ETA - RESI (Audio/Video)
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 AUDIO/VIDEO 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
RESI Audio/Video Endorsement

1.0 SIGNALS
- 1.1 Describe telephone system signal types
- 1.2 List audio signal sources and types
- 1.3 Compare video signals with radio frequencies and voice
- 1.4 Differentiate between video, audio and data Signals

2.0 Amplifiers
- 2.1 Compare power amplifiers used in residential systems with other types of audio amplifier circuits
- 2.2 Interpret an amplifier's specifications sheet
- 2.3 Explain the Dolby sound system, Dolby Digital Ex. and DTC and list the advantageous features of each
- 2.4 Explain the features and operation of Pro Logic and compare with basic audio amplifier sound processing
- 2.5 Describe CDs and DVD inclusion in the audio/video system

3.0 Speakers
- 3.1 Compare various freestanding speakers commonly utilized in home theater systems
- 3.2 Differentiate between ordinary 2-channel audio and Surround systems
- 3.3 Explain the purpose of subwoofers, their frequency range and styles
- 3.4 Explain the advantages of bookshelf speaker units
- 3.5 Describe the pre-wiring of In-Wall speakers, mounting and connections
- 3.6 Define impedance and explain its importance in matching
- 3.7 Explain speaker stiffness and its effect on audio balance
- 3.8 Explain speaker mass and its effect on audio frequencies
- 3.9 Explain damping factor in speakers

4.0 Speaker Cabling
- 4.1 Explain ways that wrong wire gauge can adversely affect the sound system
- 4.2 Describe connector requirements for multi-room In-Wall speaker
- 4.3. Compare speaker terminal connections, spring clips, binding posts, etc.
- 4.4 Explain the value of oxygen-free copper wire for audio systems
- 4.5 Define: Transient Distortion, Wow, and Flutter
- 4.6 Describe advantages, compare costs and quality with wired speakers
- 4.7 Explain the purpose and components used in cross-over networks
- 4.8 Describe wiring used on wall surfaces, hardware and esthetics

5.0 Audio Systems Basics
- 5.1 Explain why audio systems require greater bandwidth than telephone, AM radio.
- 5.2 Explain the frequency response of each type of speaker
- 5.3 Explain Total Harmonic Distortion – THD and list causes and cures
- 5.4 Define equalizer. Compare with common tone controls in amplifiers
- 5.5 Compare Digital Sampling Rates and explain optimum sampling rates
- 5.6 Explain the advantages of compression technology, how and where it is used in audio products
- 5.7 Compare quality of CDs and user functionality with audio tape or other sources
- 5.8 Compare radio reception quality with CDs and tape. Explain radio function of the stereo receiver. Describe satellite radio services

6.0 Surround Sound
- 6.1 Explain Surround Sound basics
- 6.2 Describe how to plan the placement of surround sound speaker units

6.3 Describe how to rewire to allow room areas use of surround equipment
6.4 Explain DTS and its advantages

7.0 Acoustics

7.1 Define and present examples of good and bad acoustics
7.2 Explain acoustic resistance and resonance
7.2 Explain causes of detrimental sound reflection
7.3 Explain sound refraction and discuss causes
7.4 Explain sound diffraction and explain detrimental aspects
7.5 Describe low frequency effects an area may exhibit
7.6 Explain the reasons for audio holes & nodes and ways to reduce them

8.0 Video

8.1 Describe TV Off-Air broadcast signals including HDTV multicasting
8.2 List brands and usage of DirecTV, DISH and other satellite video programming
8.3 Describe VCR technology and audio/video quality
8.4 Describe DVD – DVR audio and video quality
8.5 Explain the purpose of MPEG 4
8.6 Describe how PVRs operate and interconnect in the sound system
8.7 Define S-Video and explain its advantages
8.8 Compare video quality with various Digital Sampling Rates
8.9 Compare DVD, satellite, and off-air High Definition sources and sampling rates
8.10 Match viewing distance – Aspect Ratios with various size displays
8.11 Explain importance of seeking customer choices for products and in-home positioning
8.12 Describe display maximization – color temperature/balance
8.13 Describe various types of wireless control of audio and video equipment using remote hand units, LED and RF sending/receiving devices

9.0 Display Devices

9.1 Describe the operation and handling precautions for CRT displays
9.2 Describe CRT, LED, LCD and other projection TV technologies
9.3 Compare Monitors with TV receivers and list advantages
9.4 Compare DLP/LCD/LcoS/Plasma technologies and list advantages of each
9.5 Describe projectors/screens used in home theater applications
9.6 Describe actuators and remote control for motorized screens
9.7 Discuss scanning – interlacing, progressive and the features of both
9.8 Explain the purpose and technology of De-Interlacing and Line Doubling

10.0 Home Theater Systems

10.1 Describe audio channel selection on a receiver/amplifier
10.2 List advantages of remote wireless control of whole-house electronics from the home theater primary viewing area
10.3 Summarize modern displays and speaker aesthetics for residences
10.4 Discuss home theater seating concepts
10.5 Explain requirements of cabling, speakers and display units when retrofitting a home
10.6 Sketch the components for a motorized projection screen

11.0 Off-air Antennas

11.1 Explain off-air installation basics
11.2 Identify types of antenna-dish components and mounts
11.3 Discuss logical methods of troubleshooting dish and antenna problems
11.4 Compare analog/digital/HDTV Broadcast Signals
11.5 Describe the required small dish system installation and programming procedures that must be followed and the configuration required prior to customer subscription access.

12.0 Cable TV

12.1 Describe cable TV connections, ground blocks and wiring from street to home and entry interconnection
12.2 List minimum signal levels common for CATV systems and the use of line amplifiers where weak signals exist
12.3 Define DSL, B-VoIP, PPV and Telephone Services. List major advantages of each

13.1 Distribution Systems

13.1 Illustrate home run and daisy chain wired signal distribution systems
13.2 Illustrate and compare wireless distribution systems with wired systems
13.3 List common usages for RG 59, RG 62, RG6, CAT 5e/6, and fiber optics cabling and the advantages of each
13.4 Diagram residential signal distributions equipment interconnection
13.5 Describe how a home computer network can be used to remotely control home electronics
13.6 Explain how individual room & areas can be control from multiple locations
13.7 Describe pre-wiring and retro wiring methods, wall fish, attics, crawl spaces, etc.
13.8 Describe 70 volt sound distribution technology and indicate applications where it is desirable
13.9 List Internet resources that may be included in home networks
13.10 Explain the use of splitters, diplexers, taps, fittings and outlets
13.11 Explain how plastic optical fiber can be utilized in the home systems

14.0 Troubleshooting

14.1 Describe common technical problems in home theater systems
14.2 Describe methods and equipment used to troubleshoot signal systems or to substitute or detect systems signals
14.3 Explain the usage of signal generators - TDR and DMM
14.4 List signal problems from external sources or those caused by the A/V system components
14.5 List tools and test equipment used for installation work in homes
14.6 Describe methods and equipment used to maximize A/V Equipment capabilities
14.7 Describe procedures for accessing and resolving in-wall equipment/cabling problems
14.8 Present an example of customer equipment faults leading to dissatisfaction of the electronics work and potential loss of income for the installing dealer
14.9 Explain the grounding process and its importance in reducing ground loops as well as customer lighting/surge concerns

Recommended Study Material:

Introduction to Residential Technologies, Bedrock Learning – Course Guides/Online Training
Whole House Audio Technology and Distribution, Bedrock Learning – Course Guides/Online Training
RESI Basic Skills & Knowledge; eITPrep LLP, ISBN 1581220847
RESI Audio/Video; eITPrep LLP, ISBN 1581220871
RESI Audio and Video Systems Endorsement; eITPrep LLP, ISBN 9781581221039
HTI+ Certification – Concepts and Practice, Chuck Brooks, 4th Edition; Pearson Prentice Hall; ISBN 0131147722

