DOC. 138-R7

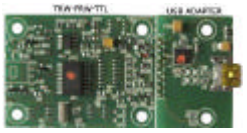
TRW SERIAL TYPE HA ISO 11784/11785 FDX

TRW-PCB

TRW-ONDA

TRW-SHELL

TRW-BOX



TRW-USB

TRW-POCKET USB

1.0 FEATURES AND SPECIFICATIONS

The TRW is a Serial Tag Reader/Writer with **built-in Antenna**, with three interface options TTL - RS232 - RS485 - USB.
The frequency is set to 134,2Khz.
- For **ANIMAL and BDE** read and write.
The **WRITE and the READ** can be selected in **HEX** or **DEC** format for the **Identification** Part.
The **WRITE operations** are enabled only on the polling model (suffix **HAS).**
The **EXTENDED** Part is always treated in **HEX**.
The **FRAME** can be **LOCKED** to avoid further writings.
The TRW was developed for **HITAGS-256** TAGs.
Can operate in Polling Mode (S) or Spontaneous mode (H).

TABLE 1. SHORT FRAME MODE

DESCRIPTION	N° BYTES	Usable BITS	MAX Value DECIMAL	MAX Value HEX
National Code	6	38	274.877.906.943	3FFFFFFFFF
Country Code	2	10	999	3E7
Data Block	1	1	1	1
Reserved Code	2	14	16.383	0
Animal Flag	1	1	1	1
Extension	3	0	0	0

Example :

National Code	**00-00-00-03-57-89 Dec**	**00-00-00-00-15-A8 Hex**
Country Code	**09-99 Dec**	**03-E7 Hex**
Data Block	**00 Dec**	**00 Hex**
Reserved Code	**00-00 Dec**	**00-00 Hex**
Animal Flag	**01 Dec**	**01 Hex**
Extension	**00-00-00 Dec**	**00-00-00 Hex**

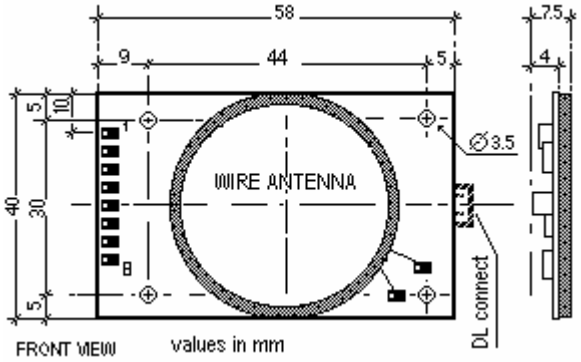
TRANSPONDERS SUPPORTED:
Type HITAGS-256 version at 134.2KHz, formatted ISO11784/5

2.0 VERSIONS

TRW-TTL-HAS-5	TTL interface. Polling mode.
TRW-TTL-HAH-5	TTL interface. Spontaneous mode.
TRW-232-HAS-12	RS232 interface. Polling mode.
TRW-232-HAH-12	RS232 interface. Spontaneous mode.
TRW-485-HAS-12	RS485 interface. Polling mode.
TRW-USB-KS-5	USB2.0 interface. Polling. Powered by USB connector.
TRW-USB-KH-5	USB2.0 interface. Spontaneous. Powered by USB connector.

Glossary: **HA**= TAG HITAG 134.2KHz **S**= Polling **H**= Spontaneous **5=**3.3 to 5V power supply **12=** 12V power supply

2.1 DIMENSION TRW-TTL/232/485/USB



CONNECTION TRW-TTL

The on-board connector is an 8 pin .1" soldering type.

Pin Number	Description	
1	**+3.3 to +5 VDC**	
2	**GND**	
3	**RX**	TTL input
4	**TX**	TTL output
5	**Spare**	TTL i/o
6	**Spare**	TTL i/o
7	**Out1**	Open Collector output.
8	**LED-OUT**	TTL output trough internal 1k?

CONNECTION TRW-485

The on-board connector is an 8 pin .1" soldering type.

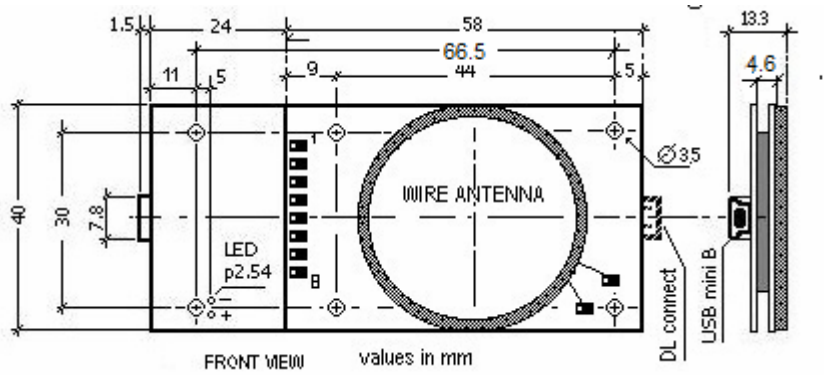
Pin Number	Description	
1	**+12VDC**	
2	**GND**	
3	**RS485-A**	
4	**RS485-B**	
5	**No Connect**.	
6	**No Connect**.	
7	**Out1**	Open Collector output.
8	**LED-OUT**	TTL output trough internal 1k?

CONNECTION TRW-232

The on-board connector is an 8 pin .1" soldering type.

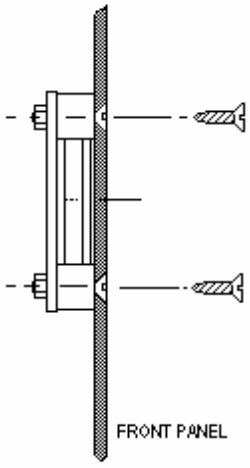
Pin Number	Description	
1	**+12VDC**	
2	**GND**	
3	**RX**	**RS232** input
4	**TX**	**RS232** output
5	**Spare**	**RS232** input
6	**Spare**	TTL i/o
7	**Out1**	Open Collector output.
8	**LED-OUT**	TTL output trough internal 1k?

DIMENSIONS PCB USB ASSEMBLED



Pin Number	Description
1	**+5VDC from PC**
2	**D+**
3	**D-**
4	**GND**
LED	TTL out (internal 1k?)

2.2 INSTALL



Due to the Radio Frequency emissions of the Reader Antenna is important to avoid the usage of metal panels in front, rear and lateral sides of the Reader.

Although the TRW-TTL provides an high resistance to EMC corruption, avoid to install it in high RF emission environments, the reading distance may result reduced.

3.0 PROTOCOL

The standard protocols for the TRW are:

-HAS Polling-Selecting — Suitable for application where the Host continuously polls the TRW. Is simple but force the HOST to be always operative else is absence of TAG.

-HAH Spontaneous — Suitable for application point to point. The TRW transmits data only when a TAG is really present. The HOST normally works in receive mode and can operate on other task in absence of TAG.

The protocol FORMAT is described below.

STX	Start of string synchronization code.
DEVICE.....	Is the Device Number. **For the TRW-TTL/RS232 is always 00H.**
LENGTH.....	Is the number of bytes following the LENGTH. Example: STX-DEVICE-LENGTH-FUNCTION-DATA0....DATA11-BCC The length is 14 DEC = 0D HEX.
FUNCTION /STATUS.....	Is the FUNCTION to be executed or the STATUS of an operation executed.
DATA0 to DATAn.....	Are the data exchanged for a max of 16 bytes.
PASSW0 to PASSW3.....	Is the Password code that permits commands exec on TAG PASSWORD PROTECTED.
BCC.....	Is calculated as the XOR of all bytes from STX to last DATA included. Example: STX-DEVICE-LENGTH-STATUS-BCC ✍ 02H-00H-02H-01H-BCC where BCC= 01H.

3.1 PROTOCOL HAS (Polling)

3.1.1 COMMANDS from HOST to TRW

COMMAND #S : SET DEVICE **VALID ONLY FOR TR-485**

DESCRIPTION	STX	DEVICE	LENGTH	FUNCTION	DATA0	BCC
HEX VALUE	02H	FFH	03H	See below	00H to 7CH	00H-FFH

FUNCTION	VALUE	DESCRIPTION
SET DEVICE	61H	The device number is set into the TR memory. Must be executed on any TR one-by-one befor to install. In DATA0 insert the DEVICE NUMBER assigned to TR.

COMMAND#P : POLL DATA

DESCRIPTION	STX	DEVICE	LENGTH	FUNCTION	FRB	N-BLOCKS	BCC
HEX VALUE	02H	00H	04H	See below	01H	06H	00H-FFH

FUNCTION	VALUE	DESCRIPTION
POLL DATA HEX	04H	The Tag data are read in **HEX** format.
POLL DATA DEC	06H	The Tag data are read in **DEC** format.

COMMAND#0 : WRITE DATA ISO11784

DESCRIPTION	STX	DEVICE	LENGTH	FUNCTION	FWB	N-BLOCKS	RESERVED	Spare (4 bytes)	DATAn	BCC
HEX VALUE	02H	00H	18H	See below	04H	04H	0FH	00-00-00-00H	00H to FFH	00H-FFH

FUNCTION	VALUE	DESCRIPTION
WRITE DATA	22H	DATAn are written in **HEX** format into the TAG. DATAn is formed **by 15 Data Bytes**.
WRITE DATA	23H	DATAn are written in **DEC** format into the TAG. DATAn is formed **by 15 Data Bytes**.

DATA has to be inserted conforming to the order specified in TABLE1.

COMMAND#1 : CONFIG NO LOCK/LOCK

DESCRIPTION	STX	DEVICE	LENGTH	FUNCTION	FWB	N-BLOCKS	Spare(4 bytes)	FBR	LBR	LOCK	RESERVED	BCC
HEX VALUE	02H	00H	0CH	See below	01H	01H	00-00-00-00H	04H	02H	00/01H	00H	00H-FFH

FUNCTION	VALUE	DESCRIPTION
WRITE CONF	80H	Modify the CONFIGURATION to LOCK/NOLOCK the Pages 4-5-6-7 on the TAG and pass it in TTF Mode. If LOCK=0 the tag is not locked. If LOCK=1 the tag will be locked in PAGES 4-5-6-7

After set the LOCK, no other write operation will be performed on the specified pages 4,5,6,7. You can t return to a NO LOCK configuration.

COMMAND #5: **TURN ON/TURN OFF** the OUT1 transistor.

DESCRIPTION	STX	DEVICE	LENGTH	FUNCTION	BCC
HEX VALUE	02H	00H	02H	See below	00H-FFH

FUNCTION	VALUE	DESCRIPTION
TURN-ON	02H	The HOST send this Command to TURN-ON (closed) the OUT1 open collector.
TURN-OFF	01H	The HOST send this Command to TURN-OFF (open) the OUT1 open collector.

COMMAND#V : READ VERSION

DESCRIPTION	STX	DEVICE	LENGTH	FUNCTION	BCC
HEX VALUE	02H	00-7CH	03H	See below	00H-FFH

FUNCTION	VALUE	DESCRIPTION
READ VERSION	76H	Read the actual firmware version of the module.

3.1.2 STRINGS from TRW to HOST

REPLY#0 : READ

DESCRIPTION	STX	DEVICE	LENGTH	STATUS	DATAn	BCC
HEX VALUE	02H	00H	11H	See below	00H to FFH	00H-FFH

FUNCTION	VALUE	DESCRIPTION
READ	04H	Data READ from the TAG are complete.

Data are send in this order:

Data 0	National Code	00-00-00-03-57-89 Dec	00-00-00-00-15-A8 Hex
Data 6	Country Code	09-99 Dec	03-E7 Hex
Data 8	Data Block	00 Dec	00 Hex
Data 9	Reserved Code	00-00 Dec	00-00 Hex
Data 11	Animal Flag	01 Dec	01 Hex
Data 12	Extension	00-00-00 Dec	00-00-00 Hex

REPLY#V : VERSION

DESCRIPTION	STX	DEVICE	LENGTH	VERSION (2 bytes)	BCC
HEX VALUE	02H	00-7CH	03H	MMH-RRH	00H-FFH

FUNCTION	DESCRIPTION
VERSION	Show the actual version (MM=Model RR=Firmware release). For this model the value **MM** is: TTL/RS232-XS=**14H** TTL/RS232-XH=**15H** and RS485-XS=**16H.**

REPLY#1 : STATUS

DESCRIPTION	STX	DEVICE	LENGTH	STATUS	BCC
HEX VALUE	02H	00H	02H	See below	00H-FFH

FUNCTION	VALUE	DESCRIPTION
READ DATA ERR	01H	The data detected on the TAG are corrupted or incomplete. RF noise environment detected.
NO TAG	02H	The TRW has detected a no tag present during a COMMAND or POLLING sequence.
COMMAND OK	04H	The command sent to TRW has been correctly executed.
COMMAND ERR	20H	The command sent to TRW was not executed because a parameter out of limit on the string or a data error was dectected on the TAG during a command execution

In the case the TRW detects a BCC error on the received string, don t exec the Command and don t transmit any Reply.

3.1.3 DATA FLOW TRW - HAS

The exchange of strings in a typical operation is described below. The HOST is considered as Master, the TRW as Slave.

HOST			TRW-HAS		
		NORMAL OPERATING MODE			
		READ SEQUENCE			
POLL HEX/DEC	===>	(poll time typ400ms)	<===	if OK	**READ**
			<===	if ERROR	**STATUS**
		CONFIG BEFORE WRITE (exec when write on a non previously configurated tag)			
CONFIG NOLOCK	===>	(response time typ 400ms)	<===	if OK/ERROR	**STATUS**
		WRITE DATA COMMAND			
WRITE DATA	===>	(response time typ 400ms)	<===	if OK	**STATUS**
			<===	if ERROR	**STATUS**
		CONFIG LOCK COMMAND (FACOLTATIVE if you want Lock the written data)			
CONFIG LOCK	===>	(response time typ 400ms)	<===	if OK/ERROR	**STATUS**
		OUT1 (example: can be used for a 12VDC Buzzer)			
TURN-ON/OFF	===>	(max response time 150ms)	<===	COMMAND-OK	

3.2 PROTOCOL HAH (Spontaneous)

The TRW operates in spontaneous mode; when the TAG enters the RF field and is correctly read, directly transmits readable data to the host.

3.2.1 STRINGS from SRW to HOST

REPLY#0 : READ

DESCRIPTION	STX	DEVICE	LENGTH	STATUS	DATAn	BCC
HEX VALUE	02H	00H	11H	See below	00H to FFH	00H-FFH

FUNCTION	VALUE	DESCRIPTION
READ	04H	Data READ from the TAG are complete.

Data are send in this order:

Data 0	National Code	00-00-00-03-57-89 Dec	00-00-00-00-15-A8 Hex
Data 6	Country Code	09-99 Dec	03-E7 Hex
Data 8	Data Block	00 Dec	00 Hex
Data 9	Reserved Code	00-00 Dec	00-00 Hex
Data 11	Animal Flag	01 Dec	01 Hex
Data 12	Extension	00-00-00 Dec	00-00-00 Hex

REPLY#V : VERSION

DESCRIPTION	STX	DEVICE	LENGTH	VERSION (2 bytes)	BCC
HEX VALUE	02H	00-7CH	03H	MMH-RRH	00H-FFH

FUNCTION	DESCRIPTION
VERSION	Show the actual version (MM=Model RR=Firmware release). For this model the value **MM** is: TTL/RS232-XS=**14H** TTL/RS232-XH=**15H** and RS485-XS=**16H.**

REPLY#1 : STATUS

DESCRIPTION	STX	DEVICE	LENGTH	STATUS	BCC
HEX VALUE	02H	00H	02H	See below	00H-FFH

FUNCTION	VALUE	DESCRIPTION
READ DATA ERR	01H	The data detected on the TAG are corrupted or incomplete. RF noise environment detected.
NO TAG	02H	The TRW has detected a no tag present during a COMMAND.
COMMAND OK	04H	The command sent to TRW has been correctly executed.
COMMAND ERR	20H	The command sent to TRW was not executed because a parameter out of limit on the string or a data error was dectected on the TAG during a command execution

3.2.2 STRINGS from HOST to TRW

COMMAND#4 : ACK

DESCRIPTION	STX	DEVICE	LENGTH	FUNCTION	BCC
HEX VALUE	02H	00H	02H	See below	00H-FFH

FUNCTION	VALUE	DESCRIPTION
ACK	10H	The HOST send this Command to the TRW to close any sequence. After the TRW wait for a TAG extraction.

COMMAND#V : READ VERSION

DESCRIPTION	STX	DEVICE	LENGTH	FUNCTION	BCC
HEX VALUE	02H	00-7CH	03H	See below	00H-FFH

FUNCTION	VALUE	DESCRIPTION
READ VERSION	76H	Read the actual firmware version of the module.

COMMAND #5: **TURN ON/TURN OFF** the OUT1 transistor.

DESCRIPTION	STX	DEVICE	LENGTH	FUNCTION	BCC
HEX VALUE	02H	00H	02H	See below	00H-FFH

FUNCTION	VALUE	DESCRIPTION
TURN-ON	02H	The HOST send this Command to TURN-ON (closed) the OUT1 open collector.
TURN-OFF	01H	The HOST send this Command to TURN-OFF (open) the OUT1 open collector.

In the case the TRW detects a BCC error on the received string, don t exec the Command and don t transmit any Reply.

3.2.3 DATA FLOW TRW-HAH

The REPLY#0 function as a **trigger** to start a COMMAND sequence.
When a REPLY#0 is fully received, the HOST can send a COMMAND in a **time window** of 500 ms.
Over this time, if no command has been sent, the TRW automatically repeat a READ DATA sequence till TAG extraction or a COMMAND receive, except for COMMAND#4.
If receive COMMAND#4 the TRW close the sequence and wait for a TAG extraction.
The **time window** on TRW is **reloaded** at any reply during a COMMAND sequence, except for critical errors.
A tipycal data flow, in spontaneous mode, is described below.

HOST		**TRW**
READ DATA sequence		
Example: in case of bad reading	<===	READ DATA-ERROR
Exit.... wait new reply.....		**Repeat READ DATA sequence....**
Example: a TAG placed into RF field is correctly read	<===	READ COMPLETE
		Time window.....250ms.....
COMMAND sequence in time window		
NO COMMAND ===>		**Repeat READ DATA sequence**
ACK ===>		**Wait for TAG extraction....**
Exit....wait new reply.....		**Return to READ DATA sequence**
TURN-ON/OFF ===> (max response time 150ms)	<===	COMMAND-OK
Exit.....or continue with commands.....		**Time window reload.**
ACK ===>		**Wait for TAG extraction....**
Exit....wait new reply.....		**Repeat READ DATA sequence**

4.0 OUT1

The Out1 is an Open Collector output driving a max. load of 80 ma at 12VDC.
It will goes ON/OFF with the COMMAND#5.

4.1 LED-OUT

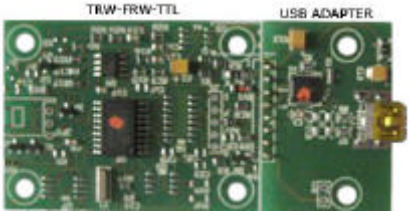
The LED-OUT is a TTL output, active high, with a 1 k? internal series resistor suitable to drive an external LED connected to GND.
It will turn ON when a KEY/CARD is moved in the RF-Field and is correctly read.
It will turn OFF when the KEY/CARD is removed by the RF-Field.

5.0 TRW-USB-HAS/HAH-5 USB2.0 modules

Before any operation need to INSTALL the drivers.
1)Unzip the package "MCP2200 Windows Driver.zip"
2)Open the folder "Driver Installation Tool"
3)Open the folder "x64" for 64bit platforms or "x86" for 32bit platforms.
4)Launch the application "MCP2200DriverInstallationTool.exe".
5)Connect the TRW-USB device and follows the Microsoft instructions to complete the INSTALL on your platform.
6)The install assign a COM PORT to your device. Now you can communicate on this PORT.

To connect the TRW-USB module use a cable of the desired length mounting the connectors:
USB 2.0 TYPE A PLUG (side HOST) and USB2.0 MINI TYPE B PLUG (side FRW)

The available models for order are:
TRW-USB-HAS/HAH-5 (PCB version) and TRW-USB-HAS/HAH-5-POCKET



TRW-USB-Version PCB

TRW-USB- Version POCKET

6.0 TRW-HAS/HAH-12-SHELL/ONDA

These models are suggested **only for READ purpose**.
The use of **WRITE** commands has to be made by experienced operators that use a sure method of positioning and keeping the tag in the RF FIELD. Otherwise the tag can be damaged.
Has the same electrical functions of the standard TRW-232.

Dimension electronic board	Height 40 x Length 58 x depth 7.5 mm
Dimension SHELL	Height 77 x Length 112 x depth 30 mm
Dimension ONDA	Height 51 x Length 115 x depth 24 mm

TRW-ONDA

TRW-SHELL

CABLE PIN FUNCTION

COLOR	232	485
WHITE	+12VDC	+12VDC
BROWN	GND	GND
YELLOW	RX 232	RS485-A
GREEN	TX 232	RS485-B
GREY	GND	GND

EXAMPLE: HOW TO CONNECT TO A 9 PIN D-TYPE S (Female)

TR- 232-S cable	D-TYPE S connector
YELLOW(RX)	PIN 3
GREEN(TX)	PIN 2
GREY(GND)	PIN 5

IMPORTANT NOTE:
DURING A WRITE COMMAND THE TAG MUST BE MANTAINED IN THE PROPER RF FIELD TILL A REPLAY#1 OR STATUS ERROR STRING HAS BEEN RECEIVED.
MOVING THE TAG CAN CAUSE A NON RECOVERABLE FAILURE ON THE TAG ITSELF.
THIS MODEL PERMIT ONLY THE USE OF THE WRITE DATA COMMAND.

7.0 TRW-HAS-12-BOX

The module TRW is inserted into a BOX plastic enclosure.
Has the same electrical functions of the standard TRW-232.
A Cannon 9S connect all the signals. Connection with PC through a STRAIGHT CABLE.
The 12VDC power supply is connected by a standard 2mm/2,1mm plug-in:
Internal PIN +12V
External PIN GND
The TRW is protected against polarity inversion.

TRW-232-12-BOX

MECHANICAL

Dimensions	Length	11.2cm
	Width	6.8cm
	Height	2.8cm
Weight		Typ 100g

OPERATING

Power Requirements	9 to 12 VDC not stabilized max. absorption 50mA
Serial interface **Data=8bit Parity=none Stop=1bit**	Async. Half Duplex
Speed	9600 bits per second
Reading Distance (with TAG in center of RF field)	CARD Q5 typ 55 mm

Cannon 9S Connector

PIN	DESCRIPTION
1	
2	TX 232
3	RX 232
4	
5	GND
6	NOT CONNECTED
7	NOT CONNECTED
8	NOT CONNECTED
9	NOT CONNECTED

8.0 SPECIFICATIONS

OPERATING

Power Requirements	12 VDC ? 10% at max 55mA . 5 VDC ? 5% at max 50mA max ripple 10mV
Serial interface **Data = 8bit Parity = none Stop = 1bit**	HAS: BiNARY asynchronous half duplex, polling-selecting protocol . HAH: BINARY asynchronous half duplex, spontaneous protocol .
Baud Rate	9600 bits per second
Reading Distance (with TAG in center of RF field)	Depends on Tag Form
Writing Distance (with TAG in center of RF field) **IMPORTANT: Don t remove the TAG/CARD during the whole writing.**	Depends on Tag Form

MECHANICAL PCB

Dimensions	40mm x 58mm x 10 mm
Weight	Max 60g

ENVIRONMENTAL

Temperature	Operating Storage	-10°C to 60°C -30°C to 70°C
Humidity	Operating Storage	10% to 90% non condensing 0% to 95% non condensing

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