

## ETA - RESI (Computer Networking) - 2009 NCEE COMPETENCIES PROJECT

### RESIDENTIAL ELECTRONICS SYSTEMS INTEGRATOR – RESI

(There are two levels of expertise proposed for those workers who install electronics cables in residences and interconnect electronics communications, computer, control or entertainment equipment. **RESI, the Residential Electronics Systems Integrator**; and the **Master RESI, Residential Electronics Systems Integrator.** )

The **BASIC RESI** is proficient in the design of pre-wiring for home theater and telecommunications equipment interconnection. He/she will install network wiring for cable TV, satellite and antenna outlets, telephone equipment outlets, audio and video entertainment, and computer equipment in such a manner that all control and communication signals can be integrated at the home controller and converged into one cogent IP bit stream, to either be used within the residence or to be passed back and forth through the home gateway. He/she will be proficient in the many protocols used over diverse media to communicate with and control residential electronics systems, in addition to the skills required for low voltage wiring installation. He/she will work from house telecommunications wiring plans, installing cable fittings and selecting the specified cabling for each technology. He/she will test, mark and document all cabling and will have the ability to troubleshoot and restore pre-existing cabling systems. RESI Integrators typically will also be qualified in one or more of the five (5) endorsement specialty areas listed below.

The **MASTER RESI** will be proficient at all of the RESI skills and knowledge as well as in planning and designing electronics and communications equipment systems and layout for new and existing construction. The MASTER RESI is capable of designing the entire system and network for audio, video, data and control of security and environment. He/she also is capable of troubleshooting and debugging the system and planning installation or modifications. The MASTER RESI has extensive knowledge of the operation and technology and is proficient in **each** of the basic five subcategories of residential electronics.

Integrators who hold the Basic RESI Certification can also add one or more of the endorsements such as the below listed COMPUTER NETWORKING specialty.

- **RESI (Basic Core Integrator)**
- **RESI Endorsements:**
  1. **Audio/Video**
  2. **Computer Networking**
  3. **Security-Surveillance**
  4. **CCTV (Closed-Circuit TV)**
  5. **Environmental Control**
- **MASTER RESI**

The **MASTER RESI** certification prerequisites include successfully completing the core RESI certification requirements, plus holding **each** of the five (5) RESI subcategory endorsements.

To qualify for the ETA **MASTER RESI**, Residential Electronics Systems Integrator, a technician must:

- Hold the RESI Basic certification
- Pass each of the five (5) specialty endorsements
- Pass a separate Master RESI examination

**ETA COMPETENCIES - 2009**  
**RESI Computer Networking Endorsement****1.0 SIGNALS**

- 1.1 Telephone
  - 1.1.1 Describe the characteristics of analog & digital telephone systems.
  - 1.1.2 Identify basic features of telephone wiring systems.
  - 1.1.3 Explain how modems negotiate a connection.
  - 1.1.4 Describe various dialing properties (e.g. ISDN, DSL)
- 1.2 Audio
  - 1.2.1 Describe how analog television functions & television images are converted to digital form in a variety of formats & compressions.
  - 1.2.2 Explain Sampling Rates.
  - 1.2.3 Discuss Analog signal conversion to digital signal & visa versa.
  - 1.2.4 Explain Codecs, MPEG formats, & Buffering.
- 1.3 Video
  - 1.3.1 Describe the various types of digital video available on the Internet & the features & limitations of each.
  - 1.3.2 Explain digital video/audio switcher.
  - 1.3.3 Describe RGB & H/V signal method.
- 1.4 Data Signals
  - 1.4.1 Explain how data is converted into electrical signals.
  - 1.4.2 Explain serial & parallel data transfer.
  - 1.4.3 Explain the difference between Bit Rate & Baud.

**2.0 Hardware Basics**

- 2.1 Computer System Connectors-Plugs
  - 2.1.1 Identify RJ-45, twisted-pair wires, BNC, AUI 15-pin D-shaped connectors, UTP & STP.
- 2.2 Dip Switches
  - 2.2.1 Explain dipswitch configurations & purpose.
- 2.3 Slot Design
  - 2.3.1 Identify PCI, USB, PCI Express and know their usage.
- 2.4 Peer-to-Peer Configuration
  - 2.4.1 Compare node configurations in Peer-to-Peer design.
  - 2.4.2 Identify Star, Ring, & Bus configuration.
  - 2.4.3 Explain token ring networking.
  - 2.4.4 Explain packet transfer on the network.
- 2.5 X10
  - 2.5.1 Explain X10 & the history behind X10.
  - 2.5.2 Identify X10 modules.
  - 2.5.3 Explain advantages of X10.
  - 2.5.4 Explain disadvantages of X10 over Ethernet.
- 2.6 Routers
  - 2.6.1 Describe routers & placement in the network.
  - 2.6.2 Explain proper usage of routers in a network environment.

- 2.7 Switches
  - 2.7.1 Describe switches & placement in a network environment.
  - 2.7.2 Explain proper usage of switches in a network environment.
- 2.8 Bridges
  - 2.8.1 Explain the difference between a bridge & router.
- 2.9 Cable/DSL Modems
  - 2.9.1 Describe the operation of cable and DSL modems
  - 2.9.2 Explain PPPoE (*Point-to-Point Protocol over Ethernet*) and its security risk.
- 2.10 Firewalls
  - 2.10.1 Explain firewall technology & how to implement firewalls in a network environment.
  - 2.10.2 Describe software firewalls.
  - 2.10.3 Describe hardware firewalls.
- 3.0 Local Area Networks – LANs**
  - 3.1 Network Basics
    - 3.1.1 Explain the purpose and features of the RS-232, RS-485, RJ-45 standards
    - 3.1.2 Identify RS-232, RS-485 & RJ-45 connectors.
    - 3.1.3 Coax
      - 3.1.3.1 Explain Thin-net & Thick-net coax.
      - 3.1.3.2 Explain the lengths of transmission for both Thin and Thick- net.
    - 3.1.4 Fiber
      - 3.1.4.1 Explain fiber optics cable system technology.
  - 3.2 10/100/1000 Ethernet
    - 3.2.1 Discuss differences and speed of T10, T100 and T1000 Ethernet
  - 3.3 Windows Based
    - 3.3.1 Describe various operating systems for networks and the advantages of Windows-based software
  - 3.4 Busses
    - 3.4.1 Explain busses, their purposes and their speeds.
    - 3.4.2 Explain PCI Express.
  - 3.5 Power-Line Network
    - 3.5.1 Discuss Power-Line Network & its advantages over Ethernet & Home PNA
    - 3.5.2 Explain FDM (Frequency Division Multiplexing)
- 4.0 Software**
  - 4.1 Directories
    - 4.1.1 Described how directories are organized, named and utilized
  - 4.2 Storage Methods
    - 4.2.1 List common storage methods utilized by computer networks
  - 4.3 Compression Methods
    - 4.3.1 Explain compression methods and their usage in transmission and storage

- 4.4 Windows Media Center Edition 2004
  - 4.4.1 Explain WMC applications & advantages.
- 4.5 Windows XP Media Center Edition 2005
  - 4.5.1 Explain XP WMC applications & advantages.
- 4.6 Home Control Software
  - 4.6.1 Identify currently available Home Control Software.
- 4.7 Antivirus
  - 4.7.1 Explain how AV software is expected to operate.
  - 4.7.2 Discuss any issues when using AV software.
- 5.0 Internet – B-VoIP**
  - 5.1 Describe the TCP/IP, HTTP, HTTPS, etc. protocols and list where and how they are used in the residential network system
  - 5.2 Internet Basics
    - 5.2.1 Summarize the functions of the Internet, services available and usages in home networking systems
  - 5.3 Security
    - 5.3.1 Explain the basic principles of Internet security services, anti-SPAM, anti-virus, Spyware, etc.
  - 5.4 Broadband Services
    - 5.4.1 Define & explain usage in residential broadband networking.
  - 5.5 Modems
    - 5.5.1 Describe function and basics of modem operation.
  - 5.6 Addresses
    - 5.6.1 Describe the components of e-mail addresses.
  - 5.7 DNS
    - 5.7.1 Explain DNS (Domain Name Service) and how it works.
    - 5.7.2 List the seven domain name qualifiers.
  - 5.8 Ipv4
    - 5.8.1 Discuss the implementation of IPv6 and its design
    - 5.8.2 Explain the different forms of NAT (Network Address Translation).
- 6.0 Wireless Basics**
  - 6.1 802.11
    - 6.1.1 Explain the purpose & basic requirements of the 802.11 series of standards
  - 6.2 802.16
    - 6.2.1 Explain the purpose & basic requirements of the 802.16 series of standards.

- 6.4 Bluetooth
  - 6.4.1 Describe devices that can use Bluetooth technology.
  - 6.4.2 Explain short-range radio transmissions for Bluetooth technologies.
  - 6.4.3 Define possible interference issues.
- 6.5 Home RF
  - 6.5.1 Explain SWAP (Shared Wireless Access Protocol) in transmission of data.
- 7.0 Cable TV – Satellite – Off-Air Antenna Signals**
  - 7.1 Explain how interfacing of the satellite programming signals can be accessed and displayed from the home theater area
  - 7.2 Explain how HD (high definition) programming can be switched via the computer
- 8.0 Distribution Systems**
  - 8.1 Describe the uses of coaxial cables in home networking are utilized and selected using the computer network
  - 8.2 Explain the advantages of plastic optical fiber cabling in the home
  - 8.3 Describe methods of delivering content over CAT 5e and 6 cabling
- 9.0 Residential Security-Surveillance**
  - 9.1 Describe interconnection of the home network with alarm and security system equipment
  - 9.2 Describe the sensors used in security systems for residences
  - 9.3 Explain how keypads are utilized on the network
  - 9.4 Explain the need for and methods of implementing access control for selected portions of the home network system
  - 9.5 Describe the operation and functions of the system control
  - 9.6 Explain how program controllers may be configured
- 10.0 CCTV (Closed-Circuit TV)**
  - 10.1 Explain the use of Date/Time generators and discuss how they are integrated into the computer network
  - 10.2 Describe alarm interface units and how they are integrated with the computer network
  - 10.3 Explain how recorders may be used in the A/V, Environmental Control, CCTV or Security-Surveillance segments of the network system
- 11.0 Environmental Control**
  - 11.1 Discuss the usage of the network to control residential lighting
  - 11.2 Discuss programming of the various subsystems of the home
  - 11.3 Describe how sensors & actuators are integrated into the network
  - 11.4 Explain how the computer and control programs mesh into the network
  - 11.5 Describe methods of interfacing different subsystems of the network
  - 11.6 Explain how heating, ventilation, air conditioning (HVAC) may be interfaced with the home computer network
  - 11.7 Describe how event recording and storage is accomplished
- 12.0 Residential Management**
  - 12.1 Discuss aspects of inventory of products (hardware and software) in a business performing residential computer networking installations/servicing
  - 12.2 Discuss finance aspects of performing a home system
  - 12.3 List steps in scheduling the customer/builder approval of plans; acquiring system components; scheduling installation and testing and final completion of system
  - 12.4 Explain how additional modern appliances may be incorporated into the network control & management system

**13.0 System Design**

- 13.1 Explain the interaction with builder/customer in defining system needs
- 13.2 Explain how to diagram the planning sequences needed prior and during installation
- 13.3 List steps in implementation the installation

**14.0 Customer Orientation & Documentation**

- 14.1 Explain the importance of seeking customer preferences in the design, functions and timetable for installation of the system.
- 14.2 List potential customer requirements that must be met prior to completion of the installation and final documentation and orientation documentation.

**Recommended Study Material:**

Introduction to Residential Technologies, Bedrock Learning – Course Guides/Online Training  
Home Networking for Installers, Bedrock Learning – Course Guides/Online Training  
Fundamentals of Structured Wiring, Bedrock Learning – Course Guides/Online Training  
RESI Basic Skills & Knowledge; eITPrep LLP, ISBN 1581220847  
RESI Computer Networking Endorsement; eITPrep LLP, ISBN 9781581221022  
HTI+ Certification – Concepts and Practice, Chuck Brooks, 4<sup>th</sup> Edition; Pearson Prentice Hall; ISBN 0131147722