



GUIDELINE

ASHRAE Guideline 11-2018
(Supersedes ASHRAE Guideline 11-2009)

Field Testing of HVAC Controls Components

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NOTE

Approved addenda, errata, or interpretations for this guideline can be downloaded free of charge from the ASHRAE website at www.ashrae.org/technology.

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(This foreword is not a part of this guideline. It is merely informative and does not contain requirements necessary for conformance to the guideline.)

FOREWORD

ASHRAE Guideline 11 presents field testing procedures for specific devices that control the operation of an HVAC system. Field testing of HVAC controls components involves verifying the actual installation, location, and access to the various types of control devices used in HVAC systems. Some control devices can be tested on multiple levels, from a simple ON/OFF check to the computerized verification of performance criteria. The interaction and sequencing of controls devices is also covered. The results of the testing procedures define the operability of the device and ultimately the system.

The 2018 edition of Guideline 11 has been revised in several ways. The first change was to address newer direct digital control (DDC) technology but still allow the reader to understand the nuances of the older pneumatic systems that are still in use today. Secondly, redundant language was removed to make the guideline easier to read.

This guideline supplements several related ASHRAE publications, including ASHRAE Standard 111, Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems; ASHRAE Guideline 0, The Commissioning Process; and ASHRAE Guideline 1.1, HVAC&R Technical Requirements for The Commissioning Process.

1. PURPOSE

This guideline provides procedures for field testing and adjusting of control components used in building heating, ventilating, and air-conditioning (HVAC) systems.

2. SCOPE

This guideline covers the procedures, formats, and methods necessary for evaluation and documentation of the performance of devices and systems that control HVAC systems.

3. DEFINITIONS

Definitions of terms used in this guideline can be found in *ASHRAE Terminology of Heating, Ventilation, Air Conditioning, & Refrigeration*¹ and the ASHRAE Terminology online database.

control alarm: a signal—audible, visual, or both—that alerts an operator to an off-normal control condition or sensor value that may require some form of corrective action.

control component: smallest functional control element of an installation, such as a sensor or actuator.

control device: a device that can be used to control other components, such as a fan or heat exchanger, within a unit or system.

control point: the current value of a controlled variable; control point equals set point plus offset.

control safety: an element of the control system that detects one or more conditions that provide actions or indications to prevent equipment or personnel harm.

control sensor: device or instrument designed to detect and measure a control variable.

control sensor accuracy: conformity of an indicated control sensor value to an accepted standard value or true value. Quantitatively, it should be expressed as an error or an uncertainty.

control sequence: an organized narration specifying how the integrated functions of a device, system, or facility will perform. It should incorporate energy efficiency and environmental concerns with detailed, comprehensive control strategies—i.e., how each individual piece of equipment will be controlled and what information and adjustment will be available to the user. These may be provided in a combination of narratives, diagrams, and point lists for every unique type of equipment and for each system.

control system: an arrangement of elements interconnected and interacting in such a way so as to maintain or influence specified conditions in a prescribed manner.

4. GENERAL FORMAT FOR TESTING

4.1 Reasons for Testing. The components of control systems are essential for heating, ventilating, air-conditioning, and refrigeration (HVAC&R) systems to properly and efficiently perform their functions. Sensors monitor and report on conditions and equipment performance. Controllers perform the process supervision. Device operators execute the functions to produce proper unit outputs.

Each of these devices is designed to perform its basic function under a set of conditions defined in the design documents. The performance level of the device, the correct installation, and the correct operation of the system are verified under operating conditions. The documentation from these tests provides a verification of the device and system design and a record of initial performance.

4.2 Testing Parameters and Accessibility for Testing. The following parameters are necessary to properly test a device or system:

- Prior to start of testing, verify that all equipment and components are installed correctly per design documents and/or manufacturer requirements.
- Performance characteristics of the device, and the system design requirements, are understood by the tester.
- Testing procedures are developed to make the test results reliable and understandable.
- To be reliable and credible, tests are performed using the developed procedures with proper test equipment.
- The test equipment is to be placed in a comparable position to verify operation of the device/system being tested.
- Tests are performed during stable (noncycling) operating conditions.

Informative Note: These require physical access to the test site sufficient to install the test apparatus and to access the fluid being monitored.

4.3 General Testing Procedures

4.3.1 Testing Level Strategy. There are several levels or phases of testing. In some cases, only simple verification of