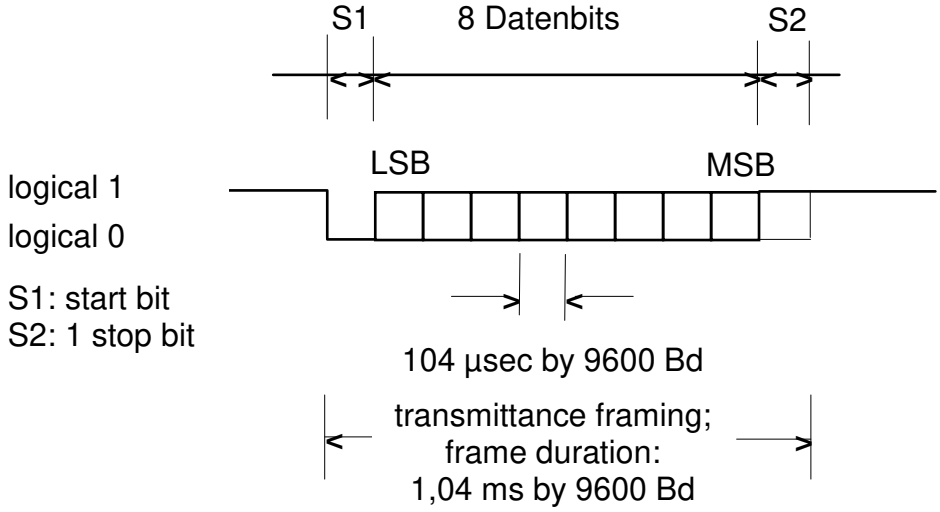
1. General Information

The Transponder-Reading-System consist of up to 99 Transponder-Reader COL-10 and one interface INTER-10 for the transmittance of the transponder information via the serial RS 232 interface to the PC.
The interface-protocol of this connection will be described within this document.
The communication between the INTER-10 and the Transponder-Readers COL-10 will be provided via a fast (data rate 125 kbit/sec) bidirectional serial RS 485 reading-bus. The interface-protocol for this reading-bus has been described at the document "LDT-RFID-RS485" and can be down-loaded from our Web-Site.

The interface INTER-10 has to be connected to an available COM-interface port of the PC by using the customary cable which has been attached to the supply. All bridge circuits and line crossings which are relevant for the RS 232 interface have been already considered within the interface. The transmittance rate interface/PC of max. 19 200 Baud has been matched to the standard serial RS 232 Interface. It casn be possible that a PC with an USB-Port and unsuitable USB/RS 232 Adapter will initiate a breakdown of the system. Therefore is it recommended to refit the PC with a COM-interface board.

The interface to the PC contains the following technical data:

electrical specification according to RS 232 without handshaking (COM-interface)
galvanical separation, Data Terminal Ready (DTR) has to be switched-on
connection SUB-D, 9poles, socket; no deallocation for arbitrary USB/RS 232-Adapter
transmittance rate adjustable between 9 600 and 19 200 Baud
transmittance parameter: 1 start-bit, 8 data-bit, no parity-bit, 1 stop-bit



Frame-structure Interface / RS 232-Interface Port

Possible system reaction (reader unit/interface):

If a transponder (TP) enters the field of a reading antenna the TP-data set of 40 bit = 5 byte and additionally the reader unit-address will be transmitted as a new data-set once to the interface and after converting to the PC.
If the TP will remain within the reading area the reader will transmit an occupied report via the INTER-10 to the PC. This report will be **continually transmitted until the reading area will be vacant**.
If the TP has left the reading area the INTER-10 will transmit **once** a vacancy-report to the PC.

INTER-10 offers 3 operation modes for the programming. Each mode can be selected by inserting relevant jumpers:

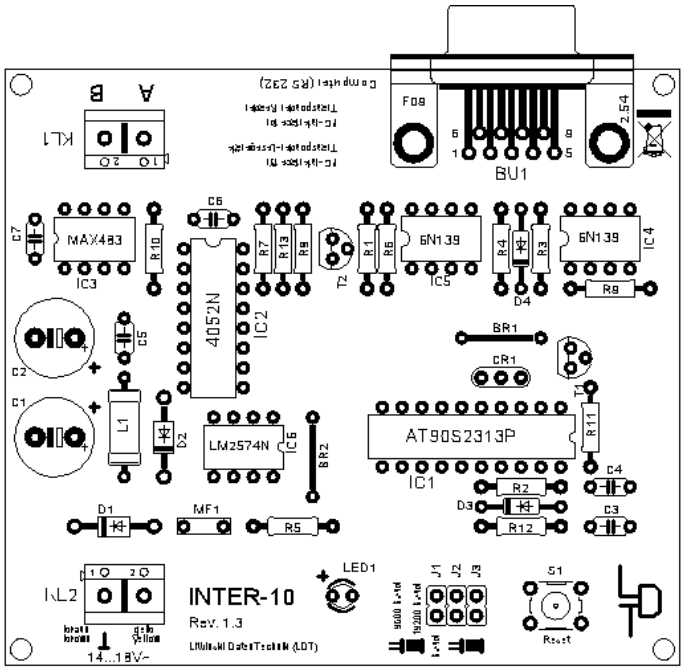
1. **Inquiry Mode**
   The PC will request the reading system to transmit data. The PC requires for the request the addresses of the readers which are connected to the reader-bus. In accordance to the program design can the request if required to be orientated to relevant addresses or to all addresses within a temporal framing in permanent succession. The data sent after the request will contain the last valid information: new number, occupied or vacant.

2. **Spontaneous Mode 1 (auto start)**
   INTER-10 supplies self-maintained data to the PC without request. Those data will be received by a cyclical fast speed request about the status of the readers after their switching-on. The answers will comply to the relevant status of the readers ("possible system reactions") and will be passed-on to the PC. Between each cycle will be spacing frequency of 80 ms.
   INTER-10 will query only physical available addresses with reason to safe cycle time. To find out which addresses are available INTER-10 will run once after switching-on a diagnosis test on the total cycle of 99 addresses and will notice, which addresses will respond to the request. Non available addresses wil be actually removed. Valid responses will be transmitted to the PC within the first cycle to assure that the PC receives a switch-on status report together with the last data reports received from the readers and stored before switched off. This assures that the PC can dispose about all actual relevant information.
   It can be possible that the PC will not be ready to operate at the same time with the reading-system and the layout after start-up. Therefore offers this operation mode additionally for the PC the possibility after start-up and program-start to send a control word which will request a complete status report (interactive traffic).
   For preventation of losing information respectively receiving wrong information the layout system and the reading system should be switched-on at the same time when using this operation mode.

3. **Spontaneous Mode 2 (cycle start by PC)**
   INTER-10 will only then start to supply data to the PC if it has been started by the PC. Then it will proceed as described above. In addition is it possible that the PC can stop the interface-cycle at any time and start again with a start command (reset). Then the PC receives a complete status report.

The above operation modes and the Baud rate can be adjusted by jumpers.

Changing the jumpers during operation will be ineffective. If alterations are required is it necessary at first to switch-off the interface respectively the complete reading system. After changing the jumpers and starting the system the new adjustments will be taken over and stored.



BU1: RS232 PC-Connection socket

KL1: Reading-BUS to the Reading Units COL-10

KL2: Voltage Supply 14 to 18 Volt AC

S1: Reset-Key

LED1: Operation Light

Jumper1: open: 9600 Baud
(Baudrate) closed: 19200 Baud

Jumper2: open: Spontaneous operation 1 or 2
(Mode) closed: Inquiry

Jumper3: open: Spontaneous operation 2
(Autostart) closed: Spontaneous operation 1

If the reading system will not supply any data is it possible within the spontaneous mode 1 to make a re-start with the reset-key.

2. Data base / Control words

Explanation of abbreviations:

Ad:	Address		
LG:	Reader	TP:	Transponder
S1:	Spontaneous mode 1	RO-TP:	Read-Only Transponder
S2:	Spontaneous mode 2	RW-TP:	Read/Write Transponder

2.1. Data traffic Interface to PC

2.1.1. Transmitting new TP-Data

Ad	B1	B2	B3	B4	S

Ad: Reader address byte
B1 to B4: TP-data bytes 1 to 4
S: Special byte; can be ignored by the application program

This data format will be sent from the interface to the PC if the PC will request data and the reading unit has read some new data (mode 1), the interface has been set into spontaneous mode 1 or 2 and received new data or a status report will be released by an auto start or after a reset.
Remark: data sets which will be transmitted from the reader-unit via the reader-bus to the interface contains 5 information bytes = 40 bit. The interface will not transmit the first original-byte to the PC but will shorten the data-set to 32 Bit and takes from the data set particular RW-TP related information and files them at the attached special-byte S which is not relevant for the PC programs. The information filed at the 1. original-byte of the TP will be used by other system components only e.g. for the automatic detection of RW-TP`s (not relevant for PC).

2.1.2. TP remains within the reading area, no new data (occupied report)

B1	B2

byte 1: control word 70_H

byte 2: LG-address

This format will be send once by the interface to the PC if the PC is requesting information within the inquiry mode but the reader-unit reads no new data because the TP remains at the reading area.
At the spontaneous mode 1 and 2 INTER-10 will sent this report to the PC **at every cycle**, **as long as a TP will remain within the reading area of a reader-unit**.

2.1.3 TP not inside the reading area (vacant report)

B1	B2

byte 1: control word 80_H

byte 2: LG-address

INTER-10 will send this report at any mode **once** to the PC as soon as a TP has left the reading area and therefore the relevant reading-unit will be vacant.

2.2. Data traffic PC to the Interface

2.2.1. Obtaining a status report within the spontaneous mode 1 (jumper 2 open, jumper 3 closed; cycle-standard pause 80 ms)

B1

1 byte with control word 88_H

The interface will be started automatically within the spontaneous mode 1 when switching-on the power supply and will create a status report (Autostart). If the PC will be started later it will not get the information of the status report. For synchronization at this mode can send the PC-program at any time the control word “obtaining status report”. The interface will then interrupt the cycle, creates a status report and will re-start automatically.

2.2.2. Interface-Start with long cycle-pause (spontaneous mode 2, jumper 2 + 3 open)

B1

1 byte with control word 20_H

If the interface will be started by the PC using this control word there will be a pause of ca. 2 sec. Implemented after each cycle. Therefore should this control word be used for testing purpose with a reader unit only to enable the user having sufficient time to control the data transfer with the test software. The cycle itself will not be influenced. Within the first cycle will be a status report transmitted.

2.2.3. Interface-Start with short (standard-) pause (spontaneous mode 2, jumper 2 + 3 open)

B1

1 byte with control word 25_H

If the interface will be started with this control word a pause of 80 ms will be implemented after each cycle. The cycle itself will not be influenced.

2.2.4. Interface "Stop" by the PC at the spontaneous mode 2 (software-reset)

B1

1 byte with control word 88_H

Within the spontaneous mode 2 will be the interface started by the PC. Therefore it starts only then with the cycle when the control word 25_H will be sent by the PC. At this mode the interface software will be resetted by sending of 88_H.
Before INTER-10 will carry out the reset it will send a control word to the reader units to assure that every LG will transmit after the reset the latest read data as a status report. Therefore can send the interface after a restart with 25_H at the first cycle the latest valid data from each LG to the PC.
Attention: at the spontaneous mode 2 (start by the PC) the interface has to be always new started after every software reset by the PC.
At the spontaneous mode 1 (Auto start) the interface will be re-started automatically after a software reset!
The control word 88_H is identical to “obtaining status report” at the spontaneous mode 1 (2.2.1.).

2.3. PC-inquiry of the reader units (jumper 2 closed)

B1	B2

byte 1: control word 88_H

byte 2: LG-address

This control word will be send within the inquiry mode if data will be requested from a particular reader unit. For this issue is it required to know the address of the reader unit.
There will be no response if TP-data or vacancy reports have already been sent before this request.

2.3.1. PC-inquiry status report within the inquiry mode, jumper 2 closed

B1	B2

byte 1: control word 33_H

byte 2: LG-address

This control word will be send from the PC to the interface if a reader unit with the address xy shall transmit the last read data set. It makes no difference if the data set has been sent before or if the reader unit is vacant or occupied.
This can be required as a status report after a restart of the user software because after a restart of the PC the actual TP-data can be requested.
If a complete status report will be required this control word has to be send to each available reader unit address.

3. Table Summary

Mode	Time sequence	Interface-	Status report	Data request	TP enters						TP remains within		TP has left	
	cycle	Start	control word/ad.	control word/ad.	reading area						reading area		reading area	
Byte sequence:			1 / 2	1 / 2	1	2	3	4	5	6	1	2	1	2
inquiry	1			88 H / Ad	Ad	D	D	D	D	S				
	2			88 H / Ad							70 H	Ad		
	3			88 H / Ad									80 H	Ad
			33 H / Ad		Ad	D	D	D	D	S				
spontaneous 1	1	automatic			Ad	D	D	D	D	S				
(autostart)	2										70 H	Ad		
	3												80 H	Ad
status report			88 H		Ad	D	D	D	D	S				
spontaneous 2	1	25 H			Ad	D	D	D	D	S				
(PC-start)	2										70 H	Ad		
	3												80 H	Ad
likewise	1	20 H			Ad	D	D	D	D	S				
(test)	2										70 H	Ad		
	3												80 H	Ad
status report			88 H		Ad	D	D	D	D	S				

25H = 80 ms cycle-pause
20H = 2 sec cycle-pause

Ad: Address byte
D: Data byte
S: Special byte

Made in Europe by
Littfinski **D**aten**T**echnik (**LDT**)
Bühler electronic GmbH
Ulmenstraße 43
15370 Fredersdorf / Germany
Phone: +49 (0) 33439 / 867-0
Internet: www.**ldt-infocenter**.com