

**PROCESS TOMOGRAPHY Ltd.  
ELECTRICAL CAPACITANCE TOMOGRAPHY SYSTEM  
TYPE PTL300E**

**INTRODUCTORY NOTES**

**\*\*\* PLEASE READ THIS DOCUMENT FIRST \*\*\***

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## **1. SUMMARY OF CONTENTS**

This document contains information about your PTL300E ECT measurement system which is being delivered to you in 2 stages:

1. This consignment, consisting of a set of technical manuals and a software CD, will allow you to install the software on your own PC and become familiar with technology, using the sample example data files which will be installed.
2. The next consignment, will contain the ECT hardware, including the CMU (Capacitance Measurement Unit), demonstration and custom multi-electrode capacitance sensors and a Control PC with pre-installed software.

We suggest you read this document carefully, as it contains instructions for installing the software, a number of minor updates/corrections to the manuals and recommendations for familiarising yourselves with ECT technology.

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## 2. OVERVIEW

ECT measurement technology is still under development and is very much a research topic in its own right at present. This is reflected in both the current state of the hardware and software of the ECT system which you have purchased. With such a rapidly changing technology and the fact that we are a very small company, it is a challenging task for us to keep the documentation and software which we supply to our customers up-to-date with the latest developments in research into ECT.

Please read carefully the following paragraphs, which briefly describe some of the documentation and software which we have sent to you in advance of the system hardware, which will be supplied at a later date. Once you have read this brief introductory document, you can install the software on your own PC and start to familiarise yourself with the ECT software and documentation. We have supplied a number of **example data files** which you can use to try out the software.

## 3. DOCUMENTATION

In the documentation package we have sent, you should find the following items:

- 3.1 This set of **Introductory Notes**.
- 3.2 **ECT32 Software User Guide**
- 3.3 **PTL300E Operating Manual** in 4 Volumes (blue ring binders)
  - Volume 1 Fundamentals
  - Volume 2 User Guide
  - Volume 3 Supplementary software
  - Volume 4 Application notes
- 3.4 **Software installation CD**.

## 4. SOFTWARE SUMMARY

The **PTL300E ECT system** is supplied with a comprehensive set of **control and analysis software**. The primary software which is used to control the ECT system and to capture and image data is the **ECT32v2 software**. However, additional software for use before and after capturing data is also supplied and a brief summary of each software item is given here.

4.1 **ECT32v2**: The main control and data capture software for use with PTL ECT systems. Full details are given in sections 2 and 5 of the **PTL300E Operating Manual** and the **ECT32v2 Software User Guide**.

4.2 **Recal**. Advanced calibration software suitable for constructing sensor C/K files. Full details in Appendix 8 of the **PTL300E Operating Manual**.

4.3 **IU2000** Supplementary image reconstruction software for producing a range of enhanced ECT images from data files captured using the ECT32v2 software. Full details are given in **Appendix 9** of the **PTL300E Operating Manual**.

4.4 **Plot3d**: 2 and 3-dimensional plotting software for use with data files generated by the ECT32 software. Full details in **Appendix 10** of the **PTL300E Operating Manual**.

4.5 **Makemap**: Sensitivity Matrix generation software for circular ECT sensors. Full details in **Appendix 11** of the **PTL300E Operating Manual**.

4.6 **MatECT: Exoperimental** set of Matlab utilities for ECT. Requires Matlab (not supplied) to be installed on the PC before use. Full details in **Appendix 12** of the **PTL300E Operating Manual**.

4.7 **BCPconvert**: File conversion software which converts data files captured using ECT32v2 into a range of other file formats. Full details in **Appendix 13** of the **PTL300E Operating Manual**.

4.8 **ECT Toolkit**. Diagnostic and maintenance software for the **PTL300E ECT system**. Full details in **Section 7** of the **PTL300E Operating Manual**.

4.9 **ECTcon**: This software is no longer needed.

4.10 **ECTRemote**: Software for exporting live data (streaming) from the control PC to a second PC. Full details in **Section 5** (chapter 30) of the **PTL300E Operating Manual**.

## 5. SOFTWARE INSTALLATION DETAILS (Revised November 2016)

### 5.1 NOTE ON WINDOWS 10

Microsoft operating systems after Windows 7 differ radically from previous versions and can be confusing for new users. Fortunately, 3rd party software (“**Classic Shell**”) is available, which restores the look, feel and functionality of previous windows versions.

We strongly recommend that the **Classic Shell** software (<http://www.classicshell.net/>) is installed on all **Windows 10 PCs** which are required to run our ECT software and the following instructions assume that this has been done.

### 5.2 SOFTWARE INSTALLATION OVERVIEW

The ECT software is supplied on a single CD. Please use this to install the software on a suitable PC.

The individual programs on the CD must be installed separately as described below.

1. Insert the CD in the CD drive. Note that the CD will not autorun.
2. Select the CD drive and use Windows or File Explorer to display the Setup files on the CD.
3. Double-click on the first setup file and follow the on-screen instructions to install the software.
4. Repeat step 3 for each setup file as detailed in section 6.
5. Complete the software installation as described in detail in section 7.

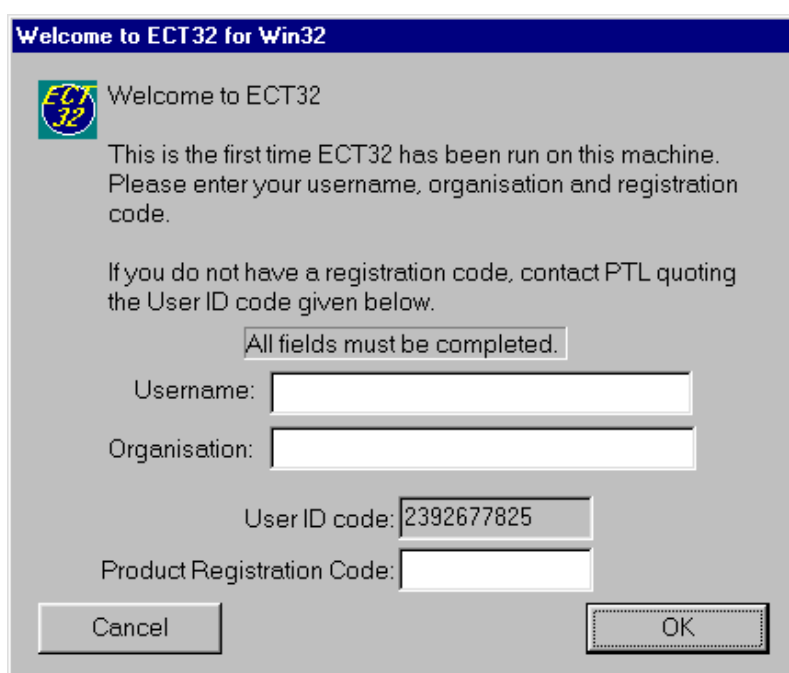
#### Notes:

1. The programs must be installed separately as described in the instructions listed in section 6 for each utility. Note that the **ECT32v2** software is protected by a **software key** which must be obtained by running the **Appcode.exe** file on the software CD before the program can be used. Note that this code is unique for each PC on which the software is installed.
2. Answer any questions during set-up with a positive response. Some of the programs will try to run once they have been installed, but will fail until the PC has been re-booted. It is necessary to **restart the PC** after software installation to ensure correct operation of the software.
3. After the programs have been installed, it is necessary to set up the **PC networking parameters** as described in **section 7** before the software can be used on-line to control the CMU..

## 6. SOFTWARE INSTALLATION DETAILS

### 6.1 ECT32 SOFTWARE INSTALLATION

1. Insert the **PTL program CDROM** in the PC and locate the file **Setup\_ECT32v\*.exe**.
2. Run this file by double clicking on it. The installation wizard will then run.
3. Accept the default folder (**C:\ECT32v2**) in which the program is to be installed when requested by the wizard.
4. The ECT32 software will be installed and an **ECT software program group window** containing a number of icon short cuts will be set up. The **ECT32v2** software will attempt to run and at this stage, a **Registration window** containing a user ID code will appear as shown below.



**Welcome to ECT32 for Win32**

**Welcome to ECT32**

This is the first time ECT32 has been run on this machine. Please enter your username, organisation and registration code.

If you do not have a registration code, contact PTL quoting the User ID code given below.

All fields must be completed.

Username:

Organisation:

User ID code:

Product Registration Code:

**Figure A7.1.1 Software Registration window**

5. Fill in a suitable User name and your organisation name and then copy the **User ID code** which appears and use the **Appcode.exe** program on the **PTL program CD rom** to generate a **Product Registration code**. Copy this **Registration code** into the **Registration window** and click the OK button.

NB. In view of the mix of lower and upper case characters in the product registration code, it is safest to cut and paste this code directly from the return email to the **Registration window** (using CTRL C to copy and /CTRL V to paste).

6. Once the code has been entered, click **OK**. The **ECT32 software** will start and the **Configuration window** will appear.

7. If the correct code is not entered, the **ECT32** software will not start. The registration window will then appear again next time the ECT32 software is run.

### 6.1.1 Notes on the Security Code

The **ECT32v2** software is **protected** by a **security code system** in the form of a **Product Registration code** (which is unique for each PC on which the software is to be used). A software **User ID code** is generated during the software installation and the **Appcode** program must be used to obtain the **Product Registration code** before the software can be run for the first time on each new PC. Alternatively, a **Product Registration code** can be obtained from PTL as described in the manuals.

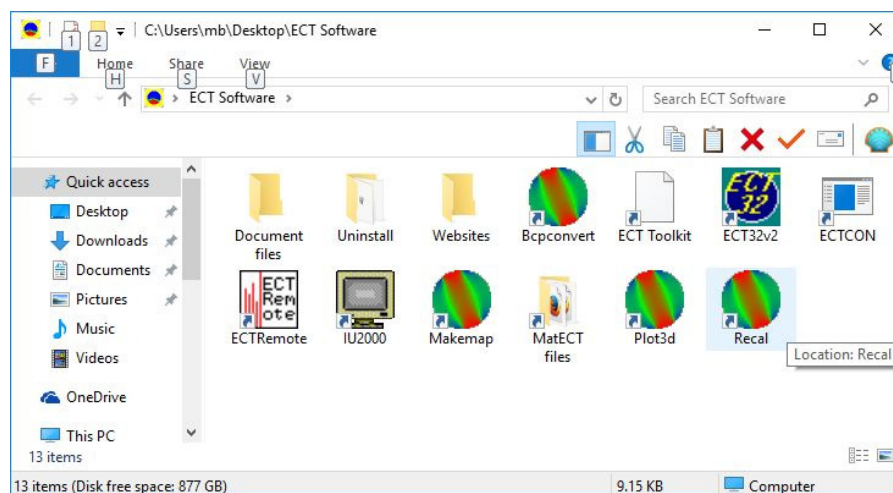
If a **Product Registration code** is not available, the **ECT32** program can be used in a restricted **Playback only** mode. In this case, the **Registration window** appears each time the **ECT32 software** is started and the program can be used in **Playback only** mode by clicking on the **Use in playback only mode** button. This facility allows unrestricted use of the **ECT32 software** with either the **example data files** provided, or with data files generated by users. It therefore allows the use of the software as an ECT teaching aid by engineering and physics students.

### 6.1.2 The ECT software group window

Following installation of the ECT32v2 software, the **ECT software group window** will contain the following icon short cuts.

<b>ECT32v2</b>	<b>ECT Toolkit</b>	<b>ECTremote</b>	<b>Websites</b>
<b>Uninstall</b>	<b>Documentation</b>		

Further icons will be added to this window as additional programs are installed.



**Figure A7.1.2 Typical ECT program group window (Windows 10).**

As well as the programs, **copies of the ECT system documentation** can also be accessed using the **documentation icons** in this window.

There is also a link to the PTL web site, which can only be accessed if the PC is connected to a network with internet access.

### 6.1.3 Windows 10 note.

In some cases, the **ECT software group window shortcut** may not be created on the **windows Desktop**. In this case, copy the folder **ECT PTL300E** from the installation CD directly to the **Windows Desktop**. **Only do this if the ECT shortcut is missing from the Desktop.**

## 6.2 IU200 IMAGE RECONSTRUCTION SOFTWARE INSTALLATION

1. Locate the file **Setup\_IU2000v\*.exe** on the **PTL ECT program CDROM**.
2. Run this file by double clicking on it. The installation wizard will then run.
3. Either accept the default folder (**C:\IU2000**) or choose a suitable folder in which the program is to be installed when requested by the wizard.
4. The **IU2000** software will be installed and an **IU2000** icon button, will appear in the **ECT software program group window**.

This completes the **IU2000** software installation.

## 6.3 RECAL ADVANCED CALIBRATION SOFTWARE INSTALLATION

1. Locate the file **Setup\_Recalv\*.exe**. on the **PTL ECT program CDROM**.
2. Run this file by double clicking on it. The installation wizard will then run.
3. Either accept the default folder (**C:\Recal**) or choose a suitable folder in which the program is to be installed when requested by the wizard.
4. The **Recal** software will be installed and a **Recal** icon button will appear in the **ECT software program group window**.

This completes the **Recal** software installation.

## 6.4 PLOT3D IMAGE RECONSTRUCTION SOFTWARE INSTALLATION

1. Locate the file **Setup\_Plot3dv\*.exe** on the **PTL ECT program CDROM**.
2. Run this file by double clicking on it. The installation wizard will then run.
3. Either accept the default folder (**C:\Plot3d**) or choose a suitable folder in which the program is to be installed when requested by the wizard.
4. The **Plot3d** software will be installed and a **Plot3d** icon button, will appear in the **ECT software program group window**.

This completes the **Plot3d** software installation.

## 6.5 MAKEMAP SENSITIVITY MAP GENERATION SOFTWARE INSTALLATION

1. Locate the file **Setup\_Makemapv\*.exe** on the **PTL ECT program CDROM**.
2. Run this file by double clicking on it. The installation wizard will then run.
3. Either accept the default folder (**C:\Makemap**) or choose a suitable folder in which the program is to be installed when requested by the wizard.



4. The **Makemap** software will be installed and a **Makemap** icon button will appear in the **ECT software program group window**.

This completes the **Makemap** software installation.

## **6.6 BCP CONVERT FILE CONVERSION SOFTWARE INSTALLATION**

1. Locate the file **Setup\_Bcpconvert\*.exe** on the **PTL ECT program CDROM**.
2. Run this file by double clicking on it. The installation wizard will then run.
3. Either accept the default folder (**C:\Bcpconvert**) or choose a suitable folder in which the program is to be installed when requested by the wizard.
4. The **Bcpconvert** software will be installed and a **Bcpconvert** icon button will appear in the **ECT software program group window**.

This completes the **Bcpconvert** software installation.

## **6.7. MATECT MATLAB UTILITIES SOFTWARE INSTALLATION \***

1. Locate the file **Setup\_MatECT\*.exe** on the **PTL ECT program CDROM**.
2. Run this file by double clicking on it. The installation wizard will then run.
3. Either accept the default folder (**C:\MatECT**) or choose a suitable folder in which the program is to be installed when requested by the wizard.
4. The **MatECT** software will be installed and a **MatECT** icon button will appear in the **ECT software program group window**.

This completes the **MatECT** software installation.

\* Please note that these Matlab utilities are offered "as is". They were written for use under Matlab v 6.0 and not all of them will work with later versions of Matlab. Users are welcome to modify the code as required.

## **6.8 FLOWAN SOFTWARE INSTALLATION (Purchase option)**

1. Locate the file **Setup\_Flowan\*.exe** on the **PTL ECT program CDROM**.
2. Run this file by double clicking on it. The installation wizard will then run.
3. Either accept the default folder (**C:\Flowan**) or choose a suitable folder in which the program is to be installed when requested by the wizard.
4. The **Flowan** software will be installed and a **Flowan** icon button will appear in the **ECT software program group window**.

This completes the **Flowan** software installation.

**Note** that the **Flowan** software is protected by a **security code** and a procedure similar to that used for the **ECT32v2** software must be followed following installation to obtain a software key.

## 6.9 DATA EXPORT SOFTWARE INSTALLATION (OPTIONAL )

A single file (**ECTRemote.exe**) must be copied to the **Remote PC** to allow it to receive the exported capacitance data.

This file should be installed on the **Remote PC** as follows:

1. On the **Control PC**, copy the **ECTRemote.exe** file in the folder **C:\ECT32v2** to a memory stick.
2. Copy the **ECTRemote.exe** file to a new folder (**C:\REM32**) on the **Remote PC**.
3. Create a **shortcut** to the file **ECTRemote.EXE** in the **rem32** folder and **drag this shortcut** to the **Windows desktop**.
4. Re-name the shortcut **icon ECTRemote**.

The demonstration data export display software is now installed and ready for use.

## 6.10 ECT SOFTWARE WINDOW AFTER SOFTWARE INSTALLATION

Following the software installation, the **ECT Software** group window should appear in a similar format to that shown below. Note that a full set of documentation for the programs can be found in the **Document files** folder.

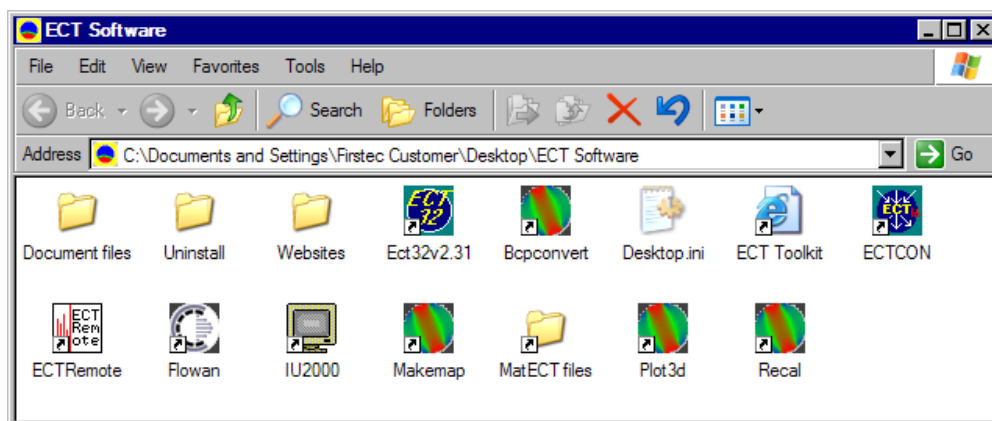


Figure A7.2 ECT Program group window

## 6.11 SOFTWARE INITIALISATION

Once all of the software has been installed, **the PC must be re-booted** by exiting Windows and restarting the PC. This initialises some of the programs which use Matlab DLL files.

## 7. SETTING UP THE CONTROL PC FOR NETWORKING

Before the **ECT32v2**, **Toolkit** and **Flowan** software can be used to control the ECT system, the **Control PC** must be set up to allow **basic networking** via the **ethernet port**. The following instructions allow the PC to be used to control the ECT system using a **crossover ethernet lead**, as described in the **Quick Start Instructions** (chapter 2.2 of the manual).

### 7.1 METHOD FOR WINDOWS 7/XP

Open the *Control panel* on the PC and double-click on the *Network Connection* icon.

Right click on *Local area connection*, and click on the *Properties* button.

Select *Internet Protocol (TCP/IP)* from the *menu list* and click on the *Properties button*.

Uncheck *Obtain an IP address automatically* and instead check *Use the following address*.

Insert the following address in the upper part of the *Internet Properties (TC/IP) Properties* window.

IP address:	192.168.0.X
Subnet mask:	255.255.255.0
Default gateway:	192.168.0.1

where X is a unique address for the PC.

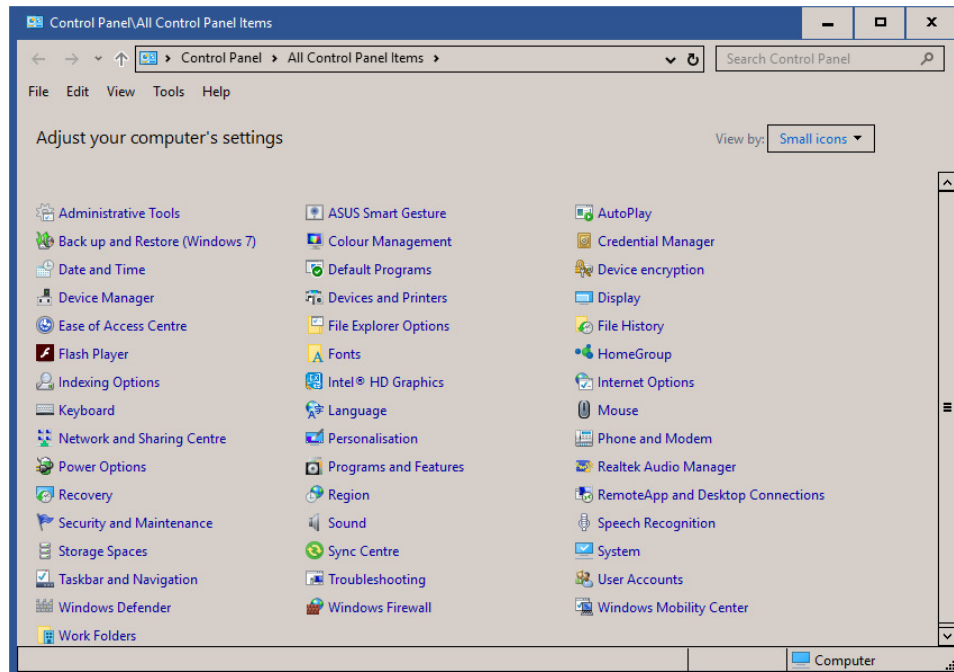
Each **DAM200E** unit has a unique **network (IP) address**, which is determined by its serial number. This can be found on the **identification plate** on the **rear panel** of the **DAM200E** unit. The PTL convention is to set X to the value 100 + the serial number of the **DAM200E unit**. So, for example, if the serial number is 038 then X becomes 138.

The DNS server address section of this window can be left blank.

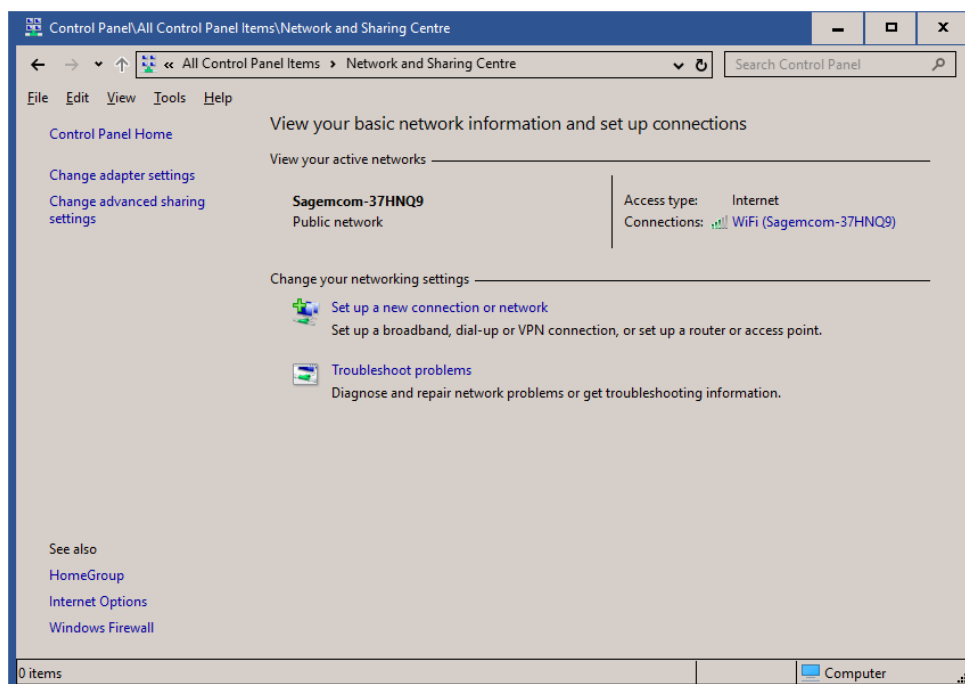
Click on the *OK buttons* to exit the network setup software.

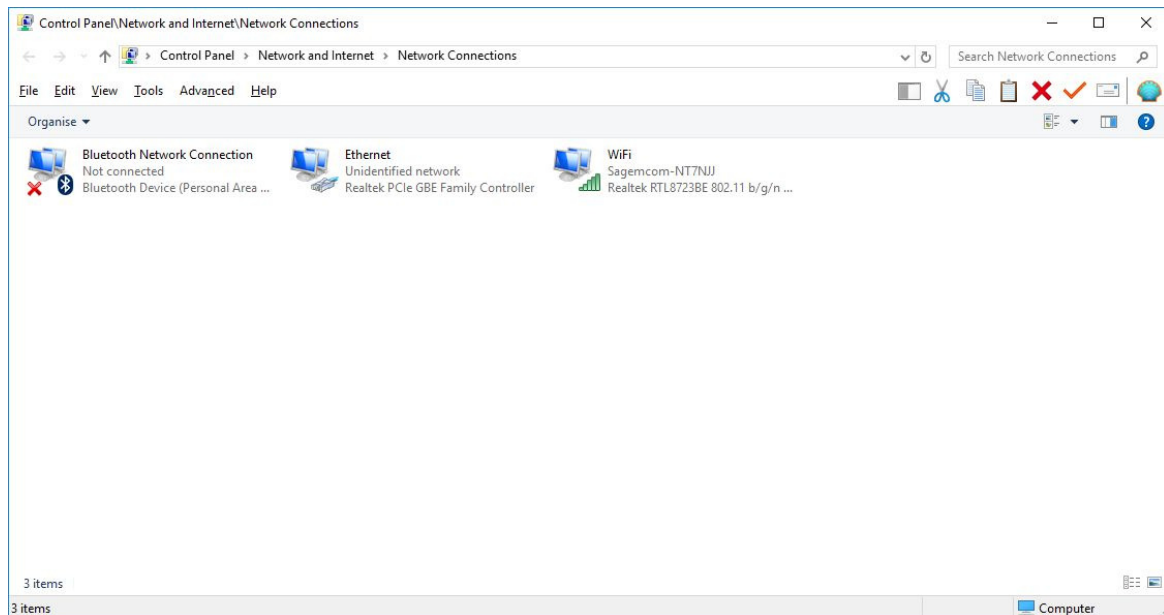
## 7.2 METHOD FOR WINDOWS 10

Open the *Control panel* on the PC and Select (Left click on) the *Network and Sharing Centre* option.

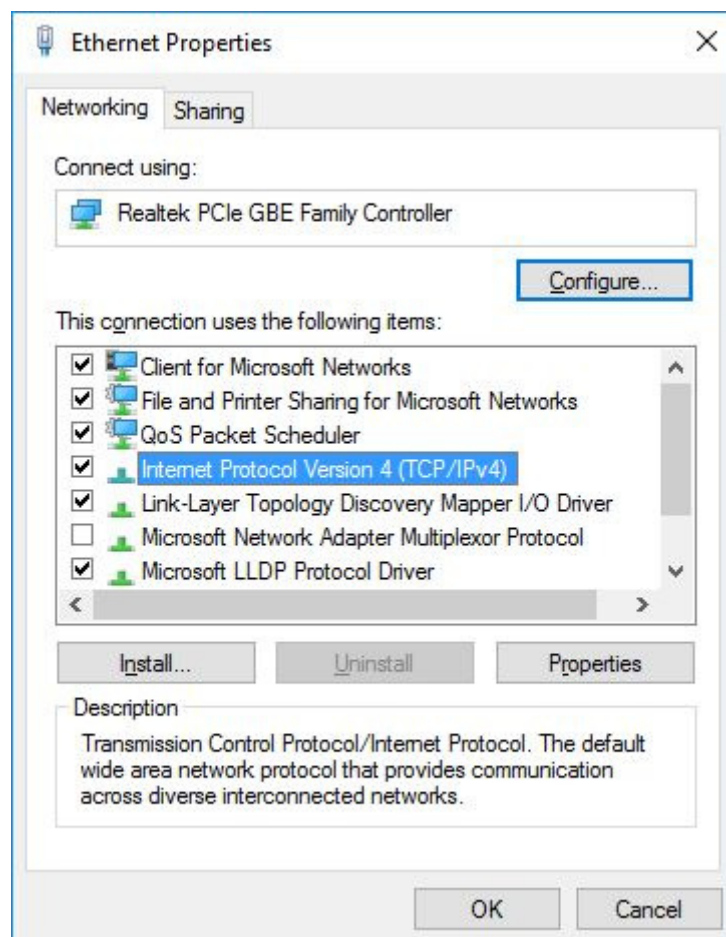


Select the *Change adapter settings* option





Right click on **Ethernet** and click the **Properties** button.

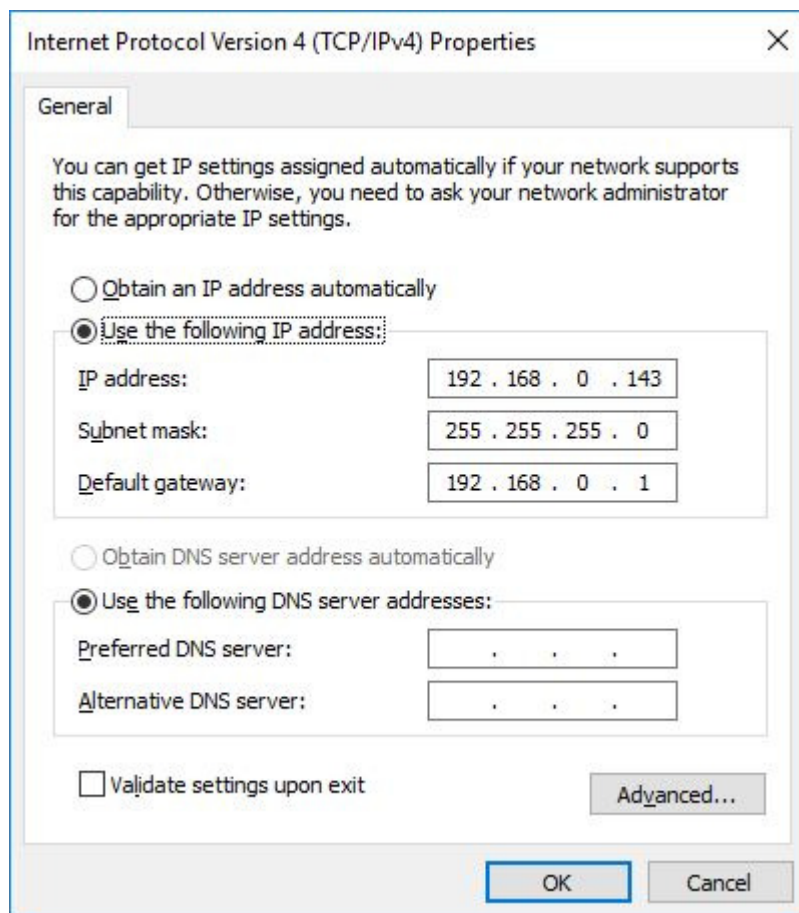


Select **Internet Protocol (TCP/IP)** from the *menu list* and click on the **Properties** button.

Uncheck ***Obtain an IP address automatically*** and instead check ***Use the following address***. Insert the following address in the upper part of the ***Internet Properties (TC/IP) Properties*** window.

IP address:	192.168.0.X
Subnet mask:	255.255.255.0
Default gateway:	192.168.0.1

where X is a unique address for the PC.



Each **DAM200E** unit has a unique **network (IP) address**, which is determined by its serial number. This can be found on the **identification plate** on the **rear panel** of the **DAM200E** unit. The PTL convention is to set X to the value 100 + the serial number of the **DAM200E** unit.

So, for example, if the serial number is 043 then X becomes 143.

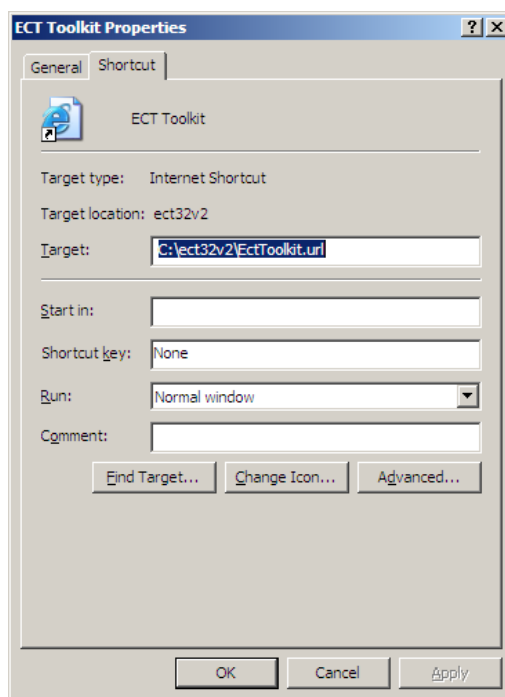
The DNS server address section of this window can be left blank.

Click on the ***OK buttons*** to exit the network setup software.

### 7.3 TO SET UP THE EMBEDDED PC NETWORK ADDRESSES

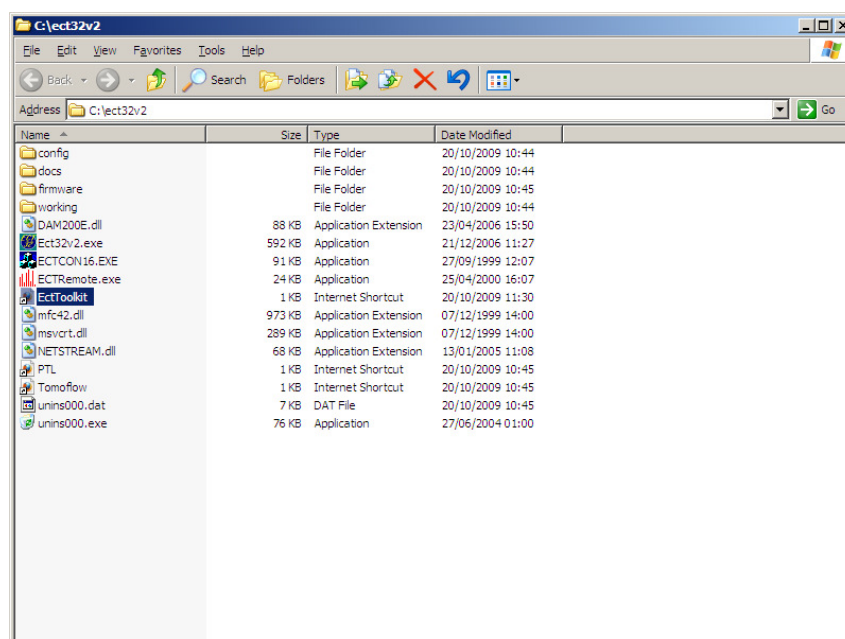
The final step is to set up the **EctToolkit** software to point to the correct address for the **DAM200E** unit connected to the **Control PC**.

Right click on the **ECT Toolkit shortcut** in the **ECT32 program group window** and click on the **Properties** button. The **ECT Toolkit Properties** window will appear as shown below:



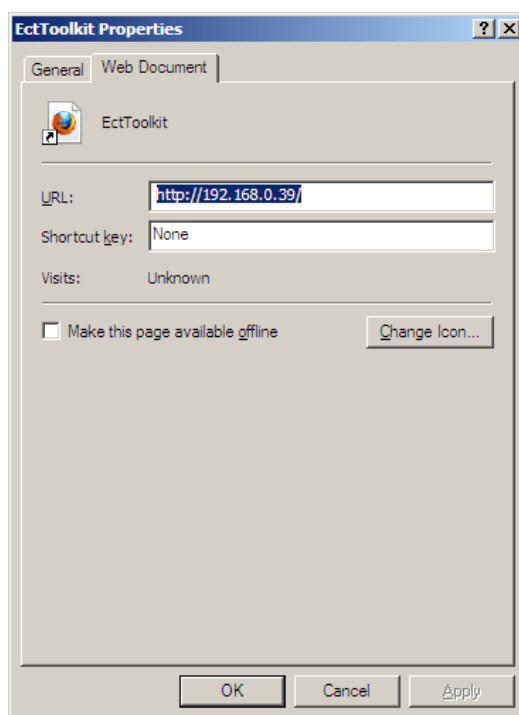
**Figure A7.3. ECT Toolkit Properties window**

Click on the **Find Target** button. This will browse to the **target file** for the **shortcut** as shown in the next figure.



**Figure A7.4 . Shortcut target file**

Right click on the highlighted target file (*EctToolkit*). The *Ect Toolkit Properties window* appears as shown in the next figure.



**Figure A7.5. EctToolkit Properties Window**

Change the *last 2 digits in the URL address* to match the *serial number* on the rear panel of the *DAM200E* unit. In the above example, this has been set to 39.

Click the *Apply button* and then click on the *OK* button to exit this window.

Now click on the *ECT Toolkit* icon in the *ECT software group window* on the *PC desktop*. This should open the *ECT Toolkit software*, indicating that an ethernet connection has been successfully established between the **control PC** and the **DAM200E** unit.

## **8. USE OF ECT32 SOFTWARE IN OFF-LINE MODE**

Use of the **ECT32** software on-line with the **PTL300E instrument**, requires a **product activation user code** for the software before it can be used as described above.

However, the software can be used to process and view data off-line in **Playback mode** (eg to view the supplied **sample data files**), by selecting the **Use in playback only mode** button in the **Registration window**. This facility allows unrestricted use of the **ECT32 software** with either the **example data files** provided, or with data files generated by users. It therefore allows the use of the **ECT32 software** as an ECT teaching aid by engineering and physics students.



## 9. SENSOR INFORMATION FILES (SENSITIVITY MAPS)

A set of **generic sensitivity maps** (ssm\_12\_32.sif etc.) have been supplied with the **ECT32v2 software** in the (default) **configure** folder.

A further two sets of **Tikhonov** maps have also been supplied in a sub-folder, which will produce more focussed (although noisier) images. The **tn\_32-1.sif** set of maps are for a Tikhonov factor of 1 (high-gain) while the **tn\_32-10.sif** maps are for a Tikhonov factor of 10 (lower gain).

Additional sensitivity maps for circular ECT sensors can be generated using the **Makemap** software supplied.

## 10. SAMPLE DATA FILES

A set of sample captured data files have also been installed in the **C:\ECT32v2\working\examples\data files** folder. These files can be used to test and evaluate any of the above software. Further details are given in the **ECT32v2 Software User Guide**.

## 11. THE NEXT STEPS

1. Please read **Volume 1 of the User Manual**, which should give you a good understanding of ECT technology.
2. Once you have done this, try using the **ECT32 software** to view some of the example data as described in the **ECT32v2 Software User Guide**.
3. If you need further information about previous work and applications of ECT, please refer to the list of references and papers on the **PTL Web site** at: **www.tomography.com** or contact us by email at **enquiries@tomography.com**.

In case of any problems, please email us at **enquiries@tomography.com**.

**Process Tomography Ltd. November 2016**