|  |  |
| --- | --- |
| Test # | Test Title |
| 1 | System Equipment Verification |
| 2 | System Start-up |
| 3 | Monitoring and Control (M&C) Software Passwords |
| 4 | Graphic Display of Data |
| 5 | Graphic Navigation Scheme |
| 6 | Command Functions |
| 7 | Command Input Errors |
| 8 | Special Functions |
| 9 | Software Editing Tools |
| 10 | Scheduling |
| 11 | Alarm Function |
| 12 | Trending |
| 13 | Demand Limiting |
| 14 | Report Generation |
| 15 | Uninterruptable Power Supply (UPS) Test |
| 16 | Routers and Repeaters |
| 17 | Gateways (Building Level) |
| 18 | Gateways (Device level) |
| 19 | Local Display Panels (LDP) |
| 20 | Open Network Point Verification |
| 21 | Custom Test Template (for contractor test development) |

# TEST NUMBER: One

TITLE: System Equipment Verification

OBJECTIVE: 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 must 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 must be available for reference purposes during the test.

2. Equipment: Verify all equipment is functional.

3. Reference Documentation: List user manual documentation and relevant testing sections.

Date of Test: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Time of Test: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Contractor's Representative: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Government's Representative: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_­­\_\_\_\_\_\_

Specification References for this verification:

Section 25 10 10

Section 23 09 13 (protocol agnostic equipment)

Section 23 09 23.01 (LonWorks)

Section 23 09 23.02 (BACnet)

Note: The table heading below shows columns labeled as U, I, and DDC; the U = UMCS Front End; the I = Integration and the DDC = Direct Digital Control (building level controls). An X indicates the test is needed if the project matches the task indicated by the column. The following table shows the various options and which columns match each:

|  |  |
| --- | --- |
| Situation | Do test with an “X” in these columns |
| New Building Control System (not integrated) | DDC |
| Integration of existing building control system to existing UMCS Front End | I |
| New Building Control System integrated to existing UMCS Front End | DDC, I |
| New UMCS Front End, not integrated to anything (this case highly unusual) | U |
| New UMCS Front End, integrate existing buildings | U,I |
| New UMCS Front End, new building control systems and integration | U,I,DDC |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Item | Action | U | I | DDC | Expected Results | Approved |
| 1 | The Control Protocol router(s) is installed and complies with Section 25 10 10. |  | X |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 2 | The Monitoring and Control (M&C) Controller Hardware is installed and complies with Section 25 10 10. | X |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 3 | The BACnet Supervisory Controller Hardware is installed and complies with Section 25 10 10. |  | X |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 4 | The Gateway(s) is installed and complies with Section 25 10 10. |  | X |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 5 | The Server Hardware is installed and complies with Section 25 10 10. | X |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 6 | The Workstation Hardware (desktop and laptop) is installed and complies with Section 25 10 10. | X | X |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 7 | The Alarm Printer is installed and complies with Section 25 10 10. | X |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 8 | The Laser Printer is installed and complies with Section 25 10 10. | X |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 9 | The Operating System is installed and complies with Section 25 10 10. | X |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 10 | The Office Automation software is installed and complies with Section 25 10 10. | X |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 11 | The Virus Protection software is installed and complies with Section 25 10 10. | X |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| Notes: | | | | | | |
| 12 | The Disk Imaging (Backup) Software is installed and complies with Section 25 10 10. | X |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 13 | The M&C Controller Hardware Configuration Software is installed and complies with Section 25 10 10. | X |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 14 | The CEA-852-C Configuration Server (for LonWorks protocol solutions) is installed and complies with Section 25 10 10. | X |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 15 | The CEA-709.1-D Network Configuration Tool (for LonWorks protocol solutions) is installed and complies with Section 25 10 10. | X |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 16 | The BACnet Network Browser (for BACnet protocol solutions) is installed and complies with Section 25 10 10. | X |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 17 | The Niagara Framework Engineering Tool (for Niagara Framework solutions) is installed and complies with Section 25 10 10. | X |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 18 | The Monitoring and Control (M&C) Software is installed and complies with Section 25 10 10. | X |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 19 | The Uninterruptible Power Supply (UPS) is installed and complies with Section 25 10 10. | X |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 20 | The Racks and Enclosures are installed and comply with Section 25 10 10. | X |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |

| Item | Action | U | I | DDC | Expected Results | Approved |
| --- | --- | --- | --- | --- | --- | --- |
| 21 | The CEA-709.1-D Router is installed and complies with Section 23 09 23.01. |  |  | X |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 22 | The CEA-709.1-D Repeater is installed and complies with Section 23 09 23.01. |  |  | X |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 23 | The CEA-709.1-D Gateway is installed and complies with Section 23 09 23.01. |  |  | X |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 24 | The CEA-852-C Router is installed and complies with Section 23 09 23.01. |  |  | X |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 25 | The Ethernet Switch is installed and complies with Section 23 09 23.01 or 23 09 23.02, as applicable. |  |  | X |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 26 | The Control Network Wiring (TP/FT-10) or TP-XF-1250 is installed in accordance with CEA-709.3, with double-terminated bus topology and complies with Section 23 09 23.01. |  |  | X |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 27 | BACnet Routers are installed and comply with Section 23 09 23.02. |  |  | X |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 28 | BACnet Gateways are installed and comply with Section 23 09 23.02. |  |  | X |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 29 | The Direct Digital Control (DDC) Hardware is installed and complies with Section 23 09 23.02. |  |  | X |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 30 | Network wiring extends to the Facility Point of Connection IAW 23 09 23.01/02 |  |  | X |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 31 | The Direct Digital Control (DDC) Hardware is installed and complies with Section 23 09 23.01. or 23 09 23.02 |  |  | X |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 31.a | The Niagara Framework Supervisory Gateways are installed and comply with Section 23 09 23.01 / .02 |  |  | X |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 31.b | The Gateways (to non-CEA 709.1-D hardware) are installed and comply with Section 23 09 23.01. |  |  | X |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 31.c | All LDPs are installed and comply with the specification paragraph titled "Local Display Panel" in 23 09 23.01 / .02 |  |  | X |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 32 | The Weathershields are installed and comply with Section 23 09 13. |  |  | X |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 33 | The Tubing is installed and complies with Section 23 09 13. |  |  | X |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 34 | The Wire and Cable are installed and complies with Section 23 09 13. |  |  | X |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 35 | The Automatic Control Valves are installed and comply with Section 23 09 13. |  |  | X |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 36 | The Dampers are installed and comply with Section 23 09 13. |  |  | X |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 37 | The Sensors and Instrumentation are installed and comply with Section 23 09 13. |  |  | X |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 38 | The Indicating Devices are installed and comply with Section 23 09 13. |  |  | X |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 39 | The Output Devices are installed and comply with Section 23 09 13. |  |  | X | This might include valves and dampers. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 40 | The User Input Devices are installed and comply with Section 23 09 13. |  |  | X |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 41 | The Multifunction Devices are installed and comply with Section 23 09 13. |  |  | X |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 42 | The Compressed Air Stations are installed and comply with Section 23 09 13. |  |  | X |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 43 | Software is submitted in accordance with Section 23 09 00 |  |  | X | (Note: Installation of software is generally not required by Section 23 09 00; Check submission and licensing of software.) |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 44 | Controller programs and configuration settings are submitted in accordance with Section 23 09 00. |  |  |  |  |  |
|  |  |  |  |  |  |  |
| Notes: | | | | | | |

# 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 are connected in accordance with manufacturer's requirements.

b. The workstation is in the off mode.

c. All controls are fully functional and tested.

d. Randomly select one controller of each make/model installed at the site for the test.

Date of Test: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Time of Test: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Contractor's Representative: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Government's Representative: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

| Item | Action | U | I | DDC | Expected Results | Approved |
| --- | --- | --- | --- | --- | --- | --- |
| 1 | Energize the server and workstation. | X |  |  | The workstation and server will power-up and perform its start-up procedure without generating any errors or problems. |  |
|  |  |  |  |  |  |  |
|  | Log in. |  |  |  | Log in successful. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  | Browse the system graphics. |  |  |  | The operator can view data from any device on the system. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 2 | Check the communication from the server to the controllers. |  | X |  | When a device is selected, dynamic point lists become visible. The presence of dynamic data is success; either an event failure message or no real-time data represents failure. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 3 | Verify on-line status. |  | X |  | All devices will indicate an on-line status at the workstation (green indicator). |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 4 | View data from a graphics page |  | X |  | Points on the page will update.  Question marks in lieu of data reflect failure. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 5 | Verify that configuration data in building level controllers is securely written to non-volatile memory. |  |  | X | All configuration parameters should be accessible. |  |
|  |  |  |  |  |  |  |
|  | a. Select **one of each type** of controller and repeat steps b. thru f. for each: application specific, programmable, etc. |  |  |  |  |  |
|  | b. Open the engineering tool to view data |  |  |  | Engineering tool opens and data is viewed |  |
|  |  |  |  |  |  |  |
|  | c. Note several parameters and record setpoints (temperature, pressure, flow) |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  | d. Remove power for at least 3 minutes from controller |  |  |  | Device goes off-line |  |
|  |  |  |  |  |  |  |
|  | e. Restore power |  |  |  | Device returns to on-line status |  |
|  |  |  |  |  |  |  |
|  | f. Verify all parameters recorded are still present and none have changed. |  |  |  | All recorded parameters are still the same. |  |
|  |  |  |  |  |  |  |
| Notes: | | | | | | |

# 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: Server and Workstation

3. Reference Documentation: Provide user manual documentation for setting up passwords

Date of Test: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Time of Test: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Contractor's Representative: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Government's Representative: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Specification References for this verification:

Section 25 10 10

UMCS (Front end)

This test is front-end specific, but assumes there is at least one connected building to work with.

| Item | Action | Expected Results | Approved |
| --- | --- | --- | --- |
| 1 | Create passwords for new users | New users exist in the server database |  |
|  | a. Set up 4 users |  |  |
|  |  |  |  |
|  | b. Assign different levels to each |  |  |
|  |  |  |  |
|  |  |  |  |
| 2 | Demonstrate level 1 authority |  |  |
|  |  |  |  |
|  | a. Sign in as the level 1 user | Sign in successful |  |
|  |  |  |  |
|  | b. Attempt to view a graphic, trend, or alarm | Action possible |  |
|  |  |  |  |
|  | c. Attempt to acknowledge an alarm | Action denied |  |
|  |  |  |  |
|  | d. Attempt to configure a trend | Action denied |  |
|  |  |  |  |
|  | e. Attempt to configure a report | Action denied |  |
|  |  |  |  |
|  | f. Attempt to override a point | Action denied |  |
|  |  |  |  |
|  | g. Attempt to configure an alarm | Action denied |  |
|  |  |  |  |
|  | h. Attempt to configure a schedule | Action denied |  |
|  |  |  |  |
|  | i. Attempt to configure demand limiting | Action denied |  |
|  |  |  |  |
|  | j. Attempt to modify graphics | Action denied |  |
|  |  |  |  |
|  | k. Attempt to create custom report | Action denied |  |
|  |  |  |  |
|  |  |  |  |
| 3 | Demonstrate level 2 authority |  |  |
|  |  |  |  |
|  | a. Sign in as the level 2 user | Action possible |  |
|  |  |  |  |
|  | b. Attempt to view a graphic, trend, or alarm | Action possible |  |
|  |  |  |  |
|  | c. Attempt to acknowledge an alarm | Action possible |  |
|  |  |  |  |
|  | d. Attempt to configure a trend | Action possible |  |
|  |  |  |  |
|  | e. Attempt to configure a report | Action possible |  |
|  |  |  |  |
|  | f. Attempt to override a point | Action denied |  |
|  |  |  |  |
|  | g. Attempt to configure an alarm | Action denied |  |
|  |  |  |  |
|  | h. Attempt to configure a schedule | Action denied |  |
|  |  |  |  |
|  | i. Attempt to configure demand limiting | Action denied |  |
|  |  |  |  |
|  | j. Attempt to modify graphics | Action denied |  |
|  |  |  |  |
|  | k. Attempt to create custom report | Action denied |  |
|  |  |  |  |
|  |  |  |  |
| 4 | Demonstrate level 3 authority |  |  |
|  |  |  |  |
|  | a. Sign in as the level 3 user | Action possible |  |
|  |  |  |  |
|  | b. Attempt to view a graphic, trend, or alarm | Action possible |  |
|  |  |  |  |
|  | c. Attempt to acknowledge an alarm | Action possible |  |
|  |  |  |  |
|  | d. Attempt to configure a trend | Action possible |  |
|  |  |  |  |
|  | e. Attempt to configure a report | Action possible |  |
|  |  |  |  |
|  | f. Attempt to override a point | Action possible |  |
|  |  |  |  |
|  | g. Attempt to configure an alarm | Action possible |  |
|  |  |  |  |
|  | h. Attempt to configure a schedule | Action possible |  |
|  |  |  |  |
|  | i. Attempt to configure demand limiting | Action possible |  |
|  |  |  |  |
|  | j. Attempt to modify graphics | Action denied |  |
|  |  |  |  |
|  | k. Attempt to create custom report | Action denied |  |
|  |  |  |  |
|  |  |  |  |
| 5 | Demonstrate level 4 authority |  |  |
|  |  |  |  |
|  | a. Sign in as the level 4 user | Action possible |  |
|  |  |  |  |
|  | b. Attempt to view a graphic, trend, or alarm | Action possible |  |
|  |  |  |  |
|  | c. Attempt to acknowledge an alarm | Action possible |  |
|  |  |  |  |
|  | d. Attempt to configure a trend | Action possible |  |
|  |  |  |  |
|  | e. Attempt to configure a report | Action possible |  |
|  |  |  |  |
|  | f. Attempt to override a point | Action possible |  |
|  |  |  |  |
|  | g. Attempt to configure an alarm | Action possible |  |
|  |  |  |  |
|  | h. Attempt to configure a schedule | Action possible |  |
|  |  |  |  |
|  | i. Attempt to configure demand limiting | Action possible |  |
|  |  |  |  |
|  | j. Attempt to modify graphics | Action possible |  |
|  |  |  |  |
|  | k. Attempt to create custom report | Action possible |  |
|  |  |  |  |
|  | l. Attempt to integrate a new building control system including, but not limited to, adding at least one device with associated network points and creating graphic pages for the new device. | Action possible |  |
| Notes: | | | |

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

2. Equipment: Complete all graphics.

3. Reference Documentation: List user manual documentation and sections pertaining to the testing.

4. Note: Different types of data and states should be clearly distinguishable from each other.

Date of Test: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Time of Test: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Contractor's Representative: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Government's Representative: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# Test Procedures

UMCS (Front end)

Many of these tests presume an operator with sufficient permissions.

| Item | Action | U | I | D | Expected Results | Approved |
| --- | --- | --- | --- | --- | --- | --- |
| 1 | Demonstrate graphics display of equipment IAW 25 10 10. |  | X |  | Equipment is represented IAW 25 10 10. |  |
|  |  |  |  |  |  |  |
|  | a. Demonstrate all functions of the system display editor IAW 25 10 10 | X |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 2 | Demonstrate the presentation of real time data. |  | X |  | Dynamic real time data is presented on a graphics page. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 3 | Demonstrate the presentation of user entered data. |  | X |  | A user defined parameter such as a setpoint is presented on a graphics page. Different types of data are shown uniquely and are clearly distinguishable from each other. |  |
|  |  |  |  |  |  |  |
| 4 | Demonstrate the presentation of a point in override. |  | X |  | An override condition is viewable on the graphic page. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 5 | Demonstrate the presentation of a device in the alarm state. |  | X |  | An alarm state is clearly viewable on the graphic page. Alarms must be noticeably different from other data. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 6 | Demonstrate the presentation of a data that is out of range. |  | X |  | Out of range conditions are indicated on the graphic page. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 7 | Demonstrate the presentation of missing data (controller is offline). |  | X |  | Missing data is indicated on the graphic page. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 8 | Demonstrate an error message when the operator attempts to execute an improper command. |  | X |  | An error message is displayed. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 9 | Demonstrate point and click access to context sensitive help. |  | X |  | Operator is able to easily access context sensitive help using the mouse. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 10 | Demonstrate the printing of a prepared report. |  | X |  | Operator is able to print a report using the mouse. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 11 | Demonstrate the display of one or more points. |  | X |  | Operator is able to request the display of one or more points. |  |
|  |  |  |  |  |  |  |
| 12 | Demonstrate the operator override of a point. |  | X |  | Operator can override a point. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 13 | Demonstrate the modification of a time schedule. |  | X |  | Operator is able to modify a time schedule. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 14 | Demonstrate the execution of a report. |  | X |  | Operator is able to initiate a report. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 15 | Demonstrate the presentation of an alarm to include: |  | X |  | Operator can view the alarm with all of the required data. |  |
|  |  |  |  |  |  |  |
|  | a. Identification |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  | b. Date and time |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  | c. Alarm Type |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  | d. Point Value |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  | e. Alarm Limits |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  | f. Alarm Priority |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  | g. Message |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  | h. Acknowledgement Status |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 18 | Demonstrate the presentation of real time trend data. |  | X |  | Operator is able to view real time trend data as a function of time. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| Notes: | | | | | | |

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

2. Equipment: Complete all graphics.

3. Reference Documentation: List user manual documentation and sections pertaining to the testing.

4. Note: Different types of data and states should be clearly distinguishable from each other.

Date of Test: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Time of Test: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Contractor's Representative: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Government's Representative: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# Test Procedures

UMCS (Front end)

Many of these tests presume an operator with sufficient permissions.

| Item | Action | U | I | D | Expected Results | Approved |
| --- | --- | --- | --- | --- | --- | --- |
| 1 | Demonstrate graphics display of equipment IAW 25 10 10. |  | X |  | Equipment is represented IAW 25 10 10. |  |
|  |  |  |  |  |  |  |
|  | a. Demonstrate all functions of the system display editor IAW 25 10 10 | X |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 2 | Demonstrate the presentation of real time data. |  | X |  | Dynamic real time data is presented on a graphics page. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 3 | Demonstrate the presentation of user entered data. |  | X |  | A user defined parameter such as a setpoint is presented on a graphics page. Different types of data are shown uniquely and are clearly distinguishable from each other. |  |
|  |  |  |  |  |  |  |
| 4 | Demonstrate the presentation of a point in override. |  | X |  | An override condition is viewable on the graphic page. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 5 | Demonstrate the presentation of a device in the alarm state. |  | X |  | An alarm state is clearly viewable on the graphic page. Alarms must be noticeably different from other data. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 6 | Demonstrate the presentation of a data that is out of range. |  | X |  | Out of range conditions are indicated on the graphic page. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 7 | Demonstrate the presentation of missing data (controller is offline). |  | X |  | Missing data is indicated on the graphic page. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 8 | Demonstrate an error message when the operator attempts to execute an improper command. |  | X |  | An error message is displayed. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 9 | Demonstrate point and click access to context sensitive help. |  | X |  | Operator is able to easily access context sensitive help using the mouse. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 10 | Demonstrate the printing of a prepared report. |  | X |  | Operator is able to print a report using the mouse. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 11 | Demonstrate the display of one or more points. |  | X |  | Operator is able to request the display of one or more points. |  |
|  |  |  |  |  |  |  |
| 12 | Demonstrate the operator override of a point. |  | X |  | Operator can override a point. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 13 | Demonstrate the modification of a time schedule. |  | X |  | Operator is able to modify a time schedule. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 14 | Demonstrate the execution of a report. |  | X |  | Operator is able to initiate a report. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 15 | Demonstrate the presentation of an alarm to include: |  | X |  | Operator can view the alarm with all of the required data. |  |
|  |  |  |  |  |  |  |
|  | a. Identification |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  | b. Date and time |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  | c. Alarm Type |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  | d. Point Value |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  | e. Alarm Limits |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  | f. Alarm Priority |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  | g. Message |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  | h. Acknowledgement Status |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 18 | Demonstrate the presentation of real time trend data. |  | X |  | Operator is able to view real time trend data as a function of time. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| Notes: | | | | | | |

# TEST NUMBER: Six

TITLE: Command Functions

OBJECTIVE: To demonstrate the functionality and ability to execute commands to the end devices.

INITIAL REQUIREMENTS/CONDITIONS:

1. Submittals: Provide documentation of all command functions prior to testing.

2. Equipment: Have all command functions programmed and functional.

3. Reference Documentation: List User Manual documentation and sections pertaining to the testing.

Date of Test: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Time of Test: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Contractor's Representative: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Government's Representative: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_­­\_\_\_\_\_\_

Test Procedures

UMCS (Front end) and DDC FOR HVAC FOR AN INTEGRATION PROJECT

| Item | Action | Expected Results | Approved |
| --- | --- | --- | --- |
| 1 | From a graphic page, modify a parameter such as a set point. | The modified value is downloaded to the controller without delay and the controller performance shall be viewable by the monitoring of dynamic points. |  |
|  |  |  |  |
|  |  |  |  |
| 2 | 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. |  |
|  |  |  |  |
|  |  |  |  |
| 3 | From a graphic page, place a binary output point under operator override and assign a fixed value. | The binary output point shall accept the assigned value and ignore changes from application logic until the point is taken out of override. |  |
|  |  |  |  |
| Notes: | | | |

# 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: Provide all command input error messages prior to testing.

2. Equipment: UMCS and DDC hardware and software

3. Reference Documentation: List User Manual documentation and sections pertaining to the testing.

Date of Test: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Time of Test: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Contractor's Representative: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Government's Representative: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_­­\_\_\_\_\_\_

Test Procedures

This is for an INTEGRATION project.

| Item | Action | Expected Results | Approved |
| --- | --- | --- | --- |
| 1 | Login using a password with point override authority. | Login occurs. |  |
|  |  |  |  |
|  |  |  |  |
| 2 | Request a display of a network variable point. | The system displays the  Controller’s point value. |  |
|  |  |  |  |
|  |  |  |  |
| 3 | Override the point to a selected value. | The override changes the value in the controller. |  |
|  |  |  |  |
|  |  |  |  |
| 4 | Release the override. | The value returns to normal. |  |
|  |  |  |  |
|  |  |  |  |
| 5 | Repeat steps 2 – 4 for <FILL IN ACCORDING TO SAMPLING CRITERIA> |  |  |
|  |  |  |  |
|  |  |  |  |
| 6 | For a network variable to a controller for which the operator only has read privileges, command the variable to a value of 90. | The operator will be denied the ability to command the variable to any value. |  |
| Notes: | | | |

# TEST NUMBER: Eight

TITLE: Special Functions

OBJECTIVE: To verify Open system requirements that enable integration between different vendor equipment as defined.

INITIAL REQUIREMENTS/CONDITIONS:

1. Submittals: Provide documentation of all integrations prior to testing.

2. Equipment: Have all UMCS and DDC hardware and software programmed, integrated, and completed.

3. Reference Documentation: List User Manual documentation and sections pertaining to the testing.

Date of Test: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Time of Test: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Contractor's Representative: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Government's Representative: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_­­\_\_\_\_\_\_

Test Procedures

UMCS (Front end)

This is for a NEW UMCS project

| Item | Action | Expected Results | Approved |
| --- | --- | --- | --- |
| 1 | Verify that a building that uses controls from a vendor other than the one being installed can be integrated into the Graphical User Interface (GUI) without any loss of functionality. | Data from the other vendor’s controllers integrate into the GUI without loss of functionality. |  |
|  |  |  |  |
| Notes: | | | |

# TEST NUMBER: Nine

TITLE: Software Editing Tools

OBJECTIVE:

1. To validate the performance of the M & C application programming tool for the programmable controllers.

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

3. Reference Documentation: List User Manual documentation and sections pertaining to the testing.

Date of Test: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Time of Test: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Contractor's Representative: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Government's Representative: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_­­\_\_\_\_\_\_

Test Procedures

UMCS (Front end) projects and Building Level DDC

| Item | Action | U | I | D | Expected Results | Approved |
| --- | --- | --- | --- | --- | --- | --- |
| 1 | Demonstrate the programming of an override function in a programmable controller. |  |  | X | Using the engineering tool at the building level, operator is able to use the programmed function to override an output point. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 2 | Demonstrate software that allows the monitoring of data from a programmable controller. |  |  | X | Using the engineering tool at the building level, operator is able to monitor points from a programmable controller |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 3 | Create alarm conditions in a programmable controller. |  |  | X | Using the engineering tool at the building, operator verifies that alarm variables can be created according to the criteria. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 4 | Repeat Steps 1- 3 for <SAMPLE VALUE> of points. |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 5 | Demonstrate timer functions within applications of a programmable controller.  a. delay on  b. delay off  c. one second delays  d. interval timers |  |  | X | Control logic shall honor the built-in timers. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 6 | Demonstrate logic loops ("for" and "while") in a programmable controller. |  |  | X | Control logic properly follows the “for, while” requirements. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 7 | Demonstrate “if-then-else” logic in a programmable controller. |  |  | X | Control logic properly follows the “if, then, else” requirements. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 8 | Demonstrate basic math functions in a programmable controller. |  |  | X | Control logic properly executes math functions. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 9 | Demonstrate Boolean math functions in a programmable controller. |  |  | X | Control logic properly executes the Boolean math functions. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 10 | Demonstrate exponential math functions in a programmable controller. |  |  | X | Control logic properly executes the exponential math functions. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 11 | Demonstrate trigonometric math functions in a programmable controller. |  |  | X | Control logic properly executes the trigonometric math functions. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 12 | Demonstrate bitwise math functions in a programmable controller. |  |  | X | Control logic properly executes the bitwise math functions. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 13 | Create a user defined subroutine/function in a programmable controller. |  |  | X | Subroutine/function works correctly and can be easily reused. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 14 | Create and save a graphic symbol at the server. | X |  |  | Symbol is saved and reusable on a new graphic. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 15 | Modify a graphic symbol at the server. | X |  |  | Operator is able to open an existing symbol and make changes. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 16 | Save a graphic symbol to a library at the server. | X |  |  | Symbol is saved and is available from the library for reuse. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 17 | Delete a graphic symbol at the server. | X |  |  | Symbol no longer exists for use. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 18 | Place a graphic symbol on a new graphic page at server. | X |  |  | When the new page is opened, the symbol is there. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 19 | Associate particular conditions with particular displays at the server. | X |  |  | When the conditional variable changes, the display changes. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 20 | Overlay alphanumeric text on a graphic at the server. | X |  |  | Text shall properly display. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 21 | Create a new graphic from an old one at the server. | X |  |  | New graphic is created and displays properly. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 22 | Place dynamic data on a graphic at the server. |  |  |  | The dynamic data is viewable on the graphic. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 23 | Define the background color of a new graphic at the server. | X |  |  | The new graphic shows the selected background color. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 24 | Define a foreground color for an element on a graphic to distinguish it from the background color at the server. | X |  |  | The color of the dynamic data that uses the foreground color shall display in the foreground color. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 25 | Position a symbol on a graphic at the server. | X |  |  | The operator is able to place a symbol at any location on a graphic. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 26 | Position and edit alphanumeric descriptors at the server. | X |  |  | The alphanumeric display shall be as designed. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 27 | Draw lines on a graphic at the server. | X |  |  | Lines shall display as drawn. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 28 | Associate the source of dynamic data for presentation on a graphic at the server. | X |  |  | Correct data is displayed. |  |
|  |  |  |  |  |  |  |
| 29 | Display analog data on a graphic page at the server. | X |  |  | Correct data is displayed. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 30 | Demonstrate the movement of the curser (crosshairs) by the use of the mouse at the server. | X |  |  | Crosshairs follow the commands from the mouse. |  |
|  |  |  |  |  |  |  |
| 31 | Demonstrate the simultaneous use of multiple graphics (coincident graphics) at the server. | X |  |  | Operator utilizes the tile function and the tab function to manage multiple graphics. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 32 | Associate graphic properties such as color with the values from dynamic variables at the server. | X |  |  | Graphic properties shall change as the value of the dynamic variable changes. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 33 | Create conditional displays based on the value of a dynamic variable at the server. | X |  |  | The graphic display shall change as the dynamic variable changes. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 34 | Review the standard symbol library at the server. | X |  |  | Operator can access symbols from the standard symbol library. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 35 | Demonstrate how to move data from the database to a report at the server. | X |  |  | The executed report contains the specified data from the database. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 36 | Add comments and headers to a report at the server. | X |  |  | The executed report contains the comments and headers. |  |
|  |  |  |  |  |  |  |
| 37 | Demonstrate the time stamping of data in a report at the server. | X |  |  | Data presented in a report includes the correct date and time the data was sampled. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 38 | Demonstrate the time stamping of the report generation at the server. | X |  |  | The report shows the correct date and time it was executed. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 39 | Demonstrate mathematical manipulation of data within a report (daily averages, highs, lows, etc.) at the server. | X |  |  | Report displays the results of the mathematical manipulations. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 40 | Demonstrate the operator’s ability to select either automatic or manual generation of a report. | X |  |  | Report one executes automatically; report two executes manually, both per the operator's instructions. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 41 | Demonstrate the operator’s ability to either display report, print to printer, or print to file. | X |  |  | Report is displayed on screen; then printed to printer; and then printed to file, all per the operator's instructions. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 42 | Demonstrate how a new device is added to the server database for presentation to the workstations. | X |  |  | New list of variables from the new device shall be available from a workstation. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| Notes: | | | | | | |

# TEST NUMBER: Ten

TITLE: Scheduling

OBJECTIVE: 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: Have scheduling loaded and set-up in all programmable and application specific controllers.

3. Reference Documentation: List User Manual documentation and sections pertaining to the testing.

Date of Test: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Time of Test: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Contractor's Representative: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Government's Representative: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_­­\_\_\_\_\_\_

Test Procedures

UMCS (Front end) and Building Level DDC

| Item | Action | U | I | D | Expected Results | Approved |
| --- | --- | --- | --- | --- | --- | --- |
| 1 | Demonstrate the functionality of a time schedule by monitoring the value of an occupancy network point as the time changes through a start time or a stop time. |  |  | X | The value of the occupancy network point properly tracks the time schedule. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 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. |  |  | X | Scheduling software accommodates the described requirements. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 3 | Setup a special event or date specific time schedule and verify that this schedule takes precedence over the weekly schedule. |  |  | X | The special event schedule takes precedence. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 4 | Setup a group time schedule for a collection of systems. This group schedule shall take precedence over the individual time schedules. |  |  | X | The group schedule takes precedence. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 5 | Demonstrate operator access to a time schedule from a graphic page. |  | X |  | Operator is able to access the time scheduling editor from a graphic page. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 6 | Display the current date and time on a graphic page. | X |  |  | Operator is able to view the current date and time from a graphic page. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 7 | Demonstrate automatic daylight savings time adjustment | X |  |  | Time of day shifts automatically. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 8 | Demonstrate the ability of a controller to accept an occupied, unoccupied and standby command. |  |  | X | Equipment shall change modes based on the scheduler data. |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| Notes: | | | | | | |

# TEST NUMBER: Eleven

TITLE: Alarm Function

OBJECTIVE: 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: Have alarms programmed and set-up in all programmable and application specific controllers.

3. Reference Documentation: List User Manual documentation and sections pertaining to the testing.

Date of Test: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Time of Test: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Contractor's Representative: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Government's Representative: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_­­\_\_\_\_\_\_

Test Procedures

UMCS (Front End) This is for an INTEGRATION project

| Item | Action | Expected Results | Approved |
| --- | --- | --- | --- |
| 1 | Initiate a basic binary alarm condition such as a fan fail to start. | a. The network variable as displayed on the server / workstation changes from a value of 0 to a value of 1.  b. The alarm is presented in the alarm window.  c. The alarm defines the source of the alarm.  d. The alarm defines the time of the alarm.  e. The alarm shows its assigned priority.  f. The alarm displays a text message. |  |
|  |  |  |  |
|  |  |  |  |
| 2 | Acknowledge the alarm. | The status of the alarm changes to acknowledged. The user that acknowledged the alarm is recorded along with the date and time of the action. |  |
|  |  |  |  |
|  |  |  |  |
| 3 | Demonstrate the "pop up" of the alarm window when an alarm occurs. | When the alarm occurs, the alarm window automatically opens. |  |
|  |  |  |  |
|  |  |  |  |
| 4 | Demonstrate the capability to send an e-mail when an alarm occurs. | The e-mail is received. |  |
|  |  |  |  |
|  |  |  |  |
| 5 | Demonstrate the printing of an alarm on the alarm printer. | The printer prints the alarm. |  |
|  |  |  |  |
|  |  |  |  |
| 6 | Export the alarm log to a CSV file. | Open the CSV file (e.g. in Excel). File displays a list of all of the alarms. |  |
|  |  |  |  |
|  |  |  |  |
| 7 | Print the alarm file. | Paper copy is printed. |  |
|  |  |  |  |
|  |  |  |  |
| 8 | Take a controller off-line. | An alarm is generated. |  |
|  |  |  |  |
|  |  |  |  |
| 9 | Simulate loss of communications. | An alarm is generated. |  |
|  |  |  |  |
|  |  |  |  |
| 10 | Simulate a point not responding to a command. | An alarm is generated. |  |
|  |  |  |  |
|  |  |  |  |
| 11 | If this alarm is programmed into the system, simulate a change of state without command. | An alarm is generated. |  |
|  |  |  |  |
|  |  |  |  |
|  | DDC for HVAC |  |  |
|  |  |  |  |
| 12 | Initiate an alarm condition such as a fan fail to start. | DDC system sends 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: | | | |

# 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: Documentation of trending capability in compliance with specifications.

2. Equipment: A selection of each controller type utilized and workstation/server programmed with trend data.

3. Reference Documentation: List User Manual documentation and sections pertaining to the testing.

Date of Test: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Time of Test: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Contractor's Representative: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Government's Representative: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_­­\_\_\_\_\_\_

Test Procedures

UMCS (Front end) This is an INTEGRATION project.

| Item | Action | Expected Results | Approved |
| --- | --- | --- | --- |
| 1 | Set up a trend with a 1 second sample rate. | The system collects data at a rate of 1 sample per second. |  |
|  |  |  |  |
|  |  |  |  |
| 2 | Set up a trend to start and stop at specific times. | The system starts and stops a trend with respect to time. |  |
|  |  |  |  |
|  |  |  |  |
| 3 | Open a trend data display that has 8 or more values trended versus time. | Trend plots shall show all variables as a function of time. |  |
|  |  |  |  |
|  |  |  |  |
| 4 | Open a pre-programmed trend data presentation. | Trend plot shall open without operator programming. |  |
|  |  |  |  |
|  |  |  |  |
| 5 | Open the trend configuration dialog box and set up a trend. | Operator shall be able to configure a trend plot. |  |
|  |  |  |  |
|  |  |  |  |
| 6 | Set up a trend for a randomly selected binary point on the network and a randomly selected analog point on the network. | Any binary or analog variable shall be trendable. |  |
|  |  |  |  |
|  |  |  |  |
| 7 | Verify that historical trend data is stored on the hard drive. | With the controller offline, historical trend data from that controller is presented in a graphical form. |  |
|  |  |  |  |
|  |  |  |  |
| 8 | Export trend log data to a CSV file for manipulation and printing by the operator. | Data is presented in a CSV file form. |  |
|  |  |  |  |
| Notes: | | | |

# TEST NUMBER: Thirteen

TITLE: Demand Limiting

OBJECTIVE: 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 selection of each controller type programmed for demand limiting strategies.

3. Reference Documentation: List User Manual documentation and sections pertaining to the testing.

Date of Test: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Time of Test: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Contractor's Representative: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Government's Representative: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_­­\_\_\_\_\_\_

Test Procedures

UMCS (Front end) This is for an INTEGRATION project which includes DEMAND LIMITING.

| Item | Action | Expected Results | Approved |
| --- | --- | --- | --- |
| 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. |  |
|  |  |  |  |
|  |  |  |  |
| 2 | Record the present kW load:\_\_\_\_\_\_\_\_\_\_\_\_\_ | The M&C displays the actual kW. |  |
|  |  |  |  |
|  |  |  |  |
| 3 | Lower the kW limit setpoint to cause program to shed load. | a. The M&C software begins shedding load according to a priority.  b. The kW usage will decrease.  c. Once the kW is below the limit setpoint, load shedding will stabilize. |  |
|  |  |  |  |
|  |  |  |  |
| 4 | Raise the kW limit setpoint to an intermediate value to cause program to restore some load. | a. The M&C SW begins restoring loads in priority order.  b. The kW usage will increase  c. Once the kW is near the limit, load shedding will stabilize. |  |
|  |  |  |  |
|  |  |  |  |
| 5 | Raise the kW limit setpoint to the original value. | a. M&C SW will restore the remainder of the loads in priority order.  b. The UMCS goes back to normal control. |  |
|  |  |  |  |
| Notes: | | | |

# TEST NUMBER: Fourteen

TITLE: Report Generation

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

INITIAL REQUIREMENTS/CONDITIONS:

1. Submittals: Provide documentation of all report logs set-up and the equipment associated with the report logs.

2. Equipment: Server/workstation, applicable controllers as required in work statement, and I/O to create reports.

3. Reference Documentation: List User Manual documentation and sections pertaining to the testing.

Date of Test: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Time of Test: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Contractor's Representative: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Government's Representative: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_­­\_\_\_\_\_\_

Test Procedures

UMCS (Front end) This is for an INTEGRATION project.

| Item | Action | Expected Results | Approved |
| --- | --- | --- | --- |
| 1 | Manually generate a report for viewing on the workstation. | Report shall present itself for viewing without disrupting the operation of the control system. |  |
|  |  |  |  |
|  |  |  |  |
| 2 | Manually generate a report and direct it to a specific printer. | Report shall print on the specified printer. |  |
|  |  |  |  |
|  |  |  |  |
| 3 | Verify that the report contains the date and time associated with the raw data. | Data samples listed in the report have the associated date and time the samples were collected. |  |
|  |  |  |  |
|  |  |  |  |
| 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. |  |
|  |  |  |  |
|  |  |  |  |
| 5 | Save a report to a file that is compatible with Microsoft Office products. | The report shall be saved in a \*\*\*.xls or .xlsx format. |  |
|  |  |  |  |
|  |  |  |  |
| 6 | Generate a CSV file with trend log data. | The CSV file with trend log data is produced. |  |
|  |  |  |  |
| Notes: | | | |

# TEST NUMBER: Fifteen

TITLE: Uninterruptable Power Supply (UPS) Test

OBJECTIVE: Validate UPS performance requirements.

INITIAL REQUIREMENTS/CONDITIONS:

1. Submittals: UPS technical and configuration documentation.

2. Equipment: The server/workstation and the UPS operational for a minimum of one week.

3. Reference Documentation: List User Manual documentation and sections pertaining to the testing.

Date of Test: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Time of Test: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Contractor's Representative: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Government's Representative: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_­­\_\_\_\_\_\_

Test Procedures

UMCS (Front end) New UMCS project.

| Item | Action | Expected Results | Approved |
| --- | --- | --- | --- |
| 1 | The UMCS home graphic page is called up. | The home page is displayed. |  |
|  |  |  |  |
|  |  |  |  |
| 2 | Unplug the UPS from the wall outlet. | a. The UMCS home page remains displayed.  b. UPS displays LED-warning lights, if applicable.  c. UPS sounds an audible warning alarm, if applicable. |  |
|  |  |  |  |
|  |  |  |  |
| 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. |  |
|  |  |  |  |
|  |  |  |  |
| 4 | Allow the UPS to be unplugged for 20 minutes. | The UPS provides continuous power and does not affect the UMCS hardware and all associated software. |  |
|  |  |  |  |
|  |  |  |  |
| 5 | Return the UPS plug to the wall outlet. | a. The UPS will not affect the UMCS hardware and all associated software.  b. Status of UPS returns to normal. |  |
|  |  |  |  |
| Notes: | | | |

# TEST NUMBER: Sixteen

TITLE: Routers and Repeaters

OBJECTIVE: Validate Protocol Specific Router and Repeater requirements.

INITIAL REQUIREMENTS/CONDITIONS:

1. Submittals: Submittal information on routers and repeaters and O&M manual on network analysis tool.

2. Equipment:

a. Each type (protocol) of router used on the project operational for at least a week.

b. Each type of repeater used on the project operational for at least a week.

c. The protocol specific network analysis tool and specific router/repeater configuration tool for each type of router/repeater utilized on the network.

3. Reference Documentation: List User Manual documentation and sections pertaining to the testing.

Date of Test: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Time of Test: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Contractor's Representative: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Government's Representative: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_­­\_\_\_\_\_\_

Test Procedures

DDC for HVAC This is for a DDC project.

| Item | Action | Expected Results | Approved |
| --- | --- | --- | --- |
| 1 | For every router and repeater, verify that network traffic passes through the device. | Data passes through the device. |  |
| Notes: | | | |

# TEST NUMBER: Seventeen

TITLE: Gateways (Building Level)

OBJECTIVE: Validate Gateway requirements.

INITIAL REQUIREMENTS/CONDITIONS:

1. Submittals:

a. Provide a list of all software that will be used to verify Gateway configurations.

b. Provide all protocol specific interface files for the Gateway.

2. Equipment:

a. Each type of Gateway (protocol specific) used on the project, energized and operational.

b. The protocol specific network analysis tool(s) and Gateway configuration tool(s) for each type of Gateway utilized on the network.

3. Reference Documentation: List User Manual documentation and sections pertaining to the testing.

Date of Test: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Time of Test: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Contractor's Representative: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Government's Representative: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_­­\_\_\_\_\_\_

Test Procedures

This is for an INTEGRATION project (not for a gateway to a single package unit).

This test does not apply to Niagara Framework Supervisory Gateways installed under the Niagara Framework building control system specification; they are covered under DDC Hardware testing.

| Item | Action | Expected Results | Approved |
| --- | --- | --- | --- |
| 1 | For each type of Gateway, connect and open the network analysis tool. | a. Tool identifies function, network address, and identifier of the device.    b. The network traffic thru each Gateway utilizes the matching protocol associated with that Gateway. |  |
|  |  |  |  |
|  |  |  |  |
| 2 | For each type of Gateway, use the Gateway configuration tool to map a point through the Gateway. | Gateway allows mapping points through it. |  |
|  |  |  |  |
|  |  |  |  |
| 3 | For each type of Gateway, use the Gateway or network configuration tool and:  a. Rename one of the variables from the Gateway.  b. Check total capacity of Gateway.  c. Demonstrate bi-directional data passing through the gateway. | a. Gateway allows all variable names to be customized.  b. Gateway has capacity as required to map over additional points.  c. Data passes through the gateway in both directions. |  |
|  |  |  |  |
|  |  |  |  |
| 4 | For each type of Gateway, remove power source from Gateway for two hours; then return power to Gateway. | Gateway retains all configuration data. |  |
|  |  |  |  |
| Notes: | | | |

# TEST NUMBER: Eighteen

TITLE: Gateways (Device level)

OBJECTIVE: Validate Gateway requirements.

INITIAL REQUIREMENTS/CONDITIONS:

1. Submittals:

a. Provide a list of all software that will be used to verify Gateway configurations.

b. Provide all protocol specific interface files for the Gateway.

2. Equipment:

a. Each type of Gateway (protocol specific) used on the project, energized and operational.

b. The protocol specific network analysis tool(s) and Gateway configuration tool(s) for each type of Gateway utilized on the network.

3. Reference Documentation: List User Manual documentation and sections pertaining to the testing.

Date of Test: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Time of Test: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Contractor's Representative: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Government's Representative: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_­­\_\_\_\_\_\_

Test Procedures

This is for a DDC project, for a gateway to a package unit. This test does not apply to Niagara Framework Supervisory Gateways installed under the Niagara Framework building control system specification; they are covered under DDC Hardware testing.

| Item | Action | Expected Results | Approved |
| --- | --- | --- | --- |
| 1 | For each type of Gateway, connect and open the network analysis tool. | a. Tool identifies function, network address, and identifier of the device.    b. The network traffic thru each Gateway utilizes the matching protocol associated with that Gateway. |  |
|  |  |  |  |
|  |  |  |  |
| 2 | For each type of Gateway, use the Gateway configuration tool to map a point through the Gateway. | Gateway allows mapping points through it. |  |
|  |  |  |  |
|  |  |  |  |
| 3 | Demonstrate that the gateway is connected to one and only one foreign device and uses 10’ or less of foreign network media. | Gateway is connected to one and only one foreign device and uses 10’ or less of foreign network media. |  |
|  |  |  |  |
|  |  |  |  |
| 4 | Demonstrate bi-directional real time data through the gateway. | Gateway passes data in real time. |  |
|  |  |  |  |
|  |  |  |  |
| 5 | For each type of Gateway, remove power source from Gateway for two hours; then return power to Gateway. | Gateway retains all configuration data. |  |
|  |  |  |  |
| Notes: | | | |

# TEST NUMBER: Nineteen

TITLE: Local Display Panels (LDP)

OBJECTIVE: Demonstrate capability of the Local Display Panel to view and override control points.

INITIAL REQUIREMENTS/CONDITIONS:

1. Submittals: O & M Manual for LDP

2. Equipment: Hardware and software to connect and demo LDP configuration tool

3. Reference Documentation: List User Manual documentation and sections pertaining to the testing.

Date of Test: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Time of Test: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Contractor's Representative: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Government's Representative: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_­­\_\_\_\_\_\_

Test Procedures

DDC for HVAC This is for a DDC project.

| Item | Action | Expected Results | Approved |
| --- | --- | --- | --- |
| 1 | Use navigation buttons on LDP to display a data point such as a temperature reading or fan status. | LDP displays all requested data/status points. |  |
|  |  |  |  |
|  |  |  |  |
| 2 | Use navigation buttons to display a control point such as a discharge air temperature setpoint. | LDP displays all requested control points. |  |
|  |  |  |  |
|  |  |  |  |
| 3 | If override capability is specified, login to the LDP using a password. | LDP requires password for login. |  |
|  |  |  |  |
|  |  |  |  |
| 4 | If this capability is specified, use LDP to override a setpoint and enter a new value. | System accepts new setpoint and reacts to control to the new setpoint. |  |
|  |  |  |  |
|  |  |  |  |
| 5 | Use LDP to release local control override. | System returns to normal control. |  |
|  |  |  |  |
| Notes: | | | |

# TEST NUMBER: Twenty

TITLE: Open Network Point Verification

OBJECTIVE: To validate that network data is exposed in a protocol-specific open manner to facilitate future integration.

INITIAL REQUIREMENTS/CONDITIONS:

1. Submittals: Network configuration tool manuals

2. Equipment: Hardware, network connection, database, and network configuration tool.

3. Reference Documentation: List User Manual documentation and sections pertaining to the testing.

Date of Test: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Time of Test: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Contractor's Representative: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Government's Representative: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_­­\_\_\_\_\_\_

Test Procedures

This is for a DDC project.

| Item | Action | Expected Results | Approved |
| --- | --- | --- | --- |
| 1 | For BACnet systems, open a BACnet browser. For LNS based systems, open an LNS tool. For Niagara Framework systems, open the Niagara Engineering Tool. | The tools/browser open and display. |  |
|  |  |  |  |
|  |  |  |  |
| 2 | For BACnet and Niagara, use the tool to discover the system; for LNS, use the tool to read the system database. | The tool displays the entire network for the project. |  |
|  |  |  |  |
|  |  |  |  |
| 3 | Randomly select a sample of network points and confirm they are using correct objects and types as defined by the protocol | Correct types are used. |  |
|  |  |  |  |
| Notes: | | | |

# CUSTOM TEST TEMPLATE INSTRUCTIONS: Use this template to develop custom tests as indicated and required to fully test system functionality. Replace text in brackets (“<” and “>”) to develop test requirements. Remove these instructions when developing test procedures.

# TEST NUMBER: <TEST NUMBER>

TITLE: <TEST TITLE>

OBJECTIVE: <STATE TEST OBJECTIVE>

INITIAL REQUIREMENTS/CONDITIONS:

1. Submittals: <LIST REQUIRED SUBMITTALS>

2. Equipment: <LIST EQUIPMENT REQUIRED FOR TEST>

3. Reference Documentation: <LIST REQUIRED REFERENCE DOCUMENTATION>

Date of Test: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Time of Test: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Contractor's Representative: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Government's Representative: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_­­\_\_\_\_\_\_

Specification References for this verification:

<LIST SECTIONS REFERENCED FOR THIS TEST>

Test Procedures: <USE THE FOLLOWING FORMAT FOR TEST PROCEDURES, EXPAND AS NECESSARY TO CAPTURE ALL TEST ITEMS>

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Action | Expected Results | Approved |
| 1 |  |  |  |
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| 2 |  |  |  |
|  |  |  |  |
|  |  |  |  |
| 3 |  |  |  |
|  |  |  |  |
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| 4 |  |  |  |
|  |  |  |  |
| Notes: | | | |