

NX APPLICATION NOTE

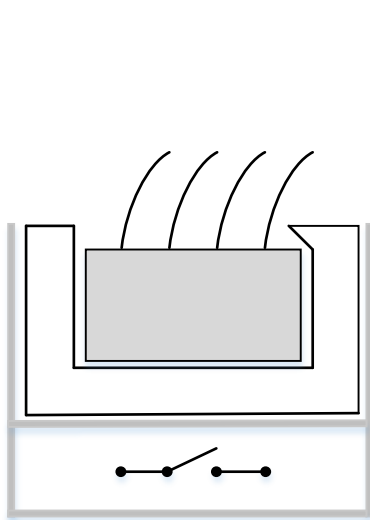
Led Guided Assembly – Connector Pinning with Continuity

Background

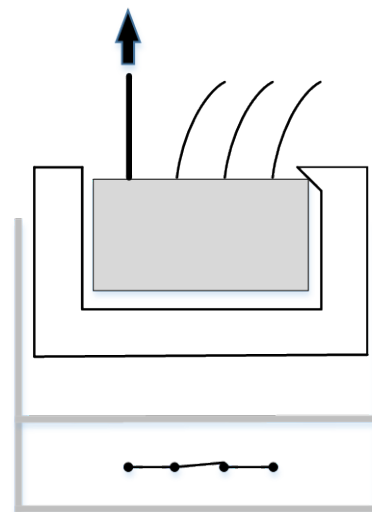
Many wire harness connectors are designed to use a “push-click-pull” method of wire insertion. This method requires the operator to push the terminated wire into the proper connector cavity until it clicks into place. Then the operator is expected to pull or tug on the wire to ensure that the terminal is properly seated. If the operator pins the wire to the wrong cavity or if the operator neglects to perform the pull test, defective wire harnesses may be shipped. To overcome these potential quality problems, some wire harness manufacturers employ a guided assembly method for pinning connectors using LED illumination to indicate the connector and cavity location for pinning the wire. This method also verifies that the operator has performed the pull test by monitoring a fixture block detection switch that is activated when the operator pulls on the wire with sufficient force.

This application note describes how to equip and program a Dynalab NX Tester to support guided assembly of wires to “push-click-pull” connectors using special LED-illuminated fixture blocks that are equipped with a built-in pull test feature where continuity testing is required for each wire. If continuity testing is not required, please refer to the Application Note entitled *LED Guided Assembly – LED Only Mode*.

The pull test feature of the fixture blocks enables the operator to pull on an inserted wire, and if enough force is applied in pulling the wire, a built-in detection switch will close as illustrated below:



Detection switch open



Operator pulls on wire. If wire is properly seated, fixture block will move upward, causing built-in detection switch to close

Requirements

- NX Editor version 1.0.19.233 or later
- NX Tester equipped with firmware version 2.19.213 or later
- 5-4009 (LED Test Point Board)

Note: This solution requires that the NX Tester be equipped ONLY with LED Test Point Board(s), part 5-4009. Standard NX Test Point Boards are not compatible with this solution.

In addition to the items listed above, the following items are required which are not available from Dynalab:

1. An assembly board equipped with “push-click-pull” fixture blocks that have the following characteristics:
 - The fixture block is equipped with one LED per cavity, so that each cavity of a connector can be illuminated.
 - Each fixture block is equipped with a normally open detection switch.
 - Each fixture block is equipped with a mechanism which allows the operator to pull on an inserted wire, resulting in the closure of its detection switch.
 - In addition to the cavity LED’s, each fixture block is equipped with an additional single LED.
2. An electrical probe point must be installed on the assembly board to facilitate continuity testing for un-terminated wires. The probe point should have an associated LED.
3. Each parts bin should be equipped with an LED.
4. If non-electrical parts are to be installed, an acknowledgement switch and LED are required.

NX Tester

This section explains the differences in behavior when an NX Tester is equipped with the LED Test Point Board and firmware version 2.19.213 or later.

Splash Screen

Upon power up, the NX Tester will momentarily display the following splash screen:

4th line indicates that
unit is equipped with
LED Test Point Board



| | |
|----------------------|-----------|
| © Dynalab, Inc. 2015 | |
| Version | 2.19.213 |
| SN | 000000035 |
| NX Pro-LED | 128TP |

Continuity Testing

A fixed continuity threshold of 1000 ohms is used for continuity testing.

Test Point Diagnostics

If the fixture is connected when test point diagnostics are executed, the LEDs will illuminate for several seconds.

Example Scenarios

The following three example scenarios are presented in this document

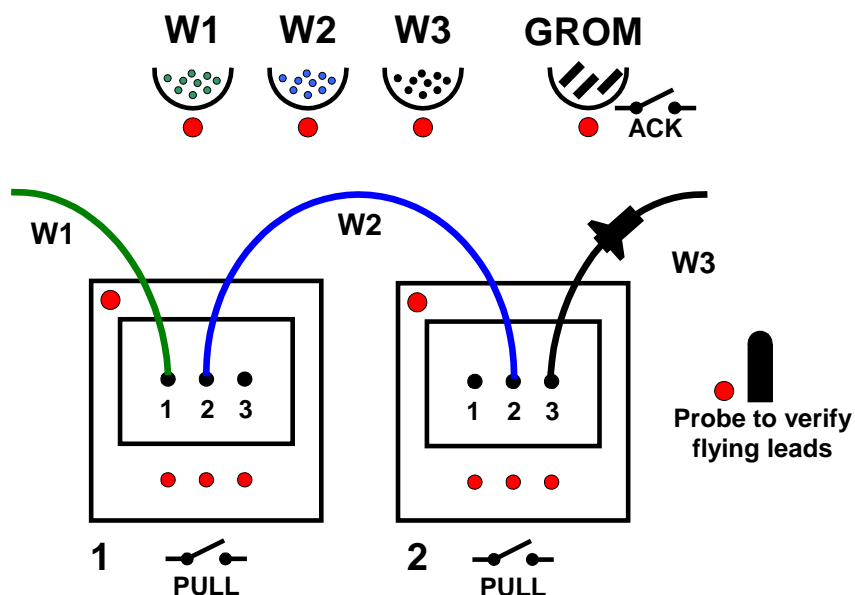
1. No pre-inserted wires: Illuminate guide LEDs, pull test both ends of each wire and test continuity
2. Some wires pre-assembled to both connectors: Illuminate guide LEDs and pull test only those wires to be added; then test continuity for all wires. **NO-PULL function.**
3. All wires pre-inserted on one connector, all wires have the same wire color: Use probe to determine where to insert wire on other connector, illuminate guide LED; then test continuity for all wires. **Probe Assist Mode.**
4. All wires pre-inserted on one connector, all wires have a different wire color. Illuminate guide LEDs to insert each wire on the other connector; then a continuity test is made for all wires. **RT-PULL function.**

Note: Syntax must be followed accordingly for functions to operate

Example Scenario 1:

No pre-inserted wires: Illuminate guide LEDs, pull test both ends of each wire, and test continuity

The following example illustrates this scenario:



The operator must perform the following tasks:

1. Select a green wire from the wires bin labeled W1. Insert one end of W1 into connector 1, cavity 1 and pull to test.
2. Touch the other end of W1 to the Probe point to verify continuity.
3. Select a blue wire from the wires bin labeled W2. Insert one end of W2 into connector 1, cavity 2 and pull to test.
4. Insert the other end of W2 into connector 2, cavity 2 and pull to test.
5. Select a grommet from the parts bin labeled GROM and press acknowledgement switch.
6. Select a black wire from the wires bin labeled W3, assemble grommet to wire, insert one end of W3 into connector 2, cavity 3 and pull to test.
7. Touch the other end of W3 to the Probe point to verify continuity.

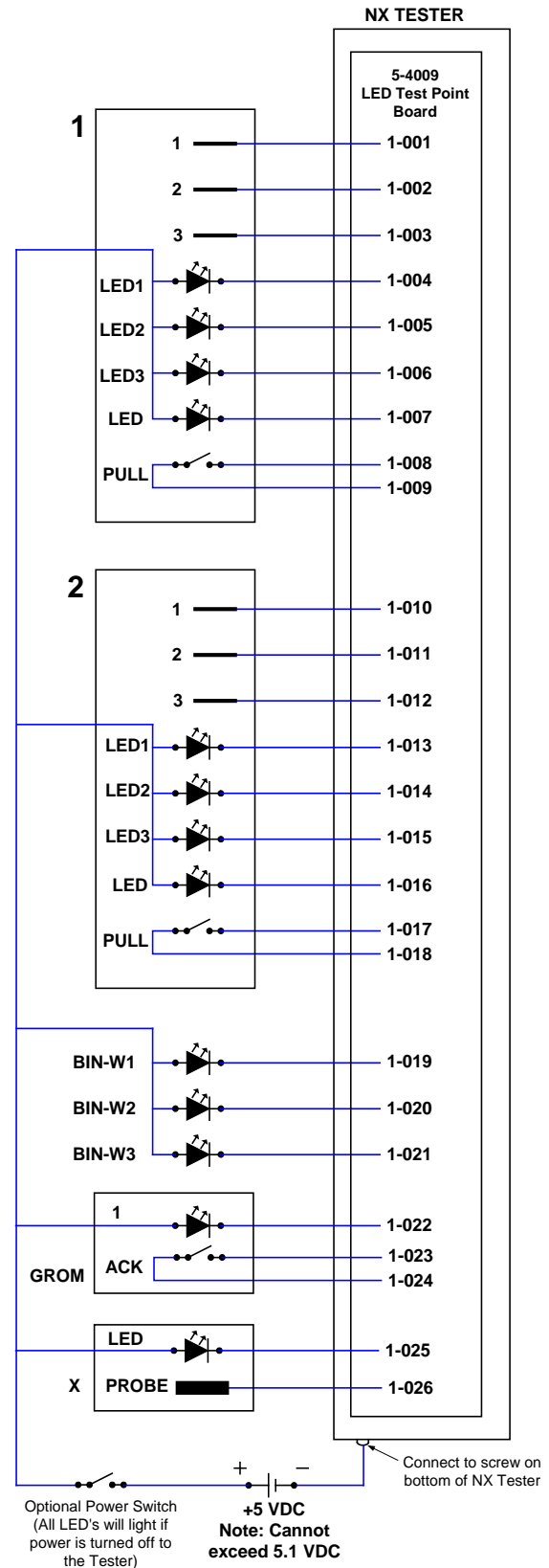
| Phase Properties | | | |
|------------------|---------|--------|-------|
| Point | Point | Name | Color |
| 1-1 | X-PROBE | BIN-W1 | GRN |
| 1-2 | 2-2 | BIN-W2 | BLU |
| GROM-LED | X-X | BIN-W3 | BLK |
| 2-3 | X-PROBE | | BLK |

Wiring

This diagram illustrates the wiring between the assembly fixture board and the NX Tester's LED Test Point Board.

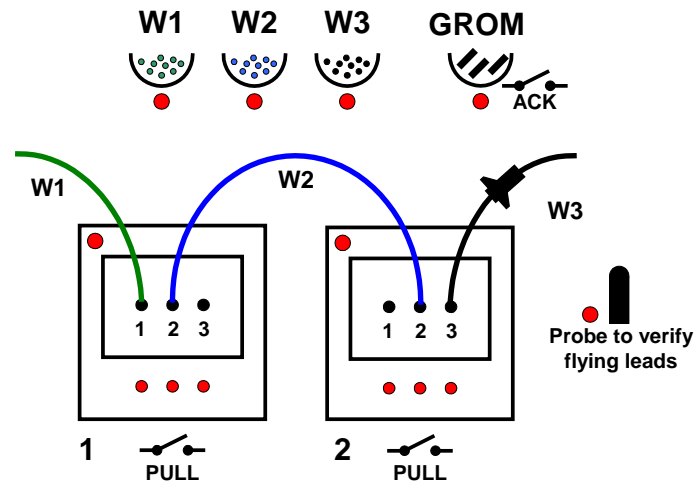
Warning: Damage will occur to diodes if the cathode is accidentally connected to ground and the anode is connected to +5VDC. The 5-4009 LED Test Point Board has built-in current limiting for diode protection

Note: If the Tester power is turned off and the +5VDC to the LED's is turned on, all LED's will light. An optional power switch or a Control Port (5-1060) can be used to turn off the power to the LED's



LED Illumination and Tester Display

This section describes LED illumination and the information displayed on the NX Tester for each of the steps.



| Step | Task | Illuminated LED(s) | Tester Display | Wait For |
|------|---|---|---|---|
| 1 | Select a green wire from the wires bin labeled W1. Insert one end of W1 into connector 1, cavity 1 and pull to test. | <ul style="list-style-type: none"> ➤ Wires bin W1 ➤ Fixture Block 1 ➤ Cavity 1-1 | LED 1-1 BIN-W1 GRN | 1-PULL detection switch closure |
| 2 | Touch the other end of W1 to the Probe point to verify continuity | <ul style="list-style-type: none"> ➤ Probe (flashing) | OPEN 1-1 PROBE GRN | Continuity 1-1 to Probe |
| 3 | Select a blue wire from the wires bin labeled W2. Insert one end of W2 into connector 1, cavity 2 and pull to test | <ul style="list-style-type: none"> ➤ Wires bin W2 ➤ Fixture Block 1 ➤ Cavity 1-2 | LED 1-2 BIN-W2 BLU | 1-PULL detection switch closure |
| 4 | Insert the other end of W2 into connector 2, pin 2 and pull to test. | <ul style="list-style-type: none"> ➤ Fixture Block 2 (flashing) ➤ Cavity 2-2 | LED 2-2 BIN-W2 BLU | 2-PULL detection switch closure & Continuity 1-2 to 2-2 |
| 5 | Select a grommet from the parts bin labeled GROM and press acknowledgment switch. | <ul style="list-style-type: none"> ➤ Wires bin GROM | LED GROM-LED BLK | GROM-ACK detection switch closure |
| 6 | Select a black wire from the wires bin labeled W3. Assemble grommet to wire W3. Insert one end of W3 into connector 2, cavity 3 and pull to test. | <ul style="list-style-type: none"> ➤ Wires bin W3 ➤ Fixture Block 2 ➤ Cavity 2-3 | LED 2-3 BIN-W3 BLK | 2-PULL detection switch closure |
| 7 | Touch the other end of W3 to the Probe point to verify continuity. | <ul style="list-style-type: none"> ➤ Probe (flashing) | OPEN 2-3 PROBE BLK | Continuity 2-3 to Probe |

Fixture Blocks Table

The following rules apply to the entries in the Fixture Blocks table:

1. Fixture blocks and detection switches that accept a connector

- The fixture block name can be anything except “X”. In this example, the first two fixture block names are “1” and “2”.
- A single detection switch must be defined for each fixture block. The detection switch may be given any name. In this example, fixture block detection switches are named “PULL”.
- The cavity pin names can be anything. In this example, the cavity pin names are “1”, “2”, and “3” for each fixture block.
- Each cavity LED must conform to the naming convention: **f-LEDp**, where **f** is the fixture block name and **p** is the cavity pin name. For instance, in the example shown in this document the cavity LEDs are named “1-LED1”, “1-LED2”, “1-LED3”, “2-LED1”, “2-LED2”, and “2-LED3”.
- The LED for the fixture block must conform to the naming convention: **f-LED**, where **f** is the fixture block name. For instance, in the example shown in this document the fixture block LEDs are named “1-LED” and “2-LED”.

Fixture Block '1' Properties

Name: 1 Reference Name:

Fixture Block Elements

| Pins | # |
|------|---|
| 1 | 1 |
| 2 | 2 |
| 3 | 3 |
| LED1 | 4 |
| LED2 | 5 |
| LED3 | 6 |
| LED | 7 |

| Detection Switches | # |
|--------------------|---|
| PULL | 8 |

Fixture Board Location: ...

Fixture Block '2' Properties

Name: 2 Reference Name:

Fixture Block Elements

| Pins | # |
|------|---|
| 1 | 1 |
| 2 | 2 |
| 3 | 3 |
| LED1 | 4 |
| LED2 | 5 |
| LED3 | 6 |
| LED | 7 |

| Detection Switches | # |
|--------------------|---|
| PULL | 8 |

Fixture Board Location: ...

2. Wire bins LEDs

- Each wire bin LED must have an entry in the fixture blocks table.
- The fixture block name and pin name for the wire bin LED can be anything. In this example, all wire bin LEDs are associated with a fixture block named **BIN**. Each wire bin LED's name is the wire name: **BIN-W1**, **BIN-W2**, and **BIN-W3**.

The screenshot shows the 'Fixture Block 'BIN' Properties' dialog box. It has a 'Name' field containing 'BIN' and an empty 'Reference Name' field. Below these are two tables under the heading 'Fixture Block Elements'. The 'Pins' table has three rows: 'W1' with index 1, 'W2' with index 2, and 'W3' with index 3. The 'Detection Switches' table is empty. At the bottom, there are navigation icons and a 'Fixture Board Location' field with a dropdown arrow.

| Pins | # |
|------|---|
| W1 | 1 |
| W2 | 2 |
| W3 | 3 |

| Detection Switches | # |
|--------------------|---|
|--------------------|---|

3. Non-electrical part bin LEDs

- The fixture block name can be anything except "X". It is suggested that the fixture block name be related to the part in some way. For instance, in this example the non-electrical part is a grommet, so the fixture block name is **GROM**.
- The fixture block contains only one pin, corresponding to the bin's LED. The pin name should conform to the naming convention: **f-LED**, where **f** is the fixture block name. In this example: **GROM-LED**.
- A single detection switch must be defined for the fixture block to be used as an acknowledgment mechanism. The detection switch may be given any name. In this example: **ACK**.

The screenshot shows the 'Fixture Block 'GROM' Properties' dialog box. It has a 'Name' field containing 'GROM' and an empty 'Reference Name' field. Below these are two tables under the heading 'Fixture Block Elements'. The 'Pins' table has one row: 'LED' with index 1. The 'Detection Switches' table has one row: 'ACK' with index 2. At the bottom, there are navigation icons and a 'Fixture Board Location' field with a dropdown arrow.

| Pins | # |
|------|---|
| LED | 1 |

| Detection Switches | # |
|--------------------|---|
| ACK | 2 |

4. Mandatory fixture block “X”

- A fixture block named **X** must be defined.
- Fixture block **X** must have one pin named **LED** corresponding to the probe LED.
- Fixture block **X** must have one pin named **PROBE** corresponding to the probe point.
- If non-electrical parts are used, fixture block X must have one pin named X. Any unused test point can be assigned to this entry.

Fixture Block X Properties

Name: X Reference Name:

Fixture Block Elements

| Pins | # |
|-------|---|
| LED | 1 |
| PROBE | 2 |
| X | 3 |

| Detection Switches | # |
|--------------------|---|
|--------------------|---|

Fixture Board Location: ...

Here is the NX Editor's Fixture Blocks table for this example.

| | Name | Test Point |
|--|-------------|------------|
| | 1-1 | 001-01 |
| Fixture Block 1 connector cavities | 1-2 | 001-02 |
| | 1-3 | 001-03 |
| Fixture Block 1 cavity LEDs | 1-LED1 | 001-04 |
| | 1-LED2 | 001-05 |
| | 1-LED3 | 001-06 |
| Fixture Block 1 LED | 1-LED | 001-07 |
| Fixture Block 1 pull test switch | 1-PULL(+) | 001-08 |
| | 1-PULL(-) | 001-09 |
| Fixture Block 2 connector cavities | 2-1 | 001-10 |
| | 2-2 | 001-11 |
| | 2-3 | 001-12 |
| Fixture Block 2 cavity LEDs | 2-LED1 | 001-13 |
| | 2-LED2 | 001-14 |
| | 2-LED3 | 001-15 |
| Fixture Block 2 LED | 2-LED | 001-16 |
| Fixture Block 2 pull test switch | 2-PULL(+) | 001-17 |
| | 2-PULL(-) | 001-18 |
| Wire bins LEDs | BIN-W1 | 001-19 |
| | BIN-W2 | 001-20 |
| | BIN-W3 | 001-21 |
| Non-electrical parts bin LED and acknowledgment switch | GROM-LED | 001-22 |
| | GROM-ACK(+) | 001-23 |
| | GROM-ACK(-) | 001-24 |
| Probe LED and probe point | X-LED | 001-25 |
| | X-PROBE | 001-26 |
| Mandatory "dummy" test point X-X | X-X | 001-55 |

There are four types of entries in the Fixture Blocks table:

1. Fixture blocks with detection switches that accept a connector
2. Wire bins LEDs
3. Non-electrical parts bin LEDs with detection switches
4. Mandatory fixture block "X" with LED, probe point and dummy test point

Connections

Before entering any connections data, make sure that the Workflow contains a Test-LED Guided workflow item that uses the same phase name. In this example, the selected phase is named Main. This suppresses the normal NX Editor connections grouping behavior.

| Phase Properties | | | |
|------------------|---------|--------|-------|
| Point | Point | Name | Color |
| 1-1 | X-PROBE | BIN-W1 | GRN |
| 1-2 | 2-2 | BIN-W2 | BLU |
| GROM-LED | X-X | BIN-W3 | BLK |
| 2-3 | X-PROBE | | BLK |

Note: The rules governing the significance of entries in the Connections table are very different from that of a normal NX Editor application. These rules are explained below and apply only to the LED Guided Assembly application.

There are three types of entries in the Connections table for the LED Guided Assembly application:

1. A wire that is terminated to a connector on one end and is unterminated on the other end.

For this type of entry, the connection point to which the wire is pinned is entered in the left-hand POINT column and **X-PROBE** is entered in the right-hand column. In the example, there are two unterminated wires, W1 and W3:

| Point | Point | Name | Color |
|----------|---------|--------|-------|
| 1-1 | X-PROBE | BIN-W1 | GRN |
| 1-2 | 2-2 | BIN-W2 | BLU |
| GROM-LED | X-X | BIN-W3 | BLK |
| 2-3 | X-PROBE | | BLK |

2. A wire that is terminated to a connector on both ends

The first connection point to which the wire is terminated is entered in the left-hand POINT column. The second connection point is entered in the right-hand POINT column. In the example, there is one wire that is terminated on both ends, W2:

| Point | Point | Name | Color |
|----------|---------|--------|-------|
| 1-1 | X-PROBE | BIN-W1 | GRN |
| 1-2 | 2-2 | BIN-W2 | BLU |
| GROM-LED | X-X | BIN-W3 | BLK |
| 2-3 | X-PROBE | | BLK |

3. A non-electrical part

The connection point for the LED associated with the non-electrical part is entered in the left-hand POINT column and **X-X** is entered in the right-hand POINT column. In the example, there is one non-electrical part, **GROM**, and its associated LED connection point is **GROM-LED**:

| Point | Point | Name | Color |
|----------|---------|--------|-------|
| 1-1 | X-PROBE | BIN-W1 | GRN |
| 1-2 | 2-2 | BIN-W2 | BLU |
| GROM-LED | X-X | BIN-W3 | BLK |
| 2-3 | X-PROBE | | BLK |

Wire bin LED connection points are entered in the Name field of the Connections table. In the example, there are 3 wire bin LEDs: BIN-W1, BIN-W2, and BIN-W3

| Point | Point | Name | Color |
|----------|---------|--------|-------|
| 1-1 | X-PROBE | BIN-W1 | GRN |
| 1-2 | 2-2 | BIN-W2 | BLU |
| GROM-LED | X-X | BIN-W3 | BLK |
| 2-3 | X-PROBE | | BLK |

The following explains each entry in the example's Connections table in further detail:

| Point | Point | Name | Color |
|----------|---------|--------|-------|
| 1-1 | X-PROBE | BIN-W1 | GRN |
| 1-2 | 2-2 | BIN-W2 | BLU |
| GROM-LED | X-X | BIN-W3 | BLK |
| 2-3 | X-PROBE | | BLK |

- The following three LEDs are illuminated
 - Fixture block 1
 - Cavity 1 of fixture block 1
 - Wire bin BIN-W1
- The tester waits for closure of the detection switch associated with fixture block 1
- After the detection switch closes, the three LEDs are turned off, and the LED associated with the probe is illuminated and flashing.
- The tester waits until continuity is made between 1-1 and X-PROBE

| Point | Point | Name | Color |
|----------|---------|--------|-------|
| 1-1 | X-PROBE | BIN-W1 | GRN |
| 1-2 | 2-2 | BIN-W2 | BLU |
| GROM-LED | X-X | BIN-W3 | BLK |
| 2-3 | X-PROBE | | BLK |

- The following three LEDs are illuminated
 - Fixture block 1
 - Cavity 2 of fixture block 1
 - Wire bin BIN-W2
- The tester waits for closure of the detection switch associated with fixture block 1
- After the detection switch closes, the three LEDs are turned off, and the following LEDs are illuminated:
 - Fixture block 2 (flashing)
 - Cavity 2 of fixture block 2
- The tester waits until continuity is made between 1-2 and 2-2 and for closure of the detection switch associated with fixture block 2.

| Point | Point | Name | Color |
|----------|---------|--------|-------|
| 1-1 | X-PROBE | BIN-W1 | GRN |
| 1-2 | 2-2 | BIN-W2 | BLU |
| GROM-LED | X-X | BIN-W3 | BLK |
| 2-3 | X-PROBE | | BLK |

- The following LED is illuminated:
 - Parts bin GROM
- The tester waits for closure of the detection switch associated the non-electrical part **GROM**

| Point | Point | Name | Color |
|----------|---------|--------|-------|
| 1-1 | X-PROBE | BIN-W1 | GRN |
| 1-2 | 2-2 | BIN-W2 | BLU |
| GROM-LED | X-X | BIN-W3 | BLK |
| 2-3 | X-PROBE | | BLK |

- The following three LEDs are illuminated
 - Fixture block 2
 - Cavity 3 of fixture block 2
 - Wire bin W3
- The tester waits for closure of the detection switch associated with fixture block 2
- After the detection switch closes, the three LEDs are turned off, and the LED associated with the probe is illuminated and flashing.
- The tester waits until continuity is made between 2-3 and X-PROBE.

Changing Assembly Order

To change the order of the operations described above, select “Show Grouped” mode, and then use the up and down arrows to change the order.

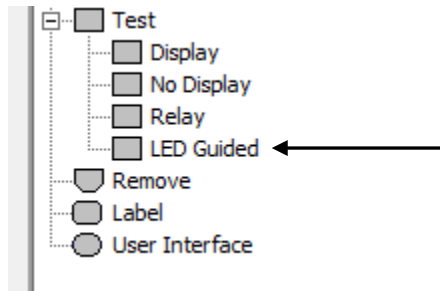
| Point | Point | Name | Color |
|---------------------|---------|--------|-------|
| [-] [↑] [↓] Group 1 | | | |
| 1-1 | X-PROBE | BIN-W1 | GRN |
| 2-3 | X-PROBE | | BLK |
| [-] [↑] [↓] Group 2 | | | |
| 1-2 | 2-2 | BIN-W2 | BLU |
| [-] [↑] [↓] Group 3 | | | |
| GROM-LED | X-X | BIN-W3 | BLK |

Programming

The NX Editor program for this example is described below.

Workflow

The **Test LED Guided** workflow item must be used for this application. Do not use Test-Display, Test-No Display, Test-Relay, or Remove workflow items for this application.



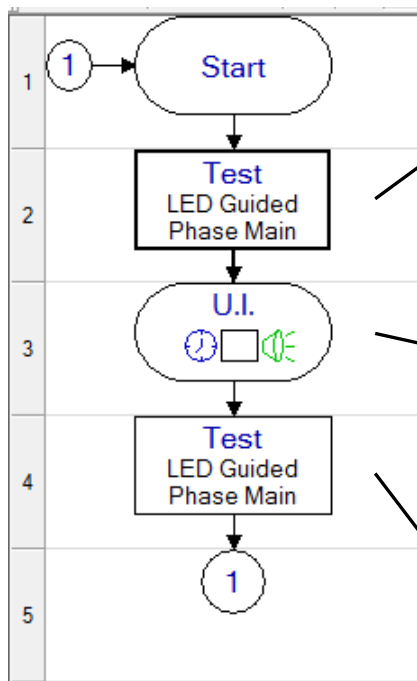
Test: Test-LED Guided Properties

Phase: Main

Mode:

- ☐ LED Only
- ☒ LED and Continuity
- ☐ Detection Switches
- ☐ No Continuity

The workflow should contain the following cells:



User Interface Properties

Audio: Twirl

☐ Repeat for Duration

Visual:

Harness passed.

Remove harness now.

☒ Until Next Display Message

☐ For Duration ☐ Flash Message

NX View Document Link

Duration:

☐ None

☒ Timed: 2 Seconds

Although the connections phase can have any name, it is suggested that the **Main** phase name be used for this application.

Test: Test-LED Guided Properties

Phase: Main

Mode:

- ☐ LED Only
- ☐ LED and Continuity
- ☐ Detection Switches
- ☒ No Continuity

Alarm on Short

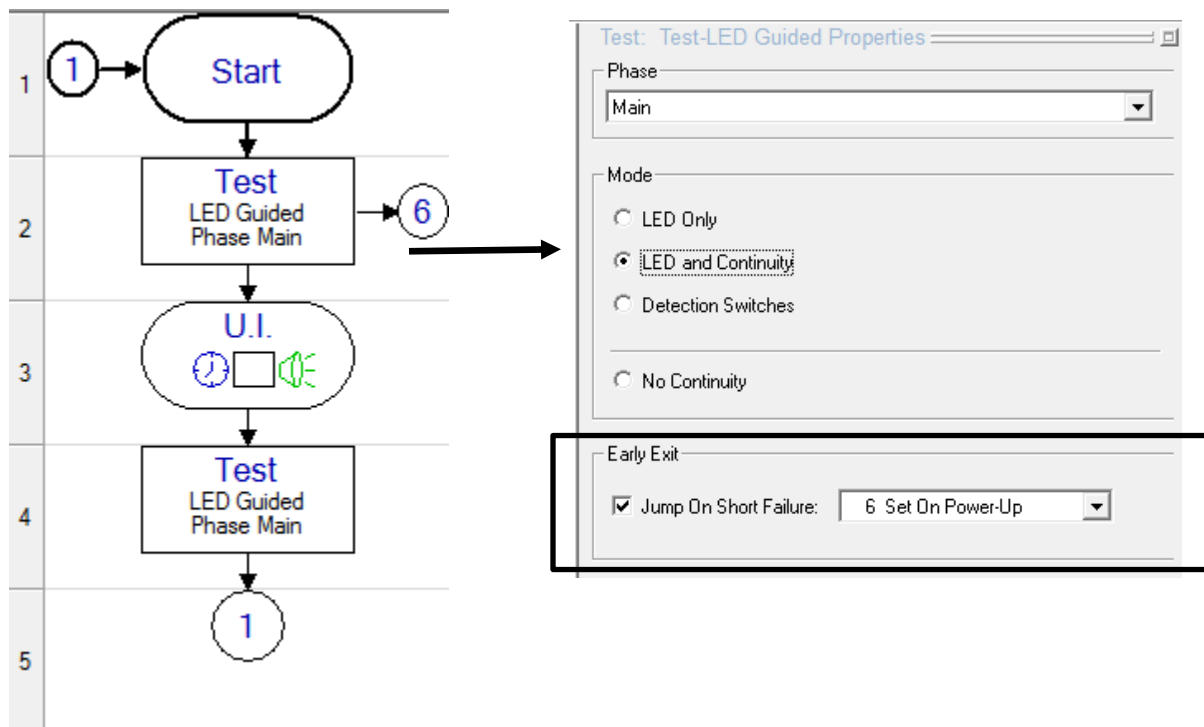
If the operator inserts a wire into the wrong cavity or an extra wire is installed, the NX Tester will respond with a **SHORT** error message. However, it may be desirable for the tester to enter an Alarm Mode, requiring authorized personnel to disable the Alarm Mode with a Supervisor Key. This would guarantee intervention and correction action.

Upon entering the Alarm Mode, the NX Tester does the following:

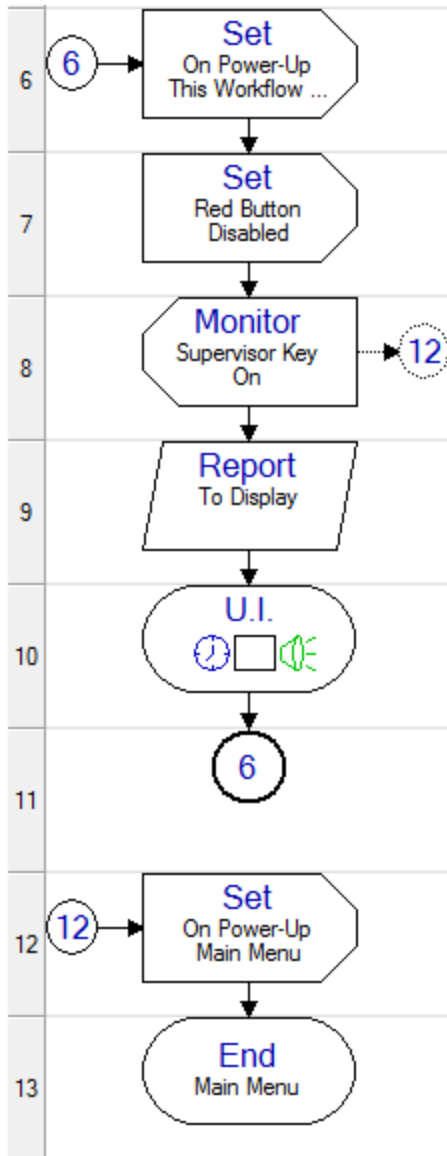
- Stops testing
- Sounds an audible alarm
- Displays a message indicating a **SHORT** failure was detected
- Requires insertion of the Supervisor Key to de-activate the Alarm Mode.

The following example workflow illustrates how to implement the Alarm Mode when a short is detected.

The first 5 cells remain the same, except in Cell 2, check the box labeled Jump On Short Failure:



The rest of the workflow is shown on the following page.



← If the tester is powered down, on subsequent power-up, execution resumes here. This ensures that the tester remains in the Alarm Mode if power is cycled.

← Red Button is disabled to prevent operator from manually aborting the test during the Alarm Mode.

← The tester monitors for insertion of the Supervisor Key. When inserted, execution resumes at cell 12.

← Provides the error information on the tester's display.

← This User Interface cell informs the operator that a SHORT was detected, and to insert the Supervisor key to proceed.

← Restore the default power up behavior to go to the main menu.

User Interface Properties

Audio

Low-High-Low

☐ Repeat for Duration

Listen

Visual

SHORT DETECTED!

Insert Supervisor

Key to continue!!!

☐ Until Next Display Message

☒ For Duration ☒ Flash Message

NX View Document Link

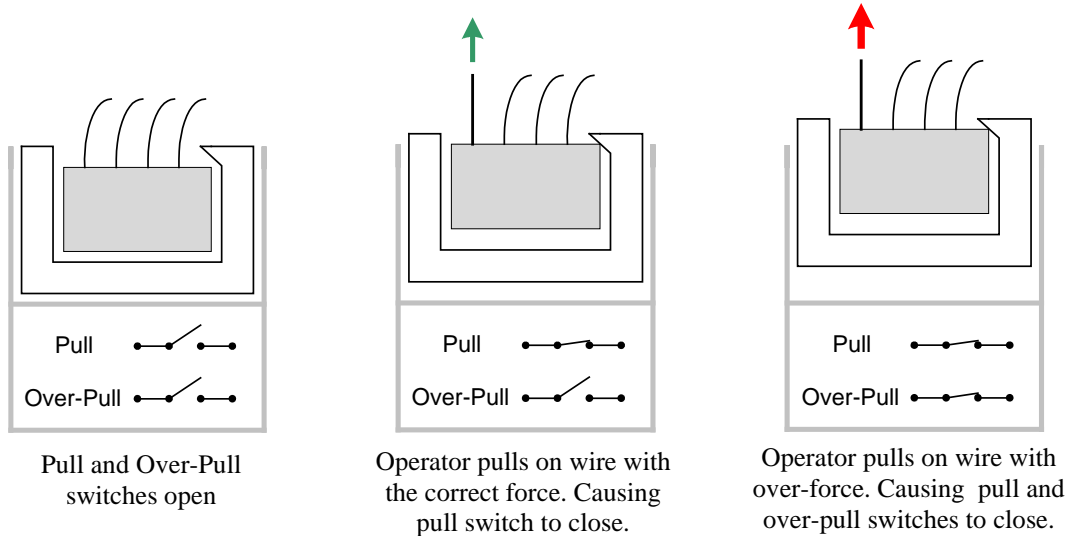
Duration

☐ None

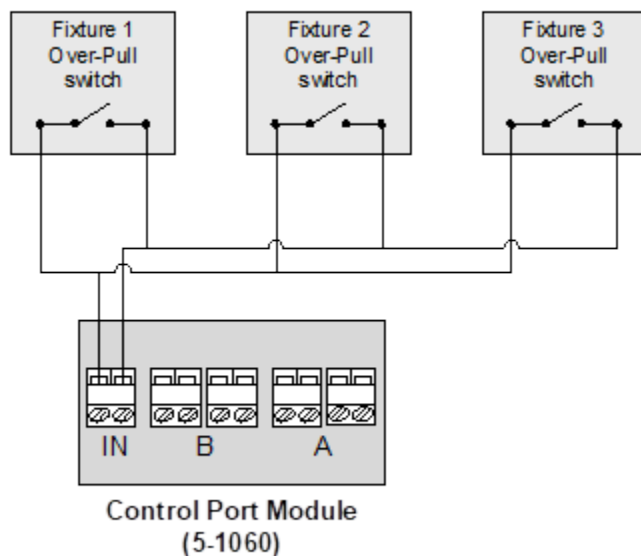
☒ Timed: 3 Seconds

Over-Pull Detection

To use this function, the fixtures must be equipped with an over-pull switch that closes if the operator over-pull the wire. The following picture illustrates the correct force that closes only the Pull Switch and the over-force that closes the Pull-Switch and Over-Pull switch:



Additionally, it is required the control port module 5-1060, with its input wired in parallel to the over-pull switch of all fixtures. The following picture illustrates the wiring:

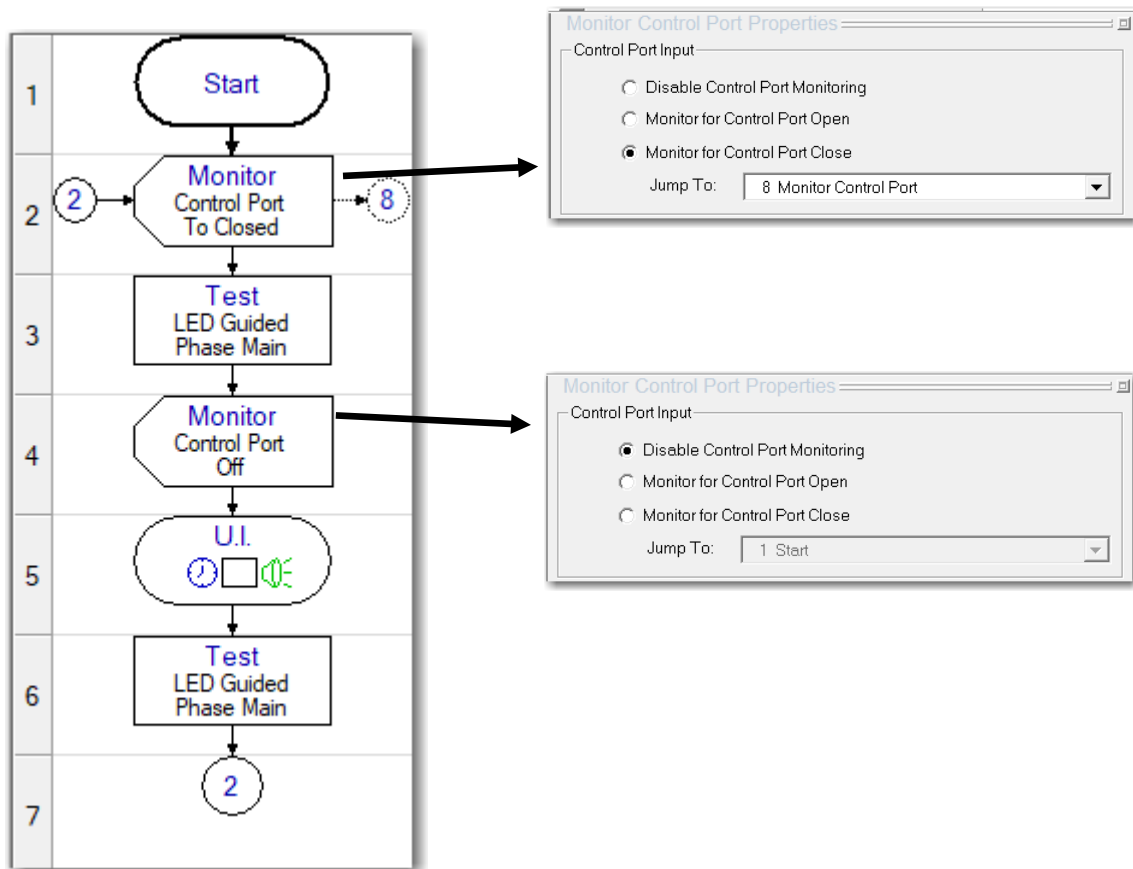


NOTE: The wiring for the pull-switch, cavities and LED's remains the same as shown in the previous section titled "Wiring".

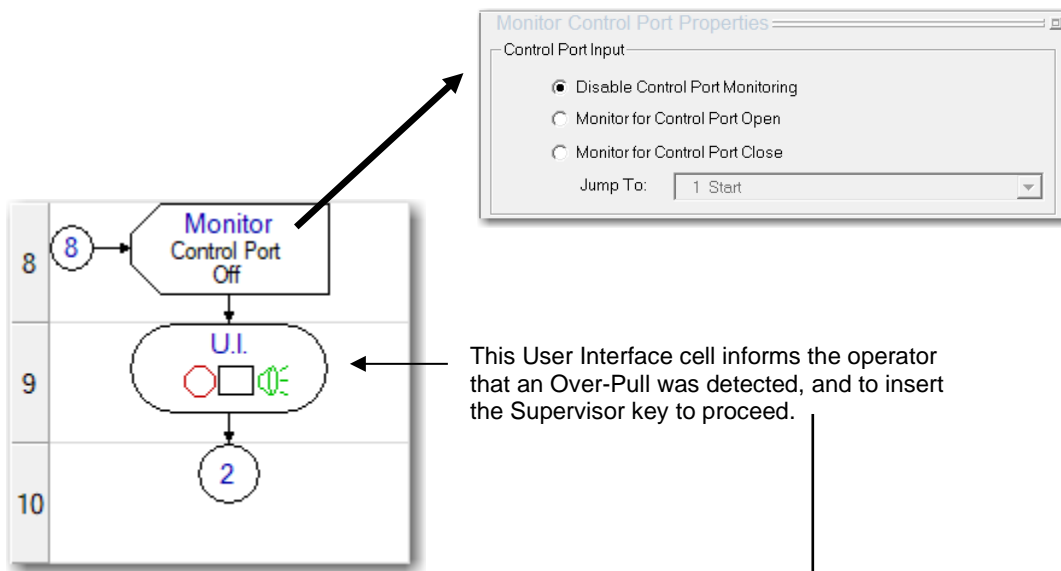
Upon entering the over-pull detection, the NX Tester does the following:

- Stops testing
- Sounds an audible alarm
- Displays a message indicating an over-pull was detected
- Requires insertion of the Supervisor Key to de-activate the Alarm Mode.
- When the test is restarted, continuity will pick up where it left off before the over-pull.

The following example workflow illustrates how to implement the Alarm Mode when an over-pull is detected.



The rest of the workflow is shown on the following page.



User Interface Properties

Audio

Blaap

☐ Repeat for Duration

Listen

Visual

Over Pull Detected!

Call Supervisor!

☒ Until Next Display Message

☐ For Duration ☐ Flash Message

NX View Document Link

Duration

☐ None

☐ Timed: 0.1 Seconds

☒ Until User Input: Supervisor Key

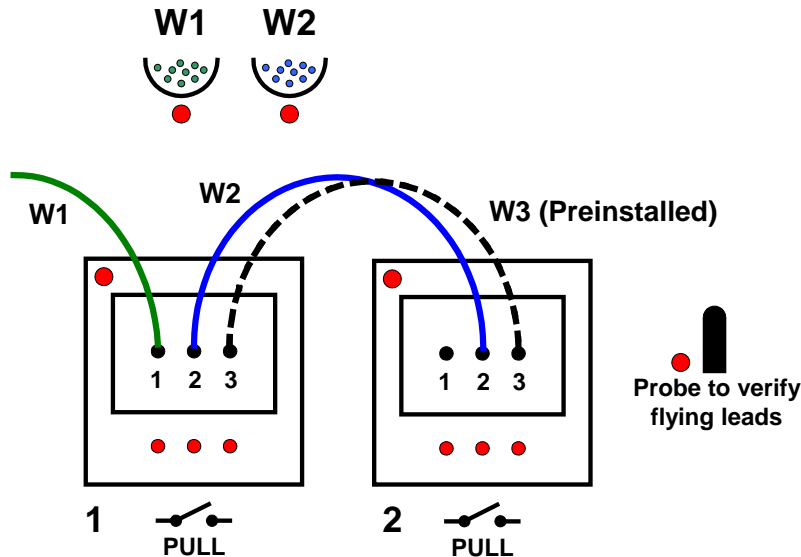
☐ Until Port Control Port is

☐ Until Port Control Port is Open

Example Scenario 2:

Some wires pre-assembled to both connectors: Illuminate guide LEDs and pull test only those wires to be added; then test continuity for all wires

The following example illustrates this scenario:



The operator must perform the following tasks:

1. Select a green wire from the wires bin labeled W1. Insert one end of W1 into connector 1, cavity 1 and pull to test.
2. Touch the other end of W1 to the Probe point to verify continuity.
3. Select a blue wire from the wires bin labeled W2. Insert one end of W2 into connector 1, cavity 2 and pull to test.
4. Insert the other end of W2 into connector 2, cavity 2 and pull to test.
5. After the operator completes these four steps, the tester will check continuity of the pre-installed wire W3.

Note that this is identical to the previous example, except wire W3 is already inserted and seated into both connectors. To accommodate this situation, the keyword “**NO-PULL**” is used in the Color column:

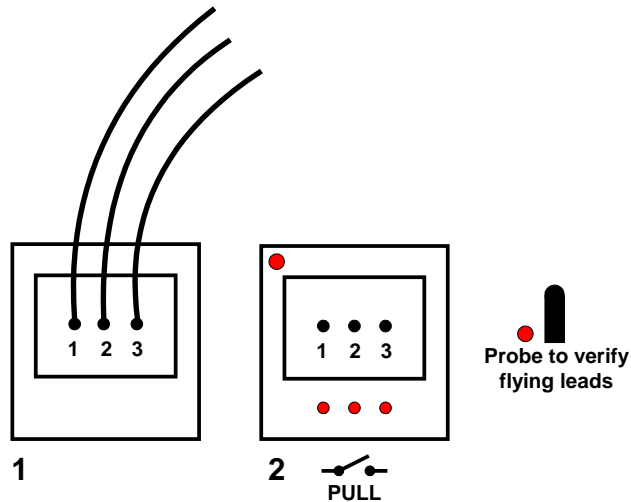
| Point | Point | Name | Color |
|-------|---------|--------|---------|
| 1-1 | X-PROBE | BIN-W1 | GRN |
| 1-2 | 2-2 | BIN-W2 | BLU |
| 1-3 | 2-3 | W3 | NO-PULL |

Whenever the keyword “**NO-PULL**” appears in the Color column, the tester will only perform a continuity test of the wire. No LED-guidance or pull test will be done, since the assumption is that the wire has already been installed in a previous operation.

Example Scenario 3:

Probe Assist Mode: All wires pre-inserted on one connector, all wires have the same wire color: Use the Probe point to determine where to insert wire on other connector, illuminate guide LED; then test continuity for all wires

The following example illustrates this scenario:



In this example, connector 1 has 3 wires already installed. The wires are not easily identifiable, so it is not possible for the operator to visually determine the destination cavity in connector 2 for any of the wires in connector 1.

The operator must perform the following tasks:

1. Select any wire and touch the Probe point. The tester responds by displaying the destination connector and cavity.
2. Insert the wire into the connector cavity indicated by the tester in step 1 and pull to test.
3. Repeat above step until all wires are terminated.
4. After all wires have been terminated, the tester will do a continuity test on all wires

This mode of operation is implemented by entering all connections data in a phase named **“ProbeAssist”**:

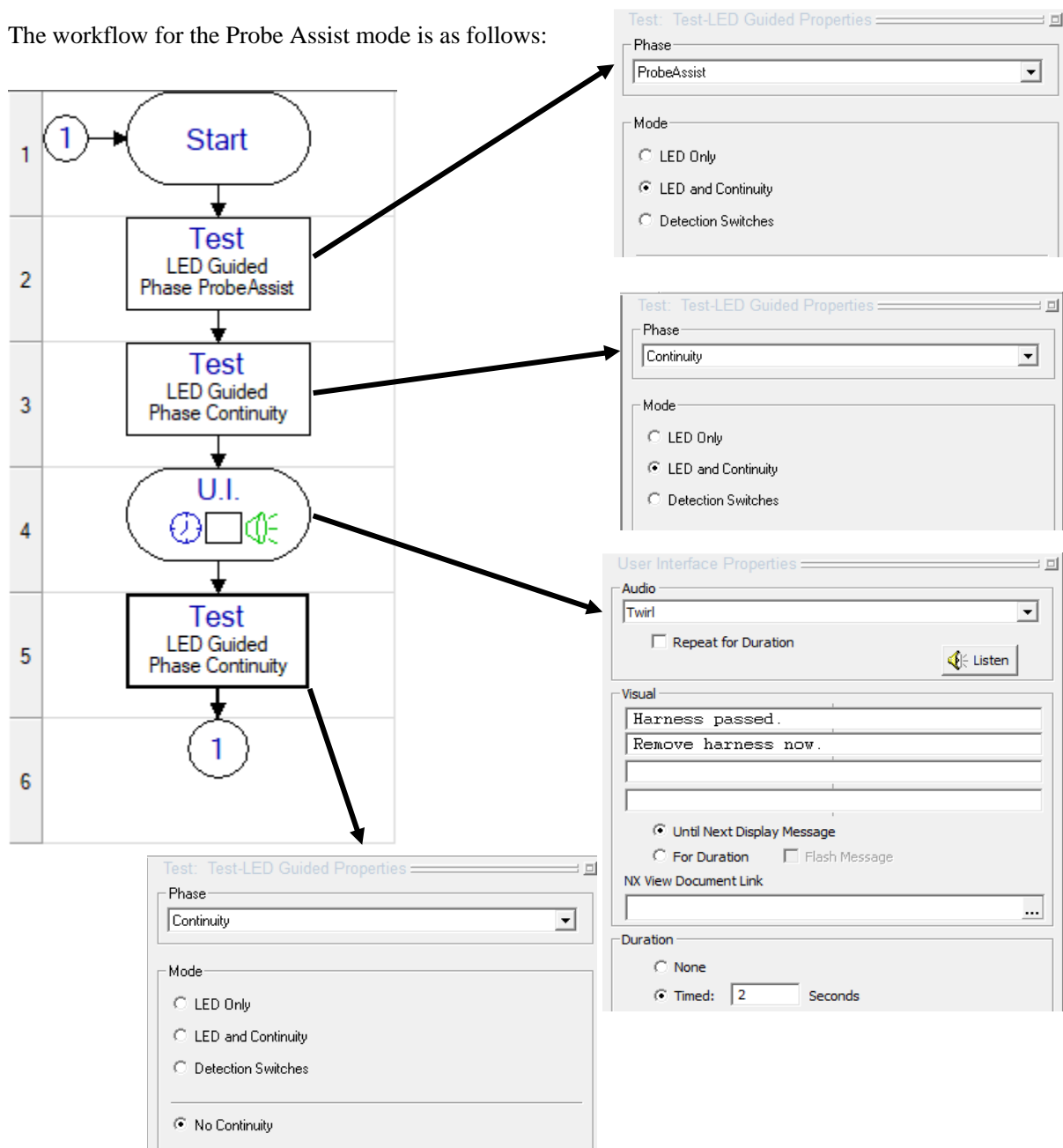
| Phase Properties | | | |
|------------------|-------|------|-------|
| Point | Point | Name | Color |
| 1-1 | 2-1 | W1 | |
| 1-2 | 2-2 | W2 | |
| 1-3 | 2-3 | W3 | |

The “**ProbeAssist**” phase should be followed by an additional phase to check continuity:

| Point | Point | Name | Color |
|-------|-------|------|---------|
| 1-1 | 2-1 | W1 | NO-PULL |
| 1-2 | 2-2 | W2 | NO-PULL |
| 1-3 | 2-3 | W3 | NO-PULL |

In this phase, named Continuity, the keyword “**NO-PULL**” is in the Color column for every connection. This tells the tester that a pull test is not required. So, in this case the tester will do a continuity test only – no LED guidance and no pull testing.

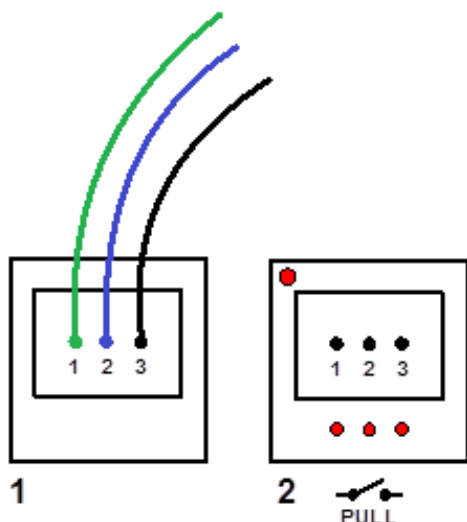
The workflow for the Probe Assist mode is as follows:



Example Scenario 4:

RT-PULL function: All wires pre-inserted on one connector, all wires have a different wire color. Insert each wire on the other connector according to the wire color, illuminate guide LED; then a continuity test is made for all wires.

The following example illustrates this scenario:



In this example, connector 1 has 3 wires already installed. The wires are easily identifiable by its colors, so the operator can visually determine the destination cavity in connector 2, for all the wires in connector 1.






The operator must perform the following tasks:


1. Select green wire from connector 1, cavity 1 and insert it into connector 2, cavity 1 and pull to test.
2. Select blue wire from connector 1, cavity 2 and insert it into connector 2, cavity 2 and pull to test.
3. Select black wire from connector 1, cavity 3 and insert it into connector 2, cavity 3 and pull to test
4. After the operator completes these three steps, the tester will check continuity of all wires.


Note that all wires were already inserted and seated in the connector 1, and the operator must take each wire according to its color and perform the Pull Test on the second connector only. No actions will be performed in the connector 1.

The **Main phase** must include the wire name and color on the Name column and the keyword **RT-PULL** in the Color column:

Phase Properties





Main

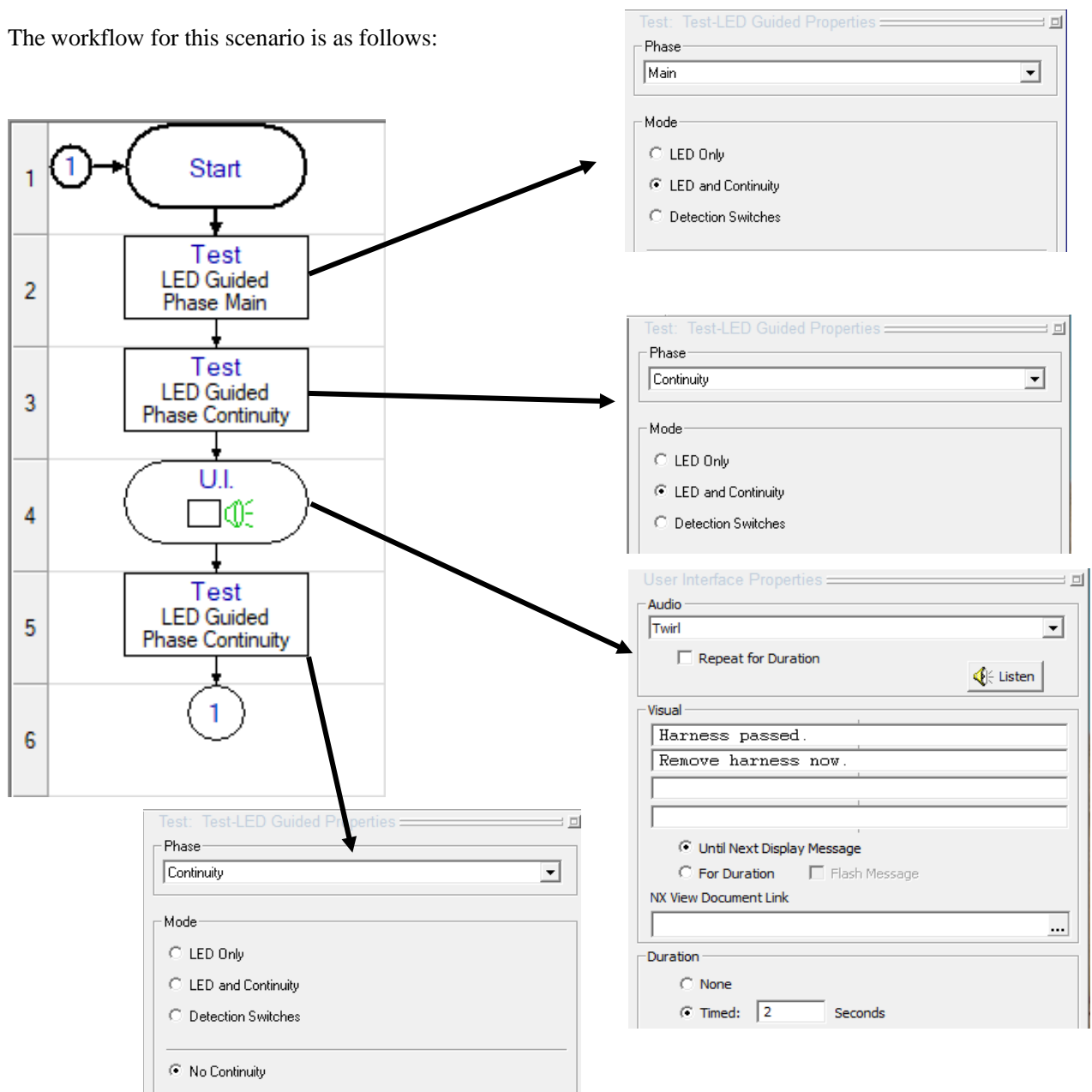
| Point | Point | Name | Color |
|-------|-------|----------|---------|
| 1-1 | 2-1 | W1-GREEN | RT-PULL |
| 1-2 | 2-2 | W2-BLUE | RT-PULL |
| 1-3 | 2-3 | W3-BLACK | RT-PULL |

The Main phase should be followed by an additional phase named as “**Continuity**” for continuity test:

| Phase Properties | | | |
|------------------|-------|----------|---------|
| Point | Point | Name | Color |
| 1-1 | 2-1 | W1-GREEN | NO-PULL |
| 1-2 | 2-2 | W2-BLUE | NO-PULL |
| 1-3 | 2-3 | W3-BLACK | NO-PULL |

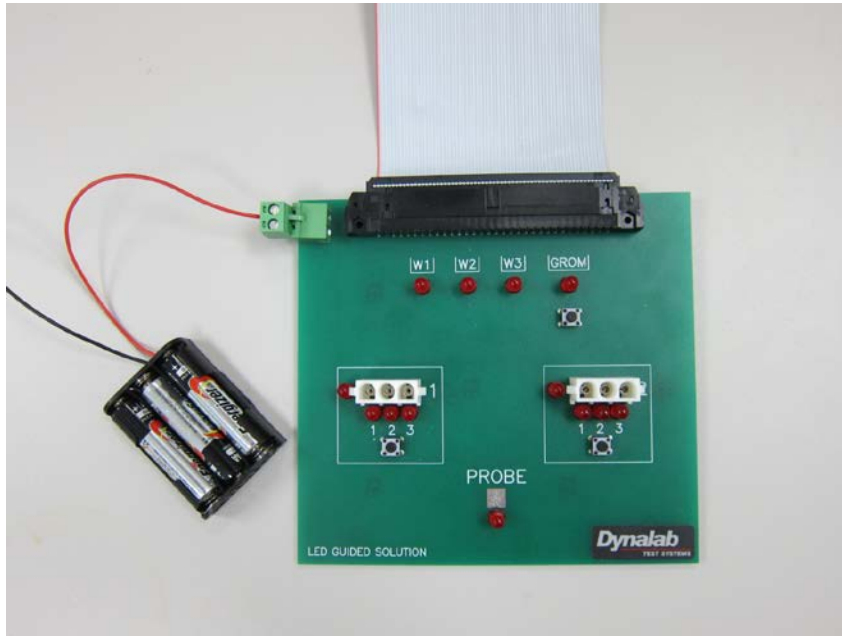
In this phase, named Continuity, the keyword NO-PULL must be used in the Color column for every connection. This action instructs to the tester that a pull test is not required. So, in this case the tester will do a continuity test only without LED guidance and pull testing.

The workflow for this scenario is as follows:



Tutorial Board

The LED Guided Tutorial Board, part number 5-1091, is available from Dynalab Test Systems. It is designed to be compatible with the example scenario used in this document.



The LED Guided Tutorial Board has LEDs corresponding to wire bins W1, W2, W3 and parts bin GROM. A push detection switch is provided to emulate the grommet bin acknowledgment switch. Each fixture block is equipped with LEDs and a push switch to emulate the pull-test detection switch. A probe point and LED are also provided. The LEDs are battery powered. A battery holder is provided with the tutorial board. An interface cable is also provided that plugs into the NX Tester. Fixture block assignments are identical to the example scenario in this document.

To setup the board:

- Connect the red wire of the battery pack to the top connection point on the terminal block as shown above.
- Connect the black wire of the battery pack to the screw on the bottom of the NX Tester
- Connect the interface cable to slot 1 on the back of the NX Tester, with the red stripe facing to the right as viewed from the rear of the tester.

