NATIONAL BUREAU OF STANDARDS REPORT

10 546

PERFORMANCE EVALUATION OF A PROPANE-FIRED HOUSEHOLD-TYPE ABSORPTION REFRIGERATOR

Manufactured by
Norcold, Inc.
Sidney, Ohio

Report to

U. S. Army Natick Laboratories
Natick, Massachusetts

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

NATIONAL BUREAU OF STANDARDS

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[1] Headquarters and Laboratories at Gaithersburg, Maryland, unless otherwise noted; mailing address Washington, D.C. 20234.
[2] Located at Boulder, Colorado 80302.
[3] Located at 5285 Port Royal Road, Springfield, Virginia 22151.

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NBS REPORT
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PERFORMANCE EVALUATION OF A PROPANE-FIRED HOUSEHOLD-TYPE ABSORPTION REFRIGERATOR

Manufactured by
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Sidney, Ohio

by
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Report to
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NBS

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

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1.0 Introduction

This report presents the results of a laboratory investigation of a propane-fired household absorption refrigerator manufactured by Norcold, Inc., Sidney, Ohio. The tests were conducted for the U. S. Army Natick Laboratories.

The purpose of this investigation was to determine a number of qualitative properties of this refrigerator. Among these properties are (in the order that they were studied):

a. The minimum fuel line pressure at which the refrigerator would operate at satisfactory cooling capacity in an ambient temperature of 90 °F at 50% relative humidity;

b. Determination of the maximum ambient temperature in which this refrigerator would operate effectively;

c. The ambient temperature at which this refrigerator established a primary failure mode;

d. The minimum thermostat setting at which the refrigerator would operate effectively in an ambient temperature that approached the primary failure mode temperature;

e. Determination of whether this refrigerator could satisfy the temperature criteria suggested in the American Standard Test Procedures for Household Electric Refrigerators (Mechanically Operated) (B38.2-1961), i.e.;

Ambient Temperature (°F)	Avg. General Food Compart. Temp. (°F)
70	36
90	38
110	41

f. The minimum pitch or yaw tilt angle that produced refrigerator failure.

Utilizing these properties just itemized, the results of this investigation can be used in developing standard test procedures for household absorption refrigerators.

1.1 Background

The Norcold refrigerator was received at the National Bureau of Standards Laboratories on July 5, 1968. The principal request of the U. S. Army Natick Laboratories for this refrigerator investigation was to determine the maximum ambient temperature at which the refrigerator could function effectively. This and other information relative to possible field application of absorption refrigeration was developed in the course of this study.

Conclusions concerning the qualitative properties described in the introduction were arrived at as a result of analysis of the experimental and computed data obtained in this study. This data is presented in graphic and tabulated form at the end of this report.

The refrigerator was not dismantled or dismembered during the course of this investigation.

2.0 Description of Test Specimen

This refrigerator was manufactured by Norcold, Inc., of Sidney, Ohio, a subsidiary of the Stolle Corporation.

The Norcold refrigerator nameplate contained the following information:

a. Model No. 64G-gas

b. Producer rated input, 1300-1600 Btu/hr

c. Energy source - i) LPG, ii) propane

d. Ammonia weight - 1.52 lbm

e. Test pressure, 717 lbf/in^2

f. Serial No. B64762632

The outside physical dimensions were 27 1/4 in. x 23 1/2 in. x 44 in. The refrigerator came equipped with the following interior features:

a. One crisper

b. Four (4) food shelves

c. One freezer compartment with three ice trays

d. One defrost tray

e. Four (4) shelves in the door

The door was sealed by a magnetic gasket.

Figures 1 through 5 are photographs of the Norcold refrigerator. Figures 1 and 2 show the front of the refrigerator with the door closed and open, respectively, and figure 3 shows the back. Figure 4 shows the freezer compartment. The burner and gas valve assembly can be seen in figure 5.

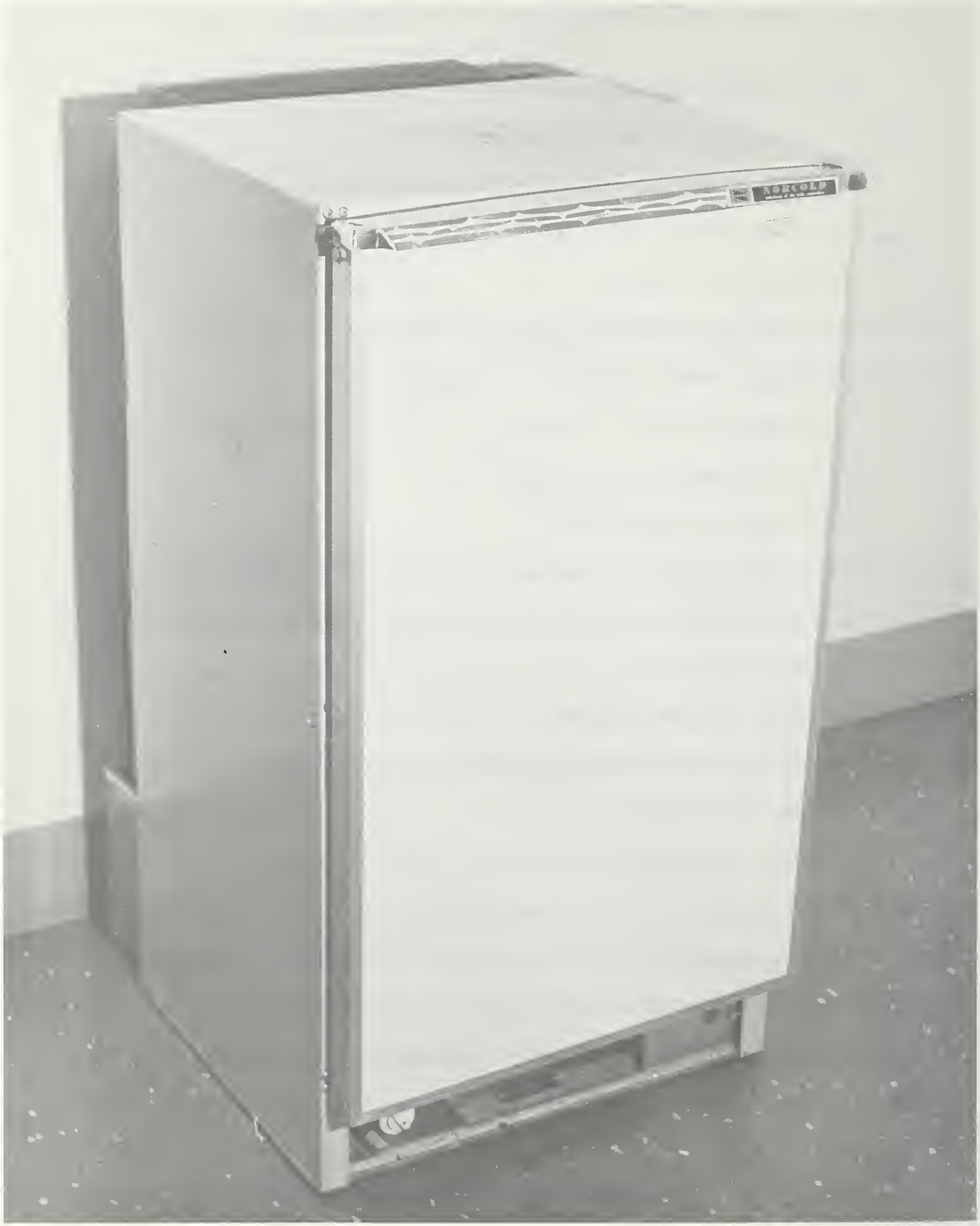


Figure 1 Front view, door closed - Norcold refrigerator.

Figure 2 Front view, door open - Norcold refrigerator.

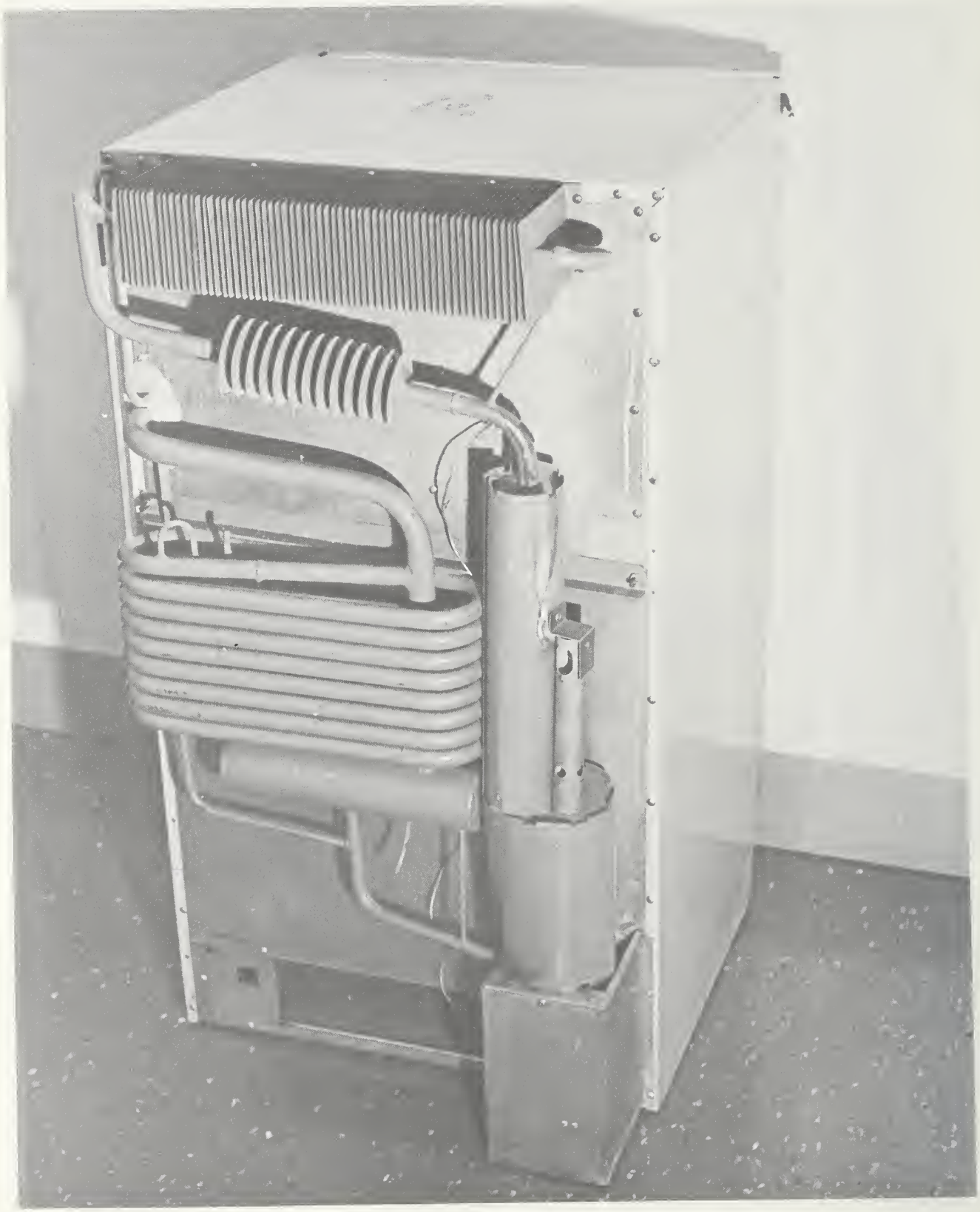


Figure 3 Back view, condenser, heater box, and absorption cooling system - Norcold refrigerator.

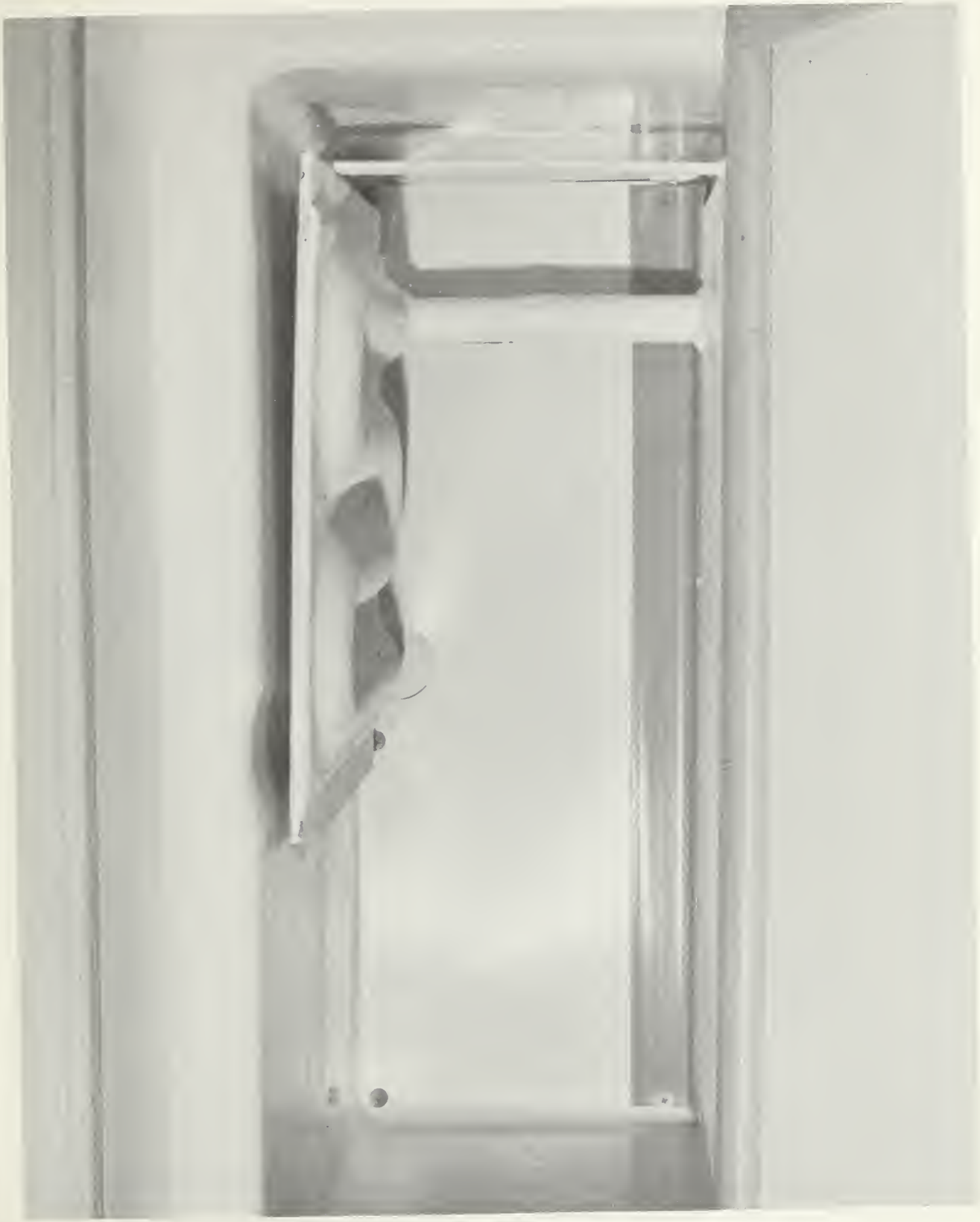


Figure 4 Freezer compartment and freezer evaporator coil - Norcold refrigerator.

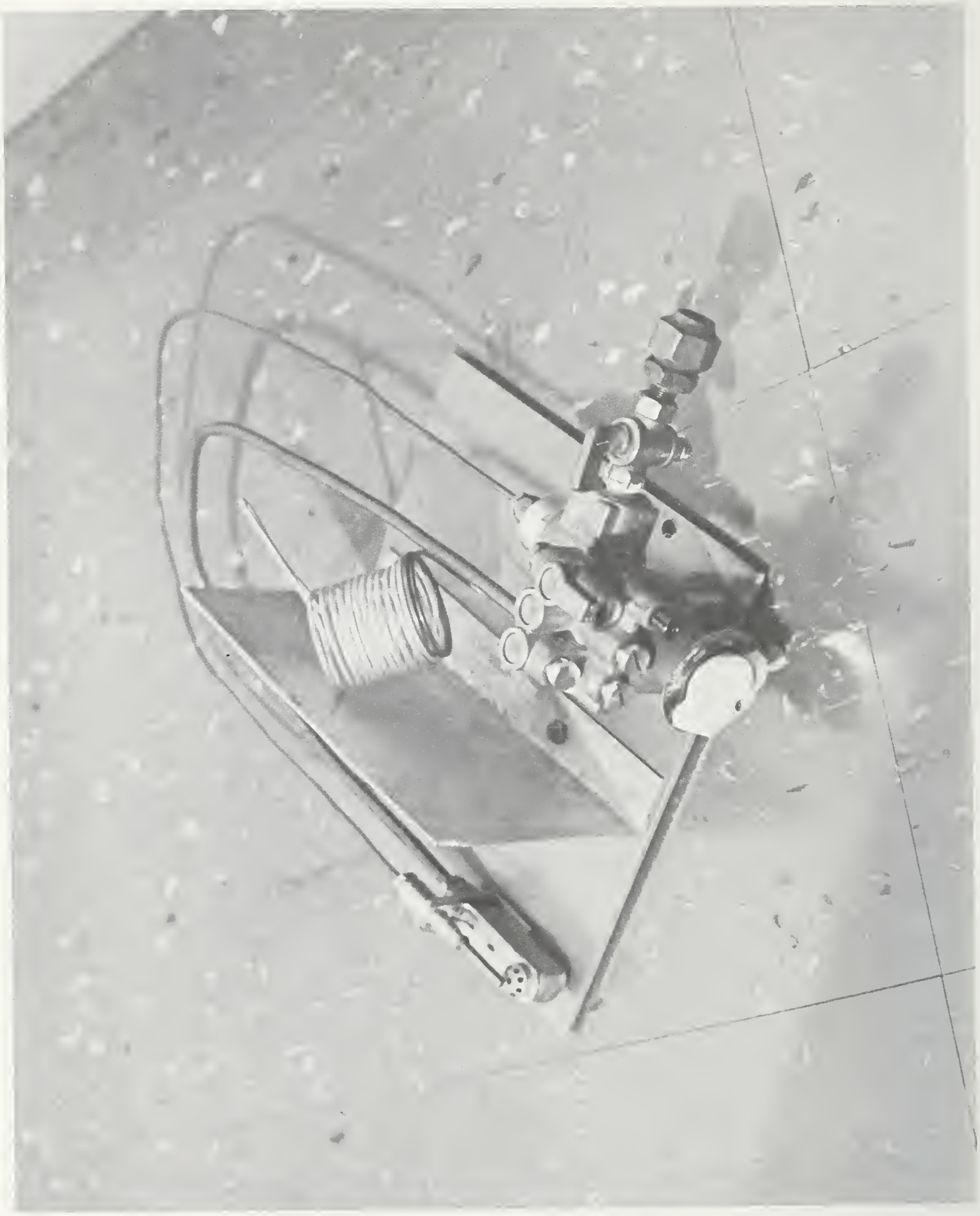


Figure 5 Burner and thermostat assembly - Norcold refrigerator.

All testing was conducted in one of the National Bureau of Standards environmental testing laboratories having a controllable ambient temperature range of 40 °F to 150 °F with simultaneous control of relative humidity.

3.0 Test Apparatus and Procedure

The test procedure developed to accomplish each of the objectives occasionally required modification of the testing apparatus. Consequently, each of the following test procedure discussions includes a description of any additions or alterations of the testing equipment required for that particular test.

Prior to testing, the refrigerator was placed in the laboratory test room. The back of the refrigerator was placed parallel to one of the laboratory walls, approximately six (6) inches from the wall. The refrigerator was leveled in the manner prescribed by the manufacturer's instruction manual furnished with the unit.

3.1 Fuel Line Pressure Test

The fuel line pressure that produced optimum cooling of the refrigerator was determined in this test. Four fuel line pressures were investigated. These pressures were: eight, eleven, thirteen, and fifteen inches W.G.

Thermocouples inside and outside of the refrigerator were used to measure performance of the refrigerator. A water manometer was used to measure the fuel line pressure.

The fuel consumption rate was determined by weighing the propane tank periodically and dividing the weight change by the time interval between weighings.

Thermocouples were located in the following places: a) one thermocouple in the air in the freezer compartment, b) a two-in-one averaging couple in the air in the general food compartment, c) a two-in-one averaging couple outside the refrigerator to measure the ambient air temperature, and d) one in an external ice bath for instrument reference purposes. Midway through this test a thermocouple was attached to the refrigerant exit point of the general food compartment evaporator coil. Also, a thermocouple was positioned in the middle of an ice cube in an ice tray in the freezer compartment. The thermocouples were used in conjunction with a self-balancing electronic potentiometer that displayed the temperature on chart paper in degrees Fahrenheit. The thermostat sensor which was attached to the general food compartment evaporator coil, was removed from its receptor and exposed to the laboratory ambient air. This was done to assure that the thermostat would call for maximum cooling capacity of the refrigerator. Figure 6 shows the thermostat sensor in its receptor. This receptor is attached to the general food compartment evaporator coil.

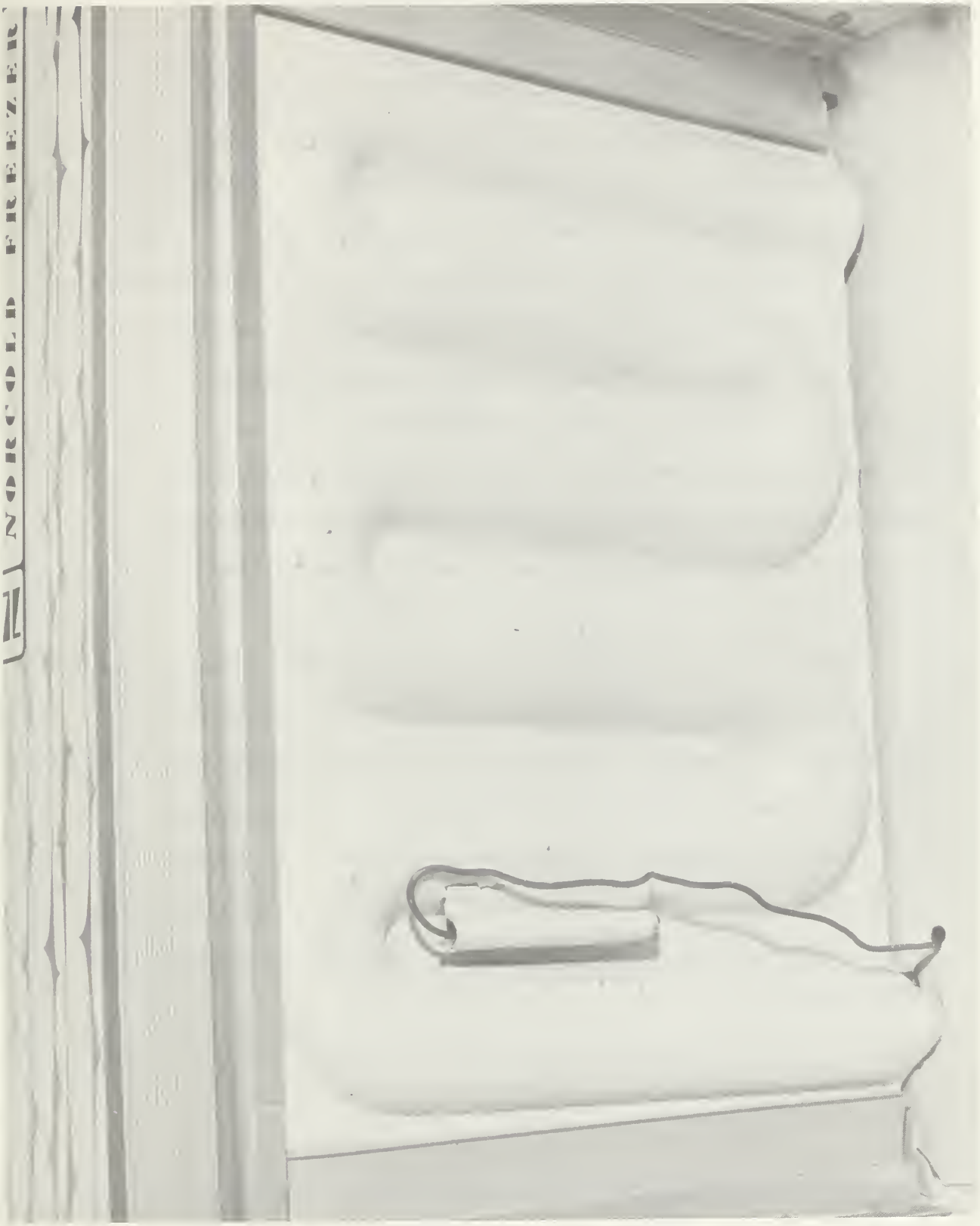
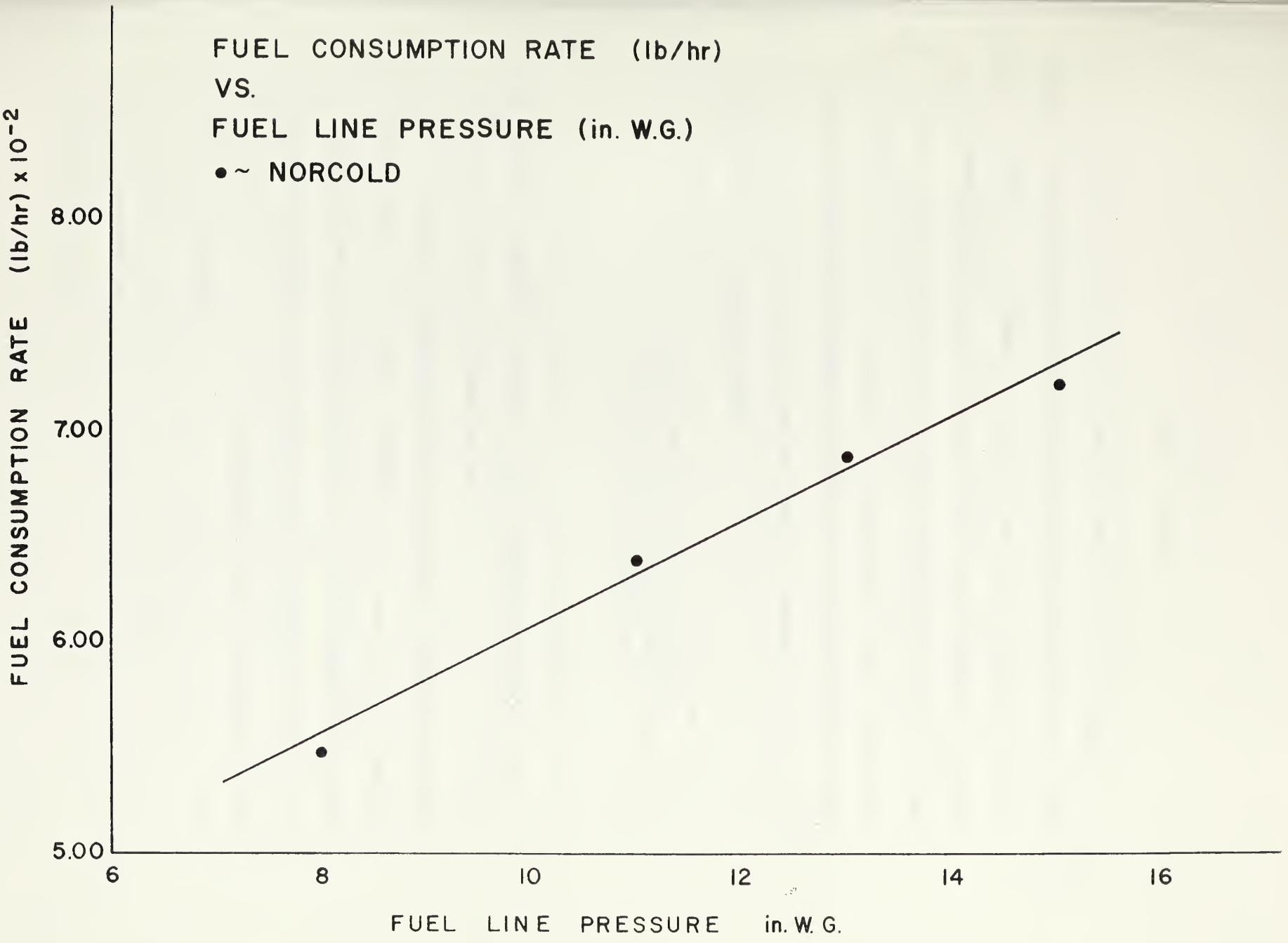


Figure 6 General food compartment evaporator coil and thermostat in receptor - Norcold refrigerator.

3.2 Elevated Ambient Temperature Test

In this test, the following procedure was used to determine the maximum ambient temperature in which the Norcold refrigerator could operate effectively. The fuel line pressure was held at the optimum level of 11 inches W.G. determined in the previous test (this same pressure was also used for the remainder of the tests in this study). Additional thermocouples to monitor performance were installed at the inlet and midpoint of the general food compartment evaporator coil. Beginning at 90 °F, the ambient temperature was increased in 10 °F increments until the refrigerator ceased to function effectively. To assure that the refrigerator attained steady-state conditions, it was operated for a minimum of one week at each incremental ambient temperature level.

After failure of the refrigerator at one of the incremental ambient temperature levels, a closer look was taken at the performance of the refrigerator at ambient temperatures which closely approached the failure-producing level. The ambient temperature was slowly increased from 100 °F until a "primary failure mode" was observed. A primary failure mode exists when, at a certain ambient temperature, a portion of the refrigerator cooling system commences ineffective or non-steady state operation.


FUEL CONSUMPTION RATE (lb/hr)
VS.
FUEL LINE PRESSURE (in. W.G.)
• ~ NORCOLD
FUEL CONSUMPTION RATE (lb/hr) x 10⁻²
8.00
7.00
6.00
5.00
6
8
10
12
14
16
FUEL LINE PRESSURE in. W. G.

Graph 1

3.3 Thermostat Tests

3.3.1

Thermostat performance tests were conducted in two parts. It was first determined which thermostat setting produced effective operation of the refrigerator with minimum fuel consumption in an ambient temperature that approached the primary failure mode temperature. For this test the thermostat sensor was re-installed in its receptor. Also, the thermostat control knob range was calibrated such that there were five equal increments between the minimum (defrost) and maximum cooling positions. The ambient temperature was controlled at about 105 °F (this was just below the primary failure mode temperature). The thermostat was then successively set at each of the six settings and the resulting performance characteristics were observed.

3.3.2

The second part of the thermostat test determined whether the refrigerator could satisfy the temperature criteria suggested in the American Standards Test Procedures for Household Electric Refrigerators (Mechanically Operated) (B38.2-1961). For this test the ambient temperature was maintained, successively, at 70 °F, 90 °F, and 110 °F. At each of these ambient temperatures, the thermostat was adjusted to its warmest position (not defrosting, position #1), the coldest position (#5), and two intermediate positions (#2 and #3.5).

3.4 Tilt Test

The last test investigated the ability of the Norcold refrigerator to operate while inclined in a pitch or yaw position. The refrigerator was tilted in one degree increments until failure due to tilt occurred. Two large protractors, accurate to $\pm$ .5°, were drawn on construction paper. These protractors were trued vertically with a plumb bob and secured to the front and side of the refrigerator. The refrigerator was tilted by lifting one of its base edges at a time with a hydraulic jack. The amount the refrigerator had been tilted was measured with the protractor and plumb bob.

4.0 Results and Discussion of Results

4.1 Fuel Line Pressure Tests

The fuel line pressure test results are summarized in Table 1. The results of this test were used to determine the fuel line pressure to be used in all the subsequent tests.

A criterion of three factors was the basis for the choice of fuel line pressure. The general food compartment temperature, the frozen food compartment temperature, and the corresponding fuel consumption rate were considered, and the fuel line pressure that produced steady state satisfactory refrigerator operation with the lowest fuel consumption rate was chosen.

During the eight-inch W.G. fuel line pressure test, there were signs of unstable operation. Consequently, this fuel line pressure was considered too low.

Table 1 Fuel Line Pressure Tests Results

Fuel Line Pressure In. W.G.	Avg. Gen. Food Comp. Temp. (°F)	Avg. Freezer Comp. Temp. (°F)	Avg. Ice Tray Comp. Temp. (°F)	Avg. Evap. Coil Temp. (°F)	Avg. Fuel Consump. Rate (lbm/hr) x 10^2	Avg. Ambient Te (°F)
8	40.60	16.4	*	*	5.46	91.1
11	39.70	15.35	2.66	2.78	6.37	91.1
13	38.07	12.90	2.70	0.00	6.85	89.8
15	37.30	13.17	0.54	-1.85	7.17	90.7

* Thermocouples to monitor these temperatures had not been installed at the time of the 8 in. W.G. fuel line pressure test.

The three remaining fuel line pressures that were tested, each produced satisfactory steady-state refrigerator operation. The one that yielded the lowest fuel consumption rate was considered as the optimum. This fuel line pressure was eleven inches W.G. Graph 1 shows the linear relationship between the fuel consumption rate and fuel line pressure. Plots of fuel consumption rate and refrigerator temperatures versus test time in calendar days are included in the appendix.

4.2 Elevated Ambient Temperature Tests

The lowest elevated temperature interval in which the refrigerator failed to operate effectively was determined in this test.

The ambient temperature was increased from 90 °F to an average of 102.6 °F, and then to an average of 109.7 °F, and was held for more than a week at each of these levels. Satisfactory operation was observed at 90 °F and 102.6 °F and some deterioration of performance was observed at 109.7 °F ambient temperature. The ambient temperature was then adjusted to an average of 118.2 °F for three days. It was apparent during this short test period that the refrigerator could not operate effectively at this elevated ambient temperature. The ambient temperature was reduced from 118 °F to 112 °F and held at this level for ten days. Satisfactory operation was not re-established. The ambient temperature was then dropped to an average of 88.2 °F and proper operation was attained. The results of this elevated ambient temperature test are tabulated in Table 2, and further discussion follows.

At the 102.6 °F ambient temperature the Norcold refrigerator operated satisfactorily. Once the refrigerator established steady state conditions, which took about a day, there was very little fluctuation of its internal temperatures for the duration of the test run at this ambient temperature.

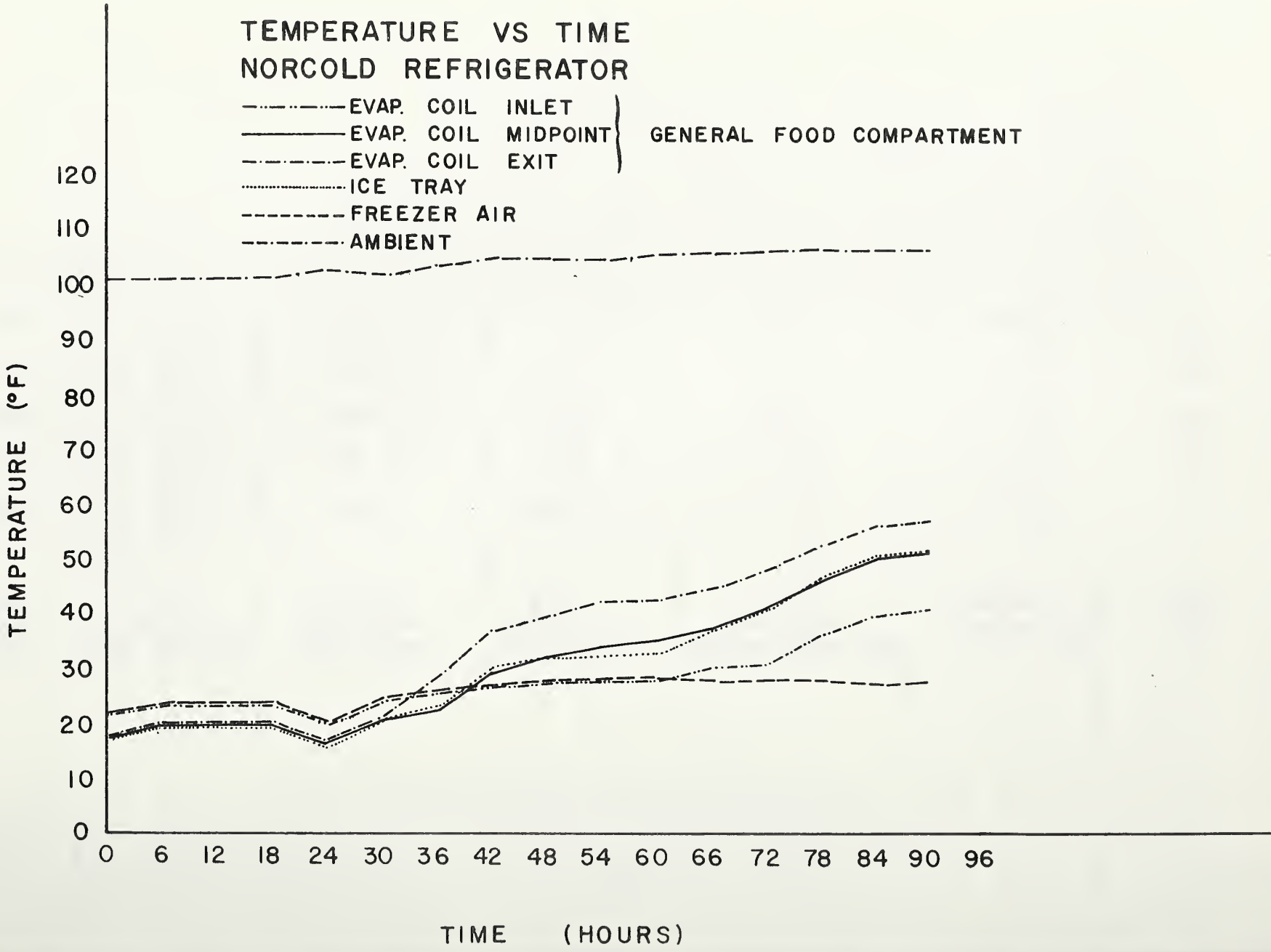
During the run at 109.7 °F ambient temperature some of the interior temperatures rose to unsatisfactory levels but did so very slowly. At the 118.2 ambient temperature level the rate of rise of interior temperatures was significantly higher.

In an attempt to regain effective refrigerator operation, the average ambient temperature was lowered to 112.6 °F. This ambient temperature was maintained for ten days. During this time, the refrigerator temperatures did not drop, but rose even higher than they were during the 118.2 °F ambient temperature test. This behavior indicated that there was a certain ambient temperature above which refrigerator operation would be ineffective. To regain effective steady-state operation the ambient temperature had to be dropped below what we have called the primary failure mode temperature.

Determining the primary failure mode temperature was accomplished in the following manner. Satisfactory refrigerator operation was established by maintaining an ambient temperature of approximately 90 °F for fourteen days. The ambient temperature was then slowly increased until evidence of a primary failure mode was observed. The results of this test are given in graph 2, which clearly illustrates the ambient temperature at which a part of the refrigerator begins to function ineffectively. The evaporator coil exhibited the primary failure mode.

Table 2 Elevated Ambient Temperature Test Results

Avg. Ambient (°F)	Avg. Gen. Food Comp. Temp. (°F)	Avg. Freezer Comp. Temp. (°F)	Avg. Ice Tray Temp. (°F)	Avg. Gen. Food Comp. Evap. Temp. (°F)	Avg. Fuel Consump. Rate (lbm/hr) x 10^2	Test Number
102.6	48.3	22.0	10.4	8.2	6.29	I
109.7	55.6	26.7	16.8	14.7	6.32	II
118.2	56.5	38.2	33.0	39.7	6.28	III
112.6	67.7	45.9	44.0	44.2	6.39	IV
88.2	39.4	13.6	1.8	- 1.1	6.46	V


TEMPERATURE VS TIME
NORCOLD REFRIGERATOR
EVAP. COIL INLET
EVAP. COIL MIDPOINT
EVAP. COIL EXIT
GENERAL FOOD COMPARTMENT
ICE TRAY
FREEZER AIR
AMBIENT
TEMPERATURE (°F)
0
10
20
30
40
50
60
70
80
90
100
110
120
0 6 12 18 24 30 36 42 48 54 60 66 72 78 84 90 96
TIME (HOURS)

Graph 2

The Norcold refrigerator exhibited its primary failure mode at an ambient temperature of 102 °F. At ambient temperatures of 101 °F and below, the Norcold maintained temperatures that did not vary significantly with respect to each other. However, at 102 °F the general food compartment evaporator coil temperature, at the exit point, began to rise at a rate higher than other interior temperatures. At the ambient temperature of 101 °F, this exit point temperature was normally 20 °F or below. Between ambient temperatures of 102 °F and 104 °F the general food compartment evaporator coil midpoint and ice tray temperatures began to follow slowly the trend established by the evaporator coil exit point temperature. At an ambient temperature of 105 °F, the inlet point temperature of the evaporator coil began to follow suit. The Norcold refrigerator, then, operated ineffectively at an ambient temperature about 105 °F. As the ambient temperature was increased above 105 °F, the refrigerator effectiveness decreased significantly.

4.3 Thermostat Test

4.3.1

The first thermostat test determined the minimum thermostat setting that would allow the refrigerator to operate effectively in an ambient temperature that was near the primary failure mode temperature. For this test, the ambient temperature was controlled at about 105 °F. The thermostat sensor was reinstalled in its receptor for these tests.

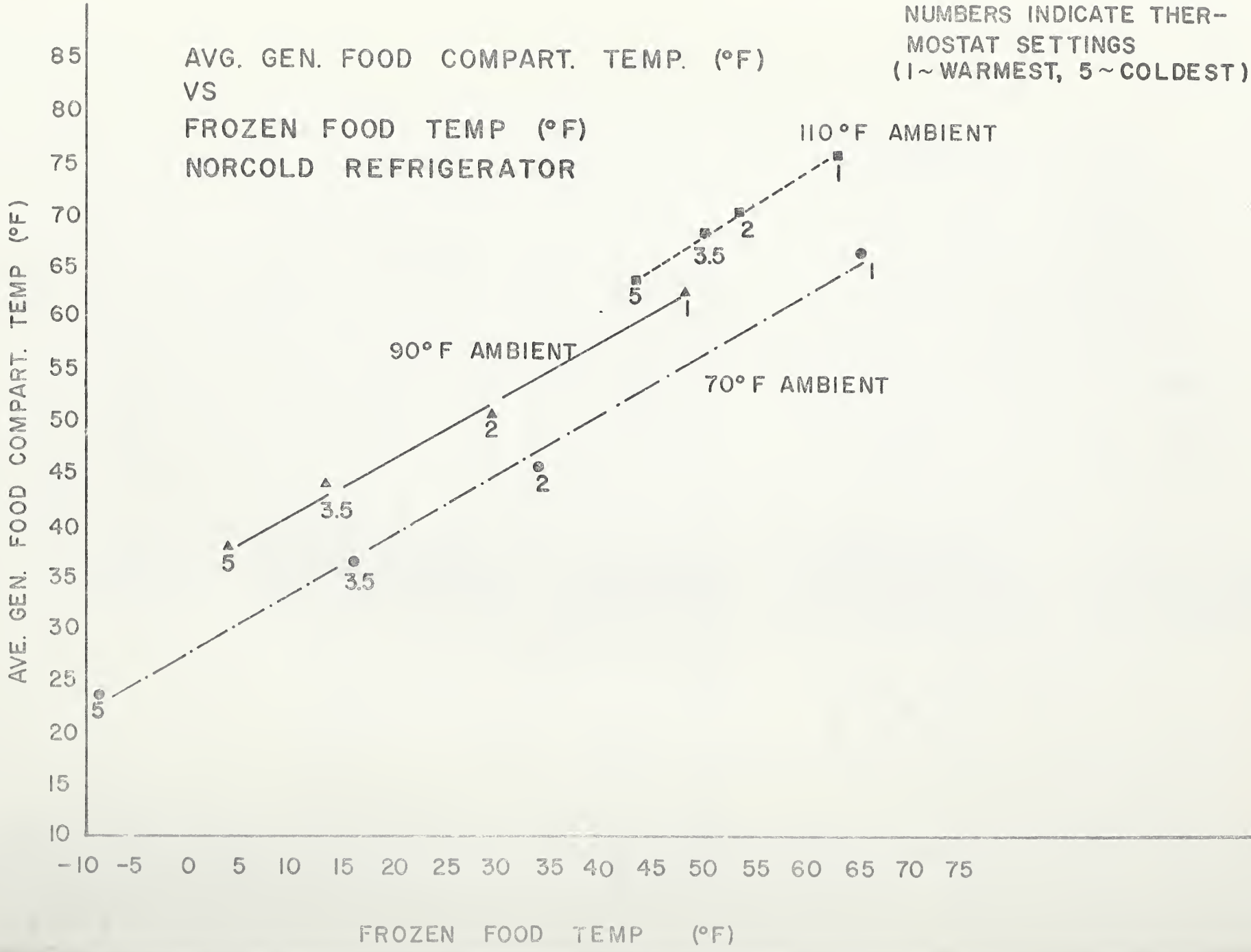
The refrigerator performed satisfactorily with its thermostat set at positions three and two. In positions five and four a primary failure mode was observed. However, the performance of the refrigerator did not suffer appreciably as a result of this primary failure mode because the rate of failure was extremely slow. The ice tray temperatures stayed between 16 °F and 22 °F; the general food compartment temperatures remained between 51.5 °F and 59.5 °F. Operating in position one the freezer and general food compartment leveled at 35 °F and 60 °F, respectively. In the zero (or defrost) position, the refrigerator defrosted.

4.3.2

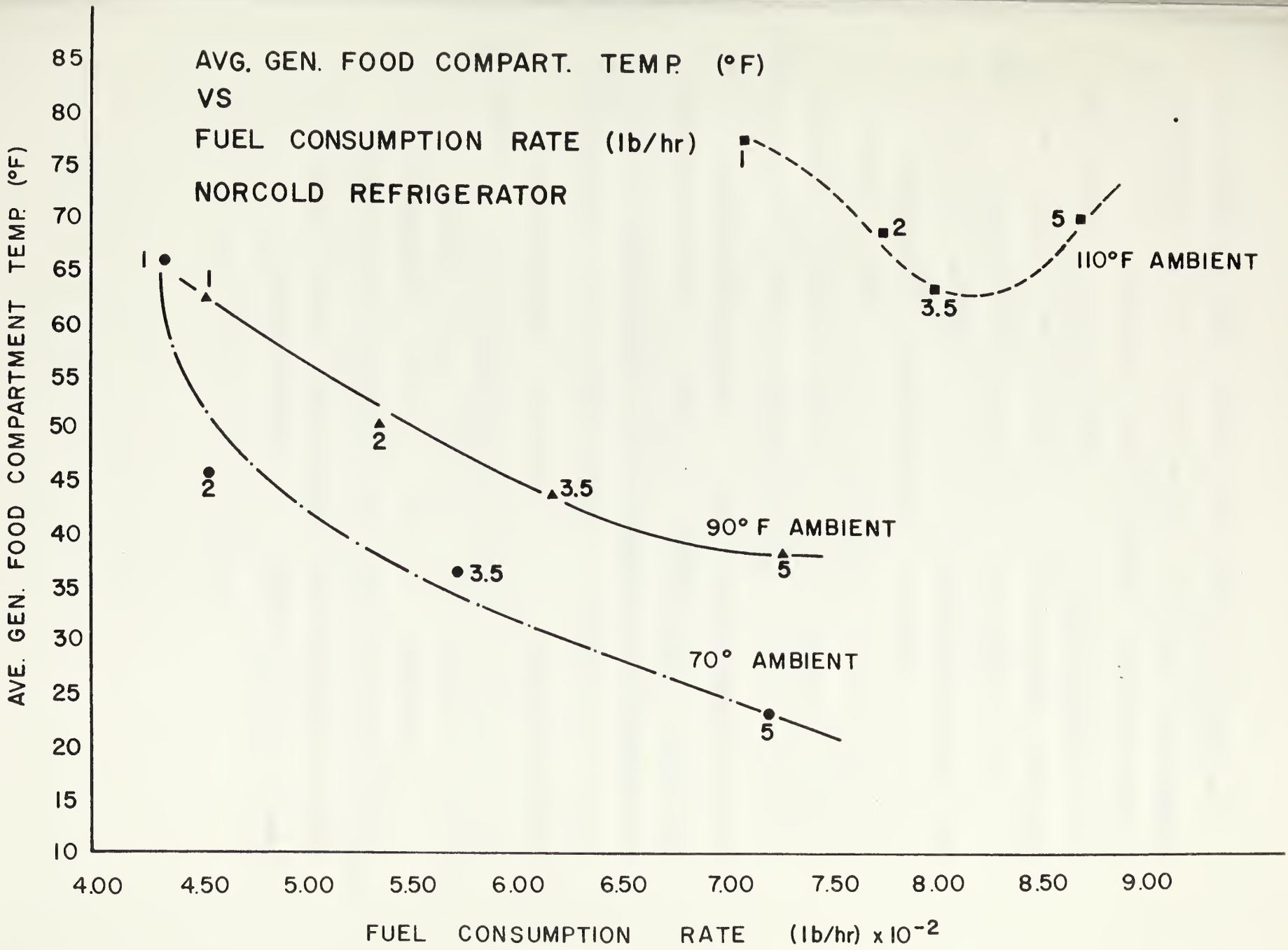
The second thermostat test followed the thermostat test procedure outlined in the American Standard Test Procedures for Household Electric Refrigerators (Mechanically Operated) (B38.2-1961). This Standard Test suggests maximum allowable refrigerator temperatures as a function of thermostat settings and ambient temperature. These temperatures and the results of this test are summarized in Table 3. Graphs 3 and 4 give frozen food temperature (i.e., ice tray temperature) versus the average general food compartment temperature and the fuel consumption rate versus the average general food compartment temperature for each of the three ambient temperatures (i.e., 70 °F, 90 °F, and 110 °F) for thermostat settings at positions 5, 3.5, 2 and 1.

Table 3 Results of Thermostat Test

Ambient* Temperature (°F)	General Food Compartment Temp. deemed acceptable in B38.2 at ambient temperature* (°F)	Lowest General Food Compartment Temp. (°F)	Frozen Food Temperature corresponding to lowest gen. food compartment temperature (°F)	Fuel Consumptio corresponding to general food com temp. (lbm/hr)
70	36	23.5	-8.5	7.20
90	38	38.0	4.0	7.32
110	41	63.5	43.5	8.00


AVG. GEN. FOOD COMPART. TEMP. (°F)
VS
FROZEN FOOD TEMP (°F)
NORCOLD REFRIGERATOR
NUMBERS INDICATE THER-
MOSTAT SETTINGS
(1~WARMEST, 5~COLDEST)
110°F AMBIENT
90°F AMBIENT
70°F AMBIENT
AVE. GEN. FOOD COMPART. TEMP (°F)
FROZEN FOOD TEMP (°F)
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
-10 -5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

Graph 3


AVG. GEN. FOOD COMPART. TEMP. (°F)
VS
FUEL CONSUMPTION RATE (lb/hr)
NORCOLD REFRIGERATOR
AVE. GEN. FOOD COMPARTMENT TEMP. (°F)
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
1
2
3.5
5
110°F AMBIENT
90° F AMBIENT
70° AMBIENT
4.00
4.50
5.00
5.50
6.00
6.50
7.00
7.50
8.00
8.50
9.00
FUEL CONSUMPTION RATE (lb/hr) x 10⁻²

Graph 4

The Norcold refrigerator had sufficient capacity to satisfy the Standard Test temperatures suggested for the 70 °F and 90 °F ambient temperature, but not at the 110 °F ambient temperature. With the thermostat at position 3.5 in a 70 °F ambient temperature, the general food compartment temperature was 36 °F, the frozen food temperature was 15 °F. At thermostat position five in 90 °F ambient temperature and at a general food compartment temperature of 38 °F, the frozen food temperature was 4 °F. However, the Norcold refrigerator was not able to establish a 41 °F temperature in the general food compartment at any thermostat setting in an ambient of 110 °F. The lowest general food compartment temperature obtained in this 110 °F ambient was 63.5 °F; the corresponding frozen food temperature was 43.5 °F. The plot of fuel consumption rate versus general food compartment temperature for the three constant ambient temperatures indicated, as would be expected, that the fuel consumption rate increased as a greater demand was put on the refrigerator cooling system.

4.4 Tilt Test Results

The refrigerator was tilted in one degree increments, forward, backward, right, and left. The results of this test are shown in Table 4. The angle shown beside each direction of tilt in Table 4 is the maximum inclination prior to inducing failure.

Table 4

Direction of Tilt	Angle (degrees)
Backward	2
Forward	1
Right	2
Left	1

5.0 Conclusions

The Norcold refrigerator was found to operate most effectively and economically at a fuel line pressure of eleven inches of water. This result is in agreement with the recommendations of the refrigerator manufacturer.

The maximum ambient temperature that this refrigerator could function effectively in was about 105 °F. Above this ambient temperature the Norcold displayed a primary failure mode. This may limit its effectiveness for field use.

The warmest thermostat setting that would allow effective refrigerator operation in ambient temperature of 105 $\pm$ 3 °F (near the primary failure mode temperature) was position two (position five is the coldest and position zero produces a defrost condition).

The Norcold had sufficient capacity to meet the Standard Test general food compartment temperatures requirements of ASA B38.2-1961 at ambient temperatures of 70 °F and 90 °F, but not in an ambient of 110 °F (and not at one thermostat setting).

No single thermostat position produced satisfactory interior temperatures at both 90 °F and 70 °F ambient temperatures. This thermostat position would have to be reset to obtain satisfactory interior temperatures with an ambient temperature change from 90 °F to 70 °F. The refrigerator could not produce satisfactory interior temperatures at any thermostat setting in an ambient temperature of 110 °F.

6. Acknowledgment

The authors appreciate the technical assistance of Mr. John Grimes. He helped assemble the testing apparatus and was responsible for the environmental control of the testing laboratory.

Appendix A Temperature Data Listings

	Frame Numbers
Fuel Line Pressure Test	1, 2, 3
Elevated Ambient Temperature Tests	4, 5, 6, 7
Thermostat Test I	8
Thermostat Test II	9

FRAME NUMBER 1 NORCOLD REFRIGERATOR

DAY	GEN FOOD COMPART TEMP	FREEZER COIL IN TEMP	AMBIENT TEMP	GEN EVAP COIL IN TEMP	GEN EVAP COIL MID TEMP	GEN EVAP COIL OUT TEMP	ICE TRAY TEMP
1	********	********	********	********	********	********	********
2	********	********	********	********	********	********	********
3	44.00	20.00	93.00	********	********	********	********
4	********	********	********	********	********	********	********
5	40.50	17.50	90.20	********	********	********	********
6	********	********	********	********	********	********	********
7	********	********	********	********	********	********	********
8	********	********	********	********	********	********	********
9	********	********	********	********	********	********	********
10	41.00	16.00	90.00	********	********	********	********
11	41.00	16.00	91.00	********	********	********	********
12	39.00	14.00	90.00	********	********	********	********
13	42.00	16.00	92.00	********	********	********	********
14	********	********	********	********	********	********	********
15	********	********	********	********	********	********	********
16	39.00	12.50	90.00	********	********	********	********
17	39.00	12.50	90.00	********	********	********	********
18	38.00	12.00	91.00	********	********	********	********
19	38.50	11.50	90.00	********	********	********	********
20	38.00	11.00	90.00	********	********	********	********
21	********	********	********	********	********	********	********
22	********	********	********	********	********	********	********
23	********	********	********	********	********	********	********
24	39.50	12.00	91.00	********	********	********	********
25	39.50	11.50	90.50	********	********	********	********
26	39.00	11.50	90.50	********	********	********	********
27	34.00	11.00	89.00	********	********	********	********
28	********	********	********	********	********	********	********
29	********	********	********	********	********	********	********
30	41.00	13.00	91.00	********	********	********	********
31	39.50	14.00	91.20	********	********	********	********
32	40.00	14.00	90.00	********	********	********	********
33	39.50	14.50	90.00	********	********	********	********
34	39.00	13.00	90.50	********	********	********	********
35	********	********	********	********	********	********	********
36	********	********	********	********	********	********	********

NOTE--ASTERISK DENOTES NO DATA

FRAME NUMBER 2 NORCOLD REFRIGERATOR

DAY	GEN FOOD COMPART TEMP	FREEZER COIL IN TEMP	AMBIENT TEMP	GEN EVAP COIL IN TEMP	GEN EVAP COIL MID TEMP	GEN EVAP COIL OUT TEMP	ICE TRAY TEMP
36	********	********	********	********	********	********	********
37	40.50	14.00	92.00	********	********	********	********
38	41.50	15.50	90.50	********	********	********	********
39	41.50	16.00	90.00	********	********	********	********
40	39.50	18.00	91.50	********	********	********	********
41	40.00	18.50	91.50	********	********	********	********
42	********	********	********	********	********	********	********
43	********	********	********	********	********	********	********
44	48.00	23.00	91.80	********	********	********	********
45	37.00	14.00	92.50	********	********	********	********
46	37.00	13.50	90.00	********	********	********	********
47	36.50	14.00	91.00	********	********	********	********
48	36.50	13.50	91.00	********	********	********	********
49	********	********	********	********	********	********	********
50	********	********	********	********	********	********	********
51	********	********	********	********	********	********	********
52	35.00	10.50	89.50	********	********	7.50	********
53	35.00	11.50	90.50	********	********	-2.00	********
54	35.00	14.00	90.00	********	********	-2.00	.00
55	35.00	14.00	90.00	********	********	-2.50	.00
56	********	********	********	********	********	********	********
57	********	********	********	********	********	********	********
58	36.00	14.00	91.50	********	********	-1.00	.50
59	36.00	13.50	90.00	********	********	-2.50	.00
60	36.50	14.00	91.50	********	********	-1.50	1.00
61	37.00	14.00	91.50	********	********	-1.50	1.00
62	37.00	14.00	92.00	********	********	-1.50	1.00
63	********	********	********	********	********	********	********
64	********	********	********	********	********	********	********
65	36.50	14.50	91.50	********	********	-1.50	1.00
66	37.00	13.50	91.00	********	********	-2.00	.50
67	37.00	13.50	93.00	********	********	-1.50	.50
68	37.50	14.00	91.50	********	********	-1.50	1.00
69	36.50	13.50	90.50	********	********	-2.00	.00
70	********	********	********	********	********	********	********
71	********	********	********	********	********	********	********

NOTE--ASTERISK DENOTES NO DATA

FRAME NUMBER 3 NORCOLD REFRIGERATOR

DAY	GEN FOOD COMPART TEMP	FREEZER COIL IN TEMP	AMBIENT TEMP	GEN EVAP COIL IN TEMP	GEN EVAP COIL MID TEMP	GEN EVAP COIL OUT TEMP	ICE TRAY TEMP
71	********	********	********	********	********	********	********
72	********	********	********	********	********	********	********
73	********	********	********	********	********	********	********
74	********	********	********	********	********	********	********
75	********	********	********	********	********	********	********
76	36.00	17.00	92.00	********	********	1.50	4.50
77	********	********	********	********	********	********	********
78	********	********	********	********	********	********	********
79	48.50	23.00	112.00	********	********	7.50	10.00
80	38.00	14.00	92.00	********	********	-1.50	1.00
81	********	********	********	********	********	********	********
82	********	********	********	********	********	********	********
83	********	********	********	********	********	********	********
84	********	********	********	********	********	********	********
85	********	********	********	********	********	********	********
86	********	********	********	********	********	********	********
87	********	********	********	********	********	********	********
88	********	********	********	********	********	********	********
89	********	********	********	********	********	********	********
90	********	********	********	********	********	********	********
91	********	********	********	********	********	********	********
92	********	********	********	********	********	********	********
93	********	********	********	********	********	********	********
94	********	********	********	********	********	********	********
95	********	********	********	********	********	********	********
96	********	********	********	********	********	********	********
97	********	********	********	********	********	********	********
98	********	********	********	********	********	********	********
99	********	********	********	********	********	********	********
100	********	********	********	********	********	********	********
101	********	********	********	********	********	********	********
102	********	********	********	********	********	********	********
103	********	********	********	********	********	********	********
104	********	********	********	********	********	********	********
105	********	********	********	********	********	********	********
106	********	********	********	********	********	********	********

NOTE--ASTERISK DENOTES NO DATA

FRAME NUMBER 4 NORCOLD REFRIGERATOR

DAY	GEN FOOD COMPART TEMP	FREEZER COIL IN TEMP	AMBIENT TEMP	GEN EVAP COIL IN TEMP	GEN EVAP COIL MID TEMP	GEN EVAP COIL OUT TEMP	ICE TRAY TEMP
1	********	********	********	********	********	********	********
2	********	********	********	********	********	********	********
3	********	********	********	********	********	********	********
4	38.00	14.00	91.50	********	********	-2.00	1.00
5	39.50	15.00	91.50	********	********	1.00	3.00
6	39.00	15.00	92.00	********	********	.50	2.50
7	********	********	********	********	********	********	********
8	********	********	********	********	********	********	********
9	39.50	15.00	92.00	********	********	1.00	3.00
10	37.00	13.00	90.50	********	********	.50	3.00
11	39.50	14.50	92.00	********	********	.50	3.00
12	39.50	14.50	91.50	********	********	.50	3.00
13	40.00	14.00	91.50	********	********	.00	2.50
14	********	********	********	********	********	********	********
15	********	********	********	********	********	********	********
16	********	********	********	********	********	********	********
17	39.50	14.50	91.50	********	********	.50	3.00
18	48.00	30.00	103.00	********	********	8.50	10.00
19	48.50	22.00	102.50	********	********	8.00	11.00
20	48.00	21.50	102.00	********	********	8.50	11.00
21	********	********	********	********	********	********	********
22	********	********	********	********	********	********	********
23	48.50	21.50	100.50	********	********	8.00	10.00
24	48.00	21.00	102.00	********	********	8.00	10.00
25	48.50	21.50	103.00	********	********	8.50	10.50
26	48.00	21.50	103.50	********	********	8.00	10.50
27	48.50	21.50	105.00	********	********	8.50	10.50
28	********	********	********	********	********	********	********
29	********	********	********	********	********	********	********
30	50.00	22.50	108.50	********	********	10.00	12.00
31	48.00	20.50	102.50	********	********	8.00	10.00
32	47.50	20.50	102.50	********	********	7.50	10.00
33	********	********	********	********	********	********	********
34	48.00	20.50	102.00	********	********	7.50	10.00
35	********	********	********	********	********	********	********
36	********	********	********	********	********	********	********

NOTE--ASTERISK DENOTES NO DATA

FRAME NUMBER 5 NORCOLD REFRIGERATOR

DAY	GEN FOOD COMPART TEMP	FREEZER COIL IN TEMP	AMBIENT TEMP	GEN EVAP COIL IN TEMP	GEN EVAP COIL MID TEMP	GEN EVAP COIL OUT TEMP	ICE TRAY TEMP
36	********	********	********	********	********	********	********
37	********	********	********	********	********	********	********
38	55.00	26.50	110.00	********	********	13.50	16.50
39	55.50	26.50	110.00	********	********	14.50	16.50
40	55.50	26.50	110.00	********	********	14.50	16.50
41	55.50	26.50	110.00	********	********	15.00	16.50
42	********	********	********	********	********	********	********
43	********	********	********	********	********	********	********
44	55.50	26.50	105.00	********	********	14.50	16.50
45	55.50	26.50	110.50	********	********	14.50	17.00
46	56.00	27.00	110.50	********	********	15.00	17.50
47	56.00	27.00	110.50	********	********	15.00	17.50
48	56.50	27.50	111.00	********	********	15.50	17.50
49	********	********	********	********	********	********	********
50	********	********	********	********	********	********	********
51	58.00	29.50	119.50	********	********	18.50	20.00
52	54.50	39.00	117.50	********	********	43.00	34.50
53	59.00	41.00	117.50	********	********	47.00	38.50
54	56.00	34.50	113.50	********	********	29.00	26.00
55	55.50	32.00	113.50	********	********	19.00	20.50
56	********	********	********	********	********	********	********
57	********	********	********	********	********	********	********
58	56.00	30.00	114.00	********	********	17.00	19.00
59	55.00	29.00	112.00	********	********	14.50	17.00
60	********	********	********	********	********	********	********
61	76.00	56.50	110.50	********	********	67.50	64.50
62	84.00	67.50	113.50	********	********	76.00	74.00
63	********	********	********	********	********	********	********
64	********	********	********	********	********	********	********
65	80.00	60.50	111.50	********	********	71.00	69.00
66	71.00	29.00	78.50	********	********	38.50	33.00
67	********	********	********	********	********	********	********
68	37.00	14.00	88.50	********	********	-1.00	2.00
69	38.50	14.50	89.50	********	********	-.50	2.50
70	********	********	********	********	********	********	********
71	********	********	********	********	********	********	********

NOTE--ASTERISK DENOTES NO DATA

FRAME NUMBER 6 NORCOLD REFRIGERATOR

DAY	GEN FOOD COMPART TEMP	FREEZER COIL IN TEMP	AMBIENT TEMP	GEN EVAP COIL IN TEMP	GEN EVAP COIL MID TEMP	GEN EVAP COIL OUT TEMP	ICE TRAY TEMP
71	********	********	********	********	********	********	********
72	41.00	15.00	91.50	********	********	1.00	4.00
73	37.50	12.50	87.00	********	********	-2.00	1.00
74	37.00	13.00	86.50	********	********	-2.00	1.00
75	38.50	14.00	88.50	********	********	-.50	2.50
76	39.00	14.00	88.00	********	********	-.50	2.50
77	********	********	********	********	********	********	********
78	********	********	********	********	********	********	********
79	36.50	12.00	85.50	********	********	-2.50	1.00
80	37.00	17.00	86.00	********	********	-2.50	1.00
81	38.00	12.50	87.00	********	********	-1.50	1.00
82	38.00	13.00	87.50	********	********	-1.00	1.50
83	39.00	13.50	89.00	********	********	-.50	2.50
84	********	********	********	********	********	********	********
85	********	********	********	********	********	********	********
86	********	********	********	********	********	********	********
87	39.50	13.50	89.00	********	********	.00	2.50
88	40.00	14.00	89.50	********	********	1.00	3.50
89	41.50	15.00	91.50	********	********	1.00	4.00
90	********	********	********	********	********	********	********
91	********	********	********	********	********	********	********
92	********	********	********	********	********	********	********
93	37.50	12.50	86.50	********	********	-2.00	1.00
94	38.00	12.50	87.50	********	********	-2.00	1.00
95	54.50	18.00	87.50	18.00	7.00	37.50	33.00
96	38.50	10.00	94.50	11.00	7.00	3.50	4.50
97	88.90	74.00	115.50	77.00	78.00	80.00	78.00
98	********	********	********	********	********	********	********
99	********	********	********	********	********	********	********
100	70.50	32.00	110.00	42.00	54.00	59.50	54.50
101	68.00	31.50	109.50	39.00	50.00	57.00	51.50
102	68.50	31.00	110.00	39.50	50.50	57.00	51.50
103	49.50	20.00	102.50	20.00	16.00	15.00	16.00
104	49.60	20.00	93.00	20.00	15.80	15.00	15.50
105	********	********	********	********	********	********	********
106	********	********	********	********	********	********	********

NOTE--ASTERISK DENOTES NO DATA

FRAME NUMBER 7 NORCOLD REFRIGERATOR

DAY	GEN FOOD COMPART TEMP	FREEZER COIL IN TEMP	AMBIENT TEMP	GEN EVAP COIL IN TEMP	GEN EVAP COIL MID TEMP	GEN EVAP COIL OUT TEMP	ICE TRAY TEMP
106	********	********	********	********	********	********	********
107	59.00	26.50	101.50	28.50	37.00	45.00	38.50
108	63.50	28.00	104.00	35.00	44.50	51.00	45.50
109	66.50	28.00	104.50	39.00	49.50	55.00	50.00
110	70.00	31.00	110.00	42.50	53.50	59.50	44.50
111	57.00	27.50	105.00	26.50	25.50	36.00	30.50
112	********	********	********	********	********	********	********
113	********	********	********	********	********	********	********
114	48.50	19.00	102.00	19.00	14.50	13.00	14.50
115	49.00	19.00	103.50	19.00	15.00	13.00	15.00
116	47.50	17.50	103.00	17.50	13.50	11.50	13.00
117	52.00	22.00	104.50	22.00	17.50	16.50	17.50
118	********	********	********	********	********	********	********
119	********	********	********	********	********	********	********
120	********	********	********	********	********	********	********
121	55.00	21.00	109.00	20.50	17.00	21.00	18.00
122	53.00	21.50	105.00	15.50	27.00	35.00	28.50
123	48.50	21.50	101.50	17.50	14.00	13.00	13.50
124	49.00	22.50	103.00	19.00	15.00	13.00	14.50
125	52.50	25.50	104.00	22.50	18.50	17.50	18.50
126	********	********	********	********	********	********	********
127	********	********	********	********	********	********	********
128	62.00	31.50	110.00	35.50	44.50	52.00	45.50
129	62.50	30.00	110.50	35.50	44.50	52.00	45.50
130	********	********	********	********	********	********	********
131	64.00	30.50	109.00	33.50	43.00	50.00	44.00
132	********	********	********	********	********	********	********
133	********	********	********	********	********	********	********
134	********	********	********	********	********	********	********
135	70.50	22.00	76.50	21.00	44.50	48.00	45.00
136	********	********	********	********	********	********	********
137	********	********	********	********	********	********	********
138	********	********	********	********	********	********	********
139	********	********	********	********	********	********	********
140	********	********	********	********	********	********	********
141	********	********	********	********	********	********	********

NOTE--ASTERISK DENOTES NO DATA

FRAME NUMBER 8 NORCOLD REFRIGERATOR

DAY	GEN FOOD COMPART TEMP	FREEZER COIL IN TEMP	AMBIENT TEMP	GEN EVAP COIL IN TEMP	GEN EVAP COIL MID TEMP	GEN EVAP COIL OUT TEMP	ICE TRAY TEMP
1	********	********	********	********	********	********	********
2	********	********	********	********	********	********	********
3	********	********	********	********	********	********	********
4	42.00	15.50	100.00	14.00	9.00	5.50	8.00
5	53.50	27.00	106.50	24.50	20.50	19.00	20.00
6	51.00	24.00	102.50	22.50	18.00	15.50	17.50
7	********	********	********	********	********	********	********
8	********	********	********	********	********	********	********
9	50.50	22.50	103.00	21.00	16.00	14.00	16.00
10	51.00	23.00	104.00	22.00	17.00	15.00	17.00
11	51.50	23.00	104.50	21.50	17.00	15.00	17.00
12	53.00	24.50	106.00	23.00	18.00	16.50	18.00
13	53.50	25.00	105.50	24.00	19.00	14.50	16.00
14	********	********	********	********	********	********	********
15	********	********	********	********	********	********	********
16	51.50	22.50	104.50	21.50	16.00	14.50	16.00
17	54.00	25.00	105.00	23.50	19.00	24.00	21.00
18	53.50	24.00	105.00	23.00	20.00	28.00	22.00
19	53.00	21.00	103.50	21.00	19.00	29.00	22.00
20	54.50	23.50	105.00	19.50	20.00	31.00	20.00
21	********	********	********	********	********	********	********
22	********	********	********	********	********	********	********
23	********	********	********	********	********	********	********
24	53.50	23.50	105.50	21.50	18.50	29.50	18.50
25	56.50	23.00	104.00	23.00	28.50	32.50	26.50
26	56.00	25.00	105.00	24.00	22.00	35.00	22.50
27	56.00	19.50	104.50	20.50	30.50	36.50	28.00
28	********	********	********	********	********	********	********
29	********	********	********	********	********	********	********
30	55.50	24.50	103.00	21.50	23.50	32.50	22.50
31	59.50	19.00	103.00	21.00	39.00	44.50	36.50
32	60.00	19.50	103.50	20.50	37.50	49.00	35.00
33	60.00	18.50	103.00	20.50	38.00	44.00	35.50
34	60.50	18.50	102.50	20.00	37.50	44.50	35.00
35	********	********	********	********	********	********	********
36	********	********	********	********	********	********	********

NOTE--ASTERISK DENOTES NO DATA

FRAME NUMBER 9 NORCOLD REFRIGERATOR

DAY	GEN FOOD COMPART TEMP	FREEZER COIL IN TEMP	AMBIENT TEMP	GEN EVAP COIL IN TEMP	GEN EVAP COIL MID TEMP	GEN EVAP COIL OUT TEMP	ICE TRAY TEMP
1	********	********	********	********	********	********	********
2	********	********	********	********	********	********	********
3	49.50	19.00	103.50	19.00	16.00	25.50	16.00
4	44.00	15.00	92.50	14.00	17.50	29.50	19.50
5	42.50	14.50	91.00	13.50	15.00	24.50	17.00
6	22.00	-4.50	96.00	-4.50	-10.00	-14.00	-9.50
7	********	********	********	********	********	********	********
8	********	********	********	********	********	********	********
9	42.00	12.00	94.50	11.00	6.50	3.50	6.50
10	23.50	-2.50	68.50	-3.00	-8.50	-12.00	-8.00
11	66.00	65.50	69.50	65.00	66.00	65.50	65.00
12	23.50	-2.50	69.00	-3.50	-8.50	-12.00	-8.50
13	45.50	5.00	69.00	14.00	35.50	********	34.00
14	********	********	********	********	********	********	********
15	********	********	********	********	********	********	********
16	36.50	8.50	69.50	7.50	17.00	22.00	16.00
17	38.50	10.00	89.00	8.50	4.00	1.00	4.00
18	62.50	46.00	90.00	49.00	49.50	46.50	48.00
19	44.00	13.00	89.00	15.00	14.50	19.50	13.50
20	50.50	11.00	90.00	14.00	31.50	37.00	29.50
21	********	********	********	********	********	********	********
22	********	********	********	********	********	********	********
23	77.50	33.50	109.50	50.00	54.00	68.00	62.50
24	70.00	30.00	109.50	38.50	55.50	59.50	53.50
25	59.00	28.00	106.50	28.00	34.00	41.50	32.00
26	63.50	29.00	110.00	31.00	44.50	52.50	43.50
27	68.00	28.50	110.50	33.50	51.50	57.50	50.00
28	********	********	********	********	********	********	********
29	********	********	********	********	********	********	********
30	********	********	********	********	********	********	********
31	********	********	********	********	********	********	********
32	********	********	********	********	********	********	********
33	********	********	********	********	********	********	********
34	********	********	********	********	********	********	********
35	********	********	********	********	********	********	********
36	********	********	********	********	********	********	********

NOTE--ASTERISK DENOTES NO DATA

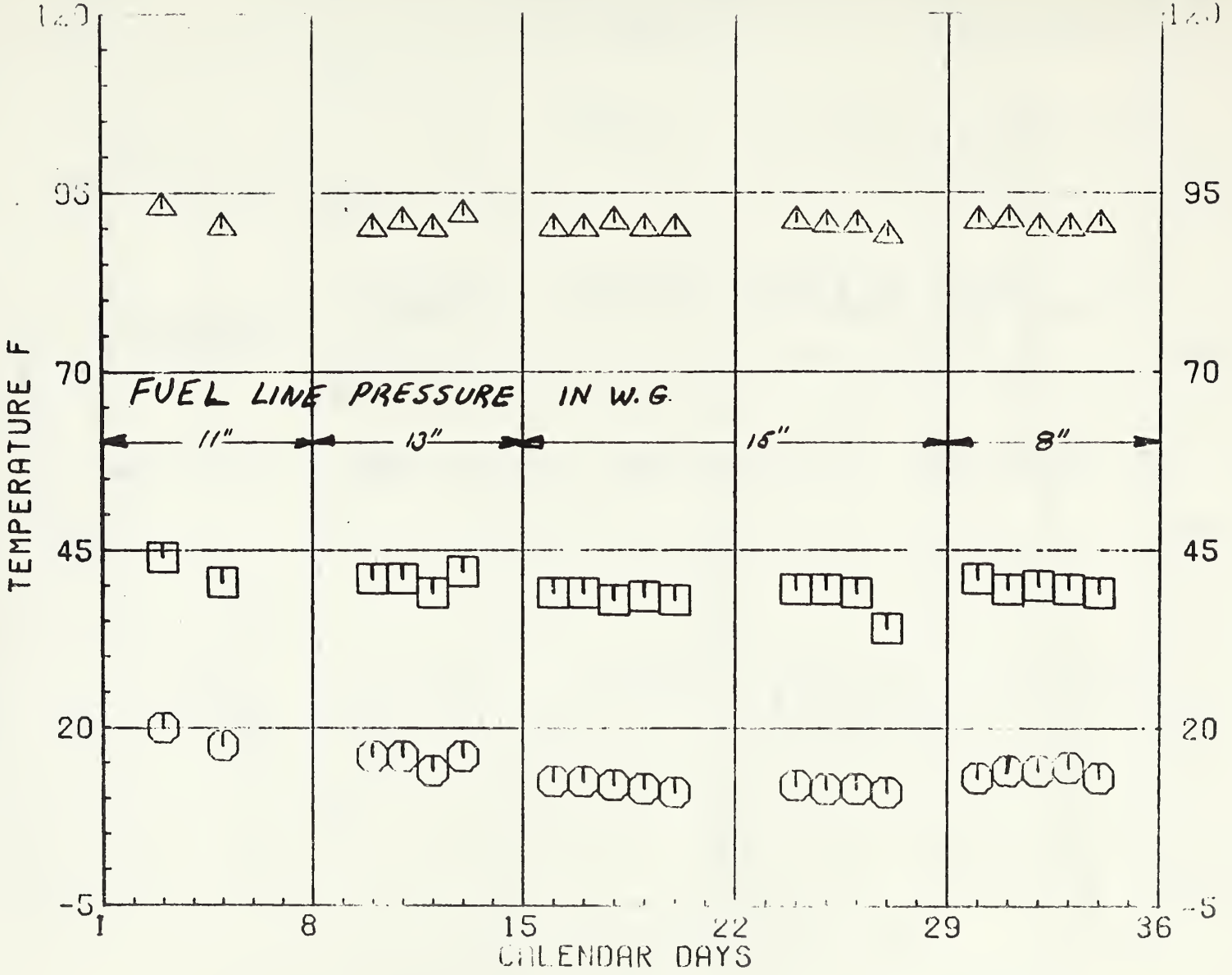
Appendix B Temperature Plots

	Frame Numbers
Fuel Line Pressure Test	1, 2, 3
Elevated Temperature Test	4, 5, 6, 7
Thermostat Test I	8
Thermostat Test II	9

SYMBOL LEGEND

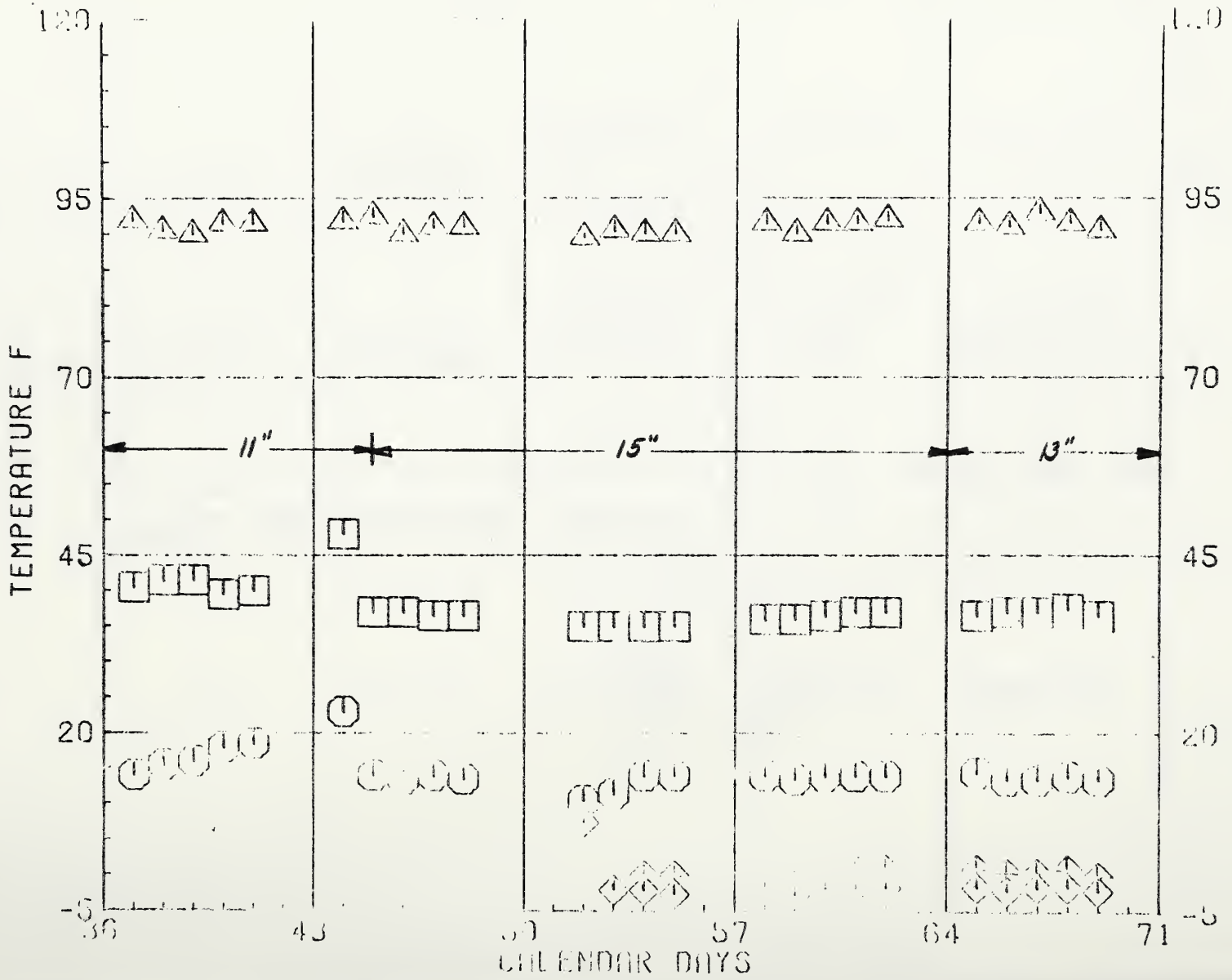
- □ GENERAL FOOD COMPART TEMP
- ○ FREEZER EVAP COIL INLET TEMP
- △ AMBIENT TEMPERATURE
- \+ GEN EVAP COIL INLET TEMP
- X GEN EVAP COIL MIDPOINT TEMP
- ◇ GEN EVAP COIL EXIT TEMP
- ⏚ ICE TRAY TEMPERATURE

TEMPERATURE VS. TEST PERIOD
NORCOLD REFRIGERATOR

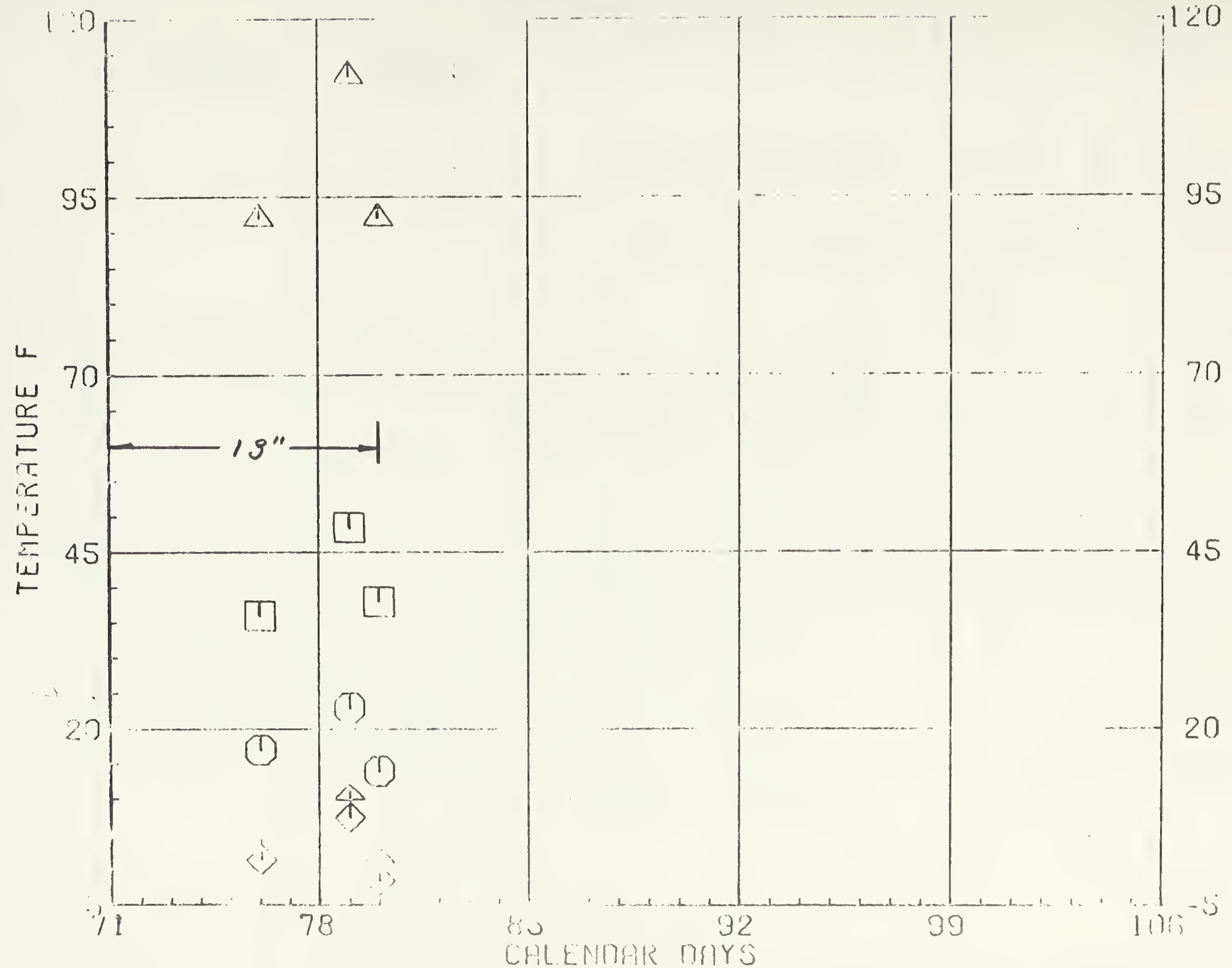


FRAME NUMBER 1

TEMPERATURE VS. TEST PERIOD
NORCOLD REFRIGERATOR

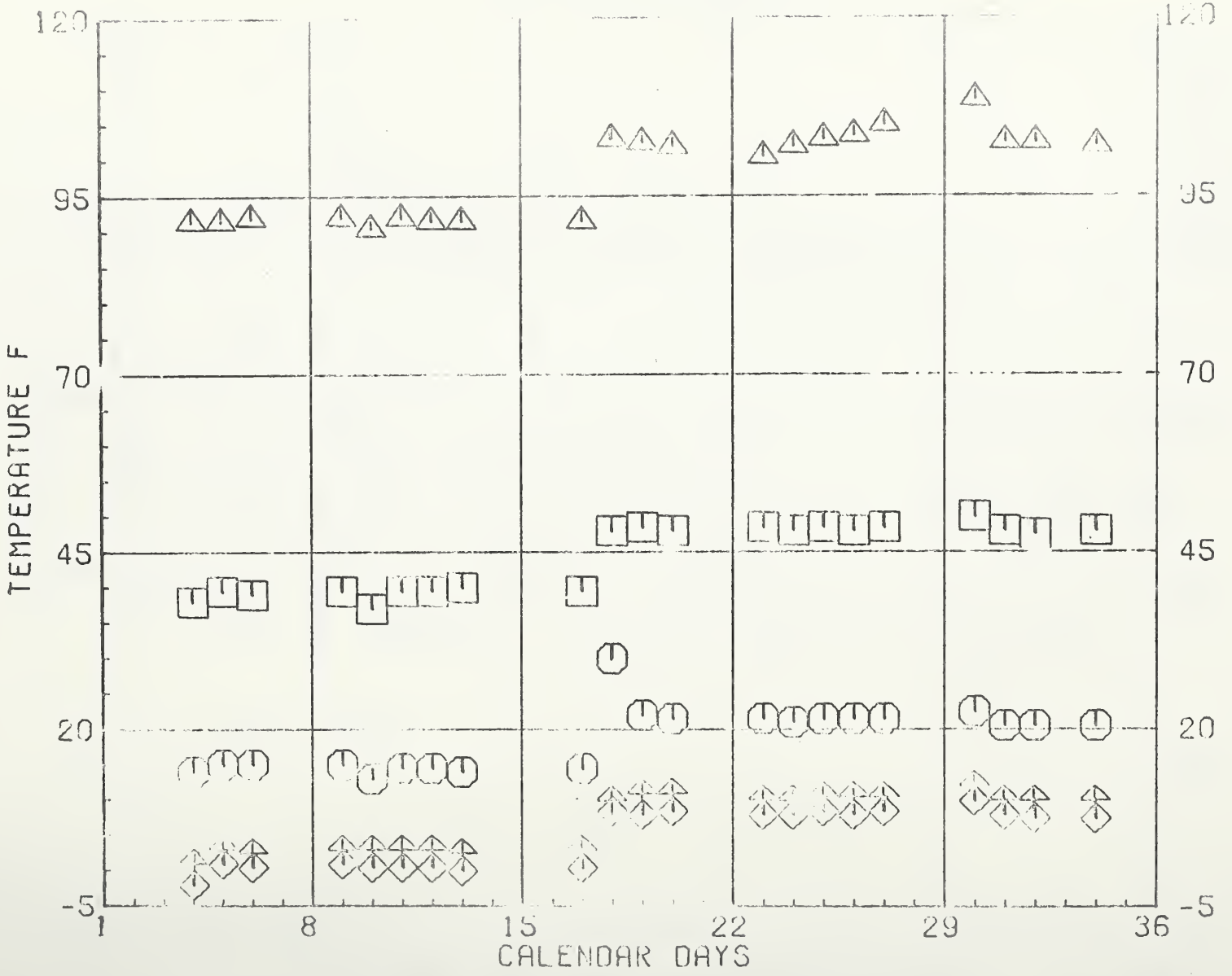


TEMPERATURE VS. TEST PERIOD
NORCOLD REFRIGERATOR



FRAME NUMBER 3

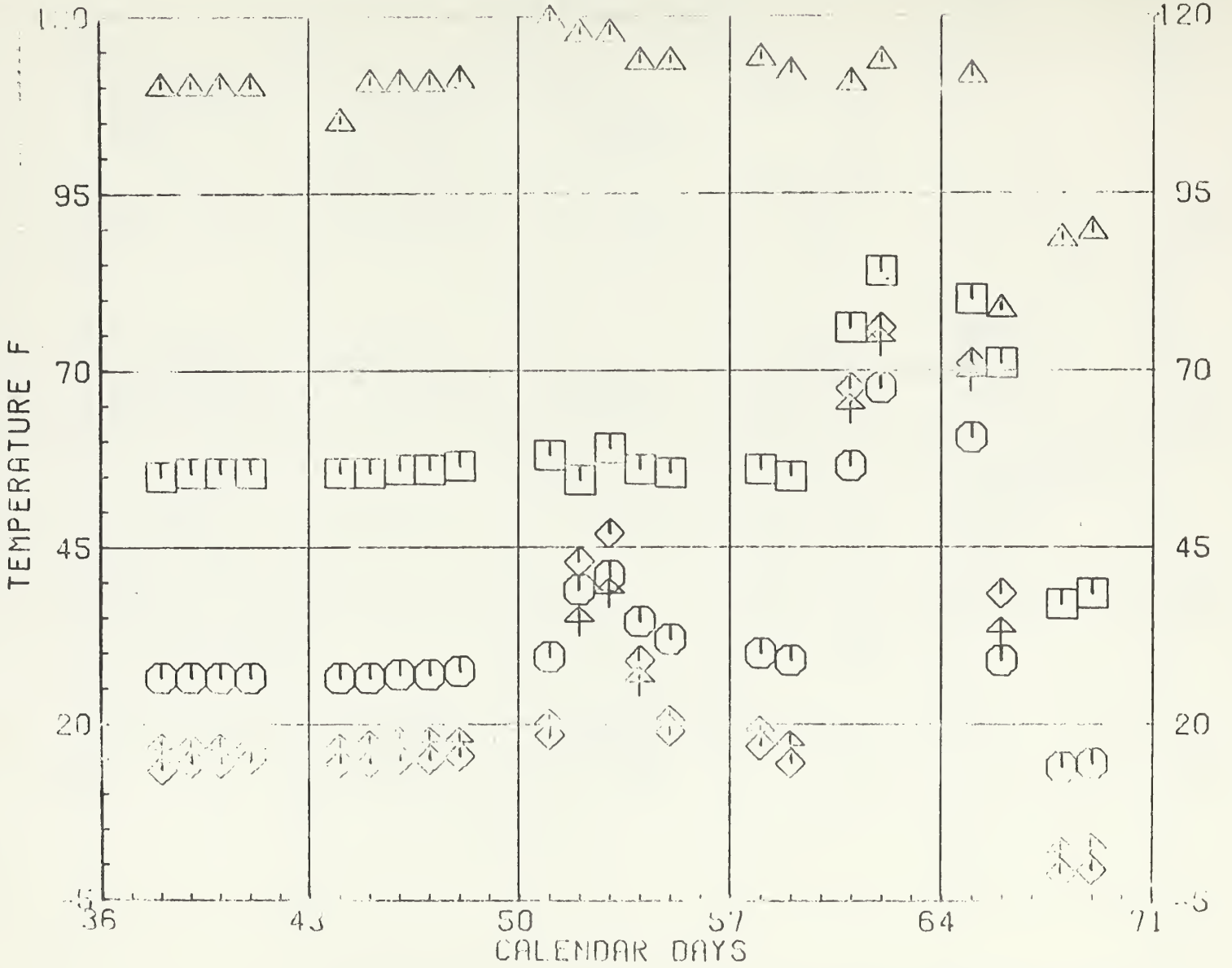
TEMPERATURE VS. TEST PERIOD
REFRIGERATOR



FRAME NUMBER 4

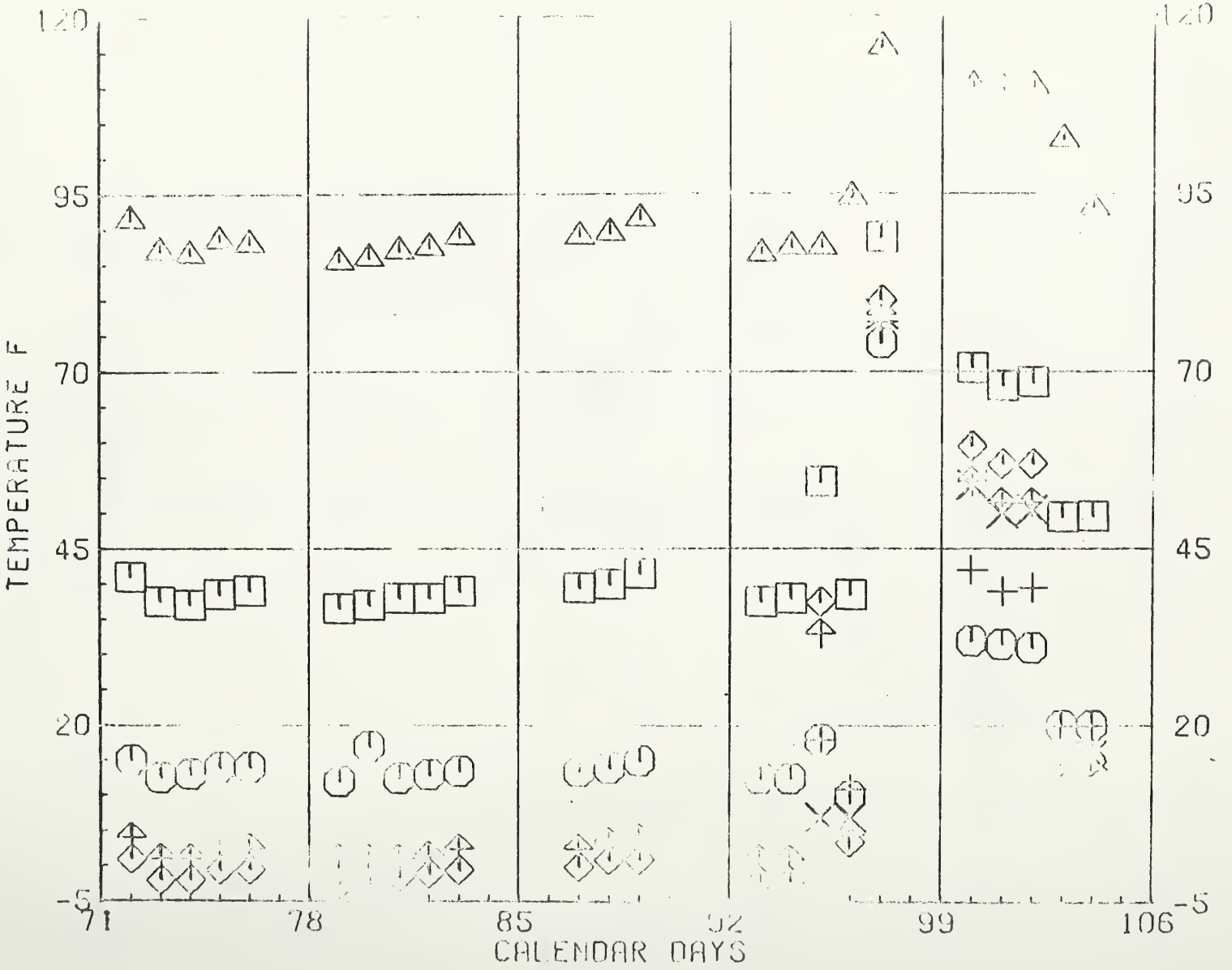
TEMPERATURE VS. TEST PERIOD

NORCOLD REFRIGERATOR



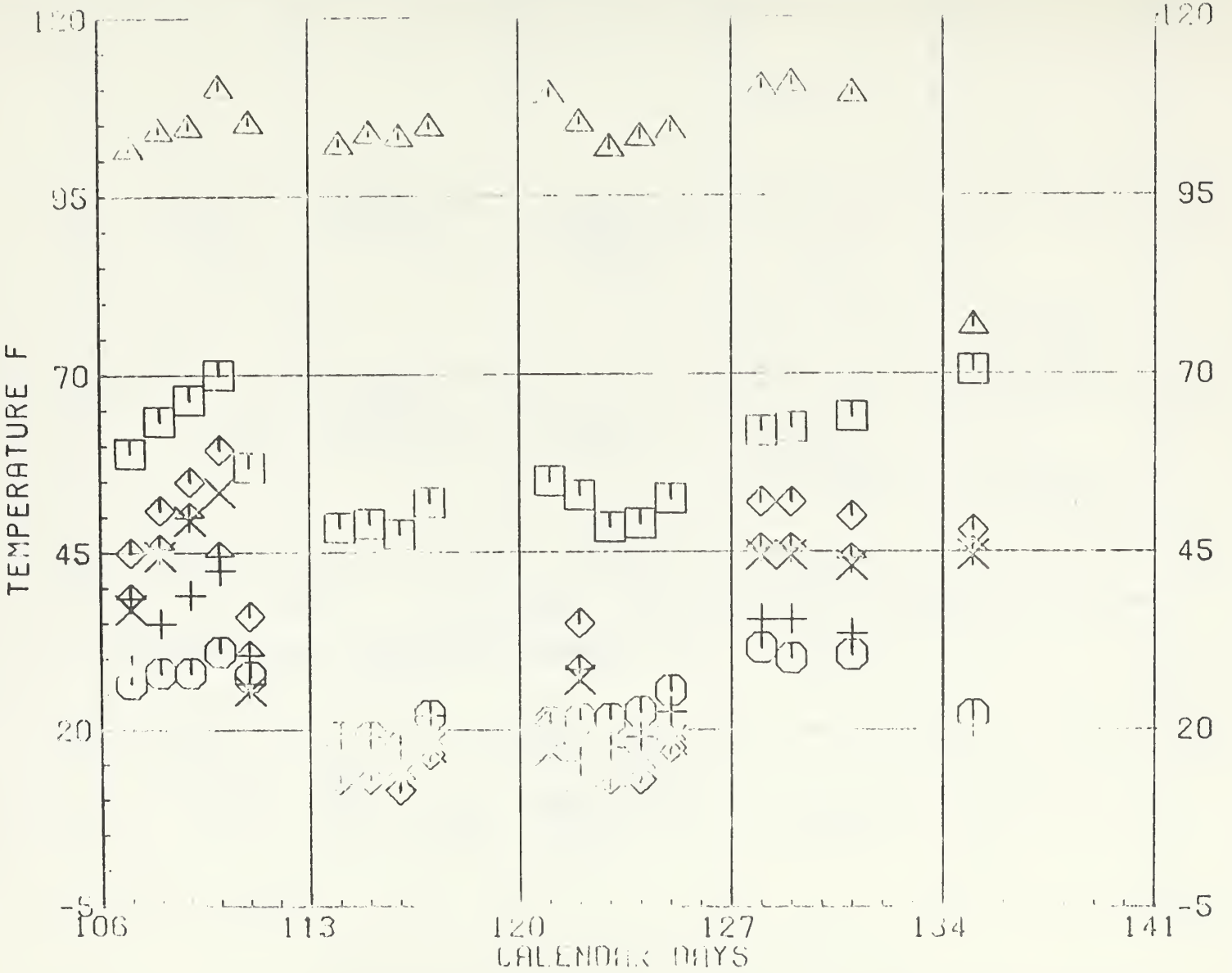
FRAME NUMBER 5

TEMPERATURE VS. TEST PERIOD
NORCOLD REFRIGERATOR



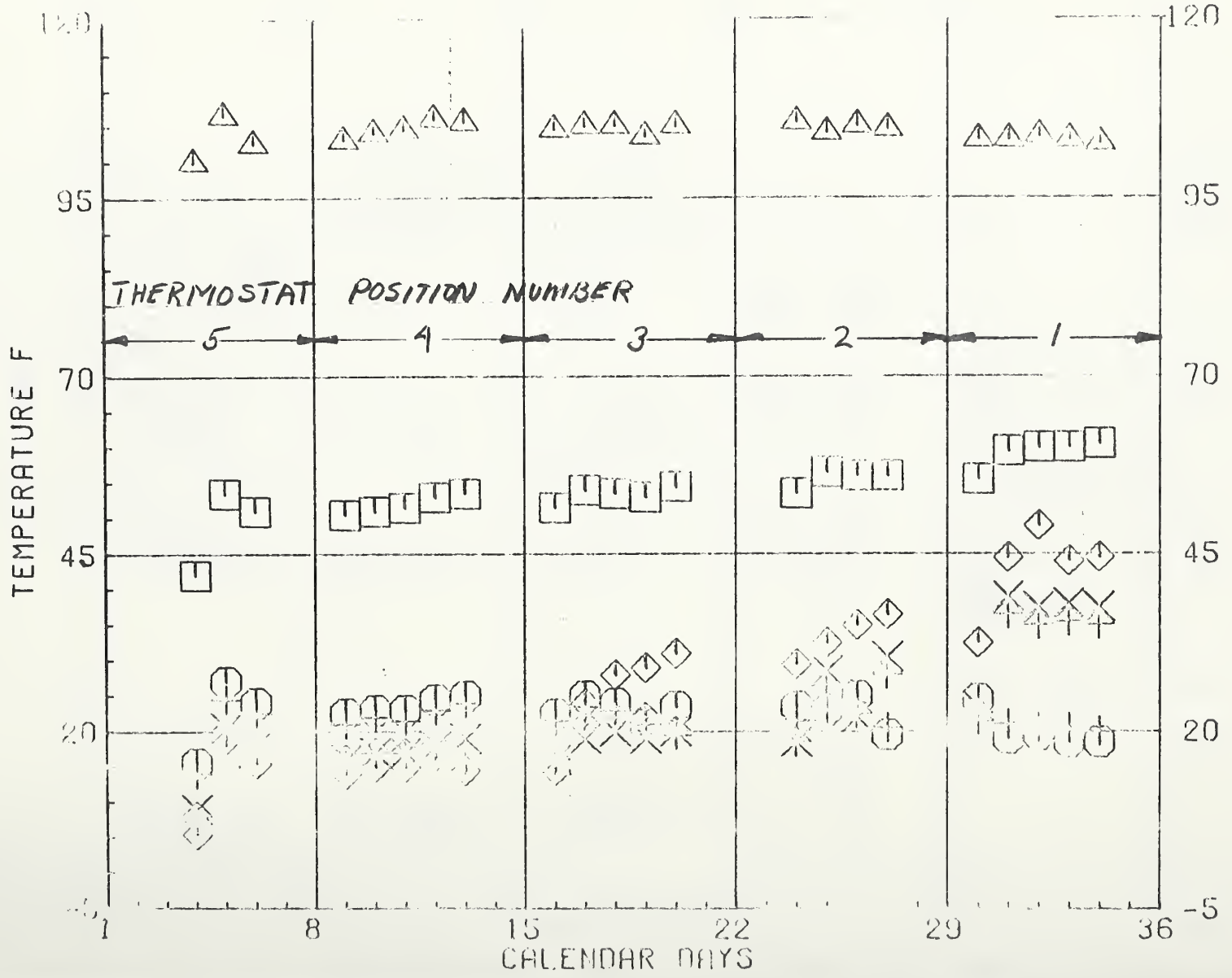
FRAME NUMBER 6

TEMPERATURE VS. TEST PERIOD
NORCOLD REFRIGERATOR



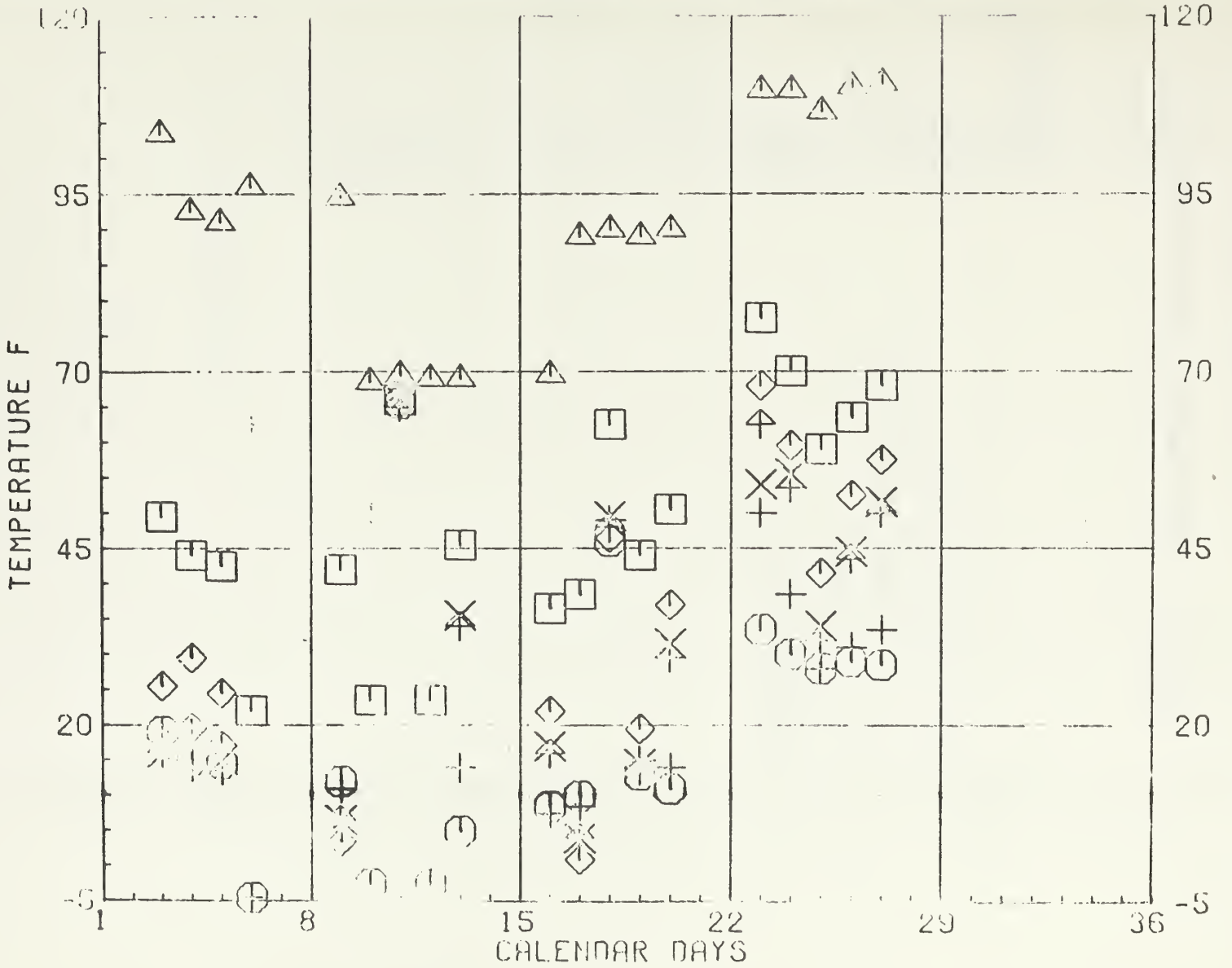
FRAME NUMBER 7

TEMPERATURE VS. TEST PERIOD
NORCOLD REFRIGERATOR



FRAME NUMBER 8

NORCOLD REFRIGERATOR



FRAME NUMBER 9

Appendix C Fuel Consumption Rate Data Listing

	Frame Number
Fuel Line Pressure Test	10, 11, 12
Elevated Ambient Temperature Test	13, 14, 15, 16
Thermostat Test I	17
Thermostat Test II	18

FRAME NUMBER 10 NORCOLD FUEL

DAY	CONSUMPTION (LBM/HR)
1	********
2	********
3	********
4	********
5	********
6	********
7	********
8	********
9	.0625
10	.0708
11	.0625
12	.0584
13	.0695
14	********
15	********
16	.0708
17	.0688
18	.0688
19	.0709
20	.0641
21	********
22	********
23	********
24	.0771
25	.0750
26	.0750
27	.0754
28	********
29	********
30	.0638
31	.0771
32	.0709
33	.0738
34	.0754
35	********
36	********

NOTE--ASTERISK DENOTES NO DATA

FRAME NUMBER 11 NORCOLD FUEL

DAY	CONSUMPTION (LBM/HR)
36	********
37	.0542
38	.0539
39	.0525
40	.0562
41	.0563
42	********
43	********
44	.0667
45	.0625
46	.0708
47	.0687
48	.0545
49	********
50	********
51	.0747
52	.0687
53	.0704
54	.0721
55	.0706
56	********
57	********
58	.0721
59	.0709
60	.0709
61	.0717
62	.0709
63	********
64	********
65	.0696
66	.0700
67	.0700
68	.0700
69	.0686
70	********
71	********

NOTE--ASTERISK DENOTES NO DATA

FRAME NUMBER 12 NORCOLD FUEL

DAY	CONSUMPTION (LBM/HR)
71	********
72	********
73	********
74	********
75	.0657
76	.0713
77	********
78	********
79	.0659
80	.0700
81	.0679
82	.0634
83	.0619
84	********
85	********
86	********
87	********
88	********
89	********
90	********
91	********
92	********
93	********
94	********
95	********
96	********
97	********
98	********
99	********
100	********
101	********
102	********
103	********
104	********
105	********
106	********

NOTE--ASTERISK DENOTES NO DATA

FRAME NUMBER 13 NORCOLD FUEL

DAY	CONSUMPTION (LBM/HR)
1	********
2	.0650
3	.0633
4	.0633
5	.0629
6	.0628
7	********
8	********
9	********
10	.0629
11	.0625
12	.0625
13	.0632
14	********
15	********
16	.0617
17	.0625
18	.0658
19	.0625
20	.0624
21	********
22	********
23	.0654
24	.0617
25	.0638
26	********
27	.0629
28	********
29	********
30	.0625
31	.0642
32	.0609
33	.0663
34	.0614
35	********
36	********

NOTE--ASTERISK DENOTES NO DATA

FRAME NUMBER 14 NORCOLD FUEL

DAY	CONSUMPTION (LBM/HR)
36	********
37	.0625
38	.0663
39	.0642
40	.0638
41	.0631
42	********
43	********
44	.0632
45	.0622
46	.0629
47	.0634
48	.0651
49	********
50	********
51	.0638
52	.0646
53	********
54	.0621
55	.0631
56	********
57	********
58	.0650
59	.0604
60	********
61	.0627
62	.0646
63	********
64	********
65	.0608
66	.0613
67	.0655
68	.0626
69	.0628
70	********
71	********

NOTE--ASTERISK DENOTES NO DATA

FRAME NUMBER 15 NORCOLD FUEL

DAY	CONSUMPTION (LBM/HR)
71	********
72	.0642
73	.0671
74	.0617
75	.0672
76	.0634
77	********
78	********
79	********
80	.0634
81	.0630
82	.0671
83	.0624
84	********
85	********
86	.0684
87	.0650
88	.0670
89	.0661
90	.0639
91	********
92	********
93	.0648
94	.0657
95	.0642
96	.0609
97	.0644
98	********
99	********
100	.0632
101	.0631
102	.0642
103	.0621
104	.0664
105	********
106	********

NOTE--ASTERISK DENOTES NO DATA

FRAME NUMBER 16 NORCOLD FUEL

DAY	CONSUMPTION (LBM/HR)
106	********
107	.0675
108	.0675
109	.0648
110	.0648
111	********
112	********
113	********
114	.0642
115	.0770
116	.0884
117	.0932
118	.0914
119	********
120	********
121	.0770
122	.0673
123	********
124	.0671
125	.0685
126	********
127	********
128	.0000
129	.0617
130	.0774
131	.0675
132	.0756
133	********
134	********
135	.0779
136	.0716
137	.0821
138	.0706
139	.0770
140	********
141	********

NOTE--ASTERISK DENOTES NO DATA

FRAME NUMBER 17 NORCOLD FUEL

DAY	CONSUMPTION (LBM/HR)
1	********
2	.0656
3	.0639
4	.0619
5	.0614
6	.0614
7	********
8	********
9	********
10	.0616
11	.0624
12	.0671
13	.0625
14	********
15	********
16	.0586
17	.0590
18	.0621
19	.0572
20	.0364
21	********
22	********
23	.0671
24	.0587
25	.1030
26	.0766
27	.0760
28	********
29	********
30	.0760
31	.0433
32	.0721
33	.0458
34	.0575
35	********
36	********

NOTE--ASTERISK DENOTES NO DATA

FRAME NUMBER 18 NORCOLD FUEL

DAY	CONSUMPTION (LBM/HR)
1	********
2	.0729
3	.0460
4	.0622
5	.0538
6	.0711
7	********
8	********
9	.0870
10	.0787
11	.0800
12	.0775
13	********
14	********
15	********
16	********
17	********
18	********
19	********
20	********
21	********
22	********
23	********
24	********
25	********
26	********
27	********
28	********
29	********
30	********
31	********
32	********
33	********
34	********
35	********
36	********

NOTE--ASTERISK DENOTES NO DATA

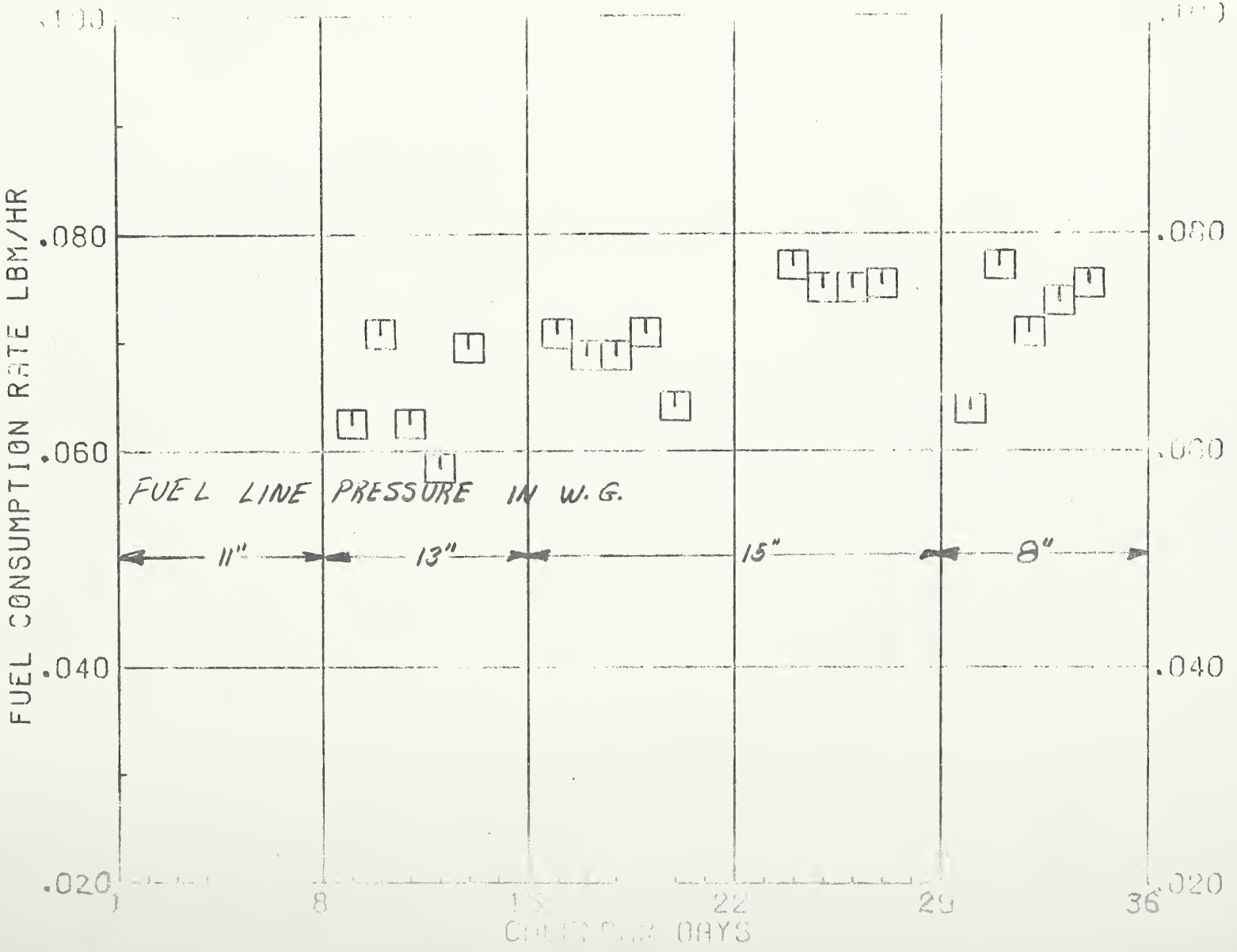
Appendix D Fuel Consumption Rate Plots

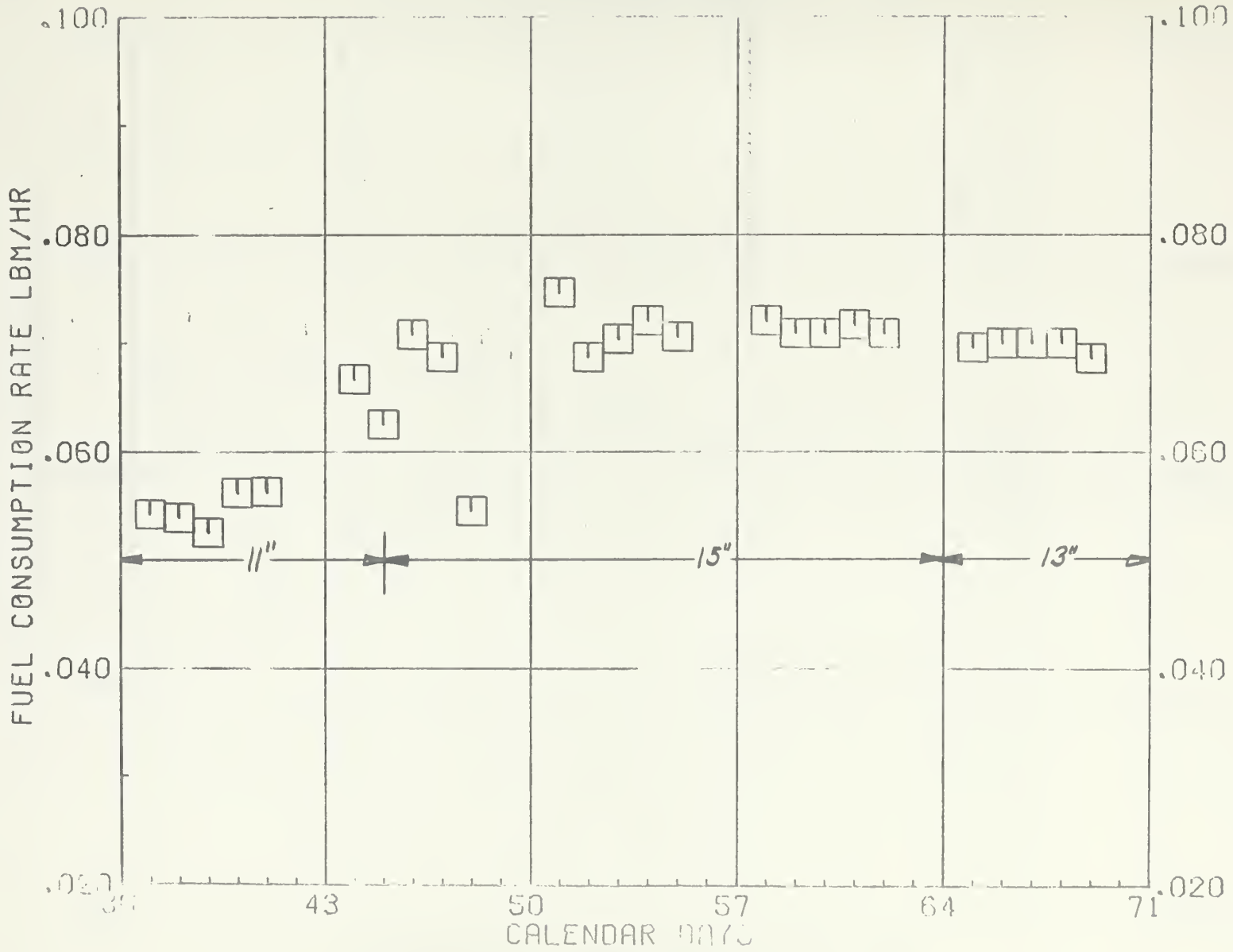
	Frame Number
Fuel Line Pressure Test	10, 11, 12
Elevated Temperature Test	13, 14, 15, 16
Thermostat Test I	17
Thermostat Test II	18

SYMBOL LEGEND

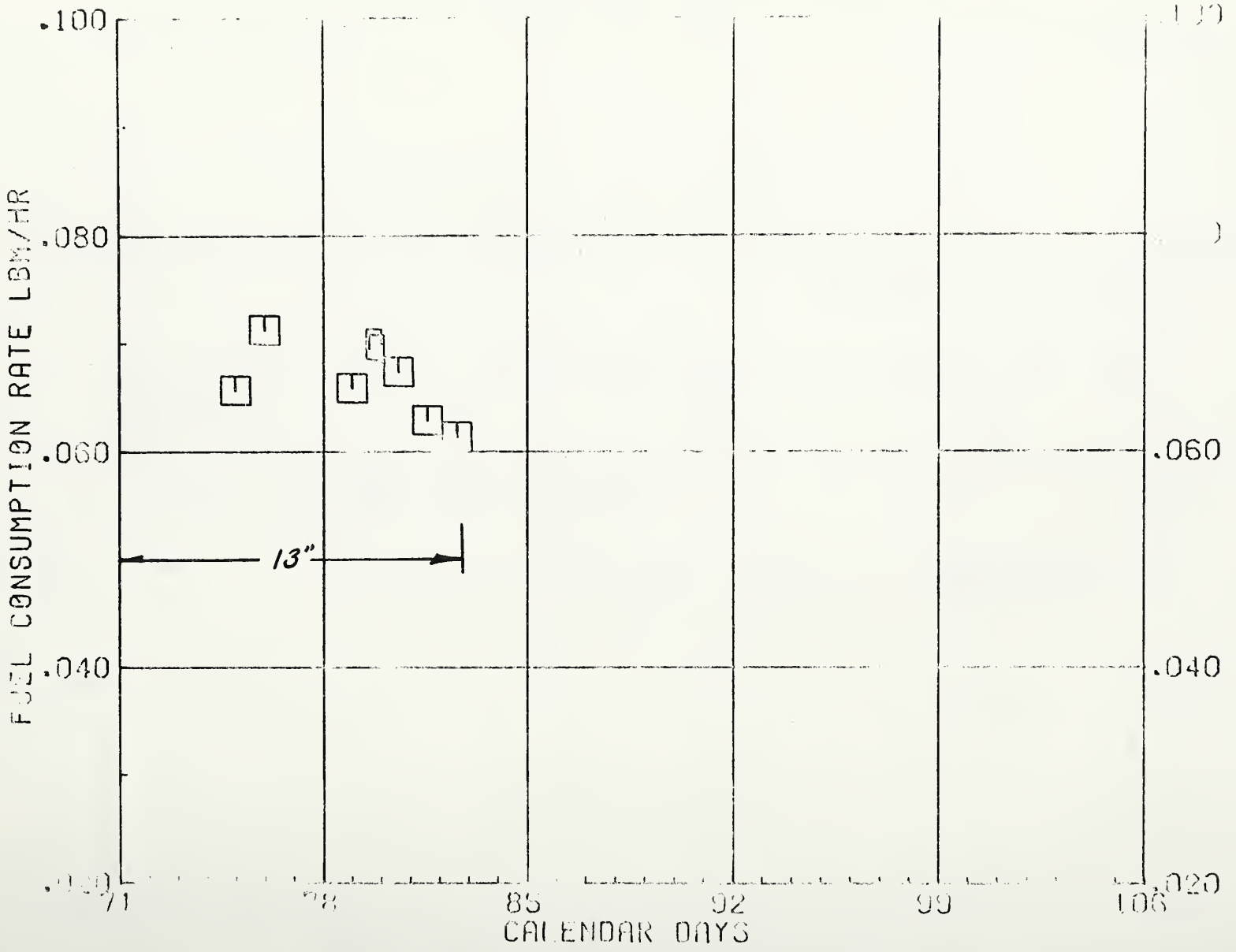
NORCOLD UNIT

FUEL CONSUMP RATE VS TEST PERIOD
NORCOLD REFRIGERATOR





FRAME NUMBER 11

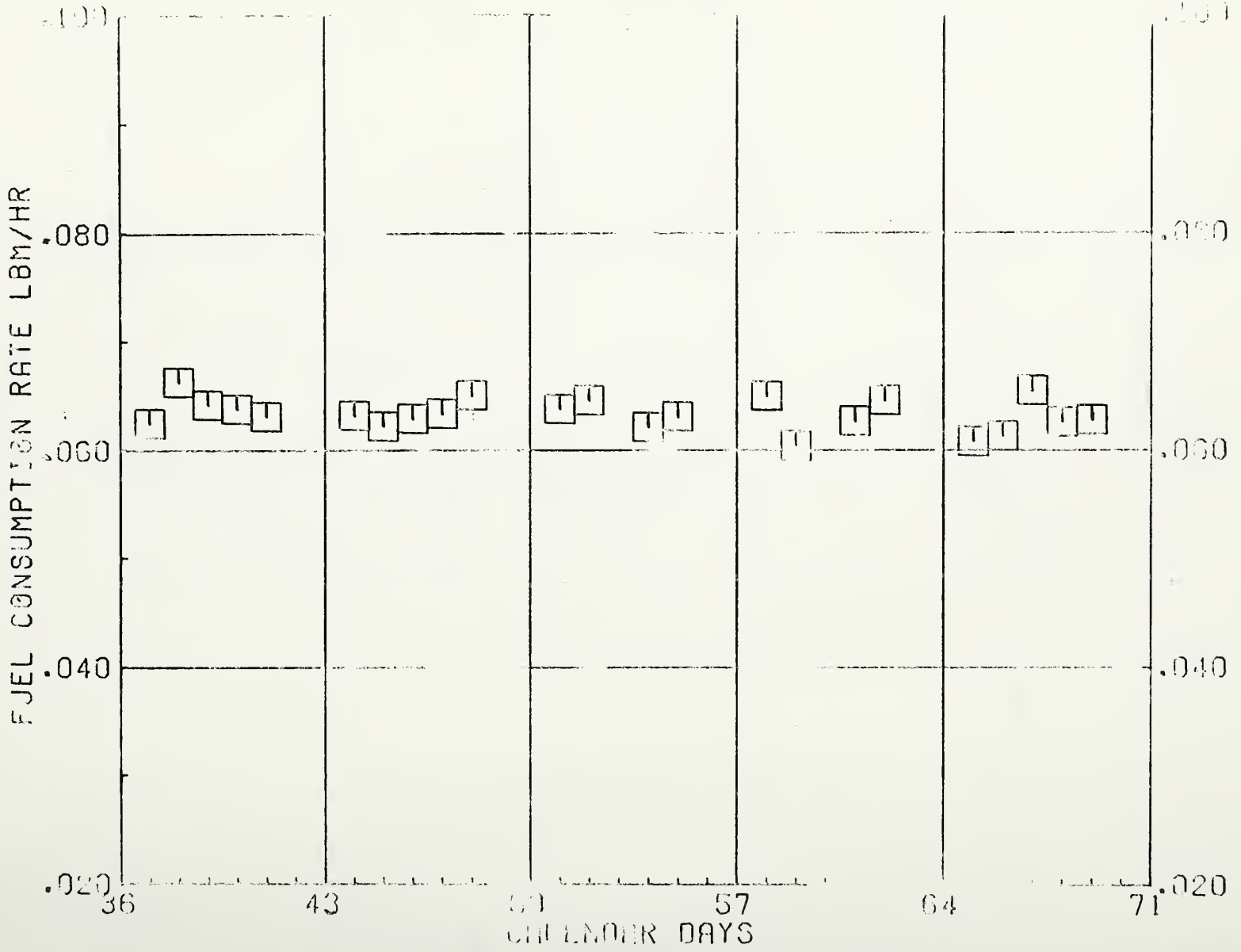


FRAME NUMBER 12

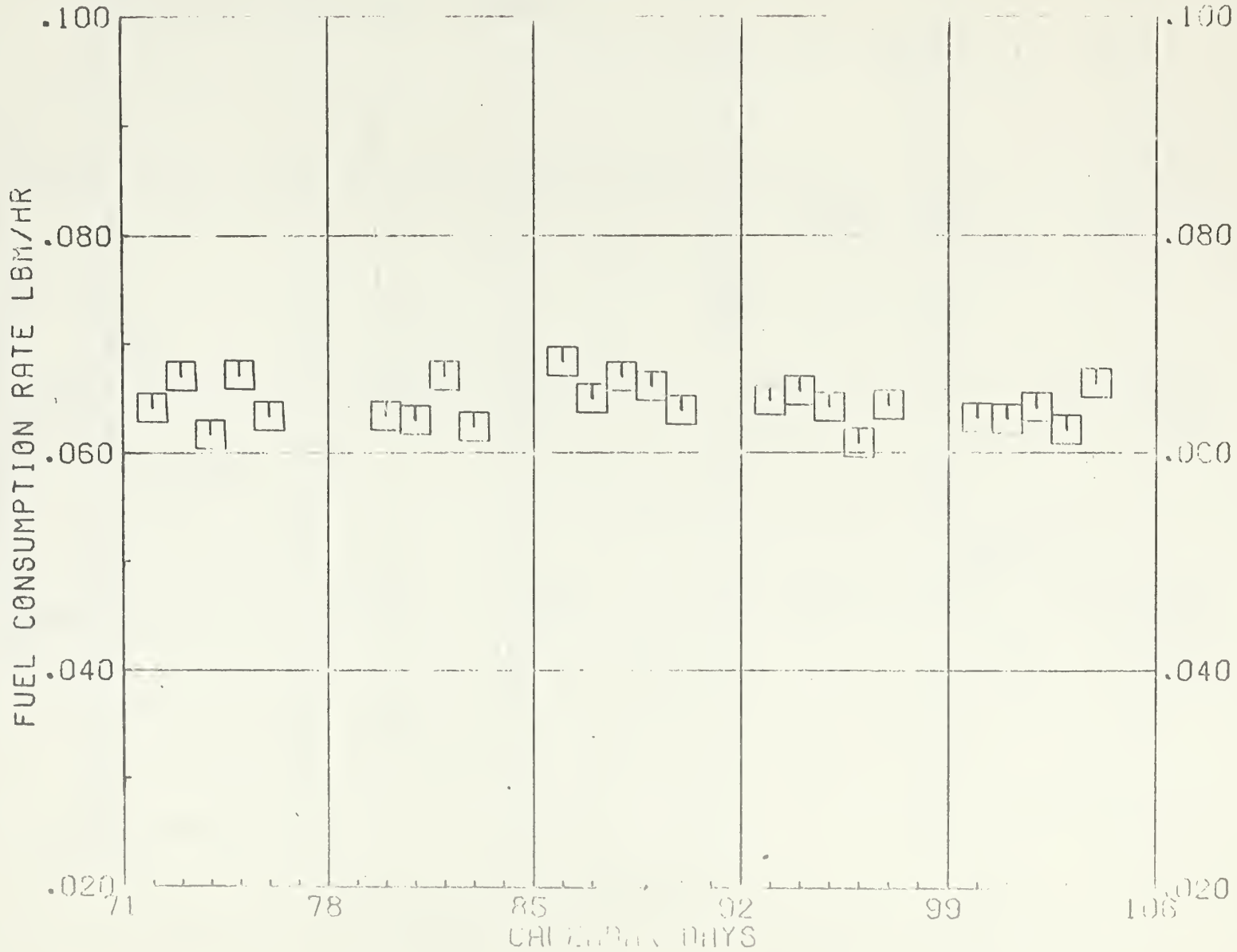
FUEL CONSUMP RATE VS TEST PERIOD
NORCOLD REFRIGERATOR

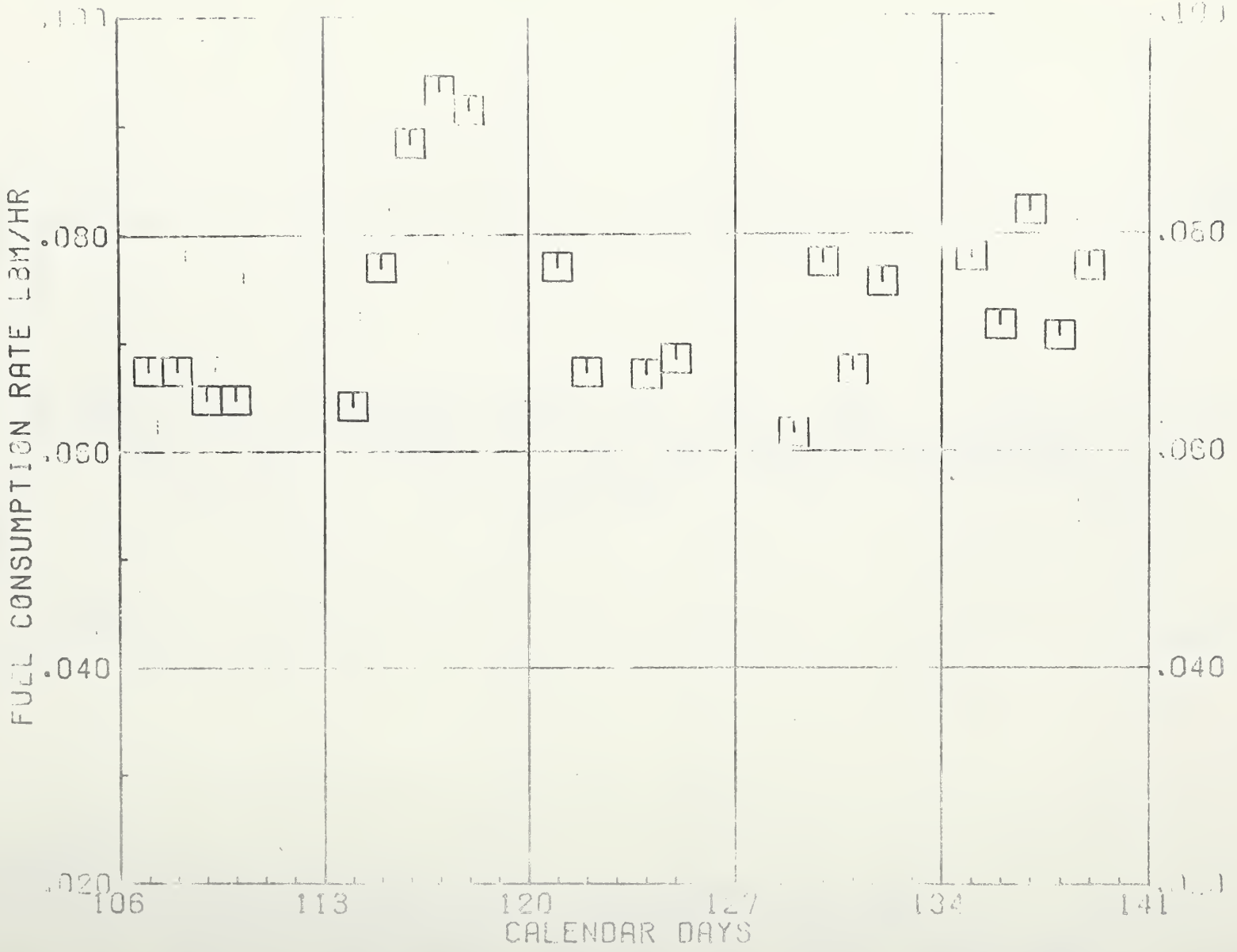
FRAME NUMBER 13

FUEL CONSUMP RATE VS TEST PERIOD
NORCOLD REFRIGERATOR

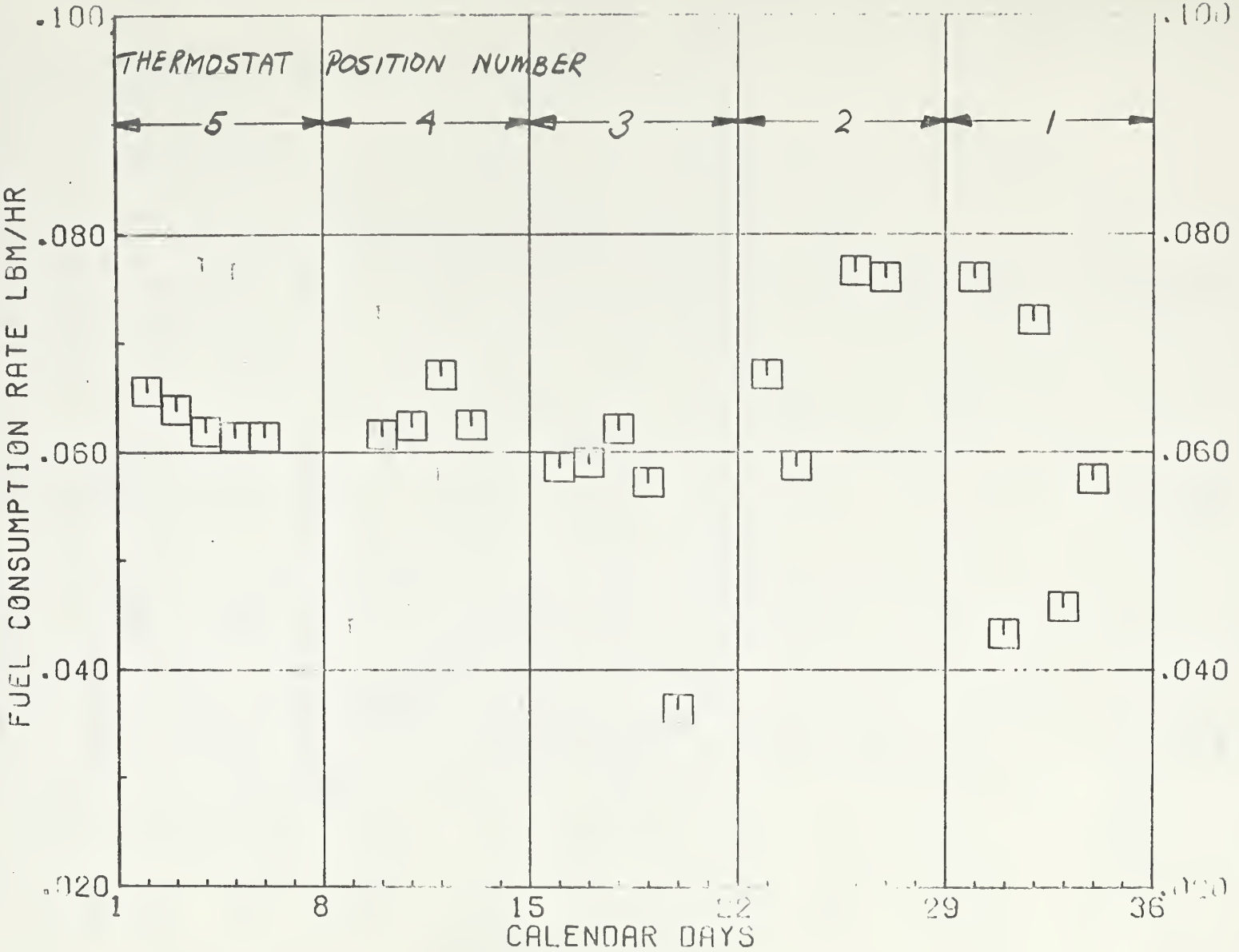


FUEL CONSUMP RATE VS TEST PERIOD
NORCOLD REFRIGERATOR



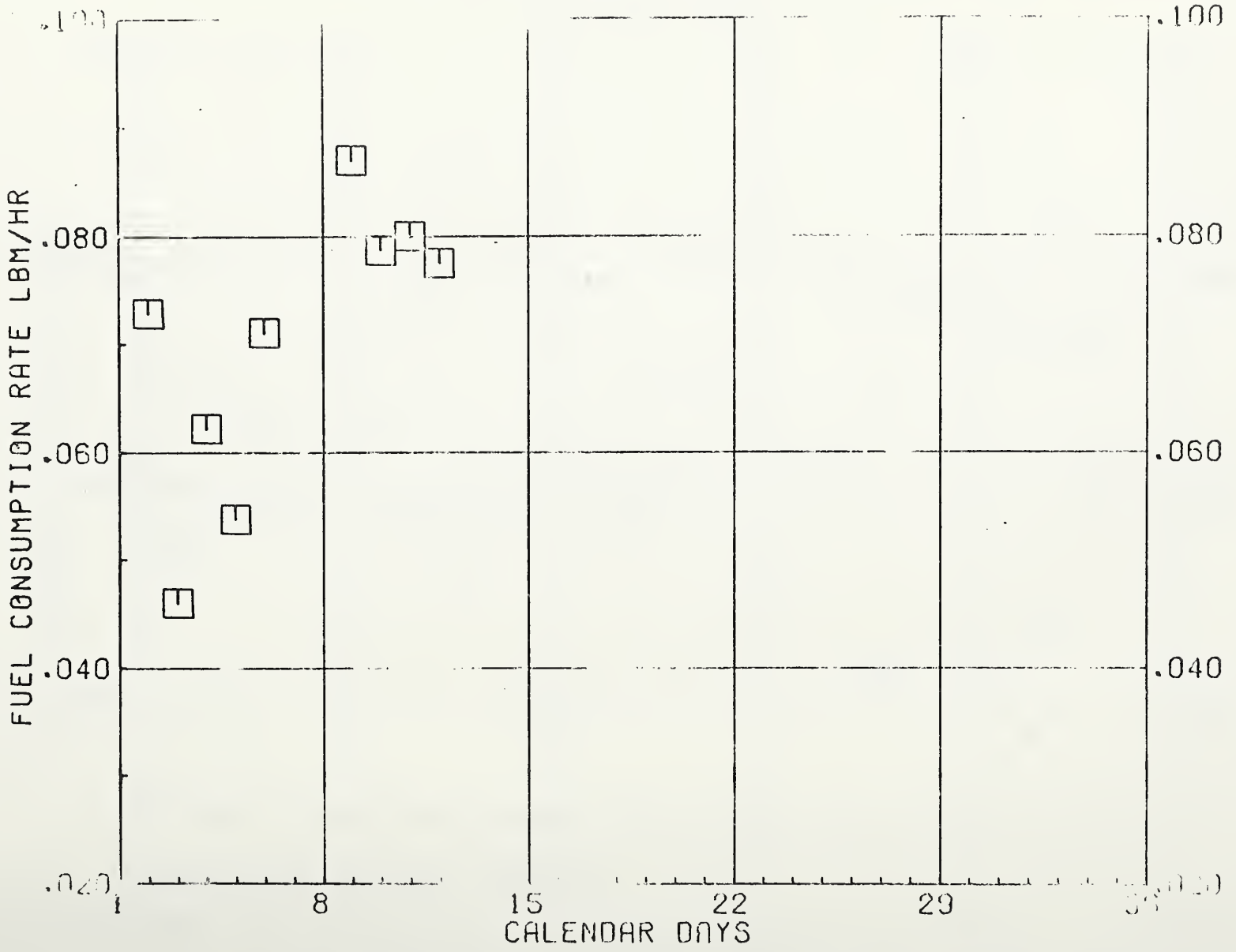

FUEL CONSUMP RATE VS TEST PERIOD
NORCOLD REFRIGERATOR
FUEL CONSUMPTION RATE LBM/HR
.080
.060
.040
.020
106
113
120
127
134
141
CALENDAR DAYS
FRAME NUMBER 16

FUEL CONSUMP RATE VS TEST PERIOD
NORCOLD REFRIGERATOR



FRAME NUMBER 17

FUEL CONSUMP RATE VS TEST PERIOD
NORCOLD REFRIGERATOR



FRAME NUMBER 18


DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS