MCR-80-1320
Contract DE-AC03-79SF 10534

Software Requirements
Addendum

Test Plan

April 1980

Molten Salt Central Receiver
Subsystem Research
Experiment

Alternate Central Receiver Power System, Phase II

MARTIN MARIETTA

Badger

Arizona Public Service Co
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SOFTWARE REQUIREMENTS

ADDENDUM TO

MOLTEN SALT RECEIVER

SUBSYSTEM RESEARCH EXPERIMENT

TEST PLAN

SOFTWARE REQUIREMENTS

CONTENTS

I. INTRODUCTION

The purpose of this document is to define the software requirements for the Martin Marietta Molten Salt Central Receiver Tests at the Central Receiver Test Facility. Contained in this document are definitions of algorithms, sensor calibration curves, CRT displays, heliostat aiming, data reduction, and an instrumentation list. This document will be updated periodically so that it will reflect the current requirements.

II. ALGORITHMS

A. RECEIVER FLOW CONTROL

The energy balance on the receiver is given by:

$$(1) \qquad \dot{m}_a C_p T_i - \dot{m}_a C_p T_o + q_R' = \sum_N (MC_p)_N \left(\frac{TN' - TN}{\Delta\tau}\right)$$

Where:

$\Delta\tau$ = Scan Rate Hrs

$\dot{m}_a = \frac{\dot{m}' + \dot{m}}{2}$

$\dot{m}'$ = Salt flow rate at new time, LB_M/HR

$\dot{m}$ = Salt Flow rate at old time, LB_M/HR

C_p = Salt Specific heat = 0.371 $^{BTU}/_{LB_M} - {}^oF$

$T_i = \frac{(TT\text{-}3B)' + (TT\text{-}3B)}{2}$

$(TT\text{-}3B)'$ = Salt inlet temp. at new time, ^oF

$(TT\text{-}3B)$ = Salt inlet temp. at old time, ^oF

$\frac{(TT\text{-}5B)' + (TT\text{-}5B)}{2}$

$(TT\text{-}5B)'$ = Salt outlet temp. at new time, ^oF

$(TT\text{-}5B)$ = Salt outlet temp. at old time, ^oF

q_R' = Power absorbed in receiver, BTU/HR

$(MC_p)_N$, TN } Values defined on Page 2

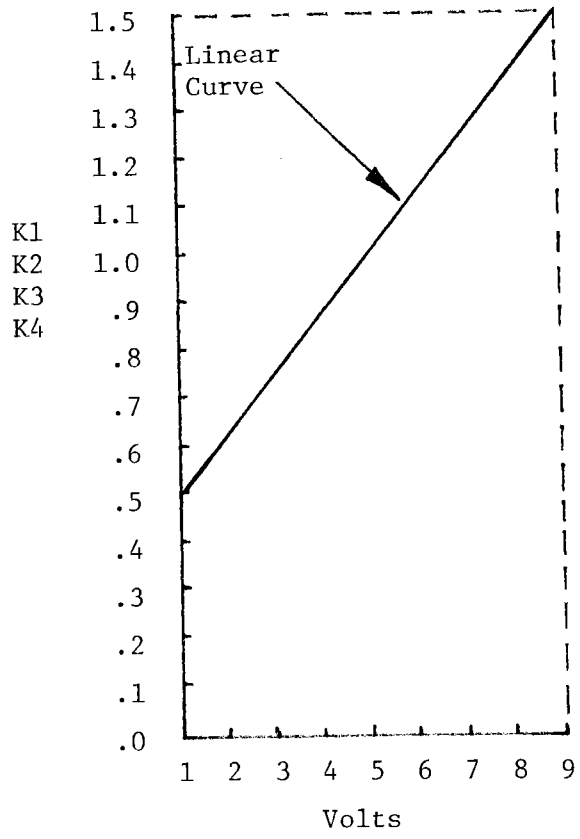
$$\sum_N (MC_p)_N \frac{(TN' - TN)}{\Delta\tau} = 6.38 \cdot K1 \left(\frac{TRH1' - TRH1}{\Delta\tau}\right) + 12.8 \cdot K1 \frac{(TRH2' - TRH2)}{\Delta\tau} + \ldots\ldots\ldots 25.6 \cdot K4 \left(\frac{TRFGL6' - TRFGL6}{\Delta\tau}\right)$$

Primed temps. are at new time, unprimed temp. are at old time

K1, K2, K3, and K4 are defined on Page 2.

Temps.	MC_P, BTU/^oF	
TRH 1	6.38	. K1
TRH 2	12.8	
TRH 3		
TRH 4		
TRH 5		
TRH 6		
TRH 7		
TRH 8		
TRH 9		
TRH 10		
TRH 11		
TRH 12		
TRH 13		
TRH 14		
TRH 15		
TRH 16		
TRH 17		
TRH 18		
TRH 19	6.38	.
TRFGU 1	42.6	. K2
TRFGU 2	36.5	.
TRFGU 3	30.4	.
TRFGU 4	30.4	.
TRFGU 5	36.5	.
TRFGU 6	42.6	.
TRFGM 1	25.6	. K3
TRFGM 2	21.9	.
TRFGM 3	18.3	.
TRFGM 4	18.3	.
TRFGM 5	21.9	.
TRFGM 6	25.6	.
TRFGL 1	25.6	. K4
TRFGL 2	21.9	.
TRFGL 3	18.3	.
TRFGL 4	18.3	.
TRFGL 5	21.9	.
TRFGL 6	25.6	.

K1, K2, K3 and K4 are correction coefficients which are set by the "Tweekers" on the control console. The signal from the console is 1 to 9 volts. The conversion from analog to digital is given by the following relation.



Solve Eq. (1) for q_R'

Then:

$$\dot{m}_{NEW} = \frac{q_R'}{C_p\ (T_{sp} - T_i)} \quad . \text{ LBM/HR}$$

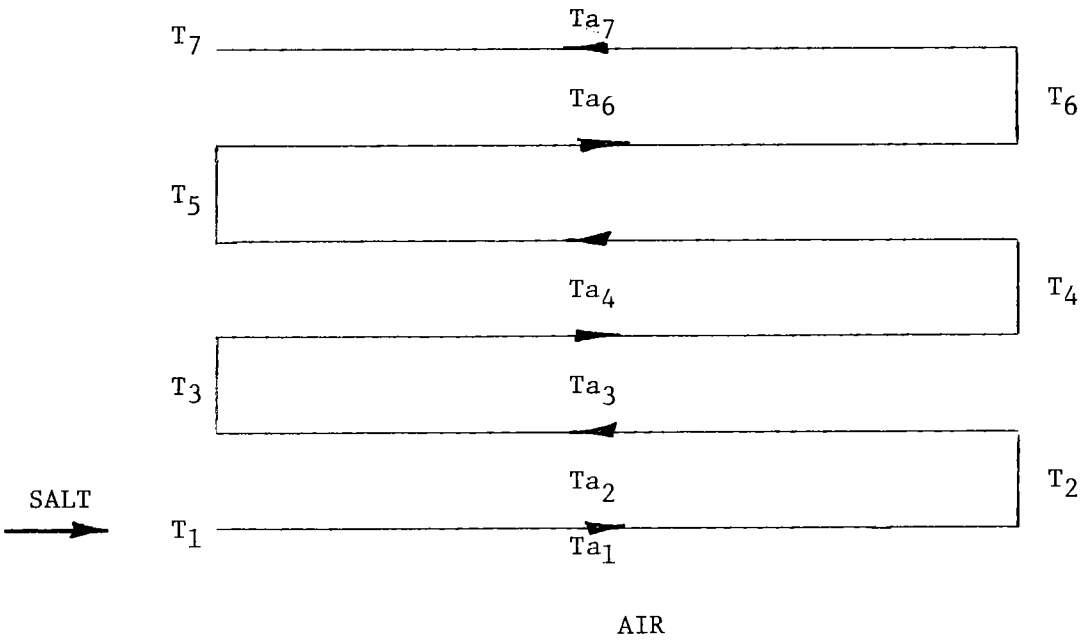
T_{sp} = Salt outlet set point temp., °F

Alarm, by flashing the $\dot{m}_{new}$ readout on the CRT, if any of the following situations occur.

$\frac{TN' - TN}{\Delta\tau}$	>	10 °F/SEC
$T_o - T_i$	>	600 °F
$\dot{m}_a$	>	100,000 LBM/HR
$\dot{m}_{NEW}$	>	100,000 LBM/HR
$\dot{m}_a$	<	22,000 LBM/HR
$\dot{m}_{NEW}$	<	22,000 LBM/HR
ANY TEMP	>	1150 °F
ANY TEMP	<	500 °F

II. ALGORITHMS

B. AIR-COOLER CONTROL



GIVEN:

$\dot{m}_s$	=	Salt mass rate of flow, lb/hr
Ta_1	=	Air inlet temp., °F
T_1	=	Salt inlet temp., °F
$T_{7_{S.P.}}$	=	Salt outlet set point temp., °F

PROBLEM: Find the pressure on the diaphragm which sets the fan blade pitch to yield the salt outlet set point temp.

$$P = 15.0348 - 7.7194 \times 10^{-5} \cdot Q + \frac{0.61202}{\text{TAN}(5.1371 \times 10^{-5} \cdot Q - 0.728544)}$$

The argument for the TAN function is in radians

P = Blade pitch diaghragm pressure, psi

$\dot{Q}_a$ = Air vol. rate of flow, ft^3/min

$\dot{m}_a$ = Air mass rate of flow, lb/hr

$= \dot{Q}_a[31.8/(Ta_1 + 460)] \times 60$

$(\frac{UA}{L})_s$ = overall conductance (per ft of tube) on salt side of tube, Btu/hr-ft-°F

$= N_U \frac{k_s}{D_i} \times \pi D_i$

$= .023\ Re^{.8}\ Pr^{.4} \times \frac{k_s}{D_i} \times \pi D_i$

$= .023\ (\frac{4\ \dot{m}_s}{\pi\ D_i\ \mu\ N_T})^{.8}\ Pr^{.4}\ \ k_s\ \pi$

$= .023\ (\frac{4\ \dot{m}_s\ \text{lb/hr} \times \frac{\text{HR}}{3600\ \text{sec}}}{\pi(.834/12)\ \text{FT} \times 1.11 \times 10^{-3}\ \text{LB/FT-SEC} \times 17.5})^{.8}\ \ 6.45^{.4} \times .23 \times \pi$

$= 0.012\ (\dot{m}_s)^{.8}$

* SEE PAGE 8

N_U = Nusselt No.

R_e = Reynolds No.

P_r = Prandtl No.

k_s = Salt conductivity, Btu/hr-ft-°F

D_i = Tube inside dia, ft

μ = Salt viscosity, lb/ft-sec

N_T = Avg. No. of tubes per pass

$$\dot{m}_s \, Cp_s \, (T_1 - T_{7SP}) = \dot{m}_a \, Cp_a \, (T_{a7} - T_{a1})$$

Cp_s = Salt specific heat, Btu/lb-°F

= 0.371

Cp_a = Air specific heat, Btu/lb-°F

= 0.24

$$T_{a7} = T_{a1} + \frac{\dot{m}_s Cp_s}{\dot{m}_a Cp_a} (T_1 - T_{7SP})$$

T_{aa} = Avg. air temp., °F

$$T_{aa} = \frac{T_{a1} + T_{a7}}{2}$$

$$T_{aa} = T_{a1} + 0.773 \frac{\dot{m}_s}{\dot{m}_a} (T_1 - T_{7SP})$$

$\left(\frac{UA}{L}\right)_a$ = Overall conductance per ft of tube on air side of tube, Btu/hr-ft-°F

$$= [5.833 + 3.417 \times 10^{-4} \, \dot{Q}_a - 1.2 \times 10^{-9} \, (\dot{Q}_a)^2] + [0.00252 + 2.832 \times 10^{-7} \, \dot{Q}_a - 1.558 \times 10^{-12} \, (\dot{Q}_a)^2] T_{aa}$$

$\left(\frac{UA}{L}\right)_o$ = Total overall conductance per ft of tube, Btu/hr-ft-°F

$$= \frac{1}{1/(UA/L)_s + 1/(UA/L)_a}$$

* $R_e = 0.262\ \dot{m}_s$

If $R_e \geq 2300$ use $(UA/L)_s$ Eq from Page 6

If $R_e < 2300$

$$(UA/L)_s = 3.66 \frac{k_s}{D_i} \pi D_i$$

$$= 2.64$$

$$T_2 = T_{a1} + (T_1 - T_{a1})\ e^{-\frac{(UA/L)_o L}{(\dot{m}_s/N_T)Cp_s}}$$

L = Length of pass, ft

$$T_2 = T_{a1} + (T_1 - T_{a1})\ e^{-\frac{1108(UA/L)_o}{\dot{m}_s}}$$

$$\dot{m}_s\ Cp_s\ (T_1 - T_2) = \dot{m}_a\ Cp_a\ (T_{a2} - T_{a1})$$

$$T_{a2} = T_{a1} + \frac{\dot{m}_s\ Cp_s}{\dot{m}_a\ Cp_a}\ (T_1 - T_2)$$

$$T_{a2} = T_{a1} + 1.55 \frac{\dot{m}_s}{\dot{m}_a} (T_1 - T_2)$$

$$T_3 = T_{a2} + (T_2 - T_{a2})\ e^{\frac{-1108(UA/L)_o}{\dot{m}_s}}$$

$$T_{a3} = T_{a2} + 1.55 \frac{\dot{m}_s}{\dot{m}_a} (T_2 - T_3)$$

$$T_N = T_{a(N-1)} + (T_{(N-1)} - T_{a(N-1)})\ e^{\frac{-1108(UA/L)_o}{\dot{m}_s}}$$

$$T_{aN} = T_{a(N-1)} + 1.55 \frac{\dot{m}_s}{\dot{m}_a}\ (T_{(N-1)} - T_N)$$

SUMMARY

GIVEN: $\dot{m}_s$, T_{a1}, T_1, $T_{7S.P.}$

Assume value for $\dot{Q}_a$

$$\dot{m}_a = \dot{Q}_a \, [31.8 / (T_{a1} + 460)] \times 60$$

$$R_e = 0.262 \, \dot{m}_s$$

If $R_e \geq 2300$

$$(UA/L)_s = 0.012 \, (m_s)^{.8}$$

If $R_e < 2300$

$$(UA/L)_s = 2.64$$

$$T_{aa} = T_{a1} + 0.773 \, \frac{\dot{m}_s}{\dot{m}_a} \, (T_1 - T_{7S.P.})$$

$$(UA/L)_a = [5.833 + 3.417 \times 10^{-4} \, \dot{Q}_a - 1.2 \times 10^{-9} \, (\dot{Q}_a)^2] + [0.00252 + 2.832 \times 10^{-7} \, \dot{Q}_a - 1.558 \times 10^{-12} \, (\dot{Q}_a)^2] T_{aa}$$

$$(UA/L)_o = \frac{1}{1 / (UA/L)_s + 1 / (UA/L)_a}$$

$$T_2 = T_{a1} + (T_1 - T_{a1}) \, e^{\frac{-1108 (UA/L)_o}{\dot{m}_s}}$$

$$T_{a2} = T_{a1} + 1.55 \, \frac{\dot{m}_s}{\dot{m}_a} \, (T_1 - T_2)$$

$$T_3 = T_{a2} + (T_2 - T_{a2}) \, e^{\frac{-1108 (UA/L)_o}{\dot{m}_s}}$$

$$T_{a3} = T_{a2} + 1.55 \, \frac{\dot{m}_s}{\dot{m}_a} \, (T_2 - T_3)$$

.
.
.

$$T_7 = T_{a6} + (T_6 - T_{a6}) \, e^{\frac{-1108 (UA/L)_o}{\dot{m}_s}}$$

Compare T_7 to $T_{7S.P.}$

If $T_{7S.P.} + T_{db} < T_7 < T_{7S.P.} - T_{db}$, T_{db} = TEMP DEAD BAND

Assume another value for $\dot{Q}_a$ and repeat calculation for T_7.

If $T_{7S.P.} + T_{db} > T_7 > T_{7S.P.} - T_{db}$

Set Diaghragm Pressure

$$P = 15.0348 - 7.7194 \times 10^{-5} \cdot Q + \frac{0.61202}{\text{TAN}(5.1371 \times 10^{-5} \cdot Q - 0.728544)}$$

The argument for the TAN function is in radians

If $Q < 21266$ Set $P = 15$

IF $Q > 73000$ Set $P = 3$

$T_{db} = 10°F$

The sensor I.D. numbers to be used for the air-cooler control calculations are as follows:

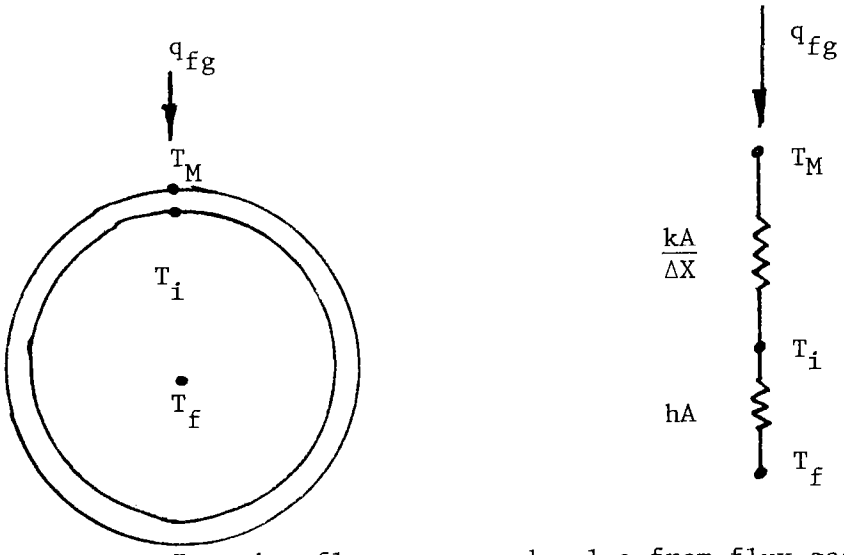
T_1 ⟶ TT-5BC

T_{a1} ⟶ TAIRINC

T_7 ⟶ TT-7BC

II. ALGORITHMS

C. CALCULATION OF MAX. TUBE WALL TEMP.



q_{fg} = Incoming flux, measured value from flux gage measurement, Btu/hr-ft^2

T_f = Measured temp., °F (fluid temp. & back wall temp.)

T_M = Max. tube temp., °F

T_i = Inside tube temp. adjacent to incoming flux, °F

k = Tube conductivity, Btu/hr-ft-°F

ΔX = Tube wall thickness, ft (0.065" = 0.00542 ft)

h = Molten salt film coeff., Btu/hr-ft^2-°F

$\dot{m}$ = Molten salt flow rate (total thru receiver), lb/hr

RANGE OF VALUES:

q_{fg}: 50,000 to 220,000 Btu/hr-ft^2

T_f: 550 to 1050°F

$\dot{m}$: 20,000 to 92,000 lbm/hr

$$\frac{kA}{\Delta X}(T_i - T_M) + q_{fg}A = 0$$

$$\frac{kA}{\Delta X}(T_M - T_i) + hA(T_f - T_i) = 0$$

AREAS DROP OUT (A)

$$T_M = T_f + \frac{(\frac{k}{\Delta X} + h)}{(\frac{k}{\Delta X}) \times h} \quad q_{fg}$$

$$T_i = \frac{\frac{k}{\Delta X} T_M + h\, T_f}{\frac{k}{\Delta X} + h}$$

$$k = 7.02 + .00496\,(\frac{T_M + T_i}{2})$$

$$h = 0.023 \frac{k_f}{D_i} (\frac{4\,\dot{m}/16}{\pi D_i\ \mu \times 3600})^{.8} (\frac{\mu\ C_p \times 3600}{k_f})^{.4}$$

k_f = 0.23 Btu/hr-ft-°F

C_p = 0.371 Btu/lbm-°F

$\mu = [-2.702 + \frac{2469.3}{T_f} + 9.0667 \times 10^{-4}\ T_f] \times 10^{-3}$, lbm/ft-sec

D_i = Inside tube dia, ft = .62 / 12 = .05167 ft

SUMMARY

$$T_M = T_f + \frac{184.6\ k + h}{184.6\ k\ h}\ q_{fg}$$

$$T_i = \frac{184.6\ k\ T_M + h\ T_f}{184.6\ k + h}$$

$$k = 7.02 + .00496\ \left(\frac{T_M + T_i}{2}\right)$$

$$h = 0.023 \times \frac{.23}{.05167}\ \left(\frac{4\ \dot{m} / 16}{\mu \times .05167 \times \mu \times 3600}\right)^{.8}\ \left(\frac{\mu \times .371 \times 3600}{.23}\right)^{.4}$$

$$= 0.00662\ \left(\frac{\dot{m}}{\mu}\right)^{.8}\ (\mu)^{.4} = 0.00662\ (\dot{m})^{.8}\ (\mu)^{-.4}$$

$$\mu = [-2.702 + \frac{2469.3}{T_f} + 9.0667 \times 10^{-4}\ T_f] \times 10^{-3}$$

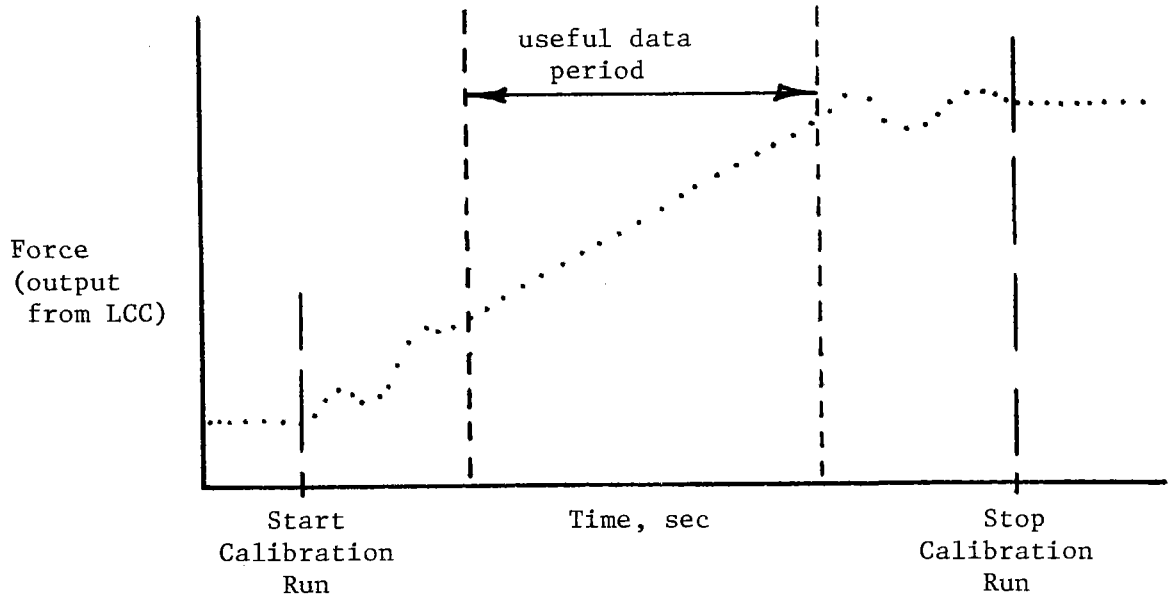
The sensor I.D. numbers to be used for the max. tube wall temp. calculations are as follows:

T_f, °F	q_{fg}, Btu/hr-ft^2
TRFGU1C	QRFGU1C
2	2
3	3
4	4
5	5
6	6
TRFGM1C	QRFGM1C
2	2
3	3
4	4
5	5
6	6
TRFGL1C	QRFGL1C
2	2
3	3
4	4
5	5
6	6

II. ALGORITHMS

D. WEIGH TANK CALCULATIONS

The data from the weigh tank load cell as a function of time will look something like the following curve.



The problem is to identify the "useful data period" during the calibration run and then to fit a linear curve (Force vs time) to the points within the "useful data period." The slope of this curve, expressed in lbm/hr, is the quantity we are seeking.

It would be helpful, although not necessary, to compute the uncertainty relative to the flow rate prediction.

II. ALGORITHMS

E. HIGH LOW ALARMS - TUBE DELTA TEMPS. (288)
(This data is on the ACUREX data logger)

Readings are grouped as follows:

T1P1D thru T16P1D
T1P2D thru T16P2D
T1P3D thru T16P3D
etc
T1P18D thru T16P18D

For each group average the sixteen temperatures to yield,

TAP1, TAP2, TAP3,.....TAP18

Compare average temps. to individual temperatures:

$$\left|\frac{TAP1 - T1P1D}{TAP1}\right|, \left|\frac{TAP1 - T2P1D}{TAP1}\right|, \ldots \left|\frac{TAP1 - T16P1D}{TAP1}\right|$$
$$\left|\frac{TAP2 - T1P2D}{TAP2}\right|, \left|\frac{TAP2 - T2P2D}{TAP2}\right|, \ldots \left|\frac{TAP2 - T16P2D}{TAP2}\right|$$
$$\vdots$$
$$\left|\frac{TAP18 - T1P18D}{TAP18}\right|, \left|\frac{TAP18 - T2P18D}{TAP18}\right|, \ldots \left|\frac{TAP18 - T16P18D}{TAP18}\right|$$

Alarm if any of the above values are greater than P.

Let P be an input variable....the initial value of P = 0.25.

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DATE 3-28-80

CUSTOMER Martin Marietta

P. O. NO. RH9-06322

INST TYPE Calorimeter

MODEL C-1341-C-43-012-072

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TESTED BY W. C. Clayton (HC 5)

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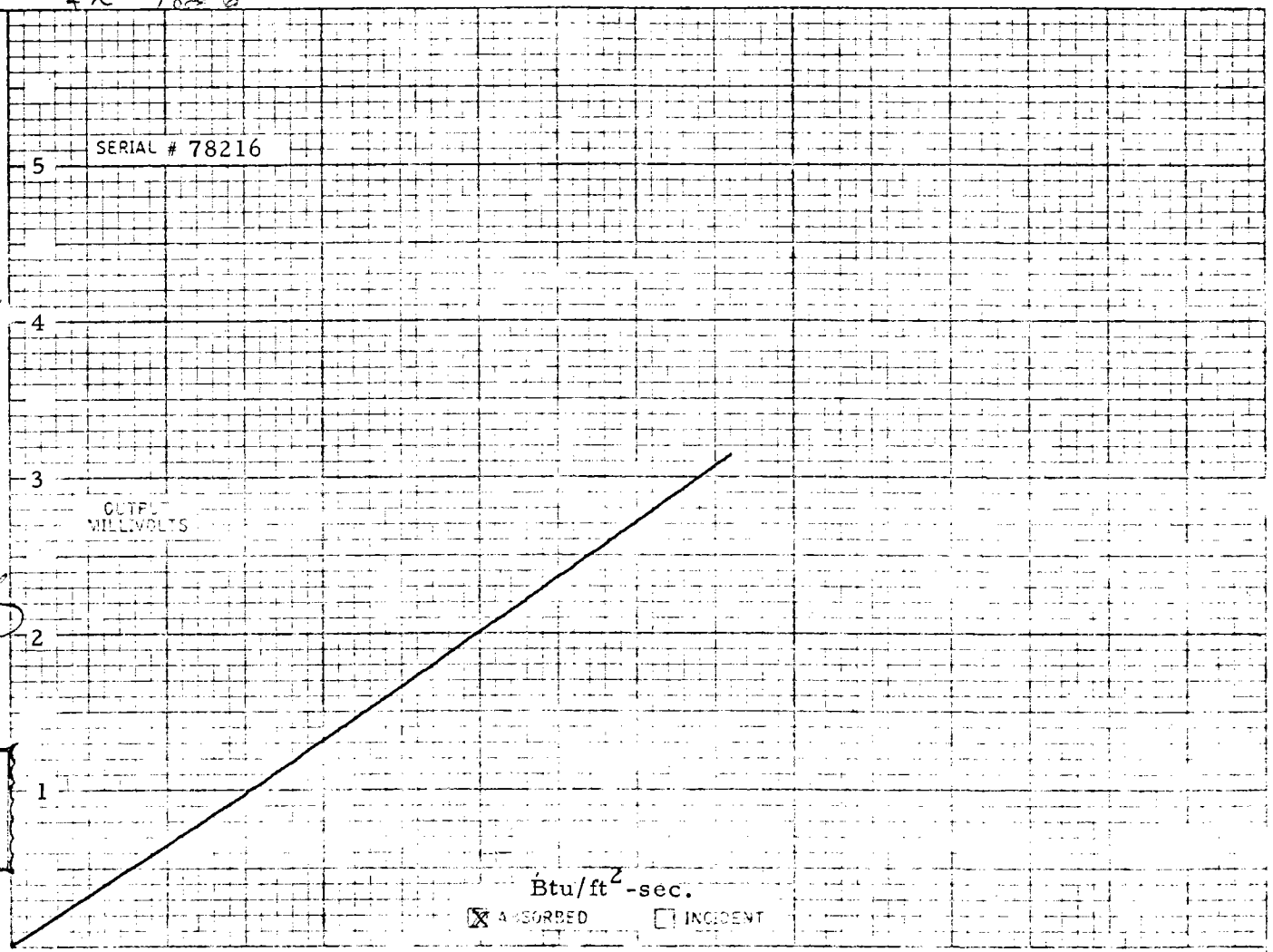
Julie A. Hango



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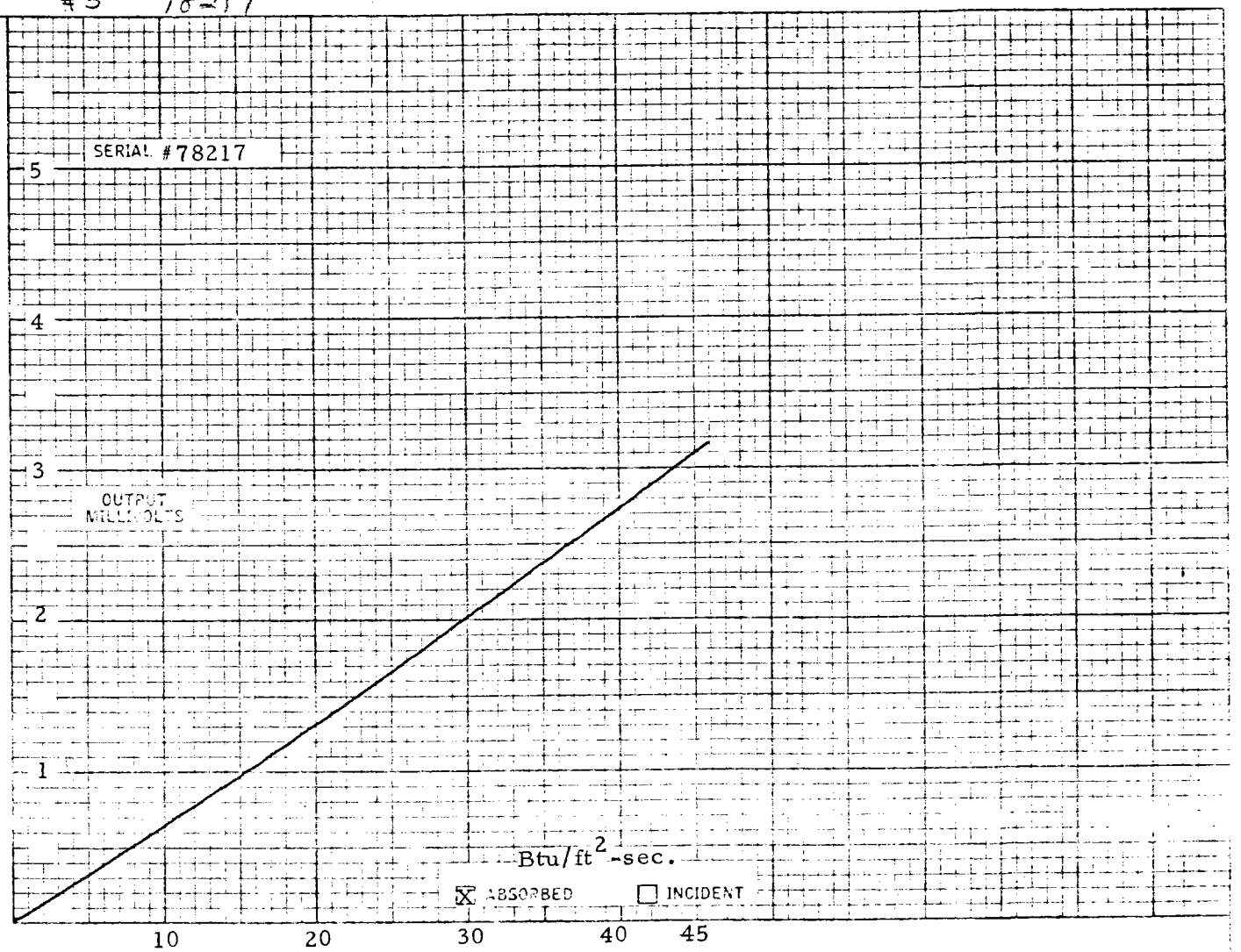

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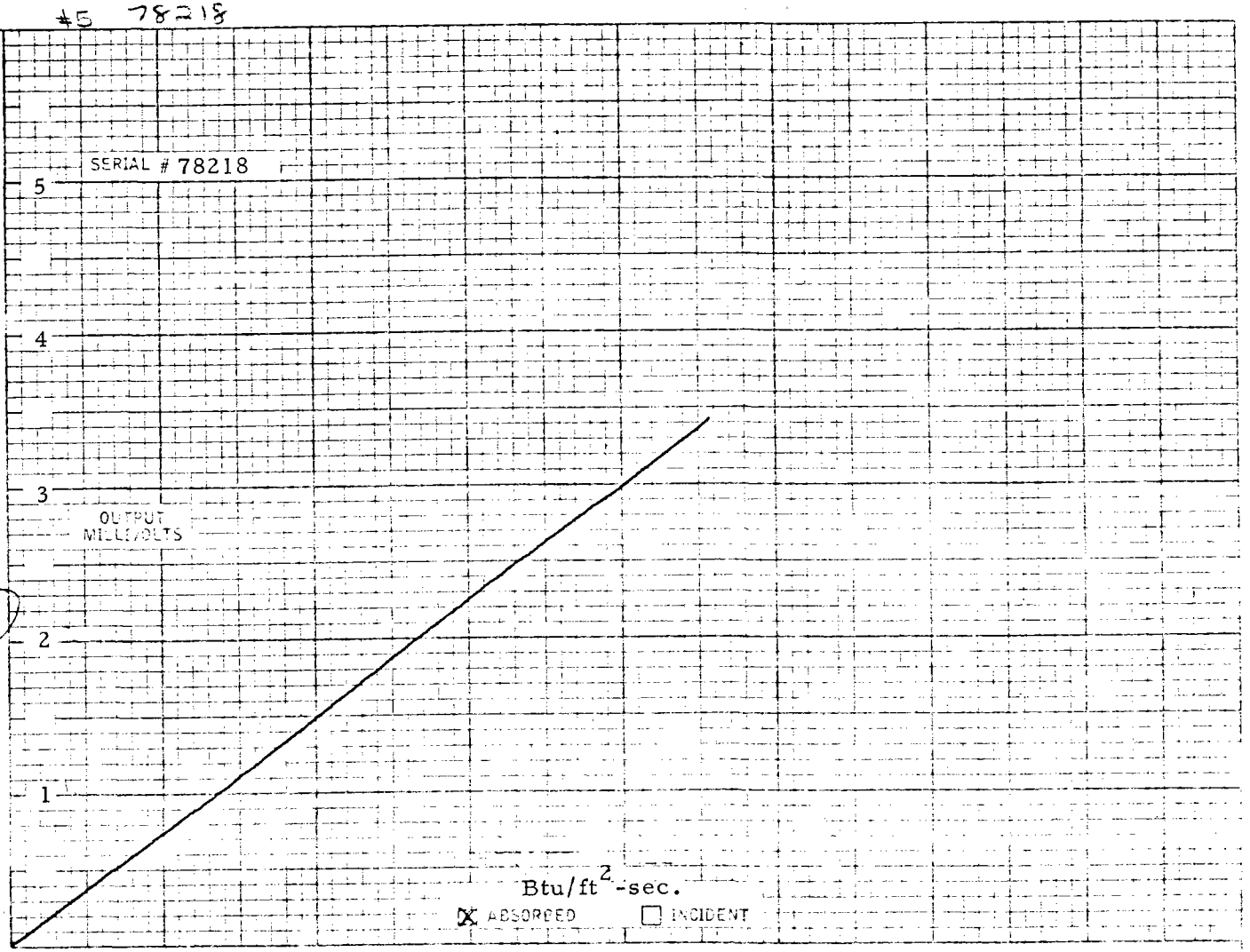

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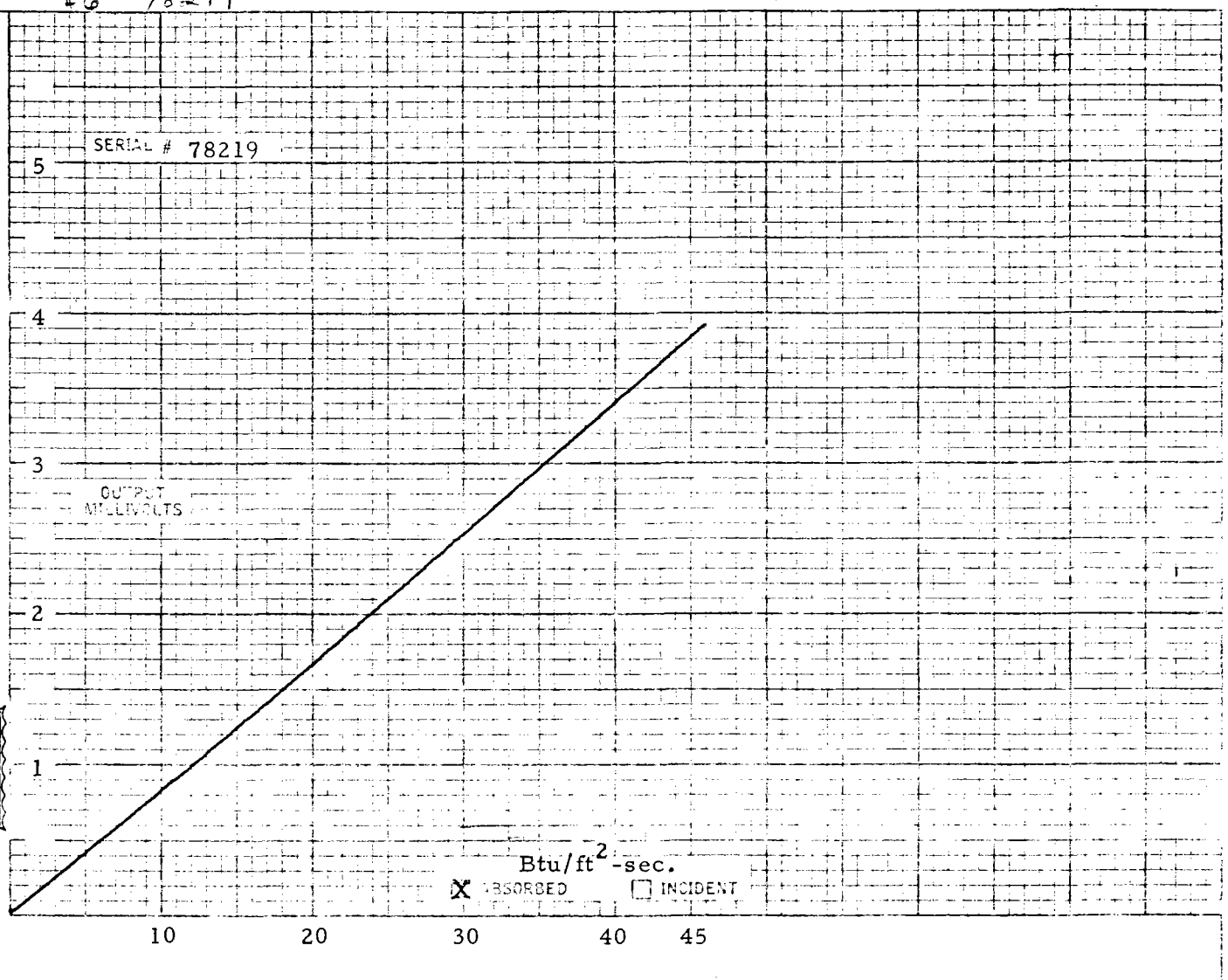

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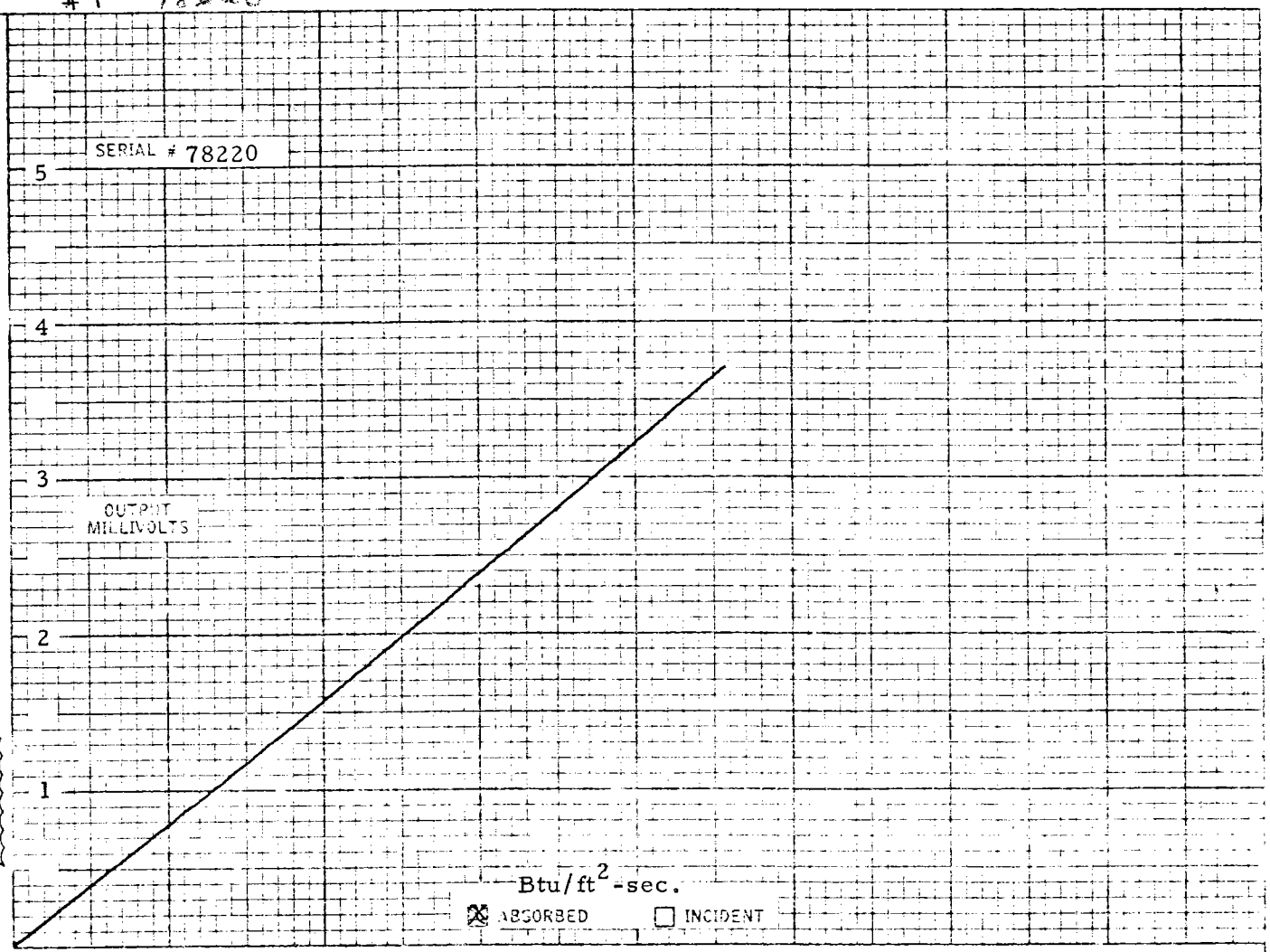

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MODEL C-1341-C-43-012-072

ABSORPTIVITY .89

CERTIFIED RECORD OF CALIBRATION DATA ON THE INSTRUMENT DESCRIBED ABOVE. THE DATA WAS OBTAINED IN HY-CAL ENGINEERING'S THERMAL FLUX FACILITY.

REFERENCE STANDARD 43592

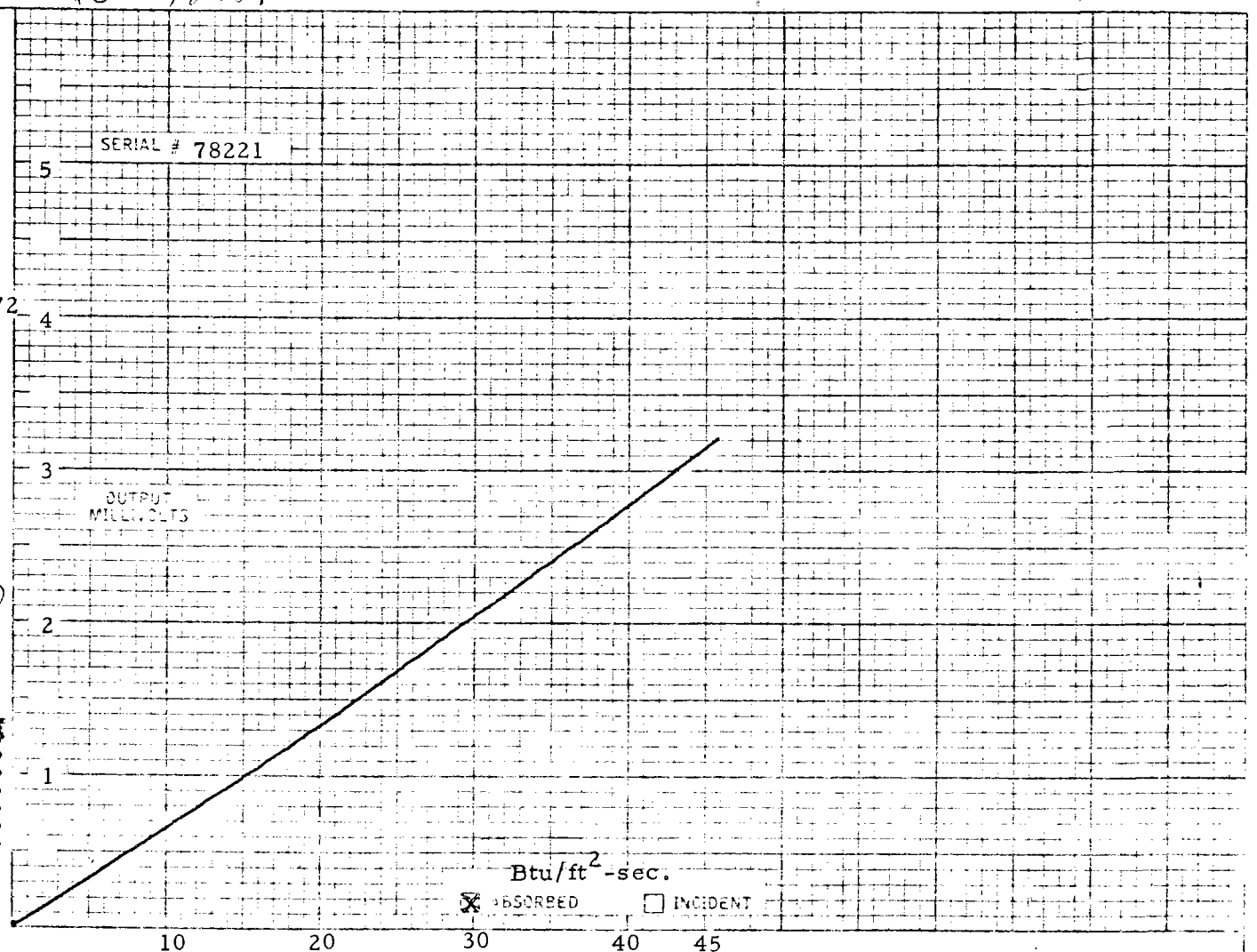
TESTED BY

Q. C. APPROVAL

OFFICIAL SEAL
JULIE A. HANGO
NOTARY PUBLIC - CALIFORNIA
LOS ANGELES COUNTY
My comm. expires JUN 28, 1982

SUBSCRIBED AND SWORN TO BEFORE ME THIS 9th DAY OF April 19 80

Julie A. Hango



PH

22

232-57

FORM 2002 REV.

"THE TEMPERATURE PEOPLE"

HY-CAL ENGINEERING

12105 Los Nietos Road • Santa Fe Springs, California 90670

CERTIFICATE OF CALIBRATION

#9 78222

DATE 3-29-80

CUSTOMER Martin Marietta

P. O. NO. RH9-063222

INST. TYPE Calorimeter

MODEL C-1341-C-43-012-072

ABSORPTIVITY .89

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Q. C. APPROVAL HC 5

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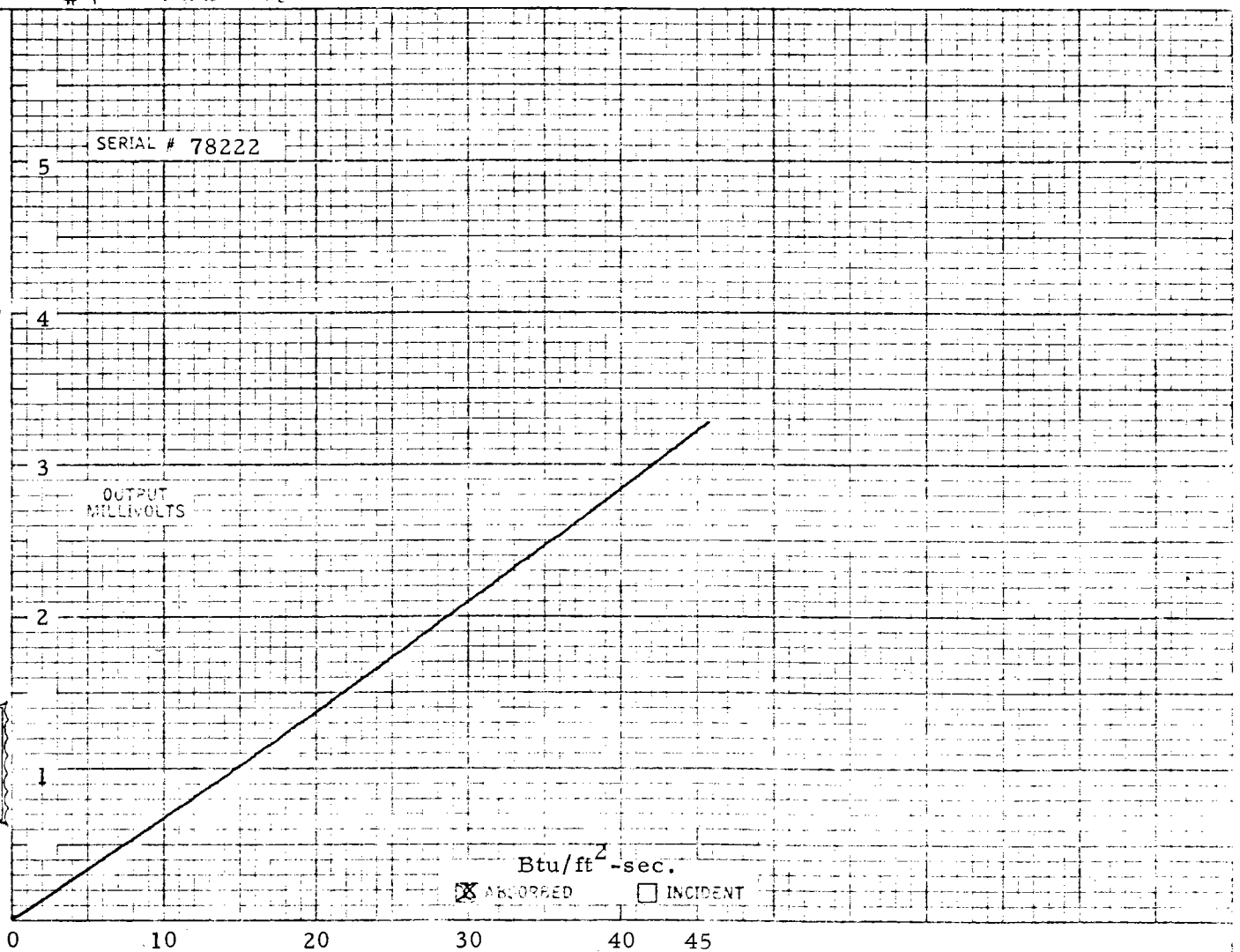

PA

23

6-66 232-57

FORM 2002 REV.

CERTIFICATE OF CALIBRATION

"THE TEMPERATURE PEOPLE"

HY-CAL ENGINEERING

12105 Los Nietos Road • Santa Fe Springs, California 90670

#10 78223

DATE 3-29-80

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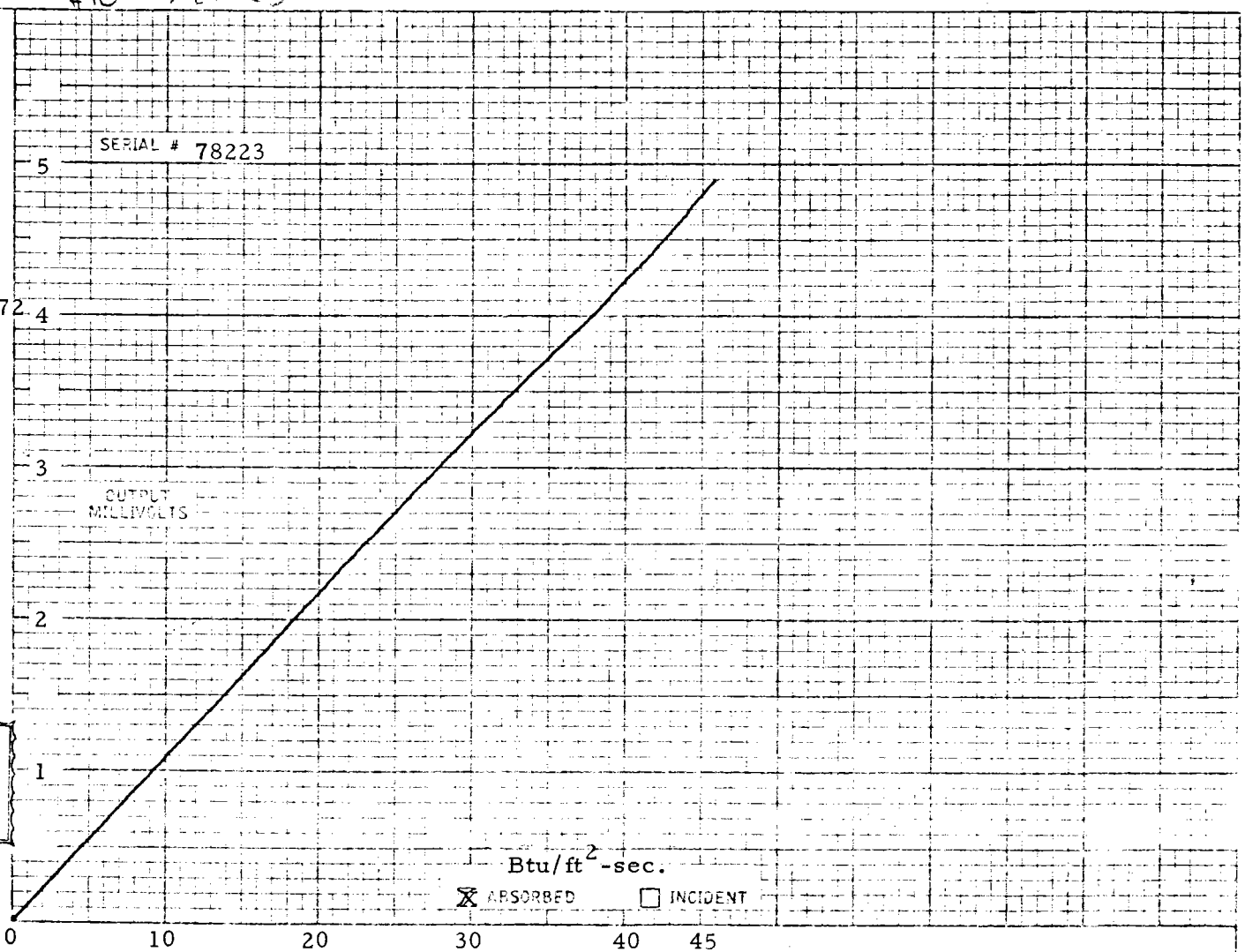

PA

6 [illegible] 232-57

FORM 2002 REV.

"THE TEMPERATURE PEOPLE"

HY-CAL ENGINEERING

2105 Las Nuevas Road • Santa Fe Springs, California 90670

CERTIFICATE OF CALIBRATION

#11 78-234

DATE 3-29-80

CUSTOMER Martin Marietta

P. O. NO. RH9-063222

INST. TYPE Calorimeter

MODEL C-1341-C-43-012-072

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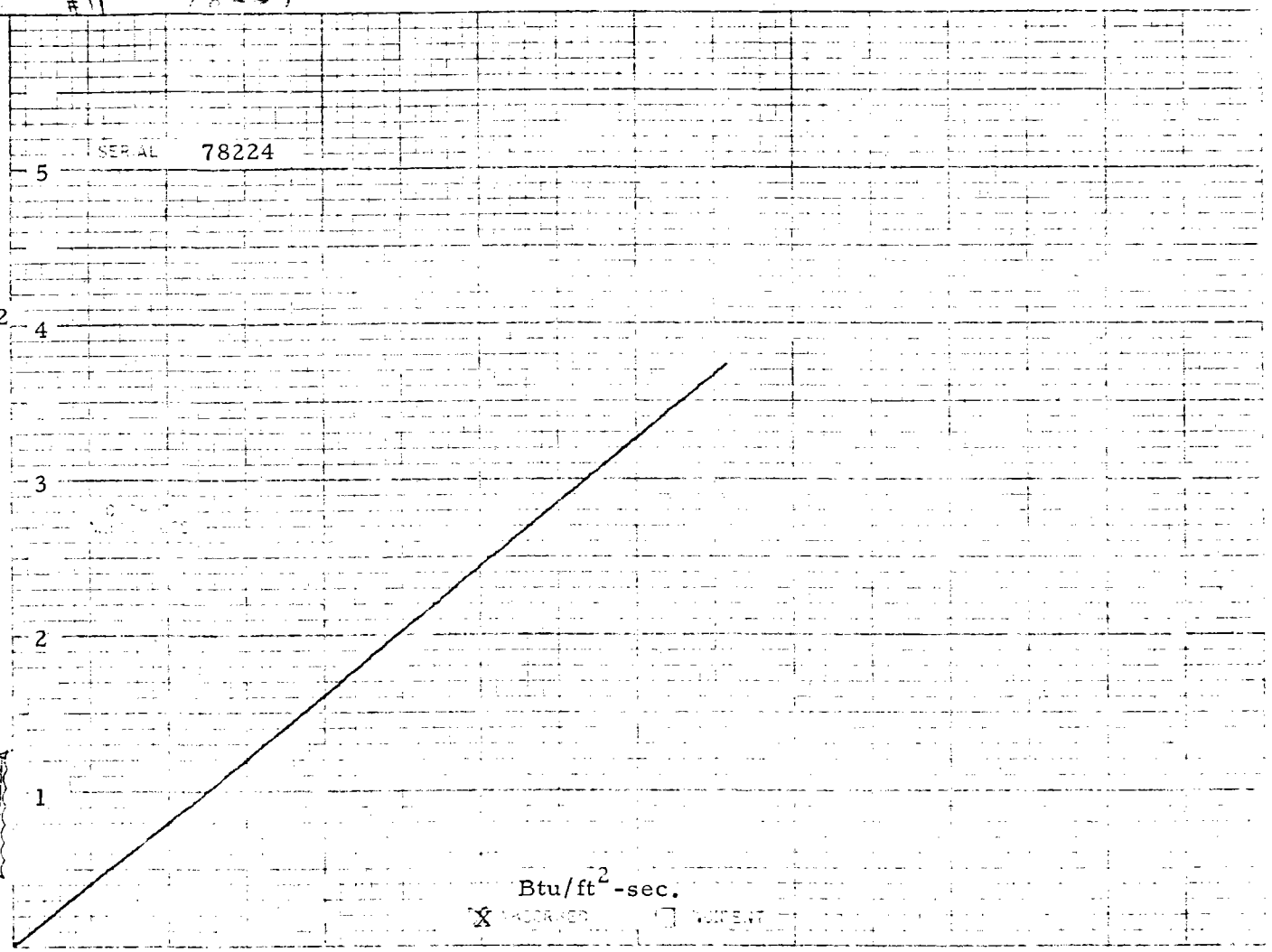
SERIAL 78224



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25

FORM 2002 REV

CERTIFICATE OF CALIBRATION

"THE TEMPERATURE PEOPLE"

HY-CAL ENGINEERING

12105 Los Nietos Road • Santa Fe Springs California 90670

#12 78225

DATE 3-29-80

CUSTOMER Martin Marietta

P. O. NO. RH9-063222

INST. TYPE Calorimeter

MODEL C-1341-C-43-012-072

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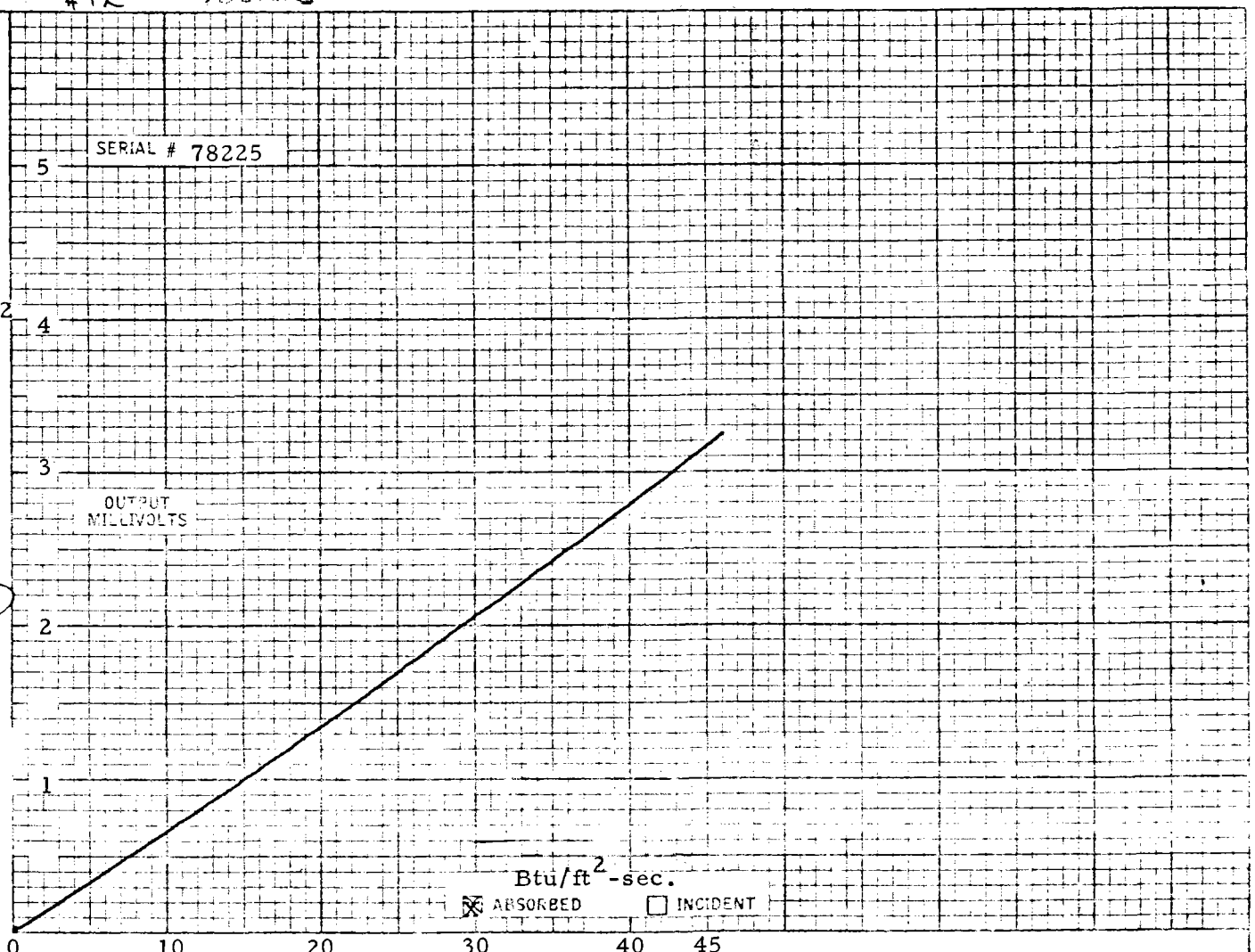
[signature]



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6 66 232-57

FORM 2002 REV.

26

"THE TEMPERATURE PEOPLE"

HY-CAL ENGINEERING

12105 Los Nietos Road • Santa Fe Springs, California 90670

CERTIFICATE OF CALIBRATION

#14 78226

DATE 3-29-80

CUSTOMER Martin Marietta

P. O. NO. RH9-063222

INST. TYPE Calorimeter

MODEL C-1341-C-43-012-072

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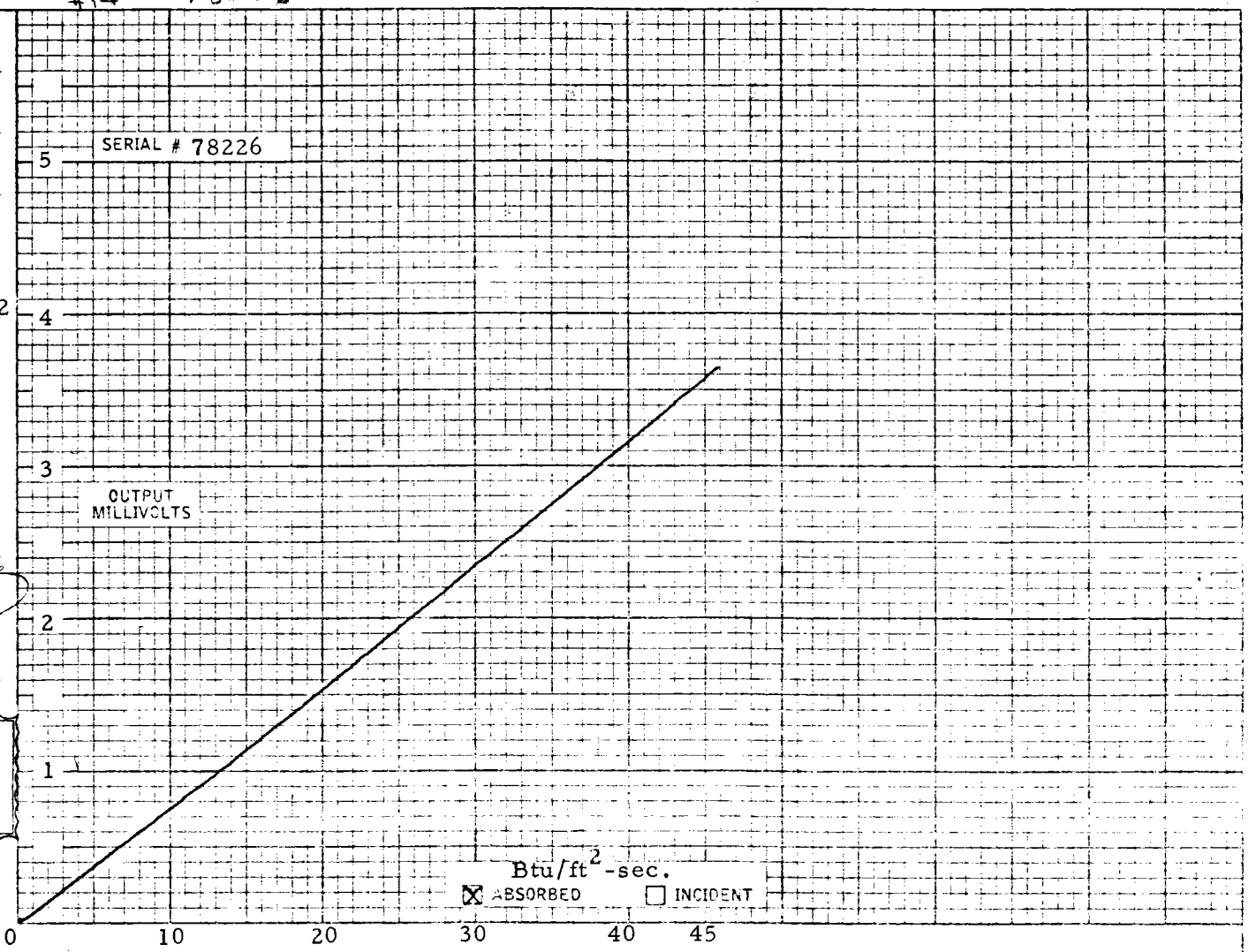

PA

27

6/65 232-57

FORM 2002 REV

"THE TEMPERATURE PEOPLE"

HY-CAL ENGINEERING

12105 Los Nietos Road • Santa Fe Springs, California 90670

CERTIFICATE OF CALIBRATION

#15 78227

DATE 3-29-80

CUSTOMER Martin Marietta

P. O. NO. RH9-063222

INST. TYPE Calorimeter

MODEL C-1341-C-43-012-072

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LOS ANGELES COUNTY
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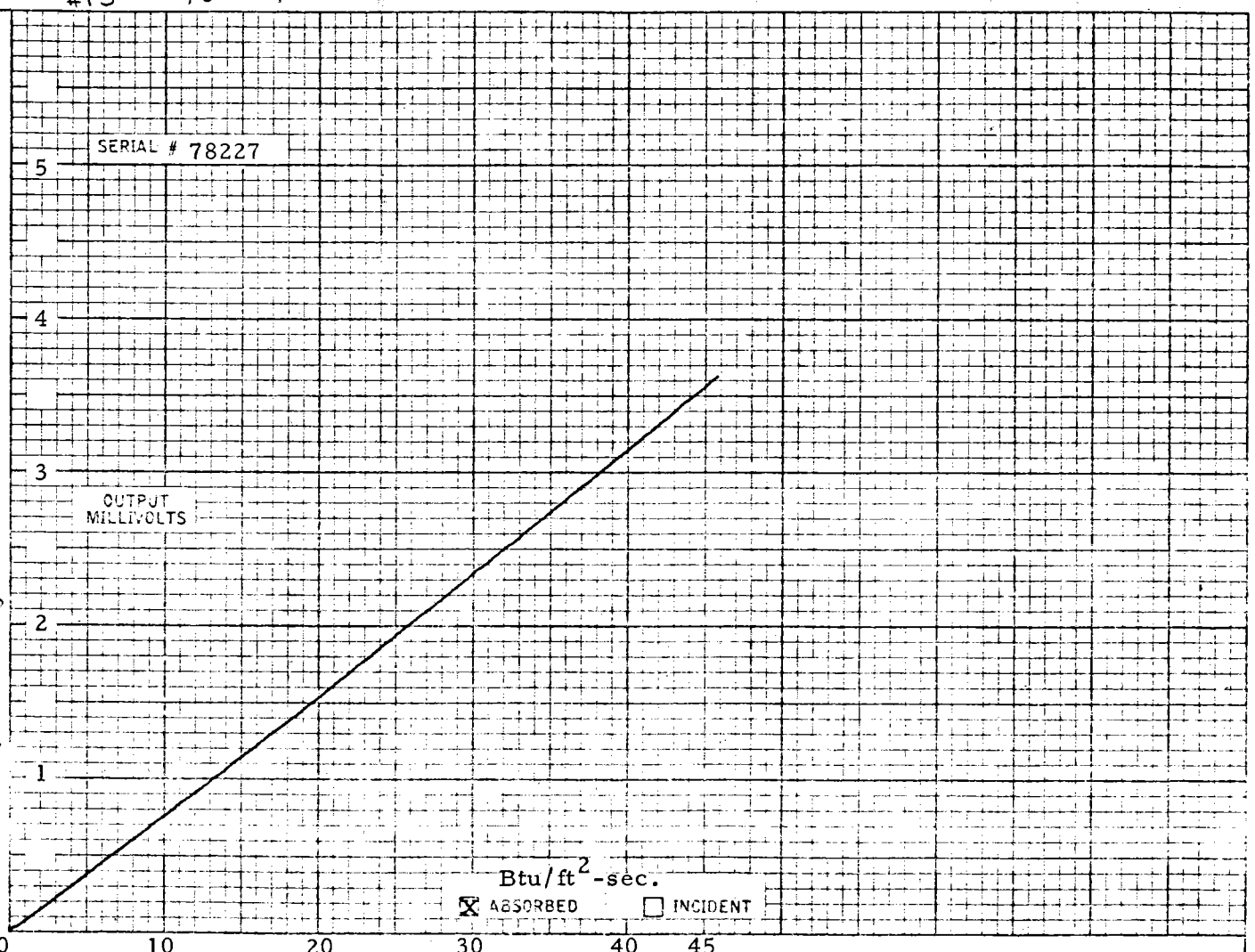

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28

232-57

FORM 2002 REV.

"THE TEMPERATURE PEOPLE"

HY-CAL ENGINEERING

12155 Los Nietos Road • Santa Fe Springs, California 90670

CERTIFICATE OF CALIBRATION

#16 78228

DATE 3-29-80

CUSTOMER Martin Marietta

P. O. NO. RH9-063222

INST. TYPE Calorimeter

MODEL C-1341-C-43-012-072

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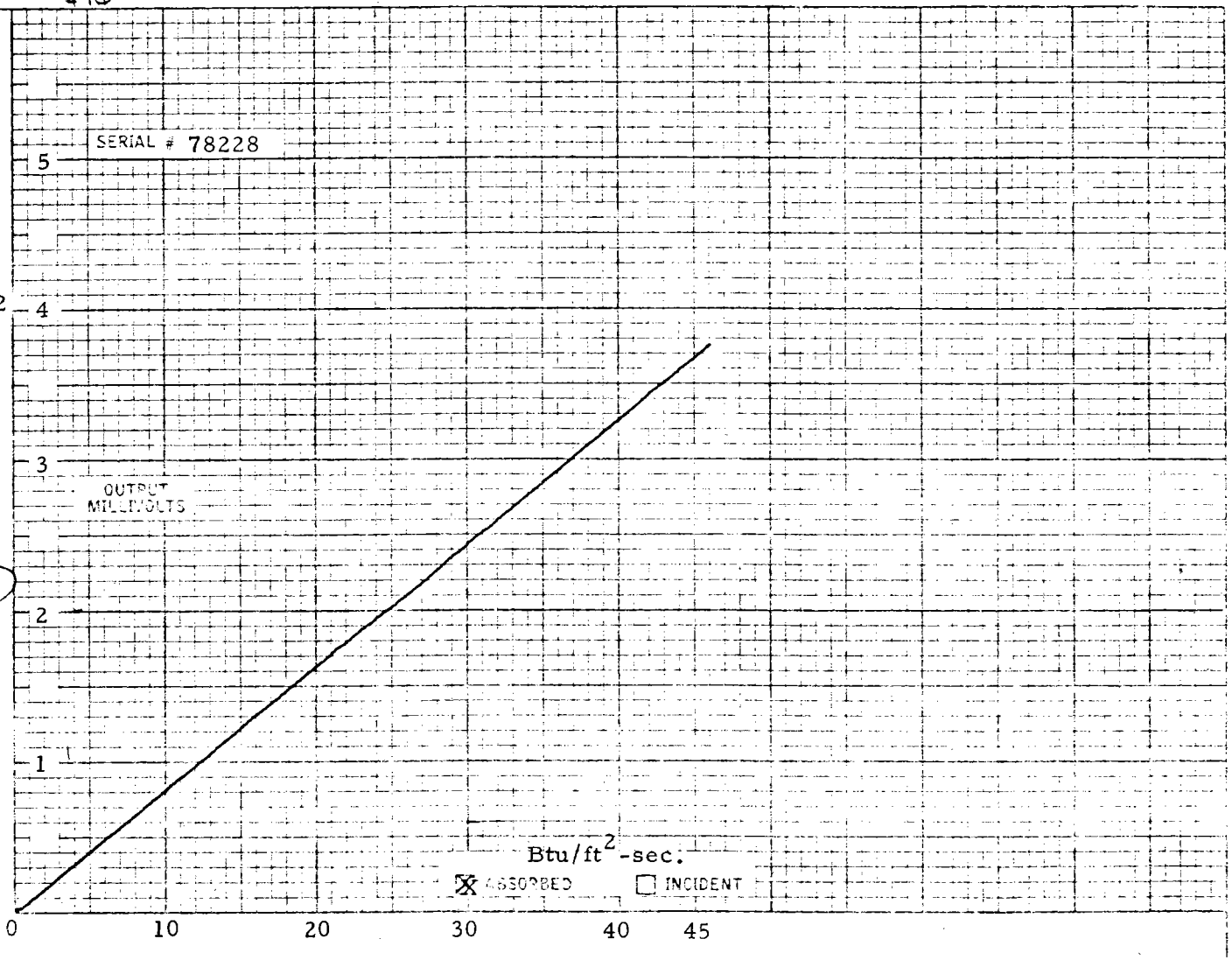

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29

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FORM 2032 REV.

CERTIFICATE OF CALIBRATION

"THE TEMPERATURE PEOPLE"

HY-CAL ENGINEERING

12105 Los Nietos Road • Santa Fe Springs California 90670

#17 78229

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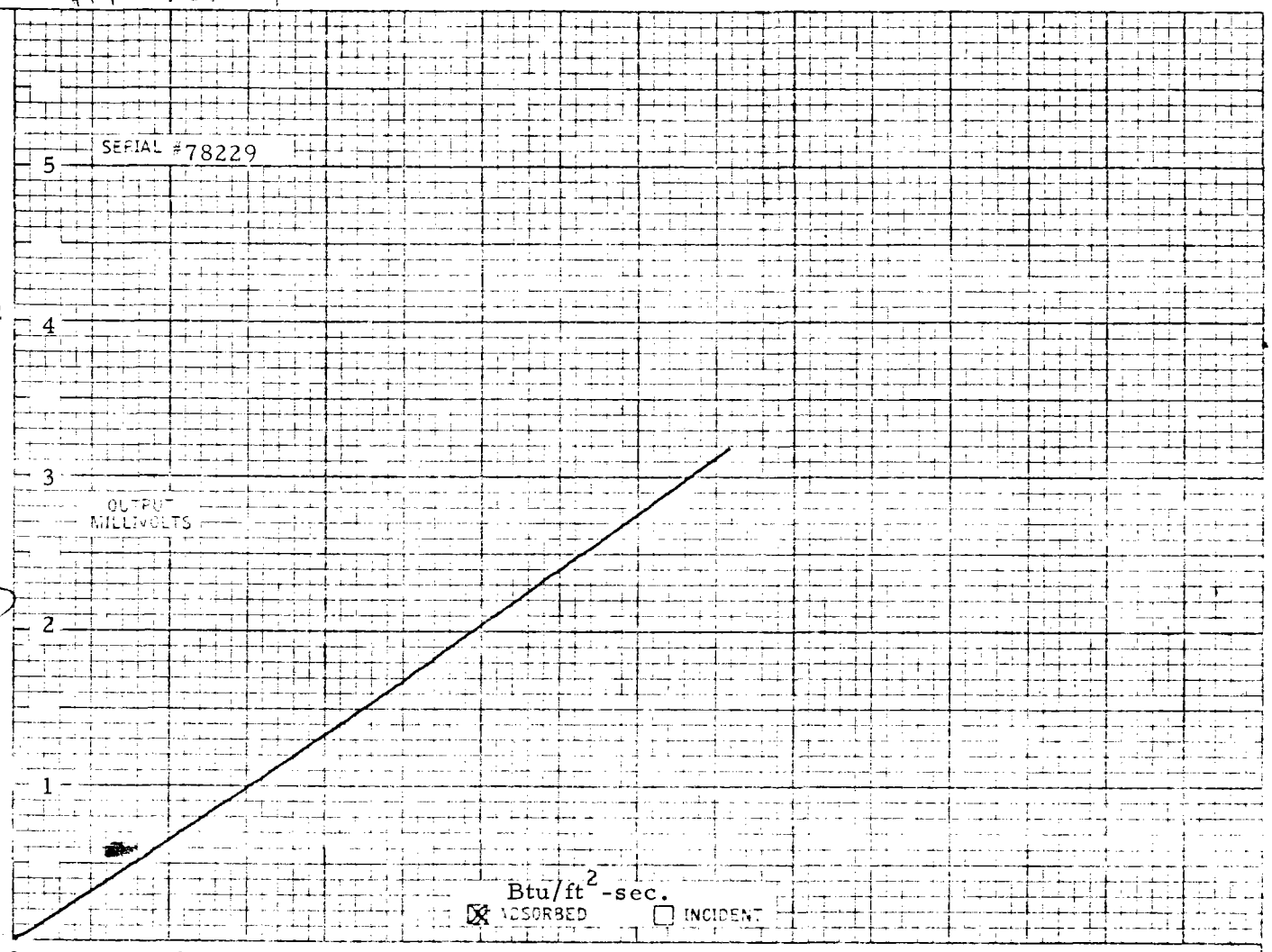

PA

6 66 232-57

FORM 2002 REV

"THE TEMPERATURE PEOPLE"

HY-CAL ENGINEERING

12105 Los Nietos Road • Santa Fe Springs, California 90670

CERTIFICATE OF CALIBRATION

#19 78230

DATE 3-29-80

CUSTOMER Martin Marietta

P. O. NO. RH9-063222

INST. TYPE Calorimeter

MODEL C-1341-C-43-012-072

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TESTED BY [signature] HC 5

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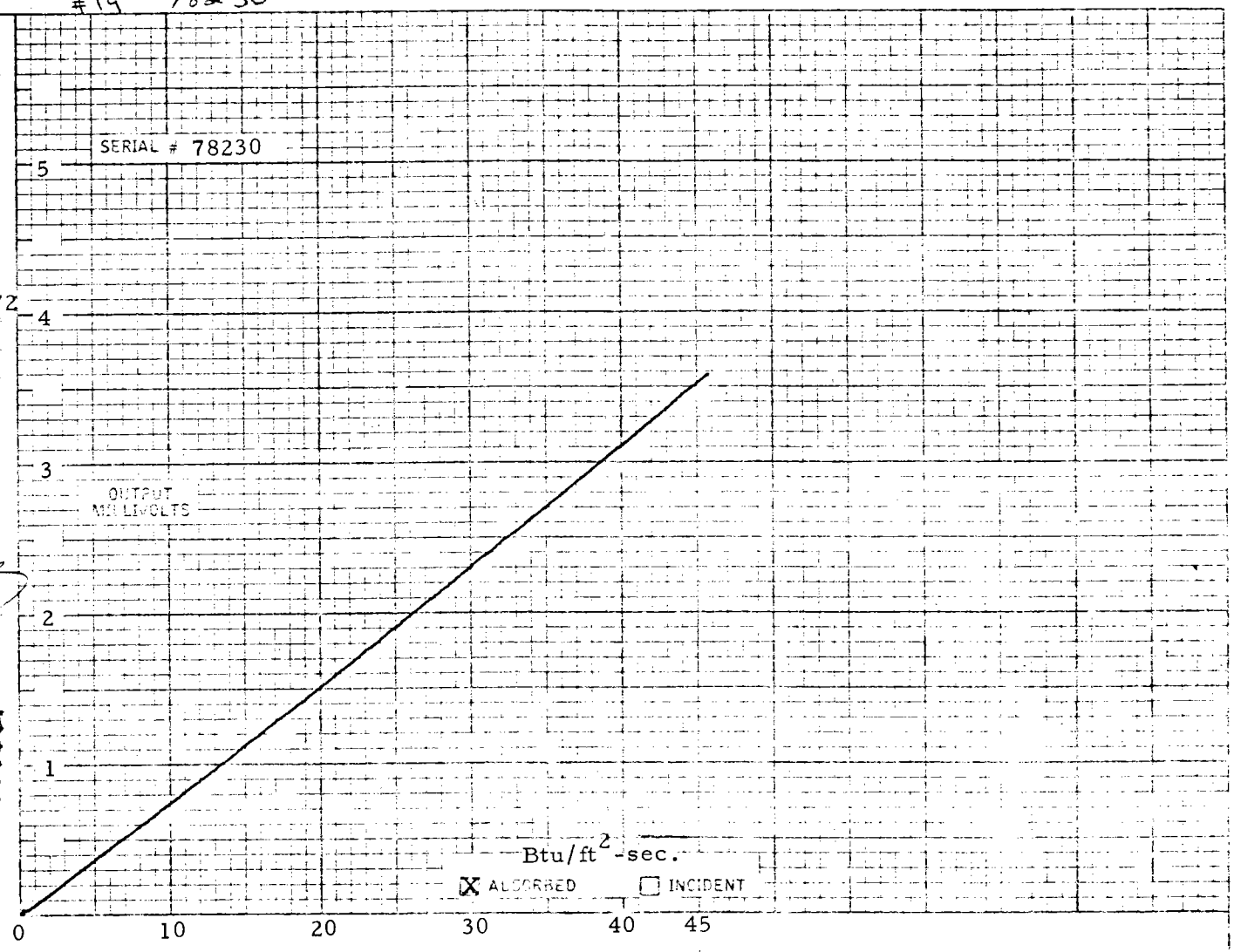
[signature]



PA

CERTIFICATE OF CALIBRATION

"THE TEMPERATURE PEOPLE"

HY-CAL ENGINEERING

12105 Los Nietos Road • Santa Fe Springs California 90670

#21 78231

DATE 3-29-80

CUSTOMER Martin Marietta

P. O. NO. RH9-063222

INST. TYPE Calorimeter

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LOS ANGELES COUNTY
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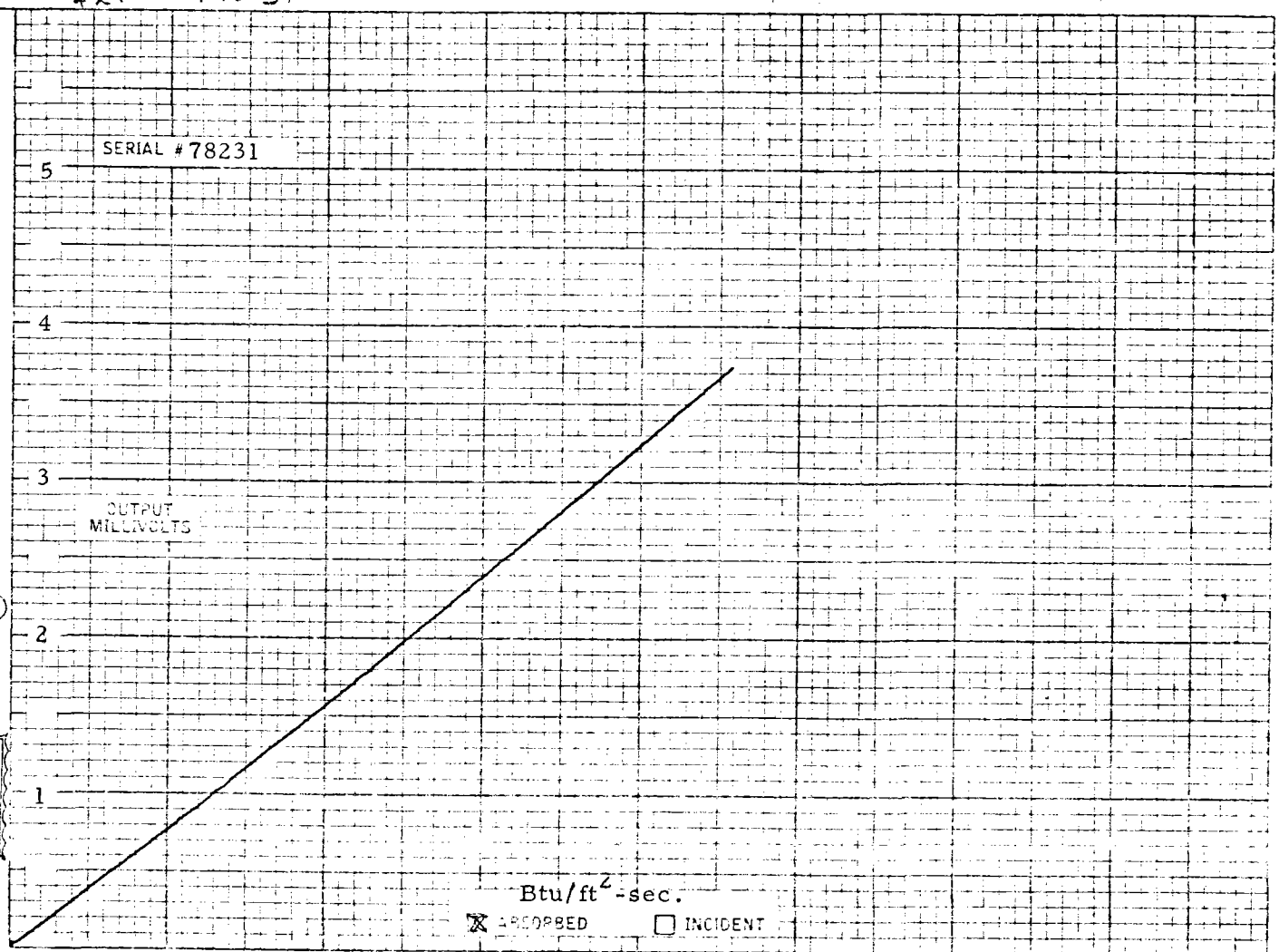
Julia A. Hango



PA

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FORM 2002 REV.

CERTIFICATE OF CALIBRATION

"THE TEMPERATURE PEOPLE"

HY-CAL ENGINEERING

12196 Los Nietos Road • Santa Fe Springs, California 90670

#23 78232

DATE 3-29-80

CUSTOMER Martin Marietta

P. O. NO. RH9-063222

INST. TYPE Calorimeter

MODEL C-3141-C-43-012-072

ABSORPTIVITY .89

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REFERENCE STANDARD 43592

TESTED BY D. M. Clayton

Q. C. APPROVAL (HC 5)

OFFICIAL SEAL
JULIE A. HANGO
NOTARY PUBLIC - CALIFORNIA
LOS ANGELES COUNTY
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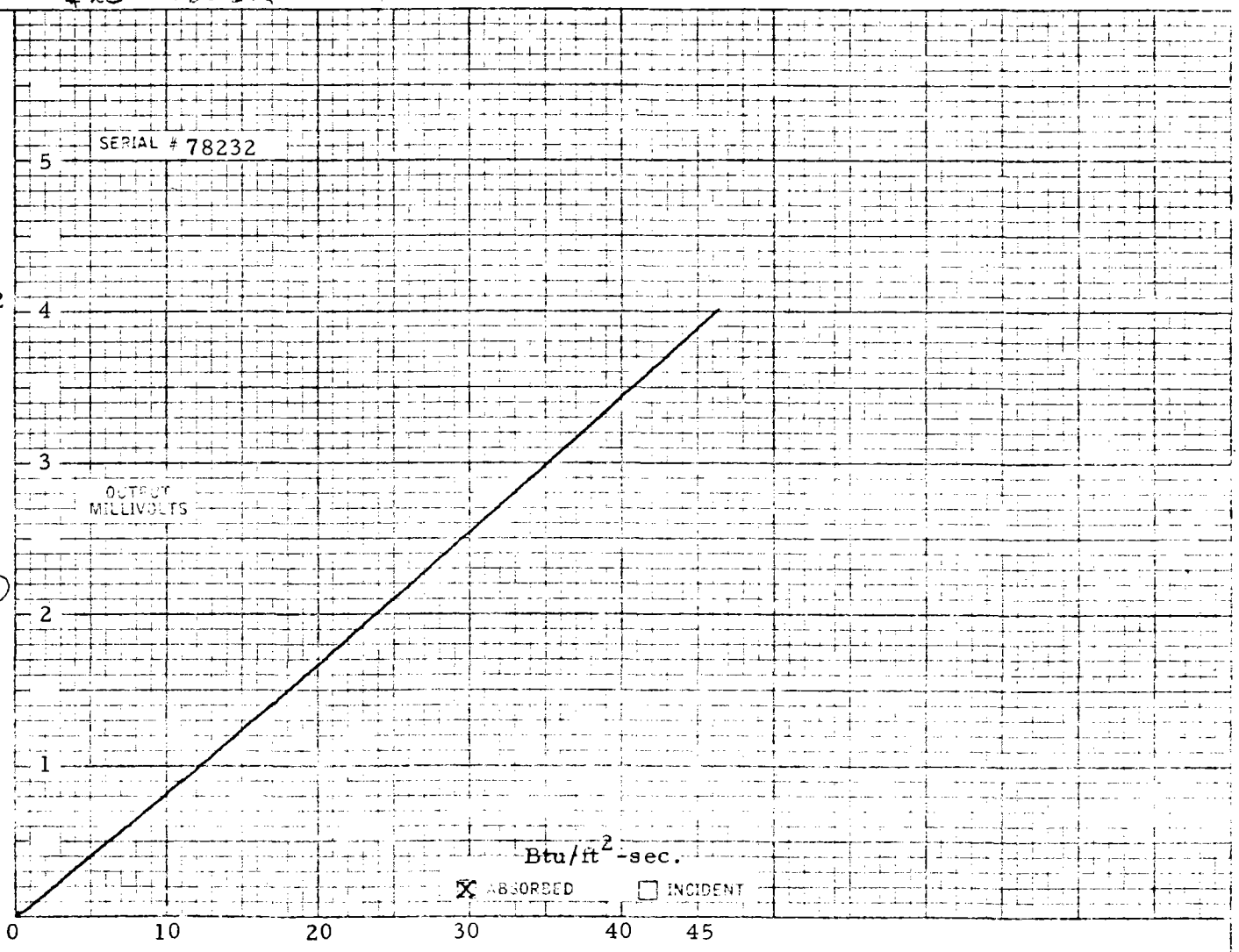

33

6 68 232-57

FORM 2002 REV.

CERTIFICATE OF CALIBRATION

"THE TEMPERATURE PEOPLE"

HY-CAL ENGINEERING

12105 Los Nietos Road • Santa Fe Springs, California 90670

#24 78233

DATE 3-29-80

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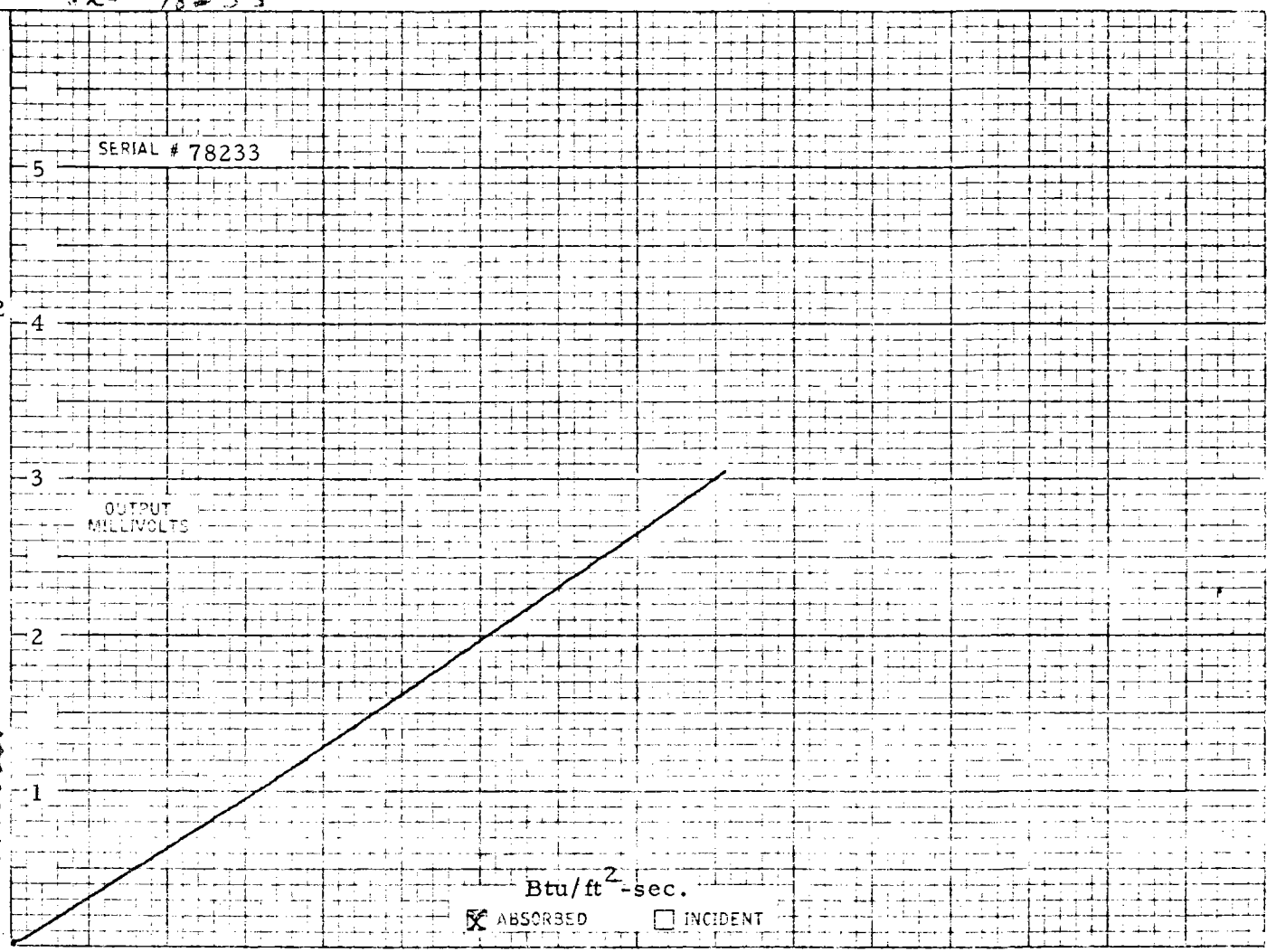

34

6-66 232-57

FORM 2002 REV.

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HY-CAL ENGINEERING

12105 Los Nietos Road • Santa Fe Springs, California 90670

CERTIFICATE OF CALIBRATION

#25 78234

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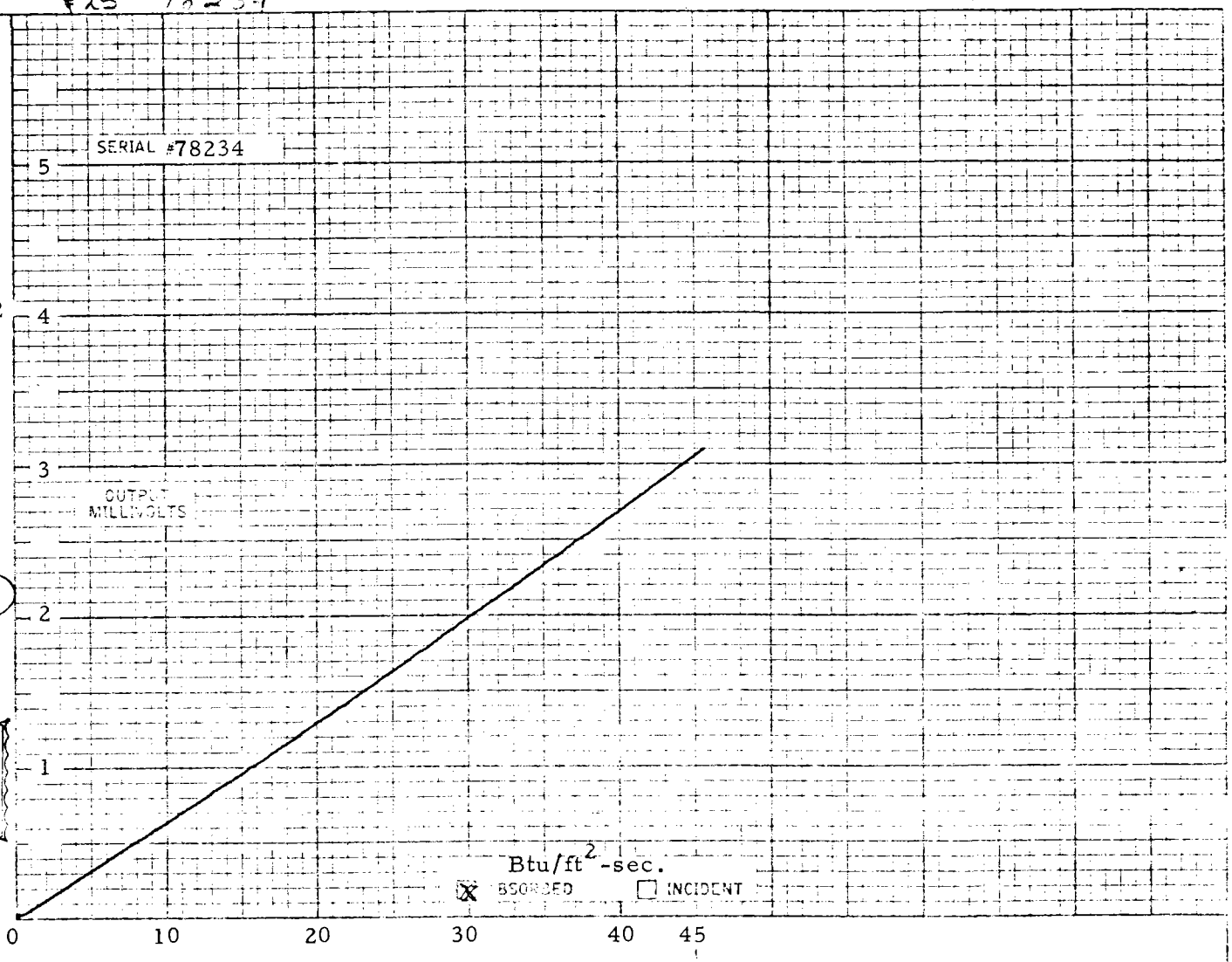

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35

6 68 232-57

FORM 2002 REV.

CERTIFICATE OF CALIBRATION

"THE TEMPERATURE PEOPLE"

HY-CAL ENGINEERING

12105 Los Nietos Road • Santa Fe Springs, California 90670

#26 78235

DATE 3-29-80

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(HC / S)

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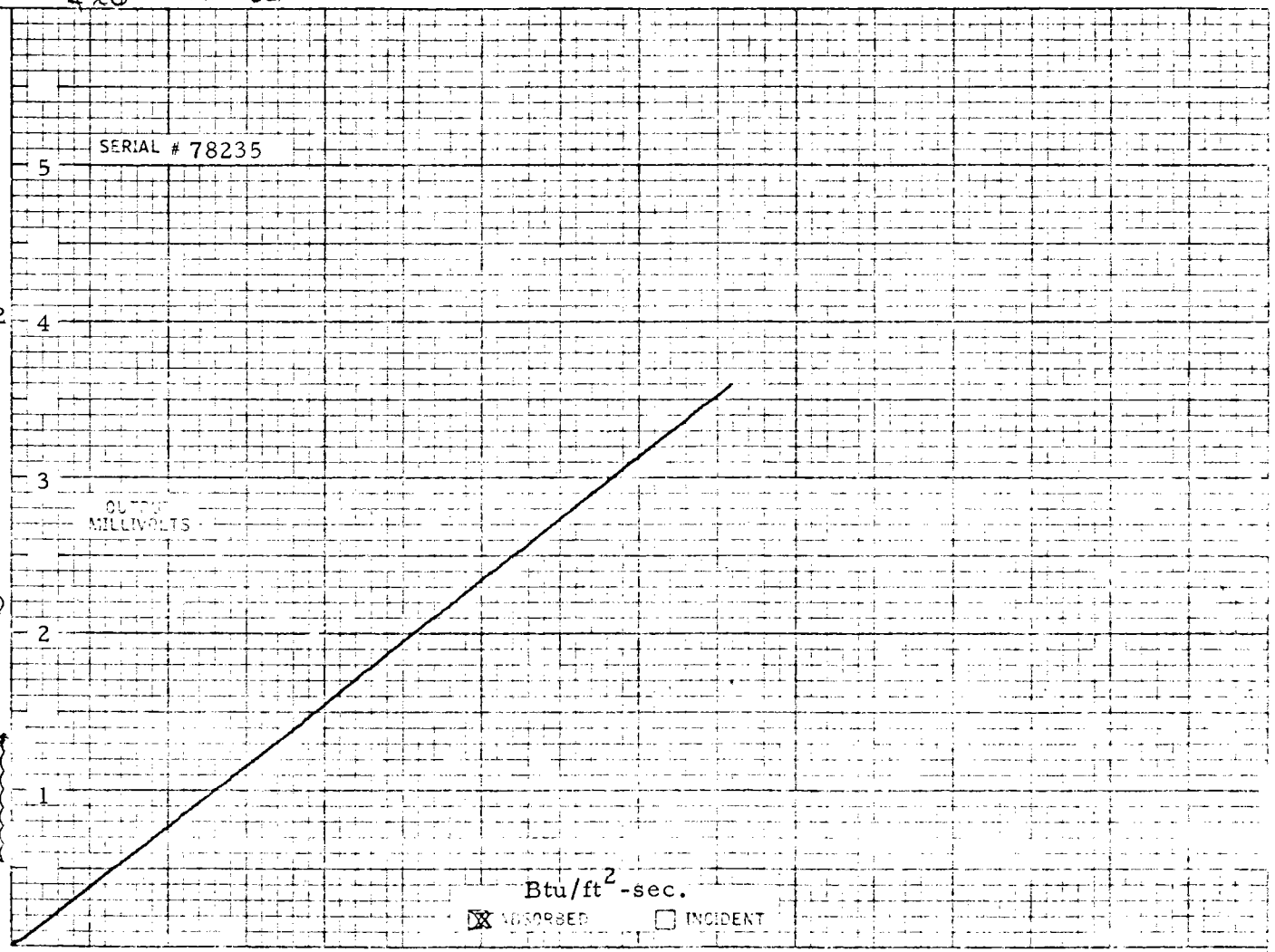
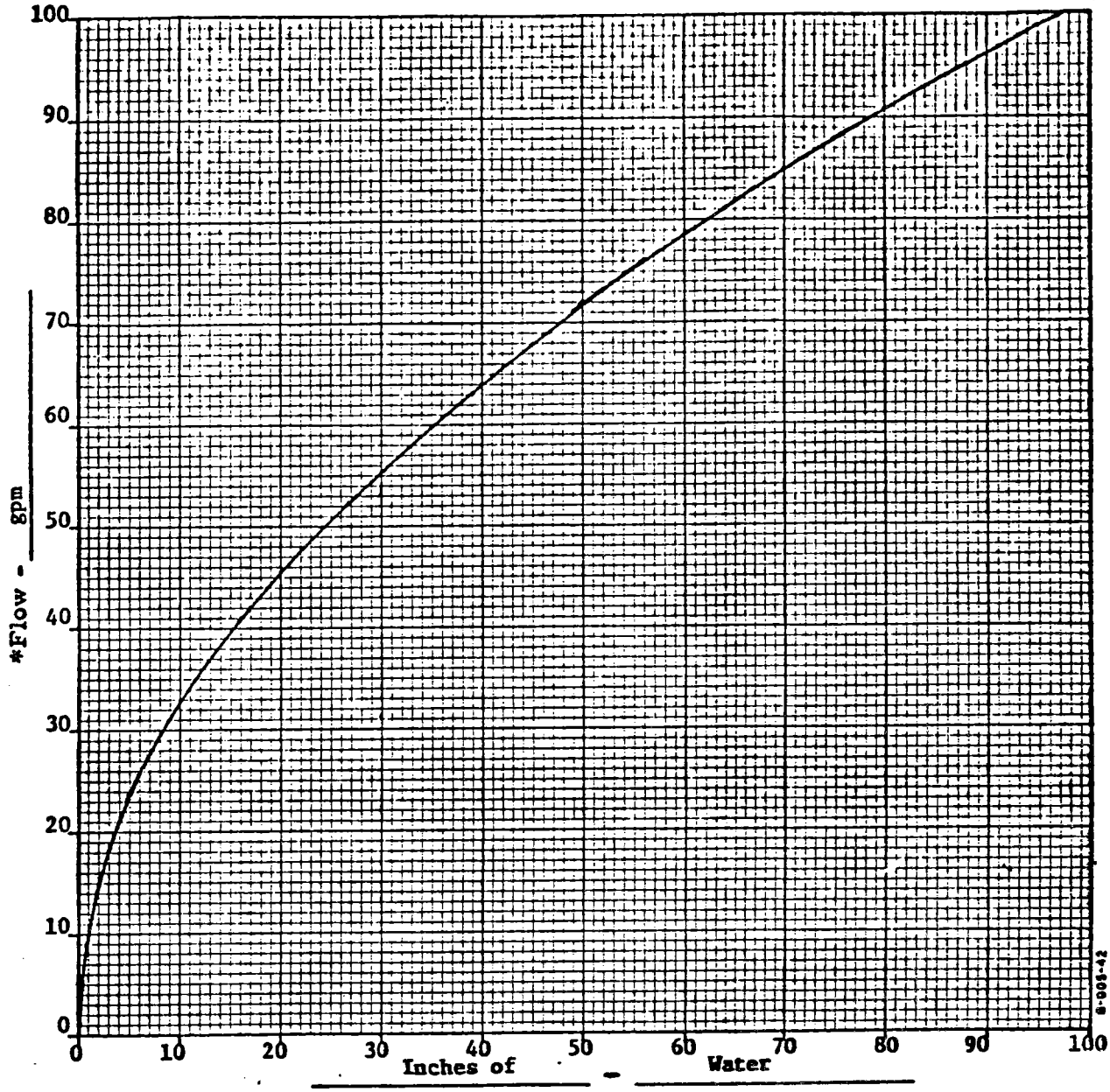


PA.

6 66 232-57

FORM 2002 REV

for Taylor Primary Flow Elements



Tag Number FE-2
Element Serial Number 88SD10201W
Element Type Segmental Wedge
Tap Location Chem Tee/H=1.043
Flowing Medium Molten Salt
Flowing Pressure (Normal) 40 psig
Flowing Temperature 550°F
Viscosity 3.4 centipoise

Specific Gravity at 60°F
Specific Gravity at Flow Temp. 1.82
Pipe I. D. or Duct Size 4.026
Flow Coefficient (Kd²) 2.3903
Meter Range 97.4" H₂0 @ 100 gpm
Customer Martin Marietta
Customers Order No. RH9-142278
T.I. Co. Order No. 10-16-548

*Volume rates of flow expressed at 60°F for liquids and 60°F and 14.7 psia for gases unless otherwise specified.

SYBRON | Taylor

Computed by N.C. Jones Mar. 31, 1980
Date

III. SENSOR CALIBRATION CURVES (Cont.)

C. LVDT'S

The LVDT output is linear. Curves will be sent for each LVDT as they are available.

III. SENSOR CALIBRATION CURVES (Cont.)

D. LOAD CELL

The output of the load cell is a linear function with a 0 to 3 volt output from the signal conditioning cart corresponding to a 0 to 3000 lb_M reading.

IV GENERAL REQUIREMENTS FOR COMPUTER OPERATIONS

1. After a kill, (for any reason)....

   a. If operating on computer, keyboard or automatic, return control to console as quickly as possible.

   b. Continue to record all data.

   c. Continue to calculate algorithms.

      . Salt flow

      . Air cooler fan blade settings

      . Tube temperatures

   d. If in exposed configuration do one of two things, after consulting with tower console.

      . Go to fail safe so that an engineer can go to tower top.

      . Bring back on line, warm up heliostats as quickly as possible.

   e. If in cavity configuration

      . Contact tower to see if there is any need to go to fail safe to allow an engineer on tower top. (The cavity doors will be closed for this case.)

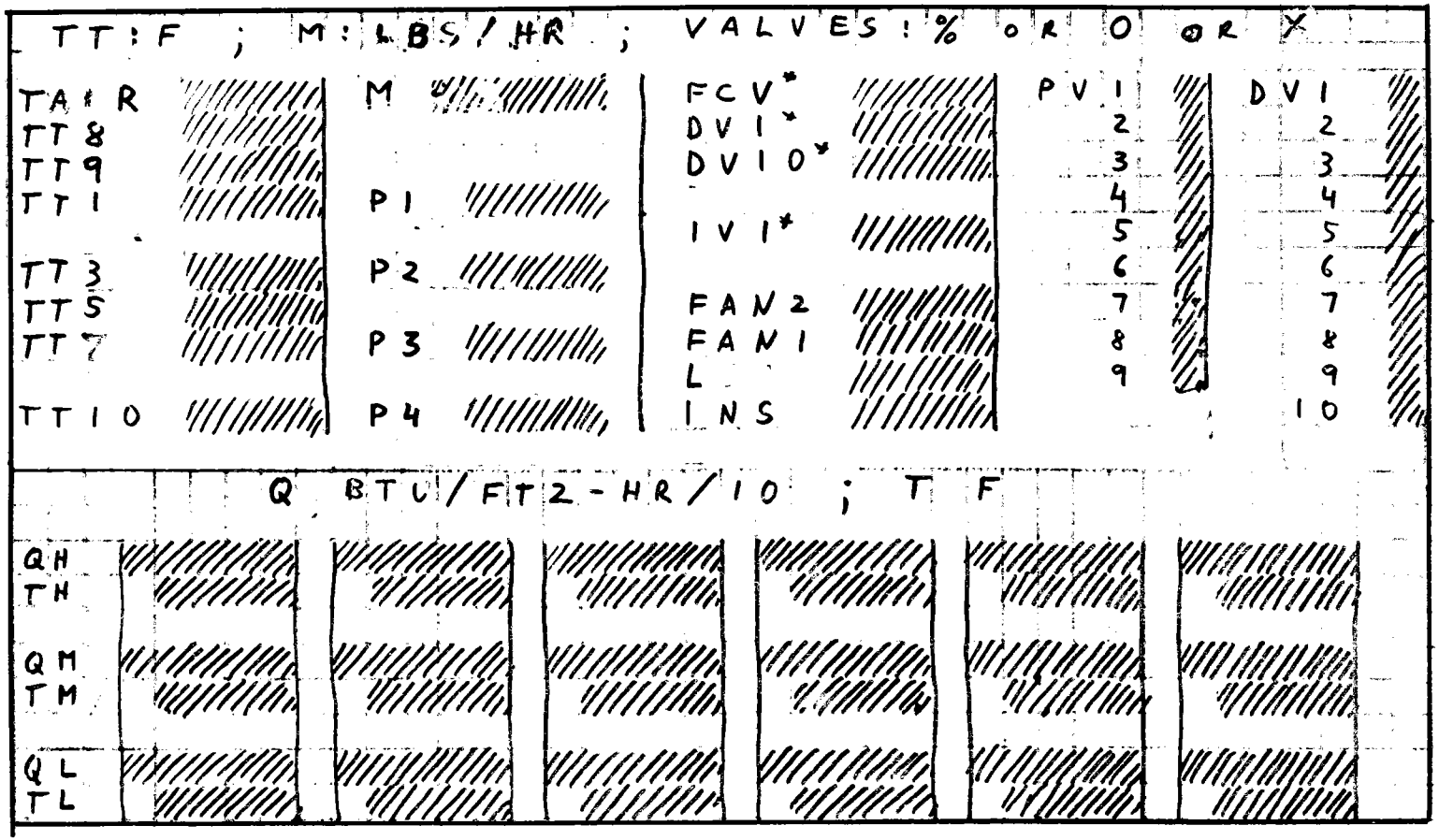
2. Heliostat Commands

   a. The heliostat field configurations for the various conditions are defined by a previous input (MMC to CRTF). We would like to be able to command these configurations by a single keystroke.

   b. Simulated cloud passage heliostat operation is needed for tests 8 PC-8, 12 PFC-3 and 18 SE-3. These tests are defined in the Test Plan.

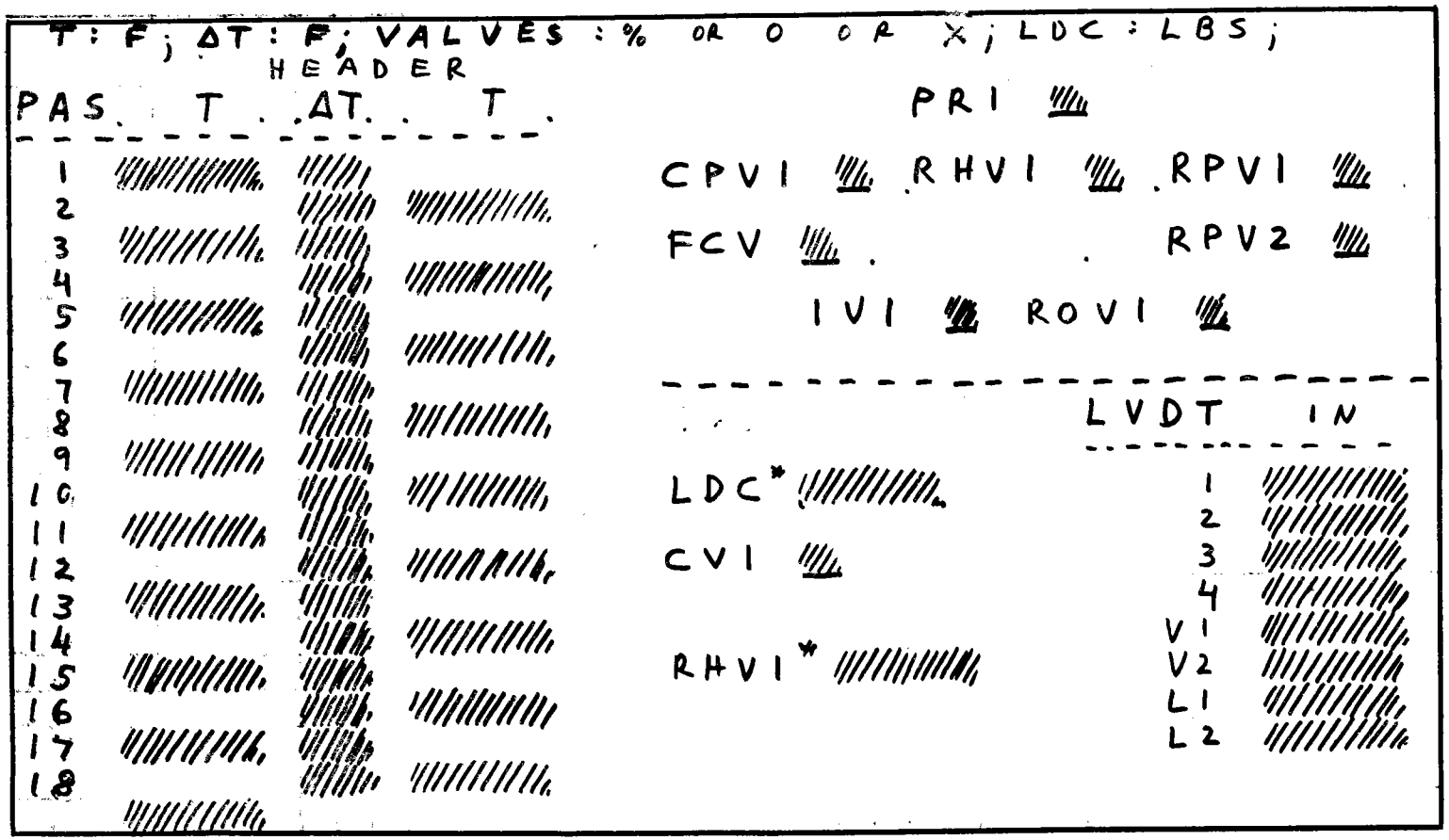
   c. Heliostat operations after a kill are defined in item one, above.

CRT DISPLAY - BASIC DATA I



* ANALOG

CRT DISPLAY - BASIC DATA II



* ANALOG

ALARM CRT DISPLAY REQUIREMENTS

SCRAM DISABLE SWITCH IS ØN/ØFF

	LØ-LØ	LØ	NØW	HI	HI-HI
FLOW	20000	25000	_____	- - -	- - -
PT-1	20	50	_____	- - -	- - -
PT-4	- - -	2	_____	- - -	- - -
TT-5B	- - -	- - -	_____	1080	1100
TT-7B	450	500	_____	700	750
THMAX	- - -	- - -	_____	1280	1300

CONTROL MODE: _____

A-SET	KEYB.	NØW	ALGØ
FLØW	- - -	_____	_____
FCV	_____	_____	_____
FCP	- - -	_____	- - -
TT5SP	_____	_____	_____
TT5B	- - -	_____	- - -
TT7SP	_____	_____	_____
TT7B	- - -	_____	- - -
FAN1	_____	_____	- - -
FAN2	_____	_____	- - -
LØUV	_____	_____	- - -
RHV1	_____	_____	- - -
IV1	_____	_____	- - -
DV1	_____	_____	- - -
DV10	_____	_____	- - -
D-SET	_____	_____	- - -

NOTES:
1. - WARNING AND KILL setpoints will be flashing when exceeded by NOW values (with disable switch ON or OFF)
2. - LO-LO and HI-HI signals are hard-wired, except THMAX which is computer-generated
3. - LO and HI signals are computer-generated by an algorithm comparing NOW values with HI and LO setpoints.
4. - Control Modes are: AUTO, KEYBOARD, or CONSOLE, the latter being a keyboard input when applicable.
5. - The ALGO column is continuously updated by the computer irrespective of control mode.
6. - The NOW column is continuously updated irrespective of control mode, as follows:
   a) The A-SET parameters through the Multiplexer; b) "D-SET" is a two-character word DI, I= 1,2,3,...,7 (see Keyboard CRT) and it is determined by an algorithm which compares actual discrete valve settings with the seven groups shown on the Keyboard CRT. "NO" replaces "DI" when no match is found
7. - THMAX represents the maximum of 18 tube-front temperatures calculated by the computer.
8. - The "KEYB" column will show the keyboard commands both before they are sent out, and upon verification through the multiplexer, except for "D-SET" which only serves as a record on this CRT. (D-SET commands are verified on the Keyboard CRT).
9. - When the Scram Disable Switch is ON, the word OFF disappears, and the word ON is flashing.
10. - FAN1 and FAN2 in the KEYB column are identical (there is only one signal available to command both fans). However, the NOW values of the two fans may differ.

KEYBOARD OPERATIONS CRT DISPLAY

DISCRETE VALVE SETTINGS (D-SET)								ANALOG SETTINGS (A-SET)		
	HOT PRG	FILL	EST. FLOW	RUN CAL	RUN REC	DRN	DRN PRG		SET PT.	DELTA INCR.
SET	D1	D2	D3	D4	D5	D6	D7			
PR1	0	0	0	0	00	0	0	TT5SP	____	____
CV1	0	0	0	X	00	0	0	TT7SP	____	____
FCV	0	0	0	0	00	0	X			
IV1	X	0	0	0	00	X	0	FGV	____	____
PV'S	X	0	X	X	XX	0	0	LOUV	____	____
DV'S	X	0	X	X	XX	0	0	FANS	____	____
CPV1	X	X	X	X	XX	0	0	RHV1	____	____
RPV1	X	X	0	X	XX	0	0	IV1	____	____
RPV2	0	0	0	0	00	X	X	DV1	____	____
ROV1	X	X	0	X	XX	0	0	DV10	____	____

NOTES: 1.- The seven arrays (D1 through D7) of discrete valve positions represent the principal operational modes of interest, and can be established by seven mutually exclusive keyboard commands, which are "verified" by side-by-side displays of actual vs. required valve positions in the appropriate DI columns prior to transmission. (Here "O" stands for "open", "X" for "closed") - See column D5 for sample display.

2.- The analog settings are contingent on the discrete settings, since the latter energize the valves, with the exception of LOUV, FANS, and RHV1, which are energized from the console.

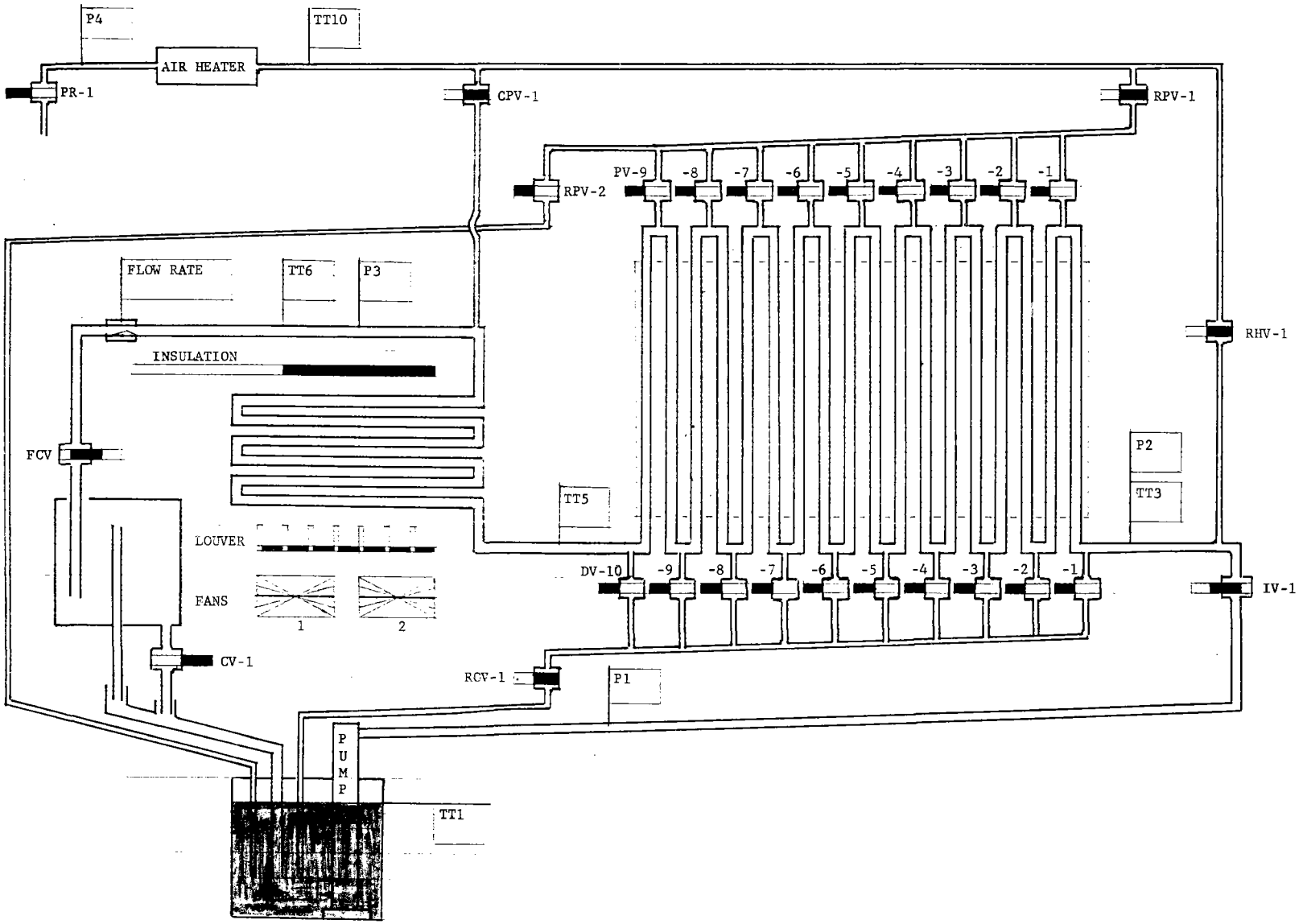
3.- Setpoints may be changed directly or incrementally, the increments being specified in the DELTA column. Incremental commands are sent without verification prior to transmission.

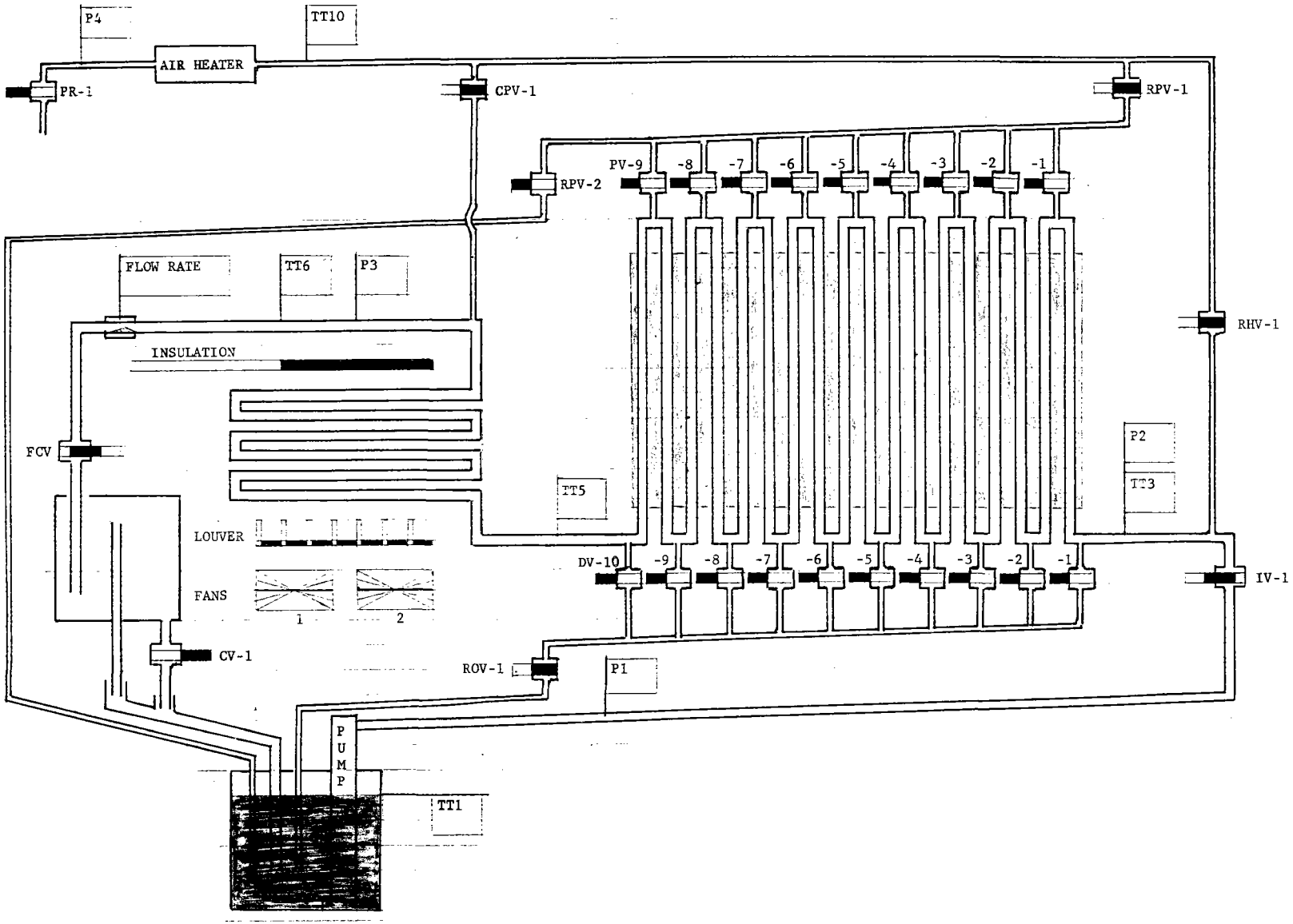
4.- The D-SETS are coupled to respective colorgraphic displays.

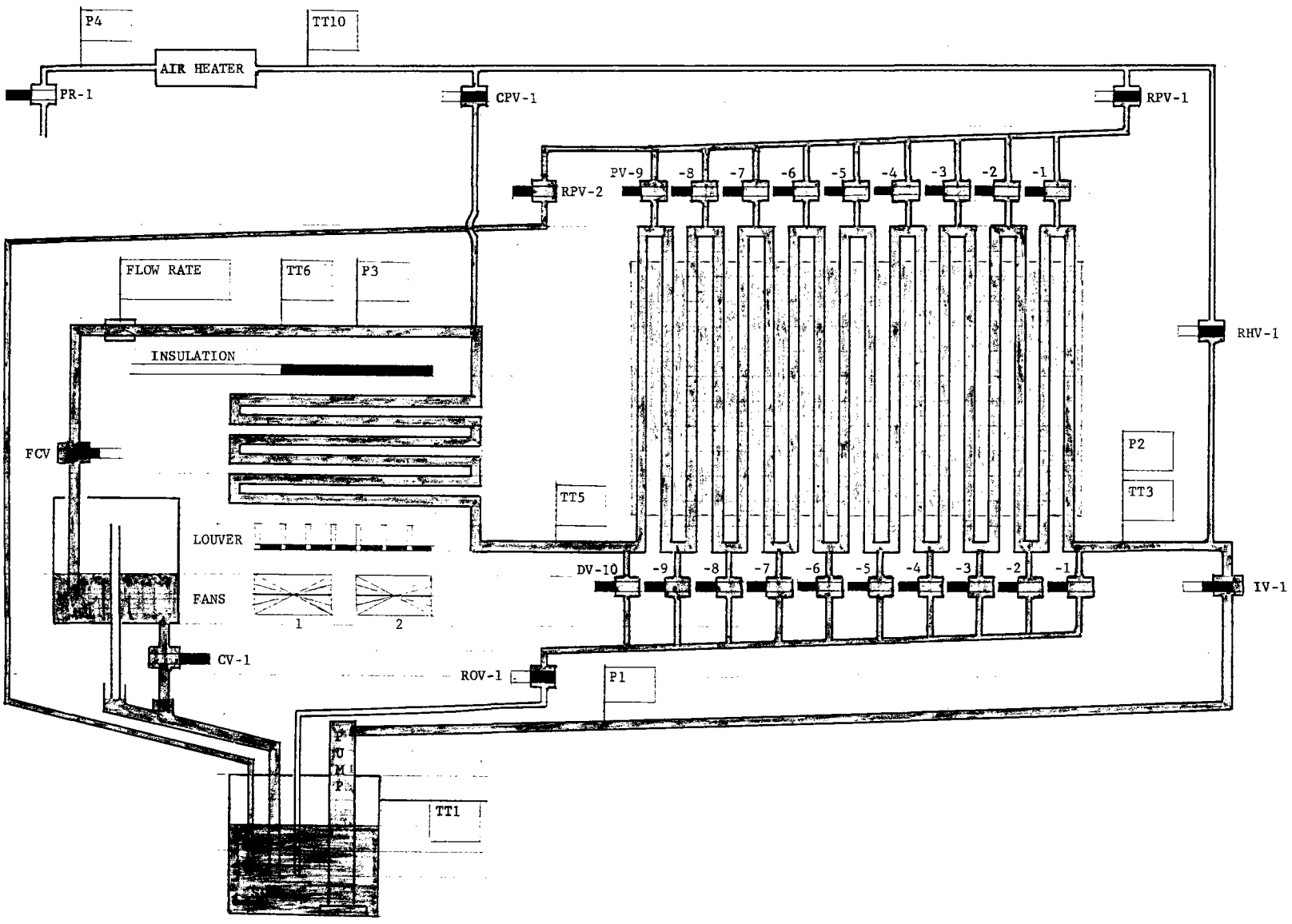
5.- TT5SP and TT7SP are setpoints used by control algorithms only, all other commands are linked to operation of hardware.

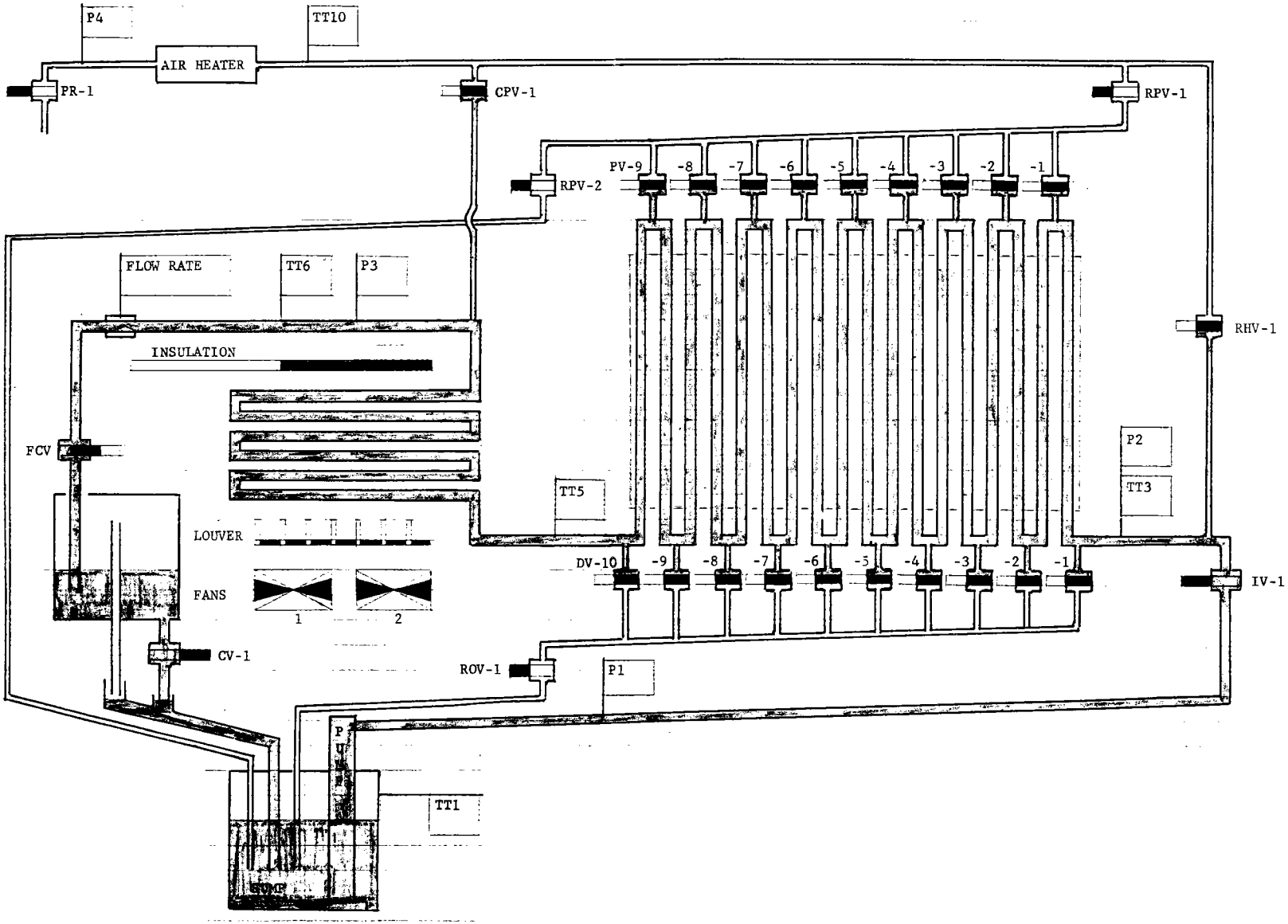
6.- Detailed MENU programming for the implementation of these keyboard operations is developed by CRTF personnel.

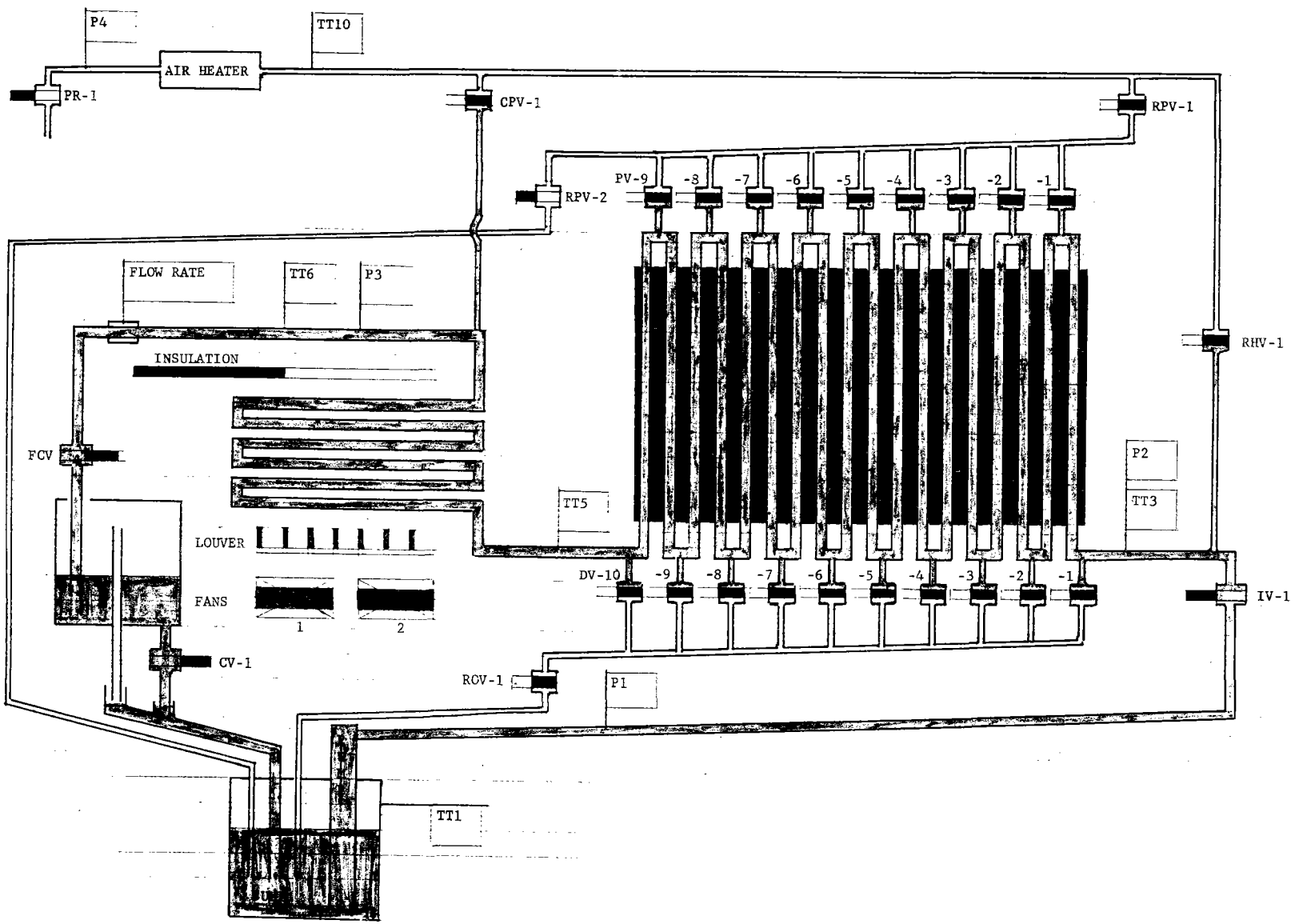
PRE-FILL CONFIGURATION

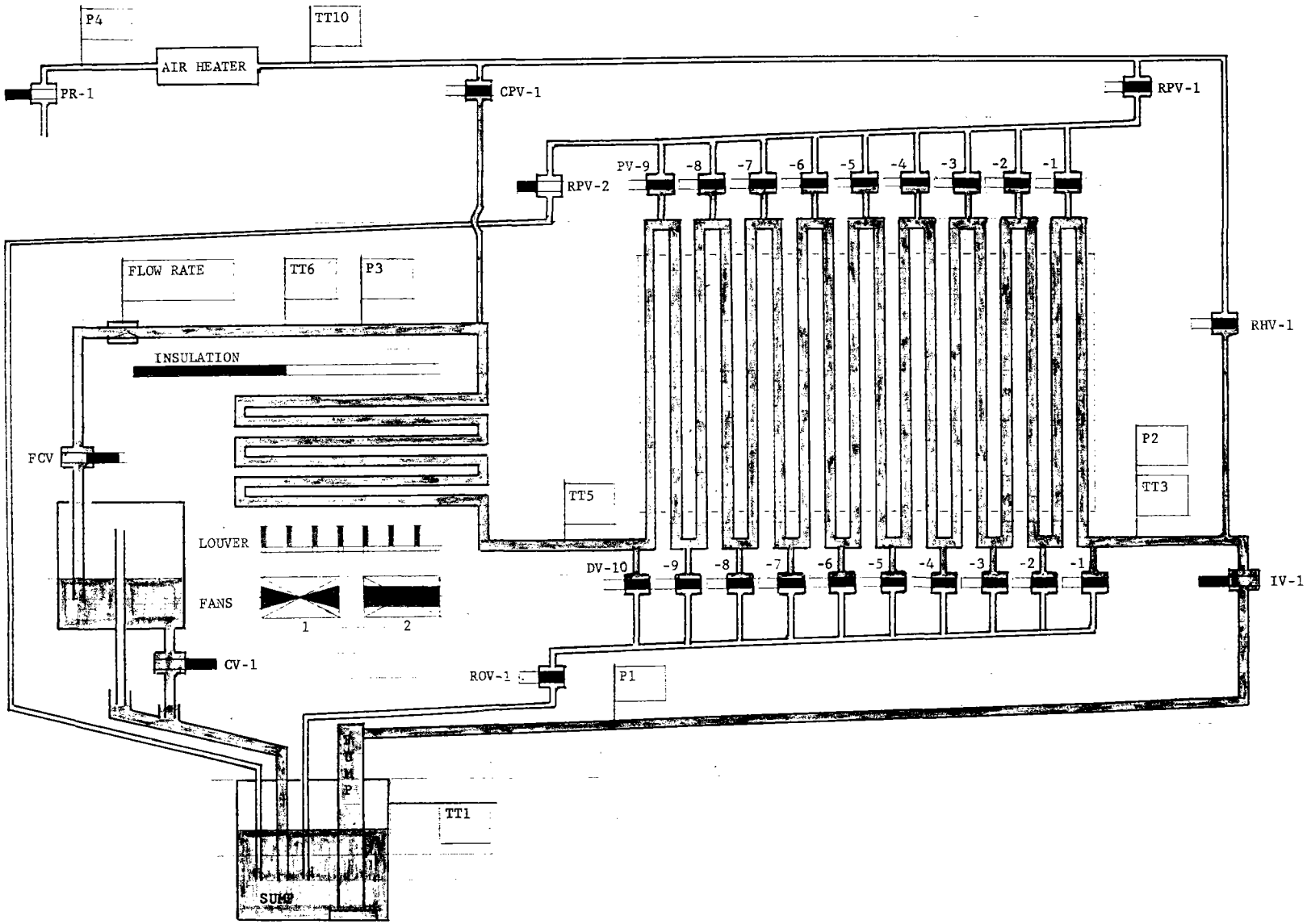



P4
TT10
AIR HEATER
PR-1
CPV-1
RPV-1
PV-9
-8
-7
-6
-5
-4
-3
-2
-1
RPV-2
FLOW RATE
TT6
P3
INSULATION
RHV-1
FCV
P2
TT3
TT5
LOUVER
DV-10
-9
-8
-7
-6
-5
-4
-3
-2
-1
IV-1
FANS
1
2
CV-1
ROV-1
P1
P
U
M
P
TT1

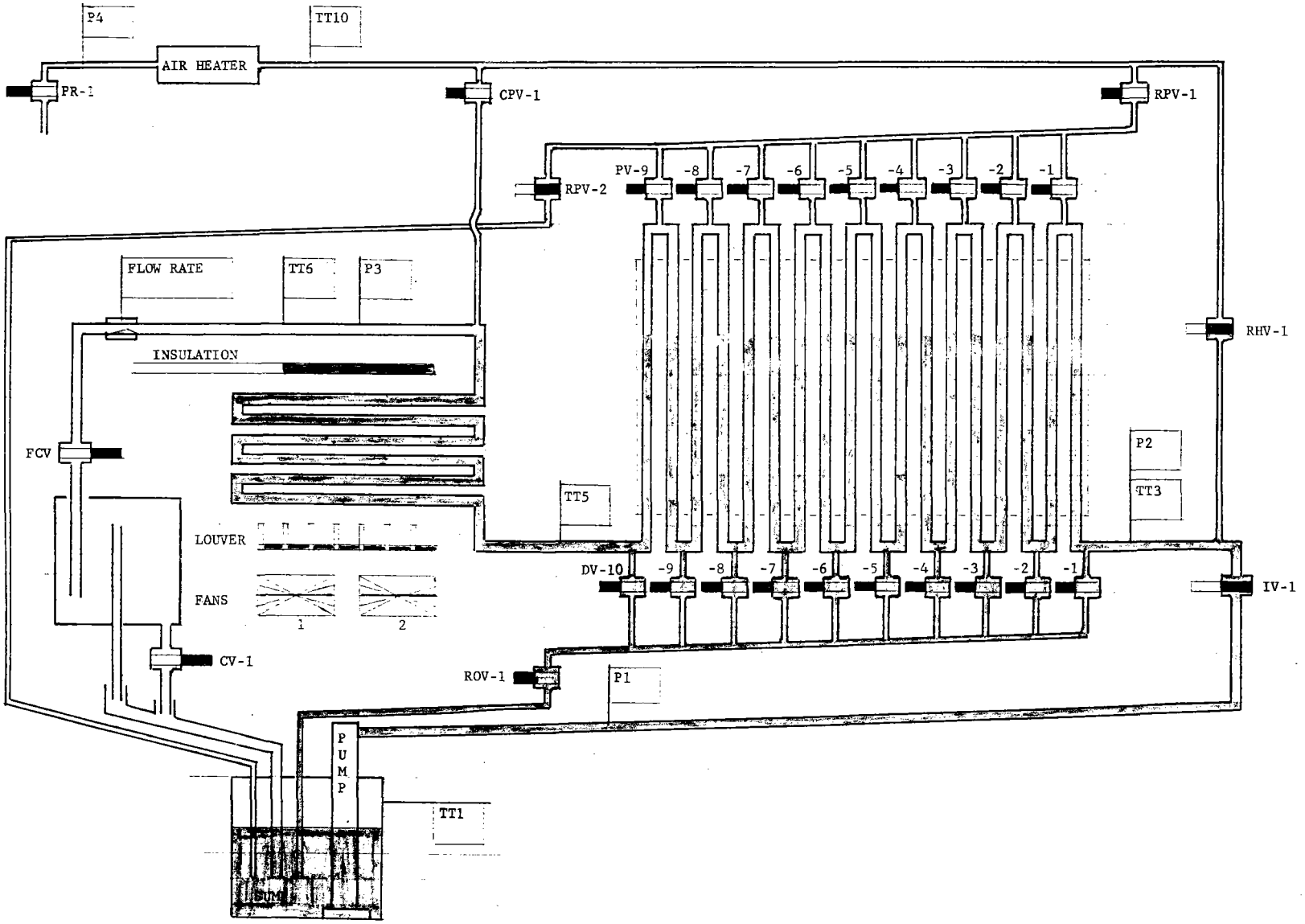

P4
TT10
AIR HEATER
PR-1
CPV-1
RPV-1
PV-9
-8
-7
-6
-5
-4
-3
-2
-1
RPV-2
FLOW RATE
TT6
P3
INSULATION
RHV-1
FCV
P2
TT3
TT5
LOUVER
DV-10
-9
-8
-7
-6
-5
-4
-3
-2
-1
IV-1
FANS
1
2
CV-1
ROV-1
P1
PUMP
TT1


P4
TT10
AIR HEATER
PR-1
CPV-1
RPV-1
PV-9
-8
-7
-6
-5
-4
-3
-2
-1
RPV-2
FLOW RATE
TT6
P3
INSULATION
RHV-1
FCV
P2
TT3
TT5
LOUVER
DV-10
-9
-8
-7
-6
-5
-4
-3
-2
-1
IV-1
FANS
1
2
CV-1
ROV-1
P1
P
U
M
P
TT1

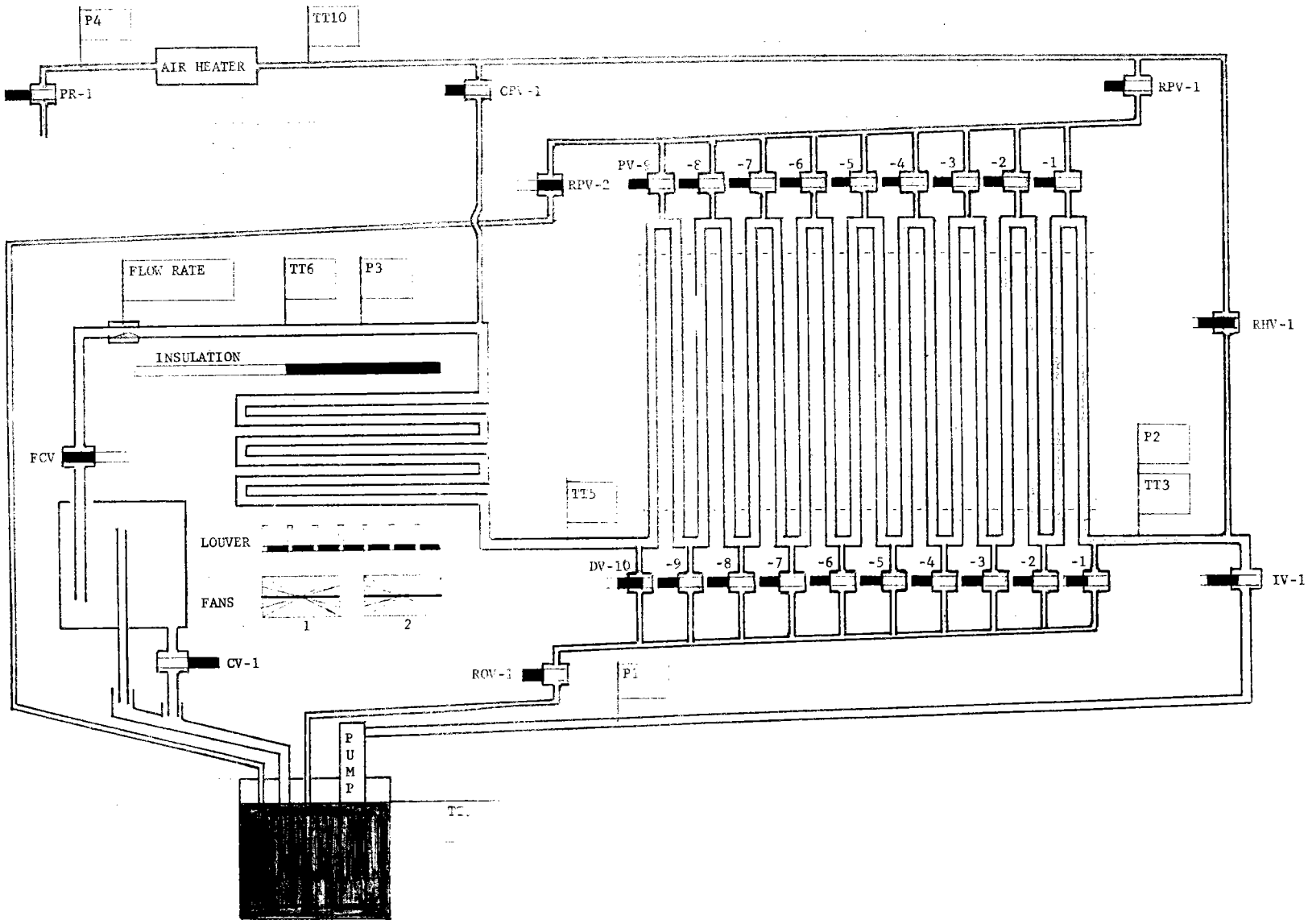

P4
TT10
AIR HEATER
PR-1
CPV-1
RPV-1
PV-9
-8
-7
-6
-5
-4
-3
-2
-1
RPV-2
FLOW RATE
TT6
P3
INSULATION
RHV-1
FCV
P2
TT3
TT5
LOUVER
DV-10
-9
-8
-7
-6
-5
-4
-3
-2
-1
IV-1
FANS
1
2
CV-1
RCV-1
P1
TT1


P4
TT10
AIR HEATER
PR-1
CPV-1
RPV-1
RPV-2
PV-9
-8
-7
-6
-5
-4
-3
-2
-1
FLOW RATE
TT6
P3
INSULATION
RHV-1
FCV
P2
TT3
TT5
LOUVER
DV-10
-9
-8
-7
-6
-5
-4
-3
-2
-1
IV-1
FANS
1
2
CV-1
ROV-1
P1
TT1
SUMP

DRAIN- PHASE I



DRAIN- PHASE II & PURGE



VIII. HELIOSTAT AIMING

A. CAVITY CONFIGURATION - DEFINITION GROUPS

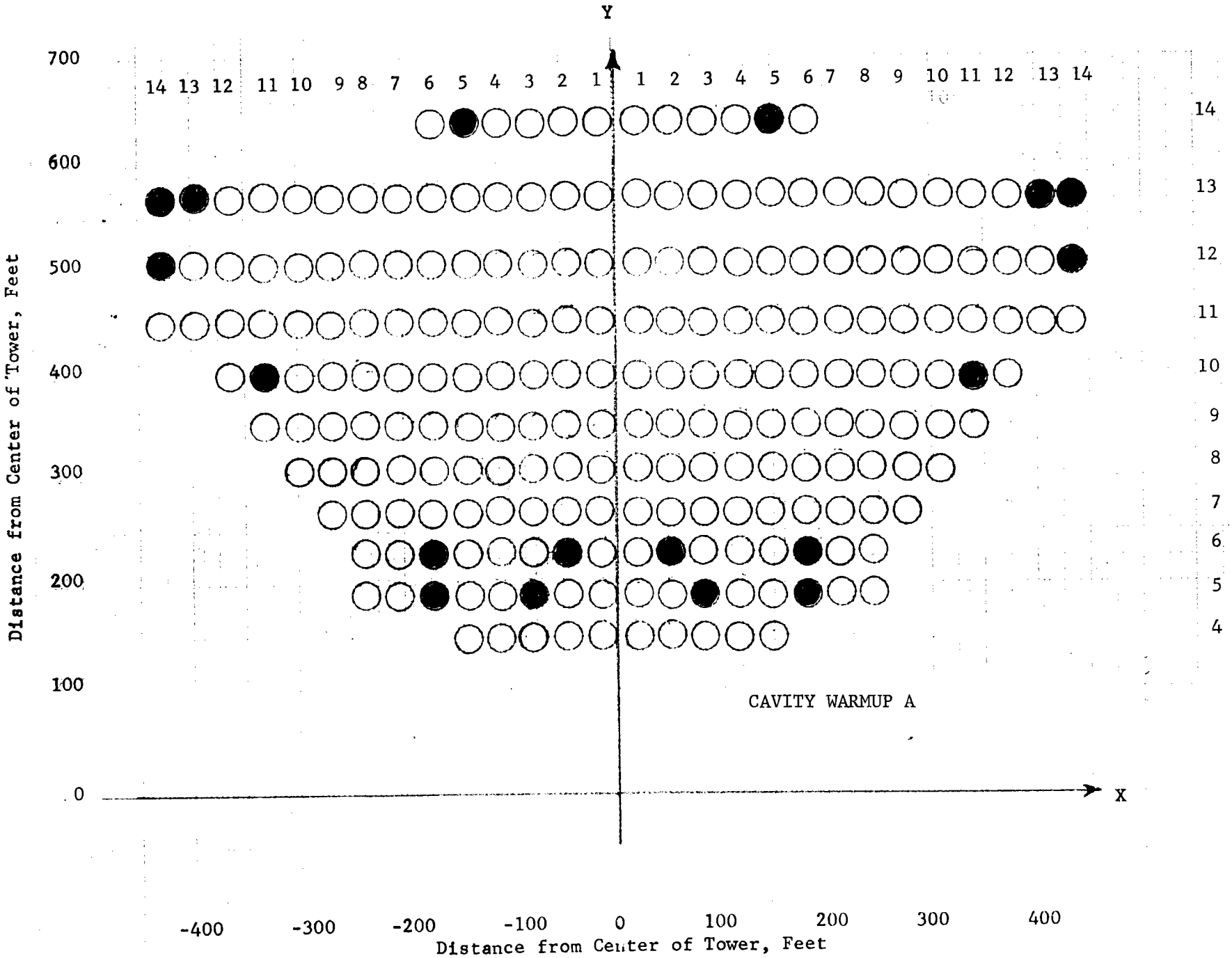
Warmup A

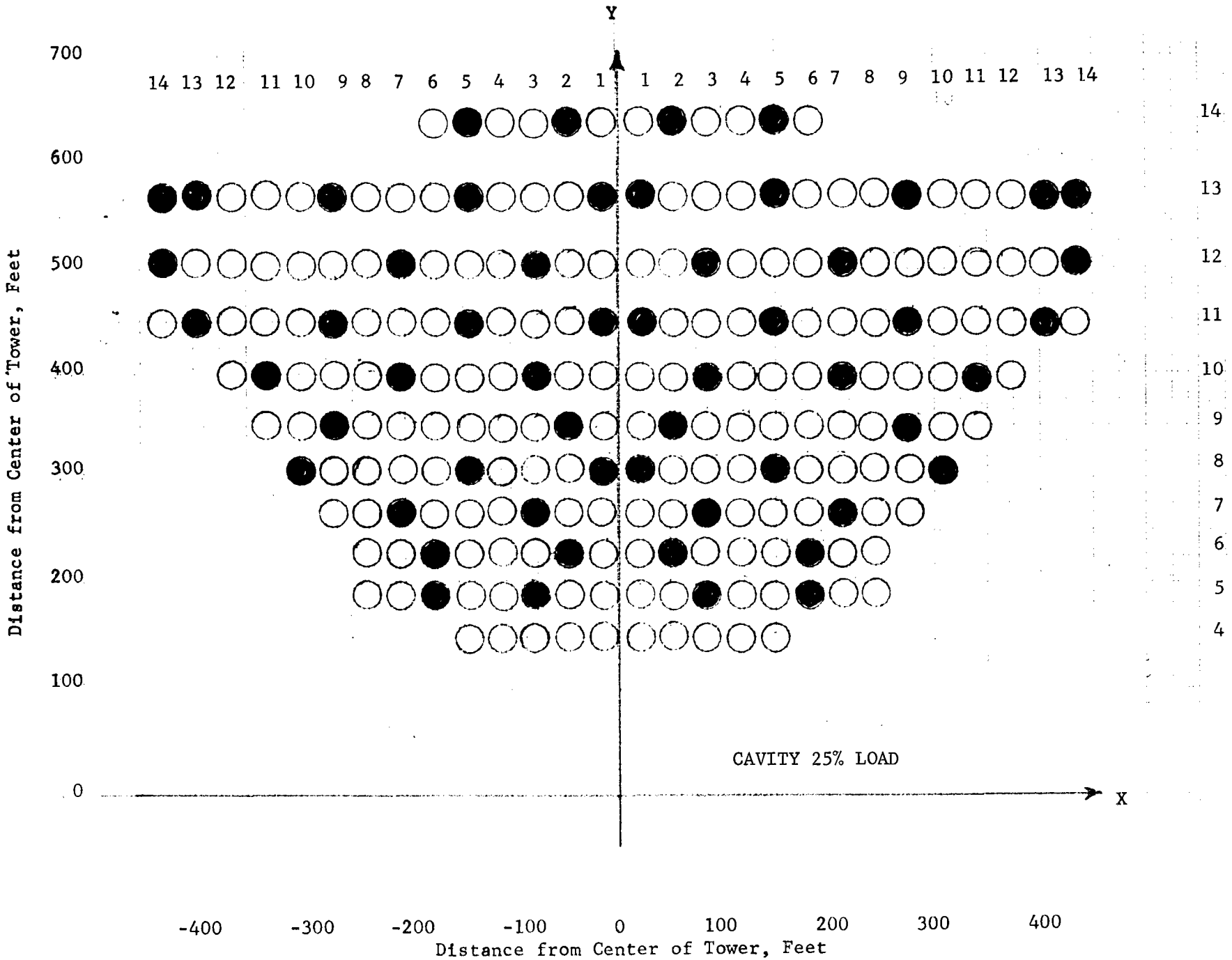
25% Load

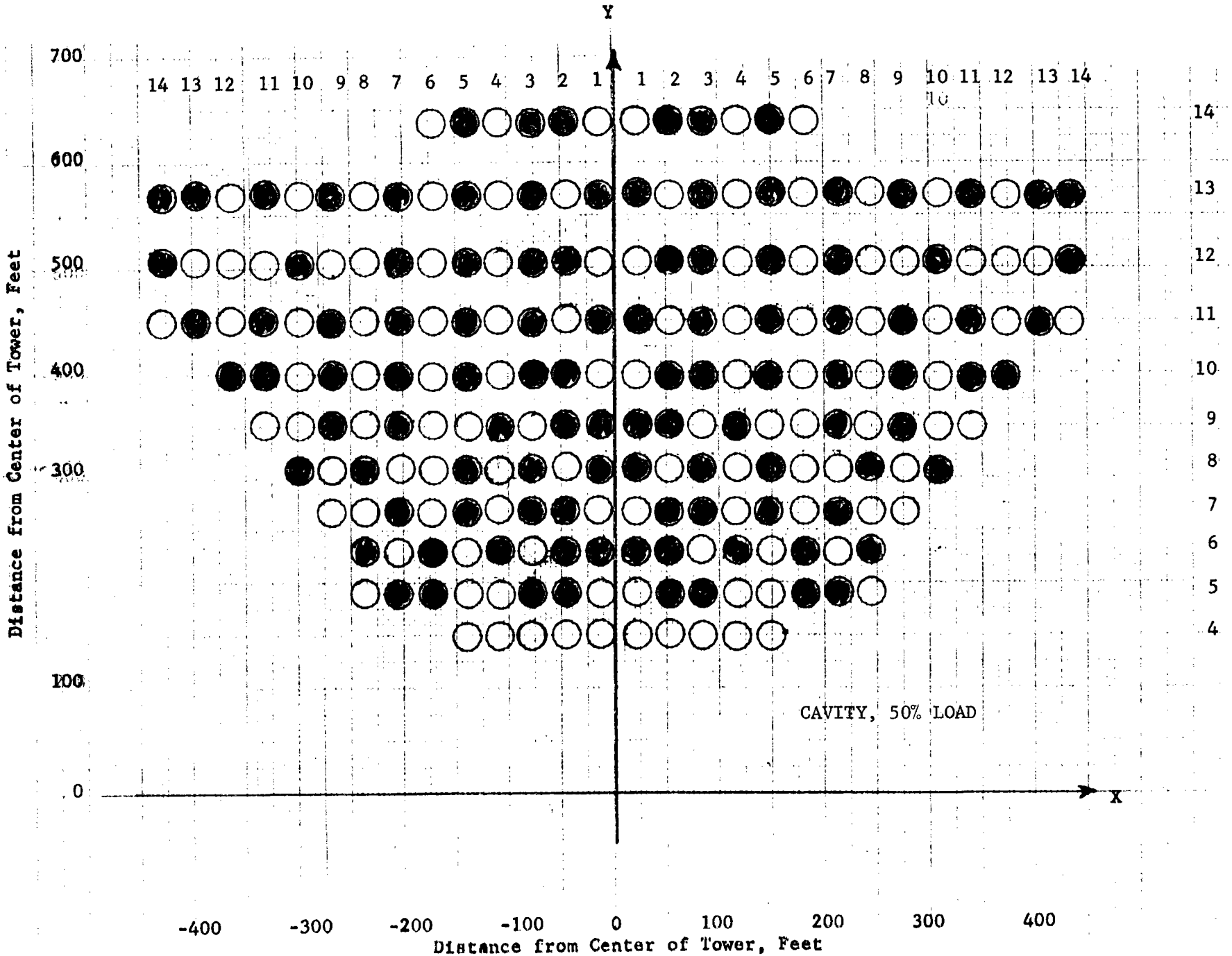
50% Load

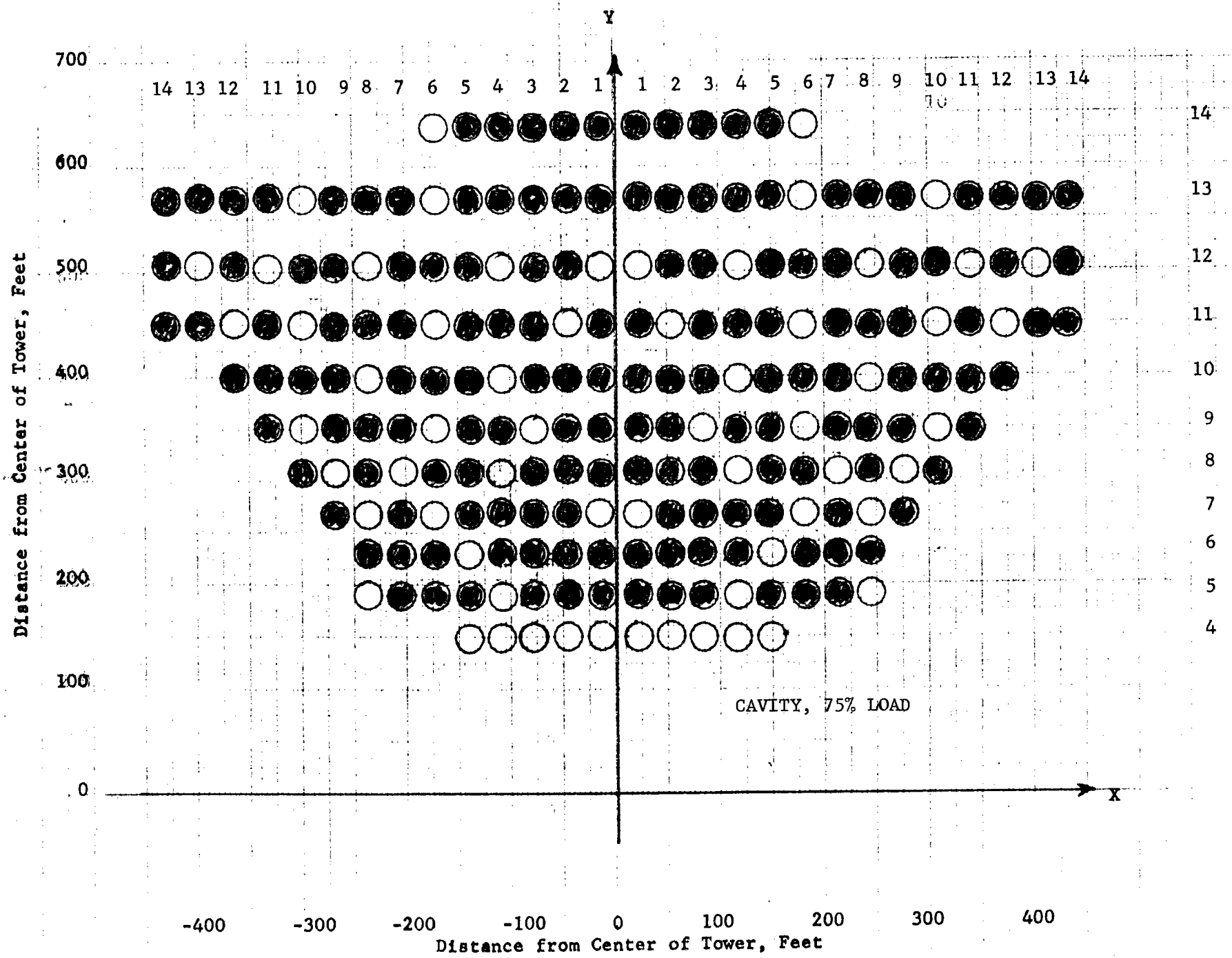
75% Load

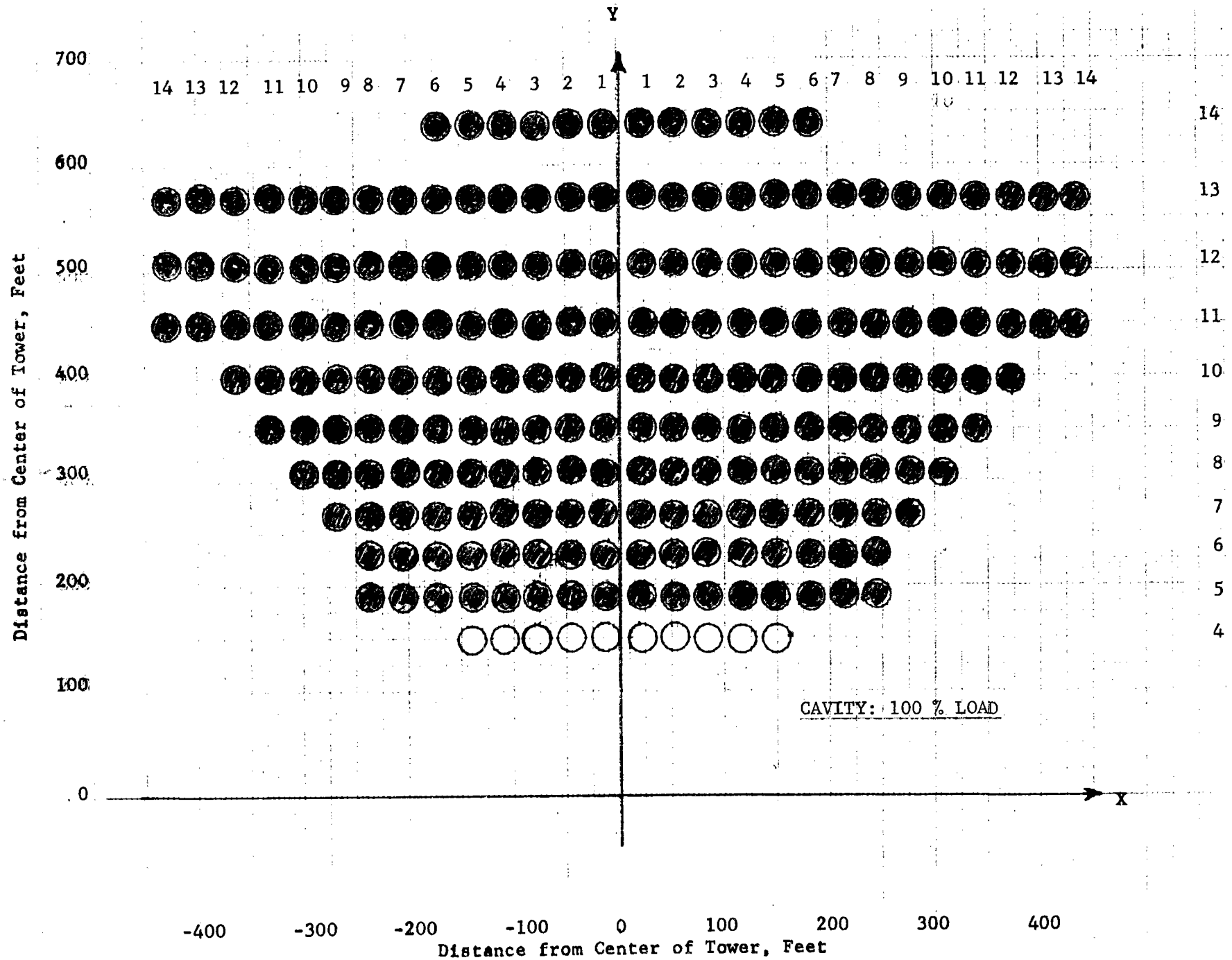
100% Load


Y
700
600
500
400
300
200
100
0
14 13 12 11 10 9 8 7 6 5 4 3 2 1 1 2 3 4 5 6 7 8 9 10 11 12 13 14
14
13
12
11
10
9
8
7
6
5
4
CAVITY WARMUP A
X
-400 -300 -200 -100 0 100 200 300 400
Distance from Center of Tower, Feet
Distance from Center of Tower, Feet


Y
700
600
500
400
300
200
100
0
14 13 12 11 10 9 8 7 6 5 4 3 2 1 1 2 3 4 5 6 7 8 9 10 11 12 13 14
14
13
12
11
10
9
8
7
6
5
4
CAVITY 25% LOAD
X
-400 -300 -200 -100 0 100 200 300 400
Distance from Center of Tower, Feet
Distance from Center of Tower, Feet


Y
X
14 13 12 11 10 9 8 7 6 5 4 3 2 1
1 2 3 4 5 6 7 8 9 10 11 12 13 14
700
600
500
400
300
100
0
14
13
12
11
10
9
8
7
6
5
4
CAVITY, 50% LOAD
-400 -300 -200 -100 0 100 200 300 400
Distance from Center of Tower, Feet
Distance from Center of Tower, Feet


Y
700
600
500
400
300
200
100
0
14 13 12 11 10 9 8 7 6 5 4 3 2 1
1 2 3 4 5 6 7 8 9 10 11 12 13 14
14
13
12
11
10
9
8
7
6
5
4
CAVITY, 75% LOAD
X
-400 -300 -200 -100 0 100 200 300 400
Distance from Center of Tower, Feet
Distance from Center of Tower, Feet


Y
X
14 13 12 11 10 9 8 7 6 5 4 3 2 1 1 2 3 4 5 6 7 8 9 10 11 12 13 14
700
600
500
400
300
200
100
0
14
13
12
11
10
9
8
7
6
5
4
CAVITY: 100 % LOAD
Distance from Center of Tower, Feet
-400 -300 -200 -100 0 100 200 300 400
Distance from Center of Tower, Feet

VIII. HELIOSTAT AIMING

B. CAVITY CONFIGURATION - INCREMENTAL GROUPS

Warmup A to Warmup B

Warmup B to Warmup C

Warmup A to 25% Load

25% Load to 50% Load

25% Load to 37.5% Load

37.5% Load to 50% Load

50% Load to 75% Load

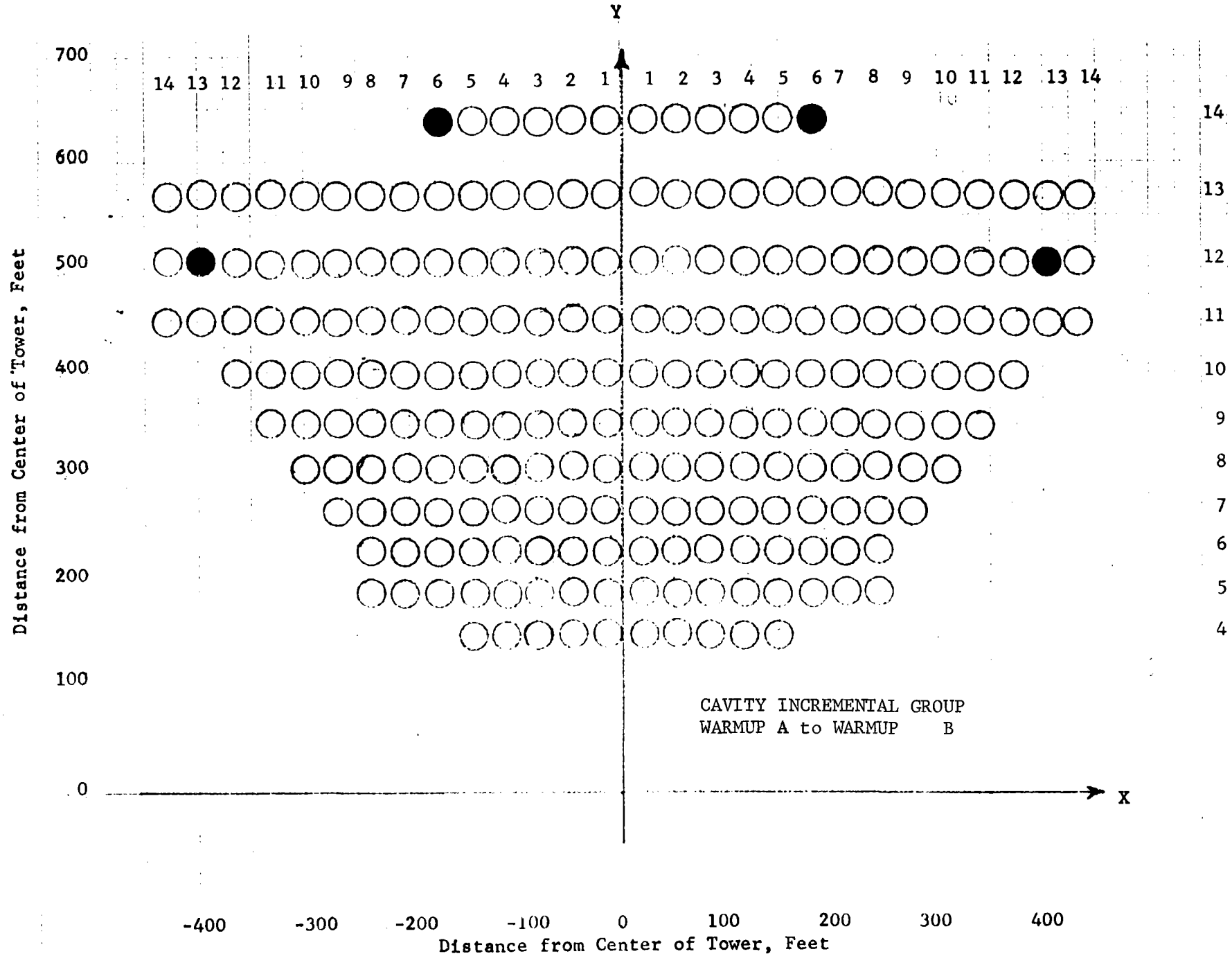
50% Load to 62.5% Load

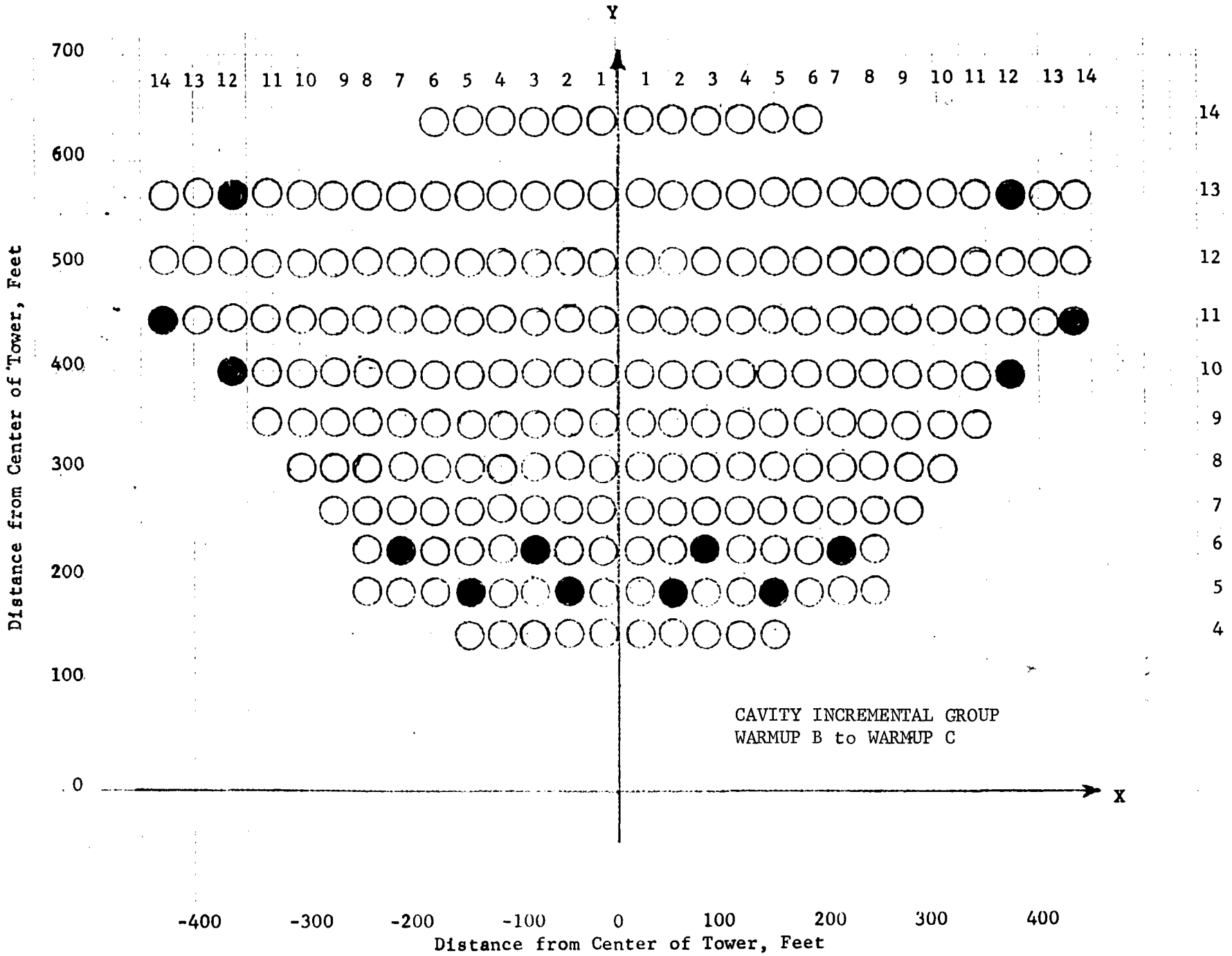
62.5% Load to 75% Load

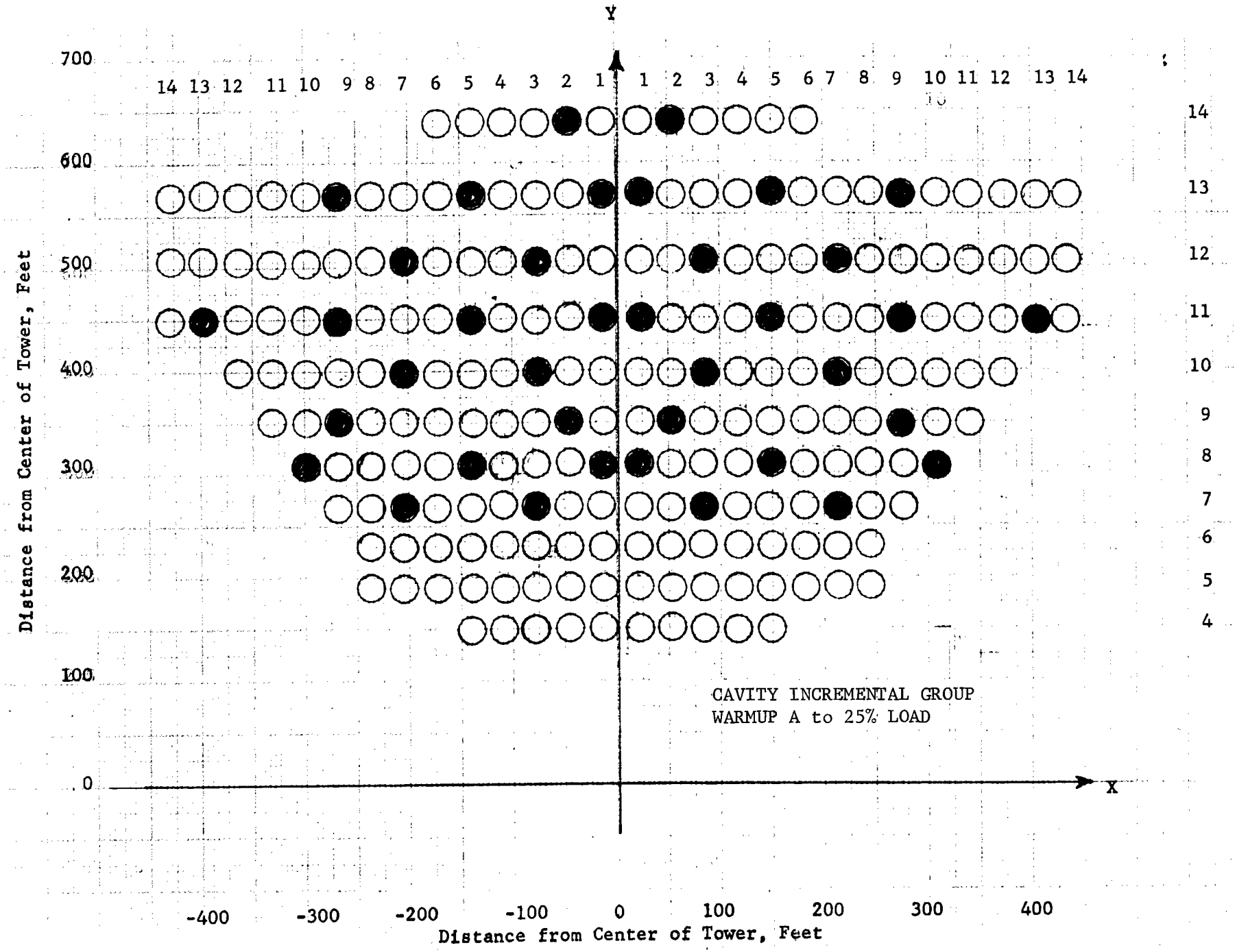
75% Load to 100% Load

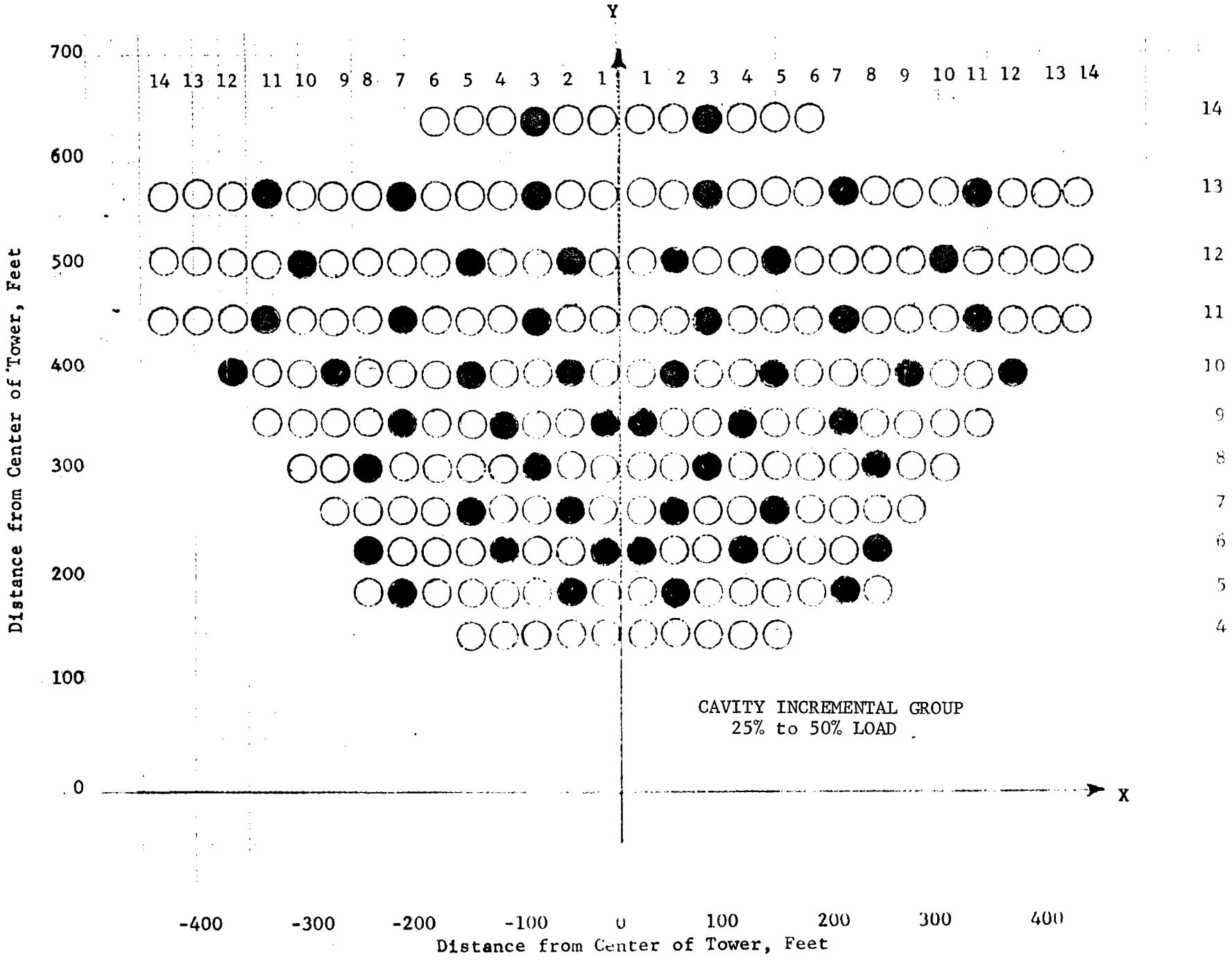
75% Load to 87.5% Load

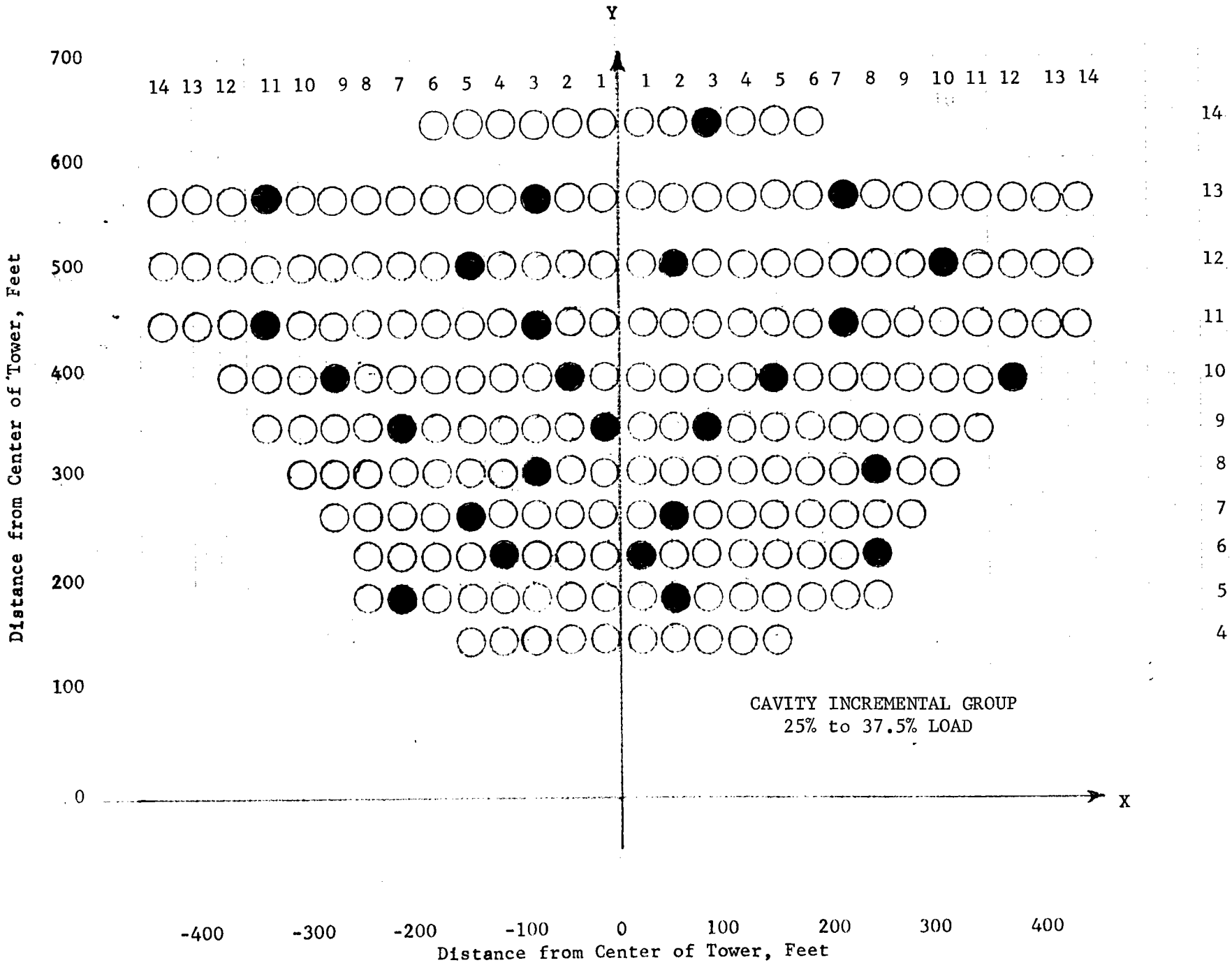
87.5% Load to 100% Load

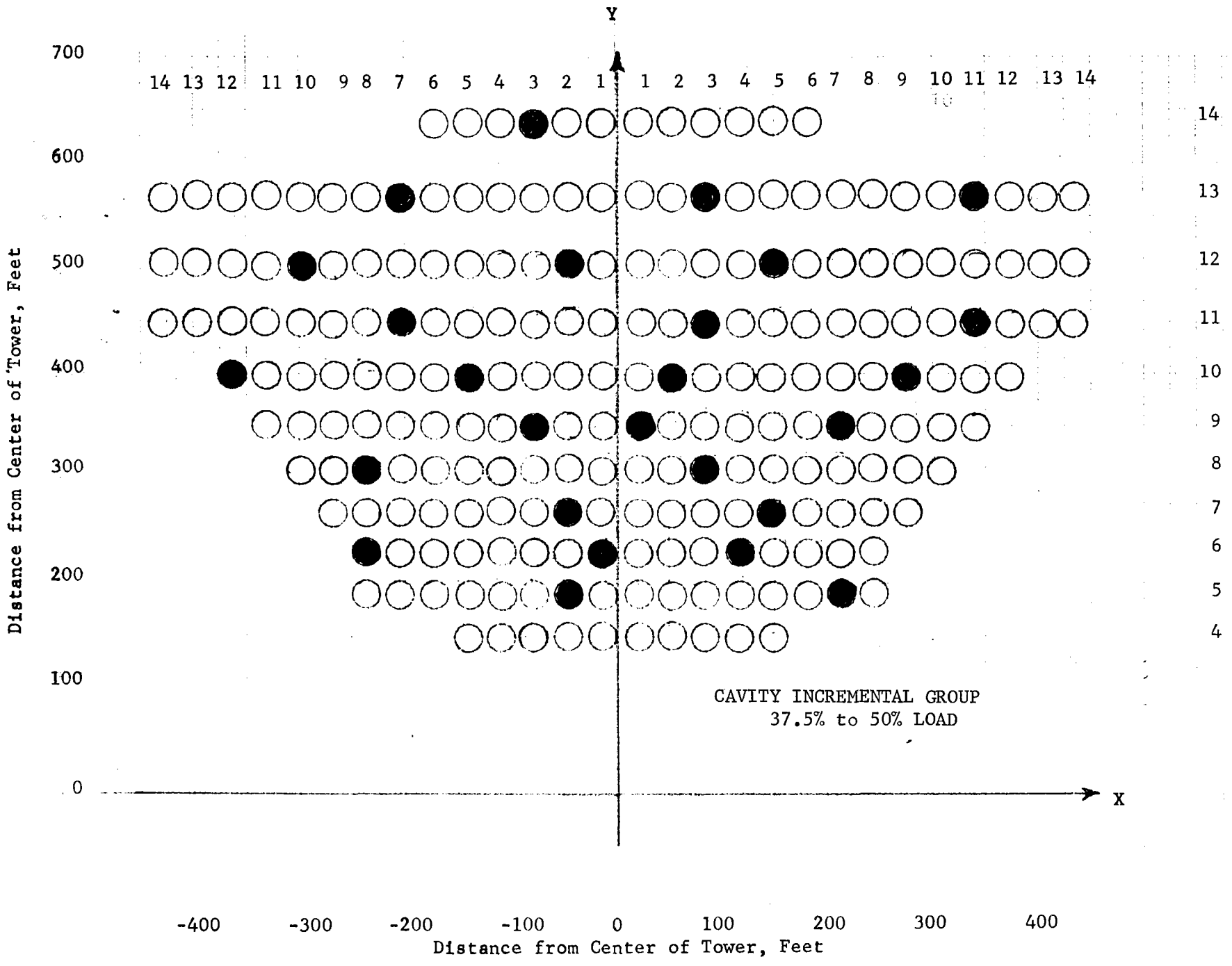

Y
700
600
500
400
300
200
100
0
14 13 12 11 10 9 8 7 6 5 4 3 2 1
1 2 3 4 5 6 7 8 9 10 11 12 13 14
14
13
12
11
10
9
8
7
6
5
4
CAVITY INCREMENTAL GROUP
WARMUP A to WARMUP B
X
-400 -300 -200 -100 0 100 200 300 400
Distance from Center of Tower, Feet
Distance from Center of Tower, Feet

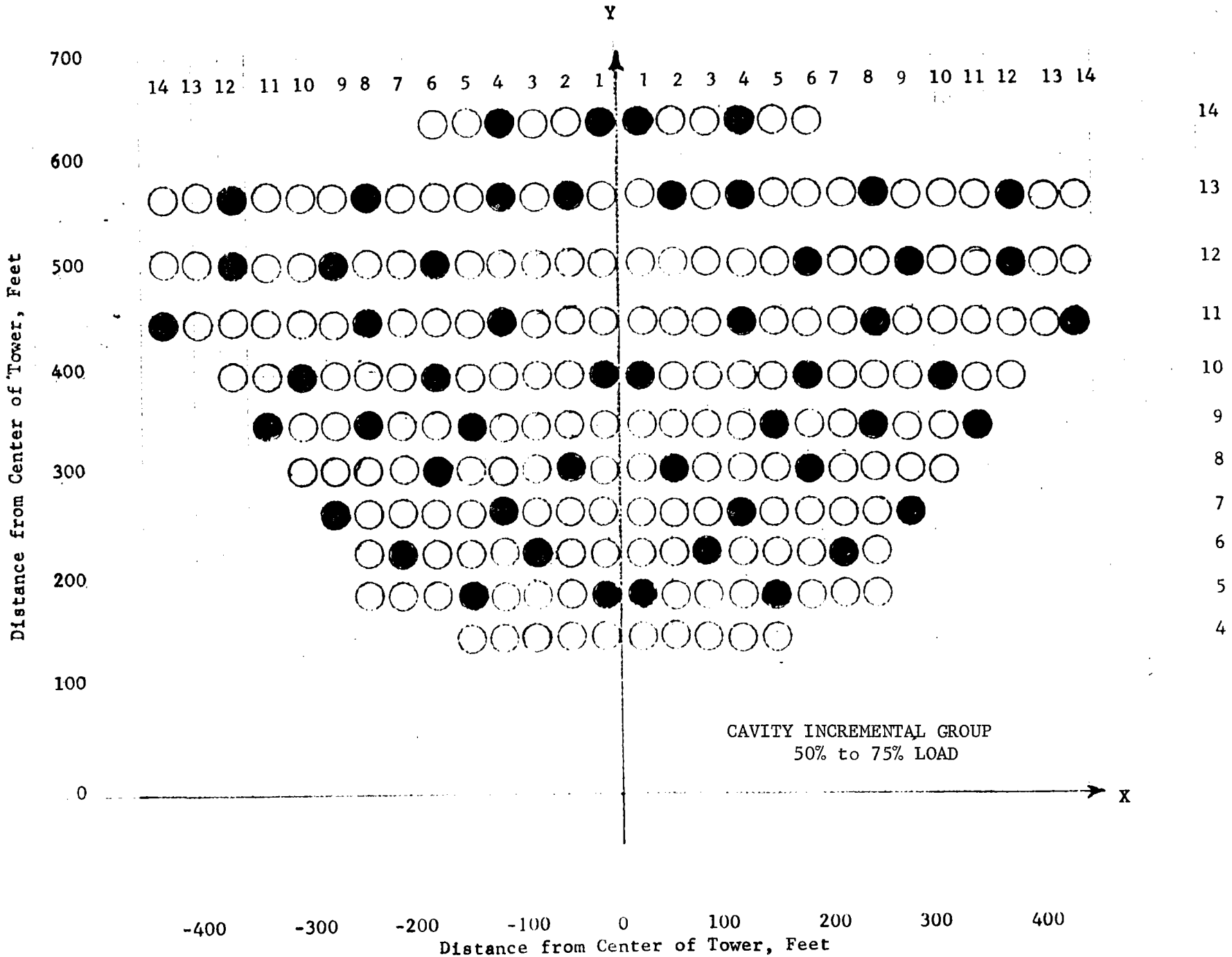

Y
700
600
500
400
300
200
100
0
14 13 12 11 10 9 8 7 6 5 4 3 2 1
1 2 3 4 5 6 7 8 9 10 11 12 13 14
14
13
12
11
10
9
8
7
6
5
4
Distance from Center of Tower, Feet
CAVITY INCREMENTAL GROUP
WARMUP B to WARMUP C
X
-400 -300 -200 -100 0 100 200 300 400
Distance from Center of Tower, Feet

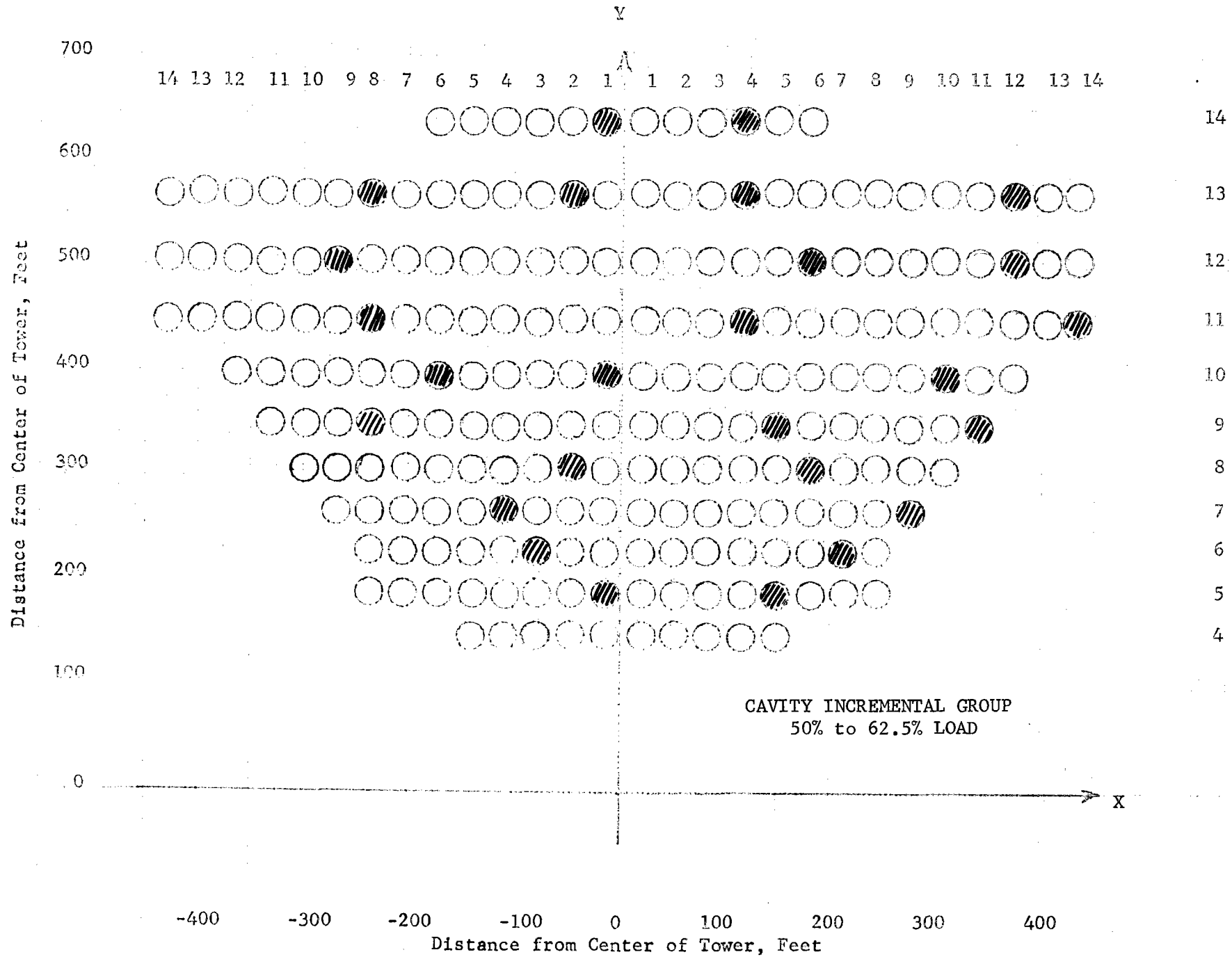

Y
700
600
500
400
300
200
100
0
14 13 12 11 10 9 8 7 6 5 4 3 2 1
1 2 3 4 5 6 7 8 9 10 11 12 13 14
14
13
12
11
10
9
8
7
6
5
4
Distance from Center of Tower, Feet
CAVITY INCREMENTAL GROUP
WARMUP A to 25% LOAD
X
-400 -300 -200 -100 0 100 200 300 400
Distance from Center of Tower, Feet

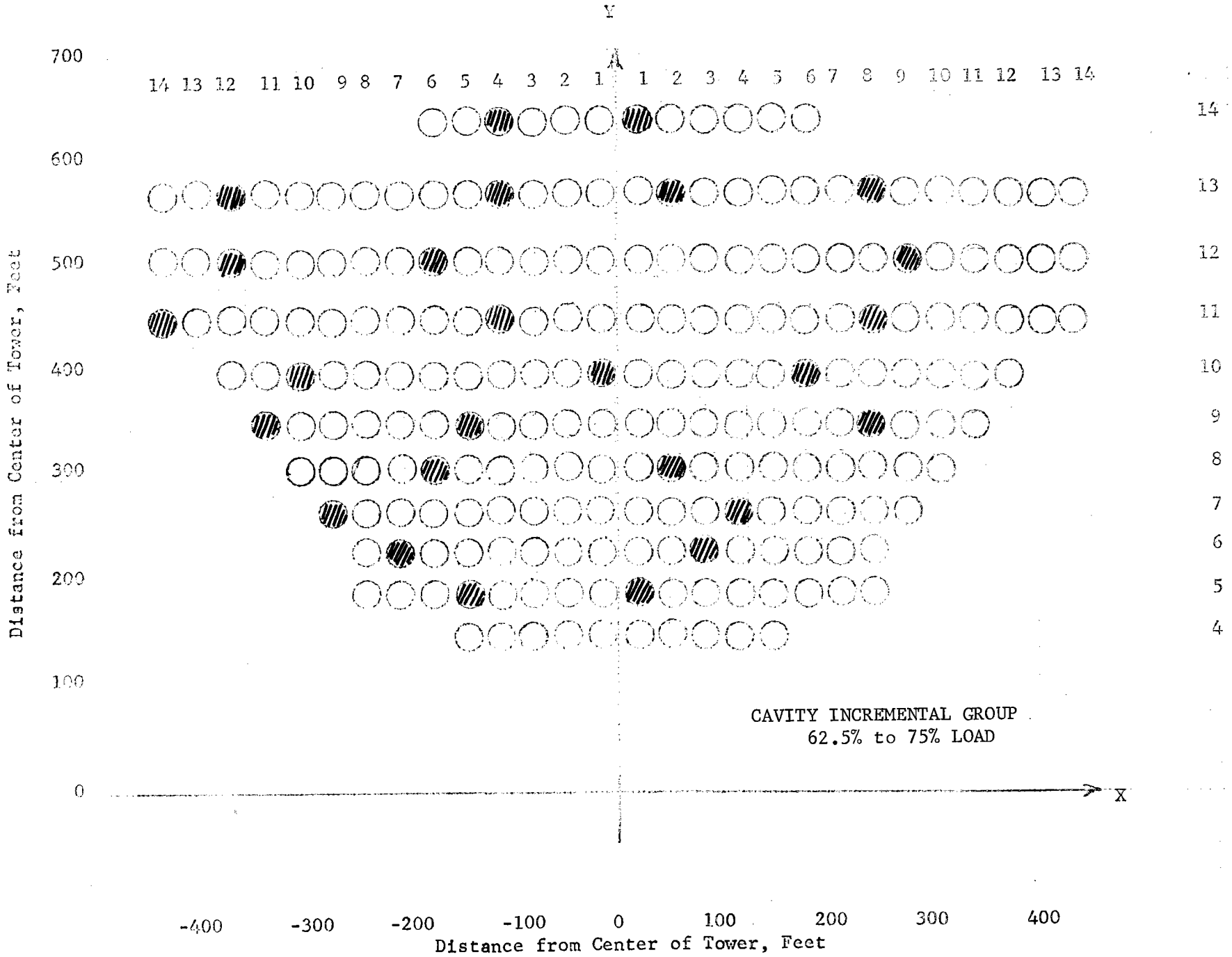

Y
700
600
500
400
300
200
100
0
14 13 12 11 10 9 8 7 6 5 4 3 2 1
1 2 3 4 5 6 7 8 9 10 11 12 13 14
14
13
12
11
10
9
8
7
6
5
4
CAVITY INCREMENTAL GROUP
25% to 50% LOAD
X
-400 -300 -200 -100 0 100 200 300 400
Distance from Center of Tower, Feet
Distance from Center of Tower, Feet

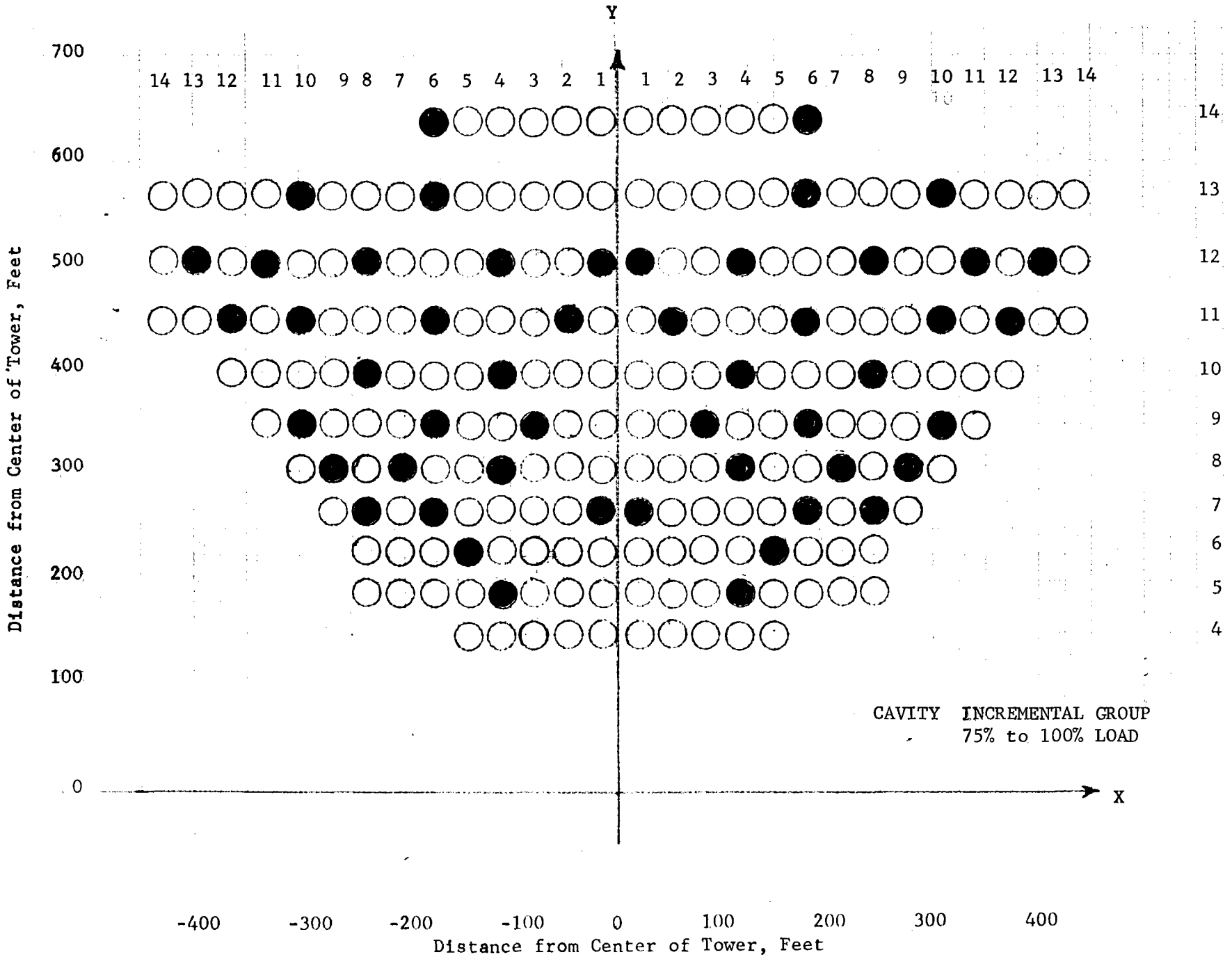

Y
700
600
500
400
300
200
100
0
14 13 12 11 10 9 8 7 6 5 4 3 2 1
1 2 3 4 5 6 7 8 9 10 11 12 13 14
14
13
12
11
10
9
8
7
6
5
4
CAVITY INCREMENTAL GROUP
25% to 37.5% LOAD
X
-400 -300 -200 -100 0 100 200 300 400
Distance from Center of Tower, Feet
Distance from Center of Tower, Feet

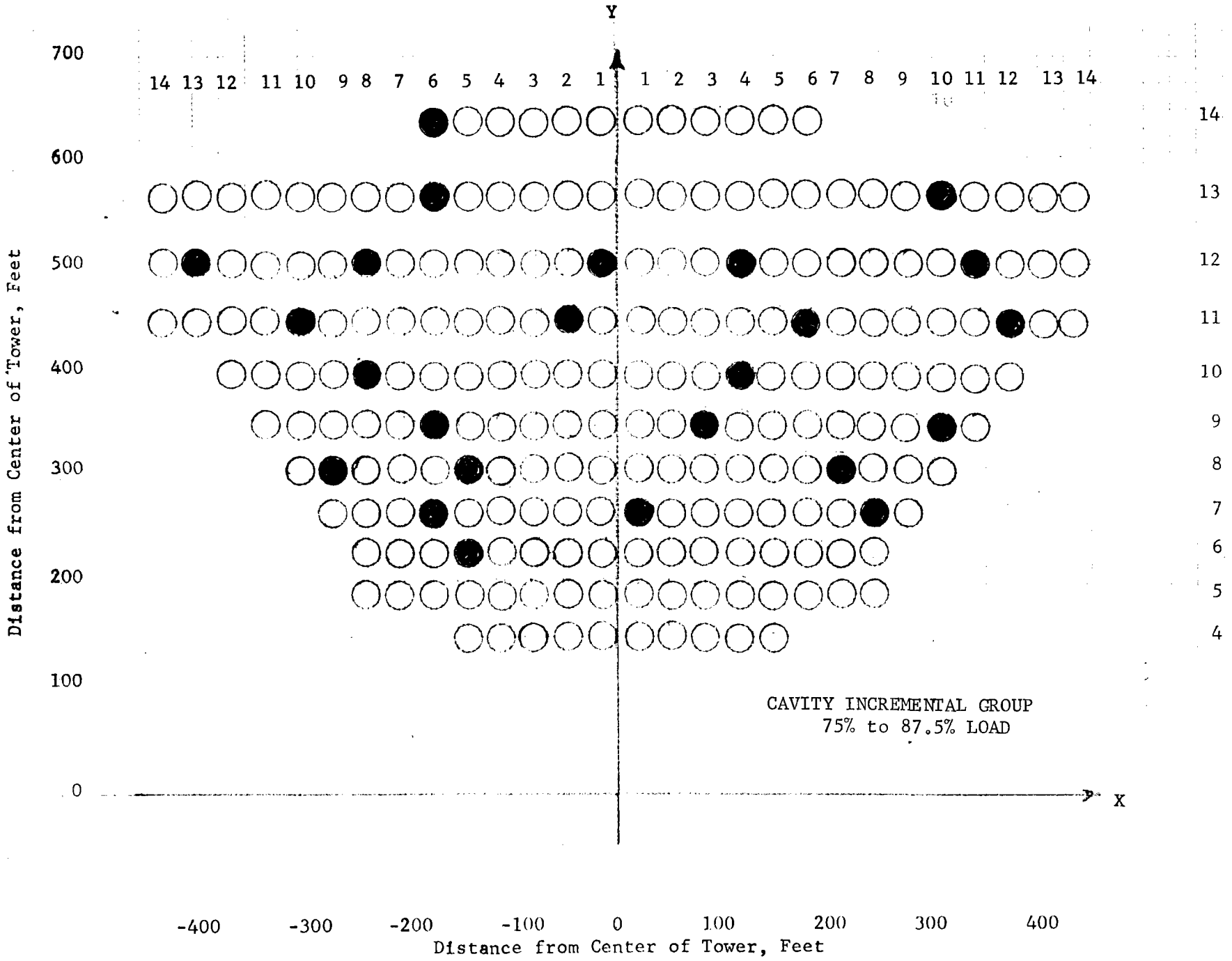

Y
700
600
500
400
300
200
100
0
14 13 12 11 10 9 8 7 6 5 4 3 2 1
1 2 3 4 5 6 7 8 9 10 11 12 13 14
14
13
12
11
10
9
8
7
6
5
4
CAVITY INCREMENTAL GROUP
37.5% to 50% LOAD
X
-400 -300 -200 -100 0 100 200 300 400
Distance from Center of Tower, Feet
Distance from Center of Tower, Feet

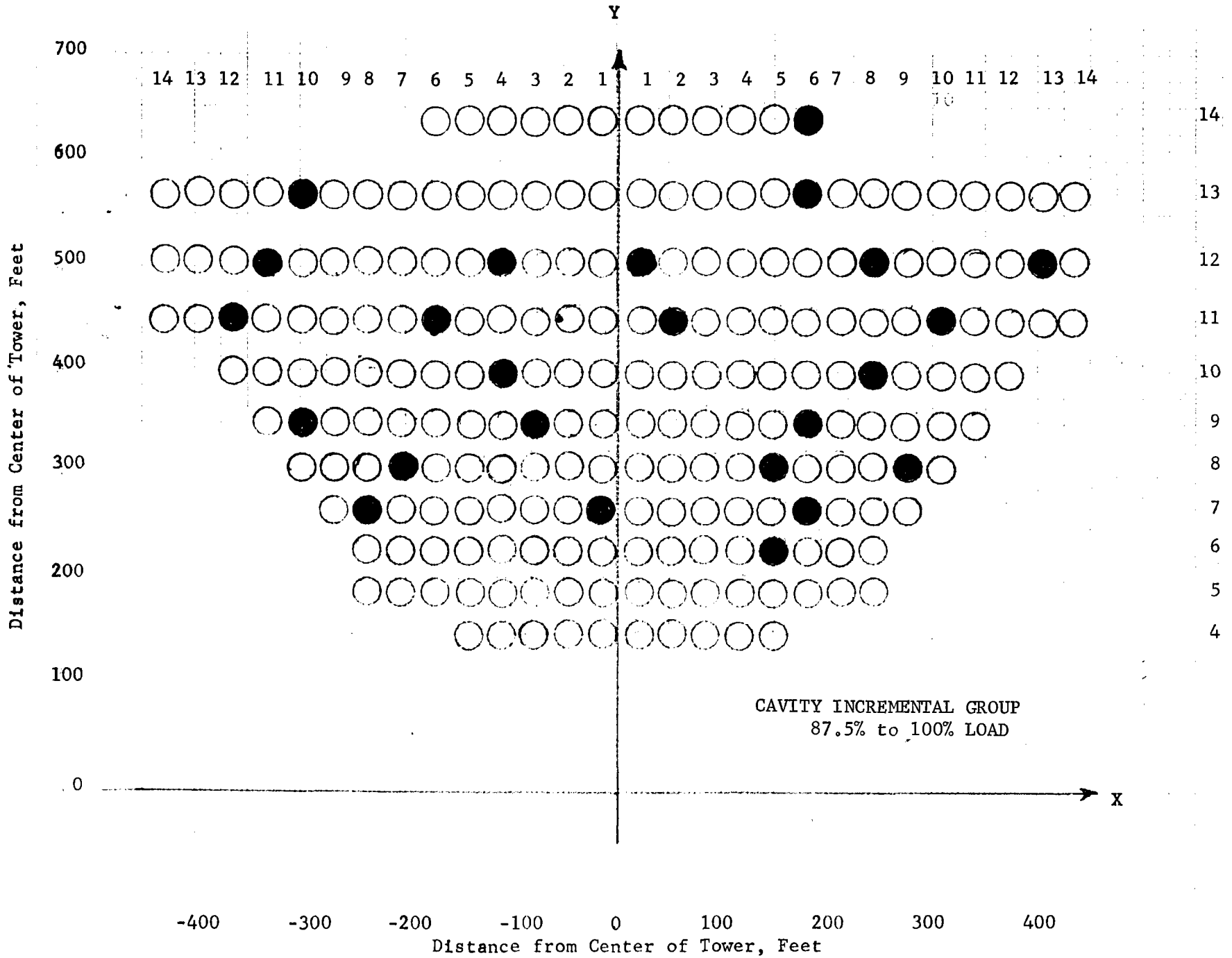

Y
700
600
500
400
300
200
100
0
14 13 12 11 10 9 8 7 6 5 4 3 2 1 1 2 3 4 5 6 7 8 9 10 11 12 13 14
14
13
12
11
10
9
8
7
6
5
4
CAVITY INCREMENTAL GROUP
50% to 75% LOAD
X
-400 -300 -200 -100 0 100 200 300 400
Distance from Center of Tower, Feet
Distance from Center of Tower, Feet


Y
A
14 13 12 11 10 9 8 7 6 5 4 3 2 1 1 2 3 4 5 6 7 8 9 10 11 12 13 14
700
600
500
400
300
200
100
0
14
13
12
11
10
9
8
7
6
5
4
CAVITY INCREMENTAL GROUP
50% to 62.5% LOAD
X
-400 -300 -200 -100 0 100 200 300 400
Distance from Center of Tower, Feet
Distance from Center of Tower, Feet


Y
700
600
500
400
300
200
100
0
14 13 12 11 10 9 8 7 6 5 4 3 2 1 1 2 3 4 5 6 7 8 9 10 11 12 13 14
14
13
12
11
10
9
8
7
6
5
4
X
Distance from Center of Tower, Feet
CAVITY INCREMENTAL GROUP
62.5% to 75% LOAD
-400 -300 -200 -100 0 100 200 300 400
Distance from Center of Tower, Feet


Y
700
600
500
400
300
200
100
0
14 13 12 11 10 9 8 7 6 5 4 3 2 1
1 2 3 4 5 6 7 8 9 10 11 12 13 14
14
13
12
11
10
9
8
7
6
5
4
Distance from Center of Tower, Feet
CAVITY INCREMENTAL GROUP
75% to 100% LOAD
X
-400 -300 -200 -100 0 100 200 300 400
Distance from Center of Tower, Feet


Y
700
600
500
400
300
200
100
0
14 13 12 11 10 9 8 7 6 5 4 3 2 1 1 2 3 4 5 6 7 8 9 10 11 12 13 14
14
13
12
11
10
9
8
7
6
5
4
CAVITY INCREMENTAL GROUP
75% to 87.5% LOAD
X
-400 -300 -200 -100 0 100 200 300 400
Distance from Center of Tower, Feet
Distance from Center of Tower, Feet


Y
700
600
500
400
300
200
100
0
14 13 12 11 10 9 8 7 6 5 4 3 2 1
1 2 3 4 5 6 7 8 9 10 11 12 13 14
14
13
12
11
10
9
8
7
6
5
4
CAVITY INCREMENTAL GROUP
87.5% to 100% LOAD
X
Distance from Center of Tower, Feet
-400 -300 -200 -100 0 100 200 300 400
Distance from Center of Tower, Feet

VIII. HELIOSTAT AIMING

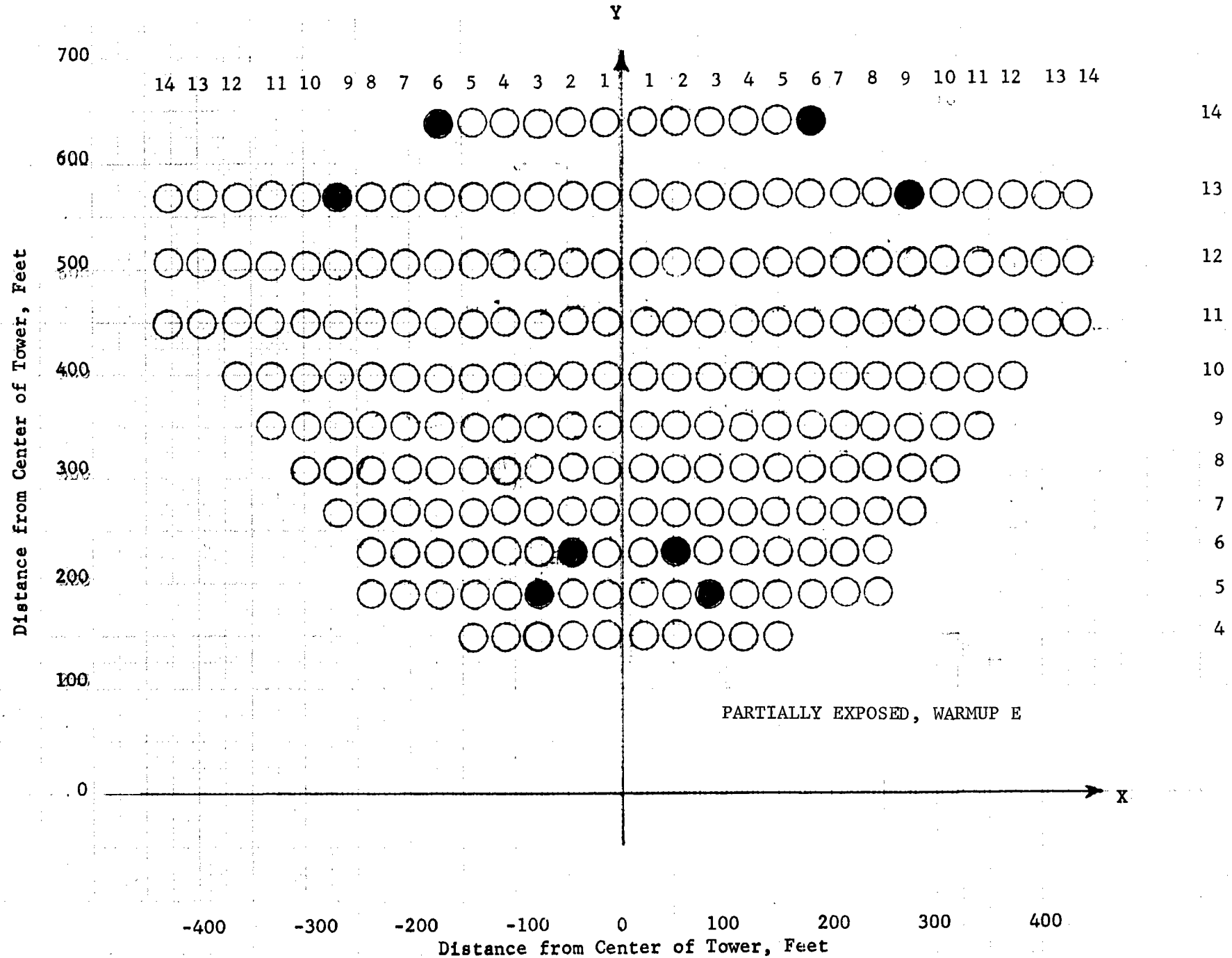
C. PARTIALLY EXPOSED CONFIGURATION - DEFINITION GROUPS

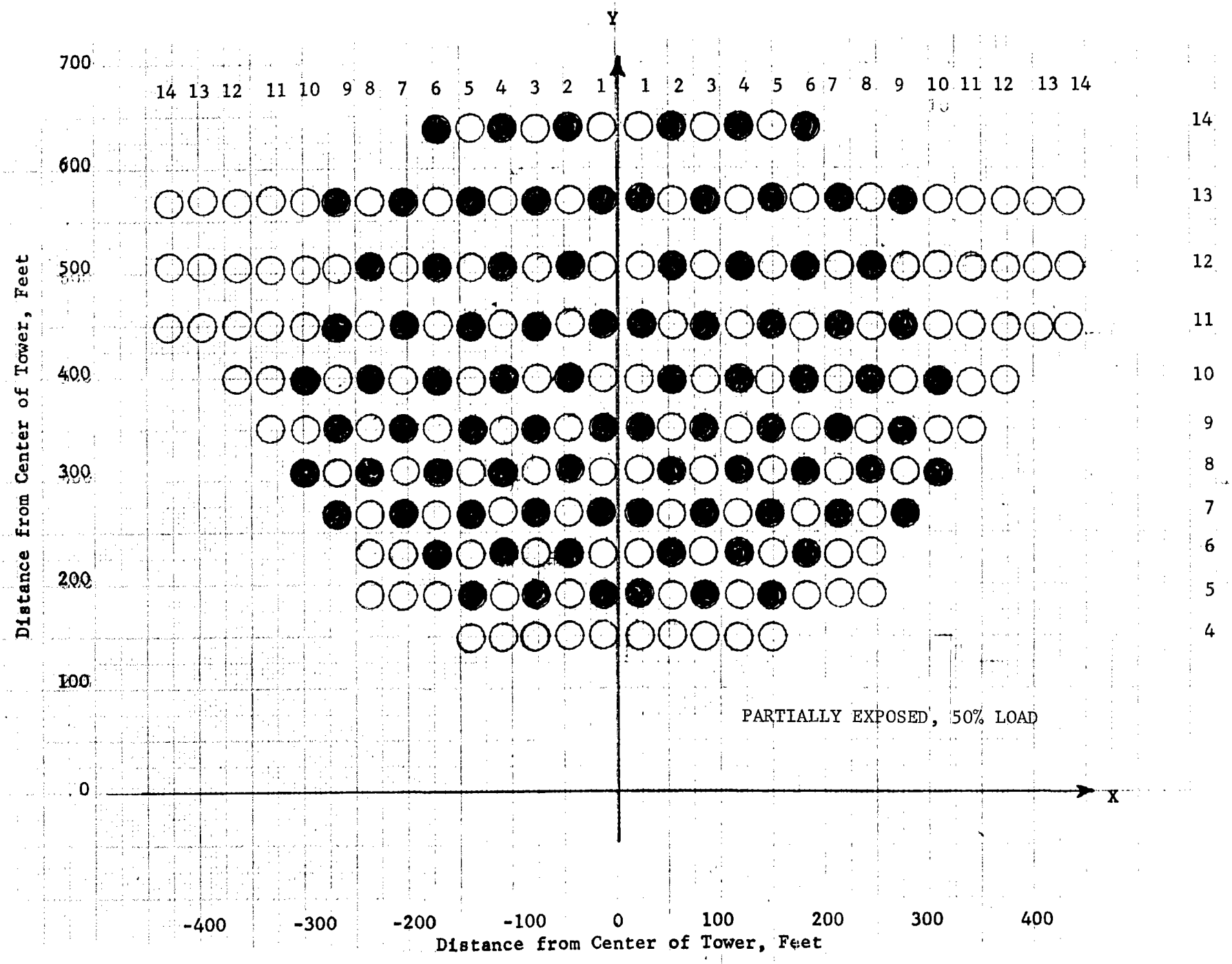
Warmup E

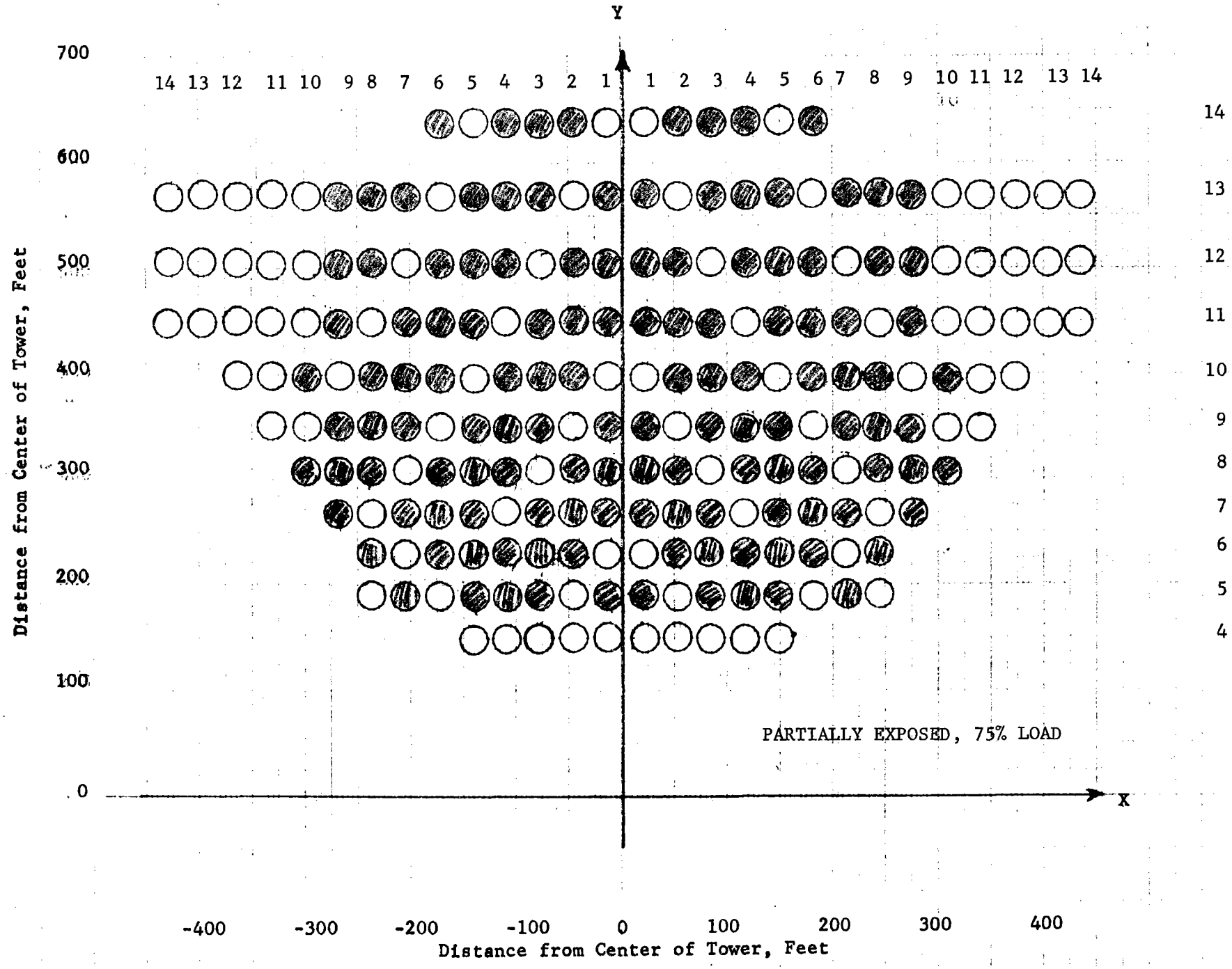
50% Load

75% Load

100 % Load


Y
700
600
500
400
300
200
100
0
14 13 12 11 10 9 8 7 6 5 4 3 2 1 1 2 3 4 5 6 7 8 9 10 11 12 13 14
14
13
12
11
10
9
8
7
6
5
4
PARTIALLY EXPOSED, WARMUP E
X
-400 -300 -200 -100 0 100 200 300 400
Distance from Center of Tower, Feet
Distance from Center of Tower, Feet


Y
700
600
500
400
300
200
100
0
14 13 12 11 10 9 8 7 6 5 4 3 2 1
1 2 3 4 5 6 7 8 9 10 11 12 13 14
14
13
12
11
10
9
8
7
6
5
4
Distance from Center of Tower, Feet
PARTIALLY EXPOSED, 50% LOAD
X
-400 -300 -200 -100 0 100 200 300 400
Distance from Center of Tower, Feet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14 13 12 11 10 9 8 7 6 5 4 3 2 1
1 2 3 4 5 6 7 8 9 10 11 12 13 14
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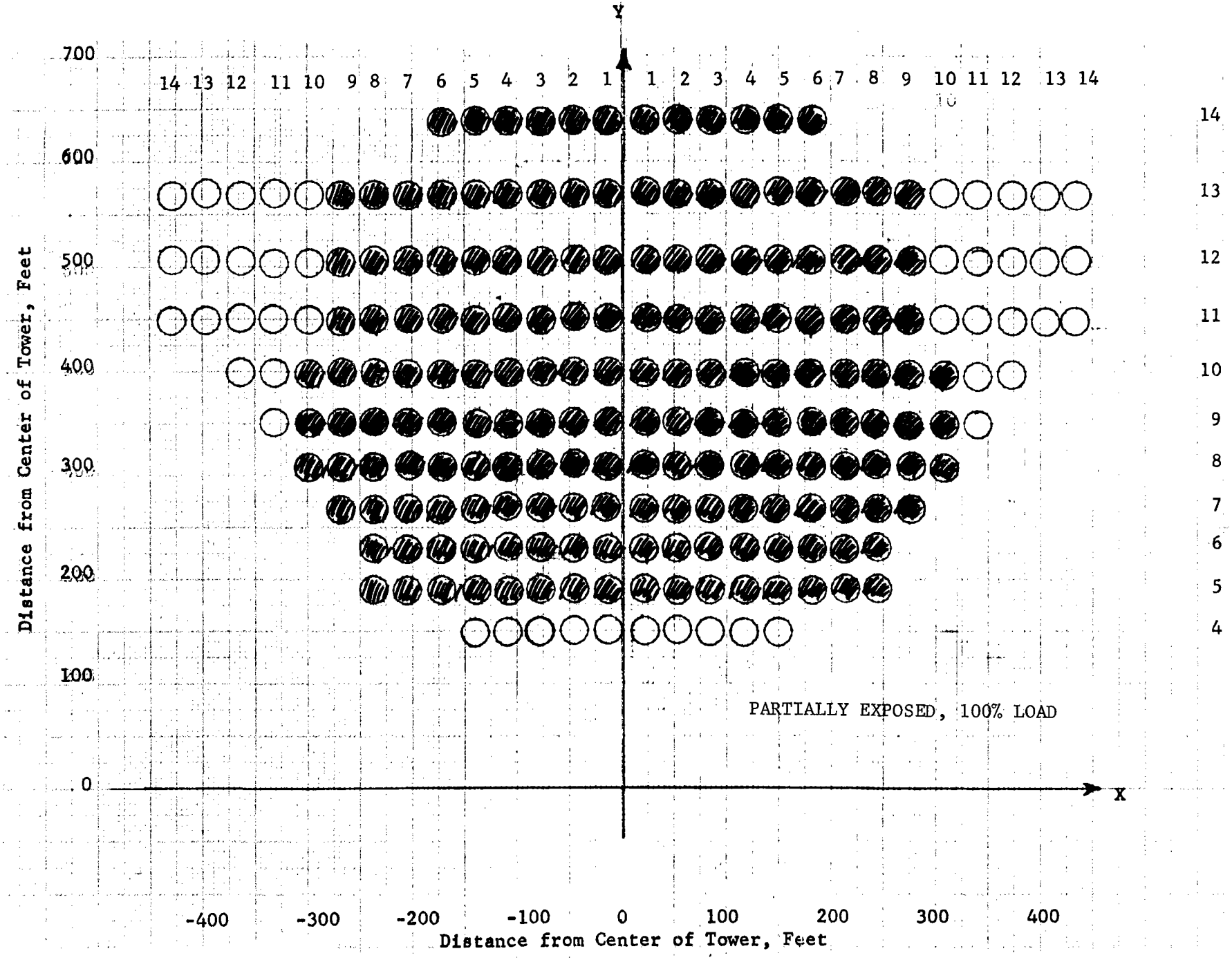
4
PARTIALLY EXPOSED, 75% LOAD
X
-400 -300 -200 -100 0 100 200 300 400
Distance from Center of Tower, Feet
Distance from Center of Tower, Feet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4
PARTIALLY EXPOSED, 100% LOAD
X
-400 -300 -200 -100 0 100 200 300 400
Distance from Center of Tower, Feet
Distance from Center of Tower, Feet

VIII. HELIOSTAT AIMING

D. PARTIALLY EXPOSED CONFIGURATION - INCREMENTAL GROUPS

Warmup E to Warmup F

Warmup F to Warmup G

Warmup E to 19% Load

19% Load to 34.5% Load

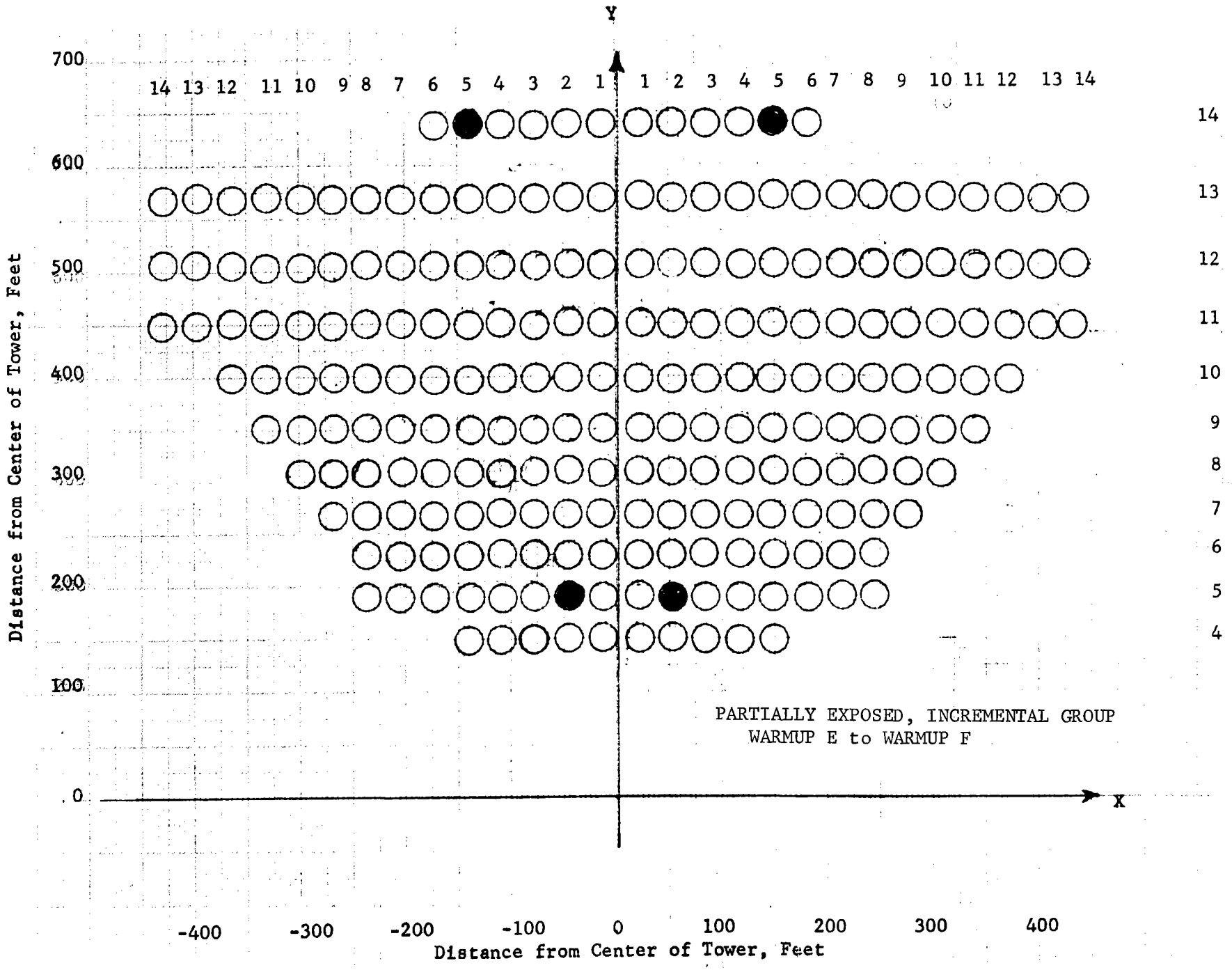
34.5% Load to 50% Load

50% Load to 62.5% Load

62.5% Load to 75% Load

75% Load to 87.5% Load

87.5% Load to 100% Load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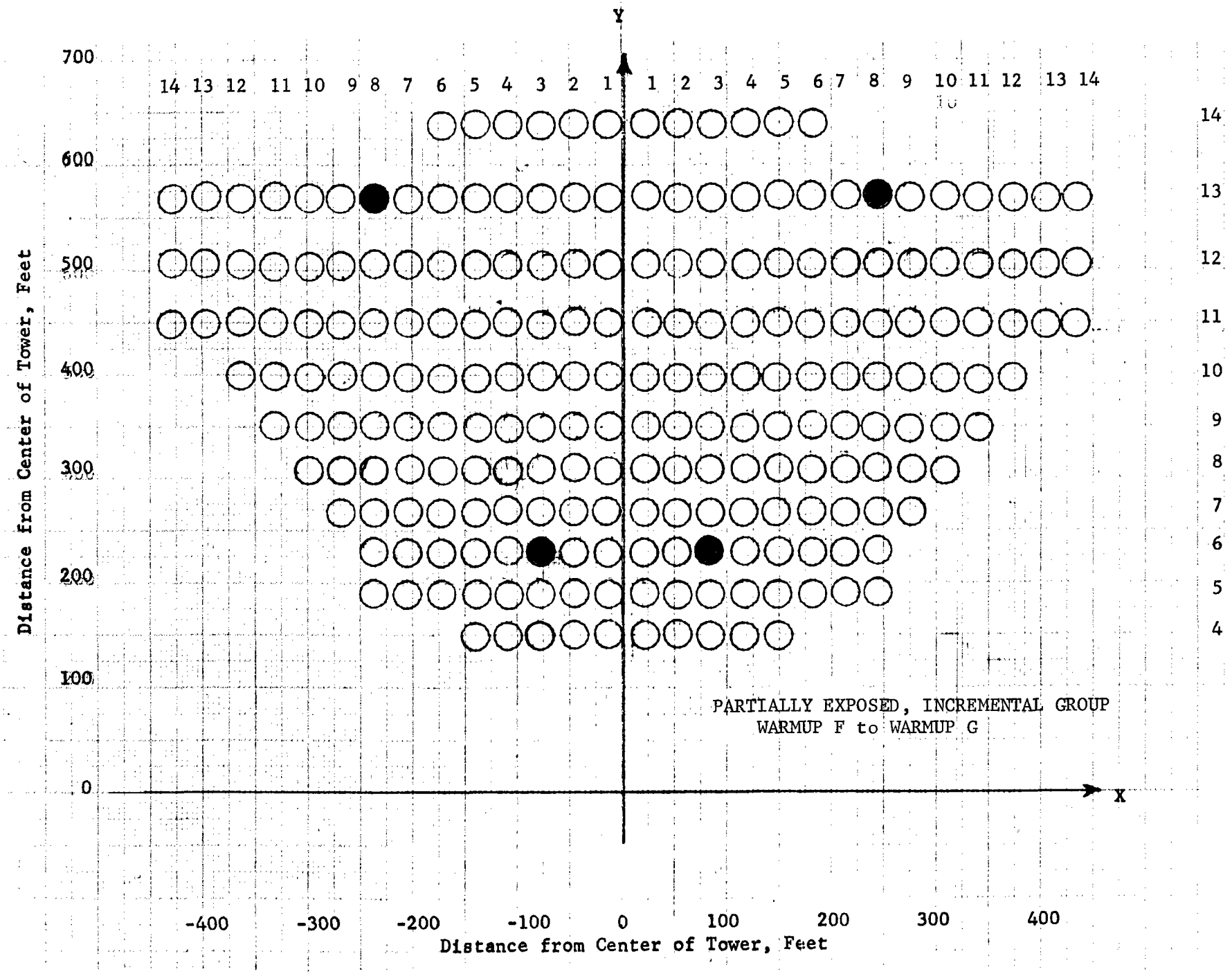
PARTIALLY EXPOSED, INCREMENTAL GROUP
WARMUP E to WARMUP F
X
-400 -300 -200 -100 0 100 200 300 400
Distance from Center of Tower, Feet
Distance from Center of Tower, Feet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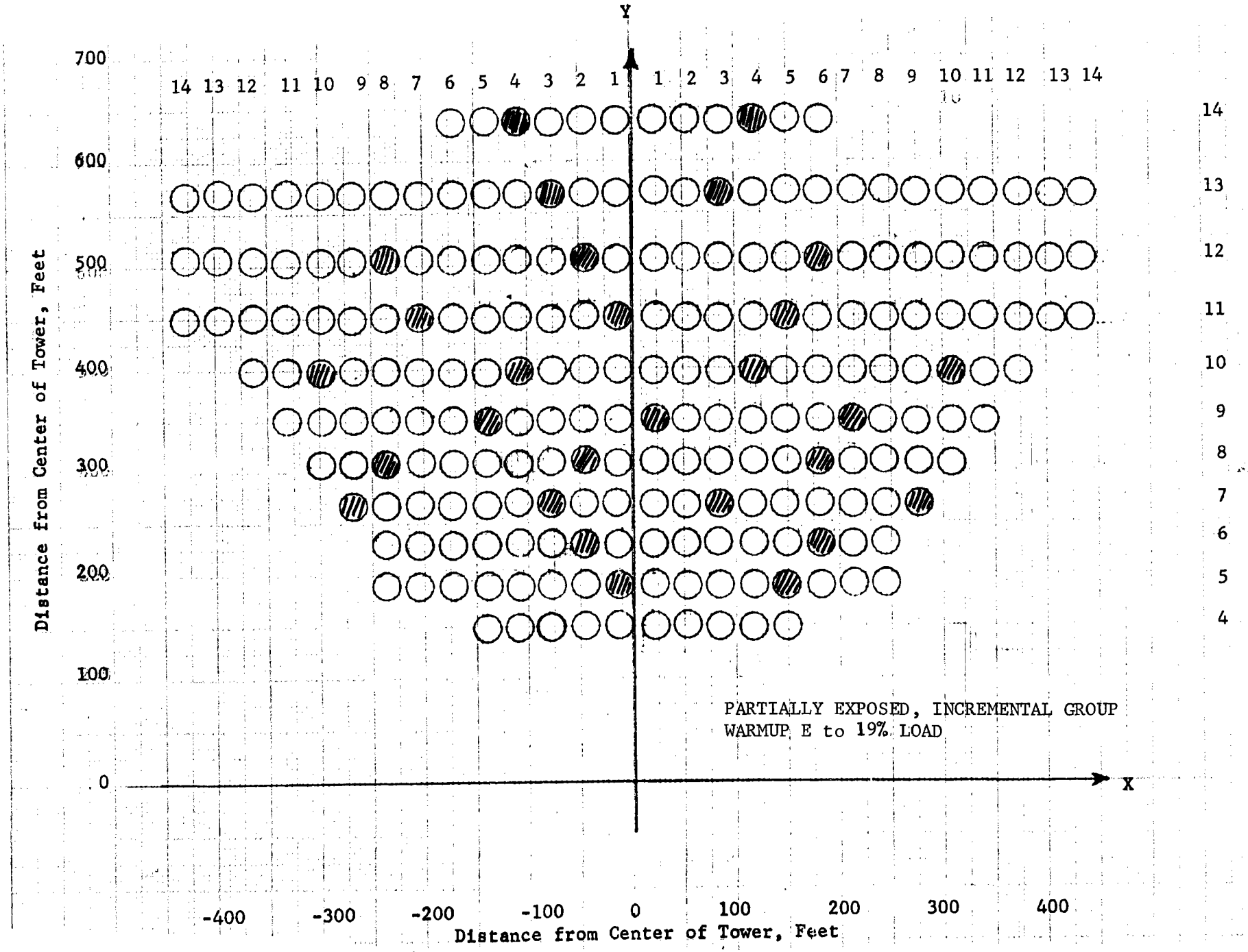
Distance From Center of Tower, Feet
PARTIALLY EXPOSED, INCREMENTAL GROUP
WARMUP F to WARMUP G
X
-400 -300 -200 -100 0 100 200 300 400
Distance from Center of Tower, Feet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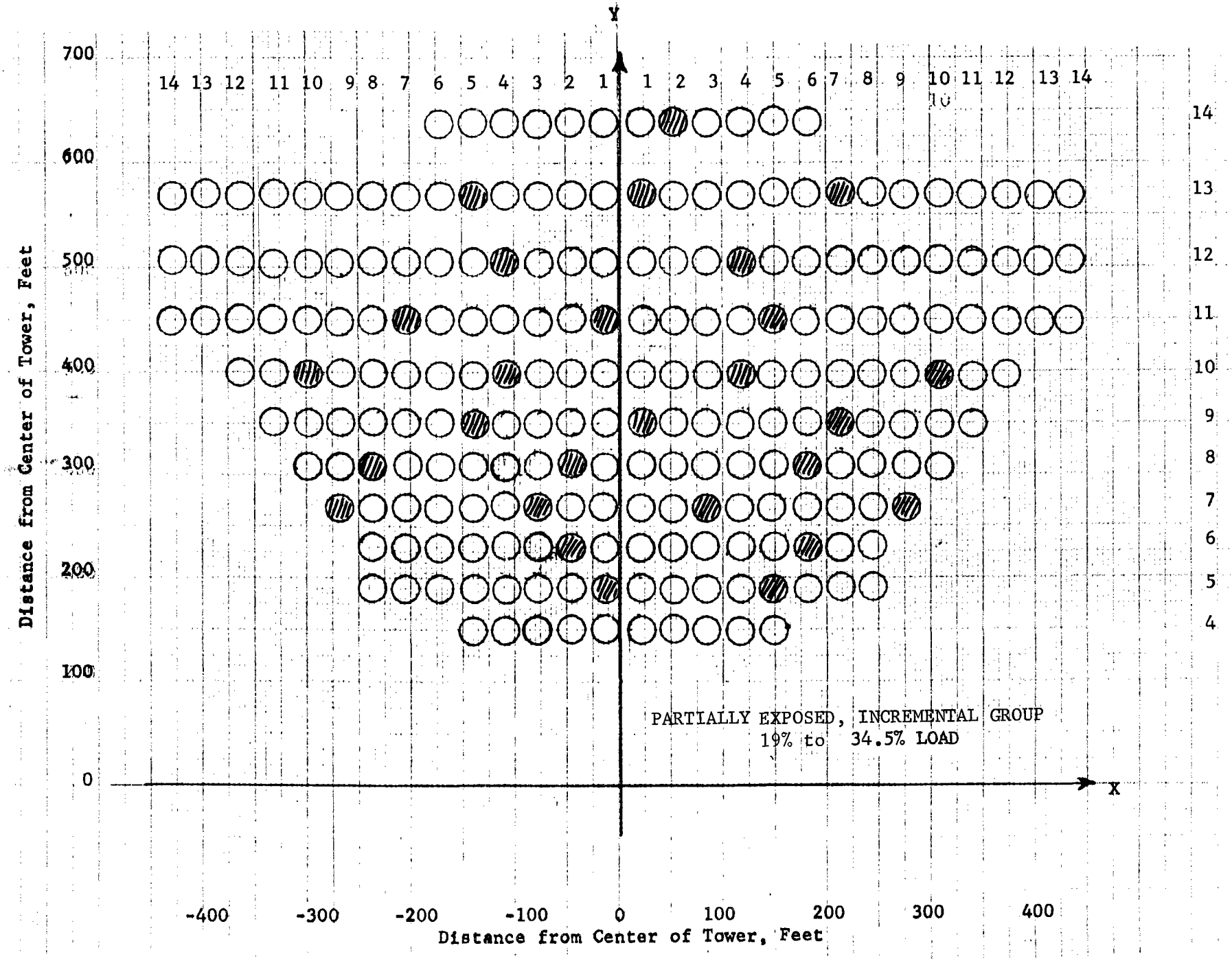
X
Distance from Center of Tower, Feet
PARTIALLY EXPOSED, INCREMENTAL GROUP
WARMUP E to 19% LOAD
-400 -300 -200 -100 0 100 200 300 400
Distance from Center of Tower, Feet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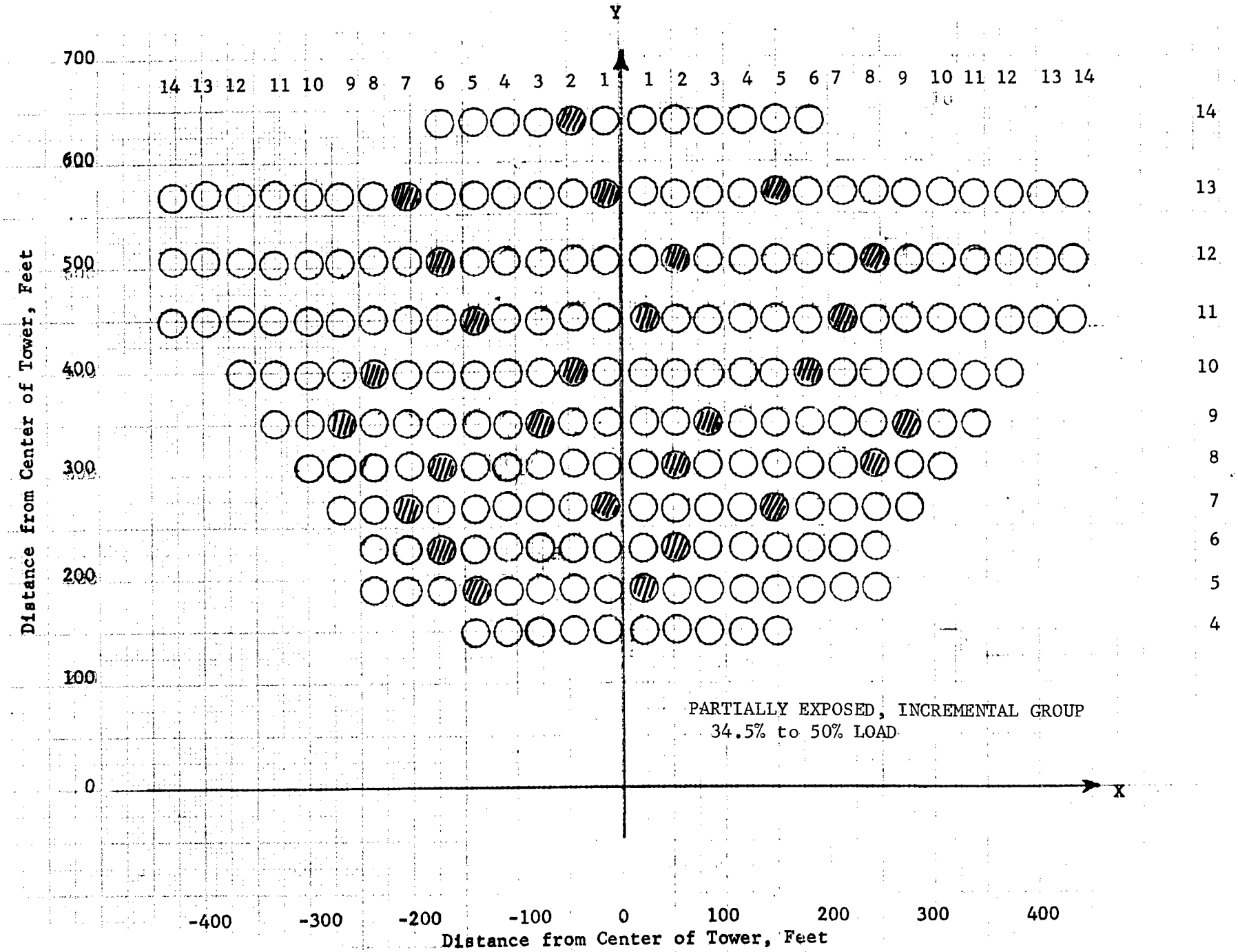
PARTIALLY EXPOSED, INCREMENTAL GROUP
19% to 34.5% LOAD
X
-400 -300 -200 -100 0 100 200 300 400
Distance from Center of Tower, Feet
Distance from Center of Tower, Feet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1 2 3 4 5 6 7 8 9 10 11 12 13 14
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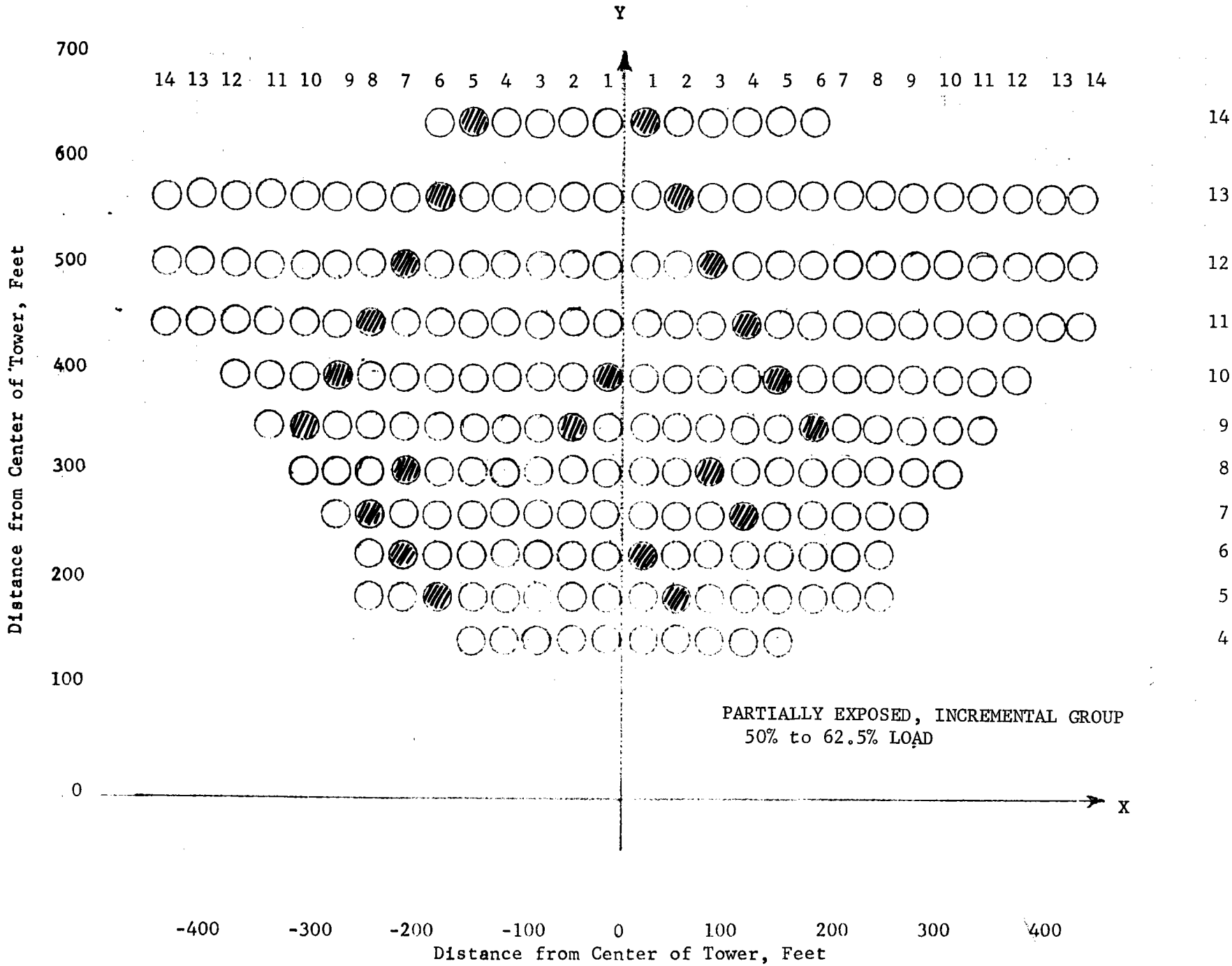
4
Distance from Center of Tower, Feet
PARTIALLY EXPOSED, INCREMENTAL GROUP
34.5% to 50% LOAD
X
-400 -300 -200 -100 0 100 200 300 400
Distance from Center of Tower, Feet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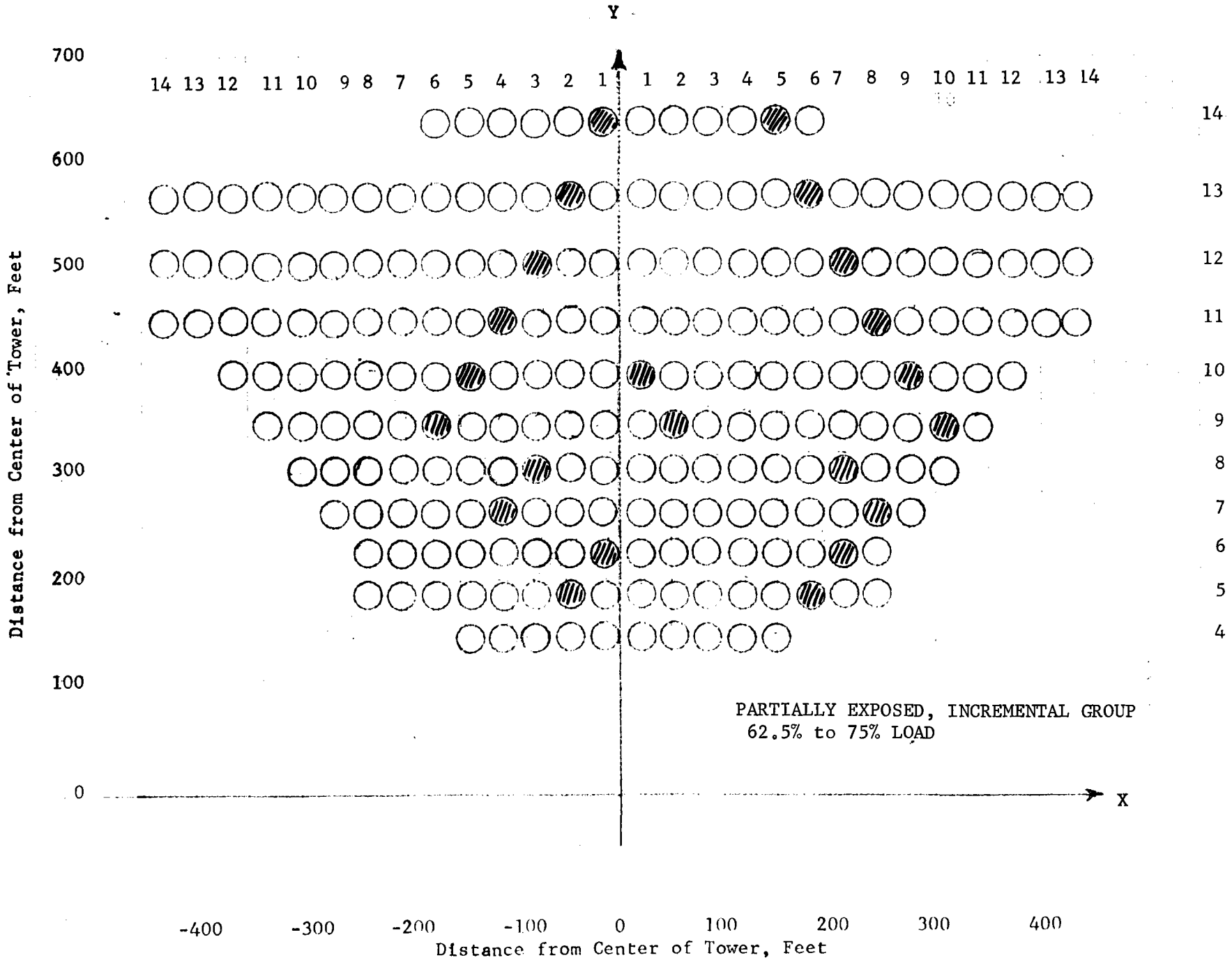
Distance from Center of Tower, Feet
PARTIALLY EXPOSED, INCREMENTAL GROUP
50% to 62.5% LOAD
X
-400 -300 -200 -100 0 100 200 300 400
Distance from Center of Tower, Feet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1 2 3 4 5 6 7 8 9 10 11 12 13 14
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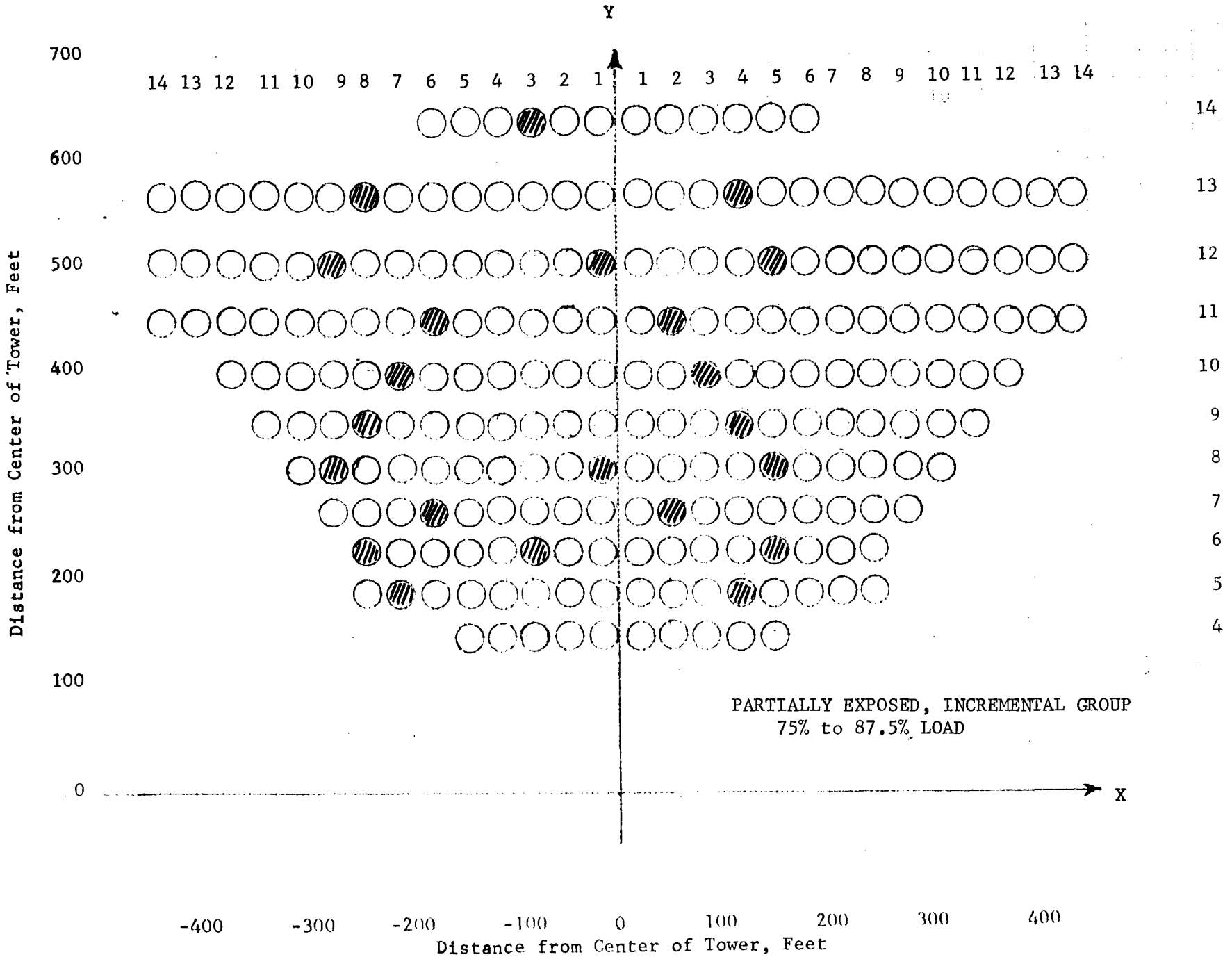
Distance from Center of Tower, Feet
PARTIALLY EXPOSED, INCREMENTAL GROUP
62.5% to 75% LOAD
X
-400 -300 -200 -100 0 100 200 300 400
Distance from Center of Tower, Feet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14 13 12 11 10 9 8 7 6 5 4 3 2 1 1 2 3 4 5 6 7 8 9 10 11 12 13 14
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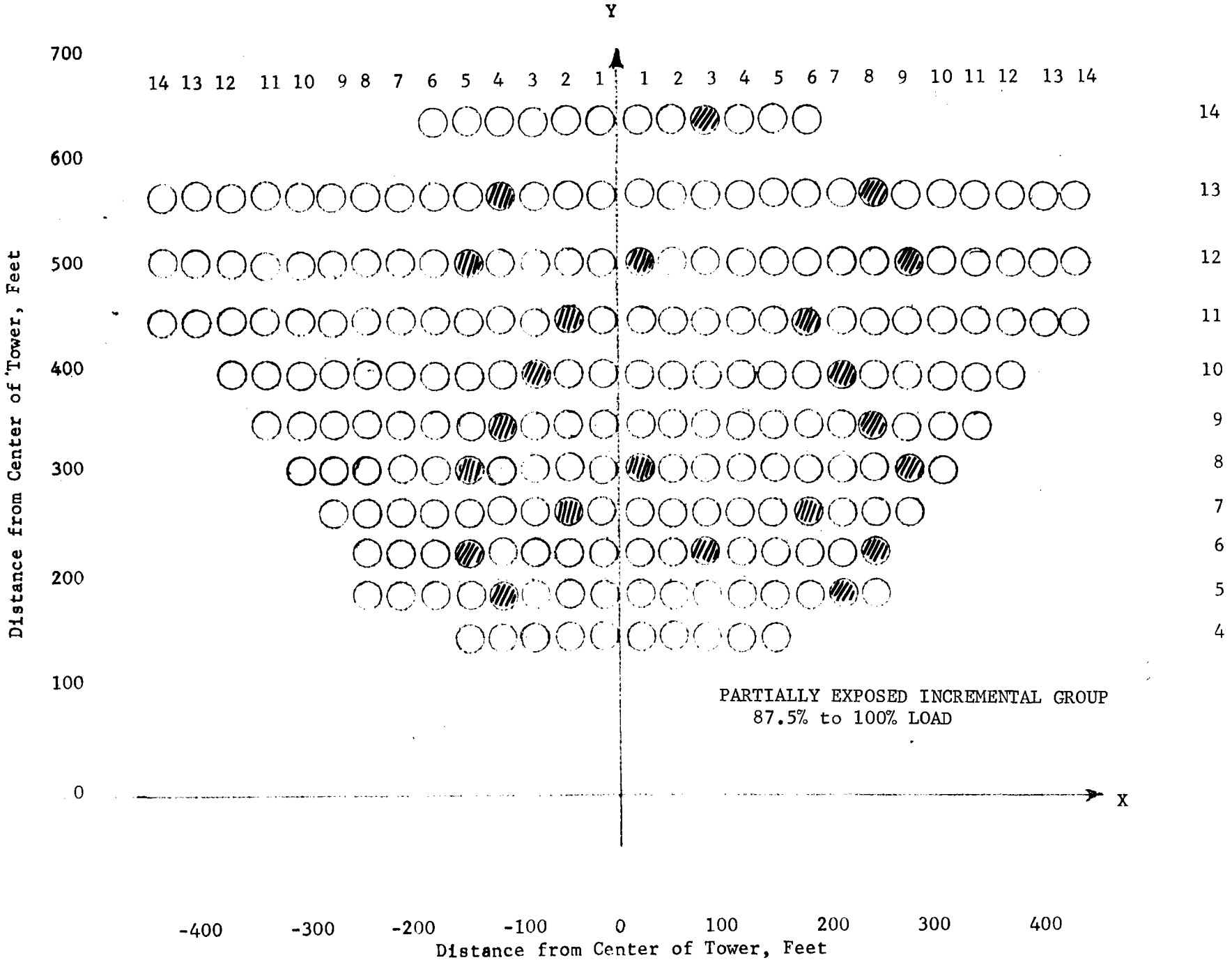
PARTIALLY EXPOSED, INCREMENTAL GROUP
75% to 87.5% LOAD
X
-400 -300 -200 -100 0 100 200 300 400
Distance from Center of Tower, Feet
Distance from Center of Tower, Feet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1 2 3 4 5 6 7 8 9 10 11 12 13 14
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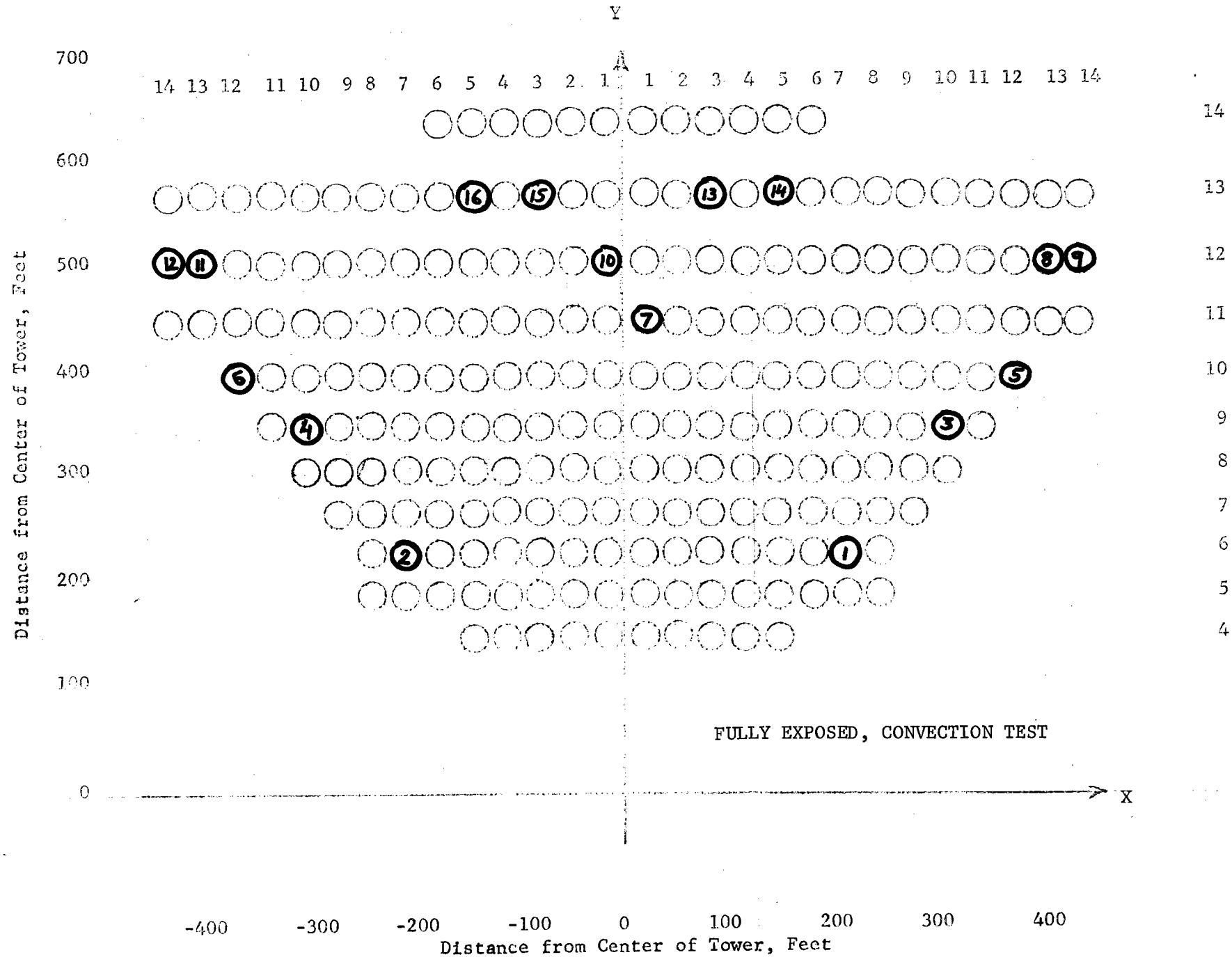
PARTIALLY EXPOSED INCREMENTAL GROUP
87.5% to 100% LOAD
X
-400 -300 -200 -100 0 100 200 300 400
Distance from Center of Tower, Feet
Distance from Center of Tower, Feet

VIII. HELIOSTAT AIMING

E. FULLY EXPOSED CONFIGURATION - CONVECTION TEST

Heliostat Configuration

Aim Point Coordinates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16
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8
9
7
6
5
3
4
2
1
FULLY EXPOSED, CONVECTION TEST
X
-400 -300 -200 -100 0 100 200 300 400
Distance from Center of Tower, Feet
Distance from Center of Tower, Feet

HELIOSTAT AIM POINTS FOR CONVECTION TEST

(FULLY EXPOSED CONFIGURATION)

HELIOSTAT NO.	AIM POINT (FT) X	Y	Z
1	-7.0	4.0	222.3
2	7.0	4.0	222.3
3	-7.0	4.0	218.3
4	7.0	4.0	218.3
5	-5.0	4.0	223.3
6	5.0	4.0	223.3
7	0.0	4.0	220.8
8	-6.0	4.0	214.3
9	-8.0	4.0	214.3
10	0.0	4.0	215.3
11	6.0	4.0	214.3
12	8.0	4.0	214.3
13	-2.0	4.0	223.3
14	-8.0	4.0	223.3
15	2.0	4.0	223.3
16	8.0	4.0	223.3

VIII. HELIOSTAT AIMING

F. SPECIAL REQUIREMENTS - CLOUD PASSAGE

Successive heliostat rows or columns will be brought off line, and then the process reversed by bringing them on line, as specified in the Test Plan.

VIII. HELIOSTAT AIMING

G. SPECIAL REQUIREMENTS - CYCLE TESTS

On-line / Off-line cycling of the entire heliostat field with a period of 2 minutes, as required by the Test Plan.

VIII. HELIOSTAT AIMING

H. SPECIAL REQUIREMENTS - HIGH LOCALIZED FLUXES

The heliostat aim point for the cavity configuration will be gradually moved inward (towards the cavity interior) along the normal to the aperture plane.

The coordinates of the starting point are:

X = 0.0 FT

Y = 11.148 FT

Z = 214.098 FT

The slope of the normal to the aperture plane is 30^{o} (Y-Z plane). The movement of the aim point will be in increments of approx. 10 cm, with stabilization allowed for at each incremental point.

IX. Data Reduction

1. Digital data in Engineering Units....Time marked with delta time at approximately 2 minute increments.

Receiver Inlet Temp., °F	TT-3BC
Receiver Outlet Temp., °F	TT-5BC
Air Cooler Outlet Temp., °F	TT-7BC
Salt mass flow rate, lbm/hr	FMC
Incoming total solar energy (RTAF), megawatts	
Wind speed, mph	
Wind direction	
Ambient Temp., °F	
Radiometer data (IR from receiver)	
Date and time	

2. Digital data in Engineering Units....Time marked at each scan. (This is flow meter calibration data....the usual time is approx. 30 sec. with the max. time at approx. 4.5 min.)

Weigh tank mass, lbm	LCC
Date and time	

3. Digital data in Engineering Units....Time marked with delta time at approximately 5 minute increments. (Total data to computer.)

Temperatures

Receiver headers, °F (deltas)	TRHD1C thru TRH18C
Receiver headers, °F	TRH1C thru TRH19C
Receiver tubes at flux gages, °F	TRFGU1C thru TRFGU6C TRFGM1C thru TRFGM6C TRFGL1C thru TRFGL6C
Sump Temp., °F	TT-1BC, TT-8BC, TT-9BC
Receiver Inlet, °F	TT-3BC
Receiver Outlet, °F	TT-5BC
Air Cooler Outlet, °F	TT-7BC
Air Heater Outlet, °F	TT-10BC
Air Cooler Inlet, °F	TT-10BC
Ambient Temp., °F	TAIRING

Pressures

Pump discharge, psi	PT-1C
Receiver Inlet, psi	PT-2C
Air Cooler Outlet, psi	PT-3C
Air Heater Outlet, psi	PT-4C
Flow meter ΔP, psi	FMC

Solar Fluxes

Receiver, Btu/hr-ft^2	QRFGL1C thru QRFGL6C QRFGM1C thru QRFGM6C QRFGU1C thru QRFGU6C

RTAF Data (total incoming), Megawatts

Displacements

Receiver tubes, inches	LVDT1C thru LVDT4C
Receiver inlet (Vertical), inches	LVDTV1C
Receiver Outlet (Vertical), inches	LVDTV2C
Receiver inlet (Lateral), inches	LVDTL1C
Receiver outlet (Lateral), inches	LVDTL2C

Computed Temperatures

Receiver front side temperatures

18 temperatures based on values from...	TRFGU1C thru TRFGU6C TRFGM1C thru TRFGM6C TRFGL1C thru TRFGL6C

Computed air flow rate, lbm/hr (from air cooler algorithm)

Wind Speed and Wind Direction, (mph)

Insolation, watts/meter^2

Date and Time

4. Plots (Time scale is 30 min. total)

Receiver Inlet Temp. vs Time	TT-3BC
Receiver Outlet Temp. vs Time	TT-5BC
Air Cooler Outlet Temp. vs Time	TT-7BC
Salt flow rate vs time	FMC
Tube temps. vs time	TRFGM1C thru TRFGM6C
Tube fluxes vs time	QRFGM1C thru QRFGM6C

5. Plots (time scale is for entire test day)

   Insolation, watts/meter^2

   Ambient temperature, °F

   Wind Speed, MPH

   Wind Direction

6. Comparative Data at given time

   RTAF fluxes, Btu/hr-ft^2

   Receiver flux gages, Btu/hr-ft^2 (flux map)

   (QRFGL1C/QRFGL6C, QRFGM1C/QRFGM6C, QRTFU1C/QRFGU6C)

7. Digital data in Engineering Units....time marked with delta time at approximately 2 minute increments. (Efficiency and Energy Balance Information)

   RTAF Data (total incoming), mega watts

   Total absorbed power, (q_a), mega watts

   q_a (Mass rate of flow x Cp x delta $temp_R$)

   $$q_a = \dot{m} \text{ lbm/hr} \times 0.371 \text{ Btu/lbm-°F} \times \text{delta } temp_R \text{ °F} \times \frac{1 \text{ mega watt}}{3.413 \times 10^6 \text{ Btu/hr}}$$

   $$q_a = 1.087 \dot{m} \times \text{delta } temp_R$$

   Power rejected by air cooler (q_c), mega watts

   $$q_c = (\text{mass rate of flow} \times Cp \times \text{delta } temp_c)$$

   $$\text{delta } temp_c = (TT\text{-}5BC) - (TT\text{-}7BC)$$

   $$q_c = 1.087 \dot{m} \text{ delta } temp_c$$

   Heat Loss - lines and sump (q_L), mega watts

   $$q_L = (\text{mass rate of flow} \times Cp \times \text{delta } temp_L)$$

   $$\text{delta } temp_L = (TT\text{-}7BC) - (TT\text{-}3BC)$$

   $$q_L = 1.087 \dot{m} \text{ delta } temp_L$$

   $$\text{Efficiency} = \frac{q_a}{q_{RTAF}}$$

GENERAL NOTES

1. All temperature measurements utilize thermocouples

2. The thermocouples recorded on the CRTF multiplexer are ungrounded.

3. All thermocouples are Type K (chromel-alumel)

4. DC voltage source is 26 $\pm$2 VDC.

5. "M.V. Direct" indicates thermocouple wire to the acquisition device.

6. "M.V. reference oven" indicates utilization of CRTF reference oven.

7. Blank spaces in system cable routing column are to be used by CRTF.

8. The final letter of the identification code defines the data acquisition equipment where the given signal terminates. "C" stands for CRTF multiplexer, "D" stands for CRTF data logger, "L" stands for Martin Marietta multipoint recorders or Martin Marietta data logger, "X" stands for Martin Marietta console.

NOMENCLATURE	LOCATION DESCRIPTION	SIGNAL	RANGE	ACQUISITION/ DISPLAY	ALARM	SYSTEM CABLE ROUTING			REMARKS
						TOWER JUNCTION BOX GALLERY	CONTROL ROOM	CONSOLE	
TRHD1C TRHD2C TRHD3C TRHD4C TRHD5C TRHD6C TRHD7C TRHD8C TRHD9C TRHD10C TRHD11C TRHD12C TRHD13C TRHD14C TRHD15C TRHD16C TRHD17C TRHD18C	DIFFERENTIAL TEMPERATURES BETWEEN HEADERS	2.5 MV	±100°F	MULTIPLEXER		TO BE LOCATED DURING FIELD INSTALLATION		NO	THERMOCOUPLE WIRES (TYPE "K") ARE ROUTED TO JUNCTION BOX ON TOWER. COPPER WIRE FROM TOWER J BOX TO GALLERY.

NOMENCLATURE	LOCATION/DESCRIPTION	SIGNAL	RANGE	ACQUISITION/ DISPLAY	ALARM	SYSTEM CABLE ROUTING				REMARKS
						TOWER JUNCTION BOX	GALLERY	CONTROL ROOM	CONSOLE	
T1P1	DIFFERENTIAL TUBE TEMPERATURES	2.5 MV	±100°F	CRTF DATA LOGGER	YES	TO BE LOCATED DURING FIELD INSTALLATION		NO	NO	GROUNDED THERMOCOUPLES WELDED TO INLET HEADER OF RESPECTIVE TUBES ON RESPECTIVE PASS. WIRES ROUTED TO JUNCTION BOX ON TOWER. COPPER WIRE FROM TOWER J BOX TO GALLERY.
T2P1										
T3P1										
T4P1										
T5P1										
T6P1										
T7P1										
T8P1										
T9P1										
T10P1										
T11P1										
T12P1										
T13P1										
T14P1										
T15P1										
T16P1										
T1P2										
T2P2										
T3P2										
T4P2										
T5P2										
T6P2										
T7P2										
T8P2										
T9P2										
T10P2										
T11P2										
T12P2										
T13P2										
T14P2										
T15P2										
T16P2										

NOMENCLATURE	LOCATION/DESCRIPTION	SIGNAL	RANGE	ACQUISITION/ DISPLAY	ALARM	SYSTEM CABLE ROUTING				REMARKS
						TOWER JUNCTION BOX	GALLERY	CONTROL ROOM	CONSOLE	
T1P3	DIFFERENTIAL TUBE TEMPERATURES	2.5 MV	±100°F	CRTF DATA LOGGER	YES	TO BE LOCATED DURING FIELD INSTALLATION		NO	NO	GROUNDED THERMOCOUPLES WELDED TO INLET HEADER OF RESPECTIVE TUBES ON RESPECTIVE PASS. WIRES ROUTED TO JUNCTION BOX ON TOWER. COPPER WIRE FROM TOWER J BOX TO GALLERY.
T2P3										
T3P3										
T4P3										
T5P3										
T6P3										
T7P3										
T8P3										
T9P3										
T10P3										
T11P3										
T12P3										
T13P3										
T14P3										
T15P3										
T16P3										
T1P4										
T2P4										
T3P4										
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T5P4										
T6P4										
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T9P4										
T10P4										
T11P4										
T12P4										
T13P4										
T14P4										
T15P4										
T16P4										

NOMENCLATURE	LOCATION DESCRIPTION	SIGNAL	RANGE	ACQUISITION / DISPLAY	ALARM	SYSTEM CABLE ROUTING				REMARKS
						TOWER JUNCTION BOX	GALLERY	CONTROL ROOM	CONSOLE	
T1P5	DIFFERENTIAL TUBE TEMPERATURES	2.5 MV	±100°F	CRTF DATA LOGGER	YES	TO BE LOCATED DURING FIELD INSTALLATION		NO	NO	GROUNDED THERMOCOUPLES WELDED TO INLET HEADER OF RESPECTIVE TUBES ON RESPECTIVE PASS. WIRES ROUTED TO JUNCTION BOX ON TOWER. COPPER WIRE FROM TOWER J BOX TO GALLERY.
T2P5										
T3P5										
T4P5										
T5P5										
T6P5										
T7P5										
T8P5										
T9P5										
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T11P5										
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T13P5										
T14P5										
T15P5										
T16P5										
T1P6										
T2P6										
T3P6										
T4P6										
T5P6										
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T8P6										
T9P6										
T10P6										
T11P6										
T12P6										
T13P6										
T14P6										
T15P6										
T16P6										

NOMENCLATURE	LOCATION DESCRIPTION	SIGNAL	RANGE	ACQUISITION/ DISPLAY	ALARM	SYSTEM CABLE ROUTING				REMARKS
						TOWER JUNCTION BOX	GALLERY	CONTROL ROOM	CONSOLE	
T1P7	DIFFERENTIAL TUBE TEMPERATURES	2.5 MV	±100°F	CRTF DATA LOGGER	YES	TO BE LOCATED DURING FIELD INSTALLATION		NO	NO	GROUNDED THERMOCOUPLES WELDED TO INLET HEADER OF RESPECTIVE TUBES ON RESPECTIVE PASS. WIRES ROUTED TO JUNCTION BOX ON TOWER. COPPER WIRE FROM TOWER J BOX TO GALLERY.
T2P7										
T3P7										
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T6P7										
T7P7										
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T15P8										
T16P8										

NOMENCLATURE	LOCATION DESCRIPTION	SIGNAL	RANGE	ACQUISITION DISPLAY	ALARM	SYSTEM CABLE ROUTING				REMARKS
						TOWER JUNCTION BOX	GALLERY	CONTROL ROOM	CONSOLE	
T1P9	DIFFERENTIAL TUBE TEMPERATURES	2.5 MV	±100°F	CRTF DATA LOGGER	YES	TO BE LOCATED DURING FIELD INSTALLATION		NO	NO	GROUNDED THERMOCOUPLES WELDED TO INLET HEADER OF RESPECTIVE TUBES ON RESPECTIVE PASS. WIRES ROUTED TO JUNCTION BOX ON TOWER. COPPER WIRE FROM TOWER J BOX TO GALLERY.
T2P9										
T3P9										
T4P9										
T5P9										
T6P9										
T7P9										
T8P9										
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T10P9										
T11P9										
T12P9										
T13P9										
T14P9										
T15P9										
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T15P10										
T16P10										

NOMENCLATURE	LOCATION DESCRIPTION	SIGNAL	RANGE	ACQUISITION/ DISPLAY	ALARM	SYSTEM CABLE ROUTING				REMARKS
						TOWER JUNCTION BOX	GALLERY	CONTROL ROOM	CONSOLE	
T1P11	DIFFERENTIAL TUBE TEMPERATURES	2.5 MV	±100°F	CRTF DATA LOGGER	YES	TO BE LOCATED DURING FIELD INSTALLATION		NO	NO	GROUNDED THERMOCOUPLES WELDED TO INLET HEADER OF RESPECTIVE TUBES ON RESPECTIVE PASS. WIRES ROUTED TO JUNCTION BOX ON TOWER. COPPER WIRE FROM TOWER J BOX TO GALLERY.
T2P11										
T3P11										
T4P11										
T5P11										
T6P11										
T7P11										
T8P11										
T9P11										
T10P11										
T11P11										
T12P11										
T13P11										
T14P11										
T15P11										
T16P11										
T1P12										
T2P12										
T3P12										
T4P12										
T5P12										
T6P12										
T7P12										
T8P12										
T9P12										
T10P12										
T11P12										
T12P12										
T13P12										
T14P12										
T15P12										
T16P12										

NOMENCLATURE	LOCATION DESCRIPTION	SIGNAL	RANGE	ACQUISITION DISPLAY	ALARM	SYSTEM CABLE ROUTING				REMARKS
						TOWER JUNCTION BOX	GALLERY	CONTROL ROOM	CONSOLE	
T1P13	DIFFERENTIAL TUBE TEMPERATURES	2.5 MV	±100°F	CRTF DATA LOGGER	YES	TO BE LOCATED DURING FIELD INSTALLATION		NO	NO	GROUNDED THERMOCOUPLES WELDED TO INLET HEADER OF RESPECTIVE TUBES ON RESPECTIVE PASS. WIRES ROUTED TO JUNCTION BOX ON TOWER. COPPER WIRE FROM TOWER J BOX TO GALLERY.
T2P13										
T3P13										
T4P13										
T5P13										
T6P13										
T7P13										
T8P13										
T9P13										
T10P13										
T11P13										
T12P13										
T13P13										
T14P13										
T15P13										
T16P13										
T1P14										
T2P14										
T3P14										
T4P14										
T5P14										
T6P14										
T7P14										
T8P14										
T9P14										
T10P14										
T11P14										
T12P14										
T13P14										
T14P14										
T15P14										
T16P14										

NOMENCLATURE	LOCATION DESCRIPTION	SIGNAL	RANGE	ACQUISITION/ DISPLAY	ALARM	SYSTEM CABLE ROUTING				REMARKS
						TOWER JUNCTION BOX	GALLERY	CONTROL ROOM	CONSOLE	
T1P15	DIFFERENTIAL TUBE TEMPERATURES	2.5 MV	±100°F	CRTF DATA LOGGER	YES	TO BE LOCATED DURING FIELD INSTALLATION		NO	NO	GROUNDED THERMOCOUPLES WELDED TO INLET HEADER OF RESPECTIVE TUBES ON RESPECTIVE PASS. WIRES ROUTED TO JUNCTION BOX ON TOWER. COPPER WIRE FROM TOWER J BOX TO GALLERY.
T2P15										
T3P15										
T4P15										
T5P15										
T6P15										
T7P15										
T8P15										
T9P15										
T10P15										
T11P15										
T12P15										
T13P15										
T14P15										
T15P15										
T16P15										
T1P16										
T2P16										
T3P16										
T4P16										
T5P16										
T6P16										
T7P16										
T8P16										
T9P16										
T10P16										
T11P16										
T12P16										
T13P16										
T14P16										
T15P16										
T16P16										

NOMENCLATURE	LOCATION DESCRIPTION	SIGNAL	RANGE	ACQUISITION DISPLAY	ALARM	SYSTEM CABLE ROUTING				REMARKS
						TOWER JUNCTION BOX	GALLERY	CONTROL ROOM	CONSOLE	
T1P17	DIFFERENTIAL TUBE TEMPERATURES	2.5 MV	±100°F	CRTF DATA LOGGER	YES	TO BE LOCATED DURING FIELD INSTALLATION		NO	NO	GROUNDED THERMOCOUPLES WELDED TO INLET HEADER OF RESPECTIVE TUBES ON RESPECTIVE PASS. WIRES ROUTED TO JUNCTION BOX ON TOWER. COPPER WIRE FROM TOWER J BOX TO GALLERY.
T2P17										
T3P17										
T4P17										
T5P17										
T6P17										
T7P17										
T8P17										
T9P17										
T10P17										
T11P17										
T12P17										
T13P17										
T14P17										
T15P17										
T16P17										
T1P18										
T2P18										
T3P18										
T4P18										
T5P18										
T6P18										
T7P18										
T8P18										
T9P18										
T10P18										
T11P18										
T12P18										
T13P18										
T14P18										
T15P18										
T16P18										

NOMENCLATURE	LOCATION/DESCRIPTION	SIGNAL	RANGE	ACQUISITION/ DISPLAY	ALARM	SYSTEM CABLE ROUTING				REMARKS
						TOWER JUNCTION BOX	GALLERY	CONTROL ROOM	CONSOLE	
TRH1C	RECEIVER HEADER	MV REFERENCE OVEN	0-1500°F	MULTIPLEXER		TO BE LOCATED DURING FIELD INSTALLATION			NO	UNGROUNDED THERMOCOUPLES WELDED ON HEADERS.
TRH2C										
TRH3C										
TRH4C										
TRH5C										
TRH6C										
TRH7C										
TRH8C										
TRH9C										
TRH10C										
TRH11C										
TRH12C										
TRH13C										
TRH14C										
TRH15C										
TRH16C										
TRH17C										
TRH18C										
TRH19C										

NOMENCLATURE	LOCATION/DESCRIPTION	SIGNAL	RANGE	ACQUISITION/ DISPLAY	ALARM	SYSTEM CABLE ROUTING				REMARKS
						TOWER JUNCTION BOX	GALLERY	CONTROL ROOM	CONSOLE	
TRH1L	RECEIVER HEADER	MV DIRECT	0-1500°F	CRTF DATA LOGGER		TO BE LOCATED DURING FIELD INSTALLATION			NO	THERMOCOUPLES WELDED TO HEADERS (GROUNDED).
TRH2L										
TRH3L										
TRH4L										
TRH5L										
TRH6L										
TRH7L										
TRH8L										
TRH9L										
TRH10L										
TRH11L										
TRH12L										
TRH13L										
TRH14L										
TRH15L										
TRH16L										
TRH17L										
TRH18L										
TRH19L										

NOMENCLATURE	LOCATION/DESCRIPTION	SIGNAL	RANGE	ACQUISITION/ DISPLAY	ALARM	SYSTEM CABLE ROUTING				REMARKS
						TOWER JUNCTION BOX	GALLERY	CONTROL ROOM	CONSOLE	
TRFGU1C TRFGU2C TRFGU3C TRFGU4C TRFGU5C TRFGU6C	RECEIVER FLUX GAUGE UPPER	MV REFERENCE OVEN	0-1500°F	MULTIPLEXER		TO BE LOCATED DURING FIELD INSTALLATION			NO	UNGROUNDED THERMOCOUPLES WELDED ON TUBES CLOSE TO FLUX GAGES. BACKSIDE
TRFGM1C TRFGM2C TRFGM3C TRFGM4C TRFGM5C TRFGM6C	RECEIVER FLUX GAUGE MIDDLE									
TRFGL1C TRFGL2C TRFGL3C TRFGL4C TRFGL5C TRFGL6C	RECEIVER FLUX GAUGE LOWER									

NOMENCLATURE	LOCATION/DESCRIPTION	SIGNAL	RANGE	ACQUISITION/ DISPLAY	ALARM	SYSTEM CABLE ROUTING				REMARKS
						TOWER JUNCTION BOX	GALLERY	CONTROL ROOM	CONSOLE	
TRSSM1L	RECEIVER SUNNY SIDE	MV, DIRECT	0-1800°F	MMC DATA LOGGER		TO BE LOCATED DURING FIELD INSTALLATION			NO	THERMOCOUPLES WELDED TO FRONT ON TUBES.
TRSSM2L										
TRSSM3L										
TRSSM4L										
TRSSM5L										
TRSSM6L										
TT-1BC	SUMP	MV, REFERENCE OVEN	0-800°F	MULTIPLEXER		NO			NO	LOWER AREA OF SUMP
TT-8BC	SUMP								NO	MIDDLE AREA OF SUMP
TT-9BC	SUMP								NO	UPPER AREA OF SUMP
TT-2BX	RECEIVER INLET	MV, DIRECT	0-1200°F	CONSOLE RECORDER					YES	
TT-3BC	RECEIVER INLET	MV, REFERENCE OVEN	0-1000°F	MULTIPLEXER					NO	
TT-4BX	RECEIVER OUTLET	MV, DIRECT	0-1200°F	CONSOLE RECORDER					YES	
TT-5BC (PARALLEL WITH TT-4A)	RECEIVER OUTLET	MV, REFERENCE OVEN	0-1500°F	MULTIPLEXER					NO	
TT-6BX	AIR COOLER OUTLET	MV, DIRECT	0-1200°F	CONSOLE RECORDER					YES	
TT-7AC *	AIR COOLER OUTLET	MV, DIRECT	0-1000°F	MULTIPLEXER					NO	
TT-7BC *	AIR COOLER OUTLET	MV, DIRECT	0-1000°F	MULTIPLEXER					NO	
TT-10BC	AIR HEATER OUTLET	MV, DIRECT	0-1000°F	MULTIPLEXER					NO	

* TT-7AC & TT-7BC ARE IN PARALLEL

NOMENCLATURE	LOCATION/DESCRIPTION	SIGNAL	RANGE	ACQUISITION/ DISPLAY	ALARM	SYSTEM CABLE ROUTING				REMARKS
						TOWER JUNCTION BOX	GALLERY	CONTROL ROOM	CONSOLE	
TAIRINC	AIR COOLER INLET	MV REFERENCE OVEN	0-200°F	MULTIPLEXER		NO			NO	AIR TEMPERATURE
TPUMPBL	PUMP BEARING	MV, DIRECT	0-250°F	MMC DATA LOGGER		NO			NO	
TLCELLL	LOAD CELL	MV, DIRECT	0-250°F	MMC DATA LOGGER		NO			NO	TAPE ON
T1ET1L	TRACE HEATING SUMP	MV DIRECT	0-1000°F	MMC DATA LOGGER		TO BE LOCATED DURING FIELD INSTALLATION			NO	Weld-on thermocouples
T2ET1L										
T1ET2L										
T2ET2L										
T1ET3L										
T2ET3L										
T1ET4L										
T2ET4L										
T1ET5L										
T2ET5L										
T3ET5L										
T5ET5L										
T1ET6L	TRACE HEATING AIR COOLER			MMC MULTIPOINT						
T2ET6L										
T3ET6L										
T1ET7L										
T2ET7L										
T3ET7L										
T1ET8L										
T2ET8L										
T3ET8L										
T1ET9L										
T2ET9L										

NOMENCLATURE	LOCATION/DESCRIPTION	SIGNAL	RANGE	ACQUISITION/ DISPLAY	ALARM	SYSTEM CABLE ROUTING				REMARKS
						TOWER JUNCTION BOX	GALLERY	CONTROL ROOM	CONSOLE	
T1ET10L	TRACE HEATING AIR COOLER	MV, DIRECT	0-1000°F	MMC MULTIPOINT		TO BE LOCATED DURING FIELD INSTALLATION			NO	WELD-ON THERMOCOUPLES
T2ET10L										
T3ET10L										
T1ET11L										
T2ET11L										
T3ET11L										
T1ET12L										
T2ET12L										
T3ET12L										
T4ET12L										
T5ET12L										
T6ET12L										
T7ET12L										
T1ET13L										
T2ET13L										
T3ET13L										
T4ET13L										
T5ET13L										
T6ET13L										
T7ET13L										
T1ET14L										
T2ET14L										
T3ET14L										
T4ET14L										
T5ET14L										
T6ET14L										
T7ET14L										
T8ET14L										

NOMENCLATURE	LOCATION/DESCRIPTION	SIGNAL	RANGE	ACQUISITION/ DISPLAY	ALARM	SYSTEM CABLE ROUTING				REMARKS
						TOWER JUNCTION BOX	GALLERY	CONTROL ROOM	CONSOLE	
T1ET15L	TRACE HEATING PIPING	MV, DIRECT	0-1000°F	MMC MULTIPOINT		TO BE LOCATED DURING FIELD INSTALLATION			NO	WELD-ON THERMOCOUPLES
T2ET15L										
T3ET15L										
T4ET15L										
T5ET15L										
T6ET15L										
T7ET15L										
T1ET16L										
T2ET16L										
T3ET16L										
T1ET17L										
T1ET18L										
T1ET19L										
T2ET19L										
T3ET19L										
T1ET20L										
T2ET20L										
T3ET20L										
T4ET20L										
T5ET20L										
T6ET20L										
T1ET21L										
T2ET21L										
T3ET21L										
T4ET21L										
T5ET21L										
T6ET21L										
T7ET21L										
T8ET21L										
T1ET22L										
T2ET22L										
T3ET22L										

NOMENCLATURE	LOCATION/DESCRIPTION	SIGNAL	RANGE	ACQUISITION/ DISPLAY	ALARM	SYSTEM CABLE ROUTING				REMARKS
						TOWER JUNCTION BOX	GALLERY	CONTROL ROOM	CONSOLE	
T1ET23L	TRACE HEAT PIPING	MV, DIRECT	0-1000°F	MMC MULTIPOINT		TO BE LOCATED DURING FIELD INSTALLATION			NO	WELD-ON THERMOCOUPLES
T2ET23L	↓	↓	↓	↓		↓			↓	↓
T3ET23L										
T4ET23L										
T5ET23L										
T6ET23L										
T7ET23L										
T8ET23L										
T9ET23L										
T1ET24L										
T2ET24L										
T3ET24L										
T4ET24L										
T5ET24L										
T6ET24L										
T7ET24L										
T8ET24L										
T9ET24L										
T10ET24L	↓	↓	↓	↓		↓			↓	↓

NOMENCLATURE	LOCATION/DESCRIPTION	SIGNAL	RANGE	ACQUISITION/ DISPLAY	ALARM	SYSTEM CABLE ROUTING				REMARKS
						TOWER JUNCTION BOX	GALLERY	CONTROL ROOM	CONSOLE	
T1ACL	AIR COOLER	MV, DIRECT	0-1000°F	MMC DATA LOGGER		TO BE LOCATED DURING FIELD INSTALLATION			NO	WELD-ON THERMOCOUPLES
T2ACL										
T3ACL										
T4ACL										
T5ACL										
T6ACL										
T7ACL										
T8ACL										
T9ACL										
T10ACL										
T11ACL										
T12ACL										
T13ACL										
T14ACL										
T15ACL										
T16ACL										
T17ACL										
T18ACL										
T19ACL										
T20ACL										

NOMENCLATURE	LOCATION/DESCRIPTION	SIGNAL	RANGE	ACQUISITION/ DISPLAY	ALARM	SYSTEM CABLE ROUTING				REMARKS
						TOWER JUNCTION BOX	GALLERY	CONTROL ROOM	CONSOLE	
TRBU1L	RECEIVER BACK UPPER	MV, DIRECT	0-200°F	MMC DATA LOGGER		TO BE LOCATED DURING FIELD INSTALLATION			NO	WELD ON THERMOCOUPLES
TRBU2L										
TRBU3L										
TRBU4L										
TRBU5L										
TRBU6L										
TRBM1L	RECEIVER BACK MIDDLE									
TRBM2L										
TRBM3L										
TRBM4L										
TRBM5L										
TRBM6L										
TRBL1L	RECEIVER BACK LOWER									
TRBL2L										
TRBL3L										
TRBL4L										
TRBL5L										
TRBL6L										THERMOCOUPLES INSIDE BOXES (OPEN JUNCTION)
TJB1L	T/C JUNCTION BOXES		0-150°F							
TJB2L										
TJB3L										
TJB4L										
TJB5L										
TJB6L										

NOMENCLATURE	LOCATION/DESCRIPTION	SIGNAL	RANGE	ACQUISITION/ DISPLAY	ALARM	SYSTEM CABLE ROUTING				REMARKS
						TOWER JUNCTION BOX	GALLERY	CONTROL ROOM	CONSOLE	
TRC1IL	RECEIVER CAVITY INTERIOR	MV, DIRECT	0-1000°F	MMC DATA LOGGER		TO BE LOCATED DURING FIELD INSTALLATION			NO	
TRC2IL										
TRC3IL										
TRC4IL										
TRC5IL										
TRC6IL										
TRC7IL										
TRC8IL										
TRC9IL										
TRC10IL										
TRC11IL										
TRC12IL										
TRC13IL										
TRC14IL										
TRC15IL										
TRC16IL										
TRC17IL										
TRC18IL										
TRC19IL										
TRC20IL										
TRC21IL										
TRC22IL										
TRC23IL										
TRC24IL										

NOMENCLATURE	LOCATION/DESCRIPTION	SIGNAL	RANGE	ACQUISITION/ DISPLAY	ALARM	SYSTEM CABLE ROUTING				REMARKS
						TOWER JUNCTION BOX	GALLERY	CONTROL ROOM	CONSOLE	
TRC1EL	RECEIVER CAVITY EXTERIOR	MV, DIRECT	0-1000°F	MMC DATA LOGGER		TO BE LOCATED DURING FIELD INSTALLATION			NO	
TRC2EL										
TRC3EL										
TRC4EL										
TRC5EL										
TRC6EL										
TRC7EL										
TRC8EL										
TRC9EL										
TRC10EL										
TRC11EL										
TRC12EL										
TRC13EL										
TRC14EL										
TRC15EL										
TRC16EL										
TRC17EL										
TRC18EL										
TRC19EL										
TRC20EL										
TRC21EL										
TRC22EL										
TRC23EL										
TRC24EL										

NOMENCLATURE	LOCATION/DESCRIPTION	SIGNAL	RANGE	ACQUISITION/ DISPLAY	ALARM	SYSTEM CABLE ROUTING				REMARKS
						TOWER JUNCTION BOX	GALLERY	CONTROL ROOM	CONSOLE	
QRFGL1C	FLUX GAGE LOWER	0 to 7.5 MV	0 to 250,000 BTU/HR-FT^2	MULTIPLEXER		23-1 23-2 23-3			NO	TWISTED PAIR WITH SHIELD
QRFGL2C	FLUX GAGE LOWER			MULTIPLEXER		23-4 23-5 23-6			NO	TWISTED PAIR WITH SHIELD
QRFGL3C	FLUX GAGE LOWER			MULTIPLEXER		23-7 23-8 23-9			NO	TWISTED PAIR WITH SHIELD
QRFGL4C	FLUX GAGE LOWER			MULTIPLEXER		23-10 23-11 23-12			NO	TWISTED PAIR WITH SHIELD
QRFGL5C	FLUX GAGE LOWER			MULTIPLEXER		23-13 23-14 23-15			NO	TWISTED PAIR WITH SHIELD
QRFGL6C	FLUX GAGE LOWER			MULTIPLEXER		23-16 23-17 23-18			NO	TWISTED PAIR WITH SHIELD
QRFGM1C	FLUX GAGE MIDDLE			MULTIPLEXER		23-19 23-20 24-1			NO	TWISTED PAIR WITH SHIELD
QRFGM2C	FLUX GAGE MIDDLE			MULTIPLEXER		24-2 24-3 24-4			NO	TWISTED PAIR WITH SHIELD
QRFGM3C	FLUX GAGE MIDDLE			MULTIPLEXER		24-5 24-6 24-7			NO	TWISTED PAIR WITH SHIELD

NOMENCLATURE	LOCATION/DESCRIPTION	SIGNAL	RANGE	ACQUISITION/ DISPLAY	ALARM	SYSTEM CABLE ROUTING				REMARKS
						TOWER JUNCTION BOX	GALLERY	CONTROL ROOM	CONSOLE	
QRFGM4C	FLUX GAGE MIDDLE	0 to 7.5 MV	0 to 250,000 BTU/HR-FT^2	MULTIPLEXER		24-8 24-9 24-10			NO	TWISTED PAIR WITH SHIELD
QRFGM5C	FLUX GAGE MIDDLE			MULTIPLEXER		24-11 24-12 24-13			NO	TWISTED PAIR WITH SHIELD
QRFGM6C	FLUX GAGE MIDDLE			MULTIPLEXER		24-14 24-15 24-16			NO	TWISTED PAIR WITH SHIELD
QRFGU1C	FLUX GAGE UPPER			MULTIPLEXER		24-17 24-18 24-19			NO	TWISTED PAIR WITH SHIELD
QRFGU2C	FLUX GAGE UPPER			MULTIPLEXER		24-20 25-1 25-2			NO	TWISTED PAIR WITH SHIELD
QRFGU3C	FLUX GAGE UPPER			MULTPLEXER		25-3 25-4 25-5			NO	TWISTED PAIR WITH SHIELD
QRFGU4C	FLUX GAGE UPPER			MULTIPLEXER		25-6 25-7 25-8			NO	TWISTED PAIR WITH SHIELD
QRFGU5C	FLUX GAGE UPPER			MULTIPLEXER		25-9 25-10 25-11			NO	TWISTED PAIR WITH SHIELD
QRFGU6C	FLUX GAGE UPPER			MULTIPLEXER		25-12 25-13 25-14			NO	TWISTED PAIR WITH SHIELD

NOMENCLATURE	LOCATION/DESCRIPTION	SIGNAL	RANGE	ACQUISITION/ DISPLAY	ALARM	SYSTEM CABLE ROUTING				REMARKS
						TOWER JUNCTION BOX	GALLERY	CONTROL ROOM	CONSOLE	
LVDT1C	DISPLACEMENT TRANSDUCER	24 VDC	±2.0 INCH	MULTIPLEXER		31-15 31-16 31-17 31-18 31-19			NO	3.5 VOLTS/INCH
LVDT2C	DISPLACEMENT TRANSDUCER	24 VDC	±2.0 INCH	MULTIPLEXER		32-1 32-2 32-3 32-4 32-5			NO	3.5 VOLTS/INCH
LVDT3C	DISPLACEMENT TRANSDUCER	24 VDC	±2.0INCH	MULTIPLEXER		32-6 32-7 32-8 32-9 32-10			NO	3.5 VOLTS/INCH
LVDT4C	DISPLACEMENT TRANSDUCER	24 VDC	±2.0 INCH	MULTIPLEXER		32-11 32-12 32-13 32-14 32-15			NO	3.5 VOLTS/INCH
LVDTV1C	DISPLACEMENT TRANSDUCER	24 VDC	±2.0 INCH	MULTIPLEXER		32-16 32-17 32-18 32-19 32-20			NO	3.5 VOLTS/INCH
LVDTV2C	DISPLACEMENT TRANSDUCER	24 VDC	±2.0 INCH	MULTIPLEXER		33-1 33-2 33-3 33-4 33-5			NO	3.5 VOLTS/INCH
LVDTL1C	DISPLACEMENT TRANSDUCER	24 VDC	±2.0 INCH	MULTIPLEXER		33-6 33-7 33-8 33-9 33-10			NO	3.5 VOLTS/INCH
LVDTL2C	DISPLACEMENT TRANSDUCER	24 VDC	±2.0 INCH	MULTIPLEXER		33-11 33-12 33-13 33-14 33-15			NO	3.5 VOLTS/INCH

NOMENCLATURE	LOCATION/DESCRIPTION	SIGNAL	RANGE	ACQUISITION/ DISPLAY	ALARM	SYSTEM CABLE ROUTING				REMARKS
						TOWER JUNCTION BOX	GALLERY	CONTROL ROOM	CONSOLE	
TT-1A	SUMP	MV DIRECT	0-1000°F	CONSOLE INDICATOR		NO			DIRECT TO TC/I PIN4 + PIN3 -	TYPE K WIRE
TT-2BX	RECEIVER INLET	MV DIRECT	0-1200°F	CONSOLE RECORDER		NO			DIRECT TO DUAL CHANNEL RECORDER	TYPE K WIRE
TT-3A	RECEIVER INLET	MV DIRECT	0-1000°F	CONSOLE INDICATOR		NO			DIRECT TO TC/I PIN4 + PIN3 -	TYPE K WIRE
TT-4A C (PARALLEL WITH TT-5B)	RECEIVER OUTLET	MV REFERENCE OVEN	0-1500°F			NO			NO	TYPE K WIRE
TT-4BX	RECEIVER OUTLET	MV DIRECT	0-1200°F	CONSOLE RECORDER		NO			DIRECT TO DUAL CHANNEL RECORDER	TYPE K WIRE
TT-5A	RECEIVER OUTLET	MV DIRECT	0-1200°F	CONSOLE CONTROLLER		NO			DIRECT TO TC/I PIN4 + PIN3 -	TYPE K WIRE
TT-5A(MULT)		1-5 VDC	0-1200°F	MULTIPLEXER		NO	NO	NO	22-15 + 22-14 -	MULTIPLEXER INPUT
TT-6A	AIR COOLER OUTLET	MV DIRECT	0-1200°F	CONSOLE CONTROLLER		NO			DIRECT TO TC/I PIN4 + PIN3 -	TYPE K WIRE
TT-6A(COMP) - FAN PITCH -		4-20mA	0-1200°F	CONSOLE CONTROLLER		NO	NO	NO	11-16 + 11-15 -	COMPUTER OUTPUT

NOMENCLATURE	LOCATION/DESCRIPTION	SIGNAL	RANGE	ACQUISITION/ DISPLAY	ALARM	SYSTEM CABLE ROUTING				REMARKS
						TOWER JUNCTION BOX	GALLERY	CONTROL ROOM	CONSOLE	
TT-10A	AIR HEATER OUTLET	MV DIRECT	0-1000°F	CONSOLE INDICATOR		NO			DIRECT TO TC/I PIN4 + PIN3 -	TYPE K WIRE
LOUVER	I/P ON LOUVER	4-20 mA	0-100%	CONSOLE CONTROLLER		14-1 + 14-2 -			11-1 + 11-2 -	FROM CONSOLE TO TOWER
LOUVER (MULT)		1-5 VDC	0-100%	MULTIPLEXER		NO	NO	NO	24-1 + 24-2 -	MULTIPLEXER INPUT
LOUVER (COMP)		4-20 mA	0-100%	I/P		NO	NO	NO	11-4 + 11-3 -	COMPUTER OUTPUT
IV-1	I/P ON VALVE	4-20 mA	0-100%	CONSOLE CONTROLLER		15-17 15-18			12-19 + 12-20 -	FROM CONSOLE TO TOWER
IV-1 (MULT)		1-5 VDC	0-100%	MULTIPLEXER		NO	NO	NO	23-18 + 23-17 -	MULTIPLEXER INPUT
IV-1 (COMP)		4-20 mA	0-100%	I/P		NO	NO	NO	12-18 + 12-17 -	COMPUTER OUTPUT
DV-1	I/P ON VALVE	4-20 mA	0-100%	CONSOLE CONTROLLER		15-7 15-8			12-7 + 12-8 -	FROM CONSOLE TO TOWER
DV-1 (MULT)		1-5 VDC	0-100%	MULTIPLEXER		NO	NO	NO	23-14 + 23-13 -	MULTIPLEXER INPUT
DV-1 (COMP)		4-20 mA	0-100%	I/P		NO	NO	NO	12-10 + 12-9 -	COMPUTER OUTPUT
DV-10	I/P ON VALVE	4-20 mA	0-100%	CONSOLE CONTROLLER		15-5 15-6			12-3 + 12-4 -	FROM CONSOLE TO TOWER
DV-10 (MULT)		1-5 VDC	0-100%	MULTIPLEXER		NO	NO	NO	23-12 + 23-11 -	MULTIPLEXER INPUT
DV-10 (COMP)		4-20 mA	0-100%	I/P		NO	NO	NO	12-6 + 12-5 -	COMPUTER OUTPUT

NOMENCLATURE	LOCATION/DESCRIPTION	SIGNAL	RANGE	ACQUISITION/ DISPLAY	ALARM	SYSTEM CABLE ROUTING				REMARKS
						TOWER JUNCTION BOX	GALLERY	CONTROL ROOM	CONSOLE	
FAN 1	I/P ON PITCH MECHANISM	4-20 mA	0-100%	CONSOLE CONTROLLER		14-11 + 14-12 -			11-11 + 11-12 -	FROM CONSOLE TO TOWER
FAN 1 (MULT)		1-5 VDC	0-100%	MULTIPLEXER		NO	NO	NO	23-5 + 23-6 -	MULTIPLEXER INPUT
FAN 2	I/P ON PITCH MECHANISM	4-20 mA	0-100%	CONSOLE CONTROLLER		14-13 + 14-14 -			11-13 + 11-14 -	FROM CONSOLE TO TOWER
FAN 2 (MULT)		1-5 VDC	0-100%	MULTIPLEXER		NO	NO	NO	23-7 + 23-8 -	MULTIPLEXER INPUT
FANS DIRECT (COMP)		1-5 VDC	0-100%	CONSOLE CONTROLLER		NO	NO	NO	23-9 - 23-10 +	COMPUTER OUTPUT
RHV-1	I/P ON VALVE	4-20 mA	0-100%	CONSOLE CONTROLLER		16-14 + 16-15 -			13-10 + 13-11 -	FROM CONSOLE TO TOWER
RHV-1 (MULT)		1-5 VDC	0-100%	MULTIPLEXER		NO	NO	NO	22-19 + 22-18 -	MULTIPLEXER INPUT
RVH-1 (COMP)		4-20 mA	0-100%	I/P		NO	NO	NO	13-12 - 13-13 +	COMPUTER OUTPUT
FCV-1	I/P ON VALVE	4-20 mA	0-100%	CONSOLE CONTROLLER		16-16 + 16-17 -			13-14 + 13-15 -	FROM CONSOLE TO TOWER
FCV-1 (MULT)		1-5 VDC	0-100%	MULTIPLEXER		NO	NO	NO	22-16 - 22-17 +	MULTIPLEXER INPUT
FT-2	ΔP/I	4-20 mA	0-100%	CONSOLE CONTROLLER		16-18 + 16-19 -			13-16 + 13-17 -	FROM TOWER TO CONSOLE
FT-2 (COMP)		4-20 mA	0-100%	CONSOLE CONTROLLER		NO	NO	NO	13-20 + 13-19 -	COMPUTER OUTPUT
FCV - SETPOINT (COMP)		4-20 mA	0-100%	CONSOLE CONTROLLER		NO	NO	NO	22-12 - 22-13 +	COMPUTER OUTPUT

NOMENCLATURE	LOCATION/DESCRIPTION	SIGNAL	RANGE	ACQUISITION/ DISPLAY	ALARM	SYSTEM CABLE ROUTING				REMARKS
						TOWER JUNCTION BOX	GALLERY	CONTROL ROOM	CONSOLE	
FCV POSITION	P/I ON FCV	4-20 mA	0-100%	CONSOLE INDICATOR		16-12 TBD 16-13			13-8 TBD 13-9	FROM TOWER TO CONSOLE
FCV POS (MULT)		1-5 VDC	0-100%	MULTIPLEXER		NO	NO	NO	TBD	MULTIPLEXER INPUT
PT-1	P/I AT PUMP OUTLET	4-20 mA	0-200 PSI	CONSOLE INDICATOR		16-6 - 16-7 + 16-8 SH			13-4 - 13-5 + 13-6 SH	FROM TOWER TO CONSOLE
PT-1 (MULT)		1-5 VDC	0-200 PSI	MULTIPLEXER		NO	NO	NO	23-1 - 23-2 +	MULTIPLEXER INPUT
PT-2	P/I AT RECEIVER INLET	4-20 mA	0-200 PSI	CONSOLE INDICATOR		15-14 - 15-15 + 15-16 SH			12-14 - 12-15 + 12-16 SH	FROM TOWER TO CONSOLE
PT-2 (MULT)		1-5 VDC	0-200 PSI	MULTIPLEXER		NO	NO	NO	23-15 - 23-16 +	MULTIPLEXER INPUT
PT-3	P/I AT AIR COOLER OUTLET	4-20 mA	0-200 PSI	CONSOLE INDICATOR		14-8 - 14-9 + 14-10 SH			11-8 - 11-9 + 11-10 SH	FROM TOWER TO CONSOLE
PT-3 (MULT)		1-5 VDC	0-200 PSI	MULTIPLEXER		NO	NO	NO	23-19 - 23-20 +	MULTIPLEXER INPUT
PT-4	P/I AT AIR HEATER	4-20 mA	0-300 PSI	CONSOLE DIGITAL DISPLAY		17-6 - 17-7 + 17-8 SH			14-4 - 14-5 + 14-6 SH	FROM TOWER TO CONSOLE
PT-4 (MULT)		1-5 VDC	0-300 PSI	MULTIPLEXER		NO	NO	NO	23-3 - 23-4 +	MULTIPLEXER INPUT

NOMENCLATURE	LOCATION/DESCRIPTION	SIGNAL	RANGE	ACQUISITION/ DISPLAY	ALARM	SYSTEM CABLE ROUTING				REMARKS
						TOWER JUNCTION BOX	GALLERY	CONTROL ROOM	CONSOLE	
DV-1 MNO	N.O. MICRO	CONTACT CLOSURE		MULTIPLEXER		25-15 25-16			NO	VALVE CONTACT CLOSURE
DV-1 MNC	N.C. MICRO	CONTACT CLOSURE		MULTIPLEXER		25-17 25-18			NO	VALVE CONTACT CLOSURE
DV-2 MNO	N.O. MICRO	CONTACT CLOSURE		MULTIPLEXER		25-19 25-20			NO	VALVE CONTACT CLOSURE
DV-2 MNC	N.C. MICRO	CONTACT CLOSURE		MULTIPLEXER		26-1 26-2			NO	VALVE CONTACT CLOSURE
DV-3 MNO	N.O. MICRO	CONTACT CLOSURE		MULTIPLEXER		26-3 26-4			NO	VALVE CONTACT CLOSURE
DV-3 MNC	N.C. MICRO	CONTACT CLOSURE		MULTIPLEXER		26-5 26-6			NO	VALVE CONTACT CLOSURE
DV-4 MNO	N.O. MICRO	CONTACT CLOSURE		MULTIPLEXER		26-7 26-8			NO	VALVE CONTACT CLOSURE
DV-4 MNC	N.C. MICRO	CONTACT CLOSURE		MULTIPLEXER		26-9 26-10			NO	VALVE CONTACT CLOSURE
DV-5 MNO	N.O. MICRO	CONTACT CLOSURE		MULTIPLEXER		26-11 26-12			NO	VALVE CONTACT CLOSURE
DV-5 MNC	N.C. MICRO	CONTACT CLOSURE		MULTIPLEXER		26-13 26-14			NO	VALVE CONTACT CLOSURE
DV-6 MNO	N.O. MICRO	CONTACT CLOSURE		MULTIPLEXER		26-15 26-16			NO	VALVE CONTACT CLOSURE
DV-6 MNC	N.C. MICRO	CONTACT CLOSURE		MULTIPLEXER		26-17 26-18			NO	VALVE CONTACT CLOSURE
DV-7 MNO	N.O. MICRO	CONTACT CLOSURE		MULTIPLEXER		26-19 26-20			NO	VALVE CONTACT CLOSURE

NOMENCLATURE	LOCATION/DESCRIPTION	SIGNAL	RANGE	ACQUISITION/ DISPLAY	ALARM	SYSTEM CABLE ROUTING				REMARKS
						TOWER JUNCTION BOX	GALLERY	CONTROL ROOM	CONSOLE	
DV-7 MNC	N.C. MICRO	CONTACT CLOSURE		MULTIPLEXER		27-1 27-2			NO	VALVE CONTACT CLOSURE
DV-8 MNO	N.O. MICRO	CONTACT CLOSURE		MULTIPLEXER		27-3 27-4			NO	VALVE CONTACT CLOSURE
DV-8 MNC	N.C. MICRO	CONTACT CLOSURE		MULTIPLEXER		27-5 27-6			NO	VALVE CONTACT CLOSURE
DV-9 MNO	N.O. MICRO	CONTACT CLOSURE		MULTPLEXER		27-7 27-8			NO	VALVE CONTACT CLOSURE
DV-9 MNC	N.C. MICRO	CONTACT CLOSURE		MULTIPLEXER		27-9 27-10			NO	VALVE CONTACT CLOSURE
DV-10 MNO	N.O. MICRO	CONTACT CLOSURE		MULTIPLEXER		27-11 27-12			NO	VALVE CONTACT CLOSURE
DV-10 MNC	N.C. MICRO	CONTACT CLOSURE		MULTIPLEXER		27-13 27-14			NO	VALVE CONTACT CLOSURE
CV-1 MNO	N.O. MICRO	CONTACT CLOSURE		MULTIPLEXER		27-15 27-16			NO	VALVE CONTACT CLOSURE
CV-1 MNC	N.C. MICRO	CONTACT CLOSURE		MULTIPLEXER		27-17 27-18			NO	VALVE CONTACT CLOSURE
IV-1 MNO	N.O. MICRO	CONTACT CLOSURE		MULTIPLEXER		27-19 27-20			NO	VALVE CONTACT CLOSURE
IV-1 MNC	N.C. MICRO	CONTACT CLOSURE		MULTIPLEXER		28-1 28-2			NO	VALVE CONTACT CLOSURE
ROV-1 MNO	N.O. MICRO	CONTACT CLOSURE		MULTIPLEXER		28-3 28-4			NO	VALVE CONTACT CLOSURE
ROV-1 MNC	N.C. MICRO	CONTACT CLOSURE		MULTIPLEXER		28-5 28-6			NO	VALVE CONTACT CLOSURE

NOMENCLATURE	LOCATION/DESCRIPTION	SIGNAL	RANGE	ACQUISITION/ DISPLAY	ALARM	SYSTEM CABLE ROUTING				REMARKS
						TOWER JUNCTION BOX	GALLERY	CONTROL ROOM	CONSOLE	
RHV-1 (MNO)	N.O. MICRO	CONTACT CLOSURE		MULTIPLEXER		28-7 28-8			NO	VALVE CONTACT CLOSURE
RHV-1 (MNC)	N.C. MICRO	CONTACT CLOSURE		MULTIPLEXER		28-9 28-10			NO	VALVE CONTACT CLOSURE
PR-1 (MNO)	N.O. MICRO	CONTACT CLOSURE		MULTIPLEXER		28-11 28-12			NO	VALVE CONTACT CLOSURE
PR-1 (MNC)	N.C. MICRO	CONTACT CLOSURE		MULTIPLEXER		28-13 28-14			NO	VALVE CONTACT CLOSURE
CPV-1 (MNO)	N.O. MICRO	CONTACT CLOSURE		MULTIPLEXER		28-15 28-16			NO	VALVE CONTACT CLOSURE
CPV-1 (MNC)	N.C. MICRO	CONTACT CLOSURE		MULTIPLEXER		28-17 28-18			NO	VALVE CONTACT CLOSURE
INSULATION (MNO)	N.O. MICRO	CONTACT CLOSURE		MULTIPLEXER		28-19 28-20			NO	VALVE CONTACT CLOSURE
INSULATION (MNC)	N.C. MICRO	CONTACT CLOSURE		MULTIPLEXER		29-1 29-2			NO	VALVE CONTACT CLOSURE
SPARE (MNO)	N.O. MICRO	CONTACT CLOSURE		MULTIPLEXER		29-3 29-4			NO	VALVE CONTACT CLOSURE
SPARE (MNC)	N.C. MICRO	CONTACT CLOSURE		MULTIPLEXER		29-5 29-6			NO	VALVE CONTACT CLOSURE
PV-1 (MNO)	N.O. MICRO	CONTACT CLOSURE		MULTIPLEXER		29-7 29-8			NO	VALVE CONTACT CLOSURE
PV-1 (MNC)	N.C. MICRO	CONTACT CLOSURE		MULTIPLEXER		29-9 29-10			NO	VALVE CONTACT CLOSURE
PV-2 (MNO)	N.O. MICRO	CONTACT CLOSURE		MULTIPLEXER		29-11 29-12			NO	VALVE CONTACT CLOSURE

NOMENCLATURE	LOCATION/DESCRIPTION	SIGNAL	RANGE	ACQUISITION/ DISPLAY	ALARM	SYSTEM CABLE ROUTING				REMARKS
						TOWER JUNCTION BOX	GALLERY	CONTROL ROOM	CONSOLE	
PV-2 (MNC)	N.C. MICRO	CONTACT CLOSURE		MULTIPLEXER		29-13 29-14			NO	VALVE CONTACT CLOSURE
PV-3 (MNO)	N.O. MICRO	CONTACT CLOSURE		MULTIPLEXER		29-15 29-16			NO	VALVE CONTACT CLOSURE
PV-3 (MNC)	N.C. MICRO	CONTACT CLOSURE		MULTIPLEXER		29-17 29-18			NO	VALVE CONTACT CLOSURE
PV-4 (MNO)	N.O. MICRO	CONTACT CLOSURE		MULTIPLEXER		29-19 29-20			NO	VALVE CONTACT CLOSURE
PV-4 (MNC)	N.C. MICRO	CONTACT CLOSURE		MULTIPLEXER		30-1 30-2			NO	VALVE CONTACT CLOSURE
PV-5 (MNO)	N.O. MICRO	CONTACT CLOSURE		MULTIPLEXER		30-3 30-4			NO	VALVE CONTACT CLOSURE
PV-5 (MNC)	N.C. MICRO	CONTACT CLOSURE		MULTIPLEXER		30-5 30-6			NO	VALVE CONTACT CLOSURE
PV-6 (MNO)	N.O. MICRO	CONTACT CLOSURE		MULTIPLEXER		30-7 30-8			NO	VALVE CONTACT CLOSURE
PV-6 (MNC)	N.C. MICRO	CONTACT CLOSURE		MULTIPLEXER		30-9 30-10			NO	VALVE CONTACT CLOSURE
PV-7 (MNO)	N.O. MICRO	CONTACT CLOSURE		MULTIPLEXER		30-11 30-12			NO	VALVE CONTACT CLOSURE
PV-7 (MNC)	N.C. MICRO	CONTACT CLOSURE		MULTIPLEXER		30-13 30-14			NO	VALVE CONTACT CLOSURE
PV-8 (MNO)	N.O. MICRO	CONTACT CLOSURE		MULTIPLEXER		30-15 30-16			NO	VALVE CONTACT CLOSURE
PV-8 (MNC)	N.C. MICRO	CONTACT CLOSURE		MULTIPLEXER		30-17 30-18			NO	VALVE CONTACT CLOSURE

NOMENCLATURE	LOCATION/DESCRIPTION	SIGNAL	RANGE	ACQUISITION/ DISPLAY	ALARM	SYSTEM CABLE ROUTING				REMARKS
						TOWER JUNCTION BOX	GALLERY	CONTROL ROOM	CONSOLE	
PV-9 (MNO)	N.O. MICRO	CONTACT CLOSURE		MULTIPLEXER		30-19 30-20			NO	VALVE CONTACT CLOSURE
PV-9 (MNC)	N.C. MICRO	CONTACT CLOSURE		MULTIPLEXER		31-1 31-2			NO	VALVE CONTACT CLOSURE
RPV-1 (MNO)	N.O. MICRO	CONTACT CLOSURE		MULTIPLEXER		31-3 31-4			NO	VALVE CONTACT CLOSURE
RPV-1 (MNC)	N.C. MICRO	CONTACT CLOSURE		MULTIPLEXER		31-5 31-6			NO	VALVE CONTACT CLOSURE
RPV-2 (MNO)	N.O. MICRO	CONTACT CLOSURE		MULTIPLEXER		31-7 31-8			NO	VALVE CONTACT CLOSURE
RPV-2 (MNC)	N.C. MICRO	CONTACT CLOSURE		MULTIPLEXER		31-9 31-10			NO	VALVE CONTACT CLOSURE
FCV-1 (MNO)	N.O. MICRO	CONTACT CLOSURE		MULTIPLEXER		31-11 31-12			NO	VALVE CONTACT CLOSURE
FCV-1 (MNC)	N.C. MICRO	CONTACT CLOSURE		MULTIPLEXER		31-13 31-14			NO	VALVE CONTACT CLOSURE

NOMENCLATURE	LOCATION/DESCRIPTION	SIGNAL	RANGE	ACQUISITION/ DISPLAY	ALARM	SYSTEM CABLE ROUTING				REMARKS
						TOWER JUNCTION BOX	GALLERY	CONTROL ROOM	CONSOLE	
DV-2 CON	VALVE SOLENOID	28 VDC		--		17-9			26-7	COIL
		28 VDC		CONSOLE LIGHT		17-10			14-8	CONTACT
		28 VDC		CONSOLE LIGHT		17-11			14-9	CONTACT
		28 VDC		--		17-12			26-10	COIL
DV-3 CON	VALVE SOLENOID	28 VDC		CONSOLE LIGHT		17-13			14-11	CONTACT
		28 VDC		CONSOLE LIGHT		17-14			14-12	CONTACT
		28 VDC		--		17-15			26-13	COIL
DV-4 CON	VALVE SOLENOID	28 VDC		CONSOLE LIGHT		17-16			14-14	CONTACT
		28 VDC		CONSOLE LIGHT		17-17			14-15	CONTACT
		28 VDC		--		17-18			26-16	COIL
DV-5 CON	VALVE SOLENOID	28 VDC		CONSOLE LIGHT		17-19			14-17	CONTACT
		28 VDC		CONSOLE LIGHT		17-20			14-18	CONTACT
		28 VDC		--		18-1			26-19	COIL
DV-6 CON	VALVE SOLENOID	28 VDC		CONSOLE LIGHT		18-2			14-20	CONTACT
		28 VDC		CONSOLE LIGHT		18-3			15-1	CONTACT
		28 VDC		--		18-4			26-2	COIL
DV-7 CON	VALVE SOLENOID	28 VDC		CONSOLE LIGHT		18-5			15-3	CONTACT
		28 VDC		CONSOLE LIGHT		18-6			15-4	CONTACT
		28 VDC		--		18-7			26-5	COIL
DV-8 CON	VALVE SOLENOID	28 VDC		CONSOLE LIGHT		18-8			15-6	CONTACT
		28 VDC		CONSOLE LIGHT		18-9			15-7	CONTACT
		28 VDC		--		18-10			26-8	COIL
DV-9 CON	VALVE SOLENOID	28 VDC		CONSOLE LIGHT		18-11			15-9	CONTACT
		28 VDC		CONSOLE LIGHT		18-12			15-10	CONTACT

NOMENCLATURE	LOCATION/DESCRIPTION	SIGNAL	RANGE	ACQUISITION/ DISPLAY	ALARM	SYSTEM CABLE ROUTING				REMARKS
						TOWER JUNCTION BOX	GALLERY	CONTROL ROOM	CONSOLE	
		28 VDC		--		18-13			26-11	COIL
PV-1 CON	VALVE SOLENOID	28 VDC		CONSOLE LIGHT		18-14			15-12	CONTACT
		28 VDC		CONSOLE LIGHT		18-15			15-13	CONTACT
		28 VDC		--		18-16			26-14	COIL
PV-2 CON	VALVE SOLENOID	28 VDC		CONSOLE LIGHT		18-17			15-15	CONTACT
		28 VDC		CONSOLE LIGHT		18-18			15-16	CONTACT
		28 VDC		--		18-19			26-17	COIL
PV-3 CON	VALVE SOLENOID	28 VDC		CONSOLE LIGHT		18-20			15-18	CONTACT
		28 VDC		CONSOLE LIGHT		19-1			15-19	CONTACT
		28 VDC		--		19-2			26-20	COIL
PV-4 CON	VALVE SOLENOID	28 VDC		CONSOLE LIGHT		19-3			16-1	CONTACT
		28 VDC		CONSOLE LIGHT		19-4			16-2	CONTACT
		28 VDC		--		19-5			26-3	COIL
PV-5 CON	VALVE SOLENOID	28 VDC		CONSOLE LIGHT		19-6			16-4	CONTACT
		28 VDC		CONSOLE LIGHT		19-7			16-5	CONTACT
		28 VDC		--		19-8			26-6	COIL
PV-6 CON	VALVE SOLENOID	28 VDC		CONSOLE LIGHT		19-9			16-7	CONTACT
		28 VDC		CONSOLE LIGHT		19-10			16-8	CONTACT
		28 VDC		--		19-11			26-9	COIL
PV-7 CON	VALVE SOLENOID	28 VDC		CONSOLE LIGHT		19-12			16-10	CONTACT
		28 VDC		CONSOLE LIGHT		19-13			16-11	CONTACT
		28 VDC		--		19-14			26-12	COIL
PV-8 CON	VALVE SOLENOID	28 VDC		CONSOLE LIGHT		19-15			16-13	CONTACT
		28 VDC		CONSOLE LIGHT		19-16			16-14	CONTACT

NOMENCLATURE	LOCATION/DESCRIPTION	SIGNAL	RANGE	ACQUISITION/ DISPLAY	ALARM	SYSTEM CABLE ROUTING				REMARKS
						TOWER JUNCTION BOX	GALLERY	CONTROL ROOM	CONSOLE	
PV-9 CON	VALVE SOLENOID	28 VDC		--		19-17			26-15	COIL
		28 VDC		CONSOLE LIGHT		19-18			16-16	CONTACT
		28 VDC		CONSOLE LIGHT		19-19			16-17	CONTACT
		28 VDC		CONSOLE LIGHT		19-20			16-18	CONTACT
81 KW HEATER	TEMPERATURE CONTROLLER	28 VDC		SWITCH		20-1			16-19	CONTACT
AV-3	CAVITY DOOR LEFT	28 VDC		CONSOLE LIGHT		20-4			17-2	N.C. CONTACT
		28 VDC		CONSOLE LIGHT		20-5			17-3	N.O. CONTACT
						20-6			17-4	COIL
						20-7			17-5	COIL
AV-4	CAVITY DOOR RIGHT	28 VDC		CONSOLE LIGHT		20-8			17-6	N.C. CONTACT
		28 VDC		CONSOLE LIGHT		20-9			17-7	N.O. CONTACT
CPV-1	COOLER PURGE VALVE					20-10			17-8	COIL
				CONSOLE LIGHT		20-11			17-9	N.C. CONTACT
				CONSOLE LIGHT		20-12			17-10	N.O. CONTACT

NOMENCLATURE	LOCATION/DESCRIPTION	SIGNAL	RANGE	ACQUISITION/ DISPLAY	ALARM	SYSTEM CABLE ROUTING				REMARKS
						TOWER JUNCTION BOX	GALLERY	CONTROL ROOM	CONSOLE	
RPV-1	PURGE SUPPLY VALVE	28 VDC				20-13			17-11	COIL
		28 VDC		CONSOLE LIGHT		20-14			17-12	N.C. CONTACT
		28 VDC		CONSOLE LIGHT		20-15			17-13	N.O. CONTACT
RPV-2	RETURN PURGE VALVE	28 VDC				20-16			17-14	COIL
		28 VDC		CONSOLE LIGHT		20-17			17-15	N.C. CONTACT
		28 VDC		CONSOLE LIGHT		20-18			17-16	N.O. CONTACT
CV-1	CALIBRATION VALVE	28 VDC				20-19			17-17	COIL
		28 VDC		CONSOLE LIGHT		20-20			17-18	N.C. CONTACT
		28 VDC		CONSOLE LIGHT		21-1			17-19	N.O. CONTACT
ROV-1	MANIFOLD DRAIN VALVE	28 VDC				21-2			17-20	COIL
		28 VDC		CONSOLE LIGHT		21-3			18-1	N.C. CONTACT
		28 VDC		CONSOLE LIGHT		21-4			18-2	N.O. CONTACT
AV-1 & 2	INSULATION COVER	28 VDC				21-5			18-3	COIL
		28 VDC				21-6			18-4	COIL
		28 VDC		CONSOLE LIGHT		21-7			18-5	N.C. CONTACT
		28 VDC		CONSOLE LIGHT		21-8			18-6	N.O. CONTACT
COOLER FAN #1	FAN CONTROL START/STOP	28 VDC				21-9			18-7	COIL
		28 VDC				21-10			18-8	CONTACT
		28 VDC				21-11			18-9	CONTACT
		28 VDC		CONSOLE LIGHT		21-12			18-10	CONTACT
		28 VDC		CONSOLE LIGHT		21-13			18-11	CONTACT

NOMENCLATURE	LOCATION/DESCRIPTION	SIGNAL	RANGE	ACQUISITION/ DISPLAY	ALARM	SYSTEM CABLE ROUTING				REMARKS
						TOWER JUNCTION BOX	GALLERY	CONTROL ROOM	CONSOLE	
COOLER FAN #2	FAN CONTROL START/STOP	28 VDC				21-14			18-12	COIL
		28 VDC				21-15			18-13	CONTACT
		28 VDC				21-16			18-14	CONTACT
		28 VDC		CONSOLE LIGHT		21-17			18-15	CONTACT
		28 VDC		CONSOLE LIGHT		21-18			18-16	CONTACT
PUMP	PUMP CONTROL START/STOP	28 VDC				21-19			18-17	COIL
		28 VDC				21-20			18-18	CONTACT
		28 VDC				22-1			18-19	CONTACT
		28 VDC		CONSOLE LIGHT		22-2			18-20	CONTACT
		28 VDC		CONSOLE LIGHT		22-3			19-1	CONTACT
PRI	MOTOR REGULATOR AIR HEATER	28 VDC				22-4			19-2	INCREASE
		28 VDC				22-5			19-3	DECREASE
RHV-1 (CON)	VALVE MICROS	28 VDC		CONSOLE LIGHT		22-6			19-4	N.C. CONTACT
		28 VDC		CONSOLE LIGHT		22-7			19-5	N.O. CONTACT
DV-10 (CON)	VALVE MICROS	28 VDC		CONSOLE LIGHT		22-8			19-6	N.C. CONTACT
		28 VDC		CONSOLE LIGHT		22-9			19-7	N.O. CONTACT
DV-1 (CON)	VALVE MICROS	28 VDC		CONSOLE LIGHT		22-10			19-8	N.C. CONTACT
		28 VDC		CONSOLE LIGHT		22-11			19-9	N.O. CONTACT
IV-1 (CON)	VALVE MICROS	28 VDC		CONSOLE LIGHT		22-12			19-10	N.C. CONTACT
		28 VDC		CONSOLE LIGHT		22-13			19-11	N.O. CONTACT
FCV (CON)	VALVE MICRO	28 VDC		CONSOLE LIGHT		22-14			19-12	N.C. CONTACT
		28 VDC		CONSOLE LIGHT		22-15			19-13	N.O. CONTACT

NOMENCLATURE	LOCATION/DESCRIPTION	SIGNAL	RANGE	ACQUISITION/ DISPLAY	ALARM	SYSTEM CABLE ROUTING				REMARKS
						TOWER JUNCTION BOX	GALLERY	CONTROL ROOM	CONSOLE	
HHS-1	SWITCH FOR SOLENOID IV-1	28 VDC		CONSOLE LIGHT		34-11			22-3	COIL
HHS-2	SWITCH FOR SOLENOID DV-1	28 VDC		CONSOLE LIGHT		34-12			22-4	COIL
HHS-3	SWITCH FOR SOLENOID DV-10	28 VDC		CONSOLE LIGHT		34-13			22-5	COIL
HHS-4	SWITCH FOR SOLENOID FCV	28 VDC		CONSOLE LIGHT		34-14			22-6	COIL
HHS-5	SWITCH FOR SOLENOID RHV-1	28 VDC		CONSOLE LIGHT		34-15			22-7	COIL
HHS-6	SPARE					34-16			22-8	

NOMENCLATURE	LOCATION/DESCRIPTION	SIGNAL	RANGE	ACQUISITION/ DISPLAY	ALARM	SYSTEM CABLE ROUTING				REMARKS
						TOWER JUNCTION BOX	GALLERY	CONTROL ROOM	CONSOLE	
ROV-1 (COMP)	N.O. CONTACT	28 VDC		VALVE CONTROL		NO	NO	NO	24-3 24-4	CONTACT CLOSURE FROM COMPUTER
RPV-1 (COMP)	N.O. CONTACT	28 VDC		VALVE CONTROL		NO	NO	NO	24-5 24-6	CONTACT CLOSURE FROM COMPUTER
RPV-2 (COMP)	N.O. CONTACT	28 VDC		VALVE CONTROL		NO	NO	NO	24-7 24-8	CONTACT CLOSURE FROM COMPUTER
RPV-1 (COMP)	N.O. CONTACT	28 VDC		VALVE CONTROL		NO	NO	NO	24-9 24-10	CONTACT CLOSURE FROM COMPUTER
CV-1 (COMP)	N.O. CONTACT	28 VDC		VALVE CONTROL		NO	NO	NO	24-11 24-12	CONTACT CLOSURE FROM COMPUTER
IV-1 (COMP)	N.O. CONTACT	28 VDC		VALVE CONTROL		NO	NO	NO	24-13 24-14	CONTACT CLOSURE FROM COMPUTER
AV-1&2(COMP)	N.O. CONTACT	28 VDC		VALVE CONTROL		NO	NO	NO	24-15 24-16	CONTACT CLOSURE FROM COMPUTER
SPARE	N.O. CONTACT	28 VDC		VALVE CONTROL		NO	NO	NO	24-17 24-18	CONTACT CLOSURE FROM COMPUTER
FCV (COMP)	N.O. CONTACT	28 VDC		VALVE CONTROL		NO	NO	NO	24-19 24-20	CONTACT CLOSURE FROM COMPUTER
DVS (COMP)	N.O. CONTACT	28 VDC		VALVE CONTROL		NO	NO	NO	25-1 25-2	CONTACT CLOSURE FROM COMPUTER
PVS (COMP)	N.O. CONTACT	28 VDC		VALVE CONTROL		NO	NO	NO	25-3 25-4	CONTACT CLOSURE FROM COMPUTER
PR-1 INC (COMP)	N.O. CONTACT	28 VDC		VALVE CONTROL INCREASE		NO	NO	NO	25-5 25-6	CONTACT CLOSURE FROM COMPUTER
PR-1 DEC (COMP)	N.O. CONTACT	28 VDC		VALVE CONTROL DECREASE		NO	NO	NO	25-7 25-8	CONTACT CLOSURE FROM COMPUTER

NOMENCLATURE	LOCATION/DESCRIPTION	SIGNAL	RANGE	ACQUISITION/ DISPLAY	ALARM	SYSTEM CABLE ROUTING				REMARKS
						TOWER JUNCTION BOX	GALLERY	CONTROL ROOM	CONSOLE	
24 VDC SUPPLY RETURN	POWER DISTRIBUTION	24 VDC				TB-9			9-1 9-2 9-3 9-4	POWER BUSS
24 VDC SUPPLY POSITIVE	POWER DISTRIBUTION	24 VDC				TB-7			4-7 4-8 4-9 4-10	POWER BUSS
WATCHDOG	N.O. CONTACT	24 VDC		ANNUNCIATOR	YES	NO	NO	NO	51-2 51-3	CONTACT CLOSURE FROM COMPUTER
WATCHDOG	N.C. CONTACT	24 VDC		ANNUNCIATOR	YES	NO	NO	NO	51-5 51-6	CONTACT CLOSURE FROM COMPUTER
PNEUMATIC PURGE	N.O. CONTACT	24 VDC		ANNUNCIATOR	YES	NO	NO	NO	51-8 51-9	CONTACT CLOSURE FROM COMPUTER
PNEUMATIC CONTROL	N.O. CONTACT	24 VDC		ANNUNCIATOR	YES	NO	NO	NO	51-11 51-12	CONTACT CLOSURE FROM COMPUTER
UPS CIRCUIT	N.C. CONTACT RELAY	24 VDC		ANNUNCIATOR	YES	NO			51-14 51-15	CONTACT CLOSURE FROM GALLERY
TUBE METAL TEMP	N.O. CONTACT	24 VDC		ANNUNCIATOR	YES	NO	NO	NO	51-16 51-17	CONTACT CLOSURE FROM GALLERY
HELIOSTAT SCRAM	N.O. CONTACT					NO	NO	NO	53-19 53-20	HARDWIRE FACILITY
SCRAM ENABLE ON	N.O. CONTACT	24 VDC		MULTIPLEXER		NO	NO	NO	52-17	
SCRAM ENABLE OFF	N.C. CONTACT	24 VDC		MULTPLEXER		NO	NO	NO	52-18	

NOMENCLATURE	LOCATION/DESCRIPTION	SIGNAL	RANGE	ACQUISITION/ DISPLAY	ALARM	SYSTEM CABLE ROUTING				REMARKS
						TOWER JUNCTION BOX	GALLERY	CONTROL ROOM	CONSOLE	
TWEEKER #1		0-10 VDC		MULTIPLEXER		NO	NO	NO	T-16 T-15	VARIABLE VOLTAGE SOURCE TO COMPUTER
TWEEKER #2		0-10 VDC		MULTIPLEXER		NO	NO	NO	T-14	VARIABLE VOLTAGE SOURCE TO COMPUTER
TWEEKER #3		0-10 VDC		MULTIPLEXER		NO	NO	NO	T-12 T-11	VARIABLE VOLTAGE SOURCE TO COMPUTER
TWEEKER #4		0-10 VDC		MULTIPLEXER		NO	NO	NO	T-10 T-9	VARIABLE VOLTAGE SOURCE TO COMPUTER

NOMENCLATURE	LOCATION/DESCRIPTION	SIGNAL	RANGE	ACQUISITION/ DISPLAY	ALARM	SYSTEM CABLE ROUTING				REMARKS
						TOWER JUNCTION BOX	GALLERY	CONTROL ROOM	HEATER CONSOLE	
HEATER #1	TRACE HEATER CONTROL	28 VDC		LIGHT		34-17			1-1	COIL
HEATER #2	TRACE HEATER CONTROL	28 VDC		LIGHT		34-18			1-2	COIL
HEATER #3	TRACE HEATER CONTROL	28 VDC		LIGHT		34-19			1-3	COIL
HEATER #4	TRACE HEATER CONTROL	28 VDC		LIGHT		34-20			1-4	COIL
HEATER #5	TRACE HEATER CONTROL	28 VDC		LIGHT		35-1			1-5	COIL
HEATER #6	TRACE HEATER CONTROL	28 VDC		LIGHT		35-2			1-6	COIL
HEATER #7	TRACE HEATER CONTROL	28 VDC		LIGHT		35-3			1-7	COIL
HEATER #8	TRACE HEATER CONTROL	28 VDC		LIGHT		35-4			1-8	COIL
HEATER #9	TRACE HEATER CONTROL	28 VDC		LIGHT		35-5			1-9	COIL
HEATER #10	TRACE HEATER CONTROL	28 VDC		LIGHT		35-6			1-10	COIL
HEATER #11	TRACE HEATER CONTROL	28 VDC		LIGHT		35-7			1-11	COIL
HEATER #12	TRACE HEATER CONTROL	28 VDC		LIGHT		35-8			1-12	COIL
HEATER #13	TRACE HEATER CONTROL	28 VDC		LIGHT		35-9			1-13	COIL
HEATER #14	TRACE HEATER CONTROL	28 VDC		LIGHT		35-10			1-14	COIL
HEATER #15	TRACE HEATER CONTROL	28 VDC		LIGHT		35-11			1-15	COIL
HEATER #16	TRACE HEATER CONTROL	28 VDC		LIGHT		35-12			1-16	COIL
HEATER #17	TRACE HEATER CONTROL	28 VDC		LIGHT		35-13			1-17	COIL

NOMENCLATURE	LOCATION/DESCRIPTION	SIGNAL	RANGE	ACQUISITION/ DISPLAY	ALARM	SYSTEM CABLE ROUTING				REMARKS
						TOWER JUNCTION BOX	GALLERY	CONTROL ROOM	HEATER CONSOLE	
HEATER #18	TRACE HEATER CONTROL	28 VDC		LIGHT		35-14			1-18	COIL
HEATER #19	TRACE HEATER CONTROL	28 VDC		LIGHT		35-15			1-19	COIL
HEATER #20	TRACE HEATER CONTROL	28 VDC		LIGHT		35-16			1-20	COIL
HEATER #21	TRACE HEATER CONTROL	28 VDC		LIGHT		35-17			2-1	COIL
HEATER #22	TRACE HEATER CONTROL	28 VDC		LIGHT		35-18			2-2	COIL
HEATER #23	TRACE HEATER CONTROL	28 VDC		LIGHT		35-19			2-3	COIL
HEATER #24	TRACE HEATER CONTROL	28 VDC		LIGHT		35-20			2-4	COIL
HEATER #25	TRACE HEATER CONTROL	28 VDC		LIGHT		36-1			2-5	COIL
HEATER #26	TRACE HEATER CONTROL	28 VDC		LIGHT		36-2			2-6	COIL