From the originator of Electronic Darts...

Arachnid Tech Tips

A Publication Especially for Operators and Technicians who service Arachnid Products

SPRING 1998

This publication is provided as an aid for field technicians and operators who troubleshoot, repair, and maintain Arachnid games. It is a technical tool designed to keep all the latest updates, service bulletins, suggestions and ideas together in one package.

A Troubleshooter's Toolbox...

Trou*ble*shoot*er \ tru-bel-shü-ter \ n 1 : a person skilled at solving or anticipating problems or difficulties.

Looking at the definition above, we recognize two attributes of a good troubleshooter. They are skilled, meaning that some amount of study or training is involved. They can anticipate, meaning that a degree of mastery of the subject has been acquired.

Faced with a service call, we grab our toolboxes and head for the site. When we get there, what is in our toolbox determines whether we will quickly locate and correct a problem or spend hours of frustration chasing up blind alleys. Obviously, the toolbox is more than a container of physical tools required to perform an adjustment or repair a component.

We have all seen the technician who consistently finds and corrects problems with seemingly little effort. We might attribute this to some innate ability or even some mystical trait. Fortunately for the rest of us, no magic is involved, good troubleshooters are made not born. All that is required are the proper diagnostic tools, knowledge of the system, and basic troubleshooting techniques that can be acquired by anyone. In the remainder of this article we will look at a troubleshooter's toolbox and outline some basic troubleshooting techniques.

Building a Toolbox

Besides the basic hand tools required for electrical and electronic repairs; screwdrivers, pliers, wire cutters & crimpers, soldering pencil, IC puller, etc., troubleshooting requires a few diagnostic tools. The following items would be the minimum for troubleshooting electronic games:

A *volt/ohm meter* (VOM) for checking line and power supply voltages and continuity of components;
an *outlet analyzer* for checking polarity and grounding of wall outlets;
a *phone line analyzer* for checking the correct polarity of phone lines attached to a modem;
a few *jumper wires* (with alligator clips on one or both ends) for dart head diagnostics.

If you are going to troubleshoot and repair video monitors you should add an *oscilloscope* to your list. This can be a costly item, but can save hours of labor, and in some instances it is the only way to locate a defective component within the monitor.

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Dartman III and Backups...

As we stressed in a previous issue, making regular backup copies of your league data is crucial.

In almost all cases, the only way to fix a damaged data file is to replace it with a backup copy.

To make it easier to backup your league data files, Dartman includes a batch file that will automatically make copies when you exit the program.

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Once you are familiar with the operation and use of these diagnostic tools, you have completed the first component of the toolbox. The next component of the toolbox consists of system knowledge. Understanding what the system (game) is supposed to and what it is not supposed to do is the key to troubleshooting. Knowing how to use the best diagnostic tools in the world will not help if we do not know where, when, and why to apply them.

Add in System Knowledge

System knowledge comes from three sources: operation or product manuals, schematic drawings and experience.

Operation manuals:
Manuals contain information about setup, functions, options, operator settings in software, parts lists, and in some cases, a troubleshooting flow chart of common problems and their likely solutions. Manuals are the main source of information used by the technician for understanding the game.

Schematic drawings:
A schematic is a drawing representing the electronic circuitry and wiring harness paths for a particular game or component. Their use requires a person to learn the symbols used to represent the various electrical components. Once the symbols are learned and a person can *read* a schematic, they are worth their weight in gold. Using schematic drawings, a person can quickly establish which components are relevant to a particular problem, thus eliminating time consuming and non-productive guess work. Schematics are also necessary to determine the "test points" and expected values when using such diagnostic tools as the VOM or oscilloscope.

The toolbox should contain the schematic drawings and an operations manual for every game you intend to service. Included with your hand and diagnostic tools they are always available for immediate reference.

Experience:
Experience is the tool that you carry in your head; or sometimes in the form of written notes. It is just as much a part of the toolbox as everything covered so far. There are two methods a person uses to gain experience. The first is gained before any actual field *work*, by familiarizing yourself with the operation of the game. Using the manuals and schematics and actually working with a real game, try to become as knowledgeable as possible with all the functions of the game and its various components. This form of experience is under your control. You decide how much time will be spent *doing your homework.*

The second way a person gains experience is the obvious one, actual application of your knowledge in the field. The time allowed for such experience may not be at your discretion. There is nothing like four angry players staring down your neck, while trying to restore their game, to convince you that the time spent on the homework above is important. It helps to keep a written log of problems you encounter and the solutions in your physical toolbox for future reference. Experience committed solely to memory has a funny way of becoming as elusive as a wet bar of soap.

This section of the toolbox, system knowledge, is never ending. However, once you become comfortable with the operation of the game and have had some actual experience in the field, your frustration rate should decrease exponentially.

Finish With Basic Troubleshooting Techniques.

The last and most important part of the tool box is a good set of troubleshooting techniques. These techniques are more of a mind set that is used when attacking any problem, rather than a rigid set of procedures to be followed. Once the basic concepts are understood, everyone will apply them in their own manner. Even though each person will apply the techniques in their own manner, upon close examination we find some basic "rules" that everyone eventually adopts. We will look at these "rules" as they apply to troubleshooting a Galaxy dart game.

Simple Things First

If you look at any troubleshooting flow chart, the first problem listed is usually something like: "Nothing lit on game." The probable causes are: *Game Not Plugged In, Main Fuse Blown, Main Switch Not Turned On, or No Line Voltage.* This may seem obvious or silly to some people, but let's look at it from another viewpoint. Since we are working on an electronic device, everything depends on proper voltages and grounding. As many problems can be caused by improper voltages, we could spend hours chasing after a problem on the main board only to find out that the cause was low voltage to the board in the first place.

Part of Simple Things First is *never assume.* Always go from the simple or obvious to the complex checking as you go. In the case of a *Galaxy dart* game, you would want to know whether you had 110 volts at the outlet, if it was properly grounded, and that you had all the proper secondary voltages from the power supply to the main board. This only takes a couple of minutes to check. Only then can you move on with the confidence that you have eliminated the obvious and now must look deeper to find the problem. Replacing the carburetor will not fix a car that is out of gas.

Divide and Conquer

After the simple things are eliminated: proper voltages, good connections, obvi-

ous physical defects, etc, we have no choice but to dig deeper to find the problem. Looking into the cabinet of a *Galaxy* game, the first thing we notice is that it is complex. Looking at the system as a whole, we can easily become lost. Fortunately, any complex system can be broken down into manageable units.

There are two methods we can use to pinpoint an area of the game that is the most likely cause of a problem. We can get out our road map (schematic) and define areas related to the problem. Or a simpler method is to start swapping parts to see where the problem goes. For example, if you believe that the problem lies on the main board, you can simply replace the board and see if the problem goes away. Or you can move it to another game and see if the problem follows the board. Either way, you have narrowed the problem down to a specific area or eliminated it as a cause. Continuing this example, should you find that the problem is with the main board, you can refer to the schematic to define components related to the area of malfunction and swap those with components that you know are working properly. This process of dividing the problem can be repeated until the problem is defined to as few components as necessary to make cost justified replacements or repairs. Once again, system knowledge will help to limit the search to relevant components and speed this process. Keeping with the analogy used above, if the starter won't turn the engine, it matters little if the gas tank is till. That could still be a problem but it is not related to the failure of the starter.

There are also a few special case "rules" to keep in mind when troubleshooting any system. They are covered briefly below:

Intermittent Problems:
This kind of malfunction is particularly hard to troubleshoot. The key to understanding intermittent problems is that any testing or measurements must be made when the *system is malfunctioning.* If the system simply will not malfunction during your presence, your only resort is to replace the components that are the "most likely" cause of the problem.

Features versus Malfunction:
Occasionally you will have a customer that calls to report a malfunction when it simply turns out that they are assuming the game should do something it wasn't intended to do or is merely a "setup" problem. This is where your system knowledge comes in handy and may save you a trip to the site.

Repairs at Crucial Times:
Obviously the last thing you want to be doing is repairing a game in the middle of a tournament or league match. In this instance you want to repair the game as quickly as possible. Be prepared for these times with a complete supply of replacement parts when you arrive at the site. Swap out the entire section of the system that is related to the problem and take the suspect components back to the shop where you have plenty of time to troubleshoot and make the repairs.

Further Reading

Whether you are a full time repair technician or it is just one of the many hats you wear, a general knowledge of electronics is a real asset. Although you can get by in most instances by swapping components, there will be times when you need an understanding of electronic circuits and components to find a problem. You can usually find several books at your local library that cover basic electronics or if you wish to own one, local electronic supply stores usually stock a small selection. *Radio Shack* is a good source of books, training material and electronic "project kits" that will help you further your knowledge. If you are looking for more formal training, most local community colleges offer courses in electronics.

Obviously this article was not a list of problems and their solutions. However, having a basic knowledge of the required tools, access to system knowledge through manuals and other product information, and applying basic troubleshooting techniques makes such a list unnecessary. Building your "toolbox" will not only help you troubleshoot and repair *Arachnid* games, it will help you do so in a cost effective manner and increase your personal satisfaction.

. ..Backups from page 1.

If you find that your Dartman backup utility does not work, it is probably because your computer runs a version of DOS other than 5.0. The utility was written to take advantage of DOS 5.0's version of Backup.exe. Unfortunately, as Microsoft updated their operating system they removed this utility.

Free Fix...

For those who would like to try them, there are two update files available on our web site at:

http://www.bullshooter.com

Once on our web page choose the tech support area and click on our new "Public" file area. Download the three files: dmbackup.bat, dmbackup.txt, and drestore.bat, then copy them to the \dm3 directory on your hard drive. You will have to overwrite the current dmbackup.bat file with the new one.

The dmbackup.txt file is an ASCII text file, containing the instructions for using both the new utilities. It can be opened and read with just about any word processor or utilities such as Microsoft Notepad or Write.

FAQs...

Frequently Asked Questions.

Q. **Do you have a place on your website to download updates, Spider Writer Screens, etc?**

A. We do now. Check out our site at http://www.bullshooter.com. There is now a PUBLIC file area in the techsupport screen that contains files that can be downloaded free of charge. In the ***future we*** will be adding more software updates, service bulletins, and clipart for your reports. Each directory contains an index file that describes the files in that area. If you have a service tip, Spider Writer Screen, or suggestion, email them to techsupport@bullshooter.com and we will consider them for inclusion.

Q. If darts are not scoring (or not scoring properly) how do I know if the problem is in the electronic circuitry or the dart head?

A. The Operator's Manual contains a section on the "Smart Target" Interface Board. This section explains how to "jumper" the pins on the interface card to determine if the electronics are working properly.

Coming up in the next issue...

A Technician's First Look at the Black Widow... ..the next generation of dart games.

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Back issues available...

A limited supply of back issues are available on a first come first serve basis. If you would like to receive a set, please contact us with your request. Thanks...

Dave Neal, Tech Tips Editor

HOW TO REACH US:

HAVE A TECHNICAL QUESTION OR PROBLEM? HAVE A TIP TO SHARE?

ON THE INTERNET: Check us out at *http://www.bullshooter.com* OR E-mail us at *techsupport@bullshooter.com*

CALL US at 1-800-435-8319 and ask for Technical Service. We will be happy to assist you in any way we can.

ON OUR TECHNICAL BBS: Connect via modem at 1-815-654-7985 to download Tech Tips, Spider Writer Screens, Service Bulletins and more..

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