

Module 8 – RFID Solution Design

Main Objectives:

1. Know the components of an RFID system
2. Know what are the configuration factors that impact overall system effectiveness

1. Know the components of an RFID system

- Reader – fixed, handheld, sled, embedded, module
- Cable – various lengths and thicknesses
- Connectors – cable connectors to reader and antenna, power connectors, network connectors
- Antenna
 - Circular polarization
 - Linear polarization
- Hub or multiplexer (not always present) - allows to connect more antennas to a reader than there are available ports.
- Peripherals (not always present) – RFID printer/encoder, barcode scanner, lights, sensors

2. Know what are the configuration factors that impact overall system effectiveness

- Reader port impedance – must match the antenna impedance (loss resistance, voltage to current, standard is 50 ohm, tuned at manufacturing) for proper performance and to avoid component damage.
- Antenna should have minimum VSWR (voltage standing wave ratio/return loss) for best impedance and most efficient operation.
- Connector type/materials
- Cable type & signal loss – The thicker the cable, the lower the loss, the more expensive the cable.
- Cable length – The longer the cable, the higher the loss, the worse system performance.
- Reader antenna polarization
 - Circular polarization – shorter read range, but orientation insensitivity

- Linear polarization – longer read range, more focused, orientation sensitive
- Reader antenna gain
 - The higher the gain, the narrower the beam but the longer read range.
 - The lower the gain, the wider the beam but the shorter the read range.
 - Gain together with reader power output have to produce certain total transmitted power that complies with regulations.
- Tag antenna size – the larger the antenna, the more power it can harvest from reader signal, the longer the read range. But may not be practical for small items.
 - Single dipole tag antenna – may be orientation sensitive with linearly polarized reader antennas
 - Dual dipole tag antenna – less orientation sensitive
- Material tag is placed on or near
 - Water, moist materials, aqueous liquids – can detune the tag, must tune specifically and create offset from the surface
 - Metal – detunes the tag, must tune specifically and create offset
- Tag processor type (“chip”) – chips differ by manufacturer, by processing speed, sensitivity, memory size and attachment to the antenna.
 - Tag antenna impedance has to match the impedance of the integrated circuit (IC) over a desired bandwidth for best performance. It is tuned at manufacturing.

What is required is knowledge of what factors must be taken into account in configuring a RFID system rather than detailed knowledge of how to do so.

Study List

For additional information and detailed explanation, please review:

[What is RFID](#)

[RF in RFID](#)

[RFID Interrogation Zones](#)

[RFID Tag Construction](#)