

# **SkillsUSA**

## **2015 Contest Projects**

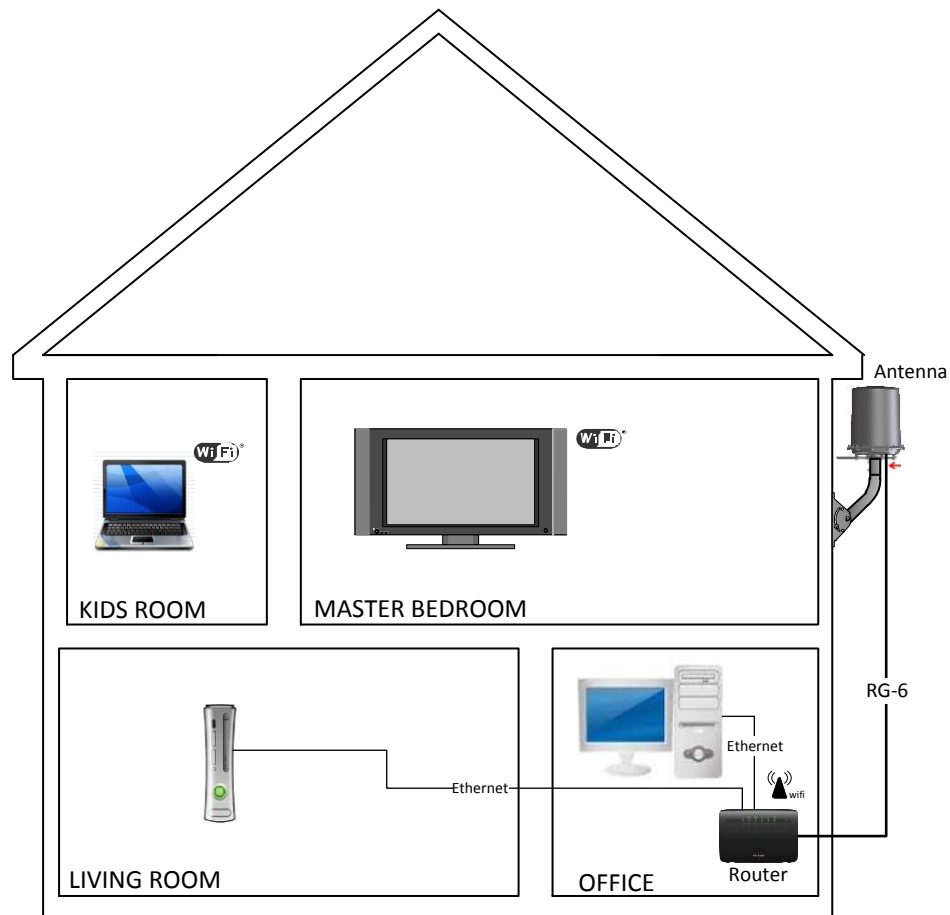
### **Residential Systems Installation and Maintenance**

Click the “Print this Section” button above to automatically print the specifications for this contest. Make sure your printer is turned on before pressing the button.

# HomeFusion Program Overview

HomeFusion Broadband is a new suite of 4G based products and services that will allow customers to have access to the internet using a fixed “wireless” solution. There are two primary components that enable the service.

1. The external HomeFusion Antenna (referred to as “**Antenna**” throughout this document) is to be mounted on the residential structure.
2. HomeFusion Broadband Router (referred to as “**Router**” throughout this document) receives its signal from the Antenna over a single RG-6 coaxial cable. This same cable will also power the Antenna via a power inserter. The Router will function as both a broadband modem as well as a wired and wireless Router.



# Network/Service Provider Overview

Technicians will be required to install and perform repairs (through replacement) to the HomeFusion product line. This will consist of NEWAsurion inventorying and shipping equipment to the installer network which NEWAsurion will manage to ensure installation or repair of equipment.

A set of equipment necessary to establish a working system includes an Antenna, Router, bracket, and power supply. The Router and power supply will be installed inside a customer's home. Installations will occur between 5-7 business days from order date at Verizon. Business days are defined as M-SAT excluding national holidays.

## Installation Service:

1. Dispatch is sent to installer of installation
2. Installer receives product
3. Installer installs product and activates equipment with Verizon Wireless
4. Installer notifies NEW via service bench interface of equipment installed and any identified defective equipment

## Repair Service

1. Customer calls Verizon Wireless to notify of failed equipment
2. Verizon Wireless triages and determines defective equipment and schedules repair for **next day**
3. Dispatch is sent to installer of repair
4. Existing equipment at installer will be used to replace defective equipment.
5. Installer replaces defective product
6. Installer notifies NEW via service bench interface of equipment installed
7. If needed, shipment is sent to installer to replace used stock / supply of repair

# Branding & Badge Requirements

All approved and screened Technicians will be issued the following branded material:

1. Client Photo ID Badge
2. Client Branded Shirt
3. Client Branded Door Hangers



The shirt and badge must be worn and displayed in a professional manner at all times from the point of arrival to final departure. The door hanger should be placed on the front door in case the customer is not home.

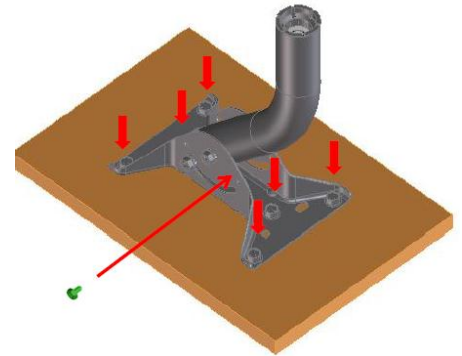
# Installation Instructions

## HomeFusion Equipment Needed for Installation

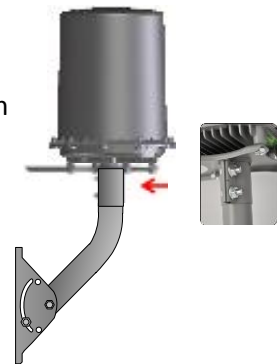
HomeFusion Broadband Antenna	HomeFusion Broadband Router
 <p>Width = 8"- Height = 10"- Weight = 4 lbs.</p>	 <p><b>Router Box also includes</b></p> <ul style="list-style-type: none"> <li>• Separate Power Supply</li> <li>• RJ11 cable</li> <li>• RJ45 cable (CAT5E)</li> </ul>
Test Battery Power Supply	21 VDC Power Inserter
	
Pedestal Assembly & Mounting Plate	Signal Test Tool (STT): LG Revolution 4G phone (un-activated)
	

# Antenna and Bracket Installation

1. Determine stud centers using tape measure and or stud finder
2. Mark bolt holes using Pedestal holes
3. Pre Drill holes into wood studs before installation of lag bolts
4. Tighten the ground screw to the pedestal base plate to securely ground the wire later
  - \* Use pitch patch or roof tar in drilled holes for roof mounts
5. Insert 4 screws through Pedestal to the wall surface
6. A bubble level is located on the top of the pedestal assemble to assist with alignment
7. Using the bubble level, level the Pedestal, tighten nuts
8. Adjust the rotation angle of bracket versus the arm axially until the bubble level on the bracket is centered
9. Fully tighten the mast screws after confirming the mast angle



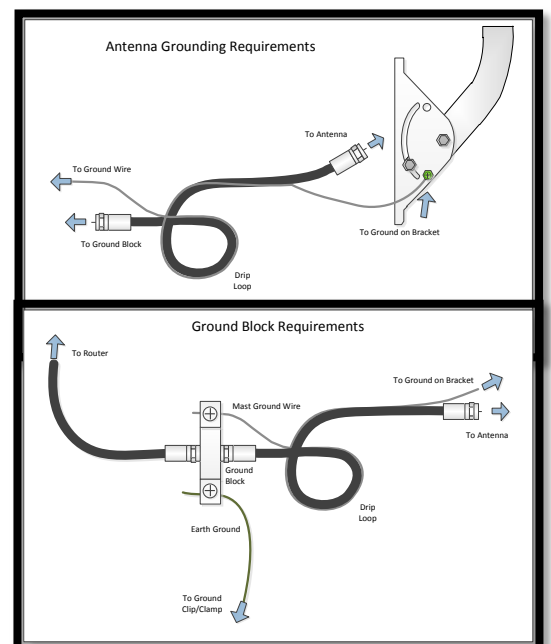
10. Remove the protective pulp and place the Antenna over the pedestal mount. Tighten the 2 screws on the mounting plate.
11. Tighten F-Connector of coaxial cable to Antenna
12. Secure Ground wire to ground screw on pedestal base plate



## Cable Routing

### Coax Cabling

- Run RG-6 cable w/17 AWG CCS attached ground wire from Antenna mounting location to ground bonding location. Use cable flex clips for all vertical and horizontal cable runs. Attach 17ga CCS ground wire to Antenna foot plate using a UL listed Green in color self-taping screw. Details on grounding can be found in section 6 of this guide.
- Mount Ground block (Ground block cannot be farther than 20ft from the ground bonding point or common house ground), Attach 17AWG CCS ground wire to ground block. Perform ground bonding – Note bonding must comply with NEC state and local codes. Attach 17AWG CCS ground wire to ground block.



# HomeFusion Broadband Router Installation

The Router will be pre-configured to operate with the HomeFusion Broadband network. Ask customer which PC / MAC they want connected and whether they want it connected via Wi-Fi or Ethernet cable.

**If Wi-Fi, Complete Steps 1-5**

**If Ethernet, Complete Steps 1-6**

- **Step 1** - Connect coax cable from Power Inserter (Signal to Home) to Router (Coaxial WAN port)
- **Step 2** - Connect coax cable from Power Inserter (Power to ODU) to Antenna power port (red). LED will initially turn red once communication is established, LED will turn green.
- **Step 3** - Connect the Power Inserter to AC Outlet
- **Step 4** - Connect the Router 12 VDC power supply to AC Outlet
- **Step 5** – Turn Router power switch to “ON” position.
- **Step 6** - Connect Router via Ethernet cable (port 1) into the Ethernet port on the computer.

## Pay Rates for Installers

- Installation Pay Rate = \$90
- Repair Pay Rate = \$75
- Mileage Rate beyond 35 mile radius = \$1 per mile
- Customer Same Day Cancellation = \$50

# Residential Systems Installation and Maintenance

Test consists of 100 questions. Timed test – 100 minutes allowed.

The questions come from seven main categories:

<u>Category</u>	<u># Questions</u>	<u>Weighting</u>
1. Electronic Systems Technical Skills	17	17%
2. IP Networking	25	25%
3. Audio / Video	20	20%
4. Home Theater	13	13%
5. Security and Access Control	7	7%
6. Integrated Control	12	12%
7. Troubleshooting	6	6%
<b>TOTAL</b>	<b>100</b>	<b>100%</b>

## EST Skills

- The device normally used at the point where the telephone or cable company's responsibility ends and the homeowner's responsibility begins is called \_\_\_\_\_.
  - Demarc
  - NIC
  - DDI
  - NIB
- \_\_\_\_\_ is the technology infrastructure transmission standard in use today.
  - POTS
  - TCP/IP
  - IP
  - Windows RCP
- When wiring a steel-framed building, use the cutouts in the metal framing material and use a \_\_\_\_\_ to protect the cable.
  - grommet
  - piece of PVC conduit
  - nail guard
  - warning tag
- Ohm's law states the voltage in a circuit is equal to the current times the resistance.
  - True
  - False
- To help protect against Electromagnetic Interference, EMI, use a cable with \_\_\_\_\_.
  - shielding
  - a large gauge
  - solid conductors
  - stranded conductors

6. Keypads should be mounted \_\_\_\_\_ inches AFF, Above Finished Floor.
- 24 to 36
  - 12 to 24
  - 48 to 52
  - 72 to 84
7. When installing Cat-5e cable, the minimum bend radius to maintain is \_\_\_\_\_.
- 1/2 inch
  - 1 inch
  - 1½ inches
  - 2 inches
8. To avoid EMI, place low voltage cables parallel to, and a minimum of \_\_\_\_\_ inches from electrical power cables, and preferably \_\_\_\_\_ inches.
- 2, 12
  - 6, 12
  - 12, 24
  - 24, 36
9. When terminating Category 5e cable on a 66 block or 110 block, use \_\_\_\_\_ termination.
- IDC, Insulation Displacement Contact
  - IDC, Installation Direct Contact
  - RJ-45
  - RJ-31
10. Every EST should consider industry certification to \_\_\_\_\_.
- offer verification of their skills
  - differentiate their firm from the competition
  - provide a value-added service to their firm
  - all of the above
11. \_\_\_\_\_ occurs when two or more components have different ground connections and current flows on the shields between the equipment.
- ground leak
  - ground loop
  - crosstalk
  - EMI
12. Damage to cables, or cables and connections exposed to water, may cause \_\_\_\_\_, resulting in noise entering the signal path, causing hiss, crosstalk and hum in audio, and flickering, hum bars and reduced output in video.
- EMI
  - ground leak
  - crosstalk
  - RFI



13. When terminating UTP cable pairs, the maximum each pair can be untwisted is \_\_\_\_\_.  
a. None  
b. ½ inch  
c. 1 inch  
d. does not matter
14. All cables are marked with a designation suffix showing where the cable may be used. A cable marked with "P" is designed to be used in \_\_\_\_\_.  
a. general purpose settings  
b. risers or between floors  
c. commercial properties  
d. plenum spaces, above ceilings and below floors
15. The minimum bend radius for RG-6 coaxial cable is \_\_\_\_\_.  
a. 1 inch  
b. 2 inches  
c. 3 inches  
d. 4 inches
16. Signal performance over wire can be impacted by \_\_\_\_\_. (Select all that apply)  
a. Crosstalk  
b. Attenuation  
c. Resistance  
d. termination
17. To reduce interference within a Cat 5 twisted pair cable the pairs are all twisted in the same direction.  
a. True  
b. False

## IP Networking

18. Electronic Static Discharge, ESD, is the \_\_\_\_\_.  
a. loss of a signal as it moves away from its source  
b. interference of a signal with other electronic devices, such as fluorescent lights  
c. deterioration of network signal due to static electricity in low humidity environments  
d. transfer of static electricity from you to components, potentially causing serious damage to equipment
19. The role of a switch on a home network is to \_\_\_\_\_.  
a. isolate the home network from the Internet  
b. allow the home network to connect to other home networks  
c. allow the home network to be viewed from the Internet  
d. provide the physical connection between the router and other network devices
20. The class of IP addresses called \_\_\_\_\_ has only 254 hosts per network and is used for most home networks.  
a. Class A  
b. Class B  
c. Class C  
d. Class D

21. A typical router has \_\_\_\_ IP address(es) and \_\_\_\_\_.  
a. One, is used to connect to the LAN  
b. One, is used to connect to the Internet  
c. Two, one is for the Web and one is for the Internet  
d. Two, one shows privately on the LAN and the other shows publicly on the Internet
22. To configure the router to only accept LAN traffic from the firewall, set up the router to \_\_\_\_\_.  
a. only accept traffic from the NetBIOS name of the firewall  
b. only accept traffic from the MAC address of the firewall  
c. physically connect to the firewall with a crossover cable  
d. none of the above
23. When creating a DHCP server in the router for a client's home network, use a private IP Address range. \_\_\_\_\_ is considered a private IP address range.  
a. 132.5.1.1-10  
b. 120.2.1.1-10  
c. 192.168.0.1-10  
d. 11.11.11.11-21
24. \_\_\_\_\_ is a valid IP address.  
a. google.com  
b. 198.2.64.12.3  
c. 192.259.0.1  
d. 192.168.0.2  
e. All of the above
25. A domain name server assigns a name to a MAC address.  
a. True  
b. False
26. The benefit(s) of NAT include \_\_\_\_\_.  
a. Enabling the use of more internal IP addresses  
b. Providing security by hiding internal IP addresses  
c. Allowing the entire home network to use only one external IP address  
d. A and B  
e. All of the above
27. The operating frequency of the IEEE 802.11b Wi-Fi version is \_\_\_\_\_.  
a. 100 MHz  
b. 600 MHz  
c. 900 MHz  
d. 1000 MHz  
e. 2.4 GHz
28. When wiring a network in a residence, follow the \_\_\_\_\_ wiring standard.  
a. POTS  
b. T568A  
c. T568B  
d. T568P

29. A computer in each bedroom, a printer in the home office, IP security cameras, and a media server in the living room can best be described as a:
- WAN
  - LAN
  - MAN
  - None of the above
30. Use a \_\_\_\_\_ connector on a Cat 5e Ethernet network cable.
- RJ-11
  - RJ-45
  - XLR
  - BNC
31. The color pairs in Cat 5e cable are \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_ and \_\_\_\_\_.
- blue, red, yellow, green
  - brown, green, orange, red
  - green, orange, yellow, blue
  - orange, brown, green, blue
32. A MAC address is the physical or hardware address of a network device and is assigned by the \_\_\_\_\_.
- manufacturer
  - modem
  - network device
  - router
33. Port numbers are used to send and receive data. Web browsing uses port \_\_\_\_\_ and sending email uses port \_\_\_\_\_.
- 20, 80
  - 25, 80
  - 80, 20
  - 80, 25
34. Use a \_\_\_\_\_ to protect against intruders external to the network.
- Firewall
  - Proxy Server
  - Switch
  - MAC
35. Wireless signals from a WAP can be stopped from traveling outside the home by \_\_\_\_\_.
- distance configuration in WAP setup
  - installing WAP reflectors around the outside of the home
  - A and B
  - None of the above
36. When connecting to a wireless network, the SSID is required. This is obtained by \_\_\_\_\_.
- entering the WEP key in the WAP
  - entering the pass phrase in the WAP
  - listening to the WAP broadcast
  - request settings from the router

37. DNS (Domain Name Service) automatically assigns unique IP addresses to network devices when they are turned on and connected to a network.
- a. True
  - b. False
38. The maximum length of a complete network segment built with 10BaseT Cat-5e cable should not exceed \_\_\_\_.
- a. 10 meters
  - b. 85 meters
  - c. 100 meters
  - d. 100 feet
39. The assignment of IP addresses to devices is typically handled by the \_\_\_\_\_ process.
- a. DNS
  - b. DHCP
  - c. NAT
  - d. MAC
40. When discussing networking technologies, the “10” in the term “10BaseT” stands for the \_\_\_\_\_.
- a. number of conductors used in the cable
  - b. data rate in megabytes per second
  - c. data rate in megabits per second
  - d. diameter of the cable
41. The amount of time it takes a VoIP packet to reach its destination is known as \_\_\_\_\_.
- a. latency
  - b. jitter specification
  - c. codec
  - d. QOS, Quality of Service
42. A three jack video system is commonly called \_\_\_\_\_ ?
- a. VGA video
  - b. S-Video
  - c. Composite Video
  - d. Component Video

## Audio / Video

43. A surround sound system with the following channels: Left, Center, Right, Subwoofer, Left-rear, and Right-rear, is called \_\_\_\_\_.
- a. Dolby Digital
  - b. 5.1
  - c. 6.0
  - d. 6.1
44. The coaxial cables used for antennas and distributing video signals typically have \_\_\_\_\_ impedance.
- a. 53 ohms
  - b. 300 ohms

- c. 90 ohms
- d. 75 ohms

45. When turning on the audio system the amplifier shuts down, this problem could be caused by \_\_\_\_\_.

- a. an open wire to the speaker
- b. a shorted speaker
- c. the system is muted
- d. a disconnected input

46. If one speaker is out of phase with the other, it will \_\_\_\_\_.

- a. have no effect on the system or sound
- b. damage the speaker(s)
- c. damage the amplifier
- d. work but will have no depth of field

47. If there are horizontal bars moving up or down through a monitor connected by composite video, most likely the video cable is \_\_\_\_\_.

- a. shorted
- b. too close to electrical wiring
- c. too long
- d. kink in it

48. Subwoofers are used to reproduce low frequency sound which is \_\_\_\_\_.

- a. deep
- b. non-directional
- c. directional
- d. sonic

49. In a multi-room audio system a 'zone' is an area or group of rooms that \_\_\_\_\_.

- a. functions as an independent source of music
- b. receives audio from the system
- c. distributes video to the system
- d. All of the above

50. Sound is measured in \_\_\_\_\_.

- a. mL
- b.  $\Omega$
- c. dB
- d. W

51. Amplifier power is expressed in watts, and the sound generated by speakers is measured in decibels (dB).

- a. True
- b. False

52. As the length of a wire run increases, \_\_\_\_\_ also increases.

- a. Resistance
- b. Wattage
- c. Interference
- d. frequency response

53. In a whole house audio system with four rooms of stereo speakers driven with only a single amplifier at the head-end \_\_\_\_\_ volume controls must be used.
- a. impedance matching
  - b. standard
  - c. non-impedance matching
  - d. switching
54. If you measure the sound from a speaker to be 87dB at 50 Watts, to get 90dB from the speaker you will need \_\_\_\_\_ watts.
- a. 25
  - b. 50
  - c. 100
  - d. 200
55. As resistance increases, impedance increases.
- a. True
  - b. False
56. The standard screen aspect ratio for HDTV is \_\_\_\_\_.
- a. 4:3
  - b. 1:1
  - c. 16:9
  - d. None of the above
57. Video displays using \_\_\_\_\_ scanning to 'paint' images on the screen can produce a better image than \_\_\_\_\_ scanning at the same resolution.
- a. SDTV, EDTV
  - b. progressive, interlaced
  - c. EDTV, HDTV
  - d. interlace, progressive
58. Plasma displays typically offer a wider viewing angle than LCD displays.
- a. True
  - b. False
59. A video output format that usually uses 3 RCA connectors is called \_\_\_\_\_ and is a(an) \_\_\_\_\_ signal.
- a. component, analog
  - b. composite, analog
  - c. s-video, analog
  - d. component, digital
60. Digital video signals can be sent over \_\_\_\_\_ video outputs.
- a. composite
  - b. component
  - c. HDMI
  - d. RGBHV
61. A 15 pin D-Sub connector is typically used to output \_\_\_\_\_ signals from computers to video displays.
- a. VGA
  - b. HDMI

- c. DVI
- d. A and B

62. The most basic video signal is \_\_\_\_\_.
- a. component video
  - b. S-VHS
  - c. DVI video
  - d. composite video

## Home Theater

63. Which remote control technology does not require the remote to be pointed at the device it is operating?
- a. Infrared
  - b. TCP/IP
  - c. RF
  - d. Both B and C above
64. The purpose of an Real Time Analyzer, RTA, is to:
- a. Measure color temperature
  - b. Determine the distortion on an audio frequency
  - c. Determine loudness at specific frequencies
  - d. None of the above
65. IR Leakage occurs when:
- a. IR wires are not insulated properly
  - b. Too much power is applied to the IR blaster
  - c. More than one component sees the IR blaster
  - d. An IR blaster is cracked
66. An SPL Meter would most likely be used during the \_\_\_\_\_ stage.
- a. pre-wire
  - b. calibration
  - c. installation
  - d. trim-out
67. Video signals are many. The one to use for the best image is \_\_\_\_\_.
- a. Component video
  - b. HDMI video
  - c. Composite video
  - d. S-Video
68. If the room has high ambient light you would NOT want to use \_\_\_\_\_.
- a. rear projection
  - b. front projection
  - c. PDP direct view
  - d. LCD direct view
69. The "p" in 1080p stands for progressive scanning.
- a. True
  - b. False

70. A UPS protects home theater components from \_\_\_\_\_.  
a. lightning strikes  
b. programming changes by the user  
c. memory loss during a power outage  
d. voltage spikes
71. The amount of wattage required for an amplifier in a home theater is a function of the \_\_\_\_\_.  
a. efficiency of the speakers  
b. distance from the speaker to the listener  
c. desired volume level at the listener  
d. all of the above
72. To deal with the heat generated by home theater equipment \_\_\_\_\_.  
a. use portable fans to circulate the room air  
b. turn off the equipment when not in use  
c. keep the room temperature low  
d. build in ventilation for the equipment
73. Video calibration typically covers  
a. contrast (white level) and brightness (black level)  
b. sharpness  
c. color hue, saturation and temperature  
d. all of the above
74. When aligning a projector, the \_\_\_\_\_ option will help make the image perfectly square.  
a. lens shift  
b. zoom  
c. keystone  
d. focus
75. To increase the volume by 3db you must \_\_\_\_\_ the wattage.  
a. double  
b. triple  
c. half  
d. none of the above

## Security and Surveillance

76. A contact that has no continuity when not activated is said to be \_\_\_\_\_.  
a. normally closed (NC)  
b. normally open (NO)  
c. Defective  
d. An EOL device
77. Series wired contact sensors use \_\_\_\_\_ contacts.  
a. multiple  
b. normally closed  
c. normally open  
d. tripped



78. A security system uses a \_\_\_\_\_ jack to seize the phone line in an alarm situation.
- a. RJ-31X
  - b. RG-31
  - c. RJ-45
  - d. RG-59
79. To maximize contrast, it is recommended to use a(an) \_\_\_\_\_ camera.
- a. Color
  - b. Black and white
  - c. Infrared
  - d. UV
80. A camera that can only track horizontal movement is known as a \_\_\_\_\_ camera.
- a. IP
  - b. PTZ
  - c. Pan
  - d. stationary
81. The minimum light level a camera can capture a clear image is expressed in the \_\_\_\_\_ rating in the camera specifications.
- a. watts
  - b. lumens
  - c. PTZ
  - d. lux
82. In areas where light is not sufficient for surveillance cameras, \_\_\_\_\_ are used.
- a. IR illuminators
  - b. color cameras
  - c. spot lights
  - d. PTZ cameras

## Integrated Control

83. A home control system uses Ethernet to communicate between the controller and 10 remote devices. To communicate to all remote devices, the controller must have \_\_\_\_\_ Ethernet ports.
- a. 1
  - b. 2
  - c. 3
  - d. 5
  - e. 10
84. The process of having a series of commands operate from a single button press is known as
- a. Auto program
  - b. Scene
  - c. Macro
  - d. Step-by-step

85. The total wattage of all the devices connected to a lighting control device is typically known as the \_\_\_\_\_.
- a. total load
  - b. lighting budget
  - c. circuit size
  - d. control current
86. A single HVAC system that uses two thermostats and maintains independent temperatures in two areas is called a \_\_\_\_\_ system.
- a. split
  - b. two-zone
  - c. dual-thermo
  - d. duplex
87. HomePlug devices communicate using \_\_\_\_\_.
- a. power lines
  - b. phone lines
  - c. RF
  - d. phono plugs
88. A homeowner is considering using Bluetooth-enabled devices for various functions. \_\_\_\_\_ is the maximum recommended distance for a Bluetooth device to communicate reliably.
- a. 12 feet
  - b. 30 feet
  - c. 75 feet
  - d. 150 feet
89. In a home control system, use the \_\_\_\_\_ feature to turn lights on and off based on a specific time of day.
- a. solar motion sensor
  - b. astronomical timer
  - c. photo sensor
  - d. clock timer
90. \_\_\_\_\_ is the best type of user interface for a home control system.
- a. Keypad
  - b. Computer
  - c. Remote control
  - d. Let the homeowner decide
91. A lighting control system can control \_\_\_\_\_.
- a. individual lamps
  - b. lighting scenes
  - c. window treatments
  - d. All of the above
92. An HVAC thermostat needs \_\_\_\_\_ volts traveling on the \_\_\_\_\_ color wire to operate.
- a. 24 , yellow
  - b. 24 , red

- c. 48 , yellow
- d. 48 , red

93. Power surges can come from \_\_\_\_\_. *Select all that apply*
- a. power fluctuations from the power company
  - b. high power use devices in the home
  - c. wireless transmitters
  - d. master controller
94. When power is lost, a(n) \_\_\_\_\_ is used to keep constant power for critical equipment.
- a. HVAC
  - b. UPS
  - c. KSU
  - d. PTZ

## Troubleshooting Methodology and Documentation

95. An Uninterruptible Power Supply \_\_\_\_\_.
- a. switches from AC to battery power when it detects an AC power line fault
  - b. provides AC power through an inverter, powered by batteries, that are charged from the AC line
  - c. switches to an alternate AC power circuit when it detects a disturbance on the current AC power circuit
  - d. Starts an AC power generator when it detects an AC power line fault
96. OSHA is an acronym for \_\_\_\_\_.
- a. Organization for Safe Home Appliances
  - b. Occupational Safety and Health Administration
  - c. Organization of Shared Home Appliances
  - d. Organization for Safety in Home Applications
97. NEC is an acronym for \_\_\_\_\_.
- a. National Electrical Code
  - b. Nominal Electrical Current
  - c. National Electronics Certification
  - d. Network Enhanced Channel
  - e. Normally Exposed Conductor
98. MSDS is an acronym for \_\_\_\_\_.
- a. Material Safety Data Sheet
  - b. Manufacturers Summary of Data Speeds
  - c. Manufacturers Supply Depot Summary
  - d. Massively Serial Data Stream
99. A surge from a lightning strike can enter a home through \_\_\_\_\_.
- a. cable service feed
  - b. electrical service feed
  - c. outdoor speakers
  - d. All of the above

100. If two computers both have the same IP address, they will \_\_\_\_\_.
- a. be able to communicate with each other
  - b. not be able to communicate with each other
  - c. communicate with each other but not the Internet
  - d. None of the above

#### Pass/Fail message

You have now completed the SkillsUSA Residential Systems and Maintenance Test.

#### Instructions

You will have 90 minutes to complete this test.  
The Test consists of 100 questions.  
You must answer a question to move on to the next question.  
GOOD LUCK!

## EST Skills

1. The device normally used at the point where the telephone or cable company's responsibility ends and the homeowner's responsibility begins is called \_\_\_\_\_.
  - a. Demarc
  - b. NIC
  - c. DDI
  - d. NIB
  
2. \_\_\_\_\_ is the technology infrastructure transmission standard in use today.
  - a. POTS
  - b. TCP/IP
  - c. IP
  - d. Windows RCP
  
3. When wiring a steel-framed building, use the cutouts in the metal framing material and use a \_\_\_\_\_ to protect the cable.
  - a. grommet
  - b. piece of PVC conduit
  - c. nail guard
  - d. warning tag
  
4. Ohm's law states the voltage in a circuit is equal to the current times the resistance.
  - a. True
  - b. False
  
5. To help protect against Electromagnetic Interference, EMI, use a cable with \_\_\_\_\_.
  - a. shielding
  - b. a large gauge
  - c. solid conductors
  - d. stranded conductors
  
6. Keypads should be mounted \_\_\_\_\_ inches AFF, Above Finished Floor.
  - a. 24 to 36
  - b. 12 to 24
  - c. 48 to 52
  - d. 72 to 84

7. When installing Cat-5e cable, the minimum bend radius to maintain is \_\_\_\_\_.  
a. 1/2 inch  
b. 1 inch  
c. 1½ inches  
d. 2 inches
8. To avoid EMI, place low voltage cables parallel to, and a minimum of \_\_\_\_\_ inches from electrical power cables, and preferably \_\_\_\_\_ inches.  
a. 2, 12  
b. 6, 12  
c. 12, 24  
d. 24, 36
9. When terminating Category 5e cable on a 66 block or 110 block, use \_\_\_\_\_ termination.  
a. IDC, Insulation Displacement Contact  
b. IDC, Installation Direct Contact  
c. RJ-45  
d. RJ-31
10. Every EST should consider industry certification to \_\_\_\_\_.  
a. offer verification of their skills  
b. differentiate their firm from the competition  
c. provide a value-added service to their firm  
d. all of the above
11. \_\_\_\_\_ occurs when two or more components have different ground connections and current flows on the shields between the equipment.  
a. ground leak  
b. ground loop  
c. crosstalk  
d. EMI
12. Damage to cables, or cables and connections exposed to water, may cause \_\_\_\_\_, resulting in noise entering the signal path, causing hiss, crosstalk and hum in audio, and flickering, hum bars and reduced output in video.  
a. EMI  
b. ground leak  
c. crosstalk  
d. RFI

13. When terminating UTP cable pairs, the maximum each pair can be untwisted is \_\_\_\_\_.  
a. None  
b. ½ inch  
c. 1 inch  
d. does not matter
14. All cables are marked with a designation suffix showing where the cable may be used. A cable marked with "P" is designed to be used in \_\_\_\_\_.  
a. general purpose settings  
b. risers or between floors  
c. commercial properties  
d. plenum spaces, above ceilings and below floors
15. The minimum bend radius for RG-6 coaxial cable is \_\_\_\_\_.  
a. 1 inch  
b. 2 inches  
c. 3 inches  
d. 4 inches
16. Signal performance over wire can be impacted by \_\_\_\_\_. (Select all that apply)  
a. Crosstalk  
b. Attenuation  
c. Resistance  
d. termination
17. To reduce interference within a Cat 5 twisted pair cable the pairs are all twisted in the same direction.  
a. True  
b. False

## IP Networking

18. Electronic Static Discharge, ESD, is the \_\_\_\_\_.  
a. loss of a signal as it moves away from its source  
b. interference of a signal with other electronic devices, such as fluorescent lights  
c. deterioration of network signal due to static electricity in low humidity environments  
d. transfer of static electricity from you to components, potentially causing serious damage to equipment

19. The role of a switch on a home network is to \_\_\_\_\_.
- a. isolate the home network from the Internet
  - b. allow the home network to connect to other home networks
  - c. allow the home network to be viewed from the Internet
  - d. provide the physical connection between the router and other network devices
20. The class of IP addresses called \_\_\_\_\_ has only 254 hosts per network and is used for most home networks.
- a. Class A
  - b. Class B
  - c. Class C
  - d. Class D
21. A typical router has \_\_\_\_\_ IP address(es) and \_\_\_\_\_.
- a. One, is used to connect to the LAN
  - b. One, is used to connect to the Internet
  - c. Two, one is for the Web and one is for the Internet
  - d. Two, one shows privately on the LAN and the other shows publicly on the Internet
22. To configure the router to only accept LAN traffic from the firewall, set up the router to \_\_\_\_\_.
- a. only accept traffic from the NetBIOS name of the firewall
  - b. only accept traffic from the MAC address of the firewall
  - c. physically connect to the firewall with a crossover cable
  - d. none of the above
23. When creating a DHCP server in the router for a client's home network, use a private IP Address range. \_\_\_\_\_ is considered a private IP address range.
- a. 132.5.1.1-10
  - b. 120.2.1.1-10
  - c. 192.168.0.1-10
  - d. 11.11.11.11-21
24. \_\_\_\_\_ is a valid IP address.
- a. google.com
  - b. 198.2.64.12.3
  - c. 192.259.0.1
  - d. 192.168.0.2
  - e. All of the above
25. A domain name server assigns a name to a MAC address.
- a. True
  - b. False



26. The benefit(s) of NAT include \_\_\_\_\_.

- a. Enabling the use of more internal IP addresses
- b. Providing security by hiding internal IP addresses
- c. Allowing the entire home network to use only one external IP address
- d. A and B
- e. All of the above

27. The operating frequency of the IEEE 802.11b Wi-Fi version is \_\_\_\_\_.

- a. 100 MHz
- b. 600 MHz
- c. 900 MHz
- d. 1000 MHz
- e. 2.4 GHz

28. When wiring a network in a residence, follow the \_\_\_\_\_ wiring standard.

- a. POTS
- b. T568A
- c. T568B
- d. T568P

29. A computer in each bedroom, a printer in the home office, IP security cameras, and a media server in the living room can best be described as a:

- a. WAN
- b. LAN
- c. MAN
- d. None of the above

30. Use a \_\_\_\_\_ connector on a Cat 5e Ethernet network cable.

- a. RJ-11
- b. RJ-45
- c. XLR
- d. BNC

31. The color pairs in Cat 5e cable are \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_ and \_\_\_\_\_.

- a. blue, red, yellow, green
- b. brown, green, orange, red
- c. green, orange, yellow, blue
- d. orange, brown, green, blue

32. A MAC address is the physical or hardware address of a network device and is assigned by the \_\_\_\_\_.

- a. manufacturer
- b. modem
- c. network device
- d. router

33. Port numbers are used to send and receive data. Web browsing uses port \_\_\_\_\_ and sending email uses port \_\_\_\_\_.

- a. 20, 80
- b. 25, 80
- c. 80, 20
- d. 80, 25

34. Use a \_\_\_\_\_ to protect against intruders external to the network.

- a. Firewall
- b. Proxy Server
- c. Switch
- d. MAC

35. Wireless signals from a WAP can be stopped from traveling outside the home by \_\_\_\_\_.

- a. distance configuration in WAP setup
- b. installing WAP reflectors around the outside of the home
- c. A and B
- d. None of the above

36. When connecting to a wireless network, the SSID is required. This is obtained by \_\_\_\_\_.

- a. entering the WEP key in the WAP
- b. entering the pass phrase in the WAP
- c. listening to the WAP broadcast
- d. request settings from the router

37. DNS (Domain Name Service) automatically assigns unique IP addresses to network devices when they are turned on and connected to a network.

- a. True
- b. False

38. The maximum length of a complete network segment built with 10BaseT Cat-5e cable should not exceed \_\_\_\_\_.

- a. 10 meters
- b. 85 meters
- c. 100 meters
- d. 100 feet

39. The assignment of IP addresses to devices is typically handled by the \_\_\_\_\_ process.

- a. DNS
- b. DHCP
- c. NAT
- d. MAC

40. When discussing networking technologies, the “10” in the term “10BaseT” stands for the \_\_\_\_\_.

- a. number of conductors used in the cable
- b. data rate in megabytes per second
- c. data rate in megabits per second
- d. diameter of the cable

41. The amount of time it takes a VoIP packet to reach its destination is known as \_\_\_\_\_.

- a. latency
- b. jitter specification
- c. codec
- d. QOS, Quality of Service

42. A three jack video system is commonly called \_\_\_\_\_ ?

- a. VGA video
- b. S-Video
- c. Composite Video
- d. Component Video

## Audio / Video

43. A surround sound system with the following channels: Left, Center, Right, Subwoofer, Left-rear, and Right-rear, is called \_\_\_\_\_.

- a. Dolby Digital
- b. 5.1
- c. 6.0
- d. 6.1

44. The coaxial cables used for antennas and distributing video signals typically have \_\_\_\_\_ impedance.
- a. 53 ohms
  - b. 300 ohms
  - c. 90 ohms
  - d. 75 ohms
45. When turning on the audio system the amplifier shuts down, this problem could be caused by \_\_\_\_\_.
- a. an open wire to the speaker
  - b. a shorted speaker
  - c. the system is muted
  - d. a disconnected input
46. If one speaker is out of phase with the other, it will \_\_\_\_\_.
- a. have no effect on the system or sound
  - b. damage the speaker(s)
  - c. damage the amplifier
  - d. work but will have no depth of field
47. If there are horizontal bars moving up or down through a monitor connected by composite video, most likely the video cable is \_\_\_\_\_.
- a. shorted
  - b. too close to electrical wiring
  - c. too long
  - d. kink in it
48. Subwoofers are used to reproduce low frequency sound which is \_\_\_\_\_.
- a. deep
  - b. non-directional
  - c. directional
  - d. sonic
49. In a multi-room audio system a 'zone' is an area or group of rooms that \_\_\_\_\_.
- a. functions as an independent source of music
  - b. receives audio from the system
  - c. distributes video to the system
  - d. All of the above

50. Sound is measured in \_\_\_\_\_.

- a. mL
- b.  $\Omega$
- c. dB
- d. W

51. Amplifier power is expressed in watts, and the sound generated by speakers is measured in decibels (dB).

- a. True
- b. False

52. As the length of a wire run increases, \_\_\_\_\_ also increases.

- a. Resistance
- b. Wattage
- c. Interference
- d. frequency response

53. In a whole house audio system with four rooms of stereo speakers driven with only a single amplifier at the head-end \_\_\_\_\_ volume controls must be used.

- a. impedance matching
- b. standard
- c. non-impedance matching
- d. switching

54. If you measure the sound from a speaker to be 87dB at 50 Watts, to get 90dB from the speaker you will need \_\_\_\_\_ watts.

- a. 25
- b. 50
- c. 100
- d. 200

55. As resistance increases, impedance increases.

- a. True
- b. False

56. The standard screen aspect ratio for HDTV is \_\_\_\_\_.

- a. 4:3
- b. 1:1
- c. 16:9
- d. None of the above

57. Video displays using \_\_\_\_\_ scanning to 'paint' images on the screen can produce a better image than \_\_\_\_\_ scanning at the same resolution.

- a. SDTV, EDTV
- b. progressive, interlaced
- c. EDTV, HDTV
- d. interlace, progressive

58. Plasma displays typically offer a wider viewing angle than LCD displays.

- a. True
- b. False

59. A video output format that usually uses 3 RCA connectors is called \_\_\_\_\_ and is a(an) \_\_\_\_\_ signal.

- a. component, analog
- b. composite, analog
- c. s-video, analog
- d. component, digital

60. Digital video signals can be sent over \_\_\_\_\_ video outputs.

- a. composite
- b. component
- c. HDMI
- d. RGBHV

61. A 15 pin D-Sub connector is typically used to output \_\_\_\_\_ signals from computers to video displays.

- a. VGA
- b. HDMI
- c. DVI
- d. A and B

62. The most basic video signal is \_\_\_\_\_.

- a. component video
- b. S-VHS
- c. DVI video
- d. composite video

# Home Theater

63. Which remote control technology does not require the remote to be pointed at the device it is operating?

- a. Infrared
- b. TCP/IP
- c. RF
- d. Both B and C above

64. The purpose of an Real Time Analyzer, RTA, is to:

- a. Measure color temperature
- b. Determine the distortion on an audio frequency
- c. Determine loudness at specific frequencies
- d. None of the above

65. IR Leakage occurs when:

- a. IR wires are not insulated properly
- b. Too much power is applied to the IR blaster
- c. More than one component sees the IR blaster
- d. An IR blaster is cracked

66. An SPL Meter would most likely be used during the \_\_\_\_\_ stage.

- a. pre-wire
- b. calibration
- c. installation
- d. trim-out

67. Video signals are many. The one to use for the best image is \_\_\_\_\_.

- a. Component video
- b. HDMI video
- c. Composite video
- d. S-Video

68. If the room has high ambient light you would NOT want to use \_\_\_\_\_.

- a. rear projection
- b. front projection
- c. PDP direct view
- d. LCD direct view

69. The “p” in 1080p stands for progressive scanning.
- a. True
  - b. False
70. A UPS protects home theater components from \_\_\_\_\_.
- a. lightning strikes
  - b. programming changes by the user
  - c. memory loss during a power outage
  - d. voltage spikes
71. The amount of wattage required for an amplifier in a home theater is a function of the \_\_\_\_\_.
- a. efficiency of the speakers
  - b. distance from the speaker to the listener
  - c. desired volume level at the listener
  - d. all of the above
72. To deal with the heat generated by home theater equipment \_\_\_\_\_.
- a. use portable fans to circulate the room air
  - b. turn off the equipment when not in use
  - c. keep the room temperature low
  - d. build in ventilation for the equipment
73. Video calibration typically covers
- a. contrast (white level) and brightness (black level)
  - b. sharpness
  - c. color hue, saturation and temperature
  - d. all of the above
74. When aligning a projector, the \_\_\_\_\_ option will help make the image perfectly square.
- a. lens shift
  - b. zoom
  - c. keystone
  - d. focus
75. To increase the volume by 3db you must \_\_\_\_\_ the wattage.
- a. double
  - b. triple
  - c. half
  - d. none of the above



## Security and Surveillance

76. A contact that has no continuity when not activated is said to be \_\_\_\_\_.  
a. normally closed (NC)  
b. normally open (NO)  
c. Defective  
d. An EOL device
77. Series wired contact sensors use \_\_\_\_\_ contacts.  
a. multiple  
b. normally closed  
c. normally open  
d. tripped
78. A security system uses a \_\_\_\_\_ jack to seize the phone line in an alarm situation.  
a. RJ-31X  
b. RG-31  
c. RJ-45  
d. RG-59
79. To maximize contrast, it is recommended to use a(an) \_\_\_\_\_ camera.  
a. Color  
b. Black and white  
c. Infrared  
d. UV
80. A camera that can only track horizontal movement is known as a \_\_\_\_\_ camera.  
a. IP  
b. PTZ  
c. Pan  
d. stationary
81. The minimum light level a camera can capture a clear image is expressed in the \_\_\_\_\_ rating in the camera specifications.  
a. watts  
b. lumens  
c. PTZ  
d. lux

82. In areas where light is not sufficient for surveillance cameras, \_\_\_\_\_ are used.
- a. IR illuminators
  - b. color cameras
  - c. spot lights
  - d. PTZ cameras

## Integrated Control

83. A home control system uses Ethernet to communicate between the controller and 10 remote devices. To communicate to all remote devices, the controller must have \_\_\_\_\_ Ethernet ports.
- a. 1
  - b. 2
  - c. 3
  - d. 5
  - e. 10
84. The process of having a series of commands operate from a single button press is known as
- a. Auto program
  - b. Scene
  - c. Macro
  - d. Step-by-step
85. The total wattage of all the devices connected to a lighting control device is typically known as the \_\_\_\_\_.
- a. total load
  - b. lighting budget
  - c. circuit size
  - d. control current
86. A single HVAC system that uses two thermostats and maintains independent temperatures in two areas is called a \_\_\_\_\_ system.
- a. split
  - b. two-zone
  - c. dual-thermo
  - d. duplex
87. HomePlug devices communicate using \_\_\_\_\_.
- a. power lines
  - b. phone lines
  - c. RF
  - d. phono plugs

88. A homeowner is considering using Bluetooth-enabled devices for various functions. \_\_\_\_\_ is the maximum recommended distance for a Bluetooth device to communicate reliably.

- a. 12 feet
- b. 30 feet
- c. 75 feet
- d. 150 feet

89. In a home control system, use the \_\_\_\_\_ feature to turn lights on and off based on a specific time of day.

- a. solar motion sensor
- b. astronomical timer
- c. photo sensor
- d. clock timer

90. \_\_\_\_\_ is the best type of user interface for a home control system.

- a. Keypad
- b. Computer
- c. Remote control
- d. Let the homeowner decide

91. A lighting control system can control \_\_\_\_\_.

- a. individual lamps
- b. lighting scenes
- c. window treatments
- d. All of the above

92. An HVAC thermostat needs \_\_\_\_\_ volts traveling on the \_\_\_\_\_ color wire to operate.

- a. 24 , yellow
- b. 24 , red
- c. 48 , yellow
- d. 48 , red

93. Power surges can come from \_\_\_\_\_. Select all that apply

- a. power fluctuations from the power company
- b. high power use devices in the home
- c. wireless transmitters
- d. master controller

94. When power is lost, a(n) \_\_\_\_\_ is used to keep constant power for critical equipment.
- a. HVAC
  - b. UPS
  - c. KSU
  - d. PTZ

## Troubleshooting Methodology and Documentation

95. An Uninterruptible Power Supply \_\_\_\_\_.
- a. switches from AC to battery power when it detects an AC power line fault
  - b. provides AC power through an inverter, powered by batteries, that are charged from the AC line
  - c. switches to an alternate AC power circuit when it detects a disturbance on the current AC power circuit
  - d. Starts an AC power generator when it detects an AC power line fault
96. OSHA is an acronym for \_\_\_\_\_.
- a. Organization for Safe Home Appliances
  - b. Occupational Safety and Health Administration
  - c. Organization of Shared Home Appliances
  - d. Organization for Safety in Home Applications
97. NEC is an acronym for \_\_\_\_\_.
- a. National Electrical Code
  - b. Nominal Electrical Current
  - c. National Electronics Certification
  - d. Network Enhanced Channel
  - e. Normally Exposed Conductor
98. MSDS is an acronym for \_\_\_\_\_.
- a. Material Safety Data Sheet
  - b. Manufacturers Summary of Data Speeds
  - c. Manufacturers Supply Depot Summary
  - d. Massively Serial Data Stream
99. A surge from a lightning strike can enter a home through \_\_\_\_\_.
- a. cable service feed
  - b. electrical service feed
  - c. outdoor speakers
  - d. All of the above

100. If two computers both have the same IP address, they will\_\_\_\_\_.
- a. be able to communicate with each other
  - b. not be able to communicate with each other
  - c. communicate with each other but not the Internet
  - d. None of the above