PURPOSE
To evaluate each contestant’s preparation for employment and to recognize outstanding students for excellence and professionalism in the field of home technology integration.

ELIGIBILITY
Open to active SkillsUSA members enrolled in programs with computer networking, telecommunications cabling, home theater installation, electronics applications and/or electronics technology as the occupational objectives.

CLOTHING REQUIREMENT
NYS Business Casual - which consists of:
- Button-up collared, white dress shirt, white blouse (collarless or small-collared) or white turtleneck, with any collar.
- Black dress slacks (accompanied by black dress socks or black or skin-tone seamless hose) or black dress skirt (knee-length, accompanied by black or skin-tone seamless hose)
- Black dress shoes - no open back or open toed shoes

Note: Contestants must wear their official contest clothing to the contest orientation meeting. Also #2 pencil, resume, and safety assurance form.

EQUIPMENT AND MATERIALS
1. Supplied by the technical committee:
   a. All necessary information for the judges and technical committee
2. Supplied by the contestant:
   a. Phillips & Flat Screwdrivers (#1 & #2)
   b. Precision (small) screwdriver set
   c. Drill Motor / Wood Drill Bit
   d. Multimeter
   e. Cable tester (Network / Coax)
   f. Laptop computer
   g. Measuring Tape (18’ +)
   h. RJ11/RJ45 crimpers
   i. Coax compression tool (BNC,F&RCA)
   j. Coax strippers
   k. High gauge wire strippers (20-25 AWG)
   l. Diagonal cutters (small)
   m. Needle-nose pliers (small)
   n. 12” Level
   o. Drywall Saw
   p. Zip Ties
   q. Fish Tape / Glow Rods
   r. Stud Finder
   s. Safety Glasses

All competitors must create a one-page résumé and submit a hard copy to the technical committee chair at orientation. Failure to do so will result in a 10-point penalty.

Note: Your resume may be judged as part of your contest” Check the Contest Guidelines and/or the updates page on the NYS SkillsUSA Web site: http://www.nysskillsusa.org

SCOPE OF THE CONTEST
The contest is defined by industry standards as set by the current industry technical committee. The contest will be divided into two parts: general knowledge test and a skilled performance.

Knowledge Performance
The contest will include a written exam assessing general knowledge of residential electronics installation and maintenance including smart house technologies. Written portions may also exist during the skills portion of the contest.

Skill Performance
The skills performance event assesses the ability of the contestant to install, maintain and troubleshoot a variety of devices encountered in a residential setting. A practical problem(s) will be given to evaluate the contestant’s ability to function on a basic entry level.
Contest Guidelines

1. The contests will have several hands-on skill scenarios that demonstrate one’s ability to perform jobs or skills selected from the list of competencies as determined by the SkillsUSA Championships technical committee. Scenarios may include any or several of the following:
   a. Diagnose and service personal residential electronic systems
   b. Diagnose and resolve operational and startup problems
   c. Locate and identify defective modules within residential electronic equipment
   d. Demonstrate ability to use diagnostic utility software and equipment
   e. Install, configure and demonstrate proper operations of devices within the residence

2. The hardware problems will relate to any residential networked systems.

3. Contestants will be awarded points based on their ability to solve the provided problems within the allotted time. Partial points can be awarded for solving partial problems.

4. Competence in the provided tasks is considered when a contestant acquires 75 percent of the available points.

5. Contestants will be provided, as required, manufacturers’ documentation of the devices to be installed and/or serviced.

6. Winners will be determined on the basis of their total scores (regardless of result on certification test), which includes diagnostic procedures, speed, standard industry procedures, accuracy of adjustments and correct component replacements.

7. Specific penalties will be assessed for the failure to properly use anti-static straps at all times when in contact with the computers and for the introduction of computer viruses into the contest computers. Penalties will be assessed at one point per occurrence, and notice of infractions will be communicated to the contestant when they occur.

Standards and Competencies

Networking

RSIM 1.0 — Identify basic networking protocols and their uses and know when/how to apply them

1.1 DHCP
1.2 UDP
1.3 DNS
1.4 TCP/IP
1.5 Subnet masks

RSIM 2.0 — Recognize and implement methods of network security

2.1 Personal computer (PC) security
2.2 Antivirus
2.3 Home networking security
2.4 Firewall knowledge

RSIM 3.0 — Configure setup and maintain a residential LAN (Local Area Network)

3.1 Client configuration
   3.1.1 Resource sharing
   3.1.2 Peer-to-peer
3.2 Remote access setup
3.3 Network device setup and integration
   3.3.1 Broadband configuration (e.g., DSL, cable and satellite)
   3.3.2 Routers
   3.3.3 Hubs
   3.3.4 Switches
   3.3.5 PoE (power over ethernet)

RSIM 4.0 — Configure setup and maintain a secure wireless network

4.1 Differentiate applications of hardwired vs. wireless networks
4.2 Assess networking security and encryption standards
   4.2.1 WEP
   4.2.2 WPA
   4.2.3 MAC filtering
   4.2.4 SSID
   4.2.5 WPA2
4.3 Wireless networking integration and troubleshooting
   4.3.1 Frequency management
4.4 Wireless protocol standards
   4.4.1 802.11 a/b/g/n

RSIM 5.0 — Identify and define network cabling characteristics and performance

5.1 Cable types
   5.1.1 CAT5
   5.1.2 CAT5e
   5.1.3 CAT6
   5.1.4 Fiber
   5.1.5 COAX
5.2 Cable length limitations
5.3 Protocols
  5.3.1 10BaseT
  5.3.2 100BaseT
  5.3.3 1000BaseT
5.4 Shielded (STP) vs. unshielded (UTP)
5.5 Plenum vs. non-plenum
5.6 Importance of conductor colors

Audio/Video
RSIM 6.0 — Implement, maintain and troubleshoot multi-room audio systems. Identify common interference sources
6.1 Control devices
  6.1.1 Keypads
  6.1.2 Rotary volume controls
  6.1.3 Sliders
  6.1.4 Push button controls
  6.1.5 Touch screen
  6.1.6 Wireless keypads
  6.1.7 Handheld devices
6.2 Differentiate and define single source, multi-source and local source.
  6.2.1 Analog audio system
  6.2.2 Analog CAT5 audio system
  6.2.3 Digital CAT5 audio system
6.3 Proper cable use
  6.3.1 Line level vs. speaker level
6.4 Amplification
  6.4.1 Ohm’s Law (e.g., impedance matched or non-impedance matched)
  6.4.2 Watts vs. dB
  6.4.3 Local amplification
  6.4.4 Centralized amplification
6.5 Speaker types
  6.5.1 In wall
  6.5.2 Surface mounted
  6.5.3 Ceiling mounted
  6.5.4 Freestanding
  6.5.5 Fixed
  6.5.6 Animated
6.6 Speaker specifications
  6.6.1 Frequency response
  6.6.2 Efficiency
  6.6.3 Power handling

RSIM 7.0 — Install, configure and maintain a residential home theater system
7.1 Audio components
  7.1.1 Define basics of acoustics (e.g., sound reflection, speaker
 placement, sound cancellation, sound balance)
  7.1.2 Audio/Video components setup and integration (e.g., digital signal cables and lengths, legacy devices)
  7.1.3 Multichannel surround (e.g., SACD, DVDA, DTS, DTSES, DDEX, DD, etc.) (e.g., crossovers and speaker setup)
7.2 Video components
  7.2.1 Display types (e.g., plasma, DLP, LCD, LCOS, CRT, rear projection, front projection, direct view)
  7.2.2 High-definition resolutions options (e.g., 720p, 1080i, 1080p, etc.)
  7.2.3 Tuner types (e.g., NTSC, PAL, ATSC, QAM, cable card, VSB, NDVBT, DVBS)
  7.2.4 Video processing (e.g., scalers, processors, up-conversion)
  7.2.5 Aspect ratios
  7.2.6 Video setup (calibration e.g., color balance, contrast, brightness, etc.)
  7.2.7 Digital video cable and connector types (e.g., DVI and HDMI — compatibility and interoperability issues)
7.3 Use MRAV (Multi-Room Audio/Video) standards if/when applicable

RSIM 8.0 — Assess, install and configure content management systems and describe their applications in a residential environment
8.1 Describe typical applications and physical connections of sources
  8.1.1 Media servers
  8.1.2 Media PC
  8.1.3 MP3 players
  8.1.4 DVD players
  8.1.5 Satellite
  8.1.6 Cable
  8.1.7 DVR
  8.1.8 Gaming systems
  8.1.9 Satellite radio
  8.1.10 Legacy devices
  8.1.11 Streaming media
8.2 Summarize types of media storage, methods to transfer and backup data
  8.2.1 Memory cards

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8.2.2 NAS devices (Network Attached Devices)
8.2.3 Remote storage
8.2.4 Local storage
8.2.5 Frequency of backup
8.3 Other connection considerations
8.3.1 Digital rights management

RSIM 9.0 — Implement, maintain and troubleshoot multi-room video systems.

9.1 Define signal types and their applications
9.1.1 Digital distribution (e.g., analog to IP converters, IP to analog converters, wireless distribution, IEEE 1394)
9.1.2 RF distribution characteristics. Identify and troubleshoot noise and interference. (e.g., splitters and taps, active and passive, attenuators, bidirectional, modulation and filtration, amplification, IR over COAX)
9.1.3 Analog Distribution (e.g., Composite, Component, and SVideo, Balun.)

9.2 Identify cable types and their applications
9.2.1 COAX (e.g., RG-59, RG-6, RG-6QS, DV, Serial data, CCS, BC)
9.2.2 CAT5/5e/6

9.3 Termination (e.g., RCA, BNC, and F)

9.4 Satellite
9.4.1 Multi-switches
9.4.2 Diplexer
9.4.3 LNB (Low Noise Block Down Converter)

Telephony/VoIP
RSIM 10.0 — Differentiate and describe POTS vs. VoIP delivery.

Identify and troubleshoot common issues

10.1 VoIP
10.1.1 Compatibility issues
10.1.2 Whole house distribution of VoIP
10.1.3 Performance and Quality of Service (QoS)

10.2 POTS
10.2.1 Cross talk
10.2.2 Radio interference
10.2.3 Dead ports
10.2.4 REN (Ringer Equivalence Number)

RSIM 11.0 — Describe and define fundamentals of telephone systems.

11.1 Multi-line
11.2 Paging
11.3 Intercom
11.4 Voice messaging/Unified messaging
11.5 Door entry/Gate entry
11.6 PBX
11.7 Key systems
11.8 Telecommunication services (e.g., caller ID, voice mail, rollover)

Security and Surveillance Systems
RSIM 12.0 — Maintain, configure and troubleshoot basic security systems and applications

12.1 Define monitored and notification methods
12.1.1 Phone line
12.1.2 Cellphone
12.1.3 Radio frequency
12.1.4 IP based

RSIM 13.0 — Describe basic security terminology and apply installation procedures and methodologies

13.1 Installation and configuration of security panel
13.1.1 Zone types
13.1.2 Delays
13.1.3 Battery backup and power supply requirements

13.2 Monitoring formats
13.2.1 SIA and Contact ID
13.2.2 4/2 and 3/1

13.3 Define types of peripherals and accessories
13.3.1 Motion sensors
13.3.2 Glass-break detectors
13.3.3 Magnetic contacts
13.3.4 Smoke fire (e.g., smoke detection, heat detection)
13.3.5 Environmental sensors (e.g., carbon monoxide, gas, water, temperature)
13.3.6 Vehicle detection
13.3.7 Photoelectric beam devices
13.3.8 Microwave beam devices
13.3.9 Pressure sensors
13.3.10 Sirens, strobes
13.3.11 Security keypads
13.3.12 Key fobs
13.3.13 Panic buttons

13.4 Describe security infrastructure types
13.4.1 Wired, 22/4- standard power devices, 22/2- Magnetic contacts, 2 and 4 conductor fire wire (e.g., keypads, sounders, power supplies, smoke and fire detectors), Power supervision relays, Polarity reversal relays, Line seizure, End of line resistors)

13.4.2 Wireless

13.5 Identify access control devices and protocols

13.5.1 Devices (e.g., keypads, card readers, biometric readers, proximity readers, door strikes, electronic deadbolts, magnetic locks)

13.5.2 Protocols (e.g., Weigand)

RSIM 14.0 — Identify, configure, install, maintain and troubleshoot security and surveillance cameras

14.1 Camera types

14.1.1 IP
14.1.2 Analog
14.1.3 Hybrid

14.2 Camera specifications

14.2.1 Lens type
14.2.2 Lux rating
14.2.3 Resolution
14.2.4 B&W vs. color
14.2.5 IR illumination
14.2.6 Power consumption

14.3 Camera applications

14.3.1 Indoor/outdoor
14.3.2 Day/night
14.3.3 Fixed vs. animated
14.3.4 Surveillance (e.g., door cams, nanny cams)
14.3.5 Recording (e.g., DVR, triggers—internal vs. external detection)
14.3.6 Sequencing vs. multiplexing

Home Control and Management

RSIM 15.0 — Identify user interfaces and their appropriate applications

15.1 Device types

15.1.1 Remote controls
15.1.2 Keypads
15.1.3 Touchscreens
15.1.4 Key fobs
15.1.5 Telephones
15.1.6 Smartphones

15.1.7 Cellphones
15.1.8 PDAs
15.1.9 Web tablets
15.1.10 Personal computers
15.1.11 Laptops

15.2 Describe the importance of simplicity and ease of use as it pertains to the end user

RSIM 16.0 — Define and recognize control systems that integrate subsystems in the home. Describe their functionality, characteristics and purpose

16.1 Embedded control systems and personal computer (PC) based control systems
16.1.1 Compatibility and interoperability issues

RSIM 17.0 — Identify commonly used communication protocols and their application

17.1 IR
17.2 Serial
17.3 IP
17.4 RF
17.5 Bluetooth
17.6 Contact closure
17.7 Inputs (zones)
17.8 Z-wave and Zigbee
17.9 ASCII
17.10 Proprietary protocols

RSIM 18.0 — Describe basic HVAC (Heating, Ventilation and Air Conditioning) terminology and install peripheral control devices

18.1 Control layer
18.1.1 Compatibility
18.2 Communication layer
18.2.1 Compatibility
18.2.2 IP based, wireless, serial and proprietary
18.3 Zones HVAC
18.3.1 Master slave configuration
18.3.2 Microprocessor controlled configuration
18.4 Programmable thermostats
18.5 Importance of referencing manufacturer specification and compatibility

RSIM 19.0 — Describe basic lighting terminology and install peripheral control devices

19.1 Identify lighting control applications
19.1.1 Indoor and outdoor
19.1.2 Centralized and distributed
19.1.3 Dimming
19.1.4 Scenes
19.1.5 Relay/switching
19.1.6 Occupancy/motion sensing
19.1.7 Time- and event-driven
19.1.8 Window treatments
19.1.9 Energy management
19.1.10 Security interface
19.1.11 Lighting connectivity
19.1.12 Motor speed control
19.2 Communication interface/bridge
19.2.1 Power line phase couplers
19.3 Identify lighting control protocols (Open standards)
  19.3.1 Z-wave
  19.3.2 ZigBee
  19.3.3 Powerline carrier (X10 protocol/PLC)
  19.3.4 UPB (Universal Powerline Bus)
19.4 Proprietary RF and proprietary low voltage
  19.4.1 Recognize compatibility issues

RSIM 20.0 — Identify and install component power protection devices
20.1 Identify whole house protection options
  20.1.1 Surge suppression
  20.1.2 Power conditioning
20.2 Identify and install point protection
  20.2.1 Surge protectors (high voltage and ancillary low voltage devices: e.g., satellite, CATV, etc.)
  20.2.2 UPS (uninterruptible power supply)
  20.2.3 Power conditioning

Troubleshooting Methodology and Documentation
RSIM 21.0 — Identify and apply the fundamentals of troubleshooting and diagnostics
21.1 Use of testing equipment
  21.1.1 Multimeter
  21.1.2 Telephone butt set
  21.1.3 Toner
  21.1.4 Signal generation
  21.1.5 Cable tester
21.2 Refer to prior documentation
21.3 Demonstrate when to communicate with technical support and what information is relevant
21.4 Troubleshoot common wireless interference issues: infrared, radio frequency, etc.
21.5 Identify demarcation and responsibilities of associated trades and/or utilities

RSIM 22.0 — Given a scenario, demonstrate how to apply troubleshooting skills to integrate subsystems
22.1 Networking
22.2 Audio/video
22.3 Telephony
22.4 Security
22.5 Home control

RSIM 23.0 — List and describe the benefits of verification of installation
23.1 Properly label wires
23.2 Wire mapping
23.3 Importance of documenting work upon completion
  23.3.1 Input/output verification for all systems
  23.3.2 Document wire placements
23.4 Certification of cable installation

RSIM 24.0 — Deliver appropriate manuals and documentation to the end user upon completion of installation.
24.1 Select, archive and appropriately distribute critical system information: Passwords, access codes, user IDs, credentials, etc.

RSIM 25.0 — Ability to safely measure AC and DC voltages
25.1 Measure AC and DC voltages using a digital multimeter (DMM)
25.2 Measure AC and DC current using a digital multimeter (DMM)
25.3 Measure the resistance of a circuit consisting of resistors using a digital multimeter (DMM)

RSIM 26.0 — Ability to test basic analog and digital circuits and repair them
26.1 Setup and operate test equipment for analog circuits
26.2 Troubleshoot switching power supplies
26.3 Analyze motor and phase control circuits
26.4 Apply logical and systematic approach to troubleshooting analog circuit devices
RSIM 27.0 — Ability to use multimeters and oscilloscopes and interpret results

27.1 Solve basic trigonometric problems as applicable to electronics (prerequisite to AC)
27.2 Identify properties of an AC signal
27.3 Identify AC sources
27.4 Analyze and measure AC signals using oscilloscope, frequency meters and generators
27.5 Analyze, construct and troubleshoot AC capacitive circuits, AC inductive circuits, RLC circuits (series, parallel, complex) series and parallel resonant circuits, filter circuits and polyphase circuits
27.6 Analyze basic motor theory and operation
27.7 Analyze basic generator theory and operation
27.8 Set up and operate oscilloscopes frequency counters, signal generators, capacitor-inductor analyzers and impedance bridges for AC circuits
27.9 Analyze and apply principles of transformers to AC circuits
Special Instructions to Contestants

Contest Name  Internet of Things

Chairperson: Hal Hawley

Due by Feb 28, 2020  Date submitted: Feb 24, 2020

Only Special Instructions received by Feb. 28, 2020 will be posted on the website!!

Other:

Added to SCOPE (Knowledge Performance)

The contest includes two written knowledge tests: the first is assessing general knowledge of residential electronics installation and maintenance including smart house technologies. The second is a customer service test that is the Electronics Technician Association-International, Customer Service Electronics Technology Specialist (CSS) exam. These may change as needs or standards are updated. If there is a need to change or revise the exam, the change will be posted on the NYS SkillsUSA website. Written portions may also exist during the skill portion of the contest.

Removed from SCOPE (Contest Guidelines)

Specific penalties will be assessed for the failure to properly use anti-static straps at all times when in contact with the computers and for the introduction of computer viruses into the contest computers. Penalties will be assessed at one point per occurrence, and notice of infractions will be communicated to the contestant when they occur.