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Application Series

SunSet xDSL: Load Coil Testing

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Publication Number APP-XDSL-012 Rev. B

INTRODUCTION

Phone companies have traditionally placed load coils on long loops over 18,000 feet to compensate for attenuation of an analog POTS signal. They are typically placed at regular intervals on the cable pair, with the first one appearing about 3,000 ft from the Central Office (CO), and then successive ones placed about every 6,000 ft. The last load coil is about 3,000 to 9,000 ft from the Customer Premises.

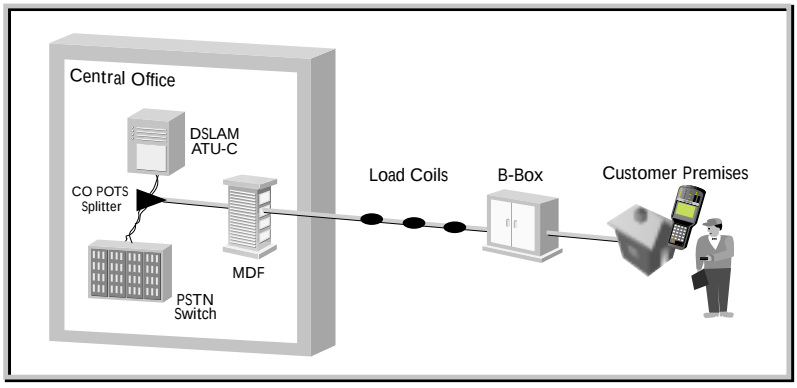


Figure 1 Load Coil diagram

Loaded cable enables transmission in the 300 to 3100 Hz range at a higher power level than unloaded cable. However, above 3000 Hz, the power level drops below that of an unloaded circuit. The result is that higher frequencies (>3000 Hz) are more heavily attenuated with load coils. Therefore, high frequency signals, like ADSL, cannot pass through load coils.

Traditionally, load coil testing was performed with an Open on the cable pair in the CO, done by having a CO Technician or "MLT" type device place an Open on the pair at the MDF so this test could be performed accurately from the field. But with the invention of the CLEC, Competitive Local Exchange Carrier (or DLEC, Data Local Exchange Carrier), this type of "help" from the CO side of the circuit is no longer provided. Now this test must be performed with the CO equipment (DSLAM, CO POTS Splitter, and POTS Switch) still connected to the pair, which causes some difficulties when running this test. The primary device that will cause a significant change in the expected results for detecting load coils is the presence of the CO POTS Splitter on the cable pair. This device will, in most cases, show up as a load coil. But the impedance change will have a different signature on the display of the test than a typical load coil, making it fairly simple to determine the difference between an actual load coil and the CO POTS Splitter. The following application note will show a clear depiction of how this device will appear on the SunSet xDSL.

To access the Load Coil test in the SunSet xDSL, first press the MENU key. If you have a Full Chassis, cursor down to LINE and press ENTER. Then cursor down to COIL DETECTION and press ENTER. The test begins as soon as the ENTER key is pressed. The screen will display a graph showing an impedance (y-axis) by frequency (x-axis) plot. Load coils cause a change in impedance and this is shown in the graph by a dip. This test works in the same fashion as typical analog "needle" style load coil detectors, where a bounce in the needle represents a load coil. In the case of the SunSet xDSL, it is represented graphically on the display.
There will also be an estimate given at the bottom of the screen for of how many load coils may be on the cable pair.*

**WARNING*: The Num of Coil count shown at the bottom of the screen is only an estimate of how many load coils are present on the cable pair. This estimate is based on the number of dips in the graph detected by the test set, but some of these dips may not be obvious to the eye and should not actually be counted as load coils. It is extremely important for the user to be able to interpret the graph displayed on the screen, and not simply rely on the count shown as the bottom of the screen.

Load coils typically have a very pronounced dip in the graph. And, they typically start their dip close to the left side of the screen. The CO POTS Splitter will show a pronounced dip as well when you are close to the CO, typically within about 9,000 ft from the CO. But, the farther you move away from the CO, the smaller the dip gets on the screen. In most cases, the Num of Coil count of the screen will still count this as 1 load coil.

Test #1 No Load Coils on the Cable Pair

This test shows how the CO POTS Splitter affects the detection of load coils, and how it is depicted on the display.

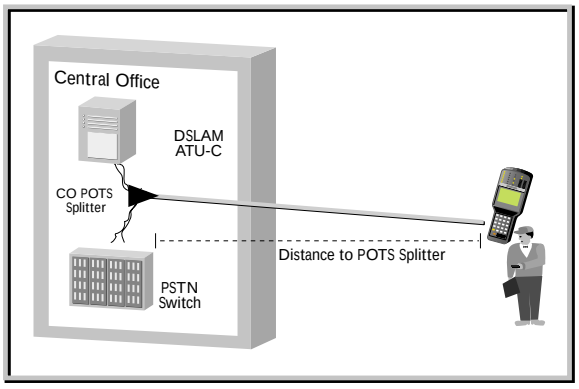


Figure 2 Load Coil Test #1

Figure 3 shows the COIL DETECTION test screen from the SunSet xDSL with a distance of only 25 ft from the test set to the CO POTS Splitter. Notice the dramatic dip in the graph, and the Num of Coil count showing 1 load coil. The dip is displayed towards the right side of the screen and is caused by the impedance change from the CO POTS Splitter. It is very obvious that there is one significant dip shown on the screen, but this is not a load coil, it is the CO POTS Splitter. The easiest way to determine this is the location on the screen. Because the dip is so far to the right of screen, it must be caused by the CO POTS Splitter, and not a load coil.

Figure 4 shows the screen from the SunSet xDSL with a distance of 6,000 ft from the test set to the CO POTS Splitter. Notice the much less pronounced dip in the graph, but the Num of Coil count still showing 1 load coil. The dip again is displayed towards the right side of the screen and is caused by the impedance change from the CO POTS Splitter. Again it is obvious that there is one significant dip shown on the screen, but this is not a load coil, it is the CO POTS Splitter. The easiest way to determine this is the location on the screen. Because the dip is so far to the right of screen, it must be caused by the CO POTS Splitter, and not a load coil.

Figure 5 shows the screen with a distance of 9,500 ft. from the test set to the CO POTS Splitter. Notice the dip in the graph is becoming less obvious, but the Num of Coil count still shows 1 load coil. The dip in this case is a smooth slope, but again is displayed towards the right side of the screen and is caused by the impedance change from the CO POTS Splitter. It is still obvious that there is one significant dip shown on the screen, but this again is not a load coil, it is the CO POTS Splitter.

Figure 6 shows the screen with a distance of 14,000 ft from the test set to the CO POTS Splitter. Notice the dip in the graph is basically gone, and the Num of Coil count now shows 0 load coils. The dip in this case is a very smooth slope, and would be hard to identify as a load coil. So the farther you are away from the DSLAM, the less amount of impedance change you'll get from the CO POTS Splitter

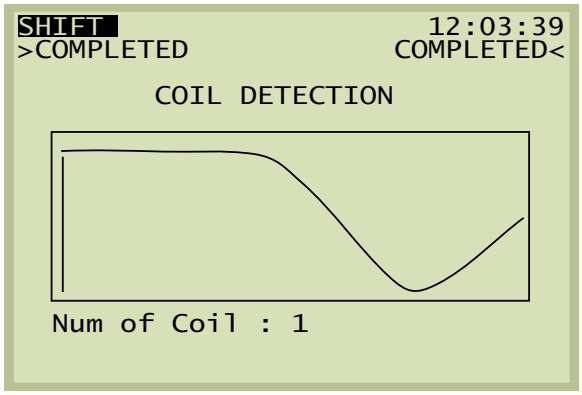


Figure 3 25 ft to DSLAM with POTS Splitter

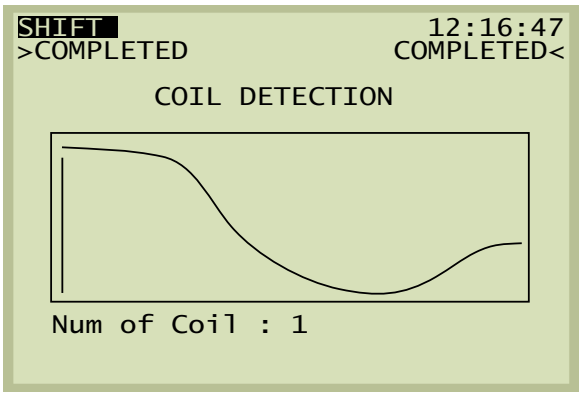


Figure 4 6,000 ft to DSLAM with POTS Splitter

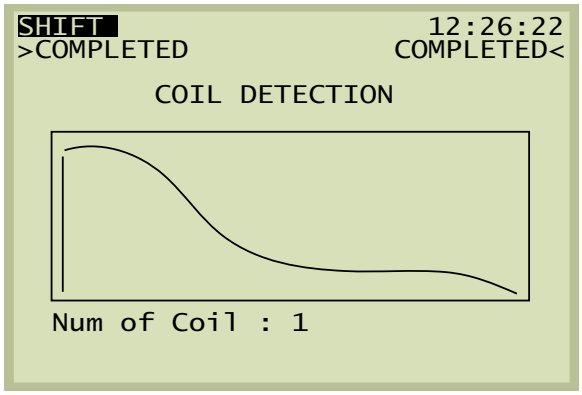


Figure 5 9,500 ft to DSLAM with POTS Splitter

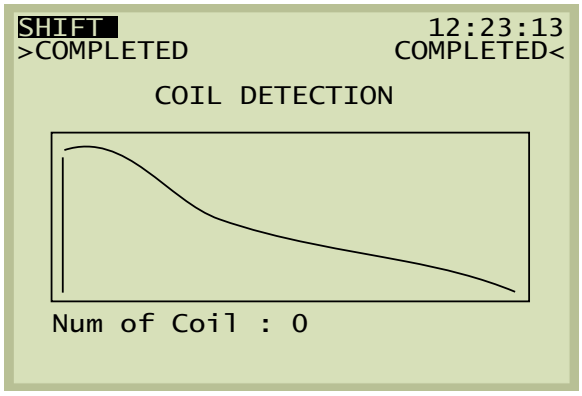


Figure 6 14,000 ft to DSLAM with POTS Splitter

Figure 7 shows the same COIL DETECTION test run on the same cable pair as in Figure 6. Notice this time though the Num of Coil count listed at the bottom of the screen shows 2 load coils. This was most likely due to the fact that there were some small dips on the screen that the counter picked up. It is obvious by looking at the graphic on the screen that there are no load coils on this cable pair.

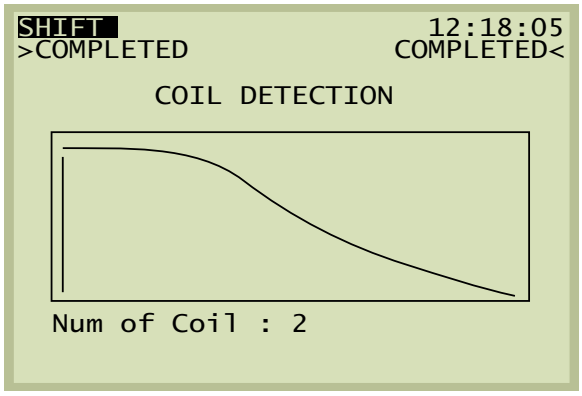


Figure 7 14,000 ft to DSLAM with POTS Splitter

Test #2 One Load Coil on the Cable Pair

This test is run with one load coil on the cable pair with different distances from the CO and the test set. It shows how a real load coil affects the graphic display, even if the CO POTS Splitter is still connected to the circuit, when the load coil is placed on different places on the cable pair.

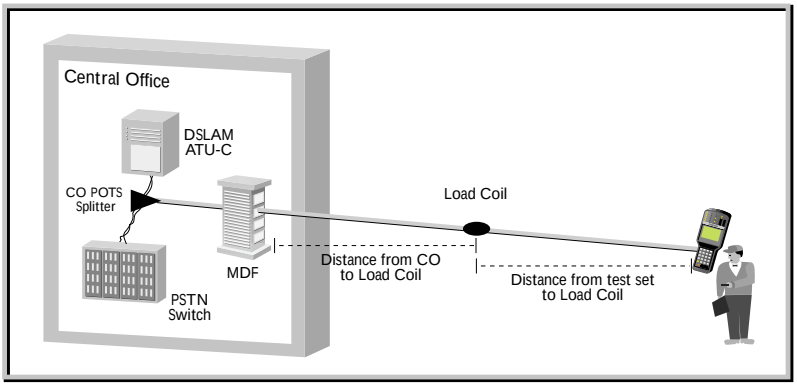


Figure 8 Load Coil Test #2

Figure 9 shows the COIL DETECTION screen from the SunSet xDSL with a distance of 6000 ft. from the test set to the load coil, and then another 6,000 ft from the load coil to the CO. Notice the dramatic dip in the graph, and the Num of Coil count showing 1 load coil. The dip is displayed towards the left side of the screen and is caused by the impedance change from the load coil. If you compare this display to the displays shown in Test #1 (Figures 3-7), there is a dramatic difference between these signatures. It is obvious that there is one significant dip shown on the screen, as in Figure 3, but this dip is much more pronounced, and much farther to the left of the screen. Because the dip is so far to the left of screen, it can be determined that this is a load coil.

Figures 10 and 11, show a comparison between a cable pair with a load coil, and one without a load coil. Figure 10 shows a distance of 10,000 ft from the test set to the load coil and then another 2,000 ft from the load coil to the CO. Notice the dramatic dip in the graph, and the Num of Coil count showing 1 load coil. The dip is displayed towards the left side of the screen and is caused by the impedance change from the load coil.

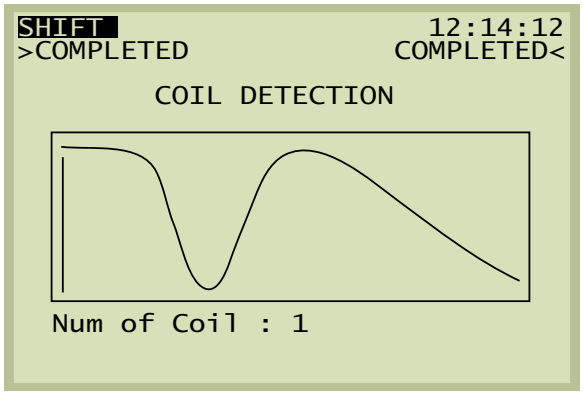


Figure 9 One Load Coil with 6,000 ft before and after

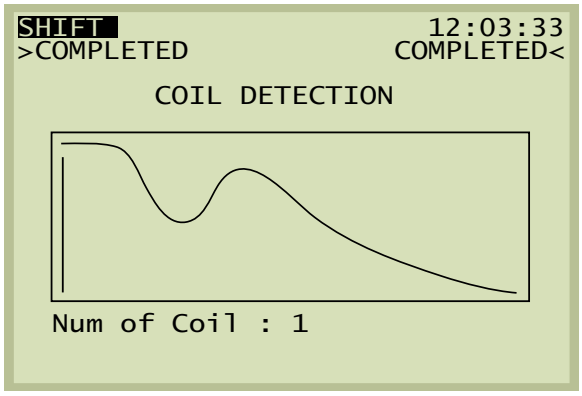


Figure 10 One Load Coil with 10,000 ft before and 2,000 ft after

Figure 11 shows a cable pair with no load coils on it, but a distance of 12,000 ft from the test set to the CO POTS Splitter. Notice the sloping dip, similar to those in Test #1, but no dramatic dip in the graph. The Num of Coil count still shows 1 load coil, but it is most likely due to the CO POTS Splitter on the pair, and not a load coil. A load coil causes a much more dramatic dip. This is very typical of longer ADSL circuits. The graphic displays very clearly that this is not a load coil.

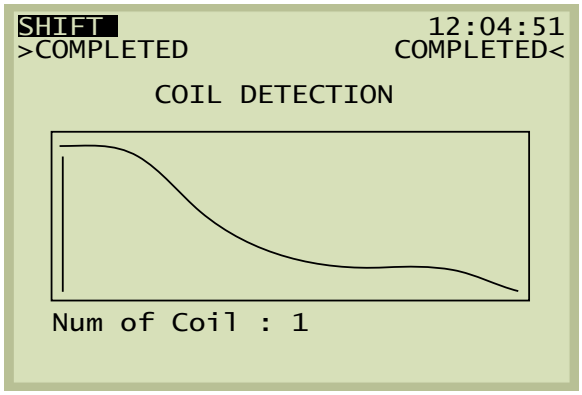


Figure 11 No Load Coils with 12,000 ft to the CO

Test #3 Two Load Coils on the Cable Pair

This test is run with two load coils on the cable pair, with one set distance fixed between each load coil. It shows how multiple load coils affect the graphic display, even if the CO POTS Splitter is still connected to the circuit.

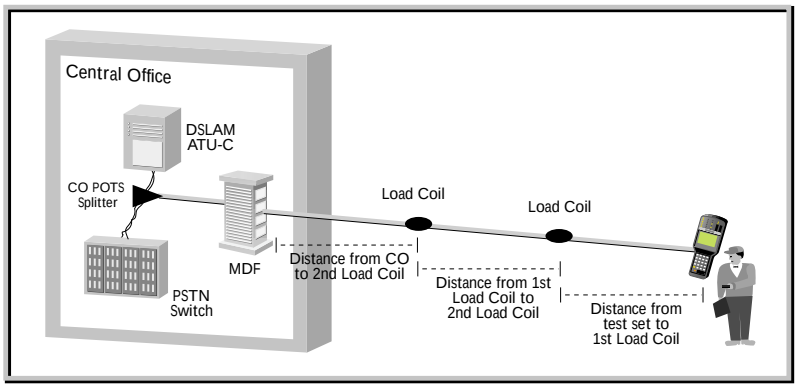


Figure 12 Load Coil Test #3

Figure 13 shows the COIL DETECTION screen from the SunSet xDSL. The load coils were placed with a distance of 6,000 ft from the test set to the 1st load coil, another 6,000 ft from the 1st load coil to the 2nd load coil, and then another 6000 ft. from the 2nd load coil to the CO. Notice the dramatic dips in the graph, and the Num of Coil count showing 2 load coils. The first dip is displayed towards the left side of the screen and is caused by the impedance change from the first load coil, and the second dip follows the first and is caused by the impedance change from the second load coil. If you compare this display to Figure 7, which also lists the Num of Coil as 2, there is a dramatic difference between these signatures. It is clear that there are two dips shown on this screen, whereas in Figure 7, there are no obvious dips. Because these dips start so far to the left of screen, and because they are so pronounced, it can be determined that there are two load coils present on this cable pair.

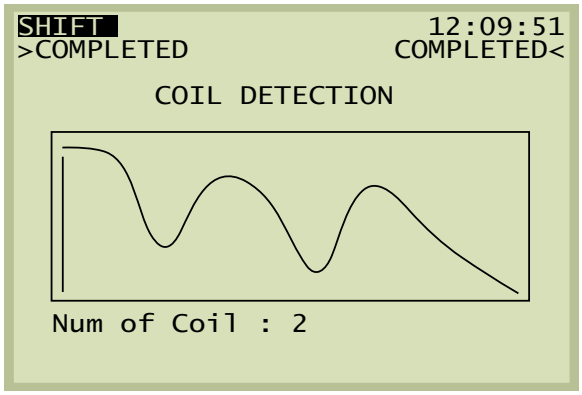
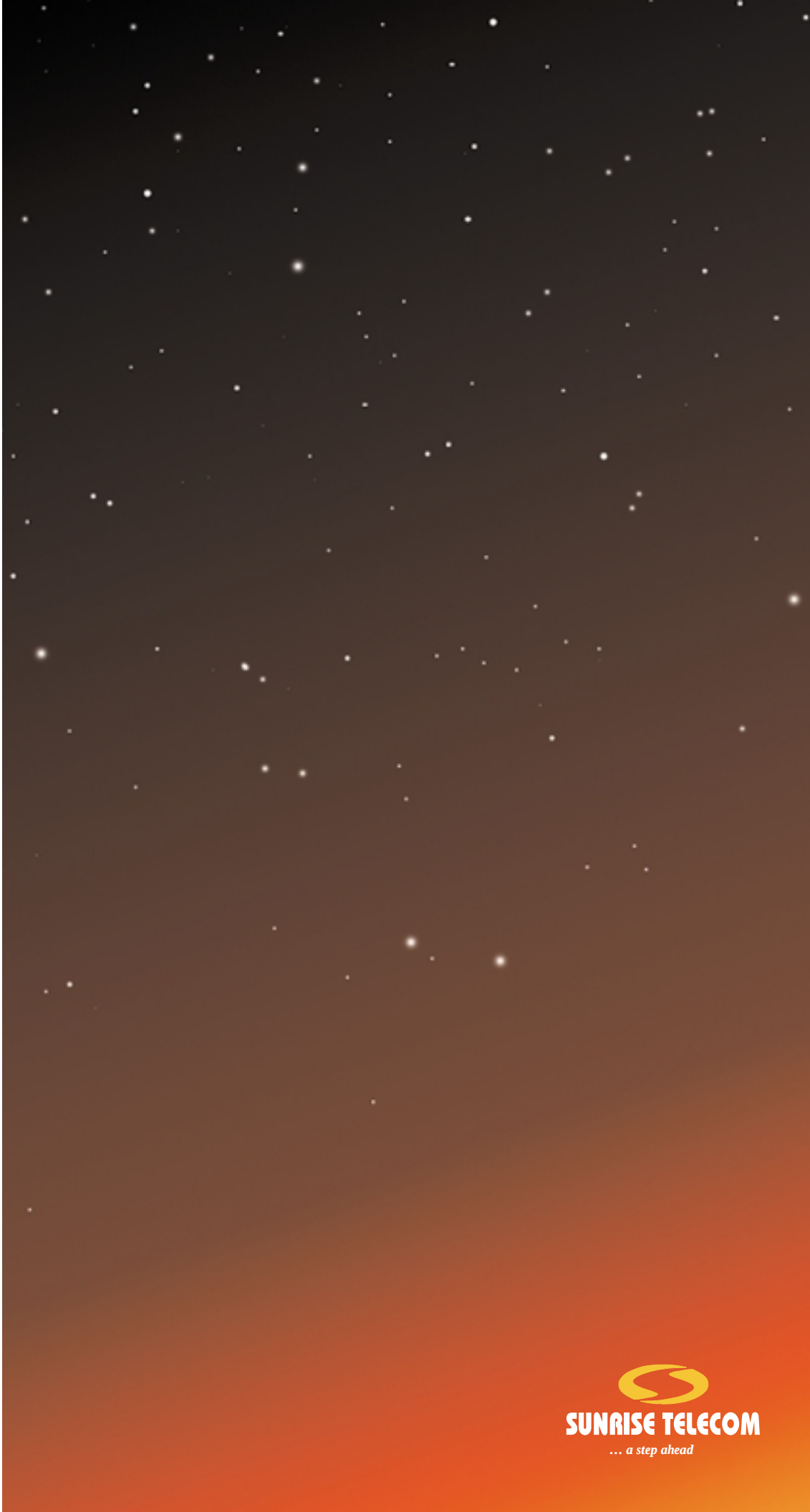


Figure 13 Two Load Coils 6,000 ft apart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