



ReCon T Energy Logger

User manual

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Revision History

Revision	Date	Comments	Author
1.2	01/01/2012	Initial revision	RACB
1.3	27/02/2012	Added network related comments	CABL
1.4	05/09/2012	Replaced “byte” with “word” in MODBUS table	CABL
1.5	12/11/2012	Added web server documentation	CABL
1.6	07/02/2013	Added information on measurement methods	RACB
1.7	30/10/2015	Bluetooth information added	MJCG
1.8	05/03/2020	Complete revision of the document. Added new functionalities incorporated in V2.60 of the firmware (current clamps, recording modes...)	CABL
1.9	05/03/2020	Added Windows 10 Bluetooth pairing process and ReCon T GRPS information	CABL
1.10	27/10/2021	Added information for GPRS/FTP connection	CABL

Important safety information

Warning. To avoid electrical shock or fire:

1. Re view the entire manual before using the ReCon T Energy Logger and its accessories and observe all warning s and cautions.
2. Do not use exposed metal BNC or b an an a plug connectors.
3. Do not insert any metal object into the connectors.
4. Do not work alone ever.
5. Avoid connecting the instrument to live voltage. If disconnecting the voltage during the installation is not possible, extreme caution. In any circumstance, always wear protective gloves, face shield, boots, helmet and any other required individual protection equipment.
6. Do not operate the ReCon T Energy Logger in explosive hazardous areas.
7. Use only insulated current probe s, test leads, and adapters as supplied with the ReConT Energy Logger.
8. Before use, inspect the ReConT Energy Logger, voltage probes, current probes, leads, and accessories for mechanical damage, and replace when damaged. Look for cracks or missing plastic. Pay special attention to the insulation surrounding the connectors.
9. Remove all probes, test leads, and accessories that are not being us ed.
10. Do not apply input voltages above the rating of the ReConT Energy Logger as shown on the input panel.
11. Do not apply voltages in excess of the marked ratings of the voltage and current probes.

Voltage and current inputs

ReCon T has integrated voltage input leads as well as flexible current sensors. The 4 Voltage input leads are marked L 1, L 2, L 3 and N (neutral) and are colourcoded according to EU standard: Brown for L 1, Black for L 2, Grey for L 3, Blue for Neutral.

The voltage cables are also used for powering the instrument. Due to its extremely low power consumption, this does not affect the measured voltage.

Voltage leads are terminated in 4-mm safety banana connectors. Crocodile clips are also supplied for use when suitable female connectors are not available.

The same standard color code is used to mark the 3 flexible current sensors. The current sensors have a marked arrow to indicate the positive sense of current.

The most common situation you will use the instrument for is analyzing the energy consumption of an installation. Connect the flexible current sensors around the input cables with the arrow pointing from the line to the load. This will result in positive readings for consumed energy.

Electric topologies

ReCon T supports 4 different measurement topologies. The following table summarizes the connections for the different cases:

Topology	No. of wires	Voltage Connection	Current Sensors
Wye	4 (L1, L2, L3, N)	L1, L2, L3, N	L1, L2, L3
Delta	3 (L1, L2, L3)	L1, L2, L3 Do not connect Neutral	L1, L2, L3
Split-Phase	3 (L1, L2, N)	L1, L2, N Do not connect L3	L1, L2 Do not connect L3
Single-Phase	2 (L1, N)	L1, N Do not connect L2, L3	L1 Do not connect L2, L3
Multi-load single-phase	2-4 (L1-L3,N)	L1-L3, N	L1-L3

The topology is selected using the setup option of MEDCALScope.

Installing your ReCon T Energy Logger

This section describes the steps you need to take to set up the ReConT Energy Logger at the measuring point and begin a recording session.

There are three distinct steps for a recording session:

Set-up

Set-up, connection, and verification of connections and measured signals. User can clear the ReCon T Energy Logger memory, make any desired ReCon T Energy Logger setting changes and check the instrument internal clock.

Recommended initial checkup

Finding then you made a mistake after a long recording session is a frustrating experience. In order to avoid this situation we strongly recommend doing a quick recording session (maybe with just 1 second recording block) and download immediately just to make sure everything is fine in the instrument set-up and the wiring connection.

End of recording

Simply disconnect the instrument in order to finish the recording session.

Connecting the ReCon T Energy Logger

To install the ReCon T Energy Logger, follow these steps:

1. Place the ReCon T Energy Logger at least 1 m away of any live voltage points. The ReConT Energy Logger can be placed on the floor or a table, or fixed to a wall or pole with the fixing installation kit.
2. Connect the supplied yellow-green crocodile clip to the measuring ground. In order to prevent ground loops make sure the measuring ground is the same as the ground on the power supply socket.
3. Connect the crocodile clips to the corresponding phases in this order: Neutral (Blue), L1 (Brown), L2 (Black), L3 (Gray).
4. After the phase sequence is verified, connect the current clamp s to the corresponding phases.

The instrument will start measuring as soon as power is applied. There is no need to press the Start/Stop button. When this button is pressed for the first time the measuring and recording are stopped and the instrument display indicates so. Pressing once more will resume the measurement and recording.

Instrument setup

Setting-up the ReCon T and downloading the recorded information are done via the MEDCALScope PC application. Simply click on the Set-up button:

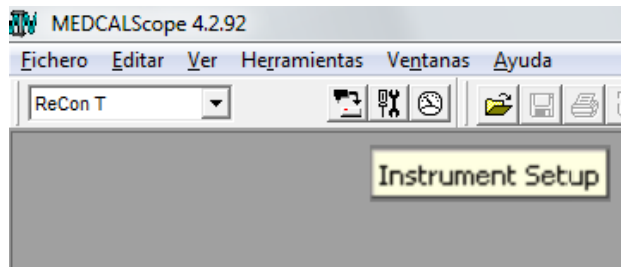


Figure 1: Tools icon for launching setup

The set-up screen is divided in 7 different areas:

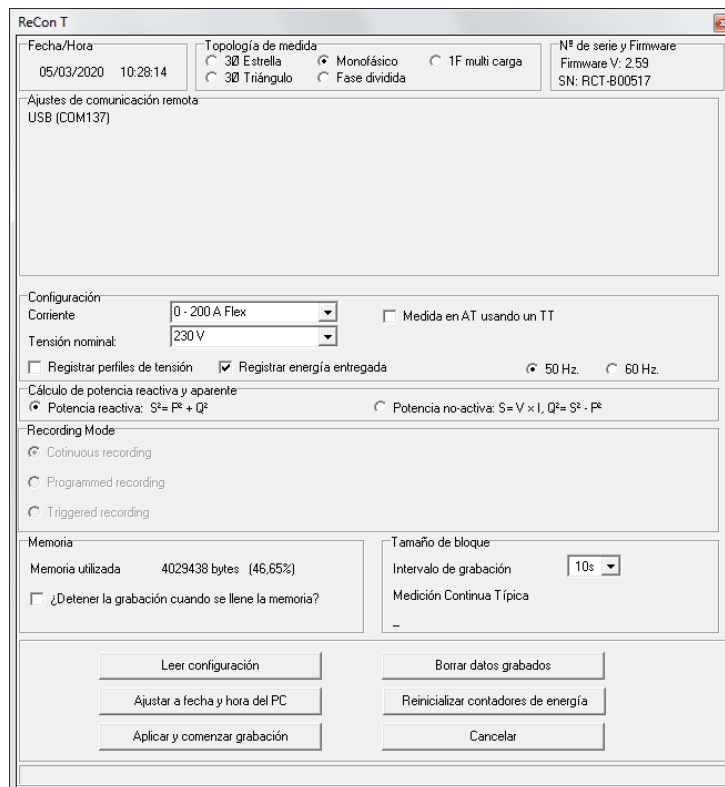


Figure 2: MEDCALScope set-up dialog

1. The first one displays the instrument internal date and time. It is important that the instrument internal clock is properly configured in order to obtain meaningful readings from the instrument. The best procedure is to synchronize the instrument with the host computer, which should have an accurate time if it has been recently connected to the internet. This is done by clicking on the *Set date and time as PC* button.
2. The second panel area is used to select the desired measurement topology. The instrument memory should be erased whenever the measurement topology is changed.
3. The third area displays the instrument firmware version and the instrument serial number.
4. Next area is the remote communications setting area. This applies only if the instrument is connected to a TCP/IP network via Ethernet or if the instrument is a ReCon T GPRS version. Please note that none of these settings affect USB communications or Bluetooth devices.
 1. You should select which communications protocol will be used to access ReCon T. Either CESINEL protocol if you intend to download data via TCP/IP using MEDCALScope, or ModBus/TCP if the instrument is integrated in a larger automation network that requires real-time access to the instrument measurements.
 2. Additionally, the TCP/IP network parameters must be configured in this panel. It is possible to select either automatic configuration via a DHCP server or manual setting of the instrument's IP address and network gateway address and subnet mask.

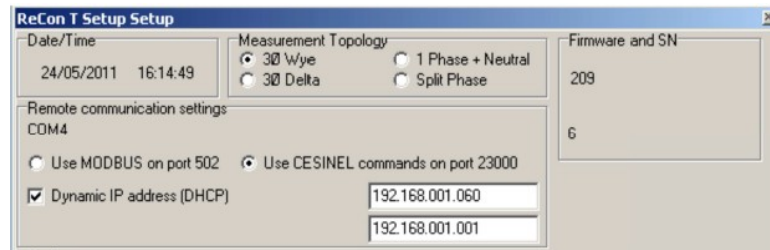


Figure 3: ReCon T with Ethernet Setup

3. For GPRS instruments¹, there are two main blocks of parameters: APN (which is related to the SIM provider, and usually includes Access Point Name, user and password -this information must be supplied by the provider, and might not need user and password, and thus they can be empty-), and FTP service (host name or IP address of FTP server², username and password for the FTP

1 ReCon T GPRS instruments allow the periodical sending of data files (compressed CSV file) with the measurements averaged at the block size

2 URLs are allowed in the form [ServerNameOrIP](#):Port/path/to/folder, with the global limitation to 70 chars (User:[Password@ServerNameOrIP](#):Port/path/to/folder must be shorter than 70 characters).

login -if needed-, time interval between data packets sent to the server and instrument identification³ to name files in FTP server).

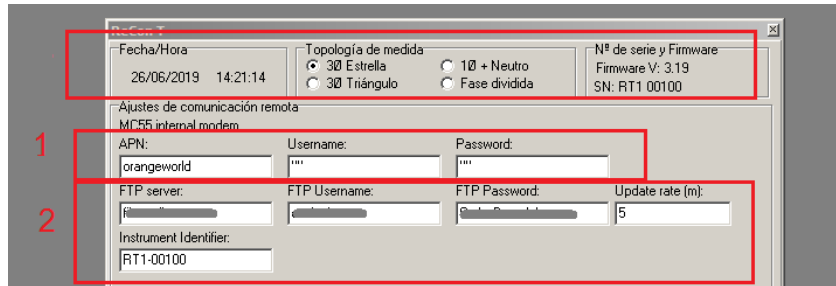


Figure 4: Remote communication settings for ReCon T GPRS

5. The fifth panel configured the instrument current measurement range and also indicates the parameters of a measuring voltage transformer if used.
 1. Current range: the flexible CT's supplied will measure up to 3200 A but also offers lower ranges of 0 to 200 A and 0 to 800 A. The ranges are selectable in the software during set up. For low currents 0 to 200 A should be selected to get the best resolution. Some ReCon T units are prepared to use also current clamps. If this is the case, 0-12 A, 0-50 A and 0-200 A ranges will appear for clamps. More detailed explanation can be found later in REVISAR
 2. Nominal voltage: the nominal voltage selector offers a wide selection of choices between 115 V and 480 V.
 3. Measuring in High Voltage (HV): sometimes the load to be analyzed is fed directly from high voltage (larger than 1 kV). It is possible to measure in these situations provided that there are measuring voltage transformers (Pts). For nominal 230 V or other Low Voltage (LV) situation the checkbox and VT ratio does not need to be altered as the ReCon T instrument automatically will sense this and pick it up.
 4. In order to setup the HV measurement parameters, check the *HV measuring using a PT* checkbox and set the appropriate values for the primary and secondary sides or the transformer. The settings provide two selectors, one for the primary and other for the secondary of this measuring transformer. As an example, if you are trying to measure the consumption of a 6.9 kV pump installed with 6.9 kV/110 V measuring voltage transformers, the settings should be adjusted as follows:

3 Maximum length of 9 chars

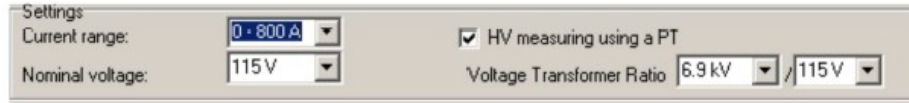


Figure 5: HV measuring setup example

This will give voltage, energy and power readings scaled to the actual pump consumption.

Additional safety reminder: ReCon T should never be used to measure directly voltages higher than 600 V. The current sensors should not be used over copper plates or non-insulated cables whose working voltages are higher than 600 V. The current sensors can be safely used over insulated conductors provided that enough distance is kept to any live voltage point.

5. In this panel there are also two options related to the measurement and recording: first checkbox enables the recording of voltage profiles when an event is detected (sag, swell, RVC) and second checkbox enables the recording of delivered energy (consumed energy is positive and is recorded always, whereas delivered energy to the network is negative and can be recorded or not).
6. Finally, user can select the frequency of the network (50 or 60 Hz).
6. Next panel shows two alternating options for reactive power and energy calculation: first option enables Q measuring from $v(t)$ and $*i(t)$ ($i(t)$ conjugated) and S calculation from measured P and S (Q is reactive power), and second option enables S measurement (from V_{rms} and I_{rms}) and Q calculation from measured P and S (Q is non-active power then).
7. Next panel is only present when instrument runs a firmware equal to or higher than V2.60. These versions of the firmware incorporates three different recording modes (that will be explained later in REVISAR): continuous recording (the standard mode, the one present in older firmware versions), programmed recording (it is a timed recording session with adjustable date and time start and date and time end) and triggered recording (recording starts when some magnitude reaches a certain value).
8. The memory panel informs of the amount of memory currently used and gives the possibility of stopping the recording once the memory is full (linear memory) or alternatively keep recording discarding the oldest recordings (circular memory).
9. Finally, the last panel provides the possibility of selecting an averaging block size between 1 second and 60 minutes. The instrument will record maximum, minimum and average values for the selected interval. Events are still checked every 200 ms with 200 ms values disregarding the value of the block size. Once the block size is selected, an estimation of the memory capacity (in days) will be shown, though this depends highly on the measured values.

The setup window also includes 6 different buttons:

1. The *Read Settings* button will re-load the actual settings from the instrument. Please beware that the changes made to any setup fields will be overwritten.
2. *Erase Recorded Data* button will clean the instrument's internal memory in order to start a fresh new recording session.
3. *Set date and time as PC* synchronizes the ReCon T internal clock with the PC's clock.
4. *Reset energy counter* clears the internal energy registers of the ReCon T. These registers are not cleared when memory is erased (so the instrument can be used as a long term energy meter apart from being used for periodic measuring sessions). User must click this button and give confirmation to the dialog that appears.
5. *Apply and start recording* will program the new settings into the instrument and will start the recording immediately after.
6. *Cancel* will close the setup discarding changes.

Current sensors

Some instruments allow two different types of current sensors to be used in different recording sessions (user must use either 3 clamps or 3 coils, but not a mixture of them): 200 A/200 mV amperometric clamps and flexible Rogowski coils. That means that they provide a connector that allows interchanging of sensors, or even an absence of current sensors (from firmware V2.61 on, voltage-only recording session is possible, so there is no need to attach current sensors, what makes transportation and installation easier, and allows longer voltage recordings -no current, power or energy is stored in memory-).

Each current sensor type allows 3 current ranges to adapt better to maximum estimated current present in installation. For flexible coils, ranges are 200 A, 800 A and 3200 A. For clamps, 12 A, 50 A and 200 A.

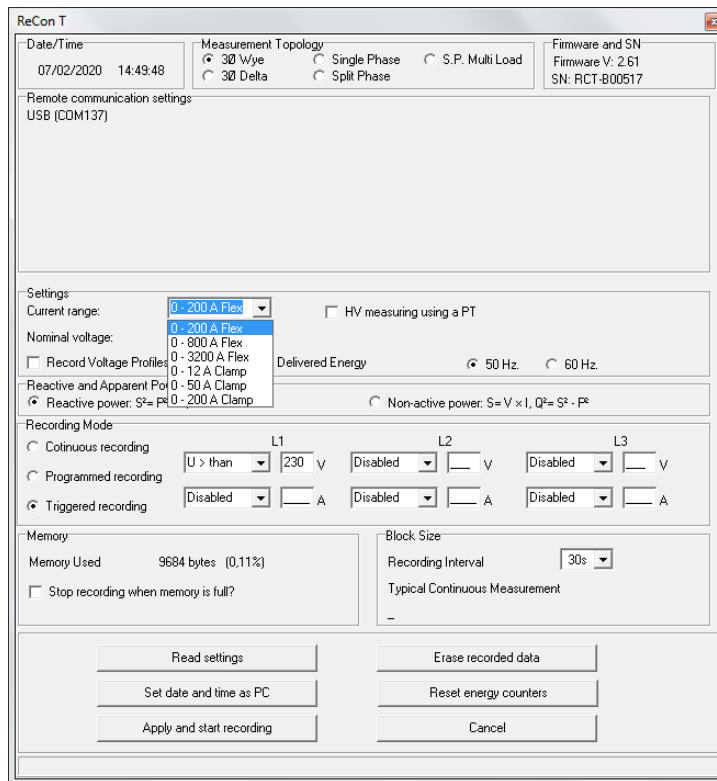


Figure 6: Setup of instruments with clamps and coils

Recording mode

New instruments (firmware version V2.60 and newer) allow three different modes of recording data. GPRS instruments do not allow Programmed or Triggered recording modes.

Continuous recording

This is the classic recording mode. The instrument starts recording data when the user clicks “Apply and start recording” and stops recording when “Erase recorded data” is clicked. The instrument measures and records data even during downloading of data, setting up of the instrument (unless setup changes force an erasure of recording data due to incompatible new setup with regard to recorded data) or real time measuring and displaying. Some instruments provide a push button to start/stop the measurement recording (user must press button for, at least, 3 s and the release).

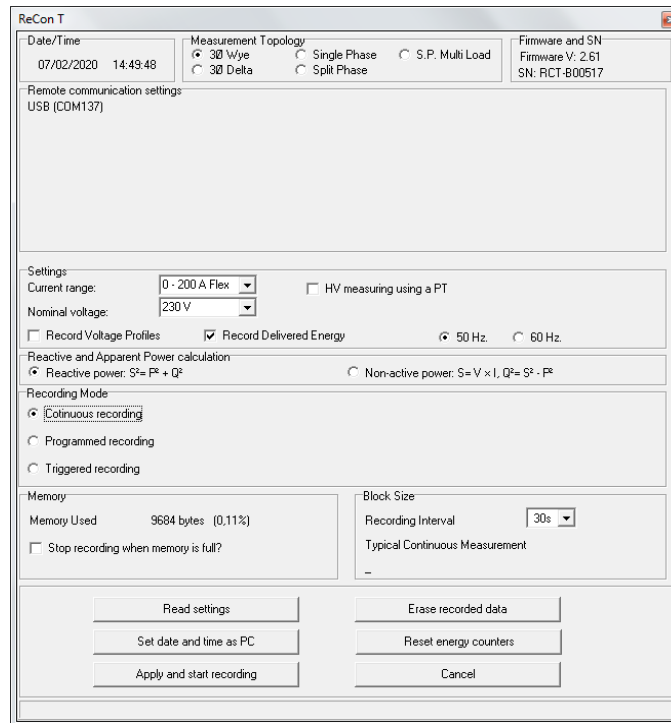


Figure 7: Continuous recording

Programmed recording

This new recording mode is a timed recording session the user can setup previous to instrument installation on field. The recording of data will start/stop at the date and time specified by the user, or it could be stopped by the user (via MedcalScope or push button -if available-) before stop date and time is reached. If memory is setup as linear memory, the programmed session could end before stop date and time. If circular memory is selected, programmed session will end at the specified data and time, but oldest measurements could be overwritten if memory fills up completely.

Reaching start date and time starts recording, but measurements records must be synchronized with multiples of the Recording interval, so first recording will not appear until first Recording interval has past.

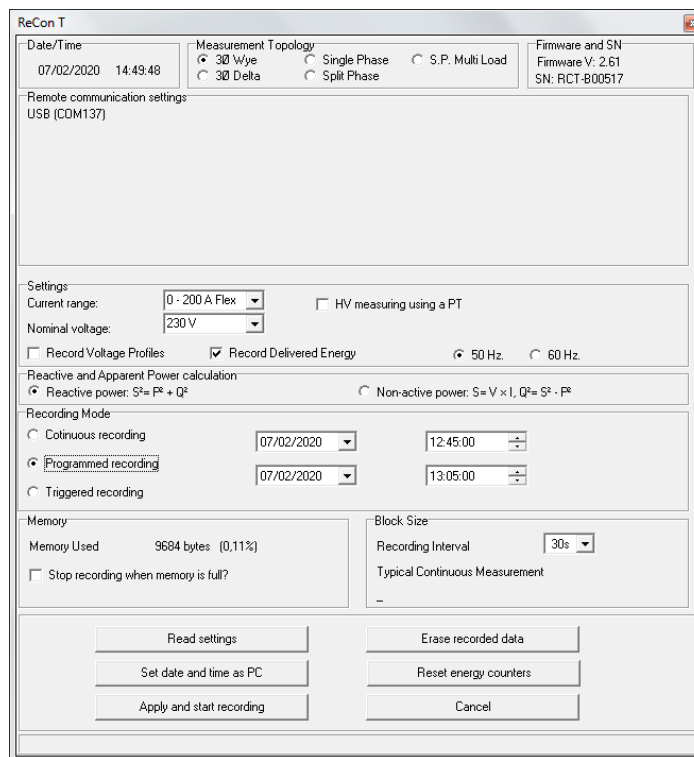


Figure 8: Programmed recording (timed session)

Triggered recording

This new recording mode is similar to the trigger functionality of an oscilloscope. The user can specify which variable or variables must reach a value (also configurable by the user) for the recording to be started. The available trigger variables are the three measured voltages and currents. Once the trigger is fired, the recording lasts until memory is full (if linear memory is selected) or user stops it (via MedcalScope or push button -if available-).

Trigger starts recording, but measurements records must be synchronized with multiples of the Recording interval, so first recording will not appear until first Recording interval has past.

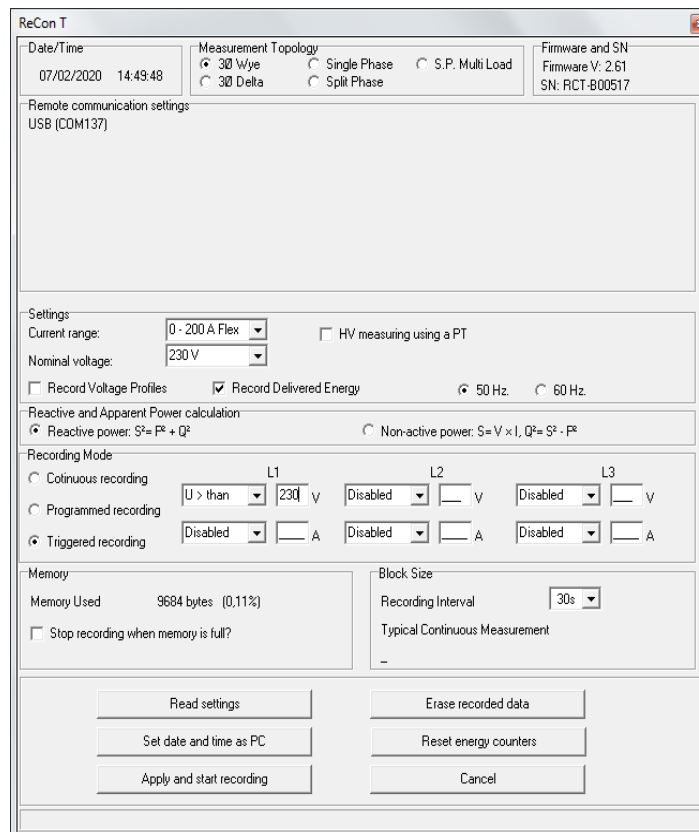


Figure 9: Triggered recording

CTs and voltage leads connection diagrams

1. 3Ø Wye (Star) topology:

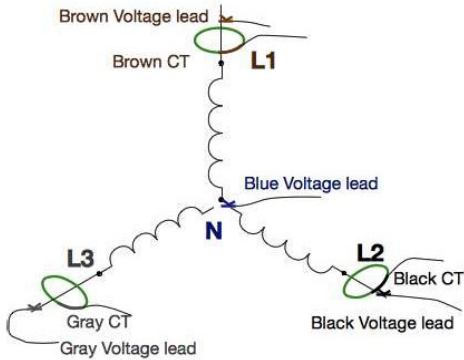


Figure 10: Connection for 3-Phase Wye (Star) topology

2. 3Ø Delta (triangle) topology:

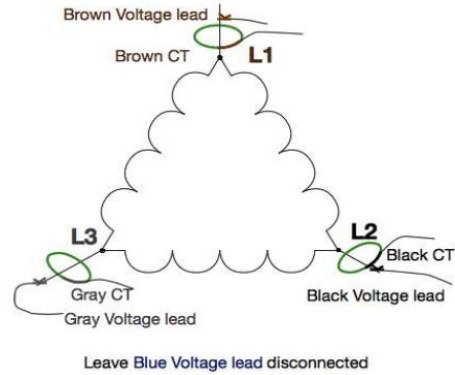
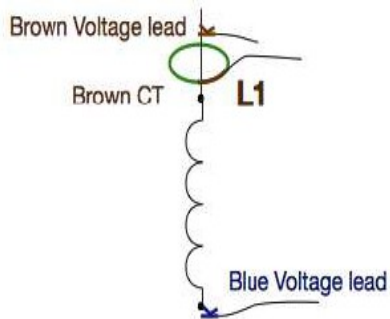


Figure 11: Connection for 3-Phase Delta (Triangle) topology

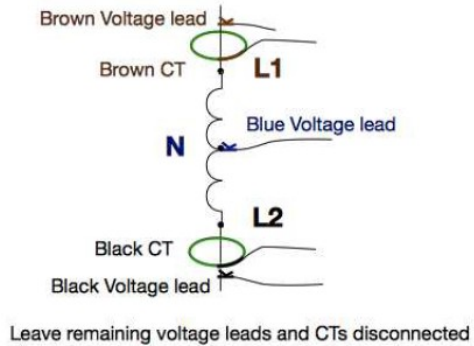
3. 1 Phase with Neutral topology:



Leave remaining voltage leads and CTs disconnected

Figure 12: Connection for single phase topology

4. Split Phase topology:



Leave remaining voltage leads and CTs disconnected

Figure 13: Connection for bi-phase (Split phase) topology

LED indicators

Some instruments do not include LCD to display measurements and information, so LEDs' behavior is modified from firmware version V2.60 on to provide the user with more information on the instrument's status.

There are basically 4 blinking modes that reflect measurement and recording status, plus 2 different colors for providing further information. If memory is full, red LED will be active blinking (or steady when measurement is stopped). Otherwise, green LED will be blinking and red LED will be off (unless there's a serious hardware malfunction and red LED is permanently on):

- Waiting for time synchronizing: as said before, measurements must be synchronized with multiples of Recording interval. Once recording is allowed to start (through any method of those explained before), there is a certain time interval when the instrument is waiting to align measurements with specified recording interval. Then, blinking of LED (green or red if memory is full) shows 0.5 Hz.
- Waiting for trigger to occur: LED (green or red if memory is full) blinks twice in one second and then it is off for another second.
- Waiting for programmed session to start: LED (green or red if memory is full) blinks three times in one second and then it is off for another second.
- Recording: once recording has been started by any method (continuous, triggered, time programmed) and synchronizing period has elapsed, LED (green or red if memory is full) blinks at 2.5 Hz.

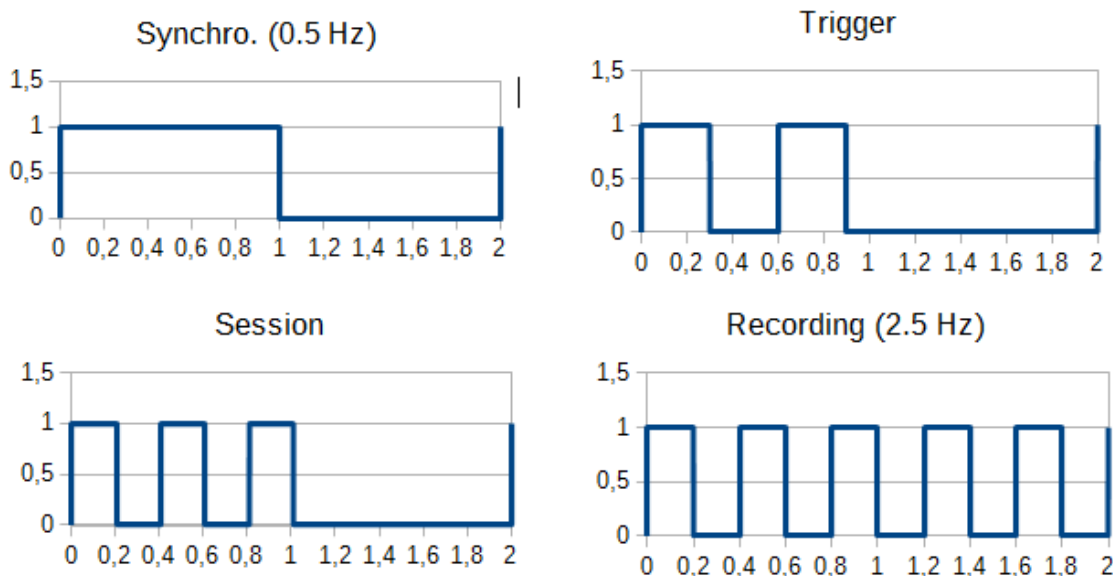


Figure 14: Led blinking code

Advanced TCP/IP configuration and use

It is possible to access one or several ReCon T instruments inside the same LAN (Local Area Network, your facility or office's wireless or wired network), allowing the facility administrator to create a network of measurement points using ReCon T units, gaining access to distributed data (via ModBus, MedcalScope or web browser) from a computer located inside or outside this LAN.

This section applies only to RECONT with Ethernet instruments.

Accessing ReCon T from inside the same LAN

If the centralized data collector computer is inside the LAN, the local IP address of the unit is enough to access the data. Medcal Scope software provides an Instrument Name-IP Address table (which will be stored in memory and, therefore, available every time MedcalScope is run) to ease the connection, provided that ReCon T units are setup properly with static IP addresses, or their dynamic IP addresses⁴ are discovered on the fly⁵, or the router is configured to always assign the same IP address to the same unit (via its MAC address –a unique identifier for each ReCon T-), which is usually done reserving certain IPs for certain MACs (consult your router's manual).

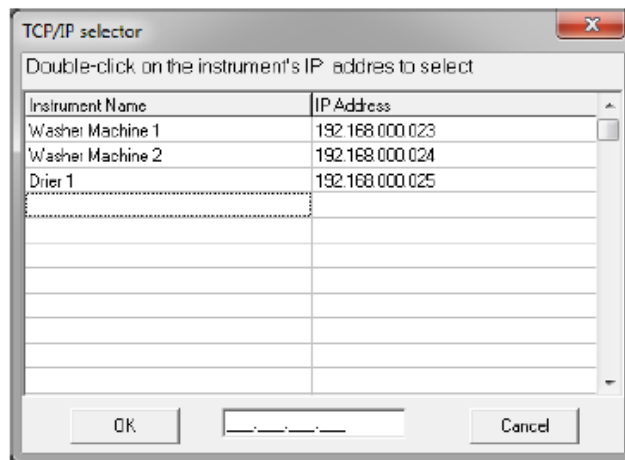


Figure 15: MedcalScope's Instrument Name-IPaddress table

4 MedcalScope allows user to configure static IP addresses or DHCP dynamic addresses

5 There are software tools to discover the elements attached to a network

Accessing ReCon T from outside the LAN. Router's NAT configuration.

If the administrator's computer is outside the LAN, the NAT (Network Address Translation) table of the LAN's router must be setup to redirect ports (http://en.wikipedia.org/wiki/Network_address_translation).

To understand the added complication, user must be aware of that all the incoming and outgoing traffic of an office or facility network (all the data from network computer's web browsers, email software ...) goes through the unique public IP address of the router (WAN IP address). That is to say that the only visible IP address from outside the office or facility is the router's public address (which can be easily guessed searching for "my public IP address" in Google or detected in the router's configuration utility if the router is DHCP configured, or must be provided by the ISP –internet server provider, from whom you rent your internet connection- if a static IP address is rented). Routers are in charge of redirecting incoming data to the local computers (local IP addresses) that requested the data. But if the incoming data is not a response to an outgoing request but a connection from the administrator's computer (via MedcalScope, Modbus software or web browser), there is no other way to redirect traffic apart from configuring the NAT table. This configuration consists just in telling the router to which local IP address and port it must redirect the incoming traffic from a certain port.

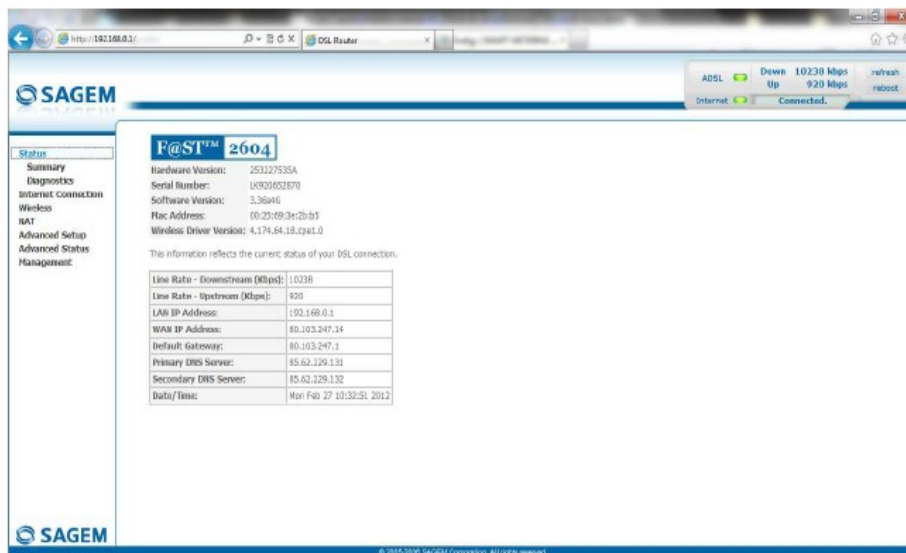


Figure 16: Router's status page: detect WAN (public) IP address

In the example below, we are telling the router to redirect the incoming data that comes from port 23502 to the port 502 of the address 192.168.0.23, which could correspond to a ReCon T configured to be accessed via ModBus.

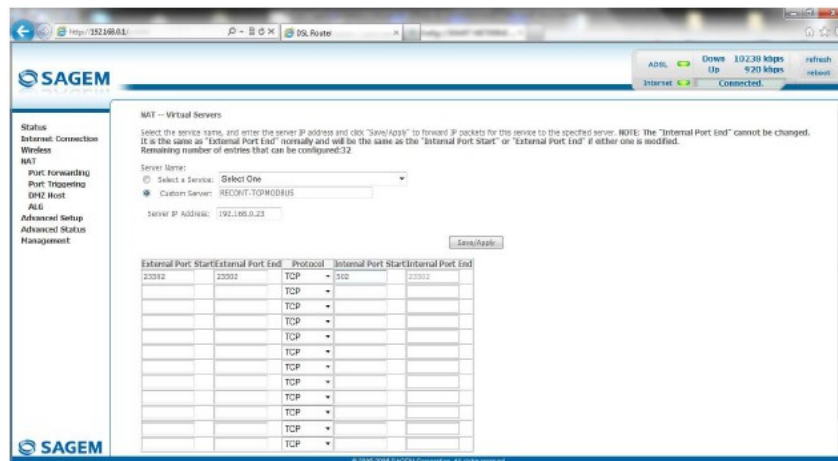


Figure 17: Router's configuration utility: NAT table configuration

In the example below, we tell the router to redirect incoming 23000 port to local 23000 port of the IP 192.168.0.25, which could be a ReCon T configured to use CESINEL protocol via MedcalScope software.

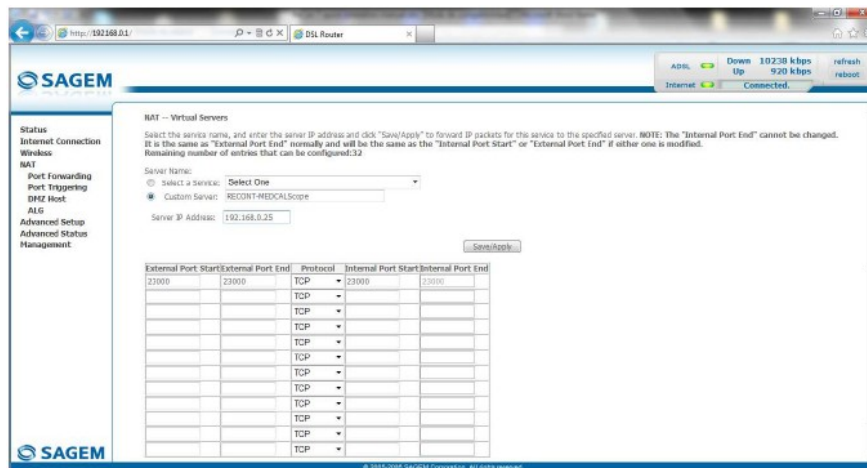


Figure 18: Router's configuration utility: NAT table configuration

With the configuration of the previous figures, and supposing that our router's public IP address is 80.10 3.247.14, we could access data via MedcalScope, Modbus software or web browser from all around the world. The accessed data will depend on the port we use for the connection.

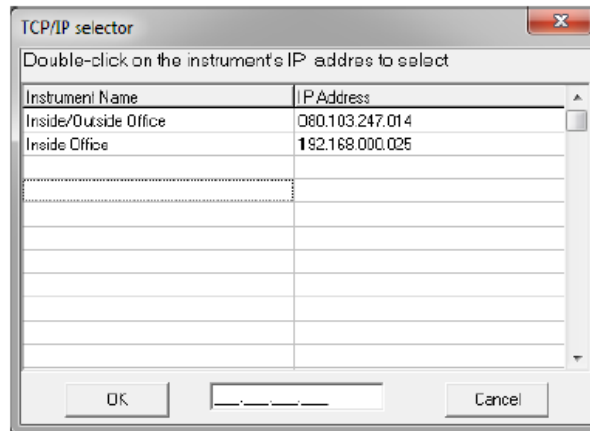


Figure 19: Figure 9: MedcalScope's IP address table: connection to a network outside and inside the PC's network

Accessing ReCon T via MedcalScope and TCP/IP connection

ReCon T instruments may be accessed via TCP/IP connection using MedcalScope software to download recorded data and to setup the instrument. The user must select TCP/IP in the available ports selector.

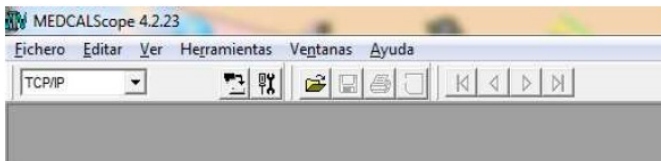


Figure 20: TCP/IP connection in MedcalScope

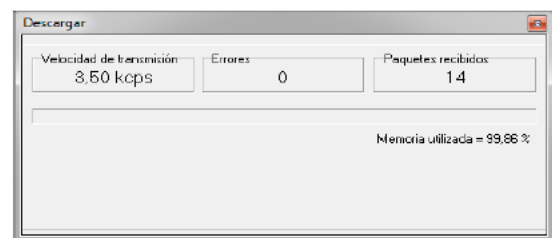


Figure 21: Data Download dialog

Then, when download or setup actions are triggered (through menu items or toolbar buttons), a TCP/IP selector dialog appears (see Figure 12), so that the user can choose an existing item or add a new one to the table with several name- ip address pairs that will be stored by the software. Once the IP address is selected and OK button is clicked, download or setup action continues and the corresponding dialog will show up (see Figure 1: Tools icon for launching setup for setup and Figure 21: Data Download dialog for download).

MODBUS in ReCon T

ReCon T instruments with Ethernet have a built-in TCP-MODBUS server that allows the user to access real time data and to integrate the ReCon T in a network with other types of instruments.

Regarding the TCP-MODBUS standard, user must be aware of two important features of the ReCon T's TCP-MODBUS server:

1. Only Holding Registers are available to the user (due to the lack of digital inputs and outputs).
2. The Unit Identifier of the TCP-MODBUS header of the requests will be ignored, as the IP of the unit (or the port forwarding method explained before) is used to rout the traffic.

Available real time measurements via MODBUS

The real time measurements available through the Holding Registers function of TCP-MODBUS are:

Address	Variable	Format	Units
0	L1. Mean ⁶ Active power of 1 second reading ⁷	16 bit signed ⁸ decimal	W ⁹
1	L2. Mean Active power of 1 second reading	16 bit signed decimal	W
2	L3. Mean Active power of 1 second reading	16 bit signed decimal	W
3	Total Mean Active power of 1 second reading	16 bit signed decimal	W
4	L1. Mean Reactive power of 1 second reading	16 bit signed decimal	var ⁹
5	L2. Mean Reactive power of 1 second reading	16 bit signed decimal	var
6	L3. Mean Reactive power of 1 second reading	16 bit signed decimal	var
7	Total Mean Reactive power of 1 second reading	16 bit signed decimal	var
8	L1. Mean Apparent power of 1 second reading	16 bit unsigned decimal	VA ⁹
9	L2. Mean Apparent power of 1 second reading	16 bit unsigned decimal	VA

6 Only average values are available in real time. For maximum and minimum vales, use MedcalScope

7 Real time measurements are updated every second synchronized with the internal clock. As TCP-MODBUS is asynchronous, measurements are not initiated on MODBUS demand but on the internal real time clock

8 Two's complement sign-magnitude format

9 See Address 34 for power scaling comments

10	L3. Mean Apparent power of 1 second reading	16 bit unsigned decimal	VA
11	Total Mean Apparent power of 1 second reading	16 bit unsigned decimal	VA
12	L1. Mean RMS Voltage of 1 second reading	16 bit unsigned decimal	V/100
13	L2. Mean RMS Voltage of 1 second reading	16 bit unsigned decimal	V/100
14	L3. Mean RMS Voltage of 1 second reading	16 bit unsigned decimal	V/100
15	L1. Mean RMS Current of 1 second reading	16 bit unsigned decimal	A/100
16	L2. Mean RMS Current of 1 second reading	16 bit unsigned decimal	A/100
17	L3. Mean RMS Current of 1 second reading	16 bit unsigned decimal	A/100
18	L1. Highest word ¹⁰ of Accumulated Active Energy ¹¹	16 bit	
19	L1. Mid-High word of Accumulated Active Energy	16 bit	
20	L1. Mid-Low word of Accumulated Active Energy	16 bit	
21	L1. Lowest word of Accumulated Active Energy	16 bit	Wh
22	L2. Highest word of Accumulated Active Energy	16 bit	
23	L2. Mid-High word of Accumulated Active Energy	16 bit	
24	L2. Mid-Low word of Accumulated Active Energy	16 bit	
25	L2. Lowest word of Accumulated Active Energy	16 bit	Wh
26	L3. Highest word of Accumulated Active Energy	16 bit	
27	L3. Mid-High word of Accumulated Active Energy	16 bit	
28	L3. Mid-Low word of Accumulated Active Energy	16 bit	
29	L3. Lowest word of Accumulated Active Energy	16 bit	Wh
30	Highest word of Total Accumulated Active Energy	16 bit	
31	Mid-High word of Total Accumulated Active Energy	16 bit	
32	Mid-Low word of Total Accumulated Active Energy	16 bit	
33	Lowest word of Total Accumulated Active Energy	16 bit	Wh
34	Power Divisor ¹²	16 bit unsigned	

Figure 22: MODBUS register map

10 MODBUS Holding Registers are 16 bits variables, so we need 4 variables to represent the 64-bit signed (two's complement) Accumulated Energy

11 Accumulated Energy: total amount of energy since manual erase (via MedcalScope). Preserved on power-off

12 Required divisor to fit Power into 16 bit variables. One of three values, related to Current Range: 10 (200 A), 50 (800 A) or 200 (3200 A). By knowing the current range or by requesting Power Divisor via MODBUS, user can convert measurements to real units

ReCon T built-in web-server

ReCon T instruments with Ethernet include a built-in http server (web server) that allows the user to see real time measurements in a web browser via a web page whose URL is the IP address of the instrument (see previous sections on how to access a ReCon T from outside/inside its LAN). The web page has an auto-refresh interval of 5 seconds, although the user may always refresh the web page via web browser commands.

Use of simultaneous access to web browser and MODBUS or CESINEL remote commands is discouraged.

In the next figure, user can see how to connect to a ReCon T whose IP address is 192.168.0.19 from inside the same LAN via a web browser.

The screenshot shows a web browser window with the URL 192.168.10.96. The page content includes the CESINEL logo and the text 'COMPANÍA ESPAÑOLA DE INSTRUMENTOS ELÉCTRICOS' and 'Web version: 1.09'. Below this is the title 'ReCon T Energy Logger' and a table of measurements.

	L1	L2	L3	Total
V (V)	230.11	7.26	2.86	
I (A)	0.00	0.00	0.00	
P (kW)	0.0	0.0	0.0	0.0
Q (kvar)	0.0	0.0	0.0	0.0
PF	0.00000	0.00000	0.00000	0.00000
Ea (kWh)	0	0	0	0
Er (kvarh)	0	0	0	0

Firmware version:	2.62 A	Block size (s):	10
Serial number:	0000000018	Current range (A):	3200
Time:	00:01:55	Topology:	Wye

Figure 23: ReCon T internal web page

Bluetooth configuration and use

For ReCon T devices with Bluetooth communications available, you must follow different steps according to your PC's operating system.

Windows XP

1. Start / Control panel (or double click Bluetooth icon) / Bluetooth devices / Add a new Bluetooth device

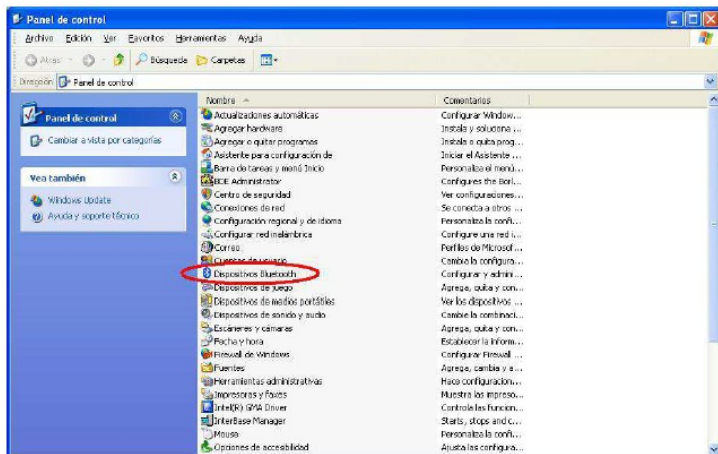


Figure 24: Windows XP: Control Panel: Bluetooth Devices

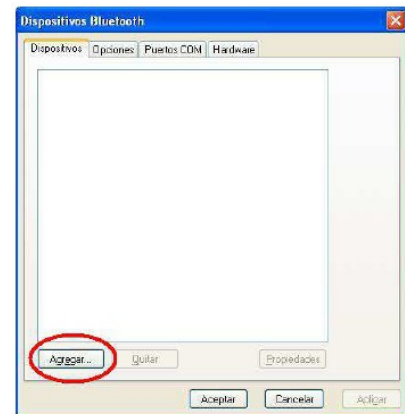


Figure 25: Windows XP: Add new Bluetooth device

2. Make sure that you check the “My device is configured and ready to be detected” option



Figure 26: Windows XP: Add new Bluetooth device wizard

3. The PC starts looking for Bluetooth devices. This process may take some time.
4. The ReCon T instrument is detected.

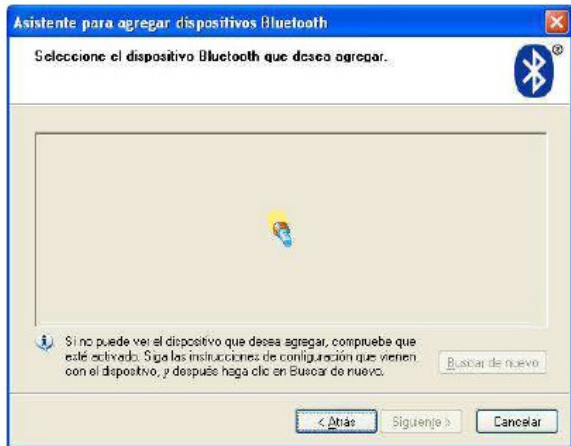


Figure 28: Windows XP: scanning devices...

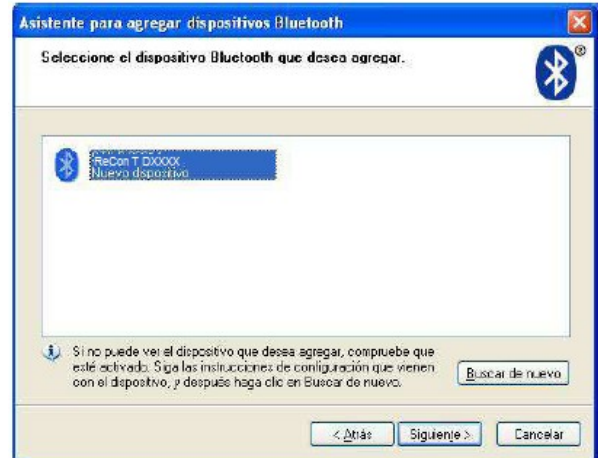


Figure 27: Windows XP: ReCon T appears in the list of discovered devices

5. Select the “Use the access key provided with the documentation” option, and then type that key in the associated field¹³.
6. The PC will connect to the ReCon T instrument, exchange access keys, and install virtual serial ports.



Figure 29: Windows XP: Pin code interchange

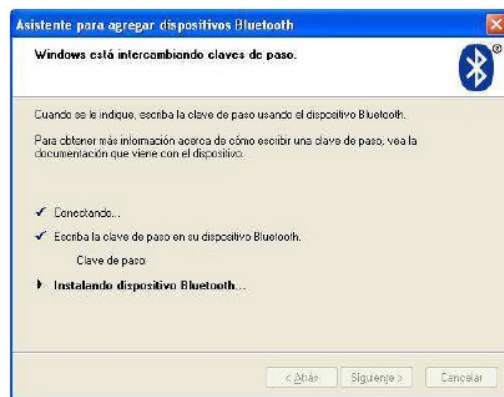


Figure 30: Windows XP installing device

¹³ The key is, by default, equal to the 4 last digits of the serial number

7. Windows XP finds the ReCon T instrument and installs it as a virtual serial port.

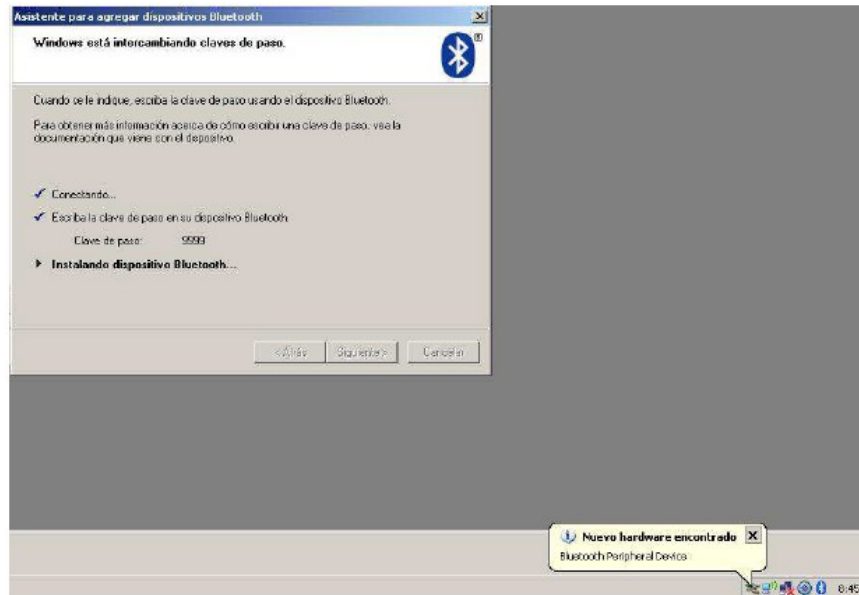


Figure 31: Windows XP: New hardware found

8. After the process is done, Windows will provide information about the virtual serial ports created. Since the ReCon T instrument will never start the communication, and will always be treated as “slave” during the process, we must pay attention to the “Output” serial port.

9. The ReCon T instrument will appear as a linked device.

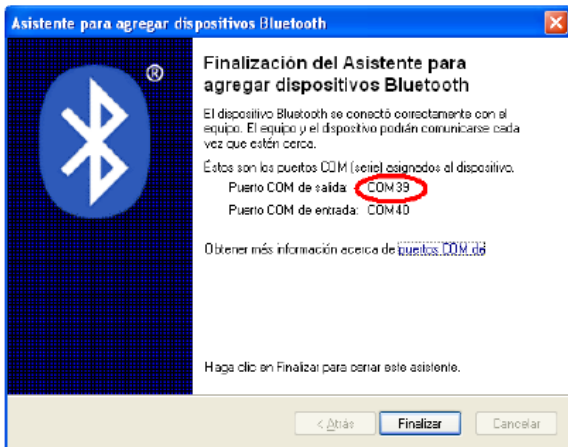


Figure 32: Windows XP: End of Wizard: outgoing port highlighted

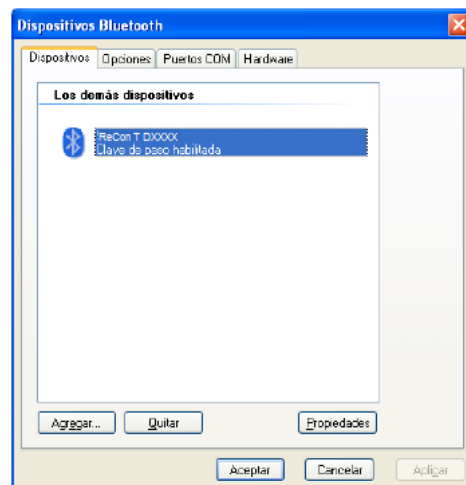


Figure 33: Windows XP: ReCon T connection ready

10. Open MedcalScope and select the output serial port created for the ReCon T Bluetooth instrument. Now you will be able to communicate with the instrument in the usual manner.



Figure 34: Bluetooth connection in MEDCALScope

11. It is recommended to check the “Show the Bluetooth icon in the notification area” option.
12. If you are not going to work with the Bluetooth ReCon T device for a long time, it is recommended to remove the instrument from the Bluetooth devices list, since the virtual serial ports are not automatically removed, and new ones are created for every new device added.

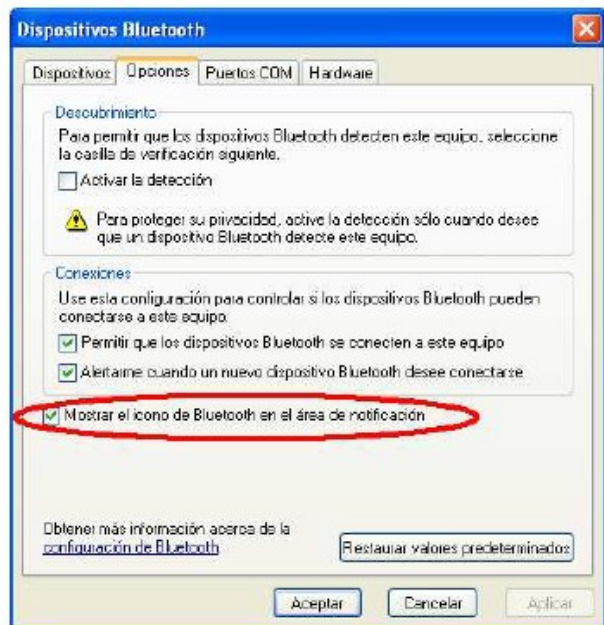


Figure 35: Windows XP: Make Bluetooth icon always visible

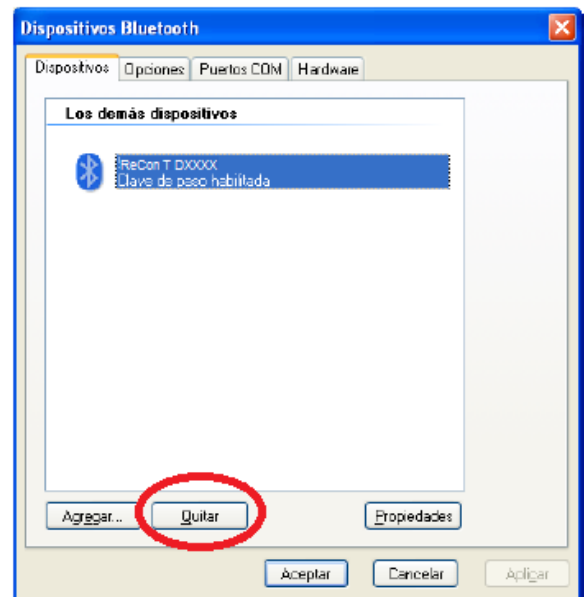


Figure 36: Windows XP: Remove device to free COM ports

Windows 7

1. Start / Control panel (or double click Bluetooth icon) / Add new device

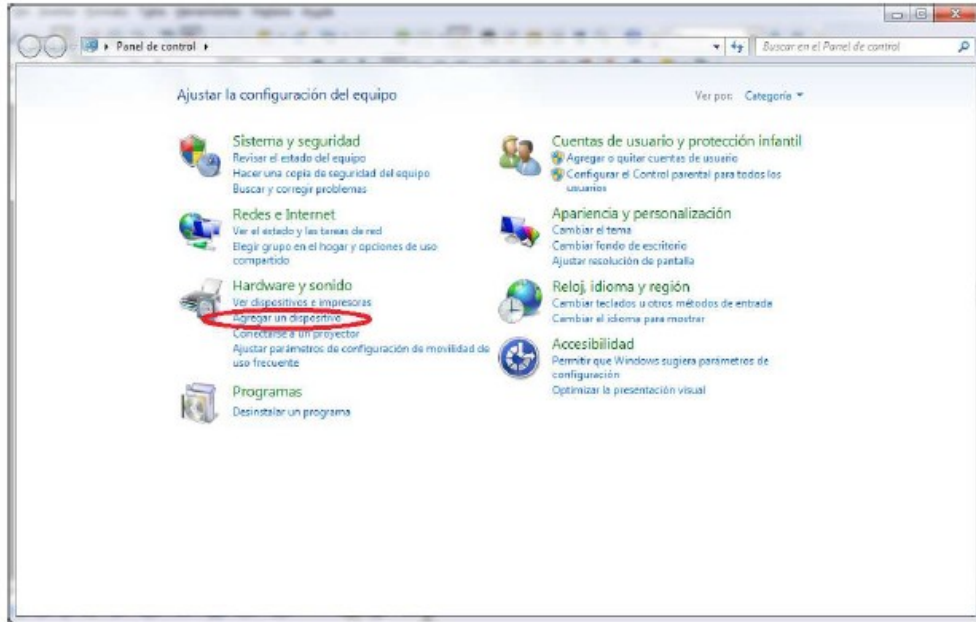


Figure 37: Windows 7 Control Panel

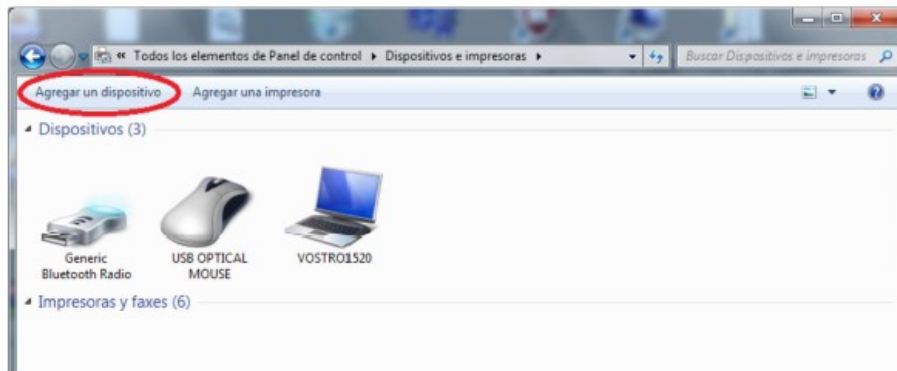


Figure 38: Windows 7: Add new device

2. The ReCon T instrument will appear once detected. Select it, and then click on the “Write the pairing key” option.

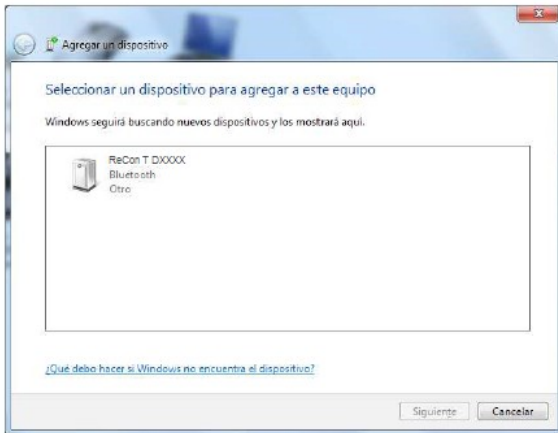


Figure 39: Windows 7 List of discovered devices

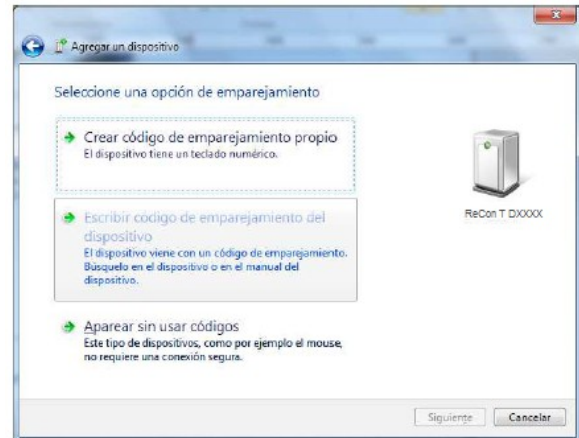


Figure 40: Windows 7: Pairing process (authentication)

3. Type the provided key and click “Next”. The PC will connect with the ReCon T instrument and will install the device controller software. A pop-up message will appear when the process is finished, and the device will be ready to be used.

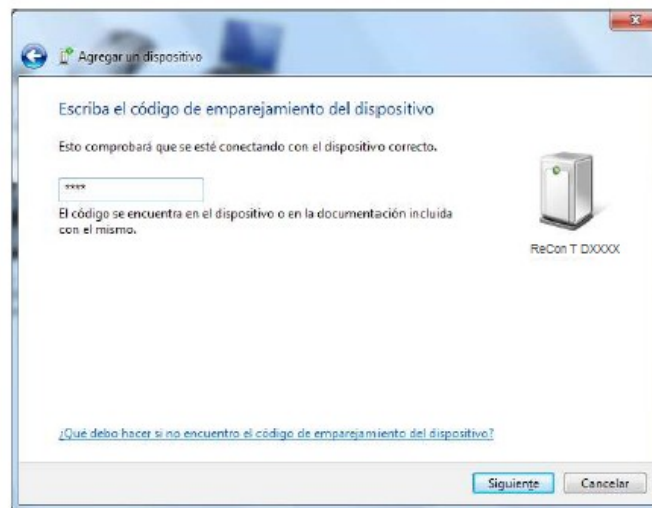


Figure 41: Windows 7: Pin code interchange

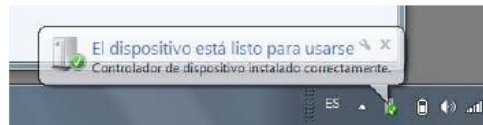
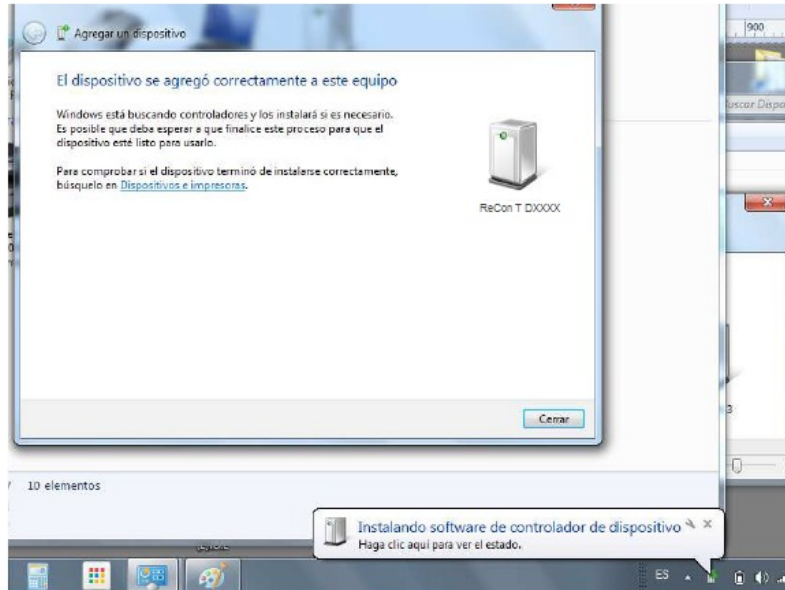


Figure 42: Windows 7: End of installation of device

4. Right click on the ReCon T icon, and select “Properties”. Go to “Services” tab, and the virtual serial port identifier will be displayed there.

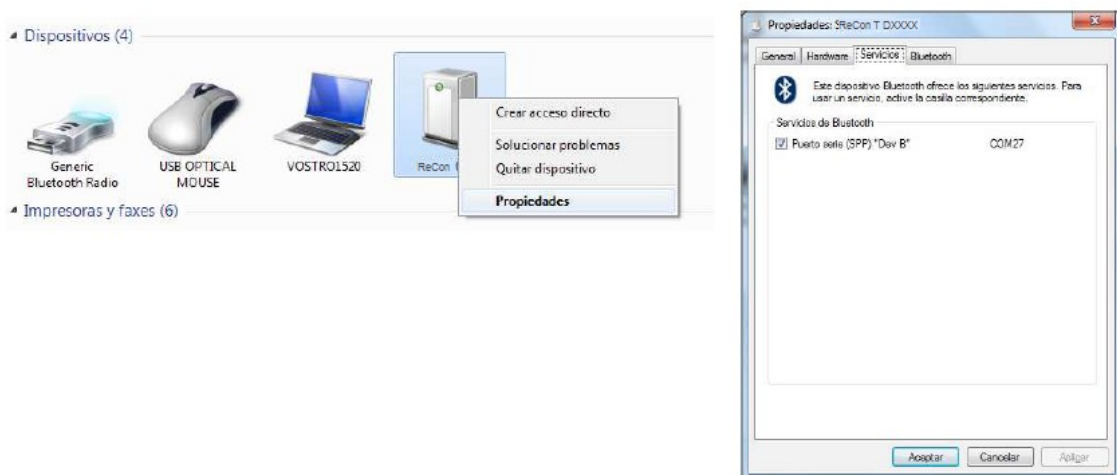


Figure 43: Windows 7: Device properties: Serial port assigned to ReCon T Bluetooth connection

5. If you are not going to work with the Bluetooth ReCon T device for a long time, it is recommended to remove the instrument from the Bluetooth devices list, since the virtual serial ports are not automatically removed, and new ones are created for every new device added.



Figure 44: Windows 7: Removing Bluetooth device to free COM ports

Windows 10

1. Start / Setup / Bluetooth and other devices (or double click Bluetooth icon) / Add new device

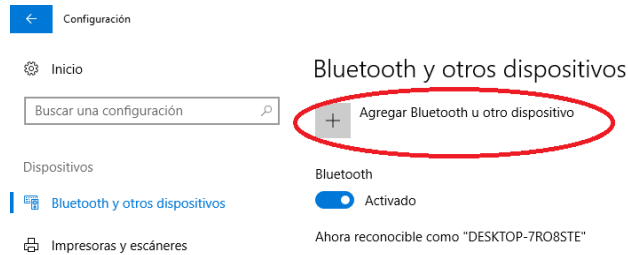


Figure 45: Windows 10: Bluetooth and devices

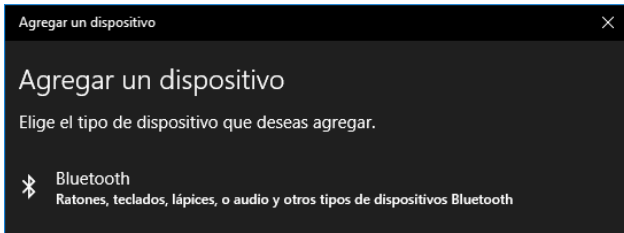


Figure 46: Windows 10: add Bluetooth device

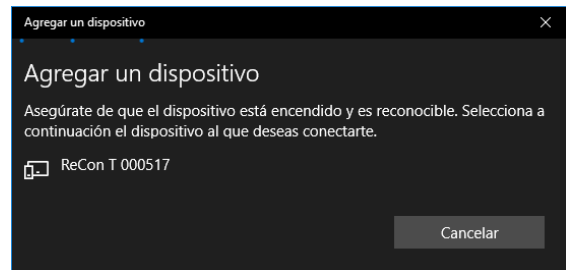


Figure 47: Windows 10: discovered devices

2. Click on the ReCon T instrument and wait for Windows to ask for PIN. Enter PIN code and click Connect.

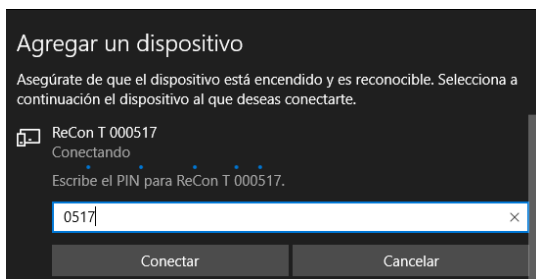


Figure 49: Windows 10: PIN authentication

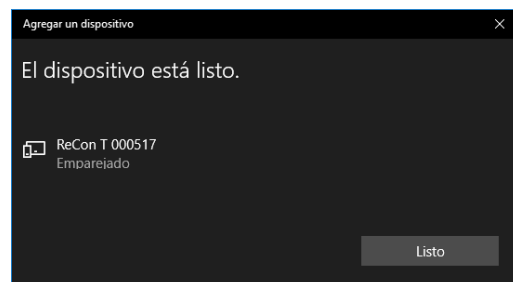


Figure 48: Windows 10: ReCon T paired

3. Go to Devices and printers, right click on ReCon T and click Properties to guess COM port under Services tab:

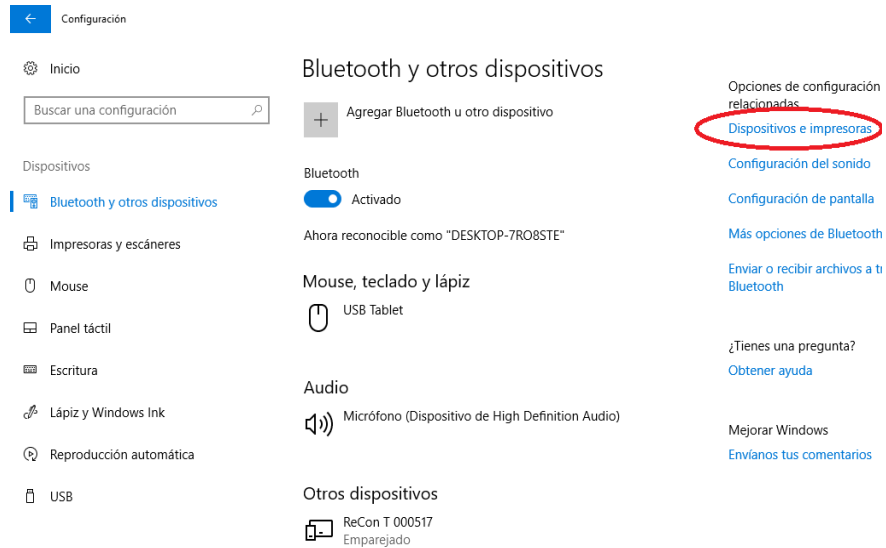


Figure 50: Windows 10: devices and printers in setup

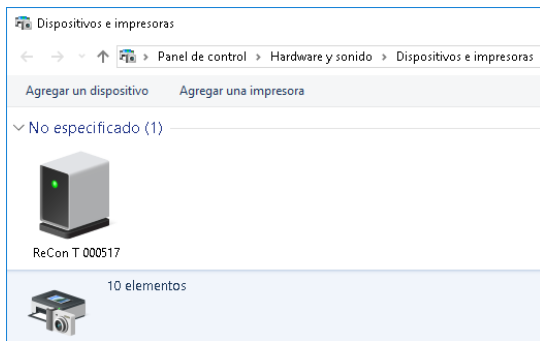


Figure 51: Windows 10: paired ReCon T

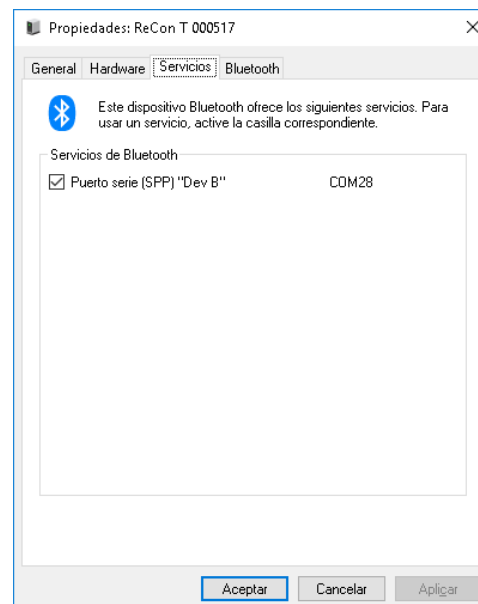


Figure 52: Windows 10: properties of paired ReCon T. COM port

Bluetooth software from other manufacturers

In case that your personal computer works with a Bluetooth stack different than the one provided by Windows (Toshiba, for instance), you must use the tools provided by the manufacturer.



Figure 53: Bluetooth icon

1. Create a new connection

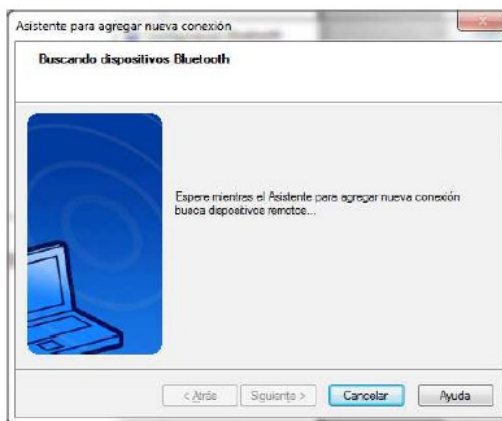


Figure 55: Toshiba Bluetooth Wizard

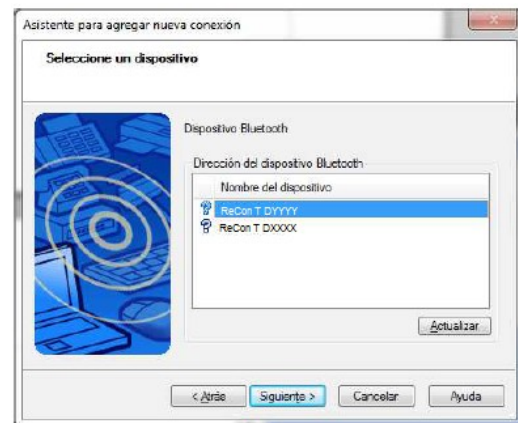


Figure 54: Toshiba: Bluetooth devices discovered

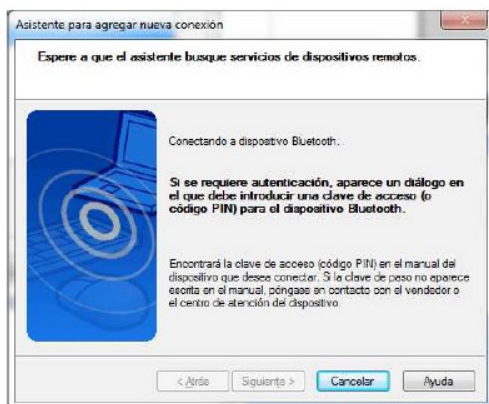


Figure 56: Toshiba: connecting to device

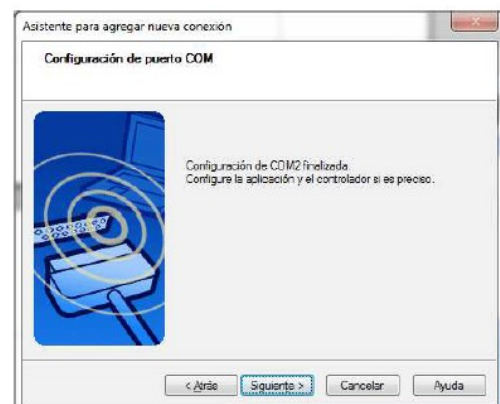


Figure 57: Toshiba: end of wizard

2. An access key will be required the first time that you try to connect with the ReCon T instrument, either using MEDCALScope or the assistant.

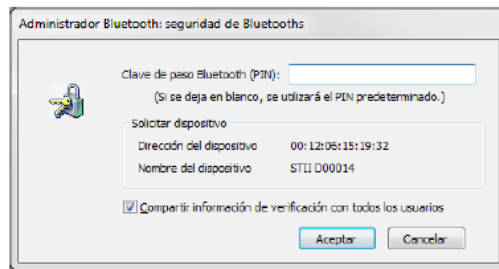


Figure 59: Toshiba: authentication dialog