



# Technical Data

## 9020A Micro-System Troubleshooter B0146 IEEE-488 Production Test

If you've ever been involved in production test, you know that automatic testing, when done properly, can be the answer to your prayers. Test times can be cut by a factor of ten, lower skill-level operators may be used, and in some cases, troubleshooting boards that did not pass may be done immediately following testing. This reduces the need for yet another fixture and tester.

But, how do you go about determining what type of ATE (Automatic Test Equipment) is right for your job? Your first decision point should be volume. Granted, large automatic board testers are expensive, but their throughput on a GO/NOGO basis is typically five times faster than an individual bench set-up. Five individual bench set-ups could easily cost more than one large automatic board tester. Your second decision point should be what the board's test requirements consist of. Typically, large automatic board testers are the best thing since sliced bread when it comes to testing digital logic. But if your boards contain very many analog devices and signals, large automatic board testers begin to falter in their capability to offer complete solutions to your testing needs.

So, if large board testers don't seem to fit your needs, you might consider the other alternative to production test. This method combines a set of instruments which will provide your board with all the required stimulus and measurement capability to fully test (and troubleshoot, if desired) your production boards. These instruments are all tied together using the IEEE-488 bus. And, with the help of an instrument controller or small computer, your test, troubleshooting, and verification procedures can all be automated as fully as you wish.

"Why", you say, "is this idea so revolutionary? It's been in use for years on older lines of products." Yes, but the older line of products did not contain microprocessors. In the past, there were no good methods to exercise a board, in the same way its microprocessor normally does. You couldn't stimulate the board and make analog measurements using other instruments. But today there is the 9020A Micro-System Troubleshooter.

The 9020A is designed specifically to interface with your microprocessor based boards and stimulate them in the same way that they are stimulated during normal operation. The 9020A is IEEE-488 controlled so it can be easily integrated into existing or about to be designed, IEEE-488 automatic test set-ups.



If you have heard about Fluke's other low-cost troubleshooters, then you already know about their capabilities. But if you haven't, let's briefly talk about the 9000-Series Micro-System Troubleshooters and their advantages in the world of troubleshooting.

The 9000-Series Instruments were designed to test and troubleshoot microprocessor-based boards and microprocessor-based systems. A self-contained interface pod is used to connect the 9000-Series mainframe to the unit under test, replacing the system's processor. Therefore no fixturing is needed. Through this universal connection, the 9000-Series Instruments gain direct access to all components which communicate with the microprocessor. The instrument can then stimulate microprocessor activity which permits testing at real time rates with correct microprocessor timing. For those components which do communicate directly with the processor, automatic "canned" tests are provided. For the other components on the board, they can be stimulated in the same manner as during normal operation and verified with the stimulus/response probe. All in all a unit that is amazingly simple to use.

"But why would one want to integrate a seemingly manual troubleshooting instrument for microprocessor circuits into an automatic test set-up?" The

answer is that you need to stimulate your hardware in the same manner as it is stimulated during actual operation. At the same time you need to make measurements to verify that the hardware is performing properly. The classic example is the requirement to measure the analog output from a digitally controlled device. How do you stimulate the digital section and then at the same time make analog measurements?

Using the 9020A in an IEEE-488 controlled system, the answer is simple. Your controller tells the 9020A to write the desired data at the locations required to turn on and output an analog voltage on your board. Also incorporated into your system would be a voltmeter connected in some manner to that analog output. Now your controller instructs the voltmeter to make a measurement and transmit that measurement for evaluation. The controller then makes a decision on that voltage measurement. Completely closed loop and completely automated.

In our example, we have taken a board that is basically half digital and half analog and done a portion of what might be involved in a production test set-up for this board. First, making use of the automatic canned test for bus-oriented components, the BUS, RAM, and ROM tests were incorporated. This is to verify that the kernel of the board is working. Once this is verified, other sections of the board can be tested.

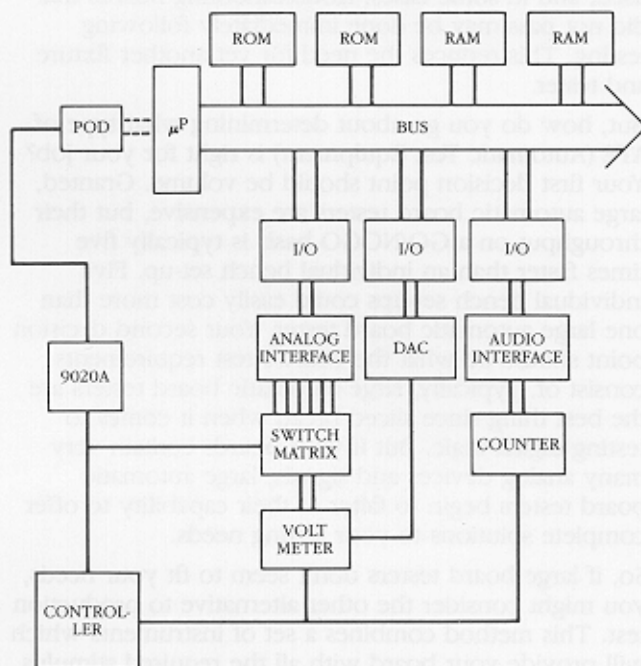
There is an audio jack on the board for output to a tape device. This is connected to a frequency counter to verify the mark and space frequencies. One output jack contains forty pins with various analog signal levels. These are run into a switch matrix to allow the voltmeter to look at one pin at a time for verification of the proper level. Another I/O port drives a DAC. The output of the DAC is also routed to the voltmeter for verification. This board requires many analog measurements, but the key is that the analog signal only appears when stimulated by the microprocessor circuitry. This is where the 9020A is invaluable for testing.

Since 1949, the test and service industry has depended on Fluke for quality instrumentation. Now with the 9020A joining the other IEEE-488 controllable instruments (controllers, voltmeters, switch matrices, counters, DAC's, and synthesizers), we are prepared to offer you a total system solution for your testing needs.

*"That's nice", you say, "but what if high volume and mostly digital boards are the real requirement?"* No

problem, at Fluke we have a full line of large automatic board testers to meet your needs. Remember, we are here to offer you solutions to your testing troubles.

We will be happy to discuss your specific testing needs with you. Let's get together and talk solutions.



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