Technical Data

9100A

Synchronizing I/O Module and Probe with "INT" Mode

Introduction

When using the I/O Module as your source for stimulus, the signatures gathered by the probe do not always agree with those gathered by the I/O module. The problem lies in how each device is synchronized.

The Fluke 9100A Digital Test System has several I/O devices which can help the user troubleshoot UUT's: the probe, the I/O module, and the Vector Output I/O module. The probe is a single channel device and can be programmed as an input device or an output device. When its mode is input, it can measure signatures, logic levels, and counts; furthermore, it can measure frequency up to 40 MHz. The probe also can be an output device, generating a constant level - either high or low - or a toggled signal based on a free run clock.

The I/O module has 40 channels. Each of the 40 channels can be independently programmed as an input pin, an output pin, or both. Each channel can be viewed as a single probe, with a maximum input frequency of 10 MHz. The Vector Output I/O is a newer version of the I/O module. In addition to the original measurement capability of the I/O module, the Vector Output I/O can output a series of patterns at a frequency as high as 25 MHz. It also has a single wire called "WAIT" which is very useful when handshaking is required.

Because the I/O module has the capability to drive a series of patterns, it is very useful in card edge testing or breaking feedback loops. When the test is only using I/O modules, synchronization can be easily done with "storepatt" and "writepatt" commands. But in cases where the probe is used, the user may encounter a synchronization problem.

In order to understand the problem, let's consider the following test situation. (See Fig. 1.)

U1 is a 74244 which drives the following devices: R1, R2, R3, R4, R5, R6, R7, R8, and J1. The measurement devices are the I/O module for U1 and the probe for all the resistors and J1.

The test program is using "storepatt" and "writepatt" commands. These are the program listings, and the response file is shown in Table 1:

```
program old
clearpatt device "/mod1"
storepatt device "/mod1", pin 17, patt "101010110"
storepatt device "/mod1", pin 15, patt "110000001"
storepatt device "/mod1", pin 13, patt "011100110"
storepatt device "/mod1", pin 11, patt "010111111"
storepatt device "/mod1", pin 8,  patt "010010110"
storepatt device "/mod1", pin 6,  patt "001000001"
storepatt device "/mod1", pin 4,  patt "000001110"
storepatt device "/mod1", pin 2,  patt "010010100"
sync device "/mod1,/probe", mode "int"
arm device "/mod1,/probe"
  writepatt device "/mod1", mode "latch"
readout device "/mod1,/probe"
reset device "/mod1"
end program
```

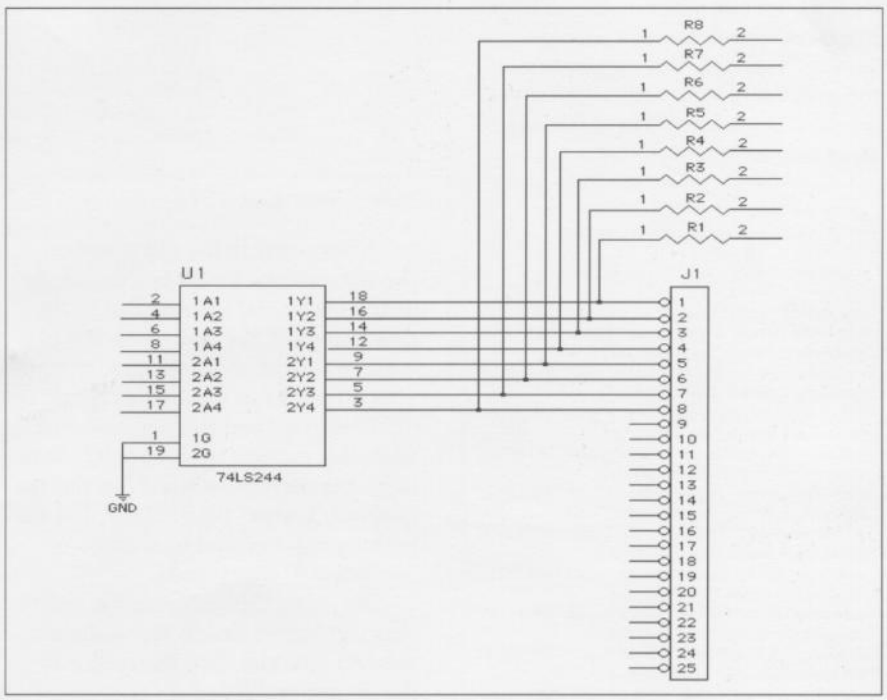

Figure 1.

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STIMULUS PROGRAM NAME: OLD DISK FREE:

Response Data

Node Signal Src	Learned With	SIG	Async SIG	Cl LVL	Counter Mode
U1-18	I/O MODULE	0095	1 0	10	TRANS
U1-18	PROBE	0000	1 0		TRANS
U1-16	I/O MODULE	000E	1 0	1 0	TRANS
U1-16	PROBE	0000	1 0		TRANS
U1-14	I/O MODULE	0041	1 0	1 0	TRANS
U1-14	PROBE	0000	1 0		TRANS
U1-12	I/O MODULE	0097	1 0	1 0	TRANS
U1-12	PROBE	0000	1 0		TRANS
U1-9	I/O MODULE	00BE	1 0	1 0	TRANS
U1-9	PROBE	0000	1 0		TRANS
U1-7	I/O MODULE	00E7	1 0	1 0	TRANS
U1-7	PROBE	0000	1 0		TRANS
U1-5	I/O MODULE	0182	1 0	1 0	TRANS
U1-5	PROBE	0000	1 0		TRANS
U1-3	I/O MODULE	0154	1 0	1 0	TRANS
U1-3	PROBE	0000	1 0		TRANS

Table 1. OLD Response File

As we can see, the responses collected by the probe are of no value because they are all "0;" furthermore, they do not agree with those responses collected by I/O module number 1. The reason for this discrepancy is the difference in the synchronization sources. The "writepatt" command will provide a clock for signature collecting for the I/O module driving the pattern, but it does not provide the probe with any synchronization source. This is why the I/O module gets solid signatures, yet the probe gets nothing.

The Solution

By altering the format of the test pattern, we can synchronize all of the measurement devices to a single source - Internal. The signatures on the probe will then agree with those on the I/O module. The following is an example:

```
program new
setword device "/mod1", word 1, as_pins
"17 15 13 11 8 6 4 2"
sync device "/mod1,/probe", mode "int"

arm device "/mod1,/probe"
writeword device "/mod1", word 1, patt "11000000"
strobeclock device "/mod1,/probe"
writeword device "/mod1", word 1, patt "01111001"
strobeclock device "/mod1,/probe"
writeword device "/mod1", word 1, patt "10100100"
strobeclock device "/mod1,/probe"
writeword device "/mod1", word 1, patt "00110000"
strobeclock device "/mod1,/probe"
writeword device "/mod1", word 1, patt "10011001"
strobeclock device "/mod1,/probe"
writeword device "/mod1", word 1, patt "00010010"
strobeclock device "/mod1,/probe"
writeword device "/mod1", word 1, patt "10111011"
strobeclock device "/mod1,/probe"
writeword device "/mod1", word 1, patt "10111010"
strobeclock device "/mod1,/probe"
writeword device "/mod1", word 1, patt "01010100"
strobeclock device "/mod1,/probe"
writeword device "/mod1", word 1, patt "XXXXXXXX"
readout device "/mod1,/probe"
end program
```

The new program provides the same stimulus to the UUT using an alternative method. The two key commands are "writeword" and "strobeclock." "Writeword" generates stimulus to the UUT while "strobeclock" provides the necessary synchronization clock to the listed devices.

STIMULUS PROGRAM NAME: NEW

Response Data

Node Signal Src	Learned With	SIG	Async LVL	Clk LVL	Counter Mode
U1-18	I/O MODULE	0095	1 0	1 0	TRANS
U1-18	PROBE	0095	1 0	1 0	TRANS
U1-16	I/O MODULE	000E	1 0	1 0	TRANS
U1-16	PROBE	000E	1 0	1 0	TRANS
U1-14	I/O MODULE	0041	1 0	1 0	TRANS
U1-14	PROBE	0041	1 0	1 0	TRANS
U1-12	I/O MODULE	0097	1 0	1 0	TRANS
U1-12	PROBE	0097	1 0	1 0	TRANS
U1-9	I/O MODULE	00BE	1 0	1 0	TRANS
U1-9	PROBE	00BE	1 0	1 0	TRANS
U1-7	I/O MODULE	00E7	1 0	1 0	TRANS
U1-7	PROBE	00E7	1 0	1 0	TRANS
U1-5	I/O MODULE	0182	1 0	1 0	TRANS
U1-5	PROBE	0182	1 0	1 0	TRANS
U1-3	I/O MODULE	0154	1 0	1 0	TRANS
U1-3	PROBE	0154	1 0	1 0	TRANS

Table 2. NEW Response File

Notice that in the old program, the test pattern for an individual pin is in a horizontal format. But in the new program, the test pattern is in a vertical format. For instance, the pattern on pin 17 in the first program is "101010110," and the command to form this pattern is "storepatt." Similarly, the pattern on pin 17 in the new program is also "101010110", but the pattern is generated by a series of "writeword" commands.

By using this method, the probe gets signatures exactly the same as the I/O module. (See the response file shown in Table 2.)

Conclusion

The "writepatt" command and the "writeword" command are two handy software tools for 9100A users. The "writepatt" command has a faster speed, but its pattern depth is limited. It can only drive up to 255 patterns at a time, and it prevents synchronizing multiple devices. The "writeword" is slower than "writepatt," but its pattern depth is virtually unlimited. The biggest advantage of "writeword" is that it provides a synchronization method for response collection with the probe. By using the "writeword" and the "strobeclock" commands, all the devices are synchronized to a single source by software. It not only gives the user a solid response, but also saves a lot of external synchronization source connections.

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