~ELECTRONIC DESIGN & MANUFACTURE ~

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Technical resources for the after sales service of Pakton products

Scope:

This document is intended for technicians who provide after sales service and repairs to Pakton products.

Contents:

- Disclaimer
- What technical information is available on Pakton products
- Technical expertise requirements
- Terminology and Basic test methods as used in repair charts

Disclaimer

Electrical appliance repairs can be dangerous and should only be carried out by suitably qualified persons. If in doubt seek advice from your local electrical safety authority. Pakton Technologies will not be responsible for damages or injuries caused by the use or misuse of this information.

Technical information

The following information is available to approved repair agents. The release of some of this information may require the signing of a Non Disclosure Agreement.

The following documents are available from Pakton, request this by email:

- Schematics
- Schematic descriptions
- Component overlays
- Bill of Materials
- Repair charts
- Technical Bulletins

The following resources are available on line:

- Manuals – See http://www.pakton.com.au/support.php
- Component specifications – See http://pakton.net/docsSecure/.datasheets.php

Good repair procedure

The basis of good electronics repair is the scientific method.

- Observe the symptoms (gather facts)
- Form a theory (based on the known facts)
- Test the theory

Continue around this loop until you prove a theory and repair the appliance.

It is poor repair procedure to randomly replace components in the hope of finding the bad one.

Divide and conquer. If there is a method of cutting a problem in halve, use it. For example if a supply rail is low it could be a problem with the regulator (source) or it could be overloaded (load). By cutting the track between the supply and the load you can split the problem up and make it much easier to solve.

Compare to a known good. Taking the same measurement on a known good board can quickly confirm whether that component is really bad, before you remove it from the PCB.

Write it down. Write down the facts, form a theory. There is no such thing as black magic, and Ohms law always applies.

Walk away. Do not sit banging your head against a brick wall for too long. Put it aside, talk to someone about it, it does not matter if they do not even understand electronics, it may help you to talk it through.

Single fault assumption. If the appliance used to work properly, and now it does not. Logically and statistically it should only have one fault. Avoid theories that involve more than one fault ***unless*** there has been a lightning or similar surge, or someone else has worked on it before you. It is possible, of course for one component failure to cause another in succession.

Lightning damage. Diode test every semiconductor, if you find most are dead then the unit is probably beyond economic repair.

Moisture Damage. Clean and dry the PCB first. If you find fine tracks are corroded completely away then this unit is probably beyond economic repair.

Arc Corrosion. If there has been any prolonged arcing inside the appliance enclosure you will see degradation of plastics as if they have been under ultraviolet light and corrosion of some metals as if it has been sprayed with acid. This unit is probably beyond economic repair.

"It doesn't work". This is not a useful explanation of a fault. Get more information, preferably from the owner.

Intermittent faults. These can be very difficult. Think about ways of making the fault occur. Heat (hair dryer), spray freeze and vibration are possible methods. Look for bad or cracked solder joints or "head on pillow" with surface mount devices.

Test Charts

These are available from Pakton

Terminology

- Basic Level (Repair Chart) – Repairs which can be done without a schematic or CRO. Basic level assumes the minimum set of tools and equipment as specified in the repair chart. We do not expect people at this level to be looking at the debug data stream.
- DMM or DVM - Digital Multi-meter. I.e, Fluke 17b.

Test Methods (Basic)

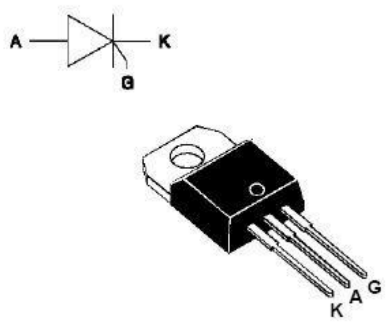
- *Measure AC Voltage*. Set the DVM to measure AC voltage function to Ṽ. Make sure the range setting is higher than the expected voltage. Unless other stated this means to use place the red lead (probe) at the requested point to measure (i.e. mains input) and the black lead to the ground or neutral inputs. For more information click on this link.
- *Measure DC Voltage*. Set the DVM to measure DC voltage or V⎓. Unless other stated this means to use a DVM to measure the actual DC voltage at the point i.e. pin 1 of IC1 with respect to ground. I.e. place the negative lead of the voltmeter on circuit board earth, ground plane or neutral inputs. For more information click on this link.
- *Measure maximum DC voltage.* This is required to check the charge voltage on capacitors. It requires a multimeter with a MIN,MAX function. Measure DC Voltage as above and press the MIN,MAX button until MAX is shown on the screen.
- *Diode Test.* Set the DVM to diode test function labelled '—▶|—'. Connect the red lead to the Anode and the black lead to the cathode (the end with the stripe or K). The DMM should read between 0.5 and 0.8 for working silicon diodes. When swapped it should read high (open circuit). For more information click on this link.
- *Diode Test a NPN type Bipolar transistor*. To test a NPN BJT transistor, connect the red probe to the base. There should be between 0.5 and 0.8 when the black probe is on the collector. Same for the emitter. When swapped it should read high (open circuit). Swap red and black for PNP type.
- *Diode Test a MOSFET*, In-circuit. Set the DVM to diode test function as above. Connect the red lead to the Drain (metal top tab) and the black to the Source (right side lead). It

should not read short circuit, the actual reading depends on the PCB. Reverse the red and black leads and it should read between 0.5 and 0.8V as per a diode.

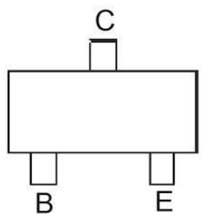
- Diode Test an SCR, In-circuit. Set the DVM to diode test function as above. Connect the red lead to the Anode (metal top tab) and the black to the Cathode (left side lead). It should not read short circuit, the actual reading depends on the PCB.
- Resistance Test an SCR, In-circuit. Set the DVM to resistance or diode test function. Connect the red lead to the Gate (right side lead) and the black to the Cathode (left side lead). It should read low, but not short circuit. The actual reading depends on the SCR and the PCB. Compare with a working unit.
- **Continuity Test.** Switch your DMM to resistance, 'Ω ' or . Place the leads on either end of the component, fuse or track you wish to test. Continuity (short circuit) - will beep or read low. No continuity (open circuit) - will not beep and will show overload OL. For more information click on this link.
- *Measure Resistance.* Switch your DMM to resistance Ω. Place the leads on either end of the component, fuse or track you wish to test. For more information click on this link.
- *Measure Capacitance*. Switch your DMM to capacitance. Place the leads on either end of the component you wish to test. For more information click on this link. Usually done with the component out of the PCB. In-circuit test readings are sometimes possible, but rarely accurate.
- *In-circuit test*. This means to measure (resistance, capacitance or Diode check) without removing the component from the PCB. It is only possible in certain situations and the reading may differ from that measure when the component is removed.
- *Lift one end.* When an In circuit test is not possible you may remove one lead of a two leaded component (such as a resistor or diode) from the PCB. A measurement done with one lead isolated is the same as measuring the component removed from the PCB.
- *Lift a pin*. On some surface mount IC's it is possible (with due care and fine instruments) to melt the solder and lift a leg.
- Cut track. It is sometimes necessary to cut a copper trace in order to check to find which component is causing a power rail to be over loaded. The track (or trace) is cut with a fine blade to cause an open circuit. You can re-connect it using solder and or a fine copper wire.
- *Discharge Capacitor.* Use a 10 W wire wound resistor of approximately 500 Ohms to discharge all capacitors. Soldering leads and probes or alligator clips to the resistor will help make this safe to use.

Common component pins

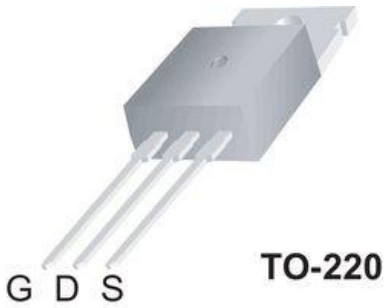
These pinout diagrams will help identify the leads of some of the components used.



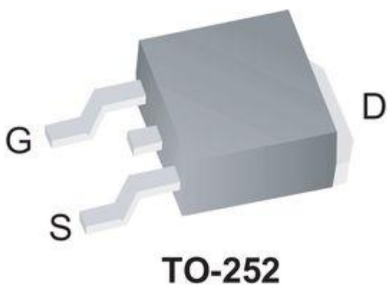
TO-220 or TO-247 SCR



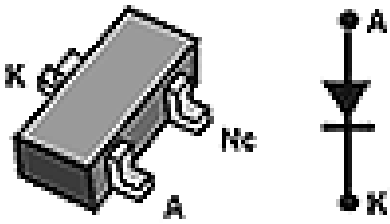
SOT23 Bi-polar transistor



MOSFET



Surface mount MOSFET


K
Nc
A
A
K