

## Terminology.

Megger Limited, the PAT4 and all its associated software use a common verbal language in descriptions and instructions in an attempt to avoid confusion. Hopefully it is all logical and makes sense, so here are a few terms and their explanations. Further details can be found within the User Guide on the pages indicated.

<b>Asset</b>	<b>22</b>
Portable electrical appliance under test	
<b>Asset ID</b>	<b>22</b>
Unique identifier for each asset. 2 clients can use the same Asset ID's, but all Asset ID's within one client must be unique.	
<b>Client</b>	<b>14</b>
Organisation for whom the testing is being performed	
<b>Continuity Test</b>	<b>37</b>
Low-Resistance test performed at low current (0.2A) to establish integrity of Earth connection on equipment that could be damaged by the high current Bond test; such as computers. Sometimes referred to as a 'Soft Test'.	
<b>Download</b>	<b>34</b>
Transfer of data from the PAT4 to the PC	
<b>Earth Bond Test</b>	<b>37</b>
Low-Resistance test performed at high current (10A or 25A) to establish integrity of Earth connection	
<b>Insulation Test</b>	<b>38</b>
High Resistance test performed at high voltage (500V) to establish integrity of the insulation material	
<b>Location</b>	<b>17</b>
Branch, Building or Department in which the asset is located	

<b>Quick-Check</b>	<b>30</b>
Any test performed on an asset which is not stored to memory	
<b>Repair Code</b>	<b>28</b>
User-designated 3-character codes to identify any work that was or will be necessary to enable the asset to pass.	
<b>Room ID</b>	<b>22</b>
Secondary identifier for asset location	
<b>Test Group</b>	<b>19 &amp; 42</b>
Category of asset – typically Class 1 or Class2 insulation etc. This determines which tests are performed, the parameters (e.g. Bond Current 0.2A, 10A or 25A) and the pass/fail levels for each test. This enables similar assets to be tested to the same criteria.	
<b>Test</b>	
Series of tests performed on an asset that are stored to PAT4 memory	
<b>Upload</b>	<b>35</b>
Transfer of data from the PC to the PAT4 (this will always clear the PAT4 memory prior to data transfer)	
<b>User</b>	
Operator of the PAT4	
<b>VA Rating</b>	<b>23</b>
Power rating of an asset.	

## THE concept of PAT testing.

### If you can't touch it, it can't hurt you.

Therefore, the idea is to prevent anyone touching anything that is electrically Live. Damaged and bare wires or broken casings exposing connector screws are definitely not good as the live parts could be touched accidentally. That's fine for faults you can see, but what about those you can't? If a fault develops in the heating element of a Steam Iron creating a connection between the mains live and the sole plate, not only is the metalwork hot, but also becomes live and therefore lethal. The sole plate can't be covered up so that it can't be touched, as it wouldn't iron very well! So, to stop the exposed

metalwork becoming live in the event of a fault, it is 'Earthed'.

The person operating the faulty equipment is at the same voltage level as the ground he is standing on; therefore, if the metalwork is also at that voltage level ('Earthed'), no danger exists. Secondary protection will also come in to play here, as when a fault occurs there will be current flowing from Live to Earth via the fault. This will cause any Earth Leakage Trip on the supply to operate, so cutting the power and removing the danger.

## PAT4 Quick-Start Guide.

So the primary method of protection here is the fact that you can't touch any live parts, but equally important is that any exposed metalwork is properly Earthed.

Further to this, if there is a slight (high resistance) fault between Live or Neutral and Earth, the

likelihood is that the fault will develop into something worse, possibly causing a fire or electrocution.

The PAT4 DV will prompt or test for all of these dangers.

## Visual inspection.

### Does it look OK?

The most important part of any test and the one that shows up the most failures is the Visual Inspection. If the asset is obviously dangerous, it should not be plugged in until it has been repaired. In fact, if the asset fails any test, it should be unplugged immediately and no further testing should take place until it is repaired. It is also important that all tests are performed in the recommended sequence such that faults are identified at the earliest opportunity.

Is the case damaged? Is the plug OK? The lead? The main power switch? Is the supply socket OK? Should there be a problem, all of these questions are asked by the PAT4 to act as an aide-memoir while checking, and give the opportunity to log any faults or areas of concern. In addition, it also asks other application type questions such as is the equipment suitable for the task to which it is being put? Is the environment OK – i.e. is the equipment designed to be used indoors, when it is actually being used outside in the rain?

## Electrical testing.

This is only intended as a get-you-going-guide, and it is essential that all safety warnings in the front of the User Guide be read first.

Similarly, further explanations on all sections here can also be found within the User Guide.

### Test Criteria

As with any of the specifics around Portable Appliance Testing, the actual test currents and voltages used, and the pass/fail levels for each test are ultimately the decision of the PAT4 Operator (or his Employer), following guidance from the IEE Code of Practice for In-Service Inspection and Testing of Electrical Equipment. The PAT4 has the ability to store those criteria into memory, such that all equipment of a similar type can be tested to the same levels. When entering asset details, a 'Test Group' is chosen and associated with that piece of equipment.

### Earthing

The integrity of the Earth connection is checked using different test currents depending on the type of equipment under test and its fuse rating. This should produce a low value, measured in Ohms.

Some equipment that uses Switch Mode Power Supplies (typically Personal Computers etc) could become damaged by the high currents used during the standard Earth Bond Test, so a low current test at about 0.2A is allowed. This is a Continuity Test, sometimes referred to as a 'Soft Test'.

In order to perform a Bond test, both ends of the circuit must be accessible and connected. Taking the trusty steam iron, one end is the Earth pin on the mains plug, the other is the sole plate. The whole point of this test is to ensure that they are both electrically bonded together. So, the connection for the Earth pin is through the socket on the front panel of the PAT, where it plugs in. The sole plate will require an additional test lead to complete the test path back to the PAT4. This is the Earth Bond Test Lead, and connects to a terminal on the PAT4.

When testing Extension Leads, the far-end connection is made through the IEC-Socket on the front of the PAT4. Short adaptors are available to connect other types of lead to that socket.

## Insulation 38

Any faulty connection between Live (or Neutral) and Earth is more likely to show when tested using a high test-voltage as the insulation material is more highly stressed. Therefore the Insulation Test is performed at 500V d.c.. For those assets which are not Earthed (Class 2, 'Double-Insulated') there is no Earth point to perform the Insulation Test between. Therefore, an additional test lead is required to connect to any exposed metal on the asset. The same lead and terminal as used during the Bond Test is used here, probing on to assembly screws or other metalwork present.

Like the high currents used in Earth Bond, the high d.c. voltage used in this test may damage some assets such as computers. Because of this, the Insulation Test may be replaced with an Earth or Touch Leakage Test performed during the Operation Test.

## Operation 38

The asset should never be run at operating voltage if any of the previous tests have indicated a failure.

During the operation test, various measurements are taken including the VA (Volts x Amps) rating to check the power drawn from the supply, and a Touch-Leakage Test. This compares the current in to the asset against the current out through the Neutral line, and any imbalance is reported as Earth Leakage.

## Flash (PAT4 DVF only) 40

It is not recommended that Flash Tests be routinely performed on assets.

The Flash Test deliberately over-stresses the Insulation Materials to encourage breakdown of any weak-points in the assembly, using 1.5kV (Class 1) and 3kV (Class 2) a.c. voltages. Over-stressing the insulation will cause premature ageing, so routine testing will cause the asset to fail much earlier in its life than would normally be expected.

The facility is there to enable initial testing and safety verification following a rebuild of the asset or re-design for any reason.

## Getting started.

### Key pad operation

#### Multi-function soft-keys

Perform the functions indicated in the display, including scrolling when up and down arrows appear



#### Escape or Delete key, and multi-function soft-key

'Select' key when option displayed, or Backspace key while typing, Escape key when not

#### OK Key, and multi-function soft-key

Enter key, or 'Select' key when option shown

While typing, SPACE = (SHIFT+0) simultaneously

HV Energise key for Flash Test

### Some Screen/Key options

**NEXT** may appear in the top-left hand corner of the display.

This provides the facility to scroll through other items in memory similar to that displayed – i.e. lists of Client names, Asset ID's, Test Groups etc.

**MORE** may appear in the top right-hand corner of the display.

This provides a further three options of ERASE, EDIT or ADD, performed on the item previously shown

### Initial Power-Up

If, at any time for any reason, you wish to reset the instrument back to the default settings and reinstate the original sample data as it was first unpacked, a Factory Reset can be performed.

Press and hold the 'R' key during power-up



Confirm Re-Set by pressing 'Y'

This is useful for resetting the instrument following initial familiarisation and training sessions, and is the state in which the following guide assumes the PAT4 to be.

## Logging on.

On initial Power Up, following various internal checks and calibration settings, the PAT4 will ask for a User Name and a PIN number. All tests are Date, Time and User stamped for traceability. Once entered, the User remains logged in (even through Power-Down) until specifically logged out. This speeds boot-up time when testing and relocating the PAT4 to a different room/department.

1. Under USER, type **'AVO'** (be sure to use O and not 0)
2. press **'OK'**
3. Under PIN, type **'1234'**
4. press **'OK'**  
(Details of adding or deleting Users can be found on page 8 of the User Guide).



## Clients and Locations

The PAT4 will not permit testing until a CLIENT and LOCATION have been selected for association with the asset.

For our purposes, we will use sample clients and locations already within memory, however new ones are easily added.

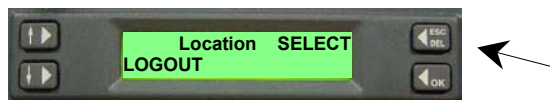
5. Under Client press **'SELECT'**



6. press **'OK'**



7. Under Location press **'SELECT'**

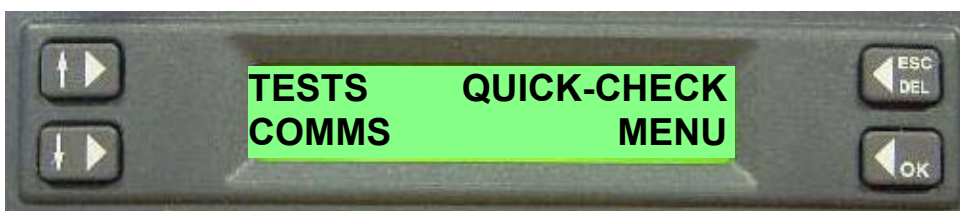


8. press **'OK'**



Under each of these sections, pressing MORE will lead to further options, including deleting the selected CLIENT or LOCATION, or adding new ones with full addresses.

The instrument now shows the main screen from where all functions can be accessed

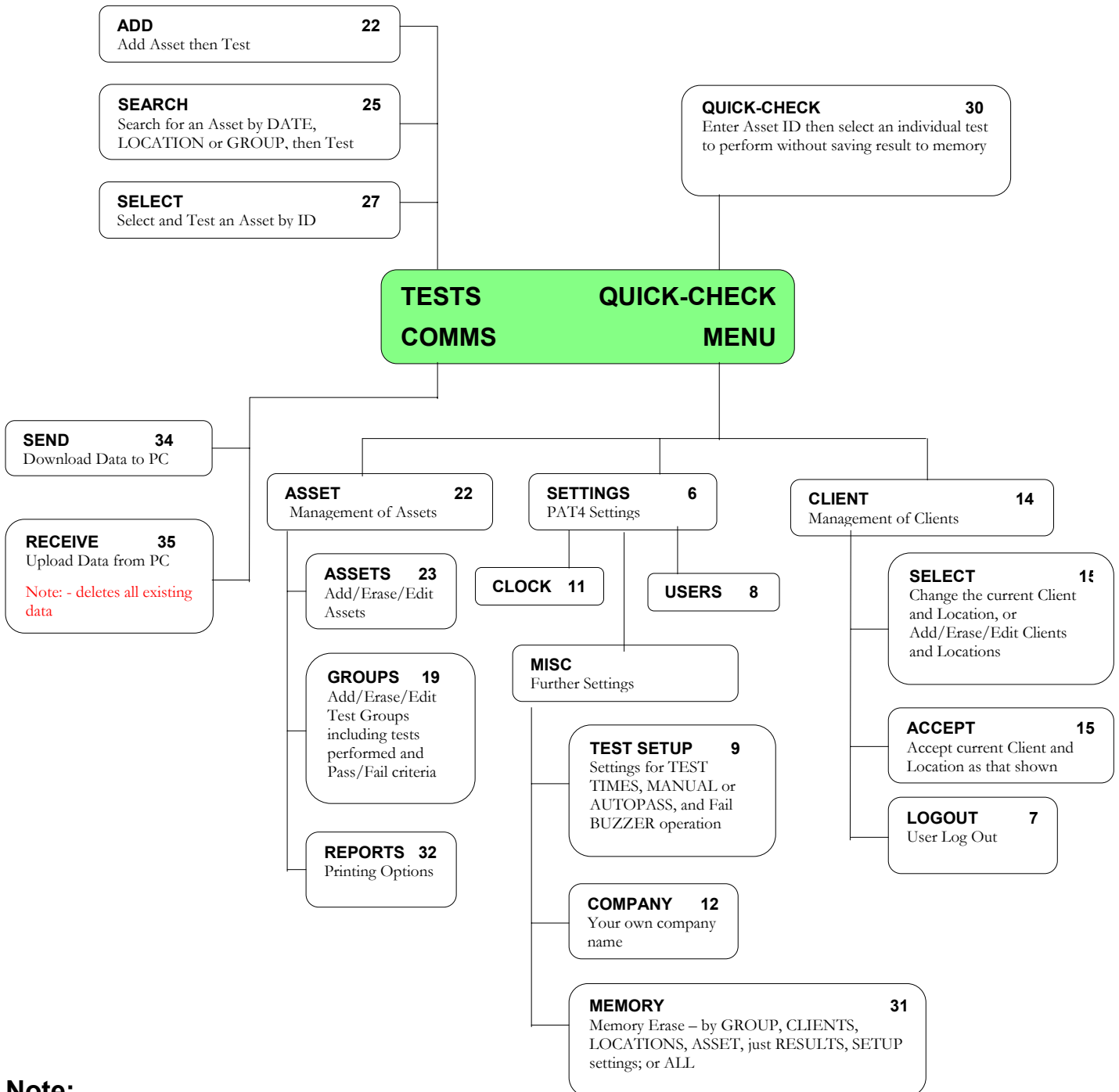


The Instrument is now ready to test an asset.

## Menu navigation.

All functions are accessible from the main screen.

The following diagram will assist in navigation through the various screen menus available from each option. Reference should additionally be made to the full User Guide at the pages indicated.



### Note:

Pressing the **'ESC'** key a number of times will ultimately return the PAT4 to the Main Screen – this is useful during the early User familiarisation stages. The exception here is when the PAT4 is awaiting information input. In which case simply accept the prompt with the **'OK'** key, and then return to the Main Screen using the **'ESC'** key.

## Testing an asset.

Here we will test a Steam Iron, Class 1 insulation (Earthed).

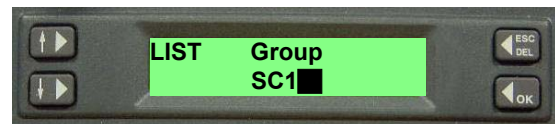
1. Perform a visual inspection of the Asset.



2. Provided the Visual Inspection is all OK, plug the asset in to the front of the PAT4



3. press **'TESTS'**
4. press **'ADD'**
5. Under **Asset ID**, type **'1'**, and press **'OK'**
6. Under **Group** type **'SC1'**  
This is for Standard Class 1 assets. If the asset being tested is not earthed (i.e. Class2), type 'SC2', and the Earth Bond test will not be performed.



7. Under **Short cut to tests** press **'TEST'**  
Pressing 'CONTINUE' will enable completion of additional optional asset information such as Serial No, Description, Room ID, Retest Frequency, VA Rating and Fuse Rating.

8. **Earth Bond Test**  
Connect the Earth Bond Lead.  
The PAT4 will ask for confirmation that the Asset is plugged in...

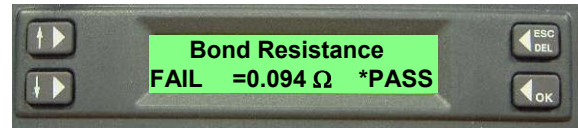
and that the Earth Bond lead is connected  
(don't forget – both ends!)



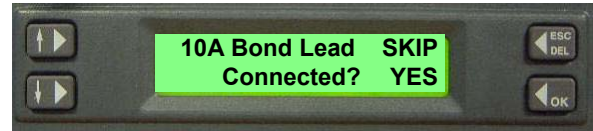
# PAT4 Quick-Start Guide.

9. Confirm Pass or Fail as required. Note Asterisk next to the recommended option.

Additional options are provided to re-test or log this result – choose **'LOG'**



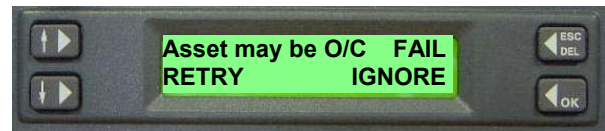
10. Further options are provided for additional Bond Tests where there are several separate sections of exposed metalwork on a single asset. If there are none, choose **'SKIP'**



11. Disconnect the Earth Bond Lead (Required for insulation testing of Class 2 Assets)

### 12. Insulation Test

The Asset is pre-tested. If an open or short-circuit is apparent between Live and Neutral the PAT4 will indicate a problem and require operator intervention to proceed. Ensure Asset is switched ON.

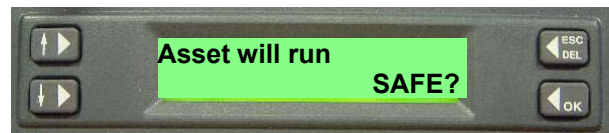


13. Confirm PASS for Insulation Test

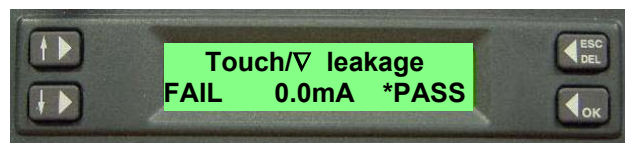


### 14. Operation Test

The PAT4 will ask for confirmation that while operating the Asset will be safe – for example an electric chain saw will need to be held properly while it is running.



15. The VA Rating and Touch Leakage will require PASS confirmation



16. A PASS/FAIL statement will be briefly displayed, followed by the option to enter a Repair Code. If no repair was or will be required, proceed by pressing **'OK'**



**This is the conclusion of the test – It's that easy!**



## Barcode Scanner.

If required, to speed testing, a Barcode Scanner can be connected to the PAT4 for scanning Asset ID, Asset Serial Number, Asset Description, Test Group.

The Scanner simply connects to the RS232 port on the front panel of the PAT4 – no setting up is required.



Once the scanner is connected, at the screen-prompt where data would normally be typed in, simply scan the barcode.

The data is read and automatically entered into the PAT4. This saves considerable amount time while testing, avoiding manually typing in information.



# PAT4 Quick-Start Guide.

## Barcode Printer.

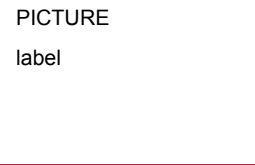
What it does – information printed

### Enabling the PRINT function

Press 'P' on Power-Up following product reset

### Options

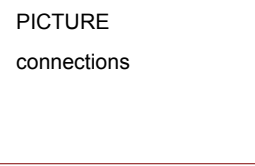
1 or two prints etc



PICTURE  
label

### Connections

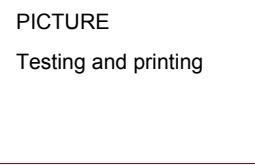
Parallel port and dongle



PICTURE  
connections

### Operation

When and how it prints



PICTURE  
Testing and printing

### Precautions

Keep the battery charged

## Notes.

### Test Groups **19 & 42**

The Test Group will determine the tests performed and what is a pass and what is a fail. Test groups can be fully added or edited through the SETTINGS menu, including the pass/fail criteria.

Default factory settings are always on the 'tight' side to ensure maximum safety, but may be relaxed by the operator for specific purposes.

A full list of Test Groups, the tests they contain and the default pass/fail levels set can be found on page 42 of the User Guide.

### Pass/Fail Prompts

Where there is a PASS/FAIL option for a test result, the PAT4 will prompt the result it believes to be correct with an asterisk. To override this advice, press the button adjacent to the result required.

### AutoPass **9**

The PAT4 can be set to AUTOPASS, where it will follow its own advice without prompting for User confirmation. It will proceed to conclusion of the test giving a final PASS or FAIL indication.

### Extension Leads **39**

Both ends of an Extension Lead or Power Lead will require connection to the PAT4 – the far end via the IEC Socket on the front panel

### 110V Operation **19**

To test a 110V appliance, the PAT4 needs to be supplied with 110V. Similarly, only 230V appliances can be tested when the PAT4 is supplied with 230V

### Circuit Pre-Test **27 & 38**

Prior to applying dangerous voltages to an asset (Insulation test and Operation Test) a basic Circuit Test is performed. This is not reported unless a potential problem exists. A d.c. continuity test is applied between L and N. This is to check for an Open Circuit

(fuse blown or appliance not switched ON), or a Short Circuit (indication of possible SC fault on an inductive load, e.g. motors, transformers).

### Multiple Earth Tests **37**

Should the Bond or Continuity test fail, further options are available. A simple re-test, if the lead connection was poor and the clip needed a 'bit of a waggle' on the asset; Long Lead compensation (see later); or log and record the fail.

Should it pass, a further 2 tests are available to store. This is for an asset that may have several separate pieces of exposed metalwork, which would all require individual testing.

### Long Lead Compensation **37**

If the Bond or Continuity test fails, an option exists to compensate for long supply leads. By pressing 'COMP', the wire size and length can be entered. The PAT4 then calculates the resistance of the lead and deducts this from the measured result.

### Previous Result Comparison **29**

An asterisk in the top left hand corner of the result screen indicates previous results are available. Press the key adjacent to the asterisk and the result will appear on screen to see if the appliance has deteriorated.

### Repair Codes **28**

On conclusion of the test there is an option to add a 3-digit Repair Code. This is optional (press 'OK' to proceed through without entering a code), and User Designated. A list of suggested codes and further explanation exists in the User Guide.

### Uploading **35**

When uploading data from a PC to a PAT4 remember that any existing data in the PAT4 will be completely deleted first. Always back data held in the PAT4 to a PC. Better safe than sorry!

## Database structure.

To help in the overall understanding of the way the PAT4 works, it is worth considering how data is stored and managed within the Database

