



# Residential Climate Controls Usability Requirements & Test Method

Stakeholder Meeting  
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Washington, DC



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# Basis & Goals

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- 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

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

# Usability Framework Overview

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- 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

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- 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)

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- 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

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- **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

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- 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:  $\leq 45$  dB SPL

# Test Procedure – Test Administration

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- 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

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- 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<sub>i</sub>* = time to complete task *i* (seconds)

*k<sub>i</sub>* = 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

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

# Sample Datasheets

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



# Let's Test The Test

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- 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