

The Electrical Fault-Finding Pack

Battery, charging, starter, fuses and wiring, in the order that finds the fault cheapest first. Four sheets and a meter.

Four sheets and a multimeter, ordered so that everything free comes before everything that has to be bought.

NOTHING IN THIS PACK WILL TELL YOU TO FIND THE YELLOW WIRE

There is no universal wiring colour standard on these machines. Owners describe loom colours varying between machines of the same brand and model, and the circulating charts contradict each other. Every branch in this pack therefore ends at something you measured or observed: voltage present or absent, continuity or open circuit, a reading that changes when the key turns or one that does not.

WHAT IS IN THIS PACK

01 Battery And Charging System Test Record

TSP-EL-02

Three voltage readings diagnose most electrical faults on these machines. Two thresholds are sourced; the rest is direction of change.

02 It Clicks But Will Not Turn

TSP-EL-03

One mechanical check first, then three electrical ones. The click itself tells you more than most people realise.

03 Fuse And Circuit Record

TSP-EL-04

What fuse protects what, on a machine whose wiring diagram does not match anybody else's. Plus the blade fuse colours, from the manufacturers' datasheets.

04 Wiring Trace And Continuity Notes

TSP-EL-01

There is no universal wiring colour standard on these machines. This sheet records the one your machine actually uses.

PRINT THIS AT ACTUAL SIZE

Several sheets in this pack carry scales, rings and bars printed at true size that you lay a part against. Those are only correct if the pack is printed at 100%. In the print dialog choose "Actual size" or "100%", not "Fit to page". Each sheet that needs it carries its own millimetre rule — check one with a steel rule before you trust any dimension in the pack.

FREE TO PRINT, COPY AND PASS ON

This pack costs nothing and always will. Print it, photocopy it, hand it to somebody in a club or a forum, leave a copy in a workshop. If you find a mistake in it, tell us and it gets corrected — every sheet carries a document number and a version so you can say exactly which one you mean.

BATTERY AND CHARGING SYSTEM TEST RECORD

BATTERIES AND METERS

A lead-acid battery gives off hydrogen and contains acid. Charge it in a ventilated place, keep sparks away from it, and do not lean over one that is charging. When measuring current, the meter must be in series and set to amps — putting a meter set to amps across a battery will destroy the meter and may destroy more than that.

READING ONE — RESTED VOLTAGE

Rested voltage on a 12V lead-acid battery. Rested means no load and no charge for several hours — a reading taken straight after riding or charging is meaningless.

RESTED VOLTAGE	WHAT IT MEANS	WHAT TO DO
12.6 – 12.7 V or above	Fully charged	The battery is not your fault. Look elsewhere
Below about 12.4 V	Not fully charged	Recharge fully before drawing any conclusion from it
Recovers on a charger, then falls again	Something is draining it, or it will not hold	Do the parasitic draw test overleaf
Will not reach 12.4 V on a charger	The battery itself is finished	Replace it before diagnosing anything else

WHY THIS TABLE HAS FOUR ROWS AND NOT TEN

You will find charts giving a voltage for every twenty-five per cent of charge. They contradict each other, and when we traced one back to a battery manufacturer only the fully-charged row was an open-circuit figure — the rest were measured under load, which makes them depend on how much current is being drawn. So this sheet prints the two thresholds that are defensible and leaves the rest out. A battery that reads full and still will not crank is a connection problem, not a charge problem.

RESTED VOLTAGE

HOURS SINCE LAST RUN OR CHARGE

DATE

 V

READING TWO — IS IT CHARGING?

Measure DC volts at the battery terminals, engine off, then again with the engine running and revved. What matters is the direction of change, not any particular number.

WHAT THE METER DOES	WHAT THAT TELLS YOU
Does not rise at all when revved	Nothing is charging. The fault is in the stator, the regulator/rectifier or the wiring between them and the battery
Rises clearly above the engine-off reading, then levels off	The charging system is producing and the regulator is regulating
Keeps climbing well past 15 V	The regulator is not regulating. Stop — this destroys batteries and blows bulbs

WHY NO TARGET VOLTAGE IS PRINTED HERE

Sources for these machines disagree with each other, and we found two figures quoted inside a single discussion thread. Many of these systems will not fully charge at idle at all, which makes an idle figure meaningless. The three observations above need no reference number to be useful, which is why they are what this sheet asks for. Corroborating signs of overcharging: a battery that gets hot, vents or smells of sulphur, and bulbs that keep blowing.

ENGINE OFF

 V

RUNNING, IDLE

 V

RUNNING, REVVED

 V

READING THREE — IS SOMETHING DRAINING IT?

THE PARASITIC DRAW TEST

Key off, everything off. Disconnect the negative battery lead and put a multimeter set to amps in series between the lead and the terminal, so all the current has to flow through the meter. The 49ccScoot FAQ gives up to 50 milliamps as acceptable. Above that, unplug suspects one at a time and watch the reading fall — an aftermarket or factory alarm is the first thing to try, then anything with a lit switch, then a stereo.

WHAT WAS UNPLUGGED	DRAW BEFORE MA	DRAW AFTER MA	CULPRIT?

THE CHECKS THAT COST NOTHING

- ☐ Battery terminals clean, bright and tight enough not to twist by hand
- ☐ Engine-to-frame earth strap present, tight and not corroded through
- ☐ No lights, alarm or accessory left live with the key off
- ☐ Battery case not swollen, cracked or weeping
- ☐ Battery not hot after a run
Heat and a sulphur smell point at overcharging
- ☐ Bulbs are not blowing repeatedly
Another overcharging sign
- ☐ Fuse and fuse holder not discoloured by heat

RUNNING RECORD

DATE	RESTED V	REVVED V	DRAW MA	WHAT YOU CONCLUDED AND DID

DATE	RESTED V	REVVED V	DRAW MA	WHAT YOU CONCLUDED AND DID

WRITE DOWN WHAT YOU SAW, NOT WHAT YOU CONCLUDED

Every box on this sheet asks for an observation. That is deliberate: the observation is recoverable later and the conclusion is not. “Plug dry after six attempts” is still useful in a month. “Fuel problem” is not, because you will not remember what made you think so.

IT CLICKS BUT WILL NOT TURN

BEFORE ANY OF THIS

Bridging a solenoid draws a very large current and will spark. Do it with the machine secure and stable, with no fuel leaking anywhere near, using insulated tools, and with your face away from the terminal. If you are not comfortable with that, this is the right point to hand it to somebody who is.

1 Does the engine turn freely on the kickstart, or by turning the rear wheel with the machine off the ground?

YES The engine is free. The fault is electrical — go on.

NO STOP. The engine cannot turn, and the starter is not the problem. A seized engine, a hydraulicked cylinder or a jammed starter drive will all do this. Pressing the button again risks damaging the starter or the ring gear.

↓ still not solved — go on

2 At the moment of the click, do the lights collapse or dim heavily?

YES The supply is being pulled down. That is a battery, a cable or a connection — not the starter motor. Go to the battery and earth checks.

NO The lights hold up. The heavy current path is not collapsing, so the fault is further along. Go on.

↓ still not solved — go on

3 Are the battery terminals and the engine-to-frame earth strap clean, bright and tight?

YES Connections look sound. Note that you checked both — the earth strap is the one people skip and the one that usually fails.

NO Clean them back to bright metal and retest before going further. A corroded earth produces exactly this symptom and costs nothing to fix.

↓ still not solved — go on

4 Bridging the solenoid's two large terminals with a heavy insulated conductor, does the starter spin?

YES The starter and its heavy cabling are fine. The fault is the solenoid itself or the small trigger circuit feeding it.

NO Still nothing. The fault is between the solenoid and the starter, or in the starter itself. Go on.

↓ still not solved — go on

5 Feeding the starter's terminal directly from the battery positive, does it spin?

YES The starter is alive. The fault is in the cabling or the solenoid between the battery and it.

NO The starter does not respond to a direct feed with a good earth. That is the point at which the starter itself is genuinely a candidate — and the first time on this sheet that it has been.

RECORD WHAT YOU FOUND

STEP	WHAT YOU OBSERVED	RESULT

BATTERY RESTED VOLTAGE

V

VOLTAGE WHILE PRESSING THE BUTTON

V

ENGINE TURNS BY HAND?

ABOUT JUMP-STARTING
Owners who do this successfully specify jumping from a car with its engine NOT running. A running car's charging system produces far more than a small scooter's electrics are built for, and the regulator, the lights and the battery can all suffer. If you jump it, jump it from a static battery.

WHAT YOU CHANGED, AND WHAT HAPPENED

FUSE AND CIRCUIT RECORD

BATTERY OFF BEFORE YOU START

Disconnect the negative battery lead before removing or inspecting fuses, except during the mapping exercise below, which by its nature has to be done with the key on. During mapping, do not touch anything but the fuses.

BLADE FUSE RATINGS AND COLOURS

Blade fuse colours, from the manufacturers' own datasheets. Ratings above 25A are omitted because we could not verify their colours to a datasheet — read the number stamped on top.

RATING	COLOUR	RATING	COLOUR
1 A	Black	7.5 A	Brown
2 A	Grey	10 A	Red
3 A	Violet	15 A	Blue
4 A	Pink	20 A	Yellow
5 A	Tan	25 A	Clear / natural

THE COLOUR IS A CROSS-CHECK, NEVER THE AUTHORITY

The rating is stamped on the top of the fuse and that is what counts. The colour code is shared across the standard ATO/ATC size and the smaller MINI size, but they are different families and not interchangeable in a holder — check the body size as well as the number. A fuse of the wrong rating fitted by a previous owner is exactly the fault you are hunting, and it will look perfectly normal until you read it.

MAPPING YOUR OWN CIRCUITS

1. Key on, engine off. Switch on the lights, and have somebody watch or use a mirror.
2. Pull one fuse. Note everything that stops working: lights, indicators, horn, dash, fuel gauge.
3. Try the starter button as well — some circuits only reveal themselves under that load.
4. Refit that fuse before pulling the next one, so you are only ever testing one at a time.
5. Write it on the map below and leave the sheet with the machine.

FUSE POSITION	RATING STAMPED ON IT	COLOUR	WHAT STOPPED WORKING WHEN PULLED

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WHEN A FUSE KEEPS BLOWING

A FUSE THAT BLOWS AGAIN IS TELLING YOU SOMETHING

Never fit a larger fuse to stop one blowing, and never bridge a holder with foil or wire. The fuse is the cheapest component in the circuit and it is failing on purpose. A fuse that blows immediately points at a short to earth; one that blows after a few minutes points at something drawing more than it should as it warms up.

How quickly it blows narrows the fault

WHEN IT BLOWS	WHAT THAT SUGGESTS
Instantly, every time	A direct short to earth. Look for chafed insulation where the loom passes a frame edge or moves with the steering
After a few minutes of running	Something drawing more current as it warms — a failing component rather than a dead short
Only when a particular switch is used	The fault is in that branch. The mapping table above tells you which
Only over bumps or when the bars are turned	An intermittent short caused by movement. Follow the loom where it flexes

WHICH FUSE BLOWS	HOW QUICKLY	WHAT IS BEING USED WHEN IT DOES

WHERE TO LOOK FOR A SHORT

- ☐ Where the loom passes through the frame or over a sharp edge
- ☐ Behind the headlight, where the loom flexes with the steering
- ☐ At the swingarm or engine, where the loom moves with the suspension
- ☐ Any connector that has been apart before and may be mis-pinned
- ☐ Any aftermarket accessory, alarm or added wiring
Start here on a machine that has been modified
- ☐ Corrosion inside a multi-pin block, which is invisible while it is connected

THERE IS NO WIRING COLOUR STANDARD ON THESE MACHINES

This is not a gap in our research — it is the finding. Experienced owners describe factory loom colours as varying between machines of the same brand and the same model, and every widely circulated colour chart we examined disagrees with at least one other. So no branch on this sheet will ever tell you to find the yellow wire. Every step ends at something you measured: voltage present or absent, continuity or open circuit, changes when the key turns or does not.

WHAT YOU FOUND

WIRING TRACE AND CONTINUITY NOTES

THERE IS NO UNIVERSAL COLOUR CODE, AND ANY CHART CLAIMING OTHERWISE IS GUESSING

Colours are broadly consistent within a factory and not at all consistent between factories. Every widely circulated “GY6 colour code” chart we have examined disagrees with at least one other. Use a meter, not a chart. Where a colour convention does hold on your machine you will discover it as you work, and this sheet is where you write it down.

BEFORE YOU START

Petrol vapour ignites, batteries produce hydrogen, and a machine on a stand can fall. Work outdoors or with the door open, keep ignition sources away from the fuel system, disconnect the battery before touching wiring, and never run an engine in a closed space. This sheet helps you observe and record. It is not a repair manual and it does not know your machine.

METER TECHNIQUE, BRIEFLY

Continuity

Battery disconnected. Meter on the continuity or lowest resistance range. Probe both ends of a wire: near zero means the wire is intact, open means it is broken somewhere between your probes.

Voltage

Battery connected. Meter on DC volts. Black probe to a known good earth, red probe to the point of interest. Measure at the component end, not at the fuse — the whole point is to find the drop between them.

WIRE BY WIRE

[illegible]

COLOUR	FROM (COMPONENT / CONNECTOR / PIN)	TO	CONTINUITY	VOLTS	NOTES

CONNECTOR MAPS

Draw each multi-pin connector as you look into its face, and label every pin with its wire colour. Note which half you are drawing — the loom side and the component side are mirror images of one another, and that is the single easiest way to wire something backwards.

CONNECTOR A

Where it is / loom or component side:

CONNECTOR B

Where it is / loom or component side:

CONNECTOR C

Where it is / loom or component side:

CONNECTOR D

Where it is / loom or component side:

FAULTS FOUND

Need to work out what you actually own?

The Scooter Parts Registry is a free public record of the Chinese factories behind US-market scooters, ATVs and go-karts — brand, engine family, VIN prefix, factory and related machines. No account, no email.

thescooterparts.com/identify