Integra™ Overview

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What is Integra?

Impinj's Integra technology is a suite of diagnostics which ensures consistently accurate data delivery that businesses can depend on. Integra, available in all Monza 6 tag chips, is the only suite of diagnostic tools allowing users to verify the reliability of encoded data anywhere in the supply chain. Relying on Integra, retailers can build advanced shopping experiences and business processes knowing that their RFID tags will deliver accurate, highly reliable data. Integra allows anyone to check if the EPC is corrupted. Using the diagnostics provided by Integra, tag manufacturers and service bureaus can ensure they are always exceeding their customers' expectations for data quality. For end users, Integra continually checks the integrity of encoded data to ensure application success.

Why does RFID data integrity matter?

As the RFID industry scales to tens of billions of tagged items per year and businesses increasingly rely on RFID in their daily operations, even a small percentage of data integrity issues can amount to significant errors in the business processes that RFID supports. For example, inaccuracies in inventory quantities caused by data errors in RFID tags can result in loss of sales in a retail store as sales associates cannot find an item for the consumer. Integra eliminates several types of data integrity issues in the tagged item supply chain.

What is the magnitude and sources of data errors?

As the industry scales and more parties and methods are employed for encoding tags, the risk of improperly encoded tags increases. For example, it is a common misconception that reading data back after encoding is the foolproof way to verify proper encoding when in fact that encoded data could change two days later.

Moreover, older printers and encoding systems that operate without proper verification of encoding can produce weakly written tags with data retention issues. Such weakly written tags respond with randomly changing EPC numbers when inventoried by the end user. The magnitude of such data errors is variable based on performance and configuration of the older printer / encoding system.

The best RFID tags are known to have less than 10 PPM (parts per million) physical defect rates resulting in data errors. While defect rates may vary from one supplier to another, the defects originate from various mechanical manufacturing processes that are common to all tag suppliers. These manufacturing processes include tag chip fabrication, inlay assembly, label conversion, encoding and printing. High mechanical stress and temperatures can result in physical damage to

RFID tag chips which later manifests itself as data errors for end users. A common symptom of such physical damage is TID memory bit failures resulting in incorrect TID numbers.

What diagnostics are included in Integra?

Integra includes the following diagnostics:

- EPC self-check
  As a tag is being inventoried by a reader, the tag chip does a quick check to verify that its EPC memory is not weakly written before returning the EPC value to the reader. If during this check, the tag chip finds that its EPC memory is weakly written, it will return a zero length EPC value to the reader to indicate the error and prevent an incorrect EPC value from being returned to the reader.

- Margin Read check
  Margin Read is an EPC Gen2 complaint custom command supported by tag chips with Integra. This command allows a reader to explicitly verify that the non-volatile memory (NVM) in the tag chip is not weakly written.

- TID Parity check
  All tag chips with Integra have TID serial numbers with even parity. If the TID serial number for a tag is found to have odd parity, it indicates potential physical damage to the tag and hence questionable integrity of the data inside it.

How can inlay manufacturers and converters benefit from Integra?

Manufacturers and converters can use the TID Parity check diagnostic included in Integra as an outgoing quality check for symptoms of physical damage to tags. Mechanical damage to tag chips during manufacturing is a leading cause of failure. The TID Parity check diagnostic enables manufactures and converters to identify and exclude damaged tag chips without leading to costly failure analysis later in the supply chain, resulting in higher quality products and higher confidence of product yield.

How can service bureaus benefit from Integra?

Diagnostics included in Integra, specifically TID Parity check and EPC self-check, enable service bureaus to do data quality inspections before supplying RFID tags to end customers. The TID Parity check may be used to identify chips with physical damage while the EPC self-check may be used to ensure proper encoding of tags. Moreover, the Margin Read check can be used for deeper failure analysis when tags are found to be weakly written.

How can retailers benefit from Integra?

Retail brand owners receive the benefits from Integra diagnostics throughout the supply chain, from inlay manufacturing to converting to personalization from service bureaus, ensuring thorough data quality inspections have taken place on the supplied RFID tags. As a result, retailers can achieve much higher levels of data integrity with their RFID systems. This higher

level of trust in the integrity of the data enables advanced shopping experiences such as omni-channel fulfilment with online purchasing with in-store pickup.

Additionally, the EPC self-check diagnostic works automatically, without any special software or firmware upgrade on readers, preventing bad data from entering into the retailers' inventory systems.

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