



Residential Climate Controls Usability Requirements & Test Method

Stakeholder Meeting
December 14, 2010
Washington, DC

Basis & Goals



- Research and lab testing
- Differentiate Climate Control usability
- Reward products with easy to use energy saving modes
- Minimize complexity and cost
- Generate repeatable results
 - different labs
 - different panels
- Predictive of U.S. consumer usage



Structure of Documents

- Usability Framework
 - usability requirements
 - test metric
 - compliance criteria
- Test Method
 - panel size & composition
 - required usability tasks
 - lab test procedure
- Sample datasheets

Usability Framework Overview



- Based on Draft 2 Spec
- 2 qualification paths
 - core and additional prescriptive usability requirements
 - core prescriptive usability requirements and panel testing
- Four core requirements
 - Programmed Settings
 - Date & Time
 - Energy Saving Mode
 - Low Battery Indicator

Usability Framework Overview (cont)



- Prescriptive requirements increased from 7 to 8
 - C.1 **Schedule Period Nomenclature** is “new”:

Products that use four schedule periods shall use the descriptive names: “Morning,” “Day,” “Evening,” and “Night.” Products with more than four schedule periods may use alternate schedule period nomenclature.



Test Method Overview

- Usability panel requirements
 - 21-person
 - Based on U.S. demographics
- Test Procedures
 - Test equipment
 - Test administration
 - Unit Under Test (UUT) configuration & setup
 - Usability tasks
 - Usability task parameters
 - Data collection

Usability Panel Requirements



- Size – 21 individuals
- Composition
 - Gender
 - 50% each male and female plus one of either gender
 - Level of Education
 - Less than high-school education – 3-individuals
 - High-school graduate & less than bachelor's degree – 12-individuals
 - Bachelor's degree or higher – 6-individuals



Usability Panel Requirements (cont)

- Age
 - Age 20 to 34 – 6-individuals
 - Age 35 to 49 – 6-individuals
 - Age 50 to 64 – 6-individuals
 - Age 65 to 79 – 3-individuals
- Vision
 - No Color Vision Deficiency – 20-individuals
 - Red-Green Color Vision Deficiency – 1-individual (male)

Usability Tasks



- **Task 1:** Set Date & Time
- **Task 2:** Turn on Heat
- **Task 3:** Identify Room Temperature and Setpoint
- **Task 4:** Activate/Cancel Away Mode
- **Task 5:** Modify Program Schedule
- **Task 6:** Identify Energy Rate Tier

UUT Configuration & Test Setup



- Only required changes to “Out-of-box” config.
- Setup mimics in-home usage
 - Wall mounting, 5’ from floor
 - Written user documentation available
- Minor changes required between tasks
- Current date and time clearly posted

UUT Configuration & Test Setup (cont)



- Temperature, relative humidity and ambient noise controlled:
 - Ambient Temperature (heating season): $70 \pm 2^{\circ}\text{F}$
 - Ambient Temperature (cooling season): $78 \pm 2^{\circ}\text{F}$
 - Relative Humidity: 20–60%
 - Ambient Noise: ≤ 45 dB SPL

Test Procedure – Test Administration



- Testing conducted by test administrator:
 - Configures UUT
 - Ensures orderly, quiet & comfortable environment
 - Provides verbal instructions to panelists
 - Observes task performance
 - Assess & records task success
 - Measures & records time to complete
- No additional guidance beyond the Residential Climate Controls Test Administrator Script

Test Administrator Script



- Designed to enhance repeatability by:
 - providing exact text to be read to panelists
 - prohibiting coaching or additional assistance
 - prohibiting verbal interaction when stopwatch is running

Metric



$$M_i = \frac{200s}{1 + e^{x_i}}$$

where:

i = task number

$x_i = t_i/k_i$

t_i = time to complete task *i* (seconds)

k_i = constant for task *i*

$s = 0$ if task is completed erroneously or not completed
within allotted time

$s = 1$ if task is completed correctly, within allotted time

Usability Task Parameters



Table 3-2: Residential Climate Control – Usability Task Parameters

Task Number	Max Time to Complete (s)	Target Time to Complete (s)	k_i
1 – Set Date & Time	300	120	$k_1 = 194$
2 – Turn On Heat	60	10	$k_2 = 16$
3 – Identify Room Temperature and Setpoint	30	5	$k_3 = 8.0$
4 – Activate/Cancel Away Mode	90	15	$k_4 = 24$
5 – Modify Program Schedule	600	180	$k_5 = 291$
6 – Identify Energy Rate Tier	30	5	$k_6 = 8.0$

Compliance Criteria



- **Criterion A:** For each task, the average usability score shall be ≥ 40
- **Criterion B:** The total composite usability score shall be ≥ 70

Sample Datasheets



- Provided as a recommended format for data collection
- Unlocked Excel 2003 file
- Automatic calculation of score



Let's Test The Test

- 6 Random groups
- Purpose is to evaluate the Test Method
- Each group requires:
 - Leader – take notes and present results
 - Test Administrator
 - Configure the UUT
 - Instruct the panelists
 - Record results
- Panelist(s) perform the tasks