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USACE / NAVFAC / AFCEC / NASA **UFGS-25 08 10 (April 2006)**

Preparing Activity: USACE

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated January 2021
****

SECTION TABLE OF CONTENTS

DIVISION 25 - INTEGRATED AUTOMATION

SECTION 25 08 10

UTILITY MONITORING AND CONTROL SYSTEM TESTING

04/06

PART 1 GENERAL

1.1 REFERENCES
1.2 DEFINITIONS
1.2.1 Algorithm
1.2.2 Analog
1.2.3 Analog to Digital (A/D) Converter
1.2.4 CTA CTA-709.1-D
1.2.5 Application Specific Controller
1.2.6 Architecture
1.2.7 Binary
1.2.8 Building Point of Connection (BPOC)
1.2.9 Control Wiring
1.2.10 Demand
1.2.11 Diagnostic Program
1.2.12 Distributed Control
1.2.13 Graphical User Interface (GUI)
1.2.14 Integration
1.2.15 Interoperable
1.2.16 LonTalk(r)
1.2.17 LONWORKS(r)
1.2.18 LONMARK(r) International (LONMARK(r) Interoperability Assoc.)
1.2.19 LonMarked(r)
1.2.20 LONWORKS(r) Application Specific Controller (ASC)
1.2.21 LONWORKS(r) General Purpose Programmable Controller
1.2.22 LONWORKS(r) Network Services (LNS)
1.2.23 Network
1.2.24 Network Configuration Tool
1.2.25 Node ID
1.2.26 Node
1.2.27 Operating System (OS)
1.2.28 Operator Workstation (OWS)
1.2.29 Peripheral
1.2.30 Router
1.2.31 Standard Network Variable Type (SNVT)
1.2.32 UMCS Network Media
1.2.33 XIF

1.2.34 Gateway
1.3 SYSTEM DESCRIPTION
1.3.1 Factory Test
1.3.2 Performance Verification and Endurance Test
1.3.3 Test Equipment and Setup
1.4 SUBMITTALS

PART 2 PRODUCTS

PART 3 EXECUTION

3.1 UMCS AND BUILDING LEVEL DDC TESTING SEQUENCE
3.2 COORDINATION
3.3 PROTECTION
3.4 FACTORY TEST
3.4.1 Factory Test Plan
3.4.2 Test Procedures
3.4.3 Test Report
3.5 FIELD TEST REQUIREMENTS
3.5.1 Start-up Testing
3.5.2 Point-to-Point Testing
3.5.3 Field Calibration
3.5.4 Detailed Functional Testing
3.5.5 Alarms and Interlocks
3.5.6 System Schedules and Setpoints
3.6 PERFORMANCE VERIFICATION TEST
3.6.1 Test Plan
3.6.2 Test Procedures
3.6.3 Test Report
3.7 ENDURANCE TESTING
3.7.1 General
3.7.2 Phase I
3.7.3 Phase II
3.7.4 Phase III
3.7.5 Phase IV
3.7.6 Failure Reports
3.8 ATTACHMENT A

ATTACHMENTS:

ATTACHMENT A

-- End of Section Table of Contents --

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USACE / NAVFAC / AFCEC / NASA **UFGS-25 08 10 (April 2006)**

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****

SECTION 25 08 10

UTILITY MONITORING AND CONTROL SYSTEM TESTING
04/06

****
NOTE: This guide specification covers the requirements for factory, performance verification, and endurance test of UMCS and HVAC controls.

Adhere to UFC 1-300-02 Unified Facilities Guide Specifications (UFGS) Format Standard when editing this guide specification or preparing new project specification sections. Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable item(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments, suggestions and recommended changes for this guide specification are welcome and should be submitted as a Criteria Change Request (CCR).
****

PART 1 GENERAL

****
NOTE: The designer will need to edit this specification if only a portion of the testing is required on the project. The engineer must keep in mind there can be testing of 1) new UMCS, 2) building level controls, and/or 3) combined building level controls and UMCS.
****

1.1 REFERENCES

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NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date,

and title.

Use the Reference Wizard's Check Reference feature when you add a Reference Identifier (RID) outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.

****

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

CONSUMER TECHNOLOGY ASSOCIATION (CTA)

CTA CTA-709.1-D	(2014) Control Network Protocol Specification
CTA CTA-709.3	(1999; R 2015) Free-Topology Twisted-Pair Channel Specification
CTA CTA-852-C	(2014) Tunneling Device Area Network Protocols Over Internet Protocol Channels

1.2 DEFINITIONS

1.2.1 Algorithm

A set of well-defined rules or procedures for solving a problem or providing an output from a specific set of inputs.

1.2.2 Analog

A continuously varying signal value (temperature current, velocity, etc.).

1.2.3 Analog to Digital (A/D) Converter

An A/D converter is a circuit or device whose input is information in analog form and whose output is the same information in digital form.

1.2.4 CTA CTA-709.1-D

"Control Network Protocol Specification", Standard communication protocol for networked control systems that provides peer-to-peer communications.

1.2.5 Application Specific Controller

A device that is furnished with a pre-established built in application that is configurable but not re-programmable.

1.2.6 Architecture

Architecture is the general organization and structure of hardware and

software.

1.2.7 Binary

A two-state system where an "ON" condition is represented by a high signal level and an "OFF" condition is represented by a low signal level.

1.2.8 Building Point of Connection (BPOC)

The point of connection between the UMCS network backbone and the building network backbone. The hardware at this location, which performs/provides the connection is referred to as the BPOC Hardware.

1.2.9 Control Wiring

This includes conduit, wire, and wiring devices to install complete HVAC control systems, including motor control circuits, interlocks, sensors, PE and EP switches, and like devices. This also includes all wiring from node to node, and nodes to all sensors and points defined in the I/O summary shown on drawings or specified herein, and required to execute the sequence of operation. Does not include line voltage power wiring.

1.2.10 Demand

The maximum rate of use of electrical energy averaged over a specific interval of time, usually expressed in kW.

1.2.11 Diagnostic Program

Machine-executable instructions used to detect and isolate system and component malfunctions.

1.2.12 Distributed Control

A system whereby all control processing is decentralized and independent of a central computer. In regards to a LonWorks based system, it also means where the control logic for a single piece of building level control resides in more than one controller (node).

1.2.13 Graphical User Interface (GUI)

Human-machine interfacing allows the operator to manage, command, monitor, and program the system.

1.2.14 Integration

Establishing communication between two or more systems to create a single system.

1.2.15 Interoperable

Two devices are interoperable if installed into the same system and they communicate with each other without the use of another device (such as a gateway).

1.2.16 LonTalk(r)

Open communication protocol developed by the Echelon(r) Corporation.

1.2.17 LONWORKS(r)

The communication technology developed by Echelon(r) Corporation for control systems developed. The technology is based on the CTA CTA-709.1-D protocol and employs interoperable devices along with the capability to openly manage these devices using a network configuration tool.

1.2.18 LONMARK(r) International (LONMARK(r) Interoperability Assoc.)

Standards committee consisting of numerous independent product developers and systems integrators dedicated to determining and maintaining the interoperability guidelines for the LONWORKS(r) industry.

1.2.19 LonMarked(r)

A device that has been certified for compliance with LonMark(r) standards by the LonMark(r) International.

1.2.20 LONWORKS(r) Application Specific Controller (ASC)

A networked device or node that contains a complete, configurable application that is specific to a particular task.

1.2.21 LONWORKS(r) General Purpose Programmable Controller

A programmable control product, that unlike an ASC, is not installed with a fixed factory-installed application program. The application in the controller is custom software produced by the integrator specifically for the project.

1.2.22 LONWORKS(r) Network Services (LNS)

The database format for addressing nodes and variable bindings node-to-node.

1.2.23 Network

A system of distributed control units that are linked together on a communication bus. A network allows sharing of point information between all control units. Additionally, a network provides central monitoring and control of the entire system from any distributed control unit location.

1.2.24 Network Configuration Tool

Software used to create and modify the control network database and configure controllers.

1.2.25 Node ID

A unique 48-bit node identification (ID) tag given to each node by Echelon Corporation.

1.2.26 Node

An intelligent LONWORKS(r) device with a node ID and communicates via CTA CTA-709.1-D and is connected to an CTA CTA-709.1-D network.

1.2.27 Operating System (OS)

Software which controls the execution of computer programs and which provides scheduling, debugging, input/output controls, accounting, compilation, storage assignment, data management, and related services.

1.2.28 Operator Workstation (OWS)

The OWS consists of a high-level processing desktop or laptop computer that provides a graphic user interface to network.

1.2.29 Peripheral

Input/Output (I/O) equipment used to communicate to and from the computer and make hard copies of system outputs and magnetic files.

1.2.30 Router

A device which routes messages destined for a node on another segment subnet or domain of the control network. The device controls message traffic based on node address and priority. Routers may also serve as communication links between powerline, twisted pair, fiber, coax, and RF media.

1.2.31 Standard Network Variable Type (SNVT)

A network variable of a standard format type used to define data information transmitted and receive by the individual nodes.

1.2.32 UMCS Network Media

Transmission equipment including cables and interface modules (excluding MODEMs) permitting transmission of digital information.

1.2.33 XIF

"External Interface File" contains the contents of the manufacturer's product documentation.

1.2.34 Gateway

A device that translates from one protocol to another. Gateways are also called Communications Bridges or Protocol Translators.

1.3 SYSTEM DESCRIPTION

a. The purpose of this Specification is to define generic Factory, Performance Verification, and Endurance Test procedures for Utility Monitoring and Control Systems (UMCS) and building level DDC. These tests are to be used to assure that the physical and performance requirements of UMCS and building level DDC are tested, and that the test results are adequately documented. The Government will base certain contractual decisions on the results of these tests.

b. This document covers the factory, performance verification, and endurance test procedures for the Utility Monitoring and Control System (UMCS) and Direct Digital Control for HVAC. It has been written for a host based system where the LONWORKS(r) LNS database resides on the main computer (server) and communicates over the

Ethernet (TCP/IP) connection to the field level controller nodes. The system shall be comprised of the server hardware and software, IP network hardware and software, and building point of connection (BPOC) hardware and software.

c. The contractor who provided building level DDC under Section 23 09 00 INSTRUMENTATION AND CONTROL FOR HVAC is responsible for testing the building level DDC. All control testing and controller tuning required under Section 23 09 00 shall be completed and approved before performing Performance Verification and Endurance Tests under this section.

d. The following UFGS: Section 25 10 10 UTILITY MONITORING AND CONTROL SYSTEM (UMCS) FRONT END AND INTEGRATION and Section 23 09 00 INSTRUMENTATION AND CONTROL FOR HVAC shall be part of the contract documents.

1.3.1 Factory Test

Conduct a factory test at a company site. Perform some of the basic functions of the UMCS and building level DDC, to assure that the performance requirements of the specifications are met.

1.3.2 Performance Verification and Endurance Test

a. Shall be conducted on hardware and software installed at the jobsite to assure that the physical and performance requirements of specifications are met. Tests on network media shall include all contractor furnished media and shall include at least one type of each device installed.

b. Shall be conducted under normal mode operation, unless otherwise indicated in the initial conditions description for each test. System normal mode describes a condition in which the system is performing its assigned tasks in accordance with the contract requirements.

c. Shall utilize the operator workstation (OWS) to issue commands or verify status data.

1.3.3 Test Equipment and Setup

All test equipment calibrations shall be traceable to NIST. The accuracy of the test equipment and overall test method shall be at least twice the maximum accuracy required for the test. For example, if a temperature sensor has an accuracy of +0.5 degree C +1 degree F over the executed range, the test instrument used shall have an accuracy of at least +0.25 degree C +0.5 degree F or better. Provide all test equipment unless otherwise noted in the contract documents.

1.4 SUBMITTALS

****

NOTE: Review submittal description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list, and corresponding submittal items in the text, to reflect only the submittals required for the project. The Guide Specification technical editors have classified those items that require Government approval, due to their complexity

or criticality, with a "G." Generally, other submittal items can be reviewed by the Contractor's Quality Control System. Only add a “G” to an item, if the submittal is sufficiently important or complex in context of the project.

For Army projects, fill in the empty brackets following the "G" classification, with a code of up to three characters to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

The "S" classification indicates submittals required as proof of compliance for sustainability Guiding Principles Validation or Third Party Certification and as described in Section 01 33 00 SUBMITTAL PROCEDURES.

Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed item for Army projects.

****

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are [for Contractor Quality Control approval.][for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Factory Test; G[, [_____]]

SD-06 Test Reports

UMCS and Building Level DDC Testing Sequence
Performance Verification Test; G[, [_____]]
Endurance Testing

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 UMCS AND BUILDING LEVEL DDC TESTING SEQUENCE

Perform a successful factory test prior to start of installation work, as described in this section. During the installation phase, perform all required field testing requirements on the UMCS and building level DDC as specified in Sections 25 10 10 UTILITY MONITORING AND CONTROL SYSTEM (UMCS) FRONT END AND INTEGRATION and 23 09 00 INSTRUMENTATION AND CONTROL

FOR HVAC, to verify that systems are functioning and installed in accordance with specifications. Submit field test report prior to start of PVT and endurance testing. After completing all required field testing, perform a successful PVT and endurance test. All tests shall be successfully completed, and test reports received, prior to final acceptance of the UMCS and building level DDC. Perform and document Contractor field test on UMCS and building level DDC.

3.2 COORDINATION

Coordinate the testing schedule with the Government. Coordination shall include controls specified in other sections or divisions which include controls and control devices that are to be part of or interfaced to the UMCS specified in this section.

3.3 PROTECTION

Protect all work and material from damage by the work or workers. The Contractor is liable for any damage caused and responsible for the work and equipment until finally inspected, tested, and accepted. Protect the work against theft, and carefully store material and equipment received onsite that is not immediately installed.

3.4 FACTORY TEST

3.4.1 Factory Test Plan

Prior to the scheduling of the factory tests, provide the Government with a Factory Test Plan for approval, and wait to receive notification of approval of the Test Plan and Procedures before performing the tests. The plan shall include the following, as a minimum:

a. System one-line block diagram of equipment used in the factory test model, indicating servers, workstations, peripherals, network equipment, controllers, and instrumentation.

b. System hardware description used in the factory test.

c. System software description used in the factory test.

d. Listing of control and status points in the factory test model; plus a table with the following information:

   (1) Input and output variables.
   (2) SNVTs for each variable.
   (3) Expected engineering units for each variable.
   (4) Node ID.
   (5) Domain & subnet addressing.

e. Required passwords for each operator access level.

f. List of other test equipment.

3.4.2 Test Procedures

Develop the factory test procedures from the generic test procedures in ATTACHMENT A. The test procedures shall consist of detailed instructions for test setup, execution, and evaluation of test results. Edit the generic test procedure for the provided UMCS and building level DDC.

Perform a factory test on a model of the UMCS and building level DDC for the Government to verify the system will function to the requirements of the contract documents. The test architecture shall mimic a two building arrangement. There shall be a TCP/IP layer with two Internet Protocol (IP) to Lon routers. Below each of the routers shall be both programmable (GPPC) and application-specific controllers (ASC). One server and one workstation with printers shall be connected to the IP layer. There shall be simulated input devices connected to controllers to enable the creation of changing variables. If, during testing, the system fails a portion of a test, the Government will inform the Contractor if the entire test or only the portion that failed shall be re-performed. Give the Government a written report of those items which failed, what the problem was, and what was done to correct it. Provide onsite technical support to perform the PVT. ATTACHMENT A presents the generic Test Procedures with the following information:

a. Test identification number.

b. Test title.

c. Objective.

d. Initial conditions (if applicable).

e. Test equipment (if required).

f. Sequence of events.

g. Expected results.

3.4.3 Test Report

Submit a factory final, complete test report after completing the test, consisting of the following, as a minimum:

a. Section one of the submittal shall be a short summary of the factory test.

b. Section two of the submittal shall be a copy of the test plans.

c. Section three shall be the executed test procedure and shall be divided using tabs. Each tab section shall include all pertinent information pertaining to the executed and approved test, showing date and Government representative who witnessed/approved the test.

3.5 FIELD TEST REQUIREMENTS

The UMCS contractor shall perform and document contractor start-up and field tests as required by Sections 25 10 10 UTILITY MONITORING AND CONTROL SYSTEM (UMCS) FRONT END AND INTEGRATION and 23 09 00 INSTRUMENTATION AND CONTROL FOR HVAC. The field test validates that the UMCS and building level DDC are in operation without any problems or system errors prior to starting a PVT. Validate that all software along with all hardware is installed to meet or exceed the contract document requirements. This includes all LONWORKS(r) networking and monitoring hardware and all peripherals associated with the network and hardware. Start-up and field testing shall include:

3.5.1 Start-up Testing

All testing listed in Sections 25 10 10 and 23 09 00 shall be completed.

3.5.2 Point-to-Point Testing

All point-to-point testing of end field devices through proper input/output to graphic and operator interface shall be completed and approved.

3.5.3 Field Calibration

All field calibration shall be completed and approved.

3.5.4 Detailed Functional Testing

Detailed functional tests, verified by the Government that the system operation adheres to the Sequences of Operation.

3.5.5 Alarms and InterlocksAll alarm limits and testing shall be completed.

3.5.6 System Schedules and Setpoints

All schedule start/stops and system setpoints shall be entered, operating, and approved.

3.6 PERFORMANCE VERIFICATION TEST

3.6.1 Test Plan

Prior to the scheduling of the performance verification tests, provide the Government with a Performance Verification and Endurance Test Plan and Procedures for approval, and receive notification of approval of the Test Plan and Procedures. The plan shall include the following, as a minimum:

a. Installed system one-line block diagram, indicating servers, workstations, peripherals, network equipment, controllers, and instrumentation.

b. Installed system hardware description.

c. Installed system software description, including any software revisions made since the factory test.

d. Listing of control and status points installed in the system; plus a table with the following information:

(1) Input and output variables.
(2) SNVTs for each variable.
(3) Expected engineering units for each variable.
(4) Node ID.
(5) Domain & subnet addressing.

e. Required passwords for each operator access level.

f. List of other test equipment.

3.6.2 Test Procedures

Develop the performance verification test procedures from the generic test procedures in ATTACHMENT A. The test procedures shall consist of detailed instructions for test setup, execution, and evaluation of test results. Edit the generic test procedure for the provided UMCS and building level DDC. Perform a performance verification test (PVT) on the completed UMCS and building level DDC for the Government to verify the system is completely functional. If, during testing, the system fails a portion of a test, the Government will inform the Contractor if the entire test or only the portion that failed shall be re-performed. Give the Government a written report of those items which failed, what the problem was, and what was done to correct it. Provide on-site technical support to perform the PVT. ATTACHMENT A presents the generic UMCS Performance Verification Test Procedures with the following information:

a. Test identification number.

b. Test title.

c. Objective.

d. Initial conditions (if applicable).

e. Test equipment (if required).

f. Sequence of events.

g. Expected results.

3.6.3 Test Report

Submit a final, complete PVT test report, after completing the test, consisting of the following, as a minimum:

a. Section one of the submittal shall be a short summary of the performance verification test.

b. Section two of the submittal shall be a copy of the test plans.

c. Section three shall be the executed test procedure and shall be divided using tabs. Each tab section shall include all pertinent information pertaining to the executed and approved test, showing date and Government representative who witnessed/approved the test.

3.7 ENDURANCE TESTING

3.7.1 General

Endurance Test shall be designed to demonstrate the specified overall system reliability requirement of the completed system. Conduct the Endurance Test in four phases as described below. The Endurance Test shall not be started until the Government notifies the Contractor, in writing, that the Performance Verification Tests have been satisfactorily completed, training as specified has been completed, correction of all outstanding deficiencies has been satisfactorily completed, and that the Contractor has permission to start the Endurance Test. Provide an operator to man the system eight hours per day during first shift operations, including weekends and holidays, during Phase I and Phase III

Endurance testing, in addition to any Government personnel that may be made available. The Government may terminate testing at any time if the system fails to perform as specified. Upon termination of testing by the Government or by the Contractor, commence an assessment period as described for Phase II and Phase IV. Upon successful completion of the Endurance Test, submit test reports to the Government explaining in detail the nature of any failures, corrective action taken, and results of tests performed, prior to acceptance of the system. Keep a record of the time and cause of each outage that takes place during the test period.

3.7.2 Phase I

During the Phase I testing, operate the system as specified for 24 hours per day, 7 days per week, for 15 consecutive calendar days, including holidays. Do not make repairs during this phase of testing unless authorized by the Government, in writing. If the system experiences no failures during the Phase I test, proceed directly to Phase III testing, after receiving written permission from the Government.

3.7.3 Phase II

In Phase II, which occurs after the conclusion of Phase I, identify all failures, determine the causes of all failures, repair all failures, and submit a test failure report to the Government. After submitting the written report, convene a test review meeting at the job site to present the results and recommendations to the Government. The meeting shall be scheduled no earlier than five business days after receipt of the report by the Government. As a part of this test review meeting, demonstrate that all failures have been corrected by performing appropriate Performance Verification Tests. Based on the Contractor's report, the test review meeting, and the Contractor's recommendation, the Government will independently determine the restart point and may require that the Phase I test be totally or partially rerun. Do not commence any required retesting until after receipt of written notification by the Government.

3.7.4 Phase III

After the conclusion of any retesting which the Government may require, repeat the Phase II assessment as if Phase I had just been completed. If the retest is completed without any failures, proceed directly to Phase III testing, after receiving written permission from the Government. During Phase III testing, operate the system as specified for 24 hours per day, 7 days per week, for 15 consecutive calendar days, including holidays. Do not make repairs during this phase of testing unless authorized by the Government, in writing.

3.7.5 Phase IV

In Phase IV, which occurs after the conclusion of Phase III, identify all failures, determine the causes of all failures, repair all failures, and submit a test failure report to the Government. After submitting the written report, convene a test review meeting at the job site to present the results and recommendations to the Government. The meeting shall not be scheduled earlier than five business days after receipt of the report by the Government. As a part of this test review meeting, demonstrate that all failures have been corrected by performing appropriate Performance Verification Tests. Based on the Contractor's report, the test review meeting, and the Contractor's recommendation, the Government will independently determine the restart point and may require that the

Phase III test be totally or partially rerun. Do not commence any required retesting until after receipt of written notification by the Government. After the conclusion of any retesting which the Government may require, the Phase IV assessment shall be repeated as if Phase III had just been completed. The Contractor will not be held responsible for failures resulting from the following:

a. An outage of the main power supply in excess of the capability of any backup power source, provided that the automatic initiation of all backup sources was accomplished and that automatic shutdown and restart of the UMCS performed as specified.

b. Failure of a Government-furnished communications link, provided that the LON nodes and LON routers automatically and correctly operate in the stand-alone mode as specified, and that the failure was not due to contractor furnished equipment, installation, or software.

c. Failure of existing Government-owned equipment, provided that the failure was not due to contractor-furnished equipment, installation, or software.

3.7.6 Failure Reports

Provide UMCS Endurance Test Failure Reports. UMCS Test Failure Reports shall explain in detail the nature of each failure, corrective action taken, results of tests performed. If any failures occur during Phase I or Phase III testing, recommend the point at which the Phase I or Phase III testing, as applicable, should be resumed.

3.8 ATTACHMENT A

TEST PROCEDURES

TITLE: Test Index
OBJECTIVE: The following is an index of tests.

NOTES: Tests one through twenty contain specific "item(s)" that apply to Sections 25 10 10 UTILITY MONITORING AND CONTROL SYSTEM (UMCS) FRONT END AND INTEGRATION) and 23 09 00 INSTRUMENTATION AND CONTROL FOR HVAC. The following index of tests provides a summary of which "items numbers" apply to which specification.

Test No.	Test Title	Section 23 09 00, Section 25 10 10	DDC for HVAC
One	Initial System Equipment Verification	Items 1 through 15	Items 16 through 32
Two	System Start-up	Items 1 through 4	Items 5 and 6
Three	Monitor and Control Software	Items 1 through 5	Not Applicable
Four	Graphic Display of Data	Items 1 through 18	Not Applicable
Five	Graphic Navigation Scheme	Items 1 and 2	Not Applicable
Six	Command Functions	Items 1 through 6	Not Applicable
Seven	Command Input Errors	Items 1 through 6	Items 1 through 6
Eight	Special Functions	Item 1	Not Applicable
Nine	Software Editing Tools	Items 1 through 42	Items 1 through 42
Ten	Scheduling	Items 1 through 7	Items 8 through 10
Eleven	Alarm function	Items 1 through 15	item 16
Twelve	Trending	Items 1 through 8	Not Applicable
Thirteen	Demand Limiting	Items 1 through 8	Not Applicable
Fourteen	Report Generation	Items 1 through 6	Not Applicable
Fifteen	UPS Test	Items 1 through 5	Not Applicable
Sixteen	CTA CTA-709.1-D to IP Router Test	Items 1 through 3	Not Applicable
Seventeen	CTA CTA-709.1-D Router and Repeater	Not Applicable	Items 1 through 4

Test No.	Test Title	Section 23 09 00, Section 25 10 10	DDC for HVAC
Eighteen	CTA CTA-709.1-D Gateway Test	Items 1 through 5	Items 1 through 5
Nineteen	Local Display Panel	Not Applicable	Items 1 through 5
Twenty	Network Configuration Tool	Items 1 through 8	Items 1 through 8
Twenty-One	Custom Tests	Item 1 and 2	Item 1 and 2

PVT Checklist

OBJECTIVE:

1. Inspect/test/verify that building-level DDC system is compliant with Section 23 09 00 and capable of integration with UMCS

INITIAL REQUIREMENTS/CONDITIONS

1. The following tests shall be completed and documentation shall be submitted to the Government.

2. Date of Checklist: _____
3. Time of Checklist: _____
4. Contractor's Representative: _____
5. Government's Representative: _____

CHECKLIST PROCEDURES

Item	Action Item	Expected Results	Approved
UMCS AND DDC FOR HVAC			
1	Draft or Final As-Built Drawings	Drawings submitted and approved	_____
		Point schedule(s) showing all required UMCS SNVTs submitted	_____
		Point schedules(s) showing device network addresses submitted	_____
		Local display panel (LDP) locations indicated on drawings submitted	_____
	Notes: _____		
2	Network Bandwidth Test Report	Test completed, accepted, and a report documenting results submitted	_____
	Notes: _____		
3	Programming software	Most recent version of the programming software for each type of GPPC has been submitted	_____
	Notes: _____		

Item	Action Item	Expected Results	Approved
4	XIF Files	External interface files (XIF) files for each model of LONWORKS®-based DDC hardware has been submitted	_____
	Notes: _____		
5	LNS Database	Copies of the LNS database for the completed control network has been submitted	_____
	Notes: _____		
6	LNS Plug-in	LNS Plug-ins for each application specific controller has been submitted	_____
	Notes: _____		
7	Start-up testing report	Start-up has been successfully completed and testing report submitted	_____
		Controller tuning has been completed and document on point schedule	_____
		Calibration accuracy check completed and documented in test report	_____
		Actuator range check completed and documented in test report	_____
		Functional test to demonstrate control sequence completed and documented in test report	_____
	Notes: _____		
8	Software License	Software licenses received for all software on the project	_____
	Notes: _____		

Item	Action Item	Expected Results	Approved

End of Test

Specific Abbreviations:
Y = Yes
N = No
NA = Not Applicable

TEST NUMBER: One
TITLE: Initial System Equipment Verification

OBJECTIVE:

1. To verify that the hardware and software components of the system provided by the Contractor are in accordance with the contract plans and specifications and all approved submittals.

INITIAL REQUIREMENTS/CONDITIONS

1. Submittals

a. Submit a detailed list of all approved hardware with Manufacturer, model number and location. This list is based on the contract plans, specifications, change orders (if any) and approved submittals which shall be available for reference purposes during the test.

b. Submit a detailed list of all approved software with revision number and purpose of software. This list is based on the contract plans, specifications, change orders (if any) and approved submittals which shall be available for reference purposes during the test.

2. Equipment

a. Verify all equipment is functional.

3. Reference Documentation

a. List user manual documentation and sections pertaining to the testing.

4. Date of Test: _____
5. Time of Test: _____
6. Contractor's Representative: _____
7. Government's Representative: _____

TEST PROCEDURES

Item	Action Item	Expected Results	Approved
UMCS			
1	The workstation hardware is installed and complies with specification paragraph titled "Workstation Hardware".	_____	_____
	Notes: _____		
2	The Server hardware is installed and complies with specification paragraph titled "Server Hardware".	_____	_____
	Notes: _____		

Item	Action Item	Expected Results	Approved
3	The fiber optic patch panel is installed and complies with specification paragraph titled "Fiber Optic Patch Panel".	_____	_____
	Notes: _____		
4	The fiber optic media converter is installed and complies with specification paragraph titled "Fiber Optic Media Converter".	_____	_____
	Notes: _____		
5	The Ethernet switch is installed and complies with specification paragraph titled "Ethernet Switch".	_____	_____
	Notes: _____		
6	The IP router is installed and complies with specification paragraph titled "IP Router".	_____	_____
	Notes: _____		
7	The CTA CTA-709.1-D to IP router is installed and complies with specification paragraph titled "CTA CTA-709.1-D to IP Router".	_____	_____
	Notes: _____		
8	The CTA CTA-709.1-D gateway is installed and complies with specification paragraph titled "CTA CTA-709.1-D Gateway".	_____	_____
	Notes: _____		

Item	Action Item	Expected Results	Approved
9	The alarm printer is installed and complies with specification paragraphs titled "PRINTERS" and "Alarm Printer".	_____	_____
	Notes: _____		
10	The laser printer is installed and complies with specification paragraphs titled "PRINTERS" and "Laser Printer".	_____	_____
	Notes: _____		
11	The color printer is installed and complies with specification paragraphs titled "PRINTERS" and "Color Printer".	_____	_____
	Notes: _____		
12	The operating system is installed and complies with specification paragraph titled "Operating System (OS)".	_____	_____
	Notes: _____		
13	The office automation software is installed and complies with specification paragraph titled "Office Automation Software".	_____	_____
	Notes: _____		
14	The virus protection software is installed and complies with specification paragraph titled "Virus Protection Software".	_____	_____
	Notes: _____		
15	The configuration server is installed and complies with specification paragraph titled		

Item	Action Item	Expected Results	Approved
	"CTA CTA-852-C Configuration Server".	_____	_____
	Notes: _____		
	_____		
DDC FOR HVAC			
16	The CTA CTA-709.1-D Router is installed and complies with specification paragraph titled "CTA CTA-709.1-D Router".	_____	_____
	Notes: _____		
	_____		
17	The CTA CTA-709.3 Repeater is installed and complies with specification paragraph titled "CTA CTA-709.3 Repeater".	_____	_____
	Notes: _____		
	_____		
18	The TP/FT-10 network is installed in accordance with CTA CTA-709.3, with double-terminated bus topology.	_____	_____
	Notes: _____		
	_____		
19	Network wiring extends to the location of UMCS BPOC.	_____	_____
	Notes: _____		
	_____		
20	The Gateway is installed and complies with specification paragraph titled "Gateway".	_____	_____
	Notes: _____		
	_____		
21	All control valves are installed and comply with their associated specification paragraph under the section titled "Control Valves".	_____	_____
	Notes: _____		
	_____		

Item	Action Item	Expected Results	Approved
22	All dampers are installed and comply with their associated specification paragraph under the section titled "Dampers".	_____	_____
	Notes: _____		
23	All sensors are installed and comply with their associated specification paragraph under the section titled "Sensors".	_____	_____
	Notes: _____		
24	All indicating devices are installed and comply with their associated specification paragraph under the section titled "Indicating Devices".	_____	_____
	Notes: _____		
25	All user input devices are installed and comply with their associated specification paragraph under the section titled "User Input Devices".	_____	_____
	Notes: _____		
26	All output devices are installed and comply with their associated specification paragraph under the section titled "Output Devices".	_____	_____
	Notes: _____		
27	All multifunction devices are installed and comply with their associated specification paragraph under the section titled "Multifunction Devices".	_____	_____
	Notes: _____		

Item	Action Item	Expected Results	Approved
28	All compressed air equipment is installed and complies with their associated specification paragraph under the section titled "Compressed Air".	_____	_____
	Notes: _____		
29	All ASCs are installed and comply with the specification paragraph titled "Application Specific Controller".	_____	_____
	Notes: _____		
30	All LDPs and laptop computers are provided and comply with the specification paragraph titled "Local Display Panel".	_____	_____
	Notes: _____		
31	All GPPCs are installed and comply with the specification paragraph titled "General Purpose Programmable Controller".	_____	_____
	Notes: _____		
32	LNS-based system used to address nodes, bind variables, and LNS database of network exists on system.	_____	_____
	Notes: _____		

End of Test

Specific Abbreviations:
Y = Yes
N = No
NA = Not Applicable

TEST NUMBER: Two
TITLE: System Start-up

OBJECTIVE:

1. To validate that the system properly initializes and that the GUI properly reconnects to all communicating devices.
2. To validate that both application specific and programmable devices retain all vital information upon a power cycle.

INITIAL REQUIREMENTS/CONDITIONS

1. Submittals

a. Provide a list of all software that will be used to verify point connection at field level controllers and user interface.

b. Provide a list of all software need to verify application specific and programmable controller start-up.

2. Equipment

a. All peripherals and cables shall be connected in accordance with manufacturer's requirements.

b. The workstation shall be in the off mode.

c. All controls shall be fully functional and tested.

d. A programmable and application specific controller shall be randomly selected for the test.

3. Date of Test: _____
4. Time of Test: _____
5. Contractor's Representative: _____
6. Government's Representative: _____

TEST PROCEDURES

Item	Action Item	Expected Results	Approved
UMCS			
1	Energize the workstation.	The workstation will power-up and perform its start-up procedure without generating any errors or problems.	_____
	a) Operating system	Operating system shall be latest version of windows.	_____
	b) Start Network Configuration Tool.	The Network Configuration Tool drawing will open.	_____
	c) Start the System Plug-in.	The System plug-in will open.	_____
	d) Start the Server.	The Server will start.	_____
	e) Start the Workstation.	The Workstation will start. The operator shall now have the ability to view data from any device on the	

Item	Action Item	Expected Results	Approved
		network.	_____
	Notes: _____		
2	Check the communication from the server to the controllers.	Within the workstation software, when a device is selected, dynamic points lists become visible. Dynamic data represents success. A completion event failure message represents failure.	_____
	Notes: _____		
3	Verify on-line status.	All devices shall have on-line status indicated by the workstation software (green indicator).	_____
	Notes: _____		
4	View data from the graphical environment.	When a graphics page is opened, the points on the page should update. Question marks in lieu of data reflect failure.	_____
	Notes: _____		
DDC FOR HVAC			
5	Verify that configuration data in application specific controllers is written to EEPROM.	All configuration parameters should be accessible.	_____
	a) Open the LONWORKS® plug-in.	Software should open without errors.	_____
	b) Note several parameters such as temperature setpoints and flow settings.	Operator is able to view a sample of parameters (data values and setpoints).	_____
	c) Remove power from the controller for a minimum of 3 minutes.	Device should go off-line in Network Configuration Tool and workstation/server.	_____
	d) Replace power to the controller.	Device should return to on-line status.	_____
	e) Using the plug-in, verify that the parameters have not	Parameters shall not have changed.	_____

Item	Action Item	Expected Results	Approved
	changes.		
	Notes: _____		
6	Verify that configuration data in programmable controllers is retained after a power cycle.	_____	_____
	a) From the Workstation view several configuration parameters and note the values.	Values of the parameters can be viewed from the tree structure.	_____
	b) Remove power for a minimum of 3 minutes.	Controller will go offline in workstation software.	_____
	c) Replace power to the controller.	Controller will return to online status.	_____
	d) From the Workstation view the same configuration parameters and note the values.	Parameters values shall not have changed.	_____
	Notes: _____		

End of Test

Specific Abbreviations:
Y = Yes
N = No
NA = Not Applicable

TEST NUMBER: Three
TITLE: Monitor and Control (M&C) Software Passwords

OBJECTIVE:

1. To validate that the system utilizes four basic password levels
2. To validate that each password level has the specified authority

INITIAL REQUIREMENTS/CONDITIONS

1. Submittals

a. Provide documentation of M&C user password capacity in comparison with specification.

b. Provide a complete list of all users along with their passwords and user level prior to testing.

2. Equipment

a. Server and Workstation

3. Reference Documentation

a. Provide user manual documentation for setting up passwords

4. Date of Test: _____
5. Time of Test: _____
6. Contractor's Representative: _____
7. Government's Representative: _____

TEST PROCEDURES

Item	Action Item	Expected Results	Approved
UMCS			
1	Create password for new users.	New users shall exist in the server Database.	_____
	a) Set-up 4 users.	_____	_____
	b) Assign different levels to each.	_____	_____
	Notes: _____		
2	Demonstrate level 1 authority.	_____	_____
	a) Sign in as the level 1 user.	Sign in shall be successful.	_____
	b) Attempt to view a system graphic.	Action shall be possible.	_____
	c) Attempt to acknowledge an alarm.	Action shall be denied.	_____
	d) Attempt to configure a trend.	Action shall be denied.	_____
	e) Attempt to configure a report.	Action shall be denied.	_____

Item	Action Item	Expected Results	Approved
	f) Attempt to override a point.	Action shall be denied.	_____
	g) Attempt to configure an alarm.	Action shall be denied.	_____
	h) Attempt to configure a schedule.	Action shall be denied.	_____
	i) Attempt to configure a demand limiting parameter.	Action shall be denied.	_____
	j) Attempt to modify a graphic page.	Action shall be denied.	_____
	k) Attempt to create a custom program.	Action shall be denied.	_____
	Notes: _____		
3	Demonstrate level 2 authority.	_____	_____
	a) Sign in as the level 2 user.	Sign in shall be successful.	_____
	b) Attempt to view a system graphic.	Action shall be possible.	_____
	c) Attempt to acknowledge an alarm.	Action shall be possible.	_____
	d) Attempt to configure a trend.	Action shall be possible.	_____
	e) Attempt to configure a report.	Action shall be possible.	_____
	f) Attempt to override a point.	Action shall be denied.	_____
	g) Attempt to configure an alarm.	Action shall be denied.	_____
	h) Attempt to configure a schedule.	Action shall be denied.	_____
	i) Attempt to configure a demand limiting parameter.	Action shall be denied.	_____
	j) Attempt to modify a graphic page.	Action shall be denied.	_____
	k) Attempt to create a custom program.	Action shall be denied.	_____
	Notes: _____		
4	Demonstrate level 3 authority.	_____	_____
	a) Sign in as the level 3 user.	Sign in shall be successful.	_____
	b) Attempt to view a system graphic.	Action shall be possible.	_____
	c) Attempt to acknowledge an alarm.	Action shall be possible.	_____
	d) Attempt to configure a	Action shall be possible.	

Item	Action Item	Expected Results	Approved
	trend.		_____
	e) Attempt to configure a report.	Action shall be possible.	_____
	f) Attempt to override a point.	Action shall be possible.	_____
	g) Attempt to configure an alarm.	Action shall be possible.	_____
	h) Attempt to configure a schedule.	Action shall be possible.	_____
	i) Attempt to configure a demand limiting parameter.	Action shall be possible.	_____
	j) Attempt to modify a graphic page.	Action shall be denied.	_____
	k) Attempt to create a custom program.	Action shall be denied.	_____

Notes: _____

_____

5	Demonstrate level 4 authority.	_____	_____
	a) Sign in as the level 3 user.	Sign in shall be successful.	_____
	b) Attempt to view a system graphic.	Action shall be possible.	_____
	c) Attempt to acknowledge an alarm.	Action shall be possible.	_____
	d) Attempt to configure a trend.	Action shall be possible.	_____
	e) Attempt to configure a report.	Action shall be possible.	_____
	f) Attempt to override a point.	Action shall be possible.	_____
	g) Attempt to configure an alarm.	Action shall be possible.	_____
	h) Attempt to configure a schedule.	Action shall be possible.	_____
	i) Attempt to configure a demand limiting parameter.	Action shall be possible.	_____
	j) Attempt to modify a graphic page program.	Action shall be possible.	_____
	k) Attempt to create a custom program.	Action shall be possible.	_____

Notes: _____

_____

End of Test

Specific Abbreviations:
Y = Yes
N = No
NA = Not Applicable

TEST NUMBER: Four
TITLE: Graphic Display of Data

OBJECTIVE:

1. To validate that floor plans and equipment can be graphically displayed through GUI.
2. To validate the proper display of alarms on GUI.
3. To validate the proper display of trend data on GUI.

INITIAL REQUIREMENTS/CONDITIONS

1. Submittals

   a. Provide hard copies of "snap shots" of sample graphics pages prior to testing.

2. Equipment

   a. Complete all graphics.

3. Reference Documentation

   a. List user manual documentation and sections pertaining to the testing.

4. Notes

   a. Different types of data and states should be clearly distinguishable from each other.

5. Date of Test: _____
6. Time of Test: _____
7. Contractor's Representative: _____
8. Government's Representative: _____

TEST PROCEDURES

Item	Action Item	Expected Results	Approved
1	Demonstrate the use of a three dimensional representation of a mechanical system.	Equipment shall be represented in a three dimensional manner.	_____
	Notes: _____		
2	Demonstrate the presentation of real time data.	Dynamic real time data shall be presented on a graphics page.	_____
	Notes: _____		
3	Demonstrate the presentation of user	A user defined parameter such as a setpoint shall be	

Item	Action Item	Expected Results	Approved
	entered data.	presented on a graphics page. Different types of data and states should be clearly distinguishable from each other.	_____
	Notes: _____		
4	Demonstrate the presentation of a point in override.	An indication of override condition shall be viewable on the graphic page. Different types of data and states should be clearly distinguishable from each other.	_____
	Notes: _____		
5	Demonstrate the presentation of a device in the alarm state.	An indication of the alarm state shall be viewable on the graphic page. Different types of data and states should be clearly distinguishable from each other.	_____
	Notes: _____		
6	Demonstrate the presentation of data that is out of range.	An indication of out of range condition shall be viewable on the graphic page. Different types of data and states should be clearly distinguishable from each other.	_____
	Notes: _____		
7	Demonstrate the presentation of missing data (controller is offline).	An indication of missing data shall be viewable on the graphic page. Different types of data and states should be clearly distinguishable from each other.	_____
	Notes: _____		

Item	Action Item	Expected Results	Approved
8	Demonstrate an error message when the operator attempts to execute in improper command.	An error message shall be displayed.	_____
	Notes: _____		
9	Demonstrate point and click access to context sensitive help.	Operator shall be able to easily access context sensitive help using the mouse.	_____
	Notes: _____		
10	Demonstrate point and click access to an engineering diagram.	Operator shall be able to access an engineering diagram using the mouse.	_____
	Notes: _____		
11	Demonstrate the creation of an engineering diagram.	Operator shall be able to create an engineering diagram.	_____
	Notes: _____		
12	Demonstrate the printing of a prepared report.	Operator shall be able to print a report using the mouse.	_____
	Notes: _____		
13	Demonstrate the display of one or more points.	Operator shall be able to request the display of one or more points.	_____
	Notes: _____		
14	Demonstrate the operator override of a point.	Operator shall be able to override a point.	_____
	Notes: _____		

Item	Action Item	Expected Results	Approved
15	Demonstrate the modification of a time schedule.	Operator shall be able to modify a time schedule.	_____
	Notes: _____		
16	Demonstrate the execution of a report.	Operator shall be able to initiate a report.	_____
	Notes: _____		
17	Demonstrate the presentation of an alarm to include:	Operator shall be able to view an alarm with all of the required data.	_____
	a) Identification	_____	_____
	b) Date and time	_____	_____
	c) Alarm Type	_____	_____
	d) Set Points	_____	_____
	e) Units	_____	_____
	f) Current Value	_____	_____
	g) Priority	_____	_____
	h) Associated message & Secondary message	_____	_____
	Notes: _____		
18	Demonstrate the presentation of real time trend data.	Operator shall be able to view real time trend data as a function of time.	_____
	Notes: _____		

End of Test

Specific Abbreviations:
Y = Yes
N = No
NA = Not Applicable

TEST NUMBER: Five
TITLE: Graphic Navigation Scheme

OBJECTIVE:

1. To validate hierarchical graphic displays from main screen to end devices.

INITIAL REQUIREMENTS/CONDITIONS

1. Submittals

a. Provide a hierarchical block diagram of the system network prior to testing.

2. Equipment

a. Have all programming completed to demonstrate graphic display.

3. Reference Documentation

a. List user manual documentation and sections pertaining to the testing.

4. Date of Test: _____
5. Time of Test: _____
6. Contractor's Representative: _____
7. Government's Representative: _____

TEST PROCEDURES

Item	Action Item	Expected Results	Approved
UMCS			
1	Demonstrate the creation of a hierarchical tree structure for the presentation of point data with at least five levels.	Operator shall be able to organize point data graphic display in a hierarchical tree structure based on any organization desired. A typical organization could be: - Installation - Building - Building sub area - Main System-Unit - Terminal Unit	_____
	Notes: _____		
2	Demonstrate the creation of a hierarchical navigation structure for the graphic pages.	Operator shall be able or organize the graphical navigation from page to page using any hierarchical structure desired.	

Item	Action Item	Expected Results	Approved
		Examples:	
		Home page to building 1	
		Building 1 to AHU 1	
		Building 1 back to Home Page	
		Building 1 to 1st Floor Plan	
		AHU 1 back to Building 1	
		AHU 1 back to Home Page	
		AHU 1 to Terminal Unit Summary	
		1st Floor Plan back to Building 1	
		1st Floor Plan back to Home Page	
		1st Floor Plan to Any Terminal Device	
		Terminal Unit Summary back to AHU 1	
		Terminal Unit Summary back to Building 1	
		Terminal Unit Summary back to Home Page	
		Terminal Unit Summary to Individual Device	_____

Notes: _____

_____

End of Test

Specific Abbreviations:
Y = Yes
N = No
NA = Not Applicable

TEST NUMBER: Six
TITLE: Command Functions

OBJECTIVE:

1. To demonstrate the functionality and ability to execute command to the end devices.

INITIAL REQUIREMENTS/CONDITIONS

1. Submittals

   a. Provide documentation of all command functions prior to testing.

2. Equipment

   a. Have all command functions programmed and functional.

3. Reference Documentation

   a. List user manual documentation and sections pertaining to the testing.

4. Date of Test: _____
5. Time of Test: _____
6. Contractor's Representative: _____
7. Government's Representative: _____

TEST PROCEDURES

Item	Action Item	Expected Results	Approved
UMCS AND DDC FOR HVAC			
1	From the tree structure, modify a parameter such as a set point.	The modified value shall be downloaded to the controller without delay and the controller performance shall be viewable by the monitoring of other dynamic points.	_____
	Notes: _____		
2	From a graphic page, modify a parameter such as a set point.	The modified value shall be downloaded to the controller without delay and the controller performance shall be viewable by the monitoring of dynamic points.	_____
	Notes: _____		
3	From the tree structure, place an analog output point under operator	The analog output point shall accept the assigned value and ignore changes	

Item	Action Item	Expected Results	Approved
	override and assign a fixed value.	from application logic until the point is taken out of override.	_____
	Notes: _____		
4	From a graphic page, place an analog output point under operator override and assign a fixed value.	The analog output point shall accept the assigned value and ignore changes from application logic until the point is taken out of override.	_____
	Notes: _____		
5	From the tree structure, place a digital output point under operator override and assign a fixed value.	The digital output point shall accept the assigned value and ignore changes from application logic until the point is taken out of override.	_____
	Notes: _____		
6	From a graphic page, place a digital output point under operator override and assign a fixed value.	The digital output point shall accept the assigned value and ignore changes from application logic until the point is taken out of override.	_____
	Notes: _____		

End of Test

Specific Abbreviations:
Y = Yes
N = No
NA = Not Applicable

TEST NUMBER: Seven
TITLE: Command Input Errors

OBJECTIVE:

1. To validate that the system ensures the necessary authority for command inputs
2. To validate that the system can control the range of command input values

INITIAL REQUIREMENTS/CONDITIONS

1. Submittals

   a. Provide all command input error messages prior to testing.

2. Equipment

   a. UMCS and DDC hardware and software

3. Reference Documentation

   a. List user manual documentation and sections pertaining to the testing.

4. Date of Test: _____
5. Time of Test: _____
6. Contractor's Representative: _____
7. Government's Representative: _____

TEST PROCEDURES

Item	Action Item	Expected Results	Approved
UMCS AND DDC FOR HVAC			
1	Login using a password with point command.	Login occurs.	_____
	Notes: _____		
2	Request a display of a SNVT.	The system displays the controllers SNVT value.	_____
	Notes: _____		
3	Override the SNVT point to a selected value.	The SNVT value override changes the value in the controller.	_____
	Notes: _____		
4	Release the override of	The SNVT value returns to	

Item	Action Item	Expected Results	Approved
	a SNVT.	normal.	_____
	Notes: _____		
5	For an nvi to a controller with a limit of 50 to 80, command the nvi to a value of 90.	The value will go the maximum of 80.	_____
	Notes: _____		
6	For an nvi to a controller for which the operator only has read privileges, command the nvi to a value of 90.	The operator will be denied the ability to command the nvi to any value.	_____
	Notes: _____		

End of Test

Specific Abbreviations:
Y = Yes
N = No
NA = Not Applicable

TEST NUMBER: Eight
TITLE: Special Functions

OBJECTIVE:

1. Verify system has special integration as defined.

INITIAL REQUIREMENTS/CONDITIONS

1. Submittals

   a. Provide documentation of all integrations prior to testing.

2. Equipment

   a. Have all UMCS and DDC hardware and software programmed, integrated, and completed.

3. Reference Documentation

   a. List user manual documentation and sections pertaining to the testing.

4. Date of Test: _____
5. Time of Test: _____
6. Contractor's Representative: _____
7. Government's Representative: _____

TEST PROCEDURES

Item	Action Item	Expected Results	Approved
UMCS			
1	Verify that a building that uses controls from a vendor other than the one being installed can be integrated into the GUI without any loss of functionality. (A simulated building will be set up using an IP-L router and controllers from Honeywell, TAC, Trane, etc.)	Data from the other vendors controllers shall be integrated into the GUI and the same functionality that would exist if the controllers were from the same manufacture shall exist.	_____

Notes: _____

_____

End of Test

Specific Abbreviations:
Y = Yes
N = No
NA = Not Applicable

TEST NUMBER: Nine
TITLE: Software editing tools

OBJECTIVE:

1. To validate the performance of the M & C application programming tool for the GPPC.
2. To validate the performance of the display editing tool.
3. To validate the performance of the report generation display tool.

INITIAL REQUIREMENTS/CONDITIONS

1. Submittals

a. Provide documentation and a backup softcopy of the editing tool prior to testing.

b. Provide documentation of any future software upgrade versions that pertain to the software-editing tool.

2. Equipment

a. Have working knowledge of the full capability of the software-editing tool.

3. Reference Documentation

a. List user manual documentation and sections pertaining to the testing.

4. Date of Test: _____
5. Time of Test: _____
6. Contractor's Representative: _____
7. Government's Representative: _____

TEST PROCEDURES

Item	Action Item	Expected Results	Approved
UMCS and DDC for HVAC			
1	Demonstrate the programming of an override function in a GPPC.	Operator shall be able to use the programmed function to override an output point in a GPPC.	_____
	Notes: _____		
2	Demonstrate software that enables the monitoring of data from a GPPC.	Operator shall be able to monitor points from a GPPC.	_____
	Notes: _____		
3	Demonstrate timer	Control logic shall honor	

Item	Action Item	Expected Results	Approved
	functions within applications of GPPC.	the built in timers.	_____
	a) delay on	_____	_____
	b) delay off	_____	_____
	c) one second delays	_____	_____
	d) interval timers	_____	_____
	Notes: _____		
4	Demonstrate logic loops ("for" and "while") in GPPC.	Control logic shall honor the criteria.	_____
	Notes: _____		
5	Demonstrate if-then-else logic in GPPC.	Control logic shall properly follow the if, then, else requirements.	_____
	Notes: _____		
6	Demonstrate basic math functions in GPPC.	Control logic shall properly execute math functions.	_____
	Notes: _____		
7	Demonstrate Boolean math functions in GPPC.	Control logic shall properly execute the functions.	_____
	Notes: _____		
8	Demonstrate exponential math functions in GPPC.	Control logic shall properly execute the functions.	_____
	Notes: _____		
9	Demonstrate trigonometric math functions in GPPC.	Control logic shall properly execute the functions.	_____
	Notes: _____		
10	Demonstrate bitwise math functions in GPPC.	Control logic shall properly execute the functions.	_____

Item	Action Item	Expected Results	Approved
	Notes: _____		
11	Create a user defined subroutine/function in GPPC.	Subroutine/function shall work correctly and be easily reused.	_____
	Notes: _____		
12	Create alarm conditions in GPPC.	Alarm variables shall be created according to the criteria.	_____
	Notes: _____		
13	Create and save a graphic symbol at the server.	Symbol shall be reusable on a new graphic.	_____
	Notes: _____		
14	Modify a graphic symbol at the server.	Operator shall be able to open an existing symbol and make changes.	_____
	Notes: _____		
15	Save a graphic symbol to a library at the server.	Symbol shall be available from the library for reuse.	_____
	Notes: _____		
16	Delete a graphic symbol at the server.	Symbol shall no longer exist for use.	_____
	Notes: _____		
17	Place a graphic symbol on a new graphic page at server.	When the new page is opened, the symbol shall be there.	_____
	Notes: _____		

Item	Action Item	Expected Results	Approved
18	Associate particular conditions with particular displays at the server.	When the conditional variable changes, the display should change.	_____
	Notes: _____		
19	Overlay alphanumeric text on a graphic at the server.	Text shall properly display.	_____
	Notes: _____		
20	Create a new graphic from an old one at the server.	New graphic shall properly display.	_____
	Notes: _____		
21	Place dynamic data on a graphic at the server.	The dynamic data shall be viewable on the graphic.	_____
	Notes: _____		
22	Define the background color of a new graphic at the server.	The new graphic shall show the selected background color.	_____
	Notes: _____		
23	Define a foreground color for an element on a graphic to distinguish it from the background color at the server.	The color of the dynamic data that uses the foreground color shall display in the foreground color.	_____
	Notes: _____		
24	Position a symbol on a graphic at the server.	The operator shall be able to place a symbol at any location on a graphic.	_____
	Notes: _____		

Item	Action Item	Expected Results	Approved
25	Position and edit alphanumeric descriptors at the server.	The alphanumeric display shall be as designed.	_____
	Notes: _____		
26	Draw lines on a graphic at the server.	Lines shall display as drawn.	_____
	Notes: _____		
27	Associate source of dynamic data for presentation on a graphic at the server.	Correct data shall be displayed.	_____
	Notes: _____		
28	Display analog data on a graphic page at the server.	Correct data shall be displayed.	_____
	Notes: _____		
29	Demonstrate the movement of the curser (crosshairs) by the use of the mouse at the server.	Crosshairs shall follow the commands from the mouse.	_____
	Notes: _____		
30	Demonstrate the simultaneous use of multiple graphics (coincident graphics)at the server.	Operator shall see the use of the tile function and the use of the tab function to manage multiple graphics.	_____
	Notes: _____		
31	Associate graphic properties such as color with the values from dynamic variables at	Graphic properties shall change as the value of the dynamic variable changes.	

Item	Action Item	Expected Results	Approved
	the server.		_____
	Notes: _____		
32	Create conditional displays based on the value of a dynamic variable at the server.	The graphic display shall change as the dynamic variable changes.	_____
	Notes: _____		
33	Review the standard symbol library at the	Operator shall see how to access symbols from the standard symbol library.	_____
	Notes: _____		
34	Demonstrate how to move data from the database to a report at the server.	The executed report shall contain data from the database.	_____
	Notes: _____		
35	Add comments and headers to a report at the server.	The executed report shall contain the comments and headers.	_____
	Notes: _____		
36	Demonstrate the time stamping of data in a report at the server.	Data presented in a report shall include the date and time the data was sampled.	_____
	Notes: _____		
37	Demonstrate the time stamping of the report generation at the server.	A report shall include the date and time it executed.	_____
	Notes: _____		
38	Demonstrate basic mathematical manipulation	Report shall display the results of the mathematical	

Item	Action Item	Expected Results	Approved
	of data within a report (daily averages, highs, lows, etc.) at the server.	manipulations.	_____
	Notes: _____		
39	Demonstrate the operator's ability to select either automatic or manual generation of a report.	Reports shall execute per the operator's instructions. Report one shall execute per the operator's instructions. Report two shall execute automatically on a time basis per operator's instructions.	_____
	Notes: _____		
40	Demonstrate the selection of either display, print to printer or print to file.	Reports shall execute per the operator's instructions. Report one is printed to printer. Report two is printed to file.	_____
	Notes: _____		
41	Demonstrate how a modified application program is imported into the server database for presentation to the workstations.	Modified list of variables shall be available from a workstation.	_____
	Notes: _____		
42	Demonstrate how a new device is added to the server database for presentation to the workstations.	New list of variables from the new device shall be available from a workstation.	_____
	Notes: _____		

End of Test

Item	Action Item	Expected Results	Approved

Specific Abbreviations:
Y = Yes
N = No
NA = Not Applicable

TEST NUMBER: Ten
TITLE: Scheduling

OBJECTIVE:

1. Verify that M&C software has ability to operate end devices off a time of day schedule utilizing defined parameters.

INITIAL REQUIREMENTS/CONDITIONS

1. Submittals

a. Provide documentation of the minimum programmable schedules in comparison to the specification requirement prior to testing.

b. Provide documentation of all schedules programmed in the UMCS prior to testing.

c. Provide a trend or report log of all equipment on a schedule prior to testing.

2. Equipment

a. Have GPPC and ASC with all scheduling completed for testing.

3. Reference Documentation

a. List user manual documentation and sections pertaining to the testing.

4. Date of Test: _____
5. Time of Test: _____
6. Contractor's Representative: _____
7. Government's Representative: _____

TEST PROCEDURES

Item	Action Item	Expected Results	Approved
UMCS			
1	Demonstrate the basic functionality of a time schedule by monitoring the value of SNVT_occupancy as the time changes through a start time or a stop time.	The value of SNVT_occupancy shall properly track the time schedule.	_____
	Notes: _____		
2	Setup a weekly time schedule for a demo system with independent times for each day of the week and with up to 6 events per day.	Scheduling software shall accommodate the described requirements.	_____

Item	Action Item	Expected Results	Approved
	Notes: _____		
3	Setup a special event or date specific time schedule and verify that this schedule takes precedence over the weekly schedule.	The special event schedule shall take precedence.	_____
	Notes: _____		
4	Setup a group time schedule for a collection of systems. This group schedule shall take precedence over the individual time schedules.	The group schedule shall take precedence.	_____
	Notes: _____		
5	Demonstrate operator access to a time schedule from a graphic page.	Operator shall be able to access the time scheduling editor from a graphic page.	_____
	Notes: _____		
6	Display the current date and time on a graphic page.	Operator shall be able to view the current date and time from a graphic page.	_____
	Notes: _____		
7	Demonstrate automatic daylight savings time adjustment.	Time of day shifts automatically.	_____
	Notes: _____		
HVAC			
8	Demonstrate the ability of GPPC to accept an occupied, unoccupied and standby command from the UMCS.	Equipment shall change modes based on the UMCS or from "system scheduler" SNVT schedule data.	_____

Item	Action Item	Expected Results	Approved
	Notes: _____		
9	Demonstrate the ability of ASC to accept an occupied, unoccupied and standby command from the UMCS.	Equipment shall change modes based on the UMCS SVNT schedule data.	_____
	Notes: _____		
10	Demonstrate use of the default schedule when communication is lost to the UMCS.	Equipment should use the default schedule until communication is reestablished.	_____
	Notes: _____		

End of Test

Specific Abbreviations:
Y = Yes
N = No
NA = Not Applicable

TEST NUMBER: Eleven
TITLE: Alarm Function

OBJECTIVE:

1. Verify M&C software is capable of alarm notification and routing.

INITIAL REQUIREMENTS/CONDITIONS

1. Submittals

a. Provide documentation of alarm managing capacity in caparison with specification.

b. Provide documentation of all alarm types and priorities utilized in the M&C prior to testing.

c. Provide documentation of the alarm routing in this particular M&C.

2. Equipment

a. Provide GPPC and ASC will alarms programmed.

3. Reference Documentation

a. List user manual documentation and sections pertaining to the testing.

4. Date of Test: _____
5. Time of Test: _____
6. Contractor's Representative: _____
7. Government's Representative: _____

TEST PROCEDURES

Item	Action Item	Expected Results	Approved
UMCS			
1	Initiate a basic binary alarm condition such as a fan fail to start.	The nvo (SNVT) displayed on designated server/workstation shall change from a value of 0 to a value of 1. The alarm shall be presented in the alarm window. The alarm shall define the source of the alarm. The alarm shall define the time of the alarm. The alarm shall present its assigned priority. The alarm shall display a text message.	_____

Item	Action Item	Expected Results	Approved
	Notes: _____		
2	Demonstrate the capability of associating a secondary text message with the alarm.	With a simple point and click, the operator shall have access to the secondary text message.	_____
	Notes: _____		
3	Acknowledge the alarm.	The status of the alarm shall changed to acknowledged. The user that acknowledged the alarm shall be recorded along with the date and time of the action.	_____
	Notes: _____		
4	Demonstrate the "pop up" of the alarm window when an alarm occurs.	When the alarm occurs, the alarm window shall automatically open.	_____
	Notes: _____		
5	Demonstrate the capability to send a numeric page when an alarm occurs.	The numeric page is received.	_____
	Notes: _____		
6	Demonstrate the capability to send an e-mail when an alarm occurs.	The e-mail shall be received.	_____
	Notes: _____		
7	Demonstrate the printing of an alarm on the alarm printer.	The printer shall print the alarm.	_____
	Notes: _____		

Item	Action Item	Expected Results	Approved
8	Identify the file on the hard disk that contains all of the alarms.	Opening the file shall display a list of all of the alarms.	_____
	Notes: _____		
9	Execute a user sort on the alarm file.	The presentation shall follow the defined sort.	_____
	Notes: _____		
10	Print the alarm file.	Paper copy shall be printed.	_____
	Notes: _____		
11	Take an application specific controller off-line.	An alarm should be generated.	_____
	Notes: _____		
12	Take a programmable controller off line.	An alarm should be generated.	_____
	Notes: _____		
13	Simulate a data circuit going off line.	An alarm should be generated.	_____
	Notes: _____		
14	Simulate a point not responding to a command.	An alarm should be generated.	_____
	Notes: _____		
15	Simulate a change of state without command.	An alarm should be generated.	_____
	Notes: _____		

Item	Action Item	Expected Results	Approved
DDC FOR HVAC			
16	Initiate an alarm condition such as a fan fail to start.	DDC system shall dial a pager and send a numerical alarm. DDC system shall dial an e-mail server. The node shall be able to dial and connect to a remote server and send an e-mail via Simple Mail Transfer Protocol (SMTP). DDC system shall send an e-mail over IP Network. The alarm handling node shall be capable of connecting to an IP network and sending e-mail via Simple Mail Transfer Protocol (SMTP).	_____

Notes: _____

_____

End of Test

Specific Abbreviations:
Y = Yes
N = No
NA = Not Applicable

TEST NUMBER: Twelve
TITLE: Trending

OBJECTIVE:

1. To validate the capability for historical trend data collection and presentation

2. To validate the capability for real time trend data collection and presentation

INITIAL REQUIREMENTS/CONDITIONS

1. Submittals

a. Provide documentation of trending capability in comparison with specification.

2. Equipment

a. Provide GPPC or ASC and workstation/server programmed with trend data.

3. Reference Documentation

a. List user manual documentation and sections pertaining to the testing.

4. Date of Test: _____
5. Time of Test: _____
6. Contractor's Representative: _____
7. Government's Representative: _____

TEST PROCEDURES

Item	Action Item	Expected Results	Approved
UMCS			
1	Set up a trend with a 1 second sample rate.	It shall be possible to collect data on a 1 second sample rate.	_____
	Notes: _____		
2	Set up a trend to start and stop at specific times.	It shall be possible to start and stop a trend based on time.	_____
	Notes: _____		
3	Open a trend data display that has 8 values trended versus time.	Trend plots shall show all 8 variables as a function of time.	_____
	a) historical data	_____	_____

Item	Action Item	Expected Results	Approved
	b) instantaneous data	_____	_____
	Notes: _____		
4	Open a pre-programmed trend data presentation.	Trend plot shall open without operator programming.	_____
	Notes: _____		
5	Open the trend configuration dialog box and set up a trend.	Operator shall be able to configure a trend plot.	_____
	Notes: _____		
6	Set up a trend for a randomly selected binary value and a randomly selected analog value.	Any binary or analog variable shall be trendable.	_____
	Notes: _____		
7	Verify that historical trend data is stored on the hard drive.	With the controller offline, historical trend data from that controller shall be presented in a graphical form.	_____
	Notes: _____		
8	Export trend log data to Microsoft Excel for manipulation and printing by the operator.	Data shall be presented in a ****.xls form.	_____
	Notes: _____		

End of Test

Specific Abbreviations:
Y = Yes
N = No
NA = Not Applicable

TEST NUMBER: Thirteen
TITLE: Demand Limiting

OBJECTIVE:

1. Verify M&C software has the capability of performing demand-limiting strategies

INITIAL REQUIREMENTS/CONDITIONS

1. Submittals

   a. Provide documentation of the specific equipment being monitored.

   b. Provide documentation of the load shed priority and the equipment associated with the priorities.

2. Equipment

   a. Provide GPPC and ASC programmed for demand-limit strategies.

3. Reference Documentation

   a. List user manual documentation and sections pertaining to the testing.

4. Date of Test: _____
5. Time of Test: _____
6. Contractor's Representative: _____
7. Government's Representative: _____

TEST PROCEDURES

Item	Action Item	Expected Results	Approved
UMCS			
1	From the home page of the M&C go to or click on the graphical demand-limiting page.	The demand-limiting page will open without any errors.	_____
	Notes: _____		
2	Document the present kW load_____.	The M&C will display the actual kW.	_____
	Notes: _____		
3	Set kW limit setpoint to cause program to shed load.	_____	_____
	Notes: _____		

Item	Action Item	Expected Results	Approved
4	Turn off 25% of the mechanical equipment being monitored.	The kW usage will decrease.	_____
	Notes: _____		
5	Allow the building(s) to remain at 75% for a given time as to generate a temperature load.	The building(s) will warm-up/cool down.	_____
	Notes: _____		
6	After time period has expired, turn all equipment on at the same time.	The kW usage will greatly increase. The M&C will stop other pieces of equipment as to shed the load. The equipment shut down will be priority based. After the building(s) come under temperature control the M&C will start all of the equipment. The equipment start up will be priority based.	_____
	Notes: _____		
7	Verify the building(s) remain under temperature control and go back to the home page.	The building(s) will come under control. The home page will be displayed.	_____
	Notes: _____		
8	Reset kW setpoint to normal limits.	The UMCS goes back to normal control.	_____
	Notes: _____		

Item	Action Item	Expected Results	Approved

End of Test

Specific Abbreviations:
Y = Yes
N = No
NA = Not Applicable

TEST NUMBER: Fourteen
TITLE: Report Generation

OBJECTIVE:

1. To demonstrate that M&C software has ability to generate reports in a fixed format initialized by operator request

INITIAL REQUIREMENTS/CONDITIONS

1. Submittals

a. Provide documentation of all report logs set-up and the equipment associated with the report logs.

2. Equipment

a. Provide server/workstation, GPPC, ASC and I/O to create reports.

3. Reference Documentation

a. List user manual documentation and sections pertaining to the testing.

4. Date of Test: _____
5. Time of Test: _____
6. Contractor's Representative: _____
7. Government's Representative: _____

TEST PROCEDURES

Item	Action Item	Expected Results	Approved
UMCS			
1	Manually generate a report for viewing on the workstation.	Report shall present itself for viewing without disrupting the operation of the control system.	_____
	Notes: _____		
2	Manually generate a report and direct it to a specific printer.	Report shall print on the specified printer.	_____
	Notes: _____		
3	Verify that the report contains the date and time associated with the raw data.	Data samples listed in the report shall have the associated date and time the samples were collected.	_____
	Notes: _____		

Item	Action Item	Expected Results	Approved
4	Verify that the report has the date and time the report was generated.	The report shall include the date and time of the report generation.	_____
	Notes: _____		
5	Save a report to a file that is compatible with Microsoft Office products.	The report shall be saved in a ***.xls format.	_____
	Notes: _____		
6	Generate a comma delimited file with trend log data.	The comma delimited data shall be produced.	_____
	Notes: _____		

End of Test

Specific Abbreviations:
Y = Yes
N = No
NA = Not Applicable

TEST NUMBER: Fifteen
TITLE: UPS Test

OBJECTIVE:

1. Validate UPS requirements

INITIAL REQUIREMENTS/CONDITIONS

1. Submittals

   a. The Contractor provides documentation on UPS.

2. Equipment

   a. The server/workstation and the UPS needs to be on and operating for a minimum of one week.

3. Reference Documentation

   a. List user manual documentation and sections pertaining to the testing.

4. Date of Test: _____
5. Time of Test: _____
6. Contractor's Representative: _____
7. Government's Representative: _____

TEST PROCEDURES

Item	Action Item	Expected Results	Approved
UMCS			
1	The UMCS home graphic page is called up.	The home page is displayed.	_____
	Notes: _____		
2	Unplug the UPS from the wall outlet.	The UMCS home page remains displayed. UPS LED-warning lights if applicable. UPS sound audible warning alarm if applicable.	_____
	Notes: _____		
3	Log out of the home page of the M&C and then log back into it.	The UPS will not affect the UMCS hardware and all associated software.	_____
	Notes: _____		

Item	Action Item	Expected Results	Approved
4	Allow the UPS to be unplugged for 20 minutes.	The UPS will not affect the UMCS hardware and all associated software.	_____
	Notes: _____		
5	Return the UPS plug to the wall outlet.	The UPS will not affect the UMCS hardware and all associated software.	_____
	Notes: _____		

End of Test

Specific Abbreviations:
Y = Yes
N = No
NA = Not Applicable

TEST NUMBER: Sixteen
TITLE: CTA CTA-709.1-D to IP Router Test

OBJECTIVE:

1. Validate CTA CTA-709.1-D to IP Router requirements

INITIAL REQUIREMENTS/CONDITIONS

1. Submittals

a. Submittal information on router and O&M manual on network analysis tool.

2. Equipment

a. The router needs to be on and operating.

b. Provide a LONWORKS® network analysis tool and router configuration tool.

3. Reference Documentation

a. List user manual documentation and sections pertaining to the testing.

4. Date of Test: _____
5. Time of Test: _____
6. Contractor's Representative: _____
7. Government's Representative: _____

TEST PROCEDURES

Item	Action Item	Expected Results	Approved
UMCS			
1	Connect and open network analysis tool and verify router.	Tool shall identify function, network address, and identifier of the device.	_____
	Notes: _____		
2	Using router configuration tool, open network properties dialog box.	Router shall be utilizing a static IP address and shall not be configured for DHCP.	_____
	Notes: _____		
3	Confirm LON data is transmitted to/from LON bus to IP network.	All LONWORKS® network data is being transmitted to/from the IP network.	_____
	Notes: _____		

Item	Action Item	Expected Results	Approved

End of Test

Specific Abbreviations:
Y = Yes
N = No
NA = Not Applicable

TEST NUMBER: Seventeen
TITLE: CTA CTA-709.1-D Router and Repeater

OBJECTIVE:

1. Validate EIA-709.1B Router and Repeater requirements

INITIAL REQUIREMENTS/CONDITIONS

1. Submittals

a. Submittal information on router/repeater and O&M Manual on network analysis tool.

2. Equipment

a. The router needs to be on and operating for a minimum of one week.

b. The repeater needs to be on and operating for a minimum of one week.

c. Provide a LONWORKS® network analysis tool and router/repeater configuration tool.

3. Reference Documentation

a. List user manual documentation and sections pertaining to the testing.

4. Date of Test: _____
5. Time of Test: _____
6. Contractor's Representative: _____
7. Government's Representative: _____

TEST PROCEDURES

Item	Action Item	Expected Results	Approved
DDC FOR HVAC			
1	Connect and open network analysis tool and verify router and repeater.	Tool shall identify function, network address, and identifier of the devices.	_____
	Notes: _____		
2	Using router configuration tool, open the properties dialog box. Verify what data is configured to pass through router.	Only the data that is configured to pass through the router is being sent.	_____
	Notes: _____		
3	Using repeater	Dialog box opens.	

Item	Action Item	Expected Results	Approved
	configuration tool, open the properties dialog box.		_____
	Notes: _____		
4	Verify that repeater is configured as a repeater and that all data is being sent.	Verify that all data is being sent through the repeater.	_____
	Notes: _____		

End of Test

Specific Abbreviations:
Y = Yes
N = No
NA = Not Applicable

TEST NUMBER: Eighteen
TITLE: CTA CTA-709.1-D Gateway Test

OBJECTIVE:

1. Validate CTA CTA-709.1-D Gateway requirements.

INITIAL REQUIREMENTS/CONDITIONS

1. Submittals

a. Provide a list of all software that will be used to verify CTA CTA-709.1-D Gateway configuration.

b. Provide a LonMark external interface file (XIF) for the gateway.

2. Equipment

a. The gateway needs to be on and operating.

b. Provide a LonWorks® network analysis tool and gateway configuration tool.

3. Reference Documentation

a. List user manual documentation and sections pertaining to the testing.

4. Date of Test: _____
5. Time of Test: _____
6. Contractor's Representative: _____
7. Government's Representative: _____

TEST PROCEDURES

Item	Action Item	Expected Results	Approved
UMCS and DDC FOR HVAC			
1	Connect a LONWORKS® Network Analysis Tool to the network.	a. Tool shall identify function, network address, and identifier of the device. b. All network traffic from gateway shall be utilizing the CTA CTA-709.1-D protocol.	_____
	Notes: _____		
2	Use gateway configuration tool to verify or create a binding from gateway to a LONWORKS® controller on the network.	a. Gateway allows binding of the Standard Network Variable Types from the gateway to a LONWORKS® controller. b. Information from gateway should be bounded and	

Item	Action Item	Expected Results	Approved
		LONWORKS® controller should be receiving data.	_____

Notes: _____

_____

3	Using gateway or network configuration tool verify the following:		
	Open the properties dialog box for one of the configured SNVTs.	Gateway should allow the SNVT to be transmitted on "min", "max" and "delta".	_____
	Rename one of the SNVTs from the gateway.	Gateway should allow all variable names to be customized.	_____
	Check total capacity of Gateway.	Gateway shall have 50% extra capacity to map over additional points.	_____

Notes: _____

_____

4	Press service pin on gateway.	Gateway should broadcast the neuron ID and Program ID over the network.	_____

Notes: _____

_____

5	Remove power source from gateway for two hours. Then return power to gateway.	Gateway should retain all configuration data.	_____

Notes: _____

_____

End of Test

Specific Abbreviations:
Y = Yes
N = No
NA = Not Applicable

TEST NUMBER: Nineteen
TITLE: Local Display Panel (LDP)

OBJECTIVE:

1. To demonstrate capability of the Local display panel to view and override control points

INITIAL REQUIREMENTS/CONDITIONS

1. Submittal

   a. O & M Manual for LDP

2. Equipment

   a. Hardware and software to connect and demo LDP configuration tool

3. Reference Documentation

   a. List user manual documentation and sections pertaining to the testing.

4. Date of Test: _____
5. Time of Test: _____
6. Contractor's Representative: _____
7. Government's Representative: _____

TEST PROCEDURES

Item	Action Item	Expected Results	Approved
DDC FOR HVAC			
1	Connect LDP to LON bus. Push service pin button on LDP.	LDP Controller should broadcast its neuron ID.	_____
	Notes: _____		
2	Use navigation buttons on LDP to display a status point such as a temperature or fan status.	LCP should allow user to read all status points.	_____
	Notes: _____		
3	Use navigation buttons to display a control point such as a discharge air temperature setpoint.	LCP should allow user to read all control points.	_____
	Notes: _____		

Item	Action Item	Expected Results	Approved
4	Use LDP to override setpoint.	System accepts new setpoint. Verify system reacts to new setpoint.	_____
	Notes: _____		
5	Use LDP to release local control override.	Verify system returns to normal control.	_____
	Notes: _____		

End of Test

Specific Abbreviations:
Y = Yes
N = No
NA = Not Applicable

TEST NUMBER: Twenty
TITLE: Network Configuration Tool

OBJECTIVE:

1. To validate the performance of the network configuration tool

INITIAL REQUIREMENTS/CONDITIONS

1. Submittal

   a. Network configuration tool manuals

2. Equipment

   a. Hardware, network connection, LNS database, and network configuration tool

3. Reference Documentation

   a. List user manual documentation and sections pertaining to the testing.

4. Date of Test: _____
5. Time of Test: _____
6. Contractor's Representative: _____
7. Government's Representative: _____

TEST PROCEDURES

Item	Action Item	Expected Results	Approved
UMCS AND DDC FOR HVAC			
1	Open network configuration tool and verify LNS data for project opens is being used.	The Network Configuration Tool is being used and entire LNS database for project is exposed.	_____
	Notes: _____		
2	Open a typical LNS plug-in.	Plug-in shall open and enable configuration of the device.	_____
	Notes: _____		
3	Reconstruct a database by connecting to an existing network and uploading the data.	The database and drawing shall be created.	_____
	Notes: _____		

Item	Action Item	Expected Results	Approved
4	Verify that a graphical interface is use.	Note that Network Configuration Tool uses Visio (type) as a graphical interface.	_____
	Notes: _____		
5	Print the graphical representation.	Printing shall be successful.	_____
	Notes: _____		
6	Merge two LNS databases into a single database.	The merge shall be successful.	_____
	Notes: _____		
7	Print reports from network configuration tool.	Address table, SNVT I/O table, and SCPT/UCPT table reports shall be successfully printed.	_____
	Notes: _____		
8	Randomly select a sample of network variable and confirm they are using correct SNVT types.	Correct SNVT types were used.	_____
	Notes: _____		

End of Test

Specific Abbreviations:
Y = Yes
N = No
NA = Not Applicable

TEST NUMBER: Twenty one
TITLE: Custom Tests

OBJECTIVE:

1. To test custom applications for UMCS and/or DDC for HVAC, that are specific to a project

INITIAL REQUIREMENTS/CONDITIONS

1. Submittal

   a. Documents related to custom application - to be identified

2. Equipment

   a. Equipment to be provided related to custom application - to be identified

3. Date of Test: _____
4. Time of Test: _____
5. Contractor's Representative: _____
6. Government's Representative: _____

TEST PROCEDURES

Item	Action Item	Expected Results	Approved
UMCS AND DDC FOR HVAC			
1	Identify special tests for the UMCS that relate to a custom application for a specific project - to be completed by designer.	To be completed by designer.	_____
	Notes: _____		
2	Identify special tests for the DDC for HVAC systems that relate to a custom application for a specific project - to be completed by designer.	To be completed by designer.	_____
	Notes: _____		

End of Test

Specific Abbreviations:
Y = Yes
N = No
NA = Not Applicable

-- End of Section --