When we create firmware, calibrate and test pellet cookers, we use specific equipment and methodologies. This document will cover the high points of these items, so that users may better understand the why and how of the operation of our pellet cookers.

Equipment

The temperature measuring equipment that we use are scientific data logging instruments costing thousands of dollars. The thermocouple probes that we use are also rated for scientific usage and cost hundreds of dollars. Compare this to the $59.95 Maverick dual probe ET-732, or other consumer temperature probe equipment normally used, and you can see that there is a huge disparity in cost, reliability and accuracy.

Methodology

Our pellet cooker controller works from the physical grate surface temperature. This means that we measure and use the physical grate surface temperature readings, not temperature readings that are above the grate surface, which is a suspended air temperature. We use 2 scientific thermocouple probes for all of our processes. For a YS640, we place the 2 probes in specific locations, so that we may gather the proper temperature readings. The probes are placed exactly centered between the front and back of the cooker, and at 11" and at 22" as measured from the hopper wall. This placement is shown in Figure 1. For this discussion, we have also placed 2 additional scientific probes on the upper grate, directly above the probes on the lower shelf (see Figure 1).

In addition, we have utilized a Maverick ET-732 dual probe thermometer (see figure 1 and 2) to show, not only a comparison to the scientific probe readings, but also to illustrate the difference in the readings between a probe lying directly on the grate as compared to one above the grate reading the suspended air temperature at that specific location. The Maverick probes are located at the 11" position, on the lower grate next to the scientific probe, one probe lying on the grate surface and the second mounted in a standard probe mount approximately one inch directly above the first probe. This allows us to illustrate the temperature that the scientific probe is reading at the grate surface, how the Maverick probe compares to this reading, and how the probe above the grate compares to both (see Figure 3).

The tests

We did 2 separate tests:

1. A 2 hour test with a 50/50 mix of BBQr's Delight Pecan and Cherry. This is the normal test that we ask customers to do for verification of cooker performance. The pellets used for this test were not "fresh", as they had been sitting in the hopper for approximately 30 days.
2. A 6 hour test with our baseline pellet, BBQr's Delight Hickory, which we use for all functions where pellets are required. These pellets were "fresh", from a new bag that was just opened.

To review the results of the tests, please refer to Chart 1 for the 2 hour test results and Chart 2 for the 6 hour test. The averages listed were derived from the logged data, which is captured in 1 second intervals (temperature readings taken and logged once a second for the duration of the test).

The cooker was completely empty, except for the thermocouple probes utilized during the tests. The YS640 sliding damper was pulled fully open, all the way out to the right (chimney) side of the cooker. There wasn't any foil in the cooker. All probe wires were run into the cooker through the chimney. The cooker lid was left shut for the entire length of the tests.

Figure 1

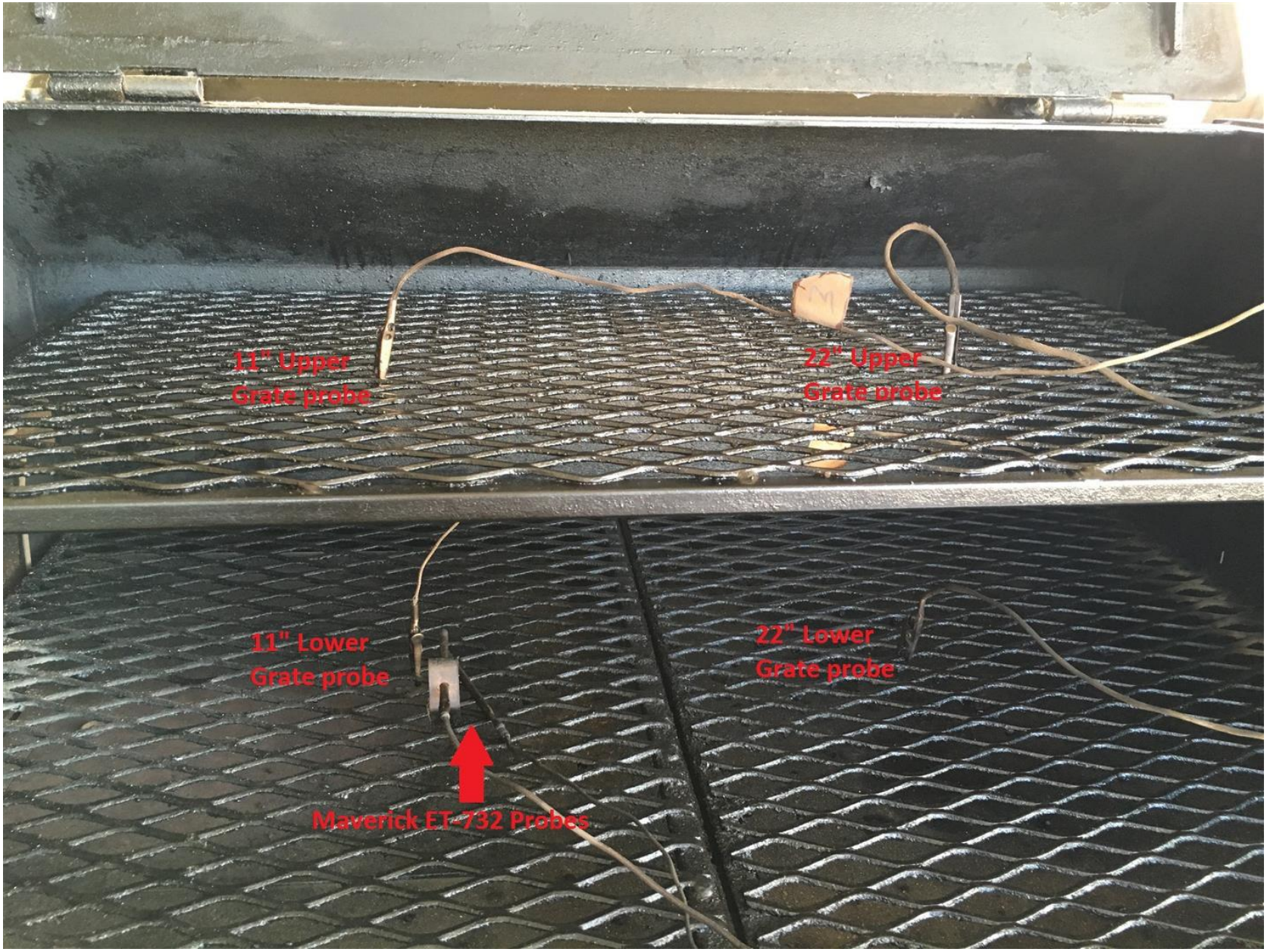

11" Upper
Grate probe
22" Upper
Grate probe
11" Lower
Grate probe
22" Lower
Grate probe
Maverick ET-732 Probes

Figure 2

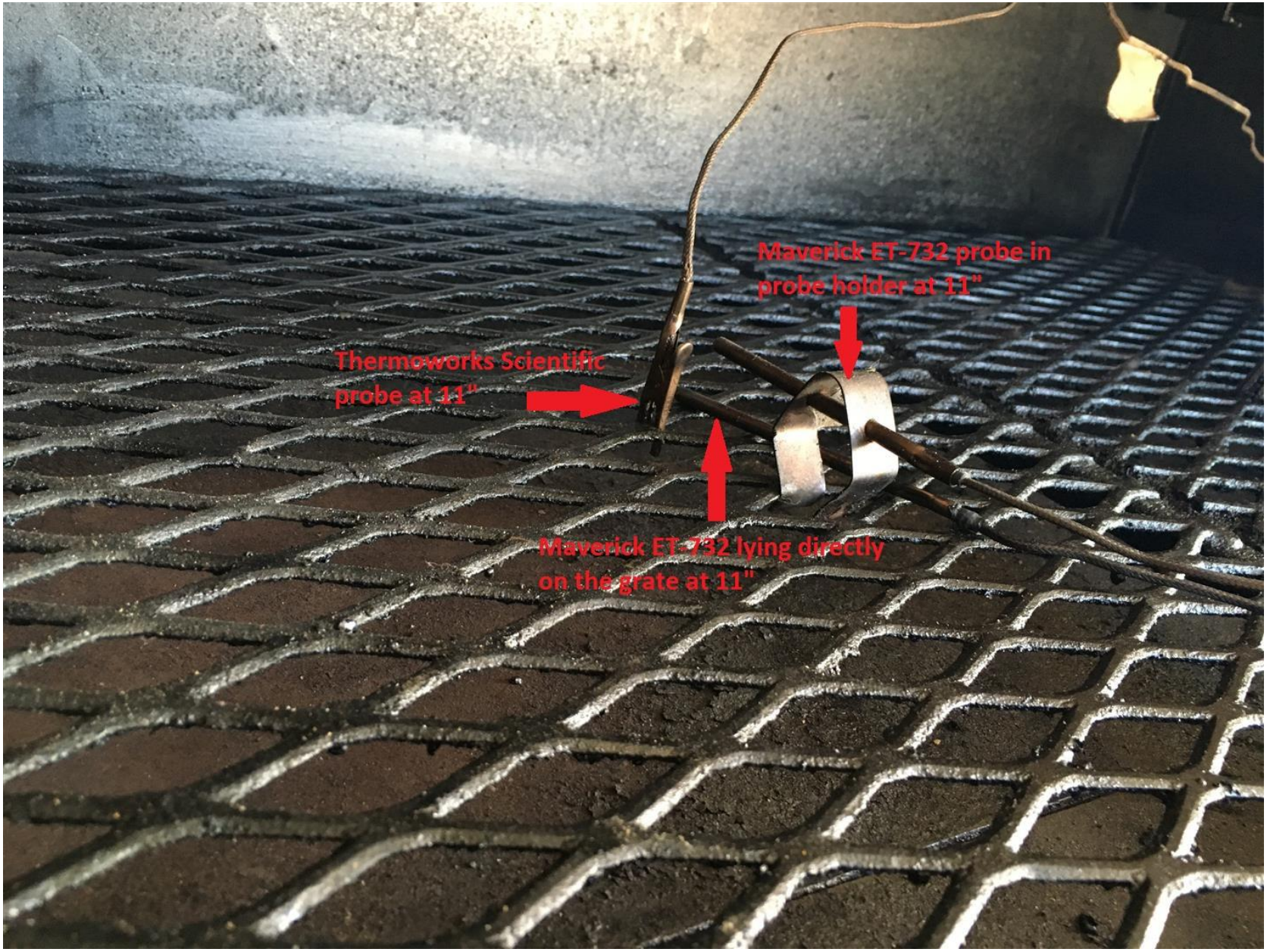

Maverick ET-732 probe in
probe holder at 11"
Thermoworks Scientific
probe at 11"
Maverick ET-732 lying directly
on the grate at 11"

Figure 3

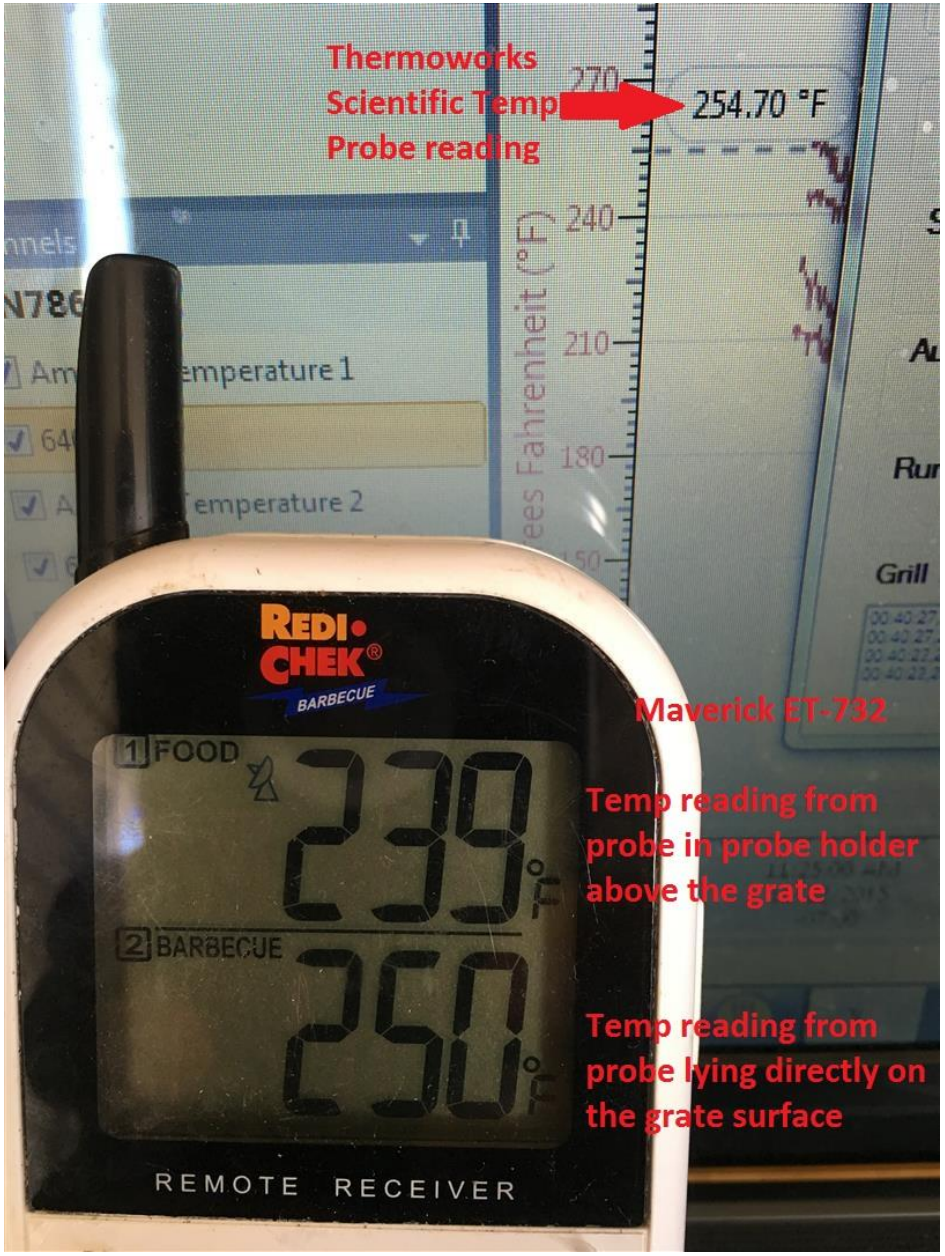

Thermoworks
Scientific Temp
Probe reading
254.70 °F
270
240
210
180
Fahrenheit (°F)
Grill
REDI CHEK
BARBECUE
Maverick ET-732
1 FOOD
239
2 BARBECUE
250
Temp reading from probe in probe holder above the grate
Temp reading from probe lying directly on the grate surface
REMOTE RECEIVER

Chart 1

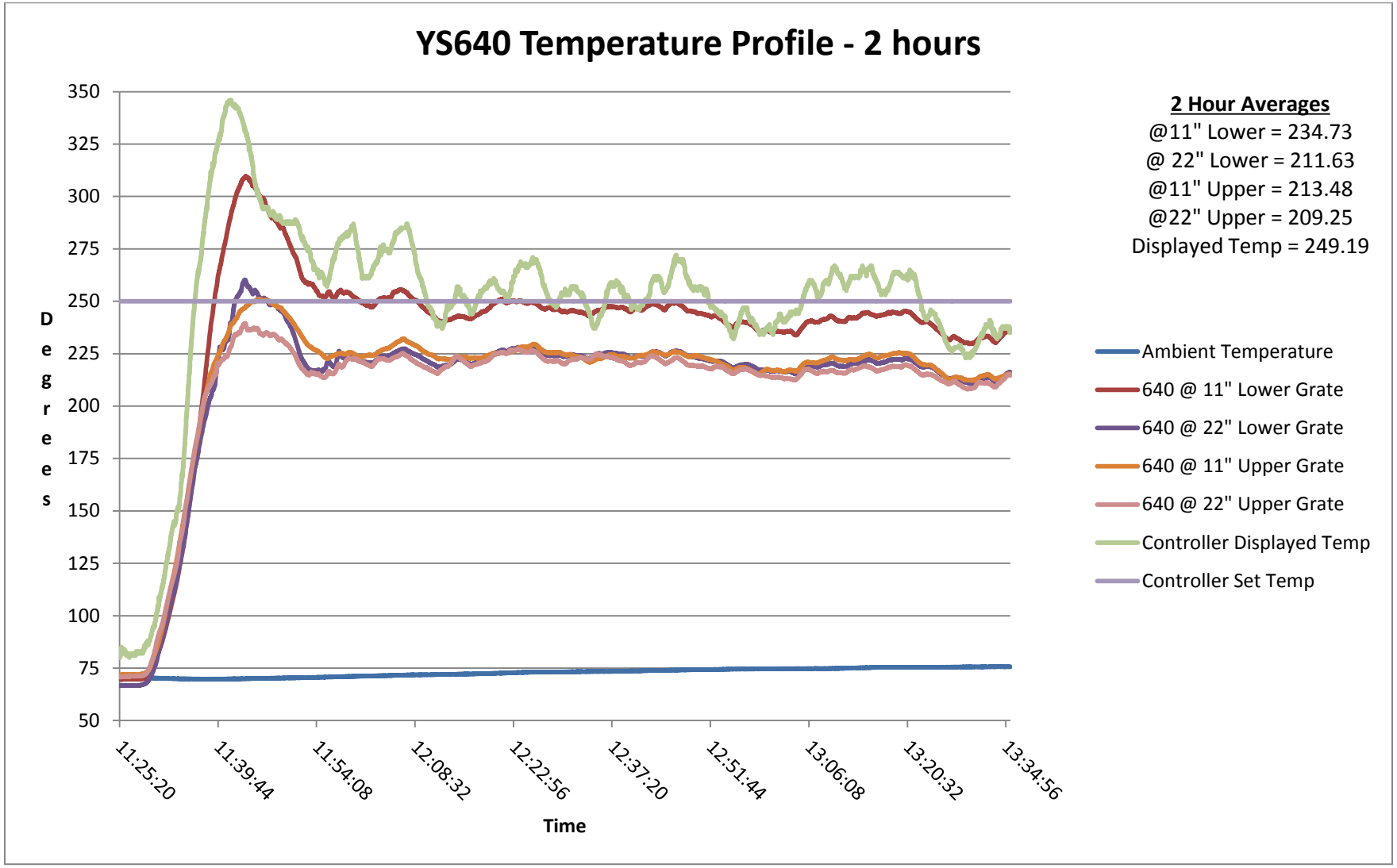
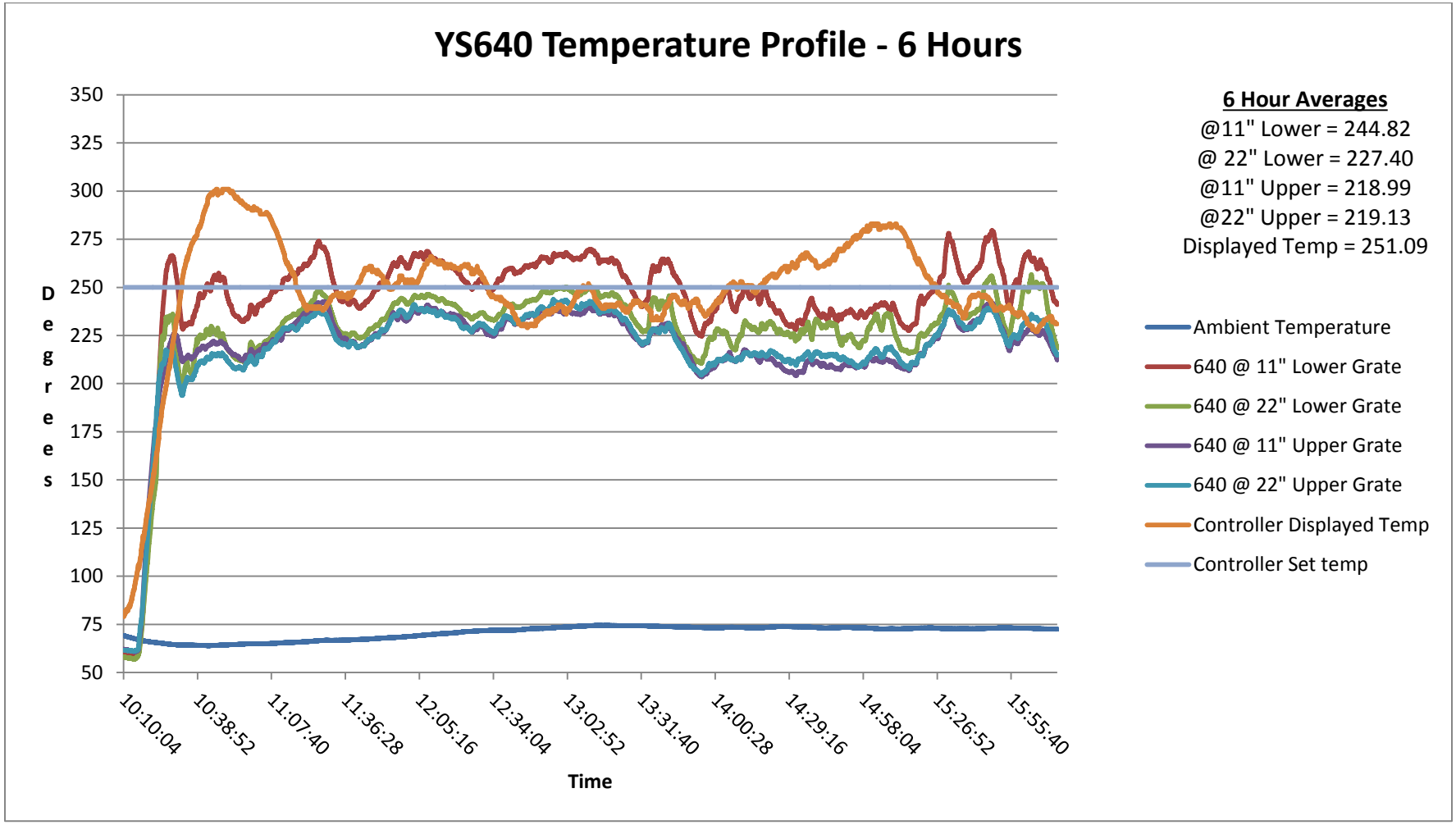

YS640 Temperature Profile - 2 hours
350
325
300
275
250
225
200
175
150
125
100
75
50
Degrees
11:25:20
11:39:44
11:54:08
12:08:32
12:22:56
12:37:20
12:51:44
13:06:08
13:20:32
13:34:56
Time
2 Hour Averages
@11" Lower = 234.73
@ 22" Lower = 211.63
@11" Upper = 213.48
@22" Upper = 209.25
Displayed Temp = 249.19
Ambient Temperature
640 @ 11" Lower Grate
640 @ 22" Lower Grate
640 @ 11" Upper Grate
640 @ 22" Upper Grate
Controller Displayed Temp
Controller Set Temp

Chart 2


YS640 Temperature Profile - 6 Hours
350
325
300
275
250
225
200
175
150
125
100
75
50
Degrees
10:10:04
10:38:52
11:07:40
11:36:28
12:05:16
12:34:04
13:02:52
13:31:40
14:00:28
14:29:16
14:58:04
15:26:52
15:55:40
Time
6 Hour Averages
@11" Lower = 244.82
@ 22" Lower = 227.40
@11" Upper = 218.99
@22" Upper = 219.13
Displayed Temp = 251.09
Ambient Temperature
640 @ 11" Lower Grate
640 @ 22" Lower Grate
640 @ 11" Upper Grate
640 @ 22" Upper Grate
Controller Displayed Temp
Controller Set temp