R-IN1300 HIGH FREQUENCY

INSTALLATION & OPERATION MANUAL

VERSION 1.5b

DATA MARS SA

Quality Made in Switzerland))) www.datamars.com

R-IN1305   R-IN1301

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# 1 INTRODUCTION

The Datamars R-IN1300 High Frequency (HF) RFID-reader, designed to work in industrial environment, is resistant to vibrations, electromagnetic interferences and is able to detect the following transponder technologies:

- T-BT 1320 & T-BT1315 (ISO 15693), HF
- I-Code 1, HF
- T-BT 7xxx serie, LF (only with Datamars R-IN7500 reader connected externally)
- Other types of transponders could be read in "Combo" mode.

The reader is able to find simultaneously more than one High Frequency (HF - multi read) transponder[1] and one Low Frequency (LF – single read) chip at the same time if you have a R-IN7500 Low Frequency reader connected externally.

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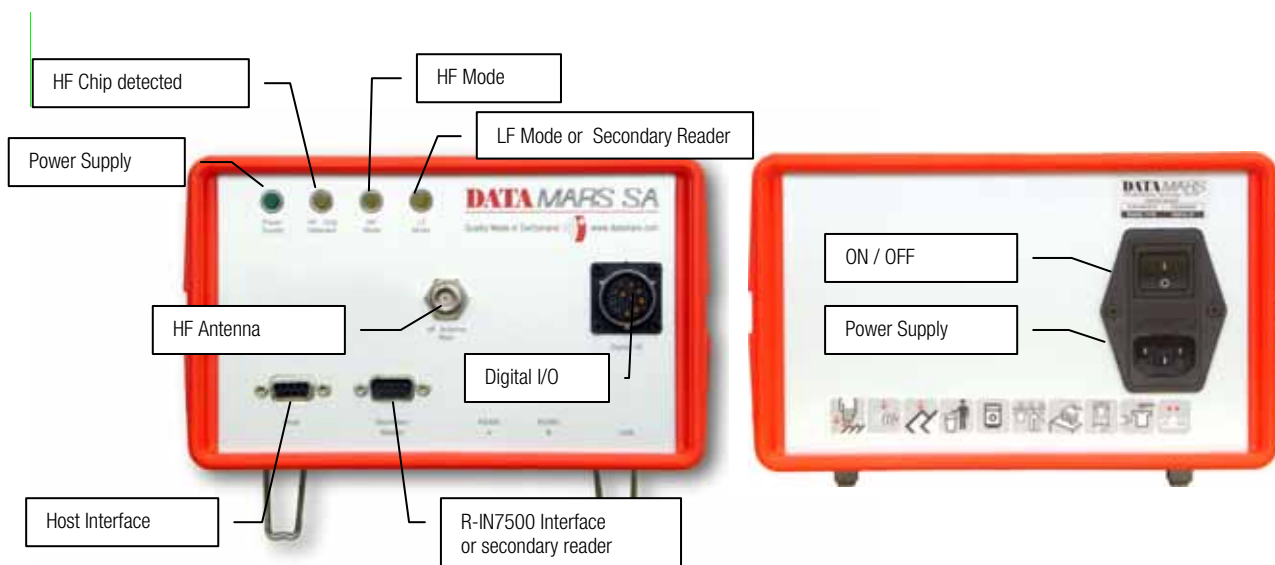
[1] the quantity of transponders detected and the accuracy of it can change depending on the used transponder, the environment, the size of the antenna etc.

2 HARDWARE CONNECTIONS

1. **Antenna**:
    Connect the black coaxial cable from the antenna to the connector marked as "HF Antenna"

2. **PC/Terminal**
    Connect the serial white cable from the connector marked "Host interface" to any serial port (COM) on your PC

3. **Power**
    Connect the power cable 100 – 240 V AC and be sure that it is well fixed.

4. Turn the reader on an check if the green LED (Power) is on.

Green light on

⚠ IMPORTANT:
Please place the antenna as far as possible from metallic surfaces to avoid possible reading interferences and avoid mounting in places where a regular ventilation is not granted. After the reader is turned on for some time the temperature might increase.

⚠ Do not plug/unplug any connectors while the reader is turned ON.

In case you have a R-IN7500 LF reader installed you can keep the same configuration. You just need to unplug the serial cable from the PC and connect it to the R-IN1300 reader to the connector marked as " Secondary Reader".

If you have a new R-IN7500 NMS:

1. Connect the Low Frequency (LF) Antenna to the connector marked "Ant.1" on the reader
2. Connect a serial cable the connector "RS-232" mentioned on the R-IN7500 to the connector "R-IN7500" mentioned on the R-IN1300 reader .
3. Connect the power cable
4. Turn the reader on

⚠ Keep a distance between the LF and the HF antenna (min. 1m) in order to not influence the reading distance.

2.1 MOUNTING

The reader can be simply laid down on the table or be mounted on the wall or under a table using the appropriate wall mounting system.

3 SOFTWARE SETUP

1. Open the supplied Product CD and double click on "setup".
2. The following window appears, click "OK"

3. By default the windows programs folder will be defined as installation path. You may change it if necessary. Click on the big square button on the left side of the window to start the installation.
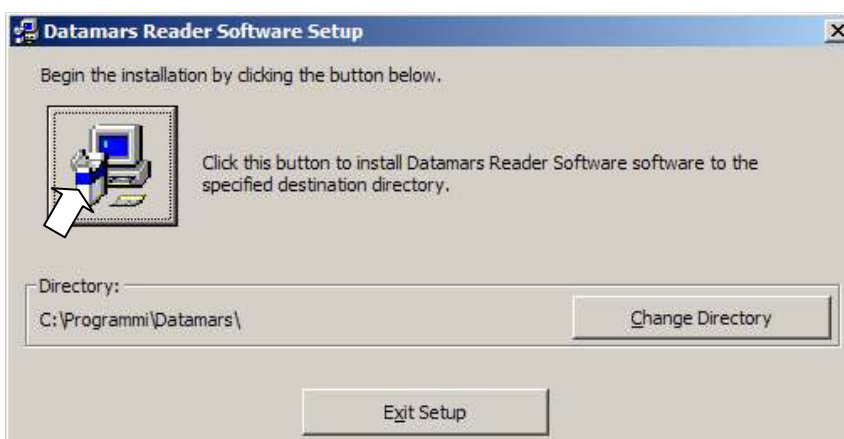
4. Click "Continue" if you agree on the proposed program group in the "Start" menu (Programs -> DATAMARS -> Datamars Reader Software). Otherwise enter a new group name and choose the position in the "Start" menu of your PC.
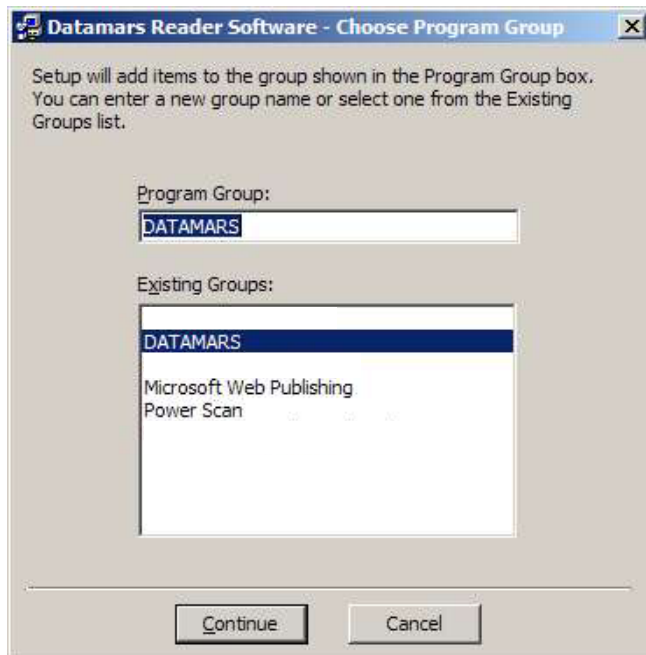
5. Wait until the progress bar reaches 100%.
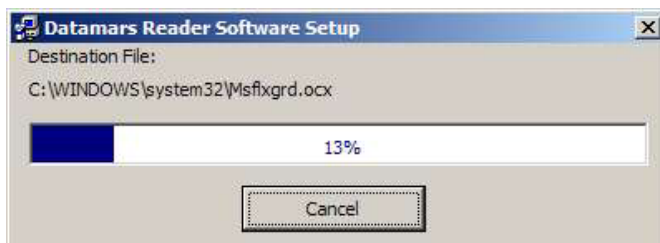
6. If the below mentioned window appears the software has successfully been installed.

4   OPERATION

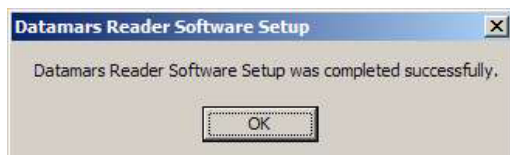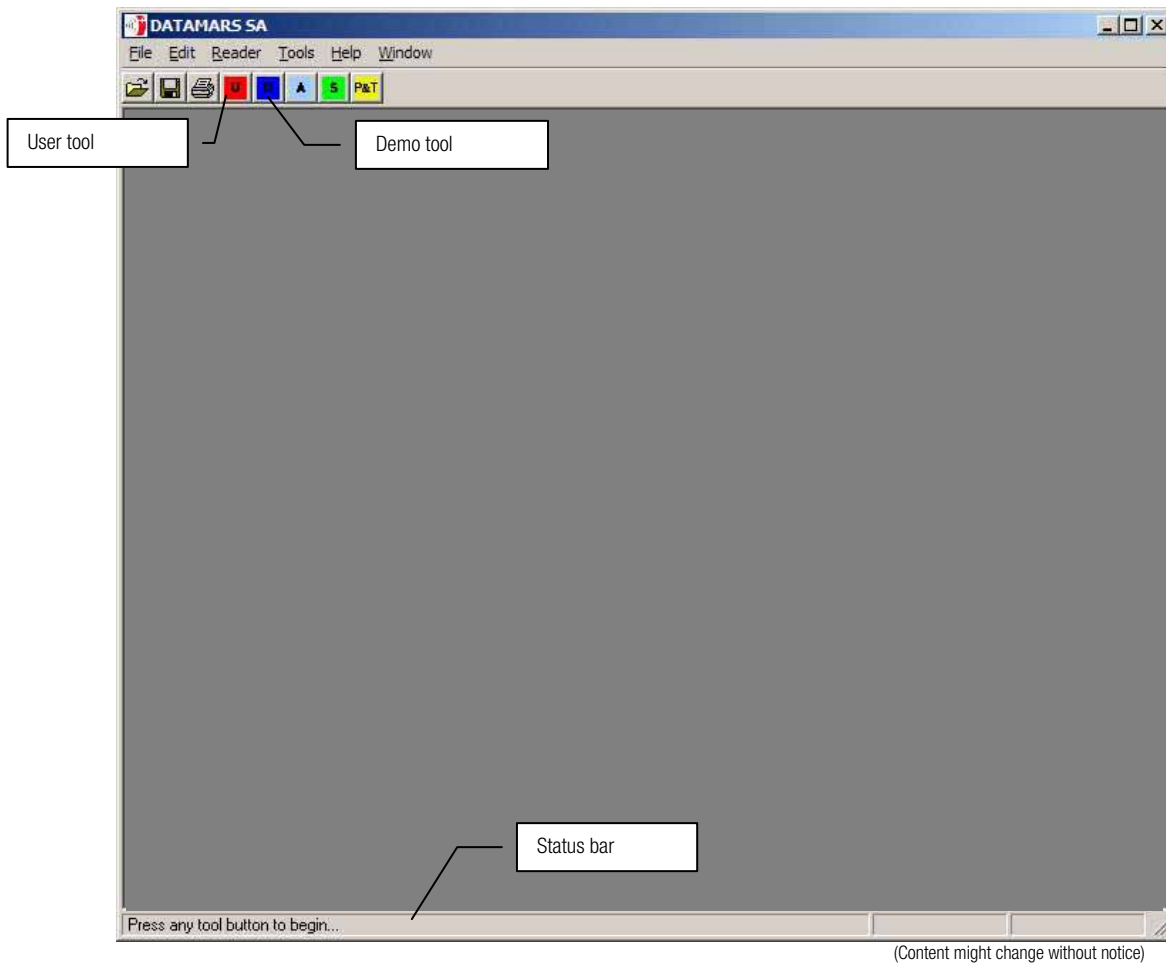The reader works with a Graphical User Interface provided by Datamars. If a PC station is not available[2] the reader can be connected directly to a terminal.

4.1   OPERATION WITH GRAPHICAL USER INTERFACE

1. Run the Graphical User Interface program (installed by default in Start-> DATAMARS-> Datamars Reader Software)

(Content might change without notice)

The software is designed to have different types of tools; see corresponding buttons on the tool bar. Currently only the red "User tool" and the blue "Demo tool" buttons are active.

By default serial port COM 1 is selected. Please have a look at chapter 4.1.1.1 if you are using a different port or if you are not sure about which port to use.

If a wrong COM port is selected, the status bar will display an error message.

Notice: The status bar always gives an indication of what the reader is doing.

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[2] If your intention is to program your own application, a Dynamic Link Library (DLL) is provided. For further information have a look at the manual "DLL" in the supplied Product CD.

2. Press the red "User tool" button
   The software will be now connected to the reader (check the status bar). This operation takes a few seconds to be completed.

Status bar
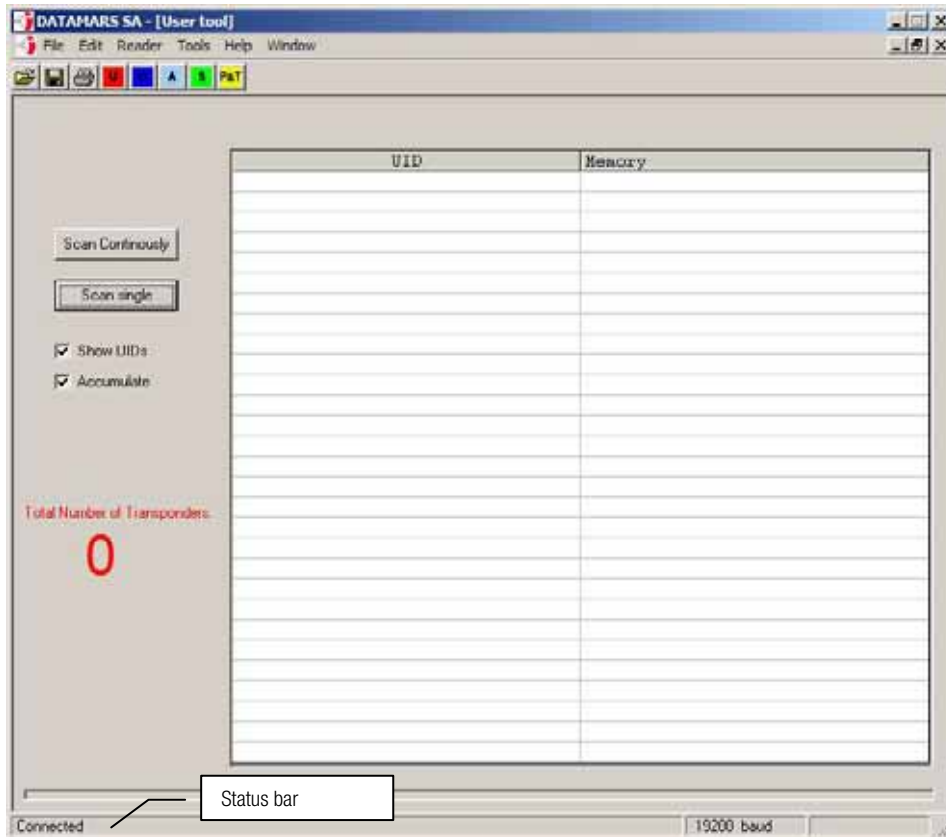
- The user has the choice to read the transponders in the reading field of the antenna continuously or just once.

- If "Scan Continuously" has been selected the bar at the bottom of the window will become red every time the reader has finished detecting transponders. To stop this operation, press "Cancel".

- By un-checking the "Show UID" box, the reader will count the transponders in the field, showing only the quantity of read transponders without mentioning the Unique Identifier Code in the UID table. This option increases the reading speed [3]. An indicative reading speed is > 30 transponders per second on a Table Top antenna.

- By checking this "Accumulate" box, the read transponders are shown on the screen and maintained until a new scan command is activated.

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[3] which in general depends on the size of the transponder, the distance of the transponder from the antenna, the size of the antenna, the environmental noise, etc.
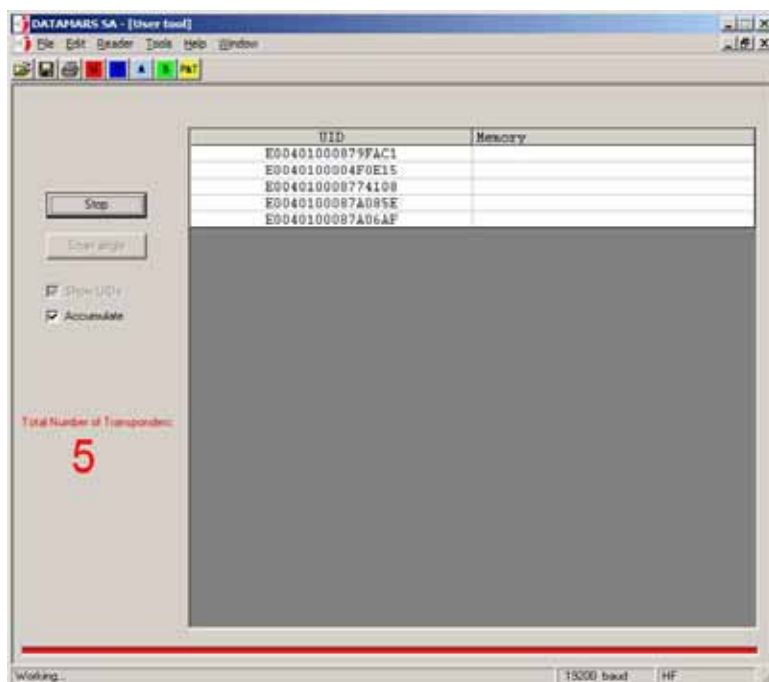
- It is possible to print the UIDs table by pressing the "Print" button on the tool bar.
- By pressing "Save" and "File -> Save As" the UIDs table is saved as a text (.txt) file.

4.2 OPTIONS

Under the menu "Reader" you can find the "Options" menu which is divided into Basic, Advanced, Antennas, Modulation and Combo.

All the options configured by the user are always saved automatically by the Software. If you need to restore the factory default setting use the appropriate button under the options tab "Basic"

4.2.1 BASIC
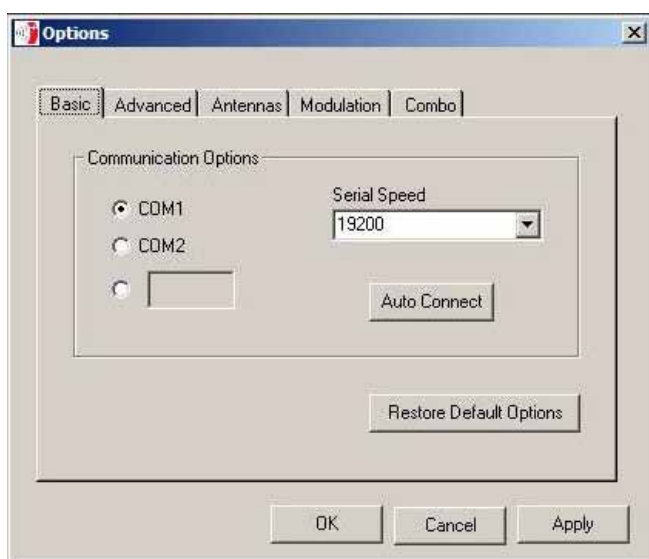
- You can choose the baud rate (serial port speed).
  We advise to leave the default speed of 19200.
- Select the port (COM) according to which port you connected the reader to.
- If you don't know the number of your COM port, press "Auto Connect" which will automatically search for your reader connection. The "User Tool" will be opened.
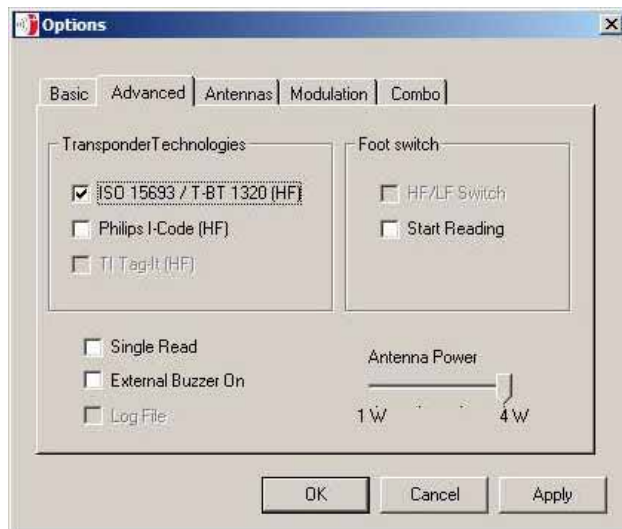- The "Restore Default" button applies all the factory settings. Be aware that all the user options will get lost.
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4.2.2 ADVANCED

- Please select which kind of transponder the reader must look for (ISO 15693 compatible HF transponders, I-Code 1 HF (Philips). Be aware that selecting more than one type of transponder reduces considerably the reading speed.

- If the reader is configured to read HF and LF (see "Combo" tab), it is possible to connect a foot switch to the I/O connector (see Appendix B for further details) to switch between HF and LF. For this option the box "HF/LF Switch" must be selected. The status bar of the main window indicates always the current working frequency. This option is only valid in "Combo" mode with R-IN7500.

- The foot switch can also be used as a "start reading" function: by pressing it once there will be one reading, by keeping the foot switch pressed there will be a continuous[4] reading.

- The foot switch can be replaced by any external switch directly from the user. See I/O configuration (Appendix B).

- By selecting "External Buzzer On" the buzzer will produce a sound and get illuminated if there is a maximum of one transponder in the field.

- Selecting "Single Read" switches the reader in fast single read mode (no multiread function). Only one transponder can be read at the same time.

- The sliding bar marked "Antenna Power" gives you the possibility to adjust the transmitting power of the antenna. It is strongly recommended to maintain the default value since a modification could significantly reduce the reading distance.

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[4] To activate this function please click once on „Scan Continuously" on the user tool

4.2.3 ANTENNAS
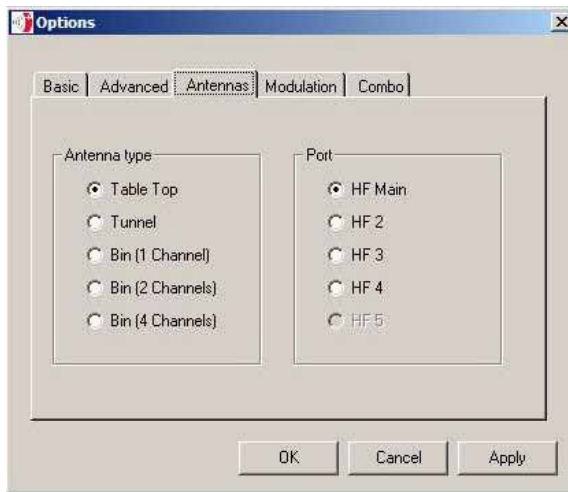
The type of antenna is selectable. If a Table Top or a Bin antenna is used (1 channel) you may choose which port to use.

4.2.4 MODULATION
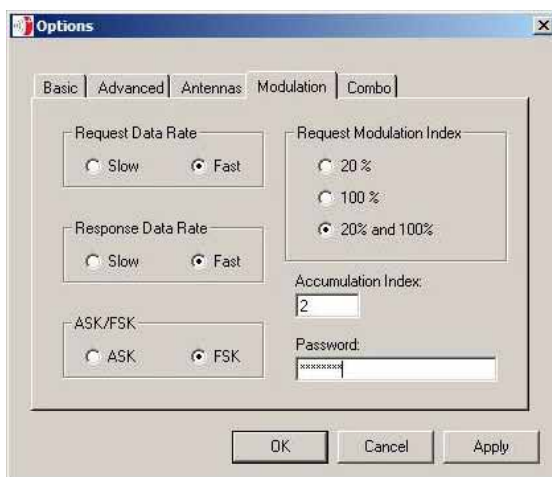
Some air-interface and modulation parameters are available. These parameters are useful for the Bin Antenna and are very sensitive, therefore a password is required to modify them. The password is: R-IN1300

- Request Date Rate: There are two possible rates for the reader to send data to the transponder: fast and slow

- Response Date Rate: There are two possible rates for the transponder to send data to the reader: fast and slow

- ASK/FSK: The transponders can respond in two different modulation modes: *ASK* or *FSK*. Generally *FSK* gives a better performance result.

- Request Modulation Index: The communication between reader and transponders can be done with 3 different modulation index modes, determining the amount of energy the transponders will receive. Generally, the mode *20% and 100%* give the best reading distance.

- Accumulation Index: This parameter is valid only for Bin antennas and is a reliability index. A higher number would increase the percentage of read transponders but would decrease slightly the reading speed. Excellent results can already be obtained whit index 2, but it can range from 1 to 15.

4.2.5 COMBO

The R-IN1300 is able to drive a secondary reader as a slave device. If you have a LF Datamars R-IN7500 reader, you can simply connect it to the secondary interface (as described in section 2) and the R-IN1300 will automatically return both LF and HF codes. The field "2nd Reader Activation Time" allows to choose the activation time of the secondary reader. It is advised to not touch this parameter in case of doubts. (See Application Examples from 3rd Party Reader)

4.2.6 APPLICATION EXAMPLE WITH 3RD PARY READER

The R-IN1300 is also able to drive some 3rd party readers. The activation time of the secondary reader can be selected with the field "2nd Reader Activation Time". The number of channels of the R-IN1300 to be scanned can be selected too. If you are using two channels, you can select between two different multiplexing modes as shown on the below mentioned examples:
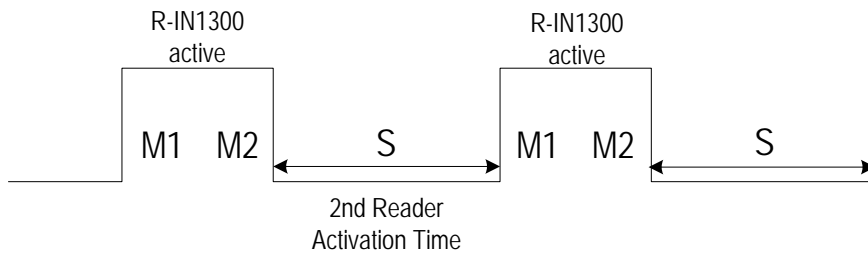
- M1 – S – M2 – S:

The two channels of the reader are multiplexed with the secondary reader as follows:
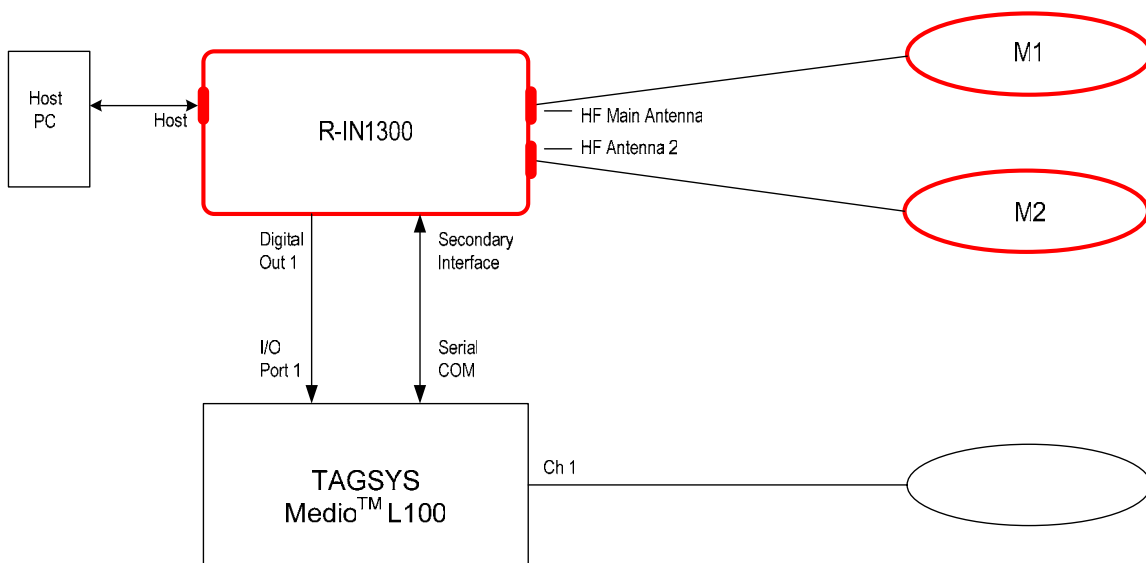(M1 = R-IN1300 channel 1, M2 =R-IN1300 channel 2)
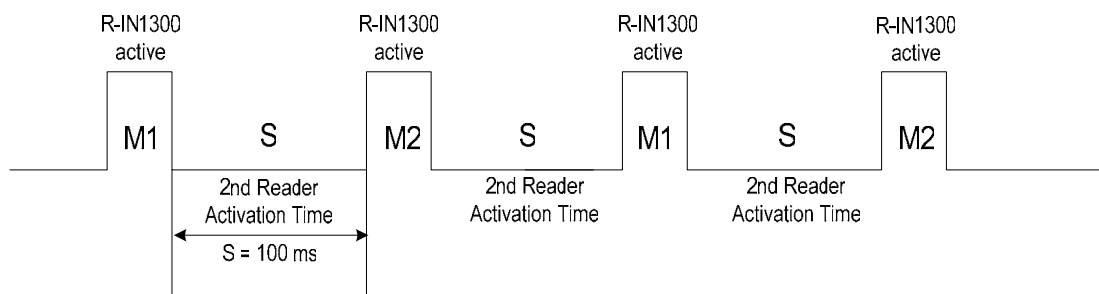
- M1 – M2 – S

The two channels of the reader are multiplexed with the secondary reader as follows:
(M1 = R-IN1300 channel 1, M2 =R-IN1300 channel 2)

The following picture shows an application example with the Tagsys reader Medio™ L100 [5]

4.3 OPERATION WITH TERMINAL

In terminal mode the R-IN1300 reader has a set of HF commands plus the complete set of commands for a possible connected LF R-IN7500 or secondary reader. For a description of the LF commands see the user manual of the R-IN7500. Below is a list of the available HF commands. All commands must be followed by a return (Enter).

General Commands

|	
*d	*Detect*: returns a list of UIDs of all the transponders present in the field
*t	*Totalize*: returns the number of HF transponders present in the field
*i	*Interrupts* any continuous mode operation (does not disable the continuous mode)
*x	List of commands and settings
*se	*Settings*: displays the current settings (Notice that the settings are maintained after power-off)

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[5] MEDIO™ L100 is a Trademark of Tagsys

General Settings

*co	*Continuous mode*: enables/disables the continuous reading mode Continuous mode is valid for *d and *t commands
*rh	*Remove headers:* enables/disables the headers when using functions "detect" and "totalize"

*lc[_]	*lc0 Disables "lock code"
	*lc1 Enables "lock code" in multi read mode the transponder codes will be shown only once
	          while they are in the field
	*lc2 Enables "lock code" in single read mode. Only one transponder can be in the field at
	          the time. The code will be shown just once.

*it	*Input trigger:* The reader reads only when foot switch is pressed. "Detect" or "totalize" shall be used after this command. If the option "remove headers" is off the reader will display always "0 transponders found" when the foot switch is not pressed. This setting is only available for the Table Top antennas.

*sa[_]	*Stand alone:* when this option is enabled the reader will automatically start reading in continuous mode immediately after turning ON the reader. The following values are allowed:
	        *sa0 Disable "stand alone" mode
	        *sa1 Enable "stand alone" in detect mode (UIDs will be shown)
	        *sa2 Enable "stand alone" in totalize mode (total number of transponders will be shown)

*br[_]	*Baud rate:* change the baud rate (serial communication speed). Allowed values are:
	        *br0 9600 bit/s
	        *br2 19200 bit/s (recommended)

*tt[_]	*Transponder technology:* Select the transponder technology. Allowed values are:
	        *tt1 ISO 15693 (T-BT1320 T-BT1315)
	        *tt2 Philips I-CODE I
	        *tt4 ISO 15693 (T-BT1320) and Philips I-CODE I

*cl[_]	Code length:
	        *cl0 16 digits UID (standard)
	        *cl2 12 digits UID (Partial code)
	        *cl3 12 digits UID (First character special)
	Special characters have been added for the12 digit mode in order to maintain the code uniqueness of the HF codes. See appendix A for further details.

*bu	*Buzzer*: enables/disables an external buzzer. The buzzer will produce a sound and get illuminated if there is a maximum of one transponder in the field. This setting is only available for the Table Top antennas.
*rd	*Restore default*: Restores the default factory settings

*an[_]	*Antenna selection:* selects the port to which the antenna is connected (if the reader has more than one HF port)
	        *an1 Selects "HF antenna main"
	        *an2 Selects "HF antenna 2
	        *an3 Selects "HF antenna 3
	        *an4 Selects "HF antenna 4

*at[_]	*Antenna Type Selections:* selects the type of antenna connected to the reader:
	        *at0 Table Top Antenna
	        *at1 Tunnel Antenna (No elimination of double codes)
	        *at2 Tunnel Antenna (With elimination of double codes)
	        *at3 Bin Antenna (No elimination of double codes)
	        *at4 Bin Antenna (With elimination of double codes)
	Elimination of double codes performed by the reader reduces the reading speed

*pw[_]	Select the antenna output *power*:
	        *pw1 1 Watt
	        *pw2 2 Watt
	        *pw3 3 Watt
	        *pw4 4 Watt
	It is advised to maintain the default power (4 watt), changes would decrease the performance of the reader.

|	

*nl[_]	*New Line* character(s) selection: Three types of new line characters can be selected
	       *nl0 Carriage return and line feed (0x0D 0x0A))
	       *nl1 Line feed (0x0A)
	       *nl2 Carriage return (0x0D)
	       *nl3 Line feed and carriage return (0x0A 0x0D)

*kw	*Keyboard wedge mode*: enables/disables the keyboard wedge mode. In this mode the data arrives in a format and speed suitable for the supported keyboard wedges.
*dt[_][_]	Inter-Code delay time Inserts delay timer between one code and the following one during the RS-232 transmission.The parameter is a number from 00 to 99 (always two digits) 01 corresponds to 60ms, 02 to 85ms etc. with steps of 25ms "t"*delaytime* = (parameter x 25) + 35, where "t" is the delay time between the codes in ms. *dt00 adds no delay (full speed) In case of KBW100 is used to collect the codes, a minimum delay of 100ms is needed (*dt03)

Combo Mode specific Settings

*cb[_]	*Combo mode* can be enabled for two different external readers, the R-IN7500 and with a third party reader:
	       *cb0 Disable Combo Mode
	       *cb1 Enable Combo Mode for the R-IN7500 (connected externally)
	       *cb2 Enable Combo Mode of third party reader (connected externally)

*t[_][_]	Secondary Reader Activation Time: Determines for how long the secondary reader stays active at every multiplexing cycle. The parameter is a number from 01 to 99 (always two digits). 01 corresponds to 50 ms, 02 to 75 ms etc. (on 25 ms steps) To find the correct parameter knowing the time in ms the following formula ca be used: "t"activationtime = (parameter x 25) + 25, where "t" is the activation time in ms. Maximum 99 (2500 ms).

*cc[_]	Number of channels in Combo Mode: If the reader is working in Combo Mode with a third party reader (*cb2), the HF reading can be done with 1 or two channels:
	       *cc1 1 channel
	       *cc1 2 channels
	This command is not considered in Combo Mode for the R-IN7500.

*cm[_]	*Combo Multiplexing mode:* When the reader is working in Combo Mode for a third party reader and with 2 channels (*cb2 and *cc2), there are two ways to configure the switching of the antennas : *cm0: The two channels of the reader are multiplexed with the secondary reader as follows: (M1 = R-IN1300 channel 1, M2 =R-IN1300 channel 2) R-IN1300 active R-IN1300 active M1 M2 S_t M1 M2 S_t 2nd Reader Activation Time *cm1: The two channels of the reader are multiplexed with the secondary reader as follows: (M1 = R-IN1300 channel 1, M2 =R-IN1300 channel 2; S_t =Secondary Reader Activation Time)
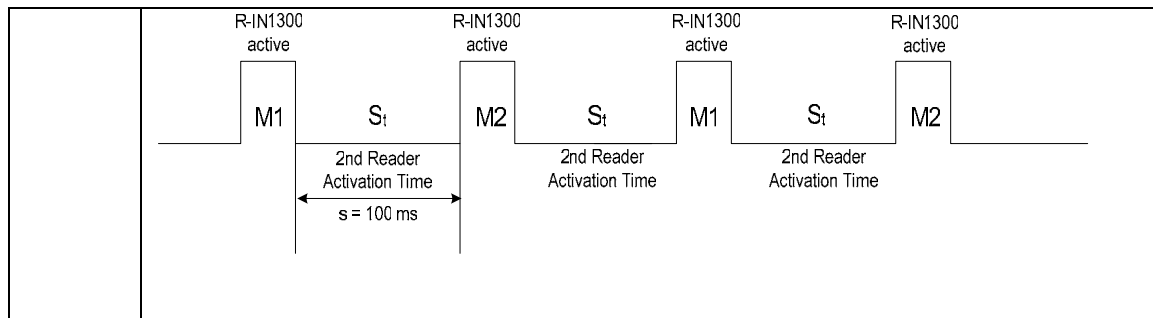
To use this mode with a Windows Hyper-Terminal emulation, proceed as follows:

1. Open a hyper-terminal session
2. Enter a session name at your choice
3. Click "OK"
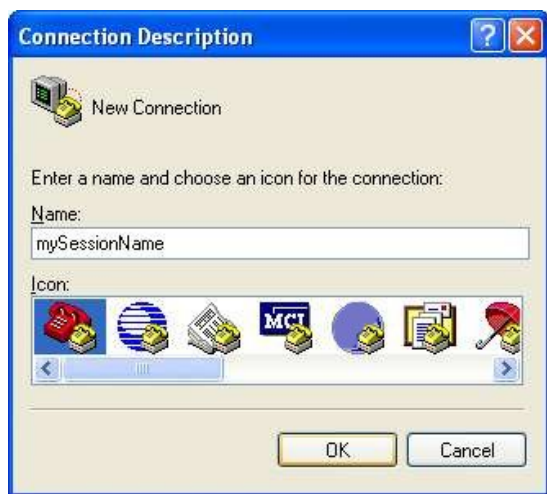
4. Select the COM port where the reader is connected out of the box "Connect using" and select "OK"
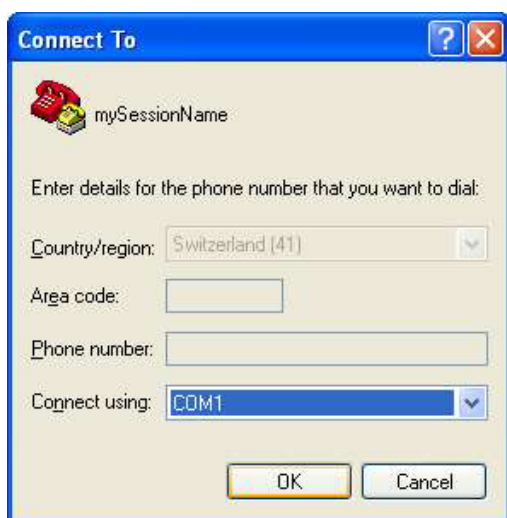
5. Select the information as mentioned below. If you have modified the setting for the baud rate (*br) you should select the bits per second accordingly.

6. Enter a command at your choice and press Enter. This is an example (*d):

5   TECHNICAL SPECIFICATIONS FOR R-IN1300

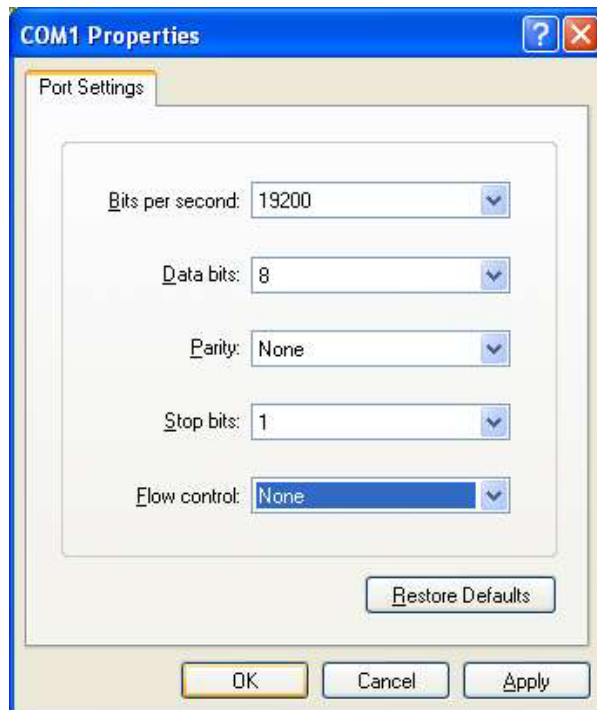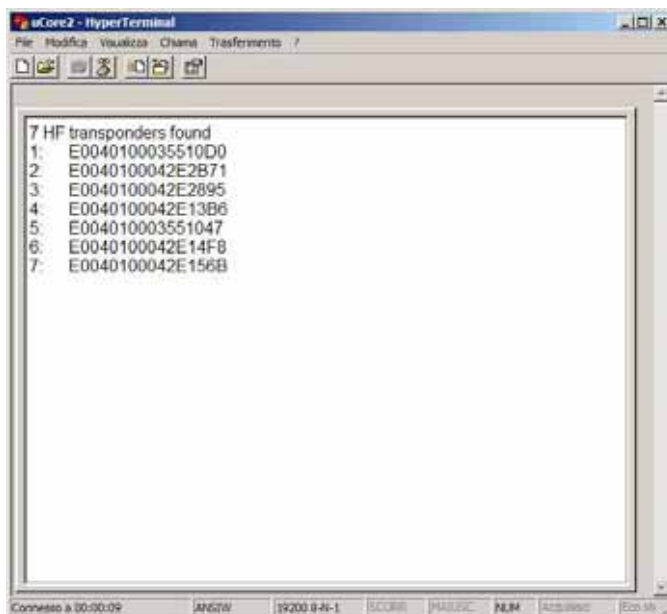## 5.1   OPERATIONAL CHARACTERISTICS

The DATAMARS SA RFID reader R-IN1300 is an integrated analog system for RFID- Applications (RFID=radio frequency identification) which works at 13.56MHz. It allows to read data stored into ISO-RFID transponders or ISO-Labels at 13.56 MHz. Single- and Multiread operation are supported. The communication between the reader and the transponder is based on the ISO 15693 (Part 1-3).

All transponders (contact less memories) are powered by a transmitted carrier radio wave at 13.56MHz and are compliant with the ISO 14443-B recommendation for the transfer of power and signals via radio transmission. For this purpose the reader R-IN1300 amplitude modulates the data on the carrier using amplitude shift keying (ASK) and the tag replies by load modulating the data on the carrier using the BPSK (Bit Phase Shift Keying).

Once the reader is connected to an appropriate client-network (via dedicated computer) it works based on the installed software like a server providing the received data from the transponders to the final client-application.

The service software helps to control and update the reader in a simple and user friendly way.

R-IN1300 supports different antennas as well as multiple configurations. Please ask for the complete list of antennas.

5.2   ELECTRICAL CHARACTERISTICS

The technical specifications include only the High Frequency R-IN1300 and not the Low Frequency reader R-IN7500.

Electrical characteristics (without antenna)

POWER SUPPLY	AC 100-240V 1A 50-60 Hz
POWER CONSUMPTION	30 W
ANTENNA OUTPUT POWER	1 – 4 (W)

Technical characteristics

OPERATING FREQUENCY	13.56 MHz
OPERATING TEMPERATURE	0°C - 40°C
DIMENSIONS	394 x 211 x 126 (mm)
WEIGHT	4.6 kg
Transponder Type	ISO15693 (T-BT 1320 or T-BT1315), I-Code 1 (Philips)
ANTI COLLISION	Yes
COMMUNICATION PROTOCOL	RS-232, RS-485, USB
AUTO TUNING	No

ANTENNA TYPES	Table Top, Tunnel, Bin others on request
READING SPEED	Dependant on number of transponder and technology (up to 40/s)
READ/WRITE	Read / Write
EMC	High attenuation characteristics (~30÷60 dB)"
IP PROTECTION DEGREE	IP54 (dust and water protected against sprays from all directions)
MAX. READABLE TRANSPONDERS	600 pieces

6 REGULATIONS

6.1 EQUIPMENT MODIFICATION

Equipment changes or modifications not expressly approved by Datamars SA, CH-6930 Bedano, the party responsible for FCC compliance, are forbidden. Such changes could void the user's authority to operate the equipment and cause hazardous conditions.

6.2 EN 300330-1/-2 (EUROPE)

The system R-IN1300 is a sending and receiving equipment and is in accordance with the R & TTE directive **EN 300 330-1 / -2.**

The system R-IN1300 fulfils the requirements of this regulation.

6.3 FCC (USA)

To comply with FCC part 15 rules in the United States, the system must be professionally installed to ensure compliance with the Part 15 certification. It is the responsibility of the operator and professional installer to ensure that only certified systems are deployed in the United States. The use of the system in any other combination (such as co-located antennas transmitting the same information) is expressly forbidden.

6.4 IC (CANADA)

The device has been designed to operate with the antennas listed below, and having a maximum gain of 2 dB. Antennas not included in this list or having a gain greater than 2 dB are strictly prohibited for use with this device. The required antenna impedance is 50 ohms.

List of antennas: Datamars antenna A-ST1330 TT
                                  Please ask for more antennas which are not listed above.

In order to reduce potential radio interferences to other users, select the antenna type and gain as follows:
equivalent isotropically radiated power (e.i.r.p.) not higher than the permitted one for a successful communication.

Operation is subject to the following two conditions:
(1) this device may not cause interference, and
(2) this device must accept any interference, including interference that may cause undesired
    operation of the device.
.

6.5 CE CERTIFICATION

The system R-IN1300 is in accordance with the requirements of protection, which are defined in the regulation concerning the electromagnetic tolerability EN301 489-1, -3, emitted by the council for the harmonisation of regulations in the member countries. The European Community regulation for Low Frequency, EN 60950, is respected.

The R-IN1300 system fulfils the requirements of this regulation.

6.6 WARRANTY

If the reader is opened by not certified offices by mistake we cannot guarantee the fulfillments of the above mentioned regulations.

7 TROUBLESHOOTING

- During the software installation you receive the error message "The destination file is in use":

    o Close all programs and try again

- During the software installation the message "A file being copied is older than the file currently on your system. Do you want to keep this file?" appears:

    o Press "yes"

- When you try to open the tool by pressing any tool button the message "Error connecting" appears in the status bar:

    o Is the serial cable connected?
    o Is the COM port you are using the one specified in the options dialog?
    o If you don't know your COM try the "Auto Connect" button in the options dialog.
    o If the two previous points didn't solve the problem turn the reader off, wait 10 seconds before turning the reader on again

- There are transponders on the antenna but the software displays no transponders:

    o Is the antenna cable connected to the reader?
    o Is the antenna connected to the connector named "Antenna 1"?
    o Are the transponders you want to read specified in the options (advanced) dialog?
    o If the three previous points didn't solve the problem turn the reader off, wait 10 seconds before turning the reader on again

- In "Terminal Mode" the string "00040000" appears.

    o Turn the reader OFF, wait 10 seconds and turn the reader ON again

APPENDIX A CODE LENGTH

In terminal mode you can configure the reader to return the UID code in 4 different formats:

1. **<u>*cl0:</u>**
standard 16 characters UID

2. **<u>*cl2:</u>**
The reader returns only the right most 12 digits of the original 16 digit UID.

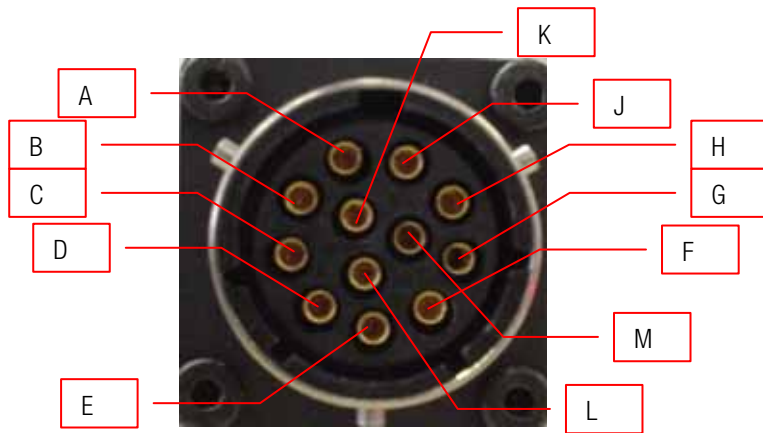⚠ **With this format it is not possible to guaranty the uniqueness of the codes !**

3. **<u>*cl3:</u>**
The reader returns 12 digits code in the fashion of "cl2", but in this case the first (left) chapter ranges from "G" to "Z" instead of from "0" to "F".

⚠ **With this format it is not possible to guaranty the uniqueness of the codes !**

APPENDIX B   I/O PIN CONFIGURATION

I/O Pin Letter	Datamars Functions
A	Footswitch + (signal)
B	Footswitch - (signal)
C	+24V
D	GND (24V)
E	Footswitch (GND 5V)
F	Footswitch (+5V)
G	Digital Out 4
H	Digital Out 1
J	Digital Out 2
K	Digital Out 3
L	Buzzer +
M	Buzzer -

BINARY INPUTS:

There is 1 binary input 5-12 V DC available for customer specific needs. The input is isolated through a galvanic opto-coupler.

BINARY OUTPUTS:

Digital Outputs:

There are totally 4 digital npn-Open-Collector outputs available. All of them are software configurable. The max. output current is 25mA. See picture.
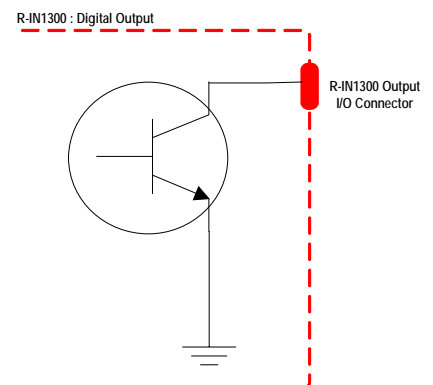
Relais:
There is a dry free contact to control higher loads which can be controlled via software.

Max. Voltage switch 50V (DC/AC)
Max. Current switch 3A
Max. Power switch 60W, 120 VA

R-IN1300 : Digital Output

R-IN1300 Output
I/O Connector