FLUKE 90 SERIES

GETTING STARTED

Application Notes

This information is intended to provide a rapid solution should you encounter a problem while getting to know your new FLUKE 90 SERIES. We don't anticipate one, but our top priority is to give you, our customer, every tool at our disposal to insure that your introduction to the FLUKE 90 SERIES is a complete success. Your 'User's Manual' contains most of the following information. The purpose of this document is to consolidate all of the critical information needed to get you over any hurdles you may encounter during the familiarization phase.

GETTING STARTED

A. Getting Past Turn-on Problems

1. Self test error codes and solutions

   For the 90 Series to perform any test, the microprocessor on the unit under test (UUT) must attain a minimum functional level. The 90 Series monitors operation of the UUT microprocessor by automatically running four basic tests during the power-up sequence. These tests detect fatal flaws that prevent the 90 Series from performing any tests at all.

   When a basic test detects a fault, the appropriate error message is displayed. The error message remains on display until any key is pressed.

ATTENTION

A failure during Self Tests may be an indication of a poor contact between the microprocessor and the 90 Series test clip. The contacts on the micro and the 90 Series test clip should be cleaned every time (using Chlorothene or similar contact cleaner) before clipping the 90 Series on to the UUT microprocessor.

Following are descriptions of the 90 Series error codes and what should be done to correct the associated problems.

Error 1 - 90 Series RAM Failure

ERROR 1
RAM FAILURE

This message indicates that the internal RAM within the 90 Series has failed.

WHAT DO I DO?

The unit must be returned to a FLUKE or PHILIPS repair center for repair.

Error 2 - 90 Series LCA Failure

ERROR 2
LCA FAILURE

This message indicates a malfunction in the Logic Cell Array (LCA) or part of its support circuitry within the 90 Series. This section of the system is the main interface between the UUT and the 90 Series microprocessor, so any failure would effect the overall performance of all tests.

WHAT DO I DO?

The unit must be returned to a FLUKE or PHILIPS repair center for repair.

Error 3 - UUT Clock Failure

ERROR 3 UUT CPU
CLOCK PIN FAULT

A malfunctioning clock on the UUT may cause test failures and constitute a fatal error. The clock test senses the rising and falling edges of the clock signal. If both edges of the clock signal are not

present, the 90 Series detects the faulty clock, halts all operations, and displays the error message.

WHAT DO I DO?

The clock circuitry on the UUT must be restored to normal before continuing. An oscilloscope is recommended to ensure the rising and falling clock edges are within the manufactures specifications and are free of excessive ground noise. A poorly operating system clock on the UUT can cause a wide variety of system malfunctions, ranging from an intermittent problem to a total hard failure.

Error 4 - UUT BUS Request Line Shorted

ERROR 4 UUT CPU
BUS REQUEST FAIL

The 90 Series must be able to drive the BUS request line. The Bus Request Test ensures that this line is drivable. If the line is not drivable, the 90 Series halts all operations and displays the error message.

WHAT MICROS AND SIGNAL LINES DOES THIS AFFECT?

Examples of some microprocessors

Z80

On the Z80, BUS REQ, pin 25, must not be tied directly to +5V. If it is not being used, standard design practice is to tie Bus Request high through a 10K ohm resistor.

If this pin is tied directly to +5V, the 90 Series cannot do DMA access of the host system, and the 90 Series will not work. The 90 Series uses DMA access to get control of the UUT bus for testing.

8085

HOLD, pin 39, must not be tied directly to ground. If it is not being used, standard design practice is to tie HOLD low through a 10K

ohm resistor. If this pin is tied directly to ground, the 90 Series cannot do DMA access of the host system, and the advanced test procedures will not work.

6809

HALT, pin 40, must not be tied directly to +5V. If it is not being used, standard design practice is to tie HALT high through a 10K ohm resistor. If this pin is tied directly to +5V, the 90 Series cannot do DMA access of the UUT, and the advanced test procedures will not work.

WHY DO WE NEED BUSREQ?

Through BUSREQ line, the 90 Series can signal the host CPU to relinquish control of the address, data and control lines so that the 90 Series can use them to access other UUT peripherals.

If more than one device exists that can take control of the bus via the BUSREQ line, the 90 Series tries to accommodate the additional devices(s) by doing the following:

1) When the 90 Series requires access to the bus, it first checks for any activity on the BUSREQ line.

2) If activity is detected on the BUSREQ line, the 90 Series will go into an idle mode waiting for the other device(s) to release the bus.

3) If no activity is detected, the 90 Series will actuate the BUSREQ line and wait for the host to signal that it has relinquished control of the UUT system bus.

While every attempt is made to allow additional DMA devices to co-exist with the 90 Series, we cannot guarantee that the other DMA device(s) in the system will check for the 90 Series using the bus. In this situation, a "bus clash" will occur, and the 90 Series may not function as desired.

When a "bus clash" condition exists, the other DMA device(s) must be disabled to allow the 90 Series to be the sole DMA device while troubleshooting the UUT system.

WHAT DO I DO?

If you find your circuit board has one of the control lines tied to +5V or ground, the 90 Series may still be used by following one of the procedures below:

1) If your microprocessor is mounted in a socket, remove the CPU and carefully bend the appropriate pin under the microprocessor chip. This will allow the 90 Series to still connect to the pin; however, the circuit board will not be connected to that pin. Because the 90 Series has pull-up resistors incorporated into its design, no external resistors will be required.

2) If your UUT's microprocessor is soldered in, the modification procedure becomes more difficult. You must carefully examine the circuit board to see if any other traces connected to the pin are incorrectly tied high or low. If no other traces appear to use the connection, the trace can be carefully cut to break the connection. If desired, a 10K resistor can be placed in line to allow 90 Series control of the CPU.

3) If you discover additional connections, you have to maintain these other connections and isolate only the DMA line of the CPU. Because these types of connections are either connected to ground or +5V, board designers may use this connection as a path to ground or +5V. Having isolated the CPU DMA line, the other traces cut must be bridged to restore the connections to the other pins or circuitry.

Error 5 - NO UUT DMA Acknowledge

ERROR 5 NO UUT
BUS ACKNOWLEDGE

The Bus Acknowledge Test ensures that the microprocessor has received the Bus Request signal and will relinquish control to the 90 Series. If the signal is not received, the 90 Series halts all operations and displays the error message.

WHAT DO I DO?

Following the guide lines previously mentioned for correcting BUSREQ line problems, modify the microprocessor or circuit board to allow the BUS ACK line to be driven.

If you do not get correct readings while doing tests like PROM checksum or RAM memory, yet there are no error messages indicating the 90 Series failed to take control of the bus, you should check the design of the UUT system. Ideally, the UUT should not use the Bus Acknowledge or Bus Request signal to disable any bus driver devices that separate the microprocessor kernel from the other system components during DMA cycles. If it does, you will have to use a jumper wire to "enable" the bus drivers. This simply means disconnecting the Bus Acknowledge signal from the enable line of the bus drivers by using the bent pin method on the CPU socket or by temporarily opening the signal on the pc board. Once the signal is disconnected, use a jumper lead to "enable" the bus driver devices during the testing period. Most often the enable signal of bus drivers is "low going" and requires tying the enable signal to the UUT system ground.

Some Intel Multi-Board systems use this method to facilitate DMA cycles; however, these systems also generally use sockets on the CPU. Temporarily isolating the signal will allow the FLUKE 90's tests to hunt for probable causes of incorrect UUT system operation.

Some STD bus CPU cards use a similar method of isolation during DMA cycles. The boards will use the bus acknowledge signals to drive the bus drivers in the opposite direction during a valid DMA acknowledge signal. The resulting 'bus clash' condition will occur during 90 Series DMA cycles. The remedy is to isolate the signal that switches the bus driver direction and temporarily jumper this signal to the non-active state during 90 Series DMA cycles.

Another method of solving the problem with Multi-Board and STD systems either switching drivers off or switching their direction is to adapt the 90 Series test clip to a Multi-Board or STD bus plug-in board. This will enable tests on the UUT system via the main system bus rather than the standard 90 Series UUT CPU connection. These

bus standards bring all of the CPU signal lines out to a card edge connector.

Error 6 - UUT WAIT Line Shorted

ERROR 6 UUT WAIT LINE SHORTED

The WAIT Line Test determines whether the UUT system can use this line to initiate short 'wait' periods during slow memory or I/O access cycles. If the test fails, the error message will be shown on the display. Not all UUT systems will use this signal; however, so check your system documentation. The 90 Series tester will check the WAIT Line during start-up test and during Bus Test routines. If you have determined that the line is not being used by your UUT, simply cover the appropriate pin on the 90 Series test clip with shrink sleeving. Isolating the UUT signal and the 90 Series test clip pin will keep the 90 Series from generating an error code on this line. The 90 Series does not use this line in any of its preprogrammed tests directly, but does check this line at power-up and during Quick Trace and Probe Control.

WHAT DO I DO IF THIS LINE IS SUPPOSED TO BE OPERATIONAL?

If the WAIT line exhibits a problem during self-tests, a hard failure on the UUT exists pertaining to that line and must be cleared before continuing with the testing.

Error 7 - UUT RESET Line Shorted

ERROR 7 UUT RESET SHORTED

This error message indicates that the 90 Series is unable to control the RESET line.

WHAT DO I DO?

This condition prohibits the UUT from performing correctly and indicates a fault between the microprocessor RESET pin and the UUT RESET circuitry. Before continuing, use a scope to view the signal during power-up and check for correct operation. The signal should pulse active for a short time to fully reset all system components tied to this signal.

Error 8 - 90 Series ROM Checksum Failure

ERROR 8
CHECKSUM FAIL

This message indicates that the 90 Series' internal program has a failure in it.

WHAT DO I DO?

The unit must be returned to a FLUKE or PHILIPS Repair Center for repairs.

Error 9 - LCD Time Out

ERROR 9 LCD
TIME OUT

If the 90 Series attempts to write a message to the LCD display and it is not acknowledged via an interrupt, the 90 Series will halt operation and display an appropriate error message.

WHAT DO I DO?

The unit must be returned to a FLUKE or PHILIPS Repair Center for repairs.

Error 10 - 90 Series UART Time Out

ERROR 10 UART
TIME OUT

If the 90 Series attempts to send a character to the internal UART but no interrupt is received, the 90 Series will halt operation and display an error message on the LCD display.

WHAT DO I DO?

The unit must be returned to a FLUKE or PHILIPS Repair Center for repairs.

2. Getting around power problems

   a) Power and ground isolation

      WHAT IS IT?

      Some systems operate on batteries or use CMOS RAM. These systems may require an external power supply for the 90 Series to operate because the host power supply probably cannot power both the 90 Series and its own circuitry. The Radio Shack Model 100 TM laptop computer is an example of such a system.

      To prevent the 90 Series from suppling power to the host circuitry, a special circuit has been incorporated in the 90 Series design.

      This circuit will not allow the external power supply to operate unless the host UUT has a proper power supply source. Furthermore, the circuit allows the 90 Series to track and follow the host power supply to ensure that the voltage supplied to the 90 Series and the voltage supplied to the host circuitry do not differ by more than .2 volts. Without this feature, the differences in the supply voltages could damage the 90 Series or the host circuitry.

   b) UUT floating point hazard

WHAT IS IT?

If you are using a computer to control the 90 Series, a potential floating ground hazard may exist. Usually, no isolation exists between the computer and it's RS-232 interface, the 90 Series and UUT ground.

WHY IS IT A PROBLEM?

If a voltage potential exists between the earth ground of the remote computer and the UUT ground, it may cause a large current to flow through the 90 Series and cause damage.

HOW CAN IT BE TESTED?

Using a voltmeter or DMM, check the voltage potential between the earth ground of the remote computer and the UUT ground. If voltage measures in excess of .5 volts, a floating ground exists and must be repaired before the 90 Series can be used.

WHAT IS THE BEST REMEDY?

To balance the potential between the ground planes, take a test clip and short the two grounds together. Then take a meter and re-check the voltage test measurement between the ground of the remote computer and the UUT ground.

To balance the potential between the ground planes of the terminal and the 90 Series, use a series 1k ohm resistor between the ground on the 90 Series and the signal ground on the remote terminal. This usually will fix the problem and can be verified by rechecking with a voltmeter. A ground potential difference between your scope ground and the ground terminal on the 90 Series Trigger/Sync output should also be checked if using the 90 Series scope trigger output to make timing measurements. If a ground potential difference exists, remedy the situation before continuing.

It is recommended that you connect a ground lead from the UUT you are testing, to the 90 Series. Use the ground side of the Trigger/Sync output lugs on the back of the

90 Series (the ground terminal is clearly marked). Some UUT systems have a significant amount of ground noise on the power supply. Connecting the ground lines together will ensure optimum performance of the 90 Series tests.

3. Watch dog timers and inactivity circuits.

WHAT ARE THEY?

Some UUT's have special safety circuits that reset the UUT CPU if it appears to be inactive for any extended period of time. The circuit detects a problem if it does not receive a pulse from the host within a preset time.

On normal execution of the host program, the software supplies the pulses on a regular basis. If a fault occurs that causes the host CPU to lose track of what it is doing, the pulses are not provided, and the watchdog circuit is activated, restoring the system to a known state.

WHAT PROBLEMS CAN OCCUR?

During Test Memory, Checksum Test and Memory Soak Test, the UUT is suspended for extended periods of time. If the UUT seems to be resetting spontaneously, a watchdog circuit may have been incorporated in the UUT design and may have to be disabled before using these tests.

WHY WILL THEY OCCUR?

During these tests, the host CPU may not be able to provide pulses to the watchdog circuit within the required time-frame, causing the watchdog circuit to reset the host microprocessor.

HOW DO I DISABLE THESE CIRCUITS?

In most cases, the circuits can be disabled simply by taking a test clip and pulling the watchdog "kick" pulse either high or low. Refer to the manufacturers specifications and documentation to gain insight on disabling these devices.