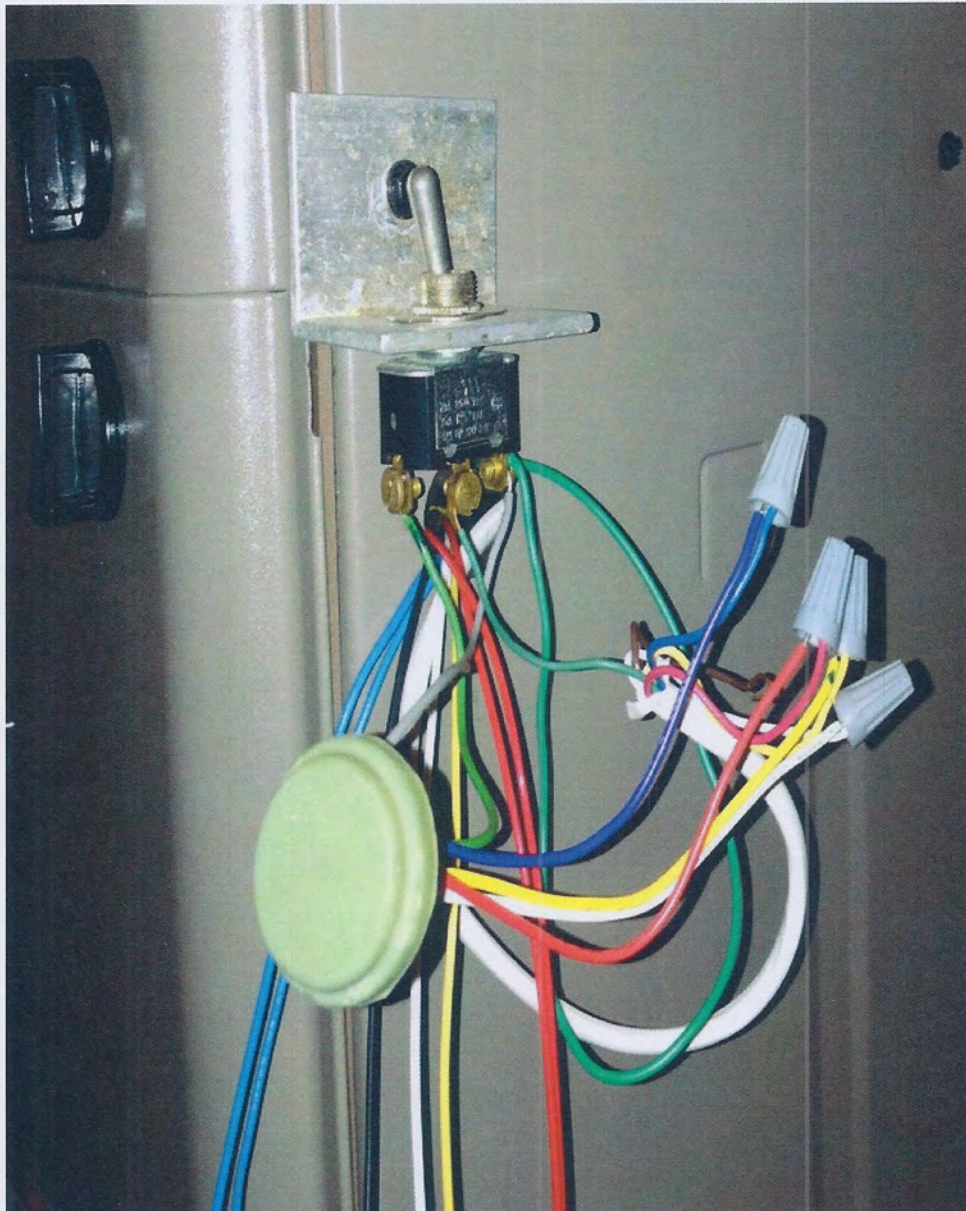


**FINAL REPORT ON
HVAC FAN STOP DELAY HEATING SAVINGS ASSESSMENT
IN RESIDENTIAL APPLICATIONS**



DEVICE A

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EXECUTIVE SUMMARY

Two similar products, the DEVICE A and DEVICE B are microchip relays that can be installed either at the thermostat or preferably in the air handler. DEVICE A claims to save gas by extending blower run time, depending on furnace run time, to capture residual heat remaining in the furnace plenum, after the default blower run time. Tests have confirmed that the DEVICE A can provide additional blower run time of 0.5, 1.0 and 1.5 minutes, although the 2.0 minute extension was not achieved.

The primary effect of this additional heat was to increase the Thermostat-ON Delay Time (the time before the thermostat reclosed to call for another heating cycle). Gas savings of 2.8% were measured in “forced cooling” heating cycle tests, – used to provide a long enough furnace operation time to activate the DEVICE A, and as much as 3.7% in “natural cooling” heating cycles tests.

Tests on “Residual Heat remaining in the furnace” for run times of 6, 7, 8, and 9 minutes (corresponding to increases of blower run times of 0.5, 1.0, 1.5 and 2.0 minutes) provided an upper limit on the heat that could be recovered by the DEVICE A. When compared with the total heat provided by the furnace gas-ON time plus blower default time of 2 minutes, the heat that could be added from the residual heat available ranged from 2.7% to 4.9%. The two-minute default blower run time recovered as much as 78% of the available residual heat without the DEVICE A. However, the additional run time of 2.0 minutes for furnace run times of 8 minutes or longer captures 97% of the residual heat available after the termination of the 2-minute default blower run time.

The savings provided by the DEVICE A do not depend on the thermostat in the system. It “takes over” and extends blower run time only after the thermostat (of any type) opens to shut off gas flow.

Systems with degraded temperature sensors (those that turn off the fan when the supply temperature is still hot enough to provide more heat – estimated to be 35% of installations) could benefit from the installation of DEVICE A. This may be a quick (and possibly less costly) method of improving an improperly operating heating system.

DEVICE B is tested similarly and briefly. Comments are shown on Page 23.

I. INTRODUCTION

In a typical residential heating system the thermostat set point determines when the gas should be shut off. However, due to the retained (residual) heat in the plenum of the furnace, the fan (blower) continues to run to deliver this heat to the living area. The length of time is determined by the system. In some older furnaces a temperature probe in the hot air stream will shut off the blower when the air temperature falls below a value determined by the manufacturer of the furnace, and is not selectable by the user. Another system involves a choice of a fixed time. The installer can select (with a jumper on the circuit board) the delay before terminating fan run time ranging from 1 minute to 2 ½ minutes, but not selectable by the user.

The DEVICE A is a chip with 6 leads that connects to the terminal block or bus bar of the air handler unit or to the room thermostat. By removing one incoming green wire and connecting it to a gray wire from the chip, the fan run time is controlled by this chip, depending on how long the furnace has been in operation. The DEVICE A claims gas savings of between 2 and 6% by this action.

II. TEST SETUP

Figure 1 shows the initial test room used with the Honeywell thermostat, Model CT87N. A 40,000 BTU/h non condensing furnace was used to provide heat, and a 2-ton air conditioner for cooling. [No cooling tests were run; cooling was required only to force the furnace to run long enough to evaluate its ability to extend blower run time at the end of a heating cycle, as further explained later.]

The test room was inside a very large warehouse where temperatures inside the warehouse and surrounding the test room were determined by the weather. This is why tests were run over intervals of similar outside (around the room) ambient temperatures to make true comparisons. Again, the objective was to compare with and without the DEVICE A, when ambient temperatures around the test room were within a few tenths of a degree F. (Note ambient temperatures in Tables 5, 6, 7)

Figure 2 shows the test room that was used with the LUX thermostat, with a 2-part 60,000/40,000 BTU/h non condensing furnace, and a 2-ton air conditioner. This room used only 3 thermocouples to give some indication of room temperatures after it was found that the DEVICE A did not have any significant effect on room temperatures.

Both rooms had thermocouples to measure temperatures at the thermostat location, return air, and supply air. Instrumentation recorded gas and electric consumption, furnace run time, blower run time, and the ability to measure within 0.1 minute the times when the thermostat opened or closed. [This required the purchase, installation, and programming of a PLC (programmable logic controller) after it was found that very short time delays had to be measured to see the effect of the DEVICE A.]

Figure 3 shows a photo of the DEVICE A mounted on the outside of the furnace.

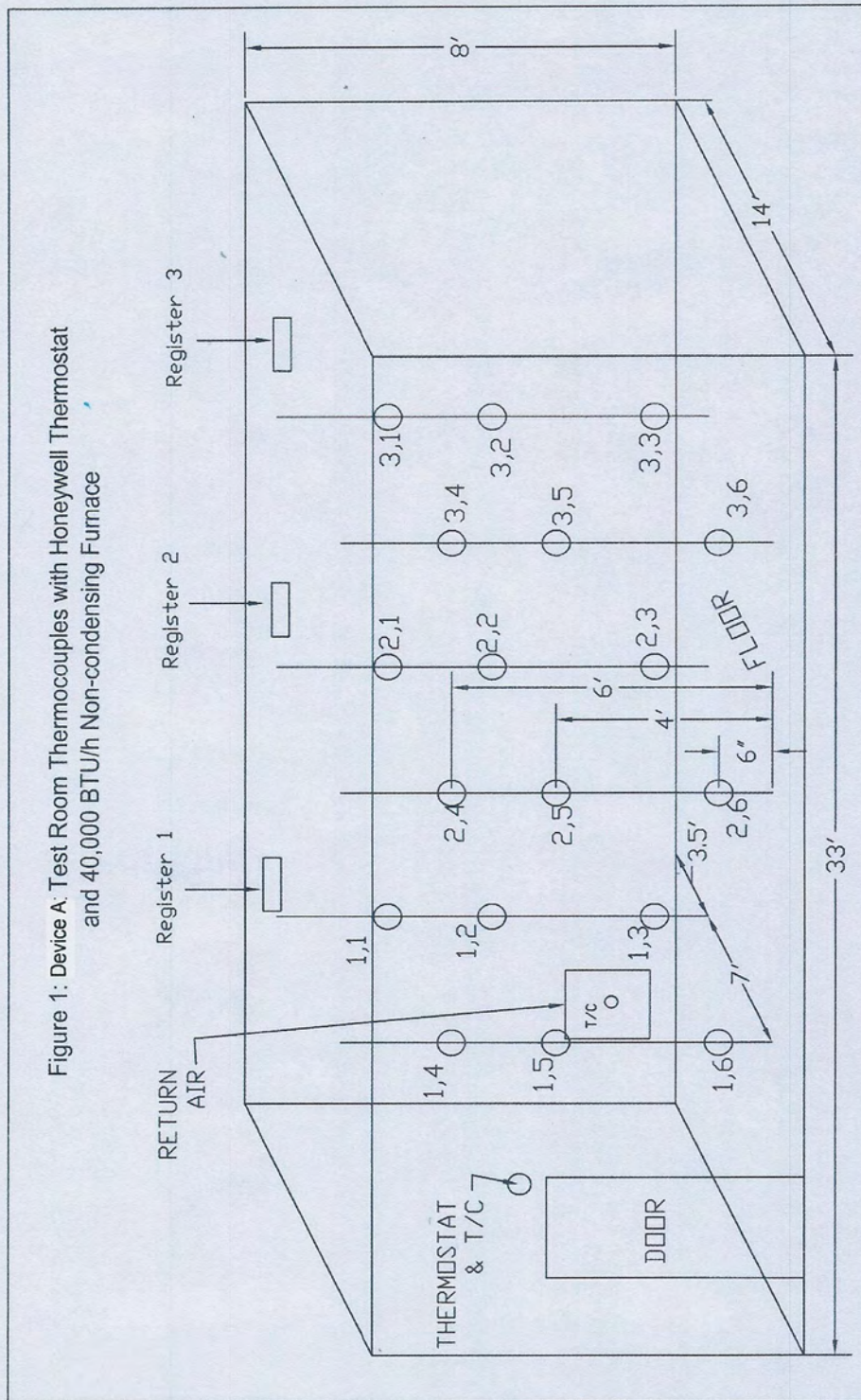


Figure 1: Device A: Test Room Thermocouples with Honeywell Thermostat and 40,000 BTU/h Non-condensing Furnace

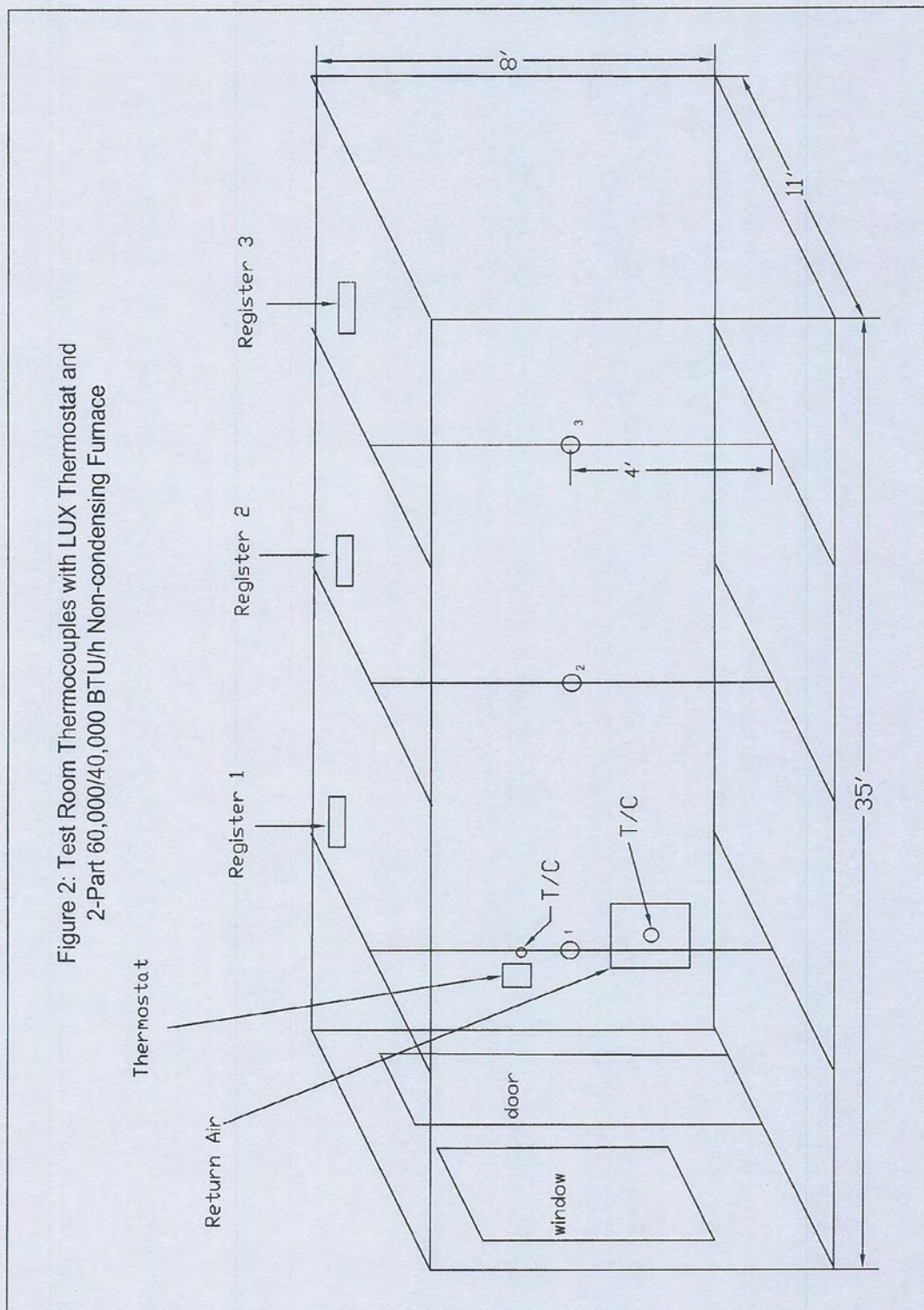


Figure 2: Test Room Thermocouples with LUX Thermostat and 2-Part 60,000/40,000 BTU/h Non-condensing Furnace

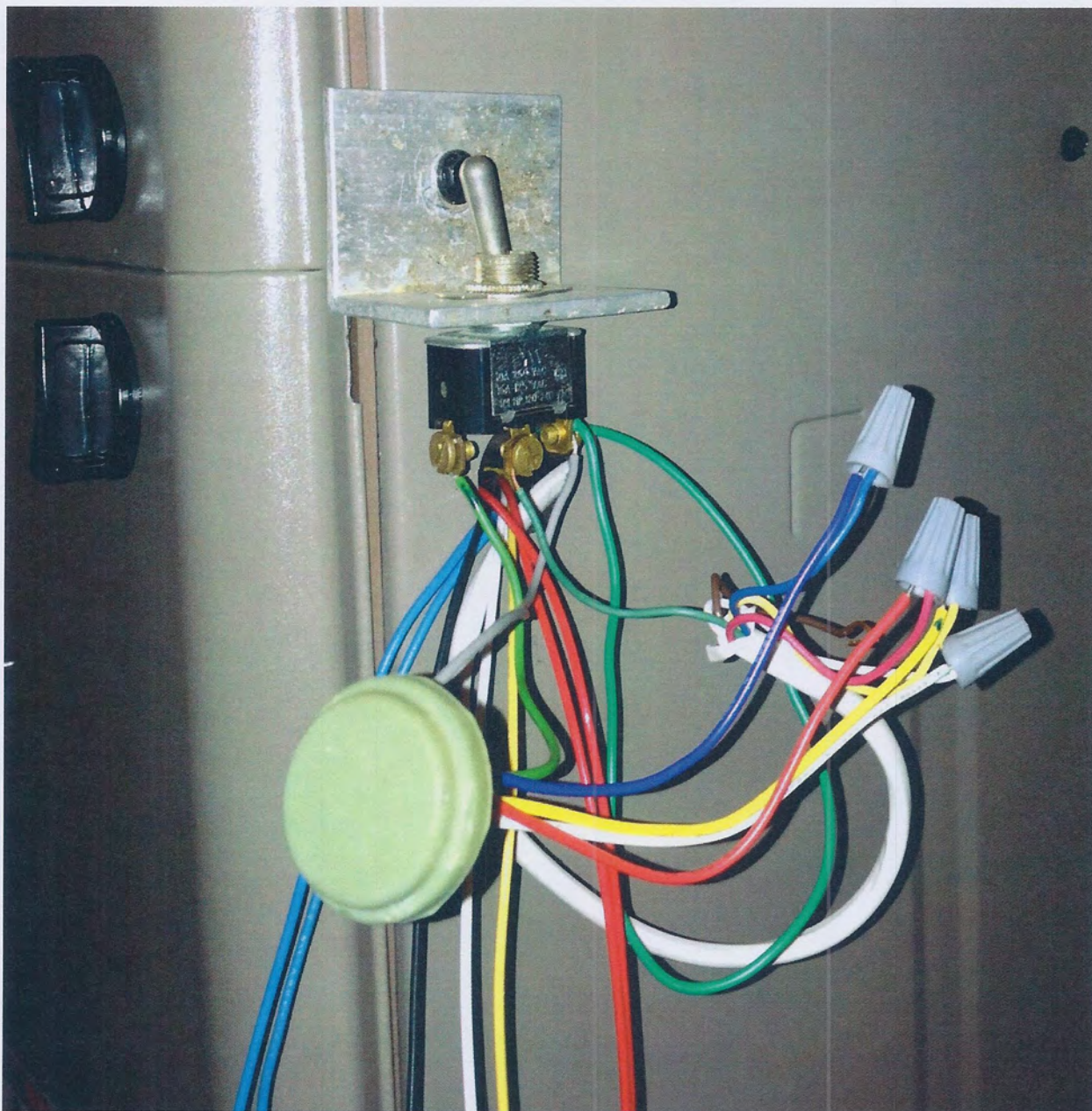


FIG. 3: Photograph of DEVICE A mounted on outside of furnace with a switch to select With or Without the DEVICE A for tests

III. TEST METHOD

When the first DEVICE A was received it came with instructions on how to install (at the thermostat or at the air handler) but it was not known that the extension of fan run time was dependent on the furnace run time. With relatively high ambient temperatures and reasonable thermostat settings, the DEVICE A appeared to have no effect on extension of fan run time beyond the 2-minute default run time provided by the furnace manufacturer. Much time was spent to check the wiring and experiment. Not until a demonstration of the chip at CWS was it revealed that a minimum furnace run time of 5 minutes was required to extend blower run time by 0.5 minute. See Table 1.

As a result of this information it was decided that the testing of the DEVICE A required two components: 1. Confirm the ability of the DEVICE A to extend blower run time for a given furnace operation time, and 2. Determine if the extension of blower run time beyond the 2-minute default run time has the potential to save gas energy.

The first component was straight forward to check, and was carried out as explained in the Test Procedure.

But what is the source of any energy savings even after sufficient furnace run time, and how to measure it?

TABLE 1
CLAIMED EFFECT OF DEVICE A ON HEATING BLOWER TIME

| BURNER ON TIME (MINS.) | BLOWER STAYS ON (MINS.) | |
|---------------------------|-------------------------|------------|
| | TOTAL | ADDITIONAL |
| Less than 4 | 2.0 | 0 |
| Between 4 and 5 | 2.0 | 0 |
| Between 5 and 6 | 2.5 | 0.5 |
| Between 6 and 7 | 3.0 | 1.0 |
| Between 7 and 8 | 3.5 | 1.5 |
| More than 8 | 4.0 | 2.0 |

The source is the stored or residual heat in the furnace plenum after the 2-minute default time. If more of this heat can be recovered and put into the house (instead of being dissipated to a “cold” garage) there should be an increase in the delay before the thermostat again calls for heat to maintain a given set point. This may lead to fewer heating cycles and a reduction in gas consumption. It was decided that tests should be run to measure this Thermostat-ON delay time, as explained in the Test Procedure.

NOTE: This measurement had limited success, in both forced cooling and natural heating cycles, with each thermostat and different furnaces and different rooms. A far better determination of possible savings resulted from “Residual Heat Recovered by DEVICE A Tests” found later in this report.

IV. TEST PROCEDURE

1. Extended Blower Run Time

The general method was to run cooling/heating cycles during the early morning hours, with and without the DEVICE A, hoping to get at least three consecutive cycles when the ambient (outside) temperatures were comparable.

In the first test (June 19, 2013) the room was cooled to 68 °F as determined by a thermocouple located in the return air stream, with a temperature controller shutting off the air conditioner. Following the 1 ½ minute blower run time the furnace was turned on. The instant the thermostat (Honeywell) opened (at a set point of 76 °F on the thermostat dial) the gas shut off, but the blower continued to run. The data logger collected furnace run time, blower run time, and heating Wh, without the DEVICE A.

This was repeated the following day with the DEVICE A in place, for the same ΔT of 8 °F between 68 and 76 °F, allowing a determination of increase in blower run time due to the DEVICE A.

To get additional furnace run times ΔT was varied from 5 to 11 °F, with the most recent tests being run in August with the Honeywell thermostat.

Further tests were run to verify the proper operation of the replaced DEVICE A with the new 2-part furnace (60,000/40,000 BTU/ h input) and the new programmable LUX thermostat, in the new room: $\Delta T = 9$ °F, 69/78 °F, 3 cycles (Aug. 30, 2013).

V. TEST RESULTS

1. Extended Blower Run Time

Tables 2 and 3 show the results of the extended blower run times for the corresponding furnace run times, for both thermostats, furnaces, and rooms. Additional blower run time did range from 0.5 minute with a furnace run time of 5.6 minutes, to 1.0 minute with a furnace run time of 6.7 minutes, and 1.5 minute with a furnace run time of 8.2 minutes, but only 1.5 minute at 24 minutes furnace run time, not the 2.0 minutes expected. (This failure to reach 2.0 minutes may be an indication that the chip had started to fail and had to be replaced in an August test when it failed to extend blower run time at all.)

Note how the increase in blower run time in Table 2 with the DEVICE A is consistent with the slight increase in heating Wh (electrical energy).

It should be noted that these forced cooling tests were run to confirm the ability of the DEVICE A to extend blower run time for a given furnace operation time. No reference has been made to any effect on gas consumption. The gas consumed during the heat-up cycle is independent of the DEVICE A. The DEVICE A “takes over” only after heating is complete.

TABLE 2
COMPARISON OF AVERAGES FOR 3-CYCLE TESTS

THERMOSTAT: HONEYWELL NO. CT87N

W = WITH DEVICE A

W/O = WITHOUT DEVICE A

| ΔT, °F | DATE | | AMBIENT °F | | HEATING Wh | | FURN. RUN TIME, MIN. | | BLOWER RUN TIME MIN. | | |
|--------------|------|------|------------|------|------------|-----|----------------------|------|----------------------|------|-------|
| | W/O | W | W/O | W | W/O | W | W/O | W | W/O | W | INCR. |
| 11□ 67/78 | 6/24 | 6/22 | 71.5 | 71.5 | 225 | 237 | 24.4 | 24.1 | 26.1 | 27.6 | 1.5 |
| 8□ 68/76 | 6/19 | 6/20 | 69.8 | 68.6 | 84 | 94 | 8.6 | 8.2 | 9.6 | 11.1 | 1.5 |
| 6 68/74 | 8/9 | 8/8 | 67.3 | 67.2 | 92 | 99 | 9.1 | 8.4 | 10.8 | 11.9 | 1.1 |
| 5* 68/73 | 8/10 | 8/11 | 69.1 | 69.1 | 68 | 71 | 6.0 | 5.6 | 8.0 | 8.5 | 0.5 |

□ This chip failed to extend blower run time when used in AUG and was replaced.

* Only 2 useable cycles

Furnace run time includes time gas is on before blower starts.

TABLE 3
EXTENDED BLOWER TIME- THERMOSTAT: LUX

| WITH DEVICE A 8/30 69/78 °F | | | | | |
|-----------------------------|---------|--------|-------------------------|------------------------|-----------------------------|
| TIME (AM) | AMB. °F | HTG Wh | FURNACE RUN TIME, MINS, | BLOWER RUN TIME, MINS. | EXTENDED BLOWER TIME, MINS. |
| 4:10 | 76.5 | | | | |
| 4:16 | 76.5 | 53 | 6.0 | 8.8 | 0.8 |
| 5:56 | 76.1 | | | | |
| 6:02 | 76.1 | 56 | 6.7 | 9.7 | 1.0 |
| 7:33 | 76.7 | | | | |
| 7:39 | 77.0 | 55 | 6.3 | 9.3 | 1.0 |

Furnace Run Time includes time gas is ON before blower starts.

Extended Blower Run Time = Blower Run Time – (Furnace Run Time + 2.0 minutes set by mfr.)

Ex: Extended Blower Run Time = 8.8 – (6.0 + 2.0) = 0.8 min.

VI. TEST PROCEDURE

2. Increase in Thermostat- ON Delay Time

a. During forced cooling.

While the forced cooling tests were being run to determine extended blower operation additional data was collected to obtain the delay before the thermostat again closed for the 6/19 and 6/20 periods, along with representative temperatures. This gave some idea of the possible gas savings as shown under Test Results.

b. Heating Cycling Tests with natural cooling.

Nine-hour heating cycling tests were run with the Honeywell thermostat from midnight to 9 AM at heating set points of 74, 76, 78 °F, relying on natural cooling only. Due to the high ambient temperatures in mid-August furnace run times were too short to activate the DEVICE A, in spite of running with various door openings to simulate a leaky house.

c. In an attempt to increase furnace run time a 2-stage furnace was installed, in a new room, with a new LUX thermostat. It had the ability to be programmed for a swing of 6 °F from a heating set point of 78 °F. This ensured sufficiently long heating cycles to activate the DEVICE A at lower ambient temperatures in late September. This was our last attempt at cycling tests with natural cooling.

VII. TEST RESULTS

2. Increase in Thermostat-ON Delay Time

a. During Forced Cooling

Tables 4 and 5 show the Blower Run Time and Thermostat-ON Delay Time without and with the DEVICE A in operation, along with some representative temperatures. Blower run time has been extended by 1.5 minute from an average of 9.6 minutes to 11.1 minutes. And thermostat-ON delay time has been increased by 0.4 minute from 5.6 to 6.0 minutes. The increase in delay time per heating cycle is:

$$\begin{aligned} & \frac{\text{Thermostat Extension Time}}{\text{Heating Cycle Time}} \\ &= \frac{\text{Delay Increase Time}}{\text{Furnace On} + \text{Furnace Off Time}} \\ &= \frac{0.4 \text{ min}}{8.2 + 6.0 \text{ min.}} \times 100\% = 2.8\% \text{ (See Table 2 for times)} \end{aligned}$$

This implies that over a 24 hr heating period there would be a reduction in the number of heating cycles from 106 to 103 with gas savings around 2.8% for this continued operation, with essentially no change in room temperatures at the 4 ft level above the floor.

b. Natural Cooling (No forced cooling). Honeywell Thermostat

As indicated earlier, the 9-hour heating cycling tests with the Honeywell thermostat resulted in furnace run times too short to activate the DEVICE A, on account of the high ambient temperatures. However, it was during these tests that variations in the switching point of the mechanical contacts of the Honeywell (inexpensive) thermostat were found at any given set point, making it difficult to make comparisons. For example, the thermostat turned off at various values ranging from 80.8 to 82.8 °F with the DEVICE A, and at temperatures from 80.7 to 82.0 °F without the DEVICE A. (The programmable LUX thermostat used later did allow natural cooling tests as shown in Tables 6 and 7)

TABLE 4
HEATING CYCLING TEST WITH FORCED COOLING
HONEYWELL THERMOSTAT

| WITHOUT THE DEVICE A 6/19 68/76 °F $\Delta T = 8$ °F | | | | | | |
|--|---------|---------|---------------------|---------------------|--------------------------------|---|
| TIME (AM) | AMB. °F | HTG. Wh | T _{ret} °F | T _{4ft} °F | BLOWER RUN TIME, MIN. | THERM.- ON DELAY TIME, MIN. |
| 3:41 | 69.6 | | 70.9 | 70.2 | | |
| 3:49 | 69.8 | 84 | 84.6 | 87.4 | 9.6 | 5.6 |
| 4:08 | 69.7 | | 69.7 | 69.4 | | |
| 4:17 | 69.8 | 86 | 85.5 | 87.7 | 10.0 | 5.7 |
| 4:35 | 69.7 | | 70.8 | 70.1 | | |
| 4:43 | 69.6 | 81 | 84.4 | 87.4 | 9.3 | 5.5 |
| AVGE | 69.8 * | 84 | 78.9 * | 79.7* | 9.6 | 5.6 |

*During Heating Cycle

TABLE 5
HEATING CYCLING TESTS WITH FORCED COOLING

| WITH DEVICE A 6/20 68/76 °F | | | | | | |
|-----------------------------|---------|---------|---------------------|---------------------|--------------------------------|---|
| TIME (AM) | AMB. °F | HTG. Wh | T _{ret} °F | T _{4ft} °F | BLOWER RUN TIME, MIN. | THERM.- ON DELAY TIME, MIN. |
| 4:04 | 69.0 | | 71.3 | 70.6 | | |
| 4:12 | 68.9 | 93 | 84.4 | 87.1 | 11.0 | 6.0 |
| 4:29 | 68.8 | | 70.1 | 69.4 | | |
| 4:38 | 68.7 | 94 | 84.8 | 86.7 | 11.2 | 6.0 |
| 4:55 | 68.2 | | 70.4 | 69.7 | | |
| 5:03 | 68.2 | 95 | 84.3 | 87.4 | 11.0 | 6.0 |
| AVGE | 68.6 * | 94 | 78.9 * | 79.8 * | 11.1 | 6.0 |

AVERAGE INCREASE IN BLOWER RUN TIME: 1.5 mins.

AVERAGE INCREASE IN THERMOSTAT-ON DELAY TIME: 0.4 min.

c. Natural Cooling. LUX Thermostat, 2-part furnace

Heating set point 78 °F, thermostat swing 6 °F

During a 24-hour period on 9/26 two sets of three consecutive cycles were identified, with and without the DEVICE A, where the ambient temperature was approximately the same (within 0.4 °F). Results are shown in Tables 6 and 7.

TABLE 6
HEATING CYCLING TESTS WITH NATURAL COOLING
LUX THERMOSTAT

| WITHOUT DEVICE A, 9/26 | | | | | | | |
|------------------------|---------|---------------------|---------|---------------------|---------------------|-------------------------------|----------------------------------|
| TIME AM | AMB. °F | GAS FT ³ | HTG. Wh | T _{ret} °F | T _{4ft} °F | BLOWER RUN TIME MIN. | THERM.- OPEN TIME, MIN. |
| 5:14 | 67.7 | | | 72.9 | 76.1 | | |
| 5:18 | 67.5 | 2.8 | 36 | 79.2 | 84.2 | 5.70 | 21.5 |
| 5:40 | 67.6 | | | 72.3 | 76.1 | | |
| 5:44 | 67.6 | 2.7 | 36 | 83.8 | 84.1 | 5.70 | 21.5 |
| 6:06 | 67.2 | | | 73.1 | 76.2 | | |
| 6:10 | 67.3 | 2.7 | 36 | 77.7 | 85.6 | 5.70 | 21.0 |
| AVGE | 67.4 | 2.7 | 36 | 75.1 | 79.2 | 5.70 | 21.3 |

(THERMOSTAT ON TIME 4.5 MIN.)

TABLE 7

| WITH DEVICE A, 9/26 | | | | | | | |
|---------------------|---------|---------------------|---------|---------------------|---------------------|-------------------------------|----------------------------------|
| TIME PM | AMB. °F | GAS FT ³ | HTG. Wh | T _{ret} °F | T _{4ft} °F | BLOWER RUN TIME MIN. | THERM.- OPEN TIME, MIN. |
| 22:48 | 67.7 | | | 74.9 | 76.1 | | |
| 22:53 | 67.4 | 3.0 | 42 | 77.5 | 87.0 | 6.75 | 23.0 |
| 23:16 | 67.1 | | | 72.4 | 76.1 | | |
| 23:21 | 67.1 | 3.0 | 42 | 78.4 | 85.3 | 6.75 | 22.0 |
| 23:43 | 67.1 | | | 73.2 | 76.2 | | |
| 23:48 | 66.6 | 3.0 | 42 | 79.5 | 85.2 | 6.75 | 22.0 |
| AVGE | 67.0 | 3.0 | 42 | 75.3 | 79.4 | 6.75 | 22.3 |

(THERMOSTAT ON TIME 5.0 MIN.)

AVERAGE INCREASE IN BLOWER RUN TIME: 0.5 min.

AVERAGE INCREASE IN THERMOSTAT-ON DELAY TIME: 1.0 min.

The increase in thermostat-ON delay time amounted to 1 minute on average from 21.3 minutes without the DEVICE A to 22.3 minutes with the DEVICE A.

The increase in delay time per heating cycle is:

Thermostat Extension Time

Heating Cycle Time

$$= \frac{\text{Delay Increase Time}}{\text{Furnace On} + \text{Furnace Off Time}}$$

$$= \frac{1.0 \text{ minute}}{5.0 + 22.3 \text{ minutes}} \times 100\% = 3.7\%$$

If the number of heating cycles and resulting gas consumption over a 24 hour period are compared, there appears to be no overall gas savings. However, this is not a fair comparison when one takes into account the comfort level in each case. With the DEVICE A, the temperature at the 4ft level in the room had an average of 79.4 °F compared with 79.2 °F without the DEVICE A. And the average return air temperature was also 0.2 °F higher (75.3 vs. 75.1 °F) with the DEVICE A.

That is, recovery of more residual heat (an increase in blower run time of 0.5 * minute in this case) pushes more heat into the room after the thermostat has shut off. This must increase heat content in the room which shows up as a higher comfort level for at least part of the time following the heating cycle. In two of the heating cycles with the DEVICE A temperatures at the end of the heating cycle were 1.2 to 2.8 °F higher at the 4ft level in the room compared without the DEVICE A.

*Due to the difference in furnace run times – 4.5 minutes without, and 5.0 minutes with the DEVICE A, – blower run time was extended by 0.5 minute – not the 1.0 minute that the Tables may suggest. This is consistent with a furnace run time between 5 and 6 minutes.

VIII. FURNACE RESIDUAL HEAT DETERMINATION

To establish an upper limit on how much gas energy could be saved, it was decided to determine an answer to the following question: How much of the residual heat remaining in a furnace after the 2-minute default fan delay, is recoverable by the DEVICE A extending this delay?

Detailed measurements were made every 5 seconds to determine:

1. BTU heat input during a heating cycle
2. BTU heat recovered during the default 2-minute delay
3. BTU potential heat recovery after the 2-minute delay

Heating cycles of 6, 7, 8, and 9-minutes in length were used to allow the DEVICE A (had it been connected) to extend fan run time from a minimum of 0.5 minute to a maximum of 2 minutes. Measurement of potential heat recovery (after the 2-minute default) was run for 2 minutes and 15 seconds at which time $T_{\text{supply}} - T_{\text{return}} = 0$, showing no more residual heat was available.

Results are shown in Table 8 for each of the furnace run times.

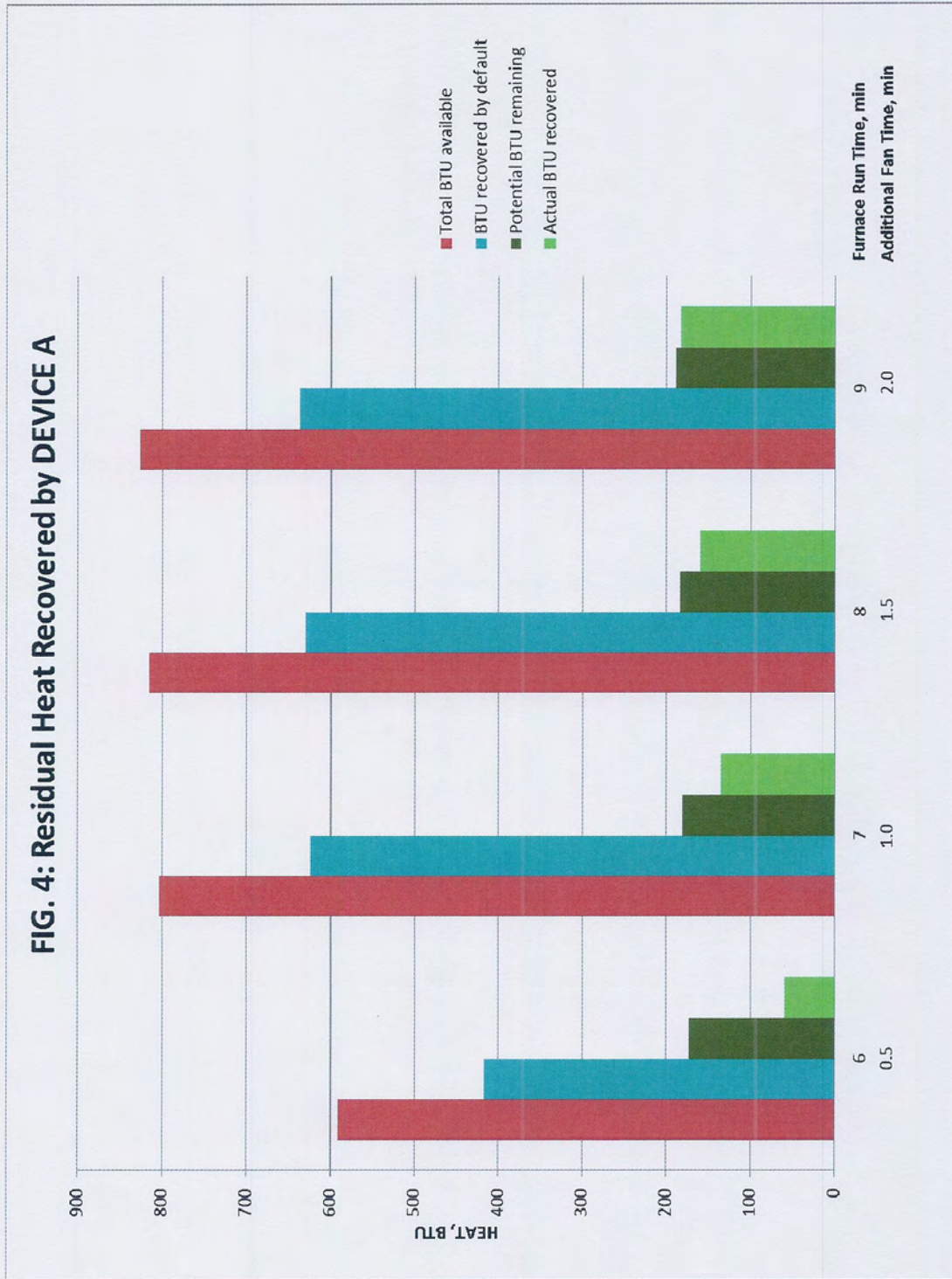
For the 6-minute heating cycle the heat input to the room was 1792 BTU, followed by 417 BTU during the 2-minute cool down, for a total of 2209 BTU, leaving 173 BTU of potential heat to be recovered. For this length of furnace run time the DEVICE A would extend the blower run time for 0.5 minute, recovering 59 BTU of heat, or an additional 2.7% compared with the total of 2209 BTU. The default cool down time of 2 minutes recovered 71% of the residual heat available. Corresponding figures for the 7, 8, and 9 minute run times indicate a maximum of around 5% can be added by the DEVICE A, neglecting any losses.

This data is also presented in a bar graph format in Fig. 4. This shows how the maximum 2 minute extension of blower run time for an 8-minute or longer furnace run time is well timed, since it does recover 97% of the residual heat available after the termination of the 2 minute default time.

Details of these residual heat tests, over 5-second intervals, are shown in Appendix I in color-coded form for ease of understanding.

TABLE 8
RESIDUAL HEAT DETERMINATION

| | FURNACE RUN TIME | | | |
|--|-------------------|-------------------|-------------------|-------------------|
| | 6 MINUTE (5.9) | 7 MINUTE (6.9) | 8 MINUTE (7.9) | 9 MINUTE (8.9) |
| HEAT INPUT DURING HTG. CYCLE, BTU | 1792 | 2111 | 2767 | 3487 |
| DEFAULT FAN DELAY HEAT RECOVERED, BTU | 417 | 623 | 630 | 637 |
| TOTAL DEFAULT HEAT, BTU | 2209 | 2734 | 3397 | 4124 |
| POTENTIAL HEAT RECOVERY BTU | 173 | 180 | 184 | 188 |
| ACTUAL HEAT RECOVERED BY DEVICE A, BTU | 59 | 134 | 160 | 183 |
| DUE TO ADDITIONAL FAN RUN TIME, MINS | 0.5 | 1.0 | 1.5 | 2.0 |
| % OF TOTAL HEAT ADDED BY DEVICE A | 2.7 | 4.9 | 4.7 | 4.4 |
| % OF RESIDUAL HEAT RECOVERED BY 2 MIN. DEFAULT | 71 | 78 | 77 | 77 |
| ADDITIONAL Wh (BTU) | 3.1 (10.6 | 6.2 (21.2) | 9.3 (31.8) | 12.4 (42.4) |



IX. ANALYSIS OF DEVICE B TESTS (not done by BR Labs)

It is claimed that the installation of a DEVICE B on a furnace can provide energy savings by improving heating efficiency by 7 to 10% (compared with a standard temperature delay) and 6 to 8% (compared with a 90-second delay of default fan run time). However, in systems with degraded temperature sensors (those that turn off the fan when the supply plenum temperature is still at 120 to 210 °F, – estimated at 35% of installations) savings can be between 7 to 23%, and depend on climate zone.

There are two means by which the DEVICE B claims to save heating energy,

1. Four minutes after the furnace is turned ON, fan speed is increased from low (normal) to high. It is claimed that this increases furnace efficiency. Note: This increase in blower speed is not possible on some newer models without switching a fan control jumper – not something that the DEVICE B can do on its own.
2. Fan run time is extended (at high speed) after the furnace turns off for 2 to 4 minutes depending on furnace run time, (as in the case of the DEVICE A).

Two cases were examined.

Case 1 considered a furnace with a temperature sensor to extend fan run time (for 4 minutes at hi speed) with the DEVICE B, resulting in gas savings of 5.7% close to the 5.9% claimed. However, a savings of 9.9% was also claimed supposedly from “a consideration of run time and off cycle time,” with an “average” of 7.9%.

Case 2 compared a furnace with a fixed time of 1.5 minute to extend fan run time, (without the DEVICE B) with the action of the DEVICE B to increase fan run time to 4 minutes (at high speed). When the number of heating cycles were taken into account the gas savings were 3.5%, not the 5.4% claimed.

The “savings” were based on an increase in “heating efficiency,” equating this increase to gas savings.

A detailed analysis of these “savings” is given in Appendix II.

X. RESIDUAL HEAT RECOVERY TESTS ON DEVICE B

The DEVICE B is a microchip that claims to provide gas savings in a heating system by extending blower run time. Like the DEVICE A, it can be installed at the thermostat or in the air handler. After 4 minutes of furnace operation it claims it will increase fan speed to high and continue at high speed for 2 minutes after the normal 1 ½ or 2 minutes default time provided by the manufacturer of the furnace.

Two samples of the DEVICE B were tested on the same furnace as used in tests on the DEVICE A, with the chip located in the air handler. The furnace was allowed to run for periods of 6, 7, 8 and 9 minutes and a determination was made of:

- i. The heat input during the heating cycle.
- ii. The heat recovered during the 2-minute default blower time.
- iii. Any heat recovered by the DEVICE B due to any extended blower run time.

The summary below and the detailed data sheets in Appendix III show that no extension of blower run time occurred at all for furnace run times of 6, 7 and 8 minutes, leaving residual heat in the furnace plenum, unrecovered. Not until a furnace run time of 9 minutes did the DEVICE B extend blower run time by 2 minutes. It recovered 159 Btu which is 4% compared with the total heat input of 3951 Btu. That is, of the total residual heat available at the end of the heating cycle, the 2-minute default blower run time recovered 80%, and the DEVICE B recovered most of the rest, but it required a minimum furnace run time of 9 minutes to recover any heat.

A repeat of the tests on the same sample showed identical results.

When the 6, 7, 8 and 9 minute furnace run times were used on the second sample no extension of blower run time was obtained. This is recorded in the data sheets as Sample 2, Test 1. However, a repeat of tests (Sample 2, Test 2) did show a 2 minute extension of blower run time but only after a 9 minute furnace run time, recovering 136 Btu. This was confirmed by a test of 9 minutes only, (Sample 2, Test 3) where 151 Btu was recovered in the two minute extension of blower operation.

Summary of Tests

| Sample | Test No. | Btu recovered for furnace run time, minutes | | | |
|--------|----------|---|---|---|-----|
| | | 6 | 7 | 8 | 9 |
| 1 | 1 | 0 | 0 | 0 | 159 |
| 1 | 2 | 0 | 0 | 0 | 159 |
| 2 | 1 | 0 | 0 | 0 | 0 |
| 2 | 2 | 0 | 0 | 0 | 136 |
| 2 | 3 | - | - | - | 151 |

It should be pointed out that the DEVICE B did not, and could not, increase the blower speed at any furnace run time. DEVICE B does acknowledge that increasing blower speed is not possible in modern furnaces but it is unclear how it could do this even in older furnaces.

These tests have shown that, unlike the DEVICE A, the DEVICE B does not increase the length of blower operation after default time in proportion to the furnace run time, leaving residual heat unrecovered. The DEVICE A is far more effective in recovering residual heat, especially for lower furnace run times.

XI. CONCLUSIONS

- The DEVICE A is a microchip that can be installed either at the thermostat or preferably in the air handler. It claims to extend blower run time by as much as 2 minutes, depending on furnace run time, to capture residual heat in the plenum of the furnace.
- The additional heat recovered by the extended blower run times did increase the Thermostat-ON delay time (the time before the thermostat reclosed to call for heat).
- Gas savings of 2.8% were measured in forced cooling heating cycle tests, and as much as 3.7% in natural cooling heating cycle tests.
- Tests on Residual Heat remaining in the furnace for furnace run times of 6, 7, 8, and 9 minutes provided an upper limit on the heat that could be recovered by the DEVICE A, ranging from 2.7 to 4.9% compared with total heat.
- Systems with degraded temperature sensors (those that turn off the fan when the supply temperature is still hot enough to provide more heat – estimated to be 35% of installations) could benefit from the installation of a DEVICE A. This may be a quick (and possibly less costly) method of improving an improperly operating heating system.

APPENDIX I
DETAILS OF RESIDUAL HEAT DETERMINATION

Furnace Residual Heat Determination (6 Minute Heating On Cycle)

| | Tsupply | Treturn | Temp. rise | Room | Ambient | CFM | approx. specific heat of air | approx. specific volume (cu. Ft/lbm) | Time | sec | Btu's Supplied |
|--------------------|---------|---------|------------|------|---------|------|------------------------------|--------------------------------------|------|-----|----------------|
| Furnace Heating On | 74.3 | 73.8 | 0.5 | 72.8 | 80.1 | 1209 | 0.24 | 14 | 1305 | 0 | 1 |
| | 75.5 | 73.4 | 2.1 | 72.8 | 80.0 | 1209 | 0.24 | 14 | 1305 | 5 | 4 |
| | 76.6 | 73.5 | 3.1 | 72.9 | 79.9 | 1209 | 0.24 | 14 | 1305 | 10 | 5 |
| | 77.6 | 73.6 | 4.0 | 72.9 | 79.7 | 1209 | 0.24 | 14 | 1305 | 15 | 7 |
| | 78.7 | 70.4 | 8.3 | 72.9 | 79.7 | 1209 | 0.24 | 14 | 1305 | 20 | 14 |
| | 79.9 | 71.9 | 8.0 | 72.9 | 79.7 | 1209 | 0.24 | 14 | 1305 | 25 | 14 |
| | 80.8 | 72.6 | 8.2 | 73.0 | 79.7 | 1209 | 0.24 | 14 | 1305 | 30 | 14 |
| | 81.5 | 72.9 | 8.6 | 73.0 | 79.9 | 1209 | 0.24 | 14 | 1305 | 35 | 15 |
| | 82.1 | 72.7 | 9.4 | 73.1 | 79.7 | 1209 | 0.24 | 14 | 1305 | 40 | 16 |
| | 82.2 | 72.7 | 9.5 | 73.3 | 79.6 | 1209 | 0.24 | 14 | 1305 | 45 | 16 |
| | 82.7 | 71.5 | 11.2 | 73.4 | 79.5 | 1209 | 0.24 | 14 | 1305 | 50 | 19 |
| | 83.6 | 72.1 | 11.5 | 73.5 | 79.5 | 1209 | 0.24 | 14 | 1305 | 55 | 20 |
| | 84.4 | 73.2 | 11.2 | 73.5 | 79.7 | 1209 | 0.24 | 14 | 1306 | 0 | 19 |
| | 84.9 | 73.3 | 11.6 | 73.5 | 79.9 | 1209 | 0.24 | 14 | 1306 | 5 | 20 |
| | 85.4 | 73.8 | 11.6 | 73.7 | 80.0 | 1209 | 0.24 | 14 | 1306 | 10 | 20 |
| | 85.9 | 74.3 | 11.6 | 73.9 | 79.9 | 1209 | 0.24 | 14 | 1306 | 15 | 20 |
| | 86.4 | 74.1 | 12.3 | 73.9 | 79.8 | 1209 | 0.24 | 14 | 1306 | 20 | 21 |
| | 86.7 | 74.6 | 12.1 | 74.0 | 79.7 | 1209 | 0.24 | 14 | 1306 | 25 | 21 |
| | 87.2 | 74.5 | 12.7 | 74.1 | 79.7 | 1209 | 0.24 | 14 | 1306 | 30 | 22 |
| | 87.8 | 74.2 | 13.6 | 74.2 | 79.6 | 1209 | 0.24 | 14 | 1306 | 35 | 23 |
| | 88.1 | 74.0 | 14.1 | 74.3 | 79.7 | 1209 | 0.24 | 14 | 1306 | 40 | 24 |
| | 88.4 | 74.1 | 14.3 | 74.4 | 79.7 | 1209 | 0.24 | 14 | 1306 | 45 | 25 |
| | 89.1 | 77.2 | 11.9 | 74.5 | 79.8 | 1209 | 0.24 | 14 | 1306 | 50 | 21 |
| | 89.5 | 75.4 | 14.1 | 74.7 | 79.7 | 1209 | 0.24 | 14 | 1306 | 55 | 24 |
| | 89.5 | 75.2 | 14.3 | 74.8 | 79.7 | 1209 | 0.24 | 14 | 1307 | 0 | 25 |
| | 89.9 | 76.2 | 13.7 | 74.9 | 79.6 | 1209 | 0.24 | 14 | 1307 | 5 | 24 |
| | 90.3 | 76.5 | 13.8 | 75.1 | 79.7 | 1209 | 0.24 | 14 | 1307 | 10 | 24 |
| | 90.9 | 76.2 | 14.7 | 75.2 | 79.7 | 1209 | 0.24 | 14 | 1307 | 15 | 25 |
| | 91.0 | 76.4 | 14.6 | 75.4 | 79.8 | 1209 | 0.24 | 14 | 1307 | 20 | 25 |
| | 91.4 | 77.1 | 14.3 | 75.6 | 79.8 | 1209 | 0.24 | 14 | 1307 | 25 | 25 |
| | 92.0 | 76.9 | 15.1 | 75.6 | 79.8 | 1209 | 0.24 | 14 | 1307 | 30 | 26 |
| | 92.3 | 76.8 | 15.5 | 75.7 | 79.8 | 1209 | 0.24 | 14 | 1307 | 35 | 27 |
| | 92.5 | 76.6 | 15.9 | 76.0 | 79.9 | 1209 | 0.24 | 14 | 1307 | 40 | 27 |
| | 93.1 | 76.7 | 16.4 | 76.2 | 79.9 | 1209 | 0.24 | 14 | 1307 | 45 | 28 |
| | 93.6 | 76.8 | 16.8 | 76.2 | 80.0 | 1209 | 0.24 | 14 | 1307 | 50 | 29 |
| | 93.5 | 77.0 | 16.5 | 76.0 | 80.0 | 1209 | 0.24 | 14 | 1307 | 55 | 28 |
| | 93.9 | 77.2 | 16.7 | 76.0 | 80.1 | 1209 | 0.24 | 14 | 1308 | 0 | 29 |
| | 94.0 | 77.1 | 16.9 | 76.1 | 80.1 | 1209 | 0.24 | 14 | 1308 | 5 | 29 |
| | 94.2 | 78.2 | 16.0 | 76.2 | 80.2 | 1209 | 0.24 | 14 | 1308 | 10 | 28 |
| | 94.3 | 79.1 | 15.2 | 76.3 | 80.2 | 1209 | 0.24 | 14 | 1308 | 15 | 26 |
| | 94.8 | 79.7 | 15.1 | 76.5 | 80.2 | 1209 | 0.24 | 14 | 1308 | 20 | 26 |
| | 95.2 | 79.0 | 16.2 | 76.6 | 80.1 | 1209 | 0.24 | 14 | 1308 | 25 | 28 |
| | 95.5 | 78.4 | 17.1 | 76.6 | 80.2 | 1209 | 0.24 | 14 | 1308 | 30 | 30 |
| | 95.8 | 79.1 | 16.7 | 77.0 | 80.2 | 1209 | 0.24 | 14 | 1308 | 35 | 29 |
| | 96.1 | 79.0 | 17.1 | 77.3 | 80.4 | 1209 | 0.24 | 14 | 1308 | 40 | 30 |
| | 96.1 | 79.0 | 17.1 | 77.4 | 80.6 | 1209 | 0.24 | 14 | 1308 | 45 | 30 |
| | 96.5 | 79.4 | 17.1 | 77.5 | 80.5 | 1209 | 0.24 | 14 | 1308 | 50 | 30 |
| | 96.6 | 80.6 | 16.0 | 77.6 | 80.4 | 1209 | 0.24 | 14 | 1308 | 55 | 28 |
| | 96.7 | 81.0 | 15.7 | 77.9 | 80.2 | 1209 | 0.24 | 14 | 1309 | 0 | 27 |
| | 96.8 | 81.1 | 15.7 | 78.2 | 80.2 | 1209 | 0.24 | 14 | 1309 | 5 | 27 |
| | 97.1 | 80.8 | 16.3 | 78.1 | 80.2 | 1209 | 0.24 | 14 | 1309 | 10 | 28 |
| | 97.2 | 80.7 | 16.5 | 78.2 | 80.0 | 1209 | 0.24 | 14 | 1309 | 15 | 28 |
| | 97.7 | 81.0 | 16.7 | 78.5 | 79.9 | 1209 | 0.24 | 14 | 1309 | 20 | 29 |
| | 97.8 | 81.1 | 16.7 | 78.6 | 79.9 | 1209 | 0.24 | 14 | 1309 | 25 | 29 |
| | 97.7 | 81.4 | 16.3 | 78.8 | 79.9 | 1209 | 0.24 | 14 | 1309 | 30 | 28 |
| | 98.2 | 81.6 | 16.6 | 78.8 | 79.9 | 1209 | 0.24 | 14 | 1309 | 35 | 29 |
| | 98.3 | 82.6 | 15.7 | 79.0 | 79.9 | 1209 | 0.24 | 14 | 1309 | 40 | 27 |
| | 98.5 | 81.2 | 17.3 | 79.1 | 79.9 | 1209 | 0.24 | 14 | 1309 | 45 | 30 |
| | 99.0 | 81.7 | 17.3 | 79.2 | 79.8 | 1209 | 0.24 | 14 | 1309 | 50 | 30 |
| | 99.1 | 85.5 | 13.6 | 78.9 | 79.9 | 1209 | 0.24 | 14 | 1309 | 55 | 23 |
| | 99.5 | 83.8 | 15.7 | 79.1 | 79.8 | 1209 | 0.24 | 14 | 1310 | 0 | 27 |
| | 99.6 | 83.3 | 16.3 | 79.2 | 79.7 | 1209 | 0.24 | 14 | 1310 | 5 | 28 |
| | 99.8 | 81.4 | 18.4 | 79.2 | 79.6 | 1209 | 0.24 | 14 | 1310 | 10 | 32 |
| | 99.9 | 82.0 | 17.9 | 79.3 | 79.7 | 1209 | 0.24 | 14 | 1310 | 15 | 31 |
| | 100.1 | 82.0 | 18.1 | 79.6 | 79.8 | 1209 | 0.24 | 14 | 1310 | 20 | 31 |
| | 100.1 | 82.1 | 18.0 | 79.7 | 80.2 | 1209 | 0.24 | 14 | 1310 | 25 | 31 |
| | 100.2 | 82.2 | 18.0 | 79.5 | 80.3 | 1209 | 0.24 | 14 | 1310 | 30 | 31 |
| | 100.1 | 82.2 | 17.9 | 79.5 | 80.2 | 1209 | 0.24 | 14 | 1310 | 35 | 31 |
| | 100.3 | 83.0 | 17.3 | 79.5 | 80.1 | 1209 | 0.24 | 14 | 1310 | 40 | 30 |
| | 100.6 | 82.6 | 18.0 | 80.1 | 80.0 | 1209 | 0.24 | 14 | 1310 | 45 | 31 |
| | 100.6 | 82.9 | 17.7 | 80.1 | 80.0 | 1209 | 0.24 | 14 | 1310 | 50 | 31 |
| | 100.8 | 83.4 | 17.4 | 79.9 | 80.0 | 1209 | 0.24 | 14 | 1310 | 55 | 30 |
| | 100.9 | 83.0 | 17.9 | 79.8 | 80.0 | 1209 | 0.24 | 14 | 1311 | 0 | 31 |

Heat Input
During Heating
cycle = 1792 btu's

Furnace Residual Heat Determination (6 Minute Heating On Cycle)

| | Tsupply | Treturn | Temp. rise | Room | Ambient | CFM | approx. specific heat of air | approx. specific volume (cu. Ft/lbm) | Time | sec | Btu's Supplied | |
|--|---------|---------|------------|------|---------|------|------------------------------|--------------------------------------|------|-----|----------------|--|
| Default Blower Off Delay | 99.9 | 82.7 | 17.2 | 79.9 | 80.3 | 1209 | 0.24 | 14 | 1311 | 5 | 30 | Default fan delay heat recovered = 417 btu's |
| | 98.5 | 82.8 | 15.7 | 80.2 | 80.2 | 1209 | 0.24 | 14 | 1311 | 10 | 27 | |
| | 98.0 | 83.7 | 14.3 | 80.4 | 80.1 | 1209 | 0.24 | 14 | 1311 | 15 | 25 | |
| | 97.5 | 82.1 | 15.4 | 80.4 | 80.1 | 1209 | 0.24 | 14 | 1311 | 20 | 27 | |
| | 96.1 | 85.0 | 11.1 | 80.5 | 80.2 | 1209 | 0.24 | 14 | 1311 | 25 | 19 | |
| | 95.5 | 84.9 | 10.6 | 80.8 | 80.1 | 1209 | 0.24 | 14 | 1311 | 30 | 18 | |
| | 94.8 | 83.6 | 11.2 | 80.8 | 80.1 | 1209 | 0.24 | 14 | 1311 | 35 | 19 | |
| | 94.6 | 82.5 | 12.1 | 80.7 | 80.0 | 1209 | 0.24 | 14 | 1311 | 40 | 21 | |
| | 94.3 | 84.8 | 9.5 | 80.6 | 79.9 | 1209 | 0.24 | 14 | 1311 | 45 | 16 | |
| | 94.5 | 85.3 | 9.2 | 80.7 | 79.9 | 1209 | 0.24 | 14 | 1311 | 50 | 16 | |
| | 94.3 | 84.3 | 10.0 | 80.6 | 79.8 | 1209 | 0.24 | 14 | 1311 | 55 | 17 | |
| | 94.0 | 85.8 | 8.2 | 80.8 | 79.9 | 1209 | 0.24 | 14 | 1312 | 0 | 14 | |
| | 93.6 | 83.7 | 9.9 | 80.7 | 79.9 | 1209 | 0.24 | 14 | 1312 | 5 | 17 | |
| | 93.3 | 83.4 | 9.9 | 80.8 | 80.1 | 1209 | 0.24 | 14 | 1312 | 10 | 17 | |
| | 92.7 | 83.6 | 9.1 | 80.6 | 80.0 | 1209 | 0.24 | 14 | 1312 | 15 | 16 | |
| | 92.1 | 82.8 | 9.3 | 80.7 | 80.0 | 1209 | 0.24 | 14 | 1312 | 20 | 16 | |
| | 91.8 | 82.6 | 9.2 | 80.6 | 80.0 | 1209 | 0.24 | 14 | 1312 | 25 | 16 | |
| | 91.4 | 82.4 | 9.0 | 80.6 | 79.9 | 1209 | 0.24 | 14 | 1312 | 30 | 16 | |
| | 91.0 | 82.7 | 8.3 | 80.5 | 80.0 | 1209 | 0.24 | 14 | 1312 | 35 | 14 | |
| | 90.7 | 82.7 | 8.0 | 80.6 | 80.0 | 1209 | 0.24 | 14 | 1312 | 40 | 14 | |
| | 90.4 | 82.6 | 7.8 | 80.4 | 80.3 | 1209 | 0.24 | 14 | 1312 | 45 | 13 | |
| | 89.9 | 85.4 | 4.5 | 80.2 | 80.5 | 1209 | 0.24 | 14 | 1312 | 50 | 8 | |
| | 89.5 | 83.8 | 5.7 | 80.2 | 80.3 | 1209 | 0.24 | 14 | 1312 | 55 | 10 | |
| | 89.2 | 82.7 | 6.5 | 80.9 | 80.2 | 1209 | 0.24 | 14 | 1313 | 0 | 11 | |
| | 89.0 | 83.6 | 5.4 | 80.8 | 80.0 | 1209 | 0.24 | 14 | 1313 | 5 | 9 | |
| | 88.7 | 82.3 | 6.4 | 80.6 | 79.9 | 1209 | 0.24 | 14 | 1313 | 10 | 11 | |
| | 88.4 | 81.9 | 6.5 | 80.5 | 79.9 | 1209 | 0.24 | 14 | 1313 | 15 | 11 | |
| | 88.0 | 82.1 | 5.9 | 80.5 | 79.9 | 1209 | 0.24 | 14 | 1313 | 20 | 10 | |
| Potential Heat Recovery With Extended Delay | 87.8 | 82.7 | 5.1 | 80.6 | 79.8 | 1209 | 0.24 | 14 | 1313 | 25 | 9 | Potential heat recovery after default fan delay = 173 btu's |
| | 87.6 | 82.1 | 5.5 | 80.3 | 79.9 | 1209 | 0.24 | 14 | 1313 | 30 | 9 | |
| | 87.3 | 81.8 | 5.5 | 80.3 | 79.9 | 1209 | 0.24 | 14 | 1313 | 35 | 9 | |
| | 86.9 | 80.9 | 6.0 | 80.6 | 79.8 | 1209 | 0.24 | 14 | 1313 | 40 | 10 | |
| | 86.7 | 82.0 | 4.7 | 80.5 | 79.6 | 1209 | 0.24 | 14 | 1313 | 45 | 8 | |
| | 86.5 | 82.3 | 4.2 | 80.6 | 79.5 | 1209 | 0.24 | 14 | 1313 | 50 | 7 | |
| | 86.2 | 82.4 | 3.8 | 80.8 | 79.4 | 1209 | 0.24 | 14 | 1313 | 55 | 7 | |
| | 86.0 | 82.2 | 3.8 | 80.9 | 79.4 | 1209 | 0.24 | 14 | 1314 | 0 | 7 | |
| | 85.7 | 82.4 | 3.3 | 80.9 | 79.5 | 1209 | 0.24 | 14 | 1314 | 5 | 6 | |
| | 85.5 | 83.9 | 1.6 | 80.8 | 79.6 | 1209 | 0.24 | 14 | 1314 | 10 | 3 | |
| | 85.3 | 82.2 | 3.1 | 80.8 | 79.7 | 1209 | 0.24 | 14 | 1314 | 15 | 5 | |
| | 85.2 | 82.1 | 3.1 | 80.8 | 79.7 | 1209 | 0.24 | 14 | 1314 | 20 | 5 | |
| | 84.9 | 82.0 | 2.9 | 80.8 | 79.8 | 1209 | 0.24 | 14 | 1314 | 25 | 5 | |
| | 84.7 | 81.8 | 2.9 | 80.7 | 79.7 | 1209 | 0.24 | 14 | 1314 | 30 | 5 | |
| | 84.6 | 81.8 | 2.8 | 80.8 | 79.7 | 1209 | 0.24 | 14 | 1314 | 35 | 5 | |
| | 84.5 | 82.0 | 2.5 | 80.8 | 79.7 | 1209 | 0.24 | 14 | 1314 | 40 | 4 | |
| | 84.4 | 81.7 | 2.7 | 80.9 | 79.7 | 1209 | 0.24 | 14 | 1314 | 45 | 5 | |
| | 84.4 | 81.6 | 2.8 | 80.9 | 79.8 | 1209 | 0.24 | 14 | 1314 | 50 | 5 | |
| | 84.5 | 81.8 | 2.7 | 80.8 | 79.9 | 1209 | 0.24 | 14 | 1314 | 55 | 5 | |
| | 84.5 | 81.8 | 2.7 | 80.6 | 80.0 | 1209 | 0.24 | 14 | 1315 | 0 | 5 | |
| | 84.6 | 82.8 | 1.8 | 80.5 | 80.1 | 1209 | 0.24 | 14 | 1315 | 5 | 3 | |
| | 84.7 | 82.2 | 2.5 | 80.5 | 80.3 | 1209 | 0.24 | 14 | 1315 | 10 | 4 | |
| | 84.9 | 84.7 | 0.2 | 80.6 | 80.2 | 1209 | 0.24 | 14 | 1315 | 15 | 0 | |

Blower Wattage = 370

Furnace Residual Heat Determination (7 Minute Heating On Cycle)

| | Tsupply | Treturn | Temp. rise | Room | Ambient | CFM | approx. specific heat of air | approx. specific volume (cu. Ft/lbm) | Time | sec | Btu's Supplied |
|--------------------|---------|---------|------------|------|---------|------|---------------------------------|---|------|-----|-------------------|
| Furnace Heating On | 77.3 | 76.7 | 0.6 | 74.6 | 80.0 | 1209 | 0.24 | 14 | 1300 | 0 | 1 |
| | 77.2 | 76.2 | 1.0 | 74.6 | 80.1 | 1209 | 0.24 | 14 | 1300 | 5 | 2 |
| | 77.3 | 76.3 | 1.0 | 74.6 | 80.0 | 1209 | 0.24 | 14 | 1300 | 10 | 2 |
| | 77.3 | 76.4 | 0.9 | 74.6 | 80.1 | 1209 | 0.24 | 14 | 1300 | 15 | 2 |
| | 78.2 | 76.3 | 1.9 | 74.6 | 80.1 | 1209 | 0.24 | 14 | 1300 | 20 | 3 |
| | 80.0 | 74.6 | 5.4 | 74.6 | 80.2 | 1209 | 0.24 | 14 | 1300 | 25 | 9 |
| | 81.3 | 74.5 | 6.8 | 74.6 | 80.1 | 1209 | 0.24 | 14 | 1300 | 30 | 12 |
| | 82.2 | 74.4 | 7.8 | 74.6 | 80.1 | 1209 | 0.24 | 14 | 1300 | 35 | 13 |
| | 82.9 | 79.4 | 3.4 | 74.6 | 80.2 | 1209 | 0.24 | 14 | 1300 | 40 | 6 |
| | 83.5 | 76.2 | 7.3 | 74.6 | 80.3 | 1209 | 0.24 | 14 | 1300 | 45 | 13 |
| | 84.0 | 76.5 | 7.5 | 74.6 | 80.3 | 1209 | 0.24 | 14 | 1300 | 50 | 13 |
| | 84.6 | 76.2 | 8.4 | 74.5 | 80.2 | 1209 | 0.24 | 14 | 1300 | 55 | 15 |
| | 85.1 | 76.0 | 9.1 | 74.6 | 80.3 | 1209 | 0.24 | 14 | 1301 | 0 | 16 |
| | 85.7 | 76.1 | 9.6 | 74.6 | 80.3 | 1209 | 0.24 | 14 | 1301 | 5 | 16 |
| | 86.3 | 76.2 | 10.1 | 74.7 | 80.3 | 1209 | 0.24 | 14 | 1301 | 10 | 17 |
| | 86.6 | 74.2 | 12.4 | 74.7 | 80.2 | 1209 | 0.24 | 14 | 1301 | 15 | 21 |
| | 86.9 | 76.4 | 10.5 | 74.7 | 80.2 | 1209 | 0.24 | 14 | 1301 | 20 | 18 |
| | 87.5 | 77.0 | 10.5 | 74.8 | 80.1 | 1209 | 0.24 | 14 | 1301 | 25 | 18 |
| | 87.9 | 76.6 | 11.3 | 74.8 | 80.0 | 1209 | 0.24 | 14 | 1301 | 30 | 20 |
| | 88.4 | 76.9 | 11.5 | 74.8 | 79.9 | 1209 | 0.24 | 14 | 1301 | 35 | 20 |
| | 88.9 | 77.0 | 11.9 | 74.8 | 80.0 | 1209 | 0.24 | 14 | 1301 | 40 | 21 |
| | 89.3 | 76.9 | 12.4 | 74.9 | 80.0 | 1209 | 0.24 | 14 | 1301 | 45 | 21 |
| | 89.9 | 76.5 | 13.4 | 75.1 | 80.0 | 1209 | 0.24 | 14 | 1301 | 50 | 23 |
| | 90.3 | 76.3 | 14.0 | 75.1 | 80.2 | 1209 | 0.24 | 14 | 1301 | 55 | 24 |
| | 90.5 | 75.0 | 15.5 | 75.1 | 80.3 | 1209 | 0.24 | 14 | 1302 | 0 | 27 |
| | 90.7 | 77.6 | 13.1 | 75.2 | 80.4 | 1209 | 0.24 | 14 | 1302 | 5 | 23 |
| | 91.2 | 78.8 | 12.4 | 75.3 | 80.5 | 1209 | 0.24 | 14 | 1302 | 10 | 21 |
| | 91.6 | 75.8 | 15.8 | 75.5 | 80.4 | 1209 | 0.24 | 14 | 1302 | 15 | 27 |
| | 91.9 | 76.2 | 15.7 | 75.6 | 80.4 | 1209 | 0.24 | 14 | 1302 | 20 | 27 |
| | 91.9 | 76.4 | 15.5 | 75.8 | 80.3 | 1209 | 0.24 | 14 | 1302 | 25 | 27 |
| | 92.1 | 76.3 | 15.8 | 76.0 | 80.3 | 1209 | 0.24 | 14 | 1302 | 30 | 27 |
| | 92.6 | 76.7 | 15.9 | 76.1 | 80.4 | 1209 | 0.24 | 14 | 1302 | 35 | 27 |
| | 92.8 | 78.1 | 14.7 | 76.3 | 80.4 | 1209 | 0.24 | 14 | 1302 | 40 | 25 |
| | 92.9 | 78.0 | 14.9 | 76.4 | 80.4 | 1209 | 0.24 | 14 | 1302 | 45 | 26 |
| | 93.4 | 77.8 | 15.6 | 76.5 | 80.3 | 1209 | 0.24 | 14 | 1302 | 50 | 27 |
| | 93.9 | 78.5 | 15.4 | 76.5 | 80.3 | 1209 | 0.24 | 14 | 1302 | 55 | 27 |
| | 94.2 | 78.6 | 15.6 | 76.6 | 80.2 | 1209 | 0.24 | 14 | 1303 | 0 | 27 |
| | 94.5 | 79.6 | 14.9 | 76.6 | 80.2 | 1209 | 0.24 | 14 | 1303 | 5 | 26 |
| | 94.8 | 77.1 | 17.7 | 77.0 | 80.2 | 1209 | 0.24 | 14 | 1303 | 10 | 30 |
| | 95.3 | 77.7 | 17.6 | 77.1 | 80.4 | 1209 | 0.24 | 14 | 1303 | 15 | 30 |
| | 95.5 | 82.1 | 13.4 | 77.1 | 80.2 | 1209 | 0.24 | 14 | 1303 | 20 | 23 |
| | 95.7 | 78.4 | 17.3 | 77.3 | 80.2 | 1209 | 0.24 | 14 | 1303 | 25 | 30 |
| | 96.0 | 78.9 | 17.1 | 77.5 | 80.0 | 1209 | 0.24 | 14 | 1303 | 30 | 30 |
| | 96.4 | 79.7 | 16.7 | 77.7 | 79.9 | 1209 | 0.24 | 14 | 1303 | 35 | 29 |
| | 96.7 | 79.6 | 17.1 | 77.6 | 79.9 | 1209 | 0.24 | 14 | 1303 | 40 | 30 |
| | 97.3 | 79.5 | 17.8 | 77.6 | 80.0 | 1209 | 0.24 | 14 | 1303 | 45 | 31 |
| | 97.6 | 79.8 | 17.8 | 77.6 | 80.1 | 1209 | 0.24 | 14 | 1303 | 50 | 31 |
| | 97.7 | 80.7 | 17.0 | 77.8 | 80.0 | 1209 | 0.24 | 14 | 1303 | 55 | 29 |
| | 97.9 | 79.3 | 18.6 | 77.9 | 80.0 | 1209 | 0.24 | 14 | 1304 | 0 | 32 |
| | 98.1 | 79.9 | 18.2 | 78.0 | 80.1 | 1209 | 0.24 | 14 | 1304 | 5 | 31 |
| | 98.3 | 80.2 | 18.1 | 78.0 | 80.0 | 1209 | 0.24 | 14 | 1304 | 10 | 31 |
| | 98.6 | 80.4 | 18.2 | 78.3 | 79.8 | 1209 | 0.24 | 14 | 1304 | 15 | 31 |
| | 98.8 | 80.7 | 18.1 | 78.6 | 79.9 | 1209 | 0.24 | 14 | 1304 | 20 | 31 |
| | 98.6 | 80.1 | 18.5 | 78.6 | 80.2 | 1209 | 0.24 | 14 | 1304 | 25 | 32 |
| | 99.0 | 82.3 | 16.7 | 78.7 | 80.2 | 1209 | 0.24 | 14 | 1304 | 30 | 29 |
| | 99.2 | 82.1 | 17.1 | 78.9 | 80.2 | 1209 | 0.24 | 14 | 1304 | 35 | 30 |
| | 98.9 | 82.1 | 16.8 | 78.8 | 80.0 | 1209 | 0.24 | 14 | 1304 | 40 | 29 |
| | 98.9 | 82.1 | 16.8 | 79.1 | 79.9 | 1209 | 0.24 | 14 | 1304 | 45 | 29 |
| | 99.2 | 81.5 | 17.7 | 79.1 | 79.9 | 1209 | 0.24 | 14 | 1304 | 50 | 30 |
| | 99.4 | 81.5 | 17.9 | 79.4 | 79.9 | 1209 | 0.24 | 14 | 1304 | 55 | 31 |
| | 99.5 | 82.3 | 17.2 | 79.7 | 79.9 | 1209 | 0.24 | 14 | 1305 | 0 | 30 |
| | 99.8 | 82.1 | 17.7 | 79.9 | 79.9 | 1209 | 0.24 | 14 | 1305 | 5 | 30 |
| | 99.8 | 82.1 | 17.7 | 79.8 | 79.9 | 1209 | 0.24 | 14 | 1305 | 10 | 31 |
| | 99.7 | 82.6 | 17.1 | 79.8 | 79.9 | 1209 | 0.24 | 14 | 1305 | 15 | 30 |
| | 99.8 | 82.4 | 17.4 | 79.9 | 80.0 | 1209 | 0.24 | 14 | 1305 | 20 | 30 |
| | 99.9 | 83.5 | 16.4 | 80.1 | 80.1 | 1209 | 0.24 | 14 | 1305 | 25 | 28 |
| | 100.4 | 83.5 | 16.9 | 80.2 | 80.1 | 1209 | 0.24 | 14 | 1305 | 30 | 29 |
| | 100.6 | 81.4 | 19.2 | 80.4 | 80.1 | 1209 | 0.24 | 14 | 1305 | 35 | 33 |
| | 100.6 | 81.5 | 19.1 | 80.6 | 80.1 | 1209 | 0.24 | 14 | 1305 | 40 | 33 |
| | 101.0 | 86.2 | 14.8 | 80.6 | 80.0 | 1209 | 0.24 | 14 | 1305 | 45 | 25 |
| | 100.8 | 81.6 | 19.2 | 80.6 | 79.9 | 1209 | 0.24 | 14 | 1305 | 50 | 33 |
| | 101.1 | 82.6 | 18.5 | 80.5 | 79.9 | 1209 | 0.24 | 14 | 1305 | 55 | 32 |
| | 101.5 | 83.2 | 18.3 | 80.6 | 79.9 | 1209 | 0.24 | 14 | 1306 | 0 | 32 |
| | 101.4 | 83.3 | 18.1 | 80.8 | 79.9 | 1209 | 0.24 | 14 | 1306 | 5 | 31 |
| | 101.3 | 85.3 | 16.0 | 80.7 | 80.0 | 1209 | 0.24 | 14 | 1306 | 10 | 28 |
| | 101.5 | 83.8 | 17.7 | 80.7 | 80.0 | 1209 | 0.24 | 14 | 1306 | 15 | 31 |
| | 101.4 | 84.7 | 16.7 | 80.8 | 79.9 | 1209 | 0.24 | 14 | 1306 | 20 | 29 |
| | 101.6 | 83.4 | 18.2 | 80.8 | 80.1 | 1209 | 0.24 | 14 | 1306 | 25 | 31 |
| | 101.6 | 83.0 | 18.6 | 80.9 | 80.0 | 1209 | 0.24 | 14 | 1306 | 30 | 32 |
| | 101.5 | 83.6 | 17.9 | 81.0 | 80.0 | 1209 | 0.24 | 14 | 1306 | 35 | 31 |
| | 101.7 | 84.5 | 17.2 | 81.0 | 80.0 | 1209 | 0.24 | 14 | 1306 | 40 | 30 |
| | 101.9 | 84.1 | 17.8 | 81.0 | 80.0 | 1209 | 0.24 | 14 | 1306 | 45 | 31 |

Heat Input
During Heating
cycle = 2111 btu's

Furnace Residual Heat Determination (7 Minute Heating On Cycle)

| | Tsupply | Treturn | Temp. rise | Room | Ambient | CFM | approx. specific heat of air | approx. specific volume (cu. Ft/lbm) | Time | sec | Btu's Supplied | |
|---|---------|---------|------------|------|---------|------|---------------------------------|---|------|-----|-------------------|--|
| | 102.1 | 84.2 | 17.9 | 81.1 | 80.0 | 1209 | 0.24 | 14 | 1306 | 50 | 31 | |
| | 102.2 | 84.3 | 17.9 | 81.2 | 80.1 | 1209 | 0.24 | 14 | 1306 | 55 | 31 | |
| | 102.8 | 84.1 | 18.7 | 81.2 | 80.2 | 1209 | 0.24 | 14 | 1307 | 0 | 32 | |
| Default Blower Off Delay | 102.9 | 84.2 | 18.7 | 81.2 | 80.2 | 1209 | 0.24 | 14 | 1307 | 5 | 32 | Default fan delay heat recovered = 623 btu's |
| | 103.9 | 84.1 | 19.8 | 81.6 | 80.2 | 1209 | 0.24 | 14 | 1307 | 10 | 34 | |
| | 103.7 | 84.3 | 19.4 | 81.8 | 80.1 | 1209 | 0.24 | 14 | 1307 | 15 | 34 | |
| | 105.2 | 84.3 | 20.9 | 82.0 | 80.0 | 1209 | 0.24 | 14 | 1307 | 20 | 36 | |
| | 107.1 | 84.6 | 22.5 | 82.0 | 80.0 | 1209 | 0.24 | 14 | 1307 | 25 | 39 | |
| | 106.1 | 84.9 | 21.2 | 82.1 | 79.9 | 1209 | 0.24 | 14 | 1307 | 30 | 37 | |
| | 105.1 | 85.0 | 20.1 | 81.9 | 80.0 | 1209 | 0.24 | 14 | 1307 | 35 | 35 | |
| | 104.1 | 86.5 | 17.6 | 82.1 | 80.1 | 1209 | 0.24 | 14 | 1307 | 40 | 30 | |
| | 103.1 | 84.1 | 19.0 | 82.0 | 80.3 | 1209 | 0.24 | 14 | 1307 | 45 | 33 | |
| | 102.3 | 86.4 | 15.9 | 82.2 | 80.3 | 1209 | 0.24 | 14 | 1307 | 50 | 27 | |
| | 101.4 | 86.0 | 15.4 | 82.0 | 80.3 | 1209 | 0.24 | 14 | 1307 | 55 | 27 | |
| | 100.6 | 84.0 | 16.6 | 81.9 | 80.3 | 1209 | 0.24 | 14 | 1308 | 0 | 29 | |
| | 99.8 | 83.9 | 15.9 | 81.8 | 80.5 | 1209 | 0.24 | 14 | 1308 | 5 | 27 | |
| | 98.9 | 86.4 | 12.5 | 81.9 | 80.5 | 1209 | 0.24 | 14 | 1308 | 10 | 22 | |
| | 98.3 | 84.7 | 13.6 | 82.5 | 80.5 | 1209 | 0.24 | 14 | 1308 | 15 | 23 | |
| | 97.5 | 84.2 | 13.3 | 82.2 | 80.6 | 1209 | 0.24 | 14 | 1308 | 20 | 23 | |
| | 97.0 | 83.9 | 13.1 | 82.0 | 80.6 | 1209 | 0.24 | 14 | 1308 | 25 | 23 | |
| | 96.3 | 83.7 | 12.6 | 82.2 | 80.5 | 1209 | 0.24 | 14 | 1308 | 30 | 22 | |
| | 95.6 | 84.1 | 11.5 | 82.0 | 80.4 | 1209 | 0.24 | 14 | 1308 | 35 | 20 | |
| | 94.8 | 83.4 | 11.4 | 82.0 | 80.3 | 1209 | 0.24 | 14 | 1308 | 40 | 20 | |
| | 94.4 | 86.2 | 8.2 | 82.2 | 80.3 | 1209 | 0.24 | 14 | 1308 | 45 | 14 | |
| | 93.9 | 86.2 | 7.7 | 82.1 | 80.2 | 1209 | 0.24 | 14 | 1308 | 50 | 13 | |
| | 93.3 | 86.3 | 7.0 | 82.0 | 80.0 | 1209 | 0.24 | 14 | 1308 | 55 | 12 | |
| | 92.8 | 86.0 | 6.8 | 81.9 | 79.9 | 1209 | 0.24 | 14 | 1309 | 0 | 12 | |
| Potential Heat Recovery With Extended Delay | 92.8 | 83.9 | 8.9 | 81.7 | 80.1 | 1209 | 0.24 | 14 | 1309 | 5 | 15 | Potential heat recovery after default fan delay = 180 btu's |
| | 92.5 | 85.7 | 6.8 | 81.6 | 80.2 | 1209 | 0.24 | 14 | 1309 | 10 | 12 | |
| | 92.0 | 83.7 | 8.3 | 81.5 | 80.4 | 1209 | 0.24 | 14 | 1309 | 15 | 14 | |
| | 91.6 | 85.5 | 6.1 | 81.4 | 80.5 | 1209 | 0.24 | 14 | 1309 | 20 | 11 | |
| | 91.2 | 83.4 | 7.8 | 81.3 | 80.4 | 1209 | 0.24 | 14 | 1309 | 25 | 13 | |
| | 90.8 | 83.7 | 7.1 | 81.3 | 80.3 | 1209 | 0.24 | 14 | 1309 | 30 | 12 | |
| | 90.3 | 86.4 | 3.9 | 81.1 | 80.2 | 1209 | 0.24 | 14 | 1309 | 35 | 7 | |
| | 90.0 | 83.8 | 6.2 | 81.4 | 80.2 | 1209 | 0.24 | 14 | 1309 | 40 | 11 | |
| | 89.6 | 83.8 | 5.8 | 81.2 | 80.2 | 1209 | 0.24 | 14 | 1309 | 45 | 10 | |
| | 89.4 | 83.7 | 5.7 | 81.1 | 80.1 | 1209 | 0.24 | 14 | 1309 | 50 | 10 | |
| | 89.1 | 83.9 | 5.2 | 81.1 | 80.2 | 1209 | 0.24 | 14 | 1309 | 55 | 9 | |
| | 88.8 | 83.0 | 5.8 | 81.0 | 80.2 | 1209 | 0.24 | 14 | 1310 | 0 | 10 | |
| | 88.2 | 83.0 | 5.2 | 80.9 | 79.5 | 1209 | 0.24 | 14 | 1310 | 5 | 9 | |
| | 86.5 | 83.1 | 3.4 | 80.8 | 79.6 | 1209 | 0.24 | 14 | 1310 | 10 | 6 | |
| | 85.7 | 83.1 | 2.6 | 80.8 | 79.7 | 1209 | 0.24 | 14 | 1310 | 15 | 4 | |
| | 85.5 | 83.1 | 2.4 | 80.8 | 79.7 | 1209 | 0.24 | 14 | 1310 | 20 | 4 | |
| | 85.4 | 83.1 | 2.3 | 80.8 | 79.8 | 1209 | 0.24 | 14 | 1310 | 25 | 4 | |
| | 85.0 | 83.1 | 1.9 | 80.7 | 79.7 | 1209 | 0.24 | 14 | 1310 | 30 | 3 | |
| | 84.8 | 83.1 | 1.7 | 80.8 | 79.7 | 1209 | 0.24 | 14 | 1310 | 35 | 3 | |
| | 84.7 | 83.0 | 1.7 | 80.8 | 79.7 | 1209 | 0.24 | 14 | 1310 | 40 | 3 | |
| | 84.6 | 82.9 | 1.7 | 80.9 | 79.7 | 1209 | 0.24 | 14 | 1310 | 45 | 3 | |
| | 84.5 | 83.0 | 1.5 | 80.9 | 79.8 | 1209 | 0.24 | 14 | 1310 | 50 | 3 | |
| | 84.1 | 83.0 | 1.1 | 80.8 | 79.9 | 1209 | 0.24 | 14 | 1310 | 55 | 2 | |
| | 83.7 | 83.0 | 0.7 | 80.6 | 80.0 | 1209 | 0.24 | 14 | 1311 | 0 | 1 | |
| | 83.5 | 83.0 | 0.5 | 80.5 | 80.1 | 1209 | 0.24 | 14 | 1311 | 5 | 1 | |
| | 83.1 | 83.0 | 0.1 | 80.5 | 80.3 | 1209 | 0.24 | 14 | 1311 | 10 | 0 | |
| | 83.0 | 83.0 | 0.0 | 80.6 | 80.2 | 1209 | 0.24 | 14 | 1311 | 15 | 0 | |

Blower Wattage = 370

Furnace Residual Heat Determination (8 Minute Heating On Cycle)

| Tsupply | Treturn | Temp. rise | Room | Ambient | CFM | approx. specific heat of air | approx. specific volume (cu. Ft/lbm) | Time | sec | Btu's Supplied |
|---------|---------|------------|------|---------|------|------------------------------|--------------------------------------|------|-----|----------------|
| 75.2 | 75.1 | 0.1 | 72.5 | 80.0 | 1209 | 0.24 | 14 | 1350 | 0 | 0 |
| 75.1 | 74.7 | 0.4 | 72.5 | 80.1 | 1209 | 0.24 | 14 | 1350 | 5 | 1 |
| 75.1 | 74.6 | 0.5 | 72.5 | 80.0 | 1209 | 0.24 | 14 | 1350 | 10 | 1 |
| 75.1 | 74.9 | 0.2 | 72.5 | 80.1 | 1209 | 0.24 | 14 | 1350 | 15 | 0 |
| 76.9 | 75.0 | 1.9 | 72.5 | 80.1 | 1209 | 0.24 | 14 | 1350 | 20 | 3 |
| 78.1 | 75.2 | 2.9 | 72.5 | 80.2 | 1209 | 0.24 | 14 | 1350 | 25 | 5 |
| 79.7 | 75.0 | 4.7 | 72.5 | 80.1 | 1209 | 0.24 | 14 | 1350 | 30 | 8 |
| 80.6 | 75.7 | 4.9 | 72.5 | 80.1 | 1209 | 0.24 | 14 | 1350 | 35 | 8 |
| 81.0 | 75.1 | 5.9 | 72.5 | 80.2 | 1209 | 0.24 | 14 | 1350 | 40 | 10 |
| 81.3 | 74.7 | 6.6 | 72.5 | 80.3 | 1209 | 0.24 | 14 | 1350 | 45 | 11 |
| 81.2 | 75.2 | 6.0 | 72.5 | 80.3 | 1209 | 0.24 | 14 | 1350 | 50 | 10 |
| 82.4 | 75.7 | 6.7 | 72.4 | 80.2 | 1209 | 0.24 | 14 | 1350 | 55 | 12 |
| 83.3 | 75.0 | 8.3 | 72.4 | 80.2 | 1209 | 0.24 | 14 | 1351 | 0 | 14 |
| 84.0 | 75.5 | 8.5 | 72.5 | 80.1 | 1209 | 0.24 | 14 | 1351 | 5 | 15 |
| 84.9 | 75.6 | 9.3 | 72.4 | 80.0 | 1209 | 0.24 | 14 | 1351 | 10 | 16 |
| 85.6 | 72.8 | 12.8 | 72.4 | 79.9 | 1209 | 0.24 | 14 | 1351 | 15 | 22 |
| 86.1 | 73.2 | 12.9 | 72.5 | 79.9 | 1209 | 0.24 | 14 | 1351 | 20 | 22 |
| 86.9 | 72.5 | 14.4 | 72.5 | 79.9 | 1209 | 0.24 | 14 | 1351 | 25 | 25 |
| 87.6 | 73.6 | 14.0 | 72.5 | 80.0 | 1209 | 0.24 | 14 | 1351 | 30 | 24 |
| 88.2 | 72.8 | 15.4 | 72.5 | 79.9 | 1209 | 0.24 | 14 | 1351 | 35 | 27 |
| 88.7 | 74.7 | 14.0 | 72.5 | 79.9 | 1209 | 0.24 | 14 | 1351 | 40 | 24 |
| 89.2 | 75.2 | 14.0 | 72.5 | 79.9 | 1209 | 0.24 | 14 | 1351 | 45 | 24 |
| 89.8 | 75.4 | 14.4 | 72.6 | 79.9 | 1209 | 0.24 | 14 | 1351 | 50 | 25 |
| 90.5 | 73.5 | 17.0 | 72.7 | 80.1 | 1209 | 0.24 | 14 | 1351 | 55 | 29 |
| 90.9 | 74.7 | 16.2 | 72.7 | 80.1 | 1209 | 0.24 | 14 | 1352 | 0 | 28 |
| 91.1 | 75.8 | 15.3 | 72.8 | 80.1 | 1209 | 0.24 | 14 | 1352 | 5 | 26 |
| 91.6 | 75.4 | 16.2 | 72.8 | 80.2 | 1209 | 0.24 | 14 | 1352 | 10 | 28 |
| 92.2 | 75.1 | 17.1 | 72.9 | 80.1 | 1209 | 0.24 | 14 | 1352 | 15 | 30 |
| 92.5 | 78.6 | 13.9 | 72.9 | 80.3 | 1209 | 0.24 | 14 | 1352 | 20 | 24 |
| 92.9 | 76.1 | 16.8 | 73.0 | 80.4 | 1209 | 0.24 | 14 | 1352 | 25 | 29 |
| 93.3 | 76.5 | 16.8 | 73.0 | 80.6 | 1209 | 0.24 | 14 | 1352 | 30 | 29 |
| 93.6 | 76.7 | 16.9 | 73.1 | 80.8 | 1209 | 0.24 | 14 | 1352 | 35 | 29 |
| 94.1 | 79.3 | 14.8 | 73.2 | 80.9 | 1209 | 0.24 | 14 | 1352 | 40 | 26 |
| 94.6 | 79.2 | 15.4 | 73.2 | 80.9 | 1209 | 0.24 | 14 | 1352 | 45 | 27 |
| 95.0 | 78.7 | 16.3 | 73.5 | 80.9 | 1209 | 0.24 | 14 | 1352 | 50 | 28 |
| 95.3 | 79.2 | 16.1 | 73.5 | 80.8 | 1209 | 0.24 | 14 | 1352 | 55 | 28 |
| 95.7 | 78.6 | 17.1 | 73.9 | 80.6 | 1209 | 0.24 | 14 | 1353 | 0 | 30 |
| 96.0 | 78.4 | 17.6 | 74.1 | 80.4 | 1209 | 0.24 | 14 | 1353 | 5 | 30 |
| 96.1 | 78.9 | 17.2 | 74.1 | 80.2 | 1209 | 0.24 | 14 | 1353 | 10 | 30 |
| 96.6 | 78.1 | 18.5 | 74.2 | 80.3 | 1209 | 0.24 | 14 | 1353 | 15 | 32 |
| 97.0 | 80.1 | 16.9 | 74.3 | 80.3 | 1209 | 0.24 | 14 | 1353 | 20 | 29 |
| 97.2 | 79.6 | 17.6 | 74.3 | 80.3 | 1209 | 0.24 | 14 | 1353 | 25 | 30 |
| 97.7 | 82.1 | 15.6 | 74.4 | 80.4 | 1209 | 0.24 | 14 | 1353 | 30 | 27 |
| 98.0 | 79.1 | 18.9 | 74.7 | 80.4 | 1209 | 0.24 | 14 | 1353 | 35 | 33 |
| 98.3 | 79.8 | 18.5 | 74.7 | 80.5 | 1209 | 0.24 | 14 | 1353 | 40 | 32 |
| 98.6 | 83.3 | 15.3 | 74.9 | 80.5 | 1209 | 0.24 | 14 | 1353 | 45 | 26 |
| 98.9 | 79.8 | 19.1 | 74.9 | 80.5 | 1209 | 0.24 | 14 | 1353 | 50 | 33 |
| 99.1 | 80.0 | 19.1 | 75.1 | 80.5 | 1209 | 0.24 | 14 | 1353 | 55 | 33 |
| 99.5 | 78.9 | 20.6 | 75.2 | 80.6 | 1209 | 0.24 | 14 | 1354 | 0 | 36 |
| 99.6 | 80.0 | 19.6 | 75.5 | 80.7 | 1209 | 0.24 | 14 | 1354 | 5 | 34 |
| 100.0 | 81.3 | 18.7 | 75.5 | 80.8 | 1209 | 0.24 | 14 | 1354 | 10 | 32 |
| 100.3 | 80.6 | 19.7 | 75.6 | 80.8 | 1209 | 0.24 | 14 | 1354 | 15 | 34 |
| 100.4 | 80.5 | 19.9 | 75.8 | 80.7 | 1209 | 0.24 | 14 | 1354 | 20 | 34 |
| 100.3 | 84.2 | 16.1 | 76.1 | 80.8 | 1209 | 0.24 | 14 | 1354 | 25 | 28 |
| 100.7 | 80.8 | 19.9 | 76.1 | 80.7 | 1209 | 0.24 | 14 | 1354 | 30 | 34 |
| 100.8 | 81.3 | 19.5 | 76.3 | 80.6 | 1209 | 0.24 | 14 | 1354 | 35 | 34 |
| 100.9 | 83.3 | 17.6 | 76.4 | 80.6 | 1209 | 0.24 | 14 | 1354 | 40 | 30 |
| 101.2 | 82.8 | 18.4 | 76.5 | 80.5 | 1209 | 0.24 | 14 | 1354 | 45 | 32 |
| 101.5 | 81.6 | 19.9 | 76.6 | 80.4 | 1209 | 0.24 | 14 | 1354 | 50 | 34 |
| 102.0 | 81.2 | 20.8 | 76.8 | 80.3 | 1209 | 0.24 | 14 | 1354 | 55 | 36 |
| 102.2 | 85.3 | 16.9 | 76.7 | 80.2 | 1209 | 0.24 | 14 | 1355 | 0 | 29 |
| 102.2 | 83.3 | 18.9 | 76.9 | 80.0 | 1209 | 0.24 | 14 | 1355 | 5 | 33 |
| 102.6 | 81.9 | 20.7 | 77.0 | 80.0 | 1209 | 0.24 | 14 | 1355 | 10 | 36 |
| 102.7 | 83.4 | 19.3 | 77.1 | 80.1 | 1209 | 0.24 | 14 | 1355 | 15 | 33 |
| 102.6 | 82.8 | 19.8 | 77.4 | 80.1 | 1209 | 0.24 | 14 | 1355 | 20 | 34 |
| 102.9 | 82.7 | 20.2 | 77.6 | 80.1 | 1209 | 0.24 | 14 | 1355 | 25 | 35 |
| 103.2 | 82.6 | 20.6 | 78.0 | 80.1 | 1209 | 0.24 | 14 | 1355 | 30 | 36 |
| 103.4 | 83.0 | 20.4 | 78.1 | 80.0 | 1209 | 0.24 | 14 | 1355 | 35 | 35 |
| 103.1 | 83.1 | 20.0 | 77.9 | 80.2 | 1209 | 0.24 | 14 | 1355 | 40 | 35 |
| 103.4 | 84.0 | 19.4 | 78.0 | 80.2 | 1209 | 0.24 | 14 | 1355 | 45 | 34 |
| 103.4 | 84.4 | 19.0 | 77.9 | 80.2 | 1209 | 0.24 | 14 | 1355 | 50 | 33 |
| 103.9 | 83.0 | 20.9 | 78.0 | 80.3 | 1209 | 0.24 | 14 | 1355 | 55 | 36 |
| 104.0 | 82.4 | 21.6 | 78.1 | 80.4 | 1209 | 0.24 | 14 | 1356 | 0 | 37 |
| 104.1 | 86.8 | 17.3 | 78.3 | 80.3 | 1209 | 0.24 | 14 | 1356 | 5 | 30 |
| 104.2 | 83.4 | 20.8 | 78.3 | 80.2 | 1209 | 0.24 | 14 | 1356 | 10 | 36 |
| 104.4 | 84.0 | 20.4 | 78.5 | 80.1 | 1209 | 0.24 | 14 | 1356 | 15 | 35 |
| 104.8 | 83.3 | 21.5 | 78.5 | 80.1 | 1209 | 0.24 | 14 | 1356 | 20 | 37 |
| 105.0 | 83.3 | 21.7 | 78.7 | 80.1 | 1209 | 0.24 | 14 | 1356 | 25 | 37 |
| 104.9 | 87.8 | 17.1 | 79.0 | 80.1 | 1209 | 0.24 | 14 | 1356 | 30 | 30 |
| 105.1 | 82.8 | 22.3 | 79.1 | 80.1 | 1209 | 0.24 | 14 | 1356 | 35 | 39 |
| 105.1 | 83.8 | 21.3 | 78.9 | 80.0 | 1209 | 0.24 | 14 | 1356 | 40 | 37 |
| 105.2 | 83.6 | 21.6 | 79.0 | 80.0 | 1209 | 0.24 | 14 | 1356 | 45 | 37 |

Furnace Heating On

Heat Input
During Heating
cycle = 2767 btu's

Furnace Residual Heat Determination (8 Minute Heating On Cycle)

| | Tsupply | Treturn | Temp. rise | Room | Ambient | CFM | approx. specific heat of air | approx. specific volume (cu. Ft/lbm) | Time | sec | Btu's Supplied | |
|---|---------|---------|------------|------|---------|------|------------------------------|--------------------------------------|------|-----|----------------|---|
| | 105.3 | 85.1 | 20.2 | 79.0 | 80.0 | 1209 | 0.24 | 14 | 1356 | 50 | 35 | |
| | 105.4 | 84.4 | 21.0 | 79.2 | 79.9 | 1209 | 0.24 | 14 | 1356 | 55 | 36 | |
| | 105.6 | 84.3 | 21.3 | 79.5 | 79.8 | 1209 | 0.24 | 14 | 1357 | 0 | 37 | |
| | 105.9 | 86.8 | 19.1 | 79.6 | 79.8 | 1209 | 0.24 | 14 | 1357 | 5 | 33 | |
| | 106.0 | 83.4 | 22.6 | 79.7 | 79.8 | 1209 | 0.24 | 14 | 1357 | 10 | 39 | |
| | 106.2 | 84.0 | 22.2 | 79.9 | 79.8 | 1209 | 0.24 | 14 | 1357 | 15 | 38 | |
| | 106.6 | 83.3 | 23.3 | 80.2 | 79.8 | 1209 | 0.24 | 14 | 1357 | 20 | 40 | |
| | 106.8 | 83.3 | 23.5 | 80.1 | 79.9 | 1209 | 0.24 | 14 | 1357 | 25 | 41 | |
| | 106.7 | 87.8 | 18.9 | 80.1 | 79.9 | 1209 | 0.24 | 14 | 1357 | 30 | 33 | |
| | 106.9 | 82.8 | 24.1 | 80.1 | 79.9 | 1209 | 0.24 | 14 | 1357 | 35 | 42 | |
| | 106.9 | 83.8 | 23.1 | 80.0 | 80.0 | 1209 | 0.24 | 14 | 1357 | 40 | 40 | |
| | 107.0 | 83.6 | 23.4 | 79.9 | 80.0 | 1209 | 0.24 | 14 | 1357 | 45 | 40 | |
| | 107.1 | 85.1 | 22.0 | 80.2 | 80.0 | 1209 | 0.24 | 14 | 1357 | 50 | 38 | |
| | 107.2 | 84.4 | 22.8 | 80.1 | 80.0 | 1209 | 0.24 | 14 | 1357 | 55 | 39 | |
| | 107.3 | 84.3 | 23.0 | 80.1 | 79.9 | 1209 | 0.24 | 14 | 1358 | 0 | 40 | |
| Default Blower Off Delay | 107.3 | 84.0 | 23.3 | 79.9 | 79.9 | 1209 | 0.24 | 14 | 1358 | 5 | 40 | Default fan delay heat recovered = 630 btu's |
| | 107.3 | 83.7 | 23.6 | 80.3 | 79.8 | 1209 | 0.24 | 14 | 1358 | 10 | 41 | |
| | 106.9 | 84.5 | 22.5 | 80.8 | 80.1 | 1209 | 0.24 | 14 | 1358 | 15 | 39 | |
| | 106.5 | 84.2 | 22.3 | 80.6 | 80.3 | 1209 | 0.24 | 14 | 1358 | 20 | 39 | |
| | 105.9 | 84.5 | 21.4 | 80.5 | 80.2 | 1209 | 0.24 | 14 | 1358 | 25 | 37 | |
| | 104.9 | 84.4 | 20.5 | 80.5 | 80.3 | 1209 | 0.24 | 14 | 1358 | 30 | 35 | |
| | 103.7 | 84.5 | 19.2 | 80.5 | 80.3 | 1209 | 0.24 | 14 | 1358 | 35 | 33 | |
| | 102.9 | 84.4 | 18.6 | 80.6 | 80.5 | 1209 | 0.24 | 14 | 1358 | 40 | 32 | |
| | 102.1 | 84.8 | 17.4 | 81.0 | 80.7 | 1209 | 0.24 | 14 | 1358 | 45 | 30 | |
| | 101.2 | 84.7 | 16.6 | 81.0 | 80.7 | 1209 | 0.24 | 14 | 1358 | 50 | 29 | |
| | 100.2 | 85.4 | 14.9 | 80.9 | 80.7 | 1209 | 0.24 | 14 | 1358 | 55 | 26 | |
| | 99.5 | 84.2 | 15.4 | 80.9 | 80.7 | 1209 | 0.24 | 14 | 1359 | 0 | 27 | |
| | 98.6 | 84.3 | 14.4 | 80.8 | 80.6 | 1209 | 0.24 | 14 | 1359 | 5 | 25 | |
| | 97.8 | 84.2 | 13.7 | 80.7 | 80.6 | 1209 | 0.24 | 14 | 1359 | 10 | 24 | |
| | 97.2 | 84.4 | 12.9 | 80.5 | 80.4 | 1209 | 0.24 | 14 | 1359 | 15 | 22 | |
| | 96.6 | 84.2 | 12.4 | 80.4 | 80.3 | 1209 | 0.24 | 14 | 1359 | 20 | 21 | |
| | 96.0 | 84.3 | 11.8 | 80.3 | 80.2 | 1209 | 0.24 | 14 | 1359 | 25 | 20 | |
| | 95.2 | 84.3 | 10.9 | 80.5 | 80.0 | 1209 | 0.24 | 14 | 1359 | 30 | 19 | |
| | 94.6 | 84.8 | 9.8 | 80.3 | 79.9 | 1209 | 0.24 | 14 | 1359 | 35 | 17 | |
| | 93.9 | 84.5 | 9.4 | 80.4 | 79.9 | 1209 | 0.24 | 14 | 1359 | 40 | 16 | |
| Potential Heat Recovery With Extended Delay | 93.5 | 84.2 | 9.3 | 80.1 | 79.9 | 1209 | 0.24 | 14 | 1359 | 45 | 16 | Potential heat recovery after default fan delay = 184 btu's |
| | 92.9 | 84.1 | 8.8 | 80.4 | 80.0 | 1209 | 0.24 | 14 | 1359 | 50 | 15 | |
| | 92.5 | 84.5 | 8.1 | 80.2 | 80.2 | 1209 | 0.24 | 14 | 1359 | 55 | 14 | |
| | 92.0 | 84.2 | 7.8 | 80.4 | 80.3 | 1209 | 0.24 | 14 | 1400 | 0 | 13 | |
| | 91.9 | 83.9 | 8.0 | 80.2 | 80.3 | 1209 | 0.24 | 14 | 1400 | 5 | 14 | |
| | 91.4 | 83.9 | 7.5 | 80.2 | 80.2 | 1209 | 0.24 | 14 | 1400 | 10 | 13 | |
| | 91.3 | 83.9 | 7.4 | 80.1 | 80.1 | 1209 | 0.24 | 14 | 1400 | 15 | 13 | |
| | 90.8 | 83.9 | 6.9 | 79.9 | 80.1 | 1209 | 0.24 | 14 | 1400 | 20 | 12 | |
| | 90.2 | 83.9 | 6.3 | 79.8 | 80.1 | 1209 | 0.24 | 14 | 1400 | 25 | 11 | |
| | 90.0 | 84.1 | 5.9 | 79.7 | 80.1 | 1209 | 0.24 | 14 | 1400 | 30 | 10 | |
| | 89.7 | 84.0 | 5.7 | 79.6 | 80.1 | 1209 | 0.24 | 14 | 1400 | 35 | 10 | |
| | 89.4 | 83.9 | 5.5 | 79.4 | 80.1 | 1209 | 0.24 | 14 | 1400 | 40 | 9 | |
| | 89.1 | 83.9 | 5.2 | 79.3 | 80.1 | 1209 | 0.24 | 14 | 1400 | 45 | 9 | |
| | 88.7 | 83.8 | 4.9 | 79.2 | 80.1 | 1209 | 0.24 | 14 | 1400 | 50 | 8 | |
| | 88.4 | 84.0 | 4.4 | 79.1 | 80.2 | 1209 | 0.24 | 14 | 1400 | 55 | 8 | |
| | 88.1 | 84.0 | 4.1 | 79.2 | 80.1 | 1209 | 0.24 | 14 | 1401 | 0 | 7 | |
| | 88.0 | 83.9 | 4.1 | 79.3 | 80.1 | 1209 | 0.24 | 14 | 1401 | 5 | 7 | |
| | 87.7 | 83.9 | 3.8 | 79.1 | 80.1 | 1209 | 0.24 | 14 | 1401 | 10 | 7 | |
| | 87.5 | 83.8 | 3.7 | 79.1 | 80.1 | 1209 | 0.24 | 14 | 1401 | 15 | 6 | |
| | 87.1 | 83.8 | 3.3 | 79.1 | 80.1 | 1209 | 0.24 | 14 | 1401 | 20 | 6 | |
| | 86.8 | 83.8 | 3.0 | 78.9 | 80.1 | 1209 | 0.24 | 14 | 1401 | 25 | 5 | |
| | 86.6 | 83.9 | 2.7 | 78.9 | 80.2 | 1209 | 0.24 | 14 | 1401 | 30 | 5 | |
| | 86.5 | 83.9 | 2.6 | 78.9 | 80.2 | 1209 | 0.24 | 14 | 1401 | 35 | 4 | |
| | 86.3 | 83.8 | 2.5 | 78.9 | 80.1 | 1209 | 0.24 | 14 | 1401 | 40 | 4 | |
| | 86.2 | 83.8 | 2.4 | 78.8 | 80.0 | 1209 | 0.24 | 14 | 1401 | 45 | 4 | |
| | 85.7 | 83.8 | 1.9 | 78.8 | 80.0 | 1209 | 0.24 | 14 | 1401 | 50 | 3 | |
| | 85.2 | 83.8 | 1.4 | 78.8 | 79.9 | 1209 | 0.24 | 14 | 1401 | 55 | 2 | |
| | 84.9 | 83.8 | 1.1 | 78.7 | 80.0 | 1209 | 0.24 | 14 | 1402 | 0 | 2 | |
| | 84.8 | 83.7 | 1.1 | 78.7 | 80.0 | 1209 | 0.24 | 14 | 1402 | 5 | 2 | |
| | 84.4 | 83.5 | 0.9 | 78.6 | 80.0 | 1209 | 0.24 | 14 | 1402 | 10 | 2 | |
| | 83.9 | 83.7 | 0.2 | 78.6 | 79.9 | 1209 | 0.24 | 14 | 1402 | 15 | 0 | |

Blower Wattage = 370

Furnace Residual Heat Determination (9 Minute Heating On Cycle)

| | Tsupply | Treturn | Temp. rise | Room | Ambient | CFM | approx. specific heat of air | approx. specific volume (cu. Ft/lbm) | Time | sec | Btu's Supplied |
|--------------------|---------|---------|------------|------|---------|------|------------------------------|--------------------------------------|------|-----|----------------|
| Furnace Heating On | 73.0 | 73.0 | 0.0 | 72.5 | 80.0 | 1209 | 0.24 | 14 | 1440 | 0 | 0 |
| | 73.0 | 72.9 | 0.1 | 73.5 | 80.4 | 1209 | 0.24 | 14 | 1440 | 5 | 0 |
| | 74.2 | 73.7 | 0.5 | 73.4 | 80.3 | 1209 | 0.24 | 14 | 1440 | 10 | 1 |
| | 77.6 | 73.7 | 3.9 | 73.5 | 80.4 | 1209 | 0.24 | 14 | 1440 | 15 | 7 |
| | 80.3 | 74.5 | 5.8 | 73.5 | 80.5 | 1209 | 0.24 | 14 | 1440 | 20 | 10 |
| | 82.4 | 74.4 | 8.0 | 73.5 | 80.7 | 1209 | 0.24 | 14 | 1440 | 25 | 14 |
| | 83.7 | 74.2 | 9.5 | 73.5 | 80.8 | 1209 | 0.24 | 14 | 1440 | 30 | 16 |
| | 84.0 | 74.6 | 9.4 | 73.5 | 80.9 | 1209 | 0.24 | 14 | 1440 | 35 | 16 |
| | 84.7 | 76.3 | 8.4 | 73.5 | 81.0 | 1209 | 0.24 | 14 | 1440 | 40 | 15 |
| | 85.8 | 76.3 | 9.5 | 73.5 | 81.1 | 1209 | 0.24 | 14 | 1440 | 45 | 16 |
| | 86.6 | 76.5 | 10.1 | 73.6 | 81.1 | 1209 | 0.24 | 14 | 1440 | 50 | 17 |
| | 87.5 | 76.9 | 10.6 | 73.7 | 81.2 | 1209 | 0.24 | 14 | 1440 | 55 | 18 |
| | 88.3 | 77.0 | 11.3 | 73.8 | 81.3 | 1209 | 0.24 | 14 | 1441 | 0 | 20 |
| | 88.9 | 78.0 | 10.9 | 73.8 | 81.0 | 1209 | 0.24 | 14 | 1441 | 5 | 19 |
| | 89.5 | 74.4 | 15.1 | 74.0 | 80.9 | 1209 | 0.24 | 14 | 1441 | 10 | 26 |
| | 89.9 | 74.3 | 15.6 | 74.0 | 81.1 | 1209 | 0.24 | 14 | 1441 | 15 | 27 |
| | 90.4 | 73.9 | 16.5 | 74.1 | 81.1 | 1209 | 0.24 | 14 | 1441 | 20 | 28 |
| | 90.6 | 74.0 | 16.6 | 74.2 | 81.1 | 1209 | 0.24 | 14 | 1441 | 25 | 29 |
| | 91.5 | 74.5 | 17.0 | 74.3 | 81.0 | 1209 | 0.24 | 14 | 1441 | 30 | 29 |
| | 92.0 | 75.3 | 16.7 | 74.5 | 80.8 | 1209 | 0.24 | 14 | 1441 | 35 | 29 |
| | 92.6 | 78.4 | 14.2 | 74.6 | 80.6 | 1209 | 0.24 | 14 | 1441 | 40 | 25 |
| | 92.9 | 76.0 | 16.9 | 74.7 | 80.5 | 1209 | 0.24 | 14 | 1441 | 45 | 29 |
| | 93.2 | 76.3 | 16.9 | 74.7 | 80.4 | 1209 | 0.24 | 14 | 1441 | 50 | 29 |
| | 93.8 | 77.0 | 16.8 | 74.9 | 80.4 | 1209 | 0.24 | 14 | 1441 | 55 | 29 |
| | 94.3 | 76.9 | 17.4 | 75.0 | 80.5 | 1209 | 0.24 | 14 | 1442 | 0 | 30 |
| | 94.7 | 76.9 | 17.8 | 75.0 | 80.6 | 1209 | 0.24 | 14 | 1442 | 5 | 31 |
| | 95.2 | 76.8 | 18.4 | 75.2 | 80.8 | 1209 | 0.24 | 14 | 1442 | 10 | 32 |
| | 95.6 | 77.6 | 18.0 | 75.4 | 80.9 | 1209 | 0.24 | 14 | 1442 | 15 | 31 |
| | 95.9 | 77.5 | 18.4 | 75.4 | 80.9 | 1209 | 0.24 | 14 | 1442 | 20 | 32 |
| | 96.1 | 77.5 | 18.6 | 75.5 | 80.7 | 1209 | 0.24 | 14 | 1442 | 25 | 32 |
| | 96.6 | 79.5 | 17.1 | 75.8 | 80.7 | 1209 | 0.24 | 14 | 1442 | 30 | 30 |
| | 97.1 | 77.5 | 19.6 | 75.9 | 80.7 | 1209 | 0.24 | 14 | 1442 | 35 | 34 |
| | 97.4 | 79.9 | 17.5 | 75.9 | 80.8 | 1209 | 0.24 | 14 | 1442 | 40 | 30 |
| | 97.5 | 80.4 | 17.1 | 76.1 | 80.9 | 1209 | 0.24 | 14 | 1442 | 45 | 30 |
| | 98.0 | 80.6 | 17.4 | 76.3 | 80.8 | 1209 | 0.24 | 14 | 1442 | 50 | 30 |
| | 98.4 | 80.5 | 17.9 | 76.5 | 80.7 | 1209 | 0.24 | 14 | 1442 | 55 | 31 |
| | 98.8 | 81.0 | 17.8 | 76.5 | 80.7 | 1209 | 0.24 | 14 | 1443 | 0 | 31 |
| | 99.0 | 80.5 | 18.5 | 76.7 | 80.7 | 1209 | 0.24 | 14 | 1443 | 5 | 32 |
| | 99.4 | 80.5 | 18.9 | 76.9 | 80.6 | 1209 | 0.24 | 14 | 1443 | 10 | 33 |
| | 99.7 | 80.8 | 18.9 | 77.1 | 80.6 | 1209 | 0.24 | 14 | 1443 | 15 | 33 |
| | 100.1 | 81.4 | 18.7 | 77.2 | 80.6 | 1209 | 0.24 | 14 | 1443 | 20 | 32 |
| | 100.2 | 81.5 | 18.7 | 77.3 | 80.5 | 1209 | 0.24 | 14 | 1443 | 25 | 32 |
| | 100.4 | 81.3 | 19.1 | 77.6 | 80.4 | 1209 | 0.24 | 14 | 1443 | 30 | 33 |
| | 100.6 | 81.0 | 19.6 | 77.9 | 80.3 | 1209 | 0.24 | 14 | 1443 | 35 | 34 |
| | 100.6 | 81.3 | 19.3 | 77.7 | 80.2 | 1209 | 0.24 | 14 | 1443 | 40 | 33 |
| | 100.8 | 80.8 | 20.0 | 77.7 | 80.2 | 1209 | 0.24 | 14 | 1443 | 45 | 35 |
| | 101.0 | 81.3 | 19.7 | 78.0 | 80.3 | 1209 | 0.24 | 14 | 1443 | 50 | 34 |
| | 101.3 | 82.1 | 19.2 | 78.2 | 80.4 | 1209 | 0.24 | 14 | 1443 | 55 | 33 |
| | 101.6 | 81.4 | 20.2 | 78.3 | 80.5 | 1209 | 0.24 | 14 | 1444 | 0 | 35 |
| | 102.0 | 83.1 | 18.9 | 78.3 | 80.4 | 1209 | 0.24 | 14 | 1444 | 5 | 33 |
| | 102.1 | 81.0 | 21.1 | 78.2 | 80.5 | 1209 | 0.24 | 14 | 1444 | 10 | 36 |
| | 102.3 | 82.5 | 19.8 | 78.1 | 80.8 | 1209 | 0.24 | 14 | 1444 | 15 | 34 |
| | 102.5 | 83.3 | 19.2 | 78.4 | 81.0 | 1209 | 0.24 | 14 | 1444 | 20 | 33 |
| | 102.6 | 83.3 | 19.3 | 78.6 | 80.9 | 1209 | 0.24 | 14 | 1444 | 25 | 33 |
| | 102.8 | 83.0 | 19.8 | 78.7 | 80.8 | 1209 | 0.24 | 14 | 1444 | 30 | 34 |
| | 102.7 | 82.9 | 19.8 | 78.8 | 80.7 | 1209 | 0.24 | 14 | 1444 | 35 | 34 |
| | 103.1 | 82.2 | 20.9 | 78.9 | 80.6 | 1209 | 0.24 | 14 | 1444 | 40 | 36 |
| | 103.5 | 83.9 | 19.6 | 79.1 | 80.5 | 1209 | 0.24 | 14 | 1444 | 45 | 34 |
| | 103.5 | 83.4 | 20.1 | 79.2 | 80.5 | 1209 | 0.24 | 14 | 1444 | 50 | 35 |
| | 103.9 | 83.0 | 20.9 | 79.1 | 80.5 | 1209 | 0.24 | 14 | 1444 | 55 | 36 |
| | 103.9 | 83.5 | 20.4 | 79.2 | 80.5 | 1209 | 0.24 | 14 | 1445 | 0 | 35 |
| | 104.0 | 83.3 | 20.7 | 79.4 | 80.5 | 1209 | 0.24 | 14 | 1445 | 5 | 36 |
| | 104.4 | 84.0 | 20.4 | 79.6 | 80.5 | 1209 | 0.24 | 14 | 1445 | 10 | 35 |
| | 104.6 | 84.1 | 20.5 | 79.8 | 80.4 | 1209 | 0.24 | 14 | 1445 | 15 | 35 |
| | 104.6 | 83.9 | 20.7 | 80.0 | 80.5 | 1209 | 0.24 | 14 | 1445 | 20 | 36 |
| | 104.9 | 84.3 | 20.6 | 80.1 | 80.7 | 1209 | 0.24 | 14 | 1445 | 25 | 36 |
| | 105.1 | 83.8 | 21.3 | 80.0 | 80.8 | 1209 | 0.24 | 14 | 1445 | 30 | 37 |
| | 105.3 | 83.4 | 21.9 | 79.8 | 81.0 | 1209 | 0.24 | 14 | 1445 | 35 | 38 |
| | 105.5 | 83.5 | 22.0 | 80.0 | 80.9 | 1209 | 0.24 | 14 | 1445 | 40 | 38 |
| | 105.8 | 84.4 | 21.4 | 80.4 | 80.9 | 1209 | 0.24 | 14 | 1445 | 45 | 37 |
| | 105.7 | 83.6 | 22.1 | 80.7 | 81.0 | 1209 | 0.24 | 14 | 1445 | 50 | 38 |
| | 105.9 | 84.3 | 21.6 | 80.5 | 80.8 | 1209 | 0.24 | 14 | 1445 | 55 | 37 |
| | 106.0 | 84.7 | 21.3 | 80.3 | 80.7 | 1209 | 0.24 | 14 | 1446 | 0 | 37 |
| | 106.1 | 84.7 | 21.4 | 80.5 | 80.8 | 1209 | 0.24 | 14 | 1446 | 5 | 37 |
| | 106.1 | 84.8 | 21.3 | 80.3 | 80.8 | 1209 | 0.24 | 14 | 1446 | 10 | 37 |
| | 106.4 | 85.5 | 20.9 | 80.2 | 80.9 | 1209 | 0.24 | 14 | 1446 | 15 | 36 |
| | 106.3 | 86.0 | 20.3 | 80.7 | 80.7 | 1209 | 0.24 | 14 | 1446 | 20 | 35 |
| | 106.4 | 84.5 | 21.9 | 81.0 | 80.7 | 1209 | 0.24 | 14 | 1446 | 25 | 38 |
| | 106.5 | 83.8 | 22.7 | 81.3 | 80.6 | 1209 | 0.24 | 14 | 1446 | 30 | 39 |
| | 106.6 | 84.6 | 22.0 | 81.0 | 80.5 | 1209 | 0.24 | 14 | 1446 | 35 | 38 |
| | 107.1 | 84.6 | 22.5 | 81.2 | 80.5 | 1209 | 0.24 | 14 | 1446 | 40 | 39 |
| | 106.9 | 85.1 | 21.8 | 81.2 | 80.4 | 1209 | 0.24 | 14 | 1446 | 45 | 38 |
| | 107.2 | 85.1 | 22.1 | 81.4 | 80.4 | 1209 | 0.24 | 14 | 1446 | 50 | 38 |
| | 107.5 | 86.1 | 21.4 | 81.4 | 80.5 | 1209 | 0.24 | 14 | 1446 | 55 | 37 |
| | 107.5 | 85.6 | 21.9 | 81.7 | 80.4 | 1209 | 0.24 | 14 | 1447 | 0 | 38 |
| | 107.5 | 86.5 | 21.0 | 81.7 | 80.5 | 1209 | 0.24 | 14 | 1447 | 5 | 36 |
| | 107.5 | 87.1 | 20.4 | 81.4 | 80.3 | 1209 | 0.24 | 14 | 1447 | 10 | 35 |
| | 107.7 | 86.2 | 21.5 | 81.3 | 80.4 | 1209 | 0.24 | 14 | 1447 | 15 | 37 |

Heat Input
During Heating
cycle = 3487 btu's

Furnace Residual Heat Determination (9 Minute Heating On Cycle)

| | Tsupply | Tretum | Temp. rise | Room | Ambient | CFM | approx. specific heat of air | approx. specific volume (cu. Ft/lbm) | Time | sec | Btu's Supplied | |
|---|---------|--------|------------|------|---------|------|------------------------------|--------------------------------------|------|-----|----------------|---|
| | 107.8 | 86.1 | 21.7 | 81.6 | 80.5 | 1209 | 0.24 | 14 | 1447 | 20 | 37 | |
| | 108.2 | 86.3 | 21.9 | 81.5 | 80.5 | 1209 | 0.24 | 14 | 1447 | 25 | 38 | |
| | 108.3 | 86.1 | 22.2 | 81.6 | 80.5 | 1209 | 0.24 | 14 | 1447 | 30 | 38 | |
| | 108.8 | 86.7 | 22.1 | 81.8 | 80.7 | 1209 | 0.24 | 14 | 1447 | 35 | 38 | |
| | 108.9 | 86.2 | 22.7 | 81.5 | 80.8 | 1209 | 0.24 | 14 | 1447 | 40 | 39 | |
| | 109.1 | 86.0 | 23.1 | 81.6 | 81.0 | 1209 | 0.24 | 14 | 1447 | 45 | 40 | |
| | 109.3 | 86.5 | 22.8 | 81.8 | 81.0 | 1209 | 0.24 | 14 | 1447 | 50 | 39 | |
| | 109.3 | 86.7 | 22.6 | 82.3 | 81.1 | 1209 | 0.24 | 14 | 1447 | 55 | 39 | |
| | 109.5 | 86.3 | 23.2 | 82.2 | 81.2 | 1209 | 0.24 | 14 | 1448 | 0 | 40 | |
| | 109.4 | 86.3 | 23.1 | 82.3 | 81.3 | 1209 | 0.24 | 14 | 1448 | 5 | 40 | |
| | 109.7 | 86.4 | 23.3 | 82.4 | 81.2 | 1209 | 0.24 | 14 | 1448 | 10 | 40 | |
| | 109.9 | 86.8 | 23.1 | 82.6 | 81.2 | 1209 | 0.24 | 14 | 1448 | 15 | 40 | |
| | 110.1 | 86.7 | 23.4 | 82.3 | 81.3 | 1209 | 0.24 | 14 | 1448 | 20 | 40 | |
| | 110.1 | 87.2 | 22.9 | 82.6 | 81.2 | 1209 | 0.24 | 14 | 1448 | 25 | 40 | |
| | 110.4 | 87.2 | 23.2 | 82.8 | 81.2 | 1209 | 0.24 | 14 | 1448 | 30 | 40 | |
| | 110.6 | 89.1 | 21.5 | 82.8 | 81.1 | 1209 | 0.24 | 14 | 1448 | 35 | 37 | |
| | 110.7 | 86.9 | 23.8 | 83.0 | 80.9 | 1209 | 0.24 | 14 | 1448 | 40 | 41 | |
| | 110.6 | 87.4 | 23.2 | 83.0 | 80.8 | 1209 | 0.24 | 14 | 1448 | 45 | 40 | |
| | 110.9 | 87.0 | 23.9 | 82.8 | 80.7 | 1209 | 0.24 | 14 | 1448 | 50 | 41 | |
| | 110.9 | 89.2 | 21.7 | 82.5 | 80.5 | 1209 | 0.24 | 14 | 1448 | 55 | 37 | |
| | 111.0 | 89.2 | 21.8 | 82.8 | 80.5 | 1209 | 0.24 | 14 | 1449 | 0 | 38 | |
| Default Blower Off Delay | 111.3 | 87.4 | 23.9 | 83.0 | 80.5 | 1209 | 0.24 | 14 | 1449 | 5 | 41 | Default fan delay heat recovered = 637 btu's |
| | 111.3 | 87.1 | 24.2 | 83.2 | 80.5 | 1209 | 0.24 | 14 | 1449 | 10 | 42 | |
| | 110.8 | 87.5 | 23.3 | 83.3 | 80.5 | 1209 | 0.24 | 14 | 1449 | 15 | 40 | |
| | 110.2 | 87.2 | 23.0 | 83.4 | 80.5 | 1209 | 0.24 | 14 | 1449 | 20 | 40 | |
| | 109.6 | 87.3 | 22.3 | 83.0 | 80.6 | 1209 | 0.24 | 14 | 1449 | 25 | 39 | |
| | 108.7 | 87.3 | 21.4 | 82.9 | 80.7 | 1209 | 0.24 | 14 | 1449 | 30 | 37 | |
| | 107.5 | 87.2 | 20.3 | 83.0 | 80.9 | 1209 | 0.24 | 14 | 1449 | 35 | 35 | |
| | 106.2 | 87.7 | 18.5 | 83.2 | 80.9 | 1209 | 0.24 | 14 | 1449 | 40 | 32 | |
| | 105.2 | 87.0 | 18.2 | 83.0 | 80.8 | 1209 | 0.24 | 14 | 1449 | 45 | 31 | |
| | 104.7 | 90.3 | 14.4 | 82.9 | 80.8 | 1209 | 0.24 | 14 | 1449 | 50 | 25 | |
| | 103.8 | 90.0 | 13.8 | 82.9 | 80.7 | 1209 | 0.24 | 14 | 1449 | 55 | 24 | |
| | 103.1 | 87.6 | 15.5 | 83.3 | 80.8 | 1209 | 0.24 | 14 | 1450 | 0 | 27 | |
| | 102.2 | 87.3 | 14.9 | 83.2 | 80.9 | 1209 | 0.24 | 14 | 1450 | 5 | 26 | |
| | 101.3 | 88.4 | 12.9 | 83.3 | 80.8 | 1209 | 0.24 | 14 | 1450 | 10 | 22 | |
| | 100.6 | 87.5 | 13.1 | 83.4 | 80.7 | 1209 | 0.24 | 14 | 1450 | 15 | 23 | |
| | 99.8 | 88.5 | 11.3 | 83.4 | 80.6 | 1209 | 0.24 | 14 | 1450 | 20 | 20 | |
| | 99.1 | 86.1 | 13.0 | 83.2 | 80.6 | 1209 | 0.24 | 14 | 1450 | 25 | 22 | |
| | 98.3 | 86.0 | 12.3 | 83.2 | 80.5 | 1209 | 0.24 | 14 | 1450 | 30 | 21 | |
| | 97.6 | 87.9 | 9.7 | 83.3 | 80.5 | 1209 | 0.24 | 14 | 1450 | 35 | 17 | |
| | 97.1 | 88.1 | 9.0 | 83.3 | 80.5 | 1209 | 0.24 | 14 | 1450 | 40 | 16 | |
| Potential Heat Recovery With Extended Delay | 96.5 | 90.1 | 6.4 | 83.1 | 80.5 | 1209 | 0.24 | 14 | 1450 | 45 | 11 | Potential heat recovery after default fan delay = 188 btu's |
| | 96.0 | 86.4 | 9.6 | 83.0 | 80.7 | 1209 | 0.24 | 14 | 1450 | 50 | 17 | |
| | 95.5 | 86.4 | 9.1 | 82.8 | 80.7 | 1209 | 0.24 | 14 | 1450 | 55 | 16 | |
| | 95.1 | 86.1 | 9.0 | 83.1 | 80.7 | 1209 | 0.24 | 14 | 1451 | 0 | 16 | |
| | 94.5 | 86.4 | 8.1 | 82.9 | 80.7 | 1209 | 0.24 | 14 | 1451 | 5 | 14 | |
| | 93.7 | 86.4 | 7.3 | 82.9 | 80.7 | 1209 | 0.24 | 14 | 1451 | 10 | 13 | |
| | 93.4 | 86.4 | 7.0 | 82.8 | 80.8 | 1209 | 0.24 | 14 | 1451 | 15 | 12 | |
| | 92.9 | 86.3 | 6.6 | 82.7 | 80.7 | 1209 | 0.24 | 14 | 1451 | 20 | 11 | |
| | 92.5 | 86.1 | 6.4 | 82.6 | 80.7 | 1209 | 0.24 | 14 | 1451 | 25 | 11 | |
| | 92.2 | 86.0 | 6.2 | 82.7 | 80.6 | 1209 | 0.24 | 14 | 1451 | 30 | 11 | |
| | 91.8 | 86.8 | 5.0 | 82.5 | 80.7 | 1209 | 0.24 | 14 | 1451 | 35 | 9 | |
| | 91.4 | 87.1 | 4.3 | 82.5 | 80.7 | 1209 | 0.24 | 14 | 1451 | 40 | 7 | |
| | 91.0 | 87.3 | 3.7 | 82.3 | 80.7 | 1209 | 0.24 | 14 | 1451 | 45 | 6 | |
| | 90.6 | 85.8 | 4.8 | 82.0 | 80.7 | 1209 | 0.24 | 14 | 1451 | 50 | 8 | |
| | 90.3 | 85.8 | 4.5 | 81.9 | 80.6 | 1209 | 0.24 | 14 | 1451 | 55 | 8 | |
| | 90.1 | 84.9 | 5.2 | 81.8 | 80.5 | 1209 | 0.24 | 14 | 1452 | 0 | 9 | |
| | 89.5 | 84.9 | 4.6 | 81.6 | 80.6 | 1209 | 0.24 | 14 | 1452 | 5 | 8 | |
| | 89.2 | 85.0 | 4.2 | 81.6 | 80.4 | 1209 | 0.24 | 14 | 1452 | 10 | 7 | |
| | 89.0 | 85.3 | 3.7 | 81.6 | 80.5 | 1209 | 0.24 | 14 | 1452 | 15 | 6 | |
| | 88.7 | 85.0 | 3.7 | 81.7 | 80.6 | 1209 | 0.24 | 14 | 1452 | 20 | 6 | |
| | 88.4 | 84.5 | 3.9 | 81.7 | 80.6 | 1209 | 0.24 | 14 | 1452 | 25 | 7 | |
| | 87.9 | 84.5 | 3.4 | 81.4 | 80.6 | 1209 | 0.24 | 14 | 1452 | 30 | 6 | |
| | 87.4 | 84.0 | 3.4 | 81.4 | 80.6 | 1209 | 0.24 | 14 | 1452 | 35 | 6 | |
| | 86.9 | 84.4 | 2.5 | 81.3 | 80.7 | 1209 | 0.24 | 14 | 1452 | 40 | 4 | |
| | 86.7 | 84.1 | 2.6 | 81.1 | 80.8 | 1209 | 0.24 | 14 | 1452 | 45 | 4 | |
| | 86.2 | 83.9 | 2.3 | 81.1 | 80.8 | 1209 | 0.24 | 14 | 1452 | 50 | 4 | |
| | 85.8 | 83.8 | 2.0 | 81.1 | 81.1 | 1209 | 0.24 | 14 | 1452 | 55 | 3 | |
| | 85.3 | 83.8 | 1.5 | 80.9 | 81.2 | 1209 | 0.24 | 14 | 1453 | 0 | 3 | |
| | 84.8 | 83.8 | 1.0 | 80.9 | 81.0 | 1209 | 0.24 | 14 | 1453 | 5 | 2 | |
| | 84.5 | 84.0 | 0.5 | 80.8 | 81.1 | 1209 | 0.24 | 14 | 1453 | 10 | 1 | |
| | 84.0 | 83.6 | 0.4 | 80.7 | 81.2 | 1209 | 0.24 | 14 | 1453 | 15 | 1 | |

Blower Wattage = 370

APPENDIX II
ANALYSIS OF DEVICE B SCG0077 TESTS OF 3/21/13
(DEVICE B CHIP)

This analysis will not consider the case of degraded temperature sensors.

CASE NO. 1

See Fig. 3 and Table 5

Test 1 is without the DEVICE B, Test 2 is with the DEVICE B with ambient temperatures around 22 °F.

Although not stated, the 80% efficient gas furnace with a BTU input of 32,689 in 14.8 minutes is probably rated at approximately 165,000 BTU/h.

The additional heat supplied to the space with the DEVICE B (18,493 BTU compared with 18,147 BTU without the DEVICE B), at high blower speed, was responsible for a furnace ON time of only 13.7 minutes, 1.1 minutes less than 14.8 minutes without the DEVICE B. And very significantly, this increased furnace OFF cycle time from 16.3 to 16.7 minutes. (An increase of 0.4 minute was also found in BR Lab tests but at a higher ambient temperature). This shorter ON time resulted in only 30,118 BTU used by the furnace compared with 32,689 BTU without the DEVICE B.

This means that the length of a heating cycle:

Without the DEVICE B, 14.8 + 16.3 or 31.1 minutes

With the DEVICE B, 13.7 + 16.7 or 30.4 minutes

And the number of heating cycles in a 24 hr period is:

Without the DEVICE B, $\frac{24 \times 60}{31.1} = 46.3$

With the DEVICE B, $\frac{24 \times 60}{30.4} = 47.4$

Thus the BTU energy used by the furnace over a 24 hour period is:

Without the DEVICE B, $46.3 \times 32,689 = 1,513,500$

With the DEVICE B, $47.4 \times 30,118 = 1,427,593$

$$\begin{aligned} \text{Percent Reduction} &= \frac{1,513,500 - 1,427,593}{1,513,500} \times 100\% \\ &= \frac{85,907}{1,513,500} \times 100\% = 5.7\% \end{aligned}$$

close to the 5.9% shown in Table 5.

But there are no additional savings from Run Time and Off Cycle time claimed in Table 5 as 9.9% with an average of 7.9%.

There is a gas saving of 5.7% over a 24-hour period with the DEVICE B.

Note: This furnace used a temperature sensor to extend fan run time 4.2 minutes without the DEVICE B, compared with 4.0 minutes with the DEVICE B, so no savings resulted from extending fan run time. However, these 4 minutes were at a higher fan speed, and could account for the slight increase of 346 BTU being added to the room with the DEVICE B. The perceived increase in efficiency (from 55.5% to 61.4%) calculated on the basis of one cycle does not take into account the effect of more cycles in a given period of 24 hours.

There is a slight increase in Wh electrical energy use with the DEVICE B from 194 to 206, or 37 BTU equivalent per heating cycle, not enough to change the overall savings of 5.7%.

CASE NO. 2

See Fig. 4 and Table 6

In this case, fan delay after furnace OFF is increased from 1.5 to 4 minutes by the action of the DEVICE B, resulting in a furnace OFF cycle time of 19.2 minutes compared with 18.0 minutes without the DEVICE B. As before, length of heating cycle is:

Without DEVICE B: 32.8 minutes,

With DEVICE B: 34 minutes

Number of heating cycles is:

Without DEVICE B: $\frac{24 \times 60}{32.8} = 43.9$

With DEVICE B: $\frac{24 \times 60}{34} = 42.3$

Total BTU used by furnace:

Without DEVICE B: $43.9 \times 32,689 = 1,435,047$

With DEVICE B: $42.3 \times 32,689 = 1,384,475$

$$\begin{aligned} \text{Percent Reduction} &= \frac{1,435,047 - 1,384,475}{1,435,047} \times 100\% \\ &= \frac{50,572}{1,435,047} \times 100\% = 3.5\% \text{ not } 5.4\% \end{aligned}$$

In this case the additional heat supplied to the space of 1754 BTU comes from an additional 2 ½ minutes of high speed fan time.

These figures are in line with those found by BR Labs, and would be even closer if comparison was made using the manufacturer's setting on our new furnace of 2 minute default fan run time, rather than 1 ½ minutes in these tests.

Comment

It is not possible to claim that an increase in efficiency of any given amount automatically equates to the same percent savings of fuel.

If a car's engine is improved to give 25 mpg compared with the initial 20 mpg, this results in an increase in "efficiency" of $\frac{25 - 20}{20} \times 100\%$ or 25%.

But if a car is never driven there are no fuel savings. So let us assume a trip of 100 miles at the two rates:

Fuel use at 20 mpg is 5 gallons

Fuel use at 25 mpg is 4 gallons

Fuel savings = $\frac{5 - 4}{5} \times 100\% = 20\%$

In the same way, we have to compare fuel use in a furnace heating system for a given heating load, which is to maintain a space at a given temperature for a given period of time, namely 24 hr.

In Case No. 2, the DEVICE B saved approximately 0.5 therm compared with 14 therms, or 3.5%. A comparison must be made on amount of fuel, not on "efficiency."

There was no mention of the effect of the higher efficiency due to the DEVICE B on space temperatures. If in fact the comfort level is increased by the DEVICE B, perhaps the thermostat setting could be reduced to increase fuel savings.

With ambient temperatures in these two tests around 20 to 30 °F, and furnace run times around 15 minutes, with a furnace capacity around 150,000 BTU/h, these results are hardly representative of coastal residences. So it is very important to state savings on the basis of climate zone.

Finally, the installation of the DEVICE B on a system that has been found to have a "degraded" temperature sensor for determining fan shut off is probably a very quick and less costly way to improve the system. But, it seems a bit disingenuous to claim "savings" by the DEVICE B when installed on an improperly operating heating system.

APPENDIX III
DEVICE B CHIP TESTS DONE BY BR LABS

Device B Heat Recovery Test (6 Minute Heating On Cycle), Sample 1, Test 1

| | Tsupply | Treturn | Temp. rise | Room | Ambient | CFM | approx. specific heat of air | approx. specific volume (cu. Ft/lbm) | Time | sec | Btu's Supplied |
|--------------------|---------|---------|------------|------|---------|------|---------------------------------|---|------|-----|-------------------|
| Furnace Heating On | 74.1 | 73.2 | 0.9 | 73.0 | 76.0 | 1207 | 0.24 | 14 | 1330 | 0 | 1 |
| | 74.1 | 73.3 | 0.8 | 73.0 | 75.9 | 1207 | 0.24 | 14 | 1330 | 5 | 1 |
| | 74.1 | 73.3 | 0.8 | 73.0 | 75.9 | 1207 | 0.24 | 14 | 1330 | 10 | 1 |
| | 74.2 | 73.4 | 0.8 | 73.0 | 76.1 | 1207 | 0.24 | 14 | 1330 | 15 | 1 |
| | 74.2 | 73.4 | 0.9 | 73.0 | 76.0 | 1207 | 0.24 | 14 | 1330 | 20 | 1 |
| | 74.2 | 73.4 | 0.8 | 73.0 | 75.9 | 1207 | 0.24 | 14 | 1330 | 25 | 1 |
| | 74.2 | 73.4 | 0.8 | 73.1 | 76.0 | 1207 | 0.24 | 14 | 1330 | 30 | 1 |
| | 74.2 | 73.4 | 0.8 | 73.0 | 75.9 | 1207 | 0.24 | 14 | 1330 | 35 | 1 |
| | 73.9 | 73.4 | 0.4 | 73.1 | 76.0 | 1207 | 0.24 | 14 | 1330 | 40 | 1 |
| | 73.8 | 73.5 | 0.3 | 73.0 | 76.0 | 1207 | 0.24 | 14 | 1330 | 45 | 1 |
| | 73.9 | 73.5 | 0.3 | 73.1 | 76.2 | 1207 | 0.24 | 14 | 1330 | 50 | 1 |
| | 73.9 | 73.6 | 0.2 | 73.1 | 76.2 | 1207 | 0.24 | 14 | 1330 | 55 | 0 |
| | 74.3 | 73.6 | 0.7 | 73.1 | 76.4 | 1207 | 0.24 | 14 | 1331 | 0 | 1 |
| | 76.6 | 73.6 | 3.0 | 73.2 | 76.5 | 1207 | 0.24 | 14 | 1331 | 5 | 5 |
| | 78.7 | 73.8 | 4.9 | 73.4 | 76.5 | 1207 | 0.24 | 14 | 1331 | 10 | 8 |
| | 80.2 | 74.1 | 6.1 | 73.4 | 76.2 | 1207 | 0.24 | 14 | 1331 | 15 | 11 |
| | 81.9 | 74.3 | 7.6 | 73.4 | 76.3 | 1207 | 0.24 | 14 | 1331 | 20 | 13 |
| | 83.2 | 74.6 | 8.6 | 73.6 | 76.4 | 1207 | 0.24 | 14 | 1331 | 25 | 15 |
| | 84.6 | 74.8 | 9.8 | 73.6 | 76.4 | 1207 | 0.24 | 14 | 1331 | 30 | 17 |
| | 85.6 | 74.7 | 10.9 | 73.8 | 76.2 | 1207 | 0.24 | 14 | 1331 | 35 | 19 |
| | 86.4 | 75.4 | 11.0 | 74.3 | 76.1 | 1207 | 0.24 | 14 | 1331 | 40 | 19 |
| | 87.2 | 76.0 | 11.2 | 74.4 | 75.8 | 1207 | 0.24 | 14 | 1331 | 45 | 19 |
| | 88.1 | 76.6 | 11.5 | 74.8 | 75.7 | 1207 | 0.24 | 14 | 1331 | 50 | 20 |
| | 88.6 | 76.9 | 11.7 | 75.0 | 75.6 | 1207 | 0.24 | 14 | 1331 | 55 | 20 |
| | 89.2 | 77.6 | 11.6 | 75.3 | 75.8 | 1207 | 0.24 | 14 | 1332 | 0 | 20 |
| | 89.9 | 76.8 | 13.1 | 75.1 | 75.9 | 1207 | 0.24 | 14 | 1332 | 5 | 23 |
| | 90.8 | 76.3 | 14.5 | 75.2 | 76.0 | 1207 | 0.24 | 14 | 1332 | 10 | 25 |
| | 91.6 | 76.7 | 14.9 | 75.3 | 75.8 | 1207 | 0.24 | 14 | 1332 | 15 | 26 |
| | 92.4 | 77.0 | 15.4 | 75.5 | 75.9 | 1207 | 0.24 | 14 | 1332 | 20 | 27 |
| | 92.8 | 77.6 | 15.2 | 75.7 | 75.7 | 1207 | 0.24 | 14 | 1332 | 25 | 26 |
| | 93.0 | 78.7 | 14.3 | 75.8 | 75.7 | 1207 | 0.24 | 14 | 1332 | 30 | 25 |
| | 93.7 | 78.8 | 14.8 | 76.3 | 75.9 | 1207 | 0.24 | 14 | 1332 | 35 | 26 |
| | 94.5 | 78.5 | 16.0 | 76.1 | 75.9 | 1207 | 0.24 | 14 | 1332 | 40 | 28 |
| | 95.1 | 78.9 | 16.2 | 76.1 | 76.0 | 1207 | 0.24 | 14 | 1332 | 45 | 28 |
| | 95.4 | 79.8 | 15.7 | 76.5 | 75.9 | 1207 | 0.24 | 14 | 1332 | 50 | 27 |
| | 95.8 | 80.5 | 15.3 | 76.8 | 76.3 | 1207 | 0.24 | 14 | 1332 | 55 | 26 |
| | 96.3 | 80.9 | 15.4 | 76.8 | 76.3 | 1207 | 0.24 | 14 | 1333 | 0 | 27 |
| | 97.2 | 81.3 | 15.9 | 77.0 | 76.4 | 1207 | 0.24 | 14 | 1333 | 5 | 27 |
| | 98.0 | 81.5 | 16.5 | 77.0 | 76.6 | 1207 | 0.24 | 14 | 1333 | 10 | 28 |
| | 98.5 | 81.8 | 16.7 | 77.1 | 76.6 | 1207 | 0.24 | 14 | 1333 | 15 | 29 |
| | 98.6 | 82.9 | 15.8 | 77.3 | 76.4 | 1207 | 0.24 | 14 | 1333 | 20 | 27 |
| | 99.1 | 83.2 | 15.9 | 77.7 | 76.4 | 1207 | 0.24 | 14 | 1333 | 25 | 27 |
| | 99.6 | 83.1 | 16.4 | 77.6 | 76.0 | 1207 | 0.24 | 14 | 1333 | 30 | 28 |
| | 100.1 | 83.5 | 16.6 | 77.9 | 75.8 | 1207 | 0.24 | 14 | 1333 | 35 | 29 |
| | 100.5 | 84.1 | 16.4 | 77.7 | 75.6 | 1207 | 0.24 | 14 | 1333 | 40 | 28 |
| | 100.5 | 83.1 | 17.4 | 77.5 | 75.4 | 1207 | 0.24 | 14 | 1333 | 45 | 30 |
| | 101.0 | 83.0 | 18.0 | 78.1 | 75.4 | 1207 | 0.24 | 14 | 1333 | 50 | 31 |
| | 101.4 | 84.5 | 16.9 | 78.2 | 75.6 | 1207 | 0.24 | 14 | 1333 | 55 | 29 |
| | 101.9 | 84.8 | 17.0 | 78.5 | 75.9 | 1207 | 0.24 | 14 | 1334 | 0 | 29 |
| | 102.4 | 85.6 | 16.9 | 78.7 | 76.1 | 1207 | 0.24 | 14 | 1334 | 5 | 29 |
| | 102.5 | 84.6 | 17.9 | 78.6 | 76.0 | 1207 | 0.24 | 14 | 1334 | 10 | 31 |
| | 103.0 | 84.2 | 18.7 | 78.7 | 75.8 | 1207 | 0.24 | 14 | 1334 | 15 | 32 |
| | 103.2 | 84.6 | 18.6 | 78.9 | 75.6 | 1207 | 0.24 | 14 | 1334 | 20 | 32 |
| | 103.3 | 85.1 | 18.2 | 79.3 | 76.1 | 1207 | 0.24 | 14 | 1334 | 25 | 31 |
| | 103.7 | 85.5 | 18.2 | 79.0 | 76.2 | 1207 | 0.24 | 14 | 1334 | 30 | 31 |
| | 104.1 | 86.6 | 17.5 | 79.2 | 76.1 | 1207 | 0.24 | 14 | 1334 | 35 | 30 |
| | 104.3 | 86.9 | 17.4 | 79.2 | 75.9 | 1207 | 0.24 | 14 | 1334 | 40 | 30 |
| | 104.7 | 86.4 | 18.3 | 79.4 | 75.7 | 1207 | 0.24 | 14 | 1334 | 45 | 32 |
| | 105.2 | 85.2 | 19.9 | 79.3 | 75.4 | 1207 | 0.24 | 14 | 1334 | 50 | 34 |
| | 105.3 | 84.6 | 20.7 | 79.4 | 75.5 | 1207 | 0.24 | 14 | 1334 | 55 | 36 |
| | 105.6 | 85.1 | 20.5 | 79.3 | 75.8 | 1207 | 0.24 | 14 | 1335 | 0 | 35 |
| | 105.8 | 87.1 | 18.7 | 79.6 | 76.0 | 1207 | 0.24 | 14 | 1335 | 5 | 32 |
| | 105.8 | 88.2 | 17.6 | 80.0 | 76.1 | 1207 | 0.24 | 14 | 1335 | 10 | 30 |
| | 106.2 | 87.5 | 18.6 | 80.3 | 76.3 | 1207 | 0.24 | 14 | 1335 | 15 | 32 |
| | 106.5 | 86.1 | 20.4 | 80.7 | 76.6 | 1207 | 0.24 | 14 | 1335 | 20 | 35 |
| | 106.5 | 85.5 | 21.0 | 81.0 | 76.6 | 1207 | 0.24 | 14 | 1335 | 25 | 36 |
| | 106.7 | 85.9 | 20.8 | 80.9 | 76.6 | 1207 | 0.24 | 14 | 1335 | 30 | 36 |
| | 107.3 | 86.5 | 20.8 | 81.0 | 76.8 | 1207 | 0.24 | 14 | 1335 | 35 | 36 |
| | 107.0 | 86.8 | 20.2 | 81.0 | 76.9 | 1207 | 0.24 | 14 | 1335 | 40 | 35 |
| | 107.2 | 86.8 | 20.4 | 80.7 | 77.0 | 1207 | 0.24 | 14 | 1335 | 45 | 35 |
| | 107.4 | 86.0 | 21.4 | 80.6 | 77.3 | 1207 | 0.24 | 14 | 1335 | 50 | 37 |
| | 107.7 | 85.5 | 22.2 | 81.1 | 76.9 | 1207 | 0.24 | 14 | 1335 | 55 | 38 |
| | 107.9 | 85.5 | 22.4 | 81.1 | 76.8 | 1207 | 0.24 | 14 | 1336 | 0 | 39 |

Heat Input
During Heating
cycle = 1662 btu's

Device B Heat Recovery Test (6 Minute Heating On Cycle), Sample 1, Test 1

| | Tsupply | Treturn | Temp. rise | Room | Ambient | CFM | approx. specific heat of air | approx. specific volume (cu. Ft/lbm) | Time | sec | Btu's Supplied | |
|---------------------------------------|---------|---------|------------|------|---------|------|------------------------------|--------------------------------------|------|-----|----------------|--|
| Default Blower Off Delay | 107.9 | 85.5 | 22.4 | 81.1 | 76.8 | 1207 | 0.24 | 14 | 1336 | 0 | 39 | Default fan delay heat recovered = 568 btu's |
| | 108.1 | 87.2 | 20.9 | 80.7 | 76.5 | 1207 | 0.24 | 14 | 1336 | 5 | 36 | |
| | 108.1 | 88.6 | 19.6 | 80.5 | 76.1 | 1207 | 0.24 | 14 | 1336 | 10 | 34 | |
| | 108.4 | 88.6 | 19.8 | 80.6 | 75.8 | 1207 | 0.24 | 14 | 1336 | 15 | 34 | |
| | 108.4 | 88.2 | 20.2 | 81.2 | 75.9 | 1207 | 0.24 | 14 | 1336 | 20 | 35 | |
| | 108.4 | 87.3 | 21.1 | 81.0 | 76.0 | 1207 | 0.24 | 14 | 1336 | 25 | 36 | |
| | 108.3 | 87.0 | 21.3 | 81.2 | 76.3 | 1207 | 0.24 | 14 | 1336 | 30 | 37 | |
| | 107.7 | 89.4 | 18.3 | 81.3 | 76.5 | 1207 | 0.24 | 14 | 1336 | 35 | 32 | |
| | 107.3 | 90.4 | 16.9 | 81.2 | 76.4 | 1207 | 0.24 | 14 | 1336 | 40 | 29 | |
| | 106.4 | 90.1 | 16.3 | 81.3 | 76.5 | 1207 | 0.24 | 14 | 1336 | 45 | 28 | |
| | 105.5 | 88.4 | 17.1 | 81.4 | 76.6 | 1207 | 0.24 | 14 | 1336 | 50 | 29 | |
| | 104.8 | 90.6 | 14.2 | 81.4 | 76.6 | 1207 | 0.24 | 14 | 1336 | 55 | 24 | |
| | 104.0 | 91.6 | 12.5 | 81.5 | 76.8 | 1207 | 0.24 | 14 | 1337 | 0 | 22 | |
| | 103.3 | 91.9 | 11.3 | 81.7 | 76.9 | 1207 | 0.24 | 14 | 1337 | 5 | 20 | |
| | 102.4 | 92.5 | 9.9 | 82.1 | 77.0 | 1207 | 0.24 | 14 | 1337 | 10 | 17 | |
| | 101.5 | 92.5 | 9.0 | 82.1 | 77.1 | 1207 | 0.24 | 14 | 1337 | 15 | 16 | |
| | 101.0 | 91.6 | 9.4 | 82.0 | 77.2 | 1207 | 0.24 | 14 | 1337 | 20 | 16 | |
| | 100.3 | 90.8 | 9.4 | 81.7 | 77.2 | 1207 | 0.24 | 14 | 1337 | 25 | 16 | |
| | 99.4 | 91.3 | 8.1 | 81.7 | 77.1 | 1207 | 0.24 | 14 | 1337 | 30 | 14 | |
| | 98.7 | 91.8 | 6.9 | 81.6 | 77.0 | 1207 | 0.24 | 14 | 1337 | 35 | 12 | |
| | 98.0 | 91.6 | 6.4 | 81.7 | 76.8 | 1207 | 0.24 | 14 | 1337 | 40 | 11 | |
| | 97.4 | 90.7 | 6.7 | 81.7 | 76.8 | 1207 | 0.24 | 14 | 1337 | 45 | 12 | |
| | 96.9 | 90.7 | 6.3 | 81.7 | 76.8 | 1207 | 0.24 | 14 | 1337 | 50 | 11 | |
| | 96.4 | 91.2 | 5.1 | 81.4 | 76.8 | 1207 | 0.24 | 14 | 1337 | 55 | 9 | |
| Device B Extended Blower Delay | 95.7 | 90.8 | 4.9 | 81.4 | 76.9 | 0 | 0.24 | 14 | 1338 | 0 | 0 | heat recovery after default fan delay = 0 btu's |
| | 95.2 | 90.7 | 4.5 | 81.3 | 76.9 | 0 | 0.24 | 14 | 1338 | 5 | 0 | |
| | 94.7 | 90.2 | 4.4 | 81.3 | 77.0 | 0 | 0.24 | 14 | 1338 | 10 | 0 | |
| | 94.1 | 90.0 | 4.1 | 81.2 | 77.0 | 0 | 0.24 | 14 | 1338 | 15 | 0 | |
| | 93.7 | 89.6 | 4.1 | 80.9 | 77.0 | 0 | 0.24 | 14 | 1338 | 20 | 0 | |
| | 93.4 | 89.3 | 4.2 | 80.7 | 77.0 | 0 | 0.24 | 14 | 1338 | 25 | 0 | |
| | 93.3 | 89.2 | 4.1 | 80.6 | 77.0 | 0 | 0.24 | 14 | 1338 | 30 | 0 | |
| | 93.1 | 89.1 | 3.9 | 80.4 | 77.0 | 0 | 0.24 | 14 | 1338 | 35 | 0 | |
| | 93.1 | 89.1 | 4.0 | 80.4 | 76.8 | 0 | 0.24 | 14 | 1338 | 40 | 0 | |
| | 93.1 | 88.7 | 4.3 | 80.3 | 76.6 | 0 | 0.24 | 14 | 1338 | 45 | 0 | |
| | 93.0 | 88.1 | 4.9 | 80.2 | 76.6 | 0 | 0.24 | 14 | 1338 | 50 | 0 | |
| | 93.4 | 87.6 | 5.8 | 80.2 | 76.4 | 0 | 0.24 | 14 | 1338 | 55 | 0 | |

Blower Wattage = 370

Comments: Device B device extended the blower on time after the default delay time by 0 minutes, 0 seconds.

Furnace heat input = HV x (volume of gas consumed) = 1040 btu/ft³ x 5.3 ft³ = 5512 btu

Device B Heat Recovery Test (7 Minute Heating On Cycle), Sample 1, Test 1

| Tsupply | Treturn | Temp. rise | Room | Ambient | CFM | approx. specific heat of air | approx. specific volume (cu. Ft/lbm) | Time | sec | Btu's Supplied |
|---------|---------|------------|------|---------|------|------------------------------|--------------------------------------|------|-----|----------------|
| 70.8 | 70.3 | 0.5 | 70.8 | 76.5 | 1208 | 0.24 | 14 | 1301 | 0 | 1 |
| 72.5 | 70.3 | 2.2 | 70.9 | 76.6 | 1208 | 0.24 | 14 | 1301 | 5 | 4 |
| 72.3 | 70.6 | 1.7 | 71.0 | 76.3 | 1208 | 0.24 | 14 | 1301 | 10 | 3 |
| 72.1 | 70.6 | 1.5 | 71.1 | 76.0 | 1208 | 0.24 | 14 | 1301 | 15 | 3 |
| 71.8 | 70.7 | 1.1 | 71.1 | 75.9 | 1208 | 0.24 | 14 | 1301 | 20 | 2 |
| 71.6 | 70.7 | 0.9 | 71.1 | 76.2 | 1208 | 0.24 | 14 | 1301 | 25 | 2 |
| 71.5 | 70.7 | 0.8 | 71.2 | 76.5 | 1208 | 0.24 | 14 | 1301 | 30 | 1 |
| 71.4 | 70.6 | 0.8 | 71.2 | 76.6 | 1208 | 0.24 | 14 | 1301 | 35 | 1 |
| 71.5 | 70.5 | 1.0 | 71.3 | 76.2 | 1208 | 0.24 | 14 | 1301 | 40 | 2 |
| 71.5 | 70.6 | 0.9 | 71.3 | 75.7 | 1208 | 0.24 | 14 | 1301 | 45 | 2 |
| 71.5 | 70.6 | 0.9 | 71.3 | 75.6 | 1208 | 0.24 | 14 | 1301 | 50 | 2 |
| 71.3 | 70.7 | 0.6 | 71.4 | 75.8 | 1208 | 0.24 | 14 | 1301 | 55 | 1 |
| 71.8 | 70.7 | 1.1 | 71.4 | 76.2 | 1208 | 0.24 | 14 | 1302 | 0 | 2 |
| 72.3 | 70.5 | 1.8 | 71.4 | 76.4 | 1208 | 0.24 | 14 | 1302 | 5 | 3 |
| 72.5 | 70.3 | 2.2 | 71.5 | 76.2 | 1208 | 0.24 | 14 | 1302 | 10 | 4 |
| 74.2 | 70.6 | 3.6 | 71.6 | 75.6 | 1208 | 0.24 | 14 | 1302 | 15 | 6 |
| 75.8 | 70.8 | 5.0 | 71.7 | 75.6 | 1208 | 0.24 | 14 | 1302 | 20 | 9 |
| 77.4 | 71.0 | 6.4 | 71.8 | 75.9 | 1208 | 0.24 | 14 | 1302 | 25 | 11 |
| 78.5 | 71.2 | 7.3 | 72.0 | 76.2 | 1208 | 0.24 | 14 | 1302 | 30 | 13 |
| 79.6 | 71.4 | 8.2 | 72.2 | 76.2 | 1208 | 0.24 | 14 | 1302 | 35 | 14 |
| 80.8 | 71.9 | 8.9 | 72.2 | 75.9 | 1208 | 0.24 | 14 | 1302 | 40 | 15 |
| 81.7 | 72.6 | 9.1 | 72.5 | 75.8 | 1208 | 0.24 | 14 | 1302 | 45 | 16 |
| 82.4 | 73.1 | 9.3 | 72.7 | 75.6 | 1208 | 0.24 | 14 | 1302 | 50 | 16 |
| 83.2 | 73.3 | 9.9 | 72.8 | 75.5 | 1208 | 0.24 | 14 | 1302 | 55 | 17 |
| 84.1 | 73.6 | 10.5 | 72.9 | 75.8 | 1208 | 0.24 | 14 | 1303 | 0 | 18 |
| 84.8 | 73.4 | 11.4 | 72.9 | 76.0 | 1208 | 0.24 | 14 | 1303 | 5 | 20 |
| 85.7 | 73.4 | 12.3 | 72.9 | 75.6 | 1208 | 0.24 | 14 | 1303 | 10 | 21 |
| 86.7 | 73.8 | 12.9 | 73.3 | 75.0 | 1208 | 0.24 | 14 | 1303 | 15 | 22 |
| 87.9 | 73.6 | 14.3 | 73.6 | 75.1 | 1208 | 0.24 | 14 | 1303 | 20 | 25 |
| 88.5 | 74.7 | 13.8 | 73.9 | 75.6 | 1208 | 0.24 | 14 | 1303 | 25 | 24 |
| 88.9 | 74.1 | 14.8 | 74.4 | 75.9 | 1208 | 0.24 | 14 | 1303 | 30 | 26 |
| 89.5 | 73.7 | 15.8 | 74.8 | 76.1 | 1208 | 0.24 | 14 | 1303 | 35 | 27 |
| 90.3 | 74.1 | 16.2 | 75.2 | 76.1 | 1208 | 0.24 | 14 | 1303 | 40 | 28 |
| 91.2 | 75.0 | 16.2 | 75.2 | 75.9 | 1208 | 0.24 | 14 | 1303 | 45 | 28 |
| 91.6 | 75.0 | 16.6 | 75.0 | 76.0 | 1208 | 0.24 | 14 | 1303 | 50 | 29 |
| 92.3 | 75.6 | 16.7 | 75.3 | 76.1 | 1208 | 0.24 | 14 | 1303 | 55 | 29 |
| 92.7 | 76.2 | 16.5 | 75.6 | 76.4 | 1208 | 0.24 | 14 | 1304 | 0 | 28 |
| 93.3 | 76.6 | 16.7 | 75.7 | 76.3 | 1208 | 0.24 | 14 | 1304 | 5 | 29 |
| 93.7 | 77.6 | 16.1 | 75.7 | 75.9 | 1208 | 0.24 | 14 | 1304 | 10 | 28 |
| 93.8 | 78.0 | 15.8 | 75.6 | 75.4 | 1208 | 0.24 | 14 | 1304 | 15 | 27 |
| 94.2 | 78.1 | 16.1 | 75.5 | 75.3 | 1208 | 0.24 | 14 | 1304 | 20 | 28 |
| 94.9 | 78.9 | 16.0 | 76.1 | 75.6 | 1208 | 0.24 | 14 | 1304 | 25 | 28 |
| 95.4 | 78.6 | 16.8 | 76.3 | 75.4 | 1208 | 0.24 | 14 | 1304 | 30 | 29 |
| 95.9 | 78.3 | 17.6 | 76.5 | 75.6 | 1208 | 0.24 | 14 | 1304 | 35 | 30 |
| 96.4 | 79.4 | 17.0 | 76.9 | 75.6 | 1208 | 0.24 | 14 | 1304 | 40 | 29 |
| 96.7 | 79.7 | 17.0 | 77.0 | 75.5 | 1208 | 0.24 | 14 | 1304 | 45 | 29 |
| 97.6 | 79.7 | 17.9 | 77.3 | 75.6 | 1208 | 0.24 | 14 | 1304 | 50 | 31 |
| 97.8 | 80.5 | 17.3 | 77.0 | 76.0 | 1208 | 0.24 | 14 | 1304 | 55 | 30 |
| 98.4 | 81.3 | 17.1 | 77.4 | 76.3 | 1208 | 0.24 | 14 | 1305 | 0 | 30 |
| 98.9 | 81.6 | 17.3 | 77.2 | 76.6 | 1208 | 0.24 | 14 | 1305 | 5 | 30 |
| 99.2 | 81.4 | 17.8 | 77.0 | 76.4 | 1208 | 0.24 | 14 | 1305 | 10 | 31 |
| 99.7 | 80.9 | 18.8 | 77.1 | 76.1 | 1208 | 0.24 | 14 | 1305 | 15 | 32 |
| 100.1 | 81.2 | 18.9 | 77.0 | 75.9 | 1208 | 0.24 | 14 | 1305 | 20 | 33 |
| 100.4 | 83.5 | 16.9 | 77.4 | 76.1 | 1208 | 0.24 | 14 | 1305 | 25 | 29 |
| 100.7 | 83.1 | 17.6 | 77.4 | 76.3 | 1208 | 0.24 | 14 | 1305 | 30 | 30 |
| 101.2 | 83.1 | 18.1 | 77.3 | 76.3 | 1208 | 0.24 | 14 | 1305 | 35 | 31 |
| 101.6 | 83.9 | 17.7 | 77.3 | 75.7 | 1208 | 0.24 | 14 | 1305 | 40 | 31 |
| 101.8 | 83.4 | 18.4 | 77.5 | 75.3 | 1208 | 0.24 | 14 | 1305 | 45 | 32 |
| 101.8 | 83.2 | 18.6 | 77.7 | 75.3 | 1208 | 0.24 | 14 | 1305 | 50 | 32 |
| 102.3 | 84.1 | 18.2 | 78.4 | 75.7 | 1208 | 0.24 | 14 | 1305 | 55 | 31 |
| 102.6 | 84.1 | 18.5 | 78.8 | 76.3 | 1208 | 0.24 | 14 | 1306 | 0 | 32 |
| 102.7 | 83.3 | 19.4 | 78.6 | 76.5 | 1208 | 0.24 | 14 | 1306 | 5 | 33 |
| 102.9 | 82.6 | 20.3 | 79.0 | 76.3 | 1208 | 0.24 | 14 | 1306 | 10 | 35 |
| 102.8 | 82.3 | 20.5 | 78.7 | 76.2 | 1208 | 0.24 | 14 | 1306 | 15 | 35 |
| 103.3 | 82.4 | 20.9 | 78.6 | 76.2 | 1208 | 0.24 | 14 | 1306 | 20 | 36 |
| 103.2 | 83.3 | 19.9 | 78.7 | 76.2 | 1208 | 0.24 | 14 | 1306 | 25 | 34 |
| 103.7 | 84.2 | 19.5 | 79.0 | 76.2 | 1208 | 0.24 | 14 | 1306 | 30 | 34 |
| 103.9 | 84.4 | 19.5 | 79.3 | 76.5 | 1208 | 0.24 | 14 | 1306 | 35 | 34 |
| 104.1 | 84.0 | 20.1 | 79.8 | 76.2 | 1208 | 0.24 | 14 | 1306 | 40 | 35 |
| 104.4 | 83.6 | 20.8 | 80.0 | 75.8 | 1208 | 0.24 | 14 | 1306 | 45 | 36 |
| 104.4 | 83.6 | 20.8 | 79.8 | 75.7 | 1208 | 0.24 | 14 | 1306 | 50 | 36 |
| 104.6 | 82.7 | 21.9 | 79.8 | 75.8 | 1208 | 0.24 | 14 | 1306 | 55 | 38 |
| 105.1 | 83.1 | 22.0 | 79.6 | 76.2 | 1208 | 0.24 | 14 | 1307 | 0 | 38 |
| 105.4 | 83.3 | 22.1 | 79.9 | 76.4 | 1208 | 0.24 | 14 | 1307 | 5 | 38 |
| 105.4 | 83.5 | 21.9 | 80.3 | 76.6 | 1208 | 0.24 | 14 | 1307 | 10 | 38 |
| 105.5 | 84.8 | 20.7 | 80.8 | 76.5 | 1208 | 0.24 | 14 | 1307 | 15 | 36 |
| 105.6 | 84.6 | 21.0 | 80.6 | 76.6 | 1208 | 0.24 | 14 | 1307 | 20 | 36 |
| 105.9 | 85.6 | 20.3 | 80.7 | 76.6 | 1208 | 0.24 | 14 | 1307 | 25 | 35 |
| 106.4 | 87.1 | 19.3 | 80.8 | 76.7 | 1208 | 0.24 | 14 | 1307 | 30 | 33 |
| 106.6 | 85.7 | 20.9 | 80.9 | 76.5 | 1208 | 0.24 | 14 | 1307 | 35 | 36 |
| 106.7 | 85.1 | 21.6 | 80.6 | 76.3 | 1208 | 0.24 | 14 | 1307 | 40 | 37 |
| 106.9 | 86.0 | 20.9 | 80.4 | 76.0 | 1208 | 0.24 | 14 | 1307 | 45 | 36 |
| 107.3 | 85.3 | 22.0 | 80.8 | 76.0 | 1208 | 0.24 | 14 | 1307 | 50 | 38 |

Furnace Heating On

Heat Input
During Heating
cycle = 2050 btu's

Device B Heat Recovery Test (7 Minute Heating On Cycle), Sample 1, Test 1

| | Tsupply | Treturn | Temp. rise | Room | Ambient | CFM | approx. specific heat of air | approx. specific volume (cu. Ft/lbm) | Time | sec | Btu's Supplied | |
|--------------------------------|---------|---------|------------|------|---------|------|------------------------------|--------------------------------------|------|-----|----------------|--|
| Default Blower Off Delay | 107.1 | 87.5 | 19.6 | 80.8 | 75.6 | 1208 | 0.24 | 14 | 1307 | 55 | 34 | Default fan delay heat recovered = 581 btu's |
| | 107.3 | 87.4 | 19.9 | 80.7 | 76.2 | 1208 | 0.24 | 14 | 1308 | 0 | 34 | |
| | 107.1 | 87.1 | 20.0 | 80.7 | 76.3 | 1208 | 0.24 | 14 | 1308 | 5 | 35 | |
| | 107.6 | 87.3 | 20.3 | 80.6 | 75.7 | 1208 | 0.24 | 14 | 1308 | 10 | 35 | |
| | 107.4 | 86.8 | 20.6 | 81.1 | 75.6 | 1208 | 0.24 | 14 | 1308 | 15 | 36 | |
| | 107.7 | 86.0 | 21.7 | 81.3 | 75.5 | 1208 | 0.24 | 14 | 1308 | 20 | 37 | |
| | 107.7 | 86.4 | 21.3 | 81.2 | 75.4 | 1208 | 0.24 | 14 | 1308 | 25 | 37 | |
| | 107.1 | 86.3 | 20.8 | 80.9 | 75.9 | 1208 | 0.24 | 14 | 1308 | 30 | 36 | |
| | 106.7 | 86.0 | 20.7 | 80.7 | 76.2 | 1208 | 0.24 | 14 | 1308 | 35 | 36 | |
| | 106.0 | 86.7 | 19.3 | 80.5 | 76.4 | 1208 | 0.24 | 14 | 1308 | 40 | 33 | |
| | 105.3 | 86.8 | 18.5 | 80.6 | 76.5 | 1208 | 0.24 | 14 | 1308 | 45 | 32 | |
| | 104.9 | 86.8 | 18.1 | 80.9 | 76.7 | 1208 | 0.24 | 14 | 1308 | 50 | 31 | |
| | 103.9 | 88.1 | 15.8 | 80.9 | 76.9 | 1208 | 0.24 | 14 | 1308 | 55 | 27 | |
| | 102.9 | 88.2 | 14.7 | 80.9 | 77.0 | 1208 | 0.24 | 14 | 1309 | 0 | 25 | |
| | 102.1 | 87.9 | 14.2 | 81.2 | 77.0 | 1208 | 0.24 | 14 | 1309 | 5 | 25 | |
| | 101.3 | 87.5 | 13.8 | 81.3 | 77.0 | 1208 | 0.24 | 14 | 1309 | 10 | 24 | |
| | 100.5 | 88.4 | 12.1 | 81.4 | 77.0 | 1208 | 0.24 | 14 | 1309 | 15 | 21 | |
| | 99.8 | 88.9 | 10.9 | 81.5 | 76.8 | 1208 | 0.24 | 14 | 1309 | 20 | 19 | |
| | 99.0 | 89.7 | 9.3 | 81.3 | 76.7 | 1208 | 0.24 | 14 | 1309 | 25 | 16 | |
| | 98.1 | 90.0 | 8.1 | 81.0 | 76.7 | 1208 | 0.24 | 14 | 1309 | 30 | 14 | |
| | 97.4 | 89.9 | 7.5 | 81.2 | 76.6 | 1208 | 0.24 | 14 | 1309 | 35 | 13 | |
| | 96.6 | 89.3 | 7.3 | 81.3 | 76.6 | 1208 | 0.24 | 14 | 1309 | 40 | 13 | |
| | 96.0 | 89.6 | 6.4 | 81.1 | 76.5 | 1208 | 0.24 | 14 | 1309 | 45 | 11 | |
| | 95.5 | 90.0 | 5.5 | 80.8 | 76.4 | 1208 | 0.24 | 14 | 1309 | 50 | 9 | |
| | 94.9 | 89.9 | 5.0 | 80.7 | 76.4 | 1208 | 0.24 | 14 | 1309 | 55 | 9 | |
| | 94.3 | 89.5 | 4.8 | 80.8 | 76.4 | 1208 | 0.24 | 14 | 1310 | 0 | 8 | |
| Device B Extended Blower Delay | 93.8 | 89.5 | 4.3 | 80.8 | 76.5 | 0 | 0.24 | 14 | 1310 | 5 | 0 | heat recovery after default fan delay = 0 btu's |
| | 93.3 | 89.0 | 4.3 | 80.8 | 76.6 | 0 | 0.24 | 14 | 1310 | 10 | 0 | |
| | 92.6 | 88.6 | 4.0 | 80.6 | 76.6 | 0 | 0.24 | 14 | 1310 | 15 | 0 | |
| | 92.2 | 88.1 | 4.1 | 80.5 | 76.7 | 0 | 0.24 | 14 | 1310 | 20 | 0 | |
| | 91.9 | 88.2 | 3.7 | 80.4 | 76.7 | 0 | 0.24 | 14 | 1310 | 25 | 0 | |
| | 92.0 | 88.2 | 3.8 | 80.0 | 76.6 | 0 | 0.24 | 14 | 1310 | 30 | 0 | |
| | 91.9 | 88.0 | 3.9 | 79.9 | 76.3 | 0 | 0.24 | 14 | 1310 | 35 | 0 | |
| | 91.9 | 87.9 | 4.0 | 79.8 | 76.1 | 0 | 0.24 | 14 | 1310 | 40 | 0 | |
| | 91.9 | 87.6 | 4.3 | 79.8 | 76.1 | 0 | 0.24 | 14 | 1310 | 45 | 0 | |
| | 91.9 | 87.1 | 4.8 | 79.8 | 76.2 | 0 | 0.24 | 14 | 1310 | 50 | 0 | |
| | 92.2 | 86.7 | 5.5 | 79.7 | 76.3 | 0 | 0.24 | 14 | 1310 | 55 | 0 | |
| | 92.1 | 86.3 | 5.8 | 79.6 | 76.4 | 0 | 0.24 | 14 | 1311 | 0 | 0 | |
| | 91.8 | 86.0 | 5.8 | 79.5 | 76.3 | 0 | 0.24 | 14 | 1311 | 5 | 0 | |
| | 91.5 | 85.9 | 5.6 | 79.4 | 76.2 | 0 | 0.24 | 14 | 1311 | 10 | 0 | |
| | 91.0 | 85.8 | 5.2 | 79.3 | 76.3 | 0 | 0.24 | 14 | 1311 | 15 | 0 | |
| | 90.5 | 85.6 | 4.9 | 79.1 | 76.3 | 0 | 0.24 | 14 | 1311 | 20 | 0 | |
| | 90.2 | 85.3 | 4.9 | 79.0 | 76.4 | 0 | 0.24 | 14 | 1311 | 25 | 0 | |
| | 90.1 | 85.0 | 5.1 | 79.0 | 76.5 | 0 | 0.24 | 14 | 1311 | 30 | 0 | |

Blower Wattage = 370

Comments: Device B device extended the blower on time after the default delay time by 0 minutes, 0 seconds.

Furnace heat input = $HV \times (\text{volume of gas consumed}) = 1040 \text{ btu/ft}^3 \times 6.3 \text{ ft}^3 = 6552 \text{ btu}$

Device B Heat Recovery Test (8 Minute Heating On Cycle), Sample 1, Test 1

| | Tsupply | Treturn | Temp. rise | Room | Ambient | CFM | approx. specific heat of air | approx. specific volume (cu. Ft/lbm) | Time | sec | Btu's Supplied |
|--------------------|---------|---------|------------|------|---------|------|---------------------------------|---|------|-----|-------------------|
| Furnace Heating On | 75.1 | 73.2 | 1.9 | 73.1 | 74.3 | 1208 | 0.24 | 14 | 1148 | 0 | 3 |
| | 75.2 | 73.3 | 1.9 | 73.2 | 74.1 | 1208 | 0.24 | 14 | 1148 | 5 | 3 |
| | 75.2 | 73.3 | 1.9 | 73.2 | 74.1 | 1208 | 0.24 | 14 | 1148 | 10 | 3 |
| | 75.3 | 73.2 | 2.1 | 73.2 | 74.1 | 1208 | 0.24 | 14 | 1148 | 15 | 4 |
| | 75.2 | 73.2 | 2.0 | 73.2 | 74.2 | 1208 | 0.24 | 14 | 1148 | 20 | 3 |
| | 75.3 | 73.2 | 2.1 | 73.2 | 74.5 | 1208 | 0.24 | 14 | 1148 | 25 | 4 |
| | 75.3 | 73.2 | 2.1 | 73.2 | 74.6 | 1208 | 0.24 | 14 | 1148 | 30 | 4 |
| | 75.1 | 73.2 | 1.9 | 73.2 | 74.6 | 1208 | 0.24 | 14 | 1148 | 35 | 3 |
| | 75.1 | 73.2 | 1.9 | 73.2 | 74.6 | 1208 | 0.24 | 14 | 1148 | 40 | 3 |
| | 75.1 | 73.3 | 1.9 | 73.2 | 74.0 | 1208 | 0.24 | 14 | 1148 | 45 | 3 |
| | 75.0 | 73.3 | 1.7 | 73.2 | 74.1 | 1208 | 0.24 | 14 | 1148 | 50 | 3 |
| | 74.9 | 73.3 | 1.6 | 73.2 | 74.3 | 1208 | 0.24 | 14 | 1148 | 55 | 3 |
| | 76.8 | 73.3 | 3.5 | 73.3 | 74.6 | 1208 | 0.24 | 14 | 1149 | 0 | 6 |
| | 78.8 | 73.3 | 5.5 | 73.4 | 74.6 | 1208 | 0.24 | 14 | 1149 | 5 | 9 |
| | 80.4 | 73.9 | 6.6 | 73.7 | 74.5 | 1208 | 0.24 | 14 | 1149 | 10 | 11 |
| | 82.3 | 74.3 | 8.0 | 73.8 | 74.2 | 1208 | 0.24 | 14 | 1149 | 15 | 14 |
| | 83.7 | 74.4 | 9.4 | 73.9 | 74.2 | 1208 | 0.24 | 14 | 1149 | 20 | 16 |
| | 85.0 | 74.7 | 10.3 | 74.1 | 74.3 | 1208 | 0.24 | 14 | 1149 | 25 | 18 |
| | 86.0 | 75.0 | 11.0 | 74.4 | 74.6 | 1208 | 0.24 | 14 | 1149 | 30 | 19 |
| | 86.8 | 75.9 | 10.9 | 74.6 | 74.5 | 1208 | 0.24 | 14 | 1149 | 35 | 19 |
| | 87.6 | 76.4 | 11.3 | 74.6 | 74.0 | 1208 | 0.24 | 14 | 1149 | 40 | 19 |
| | 88.1 | 76.6 | 11.5 | 74.6 | 73.7 | 1208 | 0.24 | 14 | 1149 | 45 | 20 |
| | 88.9 | 76.7 | 12.2 | 75.0 | 73.6 | 1208 | 0.24 | 14 | 1149 | 50 | 21 |
| | 89.8 | 77.0 | 12.8 | 75.4 | 73.8 | 1208 | 0.24 | 14 | 1149 | 55 | 22 |
| | 90.4 | 76.4 | 14.0 | 75.7 | 73.8 | 1208 | 0.24 | 14 | 1150 | 0 | 24 |
| | 91.2 | 75.9 | 15.4 | 75.7 | 74.2 | 1208 | 0.24 | 14 | 1150 | 5 | 27 |
| | 91.9 | 76.2 | 15.7 | 75.9 | 73.9 | 1208 | 0.24 | 14 | 1150 | 10 | 27 |
| | 92.7 | 77.2 | 15.5 | 75.9 | 73.9 | 1208 | 0.24 | 14 | 1150 | 15 | 27 |
| | 93.2 | 78.3 | 14.9 | 75.8 | 74.2 | 1208 | 0.24 | 14 | 1150 | 20 | 26 |
| | 93.9 | 79.4 | 14.5 | 76.5 | 74.4 | 1208 | 0.24 | 14 | 1150 | 25 | 25 |
| | 94.7 | 80.1 | 14.6 | 76.4 | 74.6 | 1208 | 0.24 | 14 | 1150 | 30 | 25 |
| | 94.9 | 79.5 | 15.5 | 76.6 | 74.8 | 1208 | 0.24 | 14 | 1150 | 35 | 27 |
| | 95.3 | 79.9 | 15.4 | 76.9 | 74.5 | 1208 | 0.24 | 14 | 1150 | 40 | 27 |
| | 96.2 | 79.1 | 17.1 | 76.9 | 73.9 | 1208 | 0.24 | 14 | 1150 | 45 | 29 |
| | 96.5 | 79.1 | 17.4 | 77.1 | 73.4 | 1208 | 0.24 | 14 | 1150 | 50 | 30 |
| | 97.2 | 80.0 | 17.2 | 77.0 | 73.4 | 1208 | 0.24 | 14 | 1150 | 55 | 30 |
| | 97.7 | 81.4 | 16.3 | 77.1 | 73.4 | 1208 | 0.24 | 14 | 1151 | 0 | 28 |
| | 97.9 | 82.1 | 15.7 | 77.0 | 73.5 | 1208 | 0.24 | 14 | 1151 | 5 | 27 |
| | 98.1 | 81.4 | 16.7 | 77.1 | 73.4 | 1208 | 0.24 | 14 | 1151 | 10 | 29 |
| | 98.6 | 81.1 | 17.5 | 77.5 | 73.5 | 1208 | 0.24 | 14 | 1151 | 15 | 30 |
| | 99.2 | 80.7 | 18.5 | 77.6 | 73.8 | 1208 | 0.24 | 14 | 1151 | 20 | 32 |
| | 99.3 | 81.8 | 17.5 | 77.9 | 74.3 | 1208 | 0.24 | 14 | 1151 | 25 | 30 |
| | 99.8 | 83.5 | 16.4 | 77.9 | 74.5 | 1208 | 0.24 | 14 | 1151 | 30 | 28 |
| | 100.2 | 83.7 | 16.5 | 77.8 | 74.4 | 1208 | 0.24 | 14 | 1151 | 35 | 28 |
| | 100.5 | 84.7 | 15.8 | 77.9 | 74.3 | 1208 | 0.24 | 14 | 1151 | 40 | 27 |
| | 100.9 | 83.9 | 17.0 | 77.9 | 73.8 | 1208 | 0.24 | 14 | 1151 | 45 | 29 |
| | 101.3 | 82.7 | 18.6 | 78.1 | 73.7 | 1208 | 0.24 | 14 | 1151 | 50 | 32 |
| | 101.2 | 84.3 | 16.9 | 78.2 | 74.3 | 1208 | 0.24 | 14 | 1151 | 55 | 29 |
| | 101.8 | 84.1 | 17.7 | 78.5 | 73.9 | 1208 | 0.24 | 14 | 1152 | 0 | 30 |
| | 102.3 | 84.0 | 18.2 | 78.7 | 74.1 | 1208 | 0.24 | 14 | 1152 | 5 | 31 |
| | 102.4 | 84.1 | 18.3 | 79.0 | 74.2 | 1208 | 0.24 | 14 | 1152 | 10 | 32 |
| | 102.7 | 83.6 | 19.1 | 78.8 | 73.9 | 1208 | 0.24 | 14 | 1152 | 15 | 33 |
| | 103.0 | 84.9 | 18.1 | 78.9 | 73.9 | 1208 | 0.24 | 14 | 1152 | 20 | 31 |
| | 103.4 | 85.5 | 18.0 | 79.1 | 73.6 | 1208 | 0.24 | 14 | 1152 | 25 | 31 |
| | 104.3 | 86.3 | 18.0 | 79.7 | 73.8 | 1208 | 0.24 | 14 | 1152 | 30 | 31 |
| | 104.2 | 86.1 | 18.1 | 79.6 | 73.9 | 1208 | 0.24 | 14 | 1152 | 35 | 31 |
| | 104.7 | 85.9 | 18.7 | 79.4 | 73.8 | 1208 | 0.24 | 14 | 1152 | 40 | 32 |
| | 105.0 | 84.8 | 20.2 | 79.3 | 73.8 | 1208 | 0.24 | 14 | 1152 | 45 | 35 |
| | 104.9 | 84.6 | 20.3 | 79.2 | 73.7 | 1208 | 0.24 | 14 | 1152 | 50 | 35 |
| | 104.9 | 85.0 | 19.9 | 79.4 | 73.8 | 1208 | 0.24 | 14 | 1152 | 55 | 34 |
| | 105.5 | 85.5 | 20.0 | 79.3 | 73.8 | 1208 | 0.24 | 14 | 1153 | 0 | 35 |
| | 105.6 | 85.7 | 19.9 | 79.7 | 73.9 | 1208 | 0.24 | 14 | 1153 | 5 | 34 |
| | 105.9 | 87.0 | 18.9 | 79.7 | 73.8 | 1208 | 0.24 | 14 | 1153 | 10 | 33 |
| | 105.9 | 86.5 | 19.4 | 79.6 | 73.7 | 1208 | 0.24 | 14 | 1153 | 15 | 34 |
| | 106.3 | 87.2 | 19.1 | 79.7 | 73.5 | 1208 | 0.24 | 14 | 1153 | 20 | 33 |
| | 106.5 | 88.7 | 17.9 | 79.7 | 73.7 | 1208 | 0.24 | 14 | 1153 | 25 | 31 |
| | 106.7 | 88.9 | 17.8 | 80.3 | 73.8 | 1208 | 0.24 | 14 | 1153 | 30 | 31 |
| | 106.9 | 86.0 | 20.9 | 80.3 | 73.8 | 1208 | 0.24 | 14 | 1153 | 35 | 36 |
| | 106.9 | 87.0 | 19.9 | 80.7 | 73.8 | 1208 | 0.24 | 14 | 1153 | 40 | 34 |
| | 107.3 | 85.5 | 21.8 | 80.6 | 73.5 | 1208 | 0.24 | 14 | 1153 | 45 | 38 |
| | 107.5 | 87.4 | 20.1 | 80.5 | 73.5 | 1208 | 0.24 | 14 | 1153 | 50 | 35 |
| | 107.5 | 86.2 | 21.3 | 80.5 | 73.6 | 1208 | 0.24 | 14 | 1153 | 55 | 37 |
| | 107.8 | 85.8 | 22.1 | 80.5 | 73.7 | 1208 | 0.24 | 14 | 1154 | 0 | 38 |
| | 108.1 | 87.8 | 20.4 | 80.7 | 74.0 | 1208 | 0.24 | 14 | 1154 | 5 | 35 |
| | 108.3 | 87.8 | 20.4 | 81.2 | 73.9 | 1208 | 0.24 | 14 | 1154 | 10 | 35 |
| | 108.4 | 86.9 | 21.4 | 81.2 | 74.0 | 1208 | 0.24 | 14 | 1154 | 15 | 37 |
| | 108.2 | 86.7 | 21.5 | 81.0 | 73.9 | 1208 | 0.24 | 14 | 1154 | 20 | 37 |
| | 108.7 | 89.4 | 19.2 | 81.5 | 74.4 | 1208 | 0.24 | 14 | 1154 | 25 | 33 |
| | 109.0 | 88.6 | 20.4 | 81.5 | 74.5 | 1208 | 0.24 | 14 | 1154 | 30 | 35 |
| | 108.8 | 87.9 | 20.9 | 81.2 | 74.3 | 1208 | 0.24 | 14 | 1154 | 35 | 36 |
| | 108.9 | 87.7 | 21.3 | 81.0 | 74.1 | 1208 | 0.24 | 14 | 1154 | 40 | 37 |
| | 109.3 | 88.1 | 21.2 | 80.9 | 74.0 | 1208 | 0.24 | 14 | 1154 | 45 | 37 |
| | 109.4 | 86.7 | 22.7 | 81.0 | 74.3 | 1208 | 0.24 | 14 | 1154 | 50 | 39 |

Heat Input
During Heating
cycle = 2642 btu's

Device B Heat Recovery Test (8 Minute Heating On Cycle), Sample 1, Test 1

| | Tsupply | Treturn | Temp. rise | Room | Ambient | CFM | approx. specific heat of air | approx. specific volume (cu. Ft/lbm) | Time | sec | Btu's Supplied | |
|--------------------------------|---------|---------|------------|------|---------|------|------------------------------|--------------------------------------|------|-----|----------------|---|
| | 109.2 | 87.0 | 22.2 | 81.0 | 74.1 | 1208 | 0.24 | 14 | 1154 | 55 | 38 | |
| | 109.4 | 87.3 | 22.1 | 81.1 | 74.2 | 1208 | 0.24 | 14 | 1155 | 0 | 38 | |
| | 109.6 | 88.5 | 21.1 | 81.2 | 74.1 | 1208 | 0.24 | 14 | 1155 | 5 | 36 | |
| | 110.0 | 89.2 | 20.8 | 81.5 | 73.9 | 1208 | 0.24 | 14 | 1155 | 10 | 36 | |
| | 110.0 | 88.5 | 21.5 | 81.9 | 73.8 | 1208 | 0.24 | 14 | 1155 | 15 | 37 | |
| | 110.6 | 88.0 | 22.6 | 82.1 | 73.7 | 1208 | 0.24 | 14 | 1155 | 20 | 39 | |
| | 110.5 | 88.5 | 22.1 | 82.0 | 73.9 | 1208 | 0.24 | 14 | 1155 | 25 | 38 | |
| | 110.5 | 88.3 | 22.2 | 82.1 | 73.9 | 1208 | 0.24 | 14 | 1155 | 30 | 38 | |
| | 110.6 | 88.3 | 22.3 | 82.1 | 74.0 | 1208 | 0.24 | 14 | 1155 | 35 | 39 | |
| | 110.5 | 87.7 | 22.8 | 82.3 | 74.2 | 1208 | 0.24 | 14 | 1155 | 40 | 39 | |
| | 110.5 | 86.8 | 23.7 | 82.6 | 74.4 | 1208 | 0.24 | 14 | 1155 | 45 | 41 | |
| | 111.0 | 87.2 | 23.8 | 82.5 | 74.2 | 1208 | 0.24 | 14 | 1155 | 50 | 41 | |
| | 111.1 | 89.0 | 22.1 | 82.6 | 74.4 | 1208 | 0.24 | 14 | 1155 | 55 | 38 | |
| | 110.6 | 88.1 | 22.5 | 82.6 | 74.3 | 1208 | 0.24 | 14 | 1156 | 0 | 39 | |
| | 111.0 | 88.5 | 22.5 | 82.6 | 74.5 | 1208 | 0.24 | 14 | 1156 | 5 | 39 | |
| Default Blower Off Delay | 111.4 | 88.6 | 22.8 | 82.4 | 74.0 | 1208 | 0.24 | 14 | 1156 | 10 | 39 | Default fan delay heat recovered = 594 btu's |
| | 111.9 | 89.5 | 22.5 | 82.2 | 73.9 | 1208 | 0.24 | 14 | 1156 | 15 | 39 | |
| | 111.9 | 91.0 | 20.8 | 82.6 | 73.6 | 1208 | 0.24 | 14 | 1156 | 20 | 36 | |
| | 111.5 | 89.2 | 22.3 | 82.9 | 73.7 | 1208 | 0.24 | 14 | 1156 | 25 | 39 | |
| | 110.9 | 88.7 | 22.2 | 83.0 | 73.8 | 1208 | 0.24 | 14 | 1156 | 30 | 38 | |
| | 110.6 | 89.6 | 21.0 | 82.9 | 73.8 | 1208 | 0.24 | 14 | 1156 | 35 | 36 | |
| | 109.5 | 90.5 | 19.0 | 82.8 | 73.8 | 1208 | 0.24 | 14 | 1156 | 40 | 33 | |
| | 108.8 | 90.5 | 18.2 | 82.9 | 74.0 | 1208 | 0.24 | 14 | 1156 | 45 | 31 | |
| | 107.8 | 90.3 | 17.5 | 82.7 | 74.2 | 1208 | 0.24 | 14 | 1156 | 50 | 30 | |
| | 106.9 | 91.2 | 15.8 | 82.7 | 74.2 | 1208 | 0.24 | 14 | 1156 | 55 | 27 | |
| | 106.1 | 91.1 | 15.0 | 82.5 | 74.2 | 1208 | 0.24 | 14 | 1157 | 0 | 26 | |
| | 105.4 | 89.9 | 15.4 | 82.8 | 74.3 | 1208 | 0.24 | 14 | 1157 | 5 | 27 | |
| | 104.9 | 92.1 | 12.7 | 83.1 | 74.3 | 1208 | 0.24 | 14 | 1157 | 10 | 22 | |
| | 104.0 | 93.5 | 10.4 | 83.0 | 74.4 | 1208 | 0.24 | 14 | 1157 | 15 | 18 | |
| | 103.1 | 94.6 | 8.5 | 82.4 | 74.5 | 1208 | 0.24 | 14 | 1157 | 20 | 15 | |
| | 102.2 | 93.5 | 8.7 | 82.6 | 74.7 | 1208 | 0.24 | 14 | 1157 | 25 | 15 | |
| | 101.4 | 93.6 | 7.9 | 82.5 | 74.8 | 1208 | 0.24 | 14 | 1157 | 30 | 14 | |
| | 100.7 | 93.5 | 7.2 | 82.8 | 74.8 | 1208 | 0.24 | 14 | 1157 | 35 | 12 | |
| | 100.2 | 92.7 | 7.5 | 82.8 | 74.9 | 1208 | 0.24 | 14 | 1157 | 40 | 13 | |
| | 99.4 | 91.9 | 7.4 | 82.7 | 74.9 | 1208 | 0.24 | 14 | 1157 | 45 | 13 | |
| Device B Extended Blower Delay | 98.9 | 92.1 | 6.8 | 82.5 | 74.9 | 1208 | 0.24 | 14 | 1157 | 50 | 12 | heat recovery after default fan delay = 0 btu's |
| | 98.4 | 92.1 | 6.3 | 82.4 | 74.9 | 1208 | 0.24 | 14 | 1157 | 55 | 11 | |
| | 97.7 | 92.1 | 5.6 | 82.3 | 74.9 | 1208 | 0.24 | 14 | 1158 | 0 | 10 | |
| | 97.1 | 92.2 | 4.9 | 82.1 | 74.8 | 0 | 0.24 | 14 | 1158 | 5 | 0 | |
| | 96.7 | 91.8 | 4.9 | 82.0 | 74.8 | 0 | 0.24 | 14 | 1158 | 10 | 0 | |
| | 95.9 | 91.5 | 4.4 | 81.9 | 74.9 | 0 | 0.24 | 14 | 1158 | 15 | 0 | |
| | 95.6 | 91.3 | 4.3 | 81.8 | 74.8 | 0 | 0.24 | 14 | 1158 | 20 | 0 | |
| | 95.4 | 91.2 | 4.2 | 81.6 | 75.0 | 0 | 0.24 | 14 | 1158 | 25 | 0 | |
| | 95.3 | 91.1 | 4.2 | 81.4 | 75.0 | 0 | 0.24 | 14 | 1158 | 30 | 0 | |
| | 95.4 | 91.0 | 4.4 | 81.4 | 75.1 | 0 | 0.24 | 14 | 1158 | 35 | 0 | |
| | 95.2 | 90.3 | 4.9 | 81.2 | 75.2 | 0 | 0.24 | 14 | 1158 | 40 | 0 | |
| | 95.7 | 89.7 | 6.0 | 81.2 | 75.2 | 0 | 0.24 | 14 | 1158 | 45 | 0 | |
| | 95.9 | 89.1 | 6.8 | 81.1 | 75.2 | 0 | 0.24 | 14 | 1158 | 50 | 0 | |
| | 95.9 | 88.7 | 7.2 | 81.0 | 75.2 | 0 | 0.24 | 14 | 1158 | 55 | 0 | |
| | 95.9 | 88.6 | 7.3 | 80.9 | 75.2 | 0 | 0.24 | 14 | 1159 | 0 | 0 | |
| | 95.7 | 86.4 | 9.3 | 80.9 | 75.2 | 0 | 0.24 | 14 | 1159 | 5 | 0 | |
| | 95.4 | 85.7 | 9.7 | 80.8 | 75.2 | 0 | 0.24 | 14 | 1159 | 10 | 0 | |
| | 93.7 | 86.3 | 7.4 | 80.8 | 75.2 | 0 | 0.24 | 14 | 1159 | 15 | 0 | |
| | 90.8 | 85.6 | 5.2 | 80.7 | 75.2 | 0 | 0.24 | 14 | 1159 | 20 | 0 | |
| | 88.1 | 86.1 | 2.0 | 80.6 | 75.3 | 0 | 0.24 | 14 | 1159 | 25 | 0 | |
| | 86.9 | 86.4 | 0.5 | 80.3 | 75.3 | 0 | 0.24 | 14 | 1159 | 30 | 0 | |
| | 86.9 | 86.8 | 0.1 | 80.0 | 75.3 | 0 | 0.24 | 14 | 1159 | 35 | 0 | |
| | 86.9 | 86.7 | 0.2 | 79.7 | 75.4 | 0 | 0.24 | 14 | 1159 | 40 | 0 | |
| | 86.8 | 86.7 | 0.1 | 79.3 | 75.4 | 0 | 0.24 | 14 | 1159 | 45 | 0 | |
| | 86.6 | 86.7 | -0.1 | 79.0 | 75.3 | 0 | 0.24 | 14 | 1159 | 50 | 0 | |
| | 86.4 | 86.2 | 0.2 | 78.8 | 75.2 | 0 | 0.24 | 14 | 1159 | 55 | 0 | |
| | 86.8 | 85.5 | 1.3 | 78.6 | 75.2 | 0 | 0.24 | 14 | 1200 | 0 | 0 | |
| | 86.4 | 84.8 | 1.6 | 78.4 | 75.1 | 0 | 0.24 | 14 | 1200 | 5 | 0 | |

Blower Wattage = 370

Comments: Device B device extended the blower on time after the default delay time by 0 minutes, 0 seconds.

Furnace heat input = $HV \times (\text{volume of gas consumed}) = 1040 \text{ btu/ft}^3 \times 8.1 \text{ ft}^3 = 7488 \text{ btu}$

Device B Heat Recovery Test (9 Minute Heating On Cycle), Sample 1, Test 1

| Tsupply | Treturn | Temp. rise | Room | Ambient | CFM | approx. specific heat of air | approx. specific volume (cu. Ft/lbm) | Time | sec | Btu's Supplied |
|---------|---------|------------|------|---------|------|---------------------------------|---|------|-----|-------------------|
| 74.6 | 70.5 | 4.2 | 72.4 | 72.5 | 1204 | 0.24 | 14 | 1105 | 0 | 7 |
| 74.7 | 70.4 | 4.3 | 72.3 | 72.4 | 1204 | 0.24 | 14 | 1105 | 5 | 7 |
| 74.7 | 70.4 | 4.4 | 72.3 | 72.3 | 1204 | 0.24 | 14 | 1105 | 10 | 7 |
| 74.7 | 70.5 | 4.3 | 72.3 | 72.2 | 1204 | 0.24 | 14 | 1105 | 15 | 7 |
| 74.6 | 70.6 | 4.0 | 72.3 | 72.2 | 1204 | 0.24 | 14 | 1105 | 20 | 7 |
| 74.5 | 70.7 | 3.8 | 72.3 | 72.2 | 1204 | 0.24 | 14 | 1105 | 25 | 7 |
| 74.6 | 70.8 | 3.7 | 72.3 | 72.2 | 1204 | 0.24 | 14 | 1105 | 30 | 6 |
| 74.8 | 70.8 | 4.0 | 72.3 | 72.4 | 1204 | 0.24 | 14 | 1105 | 35 | 7 |
| 75.1 | 71.0 | 4.1 | 72.3 | 72.5 | 1204 | 0.24 | 14 | 1105 | 40 | 7 |
| 75.1 | 71.1 | 4.0 | 72.3 | 72.2 | 1204 | 0.24 | 14 | 1105 | 45 | 7 |
| 75.4 | 71.2 | 4.2 | 72.3 | 72.2 | 1204 | 0.24 | 14 | 1105 | 50 | 7 |
| 76.2 | 71.2 | 5.0 | 72.3 | 72.4 | 1204 | 0.24 | 14 | 1105 | 55 | 9 |
| 78.2 | 71.3 | 6.9 | 72.3 | 72.4 | 1204 | 0.24 | 14 | 1106 | 0 | 12 |
| 79.8 | 71.3 | 8.5 | 72.5 | 72.5 | 1204 | 0.24 | 14 | 1106 | 5 | 15 |
| 81.4 | 71.9 | 9.5 | 72.5 | 72.4 | 1204 | 0.24 | 14 | 1106 | 10 | 16 |
| 82.5 | 72.4 | 10.1 | 72.9 | 72.0 | 1204 | 0.24 | 14 | 1106 | 15 | 17 |
| 83.8 | 72.6 | 11.2 | 73.1 | 71.7 | 1204 | 0.24 | 14 | 1106 | 20 | 19 |
| 85.0 | 73.2 | 11.9 | 73.3 | 72.1 | 1204 | 0.24 | 14 | 1106 | 25 | 20 |
| 85.8 | 74.1 | 11.7 | 73.3 | 72.0 | 1204 | 0.24 | 14 | 1106 | 30 | 20 |
| 86.5 | 74.6 | 11.9 | 73.5 | 72.0 | 1204 | 0.24 | 14 | 1106 | 35 | 20 |
| 87.1 | 74.5 | 12.5 | 73.2 | 71.9 | 1204 | 0.24 | 14 | 1106 | 40 | 22 |
| 87.6 | 74.6 | 13.0 | 73.6 | 71.7 | 1204 | 0.24 | 14 | 1106 | 45 | 22 |
| 88.7 | 73.7 | 15.0 | 73.9 | 71.7 | 1204 | 0.24 | 14 | 1106 | 50 | 26 |
| 89.5 | 74.6 | 15.0 | 74.0 | 71.7 | 1204 | 0.24 | 14 | 1106 | 55 | 26 |
| 90.3 | 74.6 | 15.8 | 74.2 | 71.8 | 1204 | 0.24 | 14 | 1107 | 0 | 27 |
| 91.1 | 74.4 | 16.7 | 74.7 | 71.6 | 1204 | 0.24 | 14 | 1107 | 5 | 29 |
| 91.5 | 75.3 | 16.2 | 74.7 | 71.4 | 1204 | 0.24 | 14 | 1107 | 10 | 28 |
| 91.8 | 75.6 | 16.2 | 74.9 | 71.2 | 1204 | 0.24 | 14 | 1107 | 15 | 28 |
| 92.5 | 76.2 | 16.3 | 75.4 | 71.3 | 1204 | 0.24 | 14 | 1107 | 20 | 28 |
| 93.3 | 77.8 | 15.5 | 75.4 | 71.6 | 1204 | 0.24 | 14 | 1107 | 25 | 27 |
| 93.8 | 79.1 | 14.8 | 75.7 | 71.5 | 1204 | 0.24 | 14 | 1107 | 30 | 25 |
| 94.3 | 78.8 | 15.6 | 75.9 | 71.4 | 1204 | 0.24 | 14 | 1107 | 35 | 27 |
| 95.0 | 78.8 | 16.3 | 76.1 | 71.3 | 1204 | 0.24 | 14 | 1107 | 40 | 28 |
| 95.2 | 78.3 | 16.9 | 76.3 | 71.3 | 1204 | 0.24 | 14 | 1107 | 45 | 29 |
| 95.5 | 77.7 | 17.8 | 76.6 | 71.2 | 1204 | 0.24 | 14 | 1107 | 50 | 31 |
| 96.1 | 78.0 | 18.2 | 76.3 | 71.2 | 1204 | 0.24 | 14 | 1107 | 55 | 31 |
| 96.6 | 77.4 | 19.2 | 76.2 | 71.3 | 1204 | 0.24 | 14 | 1108 | 0 | 33 |
| 96.8 | 78.5 | 18.4 | 76.0 | 71.3 | 1204 | 0.24 | 14 | 1108 | 5 | 32 |
| 97.3 | 79.8 | 17.5 | 76.1 | 71.3 | 1204 | 0.24 | 14 | 1108 | 10 | 30 |
| 97.8 | 79.5 | 18.3 | 76.1 | 71.2 | 1204 | 0.24 | 14 | 1108 | 15 | 31 |
| 98.1 | 79.6 | 18.6 | 76.2 | 71.1 | 1204 | 0.24 | 14 | 1108 | 20 | 32 |
| 98.3 | 81.0 | 17.3 | 76.9 | 71.3 | 1204 | 0.24 | 14 | 1108 | 25 | 30 |
| 98.7 | 81.2 | 17.4 | 76.8 | 71.2 | 1204 | 0.24 | 14 | 1108 | 30 | 30 |
| 99.2 | 80.6 | 18.6 | 77.1 | 71.2 | 1204 | 0.24 | 14 | 1108 | 35 | 32 |
| 99.6 | 81.5 | 18.1 | 77.3 | 71.2 | 1204 | 0.24 | 14 | 1108 | 40 | 31 |
| 100.3 | 81.5 | 18.8 | 77.7 | 71.2 | 1204 | 0.24 | 14 | 1108 | 45 | 32 |
| 100.5 | 81.4 | 19.1 | 77.7 | 71.4 | 1204 | 0.24 | 14 | 1108 | 50 | 33 |
| 100.8 | 83.2 | 17.6 | 77.9 | 71.9 | 1204 | 0.24 | 14 | 1108 | 55 | 30 |
| 101.1 | 82.1 | 19.0 | 78.1 | 71.6 | 1204 | 0.24 | 14 | 1109 | 0 | 33 |
| 101.1 | 81.3 | 19.8 | 78.1 | 71.6 | 1204 | 0.24 | 14 | 1109 | 5 | 34 |
| 101.5 | 82.0 | 19.5 | 78.0 | 71.7 | 1204 | 0.24 | 14 | 1109 | 10 | 34 |
| 102.0 | 82.3 | 19.7 | 78.5 | 71.6 | 1204 | 0.24 | 14 | 1109 | 15 | 34 |
| 102.3 | 81.6 | 20.7 | 78.8 | 71.6 | 1204 | 0.24 | 14 | 1109 | 20 | 36 |
| 102.5 | 84.1 | 18.3 | 79.0 | 72.0 | 1204 | 0.24 | 14 | 1109 | 25 | 32 |
| 102.8 | 83.9 | 18.9 | 78.9 | 71.7 | 1204 | 0.24 | 14 | 1109 | 30 | 32 |
| 103.0 | 83.4 | 19.6 | 78.9 | 71.6 | 1204 | 0.24 | 14 | 1109 | 35 | 34 |
| 103.2 | 82.6 | 20.6 | 79.0 | 71.6 | 1204 | 0.24 | 14 | 1109 | 40 | 35 |
| 103.4 | 83.0 | 20.4 | 79.0 | 71.6 | 1204 | 0.24 | 14 | 1109 | 45 | 35 |
| 103.5 | 83.0 | 20.5 | 79.0 | 71.7 | 1204 | 0.24 | 14 | 1109 | 50 | 35 |
| 104.1 | 84.2 | 19.9 | 78.8 | 72.2 | 1204 | 0.24 | 14 | 1109 | 55 | 34 |
| 104.2 | 85.4 | 18.9 | 79.0 | 72.0 | 1204 | 0.24 | 14 | 1110 | 0 | 32 |
| 104.2 | 84.9 | 19.4 | 79.4 | 72.1 | 1204 | 0.24 | 14 | 1110 | 5 | 33 |
| 104.5 | 84.1 | 20.4 | 79.3 | 72.1 | 1204 | 0.24 | 14 | 1110 | 10 | 35 |
| 104.8 | 84.0 | 20.8 | 79.3 | 72.1 | 1204 | 0.24 | 14 | 1110 | 15 | 36 |
| 105.1 | 84.1 | 21.0 | 79.2 | 72.1 | 1204 | 0.24 | 14 | 1110 | 20 | 36 |
| 105.3 | 84.6 | 20.7 | 79.3 | 72.2 | 1204 | 0.24 | 14 | 1110 | 25 | 36 |
| 105.3 | 84.6 | 20.7 | 79.4 | 72.2 | 1204 | 0.24 | 14 | 1110 | 30 | 36 |
| 105.5 | 84.7 | 20.8 | 79.4 | 72.1 | 1204 | 0.24 | 14 | 1110 | 35 | 36 |
| 105.5 | 83.9 | 21.5 | 79.2 | 72.0 | 1204 | 0.24 | 14 | 1110 | 40 | 37 |
| 105.8 | 84.4 | 21.4 | 79.6 | 71.9 | 1204 | 0.24 | 14 | 1110 | 45 | 37 |
| 105.6 | 84.3 | 21.3 | 79.9 | 72.0 | 1204 | 0.24 | 14 | 1110 | 50 | 37 |
| 105.8 | 86.0 | 19.9 | 79.8 | 72.1 | 1204 | 0.24 | 14 | 1110 | 55 | 34 |
| 106.2 | 85.4 | 20.8 | 79.9 | 71.9 | 1204 | 0.24 | 14 | 1111 | 0 | 36 |
| 106.6 | 84.6 | 22.0 | 80.3 | 71.8 | 1204 | 0.24 | 14 | 1111 | 5 | 38 |
| 106.9 | 85.1 | 21.8 | 80.6 | 71.9 | 1204 | 0.24 | 14 | 1111 | 10 | 38 |
| 106.8 | 84.7 | 22.1 | 80.7 | 71.8 | 1204 | 0.24 | 14 | 1111 | 15 | 38 |
| 106.5 | 84.4 | 22.1 | 80.5 | 71.9 | 1204 | 0.24 | 14 | 1111 | 20 | 38 |
| 106.7 | 85.0 | 21.7 | 80.6 | 72.0 | 1204 | 0.24 | 14 | 1111 | 25 | 37 |
| 107.0 | 86.2 | 20.8 | 80.4 | 71.9 | 1204 | 0.24 | 14 | 1111 | 30 | 36 |
| 107.5 | 86.0 | 21.5 | 80.2 | 72.0 | 1204 | 0.24 | 14 | 1111 | 35 | 37 |
| 107.6 | 86.2 | 21.5 | 80.2 | 71.8 | 1204 | 0.24 | 14 | 1111 | 40 | 37 |
| 107.8 | 85.8 | 22.0 | 80.7 | 71.6 | 1204 | 0.24 | 14 | 1111 | 45 | 38 |
| 108.0 | 86.2 | 21.7 | 80.5 | 71.4 | 1204 | 0.24 | 14 | 1111 | 50 | 37 |
| 107.8 | 85.2 | 22.6 | 80.7 | 71.7 | 1204 | 0.24 | 14 | 1111 | 55 | 39 |
| 108.0 | 86.4 | 21.6 | 80.9 | 71.9 | 1204 | 0.24 | 14 | 1112 | 0 | 37 |
| 108.3 | 85.6 | 22.7 | 81.3 | 71.9 | 1204 | 0.24 | 14 | 1112 | 5 | 39 |
| 108.4 | 86.5 | 21.9 | 81.5 | 72.0 | 1204 | 0.24 | 14 | 1112 | 10 | 38 |
| 108.3 | 85.6 | 22.7 | 81.6 | 72.0 | 1204 | 0.24 | 14 | 1112 | 15 | 39 |

Furnace Heating On

Heat Input
During Heating cycle = 3308 btu's

Device B Heat Recovery Test (9 Minute Heating On Cycle), Sample 1, Test 1

| | Tsupply | Treturn | Temp. rise | Room | Ambient | CFM | approx. specific heat of air | approx. specific volume (cu. Ft/lbm) | Time | sec | Btu's Supplied | |
|---|---------|---------|------------|------|---------|------|------------------------------|--------------------------------------|------|-----|----------------|--|
| | 108.4 | 85.7 | 22.8 | 81.6 | 71.8 | 1204 | 0.24 | 14 | 1112 | 20 | 39 | |
| | 108.7 | 84.8 | 23.9 | 81.6 | 71.7 | 1204 | 0.24 | 14 | 1112 | 25 | 41 | |
| | 108.7 | 86.1 | 22.6 | 81.5 | 71.9 | 1204 | 0.24 | 14 | 1112 | 30 | 39 | |
| | 109.1 | 85.6 | 23.5 | 81.3 | 72.1 | 1204 | 0.24 | 14 | 1112 | 35 | 40 | |
| | 109.0 | 85.7 | 23.3 | 81.2 | 72.0 | 1204 | 0.24 | 14 | 1112 | 40 | 40 | |
| | 108.9 | 85.9 | 23.0 | 81.1 | 72.0 | 1204 | 0.24 | 14 | 1112 | 45 | 40 | |
| | 109.2 | 85.0 | 24.1 | 80.9 | 71.8 | 1204 | 0.24 | 14 | 1112 | 50 | 42 | |
| | 108.8 | 85.2 | 23.5 | 80.9 | 72.0 | 1204 | 0.24 | 14 | 1112 | 55 | 40 | |
| | 109.1 | 85.7 | 23.4 | 80.8 | 72.0 | 1204 | 0.24 | 14 | 1113 | 0 | 40 | |
| | 109.4 | 87.1 | 22.3 | 81.1 | 72.0 | 1204 | 0.24 | 14 | 1113 | 5 | 38 | |
| | 109.8 | 87.7 | 22.0 | 81.2 | 72.1 | 1204 | 0.24 | 14 | 1113 | 10 | 38 | |
| | 109.6 | 86.9 | 22.8 | 81.1 | 72.1 | 1204 | 0.24 | 14 | 1113 | 15 | 39 | |
| | 109.5 | 85.4 | 24.1 | 81.0 | 72.1 | 1204 | 0.24 | 14 | 1113 | 20 | 42 | |
| | 109.3 | 86.3 | 23.0 | 81.1 | 71.9 | 1204 | 0.24 | 14 | 1113 | 25 | 40 | |
| | 109.3 | 86.2 | 23.1 | 81.4 | 72.0 | 1204 | 0.24 | 14 | 1113 | 30 | 40 | |
| | 109.6 | 86.3 | 23.4 | 81.2 | 72.1 | 1204 | 0.24 | 14 | 1113 | 35 | 40 | |
| | 109.7 | 85.9 | 23.8 | 81.1 | 72.4 | 1204 | 0.24 | 14 | 1113 | 40 | 41 | |
| | 110.3 | 85.9 | 24.4 | 81.0 | 72.1 | 1204 | 0.24 | 14 | 1113 | 45 | 42 | |
| | 109.9 | 85.9 | 24.0 | 81.7 | 72.2 | 1204 | 0.24 | 14 | 1113 | 50 | 41 | |
| | 110.2 | 87.5 | 22.7 | 81.9 | 72.4 | 1204 | 0.24 | 14 | 1113 | 55 | 39 | |
| | 110.1 | 87.8 | 22.3 | 82.1 | 72.4 | 1204 | 0.24 | 14 | 1114 | 0 | 38 | |
| Default Blower Off Delay | 110.5 | 86.8 | 23.6 | 82.3 | 72.4 | 1204 | 0.24 | 14 | 1114 | 5 | 41 | |
| | 110.2 | 87.5 | 22.7 | 81.8 | 72.3 | 1204 | 0.24 | 14 | 1114 | 10 | 39 | |
| | 110.5 | 87.4 | 23.1 | 81.5 | 72.4 | 1204 | 0.24 | 14 | 1114 | 15 | 40 | |
| | 110.7 | 88.6 | 22.2 | 81.4 | 72.2 | 1204 | 0.24 | 14 | 1114 | 20 | 38 | |
| | 110.6 | 87.6 | 23.0 | 81.8 | 72.1 | 1204 | 0.24 | 14 | 1114 | 25 | 40 | |
| | 110.1 | 86.8 | 23.3 | 82.5 | 72.1 | 1204 | 0.24 | 14 | 1114 | 30 | 40 | |
| | 109.6 | 85.9 | 23.7 | 82.5 | 71.9 | 1204 | 0.24 | 14 | 1114 | 35 | 41 | |
| | 108.9 | 86.5 | 22.4 | 82.6 | 72.2 | 1204 | 0.24 | 14 | 1114 | 40 | 39 | |
| | 108.3 | 86.8 | 21.5 | 82.8 | 72.2 | 1204 | 0.24 | 14 | 1114 | 45 | 37 | |
| | 107.3 | 86.8 | 20.5 | 83.1 | 72.3 | 1204 | 0.24 | 14 | 1114 | 50 | 35 | |
| | 106.3 | 87.7 | 18.7 | 83.0 | 72.4 | 1204 | 0.24 | 14 | 1114 | 55 | 32 | |
| | 105.3 | 87.8 | 17.5 | 82.9 | 72.5 | 1204 | 0.24 | 14 | 1115 | 0 | 30 | |
| | 104.6 | 89.8 | 14.8 | 82.6 | 72.6 | 1204 | 0.24 | 14 | 1115 | 5 | 25 | |
| | 103.8 | 90.1 | 13.7 | 82.8 | 72.7 | 1204 | 0.24 | 14 | 1115 | 10 | 24 | |
| | 102.9 | 90.1 | 12.8 | 82.6 | 72.7 | 1204 | 0.24 | 14 | 1115 | 15 | 22 | |
| | 102.1 | 90.7 | 11.4 | 82.5 | 72.6 | 1204 | 0.24 | 14 | 1115 | 20 | 20 | |
| | 101.2 | 91.5 | 9.7 | 82.2 | 72.5 | 1204 | 0.24 | 14 | 1115 | 25 | 17 | |
| | 100.6 | 91.9 | 8.7 | 82.0 | 72.5 | 1204 | 0.24 | 14 | 1115 | 30 | 15 | |
| | 99.9 | 92.7 | 7.2 | 81.7 | 72.5 | 1204 | 0.24 | 14 | 1115 | 35 | 12 | |
| | 99.1 | 92.4 | 6.7 | 81.6 | 72.5 | 1204 | 0.24 | 14 | 1115 | 40 | 12 | |
| Device B Extended Blower Delay | 98.5 | 91.5 | 7.0 | 81.4 | 72.6 | 1204 | 0.24 | 14 | 1115 | 45 | 12 | |
| | 97.9 | 90.5 | 7.4 | 81.5 | 72.7 | 1204 | 0.24 | 14 | 1115 | 50 | 13 | |
| | 97.1 | 90.7 | 6.5 | 81.7 | 72.8 | 1204 | 0.24 | 14 | 1115 | 55 | 11 | |
| | 96.6 | 90.9 | 5.7 | 81.7 | 72.9 | 1204 | 0.24 | 14 | 1116 | 0 | 10 | |
| | 96.5 | 90.8 | 5.7 | 81.4 | 72.9 | 1204 | 0.24 | 14 | 1116 | 5 | 10 | |
| | 96.3 | 89.9 | 6.4 | 81.5 | 72.9 | 1204 | 0.24 | 14 | 1116 | 10 | 11 | |
| | 95.7 | 89.9 | 5.8 | 81.4 | 72.9 | 1204 | 0.24 | 14 | 1116 | 15 | 10 | |
| | 95.1 | 89.8 | 5.3 | 81.4 | 73.1 | 1204 | 0.24 | 14 | 1116 | 20 | 9 | |
| | 94.6 | 90.1 | 4.5 | 81.3 | 73.0 | 1204 | 0.24 | 14 | 1116 | 25 | 8 | |
| | 94.2 | 89.8 | 4.4 | 81.2 | 73.1 | 1204 | 0.24 | 14 | 1116 | 30 | 8 | |
| | 93.8 | 89.3 | 4.5 | 81.0 | 73.0 | 1204 | 0.24 | 14 | 1116 | 35 | 8 | |
| | 93.2 | 88.5 | 4.7 | 80.9 | 73.1 | 1204 | 0.24 | 14 | 1116 | 40 | 8 | |
| | 93.1 | 88.2 | 4.9 | 80.8 | 73.2 | 1204 | 0.24 | 14 | 1116 | 45 | 8 | |
| | 92.8 | 88.7 | 4.1 | 80.6 | 73.2 | 1204 | 0.24 | 14 | 1116 | 50 | 7 | |
| | 92.2 | 87.5 | 4.7 | 80.4 | 73.1 | 1204 | 0.24 | 14 | 1116 | 55 | 8 | |
| | 91.8 | 87.0 | 4.8 | 80.3 | 73.2 | 1204 | 0.24 | 14 | 1117 | 0 | 8 | |
| | 91.4 | 87.3 | 4.1 | 80.3 | 73.2 | 1204 | 0.24 | 14 | 1117 | 5 | 7 | |
| | 91.0 | 87.3 | 3.7 | 80.2 | 73.2 | 1204 | 0.24 | 14 | 1117 | 10 | 6 | |
| | 90.6 | 87.3 | 3.3 | 80.1 | 73.3 | 1204 | 0.24 | 14 | 1117 | 15 | 6 | |
| | 90.5 | 87.5 | 3.0 | 80.0 | 73.2 | 1204 | 0.24 | 14 | 1117 | 20 | 5 | |
| heat recovery after default fan delay = 159 btu's | 90.0 | 87.3 | 2.7 | 79.9 | 73.2 | 1204 | 0.24 | 14 | 1117 | 25 | 5 | |
| | 89.7 | 86.8 | 2.9 | 79.9 | 73.1 | 1204 | 0.24 | 14 | 1117 | 30 | 5 | |
| | 89.2 | 86.9 | 2.3 | 79.7 | 73.2 | 1204 | 0.24 | 14 | 1117 | 35 | 4 | |
| | 89.2 | 86.6 | 2.6 | 79.6 | 73.1 | 1204 | 0.24 | 14 | 1117 | 40 | 4 | |
| | 89.0 | 86.5 | 2.5 | 79.5 | 73.1 | 1204 | 0.24 | 14 | 1117 | 45 | 4 | |
| | 88.1 | 86.2 | 1.9 | 79.5 | 73.1 | 1204 | 0.24 | 14 | 1117 | 50 | 3 | |
| | 87.6 | 85.6 | 2.0 | 79.3 | 73.1 | 1204 | 0.24 | 14 | 1117 | 55 | 3 | |
| | 87.1 | 85.6 | 1.5 | 79.2 | 73.0 | 1204 | 0.24 | 14 | 1118 | 0 | 3 | |
| | 87.0 | 85.6 | 1.4 | 79.1 | 73.1 | 0 | 0.24 | 14 | 1118 | 5 | 0 | |
| | 87.0 | 85.6 | 1.4 | 79.0 | 73.2 | 0 | 0.24 | 14 | 1118 | 10 | 0 | |
| | 86.8 | 85.3 | 1.5 | 78.9 | 73.3 | 0 | 0.24 | 14 | 1118 | 20 | 0 | |

Blower Wattage = 370

Comments: Device B device extended the blower on time after the default delay time by 2 minutes, 2 seconds.

Furnace heat input = HV x (volume of gas consumed) = 1040 btu/ft³ x 8.1 ft³ = 8424 btu

Device B Heat Recovery Test (6 Minute Heating On Cycle), Sample 1, Test 2

11/20/2013

| | Furnace Heating On | | | | | | | | | | |
|--|--------------------|---------|------------|------|---------|------|------------------------------|--------------------------------------|------|-----|----------------|
| | Tsupply | Treturn | Temp. rise | Room | Ambient | CFM | approx. specific heat of air | approx. specific volume (cu. Ft/lbm) | Time | sec | Btu's Supplied |
| | 73.3 | 71.7 | 1.6 | 72.3 | 71.0 | 1212 | 0.24 | 14 | 1013 | 0 | 3 |
| | 74.3 | 71.8 | 2.5 | 72.3 | 71.1 | 1212 | 0.24 | 14 | 1013 | 5 | 4 |
| | 74.3 | 71.9 | 2.4 | 72.3 | 71.0 | 1212 | 0.24 | 14 | 1013 | 10 | 4 |
| | 74.4 | 71.8 | 2.6 | 72.3 | 71.2 | 1212 | 0.24 | 14 | 1013 | 15 | 5 |
| | 74.5 | 71.9 | 2.6 | 72.4 | 71.2 | 1212 | 0.24 | 14 | 1013 | 20 | 5 |
| | 74.6 | 71.9 | 2.7 | 72.4 | 71.3 | 1212 | 0.24 | 14 | 1013 | 25 | 5 |
| | 74.5 | 71.9 | 2.6 | 72.4 | 71.3 | 1212 | 0.24 | 14 | 1013 | 30 | 5 |
| | 74.0 | 71.9 | 2.1 | 72.4 | 71.2 | 1212 | 0.24 | 14 | 1013 | 35 | 4 |
| | 73.7 | 72.0 | 1.7 | 72.4 | 71.3 | 1212 | 0.24 | 14 | 1013 | 40 | 3 |
| | 73.6 | 72.1 | 1.5 | 72.5 | 71.3 | 1212 | 0.24 | 14 | 1013 | 45 | 3 |
| | 73.7 | 72.2 | 1.5 | 72.5 | 71.5 | 1212 | 0.24 | 14 | 1013 | 50 | 3 |
| | 73.8 | 72.3 | 1.5 | 72.5 | 71.5 | 1212 | 0.24 | 14 | 1013 | 55 | 3 |
| | 74.7 | 72.3 | 2.4 | 72.5 | 71.5 | 1212 | 0.24 | 14 | 1014 | 0 | 4 |
| | 75.9 | 72.3 | 3.6 | 72.6 | 71.3 | 1212 | 0.24 | 14 | 1014 | 5 | 6 |
| | 77.0 | 72.7 | 4.3 | 72.6 | 71.4 | 1212 | 0.24 | 14 | 1014 | 10 | 7 |
| | 78.0 | 72.7 | 5.3 | 72.6 | 71.4 | 1212 | 0.24 | 14 | 1014 | 15 | 9 |
| | 79.0 | 72.9 | 6.1 | 72.6 | 71.4 | 1212 | 0.24 | 14 | 1014 | 20 | 11 |
| | 79.7 | 73.2 | 6.5 | 72.7 | 71.4 | 1212 | 0.24 | 14 | 1014 | 25 | 11 |
| | 80.7 | 73.6 | 7.1 | 73.0 | 71.4 | 1212 | 0.24 | 14 | 1014 | 30 | 12 |
| | 81.3 | 74.0 | 7.3 | 73.0 | 71.2 | 1212 | 0.24 | 14 | 1014 | 35 | 13 |
| | 81.9 | 74.5 | 7.4 | 73.2 | 71.2 | 1212 | 0.24 | 14 | 1014 | 40 | 13 |
| | 82.9 | 74.7 | 8.2 | 73.3 | 71.2 | 1212 | 0.24 | 14 | 1014 | 45 | 14 |
| | 83.8 | 74.8 | 9.0 | 73.5 | 71.4 | 1212 | 0.24 | 14 | 1014 | 50 | 16 |
| | 84.6 | 75.1 | 9.5 | 73.6 | 71.5 | 1212 | 0.24 | 14 | 1014 | 55 | 16 |
| | 85.6 | 75.5 | 10.1 | 73.6 | 71.3 | 1212 | 0.24 | 14 | 1015 | 0 | 17 |
| | 86.5 | 75.8 | 10.7 | 73.9 | 71.2 | 1212 | 0.24 | 14 | 1015 | 5 | 19 |
| | 87.2 | 76.0 | 11.2 | 74.1 | 71.2 | 1212 | 0.24 | 14 | 1015 | 10 | 19 |
| | 88.1 | 76.6 | 11.5 | 74.4 | 71.3 | 1212 | 0.24 | 14 | 1015 | 15 | 20 |
| | 89.1 | 77.2 | 11.9 | 74.6 | 71.3 | 1212 | 0.24 | 14 | 1015 | 20 | 21 |
| | 89.8 | 77.5 | 12.3 | 74.6 | 71.5 | 1212 | 0.24 | 14 | 1015 | 25 | 21 |
| | 90.3 | 77.6 | 12.7 | 74.9 | 71.4 | 1212 | 0.24 | 14 | 1015 | 30 | 22 |
| | 91.3 | 77.8 | 13.5 | 75.1 | 71.3 | 1212 | 0.24 | 14 | 1015 | 35 | 23 |
| | 92.0 | 77.8 | 14.2 | 75.4 | 71.3 | 1212 | 0.24 | 14 | 1015 | 40 | 25 |
| | 92.8 | 77.7 | 15.1 | 75.9 | 71.4 | 1212 | 0.24 | 14 | 1015 | 45 | 26 |
| | 93.8 | 78.3 | 15.5 | 75.9 | 71.6 | 1212 | 0.24 | 14 | 1015 | 50 | 27 |
| | 94.7 | 79.1 | 15.6 | 76.1 | 71.6 | 1212 | 0.24 | 14 | 1015 | 55 | 27 |
| | 95.2 | 79.3 | 15.9 | 76.3 | 71.6 | 1212 | 0.24 | 14 | 1016 | 0 | 28 |
| | 95.5 | 78.8 | 16.7 | 76.7 | 71.5 | 1212 | 0.24 | 14 | 1016 | 5 | 29 |
| | 96.1 | 78.2 | 17.9 | 76.7 | 71.5 | 1212 | 0.24 | 14 | 1016 | 10 | 31 |
| | 96.7 | 78.2 | 18.5 | 76.9 | 71.5 | 1212 | 0.24 | 14 | 1016 | 15 | 32 |
| | 97.1 | 79.5 | 17.6 | 77.3 | 71.6 | 1212 | 0.24 | 14 | 1016 | 20 | 30 |
| | 97.4 | 79.3 | 18.1 | 77.7 | 71.6 | 1212 | 0.24 | 14 | 1016 | 25 | 31 |
| | 97.9 | 79.5 | 18.4 | 78.0 | 71.6 | 1212 | 0.24 | 14 | 1016 | 30 | 32 |
| | 98.4 | 79.7 | 18.7 | 78.0 | 71.5 | 1212 | 0.24 | 14 | 1016 | 35 | 32 |
| | 98.7 | 79.3 | 19.4 | 77.9 | 71.6 | 1212 | 0.24 | 14 | 1016 | 40 | 34 |
| | 99.1 | 79.3 | 19.8 | 77.7 | 71.4 | 1212 | 0.24 | 14 | 1016 | 45 | 34 |
| | 99.7 | 80.9 | 18.8 | 77.8 | 71.3 | 1212 | 0.24 | 14 | 1016 | 50 | 33 |
| | 100.1 | 81.9 | 18.2 | 77.9 | 71.3 | 1212 | 0.24 | 14 | 1016 | 55 | 32 |
| | 100.6 | 81.8 | 18.8 | 78.4 | 71.3 | 1212 | 0.24 | 14 | 1017 | 0 | 33 |
| | 100.9 | 81.6 | 19.3 | 78.6 | 71.3 | 1212 | 0.24 | 14 | 1017 | 5 | 33 |
| | 101.2 | 82.1 | 19.1 | 78.9 | 71.3 | 1212 | 0.24 | 14 | 1017 | 10 | 33 |
| | 101.7 | 82.8 | 18.9 | 78.8 | 71.4 | 1212 | 0.24 | 14 | 1017 | 15 | 33 |
| | 101.9 | 83.3 | 18.6 | 78.8 | 71.4 | 1212 | 0.24 | 14 | 1017 | 20 | 32 |
| | 102.2 | 82.8 | 19.4 | 78.4 | 71.4 | 1212 | 0.24 | 14 | 1017 | 25 | 34 |
| | 102.5 | 82.4 | 20.1 | 78.1 | 71.2 | 1212 | 0.24 | 14 | 1017 | 30 | 35 |
| | 103.1 | 82.3 | 20.8 | 78.0 | 71.1 | 1212 | 0.24 | 14 | 1017 | 35 | 36 |
| | 103.4 | 82.1 | 21.3 | 78.1 | 71.1 | 1212 | 0.24 | 14 | 1017 | 40 | 37 |
| | 103.6 | 82.6 | 21.0 | 78.4 | 71.0 | 1212 | 0.24 | 14 | 1017 | 45 | 36 |
| | 103.8 | 85.3 | 18.5 | 79.0 | 71.0 | 1212 | 0.24 | 14 | 1017 | 50 | 32 |
| | 104.3 | 86.5 | 17.8 | 79.0 | 70.9 | 1212 | 0.24 | 14 | 1017 | 55 | 31 |
| | 104.7 | 85.7 | 19.0 | 78.8 | 70.9 | 1212 | 0.24 | 14 | 1018 | 0 | 33 |
| | 104.9 | 86.0 | 18.9 | 79.1 | 70.9 | 1212 | 0.24 | 14 | 1018 | 5 | 33 |
| | 104.9 | 85.5 | 19.4 | 78.9 | 70.8 | 1212 | 0.24 | 14 | 1018 | 10 | 34 |
| | 105.3 | 83.6 | 21.7 | 78.8 | 71.1 | 1212 | 0.24 | 14 | 1018 | 15 | 38 |
| | 105.6 | 85.0 | 20.6 | 79.3 | 71.0 | 1212 | 0.24 | 14 | 1018 | 20 | 36 |
| | 106.0 | 86.1 | 19.9 | 79.7 | 71.2 | 1212 | 0.24 | 14 | 1018 | 25 | 34 |
| | 106.3 | 86.4 | 19.9 | 79.7 | 71.3 | 1212 | 0.24 | 14 | 1018 | 30 | 34 |
| | 106.5 | 86.3 | 20.2 | 79.3 | 71.2 | 1212 | 0.24 | 14 | 1018 | 35 | 35 |
| | 106.7 | 86.0 | 20.7 | 79.3 | 71.3 | 1212 | 0.24 | 14 | 1018 | 40 | 36 |
| | 107.1 | 85.6 | 21.5 | 79.4 | 71.3 | 1212 | 0.24 | 14 | 1018 | 45 | 37 |
| | 107.1 | 86.6 | 20.5 | 79.4 | 71.3 | 1212 | 0.24 | 14 | 1018 | 50 | 35 |
| | 106.6 | 86.2 | 20.4 | 79.8 | 71.4 | 1212 | 0.24 | 14 | 1018 | 55 | 35 |
| | 106.4 | 86.4 | 20.0 | 80.4 | 71.5 | 1212 | 0.24 | 14 | 1019 | 0 | 35 |

Heat Input
During Heating
cycle = 1681 btu's

Device B Heat Recovery Test (6 Minute Heating On Cycle), Sample 1, Test 2

11/20/2013

| | Tsupply | Treturn | Temp. rise | Room | Ambient | CFM | approx. specific heat of air | approx. specific volume (cu. Ft/lbm) | Time | sec | Btu's Supplied | |
|--------------------------------|---------|---------|------------|------|---------|------|------------------------------|--------------------------------------|------|-----|----------------|---|
| Default Blower Off Delay | 106.7 | 86.8 | 19.9 | 80.7 | 71.5 | 1212 | 0.24 | 14 | 1019 | 5 | 34 | Default fan delay heat recovered = 525 btu's |
| | 107.0 | 86.3 | 20.7 | 80.6 | 71.4 | 1212 | 0.24 | 14 | 1019 | 10 | 36 | |
| | 107.0 | 86.3 | 20.7 | 81.0 | 71.4 | 1212 | 0.24 | 14 | 1019 | 15 | 36 | |
| | 106.9 | 86.3 | 20.6 | 81.0 | 71.4 | 1212 | 0.24 | 14 | 1019 | 20 | 36 | |
| | 106.6 | 86.7 | 19.9 | 80.9 | 71.3 | 1212 | 0.24 | 14 | 1019 | 25 | 34 | |
| | 106.0 | 86.3 | 19.7 | 81.0 | 71.3 | 1212 | 0.24 | 14 | 1019 | 30 | 34 | |
| | 105.6 | 85.9 | 19.7 | 81.2 | 71.3 | 1212 | 0.24 | 14 | 1019 | 35 | 34 | |
| | 104.8 | 88.1 | 16.7 | 81.3 | 71.2 | 1212 | 0.24 | 14 | 1019 | 40 | 29 | |
| | 103.8 | 89.9 | 13.9 | 81.1 | 71.3 | 1212 | 0.24 | 14 | 1019 | 45 | 24 | |
| | 103.0 | 89.3 | 13.7 | 80.9 | 71.3 | 1212 | 0.24 | 14 | 1019 | 50 | 24 | |
| | 102.2 | 88.0 | 14.2 | 80.7 | 71.3 | 1212 | 0.24 | 14 | 1019 | 55 | 25 | |
| | 101.4 | 89.4 | 12.0 | 80.6 | 71.2 | 1212 | 0.24 | 14 | 1020 | 0 | 21 | |
| | 100.8 | 90.1 | 10.7 | 80.8 | 71.1 | 1212 | 0.24 | 14 | 1020 | 5 | 19 | |
| | 100.0 | 89.9 | 10.1 | 80.8 | 71.1 | 1212 | 0.24 | 14 | 1020 | 10 | 17 | |
| | 99.2 | 89.9 | 9.3 | 80.8 | 71.0 | 1212 | 0.24 | 14 | 1020 | 15 | 16 | |
| | 98.7 | 90.1 | 8.6 | 80.8 | 71.0 | 1212 | 0.24 | 14 | 1020 | 20 | 15 | |
| | 98.1 | 90.3 | 7.8 | 80.7 | 71.0 | 1212 | 0.24 | 14 | 1020 | 25 | 14 | |
| | 97.4 | 90.4 | 7.0 | 80.6 | 70.9 | 1212 | 0.24 | 14 | 1020 | 30 | 12 | |
| | 96.8 | 89.7 | 7.1 | 80.5 | 70.9 | 1212 | 0.24 | 14 | 1020 | 35 | 12 | |
| | 96.1 | 89.5 | 6.6 | 80.4 | 70.9 | 1212 | 0.24 | 14 | 1020 | 40 | 11 | |
| | 95.5 | 89.5 | 6.0 | 80.3 | 70.9 | 1212 | 0.24 | 14 | 1020 | 45 | 10 | |
| | 95.0 | 88.3 | 6.7 | 80.3 | 70.9 | 1212 | 0.24 | 14 | 1020 | 50 | 12 | |
| | 94.3 | 88.3 | 6.0 | 80.4 | 70.9 | 1212 | 0.24 | 14 | 1020 | 55 | 10 | |
| | 93.8 | 87.9 | 5.9 | 80.3 | 70.8 | 1212 | 0.24 | 14 | 1021 | 0 | 10 | |
| Device B Extended Blower Delay | 93.5 | 88.2 | 5.3 | 80.1 | 70.9 | 0 | 0.24 | 14 | 1021 | 5 | 0 | heat recovery after default fan delay = 0 btu's |
| | 92.9 | 88.2 | 4.7 | 79.9 | 70.9 | 0 | 0.24 | 14 | 1021 | 10 | 0 | |
| | 92.7 | 88.0 | 4.7 | 79.8 | 71.0 | 0 | 0.24 | 14 | 1021 | 15 | 0 | |
| | 92.5 | 87.9 | 4.6 | 79.7 | 71.0 | 0 | 0.24 | 14 | 1021 | 20 | 0 | |
| | 92.4 | 87.7 | 4.7 | 79.7 | 71.0 | 0 | 0.24 | 14 | 1021 | 25 | 0 | |
| | 92.4 | 87.7 | 4.7 | 79.6 | 71.0 | 0 | 0.24 | 14 | 1021 | 30 | 0 | |
| | 92.2 | 87.5 | 4.7 | 79.6 | 70.9 | 0 | 0.24 | 14 | 1021 | 35 | 0 | |
| | 92.2 | 87.0 | 5.2 | 79.5 | 71.0 | 0 | 0.24 | 14 | 1021 | 40 | 0 | |
| | 92.2 | 86.6 | 5.6 | 79.4 | 71.0 | 0 | 0.24 | 14 | 1021 | 45 | 0 | |
| | 92.0 | 86.2 | 5.8 | 79.3 | 70.9 | 0 | 0.24 | 14 | 1021 | 50 | 0 | |
| | 92.3 | 86.0 | 6.3 | 79.2 | 70.9 | 0 | 0.24 | 14 | 1021 | 55 | 0 | |
| | 92.4 | 85.7 | 6.7 | 79.2 | 71.0 | 0 | 0.24 | 14 | 1022 | 0 | 0 | |

Blower Wattage = 370

Comments: Device B device extended the blower on time after the default delay time by 0 minutes, 0 seconds.

$$\text{Furnace heat input} = \text{HV} \times (\text{volume of gas consumed}) = 1040 \text{ btu/ft}^3 \times 5.3 \text{ ft}^3 = 5512 \text{ btu}$$

Device B Heat Recovery Test (7 Minute Heating On Cycle), Sample 1, Test 2

11/20/2013

| Tsupply | Treturn | Temp. rise | Room | Ambient | CFM | approx. specific heat of air | approx. specific volume (cu. Ft/lbm) | Time | sec | Btu's Supplied |
|---------|---------|------------|------|---------|------|---------------------------------|---|------|-----|-------------------|
| 72.1 | 71.2 | 0.8 | 71.5 | 71.4 | 1214 | 0.24 | 14 | 945 | 0 | 1 |
| 71.8 | 71.2 | 0.6 | 71.5 | 71.4 | 1214 | 0.24 | 14 | 945 | 5 | 1 |
| 71.8 | 71.2 | 0.6 | 71.6 | 71.4 | 1214 | 0.24 | 14 | 945 | 10 | 1 |
| 71.8 | 71.2 | 0.6 | 71.7 | 71.6 | 1214 | 0.24 | 14 | 945 | 15 | 1 |
| 72.0 | 71.3 | 0.7 | 71.7 | 71.7 | 1214 | 0.24 | 14 | 945 | 20 | 1 |
| 71.4 | 71.3 | 0.1 | 71.7 | 71.7 | 1214 | 0.24 | 14 | 945 | 25 | 0 |
| 71.6 | 71.3 | 0.3 | 71.8 | 71.6 | 1214 | 0.24 | 14 | 945 | 30 | 0 |
| 71.6 | 71.3 | 0.3 | 71.8 | 71.6 | 1214 | 0.24 | 14 | 945 | 35 | 1 |
| 71.6 | 71.4 | 0.2 | 71.9 | 71.6 | 1214 | 0.24 | 14 | 945 | 40 | 0 |
| 71.7 | 71.4 | 0.3 | 71.8 | 71.6 | 1214 | 0.24 | 14 | 945 | 45 | 1 |
| 71.8 | 71.5 | 0.3 | 71.9 | 71.7 | 1214 | 0.24 | 14 | 945 | 50 | 1 |
| 72.0 | 71.5 | 0.5 | 71.9 | 71.6 | 1214 | 0.24 | 14 | 945 | 55 | 1 |
| 74.1 | 71.4 | 2.7 | 72.0 | 71.5 | 1214 | 0.24 | 14 | 946 | 0 | 5 |
| 76.0 | 71.6 | 4.4 | 72.0 | 71.3 | 1214 | 0.24 | 14 | 946 | 5 | 8 |
| 75.3 | 71.8 | 3.5 | 72.1 | 71.2 | 1214 | 0.24 | 14 | 946 | 10 | 6 |
| 76.6 | 71.9 | 4.7 | 72.2 | 71.3 | 1214 | 0.24 | 14 | 946 | 15 | 8 |
| 77.8 | 72.3 | 5.5 | 72.3 | 71.4 | 1214 | 0.24 | 14 | 946 | 20 | 10 |
| 78.8 | 72.4 | 6.4 | 72.4 | 71.4 | 1214 | 0.24 | 14 | 946 | 25 | 11 |
| 79.7 | 72.7 | 7.0 | 72.6 | 71.4 | 1214 | 0.24 | 14 | 946 | 30 | 12 |
| 80.6 | 73.3 | 7.3 | 72.6 | 71.4 | 1214 | 0.24 | 14 | 946 | 35 | 13 |
| 81.6 | 73.8 | 7.8 | 72.7 | 71.4 | 1214 | 0.24 | 14 | 946 | 40 | 14 |
| 82.3 | 74.1 | 8.2 | 72.8 | 71.6 | 1214 | 0.24 | 14 | 946 | 45 | 14 |
| 83.0 | 74.5 | 8.5 | 72.8 | 71.6 | 1214 | 0.24 | 14 | 946 | 50 | 15 |
| 84.0 | 74.9 | 9.1 | 73.2 | 71.7 | 1214 | 0.24 | 14 | 946 | 55 | 16 |
| 84.7 | 75.2 | 9.5 | 73.4 | 71.7 | 1214 | 0.24 | 14 | 947 | 0 | 16 |
| 85.6 | 75.2 | 10.4 | 73.6 | 71.7 | 1214 | 0.24 | 14 | 947 | 5 | 18 |
| 86.7 | 75.4 | 11.3 | 73.8 | 71.5 | 1214 | 0.24 | 14 | 947 | 10 | 20 |
| 87.7 | 75.1 | 12.6 | 74.1 | 71.6 | 1214 | 0.24 | 14 | 947 | 15 | 22 |
| 88.6 | 75.8 | 12.8 | 74.1 | 71.6 | 1214 | 0.24 | 14 | 947 | 20 | 22 |
| 89.3 | 76.7 | 12.6 | 74.0 | 71.8 | 1214 | 0.24 | 14 | 947 | 25 | 22 |
| 89.9 | 77.3 | 12.6 | 74.3 | 71.7 | 1214 | 0.24 | 14 | 947 | 30 | 22 |
| 90.4 | 77.1 | 13.3 | 75.0 | 71.5 | 1214 | 0.24 | 14 | 947 | 35 | 23 |
| 91.1 | 76.3 | 14.8 | 75.1 | 71.5 | 1214 | 0.24 | 14 | 947 | 40 | 26 |
| 91.7 | 76.5 | 15.2 | 75.5 | 71.4 | 1214 | 0.24 | 14 | 947 | 45 | 26 |
| 92.8 | 78.0 | 14.8 | 76.0 | 71.5 | 1214 | 0.24 | 14 | 947 | 50 | 26 |
| 93.5 | 77.5 | 16.0 | 76.1 | 71.5 | 1214 | 0.24 | 14 | 947 | 55 | 28 |
| 94.0 | 77.4 | 16.6 | 76.4 | 71.6 | 1214 | 0.24 | 14 | 948 | 0 | 29 |
| 94.5 | 78.2 | 16.3 | 76.2 | 71.6 | 1214 | 0.24 | 14 | 948 | 5 | 28 |
| 95.0 | 78.2 | 16.8 | 76.1 | 71.6 | 1214 | 0.24 | 14 | 948 | 10 | 29 |
| 95.4 | 77.8 | 17.6 | 76.1 | 71.7 | 1214 | 0.24 | 14 | 948 | 15 | 31 |
| 96.1 | 78.2 | 17.9 | 76.3 | 71.7 | 1214 | 0.24 | 14 | 948 | 20 | 31 |
| 96.5 | 78.3 | 18.2 | 76.4 | 71.7 | 1214 | 0.24 | 14 | 948 | 25 | 32 |
| 96.8 | 78.7 | 18.1 | 76.2 | 71.6 | 1214 | 0.24 | 14 | 948 | 30 | 31 |
| 97.5 | 79.0 | 18.5 | 76.1 | 71.6 | 1214 | 0.24 | 14 | 948 | 35 | 32 |
| 97.9 | 79.1 | 18.8 | 76.7 | 71.5 | 1214 | 0.24 | 14 | 948 | 40 | 33 |
| 98.4 | 79.1 | 19.3 | 76.9 | 71.6 | 1214 | 0.24 | 14 | 948 | 45 | 33 |
| 98.9 | 81.4 | 17.5 | 77.2 | 71.7 | 1214 | 0.24 | 14 | 948 | 50 | 30 |
| 99.3 | 81.9 | 17.4 | 77.4 | 71.7 | 1214 | 0.24 | 14 | 948 | 55 | 30 |
| 99.9 | 82.7 | 17.2 | 77.6 | 71.6 | 1214 | 0.24 | 14 | 949 | 0 | 30 |
| 100.0 | 83.3 | 16.7 | 77.8 | 71.5 | 1214 | 0.24 | 14 | 949 | 5 | 29 |
| 100.2 | 82.1 | 18.1 | 77.9 | 71.5 | 1214 | 0.24 | 14 | 949 | 10 | 31 |
| 100.5 | 82.0 | 18.5 | 77.9 | 71.7 | 1214 | 0.24 | 14 | 949 | 15 | 32 |
| 101.1 | 83.4 | 17.7 | 78.0 | 71.6 | 1214 | 0.24 | 14 | 949 | 20 | 31 |
| 101.5 | 84.0 | 17.5 | 78.1 | 71.7 | 1214 | 0.24 | 14 | 949 | 25 | 30 |
| 102.3 | 84.4 | 17.9 | 77.8 | 71.5 | 1214 | 0.24 | 14 | 949 | 30 | 31 |
| 102.5 | 84.3 | 18.2 | 77.9 | 71.5 | 1214 | 0.24 | 14 | 949 | 35 | 32 |
| 102.6 | 84.2 | 18.4 | 78.0 | 71.5 | 1214 | 0.24 | 14 | 949 | 40 | 32 |
| 103.0 | 83.6 | 19.4 | 78.1 | 71.4 | 1214 | 0.24 | 14 | 949 | 45 | 34 |
| 103.5 | 84.7 | 18.8 | 78.0 | 71.4 | 1214 | 0.24 | 14 | 949 | 50 | 33 |
| 103.6 | 85.4 | 18.2 | 78.4 | 71.5 | 1214 | 0.24 | 14 | 949 | 55 | 32 |
| 103.7 | 86.0 | 17.7 | 78.5 | 71.4 | 1214 | 0.24 | 14 | 950 | 0 | 31 |
| 104.2 | 87.1 | 17.1 | 78.4 | 71.3 | 1214 | 0.24 | 14 | 950 | 5 | 30 |
| 104.5 | 85.8 | 18.7 | 78.6 | 71.4 | 1214 | 0.24 | 14 | 950 | 10 | 32 |
| 104.2 | 84.5 | 19.7 | 78.7 | 71.3 | 1214 | 0.24 | 14 | 950 | 15 | 34 |
| 104.7 | 83.3 | 21.4 | 78.9 | 71.3 | 1214 | 0.24 | 14 | 950 | 20 | 37 |
| 105.0 | 84.6 | 20.4 | 79.5 | 71.3 | 1214 | 0.24 | 14 | 950 | 25 | 35 |
| 105.4 | 85.3 | 20.1 | 79.7 | 71.4 | 1214 | 0.24 | 14 | 950 | 30 | 35 |
| 105.7 | 84.4 | 21.3 | 79.7 | 71.4 | 1214 | 0.24 | 14 | 950 | 35 | 37 |
| 106.2 | 85.0 | 21.2 | 80.0 | 71.4 | 1214 | 0.24 | 14 | 950 | 40 | 37 |
| 106.0 | 84.8 | 21.2 | 80.0 | 71.5 | 1214 | 0.24 | 14 | 950 | 45 | 37 |
| 106.2 | 85.8 | 20.4 | 80.1 | 71.5 | 1214 | 0.24 | 14 | 950 | 50 | 35 |
| 106.2 | 85.9 | 20.3 | 80.3 | 71.4 | 1214 | 0.24 | 14 | 950 | 55 | 35 |
| 106.4 | 85.8 | 20.6 | 80.1 | 71.4 | 1214 | 0.24 | 14 | 951 | 0 | 36 |
| 107.0 | 86.3 | 20.7 | 79.9 | 71.2 | 1214 | 0.24 | 14 | 951 | 5 | 36 |
| 106.7 | 86.5 | 20.2 | 79.9 | 71.2 | 1214 | 0.24 | 14 | 951 | 10 | 35 |
| 107.2 | 85.9 | 21.3 | 80.0 | 71.2 | 1214 | 0.24 | 14 | 951 | 15 | 37 |
| 107.4 | 87.9 | 19.5 | 80.3 | 71.1 | 1214 | 0.24 | 14 | 951 | 20 | 34 |
| 107.5 | 88.3 | 19.2 | 80.0 | 71.1 | 1214 | 0.24 | 14 | 951 | 25 | 33 |
| 107.5 | 87.5 | 20.0 | 79.9 | 71.0 | 1214 | 0.24 | 14 | 951 | 30 | 35 |
| 107.7 | 88.1 | 19.6 | 80.0 | 71.0 | 1214 | 0.24 | 14 | 951 | 35 | 34 |
| 108.2 | 88.1 | 20.1 | 80.1 | 71.0 | 1214 | 0.24 | 14 | 951 | 40 | 35 |
| 108.3 | 87.0 | 21.3 | 80.4 | 71.1 | 1214 | 0.24 | 14 | 951 | 45 | 37 |
| 108.3 | 88.9 | 19.4 | 80.1 | 71.3 | 1214 | 0.24 | 14 | 951 | 50 | 34 |
| 108.7 | 88.6 | 20.1 | 80.3 | 71.3 | 1214 | 0.24 | 14 | 951 | 55 | 35 |

Furnace Heating On

Heat Input
During Heating
cycle = 2027 btu's

Device B Heat Recovery Test (7 Minute Heating On Cycle), Sample 1, Test 2

11/20/2013

| | Tsupply | Treturn | Temp. rise | Room | Ambient | CFM | approx. specific heat of air | approx. specific volume (cu. Ft/lbm) | Time | sec | Btu's Supplied | |
|--------------------------------|---------|---------|------------|------|---------|------|------------------------------|--------------------------------------|------|-----|----------------|---|
| Default Blower Off Delay | 108.8 | 87.7 | 21.1 | 81.0 | 71.4 | 1214 | 0.24 | 14 | 952 | 0 | 37 | Default fan delay heat recovered = 557 btu's |
| | 108.6 | 87.0 | 21.6 | 81.0 | 71.4 | 1214 | 0.24 | 14 | 952 | 5 | 37 | |
| | 108.9 | 87.4 | 21.5 | 81.0 | 71.4 | 1214 | 0.24 | 14 | 952 | 10 | 37 | |
| | 109.2 | 89.1 | 20.1 | 81.2 | 71.4 | 1214 | 0.24 | 14 | 952 | 15 | 35 | |
| | 109.2 | 88.1 | 21.1 | 81.3 | 71.6 | 1214 | 0.24 | 14 | 952 | 20 | 37 | |
| | 108.5 | 87.4 | 21.1 | 81.3 | 71.5 | 1214 | 0.24 | 14 | 952 | 25 | 37 | |
| | 108.2 | 88.7 | 19.5 | 81.0 | 71.4 | 1214 | 0.24 | 14 | 952 | 30 | 34 | |
| | 107.4 | 88.3 | 19.1 | 80.9 | 71.3 | 1214 | 0.24 | 14 | 952 | 35 | 33 | |
| | 106.6 | 89.4 | 17.2 | 80.7 | 71.3 | 1214 | 0.24 | 14 | 952 | 40 | 30 | |
| | 106.0 | 89.2 | 16.8 | 80.9 | 71.2 | 1214 | 0.24 | 14 | 952 | 45 | 29 | |
| | 105.0 | 90.2 | 14.8 | 81.0 | 71.1 | 1214 | 0.24 | 14 | 952 | 50 | 26 | |
| | 104.2 | 91.0 | 13.2 | 80.9 | 71.1 | 1214 | 0.24 | 14 | 952 | 55 | 23 | |
| | 103.3 | 90.9 | 12.4 | 81.1 | 71.1 | 1214 | 0.24 | 14 | 953 | 0 | 22 | |
| | 102.6 | 91.2 | 11.4 | 81.1 | 71.2 | 1214 | 0.24 | 14 | 953 | 5 | 20 | |
| | 101.9 | 90.5 | 11.4 | 80.9 | 71.2 | 1214 | 0.24 | 14 | 953 | 10 | 20 | |
| | 100.9 | 90.4 | 10.5 | 80.9 | 71.2 | 1214 | 0.24 | 14 | 953 | 15 | 18 | |
| | 100.2 | 90.1 | 10.1 | 81.2 | 71.2 | 1214 | 0.24 | 14 | 953 | 20 | 18 | |
| | 99.7 | 90.4 | 9.3 | 81.0 | 71.1 | 1214 | 0.24 | 14 | 953 | 25 | 16 | |
| | 98.9 | 90.9 | 8.0 | 80.9 | 71.1 | 1214 | 0.24 | 14 | 953 | 30 | 14 | |
| | 98.2 | 90.6 | 7.6 | 80.8 | 71.1 | 1214 | 0.24 | 14 | 953 | 35 | 13 | |
| | 97.8 | 90.1 | 7.7 | 80.8 | 71.0 | 1214 | 0.24 | 14 | 953 | 40 | 13 | |
| | 97.0 | 89.8 | 7.2 | 80.8 | 71.0 | 1214 | 0.24 | 14 | 953 | 45 | 12 | |
| | 96.4 | 89.8 | 6.6 | 80.9 | 71.1 | 1214 | 0.24 | 14 | 953 | 50 | 11 | |
| | 95.9 | 89.1 | 6.8 | 80.8 | 71.0 | 1214 | 0.24 | 14 | 953 | 55 | 12 | |
| | 95.3 | 88.9 | 6.4 | 80.8 | 71.1 | 1214 | 0.24 | 14 | 954 | 0 | 11 | |
| Device B Extended Blower Delay | 94.8 | 89.0 | 5.8 | 80.7 | 71.1 | 0 | 0.24 | 14 | 954 | 5 | 0 | heat recovery after default fan delay = 0 btu's |
| | 94.1 | 88.7 | 5.4 | 80.6 | 71.1 | 0 | 0.24 | 14 | 954 | 10 | 0 | |
| | 93.9 | 88.9 | 5.0 | 80.4 | 71.2 | 0 | 0.24 | 14 | 954 | 15 | 0 | |
| | 93.6 | 88.6 | 5.0 | 80.3 | 71.2 | 0 | 0.24 | 14 | 954 | 20 | 0 | |
| | 93.5 | 88.4 | 5.1 | 80.2 | 71.2 | 0 | 0.24 | 14 | 954 | 25 | 0 | |
| | 93.3 | 88.3 | 5.0 | 80.1 | 71.2 | 0 | 0.24 | 14 | 954 | 30 | 0 | |
| | 93.3 | 88.0 | 5.3 | 80.1 | 71.1 | 0 | 0.24 | 14 | 954 | 35 | 0 | |
| | 93.3 | 87.5 | 5.8 | 80.0 | 71.1 | 0 | 0.24 | 14 | 954 | 40 | 0 | |
| | 93.2 | 87.1 | 6.1 | 79.9 | 71.1 | 0 | 0.24 | 14 | 954 | 45 | 0 | |
| | 93.4 | 86.7 | 6.7 | 79.8 | 71.1 | 0 | 0.24 | 14 | 954 | 50 | 0 | |
| | 93.3 | 86.5 | 6.8 | 79.8 | 71.2 | 0 | 0.24 | 14 | 954 | 55 | 0 | |
| | 92.8 | 86.4 | 6.4 | 79.7 | 71.2 | 0 | 0.24 | 14 | 955 | 0 | 0 | |
| | 92.5 | 86.2 | 6.3 | 79.6 | 71.3 | 0 | 0.24 | 14 | 955 | 5 | 0 | |
| | 92.1 | 86.0 | 6.1 | 79.5 | 71.3 | 0 | 0.24 | 14 | 955 | 10 | 0 | |
| | 91.9 | 85.9 | 6.0 | 79.3 | 71.4 | 0 | 0.24 | 14 | 955 | 15 | 0 | |
| | 91.7 | 85.9 | 5.8 | 79.2 | 71.5 | 0 | 0.24 | 14 | 955 | 20 | 0 | |
| | 91.5 | 85.8 | 5.7 | 79.2 | 71.6 | 0 | 0.24 | 14 | 955 | 25 | 0 | |
| | 91.4 | 85.6 | 5.8 | 79.1 | 71.5 | 0 | 0.24 | 14 | 955 | 30 | 0 | |

Blower Wattage = 370

Comments: Device B device extended the blower on time after the default delay time by 0 minutes, 0 seconds.

Furnace heat input = $HV \times (\text{volume of gas consumed}) = 1040 \text{ btu/ft}^3 \times 6.2 \text{ ft}^3 = 6448 \text{ btu}$

Device B Heat Recovery Test (8 Minute Heating On Cycle), Sample 1, Test 2

11/20/2013

| | Tsupply | Treturn | Temp. rise | Room | Ambient | CFM | approx. specific heat of air | approx. specific volume (cu. Ft/lbm) | Time | sec | Btu's Supplied |
|--|---------|---------|------------|------|---------|------|---------------------------------|---|------|-----|-------------------|
| | 72.1 | 71.2 | 0.9 | 71.9 | 71.5 | 1221 | 0.24 | 14 | 916 | 0 | 2 |
| | 72.0 | 71.3 | 0.7 | 71.9 | 71.6 | 1221 | 0.24 | 14 | 916 | 5 | 1 |
| | 72.1 | 71.3 | 0.8 | 71.9 | 71.6 | 1221 | 0.24 | 14 | 916 | 10 | 1 |
| | 72.1 | 71.3 | 0.8 | 71.9 | 71.7 | 1221 | 0.24 | 14 | 916 | 15 | 1 |
| | 72.2 | 71.3 | 0.9 | 71.9 | 71.9 | 1221 | 0.24 | 14 | 916 | 20 | 2 |
| | 72.2 | 71.3 | 0.9 | 72.0 | 72.0 | 1221 | 0.24 | 14 | 916 | 25 | 2 |
| | 72.1 | 71.3 | 0.8 | 72.0 | 71.9 | 1221 | 0.24 | 14 | 916 | 30 | 1 |
| | 72.8 | 71.3 | 1.5 | 72.0 | 71.8 | 1221 | 0.24 | 14 | 916 | 35 | 3 |
| | 72.7 | 71.4 | 1.3 | 72.0 | 71.7 | 1221 | 0.24 | 14 | 916 | 40 | 2 |
| | 72.6 | 71.5 | 1.1 | 72.0 | 71.7 | 1221 | 0.24 | 14 | 916 | 45 | 2 |
| | 72.5 | 71.5 | 1.0 | 72.0 | 71.7 | 1221 | 0.24 | 14 | 916 | 50 | 2 |
| | 72.6 | 71.5 | 1.1 | 72.1 | 71.7 | 1221 | 0.24 | 14 | 916 | 55 | 2 |
| | 74.3 | 71.5 | 2.8 | 72.1 | 71.6 | 1221 | 0.24 | 14 | 917 | 0 | 5 |
| | 76.1 | 71.6 | 4.5 | 72.1 | 71.5 | 1221 | 0.24 | 14 | 917 | 5 | 8 |
| | 77.5 | 71.9 | 5.6 | 72.1 | 71.5 | 1221 | 0.24 | 14 | 917 | 10 | 10 |
| | 78.9 | 72.0 | 6.9 | 72.1 | 71.6 | 1221 | 0.24 | 14 | 917 | 15 | 12 |
| | 80.0 | 72.1 | 7.9 | 72.4 | 71.6 | 1221 | 0.24 | 14 | 917 | 20 | 14 |
| | 80.2 | 72.4 | 7.8 | 72.5 | 71.7 | 1221 | 0.24 | 14 | 917 | 25 | 14 |
| | 81.4 | 72.8 | 8.6 | 72.7 | 71.7 | 1221 | 0.24 | 14 | 917 | 30 | 15 |
| | 82.4 | 73.3 | 9.1 | 72.9 | 71.7 | 1221 | 0.24 | 14 | 917 | 35 | 16 |
| | 83.1 | 73.9 | 9.2 | 72.8 | 71.7 | 1221 | 0.24 | 14 | 917 | 40 | 16 |
| | 84.0 | 74.4 | 9.6 | 72.9 | 71.8 | 1221 | 0.24 | 14 | 917 | 45 | 17 |
| | 85.0 | 74.9 | 10.1 | 73.2 | 71.7 | 1221 | 0.24 | 14 | 917 | 50 | 18 |
| | 85.8 | 75.2 | 10.6 | 73.5 | 71.8 | 1221 | 0.24 | 14 | 917 | 55 | 18 |
| | 86.5 | 75.3 | 11.2 | 73.9 | 71.8 | 1221 | 0.24 | 14 | 918 | 0 | 20 |
| | 87.4 | 75.8 | 11.6 | 74.2 | 71.8 | 1221 | 0.24 | 14 | 918 | 5 | 20 |
| | 88.2 | 76.0 | 12.2 | 74.4 | 71.8 | 1221 | 0.24 | 14 | 918 | 10 | 21 |
| | 89.0 | 76.1 | 12.9 | 74.5 | 71.8 | 1221 | 0.24 | 14 | 918 | 15 | 23 |
| | 89.7 | 76.7 | 13.0 | 74.7 | 71.8 | 1221 | 0.24 | 14 | 918 | 20 | 23 |
| | 90.3 | 76.5 | 13.8 | 74.8 | 71.9 | 1221 | 0.24 | 14 | 918 | 25 | 24 |
| | 91.3 | 76.6 | 14.7 | 74.8 | 71.9 | 1221 | 0.24 | 14 | 918 | 30 | 26 |
| | 92.0 | 76.2 | 15.8 | 74.9 | 71.8 | 1221 | 0.24 | 14 | 918 | 35 | 28 |
| | 92.7 | 76.5 | 16.2 | 74.9 | 71.8 | 1221 | 0.24 | 14 | 918 | 40 | 28 |
| | 93.3 | 76.1 | 17.2 | 74.8 | 71.7 | 1221 | 0.24 | 14 | 918 | 45 | 30 |
| | 93.9 | 77.8 | 16.1 | 75.3 | 71.8 | 1221 | 0.24 | 14 | 918 | 50 | 28 |
| | 94.3 | 77.8 | 16.5 | 75.5 | 71.7 | 1221 | 0.24 | 14 | 918 | 55 | 29 |
| | 94.7 | 77.7 | 17.0 | 75.6 | 71.4 | 1221 | 0.24 | 14 | 919 | 0 | 30 |
| | 95.2 | 77.2 | 18.0 | 75.7 | 71.3 | 1221 | 0.24 | 14 | 919 | 5 | 31 |
| | 95.9 | 77.5 | 18.4 | 75.9 | 71.3 | 1221 | 0.24 | 14 | 919 | 10 | 32 |
| | 96.3 | 78.7 | 17.6 | 76.3 | 71.2 | 1221 | 0.24 | 14 | 919 | 15 | 31 |
| | 96.7 | 79.1 | 17.6 | 76.4 | 71.2 | 1221 | 0.24 | 14 | 919 | 20 | 31 |
| | 97.3 | 79.1 | 18.2 | 76.5 | 71.2 | 1221 | 0.24 | 14 | 919 | 25 | 32 |
| | 97.6 | 79.8 | 17.8 | 76.5 | 71.2 | 1221 | 0.24 | 14 | 919 | 30 | 31 |
| | 98.1 | 80.4 | 17.7 | 76.6 | 71.1 | 1221 | 0.24 | 14 | 919 | 35 | 31 |
| | 98.5 | 81.0 | 17.5 | 77.1 | 71.2 | 1221 | 0.24 | 14 | 919 | 40 | 31 |
| | 99.0 | 81.9 | 17.1 | 77.3 | 71.2 | 1221 | 0.24 | 14 | 919 | 45 | 30 |
| | 99.3 | 82.8 | 16.5 | 77.4 | 71.2 | 1221 | 0.24 | 14 | 919 | 50 | 29 |
| | 99.7 | 83.0 | 16.7 | 77.5 | 71.2 | 1221 | 0.24 | 14 | 919 | 55 | 29 |
| | 100.2 | 82.3 | 17.9 | 77.7 | 71.1 | 1221 | 0.24 | 14 | 920 | 0 | 31 |
| | 100.4 | 81.2 | 19.2 | 77.6 | 71.0 | 1221 | 0.24 | 14 | 920 | 5 | 33 |
| | 100.8 | 81.8 | 19.0 | 77.8 | 71.1 | 1221 | 0.24 | 14 | 920 | 10 | 33 |
| | 101.1 | 81.8 | 19.3 | 78.3 | 71.1 | 1221 | 0.24 | 14 | 920 | 15 | 34 |
| | 101.1 | 83.3 | 17.8 | 78.4 | 71.2 | 1221 | 0.24 | 14 | 920 | 20 | 31 |
| | 101.8 | 84.2 | 17.6 | 78.6 | 71.4 | 1221 | 0.24 | 14 | 920 | 25 | 31 |
| | 102.0 | 84.0 | 18.0 | 78.7 | 71.4 | 1221 | 0.24 | 14 | 920 | 30 | 31 |
| | 102.5 | 84.5 | 18.0 | 78.6 | 71.2 | 1221 | 0.24 | 14 | 920 | 35 | 31 |
| | 102.6 | 82.5 | 20.1 | 78.7 | 71.3 | 1221 | 0.24 | 14 | 920 | 40 | 35 |
| | 102.5 | 82.8 | 19.7 | 79.0 | 71.2 | 1221 | 0.24 | 14 | 920 | 45 | 34 |
| | 102.5 | 84.8 | 17.7 | 79.1 | 71.2 | 1221 | 0.24 | 14 | 920 | 50 | 31 |
| | 103.2 | 86.1 | 17.1 | 79.0 | 71.3 | 1221 | 0.24 | 14 | 920 | 55 | 30 |
| | 103.8 | 86.3 | 17.5 | 79.4 | 71.3 | 1221 | 0.24 | 14 | 921 | 0 | 31 |
| | 103.8 | 86.3 | 17.5 | 79.6 | 71.2 | 1221 | 0.24 | 14 | 921 | 5 | 31 |
| | 103.7 | 85.0 | 18.7 | 79.5 | 71.2 | 1221 | 0.24 | 14 | 921 | 10 | 33 |
| | 103.9 | 83.6 | 20.3 | 79.7 | 71.1 | 1221 | 0.24 | 14 | 921 | 15 | 35 |
| | 104.2 | 84.6 | 19.6 | 79.6 | 71.1 | 1221 | 0.24 | 14 | 921 | 20 | 34 |
| | 104.6 | 85.5 | 19.1 | 79.5 | 71.1 | 1221 | 0.24 | 14 | 921 | 25 | 33 |
| | 104.7 | 85.9 | 18.8 | 79.8 | 71.1 | 1221 | 0.24 | 14 | 921 | 30 | 33 |
| | 105.1 | 85.1 | 20.0 | 79.5 | 71.2 | 1221 | 0.24 | 14 | 921 | 35 | 35 |
| | 105.2 | 84.7 | 20.5 | 79.3 | 71.3 | 1221 | 0.24 | 14 | 921 | 40 | 36 |
| | 105.5 | 84.9 | 20.6 | 79.6 | 71.4 | 1221 | 0.24 | 14 | 921 | 45 | 36 |
| | 105.5 | 86.3 | 19.2 | 79.9 | 71.5 | 1221 | 0.24 | 14 | 921 | 50 | 33 |
| | 106.1 | 86.9 | 19.2 | 80.0 | 71.6 | 1221 | 0.24 | 14 | 921 | 55 | 33 |
| | 106.0 | 87.9 | 18.1 | 80.4 | 71.4 | 1221 | 0.24 | 14 | 922 | 0 | 32 |
| | 106.2 | 87.6 | 18.6 | 80.5 | 71.4 | 1221 | 0.24 | 14 | 922 | 5 | 32 |
| | 106.7 | 86.6 | 20.1 | 80.4 | 71.4 | 1221 | 0.24 | 14 | 922 | 10 | 35 |
| | 107.0 | 85.3 | 21.7 | 80.8 | 71.4 | 1221 | 0.24 | 14 | 922 | 15 | 38 |
| | 107.0 | 85.8 | 21.2 | 80.8 | 71.4 | 1221 | 0.24 | 14 | 922 | 20 | 37 |
| | 107.1 | 85.4 | 21.7 | 80.8 | 71.4 | 1221 | 0.24 | 14 | 922 | 25 | 38 |
| | 107.3 | 85.0 | 22.3 | 80.8 | 71.5 | 1221 | 0.24 | 14 | 922 | 30 | 39 |
| | 107.6 | 84.8 | 22.8 | 80.5 | 71.5 | 1221 | 0.24 | 14 | 922 | 35 | 40 |
| | 107.7 | 84.9 | 22.8 | 80.6 | 71.6 | 1221 | 0.24 | 14 | 922 | 40 | 40 |
| | 107.7 | 85.0 | 22.7 | 80.4 | 71.7 | 1221 | 0.24 | 14 | 922 | 45 | 40 |
| | 107.6 | 87.1 | 20.5 | 80.3 | 71.7 | 1221 | 0.24 | 14 | 922 | 50 | 36 |

Heat Input
During Heating
cycle = 2561 btu's

Device B Heat Recovery Test (8 Minute Heating On Cycle), Sample 1, Test 2

11/20/2013

| | Tsupply | Treturn | Temp. rise | Room | Ambient | CFM | approx. specific heat of air | approx. specific volume (cu. Ft/lbm) | Time | sec | Btu's Supplied | |
|--------------------------------|---------|---------|------------|------|---------|------|------------------------------|--------------------------------------|------|-----|----------------|---|
| | 108.1 | 87.0 | 21.1 | 80.5 | 71.9 | 1221 | 0.24 | 14 | 922 | 55 | 37 | |
| | 108.3 | 88.6 | 19.7 | 80.5 | 71.7 | 1221 | 0.24 | 14 | 923 | 0 | 34 | |
| | 108.7 | 88.6 | 20.1 | 80.2 | 71.6 | 1221 | 0.24 | 14 | 923 | 5 | 35 | |
| | 108.7 | 87.4 | 21.3 | 80.5 | 71.7 | 1221 | 0.24 | 14 | 923 | 10 | 37 | |
| | 109.0 | 87.0 | 22.0 | 80.5 | 71.8 | 1221 | 0.24 | 14 | 923 | 15 | 38 | |
| | 108.6 | 88.8 | 19.8 | 80.4 | 72.0 | 1221 | 0.24 | 14 | 923 | 20 | 35 | |
| | 108.8 | 89.4 | 19.4 | 80.5 | 72.0 | 1221 | 0.24 | 14 | 923 | 25 | 34 | |
| | 109.0 | 87.1 | 21.9 | 80.7 | 71.8 | 1221 | 0.24 | 14 | 923 | 30 | 38 | |
| | 109.4 | 88.5 | 20.9 | 80.5 | 71.6 | 1221 | 0.24 | 14 | 923 | 35 | 36 | |
| | 109.5 | 88.4 | 21.1 | 80.8 | 71.6 | 1221 | 0.24 | 14 | 923 | 40 | 37 | |
| | 109.3 | 87.0 | 22.3 | 80.7 | 71.7 | 1221 | 0.24 | 14 | 923 | 45 | 39 | |
| | 109.7 | 88.6 | 21.1 | 80.6 | 71.6 | 1221 | 0.24 | 14 | 923 | 50 | 37 | |
| | 109.9 | 87.2 | 22.7 | 80.6 | 71.6 | 1221 | 0.24 | 14 | 923 | 55 | 40 | |
| | 110.1 | 86.2 | 23.9 | 80.7 | 71.6 | 1221 | 0.24 | 14 | 924 | 0 | 42 | |
| | 109.7 | 86.5 | 23.2 | 80.8 | 71.5 | 1221 | 0.24 | 14 | 924 | 5 | 40 | Default fan delay heat recovered = 565 btu's |
| Default Blower Off Delay | 109.7 | 88.1 | 21.6 | 81.3 | 71.5 | 1221 | 0.24 | 14 | 924 | 10 | 38 | |
| | 110.0 | 88.4 | 21.6 | 81.5 | 71.4 | 1221 | 0.24 | 14 | 924 | 15 | 38 | |
| | 109.7 | 87.0 | 22.7 | 81.6 | 71.4 | 1221 | 0.24 | 14 | 924 | 20 | 40 | |
| | 109.3 | 89.0 | 20.3 | 81.7 | 71.4 | 1221 | 0.24 | 14 | 924 | 25 | 35 | |
| | 108.9 | 89.9 | 19.0 | 81.8 | 71.4 | 1221 | 0.24 | 14 | 924 | 30 | 33 | |
| | 108.5 | 89.8 | 18.7 | 81.7 | 71.4 | 1221 | 0.24 | 14 | 924 | 35 | 33 | |
| | 108.0 | 89.4 | 18.6 | 81.6 | 71.4 | 1221 | 0.24 | 14 | 924 | 40 | 32 | |
| | 106.8 | 89.3 | 17.5 | 81.9 | 71.3 | 1221 | 0.24 | 14 | 924 | 45 | 31 | |
| | 106.0 | 89.9 | 16.1 | 82.1 | 71.2 | 1221 | 0.24 | 14 | 924 | 50 | 28 | |
| | 105.0 | 90.8 | 14.2 | 82.0 | 71.2 | 1221 | 0.24 | 14 | 924 | 55 | 25 | |
| | 104.1 | 91.7 | 12.4 | 81.7 | 71.1 | 1221 | 0.24 | 14 | 925 | 0 | 22 | |
| | 103.3 | 91.3 | 12.0 | 81.5 | 71.1 | 1221 | 0.24 | 14 | 925 | 5 | 21 | |
| | 102.6 | 91.1 | 11.5 | 81.3 | 71.2 | 1221 | 0.24 | 14 | 925 | 10 | 20 | |
| | 101.8 | 91.6 | 10.2 | 81.2 | 71.0 | 1221 | 0.24 | 14 | 925 | 15 | 18 | |
| | 101.1 | 91.8 | 9.3 | 81.1 | 71.0 | 1221 | 0.24 | 14 | 925 | 20 | 16 | |
| | 100.4 | 92.0 | 8.4 | 81.3 | 71.0 | 1221 | 0.24 | 14 | 925 | 25 | 15 | |
| | 99.6 | 92.2 | 7.4 | 81.5 | 71.0 | 1221 | 0.24 | 14 | 925 | 30 | 13 | |
| | 98.7 | 91.5 | 7.2 | 81.3 | 71.0 | 1221 | 0.24 | 14 | 925 | 35 | 13 | |
| | 98.1 | 90.7 | 7.4 | 81.2 | 71.1 | 1221 | 0.24 | 14 | 925 | 40 | 13 | |
| | 97.4 | 90.7 | 6.7 | 81.1 | 71.2 | 1221 | 0.24 | 14 | 925 | 45 | 12 | |
| | 96.8 | 90.3 | 6.5 | 81.1 | 71.2 | 1221 | 0.24 | 14 | 925 | 50 | 11 | |
| | 96.2 | 90.4 | 5.8 | 81.1 | 71.2 | 1221 | 0.24 | 14 | 925 | 55 | 10 | |
| | 95.8 | 90.4 | 5.4 | 81.0 | 71.1 | 1221 | 0.24 | 14 | 926 | 0 | 9 | heat recovery after default fan delay = 0 btu's |
| Device B Extended Blower Delay | 95.1 | 90.1 | 5.0 | 80.8 | 71.0 | 0 | 0.24 | 14 | 926 | 5 | 0 | |
| | 94.7 | 90.1 | 4.6 | 80.7 | 70.9 | 0 | 0.24 | 14 | 926 | 10 | 0 | |
| | 94.2 | 89.7 | 4.5 | 80.5 | 70.9 | 0 | 0.24 | 14 | 926 | 15 | 0 | |
| | 94.1 | 89.5 | 4.6 | 80.3 | 70.9 | 0 | 0.24 | 14 | 926 | 20 | 0 | |
| | 94.0 | 89.3 | 4.7 | 80.1 | 70.9 | 0 | 0.24 | 14 | 926 | 25 | 0 | |
| | 94.0 | 89.1 | 4.9 | 80.0 | 70.9 | 0 | 0.24 | 14 | 926 | 30 | 0 | |
| | 94.1 | 89.0 | 5.1 | 80.1 | 71.0 | 0 | 0.24 | 14 | 926 | 35 | 0 | |
| | 94.2 | 88.6 | 5.6 | 80.1 | 71.0 | 0 | 0.24 | 14 | 926 | 40 | 0 | |
| | 94.3 | 88.3 | 6.0 | 80.0 | 71.1 | 0 | 0.24 | 14 | 926 | 45 | 0 | |
| | 94.3 | 87.9 | 6.4 | 80.0 | 71.0 | 0 | 0.24 | 14 | 926 | 50 | 0 | |
| | 94.7 | 87.5 | 7.2 | 79.9 | 71.1 | 0 | 0.24 | 14 | 926 | 55 | 0 | |
| | 94.4 | 87.2 | 7.2 | 79.8 | 71.1 | 0 | 0.24 | 14 | 927 | 0 | 0 | |
| | 93.9 | 87.0 | 6.9 | 79.7 | 71.0 | 0 | 0.24 | 14 | 927 | 5 | 0 | |
| | 93.4 | 86.9 | 6.5 | 79.6 | 71.1 | 0 | 0.24 | 14 | 927 | 10 | 0 | |
| | 92.9 | 86.6 | 6.3 | 79.6 | 71.2 | 0 | 0.24 | 14 | 927 | 15 | 0 | |
| | 92.6 | 86.4 | 6.2 | 79.5 | 71.1 | 0 | 0.24 | 14 | 927 | 20 | 0 | |
| | 92.4 | 86.3 | 6.1 | 79.4 | 71.1 | 0 | 0.24 | 14 | 927 | 25 | 0 | |
| | 92.2 | 86.1 | 6.1 | 79.4 | 71.1 | 0 | 0.24 | 14 | 927 | 30 | 0 | |
| | 91.9 | 85.8 | 6.1 | 79.3 | 71.1 | 0 | 0.24 | 14 | 927 | 35 | 0 | |
| | 91.8 | 85.5 | 6.3 | 79.1 | 71.2 | 0 | 0.24 | 14 | 927 | 40 | 0 | |
| | 91.6 | 85.1 | 6.5 | 79.0 | 71.2 | 0 | 0.24 | 14 | 927 | 45 | 0 | |
| | 91.4 | 84.7 | 6.7 | 79.0 | 71.3 | 0 | 0.24 | 14 | 927 | 50 | 0 | |
| | 91.6 | 84.5 | 7.1 | 78.9 | 71.2 | 0 | 0.24 | 14 | 927 | 55 | 0 | |
| | 91.6 | 84.3 | 7.3 | 78.9 | 71.2 | 0 | 0.24 | 14 | 928 | 0 | 0 | |
| | 91.7 | 84.1 | 6.6 | 78.8 | 71.3 | 0 | 0.24 | 14 | 928 | 5 | 0 | |

Blower Wattage = 370

Comments: Device B device extended the blower on time after the default delay time by 0 minutes, 0 seconds.

Furnace heat input = HV x (volume of gas consumed) = 1040 btu/ft³ x 7.1 ft³ = 7384 btu

Device B Heat Recovery Test (9 Minute Heating On Cycle), Sample 1, Test 2

11/20/2013

| Tsupply | Treturn | Temp. rise | Room | Ambient | CFM | approx. specific heat of air | approx. specific volume (cu. Ft/lbm) | Time | sec | Btu's Supplied |
|---------|---------|------------|------|---------|------|---------------------------------|---|------|-----|-------------------|
| 73.2 | 70.4 | 2.8 | 71.3 | 71.0 | 1212 | 0.24 | 14 | 845 | 0 | 5 |
| 73.3 | 70.4 | 2.9 | 71.3 | 70.9 | 1212 | 0.24 | 14 | 845 | 5 | 5 |
| 73.3 | 70.4 | 2.9 | 71.3 | 71.0 | 1212 | 0.24 | 14 | 845 | 10 | 5 |
| 73.2 | 70.4 | 2.8 | 71.3 | 71.1 | 1212 | 0.24 | 14 | 845 | 15 | 5 |
| 73.3 | 70.4 | 2.9 | 71.3 | 71.2 | 1212 | 0.24 | 14 | 845 | 20 | 5 |
| 73.3 | 70.4 | 2.9 | 71.3 | 71.1 | 1212 | 0.24 | 14 | 845 | 25 | 5 |
| 73.3 | 70.4 | 2.9 | 71.3 | 71.0 | 1212 | 0.24 | 14 | 845 | 30 | 5 |
| 73.3 | 70.4 | 2.9 | 71.3 | 70.9 | 1212 | 0.24 | 14 | 845 | 35 | 5 |
| 73.3 | 70.4 | 2.9 | 71.3 | 71.0 | 1212 | 0.24 | 14 | 845 | 40 | 5 |
| 73.3 | 70.4 | 2.9 | 71.3 | 71.0 | 1212 | 0.24 | 14 | 845 | 45 | 5 |
| 73.5 | 70.4 | 3.1 | 71.3 | 71.0 | 1212 | 0.24 | 14 | 845 | 50 | 5 |
| 75.8 | 70.4 | 5.4 | 71.3 | 71.0 | 1212 | 0.24 | 14 | 846 | 55 | 5 |
| 78.0 | 70.5 | 7.5 | 71.5 | 71.0 | 1212 | 0.24 | 14 | 846 | 0 | 9 |
| 79.7 | 70.8 | 8.9 | 71.7 | 71.0 | 1212 | 0.24 | 14 | 846 | 5 | 13 |
| 81.2 | 70.8 | 10.4 | 71.8 | 71.1 | 1212 | 0.24 | 14 | 846 | 10 | 15 |
| 82.3 | 71.1 | 11.2 | 72.1 | 71.1 | 1212 | 0.24 | 14 | 846 | 15 | 18 |
| 83.6 | 71.6 | 12.0 | 72.0 | 71.2 | 1212 | 0.24 | 14 | 846 | 20 | 19 |
| 84.6 | 72.0 | 12.6 | 72.0 | 71.2 | 1212 | 0.24 | 14 | 846 | 25 | 21 |
| 85.2 | 72.5 | 12.7 | 72.0 | 71.2 | 1212 | 0.24 | 14 | 846 | 30 | 22 |
| 86.0 | 73.4 | 12.6 | 72.4 | 71.2 | 1212 | 0.24 | 14 | 846 | 35 | 22 |
| 86.5 | 73.8 | 12.7 | 72.8 | 71.3 | 1212 | 0.24 | 14 | 846 | 40 | 22 |
| 87.0 | 74.3 | 12.7 | 73.2 | 71.4 | 1212 | 0.24 | 14 | 846 | 45 | 22 |
| 87.9 | 74.7 | 13.2 | 73.5 | 71.5 | 1212 | 0.24 | 14 | 846 | 50 | 22 |
| 89.2 | 74.6 | 14.6 | 73.7 | 71.4 | 1212 | 0.24 | 14 | 846 | 55 | 23 |
| 89.8 | 73.8 | 16.0 | 74.1 | 71.4 | 1212 | 0.24 | 14 | 847 | 0 | 25 |
| 90.1 | 73.6 | 16.5 | 74.5 | 71.4 | 1212 | 0.24 | 14 | 847 | 5 | 28 |
| 90.9 | 74.1 | 16.8 | 74.6 | 71.4 | 1212 | 0.24 | 14 | 847 | 10 | 29 |
| 91.5 | 74.2 | 17.3 | 74.9 | 71.5 | 1212 | 0.24 | 14 | 847 | 15 | 29 |
| 92.0 | 73.9 | 18.1 | 74.8 | 71.4 | 1212 | 0.24 | 14 | 847 | 20 | 30 |
| 92.5 | 74.1 | 18.4 | 74.7 | 71.3 | 1212 | 0.24 | 14 | 847 | 25 | 31 |
| 93.3 | 75.0 | 18.3 | 74.9 | 71.2 | 1212 | 0.24 | 14 | 847 | 30 | 32 |
| 94.1 | 75.7 | 18.4 | 75.1 | 71.1 | 1212 | 0.24 | 14 | 847 | 35 | 32 |
| 94.4 | 75.1 | 19.3 | 75.0 | 71.0 | 1212 | 0.24 | 14 | 847 | 40 | 32 |
| 95.1 | 75.5 | 19.6 | 74.8 | 71.1 | 1212 | 0.24 | 14 | 847 | 45 | 33 |
| 95.5 | 76.1 | 19.4 | 75.1 | 71.1 | 1212 | 0.24 | 14 | 847 | 50 | 34 |
| 95.6 | 77.8 | 17.8 | 75.1 | 71.1 | 1212 | 0.24 | 14 | 847 | 55 | 34 |
| 96.2 | 78.9 | 17.3 | 75.8 | 71.1 | 1212 | 0.24 | 14 | 848 | 0 | 31 |
| 96.6 | 79.0 | 17.6 | 76.3 | 71.1 | 1212 | 0.24 | 14 | 848 | 5 | 30 |
| 96.9 | 78.9 | 18.0 | 76.6 | 71.2 | 1212 | 0.24 | 14 | 848 | 10 | 30 |
| 97.4 | 79.6 | 17.8 | 76.9 | 71.3 | 1212 | 0.24 | 14 | 848 | 15 | 31 |
| 97.7 | 78.6 | 19.1 | 77.1 | 71.4 | 1212 | 0.24 | 14 | 848 | 20 | 31 |
| 98.3 | 79.4 | 18.9 | 76.8 | 71.4 | 1212 | 0.24 | 14 | 848 | 25 | 33 |
| 98.1 | 79.3 | 18.8 | 77.1 | 71.3 | 1212 | 0.24 | 14 | 848 | 30 | 33 |
| 99.0 | 79.5 | 19.5 | 77.1 | 71.4 | 1212 | 0.24 | 14 | 848 | 35 | 33 |
| 99.5 | 79.2 | 20.3 | 76.8 | 71.4 | 1212 | 0.24 | 14 | 848 | 40 | 34 |
| 99.9 | 80.7 | 19.2 | 76.6 | 71.4 | 1212 | 0.24 | 14 | 848 | 45 | 35 |
| 100.3 | 81.5 | 18.8 | 76.5 | 71.5 | 1212 | 0.24 | 14 | 848 | 50 | 33 |
| 100.5 | 81.2 | 19.3 | 76.7 | 71.4 | 1212 | 0.24 | 14 | 848 | 55 | 33 |
| 100.7 | 80.9 | 19.8 | 77.1 | 71.4 | 1212 | 0.24 | 14 | 849 | 0 | 33 |
| 101.1 | 80.7 | 20.4 | 77.4 | 71.3 | 1212 | 0.24 | 14 | 849 | 5 | 34 |
| 101.4 | 81.3 | 20.1 | 77.3 | 71.4 | 1212 | 0.24 | 14 | 849 | 10 | 35 |
| 101.8 | 83.0 | 18.8 | 77.3 | 71.4 | 1212 | 0.24 | 14 | 849 | 15 | 35 |
| 101.8 | 83.1 | 18.7 | 77.5 | 71.4 | 1212 | 0.24 | 14 | 849 | 20 | 33 |
| 102.2 | 83.4 | 18.8 | 77.7 | 71.4 | 1212 | 0.24 | 14 | 849 | 25 | 32 |
| 102.6 | 83.8 | 18.8 | 77.8 | 71.4 | 1212 | 0.24 | 14 | 849 | 30 | 33 |
| 102.9 | 83.3 | 19.6 | 77.9 | 71.3 | 1212 | 0.24 | 14 | 849 | 35 | 33 |
| 103.0 | 82.5 | 20.5 | 77.9 | 71.3 | 1212 | 0.24 | 14 | 849 | 40 | 34 |
| 103.2 | 83.3 | 19.9 | 78.0 | 71.4 | 1212 | 0.24 | 14 | 849 | 45 | 35 |
| 103.5 | 84.1 | 19.4 | 78.1 | 71.4 | 1212 | 0.24 | 14 | 849 | 50 | 34 |
| 103.4 | 84.8 | 18.6 | 77.9 | 71.4 | 1212 | 0.24 | 14 | 849 | 55 | 34 |
| 103.9 | 84.8 | 19.1 | 77.8 | 71.3 | 1212 | 0.24 | 14 | 850 | 0 | 32 |
| 104.2 | 83.5 | 20.7 | 77.9 | 71.3 | 1212 | 0.24 | 14 | 850 | 5 | 33 |
| 104.3 | 83.8 | 20.5 | 78.5 | 71.3 | 1212 | 0.24 | 14 | 850 | 10 | 36 |
| 104.4 | 85.2 | 19.2 | 78.7 | 71.4 | 1212 | 0.24 | 14 | 850 | 15 | 35 |
| 104.9 | 86.4 | 18.5 | 78.9 | 71.5 | 1212 | 0.24 | 14 | 850 | 20 | 33 |
| 105.5 | 86.5 | 19.0 | 78.7 | 71.5 | 1212 | 0.24 | 14 | 850 | 25 | 32 |
| 105.5 | 86.4 | 19.1 | 78.7 | 71.4 | 1212 | 0.24 | 14 | 850 | 30 | 33 |
| 105.7 | 84.7 | 21.0 | 78.5 | 71.3 | 1212 | 0.24 | 14 | 850 | 35 | 33 |
| 105.8 | 85.1 | 20.7 | 78.5 | 71.3 | 1212 | 0.24 | 14 | 850 | 40 | 36 |
| 105.8 | 85.1 | 20.7 | 78.3 | 71.4 | 1212 | 0.24 | 14 | 850 | 45 | 36 |
| 106.0 | 86.2 | 19.8 | 78.4 | 71.4 | 1212 | 0.24 | 14 | 850 | 50 | 36 |
| 106.1 | 86.9 | 19.2 | 78.7 | 71.3 | 1212 | 0.24 | 14 | 850 | 55 | 34 |
| 106.5 | 85.9 | 20.6 | 78.6 | 71.2 | 1212 | 0.24 | 14 | 851 | 0 | 33 |
| 106.7 | 85.3 | 21.4 | 78.8 | 71.2 | 1212 | 0.24 | 14 | 851 | 5 | 36 |
| 107.1 | 84.8 | 22.3 | 79.0 | 71.2 | 1212 | 0.24 | 14 | 851 | 10 | 37 |
| 106.9 | 83.7 | 23.2 | 79.1 | 71.3 | 1212 | 0.24 | 14 | 851 | 15 | 39 |
| 106.9 | 82.9 | 24.0 | 79.3 | 71.3 | 1212 | 0.24 | 14 | 851 | 20 | 40 |
| 107.0 | 84.3 | 22.7 | 79.3 | 71.4 | 1212 | 0.24 | 14 | 851 | 25 | 42 |
| 107.2 | 83.7 | 23.5 | 79.1 | 71.5 | 1212 | 0.24 | 14 | 851 | 30 | 39 |
| 107.0 | 82.8 | 24.2 | 79.1 | 71.5 | 1212 | 0.24 | 14 | 851 | 35 | 41 |
| 107.0 | 82.7 | 24.3 | 79.4 | 71.6 | 1212 | 0.24 | 14 | 851 | 40 | 42 |
| 107.2 | 84.6 | 22.6 | 79.6 | 71.6 | 1212 | 0.24 | 14 | 851 | 45 | 42 |
| 107.3 | 86.3 | 21.0 | 79.8 | 71.7 | 1212 | 0.24 | 14 | 851 | 50 | 39 |
| 107.5 | 87.1 | 20.4 | 80.1 | 71.6 | 1212 | 0.24 | 14 | 851 | 55 | 36 |
| 107.8 | 87.4 | 20.4 | 80.5 | 71.6 | 1212 | 0.24 | 14 | 852 | 0 | 35 |
| 108.0 | 87.0 | 21.0 | 80.5 | 71.7 | 1212 | 0.24 | 14 | 852 | 5 | 35 |
| 108.0 | 87.3 | 20.7 | 80.3 | 71.7 | 1212 | 0.24 | 14 | 852 | 10 | 36 |
| | | | | | | | | 852 | 15 | 36 |

Furnace Heating On

Heat Input
During Heating
cycle = 3319 btu/s

Device B Heat Recovery Test (9 Minute Heating On Cycle), Sample 1, Test 2

11/20/2013

| | Tsupply | Treturn | Temp. rise | Room | Ambient | CFM | approx. specific heat of air | approx. specific volume (cu. Ft/lbm) | Time | sec | Btu's Supplied | |
|--------------------------------|---------|---------|------------|------|---------|------|------------------------------|--------------------------------------|------|-----|----------------|---|
| | 107.9 | 86.2 | 21.7 | 80.3 | 71.7 | 1212 | 0.24 | 14 | 852 | 20 | 38 | |
| | 108.0 | 85.4 | 22.6 | 80.7 | 71.8 | 1212 | 0.24 | 14 | 852 | 25 | 39 | |
| | 108.0 | 83.8 | 24.2 | 80.8 | 71.8 | 1212 | 0.24 | 14 | 852 | 30 | 42 | |
| | 108.4 | 84.1 | 24.3 | 80.5 | 71.8 | 1212 | 0.24 | 14 | 852 | 35 | 42 | |
| | 108.2 | 84.0 | 24.2 | 80.2 | 71.7 | 1212 | 0.24 | 14 | 852 | 40 | 42 | |
| | 108.6 | 84.0 | 24.6 | 80.6 | 71.7 | 1212 | 0.24 | 14 | 852 | 45 | 43 | |
| | 108.5 | 85.1 | 23.4 | 80.9 | 71.9 | 1212 | 0.24 | 14 | 852 | 50 | 41 | |
| | 108.7 | 85.0 | 23.7 | 81.3 | 71.9 | 1212 | 0.24 | 14 | 852 | 55 | 41 | |
| | 108.9 | 85.2 | 23.7 | 81.0 | 71.8 | 1212 | 0.24 | 14 | 853 | 0 | 41 | |
| | 109.2 | 86.3 | 22.9 | 81.2 | 71.8 | 1212 | 0.24 | 14 | 853 | 5 | 40 | |
| | 109.1 | 86.3 | 22.8 | 81.5 | 71.7 | 1212 | 0.24 | 14 | 853 | 10 | 39 | |
| | 109.2 | 85.5 | 23.7 | 81.3 | 71.6 | 1212 | 0.24 | 14 | 853 | 15 | 41 | |
| | 109.4 | 86.7 | 22.7 | 81.5 | 71.6 | 1212 | 0.24 | 14 | 853 | 20 | 39 | |
| | 109.4 | 87.2 | 22.2 | 81.2 | 71.6 | 1212 | 0.24 | 14 | 853 | 25 | 38 | |
| | 109.6 | 86.5 | 23.1 | 80.7 | 71.4 | 1212 | 0.24 | 14 | 853 | 30 | 40 | |
| | 110.1 | 88.3 | 21.8 | 80.9 | 71.4 | 1212 | 0.24 | 14 | 853 | 35 | 38 | |
| | 109.9 | 86.7 | 23.2 | 81.4 | 71.5 | 1212 | 0.24 | 14 | 853 | 40 | 40 | |
| | 110.1 | 85.7 | 24.4 | 81.1 | 71.5 | 1212 | 0.24 | 14 | 853 | 45 | 42 | |
| | 110.0 | 85.3 | 24.7 | 81.6 | 71.6 | 1212 | 0.24 | 14 | 853 | 50 | 43 | |
| | 110.0 | 86.4 | 23.6 | 81.5 | 71.6 | 1212 | 0.24 | 14 | 853 | 55 | 41 | |
| | 110.1 | 85.5 | 24.6 | 81.2 | 71.6 | 1212 | 0.24 | 14 | 854 | 0 | 43 | |
| Default Blower Off Delay | 110.7 | 86.2 | 24.5 | 81.4 | 71.6 | 1212 | 0.24 | 14 | 854 | 5 | 42 | Default fan delay heat recovered = 627 btu's |
| | 111.0 | 87.3 | 23.7 | 81.2 | 71.7 | 1212 | 0.24 | 14 | 854 | 10 | 41 | |
| | 110.9 | 87.9 | 23.0 | 81.0 | 71.7 | 1212 | 0.24 | 14 | 854 | 15 | 40 | |
| | 110.3 | 88.6 | 21.7 | 81.1 | 71.9 | 1212 | 0.24 | 14 | 854 | 20 | 38 | |
| | 110.0 | 87.3 | 22.7 | 81.6 | 72.1 | 1212 | 0.24 | 14 | 854 | 25 | 39 | |
| | 109.4 | 88.1 | 21.3 | 82.0 | 72.1 | 1212 | 0.24 | 14 | 854 | 30 | 37 | |
| | 108.6 | 88.0 | 20.6 | 82.4 | 72.0 | 1212 | 0.24 | 14 | 854 | 35 | 36 | |
| | 107.7 | 87.5 | 20.2 | 82.2 | 71.8 | 1212 | 0.24 | 14 | 854 | 40 | 35 | |
| | 107.1 | 87.3 | 19.8 | 82.1 | 71.6 | 1212 | 0.24 | 14 | 854 | 45 | 34 | |
| | 106.1 | 89.1 | 17.0 | 81.6 | 71.4 | 1212 | 0.24 | 14 | 854 | 50 | 29 | |
| | 105.4 | 90.0 | 15.4 | 81.3 | 71.2 | 1212 | 0.24 | 14 | 854 | 55 | 27 | |
| | 104.3 | 89.6 | 14.7 | 81.1 | 71.2 | 1212 | 0.24 | 14 | 855 | 0 | 25 | |
| | 103.3 | 89.1 | 14.2 | 81.0 | 71.2 | 1212 | 0.24 | 14 | 855 | 5 | 25 | |
| | 102.8 | 89.6 | 13.2 | 80.8 | 71.2 | 1212 | 0.24 | 14 | 855 | 10 | 23 | |
| | 101.9 | 90.2 | 11.7 | 81.1 | 71.2 | 1212 | 0.24 | 14 | 855 | 15 | 20 | |
| | 100.8 | 90.7 | 10.1 | 81.2 | 71.2 | 1212 | 0.24 | 14 | 855 | 20 | 17 | |
| | 100.2 | 90.2 | 10.0 | 80.9 | 71.3 | 1212 | 0.24 | 14 | 855 | 25 | 17 | |
| | 99.8 | 89.7 | 10.1 | 80.7 | 71.2 | 1212 | 0.24 | 14 | 855 | 30 | 17 | |
| | 99.1 | 89.7 | 9.4 | 80.7 | 71.2 | 1212 | 0.24 | 14 | 855 | 35 | 16 | |
| | 98.4 | 89.9 | 8.5 | 80.6 | 71.2 | 1212 | 0.24 | 14 | 855 | 40 | 15 | |
| Device B Extended Blower Delay | 97.8 | 90.1 | 7.7 | 80.5 | 71.2 | 1212 | 0.24 | 14 | 855 | 45 | 13 | heat recovery after default fan delay = 159 btu's |
| | 97.3 | 89.5 | 7.8 | 80.5 | 71.2 | 1212 | 0.24 | 14 | 855 | 50 | 14 | |
| | 96.8 | 89.2 | 7.6 | 80.4 | 71.1 | 1212 | 0.24 | 14 | 855 | 55 | 13 | |
| | 96.0 | 88.9 | 7.1 | 80.4 | 71.0 | 1212 | 0.24 | 14 | 856 | 0 | 12 | |
| | 94.5 | 88.2 | 6.3 | 80.5 | 71.0 | 1212 | 0.24 | 14 | 856 | 5 | 11 | |
| | 93.8 | 87.6 | 6.2 | 80.3 | 70.9 | 1212 | 0.24 | 14 | 856 | 10 | 11 | |
| | 93.4 | 87.6 | 5.8 | 80.2 | 71.0 | 1212 | 0.24 | 14 | 856 | 15 | 10 | |
| | 92.8 | 87.5 | 5.3 | 80.2 | 70.9 | 1212 | 0.24 | 14 | 856 | 20 | 9 | |
| | 92.4 | 87.6 | 4.8 | 80.1 | 71.0 | 1212 | 0.24 | 14 | 856 | 25 | 8 | |
| | 91.8 | 87.7 | 4.1 | 80.0 | 71.0 | 1212 | 0.24 | 14 | 856 | 30 | 7 | |
| | 91.6 | 87.3 | 4.3 | 79.9 | 71.0 | 1212 | 0.24 | 14 | 856 | 35 | 7 | |
| | 91.0 | 86.6 | 4.4 | 79.8 | 71.0 | 1212 | 0.24 | 14 | 856 | 40 | 8 | |
| | 90.5 | 86.1 | 4.4 | 79.7 | 71.0 | 1212 | 0.24 | 14 | 856 | 45 | 8 | |
| | 90.3 | 85.8 | 4.5 | 79.6 | 71.1 | 1212 | 0.24 | 14 | 856 | 50 | 8 | |
| | 90.0 | 85.8 | 4.2 | 79.5 | 71.1 | 1212 | 0.24 | 14 | 856 | 55 | 7 | |
| | 89.5 | 85.6 | 3.9 | 79.3 | 71.1 | 1212 | 0.24 | 14 | 857 | 0 | 7 | |
| | 89.1 | 85.8 | 3.3 | 79.2 | 71.1 | 1212 | 0.24 | 14 | 857 | 5 | 6 | |
| | 88.3 | 85.2 | 3.1 | 79.1 | 71.1 | 1212 | 0.24 | 14 | 857 | 10 | 5 | |
| | 88.1 | 85.0 | 3.1 | 79.0 | 71.1 | 1212 | 0.24 | 14 | 857 | 15 | 5 | |
| | 87.9 | 84.9 | 3.0 | 78.9 | 71.1 | 1212 | 0.24 | 14 | 857 | 20 | 5 | |
| | 87.6 | 84.4 | 3.2 | 78.7 | 71.1 | 1212 | 0.24 | 14 | 857 | 25 | 6 | |
| | 87.2 | 84.2 | 3.0 | 78.7 | 71.1 | 1212 | 0.24 | 14 | 857 | 30 | 5 | |
| | 87.0 | 84.0 | 3.0 | 78.6 | 71.1 | 1212 | 0.24 | 14 | 857 | 35 | 5 | |
| | 86.8 | 84.1 | 2.7 | 78.5 | 71.1 | 1212 | 0.24 | 14 | 857 | 40 | 5 | |
| | 86.5 | 84.0 | 2.5 | 78.3 | 71.2 | 1212 | 0.24 | 14 | 857 | 45 | 4 | |
| | 86.3 | 83.7 | 2.6 | 78.2 | 71.2 | 1212 | 0.24 | 14 | 857 | 50 | 5 | |
| | 86.3 | 83.8 | 2.5 | 78.1 | 71.2 | 1212 | 0.24 | 14 | 857 | 55 | 4 | |
| | 85.5 | 83.9 | 1.6 | 78.0 | 71.2 | 1212 | 0.24 | 14 | 858 | 0 | 3 | |
| | 84.8 | 83.9 | 0.9 | 77.9 | 71.1 | 0 | 0.24 | 14 | 858 | 5 | 0 | |
| | 84.1 | 83.5 | 0.6 | 77.9 | 71.0 | 0 | 0.24 | 14 | 858 | 10 | 0 | |
| | 83.4 | 83.2 | 0.2 | 77.8 | 71.0 | 0 | 0.24 | 14 | 858 | 15 | 0 | |

Blower Wattage = 370

Comments: Device B device extended the blower on time after the default delay time by 2 minutes, 1 seconds.

Furnace heat input = HV x (volume of gas consumed) = 1040 btu/ft³ x 8.2 ft³ = 8528 btu

Device B Heat Recovery Test (6 Minute Heating On Cycle), Sample 2, Test 1

11/20/2013

| | Tsupply | Treturn | Temp. rise | Room | Ambient | CFM | approx. specific heat of air | approx. specific volume (cu. Ft/lbm) | Time | sec | Btu's Supplied |
|--------------------|---------|---------|------------|------|---------|------|---------------------------------|---|------|-----|-------------------|
| Furnace Heating On | 71.1 | 69.2 | 1.9 | 71.3 | 69.4 | 1210 | 0.24 | 14 | 1417 | 0 | 3 |
| | 71.1 | 69.2 | 1.9 | 71.3 | 69.4 | 1210 | 0.24 | 14 | 1417 | 5 | 3 |
| | 71.1 | 69.3 | 1.8 | 71.3 | 69.4 | 1210 | 0.24 | 14 | 1417 | 10 | 3 |
| | 71.1 | 69.3 | 1.8 | 71.3 | 69.4 | 1210 | 0.24 | 14 | 1417 | 15 | 3 |
| | 71.1 | 69.3 | 1.8 | 71.3 | 69.4 | 1210 | 0.24 | 14 | 1417 | 20 | 3 |
| | 71.2 | 69.4 | 1.8 | 71.3 | 69.3 | 1210 | 0.24 | 14 | 1417 | 25 | 3 |
| | 71.2 | 69.5 | 1.7 | 71.3 | 69.3 | 1210 | 0.24 | 14 | 1417 | 30 | 3 |
| | 71.2 | 69.5 | 1.7 | 71.3 | 69.4 | 1210 | 0.24 | 14 | 1417 | 35 | 3 |
| | 71.2 | 69.6 | 1.6 | 71.3 | 69.4 | 1210 | 0.24 | 14 | 1417 | 40 | 3 |
| | 71.2 | 69.6 | 1.6 | 71.3 | 69.5 | 1210 | 0.24 | 14 | 1417 | 45 | 3 |
| | 71.2 | 69.8 | 1.4 | 71.3 | 69.5 | 1210 | 0.24 | 14 | 1417 | 50 | 2 |
| | 72.2 | 69.9 | 2.3 | 71.3 | 69.5 | 1210 | 0.24 | 14 | 1417 | 55 | 4 |
| | 74.4 | 70.0 | 4.4 | 71.4 | 69.5 | 1210 | 0.24 | 14 | 1418 | 0 | 8 |
| | 76.4 | 70.3 | 6.1 | 71.5 | 69.4 | 1210 | 0.24 | 14 | 1418 | 5 | 11 |
| | 78.1 | 70.6 | 7.5 | 71.6 | 69.4 | 1210 | 0.24 | 14 | 1418 | 10 | 13 |
| | 79.5 | 70.6 | 8.9 | 71.5 | 69.4 | 1210 | 0.24 | 14 | 1418 | 15 | 15 |
| | 80.5 | 70.9 | 9.6 | 71.9 | 69.4 | 1210 | 0.24 | 14 | 1418 | 20 | 17 |
| | 81.5 | 71.0 | 10.5 | 72.0 | 69.3 | 1210 | 0.24 | 14 | 1418 | 25 | 18 |
| | 82.7 | 71.4 | 11.3 | 72.2 | 69.2 | 1210 | 0.24 | 14 | 1418 | 30 | 20 |
| | 83.8 | 72.3 | 11.6 | 72.4 | 69.3 | 1210 | 0.24 | 14 | 1418 | 35 | 20 |
| | 84.3 | 73.2 | 11.1 | 72.7 | 69.2 | 1210 | 0.24 | 14 | 1418 | 40 | 19 |
| | 84.9 | 73.8 | 11.1 | 73.1 | 69.3 | 1210 | 0.24 | 14 | 1418 | 45 | 19 |
| | 85.7 | 74.0 | 11.7 | 73.4 | 69.3 | 1210 | 0.24 | 14 | 1418 | 50 | 20 |
| | 86.5 | 74.4 | 12.1 | 73.6 | 69.3 | 1210 | 0.24 | 14 | 1418 | 55 | 21 |
| | 87.2 | 74.4 | 12.7 | 73.7 | 69.3 | 1210 | 0.24 | 14 | 1419 | 0 | 22 |
| | 87.7 | 73.3 | 14.4 | 74.0 | 69.3 | 1210 | 0.24 | 14 | 1419 | 5 | 25 |
| | 88.4 | 73.2 | 15.2 | 74.4 | 69.3 | 1210 | 0.24 | 14 | 1419 | 10 | 26 |
| | 89.2 | 74.1 | 15.1 | 74.5 | 69.2 | 1210 | 0.24 | 14 | 1419 | 15 | 26 |
| | 89.6 | 74.4 | 15.2 | 74.6 | 69.0 | 1210 | 0.24 | 14 | 1419 | 20 | 26 |
| | 90.1 | 74.2 | 15.9 | 74.9 | 69.1 | 1210 | 0.24 | 14 | 1419 | 25 | 27 |
| | 90.5 | 75.1 | 15.4 | 74.9 | 69.1 | 1210 | 0.24 | 14 | 1419 | 30 | 27 |
| | 91.0 | 76.0 | 15.0 | 75.3 | 69.1 | 1210 | 0.24 | 14 | 1419 | 35 | 26 |
| | 91.7 | 75.9 | 15.8 | 75.3 | 69.0 | 1210 | 0.24 | 14 | 1419 | 40 | 27 |
| | 92.1 | 75.7 | 16.4 | 75.4 | 69.0 | 1210 | 0.24 | 14 | 1419 | 45 | 28 |
| | 93.1 | 75.7 | 17.5 | 75.4 | 68.9 | 1210 | 0.24 | 14 | 1419 | 50 | 30 |
| | 93.4 | 75.8 | 17.6 | 75.4 | 69.0 | 1210 | 0.24 | 14 | 1419 | 55 | 30 |
| | 93.7 | 75.8 | 17.9 | 75.6 | 69.1 | 1210 | 0.24 | 14 | 1420 | 0 | 31 |
| | 94.3 | 77.0 | 17.3 | 75.9 | 69.1 | 1210 | 0.24 | 14 | 1420 | 5 | 30 |
| | 94.5 | 76.9 | 17.6 | 75.9 | 69.2 | 1210 | 0.24 | 14 | 1420 | 10 | 30 |
| | 94.8 | 76.7 | 18.0 | 75.9 | 69.4 | 1210 | 0.24 | 14 | 1420 | 15 | 31 |
| | 94.9 | 77.4 | 17.5 | 76.4 | 69.3 | 1210 | 0.24 | 14 | 1420 | 20 | 30 |
| | 95.6 | 77.8 | 17.8 | 76.4 | 69.3 | 1210 | 0.24 | 14 | 1420 | 25 | 31 |
| | 96.0 | 77.6 | 18.4 | 76.7 | 69.3 | 1210 | 0.24 | 14 | 1420 | 30 | 32 |
| | 96.6 | 78.5 | 18.1 | 76.5 | 69.4 | 1210 | 0.24 | 14 | 1420 | 35 | 31 |
| | 97.1 | 80.0 | 17.1 | 76.4 | 69.3 | 1210 | 0.24 | 14 | 1420 | 40 | 30 |
| | 97.4 | 80.5 | 16.9 | 76.7 | 69.2 | 1210 | 0.24 | 14 | 1420 | 45 | 29 |
| | 97.9 | 81.7 | 16.2 | 76.9 | 69.2 | 1210 | 0.24 | 14 | 1420 | 50 | 28 |
| | 98.5 | 80.9 | 17.6 | 76.7 | 69.1 | 1210 | 0.24 | 14 | 1420 | 55 | 30 |
| | 98.5 | 80.9 | 17.7 | 76.9 | 69.2 | 1210 | 0.24 | 14 | 1421 | 0 | 31 |
| | 99.0 | 80.7 | 18.3 | 77.0 | 69.1 | 1210 | 0.24 | 14 | 1421 | 5 | 32 |
| | 99.3 | 81.4 | 17.9 | 76.8 | 69.1 | 1210 | 0.24 | 14 | 1421 | 10 | 31 |
| | 99.5 | 81.1 | 18.3 | 77.5 | 69.2 | 1210 | 0.24 | 14 | 1421 | 15 | 32 |
| | 99.8 | 81.4 | 18.4 | 77.2 | 69.2 | 1210 | 0.24 | 14 | 1421 | 20 | 32 |
| | 100.2 | 81.8 | 18.4 | 77.0 | 69.2 | 1210 | 0.24 | 14 | 1421 | 25 | 32 |
| | 100.8 | 83.2 | 17.5 | 76.9 | 69.2 | 1210 | 0.24 | 14 | 1421 | 30 | 30 |
| | 101.1 | 83.3 | 17.8 | 77.0 | 69.2 | 1210 | 0.24 | 14 | 1421 | 35 | 31 |
| | 101.0 | 83.7 | 17.3 | 77.8 | 69.2 | 1210 | 0.24 | 14 | 1421 | 40 | 30 |
| | 101.4 | 83.8 | 17.6 | 77.7 | 69.2 | 1210 | 0.24 | 14 | 1421 | 45 | 30 |
| | 101.9 | 84.6 | 17.3 | 77.8 | 69.2 | 1210 | 0.24 | 14 | 1421 | 50 | 30 |
| | 102.2 | 83.5 | 18.6 | 77.4 | 69.2 | 1210 | 0.24 | 14 | 1421 | 55 | 32 |
| | 102.2 | 82.0 | 20.2 | 77.4 | 69.2 | 1210 | 0.24 | 14 | 1422 | 0 | 35 |
| | 102.4 | 81.5 | 20.9 | 77.7 | 69.2 | 1210 | 0.24 | 14 | 1422 | 5 | 36 |
| | 102.8 | 82.9 | 20.0 | 78.2 | 69.2 | 1210 | 0.24 | 14 | 1422 | 10 | 34 |
| | 102.8 | 84.6 | 18.1 | 78.2 | 69.2 | 1210 | 0.24 | 14 | 1422 | 15 | 31 |
| | 103.2 | 84.6 | 18.6 | 78.2 | 69.2 | 1210 | 0.24 | 14 | 1422 | 20 | 32 |
| | 103.7 | 84.3 | 19.5 | 78.4 | 69.2 | 1210 | 0.24 | 14 | 1422 | 25 | 34 |
| | 103.8 | 85.4 | 18.3 | 78.7 | 69.2 | 1210 | 0.24 | 14 | 1422 | 30 | 32 |
| | 103.5 | 84.2 | 19.3 | 78.7 | 69.2 | 1210 | 0.24 | 14 | 1422 | 35 | 33 |
| | 103.8 | 83.6 | 20.2 | 78.9 | 69.2 | 1210 | 0.24 | 14 | 1422 | 40 | 35 |
| | 104.1 | 84.1 | 20.0 | 79.0 | 69.2 | 1210 | 0.24 | 14 | 1422 | 45 | 35 |
| | 104.5 | 84.6 | 19.9 | 78.6 | 69.2 | 1210 | 0.24 | 14 | 1422 | 50 | 34 |
| | 104.3 | 85.2 | 19.1 | 78.5 | 69.2 | 1210 | 0.24 | 14 | 1422 | 55 | 33 |
| | 104.7 | 84.2 | 20.6 | 78.5 | 69.3 | 1210 | 0.24 | 14 | 1423 | 0 | 36 |

Heat Input
During Heating
cycle = 1735 btu's

Device B Heat Recovery Test (6 Minute Heating On Cycle), Sample 2, Test 1

11/20/2013

| | Tsupply | Treturn | Temp. rise | Room | Ambient | CFM | approx. specific heat of air | approx. specific volume (cu. Ft/lbm) | Time | sec | Btu's Supplied | |
|--------------------------------|---------|---------|------------|------|---------|------|------------------------------|--------------------------------------|------|-----|----------------|---|
| Default Blower Off Delay | 105.2 | 85.9 | 19.2 | 78.5 | 69.2 | 1210 | 0.24 | 14 | 1423 | 5 | 33 | Default fan delay heat recovered = 431 btu's |
| | 104.9 | 85.1 | 19.8 | 78.6 | 69.2 | 1210 | 0.24 | 14 | 1423 | 10 | 34 | |
| | 104.4 | 84.4 | 20.0 | 78.7 | 69.2 | 1210 | 0.24 | 14 | 1423 | 15 | 35 | |
| | 103.5 | 84.4 | 19.1 | 78.6 | 69.2 | 1210 | 0.24 | 14 | 1423 | 20 | 33 | |
| | 103.0 | 85.1 | 17.9 | 78.9 | 69.2 | 1210 | 0.24 | 14 | 1423 | 25 | 31 | |
| | 102.3 | 86.2 | 16.1 | 79.2 | 69.2 | 1210 | 0.24 | 14 | 1423 | 30 | 28 | |
| | 101.3 | 87.9 | 13.4 | 79.5 | 69.2 | 1210 | 0.24 | 14 | 1423 | 35 | 23 | |
| | 100.6 | 88.5 | 12.1 | 79.2 | 69.2 | 1210 | 0.24 | 14 | 1423 | 40 | 21 | |
| | 99.8 | 88.3 | 11.5 | 79.2 | 69.2 | 1210 | 0.24 | 14 | 1423 | 45 | 20 | |
| | 98.7 | 88.6 | 10.1 | 79.3 | 69.2 | 1210 | 0.24 | 14 | 1423 | 50 | 17 | |
| | 97.8 | 88.0 | 9.8 | 79.6 | 69.1 | 1210 | 0.24 | 14 | 1423 | 55 | 17 | |
| | 97.1 | 87.2 | 9.9 | 79.5 | 69.1 | 1210 | 0.24 | 14 | 1424 | 0 | 17 | |
| | 96.1 | 86.8 | 9.3 | 79.5 | 69.1 | 1210 | 0.24 | 14 | 1424 | 5 | 16 | |
| | 95.4 | 87.1 | 8.3 | 79.4 | 69.1 | 1210 | 0.24 | 14 | 1424 | 10 | 14 | |
| | 94.6 | 88.0 | 6.6 | 79.3 | 69.2 | 1210 | 0.24 | 14 | 1424 | 15 | 11 | |
| | 94.0 | 87.8 | 6.2 | 79.3 | 69.2 | 1210 | 0.24 | 14 | 1424 | 20 | 11 | |
| | 93.4 | 87.4 | 6.1 | 79.4 | 69.2 | 1210 | 0.24 | 14 | 1424 | 25 | 10 | |
| | 92.5 | 86.8 | 5.7 | 79.4 | 69.1 | 1210 | 0.24 | 14 | 1424 | 30 | 10 | |
| | 92.1 | 86.7 | 5.5 | 79.2 | 69.1 | 1210 | 0.24 | 14 | 1424 | 35 | 9 | |
| | 91.5 | 86.2 | 5.4 | 78.9 | 69.1 | 1210 | 0.24 | 14 | 1424 | 40 | 9 | |
| | 90.8 | 85.8 | 5.0 | 78.8 | 69.1 | 1210 | 0.24 | 14 | 1424 | 45 | 9 | |
| | 90.0 | 85.8 | 4.3 | 79.0 | 69.2 | 1210 | 0.24 | 14 | 1424 | 50 | 7 | |
| | 89.3 | 85.2 | 4.1 | 79.0 | 69.2 | 1210 | 0.24 | 14 | 1424 | 55 | 7 | |
| | 89.2 | 85.1 | 4.0 | 78.9 | 69.2 | 1210 | 0.24 | 14 | 1425 | 0 | 7 | |
| Device B Extended Blower Delay | 88.8 | 84.8 | 3.9 | 78.8 | 69.2 | 0 | 0.24 | 14 | 1425 | 5 | 0 | heat recovery after default fan delay = 0 btu's |
| | 88.7 | 84.7 | 4.0 | 78.5 | 69.2 | 0 | 0.24 | 14 | 1425 | 10 | 0 | |
| | 88.6 | 84.6 | 4.0 | 78.4 | 69.1 | 0 | 0.24 | 14 | 1425 | 15 | 0 | |
| | 88.6 | 84.4 | 4.2 | 78.3 | 69.2 | 0 | 0.24 | 14 | 1425 | 20 | 0 | |
| | 88.8 | 84.3 | 4.5 | 78.2 | 69.1 | 0 | 0.24 | 14 | 1425 | 25 | 0 | |
| | 88.6 | 84.0 | 4.6 | 78.1 | 69.2 | 0 | 0.24 | 14 | 1425 | 30 | 0 | |
| | 88.7 | 82.5 | 6.2 | 78.1 | 69.1 | 0 | 0.24 | 14 | 1425 | 35 | 0 | |
| | 88.0 | 81.4 | 6.6 | 78.0 | 69.2 | 0 | 0.24 | 14 | 1425 | 40 | 0 | |
| | 86.8 | 81.0 | 5.8 | 78.0 | 69.2 | 0 | 0.24 | 14 | 1425 | 45 | 0 | |
| | 84.0 | 81.0 | 2.9 | 78.0 | 69.1 | 0 | 0.24 | 14 | 1425 | 50 | 0 | |
| | 81.5 | 81.2 | 0.3 | 77.7 | 69.2 | 0 | 0.24 | 14 | 1425 | 55 | 0 | |
| | 81.6 | 81.4 | -1.8 | 77.5 | 69.2 | 0 | 0.24 | 14 | 1426 | 0 | 0 | |

Blower Wattage = 370

Comments: Device B device extended the blower on time after the default delay time by 0 minutes, 0 seconds.

Furnace heat input = $HV \times (\text{volume of gas consumed}) = 1040 \text{ btu/ft}^3 \times 5.7 \text{ ft}^3 = 5928 \text{ btu}$

Device B Heat Recovery Test (7 Minute Heating On Cycle), Sample 2, Test 1

11/20/2013

| | Tsupply | Treturn | Temp. rise | Room | Ambient | CFM | approx. specific heat of air | approx. specific volume (cu. Ft/lbm) | Time | sec | Btu's Supplied |
|--------------------|---------|---------|------------|------|---------|------|---------------------------------|---|------|-----|-------------------|
| Furnace Heating On | 71.5 | 71.2 | 0.3 | 71.5 | 69.3 | 1214 | 0.24 | 14 | 1435 | 0 | 1 |
| | 71.6 | 71.2 | 0.4 | 71.5 | 69.3 | 1214 | 0.24 | 14 | 1435 | 5 | 1 |
| | 71.6 | 71.3 | 0.3 | 71.6 | 69.2 | 1214 | 0.24 | 14 | 1435 | 10 | 1 |
| | 71.7 | 71.4 | 0.3 | 71.6 | 69.2 | 1214 | 0.24 | 14 | 1435 | 15 | 1 |
| | 71.8 | 71.4 | 0.4 | 71.6 | 69.2 | 1214 | 0.24 | 14 | 1435 | 20 | 1 |
| | 71.8 | 71.5 | 0.3 | 71.7 | 69.1 | 1214 | 0.24 | 14 | 1435 | 25 | 1 |
| | 71.8 | 71.5 | 0.3 | 71.7 | 69.0 | 1214 | 0.24 | 14 | 1435 | 30 | 1 |
| | 71.8 | 71.5 | 0.3 | 71.7 | 69.1 | 1214 | 0.24 | 14 | 1435 | 35 | 1 |
| | 71.8 | 71.5 | 0.3 | 71.7 | 69.2 | 1214 | 0.24 | 14 | 1435 | 40 | 1 |
| | 71.7 | 71.5 | 0.2 | 71.7 | 69.2 | 1214 | 0.24 | 14 | 1435 | 45 | 0 |
| | 71.7 | 71.5 | 0.2 | 71.7 | 69.2 | 1214 | 0.24 | 14 | 1435 | 50 | 0 |
| | 71.7 | 71.5 | 0.2 | 71.7 | 69.1 | 1214 | 0.24 | 14 | 1435 | 55 | 0 |
| | 72.4 | 71.5 | 0.9 | 71.7 | 69.1 | 1214 | 0.24 | 14 | 1436 | 0 | 2 |
| | 74.9 | 71.5 | 3.0 | 71.8 | 69.1 | 1214 | 0.24 | 14 | 1436 | 5 | 5 |
| | 76.4 | 71.5 | 4.9 | 71.9 | 69.1 | 1214 | 0.24 | 14 | 1436 | 10 | 8 |
| | 78.2 | 71.8 | 6.4 | 72.0 | 69.1 | 1214 | 0.24 | 14 | 1436 | 15 | 11 |
| | 79.7 | 72.0 | 7.7 | 72.0 | 69.1 | 1214 | 0.24 | 14 | 1436 | 20 | 13 |
| | 80.9 | 72.2 | 8.7 | 72.2 | 69.1 | 1214 | 0.24 | 14 | 1436 | 25 | 15 |
| | 81.9 | 72.4 | 9.6 | 72.2 | 69.2 | 1214 | 0.24 | 14 | 1436 | 30 | 17 |
| | 83.1 | 72.8 | 10.4 | 72.4 | 69.2 | 1214 | 0.24 | 14 | 1436 | 35 | 18 |
| | 83.8 | 73.5 | 10.3 | 72.7 | 69.2 | 1214 | 0.24 | 14 | 1436 | 40 | 18 |
| | 84.8 | 74.1 | 10.7 | 72.7 | 69.2 | 1214 | 0.24 | 14 | 1436 | 45 | 19 |
| | 85.7 | 73.9 | 11.9 | 73.2 | 69.2 | 1214 | 0.24 | 14 | 1436 | 50 | 21 |
| | 86.4 | 74.1 | 12.3 | 73.4 | 69.2 | 1214 | 0.24 | 14 | 1436 | 55 | 21 |
| | 87.0 | 74.1 | 12.9 | 73.8 | 69.2 | 1214 | 0.24 | 14 | 1437 | 0 | 22 |
| | 87.9 | 74.6 | 13.3 | 74.2 | 69.2 | 1214 | 0.24 | 14 | 1437 | 5 | 23 |
| | 88.7 | 75.1 | 13.6 | 74.1 | 69.1 | 1214 | 0.24 | 14 | 1437 | 10 | 24 |
| | 89.3 | 74.4 | 15.0 | 74.1 | 69.2 | 1214 | 0.24 | 14 | 1437 | 15 | 26 |
| | 90.1 | 74.2 | 15.9 | 74.6 | 69.3 | 1214 | 0.24 | 14 | 1437 | 20 | 28 |
| | 90.5 | 74.2 | 16.3 | 74.9 | 69.2 | 1214 | 0.24 | 14 | 1437 | 25 | 28 |
| | 90.8 | 74.3 | 16.5 | 75.1 | 69.2 | 1214 | 0.24 | 14 | 1437 | 30 | 29 |
| | 91.3 | 74.8 | 16.5 | 74.9 | 69.2 | 1214 | 0.24 | 14 | 1437 | 35 | 29 |
| | 91.8 | 75.2 | 16.6 | 75.2 | 69.2 | 1214 | 0.24 | 14 | 1437 | 40 | 29 |
| | 92.1 | 75.6 | 16.5 | 75.3 | 69.2 | 1214 | 0.24 | 14 | 1437 | 45 | 29 |
| | 92.9 | 76.3 | 16.6 | 75.8 | 69.2 | 1214 | 0.24 | 14 | 1437 | 50 | 29 |
| | 93.5 | 76.9 | 16.6 | 76.0 | 69.1 | 1214 | 0.24 | 14 | 1437 | 55 | 29 |
| | 93.7 | 78.5 | 15.3 | 76.3 | 69.3 | 1214 | 0.24 | 14 | 1438 | 0 | 26 |
| | 94.5 | 78.8 | 15.6 | 76.4 | 69.3 | 1214 | 0.24 | 14 | 1438 | 5 | 27 |
| | 94.7 | 78.9 | 15.8 | 76.4 | 69.2 | 1214 | 0.24 | 14 | 1438 | 10 | 27 |
| | 95.2 | 79.0 | 16.2 | 76.7 | 69.2 | 1214 | 0.24 | 14 | 1438 | 15 | 28 |
| | 95.6 | 80.3 | 15.4 | 76.8 | 69.3 | 1214 | 0.24 | 14 | 1438 | 20 | 27 |
| | 96.2 | 80.7 | 15.5 | 77.2 | 69.3 | 1214 | 0.24 | 14 | 1438 | 25 | 27 |
| | 96.2 | 80.8 | 15.3 | 77.2 | 69.3 | 1214 | 0.24 | 14 | 1438 | 30 | 27 |
| | 96.6 | 79.7 | 16.9 | 77.3 | 69.3 | 1214 | 0.24 | 14 | 1438 | 35 | 29 |
| | 97.4 | 79.6 | 17.8 | 77.6 | 69.3 | 1214 | 0.24 | 14 | 1438 | 40 | 31 |
| | 97.6 | 79.3 | 18.3 | 77.5 | 69.3 | 1214 | 0.24 | 14 | 1438 | 45 | 32 |
| | 97.6 | 80.0 | 17.6 | 77.4 | 69.1 | 1214 | 0.24 | 14 | 1438 | 50 | 30 |
| | 98.1 | 81.2 | 16.9 | 77.1 | 69.2 | 1214 | 0.24 | 14 | 1438 | 55 | 29 |
| | 98.7 | 82.6 | 16.1 | 77.2 | 69.2 | 1214 | 0.24 | 14 | 1439 | 0 | 28 |
| | 99.1 | 81.8 | 17.4 | 76.9 | 69.1 | 1214 | 0.24 | 14 | 1439 | 5 | 30 |
| | 99.4 | 82.4 | 17.0 | 77.0 | 69.1 | 1214 | 0.24 | 14 | 1439 | 10 | 30 |
| | 99.4 | 83.4 | 16.0 | 77.0 | 69.1 | 1214 | 0.24 | 14 | 1439 | 15 | 28 |
| | 100.1 | 83.1 | 17.0 | 76.9 | 69.2 | 1214 | 0.24 | 14 | 1439 | 20 | 30 |
| | 100.3 | 83.1 | 17.2 | 76.8 | 69.1 | 1214 | 0.24 | 14 | 1439 | 25 | 30 |
| | 100.8 | 83.0 | 17.8 | 76.8 | 69.1 | 1214 | 0.24 | 14 | 1439 | 30 | 31 |
| | 101.1 | 84.6 | 16.5 | 76.9 | 69.2 | 1214 | 0.24 | 14 | 1439 | 35 | 29 |
| | 101.4 | 85.3 | 16.1 | 77.0 | 69.2 | 1214 | 0.24 | 14 | 1439 | 40 | 28 |
| | 101.8 | 85.1 | 16.7 | 77.0 | 69.1 | 1214 | 0.24 | 14 | 1439 | 45 | 29 |
| | 102.1 | 85.1 | 17.0 | 77.1 | 69.2 | 1214 | 0.24 | 14 | 1439 | 50 | 29 |
| | 102.2 | 85.1 | 17.1 | 77.7 | 69.1 | 1214 | 0.24 | 14 | 1439 | 55 | 30 |
| | 102.4 | 86.1 | 16.2 | 78.2 | 69.1 | 1214 | 0.24 | 14 | 1440 | 0 | 28 |
| | 102.7 | 84.8 | 17.9 | 78.6 | 69.0 | 1214 | 0.24 | 14 | 1440 | 5 | 31 |
| | 102.9 | 82.9 | 20.0 | 78.5 | 69.2 | 1214 | 0.24 | 14 | 1440 | 10 | 35 |
| | 102.9 | 82.7 | 20.2 | 78.5 | 69.1 | 1214 | 0.24 | 14 | 1440 | 15 | 35 |
| | 103.2 | 83.1 | 20.1 | 78.3 | 69.1 | 1214 | 0.24 | 14 | 1440 | 20 | 35 |
| | 103.3 | 82.9 | 20.4 | 78.2 | 69.2 | 1214 | 0.24 | 14 | 1440 | 25 | 35 |
| | 103.6 | 83.3 | 20.3 | 78.3 | 69.1 | 1214 | 0.24 | 14 | 1440 | 30 | 35 |
| | 103.9 | 84.6 | 19.3 | 78.1 | 69.1 | 1214 | 0.24 | 14 | 1440 | 35 | 33 |
| | 104.2 | 86.2 | 18.0 | 78.3 | 69.1 | 1214 | 0.24 | 14 | 1440 | 40 | 31 |
| | 104.6 | 86.7 | 17.9 | 78.5 | 69.1 | 1214 | 0.24 | 14 | 1440 | 45 | 31 |
| | 104.8 | 85.3 | 19.6 | 79.0 | 69.2 | 1214 | 0.24 | 14 | 1440 | 50 | 34 |
| | 104.6 | 84.6 | 20.1 | 79.3 | 69.1 | 1214 | 0.24 | 14 | 1440 | 55 | 35 |
| | 104.8 | 85.8 | 19.0 | 79.7 | 69.2 | 1214 | 0.24 | 14 | 1441 | 0 | 33 |
| | 105.3 | 86.1 | 19.2 | 79.9 | 69.1 | 1214 | 0.24 | 14 | 1441 | 5 | 33 |
| | 105.5 | 86.1 | 19.4 | 79.8 | 69.1 | 1214 | 0.24 | 14 | 1441 | 10 | 34 |
| | 105.5 | 86.4 | 19.1 | 79.5 | 69.1 | 1214 | 0.24 | 14 | 1441 | 15 | 33 |
| | 105.7 | 86.9 | 18.8 | 79.4 | 69.1 | 1214 | 0.24 | 14 | 1441 | 20 | 33 |
| | 106.1 | 86.6 | 19.4 | 79.6 | 68.9 | 1214 | 0.24 | 14 | 1441 | 25 | 34 |
| | 106.7 | 86.0 | 20.7 | 79.7 | 68.9 | 1214 | 0.24 | 14 | 1441 | 30 | 36 |
| | 106.4 | 85.9 | 20.5 | 80.2 | 68.8 | 1214 | 0.24 | 14 | 1441 | 35 | 36 |
| | 106.4 | 86.3 | 20.2 | 80.4 | 68.9 | 1214 | 0.24 | 14 | 1441 | 40 | 35 |
| | 106.7 | 86.2 | 20.4 | 80.7 | 68.9 | 1214 | 0.24 | 14 | 1441 | 45 | 35 |
| | 106.4 | 85.8 | 20.6 | 80.5 | 68.9 | 1214 | 0.24 | 14 | 1441 | 50 | 36 |

Heat Input
During Heating
cycle = 2035 btu's

Device B Heat Recovery Test (7 Minute Heating On Cycle), Sample 2, Test 1

11/20/2013

| | Tsupply | Treturn | Temp. rise | Room | Ambient | CFM | approx. specific heat of air | approx. specific volume (cu. Ft/lbm) | Time | sec | Btu's Supplied | |
|--------------------------------|---------|---------|------------|------|---------|------|------------------------------|--------------------------------------|------|-----|----------------|---|
| Default Blower Off Delay | 106.8 | 86.2 | 20.6 | 80.6 | 69.0 | 1214 | 0.24 | 14 | 1441 | 55 | 36 | Default fan delay heat recovered = 484 btu's |
| | 106.9 | 86.8 | 20.2 | 80.7 | 69.0 | 1214 | 0.24 | 14 | 1442 | 0 | 35 | |
| | 107.1 | 87.0 | 20.1 | 81.0 | 69.0 | 1214 | 0.24 | 14 | 1442 | 5 | 35 | |
| | 107.2 | 86.9 | 20.3 | 80.7 | 69.0 | 1214 | 0.24 | 14 | 1442 | 10 | 35 | |
| | 107.0 | 86.0 | 20.9 | 80.3 | 69.0 | 1214 | 0.24 | 14 | 1442 | 15 | 36 | |
| | 106.3 | 85.6 | 20.7 | 80.2 | 69.1 | 1214 | 0.24 | 14 | 1442 | 20 | 36 | |
| | 105.6 | 86.0 | 19.6 | 80.4 | 69.1 | 1214 | 0.24 | 14 | 1442 | 25 | 34 | |
| | 104.8 | 86.6 | 18.1 | 80.1 | 69.1 | 1214 | 0.24 | 14 | 1442 | 30 | 31 | |
| | 104.2 | 86.7 | 17.5 | 80.4 | 69.2 | 1214 | 0.24 | 14 | 1442 | 35 | 30 | |
| | 103.4 | 89.4 | 14.0 | 80.2 | 69.2 | 1214 | 0.24 | 14 | 1442 | 40 | 24 | |
| | 102.6 | 89.8 | 12.8 | 80.3 | 69.1 | 1214 | 0.24 | 14 | 1442 | 45 | 22 | |
| | 101.5 | 89.2 | 12.3 | 80.4 | 69.1 | 1214 | 0.24 | 14 | 1442 | 50 | 21 | |
| | 100.7 | 88.7 | 12.1 | 80.5 | 69.1 | 1214 | 0.24 | 14 | 1442 | 55 | 21 | |
| | 100.1 | 89.3 | 10.8 | 80.8 | 69.2 | 1214 | 0.24 | 14 | 1443 | 0 | 19 | |
| | 99.4 | 90.2 | 9.2 | 81.1 | 69.1 | 1214 | 0.24 | 14 | 1443 | 5 | 16 | |
| | 98.5 | 89.3 | 9.2 | 81.2 | 69.2 | 1214 | 0.24 | 14 | 1443 | 10 | 16 | |
| | 97.8 | 89.0 | 8.8 | 81.2 | 69.2 | 1214 | 0.24 | 14 | 1443 | 15 | 15 | |
| | 96.9 | 88.4 | 8.5 | 80.9 | 69.1 | 1214 | 0.24 | 14 | 1443 | 20 | 15 | |
| | 96.2 | 88.4 | 7.8 | 80.8 | 69.2 | 1214 | 0.24 | 14 | 1443 | 25 | 13 | |
| | 95.4 | 88.8 | 6.6 | 80.8 | 69.2 | 1214 | 0.24 | 14 | 1443 | 30 | 11 | |
| | 94.8 | 88.5 | 6.2 | 80.6 | 69.2 | 1214 | 0.24 | 14 | 1443 | 35 | 11 | |
| | 94.3 | 89.0 | 5.4 | 80.5 | 69.1 | 1214 | 0.24 | 14 | 1443 | 40 | 9 | |
| | 93.7 | 89.3 | 4.4 | 80.5 | 69.2 | 1214 | 0.24 | 14 | 1443 | 45 | 8 | |
| | 93.0 | 88.4 | 4.5 | 80.4 | 69.1 | 1214 | 0.24 | 14 | 1443 | 50 | 8 | |
| | 92.5 | 87.9 | 4.7 | 80.3 | 69.1 | 1214 | 0.24 | 14 | 1443 | 55 | 8 | |
| | 92.0 | 87.7 | 4.3 | 79.9 | 69.1 | 1214 | 0.24 | 14 | 1444 | 0 | 7 | |
| Device B Extended Blower Delay | 91.5 | 87.2 | 4.3 | 79.7 | 69.2 | 0 | 0.24 | 14 | 1444 | 5 | 0 | heat recovery after default fan delay = 0 btu's |
| | 90.9 | 87.1 | 3.7 | 79.6 | 69.2 | 0 | 0.24 | 14 | 1444 | 10 | 0 | |
| | 90.3 | 87.0 | 3.3 | 79.3 | 69.2 | 0 | 0.24 | 14 | 1444 | 15 | 0 | |
| | 89.9 | 86.5 | 3.4 | 79.3 | 69.1 | 0 | 0.24 | 14 | 1444 | 20 | 0 | |
| | 89.6 | 86.1 | 3.5 | 79.3 | 69.2 | 0 | 0.24 | 14 | 1444 | 25 | 0 | |
| | 89.2 | 86.0 | 3.2 | 79.3 | 69.2 | 0 | 0.24 | 14 | 1444 | 30 | 0 | |
| | 88.8 | 86.0 | 2.8 | 79.3 | 69.2 | 0 | 0.24 | 14 | 1444 | 35 | 0 | |
| | 88.4 | 86.1 | 2.3 | 79.3 | 69.2 | 0 | 0.24 | 14 | 1444 | 40 | 0 | |
| | 87.9 | 85.8 | 2.1 | 79.2 | 69.2 | 0 | 0.24 | 14 | 1444 | 45 | 0 | |
| | 87.7 | 85.6 | 2.1 | 79.1 | 69.2 | 0 | 0.24 | 14 | 1444 | 50 | 0 | |
| | 87.2 | 85.4 | 1.7 | 79.0 | 69.2 | 0 | 0.24 | 14 | 1444 | 55 | 0 | |
| | 86.9 | 85.1 | 1.8 | 78.8 | 69.2 | 0 | 0.24 | 14 | 1445 | 0 | 0 | |
| | 86.5 | 84.8 | 1.7 | 78.7 | 69.1 | 0 | 0.24 | 14 | 1445 | 5 | 0 | |
| | 86.2 | 84.9 | 1.3 | 78.6 | 69.1 | 0 | 0.24 | 14 | 1445 | 10 | 0 | |
| | 85.9 | 84.5 | 1.4 | 78.5 | 69.1 | 0 | 0.24 | 14 | 1445 | 15 | 0 | |
| | 85.7 | 84.5 | 1.2 | 78.4 | 69.1 | 0 | 0.24 | 14 | 1445 | 20 | 0 | |
| | 85.5 | 84.3 | 1.2 | 78.3 | 69.1 | 0 | 0.24 | 14 | 1445 | 25 | 0 | |
| | 85.3 | 84.1 | 1.2 | 78.2 | 69.1 | 0 | 0.24 | 14 | 1445 | 30 | 0 | |

Blower Wattage = 370

Comments: Device B device extended the blower on time after the default delay time by 0 minutes, 0 seconds.

Furnace heat input = $HV \times (\text{volume of gas consumed}) = 1040 \text{ btu/ft}^3 \times 6.2 \text{ ft}^3 = 6448 \text{ btu}$

Device B Heat Recovery Test (8 Minute Heating On Cycle), Sample 2, Test 1

11/20/2013

| Tsupply | Treturn | Temp. rise | Room | Ambient | CFM | approx. specific heat of air | approx. specific volume (cu. Ft/lbm) | Time | sec | Btu's Supplied |
|---------|---------|------------|------|---------|------|---------------------------------|---|------|-----|-------------------|
| 70.0 | 69.3 | 0.7 | 71.2 | 69.0 | 1205 | 0.24 | 14 | 1510 | 0 | 1 |
| 70.2 | 69.3 | 1.0 | 71.2 | 69.0 | 1205 | 0.24 | 14 | 1510 | 5 | 2 |
| 70.3 | 69.3 | 1.0 | 71.1 | 69.0 | 1205 | 0.24 | 14 | 1510 | 10 | 2 |
| 70.4 | 69.3 | 1.1 | 71.2 | 68.9 | 1205 | 0.24 | 14 | 1510 | 15 | 2 |
| 70.5 | 69.4 | 1.1 | 71.2 | 68.9 | 1205 | 0.24 | 14 | 1510 | 20 | 2 |
| 70.5 | 69.3 | 1.1 | 71.2 | 69.0 | 1205 | 0.24 | 14 | 1510 | 25 | 2 |
| 70.5 | 69.3 | 1.1 | 71.2 | 69.0 | 1205 | 0.24 | 14 | 1510 | 30 | 2 |
| 70.9 | 69.3 | 1.6 | 71.2 | 69.1 | 1205 | 0.24 | 14 | 1510 | 35 | 3 |
| 71.1 | 69.4 | 1.7 | 71.2 | 69.1 | 1205 | 0.24 | 14 | 1510 | 40 | 3 |
| 70.9 | 69.4 | 1.5 | 71.2 | 69.1 | 1205 | 0.24 | 14 | 1510 | 45 | 3 |
| 70.8 | 69.4 | 1.4 | 71.2 | 69.2 | 1205 | 0.24 | 14 | 1510 | 50 | 2 |
| 70.8 | 69.5 | 1.3 | 71.2 | 69.2 | 1205 | 0.24 | 14 | 1510 | 55 | 2 |
| 71.9 | 69.6 | 2.3 | 71.3 | 69.2 | 1205 | 0.24 | 14 | 1511 | 0 | 4 |
| 73.2 | 69.9 | 3.3 | 71.3 | 69.1 | 1205 | 0.24 | 14 | 1511 | 5 | 6 |
| 74.3 | 70.0 | 4.3 | 71.3 | 69.1 | 1205 | 0.24 | 14 | 1511 | 10 | 7 |
| 75.4 | 70.1 | 5.3 | 71.4 | 69.1 | 1205 | 0.24 | 14 | 1511 | 15 | 9 |
| 76.4 | 70.4 | 6.0 | 71.6 | 69.1 | 1205 | 0.24 | 14 | 1511 | 20 | 10 |
| 77.3 | 70.8 | 6.5 | 71.7 | 69.1 | 1205 | 0.24 | 14 | 1511 | 25 | 11 |
| 78.0 | 71.1 | 6.9 | 71.7 | 69.1 | 1205 | 0.24 | 14 | 1511 | 30 | 12 |
| 78.5 | 71.6 | 6.9 | 71.8 | 69.1 | 1205 | 0.24 | 14 | 1511 | 35 | 12 |
| 79.1 | 71.8 | 7.3 | 71.9 | 69.1 | 1205 | 0.24 | 14 | 1511 | 40 | 13 |
| 79.9 | 72.0 | 7.9 | 72.0 | 69.1 | 1205 | 0.24 | 14 | 1511 | 45 | 14 |
| 80.6 | 72.4 | 8.2 | 72.1 | 69.1 | 1205 | 0.24 | 14 | 1511 | 50 | 14 |
| 81.4 | 72.6 | 8.8 | 72.2 | 69.1 | 1205 | 0.24 | 14 | 1511 | 55 | 15 |
| 82.1 | 73.0 | 9.1 | 72.2 | 69.2 | 1205 | 0.24 | 14 | 1512 | 0 | 16 |
| 82.9 | 73.3 | 9.6 | 72.3 | 69.1 | 1205 | 0.24 | 14 | 1512 | 5 | 17 |
| 83.7 | 73.5 | 10.2 | 72.6 | 69.1 | 1205 | 0.24 | 14 | 1512 | 10 | 18 |
| 84.5 | 74.3 | 10.2 | 72.9 | 69.1 | 1205 | 0.24 | 14 | 1512 | 15 | 18 |
| 85.2 | 74.7 | 10.5 | 73.0 | 69.2 | 1205 | 0.24 | 14 | 1512 | 20 | 18 |
| 85.8 | 74.9 | 10.9 | 73.1 | 69.2 | 1205 | 0.24 | 14 | 1512 | 25 | 19 |
| 86.7 | 75.3 | 11.4 | 73.2 | 69.2 | 1205 | 0.24 | 14 | 1512 | 30 | 20 |
| 87.9 | 75.2 | 12.7 | 73.4 | 69.1 | 1205 | 0.24 | 14 | 1512 | 35 | 22 |
| 88.6 | 75.6 | 13.0 | 73.9 | 69.1 | 1205 | 0.24 | 14 | 1512 | 40 | 22 |
| 89.4 | 76.1 | 13.3 | 74.3 | 69.1 | 1205 | 0.24 | 14 | 1512 | 45 | 23 |
| 89.9 | 75.4 | 14.5 | 74.3 | 69.0 | 1205 | 0.24 | 14 | 1512 | 50 | 25 |
| 90.9 | 75.2 | 15.7 | 74.5 | 69.0 | 1205 | 0.24 | 14 | 1512 | 55 | 27 |
| 91.9 | 75.7 | 16.2 | 75.0 | 69.0 | 1205 | 0.24 | 14 | 1513 | 0 | 28 |
| 92.5 | 75.5 | 17.0 | 75.3 | 69.0 | 1205 | 0.24 | 14 | 1513 | 5 | 29 |
| 93.0 | 75.6 | 17.4 | 75.5 | 69.0 | 1205 | 0.24 | 14 | 1513 | 10 | 30 |
| 93.7 | 75.7 | 18.0 | 75.4 | 69.0 | 1205 | 0.24 | 14 | 1513 | 15 | 31 |
| 94.2 | 76.3 | 17.9 | 75.5 | 69.0 | 1205 | 0.24 | 14 | 1513 | 20 | 31 |
| 94.7 | 76.3 | 18.4 | 75.6 | 69.0 | 1205 | 0.24 | 14 | 1513 | 25 | 32 |
| 95.4 | 76.3 | 19.1 | 75.5 | 69.0 | 1205 | 0.24 | 14 | 1513 | 30 | 33 |
| 95.4 | 76.5 | 18.9 | 75.6 | 69.1 | 1205 | 0.24 | 14 | 1513 | 35 | 33 |
| 95.9 | 76.5 | 19.4 | 75.5 | 69.1 | 1205 | 0.24 | 14 | 1513 | 40 | 33 |
| 96.1 | 76.8 | 19.3 | 75.9 | 69.1 | 1205 | 0.24 | 14 | 1513 | 45 | 33 |
| 96.8 | 77.5 | 19.3 | 76.1 | 69.1 | 1205 | 0.24 | 14 | 1513 | 50 | 33 |
| 97.4 | 77.8 | 19.6 | 76.0 | 69.1 | 1205 | 0.24 | 14 | 1513 | 55 | 34 |
| 97.7 | 77.6 | 20.1 | 76.5 | 69.1 | 1205 | 0.24 | 14 | 1514 | 0 | 35 |
| 98.1 | 78.2 | 19.9 | 76.9 | 69.1 | 1205 | 0.24 | 14 | 1514 | 5 | 34 |
| 98.5 | 79.0 | 19.5 | 77.1 | 69.1 | 1205 | 0.24 | 14 | 1514 | 10 | 34 |
| 98.9 | 79.6 | 19.3 | 77.4 | 69.1 | 1205 | 0.24 | 14 | 1514 | 15 | 33 |
| 99.3 | 80.6 | 18.7 | 77.5 | 69.1 | 1205 | 0.24 | 14 | 1514 | 20 | 32 |
| 99.7 | 81.5 | 18.2 | 77.4 | 69.1 | 1205 | 0.24 | 14 | 1514 | 25 | 31 |
| 99.9 | 82.4 | 17.5 | 77.2 | 69.1 | 1205 | 0.24 | 14 | 1514 | 30 | 30 |
| 100.6 | 82.2 | 18.4 | 77.2 | 69.1 | 1205 | 0.24 | 14 | 1514 | 35 | 32 |
| 100.6 | 81.7 | 18.9 | 77.7 | 69.1 | 1205 | 0.24 | 14 | 1514 | 40 | 33 |
| 100.7 | 82.9 | 17.8 | 77.8 | 69.1 | 1205 | 0.24 | 14 | 1514 | 45 | 31 |
| 101.2 | 82.5 | 18.7 | 77.9 | 69.1 | 1205 | 0.24 | 14 | 1514 | 50 | 32 |
| 101.6 | 83.5 | 18.1 | 78.2 | 69.1 | 1205 | 0.24 | 14 | 1514 | 55 | 31 |
| 101.9 | 83.0 | 18.9 | 78.5 | 69.1 | 1205 | 0.24 | 14 | 1515 | 0 | 33 |
| 102.2 | 83.7 | 18.5 | 78.5 | 69.0 | 1205 | 0.24 | 14 | 1515 | 5 | 32 |
| 102.5 | 83.8 | 18.7 | 78.2 | 69.0 | 1205 | 0.24 | 14 | 1515 | 10 | 32 |
| 102.6 | 83.3 | 19.3 | 78.2 | 69.0 | 1205 | 0.24 | 14 | 1515 | 15 | 33 |
| 102.8 | 82.1 | 20.7 | 78.5 | 69.0 | 1205 | 0.24 | 14 | 1515 | 20 | 36 |
| 103.0 | 82.0 | 21.0 | 78.2 | 69.0 | 1205 | 0.24 | 14 | 1515 | 25 | 36 |
| 103.3 | 82.6 | 20.7 | 78.2 | 69.0 | 1205 | 0.24 | 14 | 1515 | 30 | 36 |
| 103.5 | 83.6 | 19.9 | 78.0 | 69.0 | 1205 | 0.24 | 14 | 1515 | 35 | 34 |
| 103.8 | 83.8 | 20.0 | 78.5 | 69.0 | 1205 | 0.24 | 14 | 1515 | 40 | 34 |
| 104.0 | 83.3 | 20.7 | 78.8 | 69.0 | 1205 | 0.24 | 14 | 1515 | 45 | 36 |
| 104.1 | 83.6 | 20.5 | 78.6 | 69.0 | 1205 | 0.24 | 14 | 1515 | 50 | 35 |
| 104.5 | 83.6 | 20.9 | 78.7 | 69.0 | 1205 | 0.24 | 14 | 1515 | 55 | 36 |
| 104.9 | 84.4 | 20.5 | 78.9 | 69.0 | 1205 | 0.24 | 14 | 1516 | 0 | 35 |
| 105.2 | 84.3 | 20.9 | 78.5 | 69.1 | 1205 | 0.24 | 14 | 1516 | 5 | 36 |
| 105.2 | 84.7 | 20.5 | 78.6 | 69.1 | 1205 | 0.24 | 14 | 1516 | 10 | 35 |
| 105.3 | 84.6 | 20.7 | 78.5 | 69.1 | 1205 | 0.24 | 14 | 1516 | 15 | 36 |
| 105.6 | 84.7 | 20.9 | 78.6 | 69.1 | 1205 | 0.24 | 14 | 1516 | 20 | 36 |
| 105.6 | 86.5 | 19.1 | 78.7 | 69.0 | 1205 | 0.24 | 14 | 1516 | 25 | 33 |
| 105.9 | 85.2 | 20.7 | 79.1 | 69.0 | 1205 | 0.24 | 14 | 1516 | 30 | 36 |
| 106.0 | 84.1 | 21.9 | 79.8 | 69.0 | 1205 | 0.24 | 14 | 1516 | 35 | 38 |
| 106.4 | 84.6 | 21.8 | 79.7 | 69.0 | 1205 | 0.24 | 14 | 1516 | 40 | 38 |
| 107.0 | 85.8 | 21.2 | 79.4 | 69.0 | 1205 | 0.24 | 14 | 1516 | 45 | 36 |
| 107.1 | 85.2 | 21.9 | 79.4 | 69.0 | 1205 | 0.24 | 14 | 1516 | 50 | 38 |

Heat Input
During Heating
cycle = 2503 btu/s

Device B Heat Recovery Test (8 Minute Heating On Cycle), Sample 2, Test 1

11/20/2013

| | Tsupply | Treturn | Temp. rise | Room | Ambient | CFM | approx. specific heat of air | approx. specific volume (cu. Ft/lbm) | Time | sec | Btu's Supplied | |
|--------------------------------|---------|---------|------------|------|---------|------|------------------------------|--------------------------------------|------|-----|----------------|---|
| | 107.3 | 84.1 | 23.2 | 79.7 | 69.0 | 1205 | 0.24 | 14 | 1516 | 55 | 40 | |
| | 107.4 | 84.9 | 22.5 | 79.6 | 69.0 | 1205 | 0.24 | 14 | 1517 | 0 | 39 | |
| | 107.7 | 85.6 | 22.1 | 79.5 | 69.0 | 1205 | 0.24 | 14 | 1517 | 5 | 38 | |
| | 108.0 | 86.5 | 21.5 | 79.4 | 69.0 | 1205 | 0.24 | 14 | 1517 | 10 | 37 | |
| | 108.0 | 87.3 | 20.7 | 79.5 | 69.0 | 1205 | 0.24 | 14 | 1517 | 15 | 36 | |
| | 108.1 | 89.3 | 18.8 | 79.5 | 69.1 | 1205 | 0.24 | 14 | 1517 | 20 | 32 | |
| | 108.6 | 89.2 | 19.4 | 79.7 | 69.1 | 1205 | 0.24 | 14 | 1517 | 25 | 33 | |
| | 108.7 | 87.2 | 21.5 | 80.2 | 69.1 | 1205 | 0.24 | 14 | 1517 | 30 | 37 | |
| | 108.9 | 85.0 | 23.9 | 80.5 | 69.1 | 1205 | 0.24 | 14 | 1517 | 35 | 41 | |
| | 108.6 | 85.3 | 23.3 | 80.9 | 69.1 | 1205 | 0.24 | 14 | 1517 | 40 | 40 | |
| | 108.6 | 86.3 | 22.3 | 81.0 | 69.1 | 1205 | 0.24 | 14 | 1517 | 45 | 38 | |
| | 108.7 | 85.8 | 22.9 | 81.4 | 69.1 | 1205 | 0.24 | 14 | 1517 | 50 | 39 | |
| | 108.6 | 85.4 | 23.2 | 81.0 | 69.1 | 1205 | 0.24 | 14 | 1517 | 55 | 40 | |
| | 109.3 | 85.8 | 23.5 | 80.8 | 69.1 | 1205 | 0.24 | 14 | 1518 | 0 | 40 | |
| | 108.2 | 87.1 | 21.1 | 80.5 | 69.1 | 1205 | 0.24 | 14 | 1518 | 5 | 36 | Default fan delay heat recovered = 493 btu's |
| Default Blower Off Delay | 108.1 | 85.1 | 23.0 | 80.2 | 69.1 | 1205 | 0.24 | 14 | 1518 | 10 | 40 | |
| | 107.2 | 86.8 | 20.4 | 80.9 | 69.1 | 1205 | 0.24 | 14 | 1518 | 15 | 35 | |
| | 106.7 | 88.4 | 18.3 | 81.0 | 69.1 | 1205 | 0.24 | 14 | 1518 | 20 | 32 | |
| | 105.9 | 86.0 | 19.9 | 80.9 | 69.1 | 1205 | 0.24 | 14 | 1518 | 25 | 34 | |
| | 105.2 | 86.2 | 19.0 | 81.1 | 69.1 | 1205 | 0.24 | 14 | 1518 | 30 | 33 | |
| | 104.4 | 87.9 | 16.5 | 81.2 | 69.1 | 1205 | 0.24 | 14 | 1518 | 35 | 28 | |
| | 103.6 | 89.4 | 14.2 | 81.4 | 69.1 | 1205 | 0.24 | 14 | 1518 | 40 | 24 | |
| | 102.7 | 89.3 | 13.4 | 81.4 | 69.1 | 1205 | 0.24 | 14 | 1518 | 45 | 23 | |
| | 101.6 | 88.5 | 13.1 | 81.5 | 69.1 | 1205 | 0.24 | 14 | 1518 | 50 | 23 | |
| | 100.8 | 88.4 | 12.4 | 81.5 | 69.1 | 1205 | 0.24 | 14 | 1518 | 55 | 21 | |
| | 100.1 | 87.1 | 13.0 | 81.4 | 69.1 | 1205 | 0.24 | 14 | 1519 | 0 | 22 | |
| | 99.3 | 88.2 | 11.1 | 81.3 | 69.1 | 1205 | 0.24 | 14 | 1519 | 5 | 19 | |
| | 98.6 | 89.2 | 9.4 | 81.3 | 69.1 | 1205 | 0.24 | 14 | 1519 | 10 | 16 | |
| | 97.8 | 89.7 | 8.1 | 81.2 | 69.0 | 1205 | 0.24 | 14 | 1519 | 15 | 14 | |
| | 97.1 | 89.7 | 7.4 | 81.1 | 69.0 | 1205 | 0.24 | 14 | 1519 | 20 | 13 | |
| | 96.2 | 89.0 | 7.2 | 81.1 | 69.0 | 1205 | 0.24 | 14 | 1519 | 25 | 12 | |
| | 95.6 | 88.9 | 6.7 | 80.9 | 69.0 | 1205 | 0.24 | 14 | 1519 | 30 | 12 | |
| | 95.0 | 88.8 | 6.2 | 80.8 | 69.0 | 1205 | 0.24 | 14 | 1519 | 35 | 11 | |
| | 94.5 | 88.7 | 5.8 | 80.7 | 69.0 | 1205 | 0.24 | 14 | 1519 | 40 | 10 | |
| | 93.9 | 88.8 | 5.1 | 80.7 | 68.9 | 1205 | 0.24 | 14 | 1519 | 45 | 9 | |
| | 93.6 | 88.6 | 5.0 | 80.5 | 69.0 | 1205 | 0.24 | 14 | 1519 | 50 | 9 | |
| | 92.9 | 87.8 | 5.1 | 80.3 | 69.0 | 1205 | 0.24 | 14 | 1519 | 55 | 9 | |
| | 92.5 | 87.8 | 4.7 | 80.1 | 69.0 | 1205 | 0.24 | 14 | 1520 | 0 | 8 | |
| Device B Extended Blower Delay | 91.5 | 87.5 | 4.0 | 79.9 | 69.0 | 0 | 0.24 | 14 | 1520 | 5 | 0 | heat recovery after default fan delay = 0 btu's |
| | 91.3 | 87.5 | 3.8 | 79.7 | 69.1 | 0 | 0.24 | 14 | 1520 | 10 | 0 | |
| | 91.2 | 87.4 | 3.8 | 79.6 | 69.1 | 0 | 0.24 | 14 | 1520 | 15 | 0 | |
| | 91.2 | 87.2 | 4.0 | 79.5 | 69.0 | 0 | 0.24 | 14 | 1520 | 20 | 0 | |
| | 91.3 | 87.1 | 4.2 | 79.4 | 69.0 | 0 | 0.24 | 14 | 1520 | 25 | 0 | |
| | 91.3 | 86.7 | 4.6 | 79.3 | 69.1 | 0 | 0.24 | 14 | 1520 | 30 | 0 | |
| | 91.6 | 86.1 | 5.5 | 79.3 | 69.1 | 0 | 0.24 | 14 | 1520 | 35 | 0 | |
| | 91.8 | 85.7 | 6.1 | 79.2 | 69.1 | 0 | 0.24 | 14 | 1520 | 40 | 0 | |
| | 91.4 | 83.4 | 8.0 | 79.1 | 69.1 | 0 | 0.24 | 14 | 1520 | 45 | 0 | |
| | 90.8 | 82.3 | 8.5 | 79.0 | 69.1 | 0 | 0.24 | 14 | 1520 | 50 | 0 | |
| | 89.1 | 81.9 | 7.2 | 78.9 | 69.0 | 0 | 0.24 | 14 | 1520 | 55 | 0 | |
| | 86.9 | 83.0 | 3.9 | 78.9 | 69.0 | 0 | 0.24 | 14 | 1521 | 0 | 0 | |
| | 84.3 | 84.1 | 0.2 | 78.7 | 69.0 | 0 | 0.24 | 14 | 1521 | 5 | 0 | |
| | 84.3 | 84.1 | 0.2 | 78.4 | 69.0 | 0 | 0.24 | 14 | 1521 | 10 | 0 | |
| | 84.3 | 82.0 | 2.3 | 78.1 | 69.0 | 0 | 0.24 | 14 | 1521 | 15 | 0 | |
| | 84.5 | 83.4 | 1.1 | 77.7 | 69.0 | 0 | 0.24 | 14 | 1521 | 20 | 0 | |
| | 84.6 | 82.7 | 1.9 | 77.4 | 69.1 | 0 | 0.24 | 14 | 1521 | 25 | 0 | |
| | 84.3 | 82.5 | 1.8 | 77.1 | 69.0 | 0 | 0.24 | 14 | 1521 | 30 | 0 | |
| | 84.7 | 82.4 | 2.3 | 76.9 | 69.0 | 0 | 0.24 | 14 | 1521 | 35 | 0 | |
| | 84.3 | 81.5 | 2.8 | 76.8 | 68.9 | 0 | 0.24 | 14 | 1521 | 40 | 0 | |
| | 84.4 | 80.8 | 3.6 | 76.7 | 68.9 | 0 | 0.24 | 14 | 1521 | 45 | 0 | |
| | 84.5 | 80.4 | 4.1 | 76.6 | 68.9 | 0 | 0.24 | 14 | 1521 | 50 | 0 | |
| | 84.3 | 80.0 | 4.3 | 76.4 | 68.9 | 0 | 0.24 | 14 | 1521 | 55 | 0 | |
| | 84.2 | 79.4 | 4.8 | 76.2 | 68.9 | 0 | 0.24 | 14 | 1522 | 0 | 0 | |
| | 84.3 | 79.1 | 5.2 | 76.0 | 68.9 | 0 | 0.24 | 14 | 1522 | 5 | 0 | |

Blower Wattage = 370

Comments: Device B device extended the blower on time after the default delay time by 0 minutes, 0 seconds.

Furnace heat input = HV x (volume of gas consumed) = 1040 btu/ft³ x 7.2 ft³ = 7488 btu

Device B Heat Recovery Test (9 Minute Heating On Cycle), Sample 2, Test 1

11/20/2013

| Tsupply | Treturn | Temp. rise | Room | Ambient | CFM | approx. specific heat of air | approx. specific volume (cu. ft/lbm) | Time | sec | Btu's Supplied |
|---------|---------|------------|------|---------|------|---------------------------------|---|------|-----|-------------------|
| 70.4 | 69.2 | 1.2 | 70.9 | 69.0 | 1213 | 0.24 | 14 | 1538 | 0 | 2 |
| 70.5 | 69.3 | 1.3 | 71.0 | 68.9 | 1213 | 0.24 | 14 | 1538 | 5 | 2 |
| 70.6 | 69.3 | 1.4 | 71.0 | 68.9 | 1213 | 0.24 | 14 | 1538 | 10 | 2 |
| 70.8 | 69.3 | 1.5 | 71.0 | 68.9 | 1213 | 0.24 | 14 | 1538 | 15 | 3 |
| 70.8 | 69.3 | 1.5 | 71.0 | 68.9 | 1213 | 0.24 | 14 | 1538 | 20 | 3 |
| 70.9 | 69.4 | 1.6 | 71.0 | 68.9 | 1213 | 0.24 | 14 | 1538 | 25 | 3 |
| 71.1 | 69.4 | 1.8 | 71.0 | 68.9 | 1213 | 0.24 | 14 | 1538 | 30 | 3 |
| 71.1 | 69.4 | 1.8 | 71.0 | 68.9 | 1213 | 0.24 | 14 | 1538 | 35 | 3 |
| 70.7 | 69.3 | 1.4 | 71.0 | 68.9 | 1213 | 0.24 | 14 | 1538 | 40 | 2 |
| 71.7 | 69.4 | 2.3 | 71.0 | 68.9 | 1213 | 0.24 | 14 | 1538 | 45 | 4 |
| 71.9 | 69.4 | 2.5 | 71.0 | 68.9 | 1213 | 0.24 | 14 | 1538 | 50 | 4 |
| 74.3 | 69.5 | 4.8 | 71.0 | 69.0 | 1213 | 0.24 | 14 | 1538 | 55 | 8 |
| 75.5 | 69.5 | 6.0 | 71.1 | 69.0 | 1213 | 0.24 | 14 | 1539 | 0 | 10 |
| 76.8 | 69.8 | 7.0 | 71.2 | 69.0 | 1213 | 0.24 | 14 | 1539 | 5 | 12 |
| 77.8 | 70.0 | 7.8 | 71.3 | 69.0 | 1213 | 0.24 | 14 | 1539 | 10 | 14 |
| 78.7 | 70.1 | 8.6 | 71.3 | 69.0 | 1213 | 0.24 | 14 | 1539 | 15 | 15 |
| 79.5 | 70.2 | 9.3 | 71.4 | 69.0 | 1213 | 0.24 | 14 | 1539 | 20 | 16 |
| 80.1 | 70.3 | 9.8 | 71.4 | 69.0 | 1213 | 0.24 | 14 | 1539 | 25 | 17 |
| 80.5 | 70.8 | 9.7 | 71.4 | 69.0 | 1213 | 0.24 | 14 | 1539 | 30 | 17 |
| 81.6 | 71.2 | 10.4 | 71.5 | 69.0 | 1213 | 0.24 | 14 | 1539 | 35 | 18 |
| 82.1 | 71.5 | 10.6 | 71.7 | 69.0 | 1213 | 0.24 | 14 | 1539 | 40 | 18 |
| 82.6 | 71.9 | 10.7 | 71.9 | 68.9 | 1213 | 0.24 | 14 | 1539 | 45 | 19 |
| 83.3 | 72.3 | 11.0 | 72.0 | 68.9 | 1213 | 0.24 | 14 | 1539 | 50 | 19 |
| 84.0 | 72.5 | 11.5 | 72.1 | 68.9 | 1213 | 0.24 | 14 | 1539 | 55 | 20 |
| 85.0 | 72.8 | 12.2 | 72.3 | 68.9 | 1213 | 0.24 | 14 | 1540 | 0 | 21 |
| 85.5 | 73.0 | 12.5 | 72.5 | 68.9 | 1213 | 0.24 | 14 | 1540 | 5 | 22 |
| 86.1 | 73.4 | 12.7 | 72.7 | 68.9 | 1213 | 0.24 | 14 | 1540 | 10 | 22 |
| 86.7 | 73.9 | 12.8 | 72.9 | 68.9 | 1213 | 0.24 | 14 | 1540 | 15 | 22 |
| 87.5 | 74.2 | 13.3 | 73.2 | 68.9 | 1213 | 0.24 | 14 | 1540 | 20 | 23 |
| 88.5 | 74.6 | 13.9 | 73.4 | 68.9 | 1213 | 0.24 | 14 | 1540 | 25 | 24 |
| 89.1 | 74.7 | 14.4 | 73.6 | 68.9 | 1213 | 0.24 | 14 | 1540 | 30 | 25 |
| 90.0 | 74.9 | 15.1 | 73.7 | 68.9 | 1213 | 0.24 | 14 | 1540 | 35 | 26 |
| 91.1 | 75.1 | 16.0 | 73.9 | 68.9 | 1213 | 0.24 | 14 | 1540 | 40 | 28 |
| 91.7 | 75.4 | 16.3 | 73.9 | 68.9 | 1213 | 0.24 | 14 | 1540 | 45 | 28 |
| 92.5 | 75.8 | 16.7 | 74.2 | 68.9 | 1213 | 0.24 | 14 | 1540 | 50 | 29 |
| 93.1 | 76.4 | 16.7 | 74.4 | 68.9 | 1213 | 0.24 | 14 | 1540 | 55 | 29 |
| 93.6 | 76.7 | 16.9 | 74.8 | 69.0 | 1213 | 0.24 | 14 | 1541 | 0 | 29 |
| 94.2 | 76.9 | 17.3 | 75.0 | 69.0 | 1213 | 0.24 | 14 | 1541 | 5 | 30 |
| 94.9 | 76.1 | 18.8 | 75.1 | 69.0 | 1213 | 0.24 | 14 | 1541 | 10 | 33 |
| 95.6 | 76.3 | 19.3 | 75.1 | 69.0 | 1213 | 0.24 | 14 | 1541 | 15 | 33 |
| 96.1 | 75.8 | 20.3 | 75.1 | 69.0 | 1213 | 0.24 | 14 | 1541 | 20 | 35 |
| 96.4 | 75.8 | 20.6 | 75.2 | 69.0 | 1213 | 0.24 | 14 | 1541 | 25 | 36 |
| 97.0 | 75.9 | 21.1 | 75.6 | 69.0 | 1213 | 0.24 | 14 | 1541 | 30 | 37 |
| 97.7 | 76.0 | 21.7 | 75.7 | 69.0 | 1213 | 0.24 | 14 | 1541 | 35 | 38 |
| 97.9 | 76.8 | 21.1 | 76.2 | 69.0 | 1213 | 0.24 | 14 | 1541 | 40 | 37 |
| 98.6 | 78.3 | 20.3 | 75.8 | 69.0 | 1213 | 0.24 | 14 | 1541 | 45 | 35 |
| 99.0 | 79.3 | 19.7 | 76.0 | 69.0 | 1213 | 0.24 | 14 | 1541 | 50 | 34 |
| 99.5 | 79.6 | 19.9 | 76.3 | 69.0 | 1213 | 0.24 | 14 | 1541 | 55 | 34 |
| 100.0 | 80.3 | 19.7 | 76.5 | 69.1 | 1213 | 0.24 | 14 | 1542 | 0 | 34 |
| 100.6 | 80.4 | 20.2 | 76.8 | 69.0 | 1213 | 0.24 | 14 | 1542 | 5 | 35 |
| 100.7 | 80.1 | 20.6 | 77.0 | 69.0 | 1213 | 0.24 | 14 | 1542 | 10 | 36 |
| 101.2 | 81.0 | 20.2 | 77.4 | 69.0 | 1213 | 0.24 | 14 | 1542 | 15 | 35 |
| 101.6 | 80.8 | 20.8 | 77.4 | 69.1 | 1213 | 0.24 | 14 | 1542 | 20 | 36 |
| 101.4 | 80.0 | 21.4 | 77.4 | 69.0 | 1213 | 0.24 | 14 | 1542 | 25 | 37 |
| 102.0 | 79.2 | 22.8 | 77.1 | 69.1 | 1213 | 0.24 | 14 | 1542 | 30 | 40 |
| 102.2 | 79.2 | 23.0 | 77.3 | 69.0 | 1213 | 0.24 | 14 | 1542 | 35 | 40 |
| 102.1 | 79.6 | 22.5 | 77.4 | 69.0 | 1213 | 0.24 | 14 | 1542 | 40 | 39 |
| 102.6 | 80.4 | 22.2 | 77.3 | 69.0 | 1213 | 0.24 | 14 | 1542 | 45 | 38 |
| 103.1 | 81.9 | 21.2 | 77.4 | 69.0 | 1213 | 0.24 | 14 | 1542 | 50 | 37 |
| 103.0 | 81.3 | 21.7 | 78.0 | 68.9 | 1213 | 0.24 | 14 | 1542 | 55 | 38 |
| 103.7 | 81.0 | 22.7 | 77.9 | 68.9 | 1213 | 0.24 | 14 | 1543 | 0 | 39 |
| 104.1 | 81.9 | 22.2 | 78.0 | 68.8 | 1213 | 0.24 | 14 | 1543 | 5 | 38 |
| 104.1 | 83.8 | 20.3 | 78.2 | 68.8 | 1213 | 0.24 | 14 | 1543 | 10 | 35 |
| 104.8 | 84.3 | 20.5 | 78.0 | 68.7 | 1213 | 0.24 | 14 | 1543 | 15 | 36 |
| 104.9 | 84.3 | 20.6 | 78.2 | 68.8 | 1213 | 0.24 | 14 | 1543 | 20 | 36 |
| 105.3 | 84.6 | 20.7 | 78.2 | 68.8 | 1213 | 0.24 | 14 | 1543 | 25 | 36 |
| 105.6 | 85.3 | 20.3 | 78.3 | 68.8 | 1213 | 0.24 | 14 | 1543 | 30 | 35 |
| 106.2 | 85.1 | 21.1 | 78.0 | 68.8 | 1213 | 0.24 | 14 | 1543 | 35 | 37 |
| 106.4 | 85.4 | 21.0 | 78.2 | 68.8 | 1213 | 0.24 | 14 | 1543 | 40 | 36 |
| 106.9 | 84.6 | 22.3 | 78.5 | 68.8 | 1213 | 0.24 | 14 | 1543 | 45 | 39 |
| 106.3 | 85.7 | 20.6 | 78.3 | 68.8 | 1213 | 0.24 | 14 | 1543 | 50 | 36 |
| 106.2 | 86.5 | 19.7 | 78.2 | 68.8 | 1213 | 0.24 | 14 | 1543 | 55 | 34 |
| 107.1 | 85.9 | 21.2 | 78.4 | 68.8 | 1213 | 0.24 | 14 | 1544 | 0 | 37 |
| 107.5 | 85.2 | 22.3 | 79.0 | 68.8 | 1213 | 0.24 | 14 | 1544 | 5 | 39 |
| 107.5 | 85.4 | 22.1 | 78.8 | 68.8 | 1213 | 0.24 | 14 | 1544 | 10 | 38 |
| 107.7 | 86.0 | 21.7 | 78.9 | 68.8 | 1213 | 0.24 | 14 | 1544 | 15 | 38 |
| 108.2 | 85.1 | 23.1 | 79.1 | 68.8 | 1213 | 0.24 | 14 | 1544 | 20 | 40 |
| 108.6 | 84.7 | 23.9 | 79.1 | 68.8 | 1213 | 0.24 | 14 | 1544 | 25 | 41 |
| 108.3 | 85.4 | 22.9 | 78.9 | 68.8 | 1213 | 0.24 | 14 | 1544 | 30 | 40 |
| 108.5 | 85.7 | 22.8 | 78.9 | 68.8 | 1213 | 0.24 | 14 | 1544 | 35 | 40 |
| 108.9 | 86.1 | 22.8 | 79.2 | 68.8 | 1213 | 0.24 | 14 | 1544 | 40 | 40 |
| 109.0 | 86.2 | 22.8 | 79.7 | 68.8 | 1213 | 0.24 | 14 | 1544 | 45 | 40 |
| 108.8 | 86.4 | 22.4 | 80.0 | 68.8 | 1213 | 0.24 | 14 | 1544 | 50 | 39 |
| 109.2 | 87.3 | 21.9 | 80.1 | 68.9 | 1213 | 0.24 | 14 | 1544 | 55 | 38 |
| 109.4 | 85.8 | 23.6 | 80.2 | 68.9 | 1213 | 0.24 | 14 | 1545 | 0 | 41 |
| 109.4 | 84.8 | 24.6 | 80.4 | 68.9 | 1213 | 0.24 | 14 | 1545 | 5 | 43 |
| 109.6 | 84.6 | 25.0 | 80.1 | 68.9 | 1213 | 0.24 | 14 | 1545 | 10 | 43 |
| 109.8 | 86.5 | 23.3 | 80.4 | 68.9 | 1213 | 0.24 | 14 | 1545 | 15 | 40 |

Furnace Heating On

Heat Input
During Heating
cycle = 3359 btu's

Device B Heat Recovery Test (9 Minute Heating On Cycle), Sample 2, Test 1

11/20/2013

| | Tsupply | Treturn | Temp. rise | Room | Ambient | CFM | approx. specific heat of air | approx. specific volume (cu. Ft/lbm) | Time | sec | Btu's Supplied | |
|--------------------------------|---------|---------|------------|------|---------|------|------------------------------|--------------------------------------|------|-----|----------------|---|
| | 110.1 | 86.0 | 24.1 | 80.5 | 68.9 | 1213 | 0.24 | 14 | 1545 | 20 | 42 | |
| | 110.5 | 85.8 | 24.7 | 80.6 | 68.9 | 1213 | 0.24 | 14 | 1545 | 25 | 43 | |
| | 110.6 | 85.7 | 24.9 | 80.7 | 68.9 | 1213 | 0.24 | 14 | 1545 | 30 | 43 | |
| | 110.9 | 84.8 | 26.1 | 80.2 | 68.9 | 1213 | 0.24 | 14 | 1545 | 35 | 45 | |
| | 110.6 | 86.0 | 24.6 | 80.2 | 68.9 | 1213 | 0.24 | 14 | 1545 | 40 | 43 | |
| | 110.6 | 85.9 | 24.7 | 80.4 | 68.9 | 1213 | 0.24 | 14 | 1545 | 45 | 43 | |
| | 110.9 | 87.6 | 23.3 | 80.4 | 68.9 | 1213 | 0.24 | 14 | 1545 | 50 | 40 | |
| | 111.3 | 86.5 | 24.8 | 80.8 | 68.9 | 1213 | 0.24 | 14 | 1545 | 55 | 43 | |
| | 111.5 | 85.8 | 25.7 | 80.8 | 68.9 | 1213 | 0.24 | 14 | 1546 | 0 | 45 | |
| | 111.6 | 85.3 | 26.3 | 80.9 | 68.9 | 1213 | 0.24 | 14 | 1546 | 5 | 46 | |
| | 111.6 | 85.3 | 26.3 | 80.7 | 68.9 | 1213 | 0.24 | 14 | 1546 | 10 | 46 | |
| | 112.0 | 85.9 | 26.1 | 80.9 | 68.9 | 1213 | 0.24 | 14 | 1546 | 15 | 45 | |
| | 112.1 | 86.5 | 25.6 | 80.5 | 68.9 | 1213 | 0.24 | 14 | 1546 | 20 | 44 | |
| | 112.3 | 89.3 | 23.0 | 80.3 | 68.9 | 1213 | 0.24 | 14 | 1546 | 25 | 40 | |
| | 112.6 | 89.1 | 23.5 | 80.2 | 68.8 | 1213 | 0.24 | 14 | 1546 | 30 | 41 | |
| | 113.0 | 87.6 | 25.4 | 80.1 | 68.8 | 1213 | 0.24 | 14 | 1546 | 35 | 44 | |
| | 112.7 | 88.3 | 24.4 | 80.6 | 68.8 | 1213 | 0.24 | 14 | 1546 | 40 | 42 | |
| | 112.5 | 87.8 | 24.7 | 80.4 | 68.8 | 1213 | 0.24 | 14 | 1546 | 45 | 43 | |
| | 112.7 | 89.0 | 23.7 | 80.6 | 68.8 | 1213 | 0.24 | 14 | 1546 | 50 | 41 | |
| | 112.8 | 88.3 | 24.5 | 80.9 | 68.8 | 1213 | 0.24 | 14 | 1546 | 55 | 42 | |
| | 111.3 | 88.7 | 22.6 | 80.9 | 68.8 | 1213 | 0.24 | 14 | 1547 | 0 | 39 | |
| Default Blower Off Delay | 111.5 | 88.6 | 22.9 | 80.8 | 68.9 | 1213 | 0.24 | 14 | 1547 | 5 | 40 | Default fan delay heat recovered = 582 btu's |
| | 111.1 | 86.2 | 24.9 | 81.1 | 68.9 | 1213 | 0.24 | 14 | 1547 | 10 | 43 | |
| | 110.4 | 86.8 | 23.6 | 81.5 | 68.9 | 1213 | 0.24 | 14 | 1547 | 15 | 41 | |
| | 109.6 | 86.6 | 23.0 | 81.8 | 68.9 | 1213 | 0.24 | 14 | 1547 | 20 | 40 | |
| | 108.9 | 88.7 | 20.2 | 81.6 | 68.9 | 1213 | 0.24 | 14 | 1547 | 25 | 35 | |
| | 108.2 | 89.0 | 19.2 | 81.7 | 68.9 | 1213 | 0.24 | 14 | 1547 | 30 | 33 | |
| | 107.2 | 89.0 | 18.2 | 81.6 | 68.9 | 1213 | 0.24 | 14 | 1547 | 35 | 32 | |
| | 106.3 | 87.7 | 18.6 | 81.6 | 68.9 | 1213 | 0.24 | 14 | 1547 | 40 | 32 | |
| | 105.3 | 88.1 | 17.2 | 81.6 | 68.9 | 1213 | 0.24 | 14 | 1547 | 45 | 30 | |
| | 104.7 | 89.2 | 15.5 | 81.6 | 68.9 | 1213 | 0.24 | 14 | 1547 | 50 | 27 | |
| | 103.9 | 89.8 | 14.1 | 81.6 | 68.9 | 1213 | 0.24 | 14 | 1547 | 55 | 24 | |
| | 103.1 | 90.2 | 12.9 | 81.2 | 68.9 | 1213 | 0.24 | 14 | 1548 | 0 | 22 | |
| | 102.3 | 90.2 | 12.1 | 81.0 | 68.9 | 1213 | 0.24 | 14 | 1548 | 5 | 21 | |
| | 101.6 | 89.8 | 11.8 | 80.9 | 68.9 | 1213 | 0.24 | 14 | 1548 | 10 | 20 | |
| | 100.9 | 89.7 | 11.2 | 80.9 | 68.9 | 1213 | 0.24 | 14 | 1548 | 15 | 19 | |
| | 99.9 | 89.8 | 10.1 | 80.8 | 68.9 | 1213 | 0.24 | 14 | 1548 | 20 | 18 | |
| | 99.4 | 90.5 | 8.9 | 80.8 | 68.9 | 1213 | 0.24 | 14 | 1548 | 25 | 15 | |
| | 98.8 | 90.3 | 8.5 | 80.7 | 68.9 | 1213 | 0.24 | 14 | 1548 | 30 | 15 | |
| | 98.3 | 90.0 | 8.3 | 80.9 | 68.8 | 1213 | 0.24 | 14 | 1548 | 35 | 14 | |
| | 97.7 | 89.4 | 8.3 | 81.0 | 68.9 | 1213 | 0.24 | 14 | 1548 | 40 | 14 | |
| Device B Extended Blower Delay | 96.9 | 89.5 | 7.4 | 80.8 | 68.8 | 1213 | 0.24 | 14 | 1548 | 45 | 13 | heat recovery after default fan delay = 0 btu's |
| | 95.7 | 89.0 | 6.7 | 80.7 | 68.8 | 1213 | 0.24 | 14 | 1548 | 50 | 12 | |
| | 95.0 | 88.5 | 6.5 | 80.6 | 68.8 | 1213 | 0.24 | 14 | 1548 | 55 | 11 | |
| | 94.5 | 88.5 | 6.0 | 80.5 | 68.8 | 1213 | 0.24 | 14 | 1549 | 0 | 10 | |
| | 92.1 | 88.5 | 3.6 | 80.2 | 68.8 | 0 | 0.24 | 14 | 1549 | 5 | 0 | |
| | 91.8 | 88.4 | 3.4 | 80.1 | 68.8 | 0 | 0.24 | 14 | 1549 | 10 | 0 | |
| | 91.8 | 88.3 | 3.5 | 80.1 | 68.8 | 0 | 0.24 | 14 | 1549 | 15 | 0 | |
| | 91.9 | 88.1 | 3.8 | 80.0 | 68.8 | 0 | 0.24 | 14 | 1549 | 20 | 0 | |
| | 91.7 | 87.9 | 3.8 | 80.0 | 68.9 | 0 | 0.24 | 14 | 1549 | 25 | 0 | |
| | 91.6 | 87.4 | 4.2 | 79.8 | 68.8 | 0 | 0.24 | 14 | 1549 | 30 | 0 | |
| | 91.7 | 86.9 | 4.8 | 79.6 | 68.8 | 0 | 0.24 | 14 | 1549 | 35 | 0 | |
| | 91.9 | 86.5 | 5.4 | 79.6 | 68.8 | 0 | 0.24 | 14 | 1549 | 40 | 0 | |
| | 91.6 | 86.3 | 5.3 | 79.6 | 68.9 | 0 | 0.24 | 14 | 1549 | 45 | 0 | |
| | 91.1 | 86.1 | 5.0 | 79.5 | 68.9 | 0 | 0.24 | 14 | 1549 | 50 | 0 | |
| | 90.8 | 85.9 | 4.9 | 79.3 | 68.8 | 0 | 0.24 | 14 | 1549 | 55 | 0 | |
| | 90.5 | 85.8 | 4.7 | 79.2 | 68.8 | 0 | 0.24 | 14 | 1550 | 0 | 0 | |
| | 90.2 | 85.7 | 4.5 | 79.2 | 68.8 | 0 | 0.24 | 14 | 1550 | 5 | 0 | |
| | 90.0 | 85.6 | 4.4 | 79.1 | 68.8 | 0 | 0.24 | 14 | 1550 | 10 | 0 | |
| | 89.8 | 85.5 | 4.3 | 79.0 | 68.8 | 0 | 0.24 | 14 | 1550 | 15 | 0 | |
| | 89.7 | 85.3 | 4.4 | 78.9 | 68.8 | 0 | 0.24 | 14 | 1550 | 20 | 0 | |
| | 89.6 | 85.0 | 4.6 | 78.8 | 68.8 | 0 | 0.24 | 14 | 1550 | 25 | 0 | |
| | 89.6 | 85.1 | 4.5 | 78.8 | 68.8 | 0 | 0.24 | 14 | 1550 | 30 | 0 | |
| | 89.6 | 84.8 | 4.8 | 78.7 | 68.8 | 0 | 0.24 | 14 | 1550 | 35 | 0 | |
| | 89.6 | 84.6 | 5.0 | 78.7 | 68.8 | 0 | 0.24 | 14 | 1550 | 40 | 0 | |
| | 89.7 | 84.4 | 5.3 | 78.6 | 68.8 | 0 | 0.24 | 14 | 1550 | 45 | 0 | |
| | 89.2 | 84.2 | 5.0 | 78.5 | 68.8 | 0 | 0.24 | 14 | 1550 | 50 | 0 | |
| | 89.4 | 84.0 | 5.4 | 78.4 | 68.8 | 0 | 0.24 | 14 | 1550 | 55 | 0 | |
| | 89.2 | 83.8 | 5.4 | 78.4 | 68.8 | 0 | 0.24 | 14 | 1551 | 0 | 0 | |
| | 89.3 | 83.6 | 5.7 | 78.3 | 68.8 | 0 | 0.24 | 14 | 1551 | 5 | 0 | |
| | 89.4 | 83.4 | 6.0 | 78.2 | 68.8 | 0 | 0.24 | 14 | 1551 | 10 | 0 | |
| | 89.1 | 83.2 | 5.9 | 78.2 | 68.8 | 0 | 0.24 | 14 | 1551 | 20 | 0 | |

Blower Wattage = 370

Comments: Device B device extended the blower on time after the default delay time by 0 minutes, 0 seconds.

Furnace heat input = HV x (volume of gas consumed) = 1040 btu/ft³ x 8.1 ft³ = 8424 btu

Device B Heat Recovery Test (6 Minute Heating On Cycle), Sample 2, Test 2

11/21/2013

| Tsupply | Treturn | Temp. rise | Room | Ambient | CFM | approx. specific heat of air | approx. specific volume (cu. Ft/lbm) | Time | sec | Btu's Supplied |
|---------|---------|------------|------|---------|------|---------------------------------|---|------|-----|-------------------|
| 70.6 | 70.1 | 0.5 | 71.6 | 65.9 | 1209 | 0.24 | 14 | 1058 | 0 | 1 |
| 70.6 | 70.1 | 0.5 | 71.6 | 65.9 | 1209 | 0.24 | 14 | 1058 | 5 | 1 |
| 70.7 | 70.1 | 0.6 | 71.6 | 65.8 | 1209 | 0.24 | 14 | 1058 | 10 | 1 |
| 70.8 | 70.2 | 0.6 | 71.6 | 66.0 | 1209 | 0.24 | 14 | 1058 | 15 | 1 |
| 70.9 | 70.2 | 0.7 | 71.6 | 65.9 | 1209 | 0.24 | 14 | 1058 | 20 | 1 |
| 71.0 | 70.2 | 0.8 | 71.6 | 65.9 | 1209 | 0.24 | 14 | 1058 | 25 | 1 |
| 71.1 | 70.1 | 1.0 | 71.6 | 65.8 | 1209 | 0.24 | 14 | 1058 | 30 | 2 |
| 70.8 | 70.2 | 0.6 | 71.6 | 65.9 | 1209 | 0.24 | 14 | 1058 | 35 | 1 |
| 70.6 | 70.2 | 0.4 | 71.6 | 65.9 | 1209 | 0.24 | 14 | 1058 | 40 | 1 |
| 70.6 | 70.2 | 0.4 | 71.6 | 65.9 | 1209 | 0.24 | 14 | 1058 | 45 | 1 |
| 70.5 | 70.2 | 0.3 | 71.6 | 66.0 | 1209 | 0.24 | 14 | 1058 | 50 | 1 |
| 72.4 | 70.2 | 2.2 | 71.6 | 66.0 | 1209 | 0.24 | 14 | 1058 | 55 | 4 |
| 73.8 | 70.4 | 3.4 | 71.7 | 66.0 | 1209 | 0.24 | 14 | 1059 | 0 | 6 |
| 75.1 | 70.5 | 4.6 | 71.7 | 65.9 | 1209 | 0.24 | 14 | 1059 | 5 | 8 |
| 76.3 | 70.8 | 5.5 | 71.7 | 65.9 | 1209 | 0.24 | 14 | 1059 | 10 | 9 |
| 77.3 | 71.0 | 6.3 | 71.8 | 66.0 | 1209 | 0.24 | 14 | 1059 | 15 | 11 |
| 78.4 | 71.2 | 7.2 | 71.8 | 66.0 | 1209 | 0.24 | 14 | 1059 | 20 | 12 |
| 79.4 | 71.5 | 7.9 | 71.9 | 65.9 | 1209 | 0.24 | 14 | 1059 | 25 | 14 |
| 80.1 | 72.0 | 8.1 | 72.0 | 66.0 | 1209 | 0.24 | 14 | 1059 | 30 | 14 |
| 81.0 | 72.4 | 8.6 | 72.0 | 66.0 | 1209 | 0.24 | 14 | 1059 | 35 | 15 |
| 81.8 | 72.7 | 9.1 | 72.0 | 66.0 | 1209 | 0.24 | 14 | 1059 | 40 | 16 |
| 82.6 | 72.3 | 10.3 | 72.2 | 65.9 | 1209 | 0.24 | 14 | 1059 | 45 | 18 |
| 83.6 | 72.5 | 11.1 | 72.5 | 65.9 | 1209 | 0.24 | 14 | 1059 | 50 | 19 |
| 84.6 | 73.4 | 11.2 | 72.6 | 66.0 | 1209 | 0.24 | 14 | 1059 | 55 | 19 |
| 85.4 | 74.1 | 11.3 | 72.9 | 66.0 | 1209 | 0.24 | 14 | 1100 | 0 | 20 |
| 86.2 | 74.5 | 11.7 | 73.1 | 66.0 | 1209 | 0.24 | 14 | 1100 | 5 | 20 |
| 87.0 | 74.6 | 12.4 | 73.4 | 65.9 | 1209 | 0.24 | 14 | 1100 | 10 | 21 |
| 87.8 | 74.8 | 13.0 | 73.8 | 65.9 | 1209 | 0.24 | 14 | 1100 | 15 | 22 |
| 88.6 | 75.2 | 13.4 | 74.1 | 66.1 | 1209 | 0.24 | 14 | 1100 | 20 | 23 |
| 89.3 | 75.7 | 13.6 | 74.4 | 66.2 | 1209 | 0.24 | 14 | 1100 | 25 | 23 |
| 89.9 | 76.1 | 13.8 | 74.5 | 66.1 | 1209 | 0.24 | 14 | 1100 | 30 | 24 |
| 90.7 | 76.1 | 14.6 | 74.9 | 66.0 | 1209 | 0.24 | 14 | 1100 | 35 | 25 |
| 91.3 | 75.2 | 16.1 | 75.2 | 66.1 | 1209 | 0.24 | 14 | 1100 | 40 | 28 |
| 91.6 | 75.3 | 16.3 | 75.3 | 66.1 | 1209 | 0.24 | 14 | 1100 | 45 | 28 |
| 92.3 | 76.2 | 16.1 | 75.2 | 66.0 | 1209 | 0.24 | 14 | 1100 | 50 | 28 |
| 93.1 | 76.0 | 17.1 | 75.4 | 66.0 | 1209 | 0.24 | 14 | 1100 | 55 | 30 |
| 93.6 | 75.9 | 17.7 | 75.3 | 66.0 | 1209 | 0.24 | 14 | 1101 | 0 | 31 |
| 93.9 | 75.9 | 18.0 | 75.1 | 66.0 | 1209 | 0.24 | 14 | 1101 | 5 | 31 |
| 94.3 | 76.1 | 18.2 | 75.2 | 65.9 | 1209 | 0.24 | 14 | 1101 | 10 | 31 |
| 94.7 | 75.6 | 19.1 | 75.3 | 65.9 | 1209 | 0.24 | 14 | 1101 | 15 | 33 |
| 95.3 | 76.3 | 19.0 | 75.2 | 65.9 | 1209 | 0.24 | 14 | 1101 | 20 | 33 |
| 95.7 | 77.1 | 18.6 | 75.8 | 66.0 | 1209 | 0.24 | 14 | 1101 | 25 | 32 |
| 95.9 | 77.6 | 18.3 | 76.2 | 66.0 | 1209 | 0.24 | 14 | 1101 | 30 | 32 |
| 96.4 | 77.5 | 18.9 | 76.3 | 66.0 | 1209 | 0.24 | 14 | 1101 | 35 | 33 |
| 96.8 | 78.1 | 18.7 | 76.6 | 66.0 | 1209 | 0.24 | 14 | 1101 | 40 | 32 |
| 97.0 | 78.6 | 18.4 | 76.8 | 66.0 | 1209 | 0.24 | 14 | 1101 | 45 | 32 |
| 97.5 | 80.1 | 17.4 | 77.1 | 66.0 | 1209 | 0.24 | 14 | 1101 | 50 | 30 |
| 97.5 | 80.2 | 17.3 | 77.1 | 66.0 | 1209 | 0.24 | 14 | 1101 | 55 | 30 |
| 98.5 | 79.7 | 18.8 | 77.3 | 65.9 | 1209 | 0.24 | 14 | 1102 | 0 | 32 |
| 98.9 | 79.4 | 19.5 | 77.3 | 66.0 | 1209 | 0.24 | 14 | 1102 | 5 | 34 |
| 99.5 | 80.2 | 19.3 | 77.3 | 66.0 | 1209 | 0.24 | 14 | 1102 | 10 | 33 |
| 100.0 | 81.7 | 18.3 | 77.2 | 66.0 | 1209 | 0.24 | 14 | 1102 | 15 | 32 |
| 100.3 | 81.7 | 18.6 | 77.3 | 66.0 | 1209 | 0.24 | 14 | 1102 | 20 | 32 |
| 100.5 | 82.8 | 17.7 | 77.0 | 66.2 | 1209 | 0.24 | 14 | 1102 | 25 | 31 |
| 101.2 | 82.4 | 18.8 | 77.4 | 66.2 | 1209 | 0.24 | 14 | 1102 | 30 | 32 |
| 101.5 | 83.0 | 18.5 | 77.3 | 66.2 | 1209 | 0.24 | 14 | 1102 | 35 | 32 |
| 101.5 | 83.1 | 18.4 | 77.4 | 66.1 | 1209 | 0.24 | 14 | 1102 | 40 | 32 |
| 101.6 | 81.4 | 20.2 | 77.4 | 66.1 | 1209 | 0.24 | 14 | 1102 | 45 | 35 |
| 101.7 | 82.5 | 19.2 | 77.7 | 66.1 | 1209 | 0.24 | 14 | 1102 | 50 | 33 |
| 102.3 | 83.2 | 19.1 | 77.8 | 66.2 | 1209 | 0.24 | 14 | 1102 | 55 | 33 |
| 102.7 | 82.8 | 19.9 | 77.8 | 66.1 | 1209 | 0.24 | 14 | 1103 | 0 | 34 |
| 103.2 | 83.9 | 19.3 | 77.9 | 66.1 | 1209 | 0.24 | 14 | 1103 | 5 | 33 |
| 103.2 | 83.2 | 20.0 | 77.8 | 66.0 | 1209 | 0.24 | 14 | 1103 | 10 | 35 |
| 103.6 | 82.4 | 21.2 | 77.8 | 66.1 | 1209 | 0.24 | 14 | 1103 | 15 | 37 |
| 103.8 | 83.4 | 20.4 | 78.0 | 66.1 | 1209 | 0.24 | 14 | 1103 | 20 | 35 |
| 104.1 | 83.3 | 20.8 | 77.8 | 66.0 | 1209 | 0.24 | 14 | 1103 | 25 | 36 |
| 104.4 | 84.8 | 19.6 | 77.7 | 66.0 | 1209 | 0.24 | 14 | 1103 | 30 | 34 |
| 104.4 | 84.4 | 20.0 | 77.8 | 66.0 | 1209 | 0.24 | 14 | 1103 | 35 | 35 |
| 104.6 | 84.0 | 20.6 | 77.9 | 66.0 | 1209 | 0.24 | 14 | 1103 | 40 | 36 |
| 104.8 | 83.5 | 21.3 | 78.2 | 66.1 | 1209 | 0.24 | 14 | 1103 | 45 | 37 |
| 104.9 | 86.0 | 18.9 | 78.0 | 66.3 | 1209 | 0.24 | 14 | 1103 | 50 | 33 |
| 105.0 | 86.6 | 18.4 | 78.4 | 66.2 | 1209 | 0.24 | 14 | 1103 | 55 | 32 |
| 105.3 | 85.9 | 19.4 | 78.6 | 66.3 | 1209 | 0.24 | 14 | 1104 | 0 | 34 |

Heat Input
During Heating
cycle = 1688 btu's

Device B Heat Recovery Test (6 Minute Heating On Cycle), Sample 2, Test 2

11/21/2013

| | Tsupply | Treturn | Temp. rise | Room | Ambient | CFM | approx. specific heat of air | approx. specific volume (cu. Ft/lbm) | Time | sec | Btu's Supplied | |
|--------------------------------|---------|---------|------------|------|---------|------|------------------------------|--------------------------------------|------|-----|----------------|---|
| Default Blower Off Delay | 104.5 | 85.8 | 18.7 | 78.4 | 66.2 | 1209 | 0.24 | 14 | 1104 | 5 | 32 | Default fan delay heat recovered = 480 btu's |
| | 104.5 | 86.1 | 18.4 | 78.6 | 66.2 | 1209 | 0.24 | 14 | 1104 | 10 | 32 | |
| | 104.8 | 83.7 | 21.1 | 79.2 | 66.1 | 1209 | 0.24 | 14 | 1104 | 15 | 36 | |
| | 104.1 | 86.1 | 18.0 | 79.3 | 66.2 | 1209 | 0.24 | 14 | 1104 | 20 | 31 | |
| | 103.7 | 86.6 | 17.1 | 79.4 | 66.2 | 1209 | 0.24 | 14 | 1104 | 25 | 30 | |
| | 103.3 | 86.2 | 17.1 | 79.7 | 66.1 | 1209 | 0.24 | 14 | 1104 | 30 | 30 | |
| | 102.6 | 86.7 | 15.9 | 79.7 | 66.1 | 1209 | 0.24 | 14 | 1104 | 35 | 27 | |
| | 101.8 | 87.5 | 14.3 | 79.7 | 66.1 | 1209 | 0.24 | 14 | 1104 | 40 | 25 | |
| | 100.8 | 86.6 | 14.2 | 79.6 | 66.1 | 1209 | 0.24 | 14 | 1104 | 45 | 25 | |
| | 100.1 | 86.8 | 13.3 | 79.3 | 66.0 | 1209 | 0.24 | 14 | 1104 | 50 | 23 | |
| | 99.5 | 86.6 | 12.9 | 79.2 | 66.0 | 1209 | 0.24 | 14 | 1104 | 55 | 22 | |
| | 98.6 | 87.4 | 11.2 | 79.2 | 66.0 | 1209 | 0.24 | 14 | 1105 | 0 | 19 | |
| | 97.9 | 87.6 | 10.3 | 79.4 | 66.0 | 1209 | 0.24 | 14 | 1105 | 5 | 18 | |
| | 97.0 | 87.3 | 9.7 | 79.4 | 66.0 | 1209 | 0.24 | 14 | 1105 | 10 | 17 | |
| | 96.4 | 87.1 | 9.3 | 79.3 | 66.0 | 1209 | 0.24 | 14 | 1105 | 15 | 16 | |
| | 95.4 | 87.1 | 8.3 | 79.4 | 66.0 | 1209 | 0.24 | 14 | 1105 | 20 | 14 | |
| | 94.8 | 87.4 | 7.4 | 79.4 | 66.0 | 1209 | 0.24 | 14 | 1105 | 25 | 13 | |
| | 94.1 | 87.3 | 6.8 | 79.4 | 66.0 | 1209 | 0.24 | 14 | 1105 | 30 | 12 | |
| | 93.7 | 86.8 | 6.9 | 79.4 | 66.0 | 1209 | 0.24 | 14 | 1105 | 35 | 12 | |
| | 93.0 | 86.8 | 6.2 | 79.5 | 66.0 | 1209 | 0.24 | 14 | 1105 | 40 | 11 | |
| | 92.2 | 86.1 | 6.1 | 79.4 | 66.0 | 1209 | 0.24 | 14 | 1105 | 45 | 11 | |
| | 91.7 | 86.3 | 5.4 | 79.4 | 66.0 | 1209 | 0.24 | 14 | 1105 | 50 | 9 | |
| | 91.3 | 86.2 | 5.1 | 79.2 | 66.0 | 1209 | 0.24 | 14 | 1105 | 55 | 9 | |
| | 90.2 | 85.9 | 4.3 | 79.0 | 66.0 | 1209 | 0.24 | 14 | 1106 | 0 | 7 | |
| Device B Extended Blower Delay | 89.0 | 85.7 | 3.3 | 78.9 | 66.0 | 0 | 0.24 | 14 | 1106 | 5 | 0 | heat recovery after default fan delay = 0 btu's |
| | 88.7 | 85.4 | 3.3 | 78.8 | 66.0 | 0 | 0.24 | 14 | 1106 | 10 | 0 | |
| | 88.6 | 85.2 | 3.4 | 78.5 | 66.0 | 0 | 0.24 | 14 | 1106 | 15 | 0 | |
| | 88.5 | 85.2 | 3.3 | 78.3 | 66.0 | 0 | 0.24 | 14 | 1106 | 20 | 0 | |
| | 88.4 | 85.1 | 3.3 | 78.3 | 66.0 | 0 | 0.24 | 14 | 1106 | 25 | 0 | |
| | 88.4 | 85.0 | 3.4 | 78.3 | 66.0 | 0 | 0.24 | 14 | 1106 | 30 | 0 | |
| | 88.2 | 84.6 | 3.6 | 78.3 | 66.0 | 0 | 0.24 | 14 | 1106 | 35 | 0 | |
| | 88.4 | 84.1 | 4.3 | 78.2 | 66.0 | 0 | 0.24 | 14 | 1106 | 40 | 0 | |
| | 88.7 | 83.7 | 5.0 | 78.2 | 66.0 | 0 | 0.24 | 14 | 1106 | 45 | 0 | |
| | 88.8 | 83.5 | 5.3 | 78.2 | 66.0 | 0 | 0.24 | 14 | 1106 | 50 | 0 | |
| | 88.4 | 83.3 | 5.1 | 78.1 | 66.0 | 0 | 0.24 | 14 | 1106 | 55 | 0 | |
| | 88.0 | 83.2 | 4.8 | 78.1 | 66.0 | 0 | 0.24 | 14 | 1107 | 0 | 0 | |

Blower Wattage = 370

Comments: Device B device extended the blower on time after the default delay time by 0 minutes, 0 seconds.

Furnace heat input = $HV \times (\text{volume of gas consumed}) = 1040 \text{ btu/ft}^3 \times 5.2 \text{ ft}^3 = 5408 \text{ btu}$

Device B Heat Recovery Test (7 Minute Heating On Cycle), Sample 2, Test 2

11/21/2013

| Tsupply | Treturn | Temp. rise | Room | Ambient | CFM | approx. specific heat of air | approx. specific volume (cu. Ft/lbm) | Time | sec | Btu's Supplied |
|---------|---------|------------|------|---------|------|---------------------------------|---|------|-----|-------------------|
| 70.4 | 69.5 | 0.9 | 71.3 | 65.7 | 1208 | 0.24 | 14 | 1034 | 0 | 2 |
| 70.5 | 69.5 | 1.0 | 71.3 | 65.7 | 1208 | 0.24 | 14 | 1034 | 5 | 2 |
| 70.5 | 69.5 | 1.0 | 71.3 | 65.7 | 1208 | 0.24 | 14 | 1034 | 10 | 2 |
| 70.6 | 69.5 | 1.1 | 71.3 | 65.8 | 1208 | 0.24 | 14 | 1034 | 15 | 2 |
| 70.7 | 69.5 | 1.2 | 71.3 | 65.8 | 1208 | 0.24 | 14 | 1034 | 20 | 2 |
| 70.7 | 69.5 | 1.2 | 71.3 | 65.7 | 1208 | 0.24 | 14 | 1034 | 25 | 2 |
| 70.8 | 69.6 | 1.2 | 71.3 | 65.7 | 1208 | 0.24 | 14 | 1034 | 30 | 2 |
| 70.6 | 69.6 | 1.0 | 71.3 | 65.7 | 1208 | 0.24 | 14 | 1034 | 35 | 2 |
| 70.4 | 69.5 | 0.9 | 71.4 | 65.7 | 1208 | 0.24 | 14 | 1034 | 40 | 2 |
| 70.2 | 69.4 | 0.8 | 71.4 | 65.7 | 1208 | 0.24 | 14 | 1034 | 45 | 1 |
| 70.0 | 69.5 | 0.5 | 71.4 | 65.7 | 1208 | 0.24 | 14 | 1034 | 50 | 1 |
| 70.8 | 69.6 | 1.2 | 71.4 | 65.7 | 1208 | 0.24 | 14 | 1034 | 55 | 2 |
| 72.0 | 69.8 | 2.2 | 71.4 | 65.6 | 1208 | 0.24 | 14 | 1035 | 0 | 4 |
| 73.3 | 70.0 | 3.3 | 71.5 | 65.7 | 1208 | 0.24 | 14 | 1035 | 5 | 6 |
| 74.3 | 70.1 | 4.2 | 71.5 | 65.7 | 1208 | 0.24 | 14 | 1035 | 10 | 7 |
| 75.3 | 70.3 | 5.0 | 71.5 | 65.7 | 1208 | 0.24 | 14 | 1035 | 15 | 9 |
| 76.2 | 70.5 | 5.7 | 71.6 | 65.6 | 1208 | 0.24 | 14 | 1035 | 20 | 10 |
| 77.3 | 70.8 | 6.5 | 71.7 | 65.6 | 1208 | 0.24 | 14 | 1035 | 25 | 11 |
| 78.1 | 71.1 | 7.0 | 71.6 | 65.7 | 1208 | 0.24 | 14 | 1035 | 30 | 12 |
| 78.7 | 71.7 | 7.0 | 71.7 | 65.7 | 1208 | 0.24 | 14 | 1035 | 35 | 12 |
| 79.6 | 72.1 | 7.5 | 71.9 | 65.8 | 1208 | 0.24 | 14 | 1035 | 40 | 13 |
| 80.3 | 72.3 | 8.0 | 72.0 | 65.7 | 1208 | 0.24 | 14 | 1035 | 45 | 14 |
| 81.2 | 72.7 | 8.5 | 72.3 | 65.8 | 1208 | 0.24 | 14 | 1035 | 50 | 15 |
| 82.1 | 73.1 | 9.0 | 72.4 | 65.7 | 1208 | 0.24 | 14 | 1035 | 55 | 16 |
| 82.8 | 73.3 | 9.5 | 72.5 | 65.8 | 1208 | 0.24 | 14 | 1036 | 0 | 16 |
| 83.6 | 73.6 | 10.0 | 72.7 | 65.7 | 1208 | 0.24 | 14 | 1036 | 5 | 17 |
| 84.4 | 73.8 | 10.6 | 73.0 | 65.7 | 1208 | 0.24 | 14 | 1036 | 10 | 18 |
| 85.5 | 74.0 | 11.5 | 73.2 | 65.6 | 1208 | 0.24 | 14 | 1036 | 15 | 20 |
| 86.2 | 74.6 | 11.6 | 73.5 | 65.6 | 1208 | 0.24 | 14 | 1036 | 20 | 20 |
| 87.0 | 75.3 | 11.7 | 73.9 | 65.6 | 1208 | 0.24 | 14 | 1036 | 25 | 20 |
| 87.5 | 75.4 | 12.1 | 74.1 | 65.7 | 1208 | 0.24 | 14 | 1036 | 30 | 21 |
| 88.2 | 75.6 | 12.6 | 74.4 | 65.7 | 1208 | 0.24 | 14 | 1036 | 35 | 22 |
| 88.8 | 75.9 | 12.9 | 74.6 | 65.6 | 1208 | 0.24 | 14 | 1036 | 40 | 22 |
| 89.8 | 75.3 | 14.5 | 74.7 | 65.7 | 1208 | 0.24 | 14 | 1036 | 45 | 25 |
| 90.4 | 74.5 | 15.9 | 75.0 | 65.7 | 1208 | 0.24 | 14 | 1036 | 50 | 27 |
| 91.1 | 74.4 | 16.7 | 75.4 | 65.7 | 1208 | 0.24 | 14 | 1036 | 55 | 29 |
| 91.5 | 75.3 | 16.2 | 75.6 | 65.7 | 1208 | 0.24 | 14 | 1037 | 0 | 28 |
| 91.8 | 76.3 | 15.5 | 75.9 | 65.6 | 1208 | 0.24 | 14 | 1037 | 5 | 27 |
| 92.3 | 75.5 | 16.8 | 76.0 | 65.6 | 1208 | 0.24 | 14 | 1037 | 10 | 29 |
| 92.8 | 76.1 | 16.7 | 75.8 | 65.6 | 1208 | 0.24 | 14 | 1037 | 15 | 29 |
| 93.3 | 76.0 | 17.3 | 75.5 | 65.8 | 1208 | 0.24 | 14 | 1037 | 20 | 30 |
| 93.4 | 76.3 | 17.1 | 75.5 | 65.8 | 1208 | 0.24 | 14 | 1037 | 25 | 30 |
| 94.1 | 76.4 | 17.7 | 75.5 | 65.8 | 1208 | 0.24 | 14 | 1037 | 30 | 31 |
| 94.7 | 76.1 | 18.6 | 75.6 | 65.8 | 1208 | 0.24 | 14 | 1037 | 35 | 32 |
| 95.0 | 76.4 | 18.6 | 75.7 | 65.8 | 1208 | 0.24 | 14 | 1037 | 40 | 32 |
| 95.5 | 77.0 | 18.5 | 75.8 | 65.8 | 1208 | 0.24 | 14 | 1037 | 45 | 32 |
| 96.1 | 78.0 | 18.1 | 76.2 | 65.8 | 1208 | 0.24 | 14 | 1037 | 50 | 31 |
| 96.8 | 79.5 | 17.3 | 76.5 | 65.9 | 1208 | 0.24 | 14 | 1037 | 55 | 30 |
| 97.2 | 80.7 | 16.5 | 76.6 | 65.9 | 1208 | 0.24 | 14 | 1038 | 0 | 28 |
| 97.5 | 79.6 | 17.9 | 76.8 | 65.9 | 1208 | 0.24 | 14 | 1038 | 5 | 31 |
| 97.1 | 79.5 | 17.6 | 76.8 | 65.8 | 1208 | 0.24 | 14 | 1038 | 10 | 30 |
| 97.4 | 77.6 | 19.8 | 76.8 | 65.8 | 1208 | 0.24 | 14 | 1038 | 15 | 34 |
| 98.0 | 78.2 | 19.8 | 76.7 | 65.8 | 1208 | 0.24 | 14 | 1038 | 20 | 34 |
| 98.6 | 79.6 | 19.0 | 76.7 | 65.8 | 1208 | 0.24 | 14 | 1038 | 25 | 33 |
| 99.1 | 80.8 | 18.3 | 76.9 | 65.9 | 1208 | 0.24 | 14 | 1038 | 30 | 32 |
| 99.3 | 81.0 | 18.3 | 77.1 | 65.8 | 1208 | 0.24 | 14 | 1038 | 35 | 32 |
| 99.5 | 80.2 | 19.3 | 77.5 | 65.8 | 1208 | 0.24 | 14 | 1038 | 40 | 33 |
| 99.8 | 80.5 | 19.3 | 77.2 | 65.7 | 1208 | 0.24 | 14 | 1038 | 45 | 33 |
| 100.2 | 80.3 | 19.9 | 77.1 | 65.8 | 1208 | 0.24 | 14 | 1038 | 50 | 34 |
| 100.5 | 82.6 | 17.9 | 77.3 | 65.8 | 1208 | 0.24 | 14 | 1038 | 55 | 31 |
| 100.9 | 83.2 | 17.7 | 77.7 | 65.7 | 1208 | 0.24 | 14 | 1039 | 0 | 31 |
| 101.3 | 83.8 | 17.5 | 77.7 | 65.7 | 1208 | 0.24 | 14 | 1039 | 5 | 30 |
| 101.3 | 82.4 | 18.9 | 77.4 | 65.7 | 1208 | 0.24 | 14 | 1039 | 10 | 33 |
| 101.3 | 81.2 | 20.1 | 77.3 | 65.7 | 1208 | 0.24 | 14 | 1039 | 15 | 35 |
| 101.4 | 82.4 | 19.0 | 77.4 | 65.7 | 1208 | 0.24 | 14 | 1039 | 20 | 33 |
| 101.9 | 83.0 | 18.9 | 77.5 | 65.7 | 1208 | 0.24 | 14 | 1039 | 25 | 33 |
| 102.4 | 83.9 | 18.5 | 77.7 | 65.7 | 1208 | 0.24 | 14 | 1039 | 30 | 32 |
| 102.6 | 84.2 | 18.4 | 77.1 | 65.7 | 1208 | 0.24 | 14 | 1039 | 35 | 32 |
| 103.0 | 84.4 | 18.6 | 78.0 | 65.7 | 1208 | 0.24 | 14 | 1039 | 40 | 32 |
| 102.9 | 82.8 | 20.1 | 78.2 | 65.7 | 1208 | 0.24 | 14 | 1039 | 45 | 35 |
| 103.4 | 83.5 | 19.9 | 78.4 | 65.7 | 1208 | 0.24 | 14 | 1039 | 50 | 34 |
| 103.4 | 84.7 | 18.7 | 78.5 | 65.7 | 1208 | 0.24 | 14 | 1039 | 55 | 32 |
| 103.8 | 86.0 | 17.8 | 78.8 | 65.7 | 1208 | 0.24 | 14 | 1040 | 0 | 31 |
| 103.8 | 86.0 | 17.8 | 78.9 | 65.8 | 1208 | 0.24 | 14 | 1040 | 5 | 31 |
| 103.7 | 84.2 | 19.5 | 78.5 | 65.8 | 1208 | 0.24 | 14 | 1040 | 10 | 34 |
| 103.8 | 83.0 | 20.8 | 78.8 | 65.8 | 1208 | 0.24 | 14 | 1040 | 15 | 36 |
| 104.3 | 85.2 | 19.1 | 78.9 | 65.8 | 1208 | 0.24 | 14 | 1040 | 20 | 33 |
| 104.6 | 86.1 | 18.5 | 78.8 | 65.8 | 1208 | 0.24 | 14 | 1040 | 25 | 32 |
| 104.7 | 86.1 | 18.6 | 78.8 | 65.8 | 1208 | 0.24 | 14 | 1040 | 30 | 32 |
| 105.3 | 85.6 | 19.7 | 78.7 | 65.8 | 1208 | 0.24 | 14 | 1040 | 35 | 34 |
| 105.5 | 84.8 | 20.7 | 78.5 | 65.8 | 1208 | 0.24 | 14 | 1040 | 40 | 36 |
| 105.1 | 84.4 | 20.7 | 78.4 | 65.8 | 1208 | 0.24 | 14 | 1040 | 45 | 36 |
| 105.6 | 83.7 | 21.9 | 78.5 | 65.8 | 1208 | 0.24 | 14 | 1040 | 50 | 38 |
| 105.0 | 83.2 | 21.8 | 79.0 | 65.8 | 1208 | 0.24 | 14 | 1040 | 55 | 38 |

Furnace Heating On

Heat Input
During Heating
cycle = 1989 btu/s

Device B Heat Recovery Test (7 Minute Heating On Cycle), Sample 2, Test 2

11/21/2013

| | Tsupply | Treturn | Temp. rise | Room | Ambient | CFM | approx. specific heat of air | approx. specific volume (cu. Ft/lbm) | Time | sec | Btu's Supplied | |
|--------------------------------|---------|---------|------------|------|---------|------|---------------------------------|---|------|-----|-------------------|---|
| Default Blower Off Delay | 105.1 | 82.8 | 22.3 | 79.4 | 65.8 | 1208 | 0.24 | 14 | 1041 | 0 | 38 | Default fan delay heat recovered = 543 btu's |
| | 105.4 | 83.0 | 22.4 | 79.6 | 65.7 | 1208 | 0.24 | 14 | 1041 | 5 | 39 | |
| | 105.7 | 83.9 | 21.8 | 79.9 | 65.8 | 1208 | 0.24 | 14 | 1041 | 10 | 38 | |
| | 105.7 | 84.9 | 20.8 | 79.9 | 65.7 | 1208 | 0.24 | 14 | 1041 | 15 | 36 | |
| | 105.5 | 84.6 | 20.9 | 80.0 | 65.7 | 1208 | 0.24 | 14 | 1041 | 20 | 36 | |
| | 105.0 | 85.2 | 19.8 | 80.1 | 65.7 | 1208 | 0.24 | 14 | 1041 | 25 | 34 | |
| | 104.4 | 84.1 | 20.3 | 79.8 | 65.7 | 1208 | 0.24 | 14 | 1041 | 30 | 35 | |
| | 103.6 | 83.1 | 20.5 | 79.8 | 65.7 | 1208 | 0.24 | 14 | 1041 | 35 | 35 | |
| | 102.9 | 84.2 | 18.7 | 79.6 | 65.7 | 1208 | 0.24 | 14 | 1041 | 40 | 32 | |
| | 102.1 | 86.7 | 15.4 | 79.4 | 65.7 | 1208 | 0.24 | 14 | 1041 | 45 | 27 | |
| | 101.3 | 88.1 | 13.2 | 79.3 | 65.7 | 1208 | 0.24 | 14 | 1041 | 50 | 23 | |
| | 100.5 | 87.4 | 13.1 | 79.9 | 65.7 | 1208 | 0.24 | 14 | 1041 | 55 | 23 | |
| | 99.9 | 86.3 | 13.6 | 80.1 | 65.7 | 1208 | 0.24 | 14 | 1042 | 0 | 23 | |
| | 98.6 | 86.8 | 11.8 | 80.2 | 65.7 | 1208 | 0.24 | 14 | 1042 | 5 | 20 | |
| | 98.0 | 87.0 | 11.0 | 80.2 | 65.7 | 1208 | 0.24 | 14 | 1042 | 10 | 19 | |
| | 97.4 | 87.2 | 10.2 | 80.0 | 65.7 | 1208 | 0.24 | 14 | 1042 | 15 | 18 | |
| | 96.9 | 87.2 | 9.7 | 79.9 | 65.7 | 1208 | 0.24 | 14 | 1042 | 20 | 17 | |
| | 96.1 | 87.5 | 8.6 | 79.8 | 65.7 | 1208 | 0.24 | 14 | 1042 | 25 | 15 | |
| | 95.4 | 87.6 | 7.8 | 79.7 | 65.7 | 1208 | 0.24 | 14 | 1042 | 30 | 13 | |
| | 94.7 | 87.3 | 7.4 | 79.6 | 65.7 | 1208 | 0.24 | 14 | 1042 | 35 | 13 | |
| | 94.0 | 87.4 | 6.6 | 79.2 | 65.6 | 1208 | 0.24 | 14 | 1042 | 40 | 11 | |
| | 92.9 | 86.9 | 6.0 | 79.2 | 65.6 | 1208 | 0.24 | 14 | 1042 | 45 | 10 | |
| | 92.4 | 86.7 | 5.7 | 79.3 | 65.6 | 1208 | 0.24 | 14 | 1042 | 50 | 10 | |
| | 91.7 | 86.7 | 5.0 | 79.3 | 65.6 | 1208 | 0.24 | 14 | 1042 | 55 | 9 | |
| | 91.1 | 86.8 | 4.3 | 79.3 | 65.6 | 1208 | 0.24 | 14 | 1043 | 0 | 7 | |
| Device B Extended Blower Delay | 90.2 | 86.6 | 3.6 | 79.4 | 65.6 | 0 | 0.24 | 14 | 1043 | 5 | 0 | heat recovery after default fan delay = 0 btu's |
| | 89.7 | 86.0 | 3.7 | 79.2 | 65.7 | 0 | 0.24 | 14 | 1043 | 10 | 0 | |
| | 89.5 | 85.7 | 3.8 | 79.1 | 65.7 | 0 | 0.24 | 14 | 1043 | 15 | 0 | |
| | 89.3 | 85.4 | 3.9 | 78.9 | 65.7 | 0 | 0.24 | 14 | 1043 | 20 | 0 | |
| | 89.2 | 85.4 | 3.8 | 78.7 | 65.7 | 0 | 0.24 | 14 | 1043 | 25 | 0 | |
| | 89.1 | 85.0 | 4.1 | 78.6 | 65.7 | 0 | 0.24 | 14 | 1043 | 30 | 0 | |
| | 89.0 | 84.6 | 4.4 | 78.5 | 65.6 | 0 | 0.24 | 14 | 1043 | 35 | 0 | |
| | 89.0 | 84.4 | 4.6 | 78.4 | 65.7 | 0 | 0.24 | 14 | 1043 | 40 | 0 | |
| | 89.1 | 84.0 | 5.1 | 78.3 | 65.6 | 0 | 0.24 | 14 | 1043 | 45 | 0 | |
| | 89.0 | 83.7 | 5.3 | 78.2 | 65.6 | 0 | 0.24 | 14 | 1043 | 50 | 0 | |
| | 88.6 | 83.5 | 5.1 | 78.2 | 65.7 | 0 | 0.24 | 14 | 1043 | 55 | 0 | |
| | 88.2 | 83.3 | 4.9 | 78.2 | 65.7 | 0 | 0.24 | 14 | 1044 | 0 | 0 | |
| | 87.7 | 83.2 | 4.5 | 78.1 | 65.6 | 0 | 0.24 | 14 | 1044 | 5 | 0 | |
| | 87.5 | 83.1 | 4.4 | 78.0 | 65.6 | 0 | 0.24 | 14 | 1044 | 10 | 0 | |
| | 87.2 | 82.9 | 4.3 | 77.8 | 65.6 | 0 | 0.24 | 14 | 1044 | 15 | 0 | |
| | 87.0 | 82.8 | 4.2 | 77.7 | 65.6 | 0 | 0.24 | 14 | 1044 | 20 | 0 | |
| | 86.9 | 82.7 | 4.2 | 77.6 | 65.7 | 0 | 0.24 | 14 | 1044 | 25 | 0 | |
| | 86.9 | 82.5 | 4.4 | 77.6 | 65.6 | 0 | 0.24 | 14 | 1044 | 30 | 0 | |

Blower Wattage = 370

Comments: Device B device extended the blower on time after the default delay time by 0 minutes, 0 seconds.

Furnace heat input = $HV \times (\text{volume of gas consumed}) = 1040 \text{ btu/ft}^3 \times 6.2 \text{ ft}^3 = 6448 \text{ btu}$

Device B Heat Recovery Test (8 Minute Heating On Cycle), Sample 2, Test 2

11/21/2013

| Tsupply | Treturn | Temp. rise | Room | Ambient | CFM | approx. specific heat of air | approx. specific volume (cu. Ft/lbm) | Time | sec | Btu's Supplied |
|---------|---------|------------|------|---------|------|------------------------------|--------------------------------------|------|-----|----------------|
| 69.2 | 68.7 | 0.5 | 70.8 | 65.4 | 1210 | 0.24 | 14 | 1008 | 0 | 1 |
| 69.2 | 68.7 | 0.5 | 70.8 | 65.4 | 1210 | 0.24 | 14 | 1008 | 5 | 1 |
| 69.3 | 68.8 | 0.5 | 70.8 | 65.4 | 1210 | 0.24 | 14 | 1008 | 10 | 1 |
| 69.3 | 68.8 | 0.5 | 70.9 | 65.6 | 1210 | 0.24 | 14 | 1008 | 15 | 1 |
| 69.3 | 68.8 | 0.5 | 70.9 | 65.6 | 1210 | 0.24 | 14 | 1008 | 20 | 1 |
| 69.3 | 68.8 | 0.5 | 70.8 | 65.5 | 1210 | 0.24 | 14 | 1008 | 25 | 1 |
| 69.3 | 68.7 | 0.6 | 70.8 | 65.5 | 1210 | 0.24 | 14 | 1008 | 30 | 1 |
| 68.9 | 68.9 | 0.1 | 70.9 | 65.5 | 1210 | 0.24 | 14 | 1008 | 35 | 0 |
| 68.8 | 68.8 | 0.0 | 70.9 | 65.5 | 1210 | 0.24 | 14 | 1008 | 40 | 0 |
| 69.6 | 68.8 | 0.7 | 70.9 | 65.4 | 1210 | 0.24 | 14 | 1008 | 45 | 1 |
| 69.6 | 68.8 | 0.7 | 70.9 | 65.5 | 1210 | 0.24 | 14 | 1008 | 50 | 1 |
| 69.5 | 68.9 | 0.6 | 70.9 | 65.5 | 1210 | 0.24 | 14 | 1008 | 55 | 1 |
| 70.5 | 68.9 | 1.6 | 70.9 | 65.4 | 1210 | 0.24 | 14 | 1009 | 0 | 3 |
| 71.6 | 69.0 | 2.6 | 70.9 | 65.4 | 1210 | 0.24 | 14 | 1009 | 5 | 5 |
| 72.4 | 69.2 | 3.2 | 70.9 | 65.4 | 1210 | 0.24 | 14 | 1009 | 10 | 6 |
| 73.4 | 69.3 | 4.1 | 71.1 | 65.4 | 1210 | 0.24 | 14 | 1009 | 15 | 7 |
| 74.3 | 69.5 | 4.8 | 71.1 | 65.4 | 1210 | 0.24 | 14 | 1009 | 20 | 8 |
| 75.4 | 69.7 | 5.7 | 71.2 | 65.4 | 1210 | 0.24 | 14 | 1009 | 25 | 10 |
| 76.3 | 69.9 | 6.4 | 71.1 | 65.3 | 1210 | 0.24 | 14 | 1009 | 30 | 11 |
| 77.2 | 70.2 | 7.0 | 71.2 | 65.3 | 1210 | 0.24 | 14 | 1009 | 35 | 12 |
| 78.0 | 70.6 | 7.4 | 71.3 | 65.4 | 1210 | 0.24 | 14 | 1009 | 40 | 13 |
| 79.0 | 70.9 | 8.1 | 71.3 | 65.4 | 1210 | 0.24 | 14 | 1009 | 45 | 14 |
| 80.0 | 71.2 | 8.8 | 71.4 | 65.4 | 1210 | 0.24 | 14 | 1009 | 50 | 15 |
| 80.9 | 71.7 | 9.2 | 71.6 | 65.4 | 1210 | 0.24 | 14 | 1009 | 55 | 16 |
| 81.8 | 72.1 | 9.7 | 71.8 | 65.3 | 1210 | 0.24 | 14 | 1010 | 0 | 17 |
| 83.0 | 72.5 | 10.5 | 72.1 | 65.3 | 1210 | 0.24 | 14 | 1010 | 5 | 18 |
| 83.9 | 72.8 | 11.1 | 72.2 | 65.4 | 1210 | 0.24 | 14 | 1010 | 10 | 19 |
| 84.7 | 73.2 | 11.5 | 72.4 | 65.4 | 1210 | 0.24 | 14 | 1010 | 15 | 20 |
| 85.5 | 73.8 | 11.7 | 72.5 | 65.4 | 1210 | 0.24 | 14 | 1010 | 20 | 20 |
| 86.2 | 74.2 | 12.0 | 72.7 | 65.5 | 1210 | 0.24 | 14 | 1010 | 25 | 21 |
| 87.0 | 74.3 | 12.7 | 72.7 | 65.4 | 1210 | 0.24 | 14 | 1010 | 30 | 22 |
| 87.9 | 74.5 | 13.4 | 73.1 | 65.4 | 1210 | 0.24 | 14 | 1010 | 35 | 23 |
| 88.6 | 74.7 | 13.9 | 73.6 | 65.4 | 1210 | 0.24 | 14 | 1010 | 40 | 24 |
| 89.2 | 74.8 | 14.4 | 73.9 | 65.4 | 1210 | 0.24 | 14 | 1010 | 45 | 25 |
| 90.0 | 75.1 | 14.9 | 74.3 | 65.4 | 1210 | 0.24 | 14 | 1010 | 50 | 26 |
| 90.6 | 75.4 | 15.2 | 74.6 | 65.4 | 1210 | 0.24 | 14 | 1010 | 55 | 26 |
| 90.9 | 75.4 | 15.5 | 74.6 | 65.4 | 1210 | 0.24 | 14 | 1011 | 0 | 27 |
| 91.3 | 75.3 | 16.0 | 74.9 | 65.4 | 1210 | 0.24 | 14 | 1011 | 5 | 28 |
| 92.1 | 74.9 | 17.2 | 75.1 | 65.4 | 1210 | 0.24 | 14 | 1011 | 10 | 30 |
| 92.6 | 75.7 | 16.9 | 75.0 | 65.4 | 1210 | 0.24 | 14 | 1011 | 15 | 29 |
| 93.0 | 75.8 | 17.2 | 74.9 | 65.5 | 1210 | 0.24 | 14 | 1011 | 20 | 30 |
| 93.4 | 75.4 | 18.0 | 74.7 | 65.4 | 1210 | 0.24 | 14 | 1011 | 25 | 31 |
| 94.0 | 76.3 | 17.7 | 74.5 | 65.4 | 1210 | 0.24 | 14 | 1011 | 30 | 31 |
| 94.5 | 77.0 | 17.5 | 74.4 | 65.4 | 1210 | 0.24 | 14 | 1011 | 35 | 30 |
| 94.5 | 77.2 | 17.3 | 74.6 | 65.4 | 1210 | 0.24 | 14 | 1011 | 40 | 30 |
| 95.0 | 78.0 | 17.0 | 74.7 | 65.4 | 1210 | 0.24 | 14 | 1011 | 45 | 29 |
| 95.3 | 78.1 | 17.2 | 74.7 | 65.4 | 1210 | 0.24 | 14 | 1011 | 50 | 30 |
| 95.9 | 79.2 | 16.7 | 75.2 | 65.4 | 1210 | 0.24 | 14 | 1011 | 55 | 29 |
| 96.3 | 79.3 | 17.0 | 75.5 | 65.4 | 1210 | 0.24 | 14 | 1012 | 0 | 29 |
| 96.7 | 79.9 | 16.8 | 75.8 | 65.3 | 1210 | 0.24 | 14 | 1012 | 5 | 29 |
| 96.8 | 79.6 | 17.2 | 75.9 | 65.4 | 1210 | 0.24 | 14 | 1012 | 10 | 30 |
| 97.2 | 78.6 | 18.6 | 76.1 | 65.5 | 1210 | 0.24 | 14 | 1012 | 15 | 32 |
| 97.7 | 79.4 | 18.3 | 76.1 | 65.5 | 1210 | 0.24 | 14 | 1012 | 20 | 32 |
| 98.0 | 80.2 | 17.8 | 76.2 | 65.5 | 1210 | 0.24 | 14 | 1012 | 25 | 31 |
| 98.3 | 80.6 | 17.7 | 76.5 | 65.5 | 1210 | 0.24 | 14 | 1012 | 30 | 31 |
| 98.8 | 79.6 | 19.2 | 76.3 | 65.5 | 1210 | 0.24 | 14 | 1012 | 35 | 33 |
| 99.0 | 79.0 | 20.0 | 76.3 | 65.5 | 1210 | 0.24 | 14 | 1012 | 40 | 35 |
| 99.1 | 79.6 | 19.5 | 76.5 | 65.4 | 1210 | 0.24 | 14 | 1012 | 45 | 34 |
| 99.1 | 80.6 | 18.5 | 76.9 | 65.4 | 1210 | 0.24 | 14 | 1012 | 50 | 32 |
| 99.5 | 81.6 | 17.9 | 77.1 | 65.3 | 1210 | 0.24 | 14 | 1012 | 55 | 31 |
| 100.0 | 81.0 | 19.0 | 77.2 | 65.3 | 1210 | 0.24 | 14 | 1013 | 0 | 33 |
| 99.8 | 81.5 | 18.3 | 77.2 | 65.4 | 1210 | 0.24 | 14 | 1013 | 5 | 32 |
| 100.2 | 80.6 | 19.6 | 77.1 | 65.4 | 1210 | 0.24 | 14 | 1013 | 10 | 34 |
| 100.5 | 79.8 | 20.7 | 76.9 | 65.5 | 1210 | 0.24 | 14 | 1013 | 15 | 36 |
| 100.5 | 81.0 | 19.5 | 76.8 | 65.5 | 1210 | 0.24 | 14 | 1013 | 20 | 34 |
| 101.0 | 83.2 | 17.8 | 77.1 | 65.6 | 1210 | 0.24 | 14 | 1013 | 25 | 31 |
| 101.3 | 83.8 | 17.5 | 77.9 | 65.5 | 1210 | 0.24 | 14 | 1013 | 30 | 30 |
| 101.8 | 82.8 | 19.0 | 77.7 | 65.5 | 1210 | 0.24 | 14 | 1013 | 35 | 33 |
| 101.8 | 81.5 | 20.3 | 77.4 | 65.5 | 1210 | 0.24 | 14 | 1013 | 40 | 35 |
| 102.0 | 82.0 | 20.0 | 77.5 | 65.6 | 1210 | 0.24 | 14 | 1013 | 45 | 35 |
| 102.1 | 83.8 | 18.3 | 77.9 | 65.5 | 1210 | 0.24 | 14 | 1013 | 50 | 32 |
| 102.2 | 83.0 | 19.2 | 78.1 | 65.5 | 1210 | 0.24 | 14 | 1013 | 55 | 33 |
| 102.1 | 81.8 | 20.3 | 78.2 | 65.5 | 1210 | 0.24 | 14 | 1014 | 0 | 35 |
| 102.4 | 80.8 | 21.6 | 78.6 | 65.4 | 1210 | 0.24 | 14 | 1014 | 5 | 37 |
| 102.7 | 80.7 | 22.0 | 78.5 | 65.4 | 1210 | 0.24 | 14 | 1014 | 10 | 38 |
| 103.0 | 80.2 | 22.8 | 78.7 | 65.4 | 1210 | 0.24 | 14 | 1014 | 15 | 39 |
| 103.2 | 82.6 | 20.6 | 78.7 | 65.4 | 1210 | 0.24 | 14 | 1014 | 20 | 36 |
| 103.4 | 84.4 | 19.0 | 78.3 | 65.4 | 1210 | 0.24 | 14 | 1014 | 25 | 33 |
| 103.3 | 85.1 | 18.2 | 78.4 | 65.5 | 1210 | 0.24 | 14 | 1014 | 30 | 31 |
| 103.7 | 83.5 | 20.2 | 78.3 | 65.4 | 1210 | 0.24 | 14 | 1014 | 35 | 35 |
| 103.9 | 82.6 | 21.3 | 78.5 | 65.4 | 1210 | 0.24 | 14 | 1014 | 40 | 37 |
| 103.9 | 81.1 | 22.8 | 78.5 | 65.4 | 1210 | 0.24 | 14 | 1014 | 45 | 39 |
| 103.8 | 79.9 | 23.9 | 79.0 | 65.4 | 1210 | 0.24 | 14 | 1014 | 50 | 41 |

Furnace Heating On

Heat Input
During Heating
cycle = 2463 btu's

Device B Heat Recovery Test (8 Minute Heating On Cycle), Sample 2, Test 2

11/21/2013

| | Tsupply | Treturn | Temp. rise | Room | Ambient | CFM | approx. specific heat of air | approx. specific volume (cu. Ft/lbm) | Time | sec | Btu's Supplied |
|--------------------------------|---------|---------|------------|------|---------|------|------------------------------|--------------------------------------|------|-----|----------------|
| | 104.0 | 80.8 | 23.2 | 78.8 | 65.3 | 1210 | 0.24 | 14 | 1014 | 55 | 40 |
| | 104.1 | 81.9 | 22.2 | 79.3 | 65.3 | 1210 | 0.24 | 14 | 1015 | 0 | 38 |
| | 104.4 | 82.1 | 22.3 | 79.3 | 65.3 | 1210 | 0.24 | 14 | 1015 | 5 | 39 |
| | 103.8 | 81.2 | 22.6 | 79.3 | 65.3 | 1210 | 0.24 | 14 | 1015 | 10 | 39 |
| | 104.2 | 81.7 | 22.5 | 79.6 | 65.3 | 1210 | 0.24 | 14 | 1015 | 15 | 39 |
| | 104.3 | 82.3 | 22.0 | 79.8 | 65.3 | 1210 | 0.24 | 14 | 1015 | 20 | 38 |
| | 104.5 | 81.7 | 22.8 | 79.4 | 65.3 | 1210 | 0.24 | 14 | 1015 | 25 | 39 |
| | 104.7 | 83.3 | 21.4 | 79.8 | 65.3 | 1210 | 0.24 | 14 | 1015 | 30 | 37 |
| | 104.7 | 82.8 | 21.9 | 80.1 | 65.3 | 1210 | 0.24 | 14 | 1015 | 35 | 38 |
| | 104.7 | 82.0 | 22.7 | 80.0 | 65.3 | 1210 | 0.24 | 14 | 1015 | 40 | 39 |
| | 105.0 | 82.6 | 22.4 | 80.2 | 65.3 | 1210 | 0.24 | 14 | 1015 | 45 | 39 |
| | 105.3 | 83.0 | 22.3 | 80.3 | 65.3 | 1210 | 0.24 | 14 | 1015 | 50 | 39 |
| | 105.4 | 81.9 | 23.5 | 80.0 | 65.4 | 1210 | 0.24 | 14 | 1015 | 55 | 41 |
| | 105.6 | 82.6 | 23.0 | 79.9 | 65.4 | 1210 | 0.24 | 14 | 1016 | 0 | 40 |
| | 105.6 | 82.3 | 23.3 | 80.0 | 65.3 | 1210 | 0.24 | 14 | 1016 | 5 | 40 |
| Default Blower Off Delay | 105.7 | 83.1 | 22.6 | 79.8 | 65.4 | 1210 | 0.24 | 14 | 1016 | 10 | 39 |
| | 105.7 | 82.3 | 23.4 | 79.6 | 65.4 | 1210 | 0.24 | 14 | 1016 | 15 | 40 |
| | 105.4 | 85.4 | 20.0 | 79.7 | 65.4 | 1210 | 0.24 | 14 | 1016 | 20 | 35 |
| | 105.0 | 86.7 | 18.3 | 80.3 | 65.4 | 1210 | 0.24 | 14 | 1016 | 25 | 32 |
| | 104.4 | 85.3 | 19.1 | 80.2 | 65.3 | 1210 | 0.24 | 14 | 1016 | 30 | 33 |
| | 103.7 | 83.8 | 19.9 | 79.9 | 65.3 | 1210 | 0.24 | 14 | 1016 | 35 | 34 |
| | 103.2 | 86.4 | 16.8 | 80.3 | 65.3 | 1210 | 0.24 | 14 | 1016 | 40 | 29 |
| | 102.3 | 86.3 | 16.0 | 79.8 | 65.3 | 1210 | 0.24 | 14 | 1016 | 45 | 28 |
| | 101.6 | 86.5 | 15.1 | 79.7 | 65.3 | 1210 | 0.24 | 14 | 1016 | 50 | 26 |
| | 100.5 | 84.8 | 15.7 | 79.7 | 65.3 | 1210 | 0.24 | 14 | 1016 | 55 | 27 |
| | 99.4 | 86.9 | 12.5 | 79.6 | 65.3 | 1210 | 0.24 | 14 | 1017 | 0 | 22 |
| | 99.0 | 87.8 | 11.2 | 79.7 | 65.3 | 1210 | 0.24 | 14 | 1017 | 5 | 19 |
| | 98.3 | 88.3 | 10.0 | 79.4 | 65.3 | 1210 | 0.24 | 14 | 1017 | 10 | 17 |
| | 97.5 | 88.2 | 9.3 | 79.3 | 65.3 | 1210 | 0.24 | 14 | 1017 | 15 | 16 |
| | 96.9 | 87.5 | 9.4 | 79.3 | 65.3 | 1210 | 0.24 | 14 | 1017 | 20 | 16 |
| | 96.0 | 87.9 | 8.1 | 79.4 | 65.3 | 1210 | 0.24 | 14 | 1017 | 25 | 14 |
| | 95.4 | 88.2 | 7.2 | 79.5 | 65.3 | 1210 | 0.24 | 14 | 1017 | 30 | 12 |
| | 94.8 | 88.0 | 6.8 | 79.5 | 65.3 | 1210 | 0.24 | 14 | 1017 | 35 | 12 |
| | 94.2 | 87.1 | 7.1 | 79.4 | 65.3 | 1210 | 0.24 | 14 | 1017 | 40 | 12 |
| | 93.5 | 87.0 | 6.5 | 79.3 | 65.3 | 1210 | 0.24 | 14 | 1017 | 45 | 11 |
| | 92.8 | 86.9 | 5.9 | 79.2 | 65.3 | 1210 | 0.24 | 14 | 1017 | 50 | 10 |
| | 92.2 | 87.1 | 5.1 | 78.9 | 65.3 | 1210 | 0.24 | 14 | 1017 | 55 | 9 |
| | 91.8 | 86.5 | 5.3 | 78.8 | 65.3 | 1210 | 0.24 | 14 | 1018 | 0 | 9 |
| Device B Extended Blower Delay | 90.2 | 86.3 | 3.9 | 78.6 | 65.3 | 0 | 0.24 | 14 | 1018 | 5 | 0 |
| | 89.5 | 86.1 | 3.4 | 78.7 | 65.3 | 0 | 0.24 | 14 | 1018 | 10 | 0 |
| | 89.3 | 85.9 | 3.4 | 78.7 | 65.3 | 0 | 0.24 | 14 | 1018 | 15 | 0 |
| | 89.1 | 85.7 | 3.4 | 78.5 | 65.3 | 0 | 0.24 | 14 | 1018 | 20 | 0 |
| | 88.9 | 85.7 | 3.2 | 78.5 | 65.3 | 0 | 0.24 | 14 | 1018 | 25 | 0 |
| | 89.0 | 85.5 | 3.5 | 78.5 | 65.3 | 0 | 0.24 | 14 | 1018 | 30 | 0 |
| | 89.0 | 85.4 | 3.6 | 78.4 | 65.3 | 0 | 0.24 | 14 | 1018 | 35 | 0 |
| | 89.1 | 84.9 | 4.2 | 78.4 | 65.3 | 0 | 0.24 | 14 | 1018 | 40 | 0 |
| | 89.0 | 84.5 | 4.5 | 78.3 | 65.3 | 0 | 0.24 | 14 | 1018 | 45 | 0 |
| | 89.1 | 84.0 | 5.1 | 78.2 | 65.3 | 0 | 0.24 | 14 | 1018 | 50 | 0 |
| | 89.1 | 83.8 | 5.3 | 78.2 | 65.3 | 0 | 0.24 | 14 | 1018 | 55 | 0 |
| | 88.6 | 83.6 | 5.0 | 78.1 | 65.3 | 0 | 0.24 | 14 | 1019 | 0 | 0 |
| | 88.2 | 83.4 | 4.8 | 77.9 | 65.3 | 0 | 0.24 | 14 | 1019 | 5 | 0 |
| | 87.9 | 83.1 | 4.8 | 77.8 | 65.3 | 0 | 0.24 | 14 | 1019 | 10 | 0 |
| | 87.6 | 82.9 | 4.7 | 77.7 | 65.3 | 0 | 0.24 | 14 | 1019 | 15 | 0 |
| | 87.3 | 82.7 | 4.6 | 77.6 | 65.3 | 0 | 0.24 | 14 | 1019 | 20 | 0 |
| | 87.1 | 82.5 | 4.6 | 77.5 | 65.3 | 0 | 0.24 | 14 | 1019 | 25 | 0 |
| | 87.0 | 82.5 | 4.5 | 77.4 | 65.3 | 0 | 0.24 | 14 | 1019 | 30 | 0 |
| | 86.7 | 82.2 | 4.5 | 77.3 | 65.3 | 0 | 0.24 | 14 | 1019 | 35 | 0 |
| | 86.6 | 81.9 | 4.7 | 77.3 | 65.3 | 0 | 0.24 | 14 | 1019 | 40 | 0 |
| | 86.6 | 81.7 | 4.9 | 77.3 | 65.3 | 0 | 0.24 | 14 | 1019 | 45 | 0 |
| | 86.8 | 81.4 | 5.4 | 77.2 | 65.3 | 0 | 0.24 | 14 | 1019 | 50 | 0 |
| | 86.6 | 81.2 | 5.4 | 77.1 | 65.3 | 0 | 0.24 | 14 | 1019 | 55 | 0 |
| | 86.4 | 81.0 | 5.4 | 77.1 | 65.3 | 0 | 0.24 | 14 | 1020 | 0 | 0 |
| | 86.6 | 81.0 | 5.6 | 77.0 | 65.3 | 0 | 0.24 | 14 | 1020 | 5 | 0 |

Default fan delay heat recovered = 544 btu's

heat recovery after default fan delay = 0 btu's

Blower Wattage = 370

Comments: Device B device extended the blower on time after the default delay time by 0 minutes, 0 seconds.

Furnace heat input = HV x (volume of gas consumed) = 1040 btu/ft³ x 7.0 ft³ = 7280 btu

Device B Heat Recovery Test (9 Minute Heating On Cycle), Sample 2, Test 2

11/21/2013

| Tsupply | Treturn | Temp. rise | Room | Ambient | CFM | approx. specific heat of air | approx. specific volume (cu. Ft/lbm) | Time | sec | Btu's Supplied |
|---------|---------|------------|------|---------|------|---------------------------------|---|------|-----|-------------------|
| 68.0 | 66.5 | 1.5 | 69.6 | 65.1 | 1214 | 0.24 | 14 | 943 | 0 | 3 |
| 68.5 | 66.5 | 2.1 | 69.6 | 65.1 | 1214 | 0.24 | 14 | 943 | 5 | 4 |
| 69.0 | 66.5 | 2.6 | 69.6 | 65.1 | 1214 | 0.24 | 14 | 943 | 10 | 4 |
| 69.5 | 66.5 | 3.0 | 69.6 | 65.1 | 1214 | 0.24 | 14 | 943 | 15 | 5 |
| 69.5 | 66.5 | 3.0 | 69.6 | 65.1 | 1214 | 0.24 | 14 | 943 | 20 | 5 |
| 70.0 | 66.5 | 3.5 | 69.6 | 65.1 | 1214 | 0.24 | 14 | 943 | 25 | 6 |
| 70.0 | 66.5 | 3.4 | 69.6 | 65.1 | 1214 | 0.24 | 14 | 943 | 30 | 6 |
| 69.9 | 66.5 | 3.4 | 69.6 | 65.1 | 1214 | 0.24 | 14 | 943 | 35 | 6 |
| 69.9 | 66.6 | 3.2 | 69.6 | 65.1 | 1214 | 0.24 | 14 | 943 | 40 | 6 |
| 69.8 | 66.7 | 3.0 | 69.7 | 65.1 | 1214 | 0.24 | 14 | 943 | 45 | 5 |
| 69.7 | 66.7 | 3.0 | 69.7 | 65.1 | 1214 | 0.24 | 14 | 943 | 50 | 5 |
| 69.9 | 66.8 | 3.1 | 69.6 | 65.2 | 1214 | 0.24 | 14 | 943 | 55 | 5 |
| 72.0 | 67.0 | 5.0 | 69.7 | 65.2 | 1214 | 0.24 | 14 | 944 | 0 | 9 |
| 74.3 | 67.1 | 7.2 | 69.7 | 65.1 | 1214 | 0.24 | 14 | 944 | 5 | 13 |
| 76.2 | 67.4 | 8.9 | 69.8 | 65.1 | 1214 | 0.24 | 14 | 944 | 10 | 15 |
| 77.7 | 67.5 | 10.3 | 69.9 | 65.2 | 1214 | 0.24 | 14 | 944 | 15 | 18 |
| 79.0 | 67.7 | 11.3 | 70.1 | 65.2 | 1214 | 0.24 | 14 | 944 | 20 | 20 |
| 79.9 | 68.0 | 11.9 | 70.4 | 65.2 | 1214 | 0.24 | 14 | 944 | 25 | 21 |
| 80.9 | 68.4 | 12.6 | 70.4 | 65.2 | 1214 | 0.24 | 14 | 944 | 30 | 22 |
| 81.6 | 68.8 | 12.8 | 70.6 | 65.2 | 1214 | 0.24 | 14 | 944 | 35 | 22 |
| 82.3 | 69.5 | 12.8 | 70.8 | 65.2 | 1214 | 0.24 | 14 | 944 | 40 | 22 |
| 83.1 | 70.2 | 12.9 | 71.2 | 65.2 | 1214 | 0.24 | 14 | 944 | 45 | 22 |
| 84.0 | 71.0 | 13.0 | 71.2 | 65.2 | 1214 | 0.24 | 14 | 944 | 50 | 23 |
| 84.6 | 71.0 | 13.6 | 71.5 | 65.2 | 1214 | 0.24 | 14 | 944 | 55 | 24 |
| 85.2 | 71.2 | 14.0 | 71.7 | 65.1 | 1214 | 0.24 | 14 | 945 | 0 | 24 |
| 85.9 | 70.7 | 15.2 | 71.6 | 65.1 | 1214 | 0.24 | 14 | 945 | 5 | 26 |
| 86.5 | 70.2 | 16.3 | 72.0 | 65.1 | 1214 | 0.24 | 14 | 945 | 10 | 28 |
| 87.0 | 70.7 | 16.3 | 72.5 | 65.1 | 1214 | 0.24 | 14 | 945 | 15 | 28 |
| 88.1 | 71.3 | 16.8 | 72.9 | 65.2 | 1214 | 0.24 | 14 | 945 | 20 | 29 |
| 88.7 | 71.9 | 16.8 | 72.9 | 65.1 | 1214 | 0.24 | 14 | 945 | 25 | 29 |
| 89.3 | 71.9 | 17.4 | 72.9 | 65.1 | 1214 | 0.24 | 14 | 945 | 30 | 30 |
| 89.9 | 71.3 | 18.6 | 72.8 | 65.1 | 1214 | 0.24 | 14 | 945 | 35 | 32 |
| 90.1 | 71.1 | 19.0 | 72.7 | 65.1 | 1214 | 0.24 | 14 | 945 | 40 | 33 |
| 90.9 | 71.6 | 19.3 | 72.9 | 65.1 | 1214 | 0.24 | 14 | 945 | 45 | 33 |
| 91.4 | 72.2 | 19.2 | 72.9 | 65.1 | 1214 | 0.24 | 14 | 945 | 50 | 33 |
| 92.0 | 73.3 | 18.7 | 72.9 | 65.2 | 1214 | 0.24 | 14 | 945 | 55 | 32 |
| 92.3 | 73.6 | 18.7 | 72.9 | 65.1 | 1214 | 0.24 | 14 | 946 | 0 | 32 |
| 92.9 | 74.4 | 18.5 | 73.2 | 65.1 | 1214 | 0.24 | 14 | 946 | 5 | 32 |
| 93.2 | 74.7 | 18.5 | 73.5 | 65.1 | 1214 | 0.24 | 14 | 946 | 10 | 32 |
| 93.4 | 74.6 | 18.8 | 73.9 | 65.2 | 1214 | 0.24 | 14 | 946 | 15 | 33 |
| 93.9 | 75.8 | 18.1 | 74.0 | 65.1 | 1214 | 0.24 | 14 | 946 | 20 | 31 |
| 94.7 | 76.3 | 18.4 | 73.6 | 65.1 | 1214 | 0.24 | 14 | 946 | 25 | 32 |
| 95.1 | 76.9 | 18.2 | 74.1 | 65.1 | 1214 | 0.24 | 14 | 946 | 30 | 32 |
| 95.5 | 76.8 | 18.7 | 74.3 | 65.1 | 1214 | 0.24 | 14 | 946 | 35 | 32 |
| 95.5 | 75.8 | 19.7 | 74.6 | 65.1 | 1214 | 0.24 | 14 | 946 | 40 | 34 |
| 95.7 | 74.7 | 21.0 | 74.7 | 65.1 | 1214 | 0.24 | 14 | 946 | 45 | 36 |
| 96.1 | 76.3 | 19.8 | 74.4 | 65.1 | 1214 | 0.24 | 14 | 946 | 50 | 34 |
| 96.6 | 76.9 | 19.7 | 74.2 | 65.1 | 1214 | 0.24 | 14 | 946 | 55 | 34 |
| 97.1 | 77.5 | 19.6 | 74.3 | 65.2 | 1214 | 0.24 | 14 | 947 | 0 | 34 |
| 97.4 | 77.3 | 20.1 | 74.6 | 65.1 | 1214 | 0.24 | 14 | 947 | 5 | 35 |
| 97.8 | 77.9 | 19.9 | 74.6 | 65.2 | 1214 | 0.24 | 14 | 947 | 10 | 35 |
| 97.7 | 76.5 | 21.2 | 74.7 | 65.1 | 1214 | 0.24 | 14 | 947 | 15 | 37 |
| 98.0 | 78.4 | 19.6 | 75.2 | 65.1 | 1214 | 0.24 | 14 | 947 | 20 | 34 |
| 98.5 | 78.5 | 20.0 | 75.0 | 65.1 | 1214 | 0.24 | 14 | 947 | 25 | 35 |
| 98.9 | 79.2 | 19.7 | 75.4 | 65.1 | 1214 | 0.24 | 14 | 947 | 30 | 34 |
| 99.3 | 79.7 | 19.6 | 75.6 | 65.2 | 1214 | 0.24 | 14 | 947 | 35 | 34 |
| 99.3 | 79.9 | 19.4 | 75.4 | 65.2 | 1214 | 0.24 | 14 | 947 | 40 | 34 |
| 99.5 | 79.3 | 20.2 | 75.3 | 65.3 | 1214 | 0.24 | 14 | 947 | 45 | 35 |
| 99.9 | 80.4 | 19.5 | 75.4 | 65.3 | 1214 | 0.24 | 14 | 947 | 50 | 34 |
| 100.2 | 80.4 | 19.8 | 75.8 | 65.3 | 1214 | 0.24 | 14 | 947 | 55 | 34 |
| 100.5 | 80.8 | 19.7 | 76.2 | 65.2 | 1214 | 0.24 | 14 | 948 | 0 | 34 |
| 100.7 | 81.5 | 19.2 | 76.1 | 65.3 | 1214 | 0.24 | 14 | 948 | 5 | 33 |
| 100.7 | 79.4 | 21.3 | 76.2 | 65.3 | 1214 | 0.24 | 14 | 948 | 10 | 37 |
| 100.9 | 78.5 | 22.4 | 76.1 | 65.2 | 1214 | 0.24 | 14 | 948 | 15 | 39 |
| 101.6 | 80.1 | 21.5 | 76.0 | 65.3 | 1214 | 0.24 | 14 | 948 | 20 | 37 |
| 101.7 | 81.6 | 20.1 | 76.2 | 65.3 | 1214 | 0.24 | 14 | 948 | 25 | 35 |
| 101.6 | 81.4 | 20.2 | 76.0 | 65.3 | 1214 | 0.24 | 14 | 948 | 30 | 35 |
| 102.0 | 82.2 | 19.8 | 76.1 | 65.3 | 1214 | 0.24 | 14 | 948 | 35 | 34 |
| 102.1 | 80.9 | 21.2 | 76.8 | 65.3 | 1214 | 0.24 | 14 | 948 | 40 | 37 |
| 102.2 | 80.9 | 21.3 | 77.2 | 65.4 | 1214 | 0.24 | 14 | 948 | 45 | 37 |
| 102.2 | 81.7 | 20.5 | 77.3 | 65.4 | 1214 | 0.24 | 14 | 948 | 50 | 36 |
| 102.3 | 81.1 | 21.2 | 77.4 | 65.4 | 1214 | 0.24 | 14 | 948 | 55 | 37 |
| 102.8 | 80.6 | 22.2 | 77.2 | 65.4 | 1214 | 0.24 | 14 | 949 | 0 | 39 |
| 102.9 | 80.9 | 22.0 | 77.0 | 65.3 | 1214 | 0.24 | 14 | 949 | 5 | 38 |
| 103.0 | 80.1 | 22.9 | 77.1 | 65.3 | 1214 | 0.24 | 14 | 949 | 10 | 40 |
| 103.1 | 78.8 | 24.3 | 77.0 | 65.3 | 1214 | 0.24 | 14 | 949 | 15 | 42 |
| 103.1 | 80.2 | 22.9 | 77.3 | 65.3 | 1214 | 0.24 | 14 | 949 | 20 | 40 |
| 103.4 | 81.4 | 22.0 | 77.6 | 65.3 | 1214 | 0.24 | 14 | 949 | 25 | 38 |
| 103.2 | 82.2 | 21.0 | 77.4 | 65.3 | 1214 | 0.24 | 14 | 949 | 30 | 36 |
| 103.6 | 81.9 | 21.7 | 77.9 | 65.3 | 1214 | 0.24 | 14 | 949 | 35 | 38 |
| 103.6 | 80.7 | 22.9 | 78.0 | 65.3 | 1214 | 0.24 | 14 | 949 | 40 | 40 |
| 103.7 | 80.3 | 23.4 | 78.2 | 65.2 | 1214 | 0.24 | 14 | 949 | 45 | 41 |
| 103.9 | 80.5 | 23.4 | 78.3 | 65.2 | 1214 | 0.24 | 14 | 949 | 50 | 41 |
| 103.9 | 80.3 | 23.6 | 78.3 | 65.2 | 1214 | 0.24 | 14 | 949 | 55 | 41 |
| 104.2 | 80.9 | 23.3 | 78.2 | 65.2 | 1214 | 0.24 | 14 | 950 | 0 | 40 |
| 104.6 | 82.0 | 22.6 | 78.3 | 65.2 | 1214 | 0.24 | 14 | 950 | 5 | 39 |
| 104.7 | 82.9 | 21.8 | 78.2 | 65.2 | 1214 | 0.24 | 14 | 950 | 10 | 38 |
| 104.8 | 81.3 | 23.5 | 78.1 | 65.2 | 1214 | 0.24 | 14 | 950 | 15 | 41 |

Furnace Heating On

Heat Input
During Heating
cycle = 3368 btu's

Device B Heat Recovery Test (9 Minute Heating On Cycle), Sample 2, Test 2

11/21/2013

| | Tsupply | Treturn | Temp. rise | Room | Ambient | CFM | approx. specific heat of air | approx. specific volume (cu. Ft/lbm) | Time | sec | Btu's Supplied |
|--------------------------------|---------|---------|------------|------|---------|------|------------------------------|--------------------------------------|------|-----|----------------|
| | 105.0 | 84.0 | 21.0 | 78.1 | 65.2 | 1214 | 0.24 | 14 | 950 | 20 | 36 |
| | 105.0 | 82.7 | 22.3 | 78.6 | 65.2 | 1214 | 0.24 | 14 | 950 | 25 | 39 |
| | 105.1 | 83.6 | 21.5 | 78.2 | 65.1 | 1214 | 0.24 | 14 | 950 | 30 | 37 |
| | 105.2 | 82.3 | 22.9 | 78.0 | 65.2 | 1214 | 0.24 | 14 | 950 | 35 | 40 |
| | 105.2 | 82.6 | 22.6 | 78.0 | 65.2 | 1214 | 0.24 | 14 | 950 | 40 | 39 |
| | 105.1 | 82.2 | 22.9 | 78.0 | 65.3 | 1214 | 0.24 | 14 | 950 | 45 | 40 |
| | 105.4 | 81.6 | 23.8 | 78.1 | 65.3 | 1214 | 0.24 | 14 | 950 | 50 | 41 |
| | 105.7 | 81.9 | 23.8 | 78.0 | 65.3 | 1214 | 0.24 | 14 | 950 | 55 | 41 |
| | 105.8 | 81.6 | 24.2 | 78.3 | 65.2 | 1214 | 0.24 | 14 | 951 | 0 | 42 |
| | 106.1 | 82.5 | 23.6 | 78.4 | 65.2 | 1214 | 0.24 | 14 | 951 | 5 | 41 |
| | 105.7 | 83.3 | 22.4 | 78.2 | 65.2 | 1214 | 0.24 | 14 | 951 | 10 | 39 |
| | 105.9 | 83.4 | 22.5 | 78.4 | 65.2 | 1214 | 0.24 | 14 | 951 | 15 | 39 |
| | 105.9 | 83.3 | 22.6 | 78.8 | 65.2 | 1214 | 0.24 | 14 | 951 | 20 | 39 |
| | 105.9 | 82.5 | 23.4 | 78.9 | 65.2 | 1214 | 0.24 | 14 | 951 | 25 | 41 |
| | 105.9 | 82.2 | 23.7 | 79.3 | 65.3 | 1214 | 0.24 | 14 | 951 | 30 | 41 |
| | 105.6 | 80.9 | 24.7 | 79.4 | 65.2 | 1214 | 0.24 | 14 | 951 | 35 | 43 |
| | 105.4 | 81.7 | 23.7 | 79.3 | 65.3 | 1214 | 0.24 | 14 | 951 | 40 | 41 |
| | 105.6 | 79.1 | 26.5 | 79.1 | 65.2 | 1214 | 0.24 | 14 | 951 | 45 | 46 |
| | 105.6 | 82.5 | 23.1 | 79.1 | 65.2 | 1214 | 0.24 | 14 | 951 | 50 | 40 |
| | 105.8 | 82.6 | 23.2 | 79.6 | 65.3 | 1214 | 0.24 | 14 | 951 | 55 | 40 |
| | 106.1 | 82.1 | 24.0 | 79.9 | 65.2 | 1214 | 0.24 | 14 | 952 | 0 | 42 |
| Default Blower Off Delay | 106.1 | 81.9 | 24.2 | 79.3 | 65.2 | 1214 | 0.24 | 14 | 952 | 5 | 42 |
| | 106.4 | 81.9 | 24.5 | 79.1 | 65.2 | 1214 | 0.24 | 14 | 952 | 10 | 42 |
| | 106.2 | 83.5 | 22.7 | 79.3 | 65.2 | 1214 | 0.24 | 14 | 952 | 15 | 39 |
| | 105.9 | 81.5 | 24.4 | 79.3 | 65.2 | 1214 | 0.24 | 14 | 952 | 20 | 42 |
| | 105.3 | 81.5 | 23.8 | 79.5 | 65.3 | 1214 | 0.24 | 14 | 952 | 25 | 41 |
| | 105.0 | 82.7 | 22.3 | 79.5 | 65.3 | 1214 | 0.24 | 14 | 952 | 30 | 39 |
| | 104.3 | 83.3 | 21.0 | 79.2 | 65.2 | 1214 | 0.24 | 14 | 952 | 35 | 36 |
| | 103.4 | 83.9 | 19.5 | 79.2 | 65.2 | 1214 | 0.24 | 14 | 952 | 40 | 34 |
| | 102.4 | 85.7 | 16.7 | 79.2 | 65.2 | 1214 | 0.24 | 14 | 952 | 45 | 29 |
| | 101.6 | 86.3 | 15.3 | 79.2 | 65.2 | 1214 | 0.24 | 14 | 952 | 50 | 27 |
| | 100.9 | 87.2 | 13.7 | 79.5 | 65.2 | 1214 | 0.24 | 14 | 952 | 55 | 24 |
| | 100.1 | 87.5 | 12.6 | 79.6 | 65.2 | 1214 | 0.24 | 14 | 953 | 0 | 22 |
| | 99.2 | 87.3 | 11.9 | 79.7 | 65.2 | 1214 | 0.24 | 14 | 953 | 5 | 21 |
| | 98.3 | 86.7 | 11.6 | 79.5 | 65.2 | 1214 | 0.24 | 14 | 953 | 10 | 20 |
| | 97.5 | 86.6 | 10.9 | 79.5 | 65.2 | 1214 | 0.24 | 14 | 953 | 15 | 19 |
| | 96.9 | 86.2 | 10.7 | 79.5 | 65.2 | 1214 | 0.24 | 14 | 953 | 20 | 19 |
| | 96.2 | 85.9 | 10.3 | 79.2 | 65.2 | 1214 | 0.24 | 14 | 953 | 25 | 18 |
| | 95.6 | 86.4 | 9.2 | 79.1 | 65.2 | 1214 | 0.24 | 14 | 953 | 30 | 16 |
| | 94.9 | 86.7 | 8.2 | 79.0 | 65.2 | 1214 | 0.24 | 14 | 953 | 35 | 14 |
| | 94.2 | 86.3 | 7.9 | 79.1 | 65.2 | 1214 | 0.24 | 14 | 953 | 40 | 14 |
| | 93.5 | 86.3 | 7.2 | 79.0 | 65.2 | 1214 | 0.24 | 14 | 953 | 45 | 12 |
| | 92.8 | 85.6 | 7.2 | 79.0 | 65.2 | 1214 | 0.24 | 14 | 953 | 50 | 12 |
| | 92.0 | 85.2 | 6.8 | 78.9 | 65.2 | 1214 | 0.24 | 14 | 953 | 55 | 12 |
| | 91.5 | 85.1 | 6.4 | 78.8 | 65.2 | 1214 | 0.24 | 14 | 954 | 0 | 11 |
| Device B Extended Blower Delay | 91.0 | 84.9 | 6.1 | 78.6 | 65.2 | 1214 | 0.24 | 14 | 954 | 5 | 11 |
| | 90.3 | 84.6 | 5.7 | 78.5 | 65.2 | 1214 | 0.24 | 14 | 954 | 10 | 10 |
| | 89.9 | 84.4 | 5.5 | 78.4 | 65.2 | 1214 | 0.24 | 14 | 954 | 15 | 10 |
| | 89.2 | 83.9 | 5.3 | 78.3 | 65.2 | 1214 | 0.24 | 14 | 954 | 20 | 9 |
| | 88.9 | 83.9 | 5.0 | 78.2 | 65.2 | 1214 | 0.24 | 14 | 954 | 25 | 9 |
| | 88.6 | 83.6 | 5.0 | 78.1 | 65.2 | 1214 | 0.24 | 14 | 954 | 30 | 9 |
| | 88.4 | 83.4 | 5.0 | 77.9 | 65.2 | 1214 | 0.24 | 14 | 954 | 35 | 9 |
| | 87.8 | 83.2 | 4.6 | 77.8 | 65.2 | 1214 | 0.24 | 14 | 954 | 40 | 8 |
| | 87.0 | 82.8 | 4.2 | 77.6 | 65.2 | 1214 | 0.24 | 14 | 954 | 45 | 7 |
| | 86.2 | 82.1 | 4.1 | 77.5 | 65.2 | 1214 | 0.24 | 14 | 954 | 50 | 7 |
| | 85.8 | 82.0 | 3.8 | 77.4 | 65.2 | 1214 | 0.24 | 14 | 954 | 55 | 7 |
| | 85.5 | 82.1 | 3.4 | 77.3 | 65.2 | 1214 | 0.24 | 14 | 955 | 0 | 6 |
| | 84.3 | 81.3 | 3.0 | 77.3 | 65.2 | 1214 | 0.24 | 14 | 955 | 5 | 5 |
| | 83.9 | 81.3 | 2.6 | 77.2 | 65.2 | 1214 | 0.24 | 14 | 955 | 10 | 5 |
| | 83.7 | 81.2 | 2.5 | 77.1 | 65.1 | 1214 | 0.24 | 14 | 955 | 15 | 4 |
| | 83.5 | 81.3 | 2.2 | 77.0 | 65.1 | 1214 | 0.24 | 14 | 955 | 20 | 4 |
| | 83.2 | 81.2 | 2.0 | 76.9 | 65.1 | 1214 | 0.24 | 14 | 955 | 25 | 3 |
| | 83.1 | 81.0 | 2.1 | 76.8 | 65.1 | 1214 | 0.24 | 14 | 955 | 30 | 4 |
| | 82.3 | 80.8 | 1.5 | 76.7 | 65.1 | 1214 | 0.24 | 14 | 955 | 35 | 3 |
| | 82.0 | 80.8 | 1.2 | 76.6 | 65.2 | 1214 | 0.24 | 14 | 955 | 40 | 2 |
| | 81.7 | 80.7 | 1.0 | 76.5 | 65.2 | 1214 | 0.24 | 14 | 955 | 45 | 2 |
| | 81.5 | 80.6 | 0.9 | 76.4 | 65.2 | 1214 | 0.24 | 14 | 955 | 50 | 2 |
| | 81.3 | 80.0 | 1.3 | 76.3 | 65.2 | 1214 | 0.24 | 14 | 955 | 55 | 2 |
| | 80.7 | 80.0 | 0.7 | 76.2 | 65.2 | 1214 | 0.24 | 14 | 956 | 0 | 1 |
| | 80.6 | 80.0 | 0.6 | 76.2 | 65.2 | 0 | 0.24 | 14 | 956 | 5 | 0 |
| | 80.3 | 80.0 | 0.3 | 76.1 | 65.2 | 0 | 0.24 | 14 | 956 | 10 | 0 |
| | 80.2 | 80.0 | 0.2 | 75.9 | 65.2 | 0 | 0.24 | 14 | 956 | 15 | 0 |

Default fan delay heat recovered = 605 btu's

heat recovery after default fan delay = 136 btu's

Blower Wattage = 370

Comments: Device B device extended the blower on time after the default delay time by 2 minutes, 1 seconds.

Furnace heat input = HV x (volume of gas consumed) = 1040 btu/ft³ x 8.2 ft³ = 8528 btu