# 9100 Series

# Card Edge Fixture Kit

P/N 830349 September 1987 ©1987, John Fluke Mfg. Co., Inc. All rights reserved. Litho in U.S.A.



# CONTENTS

Section	Title	Page
1. Introdu	ction	. 1
1.1. 1.2. 1.3. 1.4. 1.5. 1.6.	FUNCTION OF THE CARD EDGE FIXTURE KITDESIGN PHILOSOPHYTHE 9100 TEST SYSTEMCONFIGURATIONELECTRICAL SPECIFICATIONSMECHANICAL SPECIFICATIONS	. 1 . 1 . 2 . 4 . 4
2. Assem	bly Instructions	. 5
2.1. 2.1.1. 2.1.2. 2.1.3.	PARTS LISTS	. 5 . 5 . 6
2.2.	ASSEMBLY INSTRUCTIONS, CARD EDGE FIXTURE KIT	. 6
2.2.1. 2.2.2.	Assembly Overview Step-by-Step Assembly of the	. 6
2.3.	ASSEMBLY INSTRUCTIONS, CARD EDGE FIXTURE BASE	. 0 12
2.3.1.	Overview	12
2.3.2.	Step-by-Step Assembly of the Card Edge Fixture Base	14
2.4.	MOUNTING THE CARD EDGE FIXTURE TO A CONSOLE	15
2.5.	CONNECTING AN INTERFACE POD TO THE FIXTURE	15

3. Program	nming Information	19
3.1.	ACCESSING FIXTURED PINS THROUGH TL/1	19
3.2.	TL/1 COMMANDS USEFUL WITH	
	FIXTURED I/O MODULE PINS	20
3.3.	USING GFI AND THE FIXTURE	21
3.4.	USING A FLUKE INTERFACE POD	
	WITH THE FIXTURE	21
4. Perform	nance Considerations	23
41		~~
	UUI POWER	23
4.2.	PERFORMANCE CIRCUITRY	23 23
4.2. 4.3.	PERFORMANCE CIRCUITRY	23 23 23
4.2. 4.3. 4.3.1.	DESIGN GUIDELINES FOR I/O MODULES	23 23 23 24
4.2. 4.3. 4.3.1. 4.3.2.	DUIT POWER       PERFORMANCE CIRCUITRY         PERFORMANCE CIRCUITRY       DESIGN GUIDELINES FOR I/O MODULES         How Short is Short?       Solving Common Problems	23 23 23 24 24

# Section 1 INTRODUCTION

# FUNCTION OF THE CARD EDGE FIXTURE KIT

The Card Edge Fixture Kit provides a simple means to interface the 9100 test system to boards with card-edge connectors. The kit enables up to four I/O modules to be connected to a card edge. Interface Pods can also be interfaced through this kit.

# **DESIGN PHILOSOPHY**

The fixture is designed as a kit to allow maximum customization by the customer. The following pages describe a typical way to assemble and use this fixture; but this is by no means the only way. You know more about your application than anyone else. So, use this manual as a starting point in solving your card-edge fixture problem, not as the last word.

# THE 9100 TEST SYSTEM

The 9100 test system consists of the 9100A mainframe, the optional programming station, a single point 40 MHz logic probe, up to four 10 MHz parallel I/O modules, and an interface pod. Interface pods are available to support over 50 different microprocessors.

# 1.2.

1.1.

#### 1.3.

# CONFIGURATION

The Card Edge Fixture Kit consists of the following three basic parts; each part is ordered separately.

• Y9100A-100 Card Edge Fixture Kit

This is the basic fixture kit. It includes this manual, and a performance circuit board used to connect the I/O Modules to the user supplied card edge connector. It also includes a sheet metal housing which encloses this circuit board.

• Y9100A-101 Card Edge Fixture Base

The base consists of an insulated top plate and a sheet metal chassis. The Y9100A-100 Fixture Kit is designed to be mounted on the top plate. The sheet metal chassis is designed to accept a user's power supply and fan.

• Y9100A-102 Card Edge Interface Module

This module is designed to plug into the Performance circuit board in the Card Edge Fixture Kit at one end, and into an I/O Module at the other. The interface module connects all 40 pins from an I/O module to the fixture. Up to four interface modules may be used with one fixture. One of these interface modules should be ordered for each I/O module that is to be used with the fixture.

Figure 1 shows a typical application where the three items and an Interface Pod are used to test a UUT.



Figure 1. A Typical Application

# **ELECTRICAL SPECIFICATIONS**

The electrical specifications of this fixture are really defined by the electrical specifications of the I/O Modules and Interface Pods used with it. As long as the design guidelines (given later) are followed, use of this fixture should not degrade the performance specifications of the I/O modules or Interface Pods.

# **MECHANICAL SPECIFICATIONS**

## **Overall Size**

Height......14.4 cm (5.875 inches) Width......38.6 cm (15.75 inches) Length......46.6 cm (19.0 inches)

# Size of UUT work surface

Width	
Length	

# Maximum height of components

On Performance Board

Circuit 1 side......2.5 cm (1.0 inches) Circuit 2 side.....1.8 cm (0.7 inches)

Under Fixture Base......8.2 cm (3.25 inches)

1.5.

1.6.

# Section 2 ASSEMBLY INSTRUCTIONS

# PARTS LISTS

The parts lists for both the Card Edge Fixture Kit and the Card Edge Fixture Base are shown below. These lists also function as a packing list for these two items. Note that the item number for each of these parts corresponds with the item numbers shown on Figures 2, 3, and 4. In addition, the small mechanical parts such as screws are packaged in bags, labeled with the appropriate item number. Note also that the Card Edge Interface Module, (the Y9100A-102), is shipped fully assembled.

## Y9100A-100 Card Edge Fixture Kit Parts List

ITEM	QTY	DESCRIPTION	PART NUMBER
2	1	PCB, Performance	828962
4	1	Housing Set (Bottom, Cover, Stiffene	er) 830356
6	2	Strain Relief	828947
7	4	L-bracket (2 extras)	828954
8	4	Header, 5-position, right angle	687095
9	1	Header, 30-position (10 extras)	650044
10	8	Header, 40-position	830620
11	5	Spacer, 1", hex	564070
12	8	Screw, 4-40 flathead, undercut	268193
13	4	Screw, 4-40 x .5, panhead	152132
14	5	Screw, 6-32 flathead, undercut	271817
15	9	Screw, 6-32 x .375, panhead	152165
16	4	Foot, adhesive rubber	513820
18	1	Manual	830349

# 2.1.

#### 2.1.1.

# Y9100A-101 Card Edge Fixture Base Parts List

#### 2.1.2.

ITEM	QTY	DESCRIPTION	PART NUMBER
1	1	Plate, Top	829648
3	1	Base Set (Bottom, Rear Panel)	830364
4	12	Screw, 6-32 x .625	152181
5	4	Screw, self-threading	174391

## Y9100A-102 Card Edge Interface Module

Shipped fully assembled

## ASSEMBLY INSTRUCTIONS, CARD EDGE FIXTURE KIT

#### **Assembly Overview**

2.2.1.

2.2.

2.1.3.

The Card Edge Fixture is a user-configurable fixturing solution designed to interface the 9100A I/O modules to the card edge connector on the UUT. In some cases, the Interface pods can also be connected to this fixture. Since each application may require different configurations, the fixture has been designed as simply as possible to provide maximum flexibility. The following paragraphs describe a suggested method of assembly. Refer to Figure 2 for an exploded view of the Card Edge Fixture Kit. The item numbers shown in Figure 2 match those in the parts list in paragraph 2.1.1.



Figure 2. Exploded View Of The Card Edge Fixture

#### Step-by-Step Assembly of the Card Edge Fixture Kit

- Solder the eight 40-position headers to the Performance PCB. The headers should be installed on circuit 1 side with the long wire wrap portion of the leads protruding through the PCB. These headers are to be installed in locations A1 through A4. These are the connection points for all four of the I/O modules.
- Solder the four 5-position right angle headers to the PCB. Again, install these from circuit 1 side in the designated clock qualifier areas 1 through 4. These are the points where the I/O modules clock, start, stop, enable, and common wires are connected.
- Break the 30-position wire wrap header into four 5-position headers. Install these from circuit 1 side in the designated clock qualifier areas 1 through 4. These are the points where the clock, start, stop, enable, and common signals are connected to the performance circuitry. Ten posts remain as unused extras.
- The performance board is now ready to be wired. Insert wire wrap sockets from the bottom of the board. The wirewrap pins will then be exposed on the top, along with the connections to the I/O modules. Connect I/O Modules to the performance board at A1 through A4. The pin numbers labeled there map directly to the appropriate I/O Module pin number. See paragraph 4.3 for some wiring length guidelines. Power supply connections may be made from the underside of the PCB. It is useful to install a connector for these power supply connections.

- Secure the assembled PCB to the bottom housing. This is done by attaching the five hex spacers to the circuit 1 side of the PCB using five of the 6-32 x .375 panhead screws provided. Attach this assembly to the housing using the 6-32 undercut flathead screws provided.
- Attach the UUT's card edge connector (not included) to the card edge fixture. The usual way to do this is to mount the enclosed "L" brackets to the fixture with 6-32 screws. Then screw the UUT connector to the "L" bracket with 4-40 screws. This and several other methods of mounting different style connectors are shown in Figure 3.



- Wirewrap the card edge connector to the appropriate signal post on the PCB. Remember to keep wire length to a minimum, as discussed in paragraph 4.3.
- Secure the cover and stiffener to the bottom housing using the 4-40 undercut flathead screws provided.
- From the bottom side of the fixture attach Card Edge Interface Modules, Y9100A-102 to the appropriate connectors, A1 through A4.
- Strain relieve the cables of the Card Edge Interface modules with the strain reliefs provided. These are secured using 4-40 x .5 panhead screws. It is recommended that these screws be only lightly tightened to avoid damage to the sandwiched cable.
- Protective rubber feet may be added to the corners on the bottom side of the fixture. However, if the fixture is to be permanently mounted to a base, such as the Y9100A-101, these feet should not be used.
- The fixture is now complete. Plug the Card Edge Fixture Interface modules into the appropriate I/O modules, and connect the necessary clock lines from the I/O modules into the card edge fixture to complete the mechanical portion of this assembly. Remember that an Interface Module needs to be ordered for each I/O module that is being connect to the fixture.

#### ASSEMBLY INSTRUCTIONS, CARD EDGE FIXTURE BASE

# 2.3.

## **Overview**

2.3.1.

The base assembly provides an insulated area to support the UUT and to house such devices as power supplies, fans, and additional performance circuitry. The Card Edge Fixture, (see paragraph 2.2), also mounts to this base. Figure 4 shows an exploded view of this base.

The fixture assembly sits on the base and is located with the two .250 inch brass tooling pins. Screw holes are provided to permanently secure the two units together. Alternatively, the fixture can be made to lift off the base by not using the screws.



Figure 4. Exploded View Of Base

# Step-by-Step Assembly of the Card Edge Fixture Base

- The rear panel of the base is secured to the bottom using five of the 6-32 x .5 panhead screws. This panel is removable for ease of customizing. The rear panel can be punched for components such as switches, power receptacles, and communication connectors.
- Internal components may be installed inside the base to enhance the card edge fixture. The height of these items should be less than 3.25 inches. To help provide cooling, the fixture base has been punched to accommodate a standard 3.125-inch fan (PAMOTOR 8500 series or equivalent). No hardware has been provided for mounting internal components.
- The insulated "DELRIN" top plate is secured to the top of the base using the remainder of the 6-32 x .5 screws.
- Connections between the components in the base and the performance PCB should be made through the cutouts in the "DELRIN". Power supply connections are typically made in this way. If the Card Edge Fixture is designed to be removable, these connections should be made via connectors installed either on the performance PCB or in the base itself.
- . The Card Edge Fixture may be permanently secured to the bas by positioning the fixture on the brass guide pins (which extend from the top of the "DELRIN" top plate), and securing the fixture in each corner with the four self-threading screws provided.

#### MOUNTING THE CARD EDGE FIXTURE TO A CONSOLE

The assembled Card Edge Fixture may be permanently secured to a console or workbench with screws through the bottom of the Fixture Base. Figure 5 shows the mounting hole pattern. The fixture can also be mounted on .250 inch tooling pins, which will make it easily removable.

### CONNECTING AN INTERFACE POD TO THE FIXTURE

2.5.

2.4.

In some cases, it may be desirable to connect an Interface Pod directly to the fixture performance board, rather than plugging the board into the UUT. A socket can be installed on the performance board, and the pod plugged into this socket. The pod's UUT cable should be routed out the large rectangular cutouts on the bottom of the fixture. This technique is discussed further in paragraph 4.3. Figure 6 shows an example of this technique.



16



Figure 6. Interface Pod to Fixture Performance PCB Connection

# Section 3 PROGRAMMING INFORMATION

# **ACCESSING FIXTURED PINS THROUGH TL/1**

3.1.

Accessing fixtured pins through the I/O modules is straightforward. When the fixture was wired, each pin on the UUT connector was tied to a corresponding pin on an I/O module. If information on that pin is desired, you need only to describe it by module and pin number.

# Example:

Write the UUT's XYZ signal high then low. This signal is wired to I/O module 3, pin 24.

writepin device "/mod3", pin 24., level "1", mode "latch" writepin device "/mod3", pin 24., level "0", mode "latch"

Keep in mind that all of the I/O modules pins that are connected to the card edge connector must be addressed absolutely. Mapping functions such as "clip" and "gfi device" should not be used to access these pins.

# TL/1 COMMANDS USEFUL WITH FIXTURED I/O MODULE PINS

The following commands can be used to access fixtured I/O Module pins; see your TL/1 manual for more information and the exact syntax for these commands:

3.2.

	-
counter	Sets the mode of the transition counter.
edge	Sets the polarity for start, stop, and clock.
stopcount	Sets the stop counter to a specified value.
sync	Sets the I/O module sync mode.
enable	Sets the enable mode.
arm	Arms the module(s) for taking a measurement.
strobeclock	Generate a "softclock" for CRC and level history.
checkstatus	Checks the completion status of a CRC measurement.
readout	Terminates a measurement, gets acquired data.
count	Reads the frequency or count data for one pin.
level	Reads the level history data for one pin.
sig	Reads the signature information for one pin.
getoffset	Returns the current calibration offset.
setoffset	Modifies the current calibration offset.
storepatt	Stores the pattern prior to driving.
writepatt	Writes out the previously stored patterns.
clearpatt	Clears out any previously stored pattern.
writepin	Writes the specified pin high, low, or "X".
clearoutputs	Writes all outputs to the "X" state.
compare	Sets/clears the DCE function
P ••• •	

Command Description

## **USING GFI AND THE FIXTURE**

To use GFI with this fixture, at least one I/O module should be left unconnected to the fixture. This I/O module would then be used to perform the "clip" functions when instructed by the GFI routines. GFI can also be performed with the single-point probe, which would allow the connection of all four I/O modules to the fixture.

#### USING A FLUKE INTERFACE POD WITH THE FIXTURE

There are no special requirements associated with the pod. The pod's UUT cable is plugged into the microprocessor socket on the UUT, and all normal pod operations are performed through TL/1. Instead of plugging into the UUT directly, the pod may also be plugged into the fixture performance board. This situation is discussed in paragraph 4.3.

#### 3.3.

3.4.

21

# PERFORMANCE CONSIDERATIONS

#### **UUT POWER**

In general. it is assumed that a separate power supply will be used to power the UUT (and any associated performance circuitry). This power supply may be mounted in the Card Edge Fixture Base.

## PERFORMANCE CIRCUITRY

In many cases it will be necessary to provide additional circuitry to make the fixture useful. This circuitry might include clocks, latches and buffers, specialized analog voltages, or a/d converters. There is room on the supplied circuit card for this circuitry to be wire wrapped. The added circuitry would be powered by the same power supply that powers the UUT. Make sure to follow standard design guidelines; decouple power supplies often, and keep lead lengths short.

## DESIGN GUIDELINES FOR I/O MODULES

The watchword for wiring to I/O modules is short. Try to keep the wire wrap wires as short as possible between I/O modules and UUT connector pins. This keeps inductance down, and helps ensure that the I/O module's high frequency performance will not be degraded. It is especially important to keep the clock wires of the I/O module short. If an I/O module will be dedicated to this fixture, its Clock, Start, Stop, and Enables wires can be shortened to further enhance performance.

23

# 4.1.

4.2.

Section 4

#### 4.3.

## How Short is Short?

The I/O modules are designed for use with cables up to 12 inches long. The Y9100A-102 Card Edge Interface Module, designed for use with this fixture, has cables that are 6 inches long. Thus, it is generally safe to add up to 6 inches of wire in this fixture. But in the final analysis, the signal integrity on any particular wire depends far more on the speed, driving impedance, and voltage swings of that point, than on the actual length. If problems arise after wiring the fixture, refer to the following paragraphs for some ideas to cure these problems.

## Solving Common Problems

#### 4.3.2.

• Grounding

It is important to ensure a good low inductance ground path between the I/O modules and the UUT. Each Card Edge Interface Module has 40 ground wires which connect the I/O modules to the ground traces on the performance circuit board. Make sure that these traces are connected to ALL of the ground connections available at the card edge connector. The connections should be as short as possible. Remember *short* is the key. Multiple lengths of short 30 gauge wire wrap wire provide a much lower inductance connection than a single long length of 1/4 inch copper braid. Loading

The I/O modules can present a capacitive load of about 70 pF to signals on the UUT. In some cases, this loading is too high. It can distort waveforms, and cause the UUT to malfunction. There are several possible solutions to this problem. The first is rather obvious; connect to another point. Many times, there are several points on a board that contain similar versions of the same signal. If so, some of these points may be much less susceptible to the I/O module's loading. A second option is to buffer. Install a buffer of the appropriate logic family, (LS, HC, HCT, FAST, etc.), between the UUT pin and the I/O module. This buffer would be wirewrapped onto the circuit card within the fixture. Remember to decouple the buffer well, and keep the wires *short*. Sometimes series terminations also help. This is discussed in the next paragraph.

• Termination

See the discussion on loading above. In some cases, it may be necessary to terminate certain UUT signals to cure ringing problems. Often it helps to place series resistors as close as possible to the UUT; try values in the range of 20 to 220 ohms. For very high speed signals, the resistors should probably be between 20 and 47 ohms. Also helpful at times are shunt networks such as 220 ohms from signal to +5V, and 330 ohms from signal to ground. Because of the unknown characteristic impedances of the UUT, this can be a cut-and-dry affair.

• ECL Levels

If some of the pins on the UUT are at ECL potential, buffer them with ECL to TTL translators. The TTL levels can then be accessed by the I/O modules. • Unstable Signatures

When signatures are unstable, the problem is often insufficient setup and hold times. Carefully examine timing diagrams of the UUT to make sure that the timing of clock transitions vs data signals are appropriate. If not, the "setoffset" command can be used to vary the point in time where data is sampled. This can make a previously unstable signature stable. See the discussion in the TL/1 manual on getoffset/setoffset. Waveform distortion can also be responsible for unstable signatures. For more information see the paragraphs on termination and loading above.

• Frequency Too High

Sometimes, you may wish to measure a frequency with the I/ O module that is above its 10 MHz limit. The simplest way to do this is to add a simple flip-flop divider circuit between the UUT signal and the I/O module pin. This one flip-flop can enable the I/O module to measure up to 20 MHz. The signal can be further divided to count even faster signals. Just make sure that the logic family used for the toggle flip-flop is sufficiently fast for the signal in question. Overcurrent Problems

When an overcurrent fault happens, it means that too much current was drawn by the combination of I/O modules. If this happens on a bad board, it is a good starting point for troubleshooting. On a good board, it indicates that the test needs to be changed. If there are just a few points with heavy current drain, these could be buffered. If the problem is caused by the simultaneous writing of many pins, perhaps fewer pins could be written at one time. If they do need to be written simultaneously, use the "storepatt" and "writepatt" functions rather than "writepin". These pattern functions are much faster, and much less susceptible to overcurrent faults. If the "latch" mode is used, remember that the last state driven will be latched on the outputs. It is often prudent to make the last state the "X" condition, to keep from writing unwanted static levels.

Bus-Oriented Card Edge

If the card edge signals are bus oriented, such as a plug-in card for an IBM PC, it may be difficult to write a program to test these boards with the I/O module. Often a better solution is to use the appropriate Interface Pod (an 8088 for the above example), and connect it to the fixture performance card. See Figure 6 for an illustration. If latches and address decoders are required between the pod and UUT, these can be added on the performance card. Often a simple clock oscillator or clock chip is also needed on this card. I/O modules can then be used simultaneously for other lines as appropriate.

# DESIGN GUIDELINES FOR INTERFACE PODS 4.4.

If an Interface Pod is connected inside the fixture to the UUT card edge connector, keep its lines short. The same guidelines discussed previously in the paragraph on loading apply here. Occasionally, a signal may need to be buffered to or from a pod. Be particularly careful with the highest speed signals on a processor, such as the clock lines, and address and data strobes.