SIGA-MFT Map Fault Tool User Guide

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Manufacturer

Edwards, A Division of UTC Fire & Security Americas Corporation, Inc.
8985 Town Center Parkway, Bradenton, FL 34202, USA

Version

This document applies to SIGA-MFT Software version 1.2.

FCC compliance

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Contact information

For contact information, see www.edwardsutcfs.com.

Content

Important information

Limitation of liability

To the maximum extent permitted by applicable law, in no event will UTCFS be liable for any lost profits or business opportunities, loss of use, business interruption, loss of data, or any other indirect, special, incidental, or consequential damages under any theory of liability, whether based in contract, tort, negligence, product liability, or otherwise. Because some jurisdictions do not allow the exclusion or limitation of liability for consequential or incidental damages the preceding limitation may not apply to you. In any event the total liability of UTCFS shall not exceed the purchase price of the product. The foregoing limitation will apply to the maximum extent permitted by applicable law, regardless of whether UTCFS has been advised of the possibility of such damages and regardless of whether any remedy fails of its essential purpose.

Installation in accordance with this manual, applicable codes, and the instructions of the authority having jurisdiction is mandatory.

While every precaution has been taken during the preparation of this manual to ensure the accuracy of its contents, UTCFS assumes no responsibility for errors or omissions.

Advisory messages

Advisory messages alert you to conditions or practices that can cause unwanted results. The advisory messages used in this document are shown and described below.

WARNING: Warning messages advise you of hazards that could result in injury or loss of life. They tell you which actions to take or to avoid in order to prevent the injury or loss of life.

Caution: Caution messages advise you of possible equipment damage. They tell you which actions to take or to avoid in order to prevent the damage.

Note: Note messages advise you of the possible loss of time or effort. They describe how to avoid the loss. Notes are also used to point out important information that you should read.

About the SIGA-MFT

The SIGA-MFT Map Fault Tool is a diagnostic tool intended to help you locate and resolve sources of mapping faults in a Signature Series signaling line circuit (SLC). It is shipped with SIGA-MFT Software that runs on your PC.

Figure 1: SIGA-MFT device

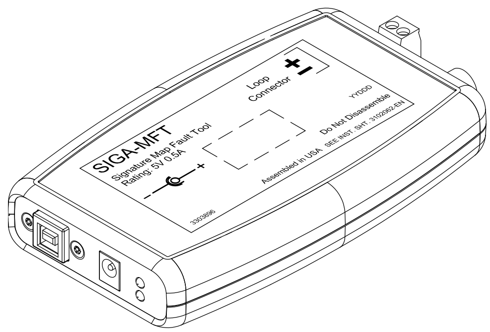
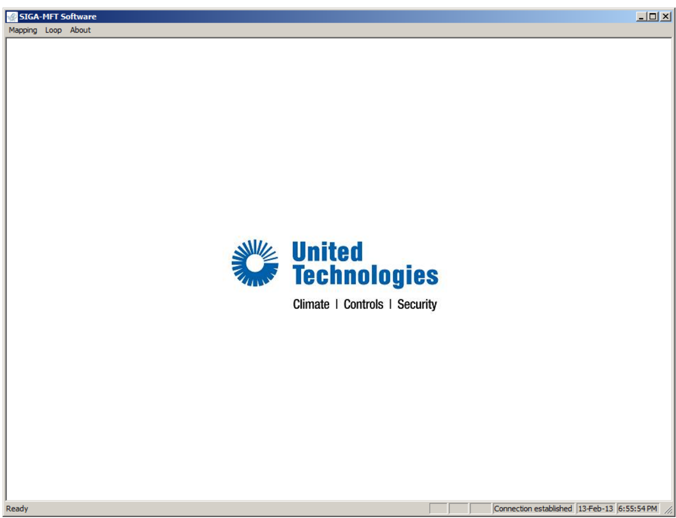


Figure 2: SIGA-MFT Software window



The SIGA-MFT comes with a USB drive containing a setup program that installs the SIGA-MFT Software and the *SIGA-MFT User Guide* on your PC. Also included are a USB cable and a 24 VDC external power supply.

In operation, the SIGA-MFT performs the following functions:

1. Identifies all devices attached to the SLC.
2. Identifies the end-of-line devices.
3. Performs contact analysis on detectors and modules.
4. Performs map consistency analysis on detectors and modules.
5. Identifies the detectors and modules that fail contact analysis.
6. Identifies the detectors and modules that fail map consistency.

Detectors and modules that fail contact analysis or map consistency are possible causes for map faults and map mismatch troubles.

In addition, the SIGA-MFT can identify these problems:

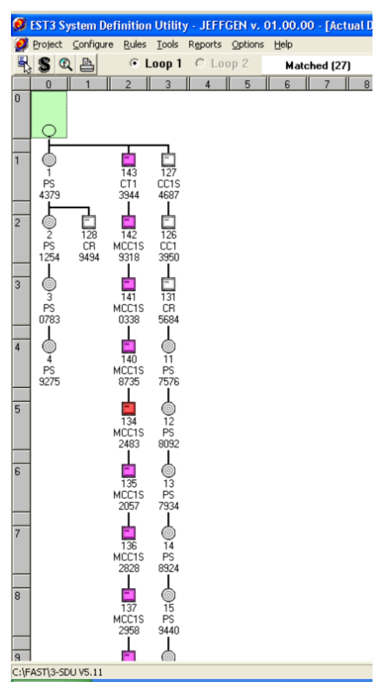
- Reversed IN/OUT wiring
- Loops within loops
- Short circuits in the SLC
- Reversed polarity connection to the SIGA-MFT
- False EOL devices or T-taps

A review of mapping

What is mapping?

The mapping process enables the system to determine the position of each device in the SLC with respect to the other devices.

Figure 3: CU or SDU mapping display



Why map a system?

- The electrical installation (wiring) is usually performed by subcontractors. This work can be verified more easily if the system is mapped.
- The end-user can replace sensors without a service call if simple system maintenance is required. The SLC controller restores a dirty/maintenance trouble if a detector is replaced with a sensor that matches the family type and position in the circuit.
- Mapping improves overall system integrity.

The mapping process

All fire alarm systems that support the Signature Series SLC use the following initialization sequence.

1. Create a database containing the serial numbers of all devices communicating in the circuit.
2. Assign a unique *short address* between 0 and 255 to each serial number.
3. Close all isolator bases and isolator modules.

Once the system has determined that no more devices are coming online, the mapping procedure begins.

The Signature Series mapping command is a broadcast command sent to all devices. It instructs a single, specific device to draw current (annunciate) while all other devices in the SLC measure the current drawn (listen). Depending on its location in the circuit, a detector or module can measure and report the current to the panel.

The procedure initiates the mapping command for each SLC device as the annunciating device and creates a response table that allows the system to generate the map overview. Figure 4 shows how the SLC controller would map devices 1 through 7. Table 1 shows the resulting map analysis.

Figure 4: Overview of the mapping process

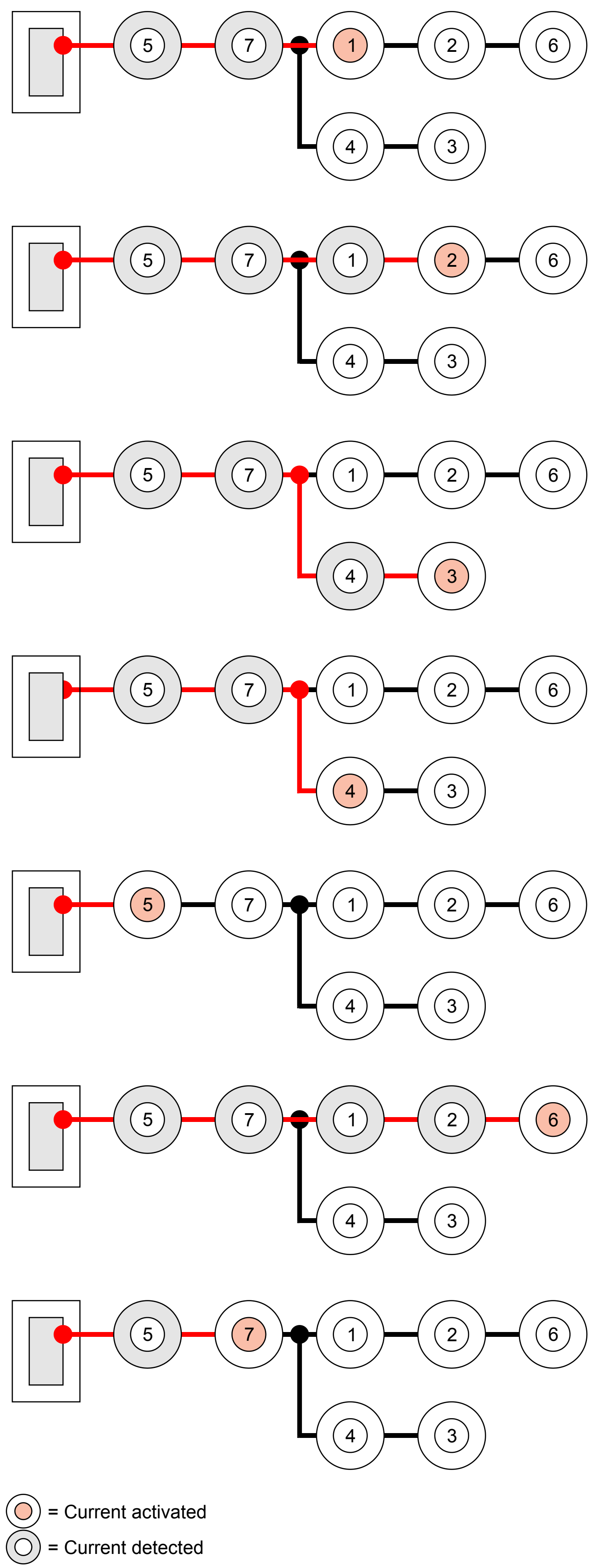


Table 1: Map analysis summary table

		Current detected						
		1	2	3	4	5	6	7
Current activated	1	O				X		X
	2	X	O			X		X
	3			O	X	X		X
	4				O	X		X
	5					O		
	6	X	X			X	O	X
	7					X		O

O = Current activated
X = Current detected

Electrical mapping overview

Figure 5: Mapping detector 2

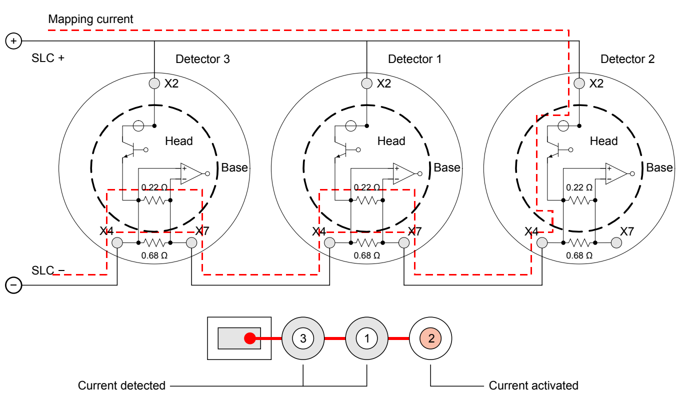
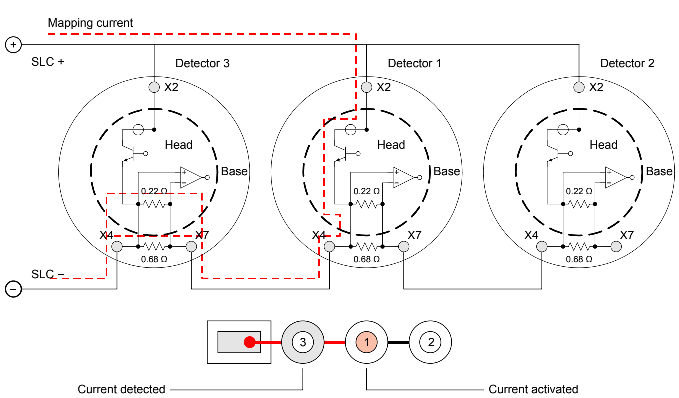


Figure 6: Mapping detector 1



Causes of map faults

What are the possible causes for map faults? The most common causes are:

- Loose wire connections on detector bases, module terminals, at the SLC card, or at a T-tap. It's important to ensure that connections are secure and that the wire at a terminal is mechanically stable. Loose connections cause contact resistance variations due to temperature changes, and this results in an intermittent connection.
- Over-tightening a detector base onto the backbox, causing it to warp, resulting in bad or intermittent connections with the detector head.
- Replacing like devices in a SLC that has been left balanced.
- Replacing devices with models that differ from the ones removed.
- Adding new devices onto an existing SLC.
- Rewiring an existing SLC.
- Balanced maps.
- Defective devices.
- More T-Taps in the SLC than the maximum allowed for the system.
- More devices in the SLC than the maximum allowed for the system.
- Resistance or capacitance in the field wiring in excess of that supported by the system.
- Reversed polarity. Connecting the SLC+ wire to the device SLC− terminal.

When you troubleshoot map faults, you should be prepared to investigate and eliminate any of these causes. The SIGA-MFT can help you isolate potential mapping faults to specific devices.

Using the SIGA-MFT

Analysis methods

The SIGA-MFT provides two methods to investigate an existing installation and pinpoint specific devices that are causing map faults or have the potential to cause a future map fault. The methods are:

- Map consistency
- Contact analysis

Method 1: Map consistency

The map consistency method maps each device in the SLC three times and compares the responses of all communicating devices. If a device is not responding consistently it is flagged for investigation.

Method 2: Contact analysis

The contact analysis method tests the *current difference* measured by "listening" devices when the "annunciating" device is activated. The current difference (DIF) is an indirect measurement of the contact resistance and can be used to identify existing mapping issues or devices that have the potential to cause an issue in the future.

Steps to follow

When you use the SIGA-MFT to troubleshoot an SLC, you'll follow these general steps:

1. Connect the SIGA-MFT.
2. Restore all devices in the SLC.
3. Set the mapping analysis options.
4. Run the mapping analysis.

Details of each step follow.

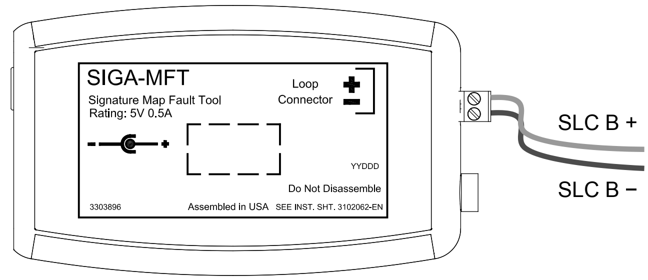
Connecting the SIGA-MFT

Be sure to install the SIGA-MFT Software on your PC before you begin using the device. Follow the instructions on the installation sheet.

The SLC wiring must be disconnected from the panel (both A and B terminals) and the B field wires must be connected to the SIGA-MFT, observing the correct polarity.

For Class A circuits, disconnect the Class A return wires. If the SLC controller has a removable terminal block, simply remove the block. The Class A return wires are not used.

Figure 7: Connecting the SLC to the SIGA-MFT



After connecting the SLC to the SIGA-MFT, connect the SIGA-MFT to your PC using the USB cable, and then start the SIGA-MFT Software.

Restoring devices in the SLC

Before you run an analysis, start by restoring the devices in the SLC.

To restore the SLC:

1. In the SIGA-MFT Software window, click Loop > Restore Loop.

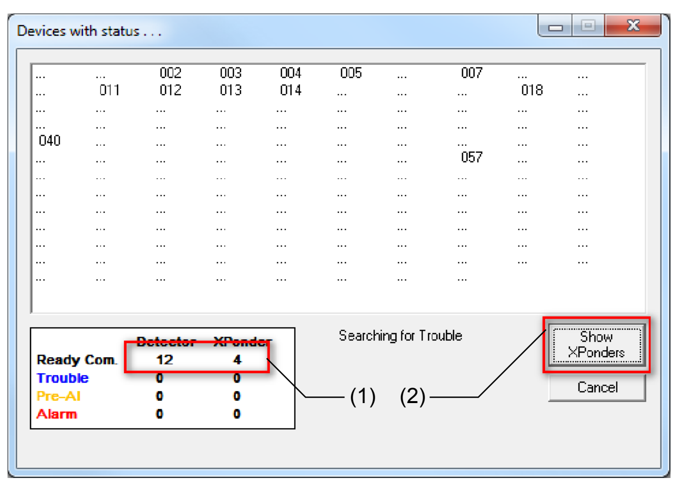
   The SIGA-MFT closes all isolators and restores communication to all devices in the SLC.

   The system displays the Devices with Status window which shows the progress of the restore.

2. When the Ready Com totals show the expected totals for devices in the SLC, click Cancel to end the restoration process.

   The expected totals are those shown in your CU or SDU mapping display.

Figure 8: Restoring devices

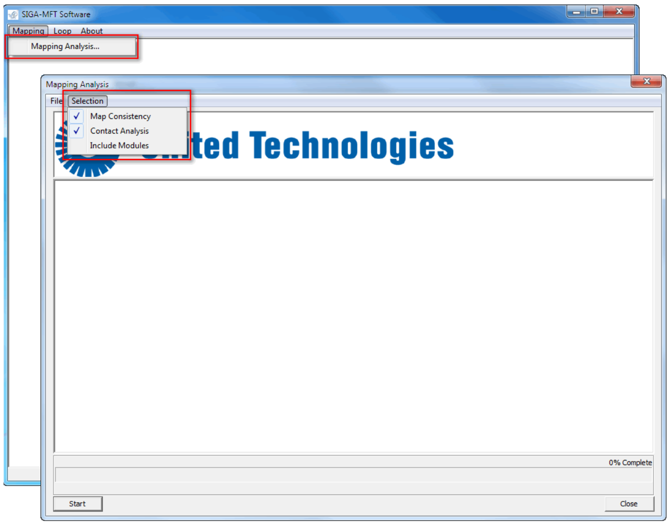


(1) The total should equal the expected number of devices in the SLC
(2) Click this button to toggle between displaying the detector and module addresses

Setting mapping analysis options

Next, set the options you want to use for the analysis. You can include or exclude modules. You can use either analysis method, or both methods. Options are set using commands on the Selection menu in the Mapping Analysis window.

Figure 9: Setting options



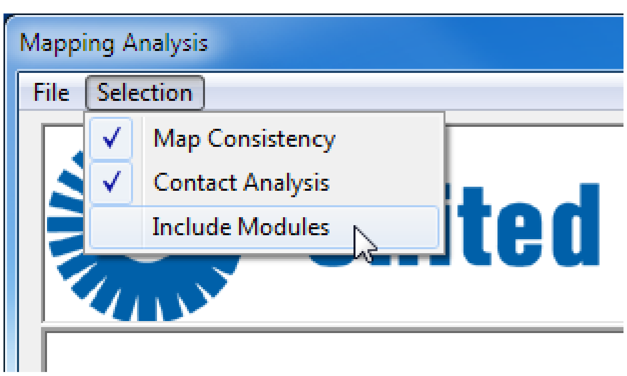
To set mapping analysis options:

1. In the SIGA-MFT Software window, click Mapping > Mapping Analysis, as shown in Figure 9 above.

   This opens the Mapping Analysis window.

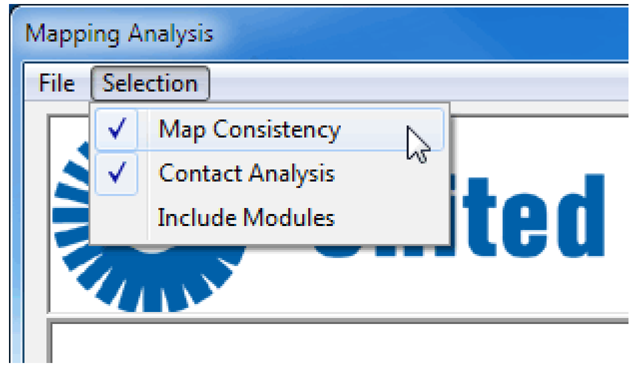
2. Modules: Click Selection > Include Modules to toggle between including and excluding modules in the analysis.

   Modules are not included by default.



3. Methods: Click Selection, and then click either Map Consistency or Contact Analysis to toggle the check boxes on or off.

   By default both analysis methods are selected. You can include or exclude either method.



Running a mapping analysis

To run the analysis:

1. In the Mapping Analysis window, click Start to run the analysis with the options you've selected.

   The window displays the mapping analysis report as it is created during the analysis. Progress is shown in a status bar at the bottom of the window, as shown in Figure 11 on page 6.

2. Click File > Save As to save the completed mapping analysis report (as a TXT file) to any location on your hard drive.

Figure 10: Starting the analysis

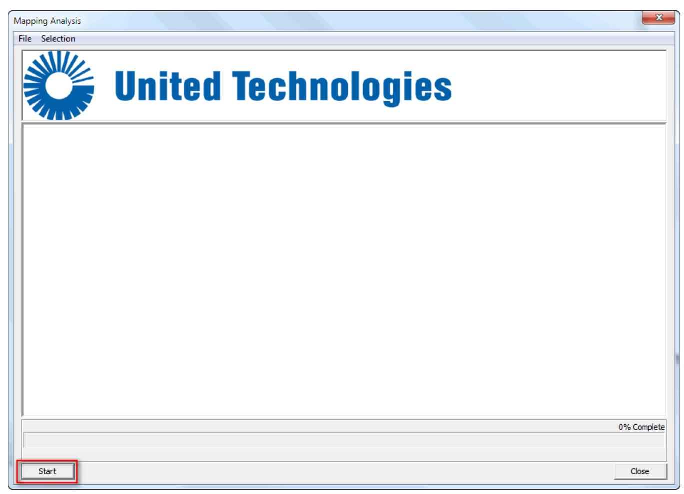
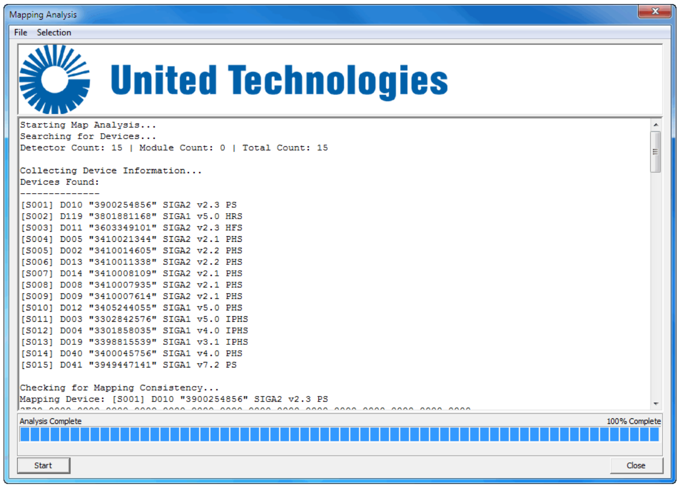


Figure 11: Mapping analysis report



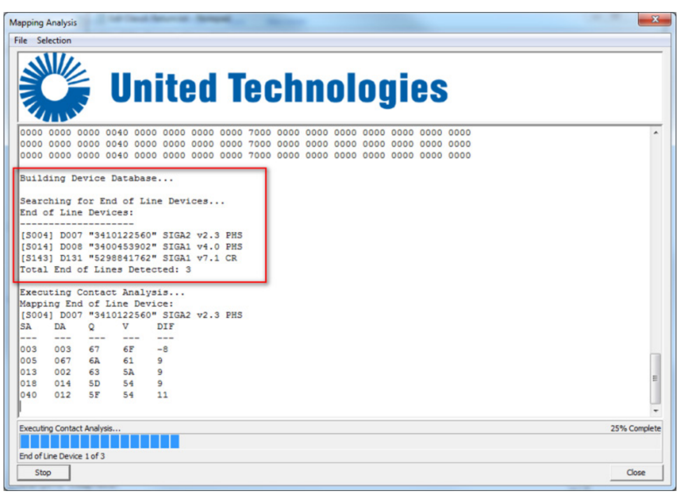
Depending on the options you've selected, the report will include a combination of the following sections:

- Device Information
- Map Consistency Report
- End-of-line Devices
- Contact Analysis Report
- Failed Analysis Devices

Detecting end-of-line devices

The SIGA-MFT automatically detects the end-of-line devices before contact analysis is performed. You don't need to determine or specify the end-of-line devices manually.

Figure 12: Detection of EOL devices



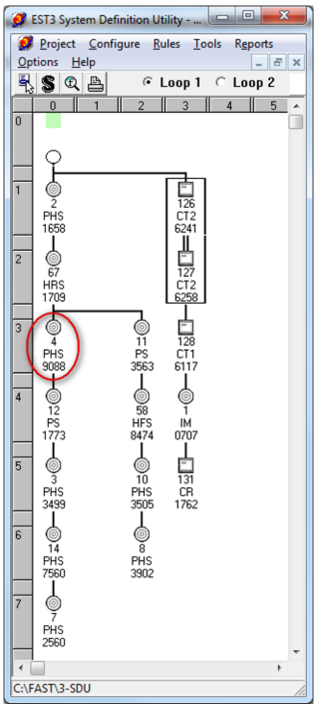
Troubleshooting examples

Example 1: Inconsistent mapping

Map

In this example, both map consistency and contact analysis methods are used for a simple class B circuit with modules and T-taps to detect inconsistent devices. Devices that don't respond to the map command consistently need to be investigated.

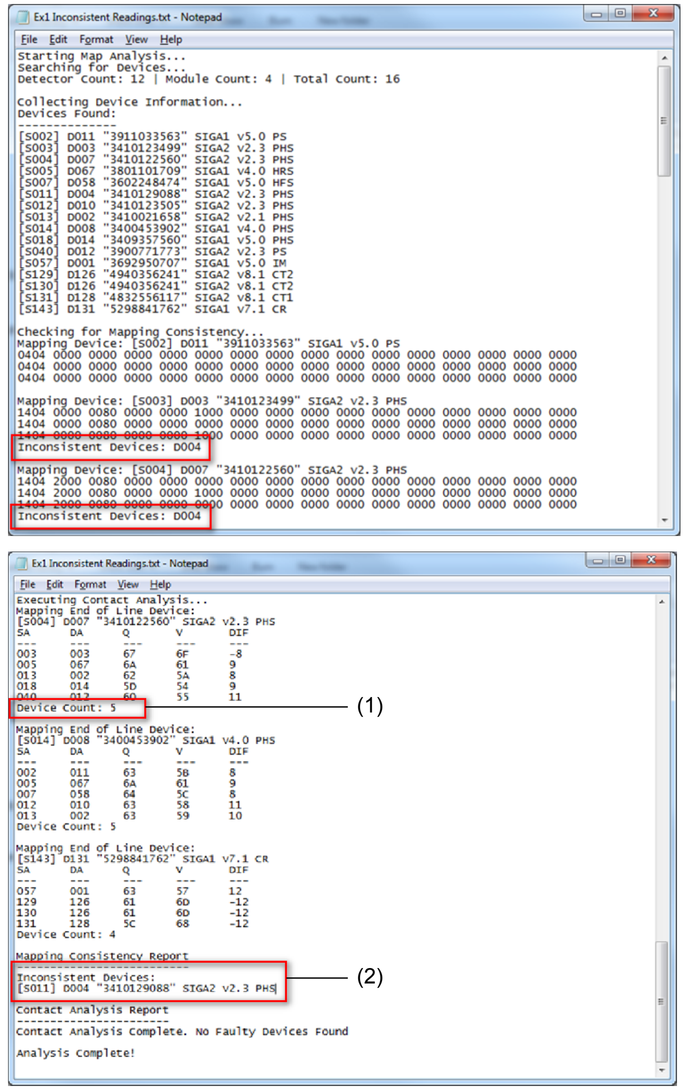
Figure 13: Inconsistent device



Reports

Inconsistent devices are flagged during the map consistency analysis and in the report summary. Note that when the map consistency fails, contact analysis does not yield accurate reports, as shown in Figure 14 below.

Figure 14: Reports for inconsistent devices



```
Ex1 Inconsistent Readings.txt - Notepad
File Edit Format View Help
Starting Map Analysis...
Searching for Devices...
Detector Count: 12 | Module Count: 4 | Total Count: 16

Collecting Device Information...
Devices Found:
--------------
[S002] D011 "3911033563" SIGA1 v5.0 PS
[S003] D003 "3410123499" SIGA2 v2.3 PHS
[S004] D007 "3410122560" SIGA2 v2.3 PHS
[S005] D067 "3801101709" SIGA1 v4.0 HRS
[S007] D058 "3602248474" SIGA1 v5.0 HFS
[S011] D004 "3410129088" SIGA2 v2.3 PHS
[S012] D010 "3410123505" SIGA2 v2.3 PHS
[S013] D002 "3410021658" SIGA2 v2.1 PHS
[S014] D008 "3400453902" SIGA1 v4.0 PHS
[S018] D014 "3409357560" SIGA1 v5.0 PHS
[S040] D012 "3900771773" SIGA2 v2.3 PS
[S057] D001 "3692950707" SIGA1 v5.0 IM
[S129] D126 "4940356241" SIGA2 v8.1 CT2
[S130] D126 "4940356241" SIGA2 v8.1 CT2
[S131] D128 "4832556117" SIGA2 v8.1 CT1
[S143] D131 "5298841762" SIGA1 v7.1 CR

Checking for Mapping Consistency...
Mapping Device: [S002] D011 "3911033563" SIGA1 v5.0 PS
0404 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0404 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0404 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000

Mapping Device: [S003] D003 "3410123499" SIGA2 v2.3 PHS
1404 0000 0080 0000 0000 1000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
1404 0000 0080 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
1404 0000 0080 0000 0000 1000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
Inconsistent Devices: D004

Mapping Device: [S004] D007 "3410122560" SIGA2 v2.3 PHS
1404 2000 0080 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
1404 2000 0080 0000 0000 1000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
1404 2000 0080 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
Inconsistent Devices: D004
```

```
Ex1 Inconsistent Readings.txt - Notepad
File Edit Format View Help
Executing Contact Analysis...
Mapping End of Line Device:
[S004] D007 "3410122560" SIGA2 v2.3 PHS
SA      DA      Q       V       DIF
---     ---     ---     ---     ---
003     003     67      6F      -8
005     067     6A      61      9
013     002     62      5A      8
018     014     5D      54      9
040     012     60      55      11
Device Count: 5

Mapping End of Line Device:
[S014] D008 "3400453902" SIGA1 v4.0 PHS
SA      DA      Q       V       DIF
---     ---     ---     ---     ---
002     011     63      5B      8
005     067     6A      61      9
007     058     64      5C      8
012     010     63      58      11
013     002     63      59      10
Device Count: 5

Mapping End of Line Device:
[S143] D131 "5298841762" SIGA1 v7.1 CR
SA      DA      Q       V       DIF
---     ---     ---     ---     ---
057     001     63      57      12
129     126     61      6D      -12
130     126     61      6D      -12
131     128     5C      68      -12
Device Count: 4

Mapping Consistency Report
--------------------------
Inconsistent Devices:
[S011] D004 "3410129088" SIGA2 v2.3 PHS

Contact Analysis Report
-----------------------
Contact Analysis Complete. No Faulty Devices Found

Analysis Complete!
```

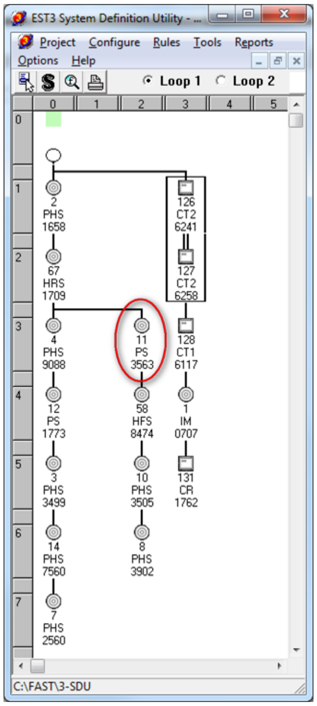

(1) The inconsistent device does not report during contact analysis
(2) The device appears in a summary section of the mapping consistency report

Example 2: Low current difference value

Map

In Example 2, both analysis methods (map consistency and contact analysis) are used for a simple class B circuit with modules and T-taps to detect devices with low current difference (DIF). Devices reporting a DIF value of 7 or less need to be investigated.

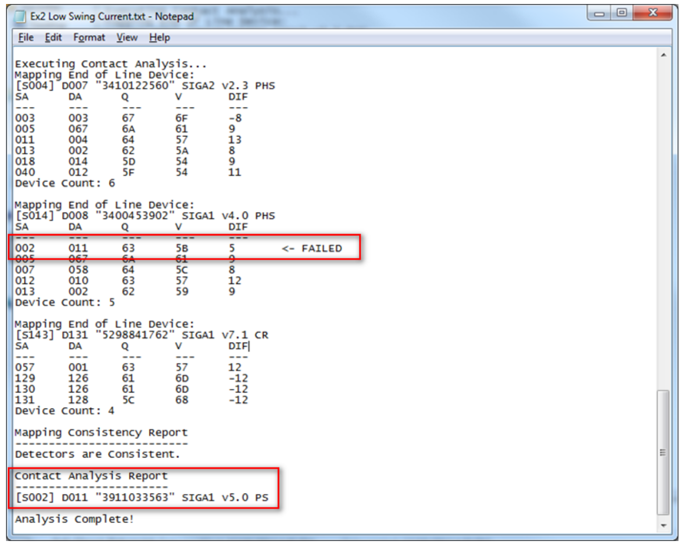
Figure 15: Low current difference device



Reports

Devices with a current DIF value of less than 7 are flagged as *failed*. They are also shown in the report summary.

Figure 16: Reports for low current difference devices



```
Ex2 Low Swing Current.txt - Notepad
File  Edit  Format  View  Help

Executing Contact Analysis...
Mapping End of Line Device:
[S004] D007 "3410122560" SIGA2 v2.3 PHS
SA       DA       Q        V        DIF
---      ---      ---      ---      ---
003      003      67       6F       -8
005      067      6A       61       9
011      004      64       57       13
013      002      62       5A       8
018      014      5D       54       9
040      012      5F       54       11
Device Count: 6

Mapping End of Line Device:
[S014] D008 "3400453902" SIGA1 v4.0 PHS
SA       DA       Q        V        DIF
---      ---      ---      ---      ---
002      011      63       5B       5        <- FAILED
005      067      6A       61       9
007      058      64       5C       8
012      010      63       57       12
013      002      62       59       9
Device Count: 5

Mapping End of Line Device:
[S143] D131 "5298841762" SIGA1 v7.1 CR
SA       DA       Q        V        DIF
---      ---      ---      ---      ---
057      001      63       57       12
129      126      61       6D       -12
130      126      61       6D       -12
131      128      5C       68       -12
Device Count: 4

Mapping Consistency Report
--------------------------
Detectors are Consistent.

Contact Analysis Report
-----------------------
[S002] D011 "3911033563" SIGA1 v5.0 PS

Analysis Complete!
```

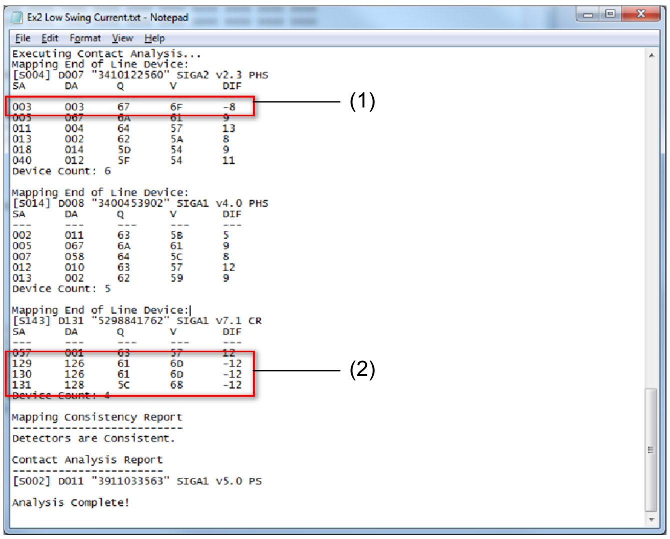
Example 3: Reversed IN/OUT wiring

When wired correctly, detectors report a positive DIF; modules report a negative DIF.

When the IN− and OUT− of a device are reversed, the opposite is true.

Incorrectly wired detector bases report a negative DIF. Incorrectly wired modules report a positive DIF.

Figure 17: Reversed base report



```
Ex2 Low Swing Current.txt - Notepad
File Edit Format View Help
Executing Contact Analysis...
Mapping End of Line Device:
[S004] D007 "3410122560" SIGA2 v2.3 PHS
SA      DA      Q       V       DIF

003     003     67      6F      -8
005     067     6A      61      9
011     004     64      57      13
013     002     62      5A      8
018     014     5D      54      9
040     012     5F      54      11
Device Count: 6

Mapping End of Line Device:
[S014] D008 "3400453902" SIGA1 v4.0 PHS
SA      DA      Q       V       DIF
---     ---     ---     ---     ---
002     011     63      5B      5
005     067     6A      61      9
007     058     64      5C      8
012     010     63      57      12
013     002     62      59      9
Device Count: 5

Mapping End of Line Device:|
[S143] D131 "5298841762" SIGA1 v7.1 CR
SA      DA      Q       V       DIF
---     ---     ---     ---     ---
057     001     63      57      12
129     126     61      6D      -12
130     126     61      6D      -12
131     128     5C      68      -12
Device Count: 4

Mapping Consistency Report
--------------------------
Detectors are Consistent.

Contact Analysis Report
-----------------------
[S002] D011 "3911033563" SIGA1 v5.0 PS

Analysis Complete!
```


(1) A negative DIF result is reported for a detector with reversed IN and OUT connections.

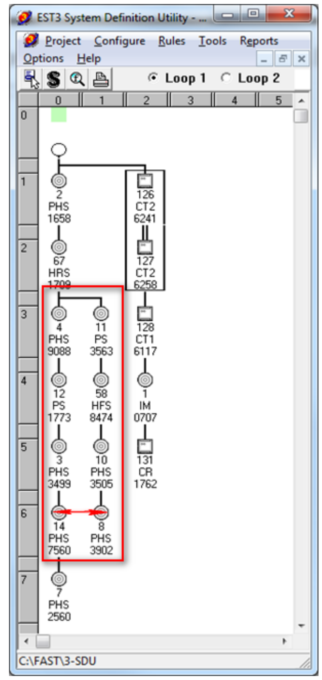
(2) Negative DIF results are also reported for correctly wired modules.

Example 4: Loop-in-a-loop

Map

A loop-in-a-loop occurs when two devices on separate T-taps are wired together. The devices in the inner loop report half their normal DIF value. Contact analysis is useful in detecting a loop-in-a-loop.

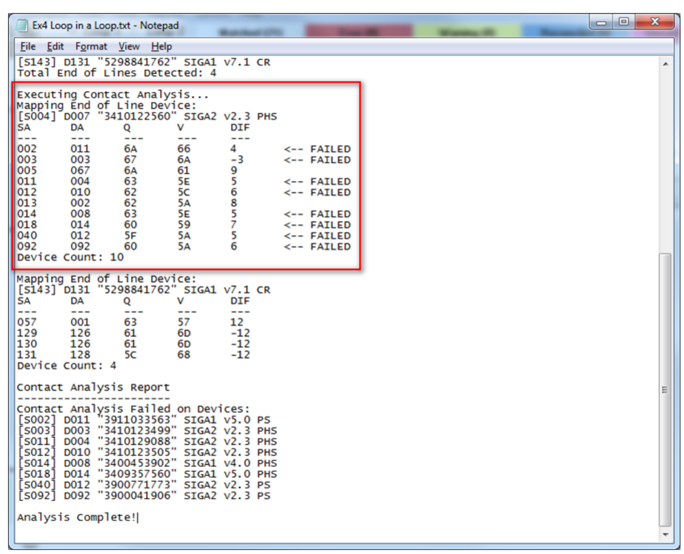
Figure 18: Devices wired together to form a loop-in-a-loop



Reports

All devices in the loop within a loop are flagged as failed in the report. Devices outside the loop are not.

Figure 19: Report for a loop-in-a-loop



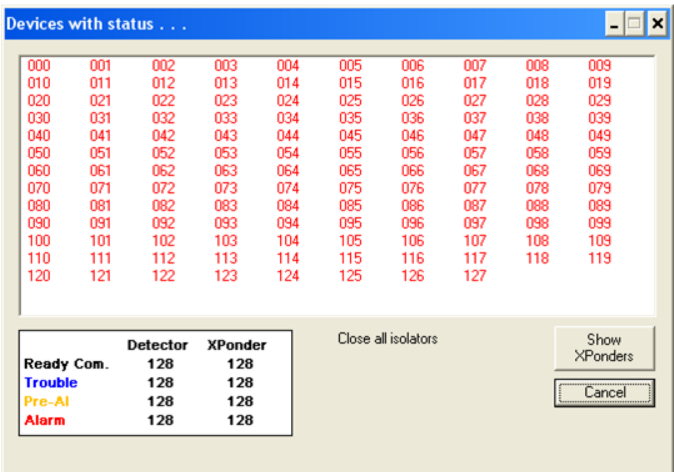
```
Ex4 Loop in a Loop.txt - Notepad
File Edit Format View Help
[S143] D131 "5298841762" SIGA1 v7.1 CR
Total End of Lines Detected: 4

Executing Contact Analysis...
Mapping End of Line Device:
[S004] D007 "3410122560" SIGA2 v2.3 PHS
SA      DA      Q       V       DIF
---     ---     ---     ---     ---
002     011     6A      66      4       <-- FAILED
003     003     67      6A      -3      <-- FAILED
005     067     6A      61      9
011     004     63      5E      5       <-- FAILED
012     010     62      5C      6       <-- FAILED
013     002     62      5A      8
014     008     63      5E      5       <-- FAILED
018     014     60      59      7       <-- FAILED
040     012     5F      5A      5       <-- FAILED
092     092     60      5A      6       <-- FAILED
Device Count: 10

Mapping End of Line Device:
[S143] D131 "5298841762" SIGA1 v7.1 CR
SA      DA      Q       V       DIF
---     ---     ---     ---     ---
057     001     63      57      12
129     126     61      6D      -12
130     126     61      6D      -12
131     128     5C      68      -12
Device Count: 4

Contact Analysis Report
-----------------------
Contact Analysis Failed on Devices:
[S002] D011 "3911033563" SIGA1 v5.0 PS
[S003] D003 "3410123499" SIGA2 v2.3 PHS
[S011] D004 "3410129088" SIGA2 v2.3 PHS
[S012] D010 "3410123505" SIGA2 v2.3 PHS
[S014] D008 "3400453902" SIGA1 v4.0 PHS
[S018] D014 "3409357560" SIGA1 v5.0 PHS
[S040] D012 "3900771773" SIGA2 v2.3 PS
[S092] D092 "3900041906" SIGA2 v2.3 PS

Analysis Complete!|
```

Example 5: Reverse input polarity or short

If there is a short in the SLC or if the input polarity is reversed, the SIGA-MFT application will not operate correctly. To check for a short in the SLC, in the SIGA-MFT Software window, click Loop > Restore Loop.

If the SLC is wired incorrectly the response will be similar to the response shown in Figure 20 below.

Figure 20: Reversed input after restore loop command



Example 6: Connecting the Class A return

When the SIGA-MFT is connected to the Class A return of an SLC and the devices are wired correctly:

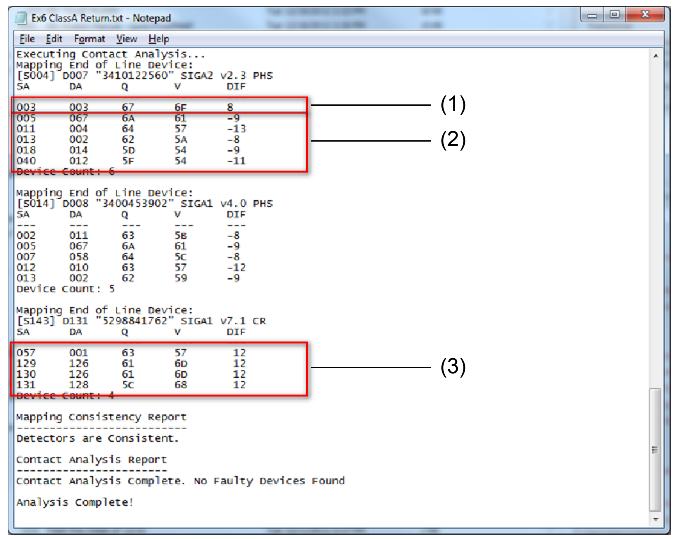
- A detector reports negative DIF values
- A module reports positive DIF values

However, if a device has reversed IN/OUT wiring:

- A detector reports positive DIF values
- A module reports negative values

Remember that you should be connecting the B field wires, not the Class A return wires.

Figure 21: SIGA-MFT connected to the Class A return line



(1) This DIF value is not negative because the base wires are reversed for this detector.
(2) Correctly-wired detectors show negative DIF values during Class A return connection.
(3) Correctly-wired modules show positive DIF values during Class A return connection.

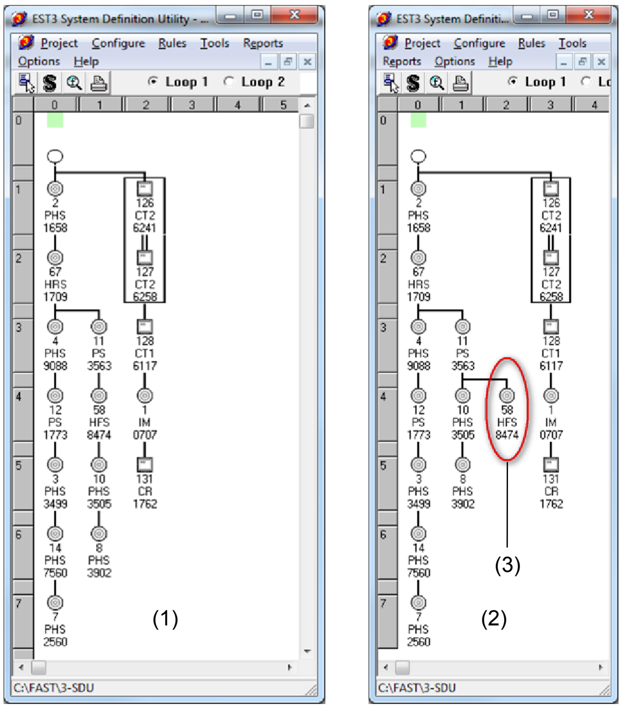
Example 7: False EOL devices

In this example, the contact analysis method is used for a simple class B circuit with modules and T-taps.

The mapping analysis report shows an unexpected end-of-line device, but this is only apparent when compared to the expected (original) CU or SDU map and statistics.

Map

Figure 22: Maps showing a false T-tap and end-of-line device



(1) Original map
(2) False T-tap and end-of-line map
(3) False end-of-line device

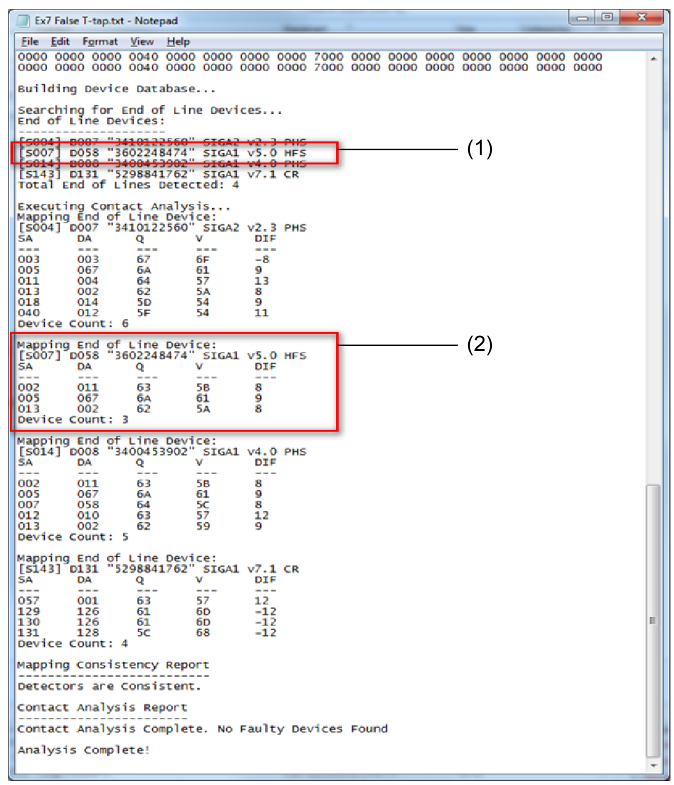
Reports

The following process can be used to investigate a device with false T-tap and end-of-line device in the map.

To troubleshoot false end-of-line devices:

1. Use the original CU or SDU map (prior to the map fault or map mismatch trouble) to get the end-of-line device addresses (from the map) and the T-tap count (from the map loop statistics).
2. Upload the current map from the SLC that is reporting the map fault or map mismatch trouble.
3. Use the current map to get the end-of-line device addresses (from the map) and the T-tap count (from the map loop statistics).
4. Use the SIGA-MFT report (the sections on end-of-line devices) to identify the device addresses that are not actual end-of line-devices.
5. Investigate the devices identified as false end-of-lines for the issues listed in “Causes of map faults” on page 3.

Figure 23: CU or SDU map vs. analysis report



(1) Device address 58 does not belong in the EOL device group.
(2) Device address 58 was analyzed as an end-of-line device in error.