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TECHNICAL NOTE #227

RE: MicroPoint™ - Sensor Cable Health Assessment
Date: 10/25/2018

GENERAL

A comprehensive Preventative Maintenance program should include periodic health assessments on each MicroPoint Sensor Cable on the site. Cables that fail the assessment test should immediately be replaced to ensure users' trust in the system.

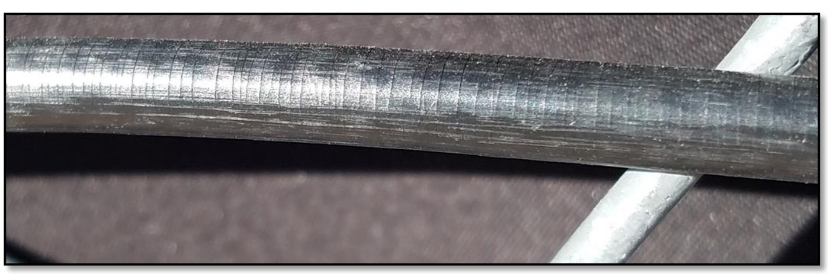
In order to determine the complete health of a MicroPoint Sensor Cable, a physical inspection, resistance testing and performance testing of each cable is required.

Visual Inspection

A visual inspection of the cable focuses primarily on the state of the outer jacket and the condition of wire ties used to affix the cable to the fence. The High Density Polyethylene outer jacket of the MicroPoint Sensor Cable is designed for maximum UV resistance. In very dry climates, however, it is possible for the outer jacket to breakdown over time resulting in visible fractures or cracking on the outer jacket on the cable. If this is severe enough, the jacket can absorb moisture and diminish performance, resulting in an increased nuisance alarm rate or detection null spots along the cable.

A healthy cable should look somewhat shiny and appear soft to the touch. Sensor cables that appear dry or brittle and have cracks like those shown in Example 2 below should be replaced. Missing UV-resistant wire ties used to affix the sensor cable to the fence should also be replaced.

Example 1: New MC115 Sensor Cable: smooth jacket, shiny, bold black, supple feel.



Example 2: Old MC115 Sensor Cable: dry, brittle, dull coat, moisture ingress possible.

Resistance Testing

Resistance Testing verifies the structural integrity of the dielectric layers within the sensor cable and ensures that it continues meet factory engineering specifications. Moisture ingress into the sensor cable can cause corrosion of the sense wires or cable braid resulting in cable fault alarms, poor detection performance or DC power transmission issues.

Using a standard Digital Multimeter (DMM), one can test the MicroPoint Cable for moisture ingress. In each of the three basic resistance tests, the cable must be completely disconnected from the PM and LU/ILU or TU (all wires should be isolated from each other).

1. Check the resistance between the shield and each of the three remaining conductors. The resistance should be greater than six-(6) Megohms. A measurement less than 100 ohms indicate a short between the conductors. Check the other end of the MicroPoint cable and insure the wires are not shorted. Verify no resistance is present between the two sense wires, or either sense wire to the center conductor.

2. If the cable measures less than 100 ohms in (1) above measure the exact resistance from sense wire to braid for each Sense Wire. If one is greater than six-(6) megohms and the other is less than 100 ohms, one Sense Wire is shorted to the braid. To determine approximately where the short exists, compute the length from the following equation where R is the resistance in ohms.

   $$\text{Length} = 3.04\ R\ (\text{meters}) = 9.97\ R\ (\text{feet})$$

3. Check the length of the cable that passes test (1) above by shorting the Sense Wires to the braid at the LU or TU end and measure the resistance between each Sense Wire and the Braid. The resistance measurement should be approximately .33 ohms per meter. The two Sense Wires should be within 5% of each other. If they are not, this indicates that one of the two Sense Wires must be damaged and the cables should be replaced. . Assuming that the two resistance measurements are within 5% of each other, the cable length is computed using the above equation. If the result is dramatically different than the known length of the cable, there may have been a problem with the calculation and suggest you repeat the measurements.

If there is water damage to the cable, it will fail test (1) above. If the cable has been cut, it will fail test (2) above. Comparing the results of test (3) with the estimated length of cable will also highlight problems.

Performance Testing

Performance Testing is periodic testing performed: 1) as part of the system acceptance test, 2) on that part of the system potentially affected when replaced components are installed, and 3) on a quarterly basis to ensure that the system continues to operate properly with no degradation over time. It is a thorough test that not only answers, “Does it detect?” but also, “How well does it detect?” It consists of the documentation of system parameters and settings, detection testing by simulations of attempts to climb and cut the fence, documentation of the results of the testing, and analysis of the test results and changes from previous Performance Tests.

Since Performance Testing is extensive and entails more than just a simple “stimulus and response” test, please refer to the detailed explanation of Performance Testing in Chapter 11 of the INTREPID™ MicroPoint Cable Installation and Operation manual that was furnished with your system. **Please contact Southwest Microwave if a copy of Chapter 11 is needed.**

CAUTION: The MicroPoint Cable is a sensor, not a wire. While it will withstand a significant amount of abuse, the sensor cable can be damaged by rough impacts, stretching, crushing or bending actions. When performing system tests, avoid striking, grabbing or stepping directly on the MicroPoint sensor cable. System testing should be nondestructive.

PERFORMANCE TEST

The following tests should be performed around the entire perimeter and, at a minimum, on every other fence panel. The test can be alternated, i.e., one climb simulation, followed by one cut simulation.

Climb Simulation

1. Climber weight should be at least 150 lbs (68kg).
2. Climb should be attempted on the attack side of the fence which should be opposite of the sensor cable.
3. The time to complete each climb test should not exceed 8 seconds for a 10 foot (3m) fence.
4. If the fence has razor wire, the **Maximum Climb Height** directly below the razor wire to prevent personal injury.
5. If the fence does not have razor wire, **the Maximum Climb Height** is when the top of fence is at waist height.
6. Grasp the fence with both hands at shoulder height.
7. Alternate hand above hand and foot above foot in a continuous and aggressive manner. Do not step on the sensor cable.
8. Each test consists of a continuous climb to **Maximum Climb Height** and back down.
9. Allow 60 seconds between each climb simulation test. (The time between tests must exceed the Masking Time, typically 60 seconds.)
10. An alarm should activate during or immediately after a complete climb down. Allow for a delay in Control reporting the alarm.
11. Document the number and locations of detections versus attempts.
12. Print out the alarm report.

Cut Simulation

13. Tools required: Southwest Microwave Fence Cut Simulation Tool P/N 26D14875-A01
14. Select an area at approximately the horizontal center of a fence panel. If the fence has a mid-rail, the test should be conducted on an area of the fence fabric below the mid-rail.
15. Cock the Cut Simulation Tool to the middle of the 3 setting positions.
16. Firmly press the tip of the Cut Simulation Tool against the fence fabric wire.
17. Trigger or release the Cut Simulation Tool tensioned mechanism so that the mechanism strikes the fence fabric wire with an audible snap.
18. Depending on processor settings, multiple cut simulations at the same location and within a time window may be required to cause an alarm. The cut simulation should be at least 1impact more than the Detection Level setting.
19. Allow 60 seconds between each cut simulation test for the Masking Time to expire.
20. Document the number and locations of detections versus attempts.
21. Print out the alarm report.

If the detection performance of the sensor cable is not satisfactory after following these steps, check the detection settings of the cable. If the performance is still not corrected, the cable should be deemed unhealthy and replaced.