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IRT Corrosion, IRT Lens Pitting and IRT Reflective Mirror Degradation

Nearly four years worth of evidence has been collected which proves that the current Radiometrics “A Series” radiometer design has successfully eliminated all problems associated with external mounting of the infrared thermometer (IRT) and reflective mirror.

Older models of radiometers were equipped with externally mounted Heitronics IRT’s and reflective gold plated mirrors as shown in Figure 1.

Figure 1. Older model radiometer shown with externally mounted IRT with IRT Cover removed.

Even though the Heitronics IRT shown in Figure 1 was specifically designed for external mounting and was shrouded by the IRT Cover shown in Figure 2, environmental conditions eventually caused corrosion to the IRT outer housing, pitting of the IRT lens, corrosion of the IRT lens housing, corrosion of the IRT cable connector, degradation of the IRT cable jacket, degradation of the gold plated reflective mirror and overall poor performance resulting in compromised data.

Figure 2. IRT Cover used to provide additional protection for externally mounted IRT's.

The typical corrosion and oxidation observed on externally mounted IRT outer housings is shown in Figure 3. The corrosion and oxidation on the IRT outer housing is mostly concentrated on the unpainted aluminum front and back plates. This unacceptable condition will compromise the seals in the IRT assembly, invade the IRT internal circuitry as shown in Figure 4 and Figure 5, and ultimately lead to catastrophic failure of the IRT.

Figure 3. Typical outer housing corrosion and oxidation observed on externally mounted IRT's.

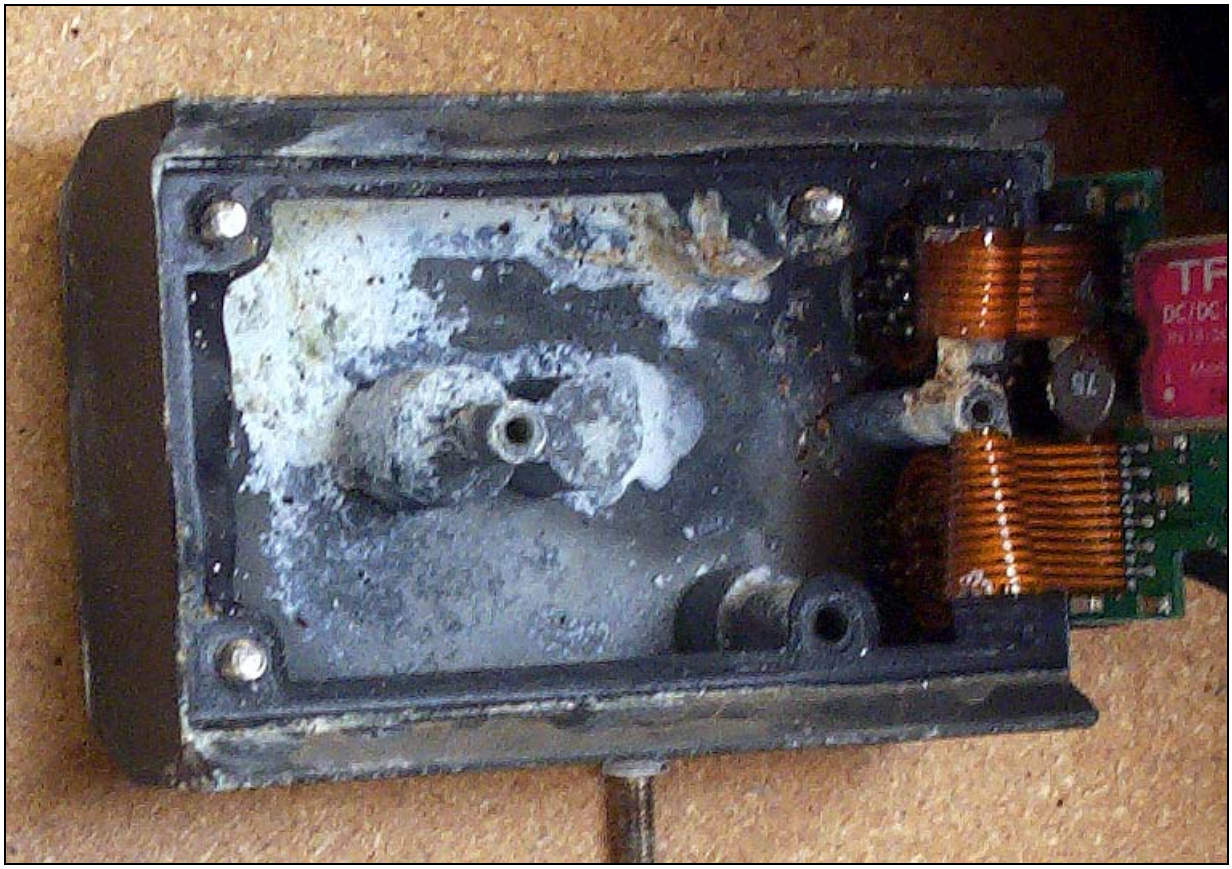

Figure 4. IRT front cover removed, revealing corrosion invasion and compromise of electronic circuitry.

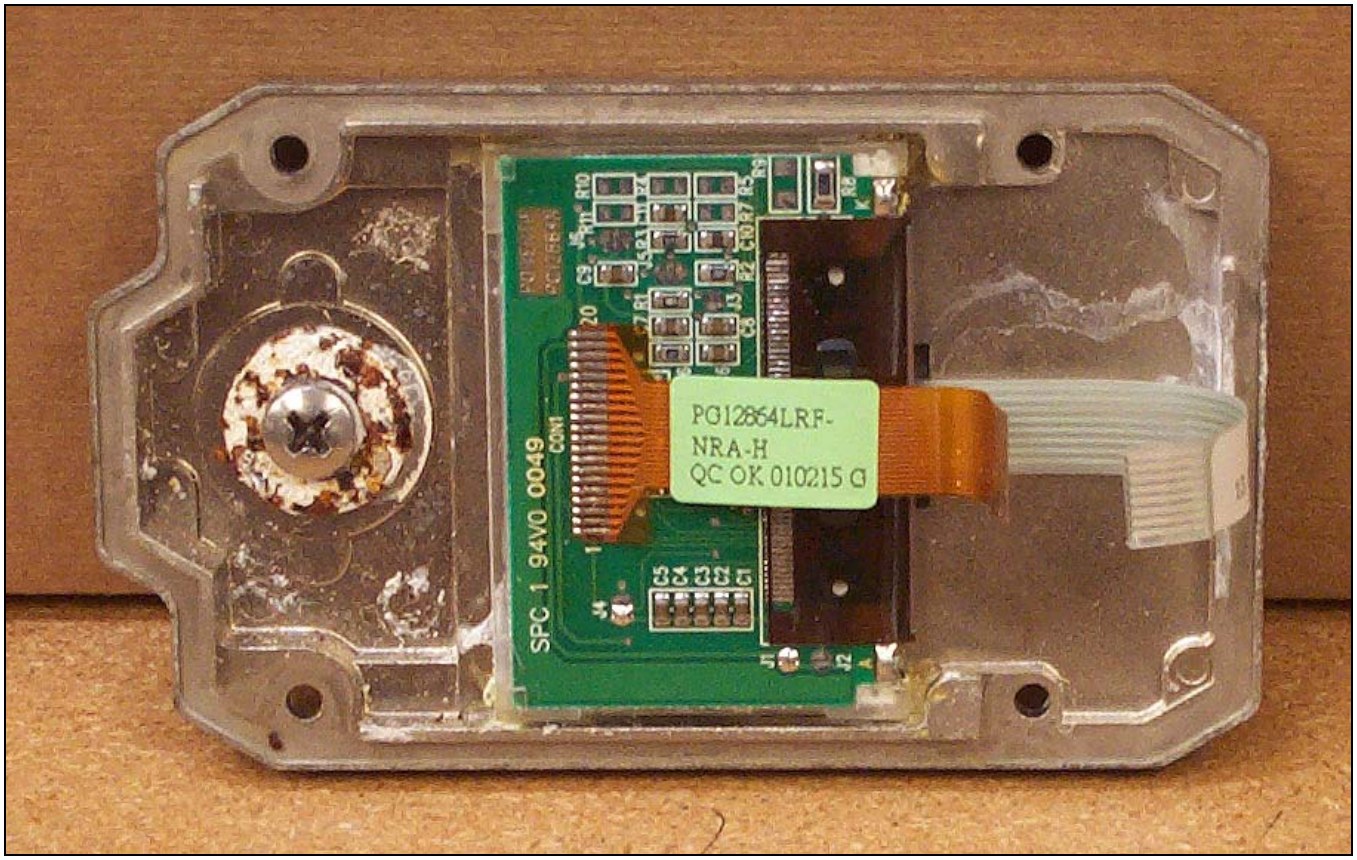

Figure 5. IRT back cover removed, revealing corrosion invasion and catastrophic circuit failure.

Even in instances where the corrosion and oxidation has not managed to invade the IRT's inner electronic assemblies, externally mounted IRT's are compromised by pollutant build-up on the IRT lens and pitting of the IRT lens as shown in Figure 7, Figure 6 and Figure 9. Typically, any model of externally mounted IRT lenses will need to be replaced, due to excessive pitting and lens coating failure, as soon as (if not before) the IRT lens housing exhibits the type of corrosion and oxidation seen in Figure 6, Figure 9 and Figure 8. The externally mounted gold plated mirror (used to reflect the overhead view into the IRT lens), regardless of the plating thickness and/or manufacturer it is purchased from, will also succumb to the environmental conditions and eventually exhibit similar degradation as shown in Figure 10.

Figure 6. IRT lens showing lens pitting and lens housing corrosion.

Figure 7. IRT lens showing lens pitting and extreme failure of lens coating.

Figure 9. IRT lens showing pollutant build-up and corrosion of lens housing.

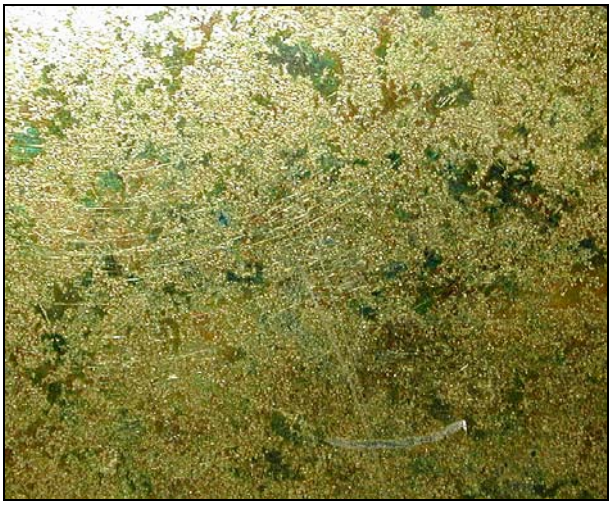

Figure 10. Close-up of gold plated mirror surface showing degradation from pollutants and environmental exposure.

Externally mounted IRT's also experience electronic failures directly attributed to ultraviolet degradation of the IRT cable outer jacket and corrosion/oxidation of the cable connector as shown in Figure 11.

Figure 11. IRT cable connector housing showing corrosion and oxidation.

All of the aforementioned problems, unacceptable conditions and failure modes have been eliminated as evidenced through nearly four years of successful "A Series" radiometer deployments in the harshest environments around the world. The "A Series" design (shown in Figure 12 and Figure 13), with the IRT completely protected inside the cabinet hood, has eliminated all IRT lens, lens housing, cable, cable connector and catastrophic IRT electronics failures and has significantly reduced customer maintenance costs. The complete elimination of the IRT mirror has reduced costs and eliminated one variable affected by pollutant buildup and degradation. The hardened coating on the "A Series" IRT window is significantly more robust against pollutants as proven through extensive operation in polluted and corrosive environments like Beijing, China, and on the deck of ocean-going vessels (e.g. University of Manitoba - Hanesiak).

Figure 12. "A Series" radiometer cabinet hood view with IRT window.

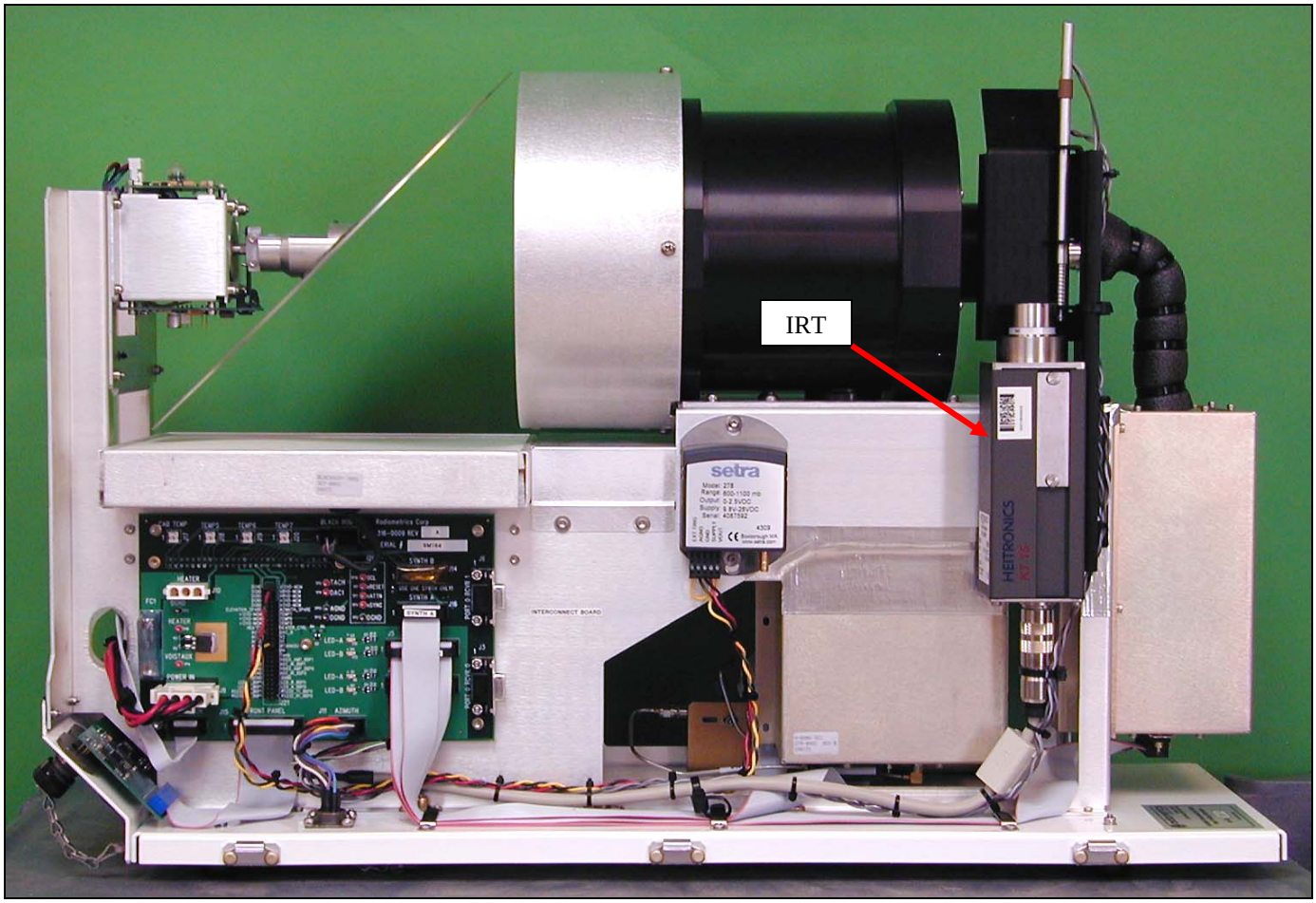

Figure 13. Interior view of "A Series" radiometer with protected and internally-mounted IRT.

It should be noted that all failures associated with the externally mounted IRT “shut-downs” (caused by operation in cold temperature extremes) have been eliminated due to the thermally controlled environment inside the “A Series” cabinet hood. Also, the “A Series” internally mounted IRT design ensures that customer data is no longer compromised by snow and moisture accumulation on the IRT lens.

In summary, the “A Series” internally mounted IRT design significantly improves IRT data reliability and accuracy, eliminates IRT failures associated with exposure to pollutants and environmental conditions, reduces customer costs associated with routine maintenance, and ensures consistent and accurate performance in all extreme climate and environmental conditions. All Radiometrics personnel should be proud of their contributions towards this significant design improvement which is substantiated by the outstanding MTBF ratings achieved with the “A Series” design.

Thank you!

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