

AUTOMATIC FAULT DETECTION AND DIAGNOSTICS FOR AIR HANDLING UNITS AND ZONE TERMINAL UNITS ACCEPTANCE

CEC-NRCA-MCH-13-A (Revised 01/16)

CALIFORNIA ENERGY COMMISSION



CERTIFICATE OF ACCEPTANCE		NRCA-MCH-13-A
Automatic Fault Detection and Diagnostics (FDD) for Air Handling Units and Zone Terminal Units Acceptance		(Page 1 of 5)
Project Name:	Enforcement Agency:	Permit Number:
Project Address:	City:	Zip Code:
System Name or Identification/Tag:	System Location or Area Served:	

<i>Note: Submit one Certificate of Acceptance for each system that must demonstrate compliance.</i>	Enforcement Agency Use: Checked by/Date
---	---

Intent:	<i>Verify that the system detects common faults in air handling units and zone terminal units.</i>
----------------	--

A. Construction Inspection
1. Instrumentation to perform test includes, but not limited to:
a. No instrumentation is required – changes are implemented at the building automation system control station.
2. Installation
a. The functional testing verifies proper installation of the controls for FDD for air handling units and zone terminal units. No additional installation checks are required.

B. Functional Testing for Air Handling Units	Results
Testing of each AHU with FDD controls shall include the following tests:	
Step 1: Sensor Drift/Failure	
a. Disconnect outside air temperature sensor from unit controller	Yes No
b. Verify that the FDD system reports a fault	Yes No
c. Connect OAT sensor to the unit controller	Yes No
d. Verify that FDD indicates normal system operation	Yes No
Step 2: Damper/Actuator Fault	
a. From the control system workstation, command the mixing box dampers to full open (100% outdoor air)	Yes No
b. Disconnect power to the actuator and verify that a fault is reported at the control workstation	Yes No
c. Reconnect power to the actuator and command the mixing box dampers to full open	Yes No
d. Verify that the control system does not report a fault	Yes No
e. From the control system workstation, command the mixing box dampers to a full-closed position (0% outdoor air)	Yes No
f. Disconnect power to the actuator and verify that a fault is reported at the control workstation	Yes No
g. Reconnect power to the actuator and command the dampers closed	Yes No
h. Verify that the control system does not report a fault during normal operation	Yes No

AUTOMATIC FAULT DETECTION AND DIAGNOSTICS FOR AIR HANDLING UNITS AND ZONE TERMINAL UNITS ACCEPTANCE

CEC-NRCA-MCH-13-A (Revised 01/16)

CALIFORNIA ENERGY COMMISSION



CERTIFICATE OF ACCEPTANCE		NRCA-MCH-13-A
Automatic Fault Detection and Diagnostics (FDD) for Air Handling Units and Zone Terminal Units Acceptance		(Page 2 of 5)
Project Name:	Enforcement Agency:	Permit Number:
Project Address:	City:	Zip Code:
System Name or Identification/Tag:	System Location or Area Served:	

Step 3: Valve/actuator fault		
a. From the control system workstation, command the heating coil valves to full open.	Yes	No
b. Disconnect power to the actuator and verify that a fault is reported	Yes	No
c. Reconnect power to the actuator and command the heating coil valve to full open	Yes	No
d. Verify that the control system does not report a fault	Yes	No
e. From the control system workstation, command the cooling coil valve to the full open position.	Yes	No
f. Disconnect power to the actuator and verify that a fault is reported	Yes	No
g. Reconnect power to the actuator and command the cooling coil valve to full open	Yes	No
h. Verify that the control system does not report a fault	Yes	No
Step 4: Inappropriate simultaneous heating, mechanical cooling, and/or economizing		
a. From the control system workstation, override the heating coil valve and verify that a fault is reported at the control workstation	Yes	No
b. From the control system workstation, override the cooling coil valve and verify that a fault is reported at the control workstation	Yes	No
c. From the control system workstation, override the mixing box dampers and verify that a fault is reported at the control workstation	Yes	No

AUTOMATIC FAULT DETECTION AND DIAGNOSTICS FOR AIR HANDLING UNITS AND ZONE TERMINAL UNITS ACCEPTANCE

CEC-NRCA-MCH-13-A (Revised 01/16)

CALIFORNIA ENERGY COMMISSION



CERTIFICATE OF ACCEPTANCE		NRCA-MCH-13-A
Automatic Fault Detection and Diagnostics (FDD) for Air Handling Units and Zone Terminal Units Acceptance		(Page 3 of 5)
Project Name:	Enforcement Agency:	Permit Number:
Project Address:	City:	Zip Code:
System Name or Identification/Tag:	System Location or Area Served:	

B. Functional Testing for Zone Terminal Units		Results
Testing shall be performed on one of each type of terminal unit (VAV box) in the project. A minimum of 5% of the terminal boxes shall be tested.		
Step 1: Sensor drift/failure		
a. Disconnect the tubing to the differential pressure sensor of the VAV box	Yes	No
b. Verify that control system detects and reports the fault	Yes	No
c. Reconnect the sensor and verify proper sensor operation	Yes	No
d. Verify that the control system does not report a fault	Yes	No
Step 2: Damper/actuator fault – damper stuck open		
a. Command the damper to be fully open	Yes	No
b. Disconnect the actuator to the damper	Yes	No
c. Adjust the cooling setpoint so that the room temperature is below the cooling setpoint to command the damper to the minimum position. Verify that the control system reports a fault	Yes	No
d. Reconnect the actuator and restore to normal operation	Yes	No
Step 3: Damper/actuator fault – damper stuck closed		
a. Set the damper to the minimum position	Yes	No
b. Disconnect the actuator to the damper	Yes	No
c. Set the cooling setpoint below the room temperature to simulate a call for cooling. Verify that the control system reports a fault	Yes	No
d. Reconnect the actuator and restore to normal operation	Yes	No
Step 4: Valve/actuator fault (For systems with hydronic reheat)		
a. Command the reheat coil valve to (full) open	Yes	No
b. Disconnect power to the actuator. Set the heating setpoint temperature to be lower than the current space temperature, to command the valve closed. Verify that the fault is reported at the control workstation	Yes	No
c. Reconnect the actuator and restore normal operation	Yes	No
Step 5: Feedback loop tuning fault (unstable airflow)		
a. Set the integral coefficient of the box controller to a value 50 times the current value. Lower the space cooling setpoint to simulate a call for cooling.	Yes	No
b. The damper cycles continuously and airflow is unstable. Verify that the control system detects and reports the fault	Yes	No
c. Reset the integral coefficient of the controller to the original value to restore normal operation	Yes	No
Step 6: Disconnected inlet duct		
a. From the control system workstation, command the damper to minimum position.	Yes	No
b. Disconnect power to the actuator and verify that a fault is reported at the control workstation.	Yes	No
c. Reset the space temperature setpoint back to its original value.	Yes	No

AUTOMATIC FAULT DETECTION AND DIAGNOSTICS FOR AIR HANDLING UNITS AND ZONE TERMINAL UNITS ACCEPTANCE

CEC-NRCA-MCH-13-A (Revised 01/16)

CALIFORNIA ENERGY COMMISSION



CERTIFICATE OF ACCEPTANCE		NRCA-MCH-13-A
Automatic Fault Detection and Diagnostics (FDD) for Air Handling Units and Zone Terminal Units Acceptance		(Page 4 of 5)
Project Name:	Enforcement Agency:	Permit Number:
Project Address:	City:	Zip Code:
System Name or Identification/Tag:	System Location or Area Served:	

C. Testing Results	PASS / FAIL
Test passes if all applicable answers are yes under Functional Testing Sections .	

D. Evaluation
<input type="checkbox"/> PASS: All Construction Inspection responses are complete and all Testing Results responses are "Pass"

AUTOMATIC FAULT DETECTION AND DIAGNOSTICS FOR AIR HANDLING UNITS AND ZONE TERMINAL UNITS ACCEPTANCE

CEC-NRCA-MCH-13-A (Revised 01/16)

CALIFORNIA ENERGY COMMISSION



CERTIFICATE OF ACCEPTANCE		NRCA-MCH-13-A
Automatic Fault Detection and Diagnostics (FDD) for Air Handling Units and Zone Terminal Units Acceptance		(Page 5 of 5)
Project Name:	Enforcement Agency:	Permit Number:
Project Address:	City:	Zip Code:
System Name or Identification/Tag:	System Location or Area Served:	

DOCUMENTATION AUTHOR'S DECLARATION STATEMENT		
1. I certify that this Certificate of Acceptance documentation is accurate and complete.		
Documentation Author Name:	Documentation Author Signature:	
Documentation Author Company Name:	Date Signed:	
Address:	ATT Certification Identification (If applicable):	
City/State/Zip:	Phone:	
FIELD TECHNICIAN'S DECLARATION STATEMENT		
I certify the following under penalty of perjury, under the laws of the State of California:		
<ol style="list-style-type: none"> The information provided on this Certificate of Acceptance is true and correct. I am the person who performed the acceptance verification reported on this Certificate of Acceptance (Field Technician). The construction or installation identified on this Certificate of Acceptance complies with the applicable acceptance requirements indicated in the plans and specifications approved by the enforcement agency, and conforms to the applicable acceptance requirements and procedures specified in Reference Nonresidential Appendix NA7. I have confirmed that the Certificate(s) of Installation for the construction or installation identified on this Certificate of Acceptance has been completed and signed by the responsible builder/installer and has been posted or made available with the building permit(s) issued for the building. 		
Field Technician Name:	Field Technician Signature:	
Field Technician Company Name:	Position with Company (Title):	
Address:	ATT Certification Identification (if applicable):	
City/State/Zip:	Phone:	Date Signed:
RESPONSIBLE PERSON'S DECLARATION STATEMENT		
I certify the following under penalty of perjury, under the laws of the State of California:		
<ol style="list-style-type: none"> I am the Field Technician, or the Field Technician is acting on my behalf as my employee or my agent and I have reviewed the information provided on this Certificate of Acceptance. I am eligible under Division 3 of the Business and Professions Code in the applicable classification to accept responsibility for the system design, construction or installation of features, materials, components, or manufactured devices for the scope of work identified on this Certificate of Acceptance and attest to the declarations in this statement (responsible acceptance person). The information provided on this Certificate of Acceptance substantiates that the construction or installation identified on this Certificate of Acceptance complies with the acceptance requirements indicated in the plans and specifications approved by the enforcement agency, and conforms to the applicable acceptance requirements and procedures specified in Reference Nonresidential Appendix NA7. I have confirmed that the Certificate(s) of Installation for the construction or installation identified on this Certificate of Acceptance has been completed and is posted or made available with the building permit(s) issued for the building. I will ensure that a completed, signed copy of this Certificate of Acceptance shall be posted, or made available with the building permit(s) issued for the building, and made available to the enforcement agency for all applicable inspections. I understand that a signed copy of this Certificate of Acceptance is required to be included with the documentation the builder provides to the building owner at occupancy. 		
Responsible Acceptance Person Name:	Responsible Acceptance Person Signature:	
Responsible Acceptance Person Company Name:	Position with Company (Title):	
Address:	CSLB License:	
City/State/Zip:	Phone:	Date Signed: