Ortner
Customer Support

ROTH &RAU

Low Frequency RFID Reader
LF-134-SER-P/M-V3.1
User Manual

Document Revision: 3.5 (all previous versions are inoperative)

Document date: February 26, 2010

Revision History

#	Date	Rev.	Description	Name
1	04.07.2006	1.1	Draft Version	SA
2	10.07.2006	1.2	Update LED 2.2.4	MB
3	21.07.2006	1.3	Updated Software Version	MB
4	18.10.2006	1.4	Updated Safety Version	HB
5	25.10.2006	1.5	Updated Hardware Version	HB
6	03.11.2006	1.6	Review	HB
7	20.11.2006	1.7	Review, reading range settings	POE
8	21.11.2006	1.8	Included Antenna case material	POE
9	23.11.2006	1.9	Review	POE
10	31.01.2007	2.0	Upgrade HW Ver. 2.3	CM
11	17.02.2007	2.1	Layout corrections	POE/CM
12	18.02.2007	2.2	Layout corrections	POE/CM
13	22.02.2007	2.3	Power Cable corrected pining	POE
14	26.02.2007	2.4	Review	POE
15	04.06.2007	2.5	Metal case, name change, converter cables, new hardware version	POE
16	20.08.2007	2.6	Antenna: new part number, explanations about parts number structures, minor updates, new pictures, Hermos compatible communication protocol	POE/SK
17	27.12.2007	2.7	Minimum reading and writing range was included	NL
18	30.01.2008	2.8	Add test point and figure at minimum reading and writing range	NL
19	31.01.2008	2.9	Add Software manual for Ortner Test Suite	MB
20	31.01.2008	3.0	Company-specific Version	HB
21	23.09.2009	3.1	Add command ‘E’ and describing of test button	RD
22	12.10.2009	3.2	Remove parts concerning Ortner-ASCII-Protocol (OTS/Examples)	RD
23	12.01.2010	3.3	Include all available ASCII protocols, new layout	RD
24	25.01.2010	3.4	Update FCC conformation, technical review, CI review, Add new commands ASCII-H-V1.0.1	AS
25	05.02.2010	3.5	New Attributes in ASCII-A	RD

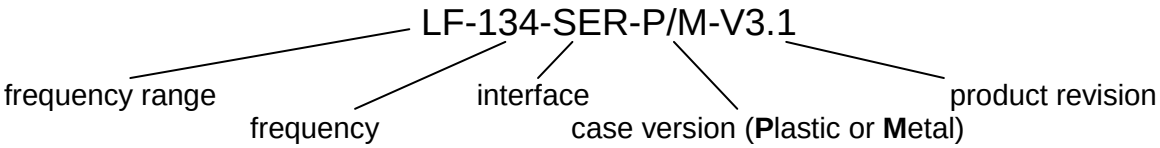
Content

List of Tables

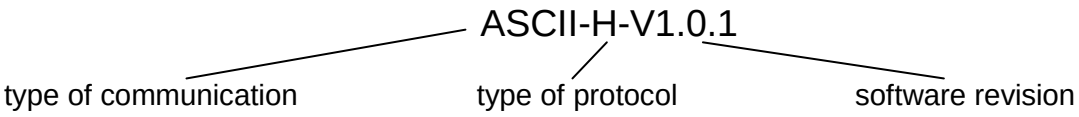
Product Revision Status

Old Product Name	New Product Code	Product Revision	Hardware Version	Available Software Versions	Manual Version
Serial Reader-P 3.0	LF-134-SER-P-V3.0	3.0 (without Test button)	2.4	ASCII-L-V2.6.1 or ASCII-H-V1.0.1 or ASCII-A-V1.0.0	3.5
Serial Reader-M 3.0	LF-134-SER-M-V3.0				
Serial Reader-P 3.1	LF-134-SER-P-V3.1	3.1 (with Test button)			
Serial Reader-M 3.1	LF-134-SER-M-V3.1				

Our new product code consists of following information:



Our new software product code consists of the following information:



Version	Description
ASCII-L-V2.6.1	Roth & Rau – Ortner developed short command set (please see section 7.2) Test button implemented incl. sending error messages to host
ASCII-H-V1.0.1	Command set compatible to Hermos protocol (please see section 7.3) Test button not implemented
ASCII-A-V1.0.0	Command set compatible to Asyst ASCII CIDRW Version S protocol (please see section 7.4) Test button implemented without sending error messages to host

Note: Product revisions are identified by revision numbers. Each revision number corresponds to versions of three components of the product: hardware, software and manual. Each product revision number is distinctive. The product revision number is assigned accordingly to distinctive versions of the three components. Version alteration of one of the components (hardware, software, manual) may alter accordingly the product revision number.

1 Safety Instructions

Please recognize the safety regulations. Nevertheless, there are dangers associated with the use of the equipment even for its intended purpose. You should therefore read the following safety information carefully and keep it in mind. Only install and operate this equipment if it is in perfect condition and with reference to this manual. Do not use the equipment if it is damaged.

1.1 Symbol and Tags

Special tags are used in this document to alert technicians to personal and equipment safety hazards. Before using this document, a thorough understanding of specific safety issues detailed in the Manual must be understood. The following types of safety tags appear in this document. Note that the following are only examples; they do not indicate a specific hazard associated with the product.

WARNING	Flammable Material
	Flames – Risk of fire

DANGER	Electricity; Electrical Hazard
	Lightning bolt – Dangerous voltage

DANGER	Explosive Material; Explosion Hazard
	Object exploding – Risk of explosion

WARNING	Non-Ionizing Radiation; Radio Frequency
	Abstract radiation transmitter – indicates electromagnetic radiation

CAUTION	General Warning
	Important instructions

1.2 General Safety Instructions

Read and understand all safety and operating instructions before installing and operating the device.

This instruction is designed for specially trained personnel. This device is NOT intended for use by the “general population” in an uncontrolled environment. Installation, operation and error handling the device shall be carried out by specially trained personnel only.

Keep these instructions. Store this manual in a place that can be accessed at any time by all persons involved in installing, operating and error handling the device.

Heed all warnings. Follow all warnings on and inside the device and operating instructions.

Install in accordance with the manufacturer's instructions only.

Only use attachments, accessories and connecting cables supplied by the manufacturer.

All error handling except the error handling listed in this manual must be carried out by the manufacturer.

People with hearing aids should remember that radio signals transmitted by the device might cause a very unpleasant buzzing noise in their hearing aids.

Do not connect the device to any kind of power supply such as a standard household power supply. The device should be connected to a power supply of the type described in these instructions only.

When you disconnect a cable, pull on its conductor and not on the cable itself. Keep the connector evenly aligned to avoid bending any connector pins. When you connect a cable, ensure that the connector pins are positioned correctly.

Never over bend the antenna cable or expose it to mechanical loads.

When replacement parts are required, use the replacement parts specified by the manufacturer only. Unauthorized substitutions may result in fire, electric shock, or other hazards.

	All antenna resonant circuit components carry high voltage!
	The installer is responsible for installing the device to comply with FCC requirements of human exposure to radio frequency.
	To prevent fire, shock hazard, or annoying interference, use recommended accessories only.
	When removing the housing lid, note that the housing lid is connected to the case with a cable. Remove the lid carefully to prevent damage – do not pull it! Do not operate the device when the housing lid is removed!
	Do NOT operate this device without a proper antenna attached. Proper antennas are antennas supplied by the manufacturer and listed in section „Antennas“.
	Never locate the antenna so that it is very close to or touching parts of the body while transmitting.

1.3 ESD Instructions

Static electricity can harm electronic components inside the device. All persons who install or maintain the device must be trained in ESD protection. ESD protection measures must be observed when opening the device.
Before removing or inserting components, disconnect the power supply.
To prevent electrostatic damage, static electricity must be discharged from the body and tools before touching components inside the device.
Touch electro sensitive components carefully at their edges only.

1.4 Proper Use

This product was developed for reading and writing the TIRIS® transponder only. Any other use of this device would constitute abuse. All antenna resonant circuit components carry high voltage! To prevent fire, shock hazard, or annoying interference, use recommended accessories only. Do not operate the device when the housing is removed! Proper antennas are antennas supplied by the manufacturer“. Never locate the antenna so that it is very close to or touching parts of the body while transmitting. This product is designed to be mounted and operated in an industrial environment as a built-in-device only. It is not designed to be used as a stand-alone or a portable device in a non-industrial environment, such as a household, automotive or open-air environment.

1.5 Qualified Personnel

This manual is designed for specially trained personnel only. This device must be installed and maintained by the manufacturer or its specially trained representatives. Intervention or error handling not expressively approved in this manual must be carried out by the manufacturer’s personnel only. If you are unsure about the qualifications that are actually required, contact the manufacturer.

Unqualified interventions may result in personal injury or damage to the device!

2 Installation

	This device is designed for use in an indoor industrial environment only. Installation is only permitted in an environmental indoor climate with a constant temperature of between 0°C and +50°C / 32°F and 122°F, humidity between 25% and 80%, and a maximum temperature of +50°C / 122°F.
	Do not install or use this device in or near water. Never spill liquids of any kind onto the device. Should spillage occur, unplug the device and let it check from a technician.
	Do not install near heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat. Do not install the device in a flammable environment.
	Never expose the device to intense changes in temperature, otherwise condensation can develop inside the device and cause damages.
	Do not locate the device near overhead power lines or other electric lights, or power circuits or where it can encounter such circuits. When installing the device, take extreme care not to encounter such circuits as they can cause serious injury or death.
	The device should not be used in the immediate vicinity of electrical units (such as medical units, monitors, telephones, televisions and energy-saver lamps), magnetic data carriers, or metallic objects. This could result in reduced reading/writing ranges.
	Never use the device in potentially explosive areas (such as paint shops).
	Do not position the device in a location where it can suffer from vibration or shock.
	When the device is installed, the installation location must be adequately illuminated.
	Do not install the device during periods of lightning.
	Ensure the installation location complies with FCC requirements for human exposure to radio frequency.

3 Federal Communications Commission (FCC)

Class A digital device. A digital device that is marketed for use in a commercial, industrial or business environment, exclusive of a device which is marketed for use by the general public or is intended to be used in the home.

Compliance

The product complies with FCC Subpart C – Intentional Radiators §15.201 and with Subpart J – Equipment Authorization Procedures § 2.209, when used for its intended purpose. All emissions are at least 40 dB below the limits in § 15.209 and are verified pursuant to the procedures in FCC Subpart J of part 2. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his/her own expense.

Antenna Requirements

The antenna is removable and does not employ a unique connector; however, the device is professionally installed and maintained. Therefore, the described LF Reader complies with FCC15.203.

Labeling Requirements

The described LF Reader is not large enough to accommodate a label with the standard FCC compliance statement. It is therefore provided here as follows:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance may void the user's authority to operate the equipment.

4 Europe CE-Conformity

Konformitätserklärung gemäß dem Gesetz über Funkanlagen und Telekommunikations-endeinrichtungen (FTEG) und der Richtlinie 1999/5/EG (R&TTE)
Declaration of Conformity in accordance with the Radio and Telecommunications Terminal Equipment Act (FTEG) and Directive 1999/5/EC (R&TTE Directive)

Der Hersteller: The manufacturer:	Roth & Rau - Ortner GmbH
erklärt, dass das Produkt: declares, that the product:	LF-134-SER-P/M-V3.1
Typ: Type:	Low Frequency RFID Reader

bei bestimmungsgemäßer Verwendung den grundlegenden Anforderungen des §3 und den übrigen einschlägigen Bestimmungen des FTEG entspricht.
complies with the essential requirements of §3 and the other relevant provisions of the FTEG, when used for its intended purpose.

Relevante Anforderung: relevant provisions:	**Vfg. 39/05** Allgemeinzuteilung von Frequenzen im Frequenzbereich 9 - 30 000 kHz für die Nutzung durch die Allgemeinheit für induktive Funkanwendungen.
Angewendete harmonisierte Normen: harmonised standards applied:	**EN 61000-6-4:2001** Elektromagnetische Verträglichkeit – Teil 6-4 Fachgrundnorm Störaussendung – Industriebe-reich EN 61000-6-2:2001 Elektromagnetische Verträglichkeit – Teil 6-2 Fachgrundnorm Störfestigkeit –Industriebereich

Dresden, 24.10.2006
Ort, Datum

Heinz Martin Esser
Name, Unterschrift

5 Service Information

5.1 Contact

To buy RFID components or spare parts, please contact our sales team:

Phone: +49 351 88861-23 / 31 (only daytime CET)
Fax: +49 351 88861-20
mailto: ortner.sales@roth-rau.com

To get Support, a RMA No. or the RMA form to place a warranty request for RFID components, please contact:

Roth & Rau - Ortner GmbH, Germany
Phone: +49 351 88861-0 (only daytime)
Fax: +49 351 88861-20
mailto: ortner.support@roth-rau.com

or

Roth & Rau - Ortner USA, Inc., Salt Lake City
Phone: 801 748 0476 (only daytime)
Fax: 801 748 0158
mailto: ortner.info@roth-rau.com

5.2 Return Material Authorization (RMA)

Before returning a defective device to Roth & Rau - Ortner, it is necessary to request a RMA number. This process ensures the proper return of the product and enables a faster classification and repair/replacement of the defective device. You can download the RMA form at www.roth-rau.com/ortner/contact.php?rma=1

Customer contacts Roth & Rau - Ortner and request a RMA number:
Phone: +49 351 88861-77
mailto: ortner.support@roth-rau.com

Roth & Rau - Ortner generates a RMA number

Using the RMA number, the customer completes the RMA form

Ship the defective unit with the RMA-Report to:
Roth & Rau - Ortner GmbH
R M A [number]
Manfred-von-Ardenne-Ring 7
01099 Dresden
GERMANY

IMPORTANT! Please prominently display the RMA number on the packaging, to allow us to serve you faster.

Acknowledgment of receipt and processing of the RMA request by Roth & Rau - Ortner

Returning the repaired/replaced device

5.3 Support

For all purchased RFID components Roth & Rau – Ortner GmbH will provide free phone or email support. This includes support for the operation of the components and also support for the integration/installation of components into other equipment. The phone support will be available at normal working times (8:00 a.m. to 5:00 p.m. CET, outside this timeframe a voice mail box will be available).

5.4 Spare parts

The components in our current array of products are available as spare parts to our customers. In case of spare part requests for products which are already removed from our actual array of products, & Rau – Ortner GmbH requires the type information. All components have an expected product lifetime of 10 years. For this time period we are able to provide spare parts.

5.5 Warranty

The warranty period is 24 months and begins with the moment of delivery of the device as proved by an invoice or other documents. The warranty includes the repair of all damages to the device that occurs within the warranty period and which are evidently caused by faults of the material or production defects.

The warranty does not include damages caused by incorrect connection, inappropriate handling and non-observance of the technical reports.

6 LF-134-SER unit

6.1 General

The LF-134-SER is an RFID module which supports 134.2 kHz half duplex transponders. The reading of 64bit “Read-only” and 64bit “Read-Write” transponder types is supported. The module contains an RS232 interface.

Features:
RS232 interface
Reads and writes RO/RW/MPT types transponders
Powerful and efficient output stage

6.2 Design

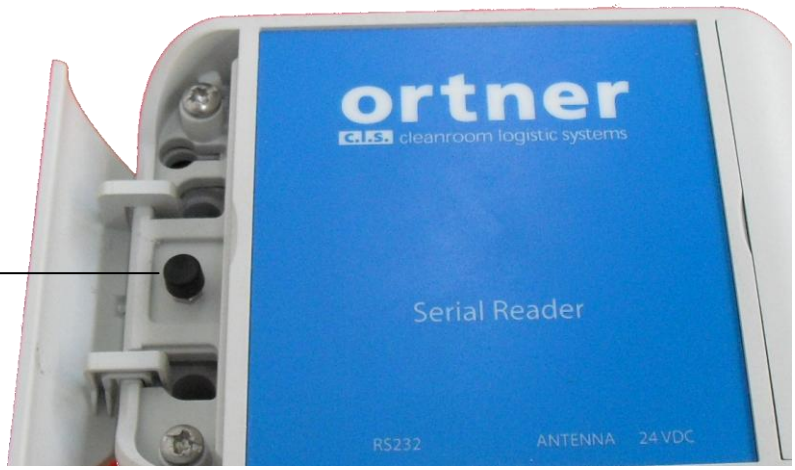
1 Status LED

2 RS232 Connector

3 Power 24 V DC

4 Antenna Connector

Test Button
V3.0 without
V3.1 with



6.3 Technical Data

Designation	Version - P	Version - M
Version	LF-134-SER with plastic case; aluminium-metallized inside	LF-134-SER with metal case; particularly suitable for production environments with high electromagnetic interference
Dimensions	120 x 90 x 50mm	97 x 90 x 39mm (without Base plate) 117 x 90 x 44 mm (with Base plate)
Weight	235g	255g (without Base plate)
Case:	ABS (Acrylonitrile butadiene styrene)	Case: tin plate Base plate: POM
Operating temperature	0°C to +50°C	
Storage temperature	-25°C to +50°C	
Voltage power supply (typical)	24 V $^{+/- 3\%}$	
Power consumption	reading 500mA / stand-by 10mA	
Antenna	Ferrite antenna	
RFID frequency	134.2kHz	
RFID chip	Tiris 134.2kHz HDX/FSK	
Readable transponder types	134.2kHz HDX/FSK, MPT, SAMPT, RW, RO	
Max. reading range (65 mm antenna)	200mm	
MTBF	≥ 40,000h	
MCBF	≥ 1,000,000 reading cycles	
Reading time one page	Average 110msec	

Table 6-1 Technical Data

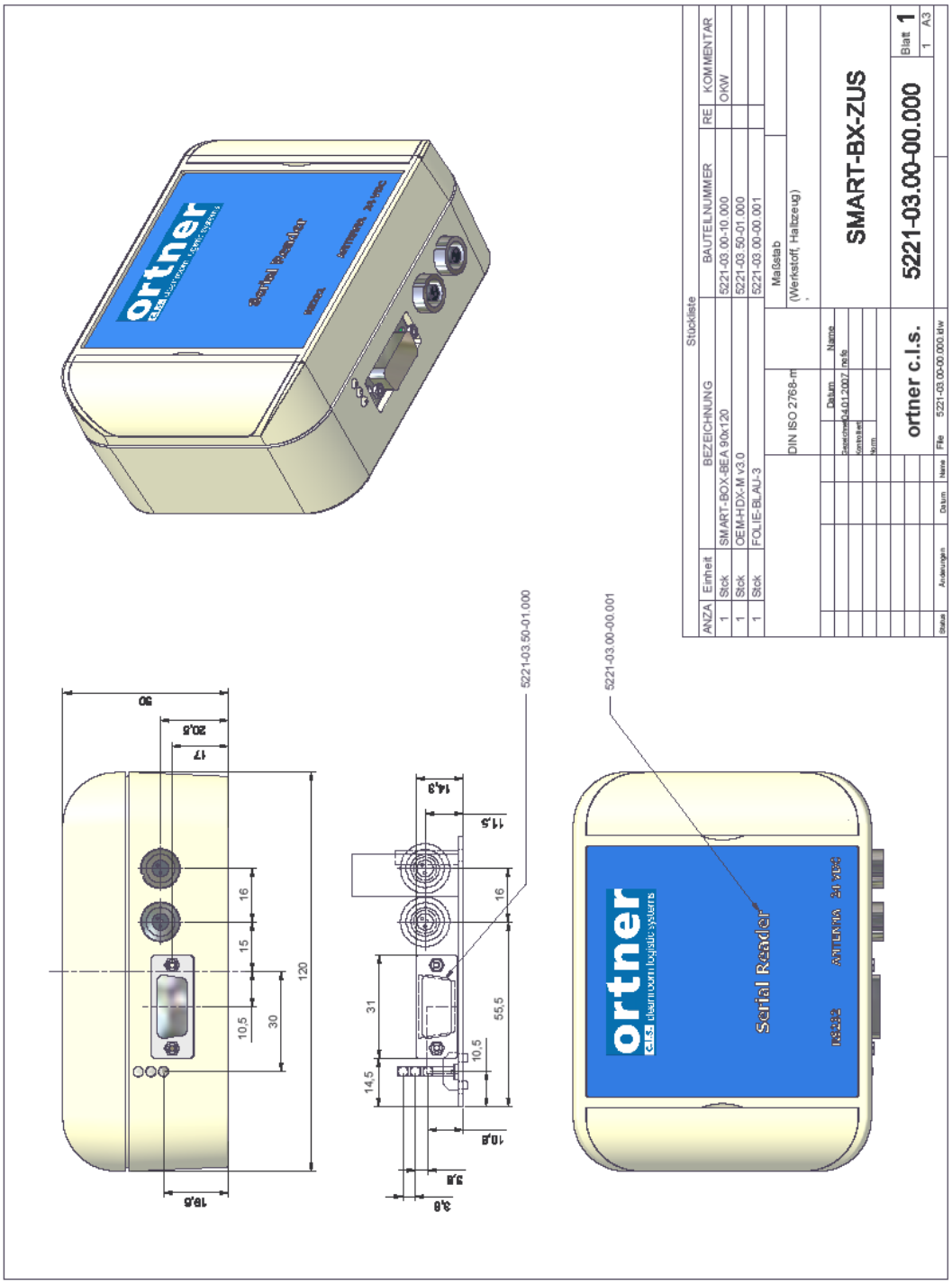


Figure 6-1: Technical Drawing LF-134-SER-P

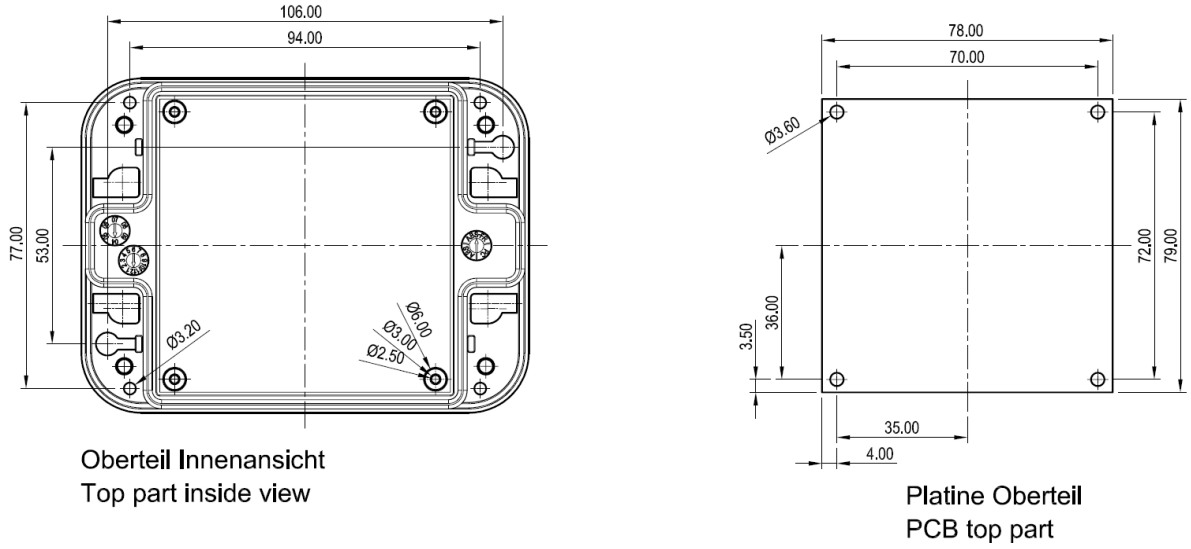


Figure 6-2: Mounting Information LF-134-SER-P

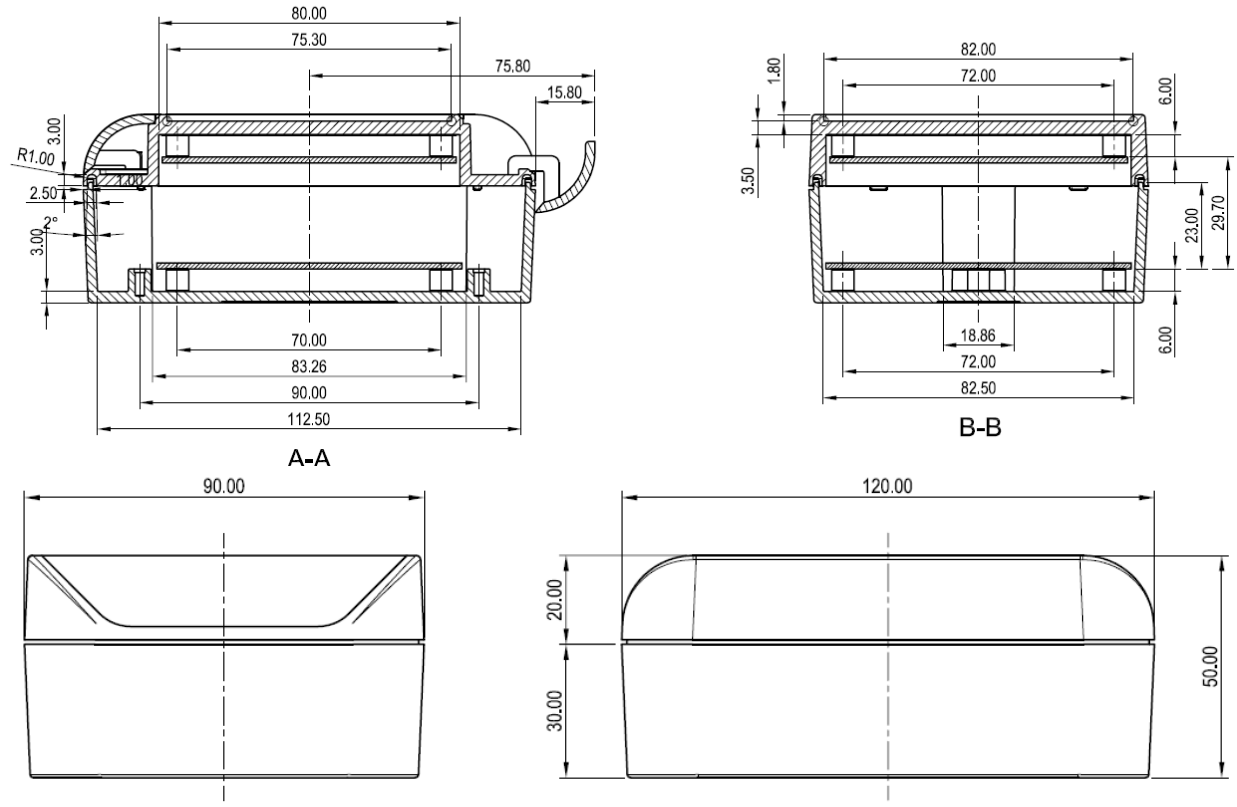


Figure 6-3: Dimensions of LF-134-SER-P

6.4 Electrical Specification

Absolute Tolerances	Min	Max
Supply Voltage	21,6 V	26,4 V
Ambient Temperature	0°C	50°C

Table 6-2 Electrical Specification

Supply Current	Supply Voltage = 24V +/- 10%
idle	10 mA
active (1 read / sec)	500 mA

Table 6-3 Supply Current

6.5 Hardware Specification/ Settings

The hardware of the LF-134-SER consists of a 4 layer PCB with female DSUB 9 pole connector for communication (J4) and a Binder 3 pin shielded connector for the antenna. The board is fitted with an ISP connector (J2) for “in circuit programming”.

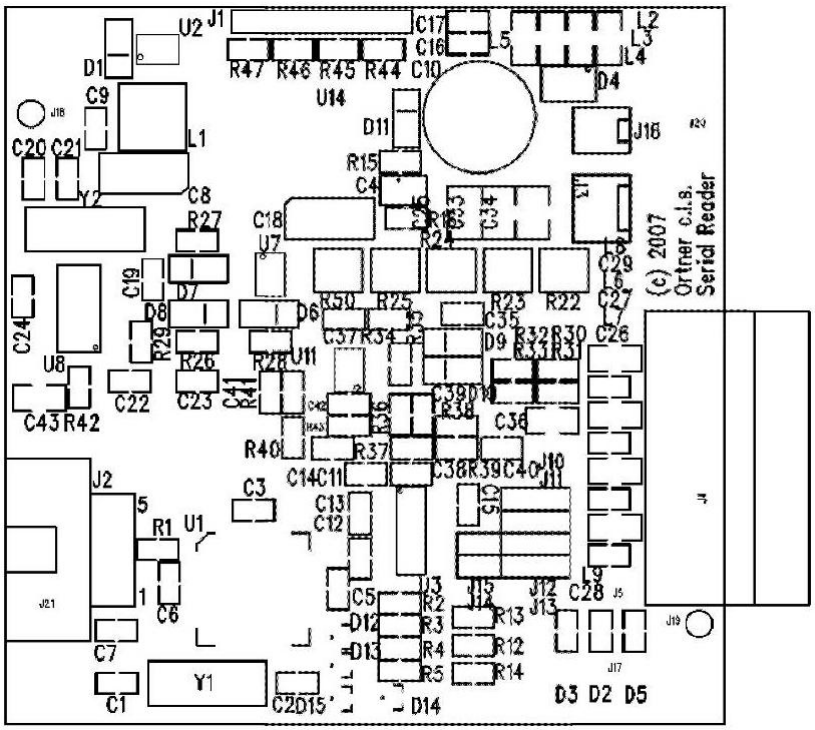


Figure 6-4: PCB view of LF-134-SER

6.6 Antenna specification

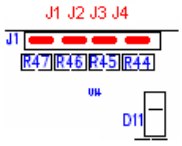
Antenna is connected to J3. Wire thickness should be at least 0.3mm but it can be an air coil or ferrite coil. 65mm Ferrite coil give >200mm read distance with a 23mm RO TAG.

Antenna specification	
Frequency	134 kHz
Inductivity	47 µH$^{+/- 5\%}$

Table 6-4 Antenna Specification

6.7 Reading power setting

Jumper J1 – J4 settings for RF power level on LF-134-SER. This setting defines the power level for the transmitting amplifier. All values are calculated values and might be differ a bit.



J1	J2	J3	J4	RF supply Voltage (approx.)	Read distance (approx.)
OFF	OFF	OFF	OFF	23,75 V	100%
OFF	OFF	OFF	ON	14,75 V	85%
ON	OFF	OFF	OFF	12,50 V	81%
ON	OFF	OFF	ON	9,70 V	74%
ON	ON	OFF	OFF	8,75 V	71%
ON	ON	OFF	ON	7,40 V	67%
ON	ON	ON	OFF	6,87 V	66%
ON	ON	ON	ON	6,07 V	63%

Table 6-5 Reading power settings

Without attenuating the output power it is not recommended to read faster than ones per second. This setting can be adjusted by placing a jumper across pin 7 and 8 on J1 (Selecting R44). The tags can be read at full speed, which is ~14 times per second with RO types. Default setting is no jumper (full power).

6.8 Communication interface specification

The setting of the serial interface depends on the applied software protocol.

Protocol	Bit rate (bit/sec)	Data bits	Stop bits	Parity
ASCII-L-V2.6.1	9600	8	1	none
ASCII-H-V1.0.1	4800/9600/19200/28800/57600	8	1	even
ASCII-A-V1.0.0	4800/9600/19200/28800/57600	8	1	none

Table 6-6 Communication interface settings

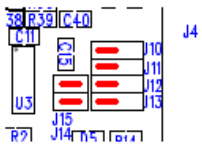
J6 – Sub D connector	
3	RXD
2	TXD
5	GND

Table 6-7 Sub D connector

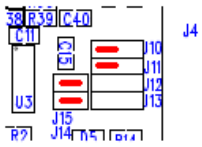
6.9 Communication interface setting

The communication interface supports different operating settings. J10 – J 15 can be used to switch the modes as shown below:

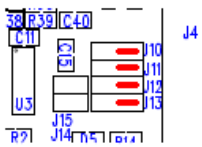
Standard RS 232 with handshake:



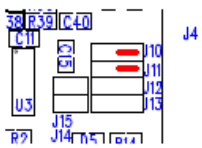
Standard RS232 without handshake:



TTL level RS232 with handshake:



TTL level RS 232 without handshake:



6.10 Power connector

In table below the Electrical specification is given for connector J3.

J1 – MISC connector	
1	24 VDC$^{+/-3\%}$
2	GND

Table 6-8: Power connector

6.11 LED signals (Indicator light)

In the table below the meaning of the LED signals is described

Color	
Green	Power/Idle
Yellow	Reading in process (Read success in test mode)
Red	Read error

Table 6-9: LED signals

7 Software

7.1 Preamble

The Implementation of our protocols is based on the ASCII communication protocol for RFID Reader – Type Tiris® (Texas Instruments)

We have three different types of ASCII protocols:

Version	Description
ASCII-L-V2.6.1	Roth & Rau – Ortner developed short command set (please see section 7.2) Test button implemented incl. sending error messages to host
ASCII-H-V1.0.1	Command set compatible to Hermos protocol (please see section 7.3) Test button not implemented
ASCII-A-V1.0.0	Command set compatible to Asyst ASCII CIDRW Version S protocol (please see section 7.4) Test button implemented without sending error messages to host

Table 7-1: Different ASCII versions

7.2 ASCII-L-V2.6.1 protocol description

7.2.1 Communication commands

There are only 9 different commands. They are as following:

Command	Description
R	Read RO, RW and MPT(Only page 0) transponders
W	Write RW transponders
V	Version and Serial number
M	Read MPT and SAMPT (Only page 0) transponders
U	Write MPT transponders
N	Read SAMPT transponders
I	Write SAMPT transponders
L	Lock MPT transponders
K	Lock SAMPT transponders
E	Returns details for last Error

Table 7-2: ASCII-L commands

Note: The commands are always upper case.

7.2.2 Command usage

7.2.2.1 Read command

The READ is initiated with an ‘R’ or 0x52. If no transponder is read, CRC is wrong, or antenna is broken it returns ‘E!<CR><LF>’ or 0x45,0x21,0x0D,0x0A.

If a transponder is read it could look like this:
‘507EC5716803000000000CE0C’,0x0D,0x0A – READ ONLY
‘50FE0123456789ABCDEF3C5A’,0x0D,0x0A – READ / WRITE

The code looks like this:

[startbyte][transponder type][LSB - > MSB–8byte][CRC–L][CRC–H],0x0D,0x0A

[startbyte] is always ‘50’.

[transponder type] is ‘7E’ for RO and ‘FE’ for R/W transponder.

[LSB - > MSB–8byte] is 8 byte of data/serial number – 16 ASCII character.
[BYTE 0] [BYTE 1] [BYTE 2] [BYTE 3] [BYTE 4] [BYTE 5] [BYTE 6] [BYTE 7]

Each byte is made of 2 ASCII characters. Every ASCII character is a HEX value (0 – 9,A – F). Every byte is defined as [high-hex][lowhex] => [BYTE].

The CRC is always calculated. If it is wrong then the LF-134-SER module returns ‘E!’

The Reverse CRC is calculated only for Byte 0 – 7 and is done with the sample routine shown below.

```
crc = 0;

for (a = 2; a < 10; a++)
{
        rev_crc_ccitt(data_buffer[a],&crc,0x8408);
}

void rev_crc_ccitt(unsigned int data,unsigned int *accum,unsigned int poly)
{
        unsigned int i;

        data = data << 1;
        for (i = 8; i > 0; i--)
        {
                data = data >> 1;
                if ((data ^ *accum) & 0x0001)
                        *accum = (*accum >> 1) ^ poly;
                else
                        *accum = *accum >> 1;
        }
}
```

7.2.2.2 Write command

The WRITE is initiated with a ‘W’ or 0x57. Followed by 8 bytes of data (16 ASCII characters). It could look like:

W0123456789ABCDEF => ‘W’[LSB - > MSB–8byte]
[LSB - > MSB–8byte] is 8 byte of data/serial number – 16 ASCII character.
[BYTE 0] [BYTE 1] [BYTE 2] [BYTE 3] [BYTE 4] [BYTE 5] [BYTE 6] [BYTE 7]

Each byte is made of 2 ASCII characters. Every ASCII character is a HEX value (0 – 9,A – F). Every byte is defined as [high-hex][lowhex] => [BYTE].

If no transponder is near, CRC is wrong, or antenna is broken it returns ‘E!<CR><LF>’ or 0x45,0x21,0x0D,0x0A.

If a transponder is written it using ‘W0123456789ABCDEF’ should look like this:
‘50FE0123456789ABCDEF3C5A’,0x0D,0x0A – READ / WRITE

If it is different the write command is not done properly. (Wrong transponder or to far away)

7.2.2.3 Version command

The Version command is initiated with a ‘V’ or 0x56.

It returns:

‘Vx.x,S/N’[20 bytes of serial number],0x0D,0x0A

If it does not return a ‘Vx.x’ as version number it is not compatible with this reference manual! Try call or email for the right document.

7.2.2.4 Read command for MPT and SAMPT page 0

The READ is initiated with an ‘M’ or 0x4D. Followed by 1 bytes of data (2 ASCII characters). It could look like:

M01 => ‘M’[address]
[address] is a single byte of page number – 2 ASCII character. The Address goes from 0x01 to 0x11 (page 1 – 17).
[BYTE 0]

The byte is made of 2 ASCII characters. Every ASCII character is a HEX value (0 – 9,A – F). Every byte is defined as [high-hex][lowhex] => [BYTE].

If no transponder is near, CRC is wrong, or antenna is broken it returns ‘E!<CR><LF>’ or 0x45,0x21,0x0D,0x0A.

If a transponder is near it will respond with the following code regardless if it is a MPT or SAMPT (Only if page 1 is read):

‘507E00000000000000000000042446’,0x0D,0x0A

[startbyte][type][LSB - > MSB][DATACRC–L][DATACRC–H][PAGE][FRAMECRC-L][FRAMECRC-H],0x0D,0x0A

[startbyte] is always ‘50’.

[type] is ‘7E’ for MPT and SAMPT transponders.

[LSB - > MSB] is 8 byte of data/serial number – 16 ASCII character.
[BYTE 0] [BYTE 1] [BYTE 2] [BYTE 3] [BYTE 4] [BYTE 5] [BYTE 6] [BYTE 7]

For the SAMPT transponders, the data field on page 1 contains a 24 bit selective address (Byte 0 – 2) and 40 bit identification data (Byte 3 – 7).

[DATACRC–L][DATACRC–H] Data CRC checksum.

The CRC is always calculated. If it is wrong then the LF-134-SER module returns ‘E!’

The Reverse CRC is calculated only for Byte 0 – 7 and is done with the sample routine below.

```
crc = 0;

for (a = 2; a < 10; a++)
{
        rev_crc_ccitt(data_buffer[a],&crc,0x8408);
}
```

```
void rev_crc_ccitt(unsigned int data,unsigned int *accum,unsigned int poly)
{
        unsigned int i;

        data = data << 1;
        for (i = 8; i > 0; i--)
        {
                data = data >> 1;
                if ((data ^ *accum) & 0x0001)
                        *accum = (*accum >> 1) ^ poly;
                else
                        *accum = *accum >> 1;
        }
}
```

[PAGE] contains two status bits and 6 page bits.

Bit 0 – 1 are the status bits.

Bit 0	Bit 1	Status
0	0	Read unlocked page
1	0	Programming done
0	1	Read locked page
1	1	Reserved

Table 7-3: Status Bits Part 1 of ASCII-L

Bit 2 – 7 is the page bits.

BIT 7 – 2: 00001 – Page 1
BIT 7 – 2: 00010 – Page 2
|
BIT 7 – 2: 01000 – Page 16
BIT 7 – 2: 01001 – Page 17

If the page bits are zero, programming or locking of page is not done correctly.
Then the status bits have the following format:

Bit 0	Bit 1	Status
0	0	Read unlocked page, locking not correctly executed
1	0	Programming done, but possible not reliable
0	1	Read locked page, but locking possible not reliable
1	1	Reserved

Table 7-4: Status Bits Part 2 of ASCII-L

[FRAMECRC–L][FRAMECRC–H] Frame data CRC checksum.

The CRC is always calculated. If it is wrong then the LF-134-SER module returns ‘E!’

The Reverse CRC is calculated only for Byte 0 – 7,datacrc and page info and is done with the sample routine below.

```
crc = 0;

for (a = 2; a < 13; a++)
{
        rev_crc_ccitt(data_buffer[a],&crc,0x8408);
}

void rev_crc_ccitt(unsigned int data,unsigned int *accum,unsigned int poly)
{
        unsigned int i;

        data = data << 1;
        for (i = 8; i > 0; i--)
        {
                data = data >> 1;
                if ((data ^ *accum) & 0x0001)
                        *accum = (*accum >> 1) ^ poly;
                else
                        *accum = *accum >> 1;
        }
}
```

7.2.2.5 Write command for MPT

The WRITE is initiated with a ‘U’ or 0x55. Followed by 1 byte page select and 8 bytes of data (16 ASCII characters).
It could look like:

U020123456789ABCDEF => ‘U’[PAGE – 1 byte][LSB - > MSB–8byte]
[LSB - > MSB–8byte] is 8 byte of data/serial number – 16 ASCII character.
[BYTE 0] [BYTE 1] [BYTE 2] [BYTE 3] [BYTE 4] [BYTE 5] [BYTE 6] [BYTE 7]

Each byte is made of 2 ASCII characters. Every ASCII character is a HEX value (0 – 9,A – F). Every byte is defined as [high-hex][lowhex] => [BYTE].

If no transponder is near, CRC is wrong, or antenna is broken it returns ‘E!<CR><LF>’ or 0x45,0x21,0x0D,0x0A.

If a transponder is written it using ‘U020123456789ABCDEF’ , the data should look like this: ‘507E0123456789ABCDEF3C5A09C19D’,0x0D,0x0A – READ / WRITE
For the format on the data from the LF-134-SER module look on description of the data format when reading a MPT in the chapter “7.2.2.4 Read command for MPT and SAMPT page 0“.

7.2.2.6 Read command for SAMPT transponders

You need the Selective read address obtained by reading an MPT and SAMPT PAGE 0 by executing the ‘M01’ command as described in chapter 7.2.2.4.

The READ is initiated with an ‘N’ or 0x4E. Followed by 1 byte of page select (2 ASCII characters) and 3 bytes of selective address-
It could look like:

N01000000 => ‘N’[address][selective address byte 0 – 3]
[address] is a single byte of page number – 2 ASCII character. The Address goes from 0x01 to 0x11 (page 1 – 17).
[BYTE 0]

[selective address byte 0 – 3] is a 3 byte selective address obtained by reading page 1 with ‘M01’ – 6 ASCII character. The Address goes from 0x000000 to 0xFFFFFF.
[BYTE 0] [BYTE 1] [BYTE 2]

The byte is made of 2 ASCII characters. Every ASCII character is a HEX value (0 – 9,A – F). Every byte is defined as [high-hex][lowhex] => [BYTE].

If no transponder is near, CRC is wrong, or antenna is broken it returns ‘E!<CR><LF>’ or 0x45,0x21,0x0D,0x0A.

If a SAMPT transponder is near it will respond with the following code:

‘507E00000000000000000000042446’,0x0D,0x0A

[startbyte][type][LSB - > MSB][DATACRC–L][DATACRC–H][PAGE][FRAMECRC-L][FRAMECRC-H],0x0D,0x0A

[startbyte] is always ‘50’.

[type] is ‘7E’ for SAMPT transponders.

[LSB - > MSB] is 8 byte of data/serial number – 16 ASCII character.
[BYTE 0] [BYTE 1] [BYTE 2] [BYTE 3] [BYTE 4] [BYTE 5] [BYTE 6] [BYTE 7]

For the SAMPT transponders, the data field on page 1 contains a 24 bit selective address (Byte 0 – 2) and 40 bit identification data (Byte 3 – 7).

[DATACRC–L][DATACRC–H] Data CRC checksum.

The CRC is always calculated. If it is wrong then the LF-134-SER module returns ‘E!’

The Reverse CRC is calculated only for Byte 0 – 7 and is done with the sample routine below.

```
crc = 0;

for (a = 2; a < 10; a++)
{
        rev_crc_ccitt(data_buffer[a],&crc,0x8408);
}
```

```
void rev_crc_ccitt(unsigned int data,unsigned int *accum,unsigned int poly)
{
        unsigned int i;

        data = data << 1;
        for (i = 8; i > 0; i--)
        {
                data = data >> 1;
                if ((data ^ *accum) & 0x0001)
                        *accum = (*accum >> 1) ^ poly;
                else
                        *accum = *accum >> 1;
        }
}
```

[PAGE] contains two status bits and 6 page bits.

Bit 0 – 1 is the status bits.

Bit 0	Bit 1	Status
0	0	Read unlocked page
1	0	Programming done
0	1	Read locked page
1	1	Reserved

Bit 2 – 7 is the page bits.

BIT 7 – 2: 00001 – Page 1
BIT 7 – 2: 00010 – Page 2
|
BIT 7 – 2: 01000 – Page 16
BIT 7 – 2: 01001 – Page 17

If the page bits are zero, programming or locking of page is not done correctly.
Then the status bits have the following format:

Bit 0	Bit 1	Status
0	0	Read unlocked page, locking not correctly executed
1	0	Programming done, but possible not reliable
0	1	Read locked page, but locking possible not reliable
1	1	Reserved

[FRAMECRC–L][FRAMECRC–H] Frame data CRC checksum.

The CRC is always calculated. If it is wrong then the LF-134-SER module returns ‘E!’

The Reverse CRC is calculated only for Byte 0 – 7,datacrc and page info and is done with the sample routine below.

crc = 0;

```
for (a = 2; a < 13; a++)
{
        rev_crc_ccitt(data_buffer[a],&crc,0x8408);
}
void rev_crc_ccitt(unsigned int data,unsigned int *accum,unsigned int poly)
{
        unsigned int i;

        data = data << 1;
        for (i = 8; i > 0; i--)
        {
                data = data >> 1;
                if ((data ^ *accum) & 0x0001)
                        *accum = (*accum >> 1) ^ poly;
                else
                        *accum = *accum >> 1;
        }
}
```

7.2.2.7 Write command for SAMPT transponders

The WRITE is initiated with an ‘I’ or 0x49. Followed by 1 byte page select, 3 bytes of selective address and 8 bytes of data (16 ASCII characters).
It could look like:

I020000000123456789ABCDEF => ‘I’[PAGE – 1 byte][selective address LSB - > MSB–3byte][LSB - > MSB–8byte]

[LSB - > MSB–8byte] is 8 byte of data/serial number – 16 ASCII character.
[BYTE 0] [BYTE 1] [BYTE 2] [BYTE 3] [BYTE 4] [BYTE 5] [BYTE 6] [BYTE 7]

Each byte is made of 2 ASCII characters. Every ASCII character is a HEX value (0 – 9,A – F). Every byte is defined as [high-hex][lowhex] => [BYTE].

If no transponder is near, CRC is wrong, or antenna is broken it returns ‘E!<CR><LF>’ or 0x45,0x21,0x0D,0x0A.

If a transponder is written it using ‘I020123456789ABCDEF’ , the data should look like this: ‘507E0123456789ABCDEF3C5A09C19D’,0x0D,0x0A – READ / WRITE

For the format on the data from the LF-134-SER module look on description of the data format when reading a MPT in the chapter “7.2.2.4 Read command for MPT and SAMPT page 0“.

7.2.2.8 LOCK command for MPT

The WRITE is initiated with an ‘L’ or 0x4C. Followed by 1 byte page address.

It could look like:

L01 => ‘L’[PAGE – 1 byte]
Each byte is made of 2 ASCII characters. Every ASCII character is a HEX value (0 – 9,A – F). Every byte is defined as [high-hex][lowhex] => [BYTE].

If no transponder is near, CRC is wrong, or antenna is broken it returns ‘E!<CR><LF>’ or 0x45,0x21,0x0D,0x0A.

If a transponder is written it using ‘L01’, the data should look like this:

‘507E0101010101010101335F063665’,0x0D,0x0A

For the format on the data from the LF-134-SER module look on description of the data format when reading a MPT in the chapter “7.2.2.4 Read command for MPT and SAMPT page 0“.

7.2.2.9 LOCK command for SAMPT

The WRITE is initiated with a ‘K’ or 0x4B. Followed by 1 byte page select, 3 bytes of selective address.

It could look like:

K01000000 => ‘K’[PAGE – 1 byte][selective address LSB - > MSB–3byte]

Each byte is made of 2 ASCII characters. Every ASCII character is a HEX value (0 – 9,A – F). Every byte is defined as [high-hex][lowhex] => [BYTE].

If no transponder is near, CRC is wrong, or antenna is broken it returns ‘E!<CR><LF>’ or 0x45,0x21,0x0D,0x0A.

If a transponder is written it using ‘K01000000’ , the data should look like this:

‘507E0101010101010101335F063665’,0x0D,0x0A

For the format on the data from the LF-134-SER module look on description of the data format when reading a MPT in the chapter “7.2.2.4 Read command for MPT and SAMPT page 0“.

7.2.2.10 ERROR command

The ERROR command is a single ‘E’ or 0x45.

If a READ- or WRITE-command returns ‘E!’ the reason for this can read out by sending the ERROR command. It returns an ‘E’ followed by a decimal value from 0 to 4 as error code.

‘E’[ERROR CODE],0x0D,0x0A

ERROR CODE	Description
0	No error
1	Read/Write failed - CRC wrong or - reread page content doesn’t match write command
2	No transponder found
3	Wrong transponder type - Read/Write single page as multi page or - Read/Write multi page (2-17) as single page
4	Write command on locked page

Table 7-5: ASCII-L Error Codes

7.3 ASCII-H-V1.0.1 protocol description

7.3.1 Structure of the Communication Protocol

7.3.1.1 General remarks

The communication will be done with ASCII - packages. After each command to the reader a defined response is sent. It is necessary to wait for this response before sending a new command.

Package Contents

Each package includes a package header (three signs), a message (two or more signs) and the end of package (five signs).

package header	Message	end of package

Package Header

The header includes the start sign (one sign) and the package length (two signs).

start	length 1	length 2

start: start sign (ASCII-sign 'S')
length 1: '0'- 'F' high byte package length (hexadecimal) - ASCII-sign
length 2: '0'- 'F' low byte package length (hexadecimal) - ASCII-sign

The message length describes the number of characters of a message.

Message Structure

The message includes a command, a target address and a source address as well as information.

command	Address	information

Command: ASCII-sign (refer to the 'Command' chapter)

Address: target/ source address; ASCII sign '0' for ID reader and 'F' for the gateway

Information: depends on the command (includes none, one or more ASCII signs '0'…'F')

End of Package

The end of package includes an end sign (one sign) and a checksum (four signs).

End	Checksum 1	checksum 2	checksum 3	checksum 4

End: end sign ASCII sign no. 13 (hexadecimal 0D)

Checksum 1: high byte - XOR logic of all data (package header, message and end sign);
ASCII '0'...'F'
Checksum 2: low byte - logic of all data (package header, message and end sign);
ASCII '0'...'F'
Checksum 3: high byte - addition of all data (package header, message and end sign);
ASCII '0'…'F'
Checksum 4: low byte - addition of all data (package header, message and end sign);
ASCII '0'...'F'

7.3.2 Commands

7.3.2.1 Commands Terminal to Reader

Command	Description
‘X'	start an externally triggered read
'W	write tag
‘G'	request parameter
'P'	change parameter
'H'	start heartbeat
'N'	start software reset
‘M’	set/read TransponderMode (single/mpt)
‘L’	lock one page
‘I’	version & serial number query
‘S’	write serial number (require password)
‘V’	version query

Table 7-6: ASCII-H-V commands

7.3.2.2 Commands Reader to Terminal

Command	Description
'x'	data from a page (externally triggered read)
'w'	response after write to tag
'p'	response during parameter setting
'g'	response to read parameters
'h'	response after heartbeat
'n'	response after software or hardware reset
'e'	failure message
‘m’	response/ack after TransponderMode-Settings
‘l’	feedback at locking of one page
‘I’	response to version & serial number query

'v'	response to version query

Table 7-7: ASCII-H responses

7.3.2.3 Hardware Reset

Terminal	Direction	Reader
	←	package head
	←	'n' command
	←	'0' source address
	←	package end

Table 7-8: Hardware reset ASCII-H

See also section: Reset for Device.

7.3.2.4 Externally Triggered Reading (Read Request from Terminal)

The reading is initiated externally through the command 'X'. The command is configurable with the following parameters:

Value	Description
'01' to '17'[1)]	read page #
'98'	read all pages until end sign or empty sign in ID bit 0..3
'99'	read whole tag

Terminal		Direction	Reader
package header		→ … →	
Command	'X'	→	
target address	'0'	→	
value	i.e.'05'	→	
package end		→ … →	

	← … ←	Package Header	
	←	'x'	command
	←	'0'	source address
	←	i.e. '05'	page
	←	'0'...'F'	ID bit 60..63
	←	'0'...'F'	ID bit 56..59
	←	'0'...'F'	ID bit 52..55
	←	'0'...'F'	ID bit 48..51
	←	'0'...'F'	ID bit 44..47

	←	'0'...'F'	ID bit 40..43
	←	'0'...'F'	ID bit 36..39
	←	'0'...'F'	ID bit 32..35
	←	'0'...'F'	ID bit 28..31
	←	'0'...'F'	ID bit 24..27
	←	'0'...'F'	ID bit 20..23
	←	'0'...'F'	ID bit 16.. 19
	←	'0'...'F'	ID bit 12.. 15
	←	'0'...'F'	ID bit 8..11
	←	'0'...'F'	ID bit 4..7
	←	'0'...'F'	ID bit 0..3
	← … ←	package End	

There is no acknowledging from the terminal.

In case of read request for more than one page (value 98 or 99) the protocol will be repeated. For the end sign the Reader sends an additional package; the message includes the command 'x' and the source address '0'). If the reading fails the reading will be repeated (parameter 3: *r/w delay time;* parameter 4: *r/w maxrepeat).* If it fails again the Reader sends a failure message 'no tag(4)' to the terminal.

[1)] decimal value

7.3.2.5 Write Tag

The terminal will send the following information to the Reader: target, page and data.

Terminal		Direction	Reader
package header		→ … →	
command	'W'	→	
target address	'0'..'E'	→	
page	'01'.. '17' [1)]	→	
'0'...'F'	ID bit 60..63	→	
'0'...'F'	ID bit 56..59	→	
'0'...'F'	ID bit 52..55	→	
'0'...'F'	ID bit 48..51	→	
'0'...'F'	ID bit 44..47	→	
'0'...'F'	ID bit 40..43	→	
'0'...'F'	ID bit 36..39	→	
'0'...'F'	ID bit 32..35	→	
'0'...'F'	ID bit 28..31	→	
'0'...'F'	ID bit 24..27	→	
'0'...'F'	ID bit 20..23	→	

'0'...'F'	ID bit 16..19	→	
'0'...'F'	ID bit 12..15	→	
'0'...'F'	ID bit 8....11	→	
'0'...'F'	ID bit 4....7	→	
'0'...'F'	ID bit 0....3	→	
package end		→ … →	

		← … ←	package header
		←	'w' command
		←	'0'..'E' source address
		← … ←	package end

If 'write tag' fails writing will be repeated in the defined time frame (parameter 3: *r/w delay time;* parameter 4: *r/w maxrepeat).* If it fails again, but Transponder is in range, the Reader sends a failure message 'write fail (3)' to the terminal. If there is no transponder in range the Reader sends a failure message ‘no tag(4).

[1)] Decimal value.

7.3.2.6 Parameter Settings

The following reader parameters can be changed:

Parameter #	Name	Description	Valid Values
0	Sensor delay	operation delay for the presence sensor	'00'.. '99' (0.1s)
1	readmode	automatic readmode	'00' only one page read '01' read to end sign or empty sign'02' all pages'10' read only one page check sensor first '11’up to end/empty sign check sensor first '12' all pages check sensor first
2	readpage	page for readmode '00'	'01'.. '17'
3	r/w repeattime	time between two readings or writings	'00'.. '99' (0.1s)
4	r/w maxrepeat	max. number of tries to read or write	'00'.. '99'
5	RS232 repeattime	waiting period[1)] for a confirmation; if no confirmation has been received, the message will be repeated (see RS232 maxrepeat)	'01.. '99' (0.1s)
6	RS232 maxrepeat	max. numbers of tries to send data to the terminal (RS232)	'00' (never ending) '01' '99'

7	watchport	message to the terminal that the carrier has been rejected from I/O	'00' not activated '01' activated
8	Baudrate	Bitrate for serial interface (will be resumed after reset!)	'01' 4800 '02' 9600 '03' 19200 '04' 28800 '05' 57600
9	Parity	Parity bit for serial interface (will be resumed after reset!)	'00' none '01' even '02' odd

Table 7-9: ASCII-H parameter settings

Terminal		Direction	Reader
package header		→ … →	
command	'P'	→	
target address	'0'..'5'	→	
parameter*	'0'..'7'	→	
value '00'..'99'		→	
package end		→ … →	

	← … ←	package header
	←	'p' command
	←	'0' source ad-
	← … ←	package end

[1)] during the waiting period no new actions (for example reading or writing) can be started

Note:
Only parameter 3 (r/w repeattime) & 4 (r/w maxrepeat) takes effect on reader. All other parameters are only for compatibility.
Parameter 7 (watchport) always contains ‘00’

7.3.2.7 Check the Current Parameter Settings

Terminal		Direction	Reader
package header		→ … →	
command	‘G'	→	
target address	'0'	→	
package end		→ …→	

	← … ←	package header

	←	'g'	command
	←	'0'	source address
	←	'0'	value number
	←	'01'.. '99'	value
	← … ←	package end	

	← … ←	package header	
	←	'g'	command
	←	'0'	source address
	←	' 1'	value number
	←	'00'.. '02'	value
	← … ←	package end	

	← … ←	package header	
	←	'g'	command
	←	'0'	source address
	←	'2'	value number
	←	'01'.. '17'	value
	← … ←	package end	

	← … ←	package header	
	←	'g'	command
	←	'0'	source address
	←	'3'	value number
	←	'00'.. '99'	value
	← … ←	package end	

	← … ←	package header	
	←	'g'	command
	←	'0'	source ad-
	←	'5'	value number
	←	'00'.. '99'	value
	← … ←	package end	

	← … ←	package header	
	←	'g'	command

	←	'0' source ad-
	←	'5' value number
	←	'01'.. '99' value
	← … ←	package end

	← … ←	package header
	←	'g' command
	←	'0' source ad-
	←	'6' value number
	←	'00'.. '99' value
	← … ←	package end

	← … ←	package header
	←	'g' command
	←	'0' source ad-
	←	'7' value number
	←	'00'.. '01' value
	← … ←	package end

	← … ←	Package header
	←	'g' [1] command
	←	'0' source ad-
	← … ←	Package end

end package includes the command 'g' and the source address

7.3.2.8 Heartbeat

This command is used to check the connection between the terminal and the ID reader.

Terminal	Direction	Reader
package header	→ … →	
command 'H'	→	
target address '0' [1]	→	
package end	→ … →	

	← … ←	package header
	←	'h' command
	←	'F' source ad-
	←	'0000'...'FFFF' reader ID

	←	'0000' return code
	← … ←	package end

Meaning of the reader ID:
Every reader has a unique 16 bit reader ID after installation.
Every ID may only be used once.

[1)] Because of compatibility to separated systems the heartbeat is also allowed with the address 'F'.

7.3.2.9 Reset for Device

This command can be used to reset the ID reader (device '0').
During the software reset the reader additionally initiates a self-test.

Terminal		Direction	Reader
package header		→ ... →	
command	'N'	→	
target address	'0'	→	
package end		→…→	

	←…←	package header
	←	'n' command
	←	'0' source ad-
	←…←	package end

7.3.2.10 Transponder Mode

This command is used to request actual mode or switch between single – and multipage-transponders. This command is only possible for Reader ('0')

Terminal		Direction	Reader
package header		→ … →	
command	'M'	→	
target address	'0'	→	
mode	'0'…'1'	→	
package end		→ … →	

	← … ←	package header
	←	'm' command
	←	'F' source ad-
	←	'0'…'1' mode [1)]
	← … ←	package end

To request the current settings, the Reader needs Command without new mode-settings (see examples). If new mode is given, the Reader only sends acknowledge without current settings.

available modes:

0 - SinglePage-Transponder
1 - MultiPage-Transponder

Note: The Transponder-Mode is only necessary for writing. On reading page ‘01’ will be always read in SinglePage-Mode.

7.3.2.11 Locking of a Page

The terminal hands over the Reader its address and the page number which shall be locked.

Terminal	Direction	Reader
package header	→ … →	
Command 'L'	→	
target address '0'	→	
page ‘01’.. ‘17’	→	
package end	→ … →	

	← … ←	Package Header
	←	'l' command
	←	'0' source ad-
	← … ←	Package End

If 'write tag' fails writing will be repeated in the defined time frame (parameter 3: *r/w delay time;* parameter 4: *r/w maxrepeat).* If it fails again the Reader sends a failure message ‘no tag (4)' to the terminal.

Note: Locking is only possible on a MultiPage-Transponder !

7.3.2.12 Interrogate Version & Serial number

With this function the Version & Serial Number of the reader can be queried. The Version consists of 8 sign, the Serial consists of 20 sign. As delimiter there is a 5 sign string “,S/N:”. The Data is sending in ClearType-ASCII !

Terminal	Direction	Reader
package header	→ … →	
Command 'I'	→	
target address 'F'	→	
package end	→ … →	

	← … ←	Package Header

	←	'i'	command
	←	'F'	source address
	←	ASCII(8)	8 sign version
	←	ASCII(5)	5 sign delimiter
	←	ASCII(20)	20 sign serial
	← … ←	Package End	

Example: S23iFASC0.9.9,S/N:ORT30179.40F8

7.3.2.13 Interrogate Version

With this function the Version-Number can be queried. The Version-Number consists of 8 signs which are stored in ASCII-code.

Terminal	Direction	Reader
package header	→ … →	
Command 'V'	→	
target address ‘F’ || ‘0’	→	
package end	→ … →	

	← … ←	Package Header	
	←	'v'	command
	←	'F' || ‘0’	source address
	←	’00’…’FF’	1. ASCII
	←	’00’…’FF’	2. ASCII
	←	’00’…’FF’	3. ASCII
	←	’00’…’FF’	4. ASCII
	←	’00’…’FF’	5. ASCII
	←	’00’…’FF’	6. ASCII
	←	’00’…’FF’	7. ASCII
	←	’00’…’FF’	8. ASCII
	← … ←	Package End	

Example: S12v0415443302E392E39.1CC6

command	values 1 to 8							
v0	41	53	43	30	2E	39	2E	39
answer	A	S	C	1	.	0	.	0

7.3.3 Failure Codes

The failure codes have the following meanings:

Failure Code	Name	Description
0	none	without failure
1	auto fail	Automatic reading is not possible[1,2)]
2	ex fail	External triggered reading is not possible[1,2)]
3	write fail	data transfer to the tag not possible[1,2,3)]
4	no tag	no tag or antenna installed
5	invalid	invalid parameter or command
6	unknown	unknown failure
7	unconfig	the device is not configured
8	check	parity or/ and checksum failure
9	void ackn	no valid acknowledge
A	locked	*Locked Page* cannot be written
:	msg len	Message too long
;	invalid	invalid parameter or command
B	no ackn	the message which has to be confirmed had been sent maximally (rs232) maxrepeat) and had not been confirmed by the terminal within the defined time frame (see parameter 5)

Table 7-10 ASCII-H failure codes

1) because the device is still busy

2) or because a message has not been confirmed by the previous read up to now

3) or incorrect page number given

Terminal	Direction	Reader
	← … ←	package header
	←	'e' command
	←	'0'.. 'E','F' source ad-
	←	'0'..'B' failure code
	←…←	package end

7.3.4 Examples for Package

ASCII	HEX	Description
'S'	53	start sign
'0'	30	highbyte message length
'2'	32	lowbyte message length
'H'	48	first sign message: value
'F'	46	second sign message: target address
CR	0D	end sign
'5'	35	highbyte checksum XOR
'2'	32	lowbyte checksum XOR
'5'	35	highbyte checksum addition
'0'	30	lowbyte checksum addition

Calculation for the XOR checksum:

53 XOR 30 XOR 32 XOR 48 XOR 46 XOR 0D = 52 -> '5' '2'

Calculation for the addition checksum:

53 + 30 + 32 + 48 + 46 + 0D = 150
Only low significant byte will be used: -> 50 -> '5' '0'

7.3.5 Other examples:

ASCII ('.' = CR)	Description
S05P0101.0BD7	setting readmode reader0 on *tag*
S04X001.33AD	explicit read reader0 page 1
S04X098.33BD	explicit read reader0 *tag*
S04X099.32BE	explicit read reader0 *whole*
S02G0.2B39	question about parameter of reader0
S05P0304.0CDC	setting parameter reader0 *repeat_timet* to 4
S02N0.2240	reset reader0
S02M0	question about mode-settings of Reader
S03M00	set mode to singlepage
S03M01	set mode to multipage

7.4 ASCII-A-V1.0.0 protocol description

7.4.1 Protocol structure

The protocol structure accords to “Asyst ASCII protocol version S”:

Command:
TargetID HCS Command $Param_1$ ... $Param_n$ (CR)(LF)[(CS1)(CS2)]

Response:
TargetID HCA Response SSACK $Param_1$ ... $Param_n$ (CR)(LF)[(CS1)(CS2)]

TargetID
Head ID
The LF-134-SER accepts TargetIDs from 1 to 31 (like SEMI E99)
TargetID in response is always 01
Command
multi-character command
Params
Optional parameters for each command
(CR)(LF)
Command delimiters (0x0D 0x0A)
(CS1)(CS2)
If ‘CHECKSUM ON’ a 16bit checksum must be present
Numeric sum including all characters from TargetID to CR/LF
CS1 – HighByte, CS2 – LowByte
SSACK
Status/error code
If EXTENDEDSSACK = OFF

7.4.2 Communication commands

Note: Commands are always upper case.

Command	Description
R	Are you there
RAR	Read attribute request
WAR	Write attribute request
RR	Read request
WDR	Write data request
RMID	Read material ID
WMID	Write material ID
SCR	Subsystem command request

Table 7-11 ASCII-A commands

7.4.3 Command usage

7.4.3.1 R - Are you there

This command is used as heartbeat between host and reader.

Example
Command:
TargetID HCS R(CR/LF)
Response:
TargetID HCA D NO [HWVERSION] [SWVERSION]

7.4.3.2 RAR - Read attribute request

This command requests the current values of head settings.

Example
Command:
TargetID HCS RAR [Paramname$_1$] ... [Paramname$_n$]
Request:
TargetID HCA RAD [SSACK] [Paramvalue$_1$] ... [Paramvalue$_n$]

Supported Attributes
BAUDRATE: Bitrate setting for RS232
CarrierIDOffset: defines start point for reading/writing MID
CarrierIDLength: length of MID
CID_MAX_LENGTH: max length to read/write MID
CID_NP_ASCII: allows / prohibits non printable characters in MID
CHECKSUM: enables / disables checksum bytes
EXTENDEDSSACK: enables / disables additional error codes. If EXTENDEDSSACK is disabled only SEMI SSACK (NO/CE/TE/EE) will be send.
‘01’ - wrong TargetID
‘02’ - invalid offset
‘03’ - invalid length
‘04’ - data too long
‘05’ - data length does not match data
‘06’ - at least one attribute does not exist
‘07’ - at least one attribute out of range
‘10’ - could not write because Tag is locked
‘14’ - subsystem command does not exist
‘15’ - at least one parameter is invalid
‘84’ - invalid checksum
‘85’ - invalid command
‘87’ - invalid command structure
HeadStatus: current head status (IDLE / BUSY)
CID_ERROR: If ON, results error if MID < CarriedIDLength.

CID_JUSTIFY: If ‘R’, MID is right justified in MID space. If ‘L’, MID is left justified in MID space.
CID_PAD: If ZERO, pads MID with ASCII 0 (0x30). If NUL, pads MID with 0x00.
ENABLE_EVENTS: If ‘ON’, power on event is sent

NOTE: The attributes below are only for compatibility. They have no effect.
PIP_AUTOREAD: ON/OFF
PIP_AUTOREAD_DATA: MID/1-(136-CID_MAX_LENGTH)
PIP_AUTOREAD_LENGTH: 1-(136-CID_MAX_LENGTH)
PIP_SENSOR_POLARITY: LO/HI
MANTWRITEONLY: EN/DI

Attribute ranges

NOTE: All Attributes are case sensitive.

Attribute	Read/Write	Range	Default
BAUDRATE	r/w	1=4800/2=9600/3=19200/4=28800/5=57600	2
CarrierIDOffset	r/w	0 to CID_MAX_LENGTH-1 CarrierIDOffset + CarrierIDLength <= CID_MAX_LENGTH	0
CarrierIDLength	r/w	1 to CID_MAX_LENGTH CarrierIDOffset + CarrierIDLength <= CID_MAX_LENGTH	16
CID_MAX_LENGTH	r/w	(8*n) n=page 1 to 17	16
CID_NP_ASCII	r/w	ON = Enabled OFF = Disabled	ON
CHECKSUM	r/w	EN = Enabled DI = Disabled	DI
EXTENDEDSSACK	r/w	ON = all error codes OFF = SEMI SSACK only	ON
HeadStatus	r	IDLE/BUSY	
CID_ERROR	r/w	ON = Enabled OFF = Disabled	OFF
CID_JUSTIFY	r/w	R = Right L = Left	R
CID_PAD	r/w	NUL = 0x00 ZERO = 0x30	ZERO
CID_DISPLAY	r/w	ON = Enabled OFF = Disabled	ON
ENABLE_EVENTS	r/w	ON = Enabled OFF = Disabled	ON

Table 7-12: ASCII-A attributes

7.4.3.3 WAR - Read attribute request

This command requests the current values of head settings.

Example
Command:
TargetID HCS WAR [Paramname] $_{1...n}$ [Paramvalue] $_{1...n}$
Request:
TargetID HCA WADA [SSACK]

7.4.3.4 RR – Read request

The RR-command performs a data read from Notepad memory

(CID_MAX_LENGTH – page 17).

Example
Command:
TargetID HCS RR [Offset] [Length](CR/LF)
Offset = startbyte for reading behind CID
Length = bytes to read
Response:
TargetID HCA RDA [SSACK] [DATA]

7.4.3.5 WDR – Write data request

This command is used to write data to Notepad memory. It writes data in blocks of 8 bytes.

Example
Command:
TargetID HCS RR [Offset] [Length] [Data](CR/LF)
Offset = startbyte for writing behind CID (it has to be match begin of a page
e.g. 0 / 8 / 16 ... 112)
Length = bytes to write
Data = data to write
Response:
TargetID HCA WDRA [SSACK]

Note: This command does not apply to single page or 'read only' transponder!

7.4.3.6 RMID – Read material ID request

This command reads the CID using parameter CarrierIDOffset and CarrierIDLength.

Example
Command:
TargetID HCS RMID(CR/LF)
Response:
TargetID HCA RMIDA [SSACK] [CID]

7.4.3.7 WMID – Write material ID request

This command writes CID to the transponder using parameter CarrierIDOffset and CarrierID-Length. If CID is longer than CarrierIDLength the reader returns an error in SSACK. If CID is shorter than CarrierIDLength CID will padded with '0' or 0x00 in order to CID_PAD and CID_JUSTIFY.

Example
Command:
TargetID HCS WMID [SSACK] [CID](CR/LF)
Response:
TargetID HCA WMIDA SSACK

7.4.3.8 SCR – Subsystem command request (only reset)

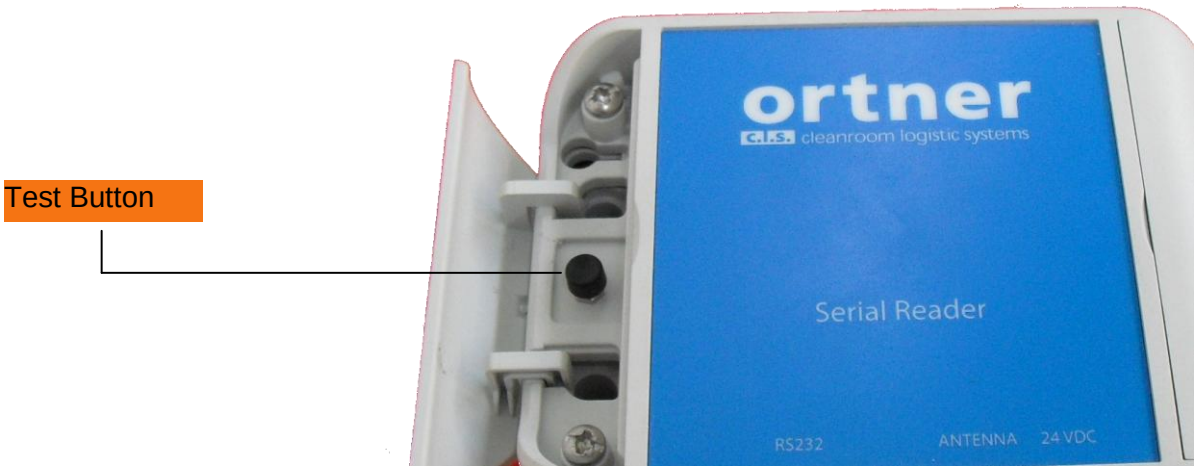
Example
Command:
TargetID HCS SCR Reset (CR/LF)
or
TargetID HCS SCR 13 (CR/LF)
Response:
TargetID HCA SCRA NO

7.5 Test button

The LF-134-SER-P-V3.1 has a test button under the left cover to check easily communication or reading range manually.

The button starts a single page read (page 0, same as command 'R') with an interval of approx. 250msec as long as the button is pressed. The read result is send to the serial interface and shown by the Status Led's.

Red LED → Read Error
Yellow LED → Read Success



8 Antenna

8.1 Technical Specification

DESIGNATION	
Frequency	134.2 kHz
Inductivity	47 µH
Core length	65 mm
Core diameter	8 mm
Total length (housing)	82 mm
Total diameter (housing)	13 mm
Housing material	Cap: PE (POLYETHYLENE) Tube: PS (POLYSTYROL)
Cable type	1x2 AWG 22
Cable length	Default 500 mm, 1000 mm, 2000 mm, Custom lengths up to 2000 mm on request
Connector Reader side	Binder 3 pin (Series 712)
Connector Antenna side	n.a.
Only valid with	LF-134-SER-P/M-V3.x

Table 8-1: Specification of the Antenna

8.2 Drawing

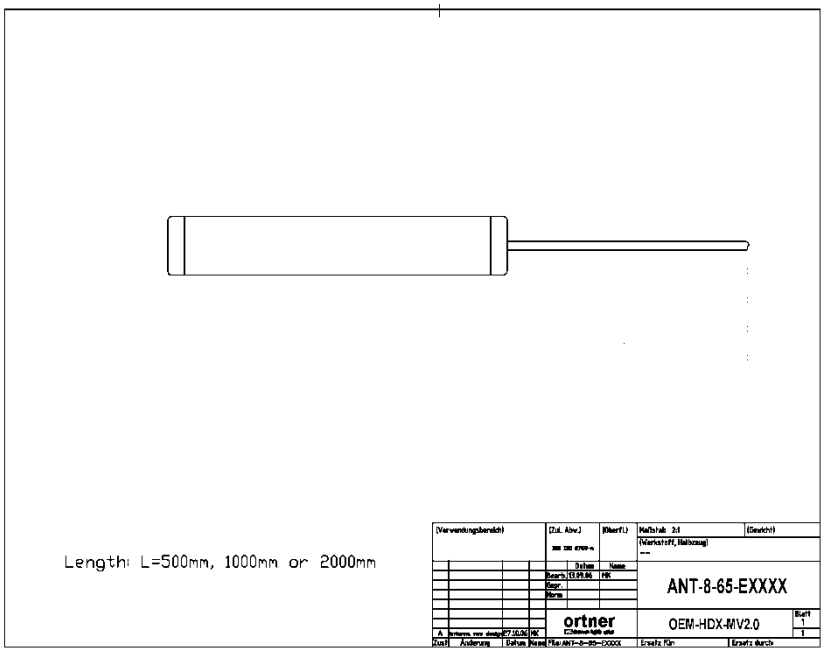


Figure 8-1: Technical drawing of ANT-8-65-EXXXX

8.3 Maximum reading and writing ranges

The reading ranges are measured with best conditions; in real environment the ranges will be much smaller due to disturbing material, like metal or other electro-magnetically fields near the Antenna location. Please improve the condition before finally decision of the antenna location.

Writing ranges under same conditions are approx. 60% of the below described reading ranges. Close to the antenna tag reading and writing will also be not possible, so prevent a tag placement very close to the antenna, as a guide value prevent a distance below 10 mm.

Antenna cable, which is available as default, up to 2 m.

To prevent trouble please contact our support team if you expect problems with the placement of the antenna in your special case!

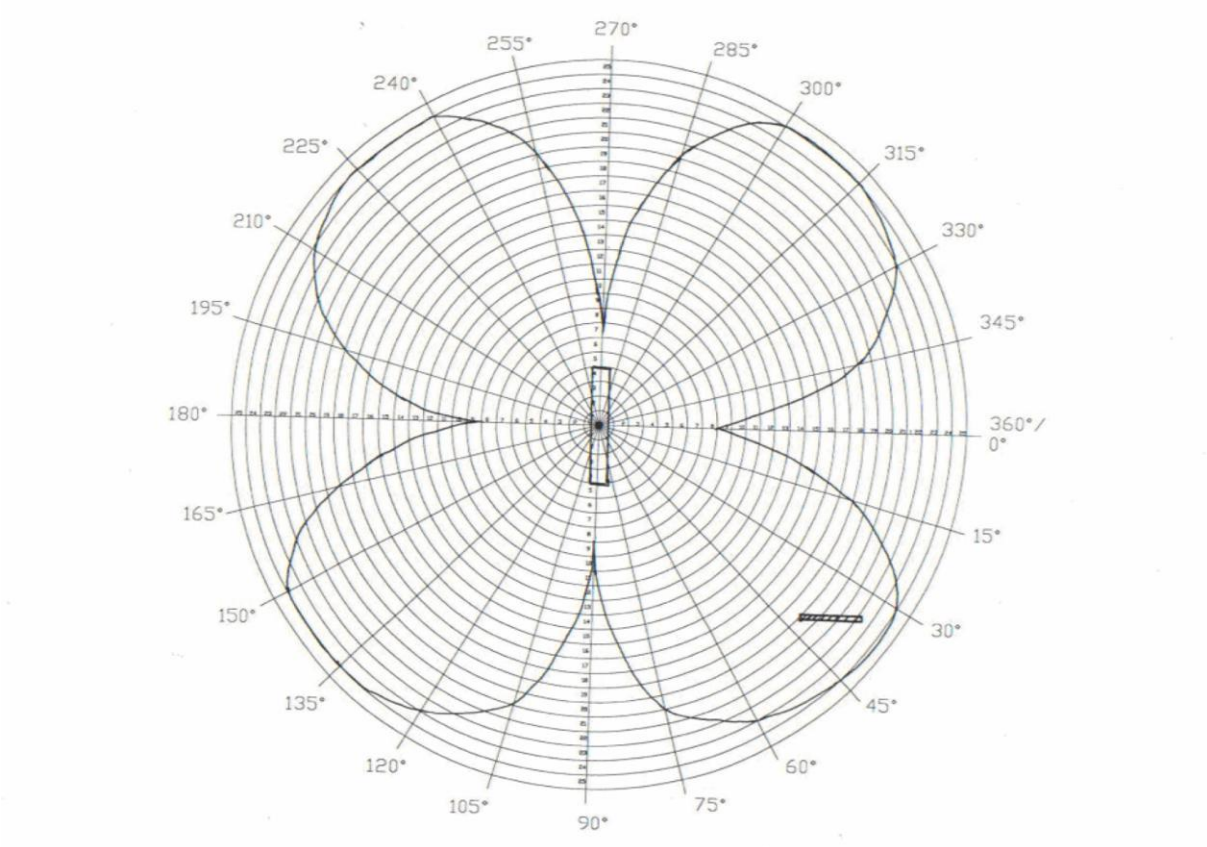


Figure 8-2: Horizontal Pattern (10 mm/div)

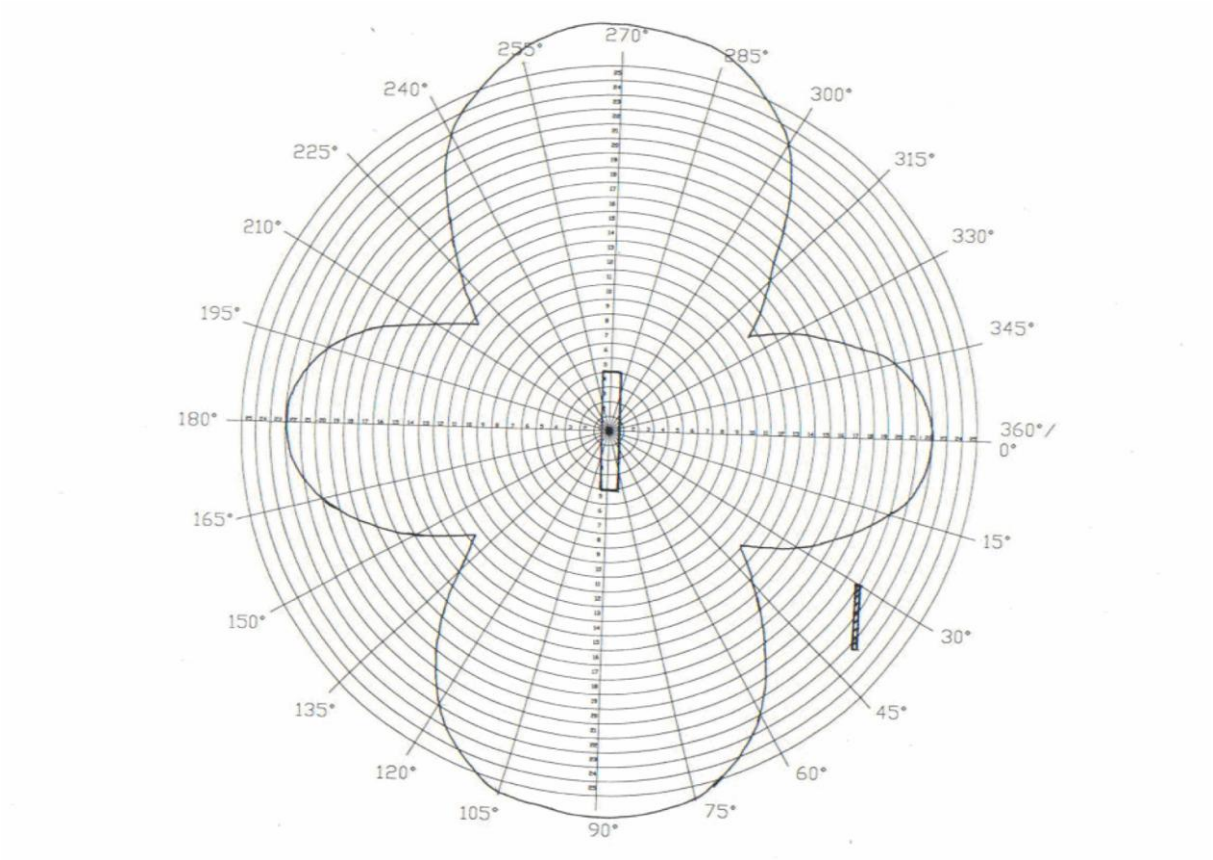


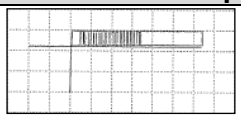
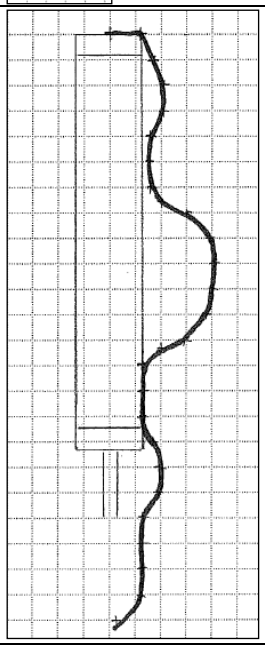
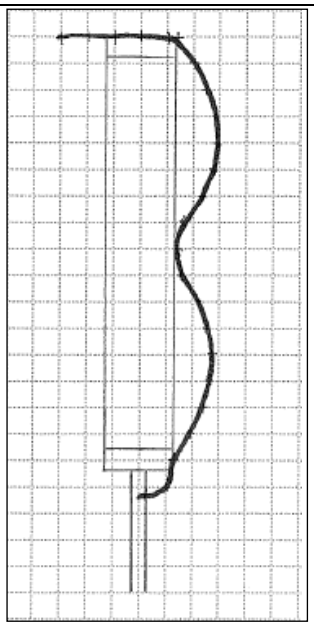
Figure 8-3: Vertical Pattern (10mm/div)

8.4 Minimum reading and writing range

Minimum reading and writing range means the range, which has to be kept between the antenna and the transponder in order to have successful reading or writing.

Distances between antenna and transponder smaller than the minimum reading and writing range are not allowed.

Minimum reading and writing range depends on antenna to transponder orientation. The following table shows the minimum reading and writing range for parallel and orthogonal orientation between antenna and transponder. Minimum reading and writing range was measured by the distance between the antenna housing boundary and the transponder boundary with a standard antenna.

PARALLEL orientation between antenna and transponder:	**ORTHOGONAL orientation between antenna and transponder:**
	
	

Minimum reading and writing range decreases at theoretical zero points (where theoretically no reading and writing is possible) and increases at theoretical maximum points. It can be expected that the *minimum* reading and writing range has a scaled characteristic/course of the *maximum* reading and writing range.

9 Communication cable

9.1 Technical Specification

DESIGNATION	
Connector Reader side	Sub-D 9
Connector Host side	Molex 5557-06R
Cable type	3x2 AWG24
Cable length	Default 500 mm, Custom lengths on request
Only valid with	LF-134-SER-P/M-V3.x

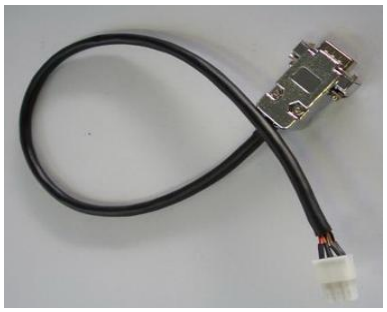


Table 9-1: communication cable

9.2 Drawing

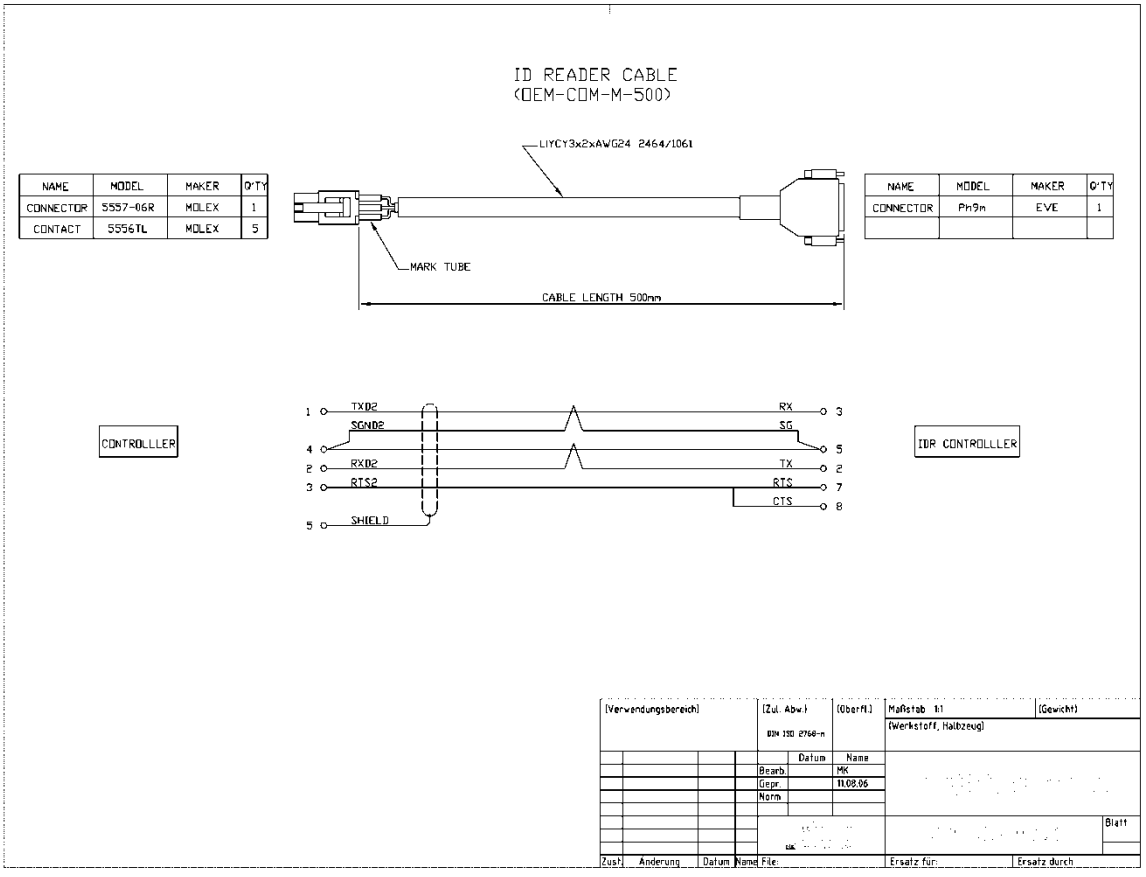


Figure 0-1: Technical drawing OEM-COM-M-500

10 Power cable

10.1 Technical Specification

DESIGNATION	
Connector Reader side	Binder 2 pin (Series 712)
Connector power supply side	Housing DF5A-3S-5C
Cable type	2x AWG24
Cable length	Default 500 mm, Custom lengths on request
Only valid with	LF-134-SER-P/M-V3.x

Table 10-1: power cable

10.2 Drawing

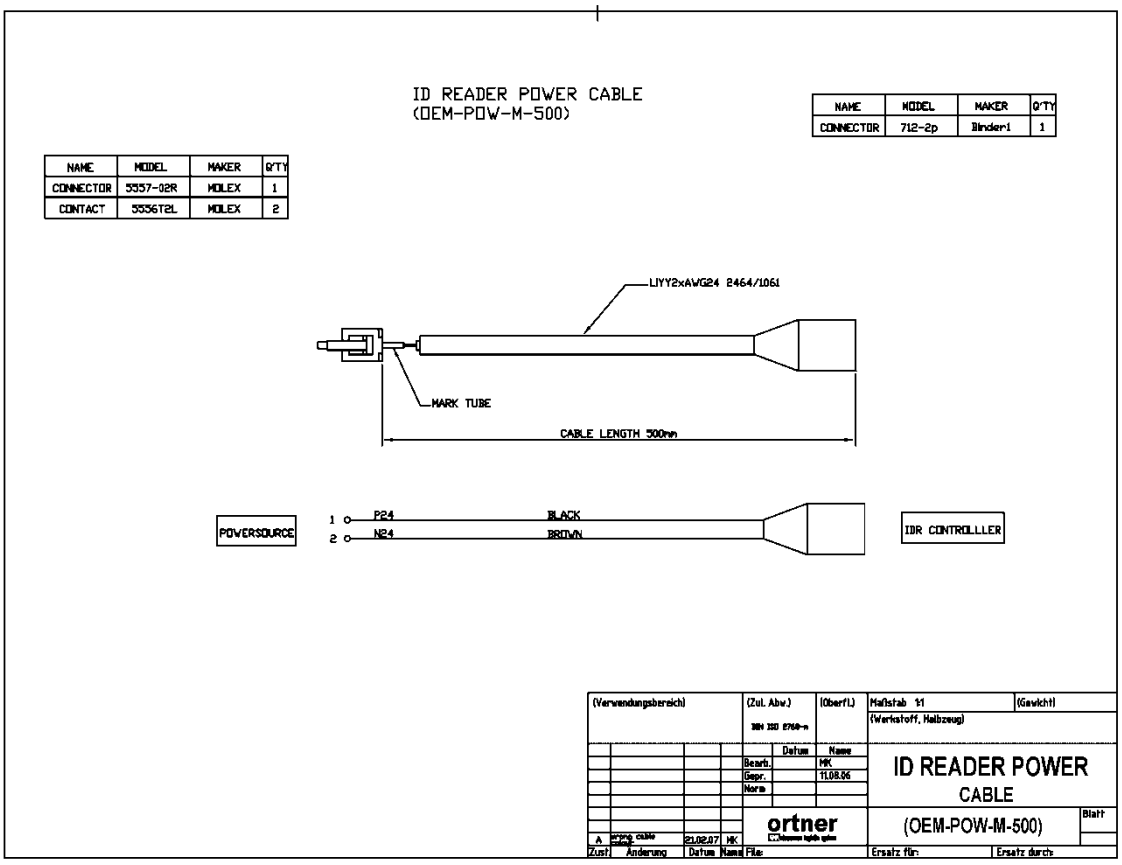


Figure 10-1: Technical drawing OEM-POW-M-500

11 Parts ordering information

	order code	Description
	LF-134-SER-P-V3.0	– product version 3.0 (plastic case) – 134,2kHz, 24V DC, 500mA – external antenna connector: Binder series 712 - 3P (antenna not included) – communication interface: SUB-D9 (female), RS232 – Please specify communication protocol! (ASCII-L, ASCII-H, ASCII-A, SECS)
	LF-134-SER-P-V3.1	– product version 3.1 (plastic case) – 134,2kHz, 24V DC, 500mA – external Test button – external antenna connector: Binder series 712 - 3P (antenna not included) – communication interface: SUB-D9 (female), RS232 – Please specify communication protocol! (ASCII-L, ASCII-H, ASCII-A, SECS)
	LF-134-SER-M-V3.0	– product version 3.0 (metal case) – 134,2kHz, 24V DC, 500mA – external antenna connector: Binder series 712 - 3P (antenna not included) – communication interface: SUB-D9 (female), RS232 – Please specify communication protocol! (ASCII-L, ASCII-H, ASCII-A, SECS)
	OEM-COM-M-XXXX	OEM-COM-M: communication cable, XXXX … cable length
	OEM-POW-M-XXXX	OEM-POW-M: power cable, XXXX … cable length
	ANT-8-65-EBXXXX	ANT: Antenna – core diameter (8 mm) – core length (65 mm) – antenna type (external) – connector type (Binder / RJ10) – XXXX … cable length (500 mm / 1000 mm / 2000 mm)

Table 11-1 parts ordering information

Manfred-von-Ardenne-Ring 7
01099 Dresden / Germany

Tel. +49 351 888 61 0
Fax +49 351 888 61 20
ortner.info@roth-rau.com
www.roth-rau.com/ortner