Radio Frequency Identification - RFID - Technical Specialist   Competency Requirements

The Radio Frequency Identification Technical Specialist will have a working fundamental knowledge of electronics communication principles. This criteria can be found in the Associate Electronics Technician (CETa, http://www.eta-i.org/electronics.html#CETa) and other Communications area http://www.eta-i.org/communications.html certification programs.

The following competencies are a listing of the knowledge and abilities necessary to perform configuration and maintenance of RFID hardware and software as an RFID Technical Specialist.

1.0   Introduction to Radio Frequency Identification (RFID) Fundamentals
- 1.1   Explain basic electrical theory and uses including:
    - 1.1.1   Ohms law
    - 1.1.2   Watts law
    - 1.1.3   Kirchhoff's law
- 1.2   Describe basic DC circuit concepts of series and parallel
- 1.3   Describe basic AC circuit concepts of RLC (resistive, inductive and capacitive) circuit
- 1.4   Describe basic semiconductors circuitry including:
    - 1.4.1   diodes
    - 1.4.2   transistors
    - 1.4.3   amplifiers
    - 1.4.4   oscillators
- 1.5   Explain electrical and network infrastructure site analysis
- 1.6   Identify symbols used in electronic circuitry and blueprints
- 1.7   Define RFID (Radio Frequency Identification) including:
    - 1.7.1   origin, history and early RFID uses:
        - 1.7.1.1 tag
        - 1.7.1.2 reader
    - 1.7.2   the EPC (Electronic Product Code)
    - 1.7.3   current RFID market awareness

2.0   SAFETY
- 2.1   Describe Radio Frequency (RF) safety protocols per industry standards
    - 2.1.1   Explain the FCC OET65 Bulletin
    - 2.1.2   Explain the IEEE/ANSI C-95 standard
- 2.2   Describe general safety guidelines:
    - 2.2.1   List the National Electrical Codes (NEC®) as they apply to RFID technology
    - 2.2.2   List Occupational Safety and Health Administration (OSHA) requirements for working with RFID technology
    - 2.2.3   List personal protection equipment (PPE) used in RFID work
    - 2.2.4   RFID power applications including:
        - 2.2.4.1   AC power
        - 2.2.4.2   Battery systems
        - 2.2.4.3   Lock Out / Tag Out procedures
    - 2.2.5   Describe safety measures used with tower and elevated surfaces
    - 2.2.6   Describe grounding and surge/lightning protection safety measures
- 2.3   Explain how to protect components from Electrostatic Discharge (ESD)

3.0   RF Fundamentals Applied in RFID
- 3.1   Explain basic RF fundamental operating principles and terminology
- 3.2   Describe basic RF spectrum and propagation
- 3.3   Explain basic principles of radio communication
- 3.4   Explain RF modulation and demodulation to include:
    - 3.4.1   Transmitter modulation
    - 3.4.2   Receiver demodulation
    - 3.4.3   Receiver bandwidth must match the transmitter modulation scheme

3.5 Describe RFID digital modulation methods:
    3.5.1 ASK (amplitude-shift keying)
    3.5.2 FSK (frequency-shift keying)
    3.5.3 PSK (phase-shift keying)
3.6 Describe a site survey requirements:
    3.6.1 RF
    3.6.2 Physical
3.7 Describe RFID coverage area
3.8 Explain RFID Antenna:
    3.8.1 characteristics including:
        3.8.1.1 Tag Antennas
        3.8.1.2 Reader Antennas
    3.8.2 wave propagation
    3.8.3 field performance

4.0 Communication Methods and Protocol in RFID
4.1 Describe coupling including:
    4.1.1 inductive
    4.1.2 electromagnetic backscatter
    4.1.3 close loop or capacitive
4.2 Define collisions (contentions) including:
    4.2.1 Tag collisions
    4.2.2 Reader collisions
4.3 Describe anti-collision tree protocols:
    4.3.1 Tree-base
    4.3.2 Query tree
    4.3.3 Binary tree
4.4 Describe the TCP/IP (transmission control protocol/internet protocol) fundamentals:
    4.4.1 wired
    4.4.2 wireless
4.5 Define tag authentication
    4.5.1 Describe RFID tag forgery security countermeasures
        4.5.1.1 Define "skimming" and "cloning"
    4.5.2 Describe "denial of service" prevention including virus protection

5.0 Tag Characteristics
5.1 Describe passive tags including:
    5.1.1 BAPS (battery assisted passive tags)
    5.1.2 advantages and disadvantages of using passive tags
5.2 Describe active tags including:
    5.2.1 "Read / Write" tags
    5.2.2 advantages and disadvantages of using active tags
5.3 Describe active/passive tags/readers including:
    5.3.1 AVI (automated vehicle id) systems with or without transponders
5.4 Explain how tags are designed
5.5 Explain signal strengths pertaining to communication range including:
    5.5.1 reader to tag requirements
    5.5.2 tag to reader available strengths
5.6 Describe a Smart Label
5.7 Explain Tag Implementation

6.0 Fundamentals of Interrogator Communications
6.1 Describe how readers (interrogators) function in an RFID system
6.2 Define the Interrogation Zone
6.3 Explain the parameters of a Dense Interrogators Environment including:
    6.3.1 Deployment Environments
6.4 Explain Interrogator international power regulations
6.5 Explain how a host computer is connected to tag reader
    6.5.1 Describe common specific wired and wireless network interfaces

6.6   Explain how a Device Driver works
6.7   Explain the role Middleware and Edgeware has in RFID architecture including:
      6.7.1   software on the reader
      6.7.2   middleware used between reader and computer
6.8   Explain ONS (object naming service) and the role it plays in an enterprise RFID System
6.9   Describe basic programming techniques including:
      6.9.1   Basic C structure
      6.9.2   XML namespace

7.0   RFID System Design Selection and Installation
7.1   Describe which Frequency selection is used including:
      7.1.1   LF
      7.1.2   HF
      7.1.3   UHF
7.2   Explain the applications of selection and installation/configurations including:
      7.2.1   Tag types
      7.2.2   Reader/Interrogator types
      7.2.3   Antenna types
      7.2.4   power distribution including:
            7.2.4.1 power supply
            7.2.4.2 cable/wiring considerations
      7.2.5   RFID peripherals

8.0   RFID Standards and Regulations
8.1   Define the EPC (Electronics Product Code)
8.2   Describe how EPCglobal Network and GS1 incorporate sharing information including:
      8.2.1   ONS
      8.2.2   EPC Discovery services
      8.2.3   EPC Information services
      8.2.4   EPC Security services
8.3   Describe common ISO Standards as it related to RFID including:
      8.3.1   18000 series (air interface frequency standards)
      8.3.2   11784 (tag data structure)
      8.3.3   11785 (air interface protocol – a.i.p.)
      8.3.4   14443 (proximity systems definitions for a.i.p.tags – payment systems)
      8.3.5   15693 (vicinity cards)
      8.3.6   18046 (tag and interrogator performance test methods)
      8.3.7   refer to the many other RFID related standards
8.4   Define the GEN 1 and GEN 2 RFID standards differences
8.5   Define the Class 0,1,2,3,4,5 tags
8.5   Define SSCC (Serial Shipping Container Code)
8.6   Define EDI (electronic data interchange) Transaction including:
      8.6.1   ASN (Advanced Shipping Notice)

9.0   Additional Instrumentation Used with RFID Systems
15.1   Describe how to use a real time spectrum analyzer
15.2   Describe how to use an oscilloscope
15.3   Describe how to use voltage/ohm meters
15.4   Describe how to use field strength meters

10.0   Troubleshooting an RFID System
14.1   Explain procedures used in Tag Data Management
14.2   Explain how to assess Readability and Reliability issues
14.3   Describe procedures to resolve Environmental Tag damage
14.4   Define SLRRP (Simple Lightweight RFID Reader Protocol)
14.5   Describe procedures used in RFID security/privacy applications

End of RFID Technician Specialist Competencies Listing

Find an ETA® Test Site   **http://www.eta-i.org/testing.html**

Additional Suggested Study Materials and Resources:

RFID Essentials; Glover/Bhatt; ISBN 978-0596009441; O'Reilly Media; 2006
The RF in RFID: Passive UHF RFID in Practice, 2E; Dobkin; ISBN 978-0123945839; Newnes; 2012
RFID: MIFARE and Contactless Cards in Application; Schalk/Bienert; ISBN 978-1907920141; Elektor; 2013
RFID Handbook: Fundamentals and Applications in Contactless Smart Cards, RFID and Near-Field Communication, 3E; Finkenzeller/Müller; ISBN 978-0470695067; Wiley; 2010
RFIDs, Near-Field Communications, and Mobile Payments: A Guide for Lawyers; Hughes/Middlebrook/Jones; ISBN 978-1627221252; American Bar Assc.; 2014
RFID Field Guide; Bhuptani/Moradpour; ISBN 978-131853553; Sun Microsystems-Prentice Hall; 2005
RFID for Dummies; Sweeney II; ISBN 978- 0764579103; For Dummies; 2005
RFID: Radio Frequency Identification; Shepard; ISBN 978-0071442992; McGraw-Hill; 2004
RFID: Applications, Security and Privacy; Garfinkel/Rosenberg; ISBN 978-0321290960; Addison-Wesley; 2005
Security in RFID and Sensor Networks; Zhang & Kitsos, editors; ISBN 978-1-4200-6839-9; CRC Press; 2009
See more Texts listed at the end of the CETa, GCT1, & GCT2 competency listings…

https://msdn.microsoft.com/en-us/library/dd352557.aspx

http://electronics.howstuffworks.com/gadgets/high-tech-gadgets/rfid.htm

http://www.radio-electronics.com/info/wireless/radio-frequency-identification-rfid/iso-epcglobal-iec-standards.php

http://www.rfidjournal.com/articles/view?1335

http://www.edi-services.com/856-advanced-ship-notice-elements.htm

http://transition.fcc.gov/Bureaus/Engineering_Technology/Documents/bulletins/oet65/oet65b.pdf

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