**RFID** TRANSPONDER **TECHNOLOGY**

# TR/TRW SERIAL TYPE UNIQUE-Q5-T5577

**TRW-PCB**          **TRW-ONDA**          **TRW-SHELL**          **TRW-BOX**
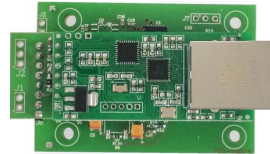
**TRW-USBN**          **TRW-USBN-POCKET**          **TRW-LAN**

## 1.0 FEATURES AND SPECIFICATIONS

**1.0 FEATURES AND SPECIFICATIONS**
The  TRW is a  Front Side Serial Tag Reader/Writer with **built-in Antenna.**

**INTERFACE OPTIONS:**
TTL - RS232 - RS485 - USB - LAN

**TRANSPONDERS SUPPORTED:**
UNIQUE  - Q5 - T5577

**WORKING METHODS:**
**- SHORT FRAME:**  5 bytes HEX, the UNIQUE  FORMAT.
**- LONG FRAME:**    17 bytes HEX, for general R/W purpose.

An useful **READ PART1** command permit to read the SERIAL NUMBER in  PAGE1 of the Q5 and T5577 tags.

Can operate in AOR MODE (**Answer On Request with PASSWORD**).

**2.0 VERSIONS**

| Reader Only models | | Read/Write models | |
|---|---|---|---|
| **TR-TTL-SS/SH-5** | TTL interface. . | **TRW-TTL-QS/QH-5** | TTL interface |
| **TR-232-SS/SH-12** | RS232 interface | **TRW-232-QS/QH-12** | RS232 interface |
| **TR-485-SS/SH-12** | RS485 interface | **TRW-485-QS/QH-12** | RS485 interface |
| **TR-USB-SS/SH-5** | USB2.0 interface. Powered by USB connector. | **TRW-USB-QS/QH-5** | USB2.0 interface. |
| **TR-LAN-SS/SH-5** | LAN interface.                            . | **TRW-LAN-QS/QH-5** | LAN interface. |

**The Reader Only models perform only the read of the SHORT FRAME, 5bytes UNIQUE code.**
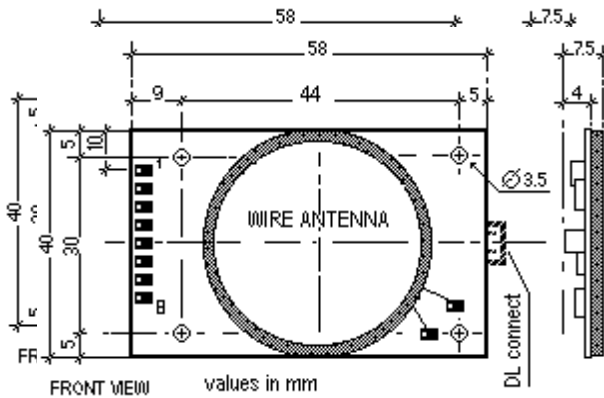Glossary:    **SS/QS**= Polling mode      **SH/QH**= Spontaneous mode       **12/5**= Power supply
              Interface: **TTL   232   485   USB   LAN**
            **Case**= PCB**/**SHELL/ONDA/BOX/ POCKET

# 2.0 MOUNTING

FRONT VIEW    values in mm

**CONNECTION TRW-TTL**
The on-board connector is an 8 pin .1" soldering type.

| Pin Number | Description | |
|---|---|---|
| 1 | +5VDC | |
| 2 | GND | |
| 3 | RX | TTL input |
| 4 | TX | TTL output |
| 5 | Spare | TTL i/o |
| 6 | MODE | TTL i/o |
| 7 | Out1 | Open Collector output. |
| 8 | LED-OUT | TTL out internal 1kΩ |

**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 | MODE | TTL input |
| 7 | Out1 | Open Collector output. |
| 8 | LED-OUT | TTL out internal 1kΩ |

**CONNECTION TRW-232**
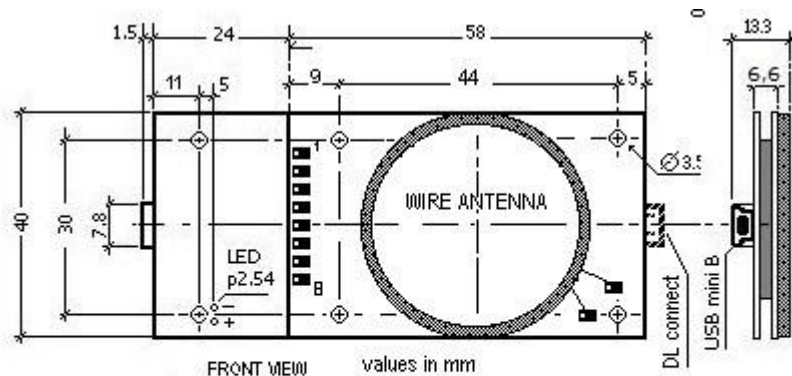The on-board connector is an 8 pin .1" soldering type.

| Pin Number | Description | |
|---|---|---|
| 1 | +12VDC | |
| 2 | GND | |
| 3 | RX | RS232 input |
| 4 | TX | RS232 output |
| 5 | Spare | RS232 input |
| 6 | MODE | TTL input |
| 7 | Out1 | Open Collector output. |
| 8 | LED-OUT | TTL out internal 1kΩ |

FRONT VIEW    values in mm

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

**The FRW-USB module is powered by the 5VDC on the USB connector.**

TOP VIEW    Values in mm
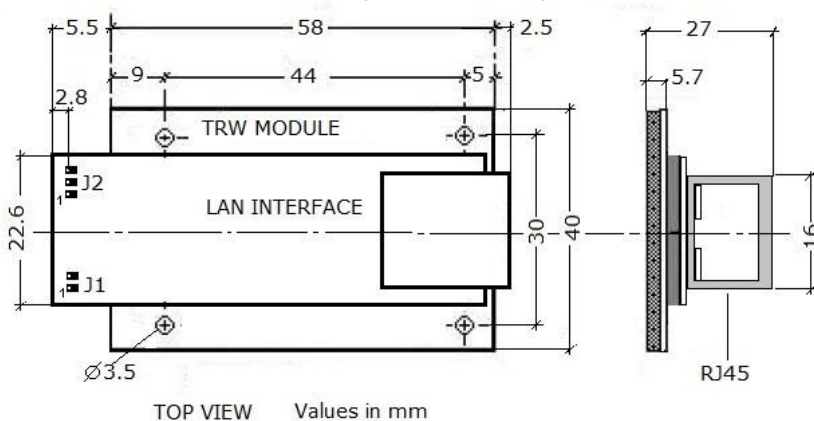
**CONNECTION J1**
The on-board connector is a 2 pin .1".

| Pin Number | Description |
|---|---|
| 1 | +5VDC |
| 2 | GND |

**CONNECTION J2**

| Pin Number | Description | |
|---|---|---|
| 1 | LED-OUT | TTL output trough internal 1kΩ |
| 2 | GND | LED ground |
| 3 | OUT1 | Open collector output |

## 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 provides an high resistance to EMC corruption, avoid to install it in high RF emission environments, the reading distance may result reduced.
In the spontaneous models (H) the RF field is always on, therefore using more than one antenna make attention to mount them at a distance of at least 1mt one another to avoid mutual noise.



FRONT PANEL
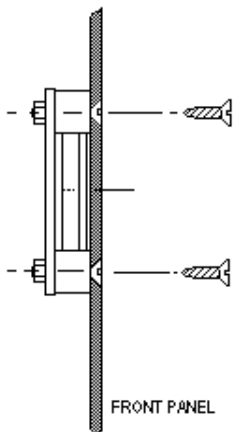
# 3.0  PROTOCOL

The standard protocols for the TRW are:
**-SS/QS**  Polling        Suitable for application where the Host continuously polls the TRW.
**-SH/QH**  Spontaneous   Suitable for application point to point. The TRW transmits data only when a TAG is present. The HOST normally works in receive mode and can operate on other task in absence of TAG. Not operable with RS485.

The protocol FORMAT is described below.
**STX**                          Start of string synchronization code.
**DEVICE**.................................Is the Device Number **(for RS485 only). For 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 17 bytes.
**PASSW0 to PASSW3**.................Is the Password code.
**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.

**The TAGs first delivery PASSWORD is always 00-00-00-00.**

# 3.1  PROTOCOL S (Polling)

The TRW-QS operates in Polling mode. The HOST is Master.
Permit the use of the formats:
SHORT -- LONG
**MODE input connector PIN6 OPEN.**

### 3.1.1 COMMANDS from HOST to TRW

**COMMAND #S :    SET DEVICE   VALID ONLY FOR TRW-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-7CH | 04H | See below | 01H | 02H-06H-0FH | 00H-FFH |

| FUNCTION | VALUE | DESCRIPTION |
|---|---|---|
| POLL DATA | 04H | The Tag data,if in valid format, are read in sequential order from the First Read Block (FRB). |

N-BLOCKS=F the TRW **automatically** detects valid formats and replay (REPLAY#0) data in:
**SHORT FRAME MODE  or LONG FRAME MODE.**
N-BLOCKS=2  the TRW detect and send only **SHORT FRAME MODE** Tags.
N-BLOCKS=6  the TRW detect and send only **LONG FRAME MODE** Tags.

## COMMAND#RP1 :     READ PART1

| DESCRIPTION | STX | DEVICE | LENGTH | FUNCTION | FRB | N-BLOCKS | BCC |
|---|---|---|---|---|---|---|---|
| HEX VALUE | 02H | 00H-7CH | 04H | See below | 00H | 00H | 00H-FFH |

| FUNCTION | VALUE | DESCRIPTION |
|---|---|---|
| READ PART1 | 7CH | The Tag data, if in valid format, are read in sequential order from the PAGE1. |

**The replay lenght distinguish the tag between Q5 and T5577.**
The UNIQUE tag gives an error replay.

## COMMAND#0 :    WRITE DATA

| DESCRIPTION | STX | DEVICE | LENGTH | FUNCTION | FWB | N-BLOCKS | PASSW (4 bytes) | DATAn (n=5-17) | BCC |
|---|---|---|---|---|---|---|---|---|---|
| HEX VALUE | 02H | 00H-7CH | 0DH-19H | See below | 01H | 02H-06H | xx-xx-xx-xxH | 00H to FFH | 00H-FFH |

| FUNCTION | VALUE | DESCRIPTION |
|---|---|---|
| WRITE DATA | 22H | DATAn are written into the TAG from the First Write Block (FWB) for N-BLOCKS. |

In **SHORT FRAME MODE** DATAn is formed **by 5 Data Bytes** and FWB=1  N-BLOCKS=2.
In **LONG  FRAME MODE** DATAn is formed **by 17 Data Bytes** and FWB=1  N-BLOCKS=6.
The PASSW is mandatory if the tag is configured to operate in PASSW or AOR mode.

## COMMAND#0L :     WRITE DATA  LOCK

| DESCRIPTION | STX | DEVICE | LENGTH | FUNCTION | FWB | N-BLOCKS | PASSW (4 bytes) | DATAn (n=5-17) | BCC |
|---|---|---|---|---|---|---|---|---|---|
| HEX VALUE | 02H | 00H-7CH | 0DH-19H | See below | 01H | 02H-06H | xx-xx-xx-xxH | 00H to FFH | 00H-FFH |

| FUNCTION | VALUE | DESCRIPTION |
|---|---|---|
| WRITE DATA | 23H | **The same as WRITE DATA** with the difference that it LOCKS the written DATA in the |

BLOCKS 1 to 2 in **SHORT FRAME MODE** and BLOCKS 1 to 6 in **LONG FRAME MODE**.
*IMPORTANT*: After this command the blocks are permanently locked. Any other write
command send a REPLY#0 with the previous data.

## COMMAND#1 :     CHANGE CONFIGURATION  Q5

| DESCRIPTION | STX | DEVICE | LENGTH | FUNCTION | FWB | N-BLOCKS | PASSW0 | .. | PASSW3 | FBR |
|---|---|---|---|---|---|---|---|---|---|---|
| HEX VALUE | 02H | 00H-7CH | 0CH | See below | 00H | 01H | 00H | | 00H | 01H |

| LBR | A/P MODE | LOCK/HV | BCC |
|---|---|---|---|
| 02H or 06H | 00H-01H-02H | 00H-01H-02H-03H | 00H-FFH |

| FUNCTION | VALUE | DESCRIPTION |
|---|---|---|
| CHANGE CONF | 80H | Write the CONFIGURATION WORD of the TAG. |

In **SHORT FRAME MODE**  LBR  has value as 2.
In **LONG FRAME MODE**  LBR has value as 6.

**A/P MODE =00H (default value)**
The tag is configured to operate without PASSW or AOR mode control.
**A/P MODE=01H**
The tag is configured to operate in AOR MODE.
In AOR MODE the tag need a **WRITE PASSWORD** command before.
*IMPORTANT:*In AOR MODE the TAG replay only if you send before a WAKE UP comman
with the correct PASSWORD. All other commands can be executed till the TAG remains
in the RF field**.**

**A/P MODE=02H**
The tag is configured to operate in PASSW MODE.
The **WRITE DATA** command requests the correct PASSW value.
In PASSW MODE the tag need a **WRITE PASSWORD** command before.
The PASSW0 to PASSW3 data field are mandatory if the tag is configured to operate in
PASSW or AOR mode. Otherwise can be 00-00-00-00H.

**LOCK/HV=00H (default value)**
The data written in BLOCK0 are **not locked**.The tag operating frequency is set at  **RF/64.**
**LOCK/HV=02H**
The data written in BLOCK0 are **not locked**. The tag operating frequency is set at  **RF/32.**

**LOCK/HV=01H**
The data written in BLOCK0 are **locked**. The tag operating frequency is set at  **RF/64.**
**LOCK/HV=03H**
The data written in BLOCK0 are **locked**. The tag operating frequency is set at  **RF/32.**

*IMPORTANT*: After this commands the block 0 (CONFIGURATION) is permanently locked. Any other CHANGE CONFIGURATION command send a REPLY#1 but the previous data are not changed.

**COMMAND#1BIS :     CHANGE CONFIGURATION  T5577**

| DESCRIPTION | STX | DEVICE | LENGTH | FUNCTION | FWB | N-BLOCKS | PASSW0 | .. | PASSW3 | FBR |
|---|---|---|---|---|---|---|---|---|---|---|
| HEX VALUE | 02H | 00H | 0CH | See below | 00H | 01H | 00H | | 00H | 01H |

| LBR | AOR  MODE | LOCK/ HV | BCC |
|---|---|---|---|
| 02H or 06H | 00H-01H-02H- | 00H-01H-02H-03H | 00H-FFH |

| FUNCTION | VALUE | DESCRIPTION |
|---|---|---|
| CHANGE CONF | 88H | **Same as CHANGE CONFIGURATION Q5**.<br>*IMPORTANT*:**Don't configure a Q5 TAG using this command(88H) , can be damaged.** |

**COMMAND#3 :     WRITE PASSWORD**

| DESCRIPTION | STX | DEVICE | LENGTH | FUNCTION | FWB | N-BLOCKS | O_PASSW0 | .. | O_ PASSW3 |
|---|---|---|---|---|---|---|---|---|---|
| HEX VALUE | 02H | 00H-7CH | 0CH | See below | 07H | 01H | 00H to FFH | | 00H  to FFH |

| PASSW0 | .. | PASSW3 | BCC |
|---|---|---|---|
| 00H to FFH | | 00H to FFH | 00H-FFH |

| FUNCTION | VALUE | DESCRIPTION |
|---|---|---|
| WRITE PASSW | A0H | The old password **O_PASSW0 to O_PASSW3** written in the TAG is substituted by the new password  **PASSW0 to PASSW3**.(the password range is: **00-00-00-00 to FF-FF-FF-FF**). WHEN TAG IS FIRST TIME DELIVERED HAS A PASSWORD: 00-00-00-00.<br>*REMEMBER* **THE NEW PASSWORD WRITTEN IN THE TAG.** |

**COMMAND#4 :     WAKE-UP**

| DESCRIPTION | STX | DEVICE | LENGTH | FUNCTION | SPARE | SPARE | PASSW0 | .. | PASSW3 | BCC |
|---|---|---|---|---|---|---|---|---|---|---|
| HEX VALUE | 02H | 00H-7CH | 08H | See below | 00H | 00H | 00H to FFH | | 00H  to FFH | 00H-FFH |

| FUNCTION | VALUE | DESCRIPTION |
|---|---|---|
| WAKE  UP | 90H | **The PASSWORD is mandatory**.<br>If operate in  **AOR  MODE,** the TAG inserted in field don't reply till receive a **WAKE-UP** command with the correct **PASSWORD**. |

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

| DESCRIPTION | STX | DEVICE | LENGTH | FUNCTION | BCC |
|---|---|---|---|---|---|
| HEX VALUE | 02H | 00H-7CH | 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 | SPARE | SPARE | BCC |
|---|---|---|---|---|---|---|---|
| HEX VALUE | 02H | 00-7CH | 04H | See below | 00H | 00H | 00H-FFH |

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

**COMMAND #SC**:   **SET STATUS CODE**

| DESCRIPTION | STX | DEVICE | LENGTH | FUNCTION | CODE | BCC |
|---|---|---|---|---|---|---|
| HEX VALUE | 02H | 00H-7CH | 03H | See below | 04H or 44H | 00H-FFH |

| FUNCTION | VALUE | DESCRIPTION |
|---|---|---|
| STATUS CODE | 33H | The HOST send this Command to  set the STATUS CODE in the REPLY#0 as **04H**. |
| STATUS CODE | 34H | The HOST send this Command to  set the STATUS CODE in the REPLY#0 as 4**4H**. |

To be used to mantain compatibility with old QS models, when requested.

### 3.1.2 STRINGS  from TRW to HOST

**IN RS485 MODE** THE DEVICE BIT7 IS ALWAYS SET TO 1**. So the address 00H is 80H and the 7CH is FCH.**

**REPLY#0 :     READ COMPLETE**

| DESCRIPTION | STX | DEVICE | LENGTH | STATUS | DATAn (n=5 or 17) | BCC |
|---|---|---|---|---|---|---|
| HEX VALUE | 02H | 00H-7CH | 07H or 13H | See below | 00H to FFH | 00H-FFH |

| FUNCTION | VALUE | DESCRIPTION |
|---|---|---|
| READ COMPL | 04H | Data READ from the TAG are complete.<br>In SHORT FRAME MODE   DATAn is formed **by 5 Data Bytes**.<br>In LONG  FRAME MODE  DATAn is formed **by 17 Data Bytes**. |

**READ COMPL   44H   ONLY VALID IN TR MODELS.** Data READ from the TAG are complete.
In SHORT FRAME MODE   DATAn is formed **by 5 Data Bytes**.

For compatibility with old models we have inserted a new command to set this code as 04H or 44H.
See COMMAND#SC  SET STATUS CODE.

**REPLY#P1 :    PART1**

| DESCRIPTION | STX | DEVICE | LENGTH | STATUS | DATAn (n=5 or 8) | BCC |
|---|---|---|---|---|---|---|
| HEX VALUE | 02H | 00H-7CH | 07H - 0AH | See below | 00H to FFH | 00H-FFH |

| FUNCTION | VALUE | DESCRIPTION |
|---|---|---|
| PART1 | 04H | Data READ from PAGE1-**UNIQUE IDENTIFIER BLOCK** is complete. |

If the lenght is **07H** the **Q5** was detected and the Data field is 5 bytes.
All the field can be used as UNIQUE identifier.
If the lenght is **0AH** the **T5577** was detected and the Data field is 8 bytes starting with E0H
(byte 7). Only the first 5 bytes can be used as UNIQUE identifier (BYTE0-1-2-3-4).

**REPLY#V :    VERSION**

| DESCRIPTION | STX | DEVICE | LENGTH | STATUS | VERSION (2 bytes) | BCC |
|---|---|---|---|---|---|---|
| HEX VALUE | 02H | 00-7CH | 04H | 04H | MMH-RRH | 00H-FFH |

| FUNCTION | DESCRIPTION |
|---|---|
| VERSION | Show the actual version ( MM=Model   RR=Firmware release ). |

        **MM** is:TTL/RS232/USB-SS=**1BH**    TTL/RS232/USB-SH=**1CH**    TTL/RS232/USB-QS=**0BH**
           TTL/RS232/USB-QH=**0CH**    RS485-SS=**1DH**    RS485-QS=**0DH**

**REPLY#1 :    STATUS**

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

| FUNCTION | VALUE | DESCRIPTION |
|---|---|---|
| READ DATA ERR | 01H | The data detected on the TAG are corrupted or incomplete or an high RF noise environment was detected. |
| NO TAG | 02H | The TRW has detected 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 FRW-QS
The  exchange of  strings in a typical operation is described below.
The HOST is considered as Master, the TRW as Slave.

**HOST**                                                                                          **TRW**

                    **NORMAL OPERATING MODE**

                    CONFIGURE SEQUENCE
**CHANGE CONFIG** ===>   (response time max 500ms)   <=== if  OK/ERROR **STATUS**

                    WRITE SEQUENCE
**WRITE DATA**   ===>   (response time max 500ms)   <===  if ERROR **STATUS**
                                                      <===  if OK **READ**
                    READ  SEQUENCE
**POLL DATA**   ===>   (poll time min 200ms in SHORT FRAME MODE ) <=== if OK **READ**
                    (poll time min 300ms in LONG FRAME MODE )
                                                  <=== if ERROR **STATUS**
                    READ PART1
**READ PART1**   ===>   (poll time min 1000ms  )                  <=== if OK **PART1**

                    **PASSW  OPERATING MODE**

                    INSERT THE NEW PASSWORD
**WRITE PASSWORD** ===> (response time max 500ms)                 <=== if  OK/ERROR **STATUS**
                    SET CONFIGURATION  in PASSW MODE
**CHANGE CONFIG**   ===>   (response time max 500ms)               <=== if  OK/ERROR **STATUS**

**Now the TAG is configured in PASSW MODE. Any WRITE/CHANGE command will be executed only if the PASSW is correct.**

                    **AOR  OPERATING MODE**

                    INSERT THE NEW PASSWORD
**WRITE PASSWORD** ===> (response time max 500ms)                 <=== if  OK/ERROR **STATUS**

**SET CONFIGURATION  in AOR MODE**

**CHANGE CONFIG**     ===> (response time max 500ms)                 <=== if  OK/ERROR **STATUS**


**Now the TAG is configured in AOR MODE, send the WAKE UP command as a polling:**


**WAKE-UP TAG with the correct PASSWORD**

**WAKE UP**          ===> (response time max 300ms)                 <=== if ERROR **STATUS**
                                                                      <=== if OK   **READ COMPLETE**


If **READ COMPLETE**, the tag has correctly accepted your **PASSWORD.**
You can exec any command till the TAG remains in the RF Field :
**CHANGE CONFIGURATION - WRITE PASSWORD - WRITE DATA.**


## 3.2  PROTOCOL TRW-H (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 TRW to HOST

**REPLY#0 :     READ COMPLETE**

| DESCRIPTION | STX | DEVICE | LENGTH | STATUS | DATAn (n=5 or 17) | BCC |
|---|---|---|---|---|---|---|
| HEX VALUE | 02H | 00H-7CH | 07H or 13H | See below | 00H to FFH | 00H-FFH |

| FUNCTION | VALUE | DESCRIPTION |
|---|---|---|
| READ COMPL | 04H | Data READ from the TAG are complete. |
| | | In SHORT FRAME MODE   DATAn is formed **by 5 Data Bytes**. |
| | | In LONG  FRAME MODE  DATAn is formed **by 17 Data Bytes**. |
| READ COMPL | 44H | **ONLY VALID IN TR MODELS.** Data READ from the TAG are complete. |
| | | In SHORT FRAME MODE   DATAn is formed **by 5 Data Bytes**. |

**REPLY#P1 :     PART1**

| DESCRIPTION | STX | DEVICE | LENGTH | STATUS | DATAn (n=5 or 8) | BCC |
|---|---|---|---|---|---|---|
| HEX VALUE | 02H | 00H-7CH | 07H - 0AH | See below | 00H to FFH | 00H-FFH |

| FUNCTION | VALUE | DESCRIPTION |
|---|---|---|
| PART1 | 04H | Data READ from PAGE1-**UNIQUE IDENTIFIER BLOCK** is complete. |
| | | If the lenght is **07H** the **Q5** was detected and the Data field is 5 bytes. |
| | | All the field can be used as UNIQUE identifier. |
| | | If the lenght is **0AH** the **T5577** was detected and the Data field is 8 bytes starting with E0H |
| | | (byte 7). Only the first 5 bytes can be used as UNIQUE identifier (BYTE0-1-2-3-4). |

**REPLY#V :     VERSION**

| DESCRIPTION | STX | DEVICE | LENGTH | STATUS | VERSION (2 bytes) | BCC |
|---|---|---|---|---|---|---|
| HEX VALUE | 02H | 00-7CH | 04H | 04H | MMH-RRH | 00H-FFH |

| FUNCTION | DESCRIPTION |
|---|---|
| VERSION | Show the actual version ( MM=Model   RR=Firmware release ). |
| | **MM** is:TTL/RS232/USB-SS=**1BH**    TTL/RS232/USB-SH=**1CH**    TTL/RS232/USB-QS=**0BH** |
| | TTL/RS232/USB-QH=**0CH**   RS485-SS=**1DH**    RS485-QS=**0DH** |

**REPLY#1 :     STATUS**

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

| FUNCTION | VALUE | DESCRIPTION |
|---|---|---|
| READ DATA ERR | 01H | The data detected on the TAG are corrupted or incomplete or an high RF noise environment was detected. |
| NO TAG | 02H | The TRW has detected 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 |

## 3.2.2 STRINGS from HOST to TRW

**COMMAND#0 :     WRITE DATA**

| DESCRIPTION | STX | DEVICE | LENGTH | FUNCTION | FWB | N-BLOCKS | PASSW (4 bytes) | DATAn (n=5-17) | BCC |
|---|---|---|---|---|---|---|---|---|---|
| HEX VALUE | 02H | 00H-7CH | 0DH-19H | See below | 01H | 02H-06H | xx-xx-xx-xxH | 00H to FFH | 00H-FFH |

| FUNCTION | VALUE | DESCRIPTION |
|---|---|---|
| WRITE DATA | 22H | DATAn are written into the TAG from the First Write Block (FWB) for N-BLOCKS. |

In **SHORT FRAME MODE** DATAn is formed **by 5 Data Bytes** and FWB=1  N-BLOCKS=2.
In **LONG  FRAME MODE** DATAn is formed **by 17 Data Bytes** and FWB=1  N-BLOCKS=6.
The PASSW is mandatory if the tag is configured to operate in PASSW or AOR mode.

**COMMAND#0L :     WRITE DATA  LOCK**

| DESCRIPTION | STX | DEVICE | LENGTH | FUNCTION | FWB | N-BLOCKS | PASSW (4 bytes) | DATAn (n=5-17) | BCC |
|---|---|---|---|---|---|---|---|---|---|
| HEX VALUE | 02H | 00H-7CH | 0DH-19H | See below | 01H | 02H-06H | xx-xx-xx-xxH | 00H to FFH | 00H-FFH |

| FUNCTION | VALUE | DESCRIPTION |
|---|---|---|
| WRITE DATA | 23H | **The same as WRITE DATA** with the difference that it LOCKS the written DATA in the BLOCKS 1 to 2 in **SHORT FRAME MODE** and BLOCKS 1 to 6 in **LONG FRAME MODE**. |

*IMPORTANT*: After this command the blocks are permanently locked. Any other write command send a REPLY#0 with the previous data.

**COMMAND#1 :     CHANGE CONFIGURATION   Q5**

| DESCRIPTION | STX | DEVICE | LENGTH | FUNCTION | FWB | N-BLOCKS | PASSW0 | .. | PASSW3 | FBR |
|---|---|---|---|---|---|---|---|---|---|---|
| HEX VALUE | 02H | 00H-7CH | 0CH | See below | 00H | 01H | 00H | | 00H | 01H |

| LBR | A/P MODE | LOCK/HV | BCC |
|---|---|---|---|
| 02H or 06H | 00H-01H-02H | 00H-01H-02H-03H | 00H-FFH |

| FUNCTION | VALUE | DESCRIPTION |
|---|---|---|
| CHANGE CONF | 80H | Write the CONFIGURATION WORD of the TAG. |

In **SHORT FRAME MODE**  LBR  has value as 2.
In **LONG FRAME MODE**  LBR has value as 6.

**A/P MODE =00H (default value)**
The tag is configured to operate without PASSW or AOR mode control.
**A/P MODE=01H**
The tag is configured to operate in AOR MODE.
In AOR MODE the tag need a **WRITE PASSWORD** command before.
*IMPORTANT:*In AOR MODE the TAG replay only if you send before a WAKE UP comman
with the correct PASSWORD. All other commands can be executed till the TAG remains
in the RF field**.**

**A/P MODE=02H**
The tag is configured to operate in PASSW MODE.
The **WRITE DATA** command requests the correct PASSW value.
In PASSW MODE the tag need a **WRITE PASSWORD** command before.
The PASSW0 to PASSW3 data field are mandatory if the tag is configured to operate in
PASSW or AOR mode. Otherwise can be 00-00-00-00H.

**LOCK/HV=00H (default value)**
The data written in BLOCK0 are **not locked**.The tag operating frequency is set at  **RF/64.**
**LOCK/HV=02H**
The data written in BLOCK0 are **not locked**. The tag operating frequency is set at  **RF/32.**

**LOCK/HV=01H**
The data written in BLOCK0 are **locked**. The tag operating frequency is set at  **RF/64.**
**LOCK/HV=03H**
The data written in BLOCK0 are **locked**. The tag operating frequency is set at  **RF/32.**
*IMPORTANT*: After this commands the block 0 (CONFIGURATION) is permanently locked.
Any other CHANGE CONFIGURATION command send a REPLY#1 but the previous data are
not changed.

**COMMAND#2:      CHANGE CONFIGURATION  T5577**

| DESCRIPTION | STX | DEVICE | LENGTH | FUNCTION | FWB | N-BLOCKS | PASSW0 | .. | PASSW3 | FBR |
|-------------|-----|--------|--------|----------|-----|----------|--------|-----|--------|-----|
| HEX VALUE | 02H | 00H | 0CH | See below | 00H | 01H | 00H | | 00H | 01H |

| LBR | AOR  MODE | LOCK/ HV | BCC |
|-----|-----------|----------|-----|
| 02H or 06H | 00H-01H-02H- | 00H-01H-02H-03H | 00H-FFH |

| FUNCTION | VALUE | DESCRIPTION |
|----------|-------|-------------|
| CHANGE CONF | 88H | **Same as CHANGE CONFIGURATION Q5.**<br>*IMPORTANT*:**Don't configure a Q5 TAG using this command(88H) , can be damaged.** |

**COMMAND#3 :     WRITE PASSWORD**

| DESCRIPTION | STX | DEVICE | LENGTH | FUNCTION | FWB | N-BLOCKS | O_PASSW0 | .. | O_ PASSW3 |
|-------------|-----|--------|--------|----------|-----|----------|----------|-----|-----------|
| HEX VALUE | 02H | 00H-7CH | 0CH | See below | 07H | 01H | 00H to FFH | | 00H  to FFH |

| PASSW0 | .. | PASSW3 | BCC |
|--------|-----|--------|-----|
| 00H to FFH | | 00H to FFH | 00H-FFH |

| FUNCTION | VALUE | DESCRIPTION |
|----------|-------|-------------|
| WRITE PASSW | A0H | The old password **O_PASSW0 to O_PASSW3** written in the TAG is substituted by the new password  **PASSW0 to PASSW3**.(the password range is: **00-00-00-00 to FF-FF-FF-FF**).<br>WHEN TAG IS FIRST TIME DELIVERED HAS A PASSWORD: 00-00-00-00.<br>*REMEMBER* **THE NEW PASSWORD WRITTEN IN THE TAG.** |

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

| DESCRIPTION | STX | DEVICE | LENGTH | FUNCTION | BCC |
|-------------|-----|--------|--------|----------|-----|
| HEX VALUE | 02H | 00H-7CH | 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 | SPARE | SPARE | BCC |
|-------------|-----|--------|--------|----------|-------|-------|-----|
| HEX VALUE | 02H | 00-7CH | 04H | See below | 00H | 00H | 00H-FFH |

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

**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.<br>After this command the TRW wait for a TAG extraction. |

**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  FRW-QH

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 250 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 (initiator)**

**READ DATA sequence**

Example: a TAG  placed into RF field is correctly read          <===   READ COMPLETE
**Time window......250ms**

Example:  in case of bad reading                                       <===   READ DATA-ERROR or NO-TAG
**Repeat READ DATA sequence....**

**COMMAND sequence in time window**

NO COMMAND    ===>                                        **Repeat READ DATA sequence**

ACK                ===>                              **Wait for TAG extraction....**

WRITE DATA/CONF/PASSW===> (max response time 500ms)    <===   STATUS  NO-TAG
**Exit.... wait new time window.....**                            **Return to READ DATA sequence**

WRITE DATA/CONF/PASSW===> (max response time 500ms)    <===   COMMAND OK
**Exit.....or continue with commands.....**                      **Time window reload.**

READ PART1                ===>   (poll time min 1000ms )       <===  if OK **Reply PART1**

# 4.0 OUT1 AND LED

## 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.

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

# 5.0 TRW-USBN-QS/QH-5  USB 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-QS/QH-5 (PCB version) and TRW-USB-QS/QH-5-POCKET**
**TR-USB-SS/SH-5 (PCB version) and TR-USB-SS/SH-5-POCKET**



**TRW-USB-Version PCB**



T**RW-USB- Version POCKET**

| Dimension POCKET | H 75 x  L 115 x D 25 mm |
|---|---|

# 6.0 TRW-QS/QH-12-ONDA  or  SHELL

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.

| Dimension SHELL | H 77 x  L 112 x D 30 mm |
|---|---|
| Dimension ONDA | H 51 x  L 115 x D 24 mm |

**ONDA**

**CABLE  PIN FUNCTION**

| COLOUR | 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)**

**SHELL**

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

**IMPORTANT:**
**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-232-QS-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 2,1mm plug-in:
**Internal PIN        +12V**
**External PIN       GND**
The TRW is protected against polarity inversion.

**TRW-232-12-BOX**

### MECHANICAL

| Length | 11.2cm |
|---|---|
| Width | 6.8cm |
| Height | 2.8cm |
| Weight | Typ 100g |

### OPERATING

| | |
|---|---|
| Power Requirements | 9 to 12 VDC not stabilized max. current 50mA |
| Serial interface **Data=8 Parity=N Stop=1** | Polling Mode |
| Speed | 9600 baud |
| Read Distance (TAG in center of RF field) | CARD Q5 typ 50 mm |

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

**Cannon 9S Connector**

# 8.0 FRW-LAN-MS/MH-5-PCB

This module operate in Transparent Mode.
All the commands and reply are executed on the FRW Reader module through a RJ45 port 10/100Mbps ETHERNET at the same mode as described in the above 3.0 Protocol paragraph.
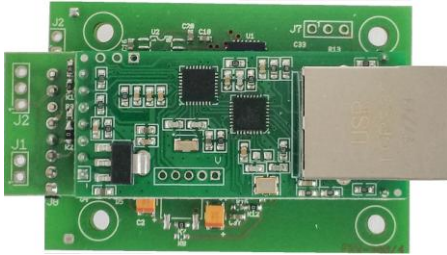


| Length | 66mm |
|--------|------|
| Width | 40mm |
| Height | 27mm |

| Power Requirements | 5VDCstabilized max. current 160mA |
|--------------------|-----------------------------------|
| Serial interface **Data=8 Parity=N Stop=1** | Polling/Spontaneous Mode |
| Speed | 9600 baud |
| Read Distance (TAG in center of RF field) | CARD tip. 50 mm |

See also par 2.0 MOUNTING for proper connections.

## 8.1 SETUP

Connect the module to an ETHERNET LAN.
The module has inside a web server.
Using a web browser like Chrome or Internet Explorer type the following line : http://192.168.0.7
Will appear the login page containing the Default Login items:
User Name:      admin
Password:       admin
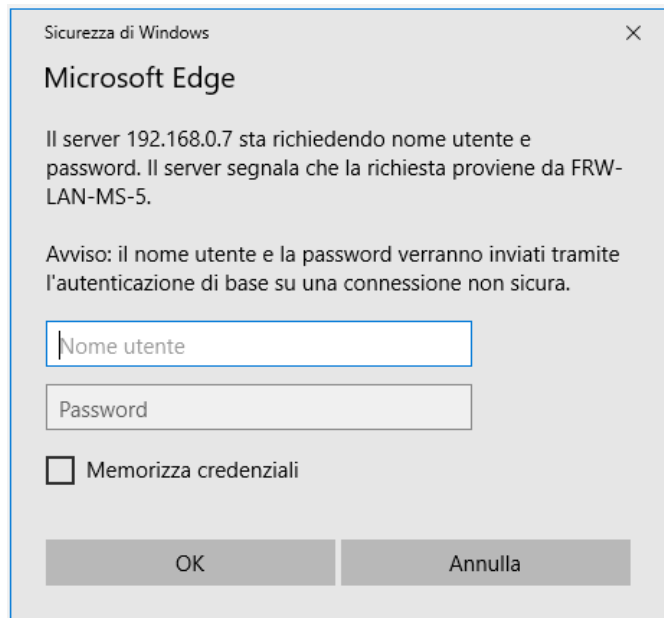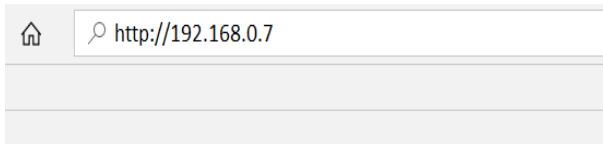




Press OK to enter the LOCAL IP CONFIG.

In the LOCAL IP CONFIG you can set your desired IP or choose DHCP mode

| Current Status | | parameter | | | Help |
|---|---|---|---|---|---|
| Local IP Config | IP type: | DHCP / Static IP | | | • **IP type:** StaticIP or DHCP |
| Serial Port | Static IP: | 192 . 168 . 0 . 7 | | | • **StaticIP:** Module's static ip |
| Expand Function | Submask: | 255 . 255 . 255 . 0 | | | • **Submask:** usually 255.255.255.0 |
| Misc Config | Gateway: | 192 . 168 . 0 . 1 | | | • **Gateway:** Usually router's ip address |
| Reboot | DNS Server: | 208 . 67 . 222 . 222 | | | • **DNS IP:** DNS gateway or Router's IP |
| | | Save    Cancel | | | |

Insert your IP parameters and press SAVE.

The Serial Port parameters are preset by INOUT . The Baud Rate must be **mandatory** 9600 bps.

| Current Status | | parameter | | Help |
|---|---|---|---|---|
| Local IP Config | Baud Rate: | 9600 bps | | • **HTTPD URL:** Module add GET/POST and HTTP/1.1 in URL automatically according to user's setting. |
| Serial Port | Data Size: | 8 bit | | |
| Expand Function | Parity: | None | | |
| Misc Config | Stop Bits: | 1 bit | | |
| Reboot | Local Port Number: | 20108 (0~65535) | | • **●HTTPD Packet Header:** Module add HOST automatically according to user's setting.Add"Content Length"automaticall in POST mode. |
| | Remote Port Number: | 7112 (1~65535) | | |
| | Work Mode: | TCP Client | | |
| | Remote Server Addr: | 192.168.0.26 [192.168.0.26] | | |
| | RESET: | ☐ | | |
| | LINK: | ☐ | | |
| | INDEX: | ☐ | | |
| | Similar RFC2217: | ☑ | | |
| | | Save    Cancel | | |

Open the REBOOT menu and press "Restart Module".

| Current Status | Reboot | | Help |
|---|---|---|---|
| Local IP Config | Restart Module | Restart Module | Restart module |
| Serial Port | | | |
| Expand Function | | | |
| Misc Config | | | |
| Reboot | | | |

Now the module is ready to operate according to our protocol as described in our documentation.
If you have an your  SW to communicate with the FRW module just operate from this.
Otherwise if you want make a TEST you can use our "Demo TRW-FRW" following the instruction in par 8.2 TEST .

## 8.2 TEST (optional)

To test the module using our Serial demo program TRW/FRW, we need to create a TCP IP virtual comm.
Install the Virtual-Serial-Software( VSS.exe) program that you can find on our site to create a virtual comm.
Run the program and press "Start VCOM" button.

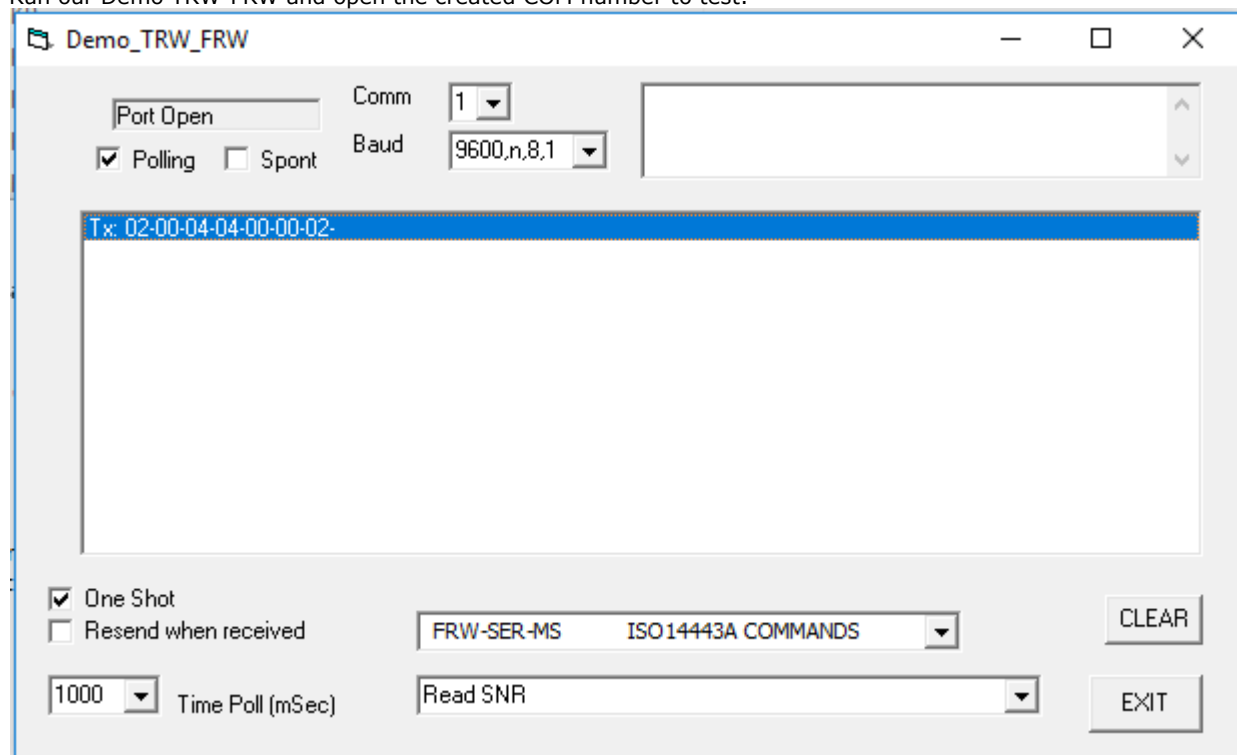The module will be detected,  select and press "Next"
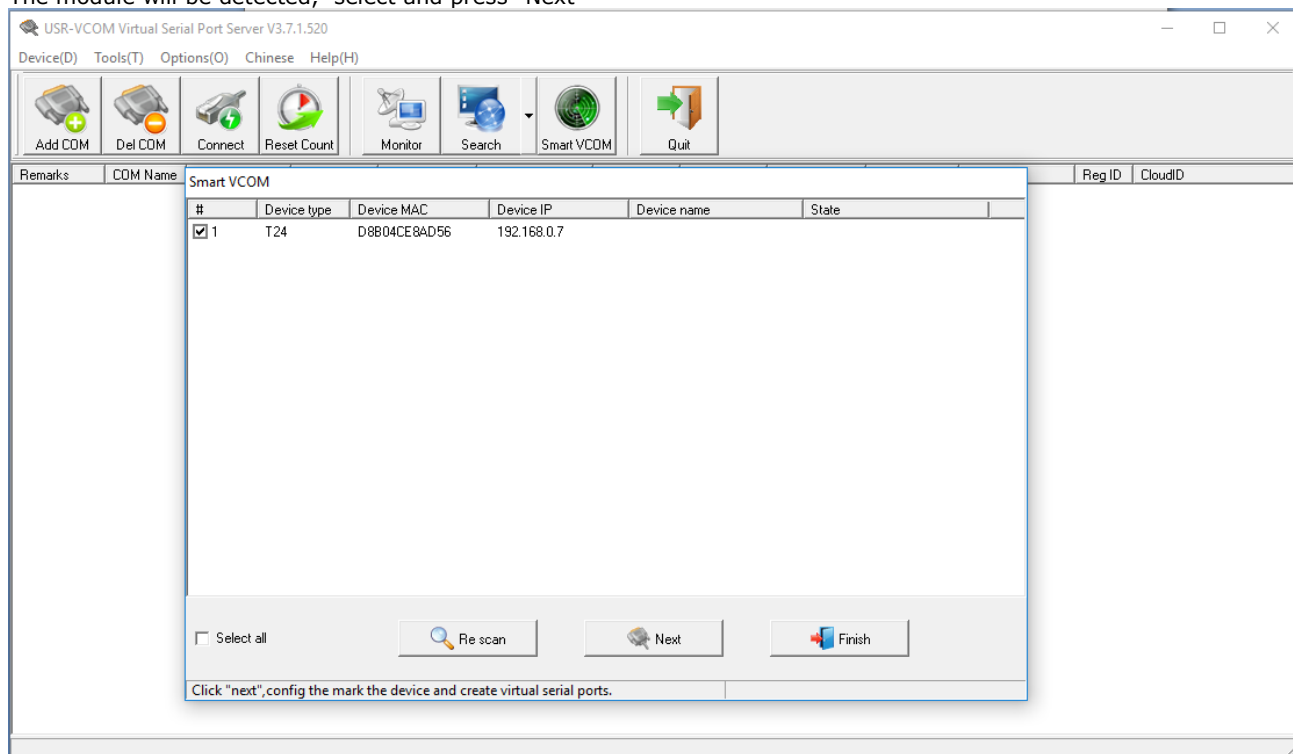


The Virtual Com will be created

The Virtual Com will be created and the number is shown
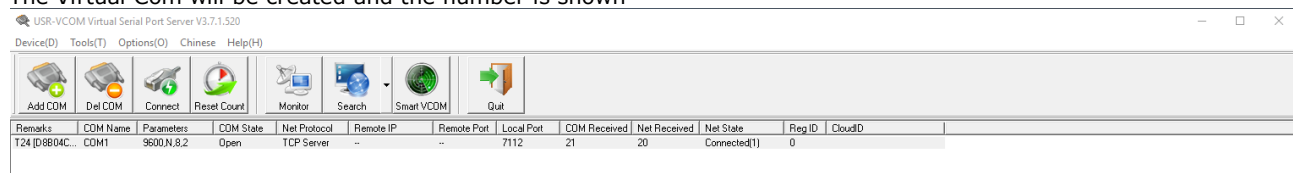


Run our Demo TRW-FRW and open the created COM number to test.

# 9.0 READER SPECIFICATIONS

| OPERATING | |
|---|---|
| Power Requirements      max. Ripple 50mVp-p | 12 VDC ± 10% at max 55mA |
| | 5   VDC ±  5%  at max 50mA        max ripple 10mV |
| Serial interface  **Data=8  Parity =N  Stop=1** | QS/SS:  polling mode |
| | QH/SH: spontaneous mode |
| Baud Rate TTL - 232 – 485 | 9600  bits per second |
| Reading Distance (with TAG in center of RF field) | CARD:  tip. 70mm |
| Writing Distance (with TAG in center of RF field) **IMPORTANT: Don't remove the TAG/CARD during the whole writing.** | CARD:  tip. 60mm |

| MECHANICAL | |
|---|---|
| Dimensions    (PCB) | 40mm x 58mm x 10 mm |
| Weight         (PCB) | Max 60g |

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