



4RF White Paper
Why industry-leading reliability is standard



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Superior performance as standard

What level of reliability should you expect from your telecommunications equipment? Performance figures are not typically published for such equipment, but information from industry experts - including customers, design engineers, and service and repair staff - suggest that typical industry failure rates are between 4 and 5%, varying by company and product line, with the failure rate of some products considerably higher than this.

In 2008, the Aprisa XE, 4RF's flexible point-to-point microwave link platform, registered a failure rate of just 0.76%, an impressive statistic compared to industry norms, and all the more remarkable considering the harsh conditions in which the Aprisa XE is often deployed. This paper explains more about the Aprisa XE's reliability and how it is achieved.

The Aprisa XE's minimal failure rate of less than 1%...

The use of telecommunications equipment varies between customers, from a back-up link, to a primary communications mechanism, to a network that is mission-critical. Equipment reliability is key to the operations of many companies and forms the basis for many high level business key performance indicators, particularly for mission-critical applications where the business can suffer significant negative impact as a result of equipment failure.

4RF considers that a failure rate of 4 to 5% is 4 to 5 times too high. Our commitment to design excellence and testing and quality assurance means that over the lifetime of our company our failure rate averages just 1.2%, and our investment in continual improvement means that the 2008 failure figure was just 0.76%.

... with no out-of-the box failures...

The out-of-box failure rate for the Aprisa XE is precisely zero, a statistic that cannot be improved upon!

... and a MTBF approaching 100 years...

Based on field install base and returns to the 4RF repair facility, the Aprisa's mean time between failures (MTBF) is a very impressive 95.72 years! To provide more context, 4RF employs just one service technician: he is needed for less than 25% of his time to carry out repairs for 4RF's entire global install base, which is approaching 10,000 units.

... despite less than optimal conditions

The performance of the Aprisa XE is even more significant considering that many of its deployments, currently in more than 130 countries around the world, are in sub-standard installations, in the harshest environments possible. A world away from the clean air-conditioned rooms normally expected for telecommunications equipment, imagine a radio bolted to the mud brick wall of an open air building, with no air-conditioning, daily sand and dust storms and temperature varying from below freezing to above 40 degrees Celsius.

The Aprisa XE's reliability



- Global installed base approaching 10,000 links
- 2008 failure rate of just 0.76%
- Zero out-of-the-box failures
- MTBF of 95.72 years

Factor 1: design excellence

The Aprisa XE consistently links distances often thought of as beyond the reach of traditional microwave radio links. This is a result of 4RF's design focus on high specifications, quality and stability, or what we call 'distance engineering'. This is the result of more than 20 years of experience in microwave radio design, coupled with the use of the latest components and techniques available when designing the Aprisa XE.

This 'distance engineering' philosophy is underpinned by the goal of producing the best digital microwave product in its class. To achieve this goal, 4RF's research and development team employed the best engineering practices and combined these with the highest quality materials and components. The end result: the Aprisa XE outperforms the competition in terms of performance and flexibility, as well as its industry-leading reliability.

One example is the use of highly stable Teflon-coated ceramic substrates rather than the more generic PCB substrates that are used in the majority of the telecommunications industry today, demonstrating the focus on quality materials that has led to the Aprisa XE's outstanding level of reliability.

Factor 2: testing and quality assurance

4RF does not use sample or batch testing: every single radio is subjected to the same extensive test suite and full range of quality checks that embody 4RF's commitment to industry-leading reliability.

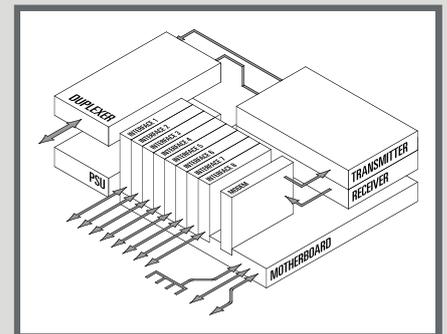
One such process is thermal cycling: 4RF has maintained that quality is of paramount importance by ensuring that every radio manufactured completes a full rigorous thermal cycle test. During this 15 hour test, the radios are subjected to several aggressive thermal ramps between -10 and +50 degrees Celsius while performance data is automatically monitored and recorded, and then analysed at the completion of the test. This contrasts markedly with today's common cost-cutting measures, such as carrying out minimal sample-based thermal cycling, replacing thermal cycling with a less effective thermal heat soak, or even carrying out no thermal testing at all.

Why do we insist on this level of testing? Aggressive thermal ramping is one of the toughest tests for the RF and oscillator circuitry that is core to a digital microwave radio's performance, and temperature changes are one of the most common causes of early life failures in the field. By carrying out stringent thermal testing, 4RF has eliminated this occurrence from the Aprisa XE.

4RF uses process control and automated testing to eliminate potential human error and ensure that the Aprisa XE exceeds performance expectations. The added benefit of automated testing is that its speed means that the number of tests carried out can be increased, so each radio can be tested in small steps across the full operational range of specifications.

The result of examining and testing all aspects of the product's assembly and performance is apparent in the Aprisa XE's unbeaten reliability.

More about the Aprisa XE



- Frequency bands from 300 MHz to 2.7 GHz
- Channel sizes from 25 kHz to 14 MHz
- Capacity from 72 kbit/s to 65 Mbit/s
- Flexible interface options: E1 / T1, 2 and 4 wire analogue, multiple data options, 10 / 100Base-T Ethernet

Factor 3: commitment to continual improvement

Continual monitoring of the Aprisa XE during the stringent manufacturing and test processes, together with all field performance and return data, provides 4RF with early identification of any batch variation or performance trends. This means that any corrective actions can be taken to ensure that high quality standards are maintained and continually improved throughout the life of the product. Add to this 4RF's continued investment in research and development, and it is clear why the Aprisa XE remains peerless in the industry.

To conclude

A high level of reliability is not an added bonus: for 4RF it is mandatory, and we are committed to ensuring that the Aprisa XE retains its industry-leading levels of reliability and reputation as a communications platform that can be depended upon for even mission-critical applications.



About 4RF

Operating in more than 130 countries, 4RF solutions are deployed by oil and gas companies, international aid organisations, public safety, military and security organisations, transport companies and utilities, broadcasters, enterprises and telecommunications operators. All 4RF products are optimised for performance in harsh climates and difficult terrain, and support legacy analogue, serial data, PDH and IP applications.



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