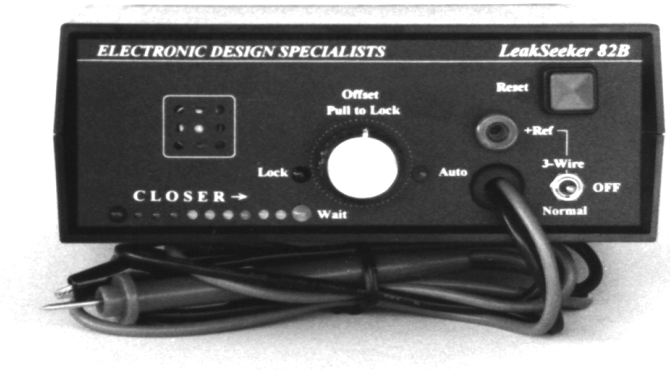
ELECTRONIC DESIGN SPECIALISTS

LeakSeeker 82B OPERATIONS MANUAL

rev 7/99



This unit is designed to be used on a non-powered circuit, as it supplies its own precise test voltages. Be sure power is disconnected from the unit under test, or your LeakSeeker will be damaged!

It is advised to check the Technical Assistance page at www.eds-inc.com ***for any last-minute additions to this manual and to answer frequently asked questions.***

Preliminary

The *LeakSeeker 82B* will locate a shorted or leaky component, or any other shorted condition, such as a pinched wire or solder bridge. If the unit has multiple pc boards, *LeakSeeker* will first identify *which board* contains the defective component, then will guide the technician directly to the *location* of the defective component on that board.

The EDS-82B *LeakSeeker* pinpoints the exact location of a shorted or leaky component by comparing the resistance at different component pads along a pc foil trace, and subtracting the foil's milliohm resistance from the calibrated value of the defective component. It consists of a 12 bit self-calibrating digital milliohmmeter with auto memory and a comparison circuit with visual and audible indicators. Initial search for a shorted component automatically starts at the *LeakSeeker*'s maximum range (about 150 ohms) and counts down to the resistance of the defective component, within a 60 milliohm "*window*" that is indicated by nine small distance lamps. It also uses a variable pitch tone, which will be at its highest when the test probe is touching the pad where the resistance is lowest, which is also where the defect is located.

LeakSeeker can use one of two different methods to locate the defect. The **Normal** test causes a precise voltage/current to appear at the test probe, and as the technician touches each pad, the small difference in the voltage/current readings is translated into the change of the beep pitch and distance lamps.

The **3-Wire** test is used when the readings are confusing, for example, if the "short" is actually *several* ohms, and a large electrolytic capacitor is somewhere along the trace. The beeper may chirp, or the pitch may constantly change as the capacitor charges or warms up, making readings difficult to interpret. The **3-wire** test separates the precise voltage reference **+Ref** from the test circuit. It is more difficult to use, so the technician should have a thorough understanding of the normal testing methods first.

Note that *LeakSeeker* can only recalibrate itself automatically as you get *closer* to the defect. If you get *further*, a lower pitch of the tone, and eventually the large red indicator will be the only indication. If you loose your way, or accidentally touch the wrong pad, you can push **Reset** and *LeakSeeker* will re-calibrate itself again, as soon as the test lead is touched to the correct pad.

An important feature is the **Lock** (with high-resolution) switch, located on the **OFFSET** knob. Indicators close to the **Offset** knob show when *LeakSeeker* is in the **Auto** (green) or **Lock** (red) mode. Normally, you would allow *LeakSeeker* to recalibrate *automatically* as you get closer to the defect; however, the **Lock** position allows you to probe a section of the pc board without *LeakSeeker* recalibrating itself if you accidentally touch the wrong pad. (It can be confusing if a ground pad is accidentally touched when *you* are looking for a three ohm short and *LeakSeeker* thinks you are looking for a ground!) While you are learning and experimenting, allow *LeakSeeker* to calibrate itself to the defect, then pull the **Offset** control knob to the *out* position to lock the *window*. Now you can touch a few suspicious pads in a small area with double the resolution, and without worrying about touching the wrong pad. After you are sure that you are getting closer, push the knob *in* so that *LeakSeeker* will recalibrate to a new *window* as you probe closer to the defect.

Normal testing

You should be sure that you are looking for a shorted or leaky part by verifying that the pc board trace you are about to test shows a suspiciously low ohms reading. For example, a normal 5 volt supply output in a VCR or TV should show several thousand ohms, after the filter caps finish charging. If you feel that you have a problem with the 5 volt supply because voltage readings are low while the unit is powered up, check to see if the supply output shows a reading of under 150 ohms (the maximum range of the *LeakSeeker*) to ground. Typically, most good supplies show resistances in the thousands of ohms while most with "shorts" will show under ten ohms. The exception to this instance is when you

suspect an *active short*, where a supply is pulled down by a component that does not show shorted with your DVM. This can happen when, for example, a vertical output chip in a TV shorts, but is powered through a diode. Although your DVM cannot measure past the diode, the *LeakSeeker* can. A steady tone after the *LeakSeeker* calibrates indicates that it found a suspicious reading under 150 ohms and your search can go on. If it simply chirps and nothing else, then no short, active or normal, was found.

Another method for checking any type of unit for shorts is to simply measure the resistance across the largest main filters in the power supply with your DVM. You will see the cap charging up to several thousand ohms. If you own the ***CapAnalyzer 88***, set the **LOW DCR** warning slider to 50 ohms. Any cap that shows 50 ohms or less is probably the supply that feeds the shorted component. For this problem, use the Normal test. However, be advised that either of these methods will not find *active* shorts.

In the **Normal** test, the **BLACK** ground wire alligator clip is connected to the best ground available, preferably at the power source. The connection must be of high quality or the results will be misleading. (Some technicians remove the alligator clip and always solder the black wire to ground to eliminate this source of errors.) First, push the **Reset** button to let *LeakSeeker* know to start a new search to find a bad part; be sure the **Offset** knob is pushed *in* to allow *LeakSeeker* to auto-calibrate, and set the knob at the center. The test probe is then touched *anywhere* along the pc board trace that you believe a shorted or leaky component is soldered to. If the board is dense, use a thin Sharpie marker to outline the trace, to prevent confusion if you accidentally touch the wrong pad.

As you hold the test probe on the first pad, *LeakSeeker* will beep at a its highest pitch and light the large yellow **Wait** lamp for a few seconds. When it has calibrated, the pitch will be lower and one of the nine small distance lamps will be lit. If the board is very dense you should pull out the **Offset** knob, which will *lock* the *window* and increase the resolution. The **Offset** knob can be adjusted for the middle of the distance ledmeter as you hold the probe to the pad.

Touching the test probe to the next solder pad along the pc trace will make the pitch higher or lower, depending on whether you are moving in the correct direction. The distance lamps will also give rough indications that you are getting closer or further from the defective component. As you touch the probe from pad to pad in the correct direction, the beeps will get higher in pitch and the distance lamps will go **CLOSER >** from the red lamps, to the yellow lamps, to the green lamps.

As you get out of range of the *window*, the last green indicator will turn off and the pitch will be very high. If the window is locked, you will need to unlock it by pushing in the **Offset** and allowing *LeakSeeker* to re-calibrate to a new *window* as you touch the next pad. The yellow **Wait** indicator will come on, and the *LeakSeeker* will find the next window. You can again pull the knob out to lock the new window and adjust the **Offset** if

you wish, and probe the next area.

As a rule, you will probably find that you will be much faster covering large distances if you do *not* use the window lock, and instead keep the knob pushed in to allow *LeakSeeker* to continuously recalibrate as you go. In close quarters, keeping the LOCK on will make it easier to check a few components because of the higher resolution.

In the AUTO position, as you get closer and the last green distance indicator turns off, *LeakSeeker* will beep at its highest pitch for one second, light the yellow **Wait** indicator, then will re-calibrate and the pitch will get lower and a new distance indicator will be on. This lets you know that *LeakSeeker* has chosen a new window. The one-second delay is intentional; if you accidentally touched the wrong pad, this delay lets you change your mind as long as you lift off of the pad before recalibration is complete. You can always double-check by touching the previous pad---the pitch should be lower.

On older boards with large traces, you may find that two pads close to each other may have the same pitch. Pulling out the knob to **Lock** the window also places *LeakSeeker* in the high resolution mode, and now you will see and hear a slight change between the two pads.

Also, you will probably find that using the window lock on very dense boards (such as camcorders) will make troubleshooting much easier, as it is all too easy to touch the wrong pad. With the window locked you won't have to worry about accidental re-calibration to the wrong pad. Troubleshoot a small section of the board at a time, then only when you are ready, push the knob in to allow *Leakseeker* to re-calibrate to the next section.

If you decide *not* to use the window lock, you should get in the habit of going one step backwards for every two steps forward**.** This double-checking method will assure you that you are truly heading in the correct direction. If, by mistake, the test probe is touched to ground or some other incorrect pad, *LeakSeeker* will beep and wait for a second to make sure you are serious, then will recalibrate itself to the incorrect pad. If you accidentally let *LeakSeeker* calibrate to the wrong pad, push **Reset** to clear the memory, then hold the probe to the correct pad where you left off to allow correct re-calibration. Whenever operation of the unit seems strange, your first instinct should be to push **Reset**.

At some point, the beep will be highest in pitch at only *one* pad along the trace. *This may be the location of the defective component.* If you continue past this pad, the pitch will start to go lower and the distance indicator will start to head towards the red indicators. If you backtrack, the pitch will <u>always</u> be highest at the pad of the possible defective component.

If the highest pitch comes from a pad that is a jumper or wire, or coil or transformer, this

means that the defect is probably on the other side of the object, in another area of the board. For example, if you are tracing a short at the collector of the horizontal output transistor and find that the highest pitch is at the flyback transformer primary, this does not necessarily mean that the transformer is shorted; the short may be on the other side of the winding, at the B+ supply. Follow it like a detective, as you may find that you may be jumper-hopping, coil-hopping, possibly even board-hopping, for example from the HV board, to the supply board and so on, to where the bad part actually is. The obvious parts that *could* be bad are parts that should *never* show as a low resistance in the first place, such as a capacitor, diode, transistor and so on.

If the defect is several ohms, you can search for the defective component in another way. High-resistance defective components are almost always thermally defective. You can use a can of freeze spray to spray each component on the trace while holding the probe anywhere on the trace. The spray will make the *LeakSeeker* change quickly in pitch when the defective component is sprayed. You should be aware that if the window is locked, *Leakseeker* won't be able to "keep up" with the resistance change as the component cools.

In normal resolution (**Auto**, knob *in*), each LED distance indicator represents 6 milliohms, or about half an inch of 0.050" thin foil. On thin traces such as modern VCRs and camcorders, the resolution is much greater because these traces have much more resistance. If you normally repair older or commercial quality electronics with unusually wide traces, your *LeakSeeker* may not have enough resolution from pad to pad. In this case, switch to the **Lock /** high-resolution mode by pulling out the **Offset** knob and adjust the offset as required. With the knob pulled out in the high resolution mode, each indicator represents 3 milliohms, and a noticable change of pitch is evident with just 1 milliohm.

3-Wire testing

3-Wire testing is used for times when **Normal** testing becomes difficult. In some cases, a component may not be shorted, but just leaky; perhaps 50 or more ohms, and a capacitor along the trace tries to charge each time the test probe is touched to a pad. Instead of steady tones, the *LeakSeeker* will chirp, or the pitch will vary, making testing very difficult in the **Norma**l position, but the **3-Wire** test will separate the **+Ref** from the test circuit, and allow the circuit to stabilize under power.

With the **Offset** knob pushed in for **Auto**-calibrate, connect the **+Ref** RED wire test clip to the normal source of the power in the supply line you are troubleshooting, for example, at the output of the power supply. This is important, as the 3-Wire test does *not* allow testing to start *anywhere* on the board as the **Normal** testing allows. *You must start at the normal source of power*, or at least, at one end of the trace. Allow about 15 seconds for all voltages, currents and temperatures to stabilize, push the **Reset** button, then touch and

hold the test probe at the starting point where the **+Ref** is connected, and allow *LeakSeeker* to calibrate. Then touch each pad along the bus and proceed as you would in the **Norma**l test. You can use, or not use, the *window lock*, as you wish.

As you proceed, just as in the **Normal** test, the pitch of the tone and distance indicators will guide you towards the defect. As you probe different branches, you will find that some branches do not have any changes from pad to pad. That is because there are no problems in that branch. Go back to the fork and try another branch.

At some point, you will reach the defect and pass it, and the distance indicators and tone pitch will again no longer change, just like the previous branches that had no problems. The point in the foil that is highest in pitch is the location of the defect. Going back towards any other branch will cause the tone to get lower, and going forward will no longer cause the pitch to change. Therefore, be sure to notice the exact location at which point the readings no longer change as you pass the defect. The exact location of the *first* pad that has the highest pitch will be the exact location of the defect. All pads beyond this point will have the same pitch as the *first* pad of the highest pitch. You can verify the defect by using a blast of freeze spray on the suspicious component. *LeakSeeker* will change pitch drastically only when the defective part is cooled.

Tutorial

To best be familiar with *LeakSeeker*, try this little experiment. You will intentionally create a defect by soldering in a low-value resistor across a capacitor in a power supply trace, then use your *LeakSeeker* to find it.

On a working VCR, locate a power supply trace on the main board and solder in a low-value resistor across a large capacitor to simulate a leaky capacitor. For example, you could solder a 4.7 ohm resistor across a filter electrolytic on the 12 volt supply bus on the main board at the capstan or video head motor drive chip. Don't power up the VCR, or you might damage the power supply. Use your DVM or ohmmeter to verify that you get the same 4.7 ohm reading everywhere the 12 volt bus goes; at the power supply board, the main board, capstan motor drive chip, head motor chip, and so on.

With the power switch in the **Normal** test, push **Reset** once, and push the **Offset** knob in for **Auto**. Start at the power supply output. You should follow the instructions for the **Normal test** and follow the *LeakSeeker's* advice, tracing a path through the pcb traces, wires, jumpers and connectors, and end up at the resistor that you soldered in. (Don't forget to remove the tutorial resistor from your experiment!)

As you progress, you will get the feel and the personality of your *LeakSeeker*. Try the **3-Wire** test method only *after* you have mastered the **Normal** test, as this test is more difficult.

IN CASE OF TROUBLE

If you accidentally forget to remove power from the unit under test, the voltage will backfeed into the *LeakSeeker* and cause damage. There is a 0.33 ohm fusable resistor inside the test probe, and a 9 volt zener diode soldered across the test probe input on the pc board. These are designed to self-destruct and protect the *LeakSeeker's* electronics. The indication that these protection devices have done their job is that *LeakSeeker* will immediately beep and try to calibrate to nothing as soon as it is turned on.

If you need assistance, or help as you learn to use your *LeakSeeker*, check the Technical Assistance page at www.eds-inc.com/ or call the **EDS** technical assistance line at (561) 487-6103. Do not return your unit for service without calling, as you may only need some help to get started. Do not expect to be an expert in a few minutes, as it is normal to have some trouble at first. Take your time now, as it will be all worth the learning time you spend now. When that next customer brings in the unit from shorted-capacitor hell, you will have it repaired in no time!

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2: All EDS products are unique and some effort is required to un-learn old habits and to learn to use an unfamiliar new device. You are expected to use this product for at least six weeks, and to read and follow the directions in the owners manual. If you are confused about any instructions in the manual or need any assistance, please call EDS for assistance and make an honest effort to learn to use the product. If the product proves to be too difficult for you to learn, it is expected that you will make comments or suggestions below to help EDS improve the product or revise the owners manual.

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