THEMAS
The Energy Management System

SOFTWARE REQUIREMENTS SPECIFICATION

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D_THEMAS_SRS_001

1.0 Introduction

The following subsections of Section 1.0 provide an overview of the entire Software Requirements Specification.

1.1 Purpose

This Software Requirements Specification (SRS) specifies the qualification requirements for The Energy Management System (THEMAS). It provides a technical description of all so ftware requirements of the system, provides traceability of software capability requirements to the Statement of Work, and identifies external interfaces. This document is intended for use by the Design Requirements team, Principle Software Architect, and other parties interested in the development and progression of THEMAS.

1.2 Scope

The scope of this document is confined to only the software requirements for the THEMAS system. Only those conditions expressed with the imperative "shall" are to be interp reted as binding requirements for this SRS. This document provides a detailed definition of all requirements for the THEMAS system. It does not provide a detailed definition of the exact systems that will interface with THEMAS. The SRS shall give a prototype of a simulated thermostat for verification and validation of THEMAS reliability. The requirements specified in this document are to be used as the basis for software design of the THEMAS system.

1.3 Definitions, Acronyms, and Abbreviations

The following section lists acronyms and abbreviations and their meaning as used in this document:

ANSI	American National Standards Institute
C	Cooling
DB	Database
DD	Data Dictionary
DFD	Data Flow Diagram
H	Heating
IEEE	Institute of Electrical and Electronic Engineers
LO	Lower Overtemperature Value
LT	Lower Trigger Value

OD	Overtemperature Delta Value
SDD	Software Design Document
SRS	Software Requirements Specification
T	Current Temperature Value
TD	Trigger Delta Value
THEMAS	The Energy Management System
TSET	Current Temperature Setting
UT	Upper Trigger Value
UO	Upper Overtemperature Value

1.4 References

The following documents shown form a part of this specification. In the event of conflict between the documents referenced and the contents of this SRS, the contents of this document shall overrule all others, with the exception of the Statement of Work.

Statement of Work	THEMAS_SOW_001
ANSI/IEE Guide to Software Requirements Specification	ANSI/IEEE STD 830-1984

Technical society and technical association specifications are generally available for reference from libraries. Copies of other specifications may be obtained from Barry Scott, THEMAS project Manager.

1.5 Overview

This document is prepared in accordance with the American National Standards Institute (ANSI) / Institute of Electrical and Electronics Engineers (IEEE) Guide to Software Requirements Specifications, ANSI/IEEE STD 830-1984. Section 2.0 of this document gives a general description of the THEMAS system. I t provides product perspectives, product functions, user characteristics, general constraints, and assumptions and dependencies of the system. Section 3.0 contains all the details the Design Requirements team needs to create a design. It will contain functional and performance requirements, design constraints, attributes and external interface requirements for the THEMAS system.

Appendix A contains the Dataflow Diagrams.

Appendix B contains the Traceability Matrix.

Appendix C contains the Data Dictionary .

2.0 General Description

This section of this SRS describes the general factors that effect the THEMAS system and its requirements. This section does not state specific requirements, it only makes these requirements easier understood.

2.1 Product Perspective

The THEMAS system is a system that operates independent of any other system, or any components of the heating and cooling system to which it is attached. The THEMAS system, however, is composed mainly of a hardware and software portion. This SRS only specifies the requirements dealing with the software portion of the system. If assumptions or dependencies about the hardware were made, they are stated in this section of the SRS.

2.2 Product Functions

The THEMAS system is divided into four major sections: Monitor Temperature, Determine Utilization, Initialize System, and System Reports. All four sections have an associated software configuration item; all except the System Reports have an associated hardware configuration item. The hardware requirements are contained in the system specification. The functions of the software for the system are contained in the following paragraphs.

2.2.1 Monitor Temperature

The monitor temperature function receives the valid temperature and system parameters. The function then goes through the process of determining temperature status. After this process is done, either temperature limit is exceeded or the temperature change is requested. If the temperature change is requested, then the determine heating/cooling mode process is activated and makes a heating/cooling request. Some other processes that help the monitor temperature function are: validate temperature, change thermostat setting, generate alarm, and system initialization.

2.2.2 Determine Utilization

The determine utilization function receives the heating/cooling request and utilization parameters. The function then processes the status of all heating/cooling units and sends out either unit unavailable or heating/cooling unit needed. The fun ction generates either a unit unavailable event which goes into the System Reports function or it generates a heating/cooling signal to turn on/off the units. The Monitor Temperature and Initialize

System functions help the determine utilization to do its processes.

2.2.3 Initialize System

The initialize system function receives the initialization data for the THEMAS system. The processes that are associated with it are: load heating/cooling unit definitions, turn off all heating/cooling units, load thermostat definitions, load utilization parameters, set trigger values, set overtemperature values, and establish valid temperature range. The outgoing information that starts the entire THEMAS system is: clear all heating/cooling signals, send thermostat definitions, send utilization parameters, send trigger values, send overtemperature values, and send valid temperature range.

2.2.4 System Reports

The system reports function receives event data from the THEMAS system. This function is a database that stores all the events in the THEMAS system. This function is mainly for the use of the supervisor of the THEMAS system to maintain an efficient heating and cooling system. The only process that interacts with the system reports function is the generate event data process.

2.3 User Characteristics

This system is intended to be used by people that maintain the heating and cooling systems in a building. The system should not need intervention from outside users other than the supervisor to maintain operation of THEMAS. The system should provide warnings to the supervisor about faulty temperatures. The displaying of the current status of the system to the supervisor should not contain excessive information which could confuse the supervisor. The system should provide information in the form of reports to the supervisor so that the system can be run efficiently.

2.4 General Constraints

The general constraints of the THEMAS system focus on the functionality provided by the external devices connected to it. The thermostats shall only provide temperature values and temperature settings. The heating and cooling units provide no feedback to the THEMAS system. When a signal is sent to a heating or cooling unit, no signal shall be available to allow the THEMAS system to determine if the signal sent to the unit was realized by the unit.

2.5 Assumptions and Dependencies

In developing the requirements for the THEMAS system, several assumptions have been made about the thermostat hardware and the heating/cooling hardware. These assumptions are stated in the following paragraphs.

2.5.1 Operating System Assumptions

The THEMAS system shall be designed to run on the Microsoft® Windows NT™ operating system. All the internal process communications shall be designed to operate on this operating system. Any communication with the thermostats and heating and cooling units shall be done through the interface to these units. These interfaces shall run on this operating system as well.

2.5.2 Thermostat Hardware Assumptions

It is assumed that the thermostat is capable of returning the current temperature and the current desired temperature setting to the THEMAS system. The thermostat is constantly returning these values with no real time delay in between the thermostat and the THEMAS system. The thermostat also has the capability of being set and controlled by a user of the THEMAS system. All data sent by the thermostat is in the correct format for the THEMAS system to use.

2.5.3 Heating/Cooling Hardware Assumptions

It is assumed that the heating/cooling unit is incapable of returning its current off/on status to the THEMAS system. The heating/cooling unit has no real time delay when sending these statuses to the THEMAS system. The heating/cooling unit shall have the capability of being turned off and on by the supervisor of the THEMAS system.

3.0 Engineering Requirements

3.1 Functional Requirements

This section is subdivided into ten main subsections: Initialize Operational Parameters, Initialize System, Validate Temperature, Monitor Temperature, Determine Utilization, Generate H/C Signal, Generate Alarm Data, Generate Event Data, Change Thermostat Setting, and Generate Reports. Each subsection describes the software requirement for that individual software component of the THEMAS system.

3.1.1 Initialize Operational Parameters

The following sections describe the Initialize System component of the THEMAS system.

3.1.1.1 Load H/C Unit Definitions (SRS-001)

3.1.1.1.1 Introduction

The THEMAS system shall control the heating and cooling units that are defined as part of the THEMAS system. The definitions of the individual heating and cooling systems reside in an initialization file. The system shall read this file and the definitions shall be derived from the initialization data in the file.

3.1.1.1.2 Inputs

Initialization Data

3.1.1.1.3 Processing

The THEMAS system shall use the information contained in the initialization data file to determine which heating and cooling units are part of the THEMAS system. There is one heating and cooling unit that corresponds to one thermostat in each of four quadrants on each of three floors of the office building.

3.1.1.1.4 Outputs

Operational Parameters

3.1.1.2 Load Thermostat Definitions (SRS-002)

3.1.1.2.1 Introduction

Each thermostat shall have a unique identifier by which that thermostat is identified in the THEMAS system. This procedure will load these definitions into the THEMAS software.

3.1.1.2.2 Inputs

Initialization Data

3.1.1.2.3 Processing

Each quadrant of each floor shall have a thermostat which is to be used to provide temperature data to the THEMAS system. The

initialization file shall contain a unique identifier for each thermostat that the system is to monitor. These identifiers shall be read from the initialization file and loaded into the THEMAS system during the initialization process.

3.1.1.2.4 Outputs
Operational Parameters

3.1.1.3 Load Utilization Parameters (SRS-003)

3.1.1.3.1 Introduction
There shall be a maximum number of heating or cooling units that can be on at any given time. This procedure loads the maximum number of concurrently running units allowed.

3.1.1.3.2 Inputs
Initialization Data

3.1.1.3.3 Processing
The maximum number of heating or cooling units that can run concurrently shall reside in an initialization file. The maximum number of concurrently running units shall be read from the initialization file and stored in the THEMAS system.

3.1.1.3.4 Outputs
Utilization Parameters

3.1.1.4 Set Trigger Values (SRS-004)

3.1.1.4.1 Introduction
The trigger value is used in combination with the current temperature to determine when a heating or cooling unit shall be turned on or off.

3.1.1.4.2 Inputs
Initialization Data

3.1.1.4.3 Processing
The trigger values shall reside in an initialization file. This procedure shall read the initialization file and establish the trigger value from the data in that file.

3.1.1.4.4 Outputs
Operational Parameters

3.1.1.5 Set Overtemp Values (SRS-005)

3.1.1.5.1 Introduction
The THEMAS system shall ensure the temperature reported by a given thermostat shall not exceed a maximum deviation value of 3 degrees Fahrenheit.

3.1.1.5.2 Inputs
Initialization Data

3.1.1.5.3 Processing
The overtemperature values shall reside in an initialization file. This procedure shall read the initialization file and establish the overtemperature value from the data in that file.

3.1.1.5.4 Outputs
Operational Parameters

3.1.1.6 Establish Valid Temperature Range (SRS-006)

3.1.1.6.1 Introduction
The THEMAS system shall only respond to temperatures that are within a reasonable value.

3.1.1.6.2 Inputs
Initialization Data

3.1.1.6.3 Processing
The valid temperature range value shall reside in an initialization file. This procedure shall read the initialization file and establish the valid temperature range from the data in it.

3.1.1.6.4 Outputs
Operational Parameters

3.1.2 Initialize System (SRS-007)

3.1.2.1 Introduction
When the THEMAS system is initialized, it shall first turn off all the heating and cooling units. Then, it shall check all the thermostats and determine if any thermostat's settings require a heating or cooling unit to be turned on back on.

3.1.2.2 Inputs
Operational Parameters

3.1.2.3 Processing
This process shall first determine a known state of all the heating and cooling units by issuing a request to turn off all the units. It shall then read the current temperature values and current temperature settings of each thermostat. If the settings reflect a need for a heating or cooling unit to be turned on, the process shall issue a request to turn on the appropriate unit. This determination shall be made in accordance with the rules outlined in section 3.1.4.1 and 3.1.4.2.

3.1.2.4 Outputs
H/C Request
3.1.3 Validate Temperature (SRS-008)

3.1.3.1 Introduction
The THEMAS system shall only respond to temperatures from the thermostats that are within the specified valid range.

3.1.3.2 Inputs
Operational Parameters
Temperature Data

3.1.3.3 Processing
Two types of temperature data shall be recognized from the thermostats: 1) the temperature setting and 2) the current temperature. This module shall process both types of data.

A current temperature value that is received from an individual thermostat shall be compared to the valid temperature range values. If the current temperature value is strictly less than the lower value of the valid temperature range or if the received temperature value is strictly greater than the upper value of the valid temperature range, then the THEMAS system shall identify the current temperature value as an invalid temperature and shall output an invalid temperature status. Otherwise, the THEMAS system shall output a valid temperature status.

A temperature setting value that is received from an individual thermostat shall be compared to the valid temperature range values. If the temperature setting value is strictly less than the lower value of the valid temperature range or if the temperature setting value is strictly greater than the upper value of the valid temperature range, then the THEMAS system shall identify the temperature setting as an invalid temperature and shall output an invalid temperature status. Otherwise, the THEMAS system shall realize the value for that thermostat’s temperature setting.

3.1.3.4 Outputs
Invalid Temperature
Valid Temperature

3.1.4 Monitor Temperature
The following sections describe the Monitor Temperature component of the THEMAS system.

3.1.4.1 Determine Temperature Status (SRS-009)

3.1.4.1.1 Introduction
The THEMAS system shall determine when a reported temperature or a changed temperature setting exceeds the limits set by the

overtemperature values. Temperatures that exceed the overtemperature limits shall be reported as such. Temperatures that do not exceed these limits shall be output for subsequent processing.

3.1.4.1.2 Inputs
Valid Temperatures
Trigger Values
Overtemp Values

3.1.4.1.3 Processing
The THEMAS system shall compare the reported temperature value to the temperature setting and detect when the temperature value exceeds the specified limits. To clarify these conditions, the following definitions will be used:

LO : Lower Overtemperature Value = TSET - OD
UO : Upper Overtemperature Value = TSET + OD

If T < LO or UO < T then the THEMAS system shall recognize this condition as the temperature limit has been exceeded. In this case this process shall output the condition of the temperature limit having been exceeded.

If LO < = T < = UO, then this process shall output the temperature status.

3.1.4.1.4 Outputs
Temperature Trigger Exceeded
Temperature Limit Exceeded

3.1.4.2 Determine H/C Mode (SRS-010)

3.1.4.2.1 Introduction
When the current temperature value exceeds the current temperature setting by a pre-defined amount, the THEMAS system shall activate the appropriate heating or cooling unit.

3.1.4.2.2 Inputs
Temperature Trigger Exceeded

3.1.4.2.3 Processing
There are two conditions for each individual thermostat that shall be tested for: 1) the thermostat’s settings are satisfied and 2) the thermostat’s temperature indicates it requires a heating or cooling unit to be turned on. To clarify these conditions, the following definitions will be used:

LT : Lower Trigger Value = TSET - TD
UT : Upper Trigger Value = TSET + TD

Condition 1: LT < = T < = UT
This condition indicates the thermostat's current temperature setting is satisfied. If this condition is true, then the module shall output a request to turn off both the heating unit and the cooling unit.

Condition 2: LO < = T < LT or UT < T < = UO
This condition the need for a heating or cooling unit to be turned on. If this condition is true, then this module shall output a request to turn on the heating unit if LO < = T < LT or the cooling unit if UT < T < = UO.

3.1.4.2.4 Outputs
H/C Request

3.1.5 Determine Utilization

3.1.5.1 Determine Status of All H/C Units (SRS-011)

3.1.5.1.1 Introduction
The THEMAS system shall control each of the heating and cooling units that are defined for the system. The THEMAS system shall limit the number of heating or cooling units that may be running simultaneously.

3.1.5.1.2 Inputs
Operational Parameters
H/C Request

3.1.5.1.3 Processing
The THEMAS system shall maintain the ON/OFF status of each heating and cooling unit. When a request to turn on or off a heating or cooling unit, the following processing will occur.

When a request to turn on a heating or cooling unit is received, the system shall determine if the request can be honored. If the maximum number of heating or cooling units is already running, the request will be added to a LIFO queue. If the maximum number of heating or cooling units is not running, this process will generate a request to turn on the requested unit.

When a request to turn off a heating or cooling unit is received, this process shall check the queue of waiting heating and cooling requests. If the queue is not empty, this process shall remove one request from the LIFO queue and check the current state of the thermostat for which the queued request was made. If that thermostat still needs a heating or cooling unit turned on, this process shall submit a request to turn that unit on.

3.1.5.1.4 Outputs
Unit Unavailable

H/C ON/OFF Request

3.1.5.2 Generate Unit Unavailable Event (SRS-012)

3.1.5.2.1 Introduction
When a request for a heating unit or cooling to be turned is denied, an event shall be generated and the THEMAS system shall record that event. The information in these events will be used for creating statistical reports.

3.1.5.2.2 Inputs
Unit Unavailable

3.1.5.2.3 Processing
This procedure shall realize the thermostat and heating or cooling information and use this information to generate a specific system event. This system event shall consist of a description of the event type (a request denied event), a designation of the thermostat that made the request, and a designation of the heating or cooling unit that was not turned on.

3.1.5.2.4 Outputs
System Event Data

3.1.5.3 Generate H/C Request (SRS-013)

3.1.5.3.1 Introduction
The THEMAS system shall control the heating and cooling units that are designated as part of the THEMAS system.

3.1.5.3.2 Inputs
H/C ON/OFF Request

3.1.5.3.3 Processing
When a request to turn on or off a heating or cooling unit is made, this process shall generate the appropriate request to carry out that request. This request shall include the designation of the heating or cooling unit and a flag to indicate whether that unit is to be turned on or off.

3.1.5.3.4 Outputs
Approved H/C Request

3.1.6 Generate H/C Signal (SRS-014)

3.1.6.1 Introduction
Once a request to turn on or off a heating or cooling unit, the THEMAS system shall provide the necessary control signal for the unit. This control signal shall also provide an indication of the unit’s status at the requesting thermostat.

3.1.6.2 Inputs
Approved H/C Request

3.1.6.3 Processing
This process shall recognize the values for the requested heating or cooling unit and the ON or OFF status that is being requested. The necessary signal to the heating or cooling unit will be generated. Since the interface to control the units has not been defined, the part of this process that will issue the signal is designated as TBD(to be determined).

In order to provide an indication of the status of the heating or cooling unit back to the requesting thermostat, this procedure shall output the status information of the heating or cooling unit.

In order to provide an operational history and statistical reports, this process shall generate an event each time a change is made to the status of a heating or cooling unit. This event shall contain the identification of the heating or cooling unit whose status is being changed.

3.1.6.4 Outputs
Heating Unit Signal
Cooling Unit Signal
Unit Status
System Events

3.1.7 Generate Alarm Data (SRS-015)

3.1.7.1 Introduction
There are two events that shall result in an alarm condition: 1) an invalid temperature value is reported from a thermostat, or 2) the reported temperature has exceeded the defined limits. This process shall determine which alarm event is to be generated.

3.1.7.2 Inputs
Invalid Temperature
Temperature Limit Exceeded

3.1.7.3 Processing
When the THEMAS system detects a request for an alarm, this process shall detect which of the two alarms are being requested.

If the system detects an invalid temperature, this process shall output a continuous series of alternating 500 Hz and 700 Hz beeps on the supervisor’s computer. Each beep shall have a three-quarter second duration. This series of beeps shall continue until the supervisor manually resets the alarm through the supervisor’s interface window.

If the system detects a temperature limit has been exceeded, this process shall output a continuous series of alternating 1000 Hz and 1500 Hz beeps on the supervisor’s computer. Each beep shall have a one-half second duration. This series of beeps shall continue until the supervisor manually resets the alarm through the supervisor’s interface window.

Each time an alarm is requested, an alarm event shall be recorded. This event shall be used to provide operational and statistical reports about the system.

3.1.7.4 Outputs
Alarm Data
Alarm Events

3.1.8 Generate Event Data (SRS-016)

3.1.8.1 Introduction
For each event that is generated, the THEMAS system shall identify each event and generate the appropriate event data.

3.1.8.2 Inputs
Alarm Events
System Events
Denied H/C Request

3.1.8.3 Processing
When an event occurs, the THEMAS system shall identify the event type and format an appropriate event message. The THEMAS system shall record each event by a description and the current system time for that event. This information shall be recorded in a Microsoft® Access® database that shall reside on the supervisor’s computer.

3.1.8.4 Outputs
Event Data

3.1.9 Change Thermostat Setting (SRS-017)

3.1.9.1 Introduction
The THEMAS system shall provide the supervisor a mechanism to change the temperature setting of any of the thermostats in the system.

3.1.9.2 Inputs
Operational Parameters

3.1.9.4 Processing
The supervisor’s interface shall display the available thermostats and their individual current temperature settings.

The supervisor shall be able to select one of the thermostats and select a value for the current temperature from a list of valid temperatures.

3.1.9.5 Outputs
Temperature Data

3.1.10 Generate Reports (SRS-018)

3.1.10.1 Introduction
The THEMAS shall provide the ability for the supervisor to select between two different types of reports: 1) the operational history of the THEMAS system for the past twelve months and 2) a statistical summary for any selected month.

3.1.10.2 Inputs
Event Data

3.1.10.3 Processing
The supervisor's interface to the THEMAS system shall provide a mechanism to select between an operational history report or a statistical summary report. Either report shall consist of an ASCII file whose location and name shall be selectable by the operator.

If the operational history report is selected, the THEMAS system shall select all the events from the event database, sort the events by date and time, and create the ASCII report file.

If the statistical report is selected, the THEMAS system shall present the operator with a list of available months from which to make a selection. After selecting one of the months, the system shall generate the ASCII report file. The statistical reports shall consist of the following statistics:

1. The percentage of time each heating and cooling unit was on for each day of that month.

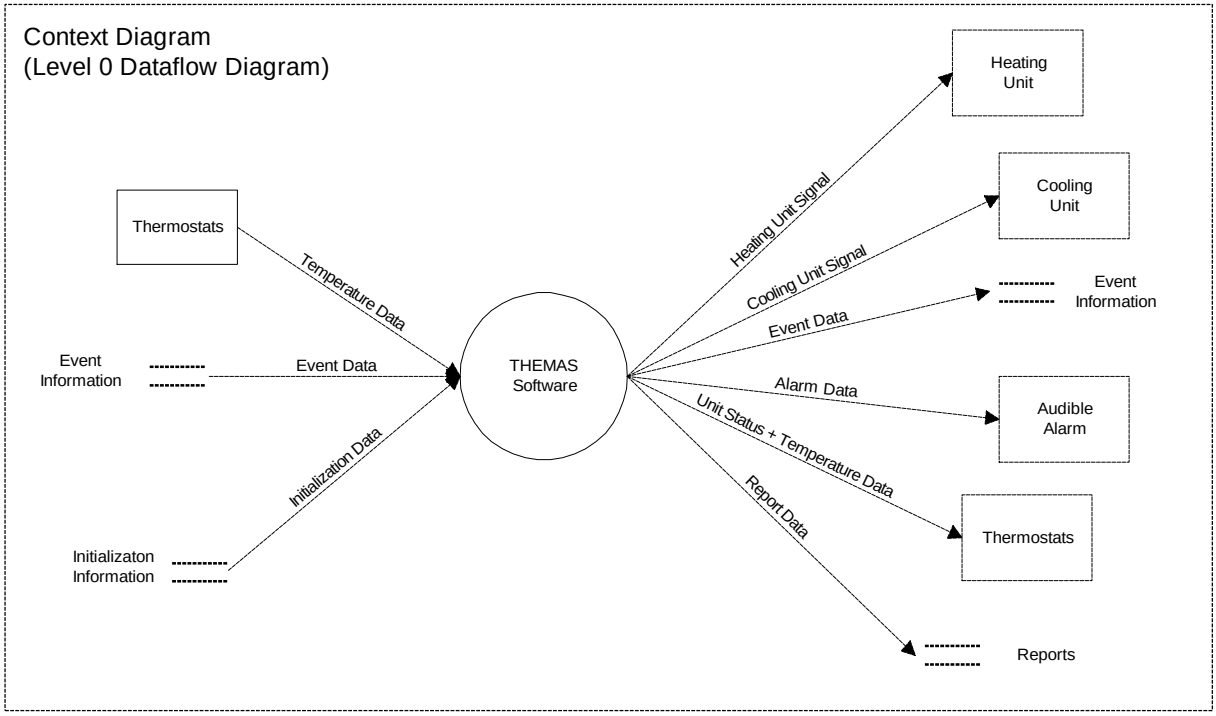
2. For each thermometer, the ratio of the number of requests for a heating and cooling unit that was granted to the number of requests for a heating or cooling unit that was denied.

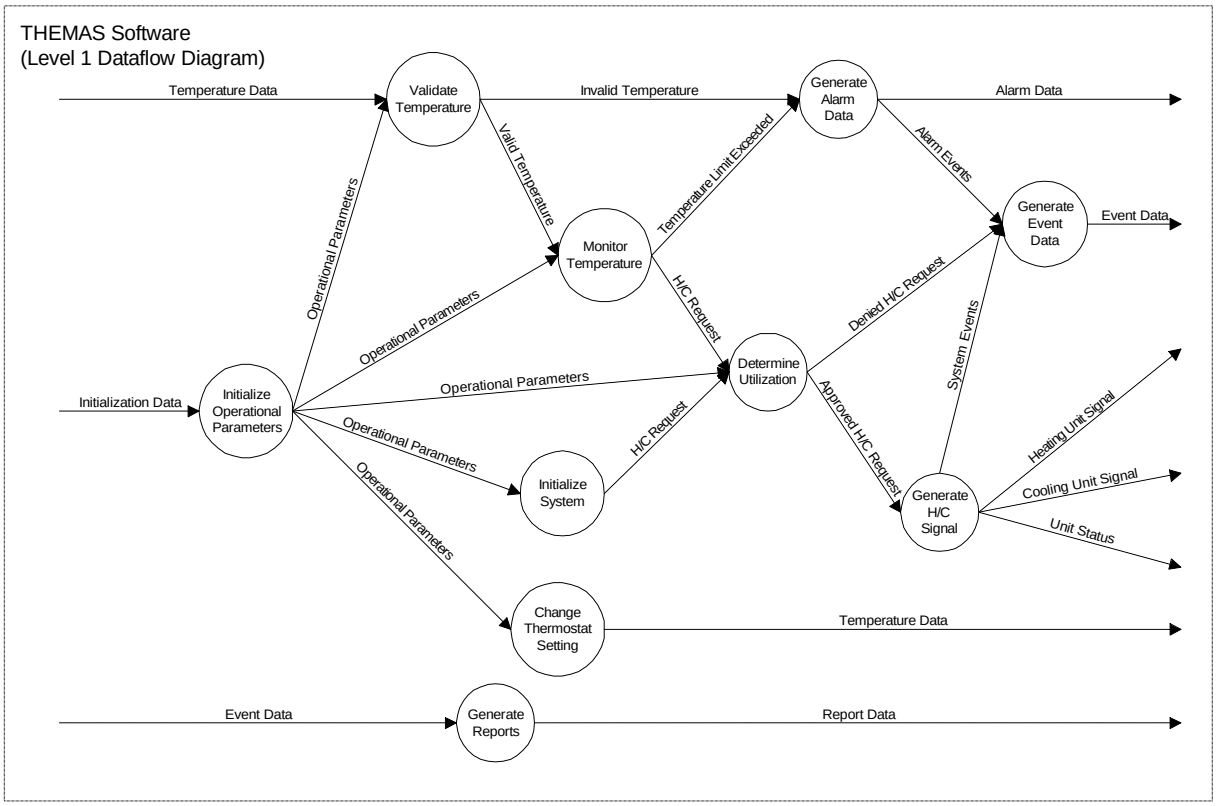
3.1.10.4 Outputs
Report Data

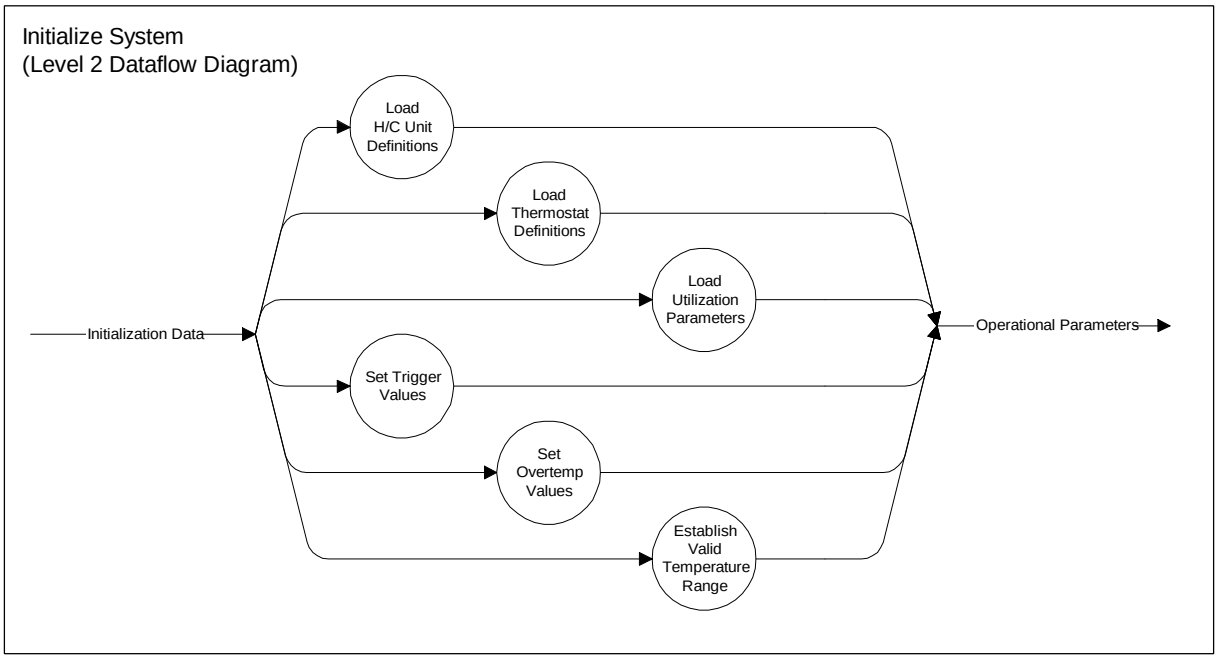
APPENDIX A - TRACEABILITY MATRIX

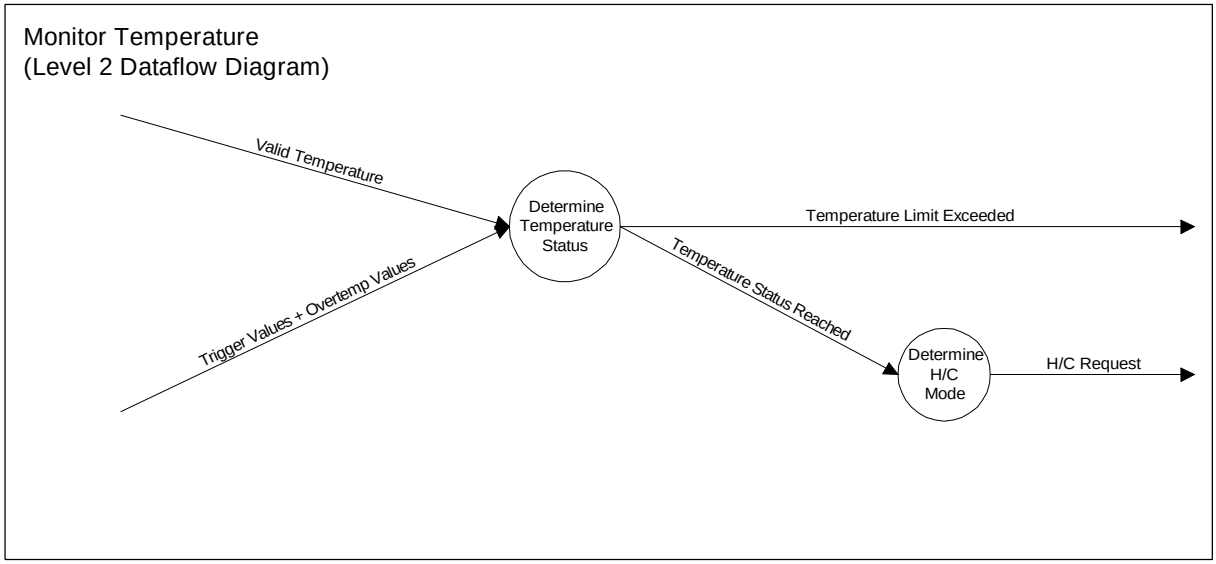
SRS Requirement	Requirement Description	Statement of Work Paragraph
SRS-001	Load H/C Unit Definitions	
SRS-002	Turn off H/C Units	2.5
SRS-003	Load Thermostat Definition	
SRS-004	Load Utilization Parameters	
SRS-005	Set Trigger Values	
SRS-006	Set Overtemp Values	
SRS-007	Establish Valid Temperature Range	
SRS-008	Validate Temperature	3.1
SRS-009	Determine Temperature Status	3.2
SRS-010	Determine H/C Mode	
SRS-011	Determine Status of all H/C Units	
SRS-012	Generate Unit Unavailable Event	
SRS-013	Generate H/C Request	2.5
SRS-014	Generate H/C Signal	2.1,2.2,2.5
SRS-015	Generate Alarm Data	3.1
SRS-016	Generate Event Data	5.1, 5.2
SRS-017	Change Thermostat Setting	2.4
SRS-018	Generate Reports	5.2

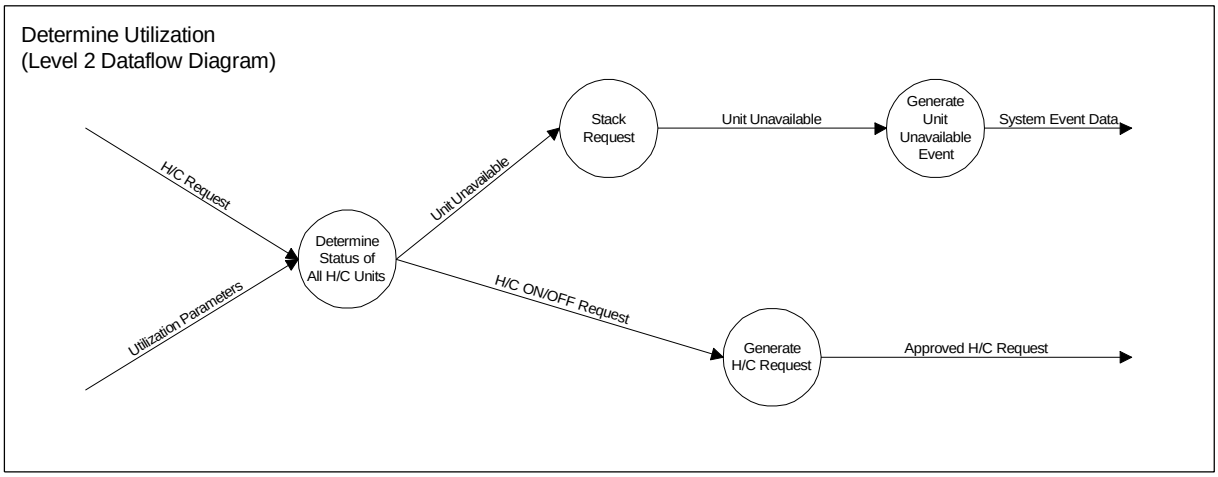
APPENDIX B - DATAFLOW DIAGRAMS


Context Diagram
(Level 0 Dataflow Diagram)
Heating Unit
Cooling Unit
Event Information
Audible Alarm
Thermostats
Reports
Thermostats
Temperature Data
Event Information
Event Data
Initialization Data
Initializaton Information
THEMAS Software
Heating Unit Signal
Cooling Unit Signal
Event Data
Alarm Data
Unit Status + Temperature Data
Report Data


THEMAS Software
(Level 1 Dataflow Diagram)
Temperature Data
Validate Temperature
Invalid Temperature
Generate Alarm Data
Alarm Data
Valid Temperature
Temperature Limit Exceeded
Alarm Events
Generate Event Data
Event Data
Operational Parameters
Monitor Temperature
H/C Request
Denied H/C Request
Operational Parameters
Determine Utilization
System Events
Initialization Data
Initialize Operational Parameters
Operational Parameters
Approved H/C Request
Heating Unit Signal
Operational Parameters
H/C Request
Initialize System
Generate H/C Signal
Cooling Unit Signal
Unit Status
Operational Parameters
Change Thermostat Setting
Temperature Data
Event Data
Generate Reports
Report Data


Initialize System
(Level 2 Dataflow Diagram)
Load H/C Unit Definitions
Load Thermostat Definitions
Load Utilization Parameters
Initialization Data
Operational Parameters
Set Trigger Values
Set Overtemp Values
Establish Valid Temperature Range


Monitor Temperature
(Level 2 Dataflow Diagram)
Valid Temperature
Trigger Values + Overtemp Values
Determine Temperature Status
Temperature Limit Exceeded
Temperature Status Reached
Determine H/C Mode
H/C Request


Determine Utilization
(Level 2 Dataflow Diagram)
H/C Request
Utilization Parameters
Determine Status of All H/C Units
Unit Unavailable
H/C ON/OFF Request
Stack Request
Unit Unavailable
Generate Unit Unavailable Event
System Event Data
Generate H/C Request
Approved H/C Request

APPENDIX C - DATA DICTIONARY

Alarm Data

Allowed Meanings
String

Notes
Defines the various alarm types.

Input To Transforms
(None)

Next Higher Dictionary Where Used
(None)

Output From Transforms
Generate Alarm Data
THEMAS Context Diagram

Alarm Events

Allowed Meanings
String

Notes
Describes the event that caused an alarm to occur.

Input To Transforms
Generate Event Data

Next Higher Dictionary Where Used
(None)

Output From Transforms
Generate Alarm Data

Approved H/C Request

Allowed Meanings
String

Notes
Defines the thermostat and heating or cooling unit to turn on or off.

Input To Transforms
Generate H/C Signal

Next Higher Dictionary Where Used
(None)

Output From Transforms
Determine Utilization
Generate H/C Request

Timestamp

Allowed Meanings
String

Notes
Denotes the current system date and time on the supervisor’s computer.

Input To Transforms
(None)

Next Higher Dictionary Where Used
Report Data

Output From Transforms
(None)

Denied H/C Request

Allowed Meanings
String

Notes
Defines the thermostat that requested heating or cooling, but was denied the request due to current system loading.

Input To Transforms
Generate Event Data

Next Higher Dictionary Where Used
(None)

Output From Transforms
Determine Utilization

Event Data

Allowed Meanings
String + Date

Notes
Describes the entries that are written to the database that are associated with each event that occurs in the system.

Input To Transforms

(None)

Next Higher Dictionary Where Used
(None)

Output From Transforms
Generate Event Data
Generate Unit Unavailable Event
THEMAS Context Diagram

H/C Request

Allowed Meanings
String

Notes
When the system detects a need for heating or cooling, this defines the thermostat and heating or cooling unit to turn on or off.

Input To Transforms
Determine Utilization
Determine Status of All H/C Units

Next Higher Dictionary Where Used
(None)

Output From Transforms
Initialize System
Monitor Temperature

H/C ON/OFF Request

Allowed Meanings
String

Notes
Defines a request to generate the signal to turn on or off a heating or cooling unit resulting from an approved request for a heating or cooling unit.

Input To Transforms
Generate H/C Request

Next Higher Dictionary Where Used
(None)

Output From Transforms
Determine Status of All H/C Units

H/C Unit Definitions

Allowed Meanings
String

Notes
Defines each discrete heating and cooling unit in the system.

Input To Transforms
(None)

Next Higher Dictionary Where Used
Operational Parameters

Output From Transforms
(None)

Initialization Data

Allowed Meanings
String + Integer

Notes
Information from the initialization file that include the thermostat definitions, heating and cooling definitions, temperature limits, and trigger values.

Input To Transforms
Establish Valid Temperature Range
Initialize Operational Parameters
Load H/C Unit Definitions
Load Thermostat Definitions
Load Utilization Parameters
Set Trigger Values
Set Overtemp Values
THEMAS Context Diagram

Next Higher Dictionary Where Used
(None)

Output From Transforms
(None)

Invalid Temperature

Allowed Meanings
String

Notes

Denotes the condition when an erroneous temperature is reported from a thermostat.

Input To Transforms
Generate Alarm Data

Next Higher Dictionary Where Used
(None)

Output From Transforms
Validate Temperature

Operational Parameters

Allowed Meanings
Determine Status Of All H/C Units + H/C Unit Definitions + Overtemp Values + Thermostat Definitions + Trigger Values + Utilization Parameters + Valid Temperatures

Notes
Information from the initialization file that include the thermostat definitions, heating and cooling definitions, temperature limits, and trigger values.

Input To Transforms
Change Thermostat Setting
Determine Utilization
Initialize System
Monitor Temperature
Validate Temperature

Next Higher Dictionary Where Used
(None)

Output From Transforms
(None)

Overtemp Values

Allowed Meanings
Integer

Notes
Defines the delta value relative to the temperature setting value. A temperature at or beyond this delta indicates the thermostat has reached a critical value where the heating or cooling unit cannot satisfy the temperature setting value.

Input To Transforms
(None)

Next Higher Dictionary Where Used
Operational Parameters

Output From Transforms
(None)

Report Data

Allowed Meanings
String + Timestamp

Notes
Contains the formatted report information.

Input To Transforms
(None)

Next Higher Dictionary Where Used
(None)

Output From Transforms
Generate Reports
THEMAS Context Diagram

System Events

Allowed Meanings
String

Notes
Describes each normal operational event that occurs in the system.

Input To Transforms
Generate Event Data

Next Higher Dictionary Where Used
(None)

Output From Transforms
Generate H/C Signal

Temperature Data

Allowed Meanings
String + Integer

Notes
Temperature and thermostat information to and from the thermostats.

Input To Transforms
THEMAS Context Diagram
Validate Temperature

Next Higher Dictionary Where Used
(None)

Output From Transforms
Change Thermostat Setting

Temperature Limit Exceeded

Allowed Meanings
String

Notes
Denotes the condition when the reported temperature has exceeded the overtemperature value.

Input To Transforms
Generate Alarm Data

Next Higher Dictionary Where Used
(None)

Output From Transforms
Determine Temperature Status
Monitor Temperature

Temperature Trigger Exceeded

Allowed Meanings
String

Notes
Denotes the condition when the reported temperature has exceeded the triggering value indicating a heating or cooling unit should be requested.

Input To Transforms
Determine H/C Mode

Next Higher Dictionary Where Used
(None)

Output From Transforms
Determine Temperature Status

Thermostat Definitions

Allowed Meanings
String

Notes
The unique identifier associated with each thermostat in the system.

Input To Transforms
(None)

Next Higher Dictionary Where Used
Operational Parameters

Output From Transforms
(None)

Trigger Values

Allowed Meanings
Integer

Notes
Defines the delta value relative to the temperature setting value. A temperature beyond this delta indicates the thermostat is requesting a heating or cooling unit event to occur.

Input To Transforms
(None)

Next Higher Dictionary Where Used
Operational Parameters

Output From Transforms
(None)

Unit Status

Allowed Meanings
String

Notes
Defines the current on or off condition of the heating and cooling units and the thermostat to which they are associated.

Input To Transforms
(None)

Next Higher Dictionary Where Used

(None)

Output From Transforms
Generate H/C Signal

Unit Unavailable

Allowed Meanings
String

Notes
Defines the heating or cooling unit that was denied a request to be turned on. Generated in response to a denied request.

Input To Transforms
Generate Unit Unavailable Event
Stack Request

Next Higher Dictionary Where Used
(None)

Output From Transforms
Determine Status of All H/C Units
Stack Request

Valid Temperatures

Allowed Meanings
Integer

Notes
Defines the upper and lower limits for a reported temperature value.

Input To Transforms
(None)

Next Higher Dictionary Where Used
Operational Parameters

Output From Transforms
(None)

Utilization Parameters

Allowed Meanings
Integer

Notes

Defines how many heating and cooling units that can run simultaneously.

Input To Transforms
(None)

Next Higher Dictionary Where Used
Operational Parameters

Output From Transforms
(None)

Valid Temperature

Allowed Meanings
String

Notes
Denotes the condition when an valid temperature is reported from a thermostat.

Input To Transforms
Monitor Temperature

Next Higher Dictionary Where Used
(None)

Output From Transforms
Validate Temperature