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REF: General-MSR 01

Basic Troubleshooting

Troubleshooting is a matter of knowledge, observation, evaluation & response.

- You need to know how something is suppose to work.
- Then you observe what is currently happening, doing tests as necessary.
- Then you evaluate how 'what is currently happening' is different from 'what is suppose to happen'.
- Then you create a theory of why that is happening.
- Then you respond by altering what you think is wrong.

If your knowledge, observation, evaluation & response were all correct, you've solved the problem. If not, you must repeat some portion of the process, perhaps changing your theory of why that is happening.

Sometimes, troubleshooting is frustrating. You need to be:

- Calm & Patient
- Accurate & Methodical
- Logical & Thorough

The most common cause of frustration is jumping to (wrong) conclusions. You hear it or see it, make a snap decision of the problem and then focus all your attention on that assumption. As Hippysmack points out, you need to detach yourself from what you think, or believe so strongly in, so you can strictly focus on what you can prove.

> You filled it full of oil last week so it couldn't have been too low, so you didn't recheck that. But, a day after filling it with oil, your friend, riding on the back, burnt their leg or foot on the exhaust, went berserk, and unknowingly, kicked the oil line, damaging or kinking it on that long trip.

When you believe that anything could have happened to it, you stand a better chance of diagnosing the problem.

If you are asking for help (like at XLForum.net), then be explicit about what you had been doing on the bike before the problem occured. Communicate what happened as the problem showed up. If you had done some diagnostic checking, what EXACTLY did you do and what EXACTLY were the results. Be thorough - give as much information as you can so folks who respond to your request for help can do some analysis of the information.

Remember, you are the one onsite - You must be the eyes, ears & hands - But you must accurately, thoroughly, communicate the facts to the remote helpers - If you have some ideas or comments, post those in a separate paragraph from the actual tests & results so as not to confuse assumptions or theories with the known facts.

Video (or pics in other cases) is very helpful, especially once a 'problem' is seen by the forum as unusual

- We diagnose problems based on what we know, what we are told and what theory says should happen.

We generally suggest doing certain tests because we have found the results to be important indicators of where to look for the source of the problems. Often times, the original poster (with the problem) doesn't understand why we're asking a certain question or when given a list, simply overlooks EACH and EVERY test check suggested. But, in most cases, EACH and EVERY test was intended to produce usable information toward a solution.

Take one test and follow it thru to completion - AND ACCURATELY REPORT THE RESULTS so others know the facts. Jumping around between different tests, intermixing the test results in your report or only doing part of a test can all create more confusion and prevent getting to a solution.

Long-distance diagnostics requires lots of accurate and specific information so that 'WE SEE' what you see - and maybe see what you don't see. And that is where having a video (or pics) of 'the problem' can be evaluated & assessed for help from afar. The perception may be the same as you had, but it might also be perceived quite differently because of other's experiences and knowledge, even though they are remotely located, trying to assess what is actually happening and why.

Be Patient, Be Accurate, Be Methodical & Be Thorough.

First Things First

Here are some succinct rules posted by Ryder Rick:[1)]

- Rule# 1 don't work on the fuel system for an electrical problem!
- Rule# 2 don't work on the electrics for a fuel problem!
- Rule# 3 don't change parts to fix something until you diagnose the problem. Don't get out the parts shotgun.

Get a factory service and parts manual and learn to fix your own bike.
… If you go swapping parts and fiddling with everything, you increase the likelihood of introducing more problems.
… Check for spark, check for fuel.
… Changing parts is a last resort.

- Rule# 4 never go on test rides without a handful of tools.
    - TOOLS are like a magic talisman - if you carry them, you rarely need them.
- Rule# 5 never go on test rides without a cell phone in your pocket.

Starter Won't Turn Over

The place to start with any electrical problem is to make sure the battery is in good shape & your ground connections are solid. Go to this section of the Sportsterpedia and Verify Voltages & Grounds. If all that checks out, then return here to follow the rest of these tests.

If the engine/starter will not turn over at all and you have verified both voltage & grounds are good, then you need to trace the voltage to the starter. Use your volt meter on the 20v DC scale and begin checking each of the following points. This is a general overview (for any bike) of the path that power takes to reach the starter motor.

Power must travel from/to the following:

1. Battery
2. Main Fuse/CircuitBreaker
3. Keyswitch
4. Ignition Circuit Fuse/CB
5. Kill Switch (if used)
6. Start Button
7. Starter Relay
8. Starter Solenoid
9. Starter Motor

Obviously, to test at some of these points will require having the Keyswitch ON, the RUN/STOP switch in the RUN Mode and the Start Button pressed.

As a **quick test** to identify what part of the circuit is not getting or passing power, set your meter on 20vDC scale and test for voltage at these easily accessed locations:

- -1- At the Battery
- -2- Incoming to the Main Fuse
- -4- Incoming to the Ignition Fuse (Keyswitch ON)
- -8- Incoming to the Solenoid (Keyswitch, RUN Mode & Start Button)

Once you know which part of the circuit does not have power, you can use the following, **more thorough list**, to check each and every location along the power pathway:

1	**At the Battery**
2	**Incoming to the Main Fuse**
	& Outgoing thru it
3	**Incoming to the Keyswitch**
	& Outgoing thru it
4	**Incoming to the Ignition Fuse**
	& Outgoing thru it
5	**Incoming to the Kill Switch**
	& Outgoing thru it
6	**Incoming to the Start Button**
	& Outgoing thru it

7	**Incoming to the Starter Relay coil**
	& Outgoing from power side of relay
8	**Incoming to the Solenoid**
	& Outgoing from power side to Starter Motor
9	**Incoming to the Starter Motor**

If all these have power, the motor should be turning.

As mentioned in the SP section on Voltages & Grounds, check all grounds in the system:

With keyswitch OFF - Set meter to 20v DC
Clamp RED meter probe to Positive Post of Battery
-Measure Reference Voltage by putting BLACK meter probe
- on Negative Post of Battery - Write down this voltage

Now move the BLACK meter probe to any point on the bike
that should be grounded and the meter should read the same
as the Reference Voltage (battery, post to post).

Test with the BLACK meter probe on the frame, engine,
starter housing, handlebars, etc. Anywhere that should
be grounded should read the same as the Refernce Voltage.\

Basic Diagnosis - Won't Start

As Rick points out, it's a good idea to divide and conquer.[2)]

There are three things required for combustion:
A) Compression
B) Fuel
C) Spark

We can quickly check B & C. These are the more likely suspects if the engine has been running just previously.

If the bike will not start, find out if the problem is fuel or spark related.

The quickest way to tell if the 'No Start' problem is fuel, is to give it a quick shot of 'Starting Fluid'. If it tries to start and runs a second or two, then the problem is likely the fuel supply (somewhere - tank, petcock, carb, etc.). **DO NOT continue to use starting fluid to run the engine.** It will quickly wash the cylinders of oil. One shot should indicate whether the issue is fuel - then track down the exact source of the problem.

If it doesn't try to start with this short shot of fluid, then it is likely missing the spark. You can test for spark by pulling a plug or using a spare. Put the plug in a plug wire, ground the plug to the engine fins,

and crank the engine. Doing this for each spark plug & wire should show a good spark across the gap. Obviously, if no spark, it's not going to fire the engine.

This kind of dividing results can quickly help you direct your attention to the problem area for many types of issues.

For sudden fuel issues, these are functions to check:

- Fuel Tank - Dirt/crud buildup, fuel level, in-tank filter, petcock switching, petcock flow
- Fuel Hose - Clogged, leaking, pinched, inline filter
- Carb - Dirt/crud, float bowl level, inlet elbow, enrichener cable, throttle cables (CV40 Section)
- Manifold - Air Leaks (all three locations)

For sudden electrical issues, these are functions to check:

- Always carefully/thoroughly check battery cables, grounds & voltages (Off,On,Cranking) (BATT/GND Section)
- Every device/connection needs to be checked for Dirt/Crud/Corrosion
- Check all fuses, relays, switches - blown, clicking, intermittent (FUSES/RELAYS Section)
- Starting - Start button, Run/Stop switch, starter relay, solenoid contacts
- Lights - Loose bulbs, broken wire (under fender)
- Instruments - Loose/intermittent connectors

Do a compression test to be sure you don't have a sticking valve or lifter:

- Do a cold test if the engine won't start - otherwise, warm up engine
  - Try a 10-15 minute ride - let engine cool just enough to touch
- Remove Spark Plugs & Air Cleaner - Connect gauge to Front Cylinder
- CRITICAL - Manually Hold Carb Slide Open & Fully Twist Open Throttle
- Crank Engine about 5-7 cycles - Repeat procedure on Rear Cylinder
- Preferred Minimum 883=120psi - 1200=150psi - 2004+ 1200=180psi (cold engine may be lower)
- Having both Cold & Warm Readings can be helpful - Let engine completely cool - Take Reading on Each Cylinder
- Keep a record for later comparison

- It's also worth checking your timing if you are still having issues where that could be the source of the problem - Timing Info.

Where available, always check the Diagnostic Trouble Codes for clues to problem areas.
A basic multimeter is an essential tool for doing electrical diagnostics.

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[1] [2]
https://www.xlforum.net/forum/sportster-motorcycle-forum/sportster-motorcycle-era-specific-and-model-specific/ironhead-sportster-motorcycle-talk-1957-1985/193811-shuts-down-after-30-miles?t=2069931