

# 9100A

## Using Multiple I/O Modules For Driving Patterns and Gathering Signatures

Using the TL/I commands, STOREPATT and WRITEPATT, is an easy way to drive a card edge or break a feedback loop using a single I/O Module. Synchronizing multiple I/O Modules for pattern drive and signature gathering, however, requires some extra set up.

### Basic Operation of I/O Modules:

Any combination of I/O Modules and individual pins on Modules can be synchronized for driving patterns or gathering signatures, or doing both at the same time. All pins on I/O Modules are gathering response data any time a pin is used, even if the pin is driving a pattern. The input circuitry is in parallel with the output drivers which can be used to verify that the data was actually driven.

The "STOREPATT" command is used to set up the output section of the I/O Module. Using this command, a pin can be set up to output a "one", a "zero", and then turned off (1,0,x) in any sequence. If an I/O Module is used for driving patterns, capturing responses, or both, at least one STOREPATT command must be used.

The "WRITEPATT" command outputs the specified sequence of patterns stored using the "STOREPATT" command. "WRITEPATT" also sends a synchronizing "strobe" signal to each I/O Module set up using the "STOREPATT" command. This allows you to use two or more I/O Modules together, one as output and one as input. Even though one module may be used exclusively for input, it stills needs

a "STOREPATT" command addressing it, so that the "WRITEPATT" can send it the synchronizing "strobe" signal. To achieve this on the input I/O Module, a dummy "STOREPATT" instruction is used, writing a single tristate character to any single pin on the I/O Module.

### Synchronizing Multiple I/O Modules:

1. Set the sync mode to internal (int) on each Module used.  
sync device "/mod1", mode "int"  
sync device "/mod2a", mode "int"  
! Internal sync mode must be used  
! with WRITEPATT to gather signature during each output pattern.
2. Always clear the I/O Modules  
clearpatt device "/mod1"  
clearpatt device "/mod2a"

Note that Module 1 is referred to as "/mod1" and Module 2 is referred to as "/mod2a." Describing a Module as "/mod1" refers to the pin numbered at the blue I/O Module connectors. By adding an "a" or "b" to the description, "/mod1a" or "/mod1b" refers to the pin numbers of the installed clip on side "a" or "b" of the Module. For more information about I/O Module and clip pin numbering refer to the Programmer's Manual page 3-65, or the TL/I Reference Manual Appendix E, I/O Module clip pin mapping.

3. Have at least one "STOREPATT" command for each Module to set up the output section. In this example, Module 1 is set to output tristate only, or its outputs are turned off. Module 2, pins 1 and 3 are driving patterns, and pin 4 output is off.

```
STOREPATT device "/mod1",
pin 1, patt "x"
```

```
! mod1 is used as input only
STOREPATT device "/mod2a",
pin1, patt "0100101101001011"
STOREPATT device "/mod2a",
pin3, patt "1101110111011101"
STOREPATT device "/mod2a",
pin 4, patt "x"
```

```
! mod2, pin 4 is used as input only
```

4. Arm all Modules used.  
arm device "/mod1./mod2a"
5. Include all Modules used in the WRITEPATT command. Latch mode is used for this application.  
WRITEPATT ("/mod1./mod2a", "latch")
6. Readout all Modules used.  
readout device "/mod1./mod2a"

The following TL/I program is an example of how to set up and use multiple I/O Modules for driving patterns and gathering responses.

```

program module

open device "/term2"

reset device "/mod1a"
reset device "/mod2a"

sync device "/mod1a", mode "int"      ! Internal sync mode must be used
sync device "/mod2a", mode "int"      ! with WRITEPATT to gather signatures
                                        ! during each output pattern.

clearpatt device "/mod1a"              ! Always clear the Modules.
clearpatt device "/mod2a"

! Use the following statement to sync I/O Module 1, used as receive only,
! to I/O Module 2, output only. This statement will allow signatures
! to be gathered on all 40 pins of I/O Module 1 synchronized with the
! vector output of Module 2.

STOREPATT device "/mod1", pin 1, patt "x"

STOREPATT device "/mod2a", pin 1, patt "0100101101001011"
STOREPATT device "/mod2a", pin 2, patt "0100101101001011"
STOREPATT device "/mod2a", pin 3, patt "1101110111011101"
STOREPATT device "/mod2a", pin 4, patt "x"      ! Pin 4 is used as an
                                                ! input on Module 2.

arm device "/mod1a,/mod2a"            ! Arm both Modules

WRITEPATT ("/mod1a,/mod2a", "latch")    ! WRITEPATT to include all Modules
                                        ! used.

readout device "/mod1a,/mod2a"         ! Readout both Modules.

a = sig device "/mod1a", pin 1, refpin"" ! Show the inputs to Module 1.
b = sig device "/mod1a", pin 2, refpin""
c = sig device "/mod1a", pin 3, refpin""
d = sig device "/mod2a", pin 1, refpin"" ! To verify the outputs from
e = sig device "/mod2a", pin 2, refpin"" ! Module 2.
f = sig device "/mod2a", pin 3, refpin""

print using "Module 1 sig 1= %%%, sig2= %%%, sig3= %%%\n",a,b,c
print using "Module 2 sig 1= %%%, sig2= %%%, sig3= %%%\n\n",d,e,f

end program

```

## Conclusion

Using a single I/O Module for both input and output has been a straight forward procedure with the Fluke 9100A. But using one Module for output and a second for input requires a few extra programming steps. This technical note has demonstrated how the "STOREPATT" command can be used to set up the input Module for proper synchronization with the output Module.

**John Fluke Mfg. Co., Inc.**  
P.O. Box C9090 Everett, WA 98206  
Tel. (206) 347-6100

For more information, call:  
(800) 443-5853 (toll-free) in the U.S.A.  
(416) 890-7600 in Canada.  
(206) 356-5500 from other countries

Philips International B.V.  
T&M Dept., Building TQIII-4  
5600 MD Eindhoven, The Netherlands  
Telex: 35000 PHTC NL/NLFEVSI

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