

Application Note

SEQUENCE PROGRAMMING
BASICS:

THE DEFAULT SEQUENCE

Sequence Programming Basics:

– The Default Sequence

PASS 6.0 Software provides powerful Sequence programming control of the Analyzer. The flexibility to program the Analyzer's test Sequence to solve a variety of testing problems is extensive. Dynalab has provided a library of Application Notes that illustrate how to program the Analyzer to address many common testing scenarios and requirements. However, it is important to understand the basics of Sequence programming before tackling the more complex problems presented in the Application Notes.

This document presents fundamental concepts required to understand the Default Sequence.

The Default Sequence

The Default Sequence is automatically generated by PASS whenever one of the default Dynalab templates is used to create a program. This Sequence may be extensively modified to suit a specific set of test requirements, or it may be suitable as is. The following is a detailed explanation.

Default Sequence

Line	Sequence Item	Parameter	Application Effect
1	TEST	MAIN	Performs a scan of the harness
2	REPORT		Displays a summary report
3	KWAIT		Waits for the Operator to push the START button
4	REPEAT		Goes to Line 1 to repeat Sequence execution

Line 1 TEST instructs the Analyzer to perform a complete scan of the Netlist specified by the parameter, in this case MAIN. During this scan, the Analyzer tests for continuity between all points that are defined as being connected and for shorts between points that are defined as not being connected.

Line 2 REPORT displays "Assembly OK" if the harness passes all tests, or displays summary information for logged errors.

Line 3 KWAIT waits for the Operator to push the START button.

Line 4 REPEAT goes to Line 1 to repeat execution of the sequence for the next harness.

It is especially important to understand how the Analyzer behaves when an error is encountered. During the TEST Sequence item, the Analyzer may discover an OPEN condition where there should be continuity or a SHORT condition where there should be no continuity. When an error condition occurs, the following happens:

- The Analyzer suspends testing
- The Analyzer displays information about the error
- The Analyzer continues to monitor the two test points associated with the error

In order to proceed, the Operator has two options:

- Push the START button to acknowledge and log the error

OR

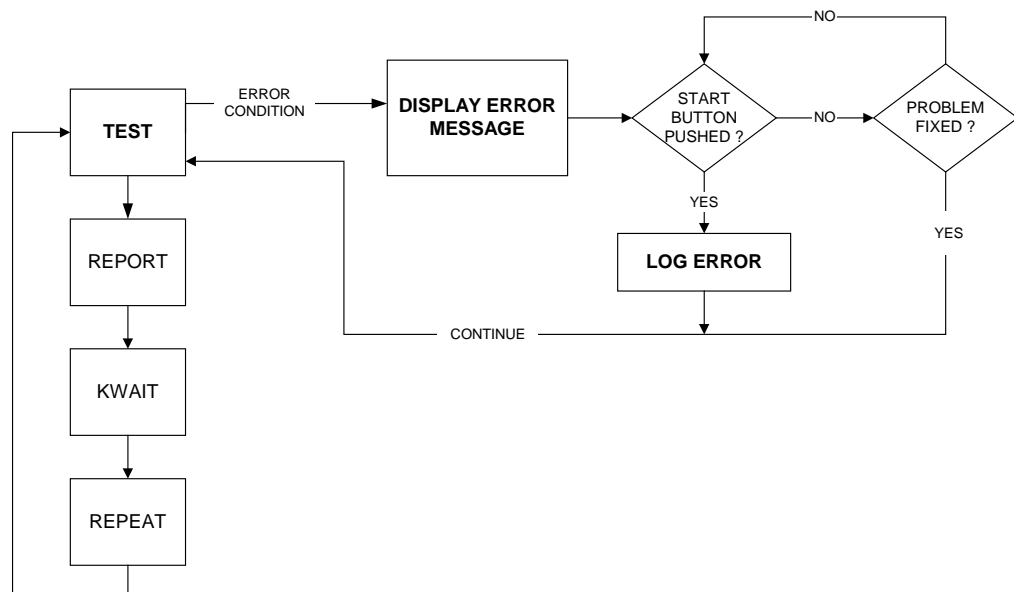
- Fix the cause of the error

If the Operator pushes the START button, the Analyzer logs the error (remembers the error for subsequent reporting) and continues with testing the rest of the harness.

If the Operator fixes the cause of the error, the Analyzer senses that the error no longer exists and automatically continues with testing the rest of the harness. The error condition is not logged (not remembered for subsequent reporting).

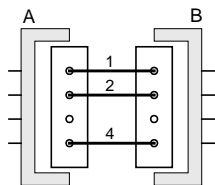
When all tests are completed, the Analyzer displays a summary report. If errors were logged, the displayed report will be a summary of the errors. If no errors were logged, the displayed report will be a message that says “ASSEMBLY OK”.

This method of error handling provided by the default Sequence is illustrated by the flowchart below.



Default Sequence Example

As an example, consider a simple 2 connector, 4 wire harness. Assume that the harness is tested after assembly. The following scenario illustrates how the Analyzer behaves when an error condition is encountered, using the default Sequence.



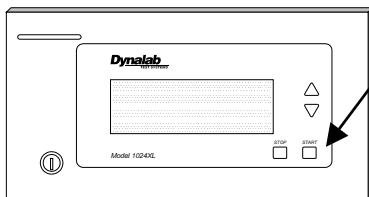
The harness is only partially assembled. The wire between Connector A pin 3 and Connector B pin 3 is missing. The Operator connects the harness to the test fixture, and starts the test. The Analyzer responds by indicating an OPEN error condition. The Analyzer suspends testing and continues to monitor the two points associated with the error.

OPEN
A-3
B-3

Analyzer displays OPEN error

At this point, the Operator has two choices:

CHOICE 1: Press START button

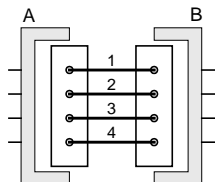


The Operator presses the START button. The Analyzer logs the error and proceeds with testing the rest of the harness. After testing is complete, the REPORT Sequence item causes the Analyzer to display a summary of the logged errors.

1 OPEN

*Analyzer displays summary of
logged errors*

CHOICE 2: Fix the error



The Operator fixes the error by properly installing the missing wire. The Analyzer senses that the error no longer exists and automatically continues with testing the rest of the harness. No further errors are found. After testing is complete, the REPORT Sequence item causes the Analyzer to display the "ASSEMBLY OK" message indicating a successful test.

ASSEMBLY OK

*Analyzer displays message
indicating successful test*

TEST Sequence Item: A detailed view

The heart of the default Sequence is the TEST Sequence item. TEST instructs the Analyzer to do many things, so it is useful to understand this Sequence item in some detail.

Default Sequence

Line	Sequence Item	Parameter
1	TEST	MAIN
2	REPORT	
3	KWAIT	
4	REPEAT	

The TEST Sequence item is really a macro. It instructs the Analyzer to examine the state of detection switches, to verify continuity between points that are supposed to be connected, and to look for shorts between points that are not supposed to be connected. It is equivalent to the following:

TEST Sequence Item

Line	Sequence Item	Parameter	Application Effect
1	SW-CLOSED	MAIN	Verifies that detection switches defined in MAIN Netlist are closed
2	CONTINUITY	MAIN	Performs complete continuity scan of MAIN Netlist
3	SHORT	MAIN	Performs complete short scan of MAIN Netlist
4	BSS	2	Branch to CONTINUITY test if Soft Short error counter is greater than zero.

Line 1 SW-CLOSED causes the Analyzer to verify that all the detection switches¹ defined in the MAIN Netlist are closed. If no detection switches are defined, this Sequence item has no effect.

Line 2 CONTINUITY causes the Analyzer to perform a complete continuity scan of the MAIN Netlist. This verifies connectivity between points that are supposed to be connected.

Line 3 SHORT causes the Analyzer to perform a complete short scan of the MAIN Netlist. This looks for unwanted connections between points that are supposed to be isolated.

Line 4 BSS causes execution to branch to line 2 if the Soft Short error counter is greater than zero.

Using the TEST Sequence item is therefore, a form of shorthand. It eliminates the need to program each of the individual steps shown above.

Although a high level description of error handling for the Default Sequence has already been presented, the specific error handling details for CONTINUITY and SHORT are slightly different and are explained in the following sections.

¹ For more information about detection switches, refer to Application Note entitled *Detecting the Presence of Mechanical Features*

CONTINUITY error handling

CONTINUITY causes the Analyzer to perform a scan, verifying connectivity between points that are supposed to be connected. If an OPEN error condition is encountered, the Analyzer checks to see if either of the two points associated with the OPEN are miswired (incorrectly connected to points from which they should be isolated).

When an OPEN error occurs, the following happens:

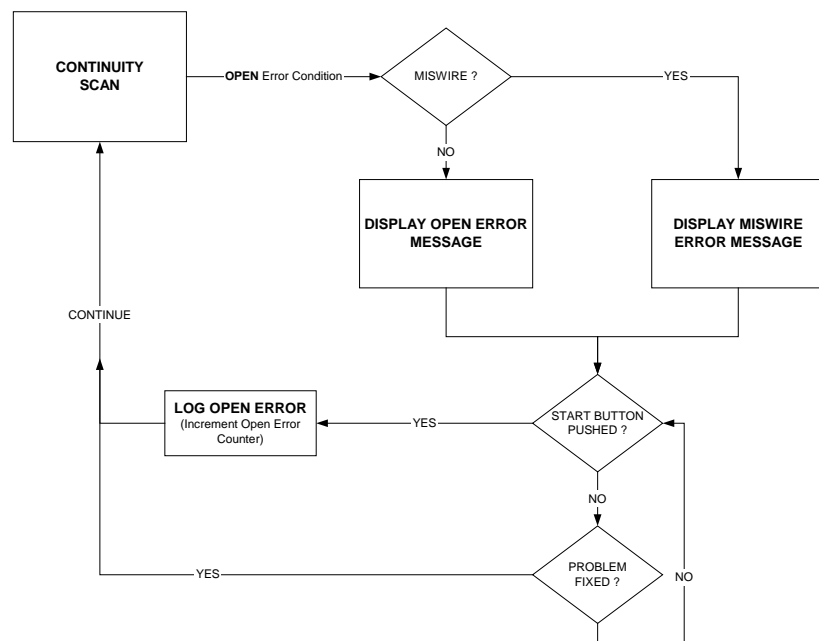
- The Analyzer suspends testing
- If a miswire condition exists, the Analyzer displays information about the MISWIRE and OPEN errors. Otherwise, the Analyzer displays information about the OPEN error only.
- The Analyzer continues to monitor the two test points associated with the OPEN error

In order to proceed, the Operator has two options:

- Push the START button to acknowledge and log the error

OR

- Fix the cause of the error



If the Operator pushes the START button, the Analyzer logs the OPEN error and continues with testing the rest of the harness.

If the Operator fixes the cause of the error, the Analyzer senses that the error no longer exists and automatically continues with testing the rest of the harness. The error condition is not logged (not remembered for subsequent reporting).

SHORT Error Handling

SHORT causes the Analyzer to perform a scan, looking for connectivity between points that are supposed to be isolated.

When an SHORT error occurs, the following happens:

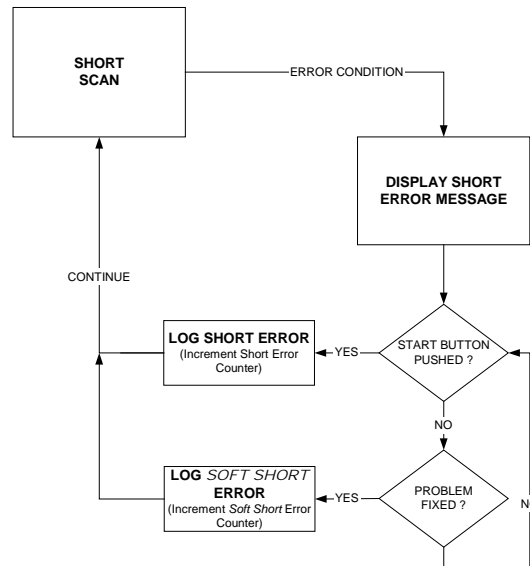
- The Analyzer suspends testing
- The Analyzer continues to monitor the two test points associated with the SHORT error

In order to proceed, the Operator has two options:

- Push the START button to acknowledge and log the error

OR

- Fix the cause of the error



If the Operator pushes the START button, the Analyzer logs the SHORT error and continues with testing the rest of the harness.

If the Operator fixes the cause of the error, the Analyzer senses that the error no longer exists and automatically continues with testing the rest of the harness. However, the Analyzer logs a SOFT SHORT error condition.

The definition of a SOFT SHORT is a SHORT condition that disappears. Note that a SHORT condition can disappear because of one of the two following scenarios:

- The Operator fixes the cause of the SHORT error

OR

- The Operator removes the harness from the test fixture without fixing the cause of the SHORT error

Since it is possible for a SHORT error to disappear simply because the Operator removes the harness from the fixture without fixing the cause of the error, it is very important that the Analyzer be able to detect this situation. At this point, it is useful to take another look at the TEST Sequence item details:

Default Sequence

Line	Sequence Item	Parameter
1	TEST	MAIN
2	REPORT	
3	KWAIT	
4	REPEAT	



TEST Sequence Item

Line	Sequence Item	Parameter	Application Effect
1	SW-CLOSED	MAIN	Verifies that detection switches defined in MAIN Netlist are closed
2	CONTINUITY	MAIN	Performs complete continuity scan of MAIN Netlist
3	SHORT	MAIN	Performs complete short scan of MAIN Netlist
4	BSS	2	Branch to CONTINUITY test if Soft Short error counter is greater than zero.



In Line 3 above (SHORT), if a SHORT error occurs, the Analyzer stops and waits:

- for the Operator to press the START button to log the error

OR

- for the error to disappear. If the SHORT error disappears, the Analyzer logs a SOFT SHORT error and continues.

In Line 4, BSS examines the SOFT SHORT error counter, and if any SOFT SHORT errors were logged it causes execution to branch back to Line 2 – CONTINUITY. Therefore, if the SHORT error disappeared because the harness was removed without fixing the error, the Analyzer will indeed sense this condition because it branches back to the CONTINUITY test. If the harness is missing, the CONTINUITY test will fail.

Error Reporting

The Default Sequence contains the REPORT Sequence item, which provides a summary report of the test results.

Default Sequence

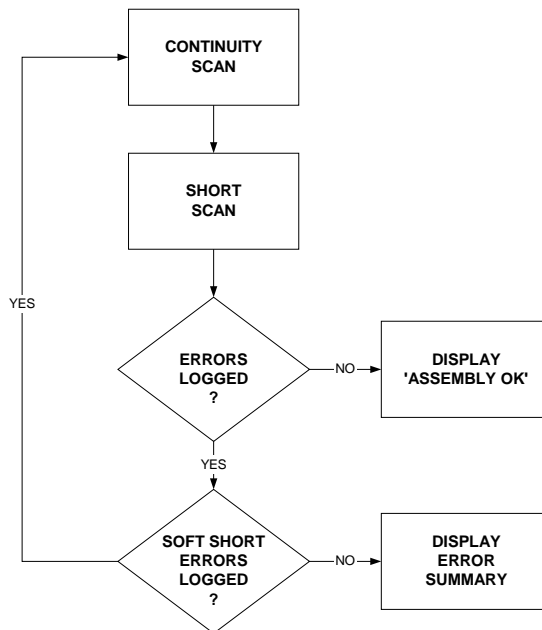
Line	Sequence Item	Parameter
1	TEST	MAIN
2	REPORT	
3	KWAIT	
4	REPEAT	

In the Default Sequence, error reporting is done by the REPORT Sequence item. The flow chart shown below summarizes the error reporting for the Default Sequence.

After the CONTINUITY and SHORT scans are completed, if no errors were logged, the REPORT Sequence item displays a message indicating 'ASSEMBLY OK'.

If errors were logged, but none were SOFT SHORT errors, the REPORT Sequence item displays a summary of the errors. Specifically, it displays the number of OPEN errors and the number of SHORT errors.

If any of the errors logged were SOFT SHORT errors, execution branches back to the CONTINUITY Sequence item to ensure that a SHORT error did not disappear due to removal of the harness.



Summary

The Default Sequence provides all the basic functionality required to test a harness using the Dynalab Circuit Analyzer. Although it can be modified and extended to suit a large variety of testing needs, the Default Sequence can be used “as is” for many testing needs.

The Default Sequence provides the following advantages:

- If an error condition is not repairable, the Operator may log the error and proceed with testing the remainder of the harness
- Provides a definite and identifiable end point to the test cycle for a harness. If the harness is good, a message displaying “Assembly OK” is displayed. If harness has defects, a summary report of the logged errors is displayed. In either case, the Operator has a definite indication that the test is complete for this harness. At this point, the Operator may decide to either re-test the current harness or test the next harness.

This Default Sequence has the following disadvantages:

- Relies on Operator judgment to fix or acknowledge and log errors found.
- Requires a lot of manual interaction between the Operator and the Analyzer: the Operator must press the START button to acknowledge and log each error condition that is not repairable.