IQ System Troubleshooting

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OVERVIEW

The purpose of this chapter is to provide detailed information about system level troubleshooting of IQ Systems. Most problems with IQ occur at the time of installation. Good installation techniques take care of most problems before they happen. This chapter provides some installation tips, but it assumes little about the quality of installation techniques. It is also important to remember that how well a system sounds or operates depends heavily on good system design and installation. The best troubleshooting skills may do very little for a poorly designed audio system. This chapter deals with troubleshooting IQ components from a control standpoint, not audio performance.

OBJECTIVES

At the completion of the lecture and labs for this chapter the student should be able to meet the following list of objectives:

- List the steps of universal troubleshooting techniques.
- Describe each step of universal troubleshooting techniques.
- State the most common installation problems encountered with IQ.
- List the configuration parameters that must match between software and interface hardware.
- State the maximum operating length RS232 and RS422.
- State the maximum loop capacitance for normal Crown Bus operation.
- State the valid range of loop addresses.
- Explain what a valid component identification is.
- List the software functions that can be used to troubleshoot IQ.
- Explain how Roll Call is a troubleshooting tool.
- Describe the proper method of taking a voltage measurement to check Crown Bus wiring.
- State the expected voltages for normal, open, shorted, and reverse polarity Crown Bus wiring.
- Describe the proper method of taking current measurements to check Crown Bus signal waveforms.
- State the minimum current for a current high and the maximum current for a current low.
- Explain how software break detection works.
- List the most likely reasons why you might see an Interface Not Found message.
- List the most likely reasons why you might not find components on a loop.
- Explain what happens to loop communication when an IQ component loses power.
- State what resources are available to help you troubleshoot an IQ problem.

SLIDES

1. Universal Techniques

- Symptom Recognition
- Symptom Elaboration
- Probable Faulty Block
- Probable Faulty Function
- Repair
- Retest

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2. Common IQ Problems
- Swith configuration
- RS232/422 cables
- Non-standard serial ports
- PC does not meet requirements
- Software configurations
- Design error or campatability problem
- Crown Bus wiring errors
- Crown Bus capacitance

3. Troubleshooting Tools
- Roll Call (FilelNew)
- Engage/Upload
- Break Detect
- Voltage Measurements
- Current Waveform Measurements
- Documentation
- Technical Support (1-800-342-6939/219-294-8200)

4. Voltage Measurement: OK
Figure 1

5. Voltage Measurement: Shorted
Figure 2

6. Voltage Measurement: Open
Figure 3

7. Voltage Measurement: Reverse Polarity
Figure 4

8. Current Measurement
Figure 5

9. Does The Software Run?
- PC Requirements
- Environment (Windows, DOS...)
- Corrupt or Incorrect Files

10. Is It Possible to Run a Roll Call?
- Demo Version
- Serial Port Parameters

11. No Interface Found?
- Interface off/unplugged
- RS232/422
- Serial port setup in software
- Interface setup
- Windows Control panel setup
- SMX in CLN mode
- RS232 smart switcher

12. Are All Components Found?
- Software support
- OIF/DLL files
- Interface compatability
- Power
- Loop wiring
- Capacitance
- Duplicate or invalid addresses

13. Factory Support Issues
- Hardware serviced only at Crown
- Upgrades
- Licensing of software
- Development products

UNIVERSAL TROUBLESHOOTING TECHNIQUES

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There are some basic procedures which apply to troubleshooting at any level, whether it be component level circuit board repair or very general system level service.

Symptom Recognition

The first step in troubleshooting is to determine that a problem really exists. All too often a problem exists in a system that is never identified and never fixed. The long term result is an unsatisfied customer. On the other hand, a system operator may expect a certain result and feels that there is something wrong with the system when he does not get that result. Recognizing symptoms of an actual problem may be very obvious or may be quite subtle. In either case a solid understanding of how an IQ System operates is critical to determining if a problem is real. Symptom recognition, then, is the determination that a problem exists by virtue of the system response being different from the expected response.

Example: Amplifiers in equipment room #1 do not respond to commands sent from the computer.

Symptom Elaboration

Once you decide that a problem exists you need to try to find out as much about the problem as possible by examining the nature of the symptoms. This step in the process often involves some very basic testing to get you looking in the right general area for the exact problem. Specifically is the process of defining the exact nature of the problem.

Example: When taking a Roll Call all components appear except those in equipment room #1.

Probable Faulty Block

Once you have gathered all the information you can about the specific nature of the problem you can usually determine where to start looking. This step often involves checking your symptoms against system documentation.

Example: Examine system prints and find that component in equipment room #1 are all on Crown Bus loop 3 and they are the only components on loop 3. Problem is likely to be a communication problem somewhere in loop 3.

Probable Faulty Function

At this point it is often necessary to use your troubleshooting tools to break the problem down until you find out exactly what the problem is.

Example: Visually inspect cable connections for loop 3 at the interface and in the equipment room. You locate a Crown Bus cable that has been pulled loose from a PIP data input at Amplifier 13. An alternate method of testing if the DOS software is used is to run a SEARCH on loop 3 using the IQ software. It would reveal a "Break on loop 3 before Amplifier 13." This would tell you where to go to physically look for a cable problem.

Problem Verification & Repair

The final step once the problem is found is to fix it and test the system. There have been times in every technician's life where they think they have found the problem, performed a repair, and found that something else was wrong. It is

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very important to verify that the system is, in fact, working after you perform a repair.

Example: Plug the cable back into the PIP then run a Roll Call to verify that all system components are on line then verify that the amplifiers respond to commands sent from the computer.

COMMON IQ SYSTEM PROBLEMS

Most IQ System problems occur at the time of installation. Most of those are related to hardware or software communication setup. Other than hardware or software settings, loop capacitance is a significant factor. In many cases wire selection is becomes a critical factor. In longer loops where capacitance is questionable it may be necessary to add an IQ-RPT Repeater to the loop.

Hardware Setup

Switches are a necessary evil in the setup of any IQ System. Component addresses must be a valid value with no duplicates of same type of component on the same Crown Bus loop. Baud, parity, and any other hardware switch settings on the component serving as system interface must be properly configured. Parity should, except in very unusual circumstances, be off. The computer, software, and RS232/422 cable must be capable of supporting the baud selected at the interface. AC power must be available and the interface must be on. RS232/422 cable must be connected at both ends to the proper computer serial port as well as the proper IQ System component. You must have a 16550 UART for the computer com port. The computer itself must meet the minimum requirements for the type of software being used.

IQ components are not likely to fail, but it is not impossible. Lightening is a respecter of no one. The most common type of hardware failure is opto-isolator damage due to high voltage spikes from lightning or other power sources. The only other major source of hardware failure is failure to follow proper static handling procedures of components with exposed static sensitive electronics such as PIP module and card cage components.

Software Setup

Most software parameters that affect whether or not you can communicate properly with the system in DOS software are found on the F10 control panel screen. In IQ For Windows both the program communication settings and the Windows Control Panel effect communication. At a minimum those settings include com port enable, com port number, IRQ number, Base Address, and baud.

Crown Bus Loop

The Crown Bus is a communication standard based on the transmission of proprietary IQ command protocol on a serial data loop. Although other media may be used to transmit the protocol, IQ hardware uses 20 ma current as the media to go into and out of components. Digital signals are, by their nature, simply pulses of DC. This in turns means that data signals are polarity sensitive. One of the most common mistakes made when wiring Crown Bus connections is to reverse the polarity of a Crown Bus cable. A broken or unplugged cable or polarity reversal anywhere in the loop consitutes a break in the loop. When the IQ-INT II unit is used as the interface a common problem is to have the input and output lines for one loop connected to the interface output of one loop and the input of another loop at the interface.

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Cable capacitance is another issue. In general Crown recommends that you keep maximum loop capacitance at 30 nF or less, although in most cases a loop will operate properly at up to 40 nF. To calculate loop capacitance add up the total loop wire length, multiply that by the capacitance per foot (or meter) rating of the cable used, and add 60 pF per component on the loop. Restart the calculation at the output of each Repeater in the loop. RFI is rarely a problem with twisted pair Crown Bus cable because the Crown Bus is usually a 20 ma current loop. Induced noise may, however, be a consideration.

PROBLEM PREVENTION (INSTALLATION TECHNIQUES)

Good installation techniques will save you a great deal of trouble after the installation is thought to be complete. The best way to install a large IQ System is to test the system a rack at a time, then add racks to the loop(s) one at a time. This may seem more time consuming, but in a large system you may save hours of work later by running a ten minute check in the equipment room.

Always use proper static handling procedures. Never pull a PIP module out or put one into an amplifier if the amplifier is powered up. It is best to always unplug the amplifier and wait a few seconds before taking a PIP card in or out. If you are involved in a situation where firmware is being upgraded always ensure that a trained technician performs the actual chip replacement.

When you setup a component one of the parameters you always have to deal with is the component address. To save time later it is always recommended that you mark components with their loop address and annotate system drawings to accurately reflect those addresses.

TOOLS AVAILABLE

There are many resources available to troubleshoot an IQ System problem. The software has a number of powerful features, the hardware also has valuable tools built in. A good visual inspection finds many problems before you have to use any equipment or software. Basic test equipment such a voltage meter can tell you a great deal, and if all else fails you can always resort to checking documentation.

Roll Call

Roll Call is the first and most important tool you have in the software. When you run a Roll Call the software establishes communication, first with the interface, then each component on each loop of the interface. The Roll Call reports status step by step. It gives you status of communication with the interface, running status of components it finds, and inventory totals. Note that all the inventory information in the world is of little value unless you know what you are supposed to find. It is critical that you know what the inventory should be. You should be able to run a Roll Call and find all the components that are connected into the system, and you should be able to get that inventory consistantly.

When you perform a Roll Call the software establishes RS232 communication with the interface first. The interface is interrogated and must report its identity as a component type. This process must be completed before any further steps may be taken. Even if the software you are using does not support the component serving as system interface, the software should recognize that an unidentified component is the interface.

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ONLINE Indicator
After running a Roll Call and finding components you need to be able to maintain communication with the system. Each component has an ONLINE indicator available in the software. This indicator is a software tool that lets you know you are in contact with the desired unit. If the ONLINE indicator goes off you should be able to reestablish contact by running a Roll Call, using Control+E, loading a dataframe file, or by using On Line Search.

Engage (^E)
If you have either had and lost communication or you have loaded a dataframe without successfully communicating you may engage the dataframe by using Control+E. This key combination engages the dataframe and forces all the settings in the software out through the com port of the computer. The settings for each component that are in the inventory of the dataframe file will be forced to the system. If the system is there and all loops and communication pathways are intact all settings should be engaged and all components should come on line. Part of the process of engaging the dataframe is to check each component in the inventory and ensure that they are present and on line.

On Line Search (DOS Software Only)
The On Line Search feature, found on the F10 control panel screen, performs a function which is similar to Roll Call. When you run a Roll Call the system takes an inventory, uploads component settings, and fills in control blocks with data. When you use On Line Search the software compares the inventory against the actual system. This is done automatically at regular intervals. It serves to automatically refresh On Line indicators. If a component drops off line for some reason, such as power loss, the On Line Search feature will automatically reestablish communication with that component when power is restored. It will also restore communication to a whole loop of components if the loop becomes broken and is later restored. While the software contains more components in its inventory than are actually on line this feature will cause the software to temporarily pause while the on line search is in progress.

On Line Search is the feature you want to use to build a dataframe file manually. When a component is added to a dataframe manually the on line search feature not only finds the component and brings it on line, but it also uploads the settings from the component into the software and makes any changes necessary to settings in the dataframe. On Line Search will upload settings even if you are only reestablishing communication. On Line Search is a feature that may be turned on and left on at all times in many systems, but it is important to understand the effects of this feature so that the software does not surprise you. Note that On Line Search does not actually locate or identify breaks; it continuously verifies the dataframe inventory.

Break Detect
Break Detect is a feature that can be switched on at the F10 control panel screen of DOS software; it is always on in IQ For Windows. It allows the software to automatically listen for signals from components that identify breaks. Before you can understand what this feature really does it is important to understand what happens in the system when a break occurs in the Crown Bus loop.

All IQ components sense Crown Bus data input continuity. A logic low is actually a high current condition and a logic high is a low current condition. When a component goes for a period of time without seeing a high current (more than 12 milliamperes) input the unit recognizes the condition as a break in commu-

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nication. Because data flows one direction around the loop the component will assume that it can still send a message out to downstream components and back to the interface. The component begins to continuously dump its identification. If there is continuity back to the interface data input the interface will carry the data stream of that component's identification through the RS232 line and back to the computer. When the Break Detect feature of the software is enabled it will listen for such a stream and report it to the operator. Because the information reported includes the loop address and type of component you can tell that the break in the Crown Bus is in the line coming into the specified component.

Break Detect works with breaks that result in loss of current continuity in the Crown Bus cables. Remember that a break may be an open cable (positive or negative side) or a polarity reversal of the cable. Note that a hardware failure of the input isolator device or output current driver also constitutes a break. Break Detect will not find a capacitance problem, nor will it find an RFI problem. More specialized utility programs may be required to run specialized tests for problems like that.

Break Detect is a feature you want on in most cases. It reports a break at the time it occurs.

Search (DOS Software Only)

Another feature found on the F10 control panel screen that is used to diagnose system communication problems is simply called Search. Search is a manual break detection process that you can run at any time. It checks a specified loop for continuity in the same manner as Break Detect. It is a feature you would use if you were not able to establish loop communication initially, you missed the alert on the screen, or you want to verify the break. To use Search you need to select the loop to search then toggle the Search feature on. It goes off automatically when it is done performing its check.

When you perform a Search you usually get one of three messages. If the loop is intact and there are no problems it gives you a message that says the loop is okay. If there is a break at the input of an IQ component with an address the software will tell you the location of the break. If the break occurs at the input to the interface or the input to a non-addressable item, such as a Repeater or fiber optic receiver, a message will appear that says it cannot locate the break, the break may be before the first component.

All Amps

A special set of features exist in the software that can prove particularly useful in large amplifier systems. As much as Crown might like to sell systems with large numbers of automatic mixers, relay cards, or other devices, most IQ Systems with a relatively large number of components are primarily amplifier systems. For this reason special All Amps features are in the software to turn all amplifiers in the entire system on or off, mute or unmute, or all Data LED on or off. The All Amps features actuate all amplifiers on any loop regardless of address and regardless of whether they are in the dataframe inventory.

As a diagnostic tool the All Amps Data LED controls may be very helpful in amplifier systems to locate a break if other software features such as Break Detect or Search fail to locate the communication problem. When Data LED is turned on for all amplifiers using the All Amps control, all amplifiers that receive the message turn on their Data LED indicator. After forcing on Data LED

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indicators you perform a visual inspection of your amplifier racks until you find the point where one amplifier has its Data LED on and the next one in the loop is not lit. When you find this point you have located the break.

Expected Crown Bus Voltages

Another way of checking for a Crown Bus wiring problem is to use a DC voltage meter and check the voltage across the positive and negative lines of the Crown Bus cable. Figures 1 through 4 demonstrate the various voltages you might see under various loop wiring conditions.

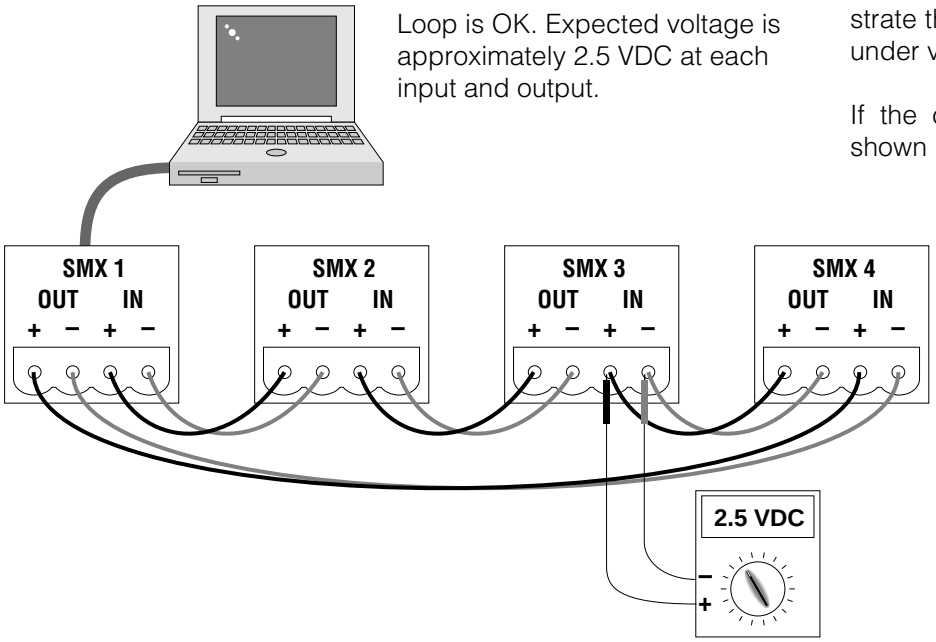

Figure 1. Loop Voltage Check

If the cable is connected properly, as shown in Figure 1, between two components with good continuity, proper polarity, and both of the components are powered up and operating you should expect to see approximately 2.5 VDC across the positive and negative Crown Bus wires.

If polarity of the Crown Bus is reversed you will see a voltage drop corresponding to the drop across a diode, or about 0.7 VDC. Figure 2 shows measurements being taken at the point in the loop where the cable is reversed.

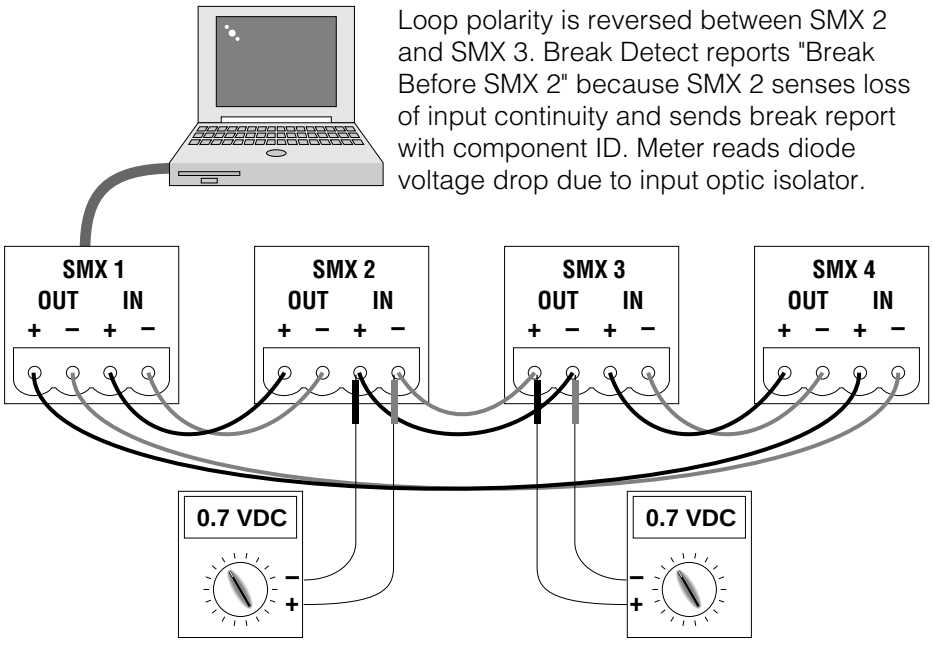

Figure 2. Loop Voltage Check With Cable Polarity Reversed

If you have no voltage drop at all the problem may be an open in one of the wires between the output of the upstream device and the point of measurement as shown in Figure 3. It could also be a short between the positive and negative wires or a shorted opto-isolator at the downstream input device, as shown in Figure 4. Another possibility would be the upstream device may not be powered up. If cable continuity is proven good and the component is turned on and plugged in the problem may be a failure of the current driver circuitry.

A high voltage condition (10 to 15 VDC) occurs when there is an open between the point of measurement and the downstream input device, as shown in Figure 3. The open may be in the Crown

Bus cable or connectors, or it may mean an open opto-isolator at the input device.

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Crown Bus Wave Form Testing

When a loop problem exists and you have determined that the DC characteristics of the Crown Bus are all good and that there are no breaks, it is time to get serious and look at the data signal wave form. This check will tell you if there is a capacitance or RFI problem on a loop. General symptoms of a capacitance or RFI problem on a loop would be partial or inconsistant loop operation. In some cases it may not be possible to establish communication at all, and in other cases ghost components may appear at a Roll Call that are not in the system at all.

To perform this test you will need to modify a loop cable by adding a 100 ohm resistor in series with the negative wire of the cable. You will also need an oscilloscope to view the signal. Signals may be generated on the Crown Bus by running Roll Calls, loading dataframes, or by disconnecting a Crown Bus cable at the input to a component at the beginning of the loop.

Figure 5 shows a test rig setup for wave form measurement. Note that if an ungrounded scope is used it makes no difference whether the resistor is in the positive or negative leg, but if a grounded scope is used you must put the resistor in the negative leg and the negative lead of the scope on the side of the resistor electrically closest to the output device.

Figure 6 shows what a good data signal looks like. Note that greater than 12 ma is required for a current high (data logic low) and current level must drop below 4 ma for a current low (data logic high).

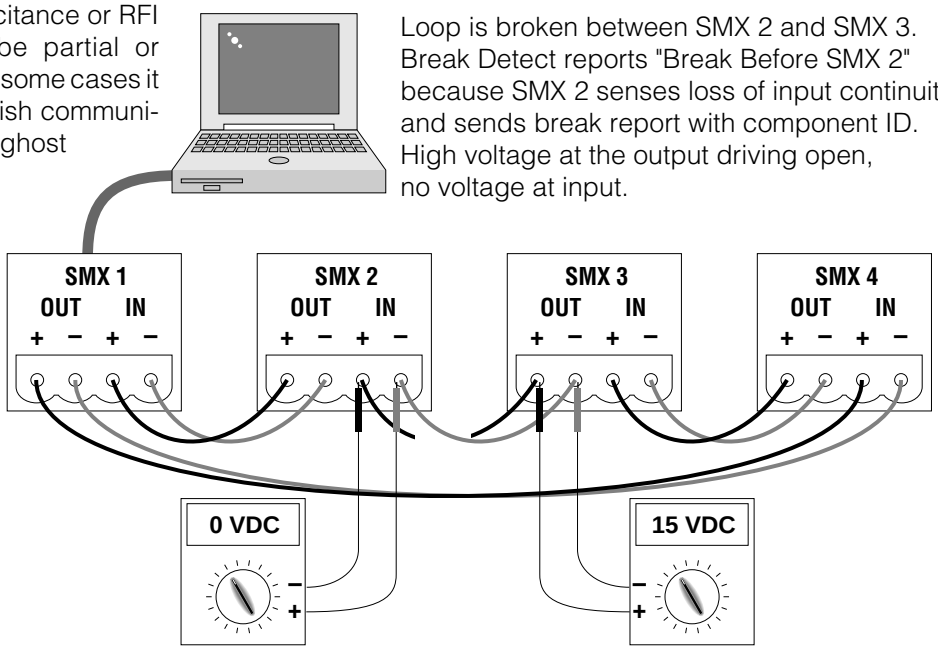

Figure 3. Loop Voltage Check With Loop Open

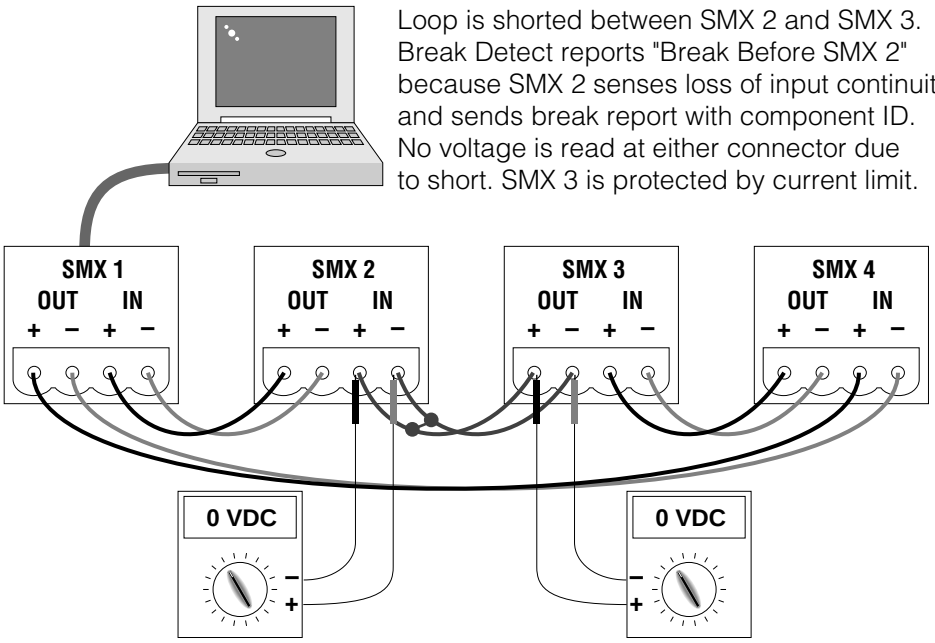

Figure 4. Loop Voltage Check With Loop Shorted

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Figure 7 shows what a wave form may look like when the loop capacitance is too high. Note that the waves are rounded and unable to reach magnitudes required for reliable communication. In high capacitance situations the problem may result in loss of high current or low current values. When the problem is extremely high RFI the problem is more likely to be a loss of low current values.

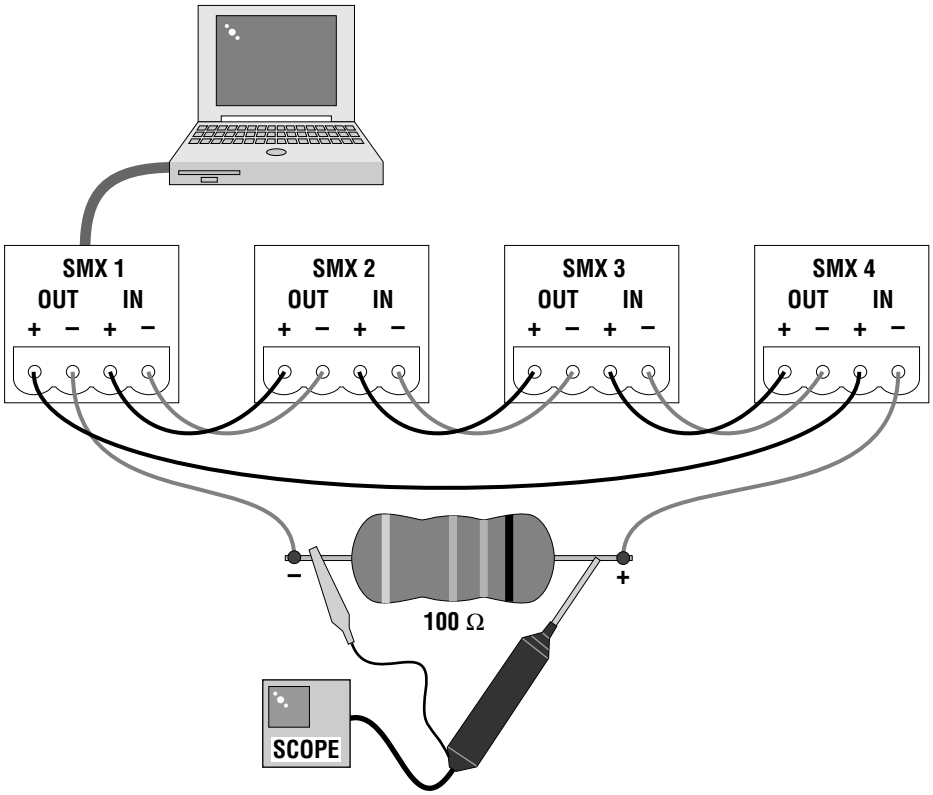

Figure 5. Loop Current Test

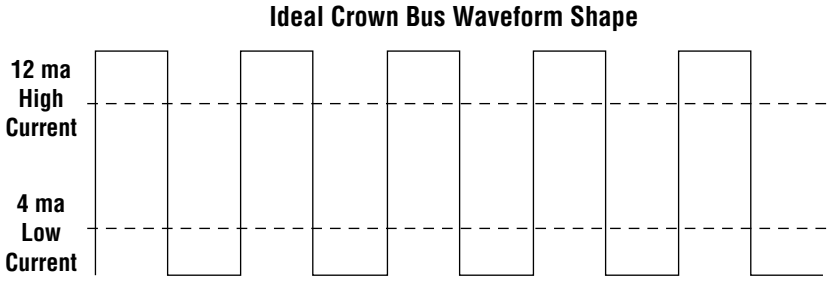

Figure 6. Ideal Loop Signal

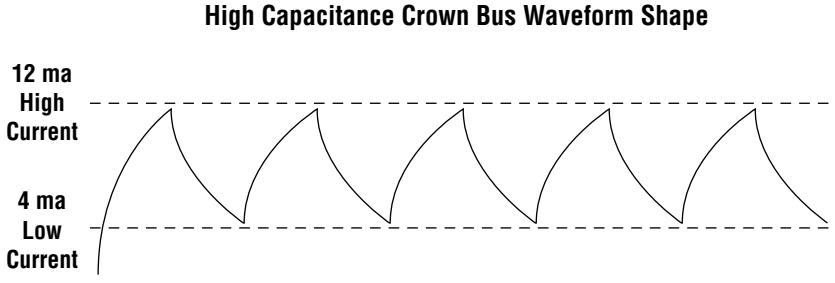

Figure 7. Loop Signal With High Capacitance

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Documentation

Crown provides instruction manuals for every hardware and software product that is in regular production. These are resources that usually provide the answers. The most complete and accurate information possible is compiled in these documents to assist you with installation and operation. These documents are usually product specific and in many cases do not cover complex system level situations that you have to deal with. We also update our documentation from time to time and continually strive to provide the best information possible. If you keep old manuals for reference keep in mind that new documentation may correct errors or provide additional information that older manuals may not have. There may be other considerations as well such as product changes.

Crown Technical Support Group: 1-800-342-6939/1-219-294-8200

A team of people at the Crown factory exists for the purpose of providing technical assistance with Crown products. If you need help the Technical Support Group is available. Normal business hours (8 am to 5 pm EST) are kept, but if you are working on a major project and feel that after hours assistance may be needed you may contact us to make special arrangements. If you are calling about a problem you are having with the system it is much easier to help you if you have taken the time to check available documentation. It is also very helpful if you have serial numbers, software revision numbers, or other relavent information handy when you call. If a hardware product is defective we will assist you in getting the product repaired. Refer also to the Factory Service section later in this chapter. If a software product is defective you should call us to make arrangements to take care of the problem. With software there are often special procedures that are beyond the scope of conventional hardware service procedures.

STEP BY STEP IQ SYSTEM TROUBLESHOOTING

There are a few basic questions that must all be answered yes to prove that an IQ System is operating properly. Does the software perform a Roll Call? Does the software find and identify an interface at Roll Call? Does the software find all components in the system at a Roll Call? Do all components remain in communication with the computer after Roll Call? If the answer to each of these questions is yes, then any problems you are having are probably in the audio path or in the way that components are programmed. To learn how to set up a component to get a desired result refer to the applicable chapter of the text book or the software and hardware manuals associated with that component.

Figure 8 is a troubleshooting flow chart. It is impossible to cover every possible problem, however most of the more significant possibilities are explored. The following sections walk through the block diagram in greater detail.

Notes

Question 1: Does the software program run?
Yes: Proceed to question 2.
No: Proceed to question 1A.

Question 1A: Does the PC meet the minimum specifications?
Yes: Proceed to question 1B.
No: Get another computer.

Question 1B: Is the correct operating system being used?
Yes: Proceed to question 1C.
No: The DOS software packages usually operate properly on machines running Windows 95, however this is not always true. It may be necessary to boot directly to DOS. If in doubt, use a PC that meets the minimum requirements with the specified operating system.

Question 1C: Are any files corrupted?
Yes: Re-install the program.
No: If the problem cannot be resolved contact Crown.

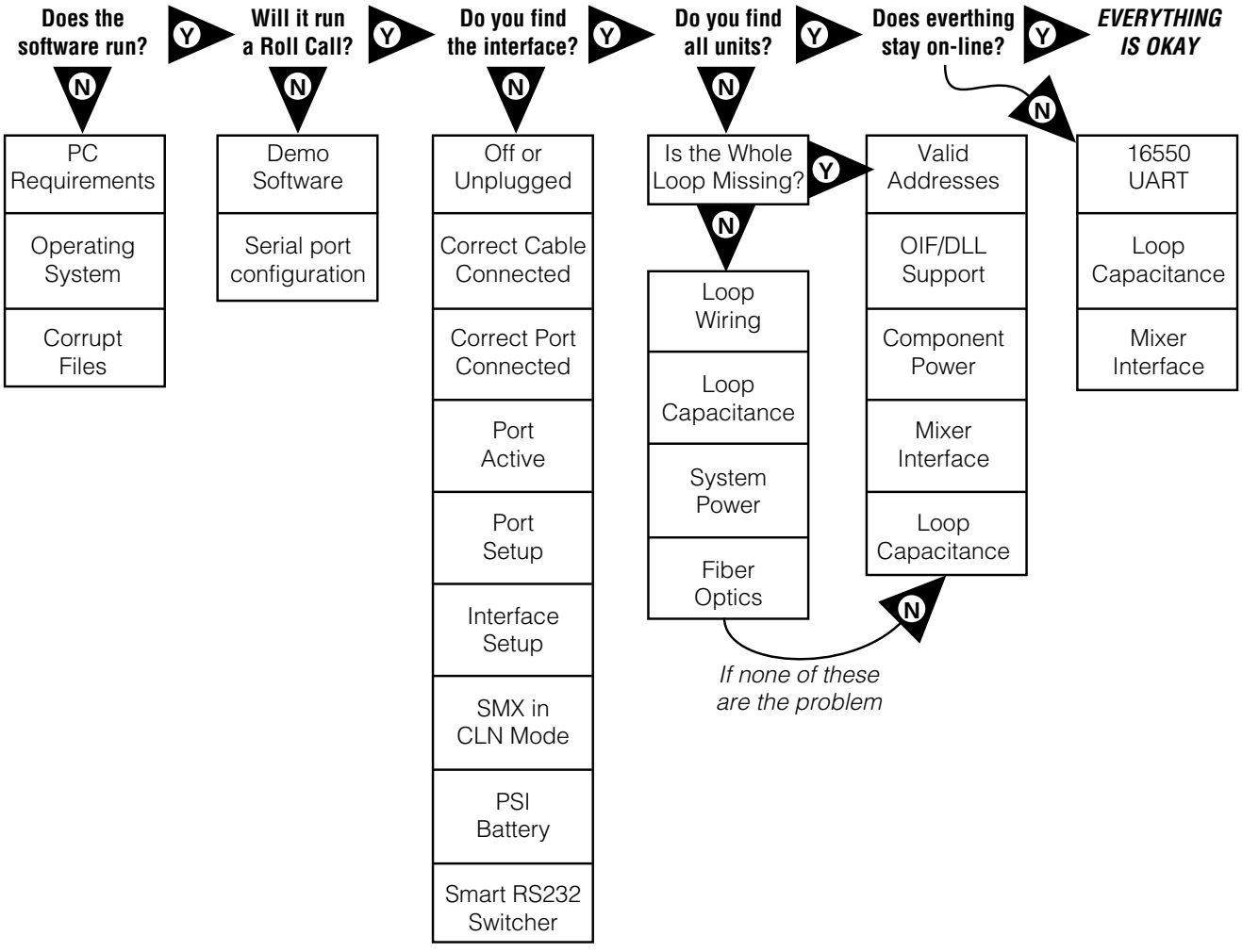

Figure 8. Troubleshooting Flow Chart

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Question 2: Does the software perform a Roll Call?
Yes: Proceed to question 3.
No: Proceed to question 2A.

Question 2A: Is the software program a demonstration version only?
Yes: The program will not communicate with an actual system if it is a demonstration only version.
No: Proceed to question 2B.

Question 2B: Is the serial port properly configured?
Yes: Check the computer's BIOS settings. If the problem cannot be resolved Contact Crown.
No: Check the Windows Control Panel for serial port configuration. Check the software serial port configuration and ensure the proper port is selected that you are not working offline. Check the computer's BIOS.

Question 3: Does the software find the interface at Roll Call?
Yes: Proceed to question 4.
No: Proceed to question 3A.

Question 3A: Is the interface off or unplugged from the AC power source?
Yes: Restore power.
No: Proceed to question 3B.

Question 3B: Is the correct RS232/422 cable being used?
Yes: If a Drone is the system interface it is sometimes necessary to remove Pin 4 from the male connector on the standard RS232 cable. Proceed to question 3C.
No: Use the correct cable.

Question 3C: Is the RS232 cable connected correctly at both ends?
Yes: Proceed to question 3D.
No: Connect the cable properly. Make sure you are connected to the proper port on the computer.

Question 3D: Is the com port active in software (you do not have Working Offline checked)?
Yes: Proceed to question 3E.
No: Set the port to active or working offline unchecked.

Question 3E: Is the serial port configured properly in the IQ software, Windows Control Panel, and the computer BIOS?
Yes: Proceed to question 3F.
No: Configure the computer.

Question 3F: Is the interface properly configured?
Yes: Proceed to question 3G.
No: Set baud to 9,600, 19,200, or 38,400. Note that maximum speed may be limited by long RS232 runs. Ensure that the RS232/422 switch is set correctly. Set parity to off, data bits to 8, stop bits to 1.

Question 3G: If an SMX-6 is used as interface, is it in CLN mode?
Yes: Use another component such as an INT II or PSI as the system interface or, if no other interface is available, reset the SMX by powering it down and temporarily disconnecting the battery.

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No: Proceed to question 3H.

Question 3H: Is an IQ-PSI the interface?
Yes: Replace the battery or use an AC adapter.
No: Proceed to question 3I.

Question 3I: Is an RS232 Switcher being used?
Yes: Try bypassing the switcher and connecting directly. Some smart switchers are not compatible.
No: Reboot the processor of the component serving as system interface by powering down the unit, waiting 30 seconds, then restoring power. If this procedure does not take care of the problem try a different unit as system interface. If that does not work or there is no other interface available contact Crown.

Question 4: Does the software find all system components at Roll Call?
Yes: Proceed to question 5.
No: Proceed to question 4A.

Question 4A: Is the whole loop missing?
Yes: Proceed to question 4F.
No: Proceed to question 4B.

Question 4B: Are all components addressed properly?
Yes: Proceed to question 4C.
No: Remember that you may not have any two components of the same type at the same address on the same loop and that addresses of 0 and 251-255 are not valid.

Question 4C: Does the software have valid OIF and DLL files for the component that is missing?
Yes: Proceed to question 4D.
No: Load the proper files from disk or contact Crown to obtain the proper files.

Question 4D: Is power turned on at the missing component?
Yes: Proceed to question 4E.
No: Power the missing unit.

Question 4E: Is a mixer being used as system interface?
Yes: Remember that mixers should not be used as the interface in large systems. You cannot use a mixer as an interface for IQ2 components.
No: Proceed to question 4F.

Question 4F: Is loop capacitance under 30 nF?
Yes: Proceed to question 4G.
No: Remember to add 60 pF per component to capacitance calculations. In cases where total capacitance is marginal loop operation may be intermittent.

Question 4G: Is the loop wired properly?
Yes: Proceed to question 4H.
No: Verify all connections are properly made, no components have been skipped, and that all connections observe proper polarity.

Question 4H: Is the system powered up?
Yes: Proceed to question 4I.

Notes

No: Often equipment located in remote locations may lose power without any notification to the operator. Most IQ components have drop-out relays so that if power is lost loop continuity will be maintained, but the components will still remain off line.

Question 4I: Is fiber optic cabling being used?
Yes: The problem is likely to be a fiber termination or possibly a tranceiver. Try running the loop on standard wire, or at least test the part(s) of the system that are at distant locations by going to those locations and testing the loop a room of components at a time. This will require taking the computer and interface to the physical location(s) of the equipment on the loop. Note that just because fiber optic cable is being used a Repeater may still be required.
No: Proceed to question 4J.

Question 4J: Is an IQ-INT II being used as system interface?
Yes: Check to make sure that a loop input and output are not connected across two different interface loop connections.
No: Proceed to question 4O.

Question 5: Do all components remain on line with the computer?
Yes: From a communication standpoint the system is operating properly. If problems occur with individual components that are not a function of system design or programming contact Crown.
No: Proceed to quesion 5A

Question 5A: Does the computer have a 16550 UART for the com port?
Yes: Proceed to question 5B.
No: Install a com port board with the 16550 UART chip. This UART supports higher speeds and includes additional memory buffers. It is commonly used with high speed modems, however a standard RS232 com port is required for IQ. If the problem continues proceed to question 5B.

Question 5B: Is loop capacitance under 30 nF?
Yes: Proceed to question 5C.
No: Remember to add 60 pF per component to capacitance calculations. In cases where total capacitance is marginal loop operation may be intermittent.

Question 5C: Is a mixer being used as system interface?
Yes: Remember that mixers should not be used as the interface in large systems. You cannot use a mixer as an interface for IQ2 components.
No: Proceed to question 5D.

Question 5D: DOS Software—Do you lose communication with the system when you move the mouse or perform intense work with graphic objects?
Yes: There is probably a mouse driver conflict or internal computer hardware problem. This may not be correctable without using a different computer. Try a different mouse driver or try loading the mouse into a different memory area. Crown recommends Logitech as the mouse of choice.
No: Proceed to question 5E.

Question 5E: Do you receive Break Detect warnings?
Yes: If you got past the first two questions without a problem there is likely to be a loop capacitance problem or an intermittent connection somewhere in the loop. Return to question 4 and proceed through the appropriate steps.
No: Contact Crown.

Notes

FACTORY SERVICE

In the unlikely event of hardware failure, service for IQ System components should be performed by factory personnel. Crown has over 100 authorized warranty stations across the U.S.; however, IQ System components (and microphones) should only be serviced at the Crown Factory. Also, all Crown hardware carries a 3-Year Full No-Fault Warranty which is fully transferrable. To obtain service from the factory ship the defective product to:

Crown Factory Service
1718 W. Mishawaka Rd Plant 2-SW
Elkhart, IN 46517

Please enclose a letter with a brief description of the problem, where to return the repaired product, contact name, and daytime phone number. PLEASE ship the unit in its original factory pack to avoid shipping damage. If you have thrown away or misplaced your factory pack you may contact the Crown Parts Department for replacement packing material. The Crown Parts Department, Factory Service, and Technical Support Group may all be reached at:

Phone (North America): 800-342-6939
Phone (International): 219-294-8200
Fax: 219-294-8301
IQ Technical Support E-mail: iqsupport@crownintl.com

Hardware Policy

Crown reserves the right to decide if a malfunctioning component will be repaired or replaced during the warranty period. In general Crown will only replace a defective product if the product fails within the first two weeks of installation or if the product has been repaired three or more times in the warranty period (the most recent being at the Crown Factory). Advanced replacements are only available through firms who have established credit accounts with Crown.

Firmware upgrades are not considered warranty service and are chargeable according to the terms established by the Crown Factory Service department. The only exception to this is if the firmware itself is somehow defective and the only way to repair the product is to upgrade the firmware version. If you have additional questions about firmware upgrades contact Crown.

Software Policy

All Turbo and Sys-Config software is site licensed. When an order is placed for any of these software packages the software is built to order with the site name embedded in the program. Developmental software is only available through an IQ Certified consultant, contactor/dealer, or customer.

Software for demonstration purposes is available at no charge from Crown. Demo copies of IQ For Windows are fully functional except that the demo software does not communicate with a real system. Demo copies of Turbo software allow full operation, including communication, however we build in an expiration date, thus it is temporary software. Contact Crown for details.

Crown has two types of software: development and release. Release software is software that has been heavily tested and meets design requirements so that it is as reliable as possible. For software to be released it must also have a finished instruction manual. In the event that a “bug” is discovered in release

Notes

software it will not usually be fixed unless it not possible to circumvent, however any defect found will be fixed in later versions. No additional features will be added to release version software. With development software there may be unidentified bugs, feature additions or changes, or there may be little or no documentation on the software. Development software is usually only made available for review or demonstration purposes, and rarely so even then. We do not want to put questionable software in your hands.

A software upgrade is defined as an upgrade from one version level of software to a higher version level. For example, going from IQ For Windows 1.0 to version 1.1 would be an upgrade. Charges will apply for software upgrades, however upgrades are less expensive than new purchases. Contact the Crown Sales department for specific information about upgrade charges.

REVIEW QUESTIONS

1. What is likely to be the problem if you start the software but cannot run a Roll Call manually or automatically?

2. What is the most significant factor that determines maximum Crown Bus length on twisted pair wire?

3. True or False: The Crown Bus is polarity sensitive.

4. List as many IQ components as possible that are static sensitive.

Notes

5. Addresses are set by eight segment DIP switches on IQ components. What addresses are not considered valid?

6. How can you quickly determine whether a communication problem is most likely between the computer and interface or on the Crown Bus?

7. How does Break Detect work?

8. List as many conditions as you can think of that would constitute a break in a Crown Bus loop.

9. If you measure 0.7 VDC across the positive and negative terminals of a Crown Bus connection, what does this indicate?

10. What are the limitations of a mixer (SMX-6 or AMB-5) as system interface?