skinner innovations

HST Series Heat Detector Tester

For Rate Compensated Fire Detectors and Thermal Switches

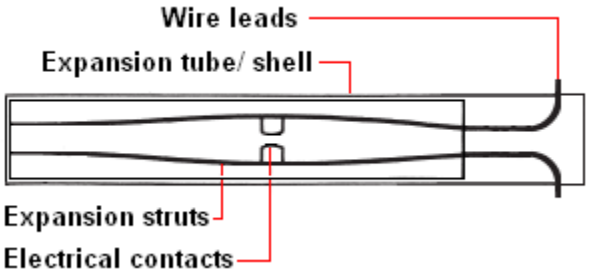
Technical Note: Rate Compensated Heat Detector Testing

Interpretation of test results

The purpose of this note is to explain detector set point, rate compensation, and how this should affect the interpretation of test results observed on remote temperature readout of the HST heat detector tester. The HST remote temperature output is taken directly from the heating unit. Detector trip points will often be observed to be lower than the manufacturer rated set point. This is due to the unique way rate compensation works to self-adjust the set point based on how quickly the temperature is rising from the starting temperature.

Set Point verses trip point- "virtual set point"

The unique feature of Rate Compensated heat detectors: "virtual" set point.
The detector has two main parts which expand or contract with temperature changes.



First is the outer expansion tube or shell.
Second is a pair of expansion "struts" or metal strips. This interior part also contains the electrical contacts.

These two parts work together to cause the detector to behave in 2 different ways:
1st- A slow rate of temp rise- Heat is allowed to penetrate into the struts, both parts expand together and detector trips close to the rated set point.
2nd- A high rate of temp rise- The shell rapidly expands before heat can penetrate to struts and the detector trips at a temperature that would appear to be lower than the rated set point.

Manufacturer Calibration (UL testing) vs. Compliance Testing

New heat detectors are calibrated (tested to UL521 standard) to a rated +/- set point.
This is done by raising the temperature in very slow, controlled manner (varying rates depending on the temperature of the detector).
For example: the temperature could be raised at 50 degrees per minute until 150 degrees is reached. Then continue at 1 degree per minute until the detector trips at 225°. Ambient temperature also needs to be accounted for by heating to a pre-determined starting temperature for a set period of time. The detector should then trip within the +/- range of manufacturers set point specification. *This type of testing is not required* for normal detector compliance testing.
Compliance testing is done after installation of the detector in the intended area of use and is required by the authority having jurisdiction. There is no requirement to test for a specific temperature. *However, the test should not damage the detector.*
The HST can be custom programmed to raise temperature at a slower rate to trip detector closer to the rated set point. (see Rate Control option Appendix B) However, the HST's intended application is to compliance test detectors in a non destructive manner, identify shifts in set point, and help ensure that the detector continues to operate as it was originally calibrated by the manufacturer. Per the UL standard, there is no way to field re-calibrate a heat/fire detector.

skinner innovations

HST Series Heat Detector Tester

For Rate Compensated Fire Detectors and Thermal Switches

Operation supplement:

Testing rate compensated heat detectors - HST Rate Control option/ Rate Compensation Verification

Sequence of Operation

Turn on HST by pressing the power button. Place tester firmly over detector. Then follow test stages 1-4 below.

Test Stage	HST LED condition	Power on/ sequence of operation	Observed condition	Interpretation of test results*	Example results 140°F (+7/-8°) Fenwal DAF detector
Stage 1 (used on rate control models)	LED steady on until 60-80% temp When LED goes off, then flashes 1 time every 15 seconds, 180 second hold timer is active	Temperature rises to 60-80% of set point Then begin 180 second stage 1 hold timer	Detector should trip for 1st time while temperature is rising. If using remote temp display, note the trip temperature.	Failure to trip may indicate detector set point has shifted high	1st detector trip at 124°F Hold temperature 128°F
	1st stage hold time: LED turns off then flashes 1 time every 15 seconds	Temperature holds at 60-80% of set point for 180 seconds	Detector should auto-reset within 1-2 minutes. Observe that detector has reset.	Failure to auto-reset may indicate detector set point has shifted high	Auto-reset approx 30 seconds after 1st stage timer begins
Stage 2 (not used on all models)	LED steady on When LED goes off, then flashes 2 times every 15 seconds, 180 second hold timer is active	Temperature rises to 85-95% of set point Begin 180 second stage 2 hold timer	Detector should trip for 2nd time while temperature is rising. If using remote temp display, note the trip temperature.	Failure to trip may indicate detector set point has shifted high	2nd detector trip at 130°F Hold temperature 136°F
	During 2nd stage hold, LED turns off then flashes 2 times every 15 seconds	Temperature holds at 85-95% of set point for 180 seconds	Detector should auto-reset within 1-2 minutes. Observe that detector has reset.	Failure to auto-reset may indicate detector set point has shifted high	Auto-reset approx 30 seconds after 2nd stage timer begins
Stage 3	LED steady on until temperature is a few degrees below the rated set point, then LED begins slow flash	Temperature rises to detectors rated set point	Detector should trip for 3rd time while temperature is rising. If using remote temp display, note the trip temperature.	Failure to trip may indicate detector set point has shifted high. Auto reset after tester has stabilized may indicate that detector has shifted low	3rd detector trip at 140°F
Stage 4	LED steady on until temperature is a few degrees below the rated set point, then LED begins slow flash	Temperature holds for 5 minutes then heat turns off for approx 60-90 seconds	Detector should auto-reset during off-time. Then, temperature begins to climb to set point again.	Detector should trip at the actual set point at this time	4th Detector trip at 141°F 5th Detector trip at 139°F 6th Detector trip at 142°F
	Stage 4 repeats 3 more times with 5 second hold time between cycles, then temperature holds steady at set point Use the average of the last four trips to determine the actual trip point*				

Operation supplement:

Testing rate compensated heat detectors - HST Rate Control option/ Rate Compensation Verification (cont.)

* Notes on testing rate compensated heat detectors using HST Series Heat Detector tester with rate control/rate compensation verification:

- The LED indicator light flashes to indicate test progress. If the HST is producing quick flashes, this may indicate a fault. Count the number of flashes and consult this manual or contact Skinner Innovations.
- Results will vary somewhat depending on ambient conditions.
- Do not expect trip points to be exactly as in the example or exactly at the manufacturers rated set point.
- Completely cool the tester before starting on next rate compensation detector test.
- After noting trip points for all detectors, it is recommended to use manufacturers +/- tolerances and good judgment to determine Pass/Fail criteria for your particular environment. Detectors should be within similar +/- tolerances. A device which falls outside of this parameter may require replacement or further evaluation. *Results will vary somewhat depending on ambient temperature, battery charge, etc. The HST can accurately determine if detector set point has shifted low or high. However these limitations should be considered when interpreting test results.*
  Detector calibration requires specialized laboratory-type equipment and is performed on new detectors at the manufacturers factory. The HST will help to detect major shifts in set point but is not intended to be used to calibrate heat detectors. To meet listing requirements, detector manufactures do not usually provide a way to field adjust heat detector set point.
  The material presented in this document is for informational purposes only. Follow the manufacturer's specific testing instructions. Detectors may require additional tests, especially if open flame or other uncontrolled source of heat has been used in the past for testing purposes. See Fenwal® Operation, Maintenance, and Installation manual for complete testing instructions.