LESSON 1

THE COMPUTER WORKSHOP

Aim
To establish a computer repair workshop.

TOOLS
1. The Basics
For basic computer servicing you need the following tools:
Basic hand tools
There are various 'computer tool kits' on the market, which are designed to provide the equipment needed by a technician. They are primarily intended to provide equipment needed to assemble or disassemble a computer and/or peripherals. They may or may not also include other equipment. Cost, range of tools, and the quality of equipment can vary a great deal.
The most basic equipment may include:
- **Socket spanners** (2 or more different sizes)
- **Standard screw drivers** – You will require one small and one large flat bladed screwdriver. Most cases are held together with Phillips screws with a slot across to accommodate flat bladed screwdrivers but some are now being fitted with security screws that require special screwdrivers. Check before setting off for a site visit.
- **Phillips head screw drivers** – Small Philips screwdrivers for power supplies, interface cards and hard and floppy disk mountings will also be required.
- **Long nosed pliers**
- **Wire cutter/stripper**
- **Chip extractor** – Special types are available for processor and chip removal to help to prevent accidental damage. The legs of a chip are particularly fragile.
- **Chip inserter**
- **Tweezers** – Extremely useful when small parts are dropped in inaccessible places.
- **Parts grabbers (claw type)**
- **Torx drivers** – These are used to remove the star shaped screw heads found on many Compaq machines.
- **Clamps**
- **A flashlight and magnifying glass** – To look under motherboards and in dark parts of the PC case and to make markings on the motherboard easier to view.
- **A small plastic container** – For keeping, screws, nuts and retaining straps etc.

Some more essential tools will be:

A Digital multi meter
This is used for testing power supply voltages and cable connectivity. Many trouble shooting procedures require voltage and resistance to be tested. Values are measured using a hand held multi meter. The meter may have an analog or a digital (LCD) read out and will use a pair of probes to connect to the device being tested.

Cleaning equipment and materials
Eg. Contact cleaning chemicals, compressed air, bristle brush, hand vacuum cleaner

Wrap plugs
These are used to diagnose serial and parallel port problems

Software for testing/diagnosing components in a system

Diagnostics hardware for testing components in a system

Anti static wrist band, mats and anti static bags Damage can be caused to circuit boards by static discharge therefore anti static equipment is vital. Spare PC components should always be stored in protective anti static bags, such as those used y manufacturers to supply interface cards.

2. Advanced requirements
The following equipment is more specialised, not required so frequently, but nevertheless useful:

- Specialised hand tools
- Pin grid array (PGA)
- Plastic leaded chip carrier (PLCC)
- Chip removal tools
- The importance of these tools cannot be overstated. If you try to pull out a processor chip without one of these tools, you are going to damage some expensive equipment.
- Soldering tools
- Soldering iron

Logic probes and pulsers
These are used to analyse and test digital circuits.

Power supply testing equipment
Variable voltage transformers
Load testers

Memory testing machines
These may be used to evaluate the operation of computer chips, memory modules etc.

Oscilloscopes
These can be used to accurately display digital and analog signals, to analyse their purity and timing.

ESD kit
This is an electrostatic discharge protection kit.

GUIDELINES FOR USING BASIC TOOLS
Electrical safety
Voltages used for domestic power supplies vary between 110 and 240V, Sufficient to give a serious electric shock. Display equipment such as computer monitors generate and store voltages of up o 30,000 volts (30KV). These voltages can be present even when the equipment has been equipment has been switched off for some time.

- It is vital that basic electrical safety guidelines are followed at all times when working on electrical equipment. In conjunction with any additional formal instructions, the following should always be noted.
- Do not work with electrical equipment unless you know what you are doing are sure of the consequences.
- Remove all the jewellery while working on electrical equipment.

- Beware of building up and static electricity or electro magnetic energy -insulate, be cautious...etc.
- Use extreme care when applying any of the above tools. In general most adjustments will not have to be forced.
- Use the right tool for the right job, don't bend or damage parts
- Use chip extraction or insertion tools to handle chips, and be cautious not to bend any pins on a chip.
- Always replace blown fuses with one of the correct rating and always check that the existing fuse was rated correctly.
- Never work alone – there should be always someone nearby to assist in an emergency.

SOLDERING

There will be occasions when a soldering iron will be necessary to fix a broken wire or similar problem on a circuit board. Not all boards are the same design wise, soldering on the motherboard should be minimal and then only on components that can be pulled through. Never throw out old motherboards as these will be ideal to practice upon.

In general, only those experienced in using a soldering iron should use this tool on a computer. The actual soldering iron will need to be specially selected, no more than 25 watts as hotter irons will cause damage to other components.

A solder sucker will allow more precision as well as quicker working speed. All it does is keep the area being worked upon clean of hot solder when dismantling pieces.

USING AN ELECTRICIAN

It may be illegal to tamper with the electrical system of a building. It may however be that problems in the electrical system may be the source of problems in a computer.

Be aware of how far you can go....legally!

The Computer workshop

When first establishing a computer workshop, generally one of the major restricting factors will be cost. Therefore any workshop will need to be cost efficient, whether it is owned or leased. It should be large enough for uncluttered working and storage area. Most workshops also have at least a minimal display area for new or even 2nd hand product sales. Many computer workshops only have a small front office area for customer pick up and some display. While out the back is work space and storage. This type of workshop should be cheaper to lease than one with a large showroom area.

Some initial research will need to be done to determine the amount of business that might be expected. This will probably dictate size, location and cost of any workshop.

Many computer technicians work from home initially until they feel that they have a sufficient customer base to warrant expansion into a larger site.

Main components of computer shop offering servicing & other facilities
- Counter for sales, security of cash, goods and staff, dealing with customers.
- Sales/service display.
- Workbenches.
- Adequate space and lighting and electricity (including work and storage areas).
- Customer waiting area (optional but very useful)
- Cash register/ credit card facilities.
- Telephone.
- Tools associated with computer repair.

ALSO USEFUL
- Computer and printer for business applications.
- Photocopying machine.
- Lunch and Tea-room facilities.

Workshop layout

The workshop layout must be practical, comfortable and within registered government health and safety standards. One problem that computer workshops seem to be afflicted with is insufficient storage space. Poor layout could result in a cluttered and inefficient workshop. Parts that are being replaced but not discarded, repaired computers whose owners are not in a rush to pick up, new parts that have been ordered can all contribute to this problem. Having good workshop layout as well as good ordering and customer awareness data should alleviate this problem to some extent.

Ensure a workshop is safe.
- install guards on any dangerous equipment (eg. exposed electricity)
- place grates over vents or other exposed holes (eg. floor drains which may tripped you)
- install non-slip surfaces where necessary
- set procedures (eg. only trained, competent and authorised staff allowed to use or repair machinery or equipment)
- provide a 'kill switch' (instant shut-off) on dangerous equipment

Always assume electrical systems are 'alive '. Test and tag electrical systems.

TOOL MAINTENANCE

Looking after your tools is very important to safety! If you look after them then they are reliable. Tools in good condition will perform in a predictable fashion.

Some simple reminders are listed below:

1. Metal

Metal tools may corrode. To prevent rust or corrosion metal either needs painting with a good metal primer, or regular coating with oil (After using, clean and wipe metal parts with an oily rag).

2. Sharpening

Some tools need to be sharp. Keeping your tools sharp usually means less effort is required to use them, so less strain is applied, and you are less likely to slip.

3. Cleaning

If tools are kept clean they are less likely to corrode or have moving parts seize. This also reduces the likelihood of microorganisms being carried on tools (and the chances of being infected if you cut yourself). Wiping a knife blade with methylated spirits can be an effective way of destroying any microorganisms.

4. Storing

Keeping your tools stored properly means they are less likely to be damaged, lost or stolen. They can also be found more easily when required, saving time.

Tools left lying around can also be dangerous, particularly if you have young children, or they can be used by burglars to break into your house, garage, sheds etc.

MANAGING THE WORKSHOP

Charging/pricing

The computer industry is an extremely cut throat business as far as pricing goes. Due to a never ending of newer and updated technology, many computer components are quickly out of date and therefore useless if not sold on during their heyday. State of the art components may only fall into that category for as little as 1 - 3 months before they are superseded. It is pointless and bad business to have stock that will not be used laying about the workshop. Order stock only when necessary.

Charging for computer repair is another area of the computer industry which needs to be approached carefully. Often older machines will not warrant repair but could possibly be upgraded. Customers should be made aware of their options when they approach you with a problem. All costs involved should be explained and itemised. This is simply good customer relations and conveys a sense of professionalism to your customers.

Remember computers are still somewhat mysterious and misunderstood machines by large sections of the population.

RECORD KEEPING

Good record keeping is simply good business sense. All transactions, repairs undertaken and parts ordered must be put on record. Apart from enabling financial planning for the future it also means less headaches at tax time. It allows you to chart the progress of the business and to change those areas that are lacking or unnecessary. If you do not feel comfortable with record keeping then you could either enrol in a short course or hire a professional to do this for you.

FINANCIAL RECORDS

It is extremely important to keep accurate, clear and accessible records of all financial transactions which take place in a business. Different businesses have different types of book keeping systems. The options are very great. A balance must be struck though where you decide between a system which gives you the detail you require and one which doesn't take too much time to maintain.

Financial records are needed because:
They help you manage your finances
 You can make decisions about what something is likely to cost in the future by seeing what it cost in the past.
They allow you to see whether your business is making a profit or loss.
They give you a basis upon which you can calculate what you will charge your customers.
They allow you to prepare and submit you tax returns.
They are legally required by government.

THE SIMPLEST APPROACH

Many small businesses do little more than keeping a record of money spent in their cheque book (and all spending is deliberately channelled through the cheque book); and keeping a record of payments received in their pay in bank book. At the end of each financial year, these records are given to their accountant, who then prepares their taxation return and any other necessary financial records (such as a balance sheet or profit and loss statement). There is nothing wrong with this approach, though something better is generally desirable.

Work scheduling

It is important when beginning a business to give your customers the very best service that you possibly can. New customers who have not dealt with you before will be watching for signs of tardiness, inattention, sloppiness of work etc..., they will also be quick to relate to others excellence of service and genuineness. **Word of Mouth** advertising is priceless and should never be underestimated. It is for these reasons that work scheduling is important. Work out approximately how much time standard repairs will take, include diagnosis, dismantling, repair and reassembly.

DO NOT over book either yourself or your workers as this will result in mistakes, repairs that are brought back, and time and money wasted.

The following notes apply to work scheduling in an organisation of considerable size with a number of employees involved. The basic premises however can be applied to businesses of any size including a small workshop operation.

Before planning can commence, you need to know:
- Details of all major programs which might affect decisions which may be made. (ie: budgets, costs, resources etc).
- Policies of the organization. (Work schedules are confined by such policies, which might include not working Sundays for instance.)
- Expectations from management. (What amount of work is expected from this section)
- Planning a work schedule involves a similar process to the problem solving technique:

Step 1.   Define objectives, goals, tasks to be achieved.

Step 2.   Put forward several alternative courses of action.

Step 3.   Make a decision which of the alternative courses of action will give the best result.

Step 4.   Put the chosen plan into action.

THE FOLLOWING CRITERIA NEED TO BE CONSIDERED WHEN MAKING DECISIONS ABOUT WORK SCHEDULES.....
(These are the things to think about when trying to decide which of your alternative courses to select and follow)

Major programs
Details of any major programs which relate to work tasks should be known so planning dovetails into the larger project.

Area of discretion
Must know terms, policies, limitations set down by management
(eg: If there are strict safety procedures, these must be accounted for when allocating time and resources to a certain job).

Forming a routine
All jobs need to be reduced to routine, practical steps.

Feasibility
If a course of action is not feasible, then it cannot be adopted.

Commitment
Courses of action must be consistent with current & future commitments.
Resources cannot be changed if they have already been allocated (eg: If you have five men in your charge & three are involved with routine maintenance work, it is wrong for you to allocate more than 2 to extraordinary work).

Cost-benefit
Generally speaking, the least costly course of action is preferred (given that the benefit from each alternative being considered would be the same)
If one course returns greater benefit than the others, that is to be preferred.

Credibility
The course of action selected must be acceptable to bot your superiors and the workers you are in charge of. If a course of action lacks credibility it should be discarded.

Uncertainty
There should be minimum risk in any course of action which is selected. If there are things which you cannot be sure about (eg: whether materials will be available on time), then that alternative should be discarded.

A work sheet such as the one below can be used to compare alternative courses of action and help with making a decision.

WORKSHEET FOR PLANNING A WORK SCHEDULE

Task	Alternative 1	Alternative 2	Alternative 3
Material Equipment Supplies	What is Needed	Why That Much?	Would others do?
Machines & Workplaces	What work must be done?	Why There?	Anywhere Else?
Sequence of Work Tasks	When must job be done	Why then	Any Alternatives?
Method of Work	How should tasks be done?	Why that way?	Any Alternatives?
Numbers & type of Employees	Who should do the job?	Why them?	Who else?

EXAMPLE ONLY:
REPAIR ESTIMATE FORM

Client Name: Mr. J. Smith
Project: Video Card Repair/ IBM-comp 386 dx40
Department: Workshop

Component: Find problem and solve		Supervisor's name: B. Brown		
LABOUR		**MATERIAL**		
Job title	No of hours reqd	Description	Quantity	Value($)
Technician	1	1-2	Probably needs 1 X 512k	$150
$15/hr		new v/card	@ $120	

	ASSIGNMENT
	Download and do the assignment called 'Lesson 1 Assignment'.

Note: Although these assignments are not necessary to complete the course, you will need to submit them and get them marked if you wish to obtain an official letter of completion from Australian Correspondence Schools.

Please submit your assignments via the main menu by clicking on 'Submit Assignment'. Your assignments can be in any word processor format (such as word, works, etc).