Application Note

TESTING ELECTRICAL PARTS THAT MATE WITH A HARNESS CONNECTOR

Dynalab
TEST SYSTEMS

Testing Electrical Parts That Mate With a Harness Connector

This document explains how to use PASS 6.0 software to program the Dynalab Analyzer to test for the presence of parts that are designed to mate with a harness connector and that change the electrical configuration of the harness.

This document has the following main sections:

1. A list of assumptions – knowledge required to perform the tasks outlined in this document.
2. An explanation of the problem
3. An explanation of the solution
4. An overview of the Dynalab solution to the problem, including an example Sequence.

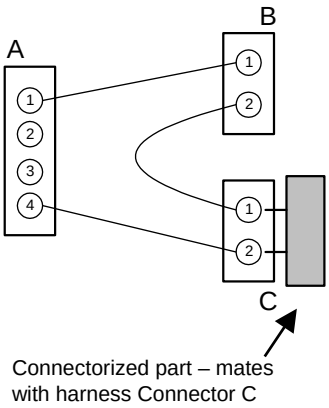
Assumptions

To successfully use this document, the following knowledge is required:

- basic knowledge of how to enter harness data using PASS® 6.0
- knowledge of how to use the Sequence table to create a Sequence

For assistance on how to use features of PASS® 6.0, see the PASS® 6.0 Help file.

Problem



Consider the example harness shown here. This harness contains three connectors (A, B and C). It also has an additional part which mates with connector C. This part has the effect of providing a continuity path between the two pins of Connector C.

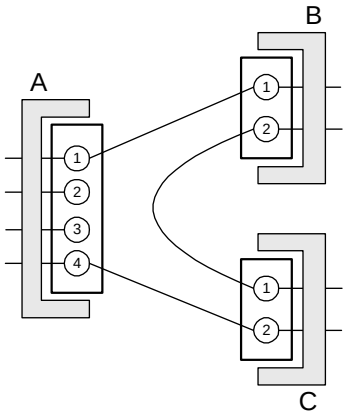
Several types of parts match this description: Shorting caps, fuses, relay coils, incandescent bulbs, switches, and LED's. They may be designed to mate with a harness connector, and they electrically change the configuration of the harness once they are added.

The purpose of this Application Note is to describe a method for testing for the presence of this type of part.

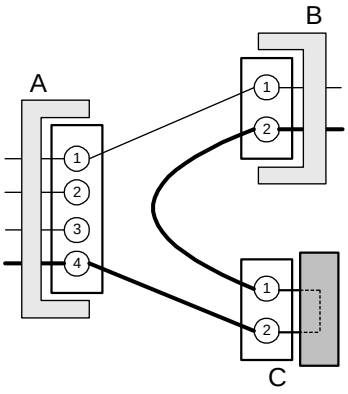
Solution

The method for testing for the presence of an electrical part which mates with a harness connector and which changes the electrical configuration of the harness has two steps:

1. Test the harness without the part
2. Prompt the operator to add the part, and then test for electrical continuity through the pins on the harness that the part effectively connects.



STEP 1:
Test the harness without the part



STEP 2:
Prompt the operator to remove the mating connector from the test fixture, and attach the part. Test for electrical continuity established by the addition of the part.

Solution Overview

What parts can be tested ?

This approach tests for the presence of an electrical part that is packaged in such a way as to mate with a harness connector and that changes the electrical configuration of the harness once it is added.

A list of such parts and their electrical characteristics follows.

Fuses

All fuses have very low resistance - typically less than 1 Ohm. The presence of a fuse can be detected using a continuity scan. It is not possible to determine the specific fuse value electrically.

Relays

Relay coils typically have a resistance less than 100 Ohms. The presence of a relay coil can be detected using a continuity scan.

Incandescent Light Bulbs

Incandescent light bulbs have a very low resistance – typically less than 1 Ohm. The presence of an incandescent light bulb can be detected using a continuity scan.

Shorting Caps

A shorting cap is a connector that contains shorting bars that electrically connect cavities together. Therefore, the presence of a shorting cap can be detected using a continuity scan.

Switches

Switches typically have multiple positions, resulting in multiple electrical states. To learn about testing switches, please refer to the Application Note entitled ***Testing Switches in a Harness.***

LED's

Most Light Emitting Diodes have the electrical characteristics of a diode, and therefore should be tested using the Analyzer's Component testing capabilities. To learn about testing LED's, please refer to the Application Note entitled ***Diode / LED Testing***

What are the steps required to test these parts ?

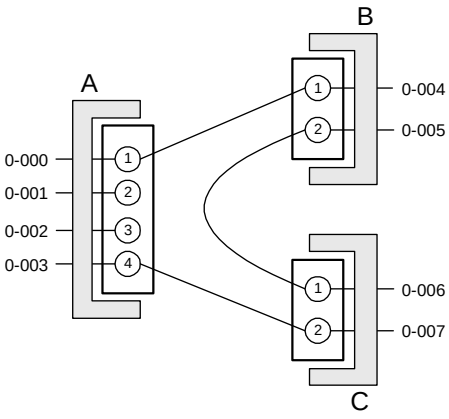
As explained earlier, the method for testing for the presence of an electrical part which mates with a harness connector and which changes the electrical configuration of the harness has two steps:

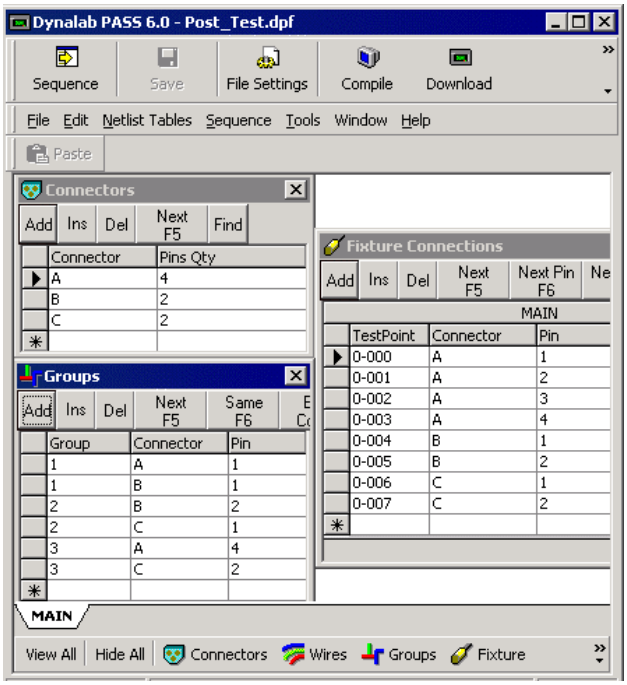
1. Test the harness without the part
2. Prompt the operator to add the part, and then test for electrical continuity through the two pins on the harness that the part effectively connects

The following is a detailed description of how to use PASS 6.0 to program the Analyzer to implement this approach.

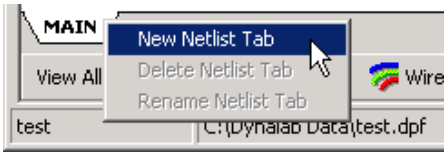
Program the harness without the part using the MAIN Netlist tab

This shows the MAIN Netlist for the example 3-connector harness, programmed using the Group Method:

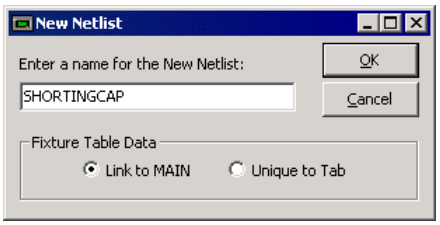




Program the additional part using an additional Netlist

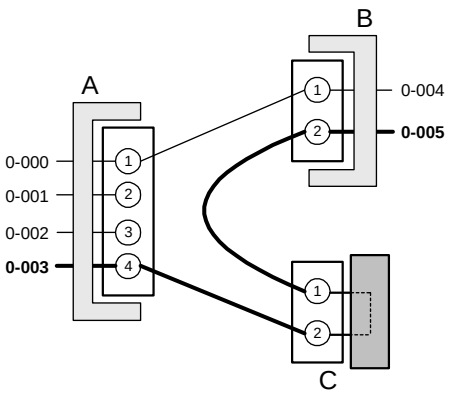


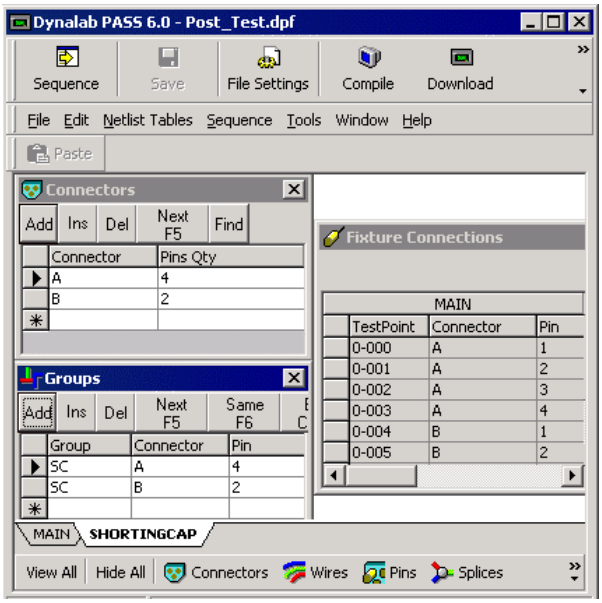
To program the additional part, create a New Netlist Tab. This is done by pointing to the MAIN Netlist tab located at the lower left of the PASS window, right clicking and selecting New Netlist Tab:



In the "New Netlist" box, enter the name of the new Netlist. For this example, "SHORTINGCAP" is the new Netlist name. Make sure that the "Link to MAIN" button is selected.

In the new Netlist tab, create the appropriate Connector(s) and Group(s) to define the connections that are made by the addition of the part. In this example, adding the part causes continuity to be established between Connector A, Pin 4 and Connector B, Pin 2.





Program the Sequence

Table 1 shows an example Sequence for the presence testing of parts – in this case, the addition of a shorting cap to a harness connector.

This Sequence works as follows:

- The Analyzer tests the harness forcing the operator to repair errors to continue.
- After the harness passes, the Analyzer displays a message instructing the operator to install the part – in this case, a shorting cap.
- The Analyzer then continuously tests for the shorting cap until it is detected.
- Once the presence of the shorting cap is detected, a message is displayed to instruct the operator to remove the harness.
- When the Analyzer detects that the harness has been removed, the test is restarted.

Table 1. Basic Testing Sequence

Line	Sequence item	Parameter	Application Effect
1	ADVOFF		Prevent advance by pressing START button on error
2	TEST	MAIN	Performs a complete Netlist scan of MAIN
3	SOUND	4	Play sound 4
4	STOPOFF		Prevents the Analyzer from stopping on errors
5	MESSAGE	10	Displays message: "INSTALL SHORTING CAP ON CONNECTOR C"
6	CONTINUITY	SHORTINGCAP	Performs a continuity scan of the Netlist "SHORTINGCAP"
7	OERP		On Error Repeat Previous
8	SOUND	0	Plays sound 0
9	MESSAGE	11	Displays message: "HARNESS PASSED... REMOVE HARNESS TO CONTINUE"
10	AUTO	MAIN	
11	REPEAT		Go to line 1 and continue Sequence execution

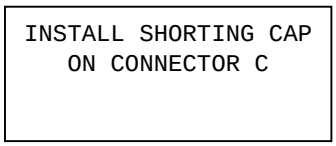
Line 1 ADVOFF: Prevents the operator from logging errors by pressing the START button. When errors are displayed, the operator must fix the error before the scan will continue. (When an error is encountered, the Analyzer stops on the error, displays the error message, and continuously scans the points where the error occurred, waiting for the operator to fix the error. The default behavior of the Analyzer is to allow the operator to press the START button to log the error – the Analyzer then would then advance by continuing to scan the remainder of the Netlist. With ADVOFF, the START button has no effect – the Analyzer will not advance, but will wait for the operator to fix the error).

Line 2 TEST instructs the Analyzer to perform a complete test of the Netlist specified by the parameter, in this case, MAIN. (The TEST Sequence item is actually a series of scans. See PASS Help for more information about the TEST Sequence item.)

Line 3 Plays sound 4 – 4 "chirps". This sound is used to indicate that the harness has passed continuity and short scans.

Line 4 STOPOFF is used to prevent the Analyzer from stopping on an error condition and displaying detailed error information.

For the Netlist scans that follow, it is best to maintain the message on the display that references the part to be installed. If error information were displayed, it would overwrite the more important and relevant part reference messages.



Analyzer display showing message 10.

Line 5 MESSAGE Sequence item instructs the Analyzer to display message 10 to instruct the operator.

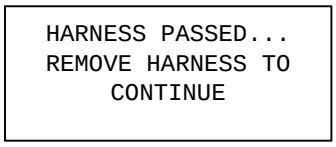
Because STOPOFF is set, the message will remain on the display until the next message is displayed in line 8.

Line 6 Performs a CONTINUITY scan of the SHORTINGCAP Netlist.

Notice the use of the CONTINUITY in place of the TEST Sequence item in the example. Since the Netlist does not provide a complete description of the harness, the Analyzer would find false Short errors if the TEST Sequence item were used.

Line 7 OERP – On Error Repeat Previous. This Sequence item causes the Analyzer to continuously test the for the part to be added until the test passes with no errors.

Line 8 Plays sound zero – "twirl". Sound zero is generally used to indicate that the harness has passed the test. (See PASS 6.0 Help for a description of available sounds.)



Analyzer display showing message 11.

Line 9 MESSAGE Sequence item instructs the Analyzer to display message 11 to instruct the operator to remove the harness to continue testing.

Line 10 AUTO instructs the Analyzer to perform a continuous continuity scan of the MAIN Netlist, looking for all harness connections to be open. Once all connections are open, the Analyzer continues execution with the next Sequence item. AUTO is used to determine that a harness has been completely removed from the fixture.

Line 11 REPEAT instructs the Analyzer to go to line 1 and repeat execution of Sequence. Sequence execution will continue to repeat in this manner until the STOP button is pressed.

To test for more parts

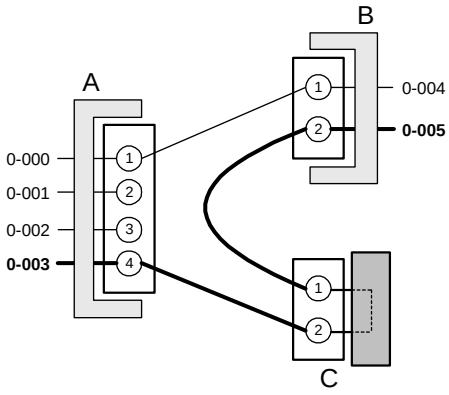
To test for the addition of more parts, simply create the required additional Netlists, and then add lines to the Sequence to test those Netlists.

In the previous example, Sequence lines 5, 6, and 7 are the instructions used to detect the first part added. To detect more parts, these lines should be duplicated and inserted between lines 7 and 8. Be sure to change the parameter to the name of the Netlist to be tested.

Intermittent Fixture Connections

The construct used in the example to prompt the operator to install a part and detect that the part is installed is depicted by lines 5, 6, and 7 of the example sequence:

4	STOPOFF		Prevents the Analyzer from stopping on errors
5	MESSAGE	10	Displays message: "INSTALL SHORTING CAP ON CONNECTOR C"
6	CONTINUITY	SHORTINGCAP	Performs a continuity scan of the Netlist "SHORTINGCAP"
7	OERP		On Error Repeat Previous



If the test fixture has a problem with intermittent connections, it is possible that the CONTINUITY check in Line 6 will not succeed even though the part has been added. For instance, in the diagram shown at left, if either of the connections on Connector A or B is intermittent, the Analyzer may not sense continuity after the part has been added.

Sometimes, the accepted practice in a situation like this is to allow the operator to wiggle the connectors until continuity is achieved. If this is the case, it may be advantageous to construct the message displayed on Line 5 to include the Connector names. This will allow the operator to know which connectors to wiggle if the connections are intermittent.