



Application Bulletin: #159

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Part or Test Program Linking Sentinel I24 Instrument

The Sentinel I24 can sequence through two or more tests using one of three different methods. The methods include:

- **Dual test sequence using standard dual pressure test types**

The Sentinel I-24 instrument has potential sequential “2P-xxxxxx” and “Press Decay/Mass Flow” test types available if supplied with the appropriate manifold type and regulator (mechanical or electronic) option. The two tests are limited to be the same type of test like dual pressure decay or dual mass flow, or potentially pressure decay/mass flow or mass flow/pressure decay. To use this method for conducting two tests in sequence, simply select the appropriate Test Type (“2P – xxxxx”) from the options available with the Manifold type purchased. Set the required timers, pressures, and test parameters for the two tests and the input/output/tooling functions for the overall test routine. With this standard sequential method both tests must be performed unless there is a severe leak or malfunction in the first test. Tooling control and all other I/O functions, test parameters, and test results are stored and performed within one part program number. This provides simplicity and continuity for the dual test process. Auto Setup does not work for this multiple test sequence.

- **Multiple test sequencing by wiring a digital test result output from one test program to the “Start Part” input specific to the follow-up test program.**

This is a hard wire approach to multiple test sequencing. The part-specific test result output like “Test Passed” or “Test Failed” is wired from one part program to the part specific “Start Part” input of a follow-up test program. Each part program is independently executed including any associated tooling control. This method makes it possible to select a unique sequence of more than two different Test types like a pressure decay test followed by an Occlusion test followed by a flow test. The tooling control and all the digital I/O functions, test parameters, and test results for each part program are performed in sequence and independently stored by each individual part program. To use this method for performing more than one test requires individually programming and calibrating each desired part program. The part programs are joined or linked by wiring the “Test Passed” or “Test Failed” digital output programmed within a test program to the programmed “Start Part” digital input of the succeeding test program. The number of available digital I/O limits the number of test programs that can be linked. It does not provide total part tooling control continuity through the sequencing of the multiple tests. The test results are individually identified by their independent test program numbers. Auto Setup and Auto Cal

would be performed for each part program independently. See Application Bulletin #149 for more details.

- **Multiple test sequencing by creating a master or parent part program that controls the overall test sequence involving multiple sub-programs or child test programs.**

This is a programming approach to connect several test programs within an overall master program structure with logic steps for performing follow-up tests based on the test results of other tests. The master or parent program controls the overall part related functions like tooling control, sequence of tests, part result outputs, and storage of test results. There is a maximum of eight links within a master or parent program.

Part Program Linking using “Parent Program” as a Test Type.

This is an overview and description of a comprehensive method to create an overall part program that sequences through a series of tests based on the results of each previous test. This Parent Program test type uses the test parameters of each individual test program for the various tests while ignoring the tooling control and part result outputs of these individual programs.

Parent Part Program – Master test scheme
Child Part Programs – Individual test programs

Description

There is a new Test Type called “Parent Program.” This test type facilitates the linking of individual part programs into a testing sequence and provides the overall control of the tooling outputs and inputs, start and stop inputs, and part result outputs for the test sequence. The following functions within each individual test program are ignored and controlled by the Parent Program.

Tooling options	Calibration functions	Autorun Methods
Barcode storage	Relax timer.	

Parent Program Variables

The following variables will be available for editing within the Parent Program. If duplicate variables exist in the Child programs, the Parent Program variables will pre-empt the values contained within the Child programs. The variables are shown below in lists based on the category of the Part Configuration menus. The number of links is determined by the number of programs where there are follow up programs or tests that are performed based on the result of a test. A link can go to one or two follow up programs or tests. It is usually best to diagram the sequence of tests that are to be performed before attempting to set up a “parent program”.

TST TYPE

Test Type	Number of Links
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LINK 1

Target Part Program	Evaluation Conditions
Accept Target Program	Reject Target Program
Next Target Program	

LINK 2

Target Part Program	Evaluation Conditions
Accept/Reject/Next Target Program	

LINK x (up to eight possible)

Target Part Program Evaluation Conditions
 Accept/Reject/Next Target Program

TIMERS

Tool Ext 1	Tool Ret 1
Tool Ext 2	Tool Ret 2
Tool Ext x (up to 5)	Tool Ret x (up to 5)
Exhaust	Relax

MISC

Part Name	Cal Method
Barcode Required	
Copy to Target Part	Copy Part Program
Autorun Method	Autorun Cycle Count
Autorun Enable	

UNITS

Time Unit

INPUTS

Inputs 1-12 options

OUTPUTS

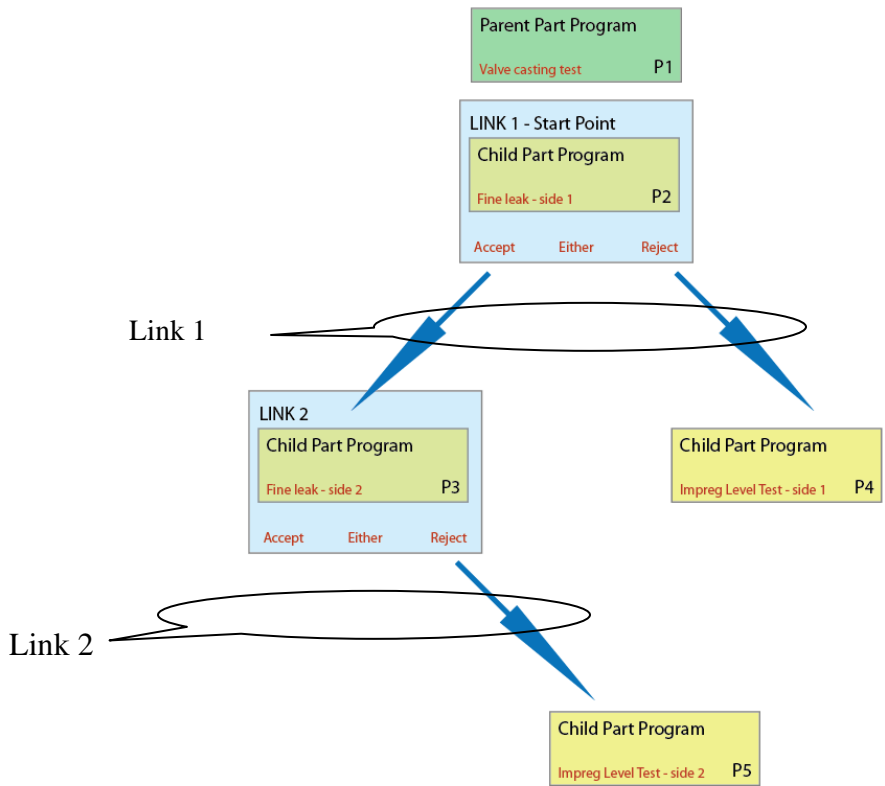
Output 1-8 options

TOOLING

Tooling Option	Number of Motions
Two Inputs to Start	Anti-Tie-Down
Part Present Check	Motion Number
Retract on Reject	Part Mark
Tooling Feedback	

Example Parent Program

Here is a sample sequence in which the user is testing a valve casting. There are two sides of the valve that must pass a fine leak test. If either side fails the fine leak test, a mass flow test is run on the failed side to determine if impregnation is a viable fix for the leaking part.



To program this test sequence, the user goes to Part Config and defines the test type for Part Program 1 to be "Parent Program." The test sequence example above requires two links.

Part Num 1	<u>tooling</u>	<TST TYPE>	<u>link 1</u>
Test Type		Parent Program	
Number of Links			2
Parent program to facilitate linking of individual part programs with Parent tooling control options.			
			6 P01

The first link screen identifies the part program where the testing in the parent program will begin. This screen indicates how additional tests are initiated or linked to this first test program based on the first test results. The defined followup tests or links from this test are defined by the "Evaluation Condition". The potential Evaluation Conditions are "Accept", "Reject", "Accept/Reject", or "Any". Further definitions of the link indicate to which part program the next sequence will jump based on the selected "Eval Condition".

- "Accept" - directs only the accept parts for further testing using the part program defined by "Accept Part Program". For rejects, severe leaks, and malfunctions the test sequence stops.
- "Reject" - directs only reject and severe leak parts for further testing using the part program defined by "Reject Part Program". For accepts and malfunctions the test sequence stops.
- "Accept/Reject" - directs accept, reject and severe leak parts for further testing using the part programs defined by "Accept Part Program" if the test passes or "Reject Part Program" if the test fails or a severe leak occurs. For malfunctions, the test sequence stops.
- "Any" - directs accept, reject and severe leak parts for further testing by one additional test program using the part program defined by "Next Part Program" for accept, reject, or severe leak tests. For malfunctions, the test sequence stops.
- For all Malfunction results the testing stops no matter how the Eval Condition is defined.

Within each link definition resides how the test sequence will jump to other part programs based on the result evaluation. In the first link for the example above we will specify that Part 4 runs on Reject, and Part 3 will run on Accept.

Part Num 1	<u>tst type</u>	<LINK 1>	<u>link 2</u>
Target Part Program			2
Eval Condition		Accept/Reject	
Accept Part Program			3
Reject Part Program			4
			6 P01

The second link required by this example targets Part Program 3. If Part 3 is Reject then Part 5 will be run. If Part 3 is Accepted, the test sequence stops with a Part Accept light and a Part Program Accept.

Part Num 1	link 1	<LINK 2>	timers
Target Part Program			3
Eval Condition			Reject
Reject Part Program			5
			6 P01

Parent Program Execution Notes

1. Child part programs may contain tooling logic, but only the tooling logic contained in the Parent program will be executed.
2. A 'Malfunction' at any time or place in the test logic will result in a Vent/Halt.
3. If any of the Child part programs are Reject, the Parent result will be Reject. (Child result evaluations will be AND'd.)
4. If the user starts a Parent Program, the Monitor screen will indicate that the parent program is running. The Stop/Reset event during any child programs will not navigate the system away from the parent part program.

Warnings

1. There is logic that may reside in part programs that will be ignored when that part program is called by a Parent Program. Ignored parameters include:
 - a. Tooling options
 - b. Calibration Mode
 - c. Autorun Method
 - d. Barcode required
 - e. Relax timer
2. Sequences that require external leak standards will pause and prompt the user to connect the appropriate leak standard. A variable delay between test sequences may induce undesired calibration measurements.