

EOSR NO. 1608

AD-A207 236

**FINAL REPORT MM&T FOR LINEAR RESONANT COOLER  
VOLUME II OF II**

Dr. R. Narayan and J. Silvestro  
Magnavox Government and Industrial Electronics Company  
46 Industrial Avenue  
Mahwah, N.J. 07430

2 February 1989

Final Report For October 1984 to September 1986

Prepared For  
U.S. Army Communications-Electronics Command (CECOM)  
Fort Monmouth, N.J. 07703-5000

U.S. Army Center For Night Vision & Electro-Optics  
Fort Belvoir, Va. 22060

DTIC  
ELECTE  
APR 24 1989  
S H D

DISTRIBUTION STATEMENT A

Approved for public release;  
Distribution Unlimited

89

102

**Best  
Available  
Copy**

**EOSR NO. 1608**

**FINAL REPORT MM&T FOR LINEAR RESONANT COOLER  
VOLUME II OF II**

**Dr. R. Narayan and J. Silvestro  
Magnavox Government and Industrial Electronics Company  
46 Industrial Avenue  
Mahwah, N.J. 07430**

**2 February 1989**

**Final Report For October 1984 to September 1986**

**Prepared For  
U.S. Army Communications-Electronics Command (CECOM)  
Fort Monmouth, N.J. 07703-5000**

**U.S. Army Center For Night Vision & Electro-Optics  
Fort Belvoir, Va. 22060**

VOLUME II CONSISTS OF THE FOLLOWING APPENDICES

APPENDIX A - SM-D-5005843 0.25 WATT LINEAR RESONANT COOLER ASSEMBLY DRAWING  
AND PARTS LIST

APPENDIX B - TABLE NO. 1 - ACCEPTANCE/PERFORMANCE TEST

- 2 - ACOUSTIC NOISE TEST DATA AND PLOTS
- 3 - BASELINE AND POST TEMPERATURE SHOCK
- 4 - LOW TEMPERATURE AND POST LOW TEMPERATURES
- 5 - HIGH TEMPERATURE AND POST HIGH TEMPERATURES
- 6 - POST MECHANICAL SHOCK
- 7 - POST VIBRATION
- 8 - EMI
- 9 - RELIABILITY (SN 011)
- 10 - RELIABILITY (SN 015)
- 11 - RELIABILITY (SN 016)

APPENDIX C - FAILURE REPORTS



|                       |                                            |
|-----------------------|--------------------------------------------|
| Accession For         |                                            |
| NTIS GRA&I            | <input checked="checked" type="checkbox"/> |
| DTIC TAB              | <input type="checkbox"/>                   |
| Unannounced           | <input type="checkbox"/>                   |
| Justification         |                                            |
| By <i>per Form 50</i> |                                            |
| Distribution/         |                                            |
| Availability Codes    |                                            |
| Dist                  | Avail and/or<br>Special                    |
| <i>A-1</i>            |                                            |

APPENDIX A

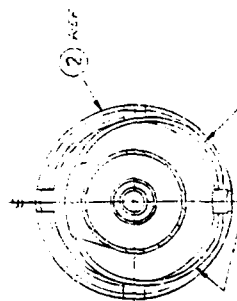
SM-D-5005843

0.25 WATT LINEAR RESONANT  
COOLER ASSEMBLY DRAWING  
AND PARTS LIST

| PARTS LIST                                                 |            | U.S. ARMY ELECTRONICS RESEARCH AND DEVELOPMENT COMMAND<br>NIGHT VISION AND ELECTRO-OPTICS LABORATORY<br>FORT BELVOIR VIRGINIA 22060 |                                     | FSCM NO.<br>54490                    | PL SM5005843                          | REV LTR / DATE<br>B<br>3 SEPT 86 |                  |
|------------------------------------------------------------|------------|-------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|--------------------------------------|---------------------------------------|----------------------------------|------------------|
| LIST TITLE<br>0.25 WATT LINEAR RESONANT<br>COOLER ASSEMBLY |            |                                                                                                                                     | CONTRACT NO.<br>DAK20-84-<br>C-0440 | AUTHENTICATION<br><i>P. B. B. B.</i> | REV AUTH<br>24407-0178                | SHT 1 OF 2                       |                  |
| ITEM OR<br>FIND NO                                         | QTY<br>REQ | FSCM NO                                                                                                                             | DRAWING OR<br>SPECIFICATION NO.     | PART OR IDENTIFICATION<br>NUMBER     | NOMENCLATURE OR DESCRIPTION           | PL                               | NOTES OR REMARKS |
| 1                                                          | 1          | 54490                                                                                                                               | SM-C-5005860                        | SM-C-5005860                         | HOUSING TIG WELD ASSEMBLY             | X                                |                  |
| 2                                                          | 1          | 54490                                                                                                                               | SM-D-5005847                        | SM-D-5005847                         | COIL & VIBRATION ABSORBER<br>ASSEMBLY | X                                |                  |
| 3                                                          | 1          | 54490                                                                                                                               | SM-D-5005849                        | SM-D-5005849                         | ELECTRONICS ASSEMBLY                  | X                                |                  |
| 4                                                          | 1          | 54490                                                                                                                               | SM-C-5005859                        | SM-C-5005859                         | CAP ASSEMBLY                          | X                                |                  |
| 5                                                          | 1          | 54490                                                                                                                               | SM-C-5005870                        | SM-C-5005870                         | SET SCREW                             |                                  |                  |
| 6                                                          | 1          | 54490                                                                                                                               | SM-C-5005873                        | SM-C-5005873-1                       | SHIM                                  |                                  |                  |
| 7                                                          | 1          | 54490                                                                                                                               | SM-C-5005873                        | SM-C-5005873-2                       | SHIM                                  |                                  |                  |
| 8                                                          | 1          | 54490                                                                                                                               | SM-C-5005873                        | SM-C-5005873-3                       | SHIM                                  |                                  |                  |
| 9                                                          | 1          | 54490                                                                                                                               | SM-C-5005873                        | SM-C-5005873-4                       | SHIM                                  |                                  |                  |
| 10                                                         | 1          | 54490                                                                                                                               | SM-C-5005979                        | SM-C-5005979-1                       | SPACER                                |                                  | 15               |
| 11                                                         | 1          | 54490                                                                                                                               | SM-C-5005979                        | SM-C-5005979-2                       | SPACER                                |                                  | 15               |
| 12                                                         | 1          | 54490                                                                                                                               | SM-C-5005979                        | SM-C-5005979-3                       | SPACER                                |                                  | 15               |
| 13                                                         | 1          | 54490                                                                                                                               | SM-C-5005938                        | SM-C-5005938                         | END CAP ASSEMBLY                      | X                                |                  |
| 14                                                         | 1          | 54490                                                                                                                               | SM-C-5005939                        | SM-C-5005939                         | CYLINDER ASSEMBLY                     | X                                |                  |
| 15                                                         | 1          | 54490                                                                                                                               | SM-C-5005937                        | SM-C-5005937                         | DISPLACER ASSEMBLY                    | X                                |                  |
| 16                                                         | 1          | 54490                                                                                                                               | SM-C-5005953                        | SM-C-5005953                         | WASHER                                |                                  |                  |
| 17                                                         | 1          | 54490                                                                                                                               | SM-C-5005956                        | SM-C-5005956                         | CLAMP                                 |                                  | 11               |
| 18                                                         | 1          | 54490                                                                                                                               | SM-D-5005958                        | SM-D-5005958                         | PROTECTOR SLEEVE                      |                                  | 11               |
| 19                                                         | 1          | 54490                                                                                                                               | SM-C-5005955                        | SM-C-5005955                         | RING, GUIDE                           |                                  |                  |
| 20                                                         | 1          | 54490                                                                                                                               | SM-C-5005967                        | SM-C-5005967                         | CAP, DUST                             |                                  | 11               |
| 21                                                         | 1          | 54490                                                                                                                               | SM-C-5005951                        | SM-C-5005951                         | SLEEVE                                |                                  |                  |
| 22                                                         | 1          | 54490                                                                                                                               | SM-C-5005959                        | SM-C-5005959                         | "O" RING                              |                                  |                  |
| 23                                                         | 5          | 54490                                                                                                                               | SM-C-5005954                        | SM-C-5005954-1                       | SPACER                                |                                  | 9, (.001/.003)   |
| 24                                                         | 5          | 54490                                                                                                                               | SM-C-5005954                        | SM-C-5005954-2                       | SPACER                                |                                  | 9, (.004/.006)   |
| 25                                                         | 5          | 54490                                                                                                                               | SM-C-5005954                        | SM-C-5005954-3                       | SPACER                                |                                  | 9, (.009/.011)   |
| 26                                                         | 5          | 54490                                                                                                                               | SM-C-5005954                        | SM-C-5005954-4                       | SPACER                                |                                  | 9, (.014/.016)   |
| 27                                                         | AR         | 54490                                                                                                                               | SM-A-5005960                        | SM-A-5005960                         | WIRE, INDIUM                          |                                  | (#.034)          |

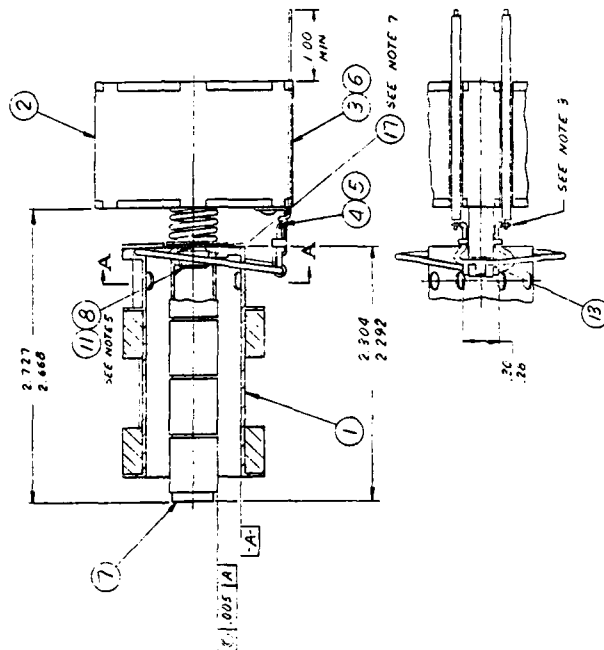
| PARTS LIST                                                 |            | U.S. ARMY ELECTRONICS RESEARCH AND DEVELOPMENT COMMAND<br>NIGHT VISION AND ELECTRO-OPTICS LABORATORY<br>FORT BELVOIR VIRGINIA 22060 |                                     | FSCM NO.<br>54490                   | PL SM5005843                                                                                 | REV LTR / DATE<br>B<br>3 SEPT 86                   |
|------------------------------------------------------------|------------|-------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|-------------------------------------|----------------------------------------------------------------------------------------------|----------------------------------------------------|
| LIST TITLE<br>0.25 WATT LINEAR RESONANT<br>COOLER ASSEMBLY |            |                                                                                                                                     | CONTRACT NO.<br>DAK20-84-<br>C-0440 | AUTHENTICATION<br><i>P. Jones</i>   | REV AUTH<br>24407-0178                                                                       | SHT 2 OF 2                                         |
| ITEM OR<br>FIND NO                                         | QTY<br>REQ | FSCM NO                                                                                                                             | DRAWING OR<br>SPECIFICATION NO.     | PART OR IDENTIFICATION<br>NUMBER    | NOMENCLATURE OR DESCRIPTION                                                                  | PL NOTES OR REMARKS                                |
| 28                                                         | 15"        | 54490                                                                                                                               | SM-C-5005982                        | SM-C-5005982                        | CABLE                                                                                        | 7                                                  |
| 29                                                         | 1          | 54490                                                                                                                               | SM-C-5005894                        | SM-C-5005894                        | TRANSFER TUBE                                                                                | 2                                                  |
| 30                                                         | 1          | 54490                                                                                                                               | SM-C-5005895                        | SM-C-5005895                        | NAMEPLATE                                                                                    | 13                                                 |
| 31                                                         | AR         | 54490                                                                                                                               | SM-A-5005896                        | SM-A-5005896                        | BRAZE FILLER METAL                                                                           | 2                                                  |
| 32                                                         | REF        | 54490                                                                                                                               | SM-A-5005911                        | SM-A-5005911                        | BRAZING SPECIFICATION (M10R0)                                                                |                                                    |
| 33                                                         | REF        | 54490                                                                                                                               | SM-A-5005912                        | SM-A-5005912                        | GENERAL CLEANING SPECIFICATIONS<br>FOR CRYOCOOLERS                                           | 1                                                  |
| 34                                                         | AR         | 81348                                                                                                                               | QQ-S-571                            | QQ-S-571<br>TYPE RMA                | SOLDER, TIN ALLOY; TIN-LEAD<br>ALLOY AND LEAD ALLOY                                          | 4, Sn60/Pb 40<br>ROSIN CORE<br>SOLDER<br>.031 DIA. |
| 35                                                         | AR         | 54490                                                                                                                               | SM-A-5005865                        | SM-A-5005865                        | EPOXY, STRUCTURAL                                                                            | 8                                                  |
| 36                                                         | REF        | 81349                                                                                                                               | MIL-W-8611                          | MIL-W-8611                          | WELDING, METAL ARC AND GAS,<br>STEELS AND CORROSION AND HEAT<br>RESISTANT ALLOYS PROCESS FOR | 6                                                  |
| 37                                                         | REF        | 96906                                                                                                                               | MIL-STD-454                         | MIL-STD-454<br>REQMT. 5             | STANDARD GEN. REQUIREMENTS<br>FOR ELECTRONIC EQUIPMENT                                       | 4                                                  |
| 38                                                         | REF        | 96906                                                                                                                               | MIL-STD-130                         | MIL-STD-130                         | IDENTIFICATION MARKING FOR<br>U.S. MILITARY PROPERTY                                         | 17                                                 |
| 39                                                         | 4          | 96906                                                                                                                               | MS16995-11                          | MS16995-11                          | SCREW SOCKET HEAD                                                                            | 11,<br>4-40 X 1/2 LG                               |
| 40                                                         | 4          | 80205                                                                                                                               | NAS-1352C04-10                      | NAS-1352C04-10                      | SCREW SOCKET HEAD                                                                            | 10,<br>4-40 X 5/8 LG                               |
| 41                                                         | AR         | 54490                                                                                                                               | SM-A-5005999                        | SM-A-5005999                        | ADHESIVE, EPOXY-STRUCTURAL                                                                   |                                                    |
| 42                                                         | 1          | 54490                                                                                                                               | SM-C-5006016                        | SM-C-5006016                        | SLEEVING, INSULATION                                                                         |                                                    |
| 43                                                         | 2          | 54490                                                                                                                               | SM-C-5005881                        | SM-C-5005881-3                      | INSULATOR                                                                                    |                                                    |
| 44                                                         | 1          | 54490                                                                                                                               | SM-C-5005899                        | SM-C-5005899                        | LEAD SHOT NO. 5                                                                              |                                                    |
| 45                                                         | 1          | 54490                                                                                                                               | SM-C-5005874                        | SM-C-5005874-1                      | SPACER                                                                                       | 18                                                 |
| 46                                                         | AR         | 81349                                                                                                                               | MIL-S-46163                         | MIL S 46163,<br>TYPE II,<br>GRADE M | ADHESIVE, SEALANT                                                                            | 19                                                 |

| NO. | DESCRIPTION            | DATE     | AMOUNT |
|-----|------------------------|----------|--------|
| 14  | A RELEASE REVISION     | 12/10/00 | 1.00   |
| 15  | A REVISED PER ECO 2000 | 12/10/00 | 1.00   |
| 16  | A REVISED PER ECO 2000 | 12/10/00 | 1.00   |
| 17  | A REVISED PER ECO 2000 | 12/10/00 | 1.00   |



Section A.A

M. 7. 28 6. 5. 20 40. 57 2. 5. 11. 19. 19  
M. 7. 28 6. 5. 20 40. 57 2. 5. 11. 19. 19  
M. 7. 28 6. 5. 20 40. 57 2. 5. 11. 19. 19



1. CLEAN AND MANIPULATE PARTS PER SNA 5005472
2. FEEDBACK LEADS FROM ITEM 1 INTO SLOTS ON BOTTOM OF ITEM 2 USING ITEM 5
3. SOLDER LEADS FROM ITEM 1 TO ITEM 3 AS SHOWN, INSULATE LEAD CONNECTIONS WITH ITEM 4. WORK-IN-SHIP SHALL BE IN ACCORDANCE WITH MIL-STD-454 REQ.5
4. IDENTIFY THIS PART (ENVELOPE, EAS OR TAG) WITH 504040-SM-D-5005847 PER MIL-STD-130
5. APPLY ITEM 11 TO ITEM 8 AND TORQUE TO 8.9 IN LBS.
- 6.
7. ADD ITEM 13 AS REQUIRED TO MEET 2.668 - 2.727 DIMENSION

**A-3**

# COIL VIBRATION

15. 11. 1955

54410 M-D 5005541

Oct 1950

APPENDIX B

TEST DATA

## APPENDIX B

### Tab No.

|    |                                             |
|----|---------------------------------------------|
| 1  | Acceptance/Performance Test                 |
| 2  | Acoustic Noise Test Data and Plots          |
| 3  | Baseline and Post Temperature Shock         |
| 4  | Low Temperature and Post Low Temperatures   |
| 5  | High Temperature and Post High Temperatures |
| 6  | Post Mechanical Shock                       |
| 7  | Post Vibration                              |
| 8  | EMI                                         |
| 9  | Reliability (SN 011)                        |
| 10 | Reliability (SN 015)                        |
| 11 | Reliability (SN 016)                        |



Sheet 1 of 2

Contract No. DAAK20-84-C-0440

PERFORMANCE TEST

Project No. 24407

DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC  
DRAWING NO. SM-D-5005842

SERIAL NO. 010

| TEST<br>PLAN PARA | PARAMETER                                                     | MEASURED             | UNITS      | LIMITS |                      |
|-------------------|---------------------------------------------------------------|----------------------|------------|--------|----------------------|
|                   |                                                               |                      |            | MIN    | MAX                  |
| 3.10              | Calibration Check                                             | COMPLY               | -          | Comply |                      |
| 4.1.1             | Inspection to SM-D-5005842                                    | COMPLY               | -          | Comply |                      |
| 4.1.2             | Weight                                                        | 2.3                  | Lbs        | -      | 2.5                  |
| 4.1.3.1           | Pressurization                                                | 330                  | PSIG       | Info   | Only                 |
| 4.1.3.2           | Leakage Rate                                                  | $1.2 \times 10^{-7}$ | STP CC/SEC | -      | $2.7 \times 10^{-7}$ |
| 4.2.2             | Test at 23°C Horiz; Turn-on Current                           | N/A                  | Amps       | Info   |                      |
| 4.2.2             | Cooldown Time to 100°K                                        | 4.5                  | Minutes    | -      | 7.5                  |
| 4.2.2             | Cooldown Time to 80°K                                         | 5.3                  | Minutes    | -      | 10                   |
| 4.2.2             | Minimum Temp                                                  | 39.5                 | °K         | Info   | 80                   |
| 4.2.2.1           | Stabl. Temp. with 0.35 Watt Heat Load                         | 65.0                 | °K         | -      | 80                   |
| 4.2.2.2           | Temp. after 1/2 Hour Operation                                | 65.8                 | °K         | -      | 80                   |
| 4.2.2.3           | Cold Finger warm end temp                                     | 41.0                 | °C         | Info   | Only                 |
| 4.2.2.4           | Input Volt 17 VDC Current <u>1.42</u> ADC<br>Power            | 24.14                | Watts      | -      | 30                   |
| 4.2.2.5           | Stabl. Temp with 0.35 Watt Heat Load                          | 65.9                 | °K         | -      | 80                   |
| 4.2.2.5           | Cold Finger Warm End Temp                                     | 41.0                 | °C         | Info   | Only                 |
| 4.2.2.5           | Input Volts 32 VDC Current <u>.84</u> ADC<br>Power            | 26.88                | Watts      | -      | 30                   |
| 4.2.3             | Test at -40°C Horiz; Turn-on Current                          | N/A                  | Amps       | Info   |                      |
| 4.2.3.1           | Cooldown Time to 100°K                                        | 5.9                  | Minutes    | -      | 7.5                  |
| 4.2.3.1           | Cooldown Time to 80°K                                         | 7.6                  | Minutes    | -      | 10                   |
| 4.2.3.2           | Stabl. Temp with 0.2 Watt Heat Load                           | 45.4                 | °K         | -      | 80                   |
| 4.2.3.2           | Temp after 1/2 Hour                                           | 44.9                 | °K         | -      | 80                   |
| 4.2.3.3           | Cold Finger Warm End Temp                                     | -28                  | °C         | Info   | Only                 |
| 4.2.3.4           | Input Volts 17 VDC Current <u>1.34</u> ADC<br>Stablized Power | 22.78                | Watts      | -      | 30                   |
| 4.2.3.5           | Temp with 0.2 Watt Head Load                                  | 45.1                 | °K         | -      | 80                   |
| 4.2.3.5           | Cold Finger Warm End Temp                                     | -27                  | °C         | Info   | Only                 |
| 4.2.3.5           | Input Volts 32 VDC Current <u>.80</u> ADC<br>Power            | 25.6                 | Watts      | -      | 30                   |
| 4.2.4             | Test at 71°C Horiz; Turn-on Current                           | N/A                  | Amps       | Info   |                      |
| 4.2.4.1           | Cooldown Time to 100°K                                        | 5.7                  | Minutes    | -      | 7.5                  |
| 4.2.4.1           | Cooldown Time to 80°K                                         | 6.8                  | Minutes    | -      | 10                   |
| 4.2.4.1           | Stabl. Temp. with 0.2 Watt Heat Load                          | 65.1                 | °K         | -      | 80                   |
| 4.2.4.1           | Temp after 1/2 hour                                           | 66.3                 | °K         | -      | 80                   |
| 4.2.4.2           | Cold Finger Warm End Temp                                     | 87                   | °C         | Info   | Only                 |
| 4.2.4.3           | Input Volts 17 VDC Current <u>1.66</u> ADC<br>Power           | 28.22                | Watts      | -      | 35                   |
| 4.2.4.4           | Stabl. Temp with 0.2 Watt Head Load                           | 65.6                 | °K         | -      | 80                   |
| 4.2.4.4           | Cold Finger Warm End Temp                                     | 87                   | °C         | Info   | Only                 |
| 4.2.4.4           | Input Volts 32 VDC Current ADC <u>.96</u><br>Power            | 30.72                | Watts      | -      | 35                   |

Performed By: P. HARTMANN

B-2

Date: 10-29-86

Witnessed By: [Signature]

31 OCT 1986

A. Magnavox

Witnessed By: [Signature]

O. A. Customer



Contract: DAAK20-84-C-0440

PERFORMANCE TEST

Project: 24407

DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC

SERIAL NO. 010

DRAWING NO. SM-D-5005842

| TEST PLAN PARA | PARAMETER                                        | MEASURED             | UNITS      | LIMITS |                      |
|----------------|--------------------------------------------------|----------------------|------------|--------|----------------------|
|                |                                                  |                      |            | MIN    | MAX                  |
| 4.2.5          | Test at 23°C Vertical; Turn-on Current           | N/A                  | Amps       | Info   |                      |
| 4.2.5.1        | Cooldown Time to 100°K                           | 4.7                  | Minutes    | -      | 7.5                  |
| 4.2.5.1        | Cooldown Time to 80°K                            | 5.4                  | Minutes    | -      | 10                   |
| 4.2.5.1        | Minimum Temp                                     | 38.9                 | °K         |        | 80                   |
| 4.2.5.2        | Stabl. Temp with 0.35 Watt Heat Load             | 66.1                 | °K         | -      | 80                   |
| 4.2.5.3        | Temp After 1/2 Hour With Heat Load               | 66.9                 | °K         | Info   | 80                   |
| 4.2.5.4        | Cold Finger Warm End Temp                        | 34                   | °C         | Info   | Only                 |
| 4.2.5.5        | Input Volts 17 VDC Current <u>1.37</u> ADC Power | 23.29                | Watts      | -      | 30                   |
| 4.2.5.6        | Stabl. Temp. with 0.35 Watt Heat Load            | 65.5                 | °K         |        | 80                   |
| 4.2.5.6        | Cold Finger Warm End Temp                        | 36                   | °C         | Info   | Only                 |
| 4.2.5.6        | Input Volt 32 VDC Current <u>.82</u> ADC Power   | 26.24                | Watts      | -      | 30                   |
| 4.2.6          | Leakage Rate                                     | 2.8x10 <sup>-7</sup> | STP CC/SEC | -      | 2.7x10 <sup>-7</sup> |

PERFORMED BY P. HARTMANN

DATE 10-31-86

WITNESSED BY [Signature] Q.A. MAGNAVOX

WITNESSED BY [Signature] Q.A. CUSTOMER

31 OCT 1986



**Magnavox**ELECTRO-OPTICAL SYSTEMS  
P.O. BOX 640, 45 INDUSTRIAL AVENUE, JERSEY, N.J. 07430-0640  
TEL: 201-529-1700 FAX: 201-529-1672PERFORMANCE TESTVIBRATION OUTPUT TEST DATA1/4 WATT LINEAR RESONANT CRYOGENIC COOLERMM & T PROGRAMDRAWING NO.: SM-D-5005842SERIAL NO.: 010CONTRACT : DAAK20-84-C-0440PROJECT : 24407

| Test Plan Para | Frequency             | Maximum Force Along Compressor Axis, $\pm$ lbs | Measure Force Along Compressor Axis, lbs. | Maximum Force In Any Compressor Radial Axis, $\pm$ lbs | Measured Force In Any compressor Radial Axis, lbs. 90° |      |
|----------------|-----------------------|------------------------------------------------|-------------------------------------------|--------------------------------------------------------|--------------------------------------------------------|------|
| 4.3.9          | Fundamental (54 Hz)   | 1.0                                            | .528                                      | 1.5                                                    | .736                                                   | 1.0  |
|                | 1st Harmonic (108 Hz) | 2.5                                            | .249                                      | 0.22                                                   | .024                                                   | .22  |
|                | 2nd Harmonic (162 Hz) | 1.4                                            | .776                                      | 0.13                                                   | .012                                                   | .060 |
|                | 3rd Harmonic (216 Hz) | 0.30                                           | .288                                      | 0.13                                                   | .008                                                   | .12  |
|                | Next 37 Harmonics     | 0.10                                           | <.1                                       | 0.10                                                   | <.1                                                    | <.1  |
|                |                       |                                                |                                           |                                                        |                                                        |      |

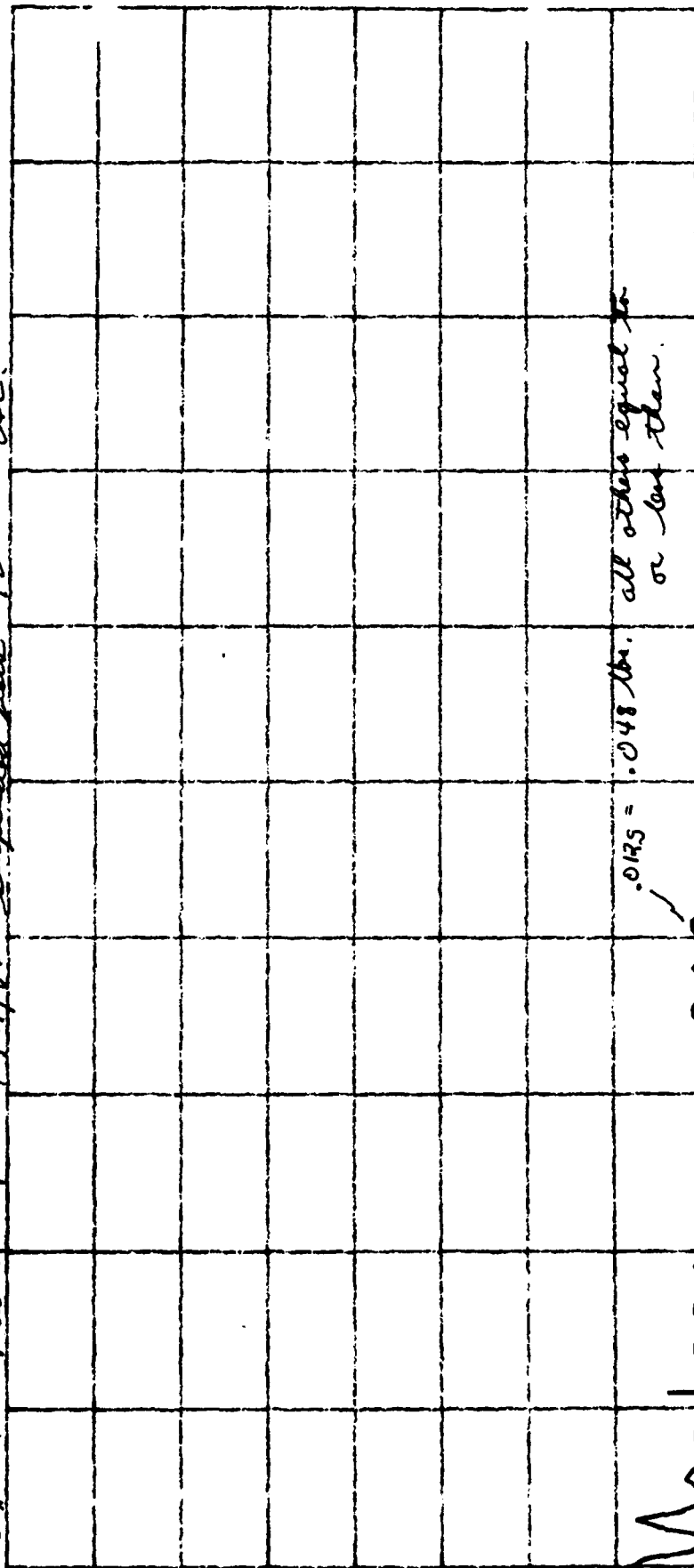
PERFORMED BY: A. CaniparoDATE: 10/27/86WITNESSED BY: P. B. Dear-ase

3710A CUSTOMER Q.A. 29 OCT 1986



MAGNAVOX Q.A.

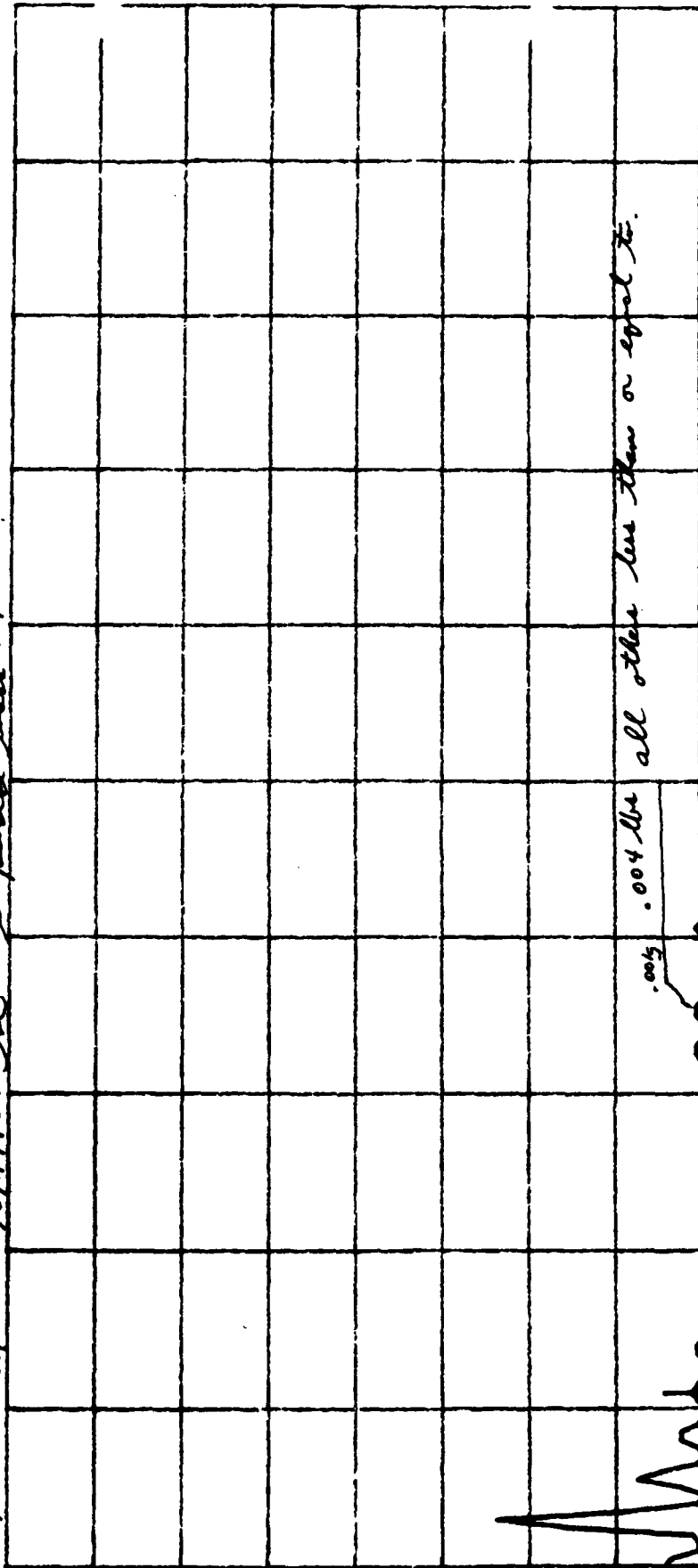
SW 010 Radial 90° 10/29/86 suspended = 4.4 lbs. *See*



864 Hz.

PWR SPECT A : 9.00E-03R      270. HZ      N: NONE P: 10HZ  
 SPAN: 50.00HZ -2.0500KHZ SN: 1.0+01V      FS: 2.0+00R      2.5-01R/

SPW 010 April 10/79/80 *de suspended mass = 4 lbs.*



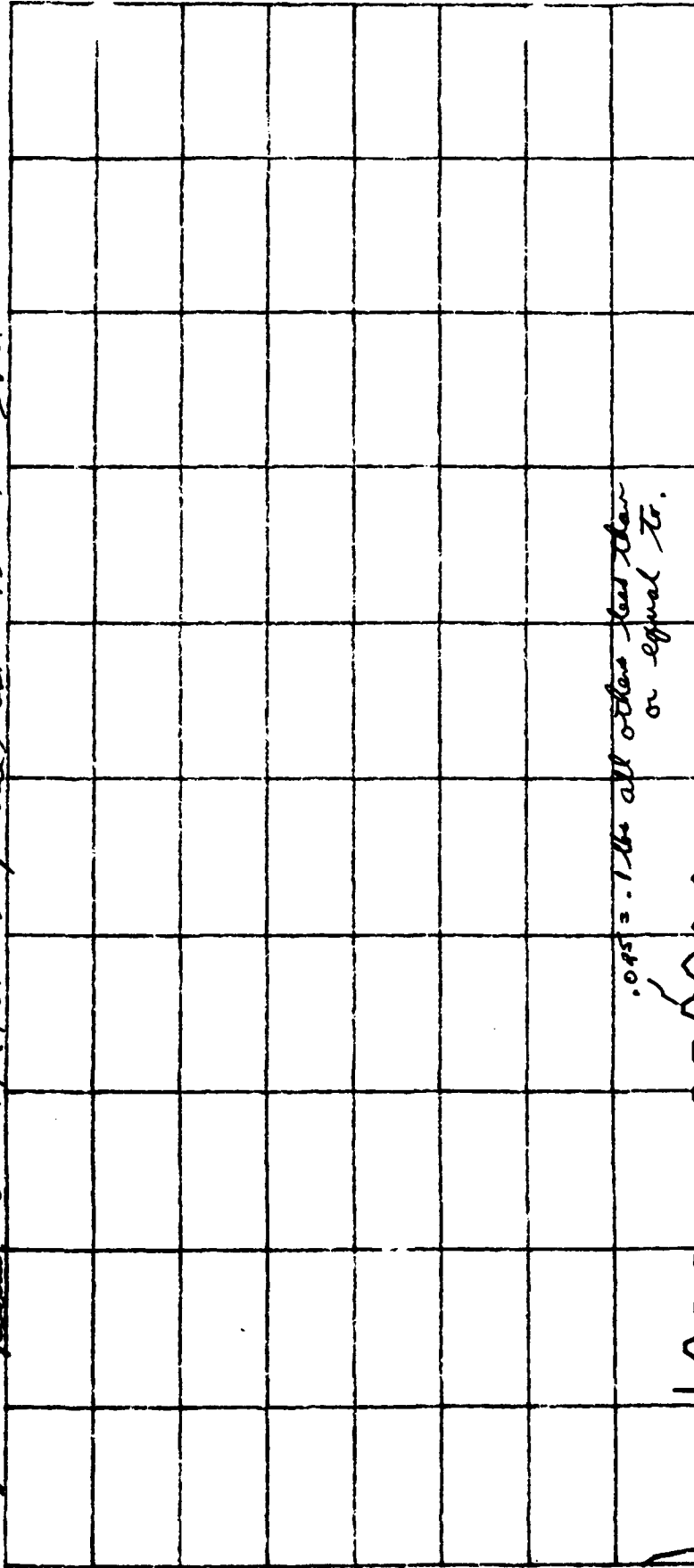
.004 lbs

.005

756 Hz.

PWR SPECT A 3.06E-02R 270. HZ N: NONE P: 10HZ  
SPAN: 50.00HZ -2.0500KHZ SN: 1.0+01V FS: 2.0+00R 2.5-01R/

SPW 010 Radial 0° 10/29/86 suspended mass = 4 lbs. *sk.*



PWR SPECT A : 4.85E-03R 270. HZ N: NONE F: 10HZ  
SPAN: 50.00HZ -2.0500KHZ SN: 1.0+01V FS: 2.0+00R 2.5-01R/

## PERFORMANCE TEST

## DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC  
DRAWING NO. SM-D-5005863/SM-D-5005842

SERIAL NO. 011

| TEST<br>PLAN PARA | PARAMETER                                                     | MEASURED             | UNITS      | LIMITS |                        |
|-------------------|---------------------------------------------------------------|----------------------|------------|--------|------------------------|
|                   |                                                               |                      |            | MIN    | MAX                    |
| 3.10              | Calibration Check                                             | <del>Compass</del>   | -          | Comply |                        |
| 4.1.1             | Inspection to SM-D-5005863/5005842                            | <del>Compass</del>   | -          | Comply |                        |
| 4.1.2             | Weight                                                        | 2.35                 | Lbs        | -      | 2.5                    |
| 4.1.3.1           | Pressurization                                                | 380                  | PSIG       | Info   | Only                   |
| 4.1.3.2           | Leakage Rate                                                  | 4 x 10 <sup>-9</sup> | STP CC/SEC | -      | 2.7 x 10 <sup>-7</sup> |
| 4.2.2             | Test at 23°C Horiz; Turn-on Current                           | 1.5 to 1.05          | Amps       | Info   |                        |
| 4.2.2             | Cooldown Time to 100°K                                        | 5.1                  | Minutes    | -      | 7.5                    |
| 4.2.2             | Cooldown Time to 80°K                                         | 5.9                  | Minutes    | -      | 10                     |
| 4.2.2             | Minimum Temp                                                  | 50.7                 | °K         | Info   | 80                     |
| 4.2.2.1           | Stabl. Temp. with 0.35 Watt Heat Load                         | 69.1                 | °K         | -      | 80                     |
| 4.2.2.2           | Temp. after 1/2 Hour Operation                                | 69.3                 | °K         | -      | 80                     |
| 4.2.2.3           | Cold Finger warm end temp                                     | 31                   | °C         | Info   | Only                   |
| 4.2.2.4           | Input Volt 17 VDC Current 1.35 ADC<br>F.B. OK Power 22.95     | 22.9                 | Watts      | -      | 30                     |
| 4.2.2.5           | Stabl. Temp with 0.35 Watt Heat Load                          | 70.3                 | °K         | -      | 80                     |
| 4.2.2.5           | Cold Finger Warm End Temp                                     | 31                   | °C         | Info   | Only                   |
| 4.2.2.5           | Input Volts 32 VDC Current .74 ADC<br>Power 23.68             | 23.7                 | Watts      | -      | 30                     |
| 4.2.3             | Test at -40°C Horiz; Turn-on Current                          | 1.2                  | Amps       | Info   |                        |
| 4.2.3.1           | Cooldown Time to 100°K                                        | 6.1                  | Minutes    | -      | 7.5                    |
| 4.2.3.1           | Cooldown Time to 80°K                                         | 6.7                  | Minutes    | -      | 10                     |
| 4.2.3.2           | Stabl. Temp with 0.2 Watt Heat Load                           | 59.2                 | °K         | -      | 80                     |
| 4.2.3.2           | Temp after 1/2 Hour                                           | 53.6                 | °K         | -      | 80                     |
| 4.2.3.3           | Cold Finger Warm End Temp                                     | -32                  | °C         | Info   | Only                   |
| 4.2.3.4           | Input Volts 17 VDC Current 1.1 ADC<br>Stablized Power 18.7    | 18.7                 | Watts      | -      | 30                     |
| 4.2.3.5           | Temp with 0.2 Watt Head Load                                  | 63.1                 | °K         | -      | 80                     |
| 4.2.3.5           | Cold Finger Warm End Temp                                     | -33                  | °C         | Info   | Only                   |
| 4.2.3.5           | Input Volts 32 VDC Current .63 ADC<br>F.B. - O.K. Power 20.16 | 20.16                | Watts      | -      | 30                     |
| 4.2.4             | Test at 71°C Horiz; Turn-on Current                           | 1.25                 | Amps       | Info   |                        |
| 4.2.4.1           | Cooldown Time to 100°K                                        | 5.8                  | Minutes    | -      | 7.5                    |
| 4.2.4.1           | Cooldown Time to 80°K                                         | 6.7                  | Minutes    | -      | 10                     |
| 4.2.4.1           | Stabl. Temp. with 0.2 Watt Heat Load                          | 68.3                 | °K         | -      | 80                     |
| 4.2.4.1           | Temp after 1/2 hour                                           | 67.6                 | °K         | -      | 80                     |
| 4.2.4.2           | Cold Finger Warm End Temp                                     | 79                   | °C         | Info   | Only                   |
| 4.2.4.3           | Input Volts 17 VDC Current 1.6 ADC<br>Power 27.2              | 27.2                 | Watts      | -      | 35                     |
| 4.2.4.4           | Stabl. Temp with 0.2 Watt Head Load                           | 69.4                 | °K         | -      | 80                     |
| 4.2.4.4           | Cold Finger Warm End Temp                                     | 72                   | °C         | Info   | Only                   |
| 4.2.4.4           | Input Volts 32 VDC Current ADC .88<br>F.B. - O.K. Power 28.2  | 28.2                 | Watts      | -      | 35                     |

*Signature*  
7/28/82

## PERFORMANCE TEST

## DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC  
DRAWING NO. SM-D-5005863/SM-D-5005842

SERIAL NO. 11

| TEST<br>PLAN PARA | PARAMETER                                             | MEASURED             | UNITS      | LIMITS |                      |
|-------------------|-------------------------------------------------------|----------------------|------------|--------|----------------------|
|                   |                                                       |                      |            | MIN    | MAX                  |
| 4.2.5             | Test at 23°C Vertical; Turn-on Current                | 1.05                 | Amps       | Info   |                      |
| 4.2.5.1           | Cooldown Time to 100°K                                | 5.0                  | Minutes    | -      | 7.5                  |
| 4.2.5.1           | Cooldown Time to 80°K                                 | 5.7                  | Minutes    | -      | 10                   |
| 4.2.5.1           | Minimum Temp                                          | 30.4                 | °K         |        | 80                   |
| 4.2.5.2           | Stabl. Temp with 0.35 Watt Heat Load                  | 65.6                 | °K         | -      | 80                   |
| 4.2.5.3           | Temp After 1/2 Hour With Heat Load                    | 68.1                 | °K         | Info   | 80                   |
| 4.2.5.4           | Cold Finger Warm End Temp                             | 31                   | °C         | Info   | Only                 |
| 4.2.5.5           | Input Volts 17 VDC Current 1.35 ADC<br>Power          | 23.0                 | Watts      | -      | 30                   |
| 4.2.5.6           | Stabl. Temp. with 0.35 Watt Heat Load                 | 72.0                 | °K         |        | 80                   |
| 4.2.5.6           | Cold Finger Warm End Temp                             | 31                   | °C         | Info   | Only                 |
| 4.2.5.6           | Input Volt 32 VDC Current .75 ADC<br>6.8 - O.K. Power | 24.0                 | Watts      | -      | 30                   |
| 4.2.6             | Leakage Rate                                          | 1.8x10 <sup>-9</sup> | STP CC/SEC | -      | 2.7x10 <sup>-7</sup> |

PERFORMED BY S. CooperDATE 28 JULY 86 29 JUL 86WITNESSED BY [Signature]

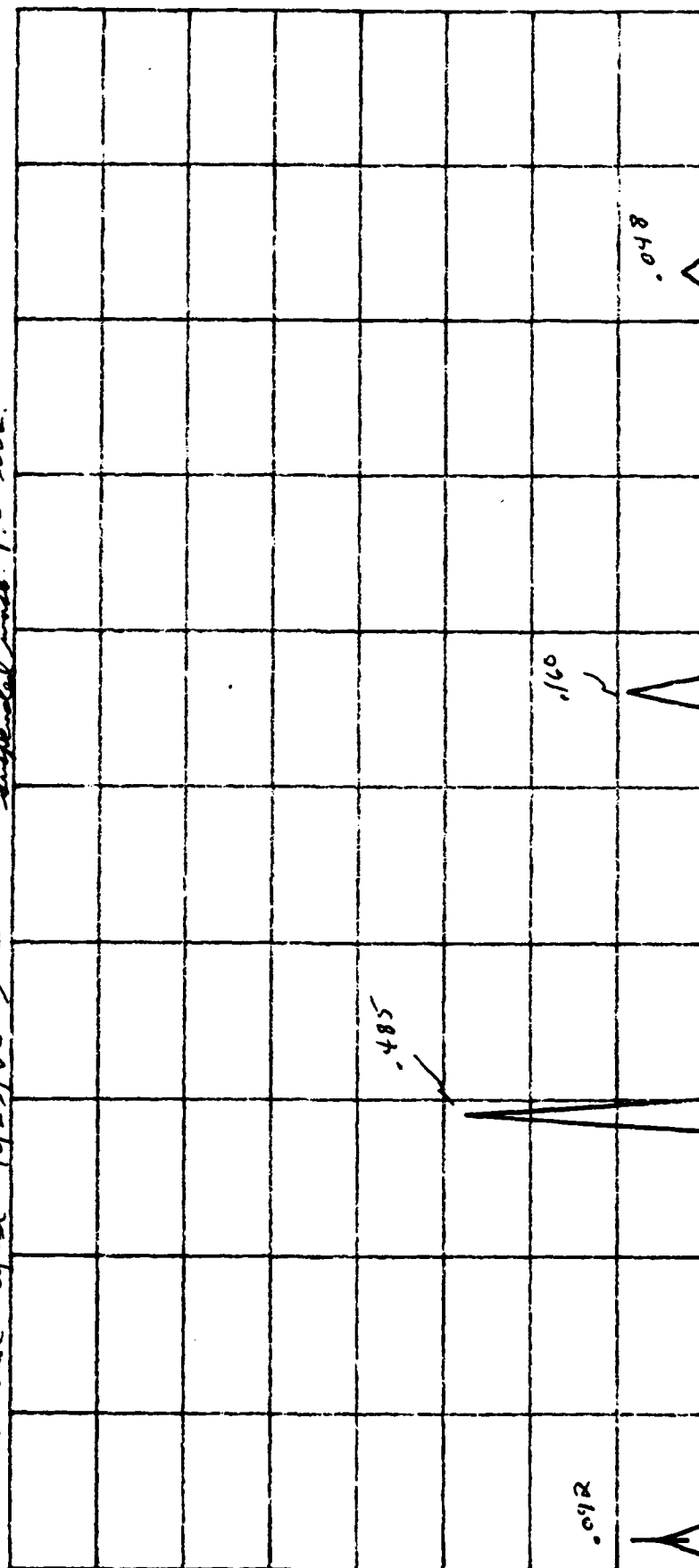
Q.A. MAGNAVOX

TIME: 1:00 P.M. 8204

WITNESSED BY \_\_\_\_\_

Q.A. CUSTOMER

SN 011 welded April 10/23/82 to suspended mass 4.0 lbs.



PWR SPECT A : 9.18E-02R 54. HZ N: NONE F: 1HZ  
 SPAN: 50.00HZ -250.00HZ SN: 7.1+00V FS: 1.4+00R 1.8-01R/



**PERFORMANCE TEST**  
**VIBRATION OUTPUT TEST DATA**  
**1/4 WATT LINEAR RESONANT CRYOGENIC COOLER**  
**MM & T PROGRAM**

DRAWING NO.: GM-D-5885843

SERIAL NO.: 011

| Test Plan Para | Frequency             | Maximum Force Along Compressor Axis, $\pm$ lbs | Measure Force Along Compressor Axis, lbs. | Maximum Force In Any Compressor Radial Axis, $\pm$ lbs | Measured Force In Any compressor Radial Axis, lbs. 0° 90° |       |
|----------------|-----------------------|------------------------------------------------|-------------------------------------------|--------------------------------------------------------|-----------------------------------------------------------|-------|
| 4.3.9          | Fundamental (54 Hz)   | 1.0                                            | 0.53                                      | 1.5                                                    | 0.87                                                      | 0.80  |
|                | 1st Harmonic (108 Hz) | 2.5                                            | 1.55                                      | 0.22                                                   | 0.08                                                      | 0.08  |
|                | 2nd Harmonic (162 Hz) | 1.4                                            | 0.54                                      | 0.13                                                   | 0.07                                                      | 0.02  |
|                | 3rd Harmonic (216 Hz) | 0.30                                           | 0.13                                      | 0.13                                                   | 0.05                                                      | 0.03  |
|                | Next 37 Harmonics     | 0.10                                           | SEE GRAPH                                 | 0.10                                                   | SEE                                                       | GRAPH |
|                |                       |                                                |                                           |                                                        |                                                           |       |

PERFORMED BY: S. Casipio

DATE: 9/8/86

WITNESSED BY:  M

CUSTOMER Q.A.

MAGNAVOX Q.A.

PERFORMANCE TEST  
VIBRATION OUTPUT TEST DATA  
1/2 WATT LINEAR RESONANT CRYOGENIC COOLER  
MM&T PROGRAM

Test Plan Paragraph: 4.3.9

Cooler S/N: 011

Total Suspended Weight 4-2

Date: 9/8/86

| S/N | Freq. | Force Along Compressor Axis |       | Force Along Radial Axis  |                |      |                |  |
|-----|-------|-----------------------------|-------|--------------------------|----------------|------|----------------|--|
|     |       | g's                         | lbs   | g's                      | Axis #1<br>lbs | g's  | Axis #2<br>lbs |  |
| 1   | 54    | .125                        | 0.53  | 0.206<br><del>.006</del> | 0.87           | .199 | 0.80           |  |
| 2   | 108   | .369                        | 1.55  | .019<br><del>.007</del>  | 0.08           | .020 | 0.08           |  |
| 3   | 162   | .129                        | 0.54  | .016<br><del>.007</del>  | 0.07           | .004 | 0.02           |  |
| 4   | 216   | .030                        | 0.13  | .011<br><del>.005</del>  | 0.05           | .008 | 0.03           |  |
| 5   | 270   | .009                        | 0.04  | .008                     | 0.03           | .009 | 0.04           |  |
| 6   | 324   | .005                        | 0.02  | .015                     | 0.06           | .003 | 0.01           |  |
| 7   | 378   | .008                        | 0.03  | .006                     | 0.03           | .012 | 0.05           |  |
| 8   | 432   | .004                        | 0.02  | .011                     | 0.05           | .005 | 0.02           |  |
| 9   | 486   | .002                        | 0.01  | .005                     | 0.02           | .010 | 0.04           |  |
| 10  | 540   | .002                        | 0.01  | .002                     | 0.01           | .007 | 0.03           |  |
| 11  | 594   | .002                        | 0.01  | .008                     | 0.03           | .003 | 0.01           |  |
| 12  | 648   | .003                        | 0.01  | .002                     | 0.01           | .007 | 0.03           |  |
| 13  | 702   | .002                        | 0.01  | .006                     | 0.03           | .008 | 0.03           |  |
| 14  | 756   | .001                        | 0.004 | .002                     | 0.01           | .003 | 0.01           |  |
| 15  | 810   | .002                        | 0.01  | .003                     | 0.01           | .006 | 0.03           |  |

Con't Page 2

\* Axis 1 = along transfer tube  
 Axis 2 = perpendicular to axis 1

Performed by: S. Canizar

Date: 9/8/86

Witnessed By: \_\_\_\_\_

B-12

Customer QA  
 Machinery QA

PERFORMANCE TEST  
VIBRATION OUTPUT TEST DATA  
1/2 WATT LINEAR RESONANT CRYOGENIC COOLER  
MM&T PROGRAM

Test Plan Paragraph: 4.3.9

Cooler S/N: 011

Total Suspended Weight 4.2 lbs

Date: 9-8-84

| S/N | Freq. | Force Along Compressor Axis |       | Force Along Radial Axis |                |       |                |  |
|-----|-------|-----------------------------|-------|-------------------------|----------------|-------|----------------|--|
|     |       | g's                         | lbs   | g's                     | Axis #1<br>lbs | g's   | Axis #2<br>lbs |  |
| 16  | 864   | .002                        | 0.01  | .003                    | 0.01           | .007  | 0.030          |  |
| 17  | 918   | .003                        | 0.01  | .001                    | 0.004          | .0005 | 0.002          |  |
| 18  | 972   | .001                        | 0.004 | .002                    | 0.010          | .004  | 0.017          |  |
| 19  | 1026  | .0005                       | 0.002 | .001                    | 0.004          | .002  | 0.01           |  |
| 20  | 1080  | .001                        | 0.004 | .006                    | 0.030          | .001  | 0.004          |  |
| 21  | 1134  | .001                        | 0.004 | .001                    | 0.004          | .001  | 0.004          |  |
| 22  | 1188  | .001                        | 0.004 | .002                    | 0.010          | .001  | 0.004          |  |
| 23  | 1242  | .001                        | 0.004 | .005                    | 0.020          | .002  | 0.01           |  |
| 24  | 1296  | .002                        | 0.01  | .003                    | 0.010          | .001  | 0.004          |  |
| 25  | 1350  | .0005                       | 0.002 | .0007                   | 0.003          | .002  | 0.01           |  |
| 26  | 1404  | .001                        | 0.004 | .001                    | 0.004          | .002  | 0.01           |  |
| 27  | 1458  | .001                        | 0.004 | .0005                   | 0.002          | .001  | 0.004          |  |

Con't Page 3

\*Axis 1 = along transfer tube  
 Axis 2 = perpendicular to axis 1

Performed By: A. Casper

Date: \_\_\_\_\_

Witnessed By: \_\_\_\_\_

Customer QA

Magnavox QA

PERFORMANCE TEST  
VIBRATION OUTPUT TEST DATA  
1/4 WATT LINEAR RESONANT CRYOGENIC COOLER  
MM&T PROGRAM

Test Plan Paragraph: 4.3.9

Cooler S/N: 011

Total Suspended Weight 4.2 lbs

Date: 9-8-86

| S/N | Freq. | Force Along Compressor Axis |       | Force Along Radial Axis |       |         |       |
|-----|-------|-----------------------------|-------|-------------------------|-------|---------|-------|
|     |       | g's                         | lbs   | Axis #1                 |       | Axis #2 |       |
|     |       |                             |       | g's                     | lbs   | g's     | lbs   |
| 28  | 1512  | .001                        | 0.004 | .0006                   | 0.003 | .002    | 0.010 |
| 29  | 1566  | .001                        | 0.004 | .0006                   | 0.003 | .004    | 0.020 |
| 30  | 1620  | .0005                       | 0.002 | .001                    | 0.004 | .003    | 0.010 |
| 31  | 1674  | .001                        | 0.004 | .0005                   | 0.002 | .001    | 0.004 |
| 32  | 1728  | .001                        | 0.004 | .001                    | 0.004 | .001    | 0.004 |
| 33  | 1782  | .0005                       | 0.002 | .002                    | 0.010 | .001    | 0.004 |
| 34  | 1836  | .0005                       | 0.002 | .002                    | 0.010 | .001    | 0.004 |
| 35  | 1890  | .001                        | 0.004 | .001                    | 0.004 | .001    | 0.004 |
| 36  | 1944  | .001                        | 0.004 | .0005                   | 0.002 | .002    | 0.010 |
| 37  | 1998  | .001                        | 0.004 | .001                    | 0.004 | .0005   | 0.002 |
| 38  | 2052  | .0007                       | 0.003 | .0005                   | 0.002 | .0005   | 0.002 |
| 39  | 2106  | .001                        | 0.004 | .001                    | 0.004 | .001    | 0.004 |
| 40  | 2160  | .0005                       | 0.002 | .0008                   | 0.003 | .001    | 0.004 |
| 41  | 2214  | .002                        | 0.010 | .0005                   | 0.002 | .0005   | 0.002 |

\*Axis 1 = along transfer tube  
 Axis 2 = perpendicular to axis 1

Performed By: S. Campbell

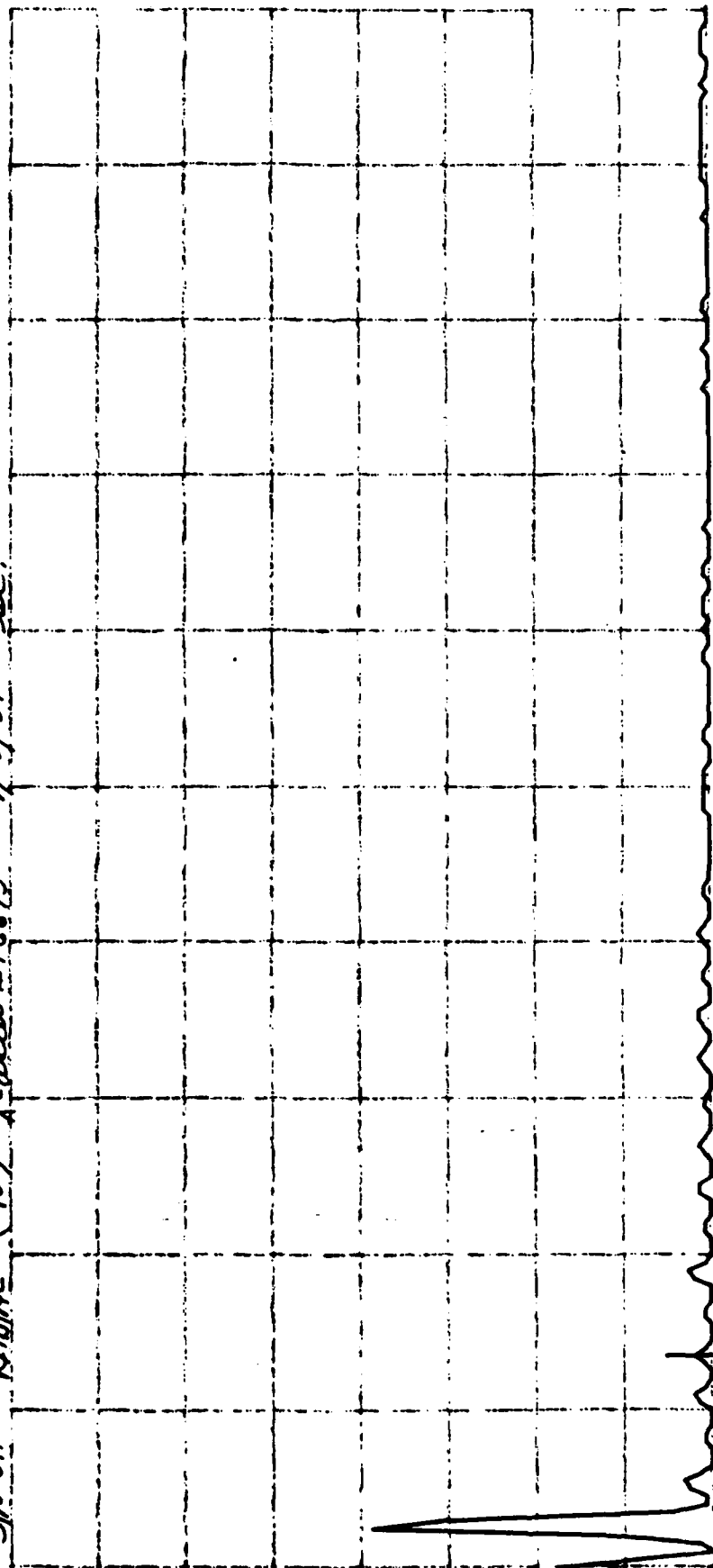
Date: \_\_\_\_\_

Witnessed By: \_\_\_\_\_

Customer QA

Magnavox QA

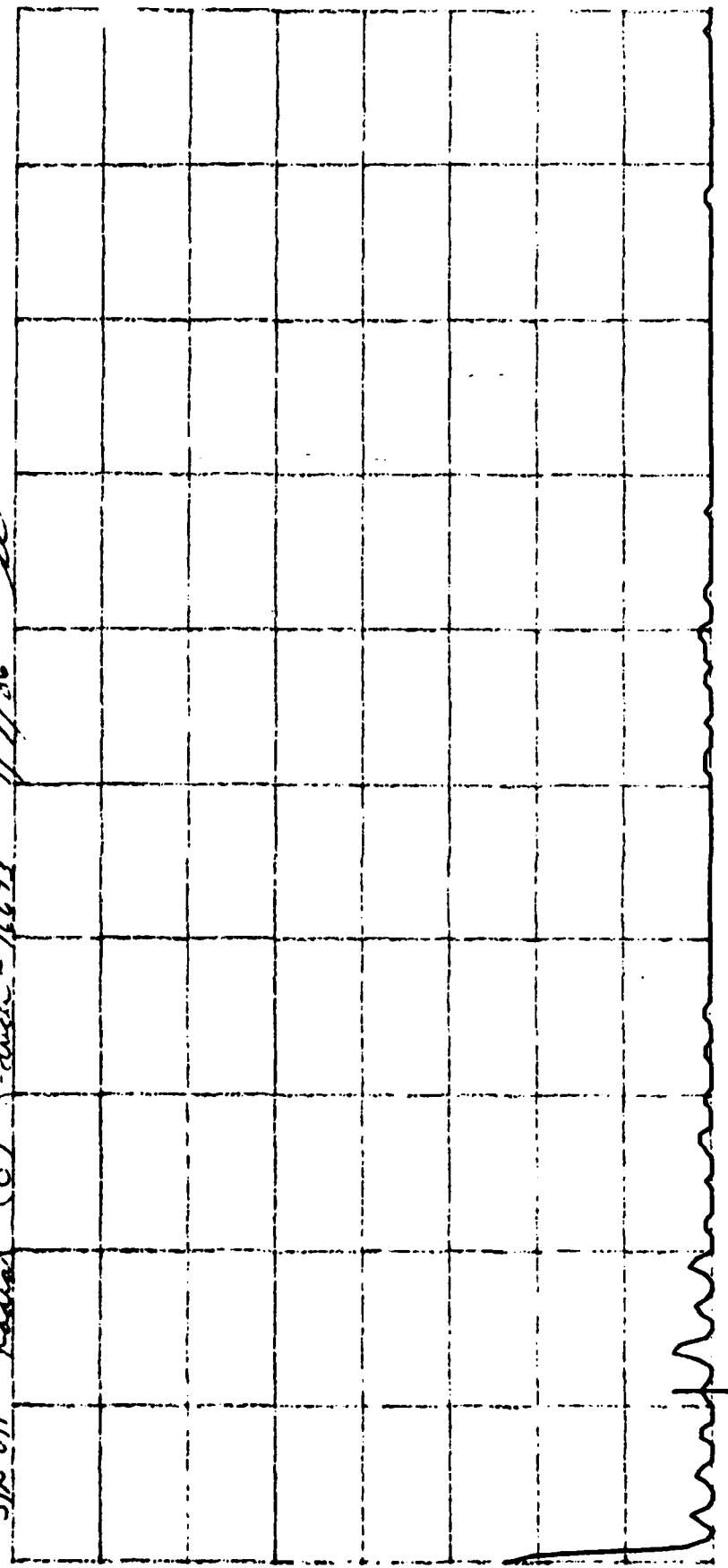
51011 RADIAL (90°) X-draw #16673 9/8/84 *de.*



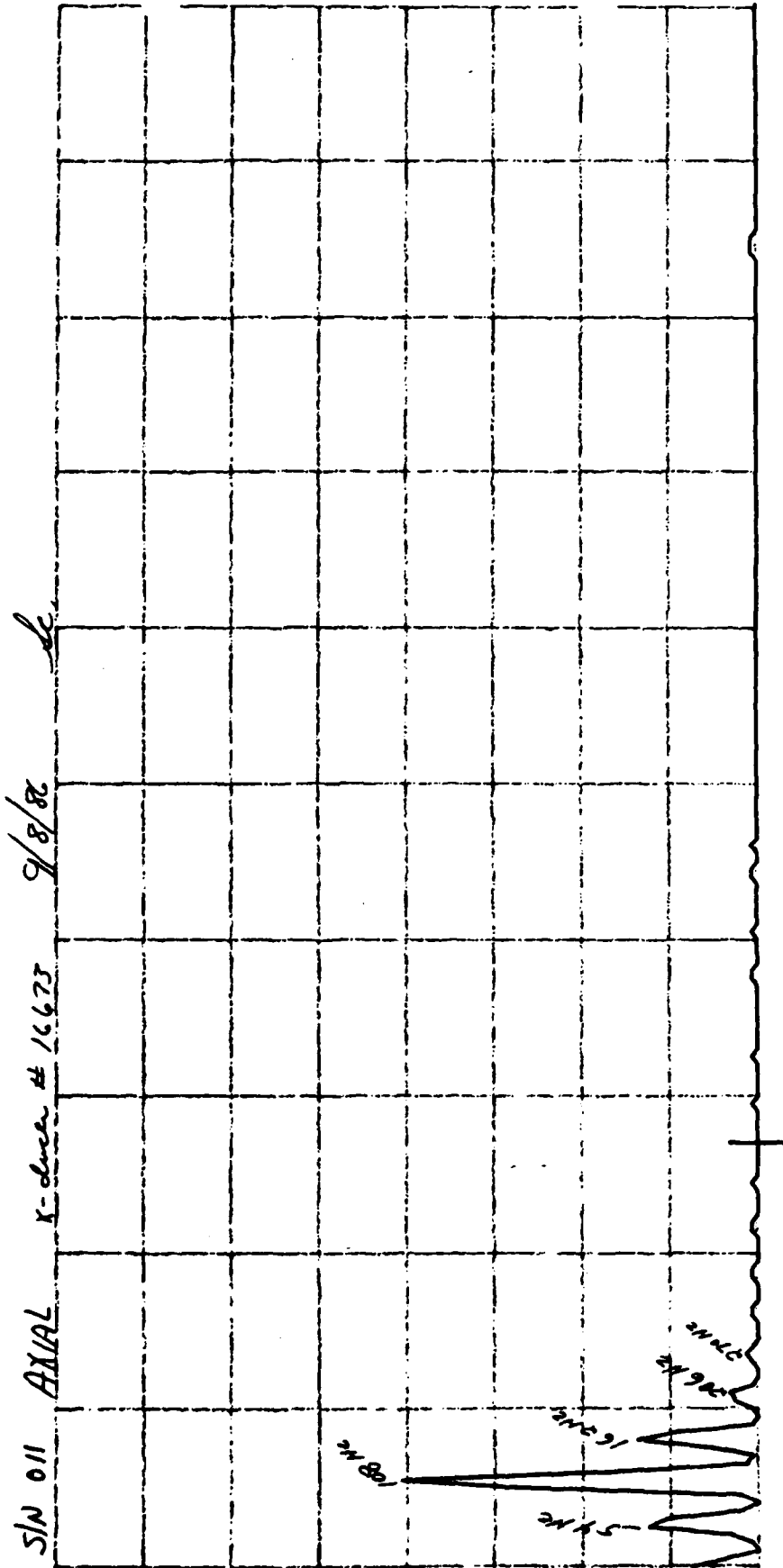
B-15

PWR SPECT B : 9.12E-03R 270. HZ N: NONE F: 10HZ  
SPAN: 0.000HZ -2.0000KHZ SN: 4.5+00V FS: 4.5-01R 5.6-02R/

5/20/11 Radial (0°) -dusca #14672 9/9/88



PWR SPECT B : 9.98E-03R 270. HZ N: NONE P: 10HZ  
SPAN: 50.00HZ -2.0500KHZ SN: 3.2+00V FS: 6.3-01R 7.9-02R/



PWR SPECT B : 8.32E-04R 540. HZ N: NONE P: 10HZ  
 SPAN: 0.000HZ -2.0000KHZ SN: 3.5+00V FS: 7.1-01R 8.9-02R/

## PERFORMANCE TEST

## DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC  
DRAWING NO. SM-D-5005863/SM-D-5005842

SERIAL NO. 013

| TEST<br>PLAN PARA | PARAMETER                                                    | MEASURED | UNITS      | LIMITS |                      |
|-------------------|--------------------------------------------------------------|----------|------------|--------|----------------------|
|                   |                                                              |          |            | MIN    | MAX                  |
| 3.10              | Calibration Check                                            | Complies | -          | Comply |                      |
| 4.1.1             | Inspection to SM-D-5005863/5005842                           | Complies | -          | Comply |                      |
| 4.1.2             | Weight                                                       | 2.34     | Lbs        | -      | 2.5                  |
| 4.1.3.1           | Pressurization                                               | 33.5     | PSIG       | Info   | Only                 |
| 4.1.3.2           | Leakage Rate                                                 | 2.10-9   | STP CC/SEC | -      | 2.7x10 <sup>-7</sup> |
| 4.2.2             | Test at 23°C Horiz; Turn-on Current                          | 40.86    | Amps       | Info   |                      |
| 4.2.2             | Cooldown Time to 100°K                                       | 5.5      | Minutes    | -      | 7.5                  |
| 4.2.2             | Cooldown Time to 80°K                                        | 6.8      | Minutes    | -      | 10                   |
| 4.2.2             | Minimum Temp                                                 | 47.2     | °K         | Info   | 80                   |
| 4.2.2.1           | Stabl. Temp. with 0.35 Watt Heat Load                        | 68.9     | °K         | -      | 80                   |
| 4.2.2.2           | Temp. after 1/2 Hour Operation                               | 69.1     | °K         | -      | 80                   |
| 4.2.2.3           | Cold Finger warm end temp                                    | 34       | °C         | Info   | Only                 |
| 4.2.2.4           | Input Volt 17 VDC Current 1.25 ADC<br>F.B.-OK Power 21.25    | 21.2     | Watts      | -      | 30                   |
| 4.2.2.5           | Stabl. Temp with 0.35 Watt Heat Load                         | 71.9     | °K         | -      | 80                   |
| 4.2.2.5           | Cold Finger Warm End Temp                                    | 34       | °C         | Info   | Only                 |
| 4.2.2.5           | Input Volts 32 VDC Current .68 ADC<br>Power 21.76            | 21.8     | Watts      | -      | 30                   |
| 4.2.3             | Test at -40°C Horiz; Turn-on Current                         | 1.1      | Amps       | Info   |                      |
| 4.2.3.1           | Cooldown Time to 100°K                                       | 6.7      | Minutes    | -      | 7.5                  |
| 4.2.3.1           | Cooldown Time to 80°K                                        | 7.5      | Minutes    | -      | 10                   |
| 4.2.3.2           | Stabl. Temp with 0.2 Watt Heat Load                          | 52.4     | °K         | -      | 80                   |
| 4.2.3.2           | Temp after 1/2 Hour                                          | 50.9     | °K         | -      | 80                   |
| 4.2.3.3           | Cold Finger Warm End Temp                                    | -30      | °C         | Info   | Only                 |
| 4.2.3.4           | Input Volts 17 VDC Current 1.13 ADC<br>Stablized Power 19.21 | 19.2     | Watts      | -      | 30                   |
| 4.2.3.5           | Temp with 0.2 Watt Head Load                                 | 53.9     | °K         | -      | 80                   |
| 4.2.3.5           | Cold Finger Warm End Temp                                    | -31      | °C         | Info   | Only                 |
| 4.2.3.5           | Input Volts 32 VDC Current .62 ADC<br>F.B.-OK Power 19.8     | 19.8     | Watts      | -      | 30                   |
| 4.2.4             | Test at 71°C Horiz; Turn-on Current                          | 1.15     | Amps       | Info   |                      |
| 4.2.4.1           | Cooldown Time to 100°K                                       | 6.4      | Minutes    | -      | 7.5                  |
| 4.2.4.1           | Cooldown Time to 80°K                                        | 7.5      | Minutes    | -      | 10                   |
| 4.2.4.1           | Stabl. Temp. with 0.2 Watt Heat Load                         | 69.8     | °K         | -      | 80                   |
| 4.2.4.1           | Temp after 1/2 hour                                          | 69.4     | °K         | -      | 80                   |
| 4.2.4.2           | Cold Finger Warm End Temp                                    | 84       | °C         | Info   | Only                 |
| 4.2.4.3           | Input Volts 17 VDC Current 1.43 ADC<br>Power                 | 24.3     | Watts      | -      | 35                   |
| 4.2.4.4           | Stabl. Temp with 0.2 Watt Head Load                          | 71.6     | °K         | -      | 80                   |
| 4.2.4.4           | Cold Finger Warm End Temp                                    | 83       | °C         | Info   | Only                 |
| 4.2.4.4           | Input Volts 32 VDC Current .80 ADC<br>F.B.-O.K. Power        | 25.6     | Watts      | -      | 35                   |

TEST PERFORMED BY : S. COOPERTEST DATE : 28 JULY 86TIME : 1:00 P.M.

29 JULY 86

8:30 A.M.

*Signature*  
7/28/86



## PERFORMANCE TEST

## DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC  
DRAWING NO. SM-D-5005863/SM-D-5005842

SERIAL NO. 13

| TEST<br>PLAN PARA | PARAMETER                                                    | MEASURED               | UNITS      | LIMITS |                        |
|-------------------|--------------------------------------------------------------|------------------------|------------|--------|------------------------|
|                   |                                                              |                        |            | MIN    | MAX                    |
| 4.2.5             | Test at 23°C Vertical; Turn-on Current                       | 4.4 x 10 <sup>-9</sup> | Amps       | Info   |                        |
| 4.2.5.1           | Cooldown Time to 100°K                                       | 5.4                    | Minutes    | -      | 7.5                    |
| 4.2.5.1           | Cooldown Time to 80°K                                        | 6.1                    | Minutes    | -      | 10                     |
| 4.2.5.1           | Minimum Temp                                                 | 49                     | °K         | -      | 80                     |
| 4.2.5.2           | Stabl. Temp with 0.35 Watt Heat Load                         | 71.1                   | °K         | -      | 80                     |
| 4.2.5.3           | Temp After 1/2 Hour With Heat Load                           | 71.5                   | °K         | Info   | 80                     |
| 4.2.5.4           | Cold Finger Warm End Temp                                    | 35                     | °C         | Info   | Only                   |
| 4.2.5.5           | Input Volts 17 VDC Current <u>1.25</u> ADC<br>Power          | 21.3                   | Watts      | -      | 30                     |
| 4.2.5.6           | Stabl. Temp. with 0.35 Watt Heat Load                        | 73.4                   | °K         | -      | 80                     |
| 4.2.5.6           | Cold Finger Warm End Temp                                    | 35                     | °C         | Info   | Only                   |
| 4.2.5.6           | Input Volt 32 VDC Current <u>.72</u> ADC<br>F.8 - O.K. Power | 23.0                   | Watts      | -      | 30                     |
| 4.2.6             | Leakage Rate                                                 | 4.4 x 10 <sup>-9</sup> | STP CC/SEC | -      | 2.7 x 10 <sup>-7</sup> |

PERFORMED BY S. Cooper

DATE 28 July 86 29 JUL 86

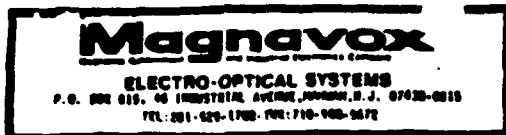
WITNESSED BY [Signature]

Q.A. MAGNAVOX

TIME: 1:00 p.m. 8:30 A.M.

WITNESSED BY [Signature]

Q.A. CUSTOMER



**PERFORMANCE TEST**  
**VIBRATION OUTPUT TEST DATA**  
**1/4 WATT LINEAR RESONANT CRYOGENIC COOLER**  
**MM & T PROGRAM**

DRAWING NO.: SM-D-5705843

SERIAL NO.: 613

| Test Plan Para | Frequency             | Maximum Force Along Compressor Axis, + lbs | Measure Force Along Compressor Axis, lbs. | Maximum Force In Any Compressor Radial Axis, + lbs | Measured Force In Any compressor Radial Axis, lbs. 90° |     |
|----------------|-----------------------|--------------------------------------------|-------------------------------------------|----------------------------------------------------|--------------------------------------------------------|-----|
| 4.3.9          | Fundamental (54 Hz)   | 1.0                                        | .55                                       | 1.5                                                | .7                                                     | .15 |
|                | 1st Harmonic (108 Hz) | 2.5                                        | 2.10                                      | 0.22                                               | .06                                                    | .13 |
|                | 2nd Harmonic (162 Hz) | 1.4                                        | .57                                       | 0.13                                               | .03                                                    | .03 |
|                | 3rd Harmonic (216 Hz) | 0.30                                       | .26                                       | 0.13                                               | .01                                                    | .02 |
|                | Next 37 Harmonics     | 0.10                                       | SEE GRAPH                                 | 0.10                                               | SEE GRAPH                                              |     |
|                |                       |                                            |                                           |                                                    |                                                        |     |

PERFORMED BY: S. Carver

DATE: 9/8/86

WITNESSED BY: [Signature]

CUSTOMER Q.A.

MAGNAVOX Q.A.

PERFORMANCE TEST  
VIBRATION OUTPUT TEST DATA  
½ WATT LINEAR RESONANT CRYOGENIC COOLER  
MM&T PROGRAM

Test Plan Paragraph: 4.3.9

Cooler S/N: 013

Total Suspended Weight: 4.2 lbs Date: 9-5-86

| S/N | Freq. | Force Along Compressor Axis |      | Force Along Radial Axis |      |         |      |
|-----|-------|-----------------------------|------|-------------------------|------|---------|------|
|     |       | g's                         | lbs  | Axis #1                 |      | Axis #2 |      |
|     |       |                             |      | g's                     | lbs  | g's     | lbs  |
| 1   | 54    | .132                        | 0.55 | .167                    | 0.70 | .036    | 0.15 |
| 2   | 108   | .500                        | 2.10 | .015                    | 0.06 | .031    | 0.13 |
| 3   | 162   | .136                        | 0.57 | .007                    | 0.03 | .007    | 0.03 |
| 4   | 216   | .063                        | 0.26 | .003                    | 0.01 | .005    | 0.02 |
| 5   | 270   | .021                        |      | .002                    |      | .002    |      |
| 6   | 324   | .033                        |      | .009                    |      | .009    |      |
| 7   | 378   | .012                        |      | .007                    |      | .012    |      |
| 8   | 432   | .006                        |      | .003                    |      | .007    |      |
| 9   | 486   | .0005                       |      | .001                    |      | .003    |      |
| 10  | 540   | .003                        |      | .003                    |      | .001    |      |
| 11  | 594   | .001                        |      | .001                    |      | .0007   |      |
| 12  | 648   | .002                        |      | .004                    |      | .002    |      |
| 13  | 702   | .001                        |      | .007                    |      | .007    |      |
| 14  | 756   | .001                        |      | .008                    |      | .015    |      |
| 15  | 810   | .0001                       |      | .007                    |      | .009    |      |

Con't Page 2

\* Axis 1 = along transfer tube  
 Axis 2 = perpendicular to axis 1

Performed by: A. Cavanna

Date: \_\_\_\_\_

Witnessed By: \_\_\_\_\_

B-21

Customer QA  
 Magnavox OA

PERFORMANCE TEST  
VIBRATION OUTPUT TEST DATA  
1/2 WATT LINEAR RESONANT CRYOGENIC COOLER  
MM&T PROGRAM

Test Plan Paragraph: 4.3.9

Cooler S/N: 013

Total Suspended Weight 4.2 lbs

Date: 9-5-86

| S/N | Freq. | Force Along<br>Compressor Axis |     | Force Along<br>Radial Axis |     |        |     |  |
|-----|-------|--------------------------------|-----|----------------------------|-----|--------|-----|--|
|     |       | g's                            | lbs | Axis*1                     |     | Axis*2 |     |  |
|     |       |                                |     | g's                        | lbs | g's    | lbs |  |
| 16  | 864   | .0001                          |     | .002                       |     | .005   |     |  |
| 17  | 918   | .0001                          |     | .001                       |     | .002   |     |  |
| 18  | 972   | .0001                          |     | .001                       |     | .001   |     |  |
| 19  | 1026  | .0001                          |     | .001                       |     | .002   |     |  |
| 20  | 1080  | .0001                          |     | .005                       |     | .002   |     |  |
| 21  | 1134  | .0001                          |     | .004                       |     | .001   |     |  |
| 22  | 1188  | .001                           |     | .002                       |     | .001   |     |  |
| 23  | 1242  | .001                           |     | .001                       |     | .001   |     |  |
| 24  | 1296  | .001                           |     | .001                       |     | .0005  |     |  |
| 25  | 1350  | .003                           |     | .0009                      |     | .0004  |     |  |
| 26  | 1404  | .0005                          |     | .0008                      |     | .0005  |     |  |
| 27  | 1458  | .001                           |     | .002                       |     | .0005  |     |  |

Don't Page 3

\*Axis 1 = along transfer tube  
 Axis 2 = perpendicular to axis 1

Performed By: A. Caniglia

Date: \_\_\_\_\_

Witnessed By: \_\_\_\_\_

Customer QA

Magnavox QA

PERFORMANCE TEST  
VIBRATION OUTPUT TEST DATA  
1/2 WATT LINEAR RESONANT CRYOGENIC COOLER  
MM&T PROGRAM

Test Plan Paragraph: 4.3.9

Cooler S/N: 013

Total Suspended Weight 4.2

Date: 9-5-86

| S/N | Freq. | Force Along<br>Compressor Axis |     | Force Along<br>Radial Axis |     |        |     |
|-----|-------|--------------------------------|-----|----------------------------|-----|--------|-----|
|     |       | g's                            | lbs | Axis*1                     |     | Axis*2 |     |
|     |       |                                |     | g's                        | lbs | g's    | lbs |
| 28  | 1512  | .0005                          |     | .003                       |     | .002   |     |
| 29  | 1566  | .001                           |     | .002                       |     | .0005  |     |
| 30  | 1620  | .002                           |     | .001                       |     | .0009  |     |
| 31  | 1674  | .001                           |     | .001                       |     | .0003  |     |
| 32  | 1728  | .0009                          |     | .001                       |     | .0002  |     |
| 33  | 1782  | .001                           |     | .001                       |     | .0008  |     |
| 34  | 1836  | .001                           |     | .001                       |     | .0007  |     |
| 35  | 1890  | .001                           |     | .0009                      |     | .0009  |     |
| 36  | 1944  | .0009                          |     | .0005                      |     | .0009  |     |
| 37  | 1998  | .0007                          |     | .0004                      |     | .0005  |     |
| 38  | 2052  | .0008                          |     | .0003                      |     | .0002  |     |
| 39  | 2106  | .0004                          |     | .0006                      |     | .0001  |     |
| 40  | 2160  | .0007                          |     | .0009                      |     | .0001  |     |
| 41  | 2214  | .0002                          |     | .002                       |     | .0003  |     |

\*Axis 1 = along transfer tube  
 Axis 2 = perpendicular to axis 1

Performed By: S. Langer

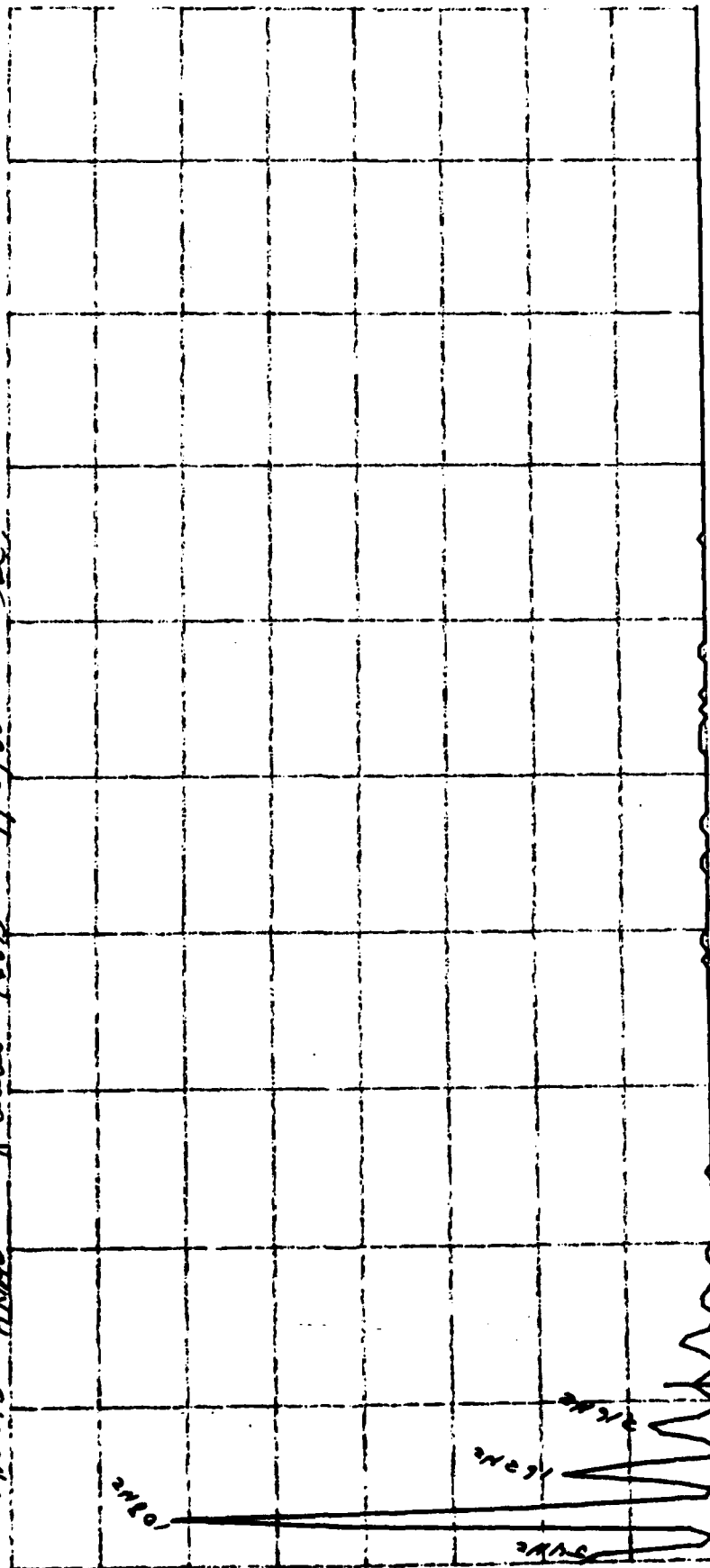
Date: \_\_\_\_\_

Witnessed By: \_\_\_\_\_

Customer QA

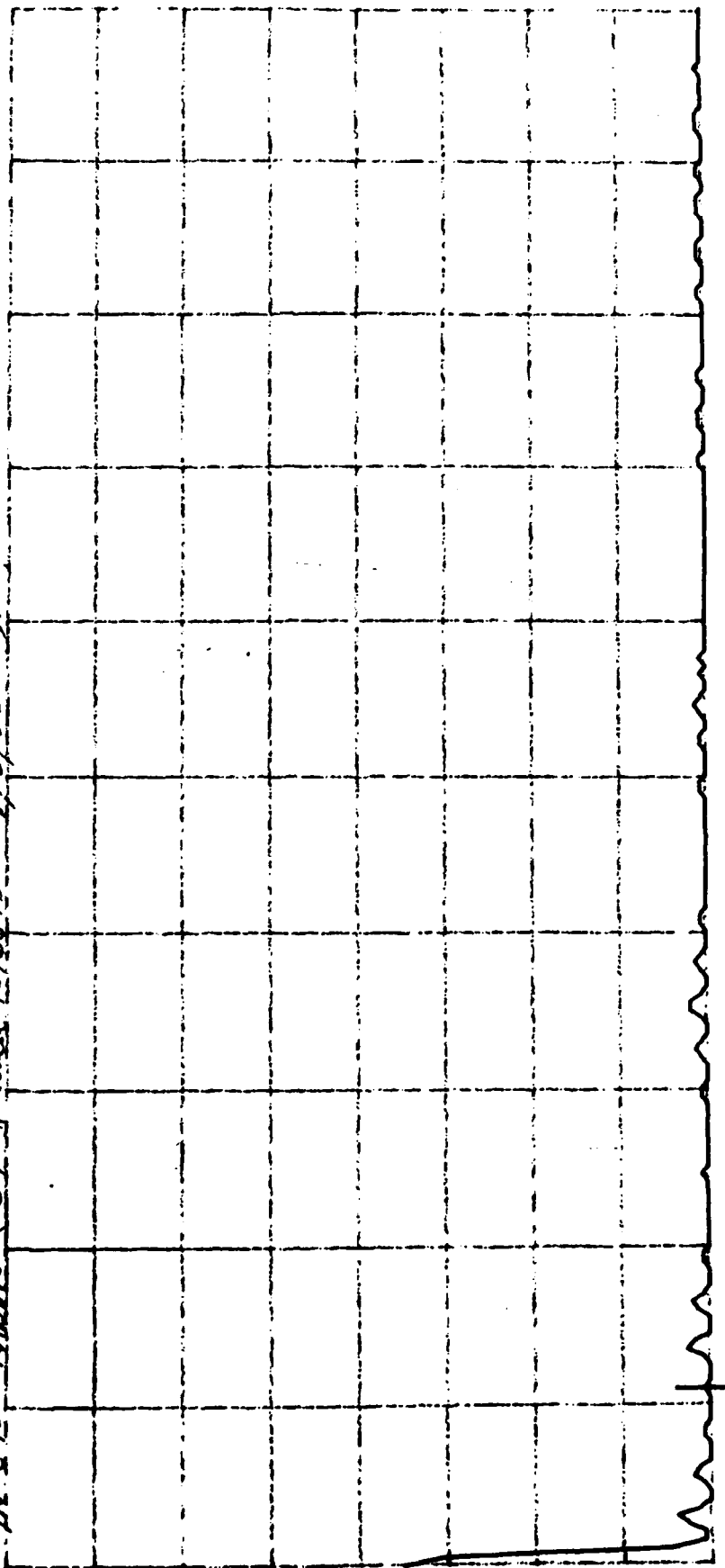
Magnavox QA

S/N 013 AXIAL I-due #1667 9/5/88 de



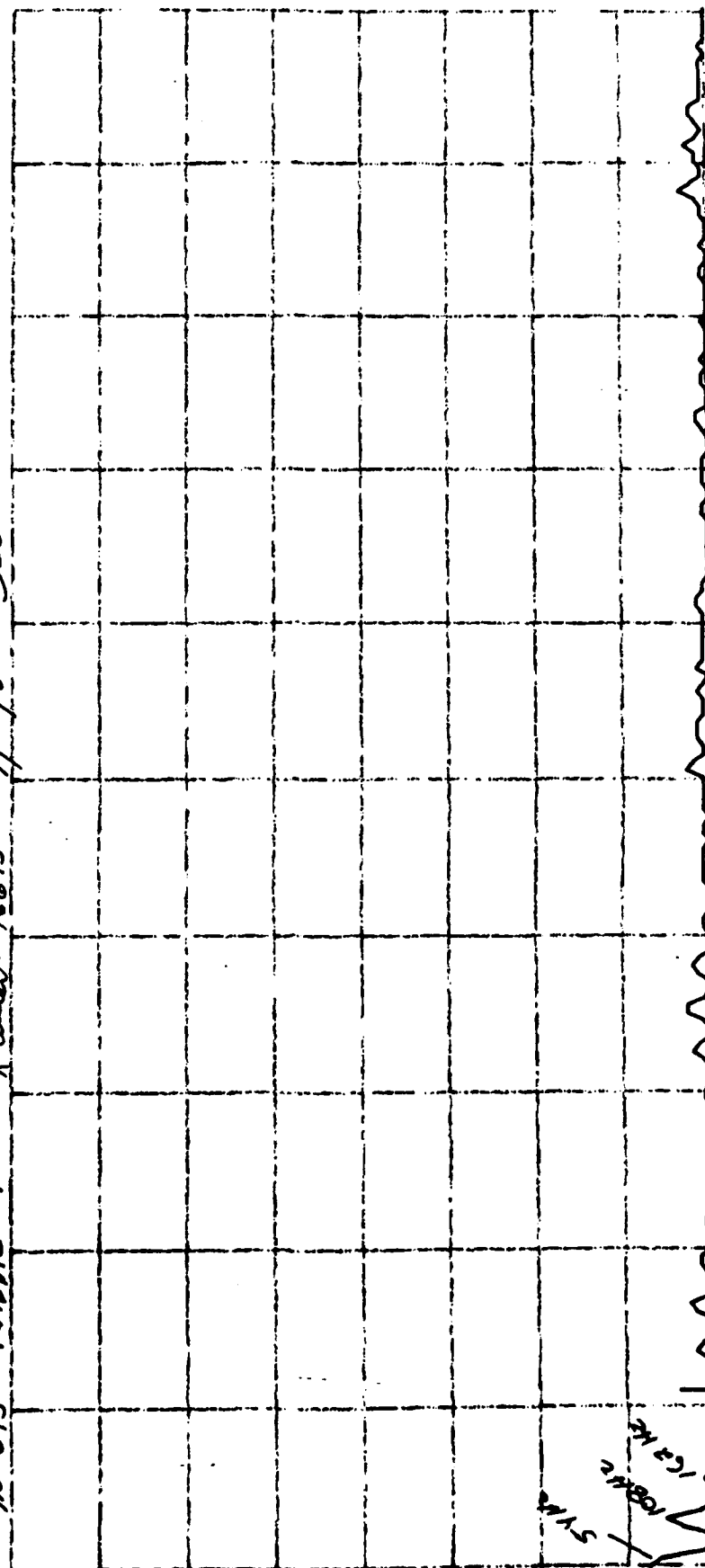
PWR SPECT B : 2.09E-02R 270. HZ N: NONE P: 10HZ  
SPAN: 50.00HZ -2.0500KHZ SN: 3.2+00V FS: 6.3-01R 7.9-02R/

SN 013 RADIAL (0.1) 1.83E-03R 270. HZ 9/8/82



PWR SPECT B 1.83E-03R 270. HZ N: NONE F: 10HZ  
SPAN: 50.00HZ -2.0500KHZ SN: 4.5+00V FS: 4.5-01R 5.6-02R/

5/10 0.15 RADIAL 90° X-driver # 14673 9/5/86



PWR SPECT B 3.40E-03R 270. HZ N: NONE P: 10HZ  
SPAN: 50.00HZ -2.0500KHZ SN: 2.2+00V FS: 4.5-01R 5.6-02R/

## PERFORMANCE TEST

## DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC  
DRAWING NO. SM-D-5005863/SM-D-5005842

SERIAL NO. 015

| TEST<br>PLAN PARA | PARAMETER                                                    | MEASURED             | UNITS      | LIMITS |                      |
|-------------------|--------------------------------------------------------------|----------------------|------------|--------|----------------------|
|                   |                                                              |                      |            | MIN    | MAX                  |
| 3.10              | Calibration Check                                            | Complies             | -          | Comply |                      |
| 4.1.1             | Inspection to SM-D-5005863/5005842                           | Complies             | -          | Comply |                      |
| 4.1.2             | Weight                                                       | 2.34                 | Lbs        | -      | 2.5                  |
| 4.1.3.1           | Pressurization                                               | 330                  | PSIG       | Info   | Only                 |
| 4.1.3.2           | Leakage Rate                                                 | 1.8x10 <sup>-1</sup> | STP CC/SEC | -      | 2.7x10 <sup>-1</sup> |
| 4.2.2             | Test at 23°C Horiz; Turn-on Current                          | 1.95                 | Amps       | Info   |                      |
| 4.2.2             | Cooldown Time to 100°K                                       | 5.3                  | Minutes    | -      | 7.5                  |
| 4.2.2             | Cooldown Time to 80°K                                        | 6.0                  | Minutes    | -      | 10                   |
| 4.2.2             | Minimum Temp                                                 | 39.5                 | °K         | Info   | 80                   |
| 4.2.2.1           | Stabl. Temp. with 0.35 Watt Heat Load                        | 67.7                 | °K         | -      | 80                   |
| 4.2.2.2           | Temp. after 1/2 Hour Operation                               | 67.9                 | °K         | -      | 80                   |
| 4.2.2.3           | Cold Finger warm end temp                                    | 34                   | °C         | Info   | Only                 |
| 4.2.2.4           | Input Volt 17 VDC Current 1.42 ADC<br>Power 24.14            | 24.1                 | Watts      | -      | 30                   |
| 4.2.2.5           | Stabl. Temp with 0.35 Watt Heat Load                         | 72.3                 | °K         | -      | 80                   |
| 4.2.2.5           | Cold Finger Warm End Temp                                    | 34                   | °C         | Info   | Only                 |
| 4.2.2.5           | Input Volts 32 VDC Current 1.77 ADC<br>F.B. OK Power 24.6    | 24.6                 | Watts      | -      | 30                   |
| 4.2.3             | Test at -40°C Horiz; Turn-on Current                         | 1.25                 | Amps       | Info   |                      |
| 4.2.3.1           | Cooldown Time to 100°K                                       | 6.6                  | Minutes    | -      | 7.5                  |
| 4.2.3.1           | Cooldown Time to 80°K                                        | 7.3                  | Minutes    | -      | 10                   |
| 4.2.3.2           | Stabl. Temp with 0.2 Watt Heat Load                          | 46.7                 | °K         | -      | 80                   |
| 4.2.3.2           | Temp after 1/2 Hour                                          | 46.8                 | °K         | -      | 80                   |
| 4.2.3.3           | Cold Finger Warm End Temp                                    | -36                  | °C         | Info   | Only                 |
| 4.2.3.4           | Input Volts 17 VDC Current 1.53 ADC<br>Stablized Power 26.01 | 26.0                 | Watts      | -      | 30                   |
| 4.2.3.5           | Temp with 0.2 Watt Head Load                                 | 47.3                 | °K         | -      | 80                   |
| 4.2.3.5           | Cold Finger Warm End Temp                                    | -31                  | °C         | Info   | Only                 |
| 4.2.3.5           | Input Volts 32 VDC Current 1.82 ADC<br>F.B. OK Power 26.24   | 26.2                 | Watts      | -      | 30                   |
| 4.2.4             | Test at 71°C Horiz; Turn-on Current                          | 1.10                 | Amps       | Info   |                      |
| 4.2.4.1           | Cooldown Time to 100°K                                       | 5.9                  | Minutes    | -      | 7.5                  |
| 4.2.4.1           | Cooldown Time to 80°K                                        | 6.9                  | Minutes    | -      | 10                   |
| 4.2.4.1           | Stabl. Temp. with 0.2 Watt Heat Load                         | 68.1                 | °K         | -      | 80                   |
| 4.2.4.1           | Temp after 1/2 hour                                          | 67.8                 | °K         | -      | 80                   |
| 4.2.4.2           | Cold Finger Warm End Temp                                    | 31                   | °C         | Info   | Only                 |
| 4.2.4.3           | Input Volts 17 VDC Current 1.52 ADC<br>F.B. O.K. Power 25.24 | 25.8                 | Watts      | -      | 35                   |
| 4.2.4.4           | Stabl. Temp with 0.2 Watt Head Load                          | 68.2                 | °K         | -      | 80                   |
| 4.2.4.4           | Cold Finger Warm End Temp                                    | 32                   | °C         | Info   | Only                 |
| 4.2.4.4           | Input Volts 32 VDC Current ADC<br>Power 27.2                 | 27.2                 | Watts      | -      | 35                   |

PERFORMED BY: *Frank V. Lubinski*

B-27

2/17/86  
-40°C  
71°C  
330°C



230 7/16/86

## PERFORMANCE TEST

## DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC  
DRAWING NO. SM-D-5005863/SM-D-5005842

SERIAL NO. 015

| TEST<br>PLAN PARA | PARAMETER                                                              | MEASURED             | UNITS      | LIMITS |                      |
|-------------------|------------------------------------------------------------------------|----------------------|------------|--------|----------------------|
|                   |                                                                        |                      |            | MIN    | MAX                  |
| 4.2.5             | Test at 23°C Vertical; Turn-on Current                                 | 1.0                  | Amps       | Info   |                      |
| 4.2.5.1           | Cooldown Time to 100°K                                                 | 5.3                  | Minutes    | -      | 7.5                  |
| 4.2.5.1           | Cooldown Time to 80°K                                                  | 6.1                  | Minutes    | -      | 10                   |
| 4.2.5.1           | Minimum Temp                                                           | 39.7                 | °K         | -      | 80                   |
| 4.2.5.2           | Stabl. Temp with 0.35 Watt Heat Load                                   | 68.4                 | °K         | -      | 80                   |
| 4.2.5.3           | Temp After 1/2 Hour With Heat Load                                     | 68.4                 | °K         | Info   | 80                   |
| 4.2.5.4           | Cold Finger Warm End Temp                                              | 34.                  | °C         | Info   | Only                 |
| 4.2.5.5           | Input Volts 17 VDC Current <u>1.37</u> ADC<br>FB-OK Power <u>23.29</u> | 23.3                 | Watts      | -      | 30                   |
| 4.2.5.6           | Stabl. Temp. with 0.35 Watt Heat Load                                  | 69.4                 | °K         | -      | 80                   |
| 4.2.5.6           | Cold Finger Warm End Temp                                              | 34                   | °C         | Info   | Only                 |
| 4.2.5.6           | Input Volt 32 VDC Current <u>.77</u> ADC<br>Power <u>24.64</u>         | 24.6                 | Watts      | -      | 30                   |
| 4.2.6             | Leakage Rate                                                           | $2.3 \times 10^{-7}$ | STP CC/SEC | -      | $2.7 \times 10^{-7}$ |

PERFORMED BY *[Signature]*DATE 7/16/86 23WITNESSED BY *[Signature]*

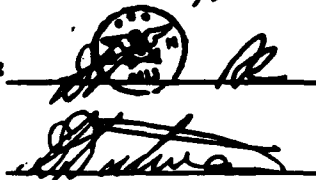
Q.A. MAGNAVOX

WITNESSED BY *[Signature]*

Q.A. CUSTOMER

**Magnavox**ELECTRO-OPTICAL SYSTEMS  
P.O. BOX 619, 40 INDUSTRIAL AVENUE, JERSEY, N.J. 07930-0619  
TEL: 201-529-1700 FAX: 201-529-0672PERFORMANCE TESTVIBRATION OUTPUT TEST DATA1/4 WATT LINEAR RESONANT CRYOGENIC COOLERMM & T PROGRAMDRAWING NO.: SM-D-500 5843.SERIAL NO.: C15

| Test Plan Para | Frequency             | Maximum Force Along Compressor Axis, $\pm$ lbs | Measure Force Along Compressor Axis, lbs. | Maximum Force In Any Compressor Radial Axis, $\pm$ lbs | Measured Force In Any compressor Radial Axis, lbs. 0° 90° |       |
|----------------|-----------------------|------------------------------------------------|-------------------------------------------|--------------------------------------------------------|-----------------------------------------------------------|-------|
| 4.3.9          | Fundamental (54 Hz)   | 1.0                                            | 0.42                                      | 1.5                                                    | 0.14                                                      | 0.47  |
|                | 1st Harmonic (108 Hz) | 2.5                                            | 1.93                                      | 0.22                                                   | 0.06                                                      | 0.70  |
|                | 2nd Harmonic (162 Hz) | 1.4                                            | 0.71                                      | 0.13                                                   | 0.03                                                      | 0.02  |
|                | 3rd Harmonic (216 Hz) | 0.30                                           | 0.20                                      | 0.13                                                   | 0.02                                                      | 0.03  |
|                | Next 37 Harmonics     | 0.10                                           | SEE GRAPH                                 | 0.10                                                   | SEE                                                       | GRAPH |
|                |                       |                                                |                                           |                                                        |                                                           |       |

PERFORMED BY: S. CozzioDATE: 9/8/86WITNESSED BY: 

CUSTOMER Q.A.

MAGNAVOX Q.A.

PERFORMANCE TEST  
VIBRATION OUTPUT TEST DATA  
1/2 WATT LINEAR RESONANT CRYOGENIC COOLER  
MM&T PROGRAM

Test Plan Paragraph: 4.3.9

Cooler S/N: 015

Total Suspended Weight 4.1 lbs

Date: 9-5-86

| S/N | Freq. | Force Along Compressor Axis |      | Force Along Radial Axis |      |         |      |
|-----|-------|-----------------------------|------|-------------------------|------|---------|------|
|     |       | g's                         | lbs  | Axis #1                 |      | Axis #2 |      |
|     | 54    | 0.102<br><del>0.102</del>   | 0.42 | 0.033                   | 0.14 | 0.114   | 0.47 |
|     | 108   | 0.470                       | 1.93 | 0.015                   | 0.06 | 0.016   | 0.70 |
|     | 162   | 0.174                       | 0.71 | 0.007                   | 0.03 | 0.005   | 0.02 |
|     | 216   | 0.048                       | 0.20 | 0.004                   | 0.02 | 0.007   | 0.03 |
|     | 270   | 0.021                       |      | 0.018                   |      | 0.017   |      |
|     | 324   | 0.023                       |      | 0.065                   |      | 0.020   |      |
|     | 378   | 0.012                       |      | 0.033                   |      | 0.026   |      |
|     | 432   | 0.001                       |      | 0.021                   |      | 0.041   |      |
|     | 486   | 0.006                       |      | 0.029                   |      | 0.027   |      |
|     | 540   | 0.003                       |      | 0.019                   |      | 0.038   |      |
|     | 594   | 0.005                       |      | 0.024                   |      | 0.025   |      |
|     | 648   | 0.012                       |      | 0.037                   |      | 0.029   |      |
|     | 702   | 0.042                       |      | 0.017                   |      | 0.063   |      |
|     | 756   | 0.014                       |      | 0.003                   |      | 0.059   |      |
|     | 810   | 0.007                       |      | 0.036                   |      | 0.044   |      |

Con't Page 2

Axis 1 = along transfer tube  
 Axis 2 = perpendicular to axis 1

Tested by: \_\_\_\_\_

Date: \_\_\_\_\_

Inspected By: \_\_\_\_\_

Customer QA  
 Magnavox QA

**PERFORMANCE TEST**  
**VIBRATION OUTPUT TEST DATA**  
**1/2 WATT LINEAR RESONANT CRYOGENIC COOLER**  
**MM&T PROGRAM**

Test Plan Paragraph: 4.3.9

Cooler S/N: 015

Total Suspended Weight 4.1 lbs

Date: 9-5-86

| S/N | Freq. | Force Along Compressor Axis |     | Force Along Radial Axis |         |  |
|-----|-------|-----------------------------|-----|-------------------------|---------|--|
|     |       | g's                         | lbs | Axis #1                 | Axis #2 |  |
| 16  | 864   | 0.008                       |     | 0.048                   | 0.011   |  |
| 17  | 918   | 0.005                       |     | 0.008                   | 0.015   |  |
| 18  | 972   | 0.001                       |     | 0.005                   | 0.016   |  |
| 19  | 1026  | 0.006                       |     | 0.007                   | 0.002   |  |
| 20  | 1080  | 0.009                       |     | 0.010                   | 0.012   |  |
| 21  | 1134  | 0.008                       |     | 0.013                   | 0.014   |  |
| 22  | 1188  | 0.008                       |     | 0.023                   | 0.010   |  |
| 23  | 1242  | 0.011                       |     | 0.006                   | 0.014   |  |
| 24  | 1296  | 0.003                       |     | 0.012                   | 0.013   |  |
| 25  | 1350  | 0.004                       |     | 0.006                   | 0.007   |  |
| 26  | 1404  | 0.008                       |     | 0.006                   | 0.005   |  |
| 27  | 1458  | 0.008                       |     | 0.007                   | 0.004   |  |

Don't Page 3

\*Axis 1 = along transfer tube  
 Axis 2 = perpendicular to axis 1

Performed By: \_\_\_\_\_

Date: \_\_\_\_\_

Witnessed By: \_\_\_\_\_

Customer QA

Magnavox QA

PERFORMANCE TEST  
VIBRATION OUTPUT TEST DATA  
1/4 WATT LINEAR RESONANT CRYOGENIC COOLER  
MM&T PROGRAM

Test Plan Paragraph: 4.3.9

Cooler S/N: 015

Total Suspended Weight 4.1 lbs

Date: 9-5-86

| S/N | Freq. | Force Along Compressor Axis |     | Force Along Radial Axis |        |       |     |
|-----|-------|-----------------------------|-----|-------------------------|--------|-------|-----|
|     |       | g's                         | lbs | Axis*1                  | Axis*2 | g's   | lbs |
| 28  | 1512  | 0.005                       |     | 0.012                   |        | 0.008 |     |
| 29  | 1566  | 0.003                       |     | 0.009                   |        | 0.004 |     |
| 30  | 1620  | 0.001                       |     | 0.001                   |        | 0.003 |     |
| 31  | 1674  | 0.005                       |     | 0.002                   |        | 0.004 |     |
| 32  | 1728  | 0.006                       |     | 0.004                   |        | 0.001 |     |
| 33  | 1782  | 0.006                       |     | 0.002                   |        | 0.005 |     |
| 34  | 1836  | 0.005                       |     | 0.007                   |        | 0.009 |     |
| 35  | 1890  | 0.006                       |     | 0.004                   |        | 0.011 |     |
| 36  | 1944  | 0.009                       |     | 0.005                   |        | 0.005 |     |
| 37  | 1998  | 0.004                       |     | 0.009                   |        | 0.003 |     |
| 38  | 2052  | 0.002                       |     | 0.004                   |        | 0.004 |     |
| 39  | 2106  | 0.003                       |     | 0.003                   |        | 0.002 |     |
| 40  | 2160  | 0.002                       |     | 0.004                   |        | 0.003 |     |
| 41  | 2214  | 0.001                       |     | 0.002                   |        | 0.002 |     |

\*Axis 1 = along transfer tube  
 Axis 2 = perpendicular to axis 1

Performed By: \_\_\_\_\_

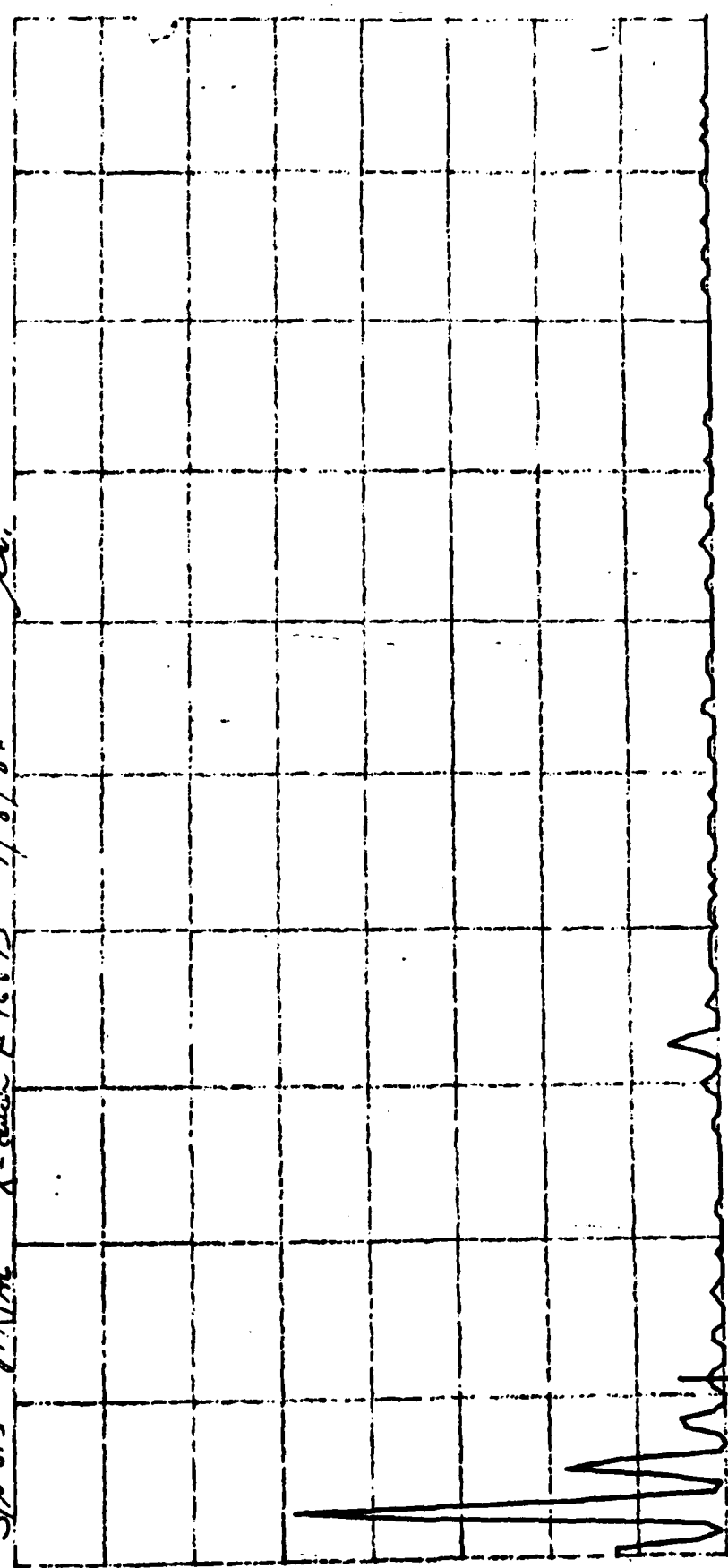
Date: \_\_\_\_\_

Witnessed By: \_\_\_\_\_

Customer QA

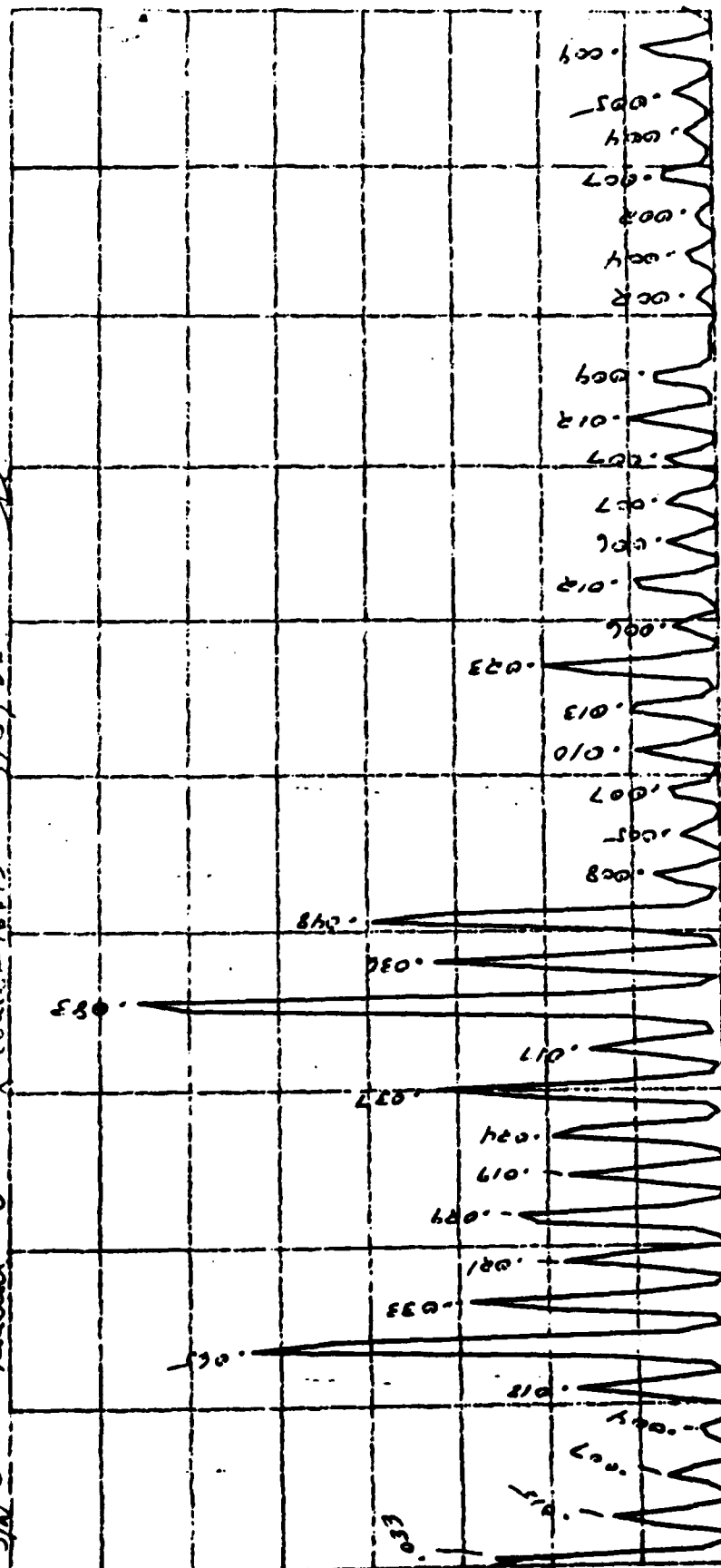
Magnavox QA

SP0015 AXIAL A-ducer #16673 9/8/86



PWR SPECT B : 2.00E-02R 270. HZ N: NONE F: 10HZ  
SPAN: 50.00HZ -2.0500KHZ SN: 7.9+00V FS: 7.9-01R 9.9-02R/

5/10/15



PWR SPECT B : 2.55E-02R 60. HZ N: NONE P: 10HZ  
SPAN: 50.00HZ -2.0500KHZ SN: 4.5+00V FS: 8.9-02R/ 1.1-02R/



**Magnavox**ELECTRO-OPTICAL SYSTEMS  
P.O. BOX 610, 40 INDUSTRIAL AVENUE, JEROME, N.J. 07450-0610  
TEL: 201-969-1700 FAX: 710-969-9672

Sheet 1 of 2

Contract No. DAAK20-84-C-0440

PERFORMANCE TEST

Project No. 24407

DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC  
DRAWING NO. SM-D-5005842SERIAL NO. 016

| TEST<br>PLAN PARA | PARAMETER                                               | MEASURED             | UNITS      | LIMITS |                      |
|-------------------|---------------------------------------------------------|----------------------|------------|--------|----------------------|
|                   |                                                         |                      |            | MIN    | MAX                  |
| 3.10              | Calibration Check                                       | COMPLY               | -          | Comply |                      |
| 4.1.1             | Inspection to SM-D-5005842                              | COMPLY               | -          | Comply |                      |
| 4.1.2             | Weight                                                  | 2.35                 | Lbs        | -      | 2.5                  |
| 4.1.3.1           | Pressurization                                          | 330                  | PSIG       | Info   | Only                 |
| 4.1.3.2           | Leakage Rate                                            | $6.0 \times 10^{-7}$ | STP CC/SEC | -      | $2.7 \times 10^{-7}$ |
| 4.2.2             | Test at 23°C Horiz; Turn-on Current                     | N/A                  | Amps       | Info   |                      |
| 4.2.2             | Cooldown Time to 100°K                                  | 4.2                  | Minutes    | -      | 7.5                  |
| 4.2.2             | Cooldown Time to 80°K                                   | 4.9                  | Minutes    | -      | 10                   |
| 4.2.2             | Minimum Temp                                            | 35.5                 | °K         | Info   | 80                   |
| 4.2.2.1           | Stabl. Temp. with 0.35 Watt Heat Load                   | 59.5                 | °K         | -      | 80                   |
| 4.2.2.2           | Temp. after 1/2 Hour Operation                          | 61.0                 | °K         | -      | 80                   |
| 4.2.2.3           | Cold Finger Warm End Temp                               | 39                   | °C         | Info   | Only                 |
| 4.2.2.4           | Input Volt 17 VDC Current 1.42 ADC<br>Power             | 24.14                | Watts      | -      | 30                   |
| 4.2.2.5           | Stabl. Temp with 0.35 Watt Heat Load                    | 63.1                 | °K         | -      | 80                   |
| 4.2.2.5           | Cold Finger Warm End Temp                               | 39                   | °C         | Info   | Only                 |
| 4.2.2.5           | Input Volts 32 VDC Current .88 ADC<br>Power             | 28.16                | Watts      | -      | 30                   |
| 4.2.3             | Test at -40°C Horiz; Turn-on Current                    | N/A                  | Amps       | Info   |                      |
| 4.2.3.1           | Cooldown Time to 100°K                                  | 3.8                  | Minutes    | -      | 7.5                  |
| 4.2.3.1           | Cooldown Time to 80°K                                   | 4.1                  | Minutes    | -      | 10                   |
| 4.2.3.2           | Stabl. Temp with 0.2 Watt Heat Load                     | 49.3                 | °K         | -      | 80                   |
| 4.2.3.2           | Temp after 1/2 Hour                                     | 49.2                 | °K         | -      | 80                   |
| 4.2.3.3           | Cold Finger Warm End Temp                               | -30                  | °C         | Info   | Only                 |
| 4.2.3.4           | Input Volts 17 VDC Current 1.46 ADC<br>Stabilized Power | 24.82                | Watts      | -      | 30                   |
| 4.2.3.5           | Temp with 0.2 Watt Head Load                            | 50.7                 | °K         | -      | 80                   |
| 4.2.3.5           | Cold Finger Warm End Temp                               | -30                  | °C         | Info   | Only                 |
| 4.2.3.5           | Input Volts 32 VDC Current .86 ADC<br>Power             | 27.52                | Watts      | -      | 30                   |
| 4.2.4             | Test at 71°C Horiz; Turn-on Current                     | N/A                  | Amps       | Info   |                      |
| 4.2.4.1           | Cooldown Time to 100°K                                  | 4.7                  | Minutes    | -      | 7.5                  |
| 4.2.4.1           | Cooldown Time to 80°K                                   | 5.5                  | Minutes    | -      | 10                   |
| 4.2.4.1           | Stabl. Temp. with 0.2 Watt Heat Load                    | 60.0                 | °K         | -      | 80                   |
| 4.2.4.1           | Temp after 1/2 hour                                     | 65.0                 | °K         | -      | 80                   |
| 4.2.4.2           | Cold Finger Warm End Temp                               | 89                   | °C         | Info   | Only                 |
| 4.2.4.3           | Input Volts 17 VDC Current 1.73 ADC<br>Power            | 29.41                | Watts      | -      | 35                   |
| 4.2.4.4           | Stabl. Temp with 0.2 Watt Head Load                     | 63.2                 | °K         | -      | 80                   |
| 4.2.4.4           | Cold Finger Warm End Temp                               | 89                   | °C         | Info   | Only                 |
| 4.2.4.4           | Input Volts 32 VDC Current 1.02<br>Power                | 32.64                | Watts      | -      | 35                   |

Performed By:

P. HARTMANN

B-36

Date: 10-23-86

Witnessed By:

Q. A. Magnavox

Q. A. Magnavox

Witnessed By:

Q. A. Customer

Q. A. Customer



Contract: DAAK20-84-C-0440

PERFORMANCE TEST

Project: 24407

DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC

SERIAL NO. 016

DRAWING NO. SM-D-5005842

| TEST<br>PLAN PARA | PARAMETER                                           | MEASURED             | UNITS      | LIMITS |                      |
|-------------------|-----------------------------------------------------|----------------------|------------|--------|----------------------|
|                   |                                                     |                      |            | MIN    | MAX                  |
| 4.2.5             | Test at 23°C Vertical; Turn-on Current              | N/A                  | Amps       | Info   |                      |
| 4.2.5.1           | Cooldown Time to 100°K                              | 4.1                  | Minutes    | -      | 7.5                  |
| 4.2.5.1           | Cooldown Time to 80°K                               | 4.7                  | Minutes    | -      | 10                   |
| 4.2.5.1           | Minimum Temp                                        | 35.5                 | °K         | -      | 80                   |
| 4.2.5.2           | Stabl. Temp with 0.35 Watt Heat Load                | 59.2                 | °K         | -      | 80                   |
| 4.2.5.3           | Temp After 1/2 Hour With Heat Load                  | 60.1                 | °K         | Info   | 80                   |
| 4.2.5.4           | Cold Finger Warm End Temp                           | 32                   | °C         | Info   | Only                 |
| 4.2.5.5           | Input Volts 17 VDC Current <u>1.49</u> ADC<br>Power | 25.33                | Watts      | -      | 30                   |
| 4.2.5.6           | Stabl. Temp. with 0.35 Watt Heat Load               | 62.5                 | °K         | -      | 80                   |
| 4.2.5.6           | Cold Finger Warm End Temp                           | 33                   | °C         | Info   | Only                 |
| 4.2.5.6           | Input Volt 32 VDC Current <u>.89</u> ADC<br>Power   | 28.48                | Watts      | -      | 30                   |
| 4.2.6             | Leakage Rate                                        | 6.0x10 <sup>-7</sup> | STP CC/SEC | -      | 2.7x10 <sup>-7</sup> |

PERFORMED BY P. HARTMANN

DATE 10-24-86

WITNESSED BY [Signature] Q.A. MAGNAVOX

WITNESSED BY [Signature] Q.A. CUSTOMER



31 OCT 1986



PERFORMANCE TEST  
VIBRATION OUTPUT TEST DATA  
1/4 WATT LINEAR RESONANT CRYOGENIC COOLER  
MM & T PROGRAM

DRAWING NO.: SM-D-5005842

SERIAL NO.: 016

| Test Plan Para | Frequency             | Maximum Force Along Compressor Axis, $\pm$ lbs | Measure Force Along Compressor Axis, lbs. | Maximum Force In Any Compressor Radial Axis, $\pm$ lbs | Measured Force In Any compressor Radial Axis, lbs. 90° |      |
|----------------|-----------------------|------------------------------------------------|-------------------------------------------|--------------------------------------------------------|--------------------------------------------------------|------|
| 4.3.9          | Fundamental (54 Hz)   | 1.0                                            | .48                                       | 1.5                                                    | 1.3                                                    | 1.0  |
|                | 1st Harmonic (108 Hz) | 2.5                                            | .25                                       | 0.22                                                   | .13                                                    | .10  |
|                | 2nd Harmonic (162 Hz) | 1.4                                            | .56                                       | 0.13                                                   | .03                                                    | .05  |
|                | 3rd Harmonic (216 Hz) | 0.30                                           | .24                                       | 0.13                                                   | .02                                                    | .02  |
|                | Next 37 Harmonics     | 0.10                                           | <.10                                      | 0.10                                                   | <.10                                                   | <.10 |
|                |                       |                                                |                                           |                                                        |                                                        |      |

PERFORMED BY: A. Casipio

DATE: 10/23/86

WITNESSED BY: [Signature]

CUSTOMER Q.A.

DCAS - CAL 53101 A

MAGNAVOX Q.A.

J. W. S. [Signature]

**PERFORMANCE TEST**  
**VIBRATION OUTPUT TEST DATA**  
**½ WATT LINEAR RESONANT CRYOGENIC COOLER**  
**MM&T PROGRAM**

Test Plan Paragraph: 4.3.9

Cooler S/N: 016

Total Suspended Weight: 4.0 lbs

Date: 10/23/86

| S/N | Freq. | Force Along Compressor Axis |      | Force Along Radial Axis |                |                |                |
|-----|-------|-----------------------------|------|-------------------------|----------------|----------------|----------------|
|     |       | g's                         | lbs  | 0°<br>g's               | Axis #1<br>lbs | Axis #2<br>g's | Axis #2<br>lbs |
| 1   | 54    | .171                        | .484 | .332                    | 1.3            | .750           | 1.0            |
| 2   | 108   | .644                        | 2.5  | .032                    | .13            | .025           | .10            |
| 3   | 162   | .140                        | .56  | .008                    | .03            | .013           | .05            |
| 4   | 216   | .061                        | .24  | .004                    | .02            | .005           | .02            |
| 5   | 270   | .025                        |      | .006                    |                | .004           |                |
| 6   | 324   | .006                        |      | .020                    |                | .007           |                |
| 7   | 378   | .009                        |      | .004                    |                | .008           |                |
| 8   | 432   | .001                        |      | .004                    |                | .001           |                |
| 9   | 486   | .002                        |      | .001                    |                | .006           |                |
| 10  | 540   | .002                        |      | .003                    |                | .004           |                |
| 11  | 594   |                             |      |                         |                | .009           |                |
| 12  | 648   |                             |      |                         |                | .012           |                |
| 13  | 702   |                             |      |                         |                | .014           |                |
| 14  | 756   |                             |      |                         |                | .012           |                |
| 15  | 810   |                             |      |                         |                | .002           |                |

Con't Page 2

\* Axis 1 = along transfer tube  
 Axis 2 = perpendicular to axis 1

Performed by: S. Casipio

Witnessed By: [Signature] 23 OCT 1986



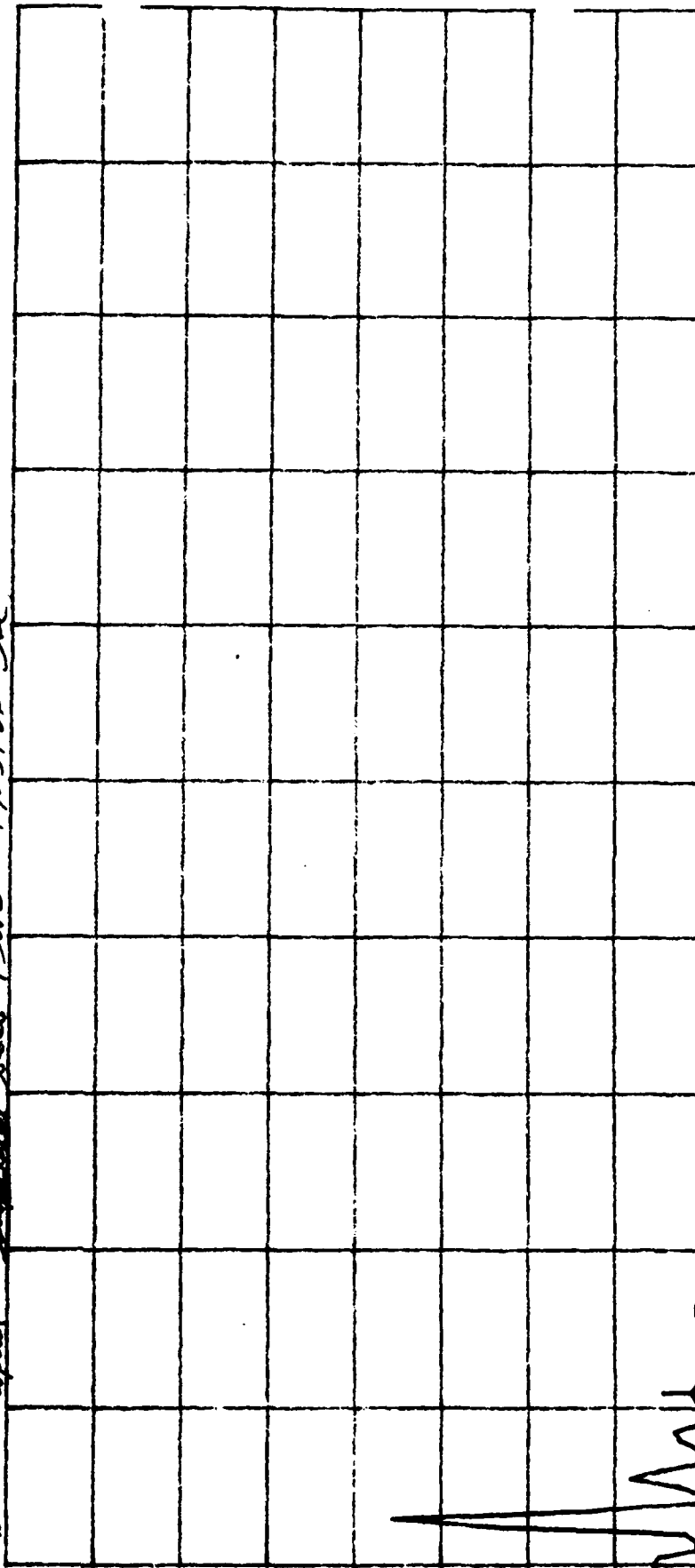
B-39

Date: 10/23/86

Customer QA

Magnavox QA

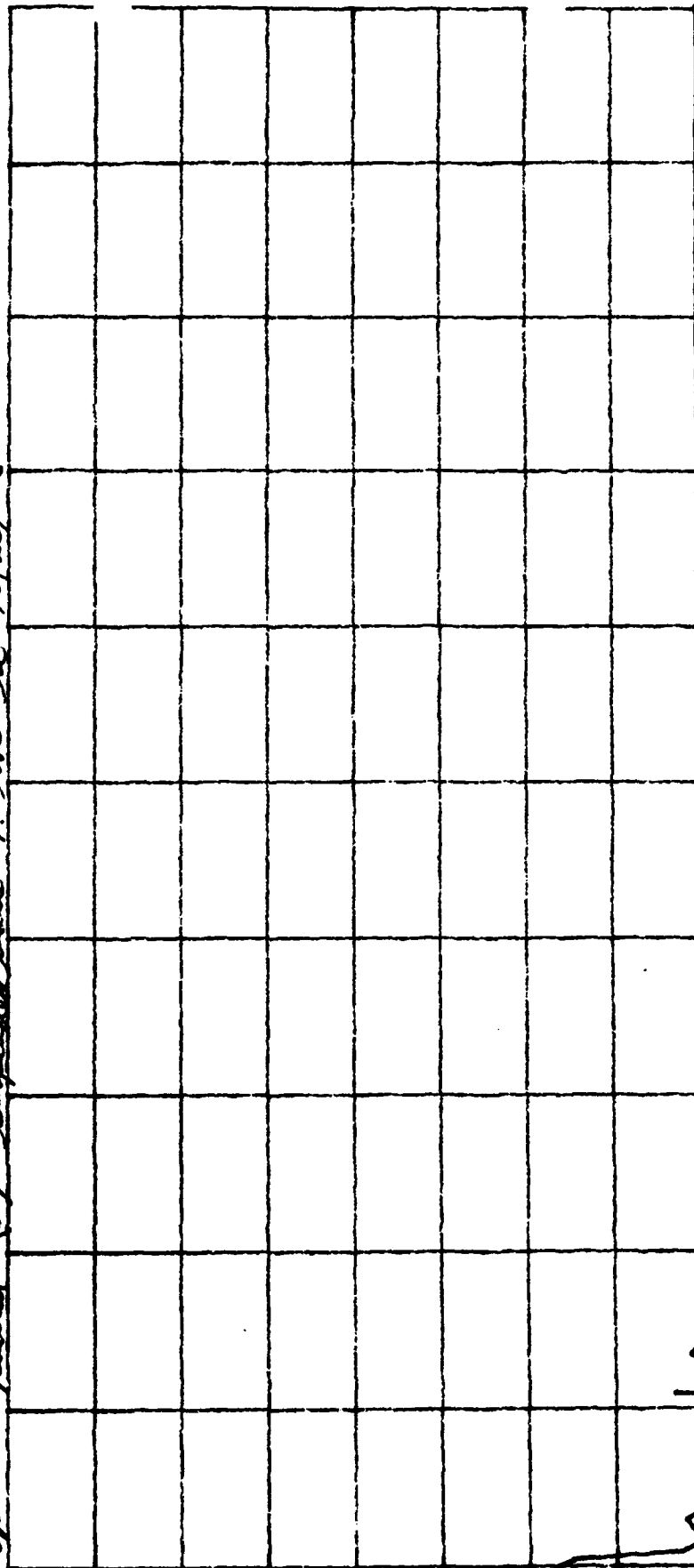
SW 016 Opial suspended across 4 the 10/23/86 de



B-40

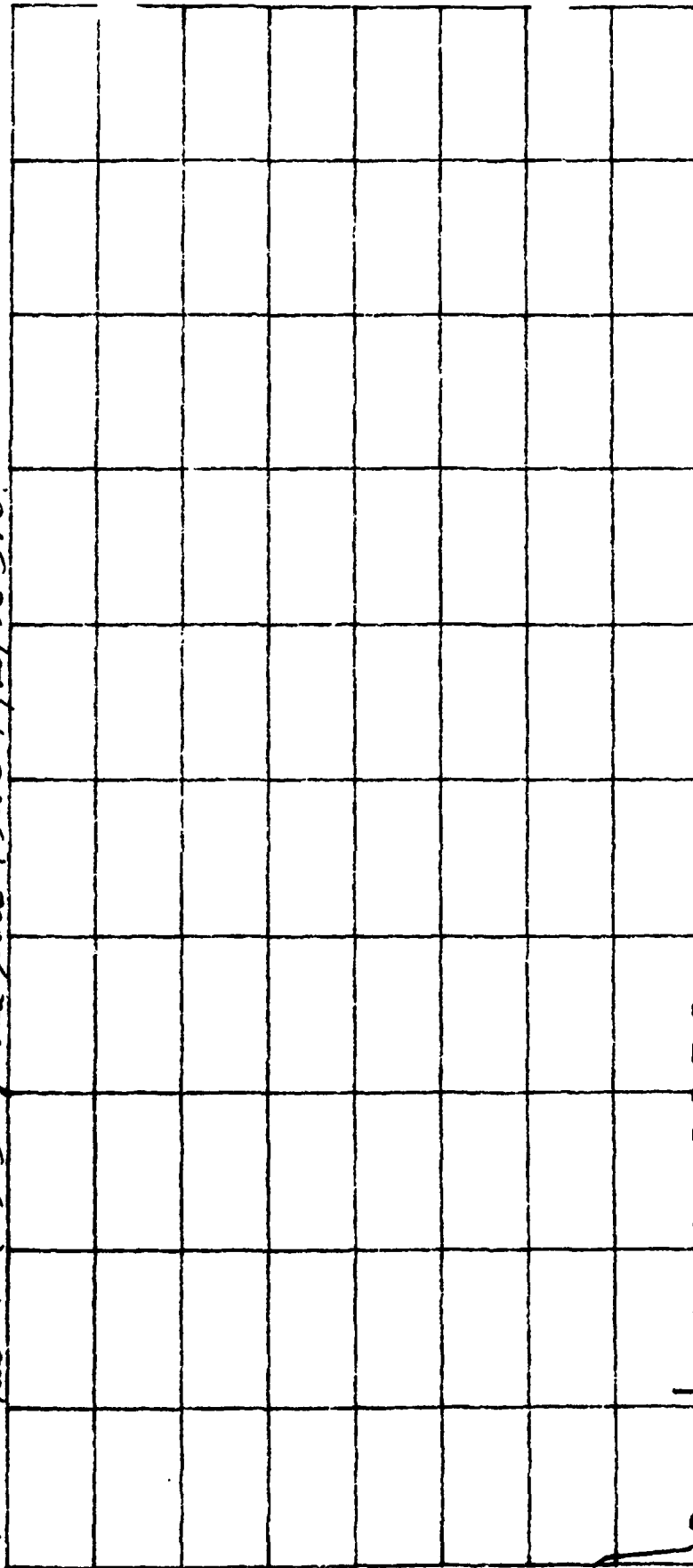
PWR SPECT A : 2.51E-02R 270. HZ N: NONE F: 10HZ  
SPAN: 50.00HZ -2.0500KHZ SN: 7.1+00V FS: 1.4+00R 1.8-01R/

500 016 Radial (0°) suspended mass 4. lbs. 10/23/56



PWR SPECT A 5.11E-03R 270. HZ N: NONE F: 10HZ  
SPAN: 50.00HZ -2.0500KHZ SN: 7.1+00V FS: 1.4+00R 1.8-01R/

5/11/16 Radial (90°) suspended from 4 lbs 10/23/86 Lc.



PWR SPECT A : 4.00E-03R 270. HZ N: NONE P: 10HZ  
SPAN: 50.00HZ -2.0500KHZ SN: 7.1+00V FS: 1.4+00R 1.8-01R/



Sheet 1 of 2

Contract No. DAAK20-84-C-0440

PERFORMANCE TEST

Project No. 24407

DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC  
DRAWING NO. SM-D-5005842

SERIAL NO. 017

| TEST<br>PLAN PARA | PARAMETER                                                     | MEASURED             | UNITS      | LIMITS |                      |
|-------------------|---------------------------------------------------------------|----------------------|------------|--------|----------------------|
|                   |                                                               |                      |            | MIN    | MAX                  |
| 3.10              | Calibration Check                                             | COMPLY               | -          | Comply |                      |
| 4.1.1             | Inspection to SM-D-5005842                                    | COMPLY               | -          | Comply |                      |
| 4.1.2             | Weight                                                        | 2.3                  | Lbs        | -      | 2.5                  |
| 4.1.3.1           | Pressurization                                                | 330                  | PSIG       | Info   | Only                 |
| 4.1.3.2           | Leakage Rate                                                  | 6.0x10 <sup>-7</sup> | STP CC/SEC | -      | 2.7x10 <sup>-7</sup> |
| 4.2.2             | Test at 23°C Horiz; Turn-on Current                           | N/A                  | Amps       | Info   |                      |
| 4.2.2             | Cooldown Time to 100°K                                        | 4.9                  | Minutes    | -      | 7.5                  |
| 4.2.2             | Cooldown Time to 80°K                                         | 5.6                  | Minutes    | -      | 10                   |
| 4.2.2             | Minimum Temp                                                  | 39.0                 | °K         | Info   | 80                   |
| 4.2.2.1           | Stabl. Temp. with 0.35 Watt Heat Load                         | 66.4                 | °K         | -      | 80                   |
| 4.2.2.2           | Temp. after 1/2 Hour Operation                                | 67.6                 | °K         | -      | 80                   |
| 4.2.2.3           | Cold Finger warm end temp                                     | 39                   | °C         | Info   | Only                 |
| 4.2.2.4           | Input Volt 17 VDC Current <u>1.37</u> ADC<br>Power            | 23.29                | Watts      | -      | 30                   |
| 4.2.2.5           | Stabl. Temp with 0.35 Watt Heat Load                          | 69.2                 | °K         | -      | 80                   |
| 4.2.2.5           | Cold Finger Warm End Temp                                     | 34                   | °C         | Info   | Only                 |
| 4.2.2.5           | Input Volts 32 VDC Current <u>.81</u> ADC<br>Power            | 25.92                | Watts      | -      | 30                   |
| 4.2.3             | Test at -40°C Horiz; Turn-on Current                          | N/A                  | Amps       | Info   |                      |
| 4.2.3.1           | Cooldown Time to 100°K                                        | 4.5                  | Minutes    | -      | 7.5                  |
| 4.2.3.1           | Cooldown Time to 80°K                                         | 5.3                  | Minutes    | -      | 10                   |
| 4.2.3.2           | Stabl. Temp with 0.2 Watt Heat Load                           | 53.7                 | °K         | -      | 80                   |
| 4.2.3.2           | Temp after 1/2 Hour                                           | 59.3                 | °K         | -      | 80                   |
| 4.2.3.3           | Cold Finger Warm End Temp                                     | -33                  | °C         | Info   | Only                 |
| 4.2.3.4           | Input Volts 17 VDC Current <u>1.40</u> ADC<br>Stablized Power | 23.80                | Watts      | -      | 30                   |
| 4.2.3.5           | Temp with 0.2 Watt Head Load                                  | 56.0                 | °K         | -      | 80                   |
| 4.2.3.5           | Cold Finger Warm End Temp                                     | -32                  | °C         | Info   | Only                 |
| 4.2.3.5           | Input Volts 32 VDC Current <u>.81</u> ADC<br>Power            | 25.92                | Watts      | -      | 30                   |
| 4.2.4             | Test at 71°C Horiz; Turn-on Current                           | N/A                  | Amps       | Info   |                      |
| 4.2.4.1           | Cooldown Time to 100°K                                        | 5.6                  | Minutes    | -      | 7.5                  |
| 4.2.4.1           | Cooldown Time to 80°K                                         | 6.7                  | Minutes    | -      | 10                   |
| 4.2.4.1           | Stabl. Temp. with 0.2 Watt Heat Load                          | 66.6                 | °K         | -      | 80                   |
| 4.2.4.1           | Temp after 1/2 hour                                           | 67.9                 | °K         | -      | 80                   |
| 4.2.4.2           | Cold Finger Warm End Temp                                     | 82                   | °C         | Info   | Only                 |
| 4.2.4.3           | Input Volts 17 VDC Current <u>1.56</u> ADC<br>Power           | 26.52                | Watts      | -      | 35                   |
| 4.2.4.4           | Stabl. Temp with 0.2 Watt Head Load                           | 69.0                 | °K         | -      | 80                   |
| 4.2.4.4           | Cold Finger Warm End Temp                                     | 82                   | °C         | Info   | Only                 |
| 4.2.4.4           | Input Volts 32 VDC Current ADC <u>.91</u><br>Power            | 29.12                | Watts      | -      | 35                   |

Performed By: P. HARTMANN

B-43

Date: 10-29-86

Witnessed By: [Signature]

Q. A. Magnavox

Witnessed By: [Signature] DCN-00K

31 OCT 1986

Q. A. Customer





Contract: DAAK20-84-C-0440

PERFORMANCE TEST

Project: 24407

DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC

SERIAL NO. 017

DRAWING NO. SM-D-5005842

| TEST<br>PLAN PARA | PARAMETER                                    | MEASURED             | UNITS      | LIMITS |                      |
|-------------------|----------------------------------------------|----------------------|------------|--------|----------------------|
|                   |                                              |                      |            | MIN    | MAX                  |
| 4.2.5             | Test at 23°C Vertical; Turn-on Current       | N/A                  | Amps       | Info   |                      |
| 4.2.5.1           | Cooldown Time to 100°K                       | 5.4                  | Minutes    | -      | 7.5                  |
| 4.2.5.1           | Cooldown Time to 80°K                        | 6.2                  | Minutes    | -      | 10                   |
| 4.2.5.1           | Minimum Temp                                 | 39.2                 | °K         |        | 80                   |
| 4.2.5.2           | Stabl. Temp with 0.35 Watt Heat Load         | 66.8                 | °K         | -      | 80                   |
| 4.2.5.3           | Temp After 1/2 Hour With Heat Load           | 66.9                 | °K         | Info   | 80                   |
| 4.2.5.4           | Cold Finger Warm End Temp                    | 39                   | °C         | Info   | Only                 |
| 4.2.5.5           | Input Volts 17 VDC Current 1.30 ADC<br>Power | 22.10                | Watts      | -      | 30                   |
| 4.2.5.6           | Stabl. Temp. with 0.35 Watt Heat Load        | 67.9                 | °K         |        | 80                   |
| 4.2.5.6           | Cold Finger Warm End Temp                    | 35                   | °C         | Info   | Only                 |
| 4.2.5.6           | Input Volt 32 VDC Current .78 ADC<br>Power   | 24.96                | Watts      | -      | 30                   |
| 4.2.6             | Leakage Rate                                 | 3.4x10 <sup>-7</sup> | STP CC/SEC | -      | 2.7x10 <sup>-7</sup> |

PERFORMED BY P. HARTMANN

DATE 10-31-86

WITNESSED BY [Signature] Q.A. MAGNAVOX

WITNESSED BY [Signature] Q.A. CUSTOMER

31 OCT 1986





**PERFORMANCE TEST**  
**VIBRATION OUTPUT TEST DATA**  
**1/4 WATT LINEAR RESONANT CRYOGENIC COOLER**  
**MH & T PROGRAM**

DRAWING NO.: SM-D-5005842

SERIAL NO.: 017

CONTRACT : DAAK20-84-C-0440

PROJECT : 24407

| Test Plan Para | Frequency                  | Maximum Force Along Compressor Axis, $\pm$ lbs | Measure Force Along Compressor Axis, lbs. | Maximum Force In Any Compressor Radial Axis, $\pm$ lbs | Measured Force In Any compressor Radial<br>0° Axis, lbs. 90° |       |
|----------------|----------------------------|------------------------------------------------|-------------------------------------------|--------------------------------------------------------|--------------------------------------------------------------|-------|
| 4.3.9          | Fundamental (54 Hz)        | 1.0                                            | .4715                                     | 1.5                                                    | .365                                                         | 1.5   |
|                | 1st Harmonic (108 Hz)      | 2.5                                            | 2.345                                     | 0.22                                                   | .0276                                                        | .022  |
|                | 2nd Harmonic (162 Hz)      | 1.4                                            | .717                                      | 0.13                                                   | .0210                                                        | .041  |
|                | 3rd Harmonic (216 Hz)      | 0.30                                           | .241                                      | 0.13                                                   | .0070                                                        | .0047 |
|                | Next 37 Harmonics (270 Hz) | 0.10                                           | .0934                                     | 0.10                                                   | .0426                                                        | .0512 |
|                |                            |                                                |                                           |                                                        |                                                              |       |

PERFORMED BY: Red Matrone DATE: 10 24 86

WITNESSED BY: [Signature] 27 OCT 1986  
DCM-QA 5310/A CUSTOMER Q.A.



[Signature] MAGNAVOX Q.A.

PERFORMANCE TEST  
VIBRATION OUTPUT TEST DATA  
1/2 WATT LINEAR RESONANT CRYOGENIC COOLER  
MM&T PROGRAM

Test Plan Paragraph: 4.3.9

Cooler S/N: 017

Total Suspended Weight 4.1 lbs

Date: 10-24-86

| S/N | Freq. | Force Along Compressor Axis |       | Force Along Radial Axis |         |        |       |
|-----|-------|-----------------------------|-------|-------------------------|---------|--------|-------|
|     |       | g's                         | lbs   | Axis*1                  |         | Axis*2 |       |
|     |       |                             |       | g's                     | lbs     | g's    | lbs   |
| 1   | 54    | .115                        | .4715 | .0891                   | .365    | .384   | 1.5   |
| 2   | 108   | .572                        | 2.345 | .00674                  | .0276   | .0074  | .022  |
| 3   | 162   | .175                        | .717  | .00514                  | .0210   | .0101  | .041  |
| 4   | 216   | .0588                       | .241  | .00172                  | .0070   | .00239 | .0097 |
| 5   | 270   | .0228                       | .0934 | .00281                  | .0115   | .00173 | .0070 |
| 6   | 324   | .00714                      | .0292 | .0104                   | .0426   | .0125  | .0512 |
| 7   | 378   | .00336                      | .0137 | .00803                  | .0329   | .00842 | .0345 |
| 8   | 432   | .00317                      | .0129 | .00143                  | .007503 | .00224 | .0091 |
| 9   | 486   | .00125                      | .0051 | .00077                  | .0029   | .00379 | .0155 |
| 10  | 540   | .00346                      | .0141 | .00169                  | .0069   | .00485 | .0198 |
| 11  | 594   | .00198                      | .0081 | .00212                  | .0086   | .00124 | .0050 |
| 12  | 648   | .000954                     | .0039 | .00204                  | .0083   | .00184 | .0075 |
| 13  | 702   | .00392                      | .0160 | .00569                  | .0233   | .00881 | .0402 |
| 14  | 756   | .00167                      | .0068 | .00338                  | .0261   | .00784 | .0321 |
| 15  | 810   | .00204                      | .0083 | .00111                  | .0045   | .00751 | .0307 |

Con't Page 2

\* Axis 1 = along transfer tube  
 Axis 2 = perpendicular to axis 1

Performed by: Paul Martineau

Date: 10-24-86

Witnessed By: [Signature]

B-46

Customer QA  
 Magnavox QA

PERFORMANCE TEST  
VIBRATION OUTPUT TEST DATA  
1/2 WATT LINEAR RESONANT CRYOGENIC COOLER  
MM&T PROGRAM

Test Plan Paragraph: 4.3.9

Cooler S/N: 017

Total Suspended Weight 4.1 lbs

Date: 10-24-86

| S/N | Freq. | Force Along Compressor Axis |        | Force Along Radial Axis |               |         |               |  |
|-----|-------|-----------------------------|--------|-------------------------|---------------|---------|---------------|--|
|     |       | g's                         | lbs    | g's                     | Axis*1<br>lbs | g's     | Axis*2<br>lbs |  |
| 16  | 864   | .0127                       | .05207 | .00373                  | .0152         | .000874 | .0035         |  |
| 17  | 918   | .00207                      | .0084  | .00206                  | .0084         | .00199  | .0081         |  |
| 18  | 972   | .00141                      | .0057  | .000832                 | .0034         | .00221  | .0090         |  |
| 19  | 1026  | .00240                      | .0098  | .00230                  | .00943        | .00520  | .0213         |  |
| 20  | 1080  | .00162                      | .0066  | .00363                  | .0144         | .0115   | .0471         |  |
| 21  | 1134  | .00111                      | .0045  | .00295                  | .0120         | .000446 | .0020         |  |
| 22  | 1188  | .00147                      | .0060  | .00153                  | .0062         | .00230  | .0094         |  |
| 23  | 1242  | .000813                     | .0033  | .00443                  | .0181         | .00407  | .0166         |  |
| 24  | 1296  | .00208                      | .0085  | .00191                  | .0078         | .00499  | .0209         |  |
| 25  | 1350  | .00212                      | .0082  | .00175                  | .0071         | .00374  | .0153         |  |
| 26  | 1404  | .000738                     | .0030  | .000824                 | .0033         | .00654  | .0026         |  |
| 27  | 1458  | .000851                     | .0034  | .000942                 | .0040         | .00135  | .0055         |  |

Con't Page 3

\*Axis 1 = along transfer tube  
 Axis 2 = perpendicular to axis 1

Performed By: David Matheson

Date: 10-24-86

Witnessed By: \_\_\_\_\_

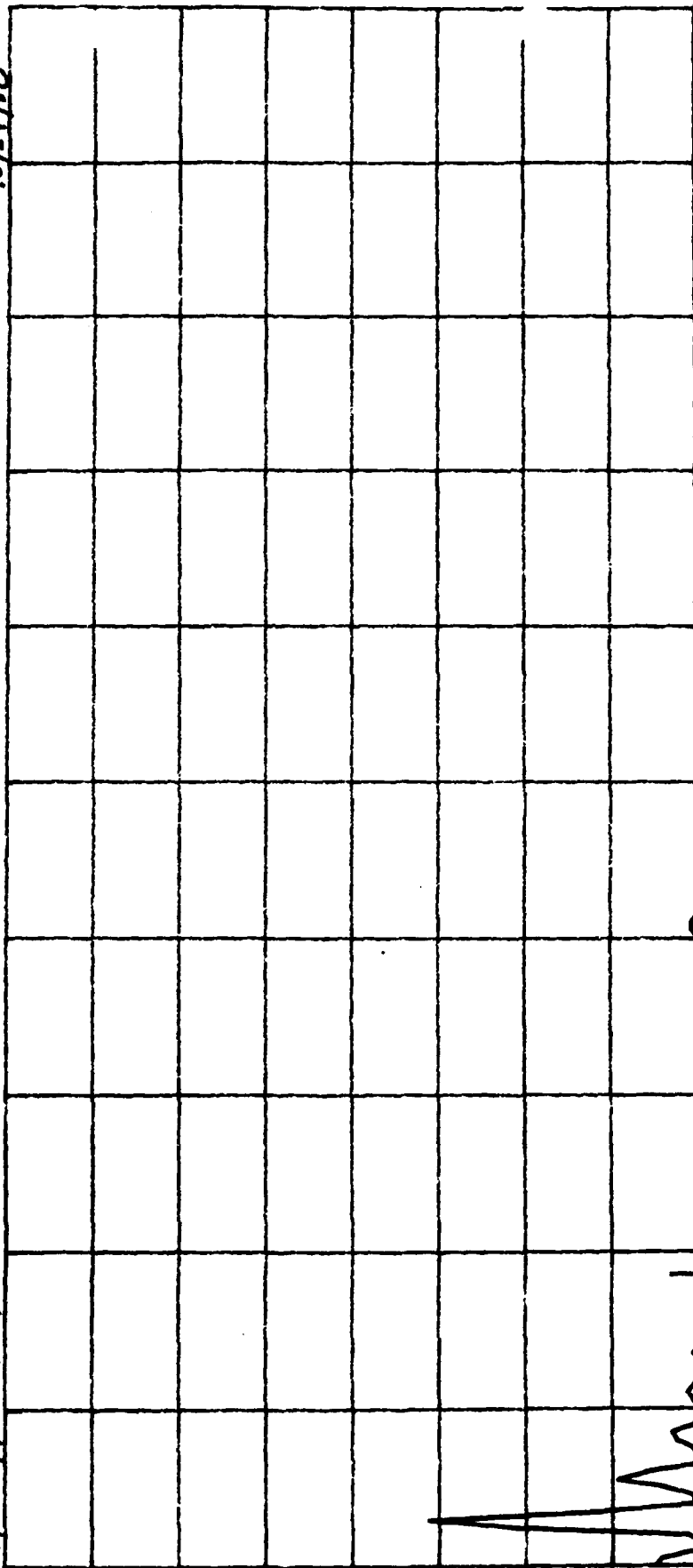
Customer QA

[Signature]

Magnavox QA

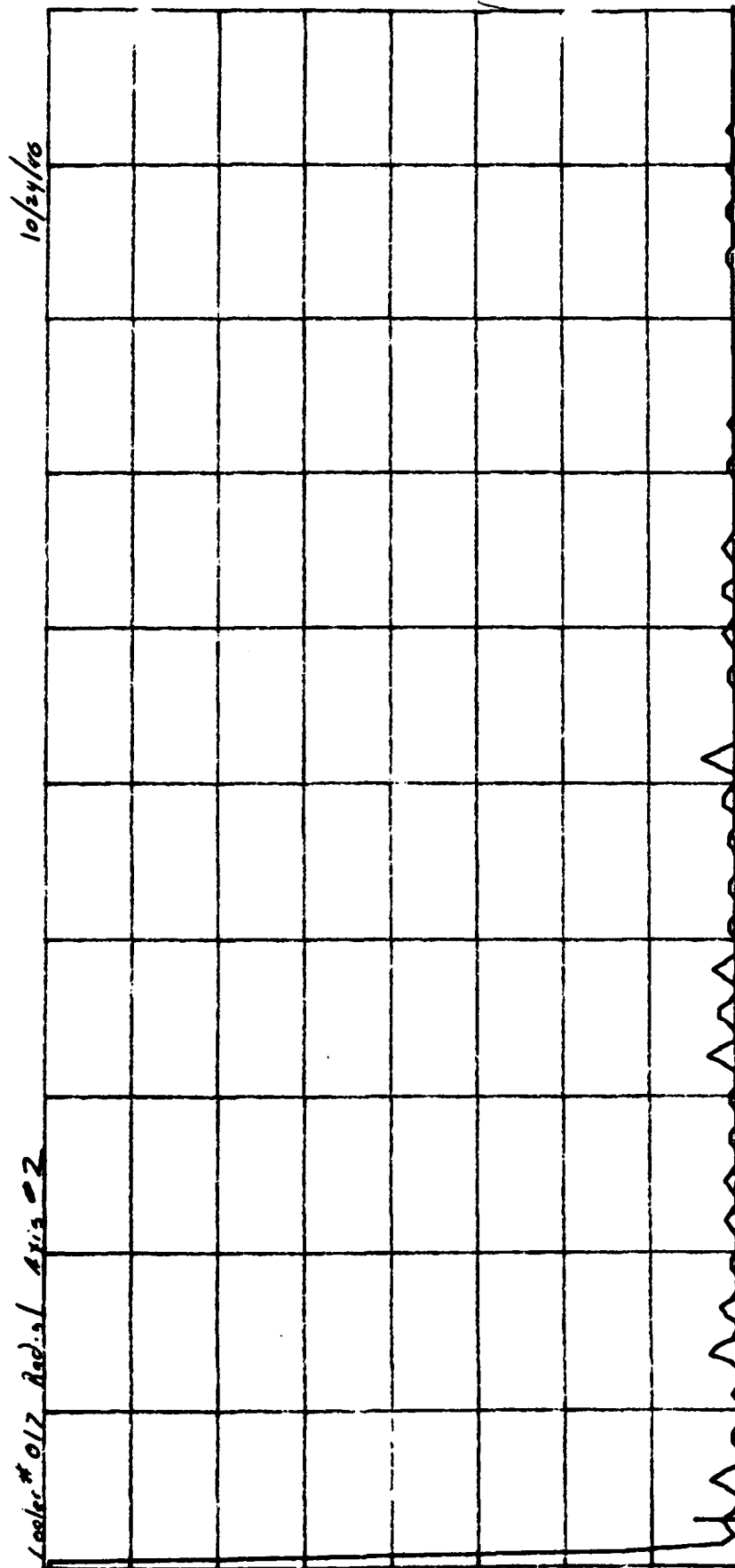
S/N 017 A.H. 91

10/24/86



B-48

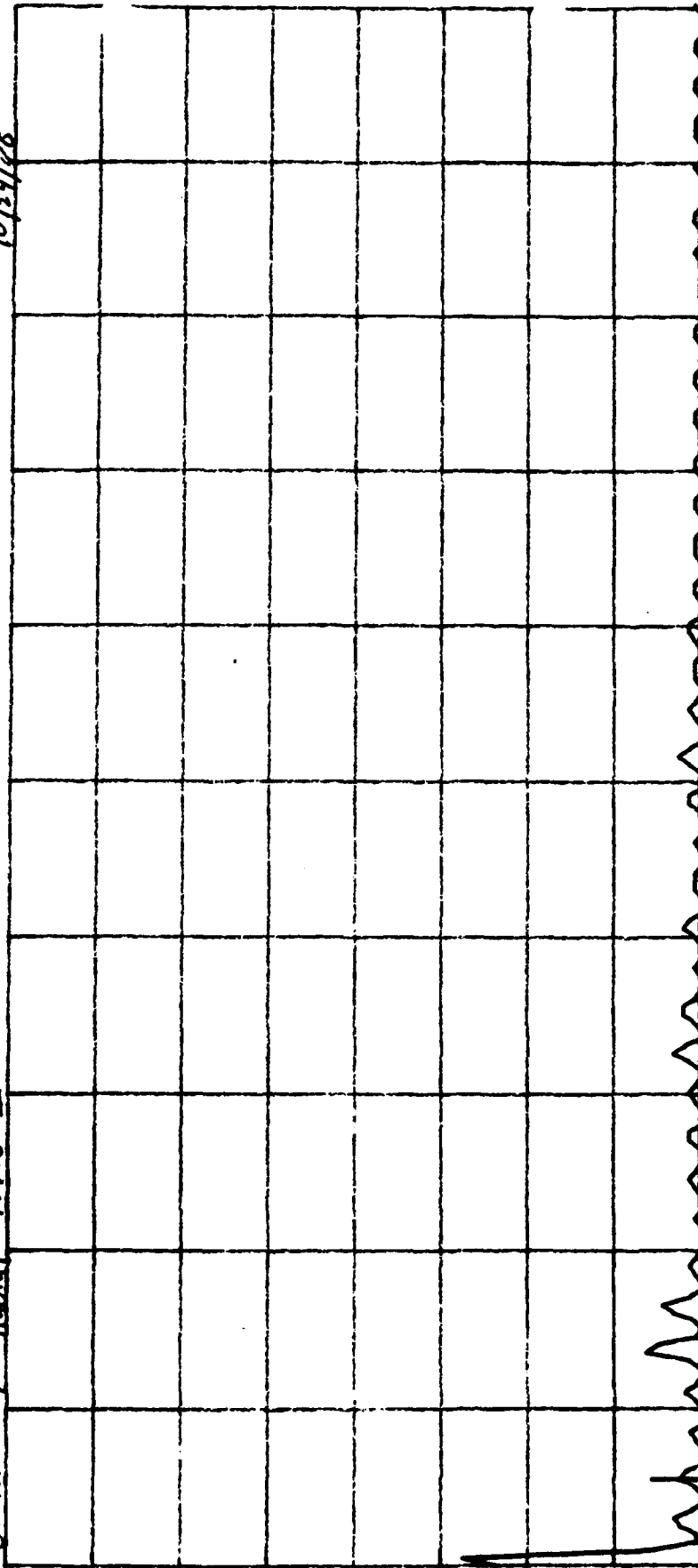
PWR SPECT A : 1.30E-03R 420. HZ N: NONE F: 10HZ  
SPAN: 50.00HZ -2.0500KHZ SN: 1.4+00V FS: 1.4+00R 1.8-01R/



PWR SPECT A 16.53E-03R 110. HZ N: NONE P: 10HZ  
 SPAN: 50.00HZ -2.0500KHZ SN: 1.4+00V FS: 2.8-01R 3.5-02R/

Cooler W017 Radial Axis #2

10/24/68



PWR SPECT A : 4. 29E-03R 160. HZ N: NONE F: 10HZ  
SPAN: 50. 00HZ -2. 0500KHZ SN: 1. 4+00V FS: 1. 4-01R 1. 8-02R/

OCTAVE BAND CENTER FREQUENCY (HZ)

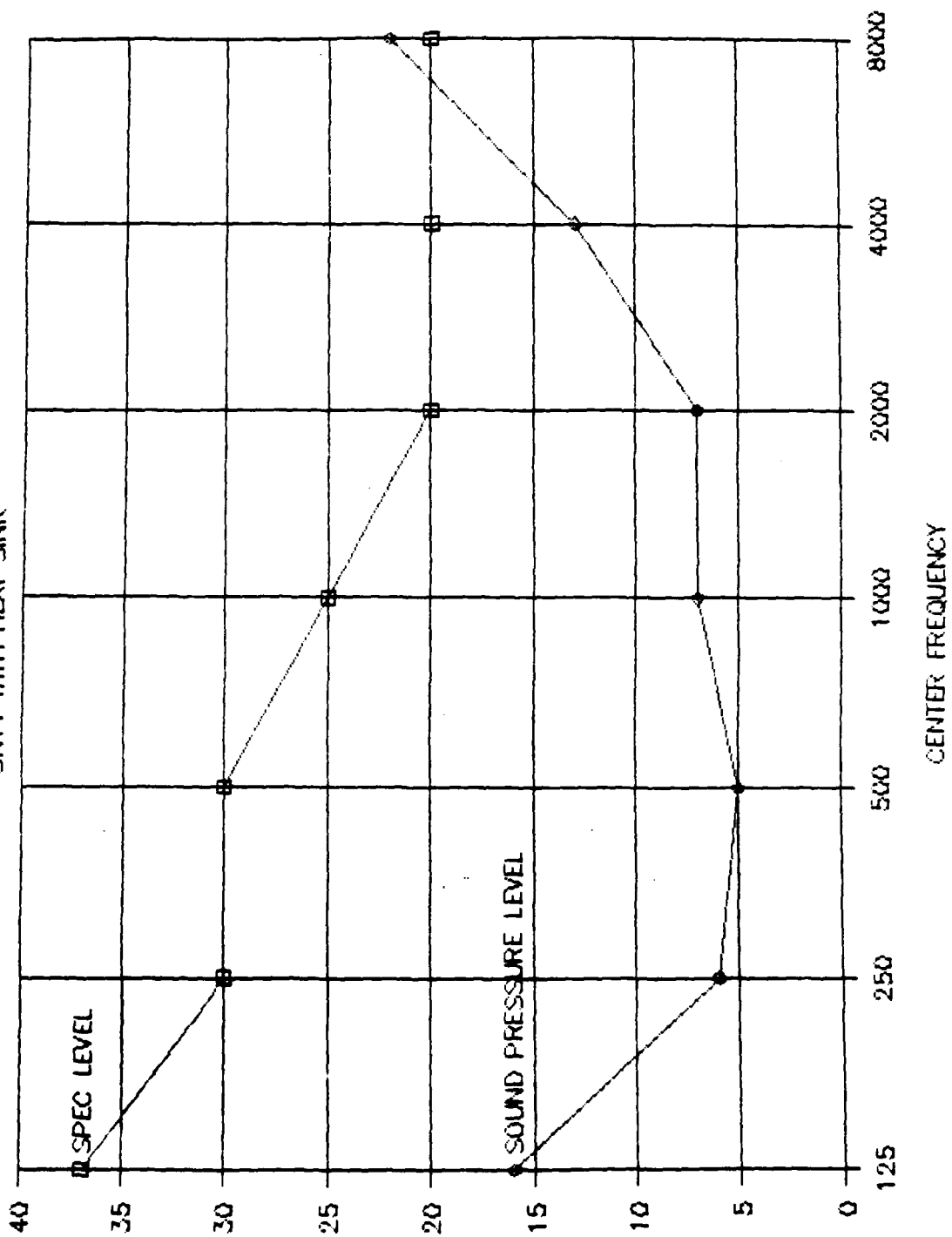
| 1/4 WATT LINEAR<br>COOLER: SN | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 |
|-------------------------------|-----|-----|-----|------|------|------|------|
| 011                           | 16  | 6   | 5   | 7    | 7    | 13   | 22   |
| 013                           | 16  | 6   | 8   | 13   | 11   | 13   | 16   |
| 015                           | 16  | 6   | 20  | 21   | 17   | 18   | 27   |
| 016                           | 22  | 9   | 9   | 6    | 4    | 6    | 13   |
| SPEC MAXIMUM:                 | 37  | 30  | 30  | 25   | 20   | 20   | 20   |

Maximum side, Octave Band Sound Pressure Levels  
Generated by the 1/4 Watt Linear Cooler (dB re: .0002 uBar)

Table 1

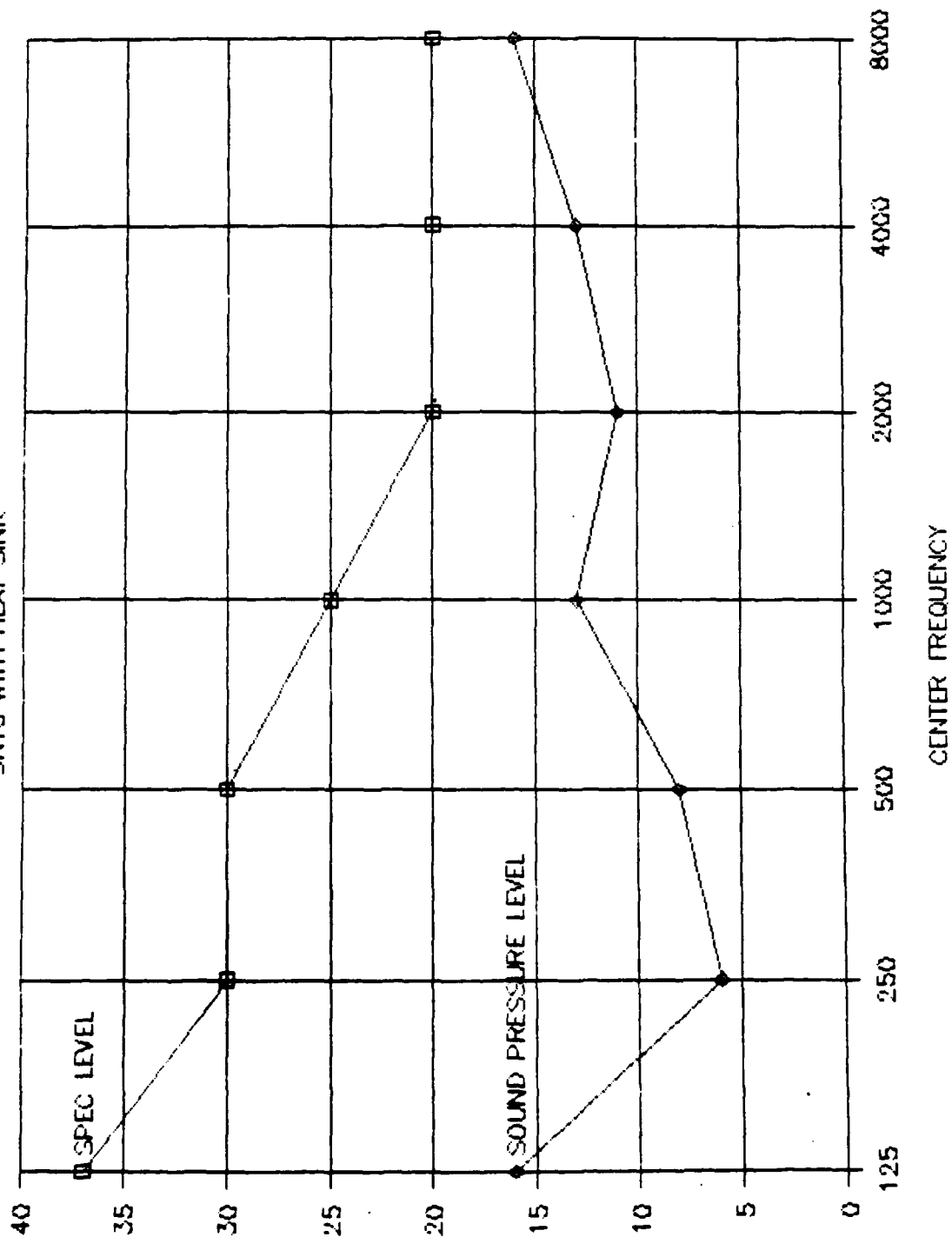
# MM&T COOLER AUDIBLE NOISE

SN11 WITH HEAT SINK



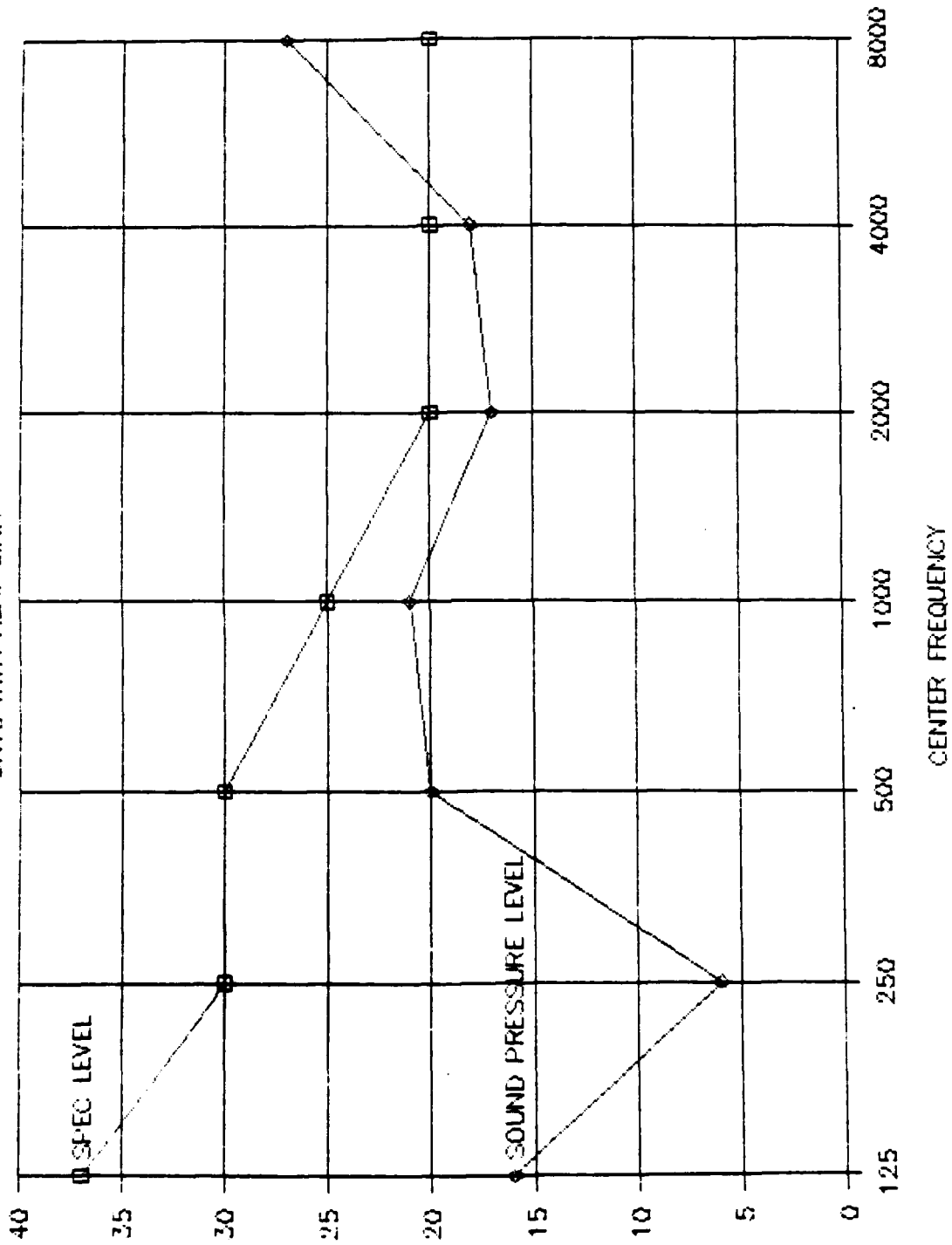
# MM&I COOLER AUDIBLE NOISE

SN13 WITH HEAT SINK



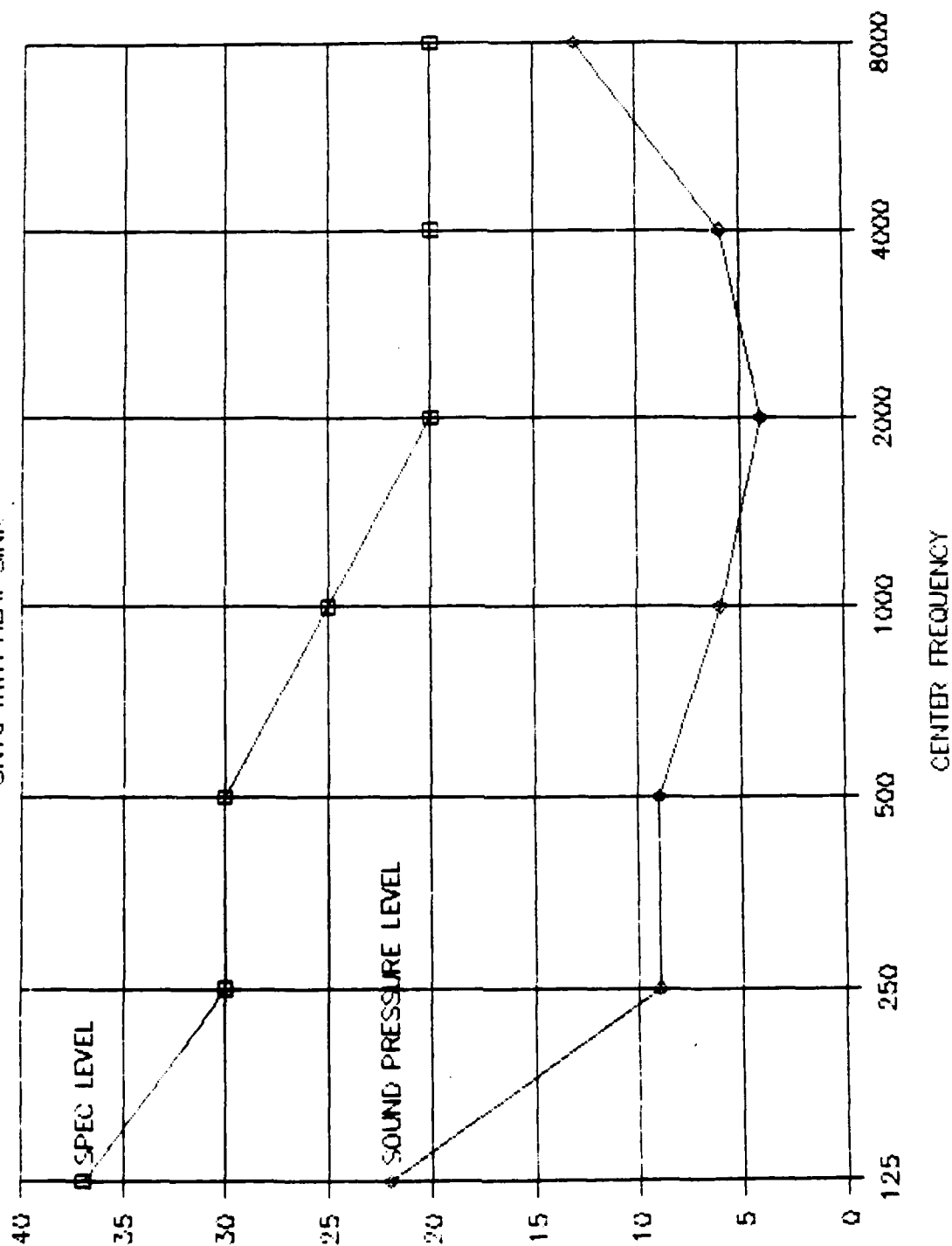
# MM&T COOLER ADJIBLE NOISE

GN15 WITH HEAT SINK



# MM&T COOLER AUDIBLE NOISE

SN116 WITH HEAT SINK



# NYEOL CRYOGENIC COOLER LAB

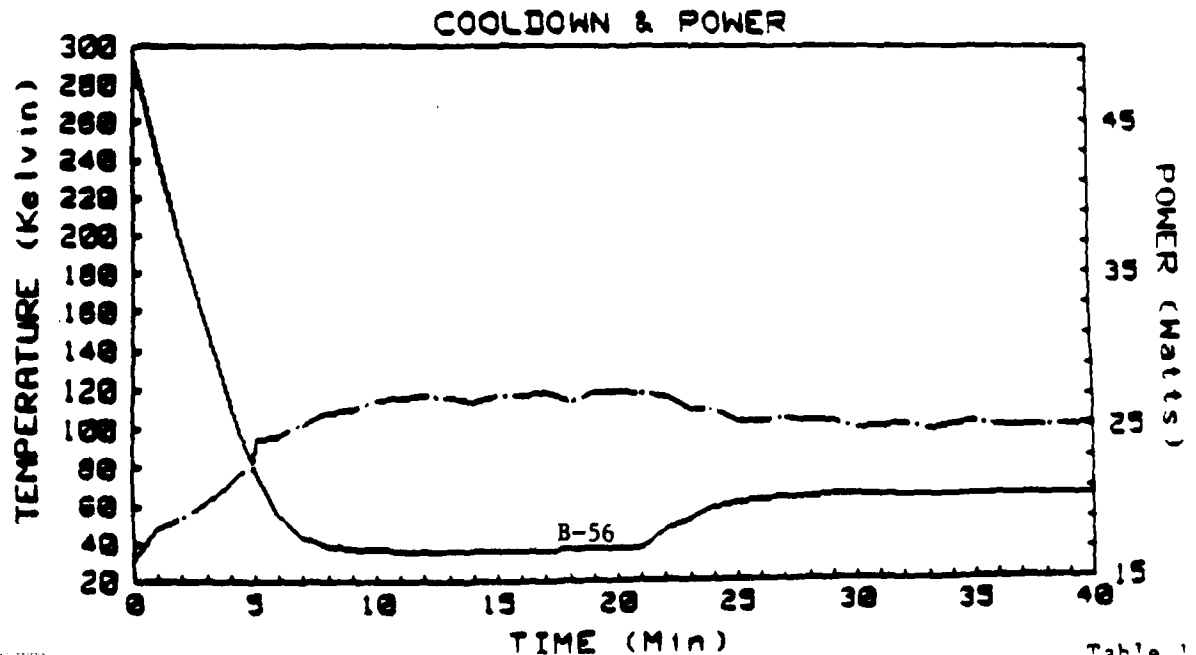
## CRYOGENIC COOLER DATA

COOLER: MAGNAVON 10  
VOLTAGE: 17.5  
AMBIENT: 23°C

DATE: 24 NOV 86 15:43  
ENGR: HLB  
PROG: CATP 1.0

TEST: BASELINE AS RECD FROM MAGIEC

| TIME  | POWER | CURRENT | KELVIN | LOAD  |
|-------|-------|---------|--------|-------|
| 0.00  | 16.38 | .936    | 299.67 | 0.000 |
| 1.00  | 18.58 | 1.091   | 244.58 | 0.000 |
| 2.00  | 19.10 | 1.101   | 196.38 | 0.000 |
| 3.00  | 20.24 | 1.177   | 192.81 | 0.000 |
| 4.00  | 21.53 | 1.271   | 113.53 | 0.000 |
| 4.45  | 22.11 | 1.263   | 98.42  | 0.000 |
| 5.00  | 22.76 | 1.309   | 79.84  | 0.000 |
| 5.12  | 24.39 | 1.394   | 76.76  | 0.000 |
| 6.00  | 24.52 | 1.441   | 59.17  | 0.000 |
| 7.00  | 25.31 | 1.482   | 43.45  | 0.000 |
| 8.00  | 26.14 | 1.532   | 38.94  | 0.000 |
| 9.00  | 26.23 | 1.528   | 37.38  | 0.000 |
| 10.00 | 26.83 | 1.464   | 36.73  | 0.000 |
| 11.00 | 26.96 | 1.489   | 36.35  | 0.000 |
| 12.00 | 27.18 | 1.577   | 36.19  | 0.000 |
| 13.00 | 27.82 | 1.512   | 36.23  | 0.000 |
| 14.00 | 26.79 | 1.533   | 36.27  | 0.000 |
| 15.00 | 27.12 | 1.553   | 36.38  | 0.000 |
| 16.00 | 27.25 | 1.563   | 36.46  | 0.000 |
| 17.00 | 27.28 | 1.571   | 36.58  | 0.000 |
| 18.00 | 26.77 | 1.531   | 36.65  | 0.000 |
| 19.00 | 27.31 | 1.544   | 36.73  | 0.000 |
| 20.00 | 27.29 | 1.568   | 36.81  | 0.000 |
| 30.00 | 24.92 | 1.487   | 64.21  | .343  |
| 40.00 | 25.11 | 1.477   | 64.83  | .343  |



# NVEOL CRYOGENIC COOLER LAB

## CRYOGENIC COOLER DATA

COOLER: MAGNAVON 10  
VOLTAGE: 17.5  
AMBIENT:

DATE: 24 NOV 86 13:34  
ENGR: HLD  
PROG: CATP 1.0

TEST: BASELINE AS RECD FROM MAGIEC

| TIME  | POWER | CURRENT | KELVIN | LOAD  |
|-------|-------|---------|--------|-------|
| 0.00  | 16.38 | .936    | 295.67 | 0.000 |
| 1.00  | 18.50 | 1.091   | 244.58 | 0.000 |
| 2.00  | 19.10 | 1.101   | 196.58 | 0.000 |
| 3.00  | 20.24 | 1.177   | 152.81 | 0.000 |
| 4.00  | 21.53 | 1.271   | 113.53 | 0.000 |
| 4.45  | 22.11 | 1.263   | 98.42  | 0.000 |
| 5.00  | 22.76 | 1.305   | 79.84  | 0.000 |
| 5.12  | 24.39 | 1.394   | 76.76  | 0.000 |
| 6.00  | 24.52 | 1.441   | 55.17  | 0.000 |
| 7.00  | 25.31 | 1.482   | 43.45  | 0.000 |
| 8.00  | 26.14 | 1.532   | 38.94  | 0.000 |
| 9.00  | 26.23 | 1.528   | 37.38  | 0.000 |
| 10.00 | 26.83 | 1.464   | 36.73  | 0.000 |
| 11.00 | 26.96 | 1.489   | 36.35  | 0.000 |
| 12.00 | 27.18 | 1.577   | 36.19  | 0.000 |
| 13.00 | 27.82 | 1.512   | 36.23  | 0.000 |
| 14.00 | 26.75 | 1.533   | 36.27  | 0.000 |
| 15.00 | 27.12 | 1.553   | 36.38  | 0.000 |
| 16.00 | 27.25 | 1.563   | 36.46  | 0.000 |
| 17.00 | 27.28 | 1.571   | 36.58  | 0.000 |
| 18.00 | 26.77 | 1.531   | 36.65  | 0.000 |
| 19.00 | 27.31 | 1.544   | 36.73  | 0.000 |
| 20.00 | 27.29 | 1.568   | 36.81  | 0.000 |
| 21.00 | 27.16 | 1.522   | 36.88  | 0.000 |
| 22.00 | 27.83 | 1.522   | 46.86  | .195  |
| 23.00 | 26.16 | 1.511   | 52.29  | .273  |
| 24.00 | 26.84 | 1.496   | 57.89  | .343  |
| 25.00 | 25.36 | 1.428   | 61.13  | .343  |
| 26.00 | 25.36 | 1.466   | 62.54  | .343  |
| 27.00 | 25.44 | 1.427   | 63.33  | .343  |
| 28.00 | 25.38 | 1.458   | 63.75  | .343  |
| 29.00 | 25.26 | 1.453   | 64.84  | .343  |
| 30.00 | 24.92 | 1.487   | 64.21  | .343  |
| 31.00 | 24.97 | 1.433   | 64.29  | .343  |
| 32.00 | 25.13 | 1.421   | 64.33  | .343  |
| 33.00 | 24.82 | 1.488   | 64.46  | .343  |
| 34.00 | 25.21 | 1.418   | 64.54  | .343  |
| 35.00 | 25.36 | 1.477   | 64.63  | .343  |
| 36.00 | 25.18 | 1.389   | 64.63  | .343  |
| 37.00 | 25.88 | 1.484   | 64.75  | .343  |
| 38.00 | 25.89 | 1.432   | 64.75  | .343  |
| 39.00 | 24.97 | 1.462   | 64.79  | .343  |
| 40.00 | 25.11 | 1.477   | 64.83  | .343  |
| 41.00 | 24.93 | 1.479   | 64.83  | .343  |

# NVEOL CRYOGENIC COOLER LAB

## CRYOGENIC COOLER DATA

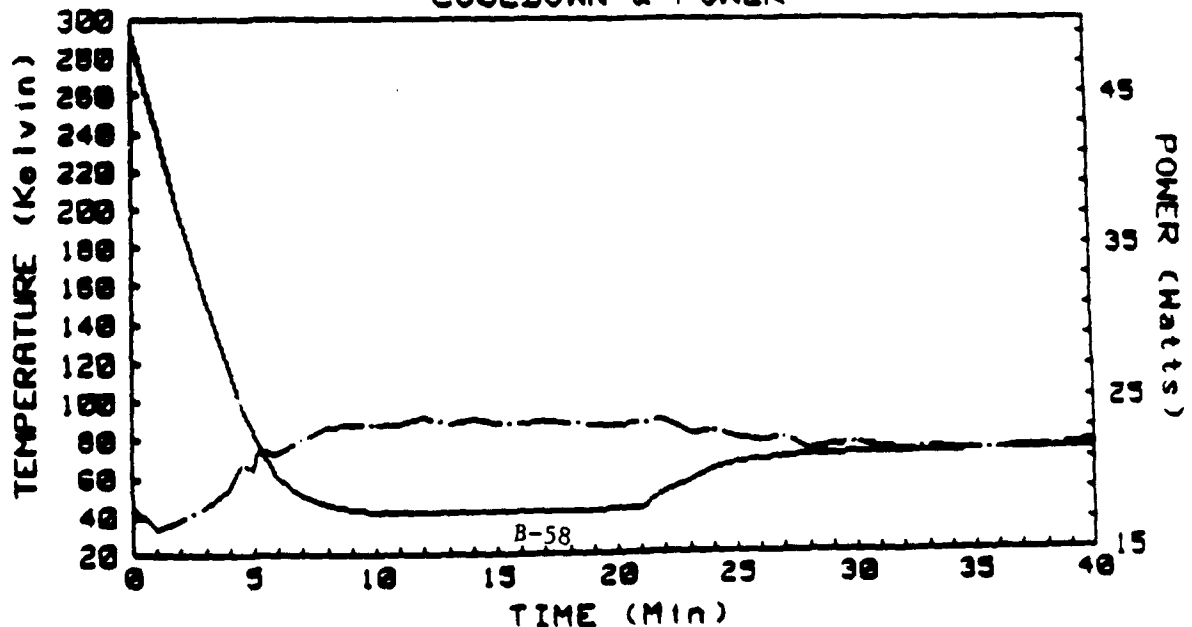
COOLER: MAGNAVOK 017  
VOLTAGE: 17.5  
AMBIENT: 23°C

DATE: 24 NOV 86 17:44  
ENGR: HAL  
PROG: CATP 1.0

TEST: BASELINE AS RECVD FROM MAGNAVOK

| TIME  | POWER | CURRENT | KELVIN | LOAD  |
|-------|-------|---------|--------|-------|
| 0.00  | 10.11 | 1.035   | 293.71 | 0.000 |
| 1.00  | 16.60 | .979    | 245.03 | 0.000 |
| 2.00  | 17.33 | 1.032   | 197.75 | 0.000 |
| 3.00  | 10.21 | 1.077   | 153.72 | 0.000 |
| 4.00  | 19.32 | 1.155   | 116.25 | 0.000 |
| 4.55  | 20.96 | 1.190   | 90.24  | 0.000 |
| 5.00  | 20.59 | 1.200   | 83.71  | 0.000 |
| 5.23  | 21.74 | 1.242   | 77.09  | 0.000 |
| 6.00  | 21.69 | 1.265   | 61.13  | 0.000 |
| 7.00  | 22.53 | 1.296   | 50.46  | 0.000 |
| 8.00  | 23.29 | 1.312   | 45.50  | 0.000 |
| 9.00  | 23.56 | 1.301   | 43.05  | 0.000 |
| 10.00 | 23.41 | 1.330   | 41.73  | 0.000 |
| 11.00 | 23.51 | 1.344   | 41.60  | 0.000 |
| 12.00 | 23.93 | 1.360   | 41.64  | 0.000 |
| 13.00 | 23.53 | 1.329   | 41.64  | 0.000 |
| 14.00 | 23.00 | 1.352   | 41.73  | 0.000 |
| 15.00 | 23.40 | 1.320   | 41.90  | 0.000 |
| 16.00 | 23.55 | 1.320   | 42.00  | 0.000 |
| 17.00 | 23.59 | 1.370   | 42.30  | 0.000 |
| 18.00 | 23.49 | 1.331   | 42.52  | 0.000 |
| 19.00 | 23.39 | 1.321   | 42.70  | 0.000 |
| 20.00 | 23.37 | 1.341   | 42.80  | 0.000 |
| 30.00 | 22.15 | 1.265   | 71.26  | .344  |
| 40.00 | 22.14 | 1.253   | 73.37  | .344  |

COOLDOWN & POWER



# NVEOL CRYOGENIC COOLER LAB

## CRYOGENIC COOLER DATA

COOLER: MAGNAVOX 817  
VOLTAGE: 17.5  
AMBIENT:

DATE: 24 NOV 86 17:44  
ENGR: HAL  
PROG: CATP 1.0

TEST: BASELINE AS RECVD FROM MAGNAVOX

| TIME  | POWER | CURRENT | KELVIN | LOAD  |
|-------|-------|---------|--------|-------|
| 0.00  | 18.11 | 1.035   | 293.71 | 0.000 |
| 1.00  | 16.68 | .979    | 249.83 | 0.000 |
| 2.00  | 17.33 | 1.032   | 197.75 | 0.000 |
| 3.00  | 18.21 | 1.077   | 153.72 | 0.000 |
| 4.00  | 19.32 | 1.155   | 116.25 | 0.000 |
| 4.55  | 20.96 | 1.190   | 98.24  | 0.000 |
| 5.00  | 20.59 | 1.200   | 83.71  | 0.000 |
| 5.23  | 21.74 | 1.242   | 77.89  | 0.000 |
| 6.00  | 21.69 | 1.265   | 61.13  | 0.000 |
| 7.00  | 22.53 | 1.296   | 50.46  | 0.000 |
| 8.00  | 23.29 | 1.312   | 45.50  | 0.000 |
| 9.00  | 23.56 | 1.301   | 43.85  | 0.000 |
| 10.00 | 23.41 | 1.330   | 41.73  | 0.000 |
| 11.00 | 23.51 | 1.344   | 41.60  | 0.000 |
| 12.00 | 23.93 | 1.360   | 41.64  | 0.000 |
| 13.00 | 23.53 | 1.329   | 41.64  | 0.000 |
| 14.00 | 23.00 | 1.352   | 41.73  | 0.000 |
| 15.00 | 23.40 | 1.320   | 41.90  | 0.000 |
| 16.00 | 23.55 | 1.320   | 42.00  | 0.000 |
| 17.00 | 23.59 | 1.370   | 42.30  | 0.000 |
| 18.00 | 23.49 | 1.331   | 42.52  | 0.000 |
| 19.00 | 23.39 | 1.321   | 42.70  | 0.000 |
| 20.00 | 23.37 | 1.341   | 42.80  | 0.000 |
| 21.00 | 23.41 | 1.327   | 43.01  | 0.000 |
| 22.00 | 23.66 | 1.329   | 52.00  | .195  |
| 23.00 | 22.77 | 1.325   | 57.44  | .273  |
| 24.00 | 22.79 | 1.277   | 63.13  | .344  |
| 25.00 | 22.42 | 1.279   | 67.01  | .344  |
| 26.00 | 22.19 | 1.229   | 68.64  | .344  |
| 27.00 | 22.37 | 1.252   | 69.69  | .344  |
| 28.00 | 21.67 | 1.217   | 70.37  | .344  |
| 29.00 | 21.99 | 1.275   | 70.83  | .344  |
| 30.00 | 22.15 | 1.265   | 71.26  | .344  |
| 31.00 | 21.81 | 1.247   | 71.54  | .344  |
| 32.00 | 21.60 | 1.217   | 71.73  | .344  |
| 33.00 | 21.70 | 1.275   | 72.00  | .344  |
| 34.00 | 21.64 | 1.216   | 72.24  | .344  |
| 35.00 | 21.60 | 1.270   | 72.47  | .344  |
| 36.00 | 21.70 | 1.242   | 72.71  | .344  |
| 37.00 | 21.71 | 1.255   | 72.94  | .344  |
| 38.00 | 21.84 | 1.217   | 73.10  | .344  |
| 39.00 | 21.90 | 1.264   | 73.29  | .344  |
| 40.00 | 22.14 | 1.253   | 73.37  | .344  |
| 41.00 | 21.45 | 1.240   | 73.53  | .344  |

# NVEOL CRYOGENIC COOLER LAB

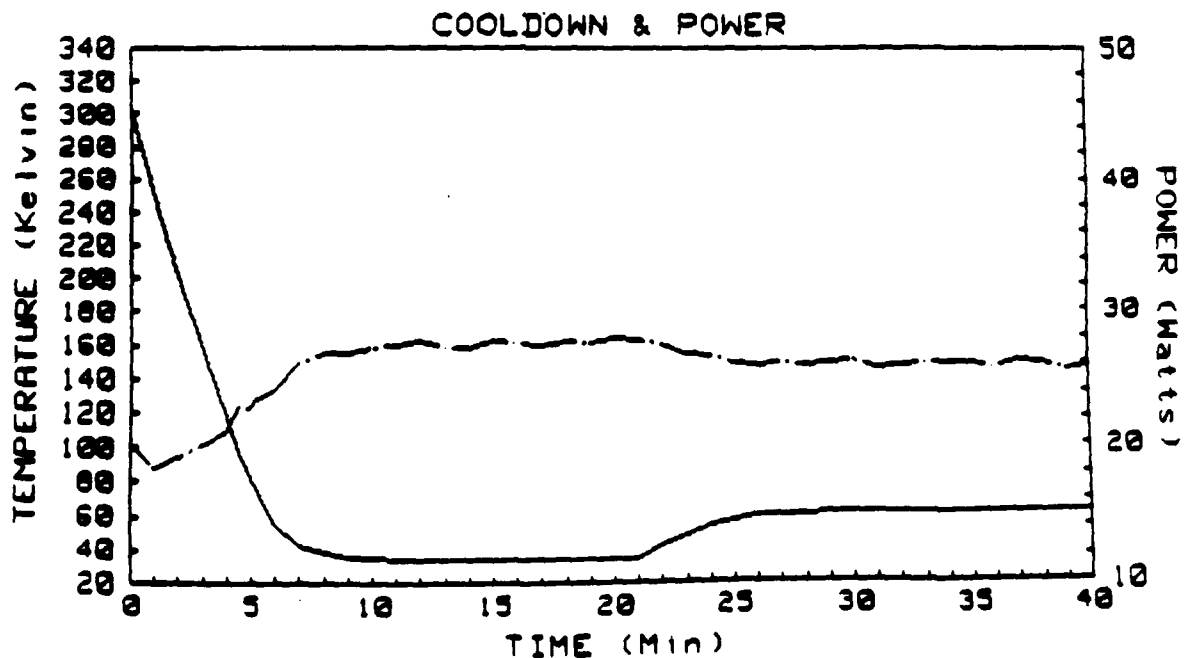
## CRYOGENIC COOLER DATA

COOLER: MAGNAVox 010  
VOLTAGE: 17.5  
AMBIENT:

DATE: 26 NOV 86 12:40  
ENGR: HAL  
PROG: CATP 1.0

TEST: Post temperature SHOCK Baseline

| TIME  | POWER | CURRENT | KELVIN | LOAD  |
|-------|-------|---------|--------|-------|
| 0.00  | 20.26 | 1.150   | 301.25 | 0.000 |
| 1.00  | 18.47 | 1.102   | 249.04 | 0.000 |
| 2.00  | 19.20 | 1.125   | 201.15 | 0.000 |
| 3.00  | 20.23 | 1.173   | 156.94 | 0.000 |
| 4.00  | 21.34 | 1.242   | 116.96 | 0.000 |
| 4.55  | 23.02 | 1.316   | 97.60  | 0.000 |
| 5.00  | 22.80 | 1.339   | 82.07  | 0.000 |
| 5.12  | 23.47 | 1.341   | 70.75  | 0.000 |
| 6.00  | 24.31 | 1.450   | 55.74  | 0.000 |
| 7.00  | 26.16 | 1.542   | 42.61  | 0.000 |
| 8.00  | 26.92 | 1.565   | 37.00  | 0.000 |
| 9.00  | 26.87 | 1.506   | 36.00  | 0.000 |
| 10.00 | 27.21 | 1.552   | 35.12  | 0.000 |
| 11.00 | 27.42 | 1.547   | 34.73  | 0.000 |
| 12.00 | 27.71 | 1.625   | 34.62  | 0.000 |
| 13.00 | 27.31 | 1.552   | 34.50  | 0.000 |
| 14.00 | 27.30 | 1.543   | 34.54  | 0.000 |
| 15.00 | 27.74 | 1.635   | 34.54  | 0.000 |
| 16.00 | 27.57 | 1.585   | 34.54  | 0.000 |
| 17.00 | 27.37 | 1.500   | 34.54  | 0.000 |
| 18.00 | 27.74 | 1.569   | 34.50  | 0.000 |
| 19.00 | 27.50 | 1.563   | 34.62  | 0.000 |
| 20.00 | 27.97 | 1.610   | 34.50  | 0.000 |
| 30.00 | 26.27 | 1.499   | 60.46  | .363  |
| 40.00 | 25.86 | 1.439   | 60.67  | .363  |



## NVEOL CRYOGENIC COOLER LAB

CRYOGENIC COOLER DATA

COOLER: MAGNAVOX 010  
 VOLTAGE: 17.5  
 AMBIENT:

DATE: 26 NOV 86 12:40  
 ENGR: HAL  
 PROG: CATP 1.0

TEST: Post temperature SHOCK Baseline

| TIME  | POWER | CURRENT | KELVIN | LOAD  |
|-------|-------|---------|--------|-------|
| 0.00  | 20.26 | 1.150   | 301.25 | 0.000 |
| 1.00  | 18.47 | 1.102   | 249.04 | 0.000 |
| 2.00  | 19.20 | 1.125   | 201.15 | 0.000 |
| 3.00  | 20.23 | 1.173   | 156.94 | 0.000 |
| 4.00  | 21.34 | 1.242   | 116.96 | 0.000 |
| 4.55  | 23.02 | 1.316   | 97.60  | 0.000 |
| 5.00  | 22.00 | 1.339   | 82.07  | 0.000 |
| 5.12  | 23.47 | 1.341   | 70.75  | 0.000 |
| 6.00  | 24.31 | 1.450   | 59.74  | 0.000 |
| 7.00  | 26.16 | 1.542   | 42.61  | 0.000 |
| 8.00  | 26.92 | 1.565   | 37.00  | 0.000 |
| 9.00  | 26.07 | 1.506   | 36.00  | 0.000 |
| 10.00 | 27.21 | 1.552   | 35.12  | 0.000 |
| 11.00 | 27.42 | 1.547   | 34.73  | 0.000 |
| 12.00 | 27.71 | 1.625   | 34.62  | 0.000 |
| 13.00 | 27.31 | 1.552   | 34.50  | 0.000 |
| 14.00 | 27.30 | 1.543   | 34.54  | 0.000 |
| 15.00 | 27.74 | 1.635   | 34.54  | 0.000 |
| 16.00 | 27.57 | 1.505   | 34.54  | 0.000 |
| 17.00 | 27.37 | 1.500   | 34.54  | 0.000 |
| 18.00 | 27.74 | 1.569   | 34.50  | 0.000 |
| 19.00 | 27.50 | 1.563   | 34.62  | 0.000 |
| 20.00 | 27.97 | 1.610   | 34.50  | 0.000 |
| 21.00 | 27.06 | 1.507   | 34.62  | 0.000 |
| 22.00 | 27.42 | 1.513   | 43.10  | .195  |
| 23.00 | 26.00 | 1.513   | 40.23  | .256  |
| 24.00 | 26.55 | 1.495   | 53.21  | .325  |
| 25.00 | 26.10 | 1.452   | 57.15  | .363  |
| 26.00 | 25.01 | 1.497   | 50.04  | .363  |
| 27.00 | 25.96 | 1.462   | 59.67  | .363  |
| 28.00 | 25.90 | 1.400   | 60.04  | .363  |
| 29.00 | 26.10 | 1.537   | 60.29  | .363  |
| 30.00 | 26.27 | 1.499   | 60.46  | .363  |
| 31.00 | 25.61 | 1.459   | 60.50  | .363  |
| 32.00 | 25.92 | 1.523   | 60.63  | .363  |
| 33.00 | 25.99 | 1.500   | 60.63  | .363  |
| 34.00 | 26.02 | 1.497   | 60.50  | .363  |
| 35.00 | 26.02 | 1.521   | 60.63  | .363  |
| 36.00 | 25.76 | 1.499   | 60.50  | .363  |
| 37.00 | 26.25 | 1.504   | 60.50  | .363  |
| 38.00 | 26.04 | 1.443   | 60.67  | .363  |
| 39.00 | 25.59 | 1.443   | 60.67  | .363  |
| 40.00 | 25.06 | 1.439   | 60.67  | .363  |
| 41.00 | 25.01 | 1.492   | 60.63  | .363  |

# NVEOL CRYOGENIC COOLER LAB

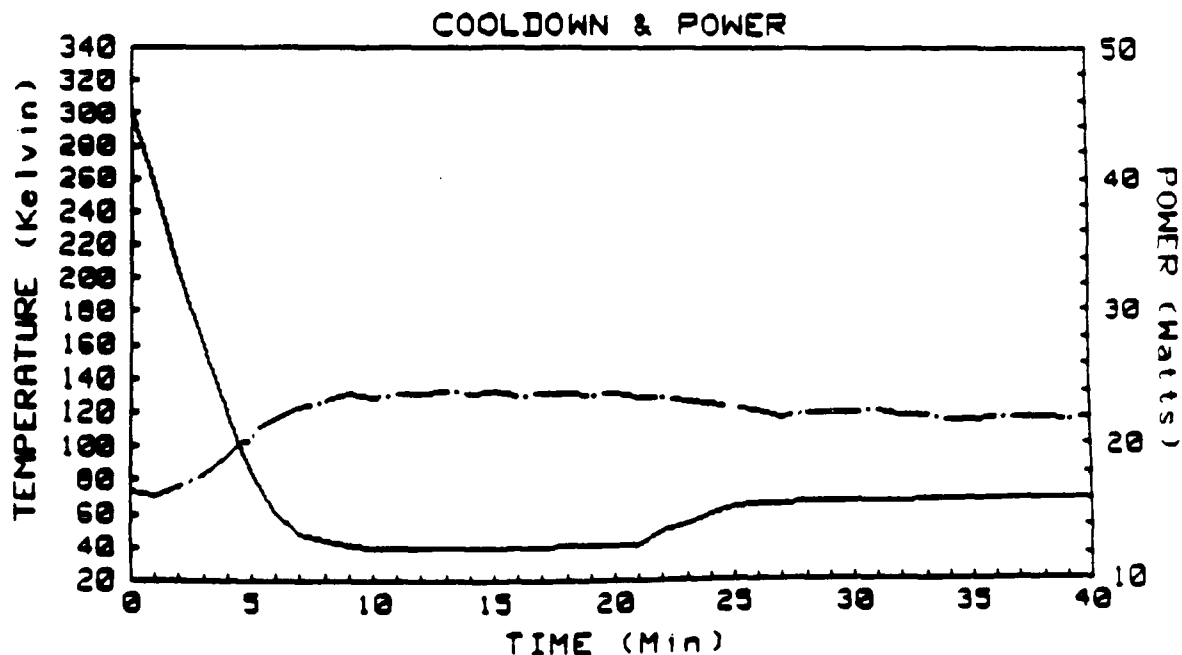
## CRYOGENIC COOLER DATA

COOLER: MAGNAVOX 817  
VOLTAGE: 17.5  
AMBIENT:

DATE: 26 NOV 86 11:34  
ENGR: HAL  
PROG: CATP\* 1.0

TEST: Post temperature SHOCK Baseline

| TIME  | POWER | CURRENT | KELVIN | LOAD  |
|-------|-------|---------|--------|-------|
| 0.00  | 16.60 | .953    | 300.40 | 0.000 |
| 1.00  | 16.39 | .983    | 253.31 | 0.000 |
| 2.00  | 17.00 | 1.001   | 204.20 | 0.000 |
| 3.00  | 17.96 | 1.003   | 159.67 | 0.000 |
| 4.00  | 19.30 | 1.130   | 119.95 | 0.000 |
| 4.65  | 20.41 | 1.166   | 97.45  | 0.000 |
| 5.00  | 20.45 | 1.220   | 86.40  | 0.000 |
| 5.33  | 21.53 | 1.230   | 77.27  | 0.000 |
| 6.00  | 21.95 | 1.300   | 61.30  | 0.000 |
| 7.00  | 22.81 | 1.321   | 48.54  | 0.000 |
| 8.00  | 23.37 | 1.320   | 43.45  | 0.000 |
| 9.00  | 23.96 | 1.376   | 41.11  | 0.000 |
| 10.00 | 23.62 | 1.345   | 40.09  | 0.000 |
| 11.00 | 24.00 | 1.354   | 39.69  | 0.000 |
| 12.00 | 23.84 | 1.329   | 39.56  | 0.000 |
| 13.00 | 24.14 | 1.397   | 39.60  | 0.000 |
| 14.00 | 23.97 | 1.405   | 39.70  | 0.000 |
| 15.00 | 24.10 | 1.400   | 39.96  | 0.000 |
| 16.00 | 23.81 | 1.327   | 40.10  | 0.000 |
| 17.00 | 23.93 | 1.333   | 40.35  | 0.000 |
| 18.00 | 23.95 | 1.364   | 40.44  | 0.000 |
| 19.00 | 23.70 | 1.309   | 40.62  | 0.000 |
| 20.00 | 23.86 | 1.330   | 40.71  | 0.000 |
| 30.00 | 22.27 | 1.204   | 66.86  | .344  |
| 40.00 | 22.84 | 1.201   | 67.94  | .344  |



B-62

Table 1.1.5

## NVEOL CRYOGENIC COOLER LAB

CRYOGENIC COOLER DATA

COOLER: MAGNAVOX 017  
 VOLTAGE: 17.5  
 AMBIENT:

DATE: 26 NOV 86 11:35  
 ENGR: HAL  
 PROG: CATP 1.0

TEST: Post temperature SHOCK Baseline

| TIME  | POWER | CURRENT | KELVIN | LOAD  |
|-------|-------|---------|--------|-------|
| 0.00  | 16.60 | .953    | 300.40 | 0.000 |
| 1.00  | 16.39 | .983    | 253.31 | 0.000 |
| 2.00  | 17.00 | 1.001   | 204.20 | 0.000 |
| 3.00  | 17.96 | 1.003   | 159.67 | 0.000 |
| 4.00  | 19.30 | 1.130   | 119.95 | 0.000 |
| 4.65  | 20.41 | 1.166   | 97.45  | 0.000 |
| 5.00  | 20.45 | 1.220   | 86.40  | 0.000 |
| 5.33  | 21.53 | 1.230   | 77.27  | 0.000 |
| 6.00  | 21.95 | 1.300   | 61.30  | 0.000 |
| 7.00  | 22.81 | 1.321   | 40.54  | 0.000 |
| 8.00  | 23.37 | 1.320   | 43.45  | 0.000 |
| 9.00  | 23.96 | 1.376   | 41.11  | 0.000 |
| 10.00 | 23.62 | 1.345   | 40.09  | 0.000 |
| 11.00 | 24.00 | 1.354   | 39.69  | 0.000 |
| 12.00 | 23.84 | 1.329   | 39.56  | 0.000 |
| 13.00 | 24.14 | 1.397   | 39.60  | 0.000 |
| 14.00 | 23.97 | 1.405   | 39.70  | 0.000 |
| 15.00 | 24.10 | 1.400   | 39.96  | 0.000 |
| 16.00 | 23.81 | 1.327   | 40.10  | 0.000 |
| 17.00 | 23.93 | 1.333   | 40.35  | 0.000 |
| 18.00 | 23.95 | 1.364   | 40.44  | 0.000 |
| 19.00 | 23.70 | 1.389   | 40.62  | 0.000 |
| 20.00 | 23.86 | 1.338   | 40.71  | 0.000 |
| 21.00 | 23.51 | 1.341   | 40.00  | 0.000 |
| 22.00 | 23.62 | 1.326   | 49.47  | .196  |
| 23.00 | 23.24 | 1.360   | 54.25  | .257  |
| 24.00 | 22.97 | 1.314   | 59.50  | .363  |
| 25.00 | 22.65 | 1.260   | 63.25  | .363  |
| 26.00 | 22.52 | 1.293   | 65.46  | .344  |
| 27.00 | 22.05 | 1.279   | 65.81  | .344  |
| 28.00 | 22.29 | 1.307   | 66.23  | .344  |
| 29.00 | 22.30 | 1.275   | 66.66  | .344  |
| 30.00 | 22.27 | 1.204   | 66.86  | .344  |
| 31.00 | 22.45 | 1.200   | 66.93  | .344  |
| 32.00 | 22.11 | 1.294   | 67.20  | .344  |
| 33.00 | 22.24 | 1.309   | 67.36  | .344  |
| 34.00 | 21.86 | 1.245   | 67.40  | .344  |
| 35.00 | 21.89 | 1.224   | 67.52  | .344  |
| 36.00 | 22.07 | 1.250   | 67.71  | .344  |
| 37.00 | 21.93 | 1.202   | 67.79  | .344  |
| 38.00 | 21.90 | 1.205   | 67.90  | .344  |
| 39.00 | 21.79 | 1.234   | 67.90  | .344  |
| 40.00 | 22.04 | 1.201   | 67.94  | .344  |
| 41.00 | 22.03 | 1.266   | 67.90  | .344  |

# NVEOL CRYOGENIC COOLER LAB

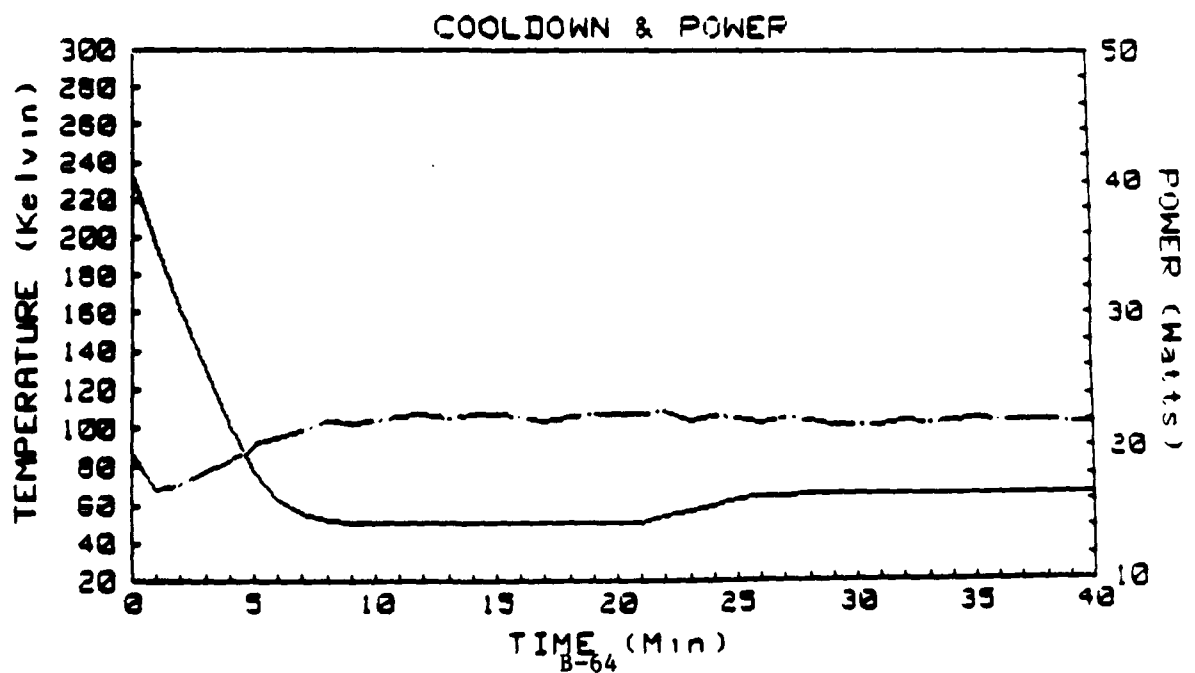
## CRYOGENIC COOLER DATA

COOLER: MAGNAVON 810  
VOLTAGE: 17.5  
AMBIENT:

DATE: 9 DEC 36 15:01  
ENGR: HLD  
PROG: CATP\* 1.0

### TEST: LOW TEMPERATURE PERFORMANCE TEST

| TIME  | POWER | CURRENT | KELVIN | LOAD  |
|-------|-------|---------|--------|-------|
| 0.00  | 19.54 | 1.116   | 233.00 | 0.000 |
| 1.00  | 16.89 | .972    | 196.80 | 0.000 |
| 2.00  | 17.29 | .950    | 162.50 | 0.000 |
| 3.00  | 18.36 | 1.052   | 131.20 | 0.000 |
| 4.00  | 19.05 | 1.119   | 103.10 | 0.000 |
| 4.23  | 19.30 | 1.100   | 97.40  | 0.000 |
| 5.00  | 19.90 | 1.150   | 79.23  | 0.000 |
| 5.13  | 20.45 | 1.160   | 77.00  | 0.000 |
| 6.00  | 20.82 | 1.199   | 63.15  | 0.000 |
| 7.00  | 21.35 | 1.261   | 55.60  | 0.000 |
| 8.00  | 21.95 | 1.294   | 52.64  | 0.000 |
| 9.00  | 21.80 | 1.265   | 51.06  | 0.000 |
| 10.00 | 21.97 | 1.274   | 50.50  | 0.000 |
| 11.00 | 22.29 | 1.264   | 50.36  | 0.000 |
| 12.00 | 22.43 | 1.276   | 50.23  | 0.000 |
| 13.00 | 22.23 | 1.307   | 50.32  | 0.000 |
| 14.00 | 22.47 | 1.317   | 50.32  | 0.000 |
| 15.00 | 22.43 | 1.296   | 50.41  | 0.000 |
| 16.00 | 22.26 | 1.247   | 50.36  | 0.000 |
| 17.00 | 21.93 | 1.270   | 50.45  | 0.000 |
| 18.00 | 22.34 | 1.314   | 50.45  | 0.000 |
| 19.00 | 22.45 | 1.296   | 50.36  | 0.000 |
| 20.00 | 22.50 | 1.294   | 50.45  | 0.000 |
| 30.00 | 21.66 | 1.202   | 55.61  | .193  |
| 40.00 | 21.89 | 1.269   | 55.85  | .193  |



CRYOGENIC COOLING DATA

COOLER: MAGNAVOX 010  
VOLTAGE: 17.5  
AMBIENT:

ATE: 9 DEC 86 15:00  
INCR: HLD  
PROG: CATP\* 1.0

TEST: LOW TEMPERATURE PERFORMANCE TEST

| TIME  | POWER | CURRENT | KELVIN | LOAD  |
|-------|-------|---------|--------|-------|
| 0.00  | 19.84 | 1.116   | 233.00 | 0.000 |
| 1.00  | 16.89 | 1.072   | 196.80 | 0.000 |
| 2.00  | 17.29 | 1.050   | 162.50 | 0.000 |
| 3.00  | 18.16 | 1.052   | 131.20 | 0.000 |
| 4.00  | 19.05 | 1.119   | 103.10 | 0.000 |
| 4.23  | 19.30 | 1.100   | 97.40  | 0.000 |
| 5.00  | 19.90 | 1.150   | 79.23  | 0.000 |
| 5.13  | 20.45 | 1.160   | 77.00  | 0.000 |
| 6.00  | 20.82 | 1.199   | 63.15  | 0.000 |
| 7.00  | 21.05 | 1.261   | 55.60  | 0.000 |
| 8.00  | 21.95 | 1.294   | 52.64  | 0.000 |
| 9.00  | 21.80 | 1.265   | 51.06  | 0.000 |
| 10.00 | 21.97 | 1.274   | 50.50  | 0.000 |
| 11.00 | 22.19 | 1.264   | 50.36  | 0.000 |
| 12.00 | 22.43 | 1.275   | 50.23  | 0.000 |
| 13.00 | 22.13 | 1.307   | 50.32  | 0.000 |
| 14.00 | 22.47 | 1.317   | 50.32  | 0.000 |
| 15.00 | 22.43 | 1.296   | 50.41  | 0.000 |
| 16.00 | 22.26 | 1.247   | 50.36  | 0.000 |
| 17.00 | 21.93 | 1.270   | 50.45  | 0.000 |
| 18.00 | 22.34 | 1.314   | 50.45  | 0.000 |
| 19.00 | 22.45 | 1.295   | 50.36  | 0.000 |
| 20.00 | 22.50 | 1.294   | 50.45  | 0.000 |
| 21.00 | 22.54 | 1.293   | 50.49  | 0.000 |
| 22.00 | 22.60 | 1.307   | 54.04  | .078  |
| 23.00 | 21.93 | 1.293   | 56.91  | .118  |
| 24.00 | 22.30 | 1.265   | 60.04  | .167  |
| 25.00 | 22.12 | 1.203   | 63.19  | .193  |
| 26.00 | 21.79 | 1.233   | 64.46  | .193  |
| 27.00 | 22.17 | 1.249   | 64.99  | .193  |
| 28.00 | 22.02 | 1.260   | 65.16  | .193  |
| 29.00 | 21.72 | 1.267   | 65.40  | .193  |
| 30.00 | 21.66 | 1.202   | 65.61  | .193  |
| 31.00 | 21.60 | 1.200   | 65.65  | .193  |
| 32.00 | 21.93 | 1.263   | 65.69  | .193  |
| 33.00 | 21.73 | 1.217   | 65.69  | .193  |
| 34.00 | 21.92 | 1.207   | 65.73  | .193  |
| 35.00 | 22.16 | 1.271   | 65.57  | .193  |
| 36.00 | 21.92 | 1.252   | 65.73  | .193  |
| 37.00 | 21.92 | 1.262   | 65.73  | .193  |
| 38.00 | 21.92 | 1.214   | 65.81  | .193  |
| 39.00 | 21.82 | 1.247   | 65.85  | .193  |
| 40.00 | 21.89 | 1.269   | 65.85  | .193  |
| 41.00 | 21.87 | 1.251   | 66.30  | .193  |

# NVEOL CRYOGENIC COOLER LNB

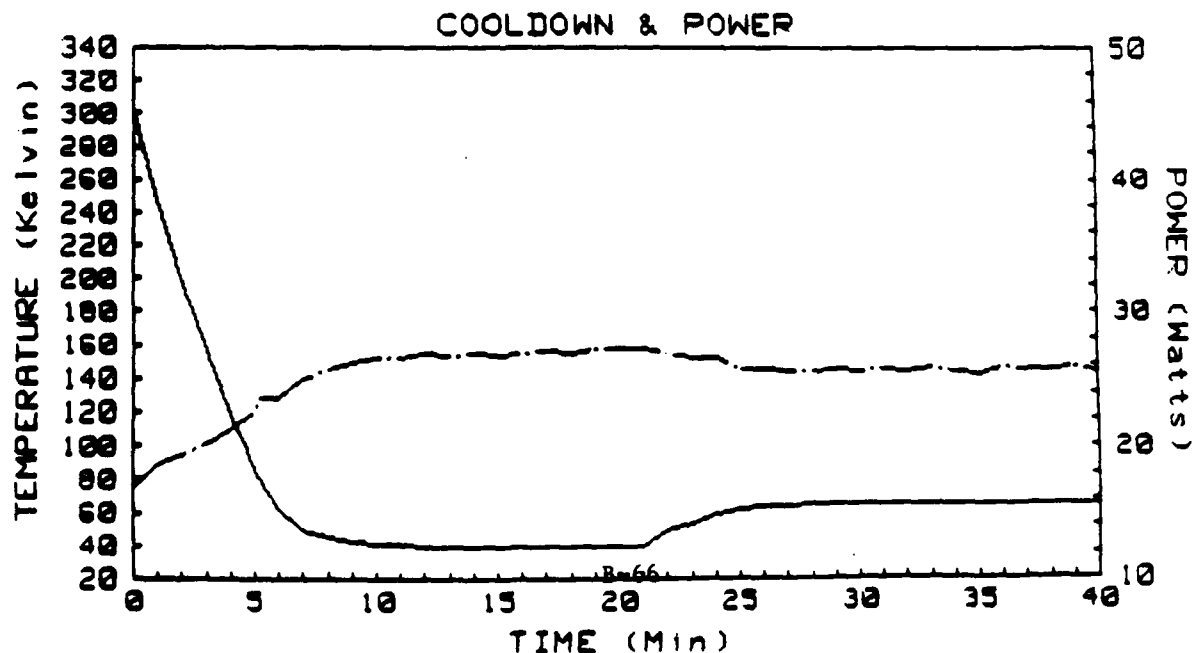
## CRYOGENIC COOLER DATA

COOLER: MAGNAVOX 010  
VOLTAGE: 17.5  
AMBIENT:

DATE: 10 DEC 1986 11:01  
ENGR: H K  
PROG: CATP\* 1.0

TEST: POST LOW TEMP. PERFORMANCE TEST < 24 DEG. C >

| TIME  | POWER | CURRENT | KELVIN | LOAD  |
|-------|-------|---------|--------|-------|
| 0.00  | 16.85 | .963    | 300.34 | 0.000 |
| 1.00  | 18.63 | 1.070   | 247.64 | 0.000 |
| 2.00  | 19.37 | 1.101   | 200.00 | 0.000 |
| 3.00  | 20.25 | 1.153   | 157.10 | 0.000 |
| 4.00  | 21.20 | 1.215   | 110.64 | 0.000 |
| 4.67  | 22.16 | 1.266   | 96.89  | 0.000 |
| 5.00  | 22.50 | 1.310   | 86.04  | 0.000 |
| 5.23  | 23.49 | 1.342   | 80.00  | 0.000 |
| 6.00  | 23.65 | 1.390   | 62.04  | 0.000 |
| 7.00  | 25.00 | 1.406   | 49.75  | 0.000 |
| 8.00  | 25.70 | 1.503   | 44.70  | 0.000 |
| 9.00  | 26.25 | 1.499   | 42.56  | 0.000 |
| 10.00 | 26.60 | 1.470   | 41.56  | 0.000 |
| 11.00 | 26.54 | 1.544   | 40.91  | 0.000 |
| 12.00 | 26.94 | 1.516   | 40.25  | 0.000 |
| 13.00 | 26.73 | 1.547   | 40.30  | 0.000 |
| 14.00 | 26.91 | 1.537   | 40.15  | 0.000 |
| 15.00 | 26.77 | 1.570   | 40.07  | 0.000 |
| 16.00 | 26.96 | 1.509   | 40.15  | 0.000 |
| 17.00 | 27.12 | 1.555   | 40.00  | 0.000 |
| 18.00 | 26.94 | 1.533   | 40.15  | 0.000 |
| 19.00 | 27.20 | 1.519   | 40.15  | 0.000 |
| 20.00 | 27.32 | 1.550   | 40.11  | 0.000 |
| 30.00 | 25.50 | 1.499   | 65.03  | .344  |
| 40.00 | 25.52 | 1.464   | 64.87  | .343  |



# NVEOL CRYOGENIC COOLER LAB

## CRYOGENIC COOLER DATA

COOLER: MAGNAVox 010  
VOLTAGE: 17.5  
AMBIENT:

DATE: 10 DEC 1986 11:01  
ENGR: H K  
PROG: CATP+ 1.0

TEST: POST LOW TEMP. PERFORMANCE TEST < 24 DEG. C >

| TIME  | POWER | CURRENT | KELVIN | LOAD  |
|-------|-------|---------|--------|-------|
| 0.00  | 16.85 | .963    | 300.34 | 0.000 |
| 1.00  | 18.63 | 1.070   | 247.64 | 0.000 |
| 2.00  | 19.37 | 1.101   | 200.00 | 0.000 |
| 3.00  | 20.25 | 1.153   | 157.10 | 0.000 |
| 4.00  | 21.20 | 1.215   | 118.64 | 0.000 |
| 4.67  | 22.16 | 1.266   | 96.89  | 0.000 |
| 5.00  | 22.50 | 1.310   | 86.04  | 0.000 |
| 5.23  | 23.49 | 1.342   | 80.00  | 0.000 |
| 6.00  | 23.65 | 1.390   | 62.04  | 0.000 |
| 7.00  | 25.00 | 1.406   | 49.75  | 0.000 |
| 8.00  | 25.70 | 1.503   | 44.70  | 0.000 |
| 9.00  | 26.25 | 1.499   | 42.56  | 0.000 |
| 10.00 | 26.60 | 1.478   | 41.56  | 0.000 |
| 11.00 | 26.54 | 1.544   | 40.91  | 0.000 |
| 12.00 | 26.94 | 1.516   | 40.25  | 0.000 |
| 13.00 | 26.73 | 1.547   | 40.30  | 0.000 |
| 14.00 | 26.91 | 1.537   | 40.15  | 0.000 |
| 15.00 | 26.77 | 1.570   | 40.07  | 0.000 |
| 16.00 | 26.96 | 1.509   | 40.15  | 0.000 |
| 17.00 | 27.12 | 1.555   | 40.00  | 0.000 |
| 18.00 | 26.94 | 1.533   | 40.15  | 0.000 |
| 19.00 | 27.20 | 1.519   | 40.15  | 0.000 |
| 20.00 | 27.32 | 1.550   | 40.11  | 0.000 |
| 21.00 | 27.27 | 1.520   | 40.11  | 0.000 |
| 22.00 | 26.89 | 1.512   | 40.92  | .195  |
| 23.00 | 26.60 | 1.490   | 54.00  | .273  |
| 24.00 | 26.50 | 1.525   | 59.23  | .344  |
| 25.00 | 25.76 | 1.450   | 52.24  | .344  |
| 26.00 | 25.63 | 1.470   | 53.52  | .344  |
| 27.00 | 25.50 | 1.462   | 54.25  | .344  |
| 28.00 | 25.57 | 1.433   | 54.50  | .344  |
| 29.00 | 25.71 | 1.471   | 54.79  | .344  |
| 30.00 | 25.50 | 1.499   | 55.03  | .344  |
| 31.00 | 25.71 | 1.400   | 55.03  | .344  |
| 32.00 | 25.40 | 1.469   | 54.66  | .344  |
| 33.00 | 25.70 | 1.472   | 54.62  | .344  |
| 34.00 | 25.56 | 1.451   | 54.75  | .344  |
| 35.00 | 25.39 | 1.420   | 54.83  | .344  |
| 36.00 | 25.79 | 1.401   | 54.83  | .344  |
| 37.00 | 25.60 | 1.476   | 54.79  | .343  |
| 38.00 | 25.70 | 1.454   | 54.87  | .343  |
| 39.00 | 25.06 | 1.454   | 54.91  | .343  |
| 40.00 | 25.52 | 1.464   | 54.87  | .343  |
| 41.00 | 25.46 | 1.461   | 54.91  | .343  |

# NVEOL CRYOGENIC COOLER LAB

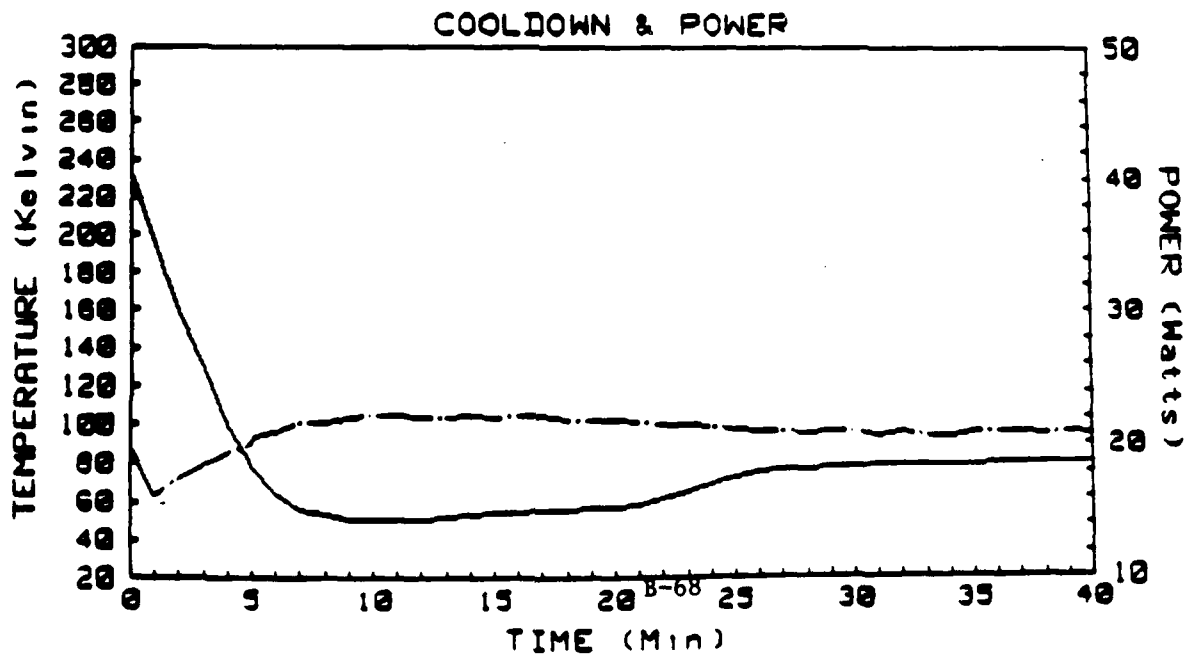
## CRYOGENIC COOLER DATA

COOLER: MAGNAVOX 017  
VOLTAGE: 17.5  
AMBIENT:

DATE: 13 DEC 86 11:32  
ENGR: HLD  
PROG: CATP+ 1.0

TEST: LOW TEMPERATURE PERFORMANCE TEST

| TIME  | POWER | CURRENT | KELVIN | LOAD  |
|-------|-------|---------|--------|-------|
| 0.00  | 19.44 | 1.111   | 231.60 | 0.000 |
| 1.00  | 16.21 | .921    | 195.44 | 0.000 |
| 2.00  | 17.36 | .990    | 159.74 | 0.000 |
| 3.00  | 18.47 | 1.060   | 120.09 | 0.000 |
| 4.00  | 19.27 | 1.143   | 100.46 | 0.000 |
| 4.13  | 19.50 | 1.115   | 97.05  | 0.000 |
| 5.00  | 20.05 | 1.125   | 70.69  | 0.000 |
| 5.13  | 20.49 | 1.171   | 76.74  | 0.000 |
| 6.00  | 20.91 | 1.253   | 63.00  | 0.000 |
| 7.00  | 21.64 | 1.232   | 56.13  | 0.000 |
| 8.00  | 21.66 | 1.209   | 52.01  | 0.000 |
| 9.00  | 22.06 | 1.261   | 51.06  | 0.000 |
| 10.00 | 22.13 | 1.220   | 50.54  | 0.000 |
| 11.00 | 22.24 | 1.263   | 50.00  | 0.000 |
| 12.00 | 21.97 | 1.263   | 51.36  | 0.000 |
| 13.00 | 22.05 | 1.296   | 52.52  | 0.000 |
| 14.00 | 22.09 | 1.250   | 53.22  | 0.000 |
| 15.00 | 21.94 | 1.226   | 54.00  | 0.000 |
| 16.00 | 22.15 | 1.251   | 54.70  | 0.000 |
| 17.00 | 22.09 | 1.251   | 55.39  | 0.000 |
| 18.00 | 21.72 | 1.240   | 56.17  | 0.000 |
| 19.00 | 21.77 | 1.167   | 56.83  | 0.000 |
| 20.00 | 21.01 | 1.221   | 57.40  | 0.000 |
| 30.00 | 20.94 | 1.202   | 73.46  | .193  |
| 40.00 | 20.60 | 1.169   | 80.23  | .193  |



# NVEOL CRYOGENIC COOLER LAB

## CRYOGENIC COOLER DATA

COOLER: MAGNAVOX 817  
VOLTAGE: 17.5  
AMBIENT:

DATE: 13 DEC 86 11:32  
ENGR: HLD  
PROG: CATP\* 1.0

TEST: LOW TEMPERATURE PERFORMANCE TEST

| TIME  | POWER | CURRENT | KELVIN | LOAD  |
|-------|-------|---------|--------|-------|
| 0.00  | 19.44 | 1.111   | 231.68 | 0.000 |
| 1.00  | 16.21 | .921    | 195.44 | 0.000 |
| 2.00  | 17.36 | .990    | 159.74 | 0.000 |
| 3.00  | 18.47 | 1.060   | 120.89 | 0.000 |
| 4.00  | 19.27 | 1.143   | 100.46 | 0.000 |
| 4.13  | 19.50 | 1.115   | 97.85  | 0.000 |
| 5.00  | 20.05 | 1.125   | 78.69  | 0.000 |
| 5.13  | 20.49 | 1.171   | 76.74  | 0.000 |
| 6.00  | 20.91 | 1.253   | 63.80  | 0.000 |
| 7.00  | 21.64 | 1.232   | 56.13  | 0.000 |
| 8.00  | 21.66 | 1.209   | 52.81  | 0.000 |
| 9.00  | 22.06 | 1.261   | 51.86  | 0.000 |
| 10.00 | 22.13 | 1.220   | 50.54  | 0.000 |
| 11.00 | 22.24 | 1.263   | 50.80  | 0.000 |
| 12.00 | 21.97 | 1.263   | 51.36  | 0.000 |
| 13.00 | 22.05 | 1.296   | 52.52  | 0.000 |
| 14.00 | 22.09 | 1.250   | 53.22  | 0.000 |
| 15.00 | 21.94 | 1.226   | 54.00  | 0.000 |
| 16.00 | 22.15 | 1.251   | 54.78  | 0.000 |
| 17.00 | 22.09 | 1.251   | 55.39  | 0.000 |
| 18.00 | 21.72 | 1.240   | 56.17  | 0.000 |
| 19.00 | 21.77 | 1.167   | 56.83  | 0.000 |
| 20.00 | 21.81 | 1.221   | 57.48  | 0.000 |
| 21.00 | 21.55 | 1.227   | 58.09  | 0.000 |
| 22.00 | 21.44 | 1.229   | 61.83  | .079  |
| 23.00 | 21.53 | 1.233   | 65.53  | .118  |
| 24.00 | 21.23 | 1.189   | 69.48  | .167  |
| 25.00 | 21.04 | 1.178   | 73.36  | .193  |
| 26.00 | 20.94 | 1.220   | 75.28  | .193  |
| 27.00 | 21.00 | 1.215   | 76.55  | .193  |
| 28.00 | 20.74 | 1.215   | 77.35  | .193  |
| 29.00 | 20.91 | 1.206   | 78.00  | .193  |
| 30.00 | 20.94 | 1.202   | 78.46  | .193  |
| 31.00 | 20.59 | 1.183   | 78.85  | .193  |
| 32.00 | 20.87 | 1.157   | 79.00  | .193  |
| 33.00 | 20.61 | 1.195   | 79.35  | .193  |
| 34.00 | 20.59 | 1.163   | 79.66  | .193  |
| 35.00 | 21.01 | 1.190   | 79.77  | .193  |
| 36.00 | 20.89 | 1.170   | 79.92  | .193  |
| 37.00 | 20.86 | 1.161   | 80.12  | .193  |
| 38.00 | 20.75 | 1.163   | 80.12  | .193  |
| 39.00 | 20.92 | 1.183   | 80.23  | .193  |
| 40.00 | 20.68 | 1.169   | 80.23  | .193  |
| 41.00 | 20.84 | 1.180   | 80.23  | .193  |

# NVEOL CRYOGENIC COOLER LAB

## CRYOGENIC COOLER DATA

COOLER: MAGNAVOX Ø17  
VOLTAGE: 17.5  
AMBIENT:

DATE: 15 DEC 86 11:25  
ENGR: HLD  
PROG: CATP\* 1.0

TEST: POST LOW TEMPERATURE PERFORMANCE TEST

| TIME  | POWER  | CURRENT | KELVIN | LOAD  |
|-------|--------|---------|--------|-------|
| 0.00  | 15.36  | .870    | 293.94 | 0.000 |
| 1.00  | -16.72 | 1.005   | 242.69 | 0.000 |
| 2.00  | 17.52  | 1.029   | 194.43 | 0.000 |
| 3.00  | 18.66  | 1.070   | 150.31 | 0.000 |
| 4.00  | 19.83  | 1.157   | 110.70 | 0.000 |
| 4.33  | 20.50  | 1.176   | 99.35  | 0.000 |
| 5.00  | 21.20  | 1.299   | 77.20  | 0.000 |
| 5.12  | 22.34  | 1.276   | 74.13  | 0.000 |
| 6.00  | 22.83  | 1.347   | 53.71  | 0.000 |
| 7.00  | 23.64  | 1.382   | 43.00  | 0.000 |
| 8.00  | 24.65  | 1.453   | 38.90  | 0.000 |
| 9.00  | 25.14  | 1.439   | 36.70  | 0.000 |
| 10.00 | 25.23  | 1.477   | 35.60  | 0.000 |
| 11.00 | 25.40  | 1.483   | 35.15  | 0.000 |
| 12.00 | 25.91  | 1.497   | 34.89  | 0.000 |
| 13.00 | 25.53  | 1.438   | 34.73  | 0.000 |
| 14.00 | 25.51  | 1.484   | 34.70  | 0.000 |
| 15.00 | 25.64  | 1.495   | 34.62  | 0.000 |
| 16.00 | 25.47  | 1.477   | 34.70  | 0.000 |
| 17.00 | 25.70  | 1.452   | 34.70  | 0.000 |
| 18.00 | 25.71  | 1.472   | 34.73  | 0.000 |
| 19.00 | 25.80  | 1.456   | 34.73  | 0.000 |
| 20.00 | 25.77  | 1.437   | 34.73  | 0.000 |
| 30.00 | 23.60  | 1.362   | 51.79  | .344  |
| 40.00 | 22.82  | 1.273   | 54.25  | .344  |

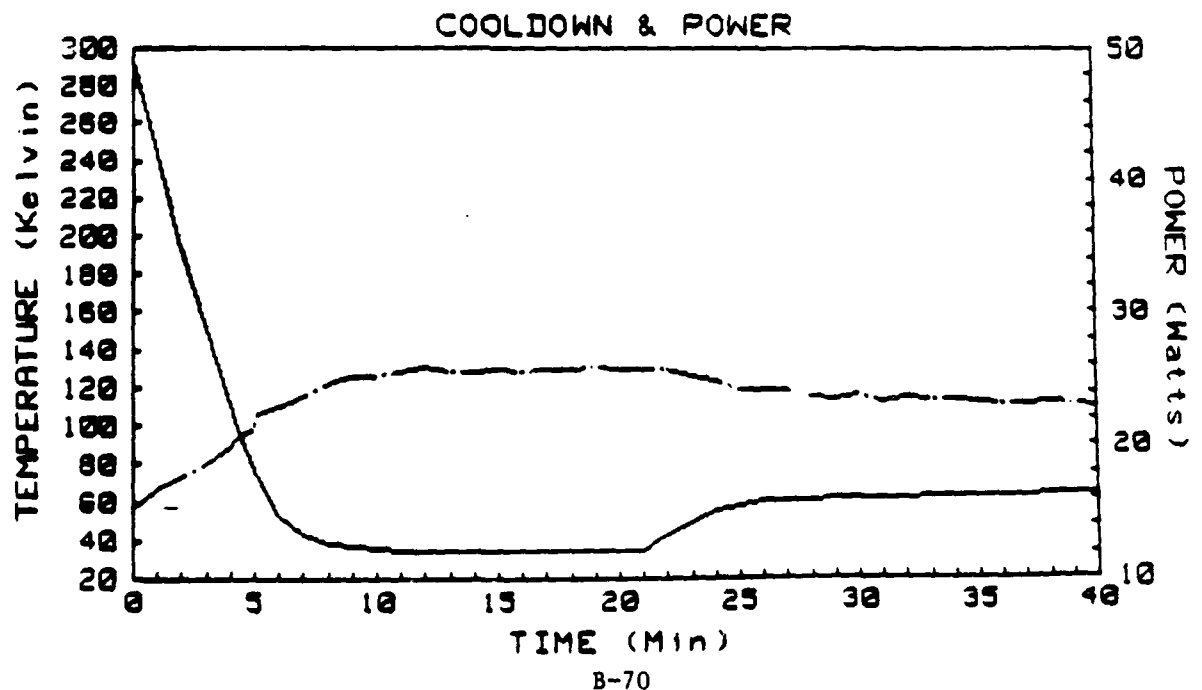


Table 1.2.9

## NVEOL CRYOGENIC COOLER LAB

CRYOGENIC COOLER DATA

COOLER: MAGNAVOX 817  
 VOLTAGE: 17.5  
 AMBIENT:

DATE: 15 DEC 86 11:25  
 ENGR: HLD  
 PROG: CATP\* 1.0

TEST: POST LOW TEMPERATURE PERFORMANCE TEST

| TIME  | POWER | CURRENT | KELVIN | LOAD  |
|-------|-------|---------|--------|-------|
| 0.00  | 15.36 | .870    | 293.94 | 0.000 |
| 1.00  | 16.72 | 1.005   | 242.69 | 0.000 |
| 2.00  | 17.52 | 1.029   | 194.43 | 0.000 |
| 3.00  | 18.66 | 1.070   | 150.31 | 0.000 |
| 4.00  | 19.83 | 1.157   | 110.70 | 0.000 |
| 4.33  | 20.50 | 1.176   | 99.35  | 0.000 |
| 5.00  | 21.20 | 1.299   | 77.20  | 0.000 |
| 5.12  | 22.34 | 1.276   | 74.13  | 0.000 |
| 6.00  | 22.83 | 1.347   | 53.71  | 0.000 |
| 7.00  | 23.64 | 1.382   | 43.00  | 0.000 |
| 8.00  | 24.65 | 1.453   | 38.90  | 0.000 |
| 9.00  | 25.14 | 1.439   | 36.70  | 0.000 |
| 10.00 | 25.23 | 1.477   | 35.60  | 0.000 |
| 11.00 | 25.40 | 1.483   | 35.15  | 0.000 |
| 12.00 | 25.91 | 1.497   | 34.89  | 0.000 |
| 13.00 | 25.53 | 1.430   | 34.73  | 0.000 |
| 14.00 | 25.51 | 1.404   | 34.70  | 0.000 |
| 15.00 | 25.64 | 1.495   | 34.62  | 0.000 |
| 16.00 | 25.47 | 1.477   | 34.70  | 0.000 |
| 17.00 | 25.70 | 1.452   | 34.70  | 0.000 |
| 18.00 | 25.71 | 1.472   | 34.73  | 0.000 |
| 19.00 | 25.00 | 1.456   | 34.73  | 0.000 |
| 20.00 | 25.77 | 1.437   | 34.73  | 0.000 |
| 21.00 | 25.64 | 1.516   | 34.77  | 0.000 |
| 22.00 | 25.61 | 1.463   | 43.07  | .195  |
| 23.00 | 25.16 | 1.413   | 49.06  | .273  |
| 24.00 | 24.79 | 1.436   | 55.23  | .363  |
| 25.00 | 24.10 | 1.380   | 58.70  | .363  |
| 26.00 | 24.02 | 1.404   | 60.29  | .363  |
| 27.00 | 24.11 | 1.375   | 61.10  | .344  |
| 28.00 | 23.57 | 1.337   | 61.06  | .344  |
| 29.00 | 23.35 | 1.321   | 61.39  | .344  |
| 30.00 | 23.60 | 1.362   | 61.79  | .344  |
| 31.00 | 23.20 | 1.322   | 62.00  | .344  |
| 32.00 | 23.56 | 1.365   | 62.37  | .344  |
| 33.00 | 23.32 | 1.311   | 62.69  | .344  |
| 34.00 | 23.33 | 1.353   | 63.02  | .344  |
| 35.00 | 23.24 | 1.323   | 63.31  | .344  |
| 36.00 | 22.90 | 1.370   | 63.52  | .344  |
| 37.00 | 23.04 | 1.309   | 63.72  | .344  |
| 38.00 | 23.14 | 1.297   | 63.00  | .344  |
| 39.00 | 22.99 | 1.305   | 64.01  | .344  |
| 40.00 | 22.02 | 1.273   | 64.25  | .344  |
| 41.00 | 22.76 | 1.306   | 64.30  | .344  |

# NVEOL CRYOGENIC COOLER LAB

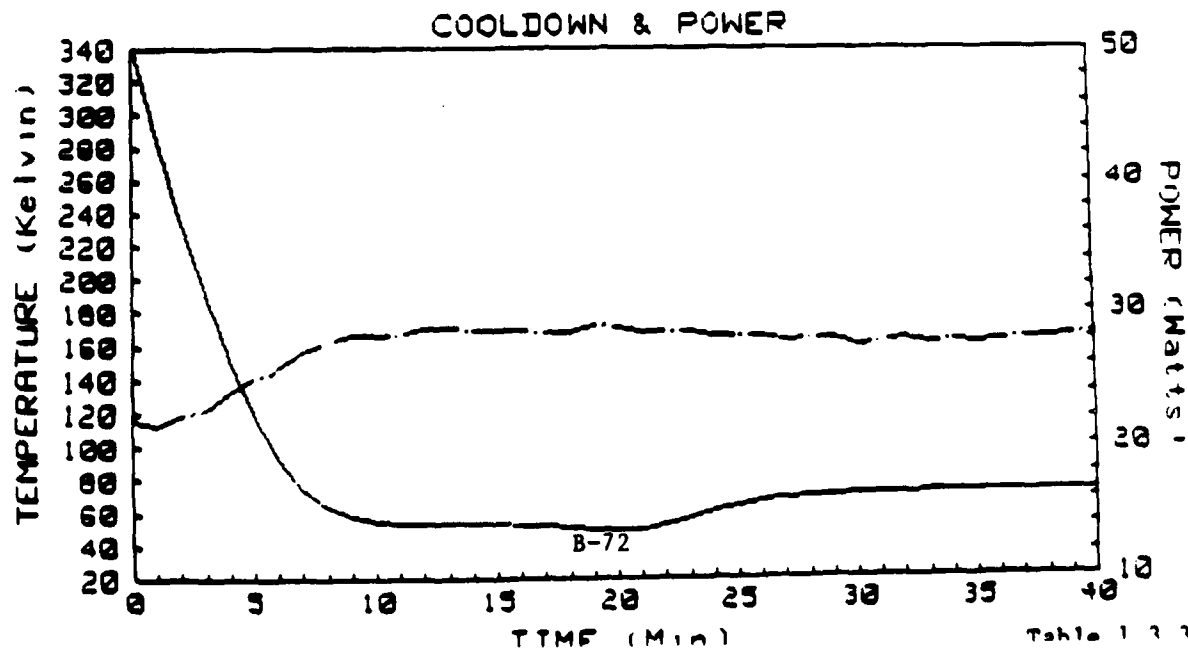
## CRYOGENIC COOLER DATA

COOLER: MAGNAVOX 010  
VOLTAGE: 17.5  
AMBIENT: 71 °C

DATE: 7 DEC 86 19:06  
ENGR: M K  
PROG: CATP\* 1.0

TEST: TEST AT 71 DEG C <AFTER 48 HOUR BAKE>

| TIME  | POWER | CURRENT | KELVIN | LOAD  |
|-------|-------|---------|--------|-------|
| 0.00  | 21.92 | 1.253   | 345.00 | 0.000 |
| 1.00  | 21.62 | 1.236   | 289.50 | 0.000 |
| 2.00  | 22.30 | 1.317   | 237.01 | 0.000 |
| 3.00  | 22.06 | 1.331   | 192.34 | 0.000 |
| 4.00  | 24.02 | 1.439   | 152.63 | 0.000 |
| 5.00  | 25.20 | 1.475   | 119.71 | 0.000 |
| 5.77  | 25.49 | 1.456   | 99.65  | 0.000 |
| 6.00  | 25.00 | 1.481   | 93.01  | 0.000 |
| 6.77  | 26.00 | 1.531   | 78.96  | 0.000 |
| 7.00  | 27.10 | 1.569   | 75.01  | 0.000 |
| 8.00  | 27.74 | 1.635   | 63.47  | 0.000 |
| 9.00  | 28.35 | 1.650   | 57.77  | 0.000 |
| 10.00 | 28.29 | 1.607   | 55.10  | 0.000 |
| 11.00 | 28.39 | 1.656   | 54.04  | 0.000 |
| 12.00 | 28.04 | 1.646   | 53.79  | 0.000 |
| 13.00 | 28.00 | 1.652   | 53.92  | 0.000 |
| 14.00 | 28.61 | 1.619   | 54.24  | 0.000 |
| 15.00 | 28.76 | 1.655   | 53.96  | 0.000 |
| 16.00 | 28.75 | 1.691   | 52.93  | 0.000 |
| 17.00 | 28.44 | 1.645   | 51.76  | 0.000 |
| 18.00 | 28.51 | 1.631   | 50.00  | 0.000 |
| 19.00 | 28.96 | 1.693   | 50.19  | 0.000 |
| 20.00 | 28.90 | 1.704   | 49.50  | 0.000 |
| 30.00 | 27.30 | 1.530   | 70.47  | .207  |
| 40.00 | 28.20 | 1.502   | 72.67  | .207  |



# NVEOL CRYOGENIC COOLER LAB

## CRYOGENIC COOLER DATA

COOLER: MAGNAVOX 010  
VOLTAGE: 17.5  
AMBIENT:

DATE: 7 DEC 86 19:07  
ENGR: H K  
PROG: CATP\* 1.0

TEST: TEST AT 71 DEG C <AFTER 48 HOUR BAKE>

| TIME  | POWER | CURRENT | KELVIN | LOAD  |
|-------|-------|---------|--------|-------|
| 0.00  | 21.92 | 1.253   | 345.00 | 0.000 |
| 1.00  | 21.62 | 1.236   | 289.50 | 0.000 |
| 2.00  | 22.30 | 1.317   | 237.81 | 0.000 |
| 3.00  | 22.86 | 1.331   | 192.34 | 0.000 |
| 4.00  | 24.02 | 1.439   | 152.63 | 0.000 |
| 5.00  | 25.20 | 1.475   | 119.71 | 0.000 |
| 5.77  | 25.49 | 1.456   | 99.65  | 0.000 |
| 6.00  | 25.80 | 1.481   | 93.81  | 0.000 |
| 6.77  | 26.00 | 1.531   | 78.96  | 0.000 |
| 7.00  | 27.10 | 1.569   | 75.81  | 0.000 |
| 8.00  | 27.74 | 1.635   | 63.47  | 0.000 |
| 9.00  | 28.35 | 1.650   | 57.77  | 0.000 |
| 10.00 | 28.29 | 1.607   | 55.10  | 0.000 |
| 11.00 | 28.39 | 1.656   | 54.04  | 0.000 |
| 12.00 | 28.84 | 1.646   | 53.79  | 0.000 |
| 13.00 | 28.80 | 1.652   | 53.92  | 0.000 |
| 14.00 | 28.61 | 1.619   | 54.24  | 0.000 |
| 15.00 | 28.76 | 1.655   | 53.96  | 0.000 |
| 16.00 | 28.75 | 1.691   | 52.93  | 0.000 |
| 17.00 | 28.44 | 1.645   | 51.76  | 0.000 |
| 18.00 | 28.51 | 1.631   | 50.80  | 0.000 |
| 19.00 | 28.96 | 1.693   | 50.19  | 0.000 |
| 20.00 | 28.90 | 1.704   | 49.58  | 0.000 |
| 21.00 | 28.56 | 1.619   | 49.01  | 0.000 |
| 22.00 | 28.51 | 1.667   | 52.93  | .078  |
| 23.00 | 28.53 | 1.604   | 56.21  | .129  |
| 24.00 | 28.18 | 1.590   | 60.57  | .179  |
| 25.00 | 28.20 | 1.655   | 64.25  | .207  |
| 26.00 | 28.07 | 1.632   | 66.55  | .207  |
| 27.00 | 27.87 | 1.636   | 69.18  | .207  |
| 28.00 | 27.96 | 1.617   | 69.17  | .207  |
| 29.00 | 27.91 | 1.621   | 69.94  | .207  |
| 30.00 | 27.30 | 1.530   | 70.47  | .207  |
| 31.00 | 27.53 | 1.561   | 70.93  | .207  |
| 32.00 | 28.02 | 1.571   | 71.27  | .207  |
| 33.00 | 27.60 | 1.560   | 71.66  | .207  |
| 34.00 | 27.87 | 1.560   | 71.90  | .207  |
| 35.00 | 27.66 | 1.577   | 72.02  | .207  |
| 36.00 | 27.86 | 1.602   | 72.21  | .207  |
| 37.00 | 27.99 | 1.565   | 72.44  | .207  |
| 38.00 | 27.90 | 1.569   | 72.48  | .207  |
| 39.00 | 28.00 | 1.612   | 72.59  | .207  |
| 40.00 | 28.20 | 1.582   | 72.67  | .207  |
| 41.00 | 28.18 | 1.667   | 72.82  | .207  |

# NVEOL CRYOGENIC COOLER LAB

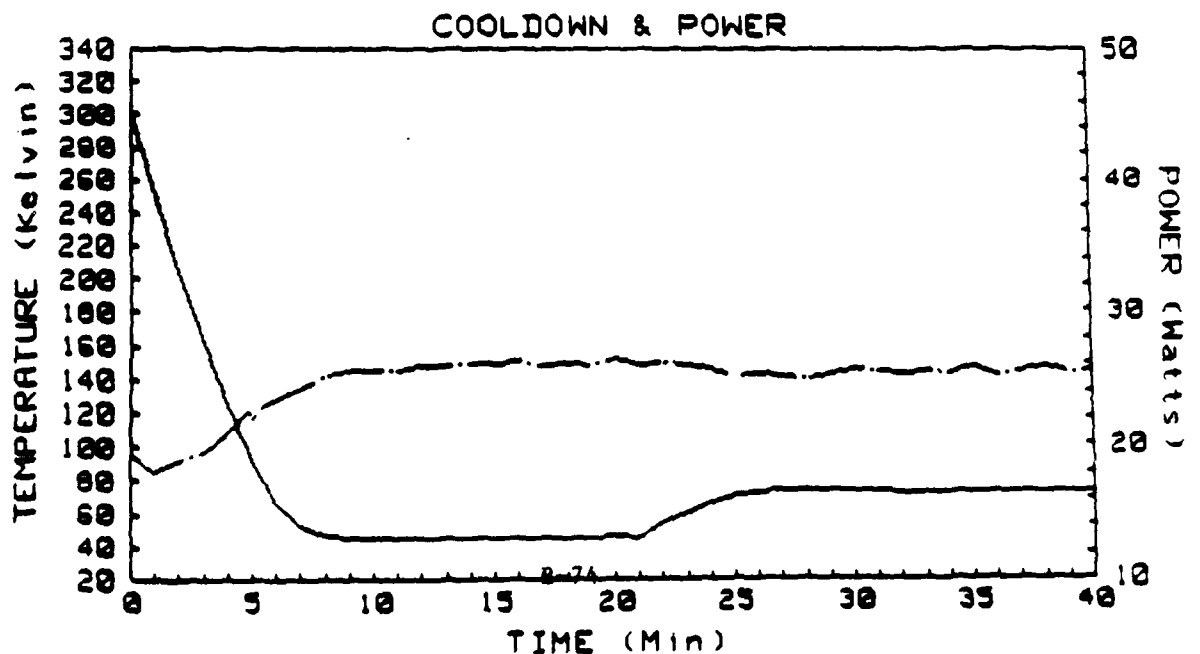
## CRYOGENIC COOLER DATA

COOLER: MAGNAVOX 010  
VOLTAGE: 17.5  
AMBIENT: 25°

DATE: 7 DEC 1986 21:26  
ENGR: H K  
PROG: CATP 1.0

TEST: POST 48 HOUR 71 DEG.C BAKE <TEST RUN AT 23 DEG.C AMB. TEMP.>

| TIME  | POWER | CURRENT | KELVIN | LOAD  |
|-------|-------|---------|--------|-------|
| 0.00  | 19.51 | 1.115   | 300.40 | 0.000 |
| 1.00  | 18.17 | 1.030   | 251.17 | 0.000 |
| 2.00  | 18.95 | 1.112   | 204.19 | 0.000 |
| 3.00  | 19.65 | 1.136   | 161.57 | 0.000 |
| 4.00  | 21.06 | 1.224   | 123.67 | 0.000 |
| 4.77  | 22.71 | 1.297   | 98.00  | 0.000 |
| 5.00  | 22.22 | 1.260   | 91.27  | 0.000 |
| 5.45  | 22.98 | 1.313   | 79.39  | 0.000 |
| 6.00  | 23.52 | 1.346   | 66.55  | 0.000 |
| 7.00  | 24.35 | 1.420   | 53.09  | 0.000 |
| 8.00  | 25.27 | 1.499   | 47.23  | 0.000 |
| 9.00  | 25.76 | 1.451   | 45.22  | 0.000 |
| 10.00 | 25.75 | 1.449   | 44.96  | 0.000 |
| 11.00 | 25.73 | 1.449   | 44.74  | 0.000 |
| 12.00 | 26.12 | 1.450   | 44.79  | 0.000 |
| 13.00 | 26.09 | 1.450   | 44.87  | 0.000 |
| 14.00 | 26.20 | 1.510   | 45.13  | 0.000 |
| 15.00 | 26.29 | 1.510   | 45.35  | 0.000 |
| 16.00 | 26.36 | 1.521   | 45.44  | 0.000 |
| 17.00 | 26.09 | 1.474   | 45.74  | 0.000 |
| 18.00 | 26.22 | 1.535   | 45.66  | 0.000 |
| 19.00 | 25.99 | 1.551   | 45.96  | 0.000 |
| 20.00 | 26.49 | 1.514   | 46.27  | 0.000 |
| 30.00 | 25.65 | 1.522   | 73.24  | .343  |
| 40.00 | 25.59 | 1.485   | 72.02  | .342  |



# NVEOL CRYOGENIC COOLER LAB

## CRYOGENIC COOLER DATA

COOLER: MAGNAVOX 010  
VOLTAGE: 17.5  
AMBIENT: 23°C

DATE: 7 DEC 1986 21:26  
ENGR: H K  
PROG: CATP+ 1.0

TEST: POST 48 HOUR 71 DEG.C BAKE <TEST RUN AT 23 DEG.C AMB. TEMP.>

| TIME  | POWER | CURRENT | KELVIN | LOAD  |
|-------|-------|---------|--------|-------|
| 0.00  | 19.51 | 1.115   | 300.40 | 0.000 |
| 1.00  | 18.17 | 1.030   | 251.17 | 0.000 |
| 2.00  | 18.95 | 1.112   | 204.19 | 0.000 |
| 3.00  | 19.65 | 1.136   | 161.57 | 0.000 |
| 4.00  | 21.06 | 1.224   | 123.67 | 0.000 |
| 4.77  | 22.71 | 1.297   | 90.00  | 0.000 |
| 5.00  | 22.22 | 1.260   | 91.27  | 0.000 |
| 5.45  | 22.90 | 1.313   | 79.39  | 0.000 |
| 6.00  | 23.52 | 1.346   | 66.55  | 0.000 |
| 7.00  | 24.35 | 1.420   | 53.09  | 0.000 |
| 8.00  | 25.27 | 1.499   | 47.23  | 0.000 |
| 9.00  | 25.76 | 1.451   | 45.22  | 0.000 |
| 10.00 | 25.75 | 1.449   | 44.96  | 0.000 |
| 11.00 | 25.73 | 1.449   | 44.74  | 0.000 |
| 12.00 | 26.12 | 1.450   | 44.79  | 0.000 |
| 13.00 | 26.09 | 1.450   | 44.07  | 0.000 |
| 14.00 | 26.20 | 1.510   | 45.13  | 0.000 |
| 15.00 | 26.29 | 1.510   | 45.35  | 0.000 |
| 16.00 | 26.36 | 1.521   | 45.44  | 0.000 |
| 17.00 | 26.09 | 1.474   | 45.74  | 0.000 |
| 18.00 | 26.22 | 1.535   | 45.66  | 0.000 |
| 19.00 | 25.99 | 1.551   | 45.96  | 0.000 |
| 20.00 | 26.49 | 1.514   | 46.27  | 0.000 |
| 21.00 | 26.11 | 1.521   | 46.01  | 0.000 |
| 22.00 | 26.20 | 1.460   | 55.93  | .195  |
| 23.00 | 25.95 | 1.501   | 61.47  | .256  |
| 24.00 | 25.66 | 1.476   | 66.04  | .342  |
| 25.00 | 25.20 | 1.402   | 71.12  | .343  |
| 26.00 | 25.20 | 1.451   | 72.71  | .343  |
| 27.00 | 25.20 | 1.406   | 73.36  | .343  |
| 28.00 | 24.95 | 1.420   | 74.01  | .343  |
| 29.00 | 25.30 | 1.420   | 73.94  | .343  |
| 30.00 | 25.65 | 1.522   | 73.24  | .343  |
| 31.00 | 25.40 | 1.440   | 72.90  | .343  |
| 32.00 | 25.37 | 1.446   | 72.59  | .343  |
| 33.00 | 25.45 | 1.404   | 72.44  | .343  |
| 34.00 | 25.29 | 1.430   | 72.32  | .342  |
| 35.00 | 25.70 | 1.439   | 72.51  | .342  |
| 36.00 | 25.13 | 1.431   | 72.59  | .342  |
| 37.00 | 25.54 | 1.474   | 72.59  | .342  |
| 38.00 | 25.01 | 1.431   | 72.67  | .342  |
| 39.00 | 25.27 | 1.452   | 72.71  | .342  |
| 40.00 | 25.59 | 1.405   | 72.02  | .342  |
| 41.00 | 25.46 | 1.450   | 72.70  | .342  |

# NVEOL CRYOGENIC COOLER LAB

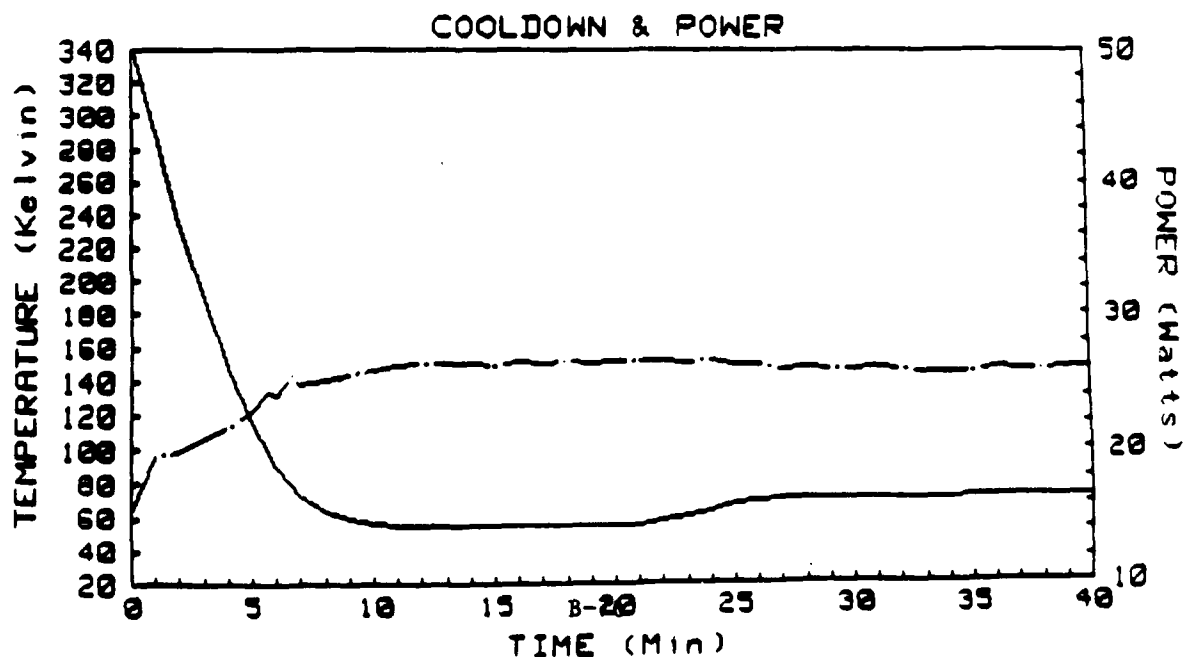
## CRYOGENIC COOLER DATA

COOLER: Magnavox 017  
VOLTAGE: 17.5  
AMBIENT:

DATE: 03 December 86 15:28  
ENGR: Henry Kling  
PROG: CATP\* 1.0

TEST: High Temp test (done at 71 C after 40 hours of baking)

| TIME  | POWER | CURRENT | KELVIN | LOAD  |
|-------|-------|---------|--------|-------|
| 0.00  | 15.53 | .887    | 346.43 | 0.000 |
| 1.00  | 19.50 | 1.140   | 289.90 | 0.000 |
| 2.00  | 19.00 | 1.129   | 235.00 | 0.000 |
| 3.00  | 20.90 | 1.226   | 189.01 | 0.000 |
| 4.00  | 21.59 | 1.235   | 148.60 | 0.000 |
| 5.00  | 22.06 | 1.320   | 115.36 | 0.000 |
| 5.65  | 24.22 | 1.384   | 90.27  | 0.000 |
| 6.00  | 23.89 | 1.380   | 90.32  | 0.000 |
| 6.65  | 25.50 | 1.457   | 70.71  | 0.000 |
| 7.00  | 24.01 | 1.427   | 73.60  | 0.000 |
| 8.00  | 25.14 | 1.502   | 64.00  | 0.000 |
| 9.00  | 25.55 | 1.462   | 59.21  | 0.000 |
| 10.00 | 25.06 | 1.502   | 56.74  | 0.000 |
| 11.00 | 26.19 | 1.499   | 55.54  | 0.000 |
| 12.00 | 26.31 | 1.407   | 54.92  | 0.000 |
| 13.00 | 26.38 | 1.520   | 54.67  | 0.000 |
| 14.00 | 26.39 | 1.500   | 54.54  | 0.000 |
| 15.00 | 26.30 | 1.516   | 54.50  | 0.000 |
| 16.00 | 26.64 | 1.540   | 54.50  | 0.000 |
| 17.00 | 26.32 | 1.494   | 54.63  | 0.000 |
| 18.00 | 26.55 | 1.536   | 54.67  | 0.000 |
| 19.00 | 26.43 | 1.510   | 54.71  | 0.000 |
| 20.00 | 26.52 | 1.540   | 54.03  | 0.000 |
| 30.00 | 25.91 | 1.485   | 71.03  | .200  |
| 40.00 | 26.02 | 1.492   | 71.61  | .200  |



# NVEOL CRYOGENIC COOLER LAB

## CRYOGENIC COOLER DATA

COOLER: Magnavox 017  
VOLTAGE: 17.5  
AMBIENT:

DATE: 03 December 86 15:27  
ENGR: Henry Kling  
PROG: CATP+ 1.0

TEST: High Temp test (done at 71 C after 40 hours of baking)

| TIME  | POWER | CURRENT | KELVIN | LOAD  |
|-------|-------|---------|--------|-------|
| 0.00  | 19.53 | .887    | 346.43 | 0.000 |
| 1.00  | 19.50 | 1.148   | 289.90 | 0.000 |
| 2.00  | 19.88 | 1.129   | 235.80 | 0.000 |
| 3.00  | 20.90 | 1.226   | 189.81 | 0.000 |
| 4.00  | 21.59 | 1.235   | 148.60 | 0.000 |
| 5.00  | 22.86 | 1.328   | 115.36 | 0.000 |
| 5.65  | 24.22 | 1.384   | 98.27  | 0.000 |
| 6.00  | 23.89 | 1.388   | 98.32  | 0.000 |
| 6.65  | 25.50 | 1.457   | 78.71  | 0.000 |
| 7.00  | 24.81 | 1.427   | 73.68  | 0.000 |
| 8.00  | 25.14 | 1.502   | 64.88  | 0.000 |
| 9.00  | 25.55 | 1.462   | 59.21  | 0.000 |
| 10.00 | 25.86 | 1.582   | 56.74  | 0.000 |
| 11.00 | 26.19 | 1.499   | 55.54  | 0.000 |
| 12.00 | 26.31 | 1.487   | 54.92  | 0.000 |
| 13.00 | 26.38 | 1.528   | 54.67  | 0.000 |
| 14.00 | 26.39 | 1.588   | 54.54  | 0.000 |
| 15.00 | 26.38 | 1.516   | 54.58  | 0.000 |
| 16.00 | 26.64 | 1.548   | 54.58  | 0.000 |
| 17.00 | 26.32 | 1.494   | 54.63  | 0.000 |
| 18.00 | 26.55 | 1.536   | 54.67  | 0.000 |
| 19.00 | 26.43 | 1.518   | 54.71  | 0.000 |
| 20.00 | 26.52 | 1.548   | 54.83  | 0.000 |
| 21.00 | 26.54 | 1.525   | 54.88  | 0.000 |
| 22.00 | 26.51 | 1.554   | 57.81  | .079  |
| 23.00 | 26.41 | 1.523   | 60.63  | .130  |
| 24.00 | 26.54 | 1.516   | 64.21  | .179  |
| 25.00 | 26.23 | 1.477   | 67.55  | .208  |
| 26.00 | 26.15 | 1.468   | 69.22  | .208  |
| 27.00 | 25.89 | 1.483   | 70.85  | .208  |
| 28.00 | 26.01 | 1.463   | 70.52  | .208  |
| 29.00 | 25.95 | 1.473   | 70.87  | .208  |
| 30.00 | 25.91 | 1.485   | 71.83  | .208  |
| 31.00 | 26.00 | 1.437   | 71.15  | .208  |
| 32.00 | 25.89 | 1.484   | 71.38  | .208  |
| 33.00 | 25.69 | 1.475   | 71.38  | .208  |
| 34.00 | 25.73 | 1.475   | 71.42  | .208  |
| 35.00 | 25.77 | 1.481   | 71.46  | .208  |
| 36.00 | 25.97 | 1.538   | 71.58  | .208  |
| 37.00 | 25.82 | 1.587   | 71.58  | .208  |
| 38.00 | 25.88 | 1.481   | 71.69  | .208  |
| 39.00 | 26.12 | 1.454   | 71.61  | .208  |
| 40.00 | 26.02 | 1.492   | 71.61  | .208  |
| 41.00 | 25.59 | 1.442   | 71.73  | .208  |

## NVEOL CRYOGENIC COOLER LAB

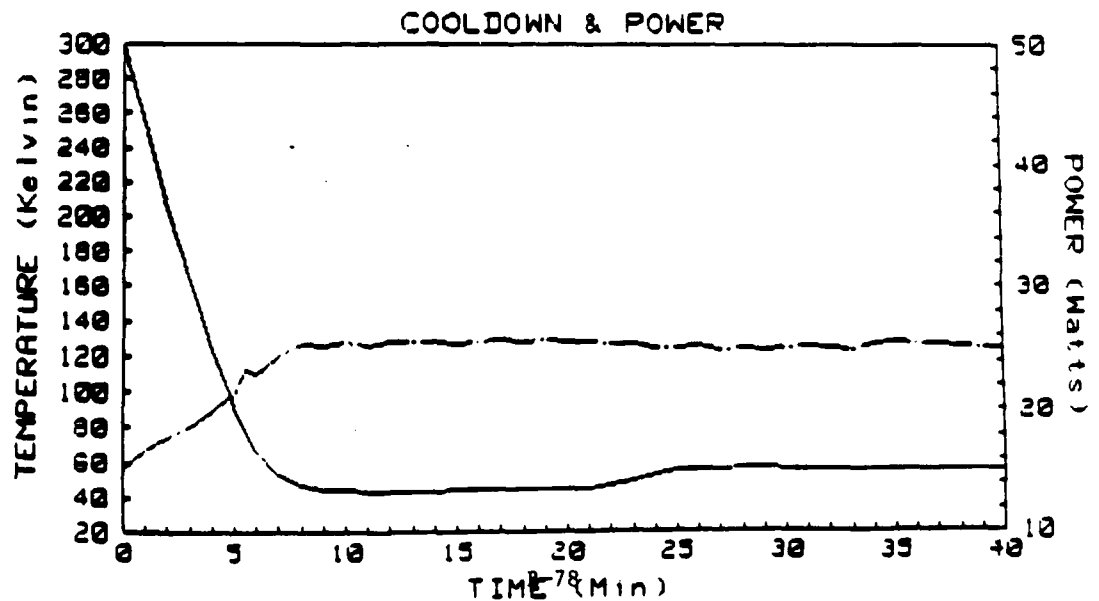
CRYOGENIC COOLER DATA

COOLER: MAGNAVOX 017  
 VOLTAGE: 17.5  
 AMBIENT:

DATE: 5 DEC 86 14:41  
 ENGR: HAL  
 PROG: CATP\* 1.0

TEST: Post High Temp baseline (at ambient).

| TIME  | POWER | CURRENT | KELVIN | LOAD  |
|-------|-------|---------|--------|-------|
| 0.00  | 15.21 | .869    | 298.99 | 0.000 |
| 1.00  | 16.78 | .988    | 252.67 | 0.000 |
| 2.00  | 17.67 | 1.030   | 205.24 | 0.000 |
| 3.00  | 18.72 | 1.087   | 162.25 | 0.000 |
| 4.00  | 19.82 | 1.170   | 123.89 | 0.000 |
| 4.77  | 21.06 | 1.203   | 98.88  | 0.000 |
| 5.00  | 21.17 | 1.229   | 91.16  | 0.000 |
| 5.45  | 23.14 | 1.322   | 79.46  | 0.000 |
| 6.00  | 22.84 | 1.364   | 66.43  | 0.000 |
| 7.00  | 24.24 | 1.419   | 52.81  | 0.000 |
| 8.00  | 25.25 | 1.479   | 47.23  | 0.000 |
| 9.00  | 25.21 | 1.398   | 44.87  | 0.000 |
| 10.00 | 25.51 | 1.468   | 44.89  | 0.000 |
| 11.00 | 25.17 | 1.440   | 43.74  | 0.000 |
| 12.00 | 25.54 | 1.493   | 43.78  | 0.000 |
| 13.00 | 25.57 | 1.518   | 43.78  | 0.000 |
| 14.00 | 25.45 | 1.479   | 43.91  | 0.000 |
| 15.00 | 25.40 | 1.462   | 44.09  | 0.000 |
| 16.00 | 25.44 | 1.423   | 44.18  | 0.000 |
| 17.00 | 25.76 | 1.420   | 44.18  | 0.000 |
| 18.00 | 25.58 | 1.486   | 44.13  | 0.000 |
| 19.00 | 25.66 | 1.434   | 44.22  | 0.000 |
| 20.00 | 25.46 | 1.498   | 44.26  | 0.000 |
| 30.00 | 24.94 | 1.433   | 55.88  | .193  |
| 40.00 | 24.94 | 1.416   | 56.89  | .193  |



## NVEOL CRYOGENIC COOLER LAB

CRYOGENIC COOLER DATA

COOLER: MAGNAVON 017  
 VOLTAGE: 17.5  
 AMBIENT: 23°C

DATE: 5 DEC 86 14:41  
 ENGR: HAL  
 PROG: CATP+ 1.0

TEST: Post High Temp baseline (at ambient).

| TIME  | POWER | CURRENT | KELVIN | LOAD  |
|-------|-------|---------|--------|-------|
| 0.00  | 15.21 | .869    | 298.99 | 0.000 |
| 1.00  | 16.78 | .908    | 292.67 | 0.000 |
| 2.00  | 17.67 | 1.030   | 285.24 | 0.000 |
| 3.00  | 18.72 | 1.007   | 162.25 | 0.000 |
| 4.00  | 19.82 | 1.178   | 123.89 | 0.000 |
| 4.77  | 21.86 | 1.203   | 98.88  | 0.000 |
| 5.00  | 21.17 | 1.229   | 91.16  | 0.000 |
| 5.45  | 23.14 | 1.322   | 79.46  | 0.000 |
| 6.00  | 22.84 | 1.364   | 66.43  | 0.000 |
| 7.00  | 24.24 | 1.419   | 52.81  | 0.000 |
| 8.00  | 25.25 | 1.479   | 47.23  | 0.000 |
| 9.00  | 25.21 | 1.398   | 44.87  | 0.000 |
| 10.00 | 25.51 | 1.468   | 44.89  | 0.000 |
| 11.00 | 25.17 | 1.440   | 43.74  | 0.000 |
| 12.00 | 25.54 | 1.493   | 43.78  | 0.000 |
| 13.00 | 25.57 | 1.518   | 43.78  | 0.000 |
| 14.00 | 25.45 | 1.479   | 43.91  | 0.000 |
| 15.00 | 25.48 | 1.462   | 44.89  | 0.000 |
| 16.00 | 25.44 | 1.423   | 44.18  | 0.000 |
| 17.00 | 25.76 | 1.420   | 44.18  | 0.000 |
| 18.00 | 25.58 | 1.486   | 44.13  | 0.000 |
| 19.00 | 25.66 | 1.434   | 44.22  | 0.000 |
| 20.00 | 25.46 | 1.490   | 44.26  | 0.000 |
| 21.00 | 25.58 | 1.419   | 44.39  | 0.000 |
| 22.00 | 25.27 | 1.475   | 47.78  | .079  |
| 23.00 | 25.27 | 1.473   | 50.86  | .118  |
| 24.00 | 25.84 | 1.448   | 52.85  | .167  |
| 25.00 | 24.99 | 1.433   | 55.39  | .193  |
| 26.00 | 25.18 | 1.484   | 56.85  | .193  |
| 27.00 | 24.81 | 1.489   | 56.89  | .193  |
| 28.00 | 24.95 | 1.418   | 56.66  | .193  |
| 29.00 | 24.88 | 1.444   | 56.54  | .193  |
| 30.00 | 24.94 | 1.433   | 55.88  | .193  |
| 31.00 | 25.28 | 1.425   | 55.93  | .193  |
| 32.00 | 24.91 | 1.378   | 55.93  | .193  |
| 33.00 | 24.87 | 1.425   | 55.84  | .193  |
| 34.00 | 25.41 | 1.488   | 55.97  | .193  |
| 35.00 | 25.58 | 1.438   | 55.97  | .193  |
| 36.00 | 25.25 | 1.486   | 56.81  | .193  |
| 37.00 | 25.38 | 1.466   | 56.81  | .193  |
| 38.00 | 25.89 | 1.495   | 56.89  | .193  |
| 39.00 | 25.85 | 1.428   | 56.89  | .193  |
| 40.00 | 24.94 | 1.416   | 56.89  | .193  |
| 41.00 | 25.86 | 1.432   | 56.89  | .193  |

# NVEOL CRYOGENIC COOLER LAB

## CRYOGENIC COOLER DATA

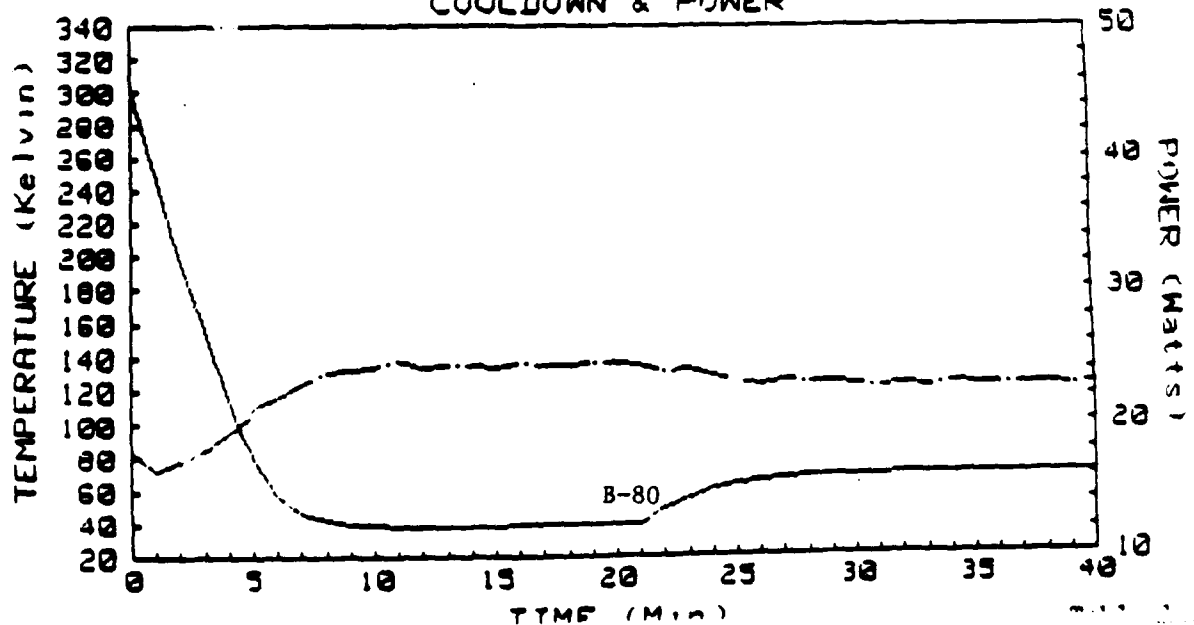
COOLER: MAGNAVOX 817  
VOLTAGE: 17.5  
AMBIENT:

DATE: 17 DEC 86 16:56  
ENGR: HLD  
PROG: CATP+ 1.0

TEST: POST MECHANICAL SHOCK TEST

| TIME  | POWER | CURRENT | KELVIN | LOAD  |
|-------|-------|---------|--------|-------|
| 0.00  | 17.97 | 1.027   | 302.64 | 0.000 |
| 1.00  | 16.51 | .960    | 250.57 | 0.000 |
| 2.00  | 17.20 | .983    | 200.99 | 0.000 |
| 3.00  | 18.12 | 1.060   | 156.96 | 0.000 |
| 4.00  | 19.34 | 1.154   | 116.10 | 0.000 |
| 4.55  | 20.10 | 1.149   | 97.33  | 0.000 |
| 5.00  | 20.70 | 1.219   | 82.50  | 0.000 |
| 5.12  | 21.44 | 1.225   | 79.42  | 0.000 |
| 6.00  | 21.90 | 1.291   | 58.17  | 0.000 |
| 7.00  | 23.03 | 1.321   | 46.40  | 0.000 |
| 8.00  | 23.91 | 1.373   | 41.91  | 0.000 |
| 9.00  | 24.10 | 1.405   | 40.04  | 0.000 |
| 10.00 | 24.20 | 1.386   | 39.13  | 0.000 |
| 11.00 | 24.72 | 1.413   | 38.75  | 0.000 |
| 12.00 | 24.30 | 1.395   | 38.67  | 0.000 |
| 13.00 | 24.45 | 1.411   | 38.67  | 0.000 |
| 14.00 | 24.45 | 1.381   | 38.79  | 0.000 |
| 15.00 | 24.35 | 1.401   | 38.90  | 0.000 |
| 16.00 | 24.68 | 1.400   | 38.09  | 0.000 |
| 17.00 | 24.47 | 1.369   | 38.24  | 0.000 |
| 18.00 | 24.47 | 1.386   | 38.35  | 0.000 |
| 19.00 | 24.69 | 1.373   | 38.47  | 0.000 |
| 20.00 | 24.50 | 1.420   | 39.62  | 0.000 |
| 30.00 | 22.90 | 1.325   | 60.29  | .343  |
| 40.00 | 22.90 | 1.293   | 60.21  | .343  |

## COOLDOWN & POWER



## NVEOL CRYOGENIC COOLER LAB

CRYOGENIC COOLER DATA

COOLER: MAGNAVOX 817  
 VOLTAGE: 17.5  
 AMBIENT:

DATE: 17 DEC 86 16:57  
 ENGR: HLD  
 PROG: CATP+ 1.0

TEST: POST MECHANICAL SHOCK TEST

| TIME  | POWER | CURRENT | KELVIN | LOAD  |
|-------|-------|---------|--------|-------|
| 0.00  | 17.97 | 1.027   | 302.64 | 0.000 |
| 1.00  | 16.51 | .960    | 250.57 | 0.000 |
| 2.00  | 17.20 | .903    | 200.99 | 0.000 |
| 3.00  | 18.12 | 1.060   | 156.06 | 0.000 |
| 4.00  | 19.34 | 1.154   | 116.10 | 0.000 |
| 4.55  | 20.10 | 1.149   | 97.33  | 0.000 |
| 5.00  | 20.70 | 1.219   | 82.50  | 0.000 |
| 5.12  | 21.44 | 1.225   | 79.42  | 0.000 |
| 6.00  | 21.90 | 1.291   | 50.17  | 0.000 |
| 7.00  | 23.03 | 1.321   | 46.40  | 0.000 |
| 8.00  | 23.91 | 1.373   | 41.91  | 0.000 |
| 9.00  | 24.18 | 1.405   | 40.04  | 0.000 |
| 10.00 | 24.20 | 1.386   | 39.13  | 0.000 |
| 11.00 | 24.72 | 1.413   | 38.75  | 0.000 |
| 12.00 | 24.30 | 1.395   | 38.67  | 0.000 |
| 13.00 | 24.45 | 1.411   | 38.67  | 0.000 |
| 14.00 | 24.45 | 1.381   | 38.79  | 0.000 |
| 15.00 | 24.35 | 1.401   | 39.90  | 0.000 |
| 16.00 | 24.60 | 1.400   | 39.09  | 0.000 |
| 17.00 | 24.47 | 1.369   | 39.24  | 0.000 |
| 18.00 | 24.47 | 1.386   | 39.35  | 0.000 |
| 19.00 | 24.69 | 1.373   | 39.47  | 0.000 |
| 20.00 | 24.50 | 1.420   | 39.62  | 0.000 |
| 21.00 | 24.49 | 1.432   | 39.81  | 0.000 |
| 22.00 | 24.00 | 1.371   | 40.97  | .195  |
| 23.00 | 24.14 | 1.343   | 54.70  | .273  |
| 24.00 | 23.56 | 1.311   | 60.49  | .343  |
| 25.00 | 23.20 | 1.302   | 63.00  | .343  |
| 26.00 | 22.70 | 1.335   | 65.57  | .343  |
| 27.00 | 23.27 | 1.320   | 66.63  | .343  |
| 28.00 | 23.04 | 1.205   | 67.60  | .343  |
| 29.00 | 22.90 | 1.336   | 67.99  | .343  |
| 30.00 | 22.90 | 1.325   | 68.29  | .343  |
| 31.00 | 22.77 | 1.314   | 68.52  | .343  |
| 32.00 | 22.89 | 1.200   | 68.64  | .343  |
| 33.00 | 22.73 | 1.320   | 68.79  | .343  |
| 34.00 | 22.90 | 1.290   | 68.90  | .343  |
| 35.00 | 22.00 | 1.324   | 68.90  | .343  |
| 36.00 | 22.79 | 1.336   | 69.06  | .343  |
| 37.00 | 22.84 | 1.290   | 68.90  | .343  |
| 38.00 | 22.00 | 1.296   | 69.17  | .343  |
| 39.00 | 22.67 | 1.200   | 69.17  | .343  |
| 40.00 | 22.90 | 1.293   | 69.21  | .343  |
| 41.00 | 22.90 | 1.203   | 69.36  | .343  |

# NVEOL CRYOGENIC COOLER LAB

## CRYOGENIC COOLER DATA

COOLER: MAGNAVOX 010  
VOLTAGE: 17.5  
AMBIENT:

DATE: 17 DEC 86 15:10  
ENGR: HLD  
PROG: CATP+ 1.0

TEST: POST MECHANICAL SHOCK TEST

| TIME  | POWER | CURRENT | KELVIN | LOAD  |
|-------|-------|---------|--------|-------|
| 0.00  | 15.40 | .800    | 297.02 | 0.000 |
| 1.00  | 18.15 | 1.066   | 245.46 | 0.000 |
| 2.00  | 18.77 | 1.117   | 197.92 | 0.000 |
| 3.00  | 19.66 | 1.136   | 154.53 | 0.000 |
| 4.00  | 20.92 | 1.193   | 115.30 | 0.000 |
| 4.55  | 22.39 | 1.279   | 96.71  | 0.000 |
| 5.00  | 22.18 | 1.297   | 82.12  | 0.000 |
| 5.12  | 23.62 | 1.350   | 79.12  | 0.000 |
| 6.00  | 23.63 | 1.400   | 58.66  | 0.000 |
| 7.00  | 24.96 | 1.452   | 47.23  | 0.000 |
| 8.00  | 25.44 | 1.500   | 43.09  | 0.000 |
| 9.00  | 25.69 | 1.461   | 41.00  | 0.000 |
| 10.00 | 26.27 | 1.522   | 40.30  | 0.000 |
| 11.00 | 26.01 | 1.460   | 40.30  | 0.000 |
| 12.00 | 26.44 | 1.505   | 40.12  | 0.000 |
| 13.00 | 25.94 | 1.512   | 40.12  | 0.000 |
| 14.00 | 26.04 | 1.471   | 40.30  | 0.000 |
| 15.00 | 26.22 | 1.503   | 39.77  | 0.000 |
| 16.00 | 26.29 | 1.507   | 39.77  | 0.000 |
| 17.00 | 25.95 | 1.481   | 39.96  | 0.000 |
| 18.00 | 25.05 | 1.443   | 40.11  | 0.000 |
| 19.00 | 26.10 | 1.499   | 40.30  | 0.000 |
| 20.00 | 26.21 | 1.510   | 40.21  | 0.000 |
| 30.00 | 24.59 | 1.423   | 56.06  | .343  |
| 40.00 | 24.07 | 1.420   | 56.92  | .343  |

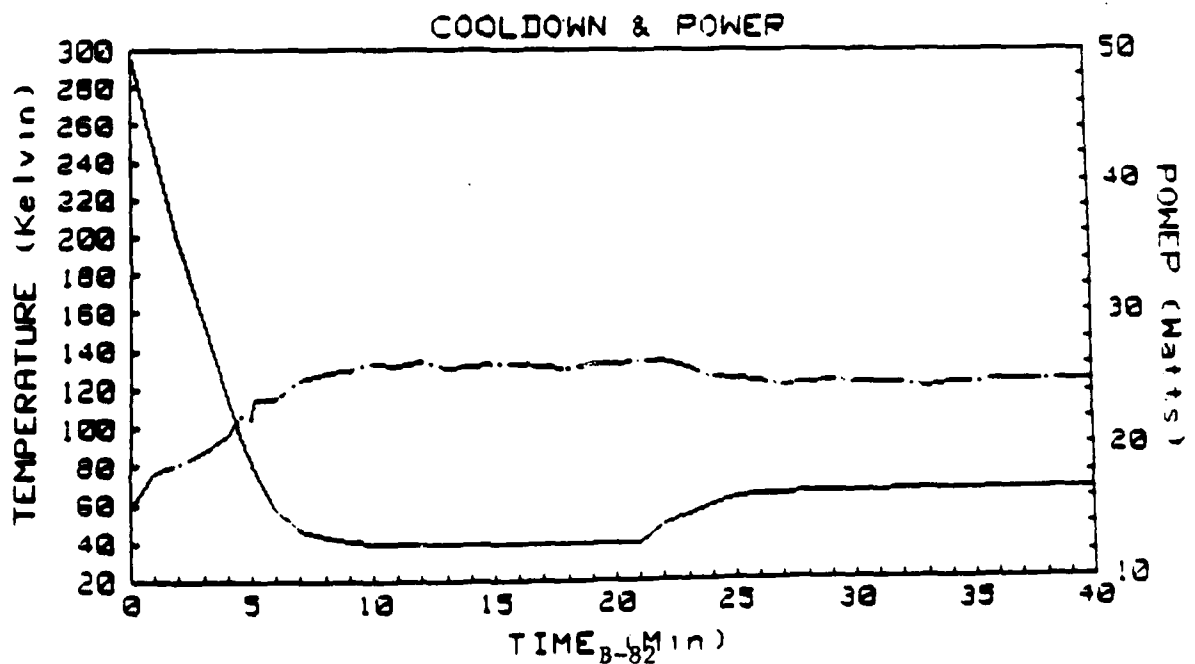


Table 1.4.5

## NVEOL CRYOGENIC COOLER LAB

CRYOGENIC COOLER DATA

COOLER: MAGNAVOX 010  
 VOLTAGE: 17.5  
 AMBIENT:

DATE: 17 DEC 86 15:10  
 ENGR: HLD  
 PROG: CATP+ 1.0

TEST: POST MECHANICAL SHOCK TEST

| TIME  | POWER | CURRENT | KELVIN | LOAD  |
|-------|-------|---------|--------|-------|
| 0.00  | 15.40 | .000    | 297.02 | 0.000 |
| 1.00  | 18.15 | 1.066   | 245.46 | 0.000 |
| 2.00  | 18.77 | 1.117   | 197.92 | 0.000 |
| 3.00  | 19.66 | 1.136   | 154.53 | 0.000 |
| 4.00  | 20.92 | 1.193   | 115.30 | 0.000 |
| 4.55  | 22.39 | 1.279   | 96.71  | 0.000 |
| 5.00  | 22.10 | 1.297   | 82.12  | 0.000 |
| 5.12  | 23.62 | 1.350   | 79.12  | 0.000 |
| 6.00  | 23.63 | 1.400   | 58.66  | 0.000 |
| 7.00  | 24.96 | 1.452   | 47.23  | 0.000 |
| 8.00  | 25.44 | 1.500   | 43.09  | 0.000 |
| 9.00  | 25.69 | 1.461   | 41.00  | 0.000 |
| 10.00 | 26.27 | 1.522   | 40.30  | 0.000 |
| 11.00 | 26.01 | 1.460   | 40.30  | 0.000 |
| 12.00 | 26.44 | 1.505   | 40.12  | 0.000 |
| 13.00 | 25.94 | 1.512   | 40.12  | 0.000 |
| 14.00 | 26.04 | 1.471   | 40.30  | 0.000 |
| 15.00 | 26.22 | 1.503   | 39.77  | 0.000 |
| 16.00 | 26.29 | 1.507   | 39.77  | 0.000 |
| 17.00 | 25.95 | 1.401   | 39.96  | 0.000 |
| 18.00 | 25.05 | 1.443   | 40.11  | 0.000 |
| 19.00 | 26.10 | 1.499   | 40.30  | 0.000 |
| 20.00 | 26.21 | 1.510   | 40.21  | 0.000 |
| 21.00 | 26.35 | 1.495   | 40.34  | 0.000 |
| 22.00 | 26.34 | 1.504   | 49.06  | .195  |
| 23.00 | 25.91 | 1.474   | 54.20  | .273  |
| 24.00 | 25.20 | 1.425   | 59.56  | .343  |
| 25.00 | 24.96 | 1.387   | 62.61  | .343  |
| 26.00 | 24.83 | 1.425   | 64.09  | .343  |
| 27.00 | 24.40 | 1.399   | 64.91  | .343  |
| 28.00 | 24.56 | 1.365   | 65.44  | .343  |
| 29.00 | 24.72 | 1.444   | 65.09  | .343  |
| 30.00 | 24.59 | 1.423   | 66.06  | .343  |
| 31.00 | 24.55 | 1.442   | 66.10  | .343  |
| 32.00 | 24.63 | 1.413   | 66.35  | .343  |
| 33.00 | 24.30 | 1.404   | 66.39  | .343  |
| 34.00 | 24.71 | 1.417   | 66.47  | .343  |
| 35.00 | 24.69 | 1.403   | 66.59  | .343  |
| 36.00 | 24.76 | 1.416   | 66.63  | .343  |
| 37.00 | 24.75 | 1.440   | 66.72  | .343  |
| 38.00 | 24.73 | 1.422   | 66.80  | .343  |
| 39.00 | 24.70 | 1.459   | 66.80  | .343  |
| 40.00 | 24.87 | 1.420   | 66.92  | .343  |
| 41.00 | 24.83 | 1.412   | 66.92  | .343  |

# NVEOL CRYOGENIC COOLER LAB

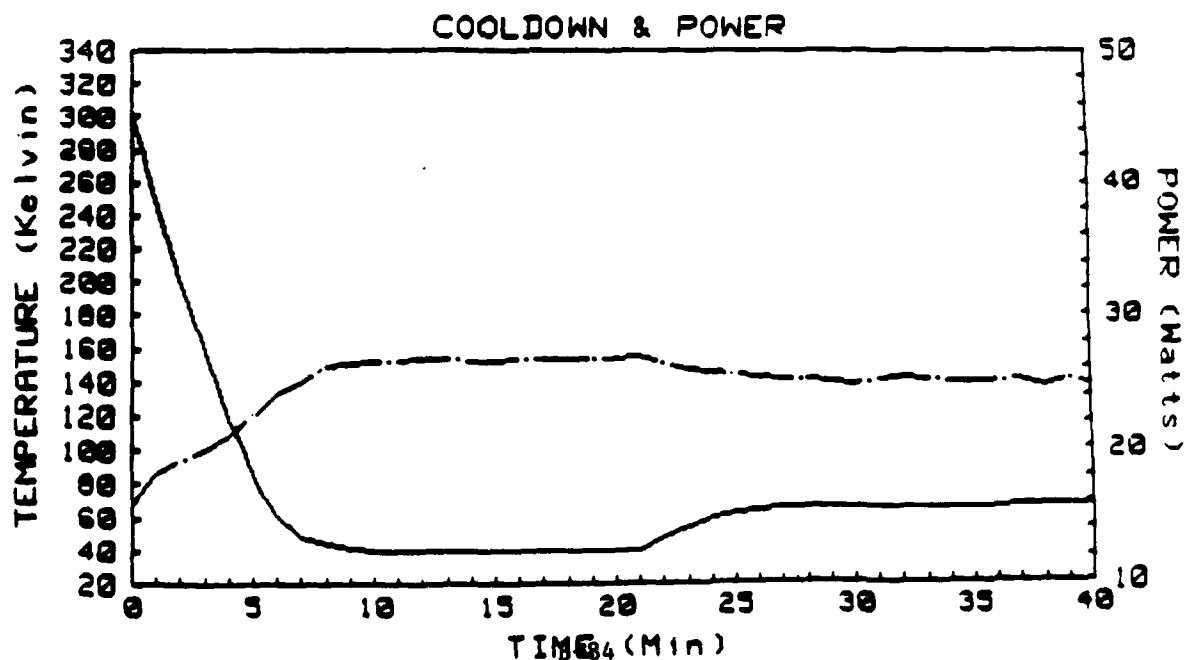
## CRYOGENIC COOLER DATA

COOLER: MAGNAVOX 010  
VOLTAGE: 17.5  
AMBIENT:

DATE: 7 JAN 87 16:24  
ENGR: HLD  
PROG: CATP\* 1.0

TEST: POST VIBRATION BASELINE TEST

| TIME  | POWER | CURRENT | KELVIN | LOAD  |
|-------|-------|---------|--------|-------|
| 0.00  | 16.02 | .916    | 301.90 | 0.000 |
| 1.00  | 18.30 | 1.055   | 250.01 | 0.000 |
| 2.00  | 19.16 | 1.100   | 202.49 | 0.000 |
| 3.00  | 19.90 | 1.102   | 150.81 | 0.000 |
| 4.00  | 21.10 | 1.233   | 119.37 | 0.000 |
| 4.67  | 22.23 | 1.270   | 97.22  | 0.000 |
| 5.00  | 22.70 | 1.361   | 86.00  | 0.000 |
| 5.23  | 22.77 | 1.301   | 79.77  | 0.000 |
| 6.00  | 24.16 | 1.435   | 61.14  | 0.000 |
| 7.00  | 25.00 | 1.510   | 48.62  | 0.000 |
| 8.00  | 26.14 | 1.456   | 43.52  | 0.000 |
| 9.00  | 26.35 | 1.457   | 41.34  | 0.000 |
| 10.00 | 26.64 | 1.530   | 40.43  | 0.000 |
| 11.00 | 26.50 | 1.530   | 40.39  | 0.000 |
| 12.00 | 26.77 | 1.502   | 39.50  | 0.000 |
| 13.00 | 26.60 | 1.542   | 39.62  | 0.000 |
| 14.00 | 26.57 | 1.531   | 39.92  | 0.000 |
| 15.00 | 26.62 | 1.471   | 39.73  | 0.000 |
| 16.00 | 26.60 | 1.542   | 39.85  | 0.000 |
| 17.00 | 26.74 | 1.477   | 40.22  | 0.000 |
| 18.00 | 26.66 | 1.557   | 39.96  | 0.000 |
| 19.00 | 26.76 | 1.502   | 40.04  | 0.000 |
| 20.00 | 26.66 | 1.502   | 40.22  | 0.000 |
| 30.00 | 24.86 | 1.441   | 65.36  | .343  |
| 40.00 | 24.77 | 1.306   | 66.06  | .343  |



# NVEOL CRYOGENIC COOLER LAB

## CRYOGENIC COOLER DATA

COOLER: MAGNAVOX 810  
VOLTAGE: 17.5  
AMBIENT:

DATE: 7 JAN 87 16:25  
ENGR: HLD  
PROG: CATP+ 1.0

TEST: POST VIBRATION BASELINE TEST

| TIME  | POWER | CURRENT | KELVIN | LOAD  |
|-------|-------|---------|--------|-------|
| 0.00  | 16.02 | .916    | 301.90 | 0.000 |
| 1.00  | 18.30 | 1.055   | 250.01 | 0.000 |
| 2.00  | 19.16 | 1.100   | 202.49 | 0.000 |
| 3.00  | 19.90 | 1.102   | 150.01 | 0.000 |
| 4.00  | 21.10 | 1.233   | 119.37 | 0.000 |
| 4.67  | 22.23 | 1.270   | 97.22  | 0.000 |
| 5.00  | 22.70 | 1.361   | 86.00  | 0.000 |
| 5.23  | 22.77 | 1.301   | 79.77  | 0.000 |
| 6.00  | 24.16 | 1.435   | 61.14  | 0.000 |
| 7.00  | 25.00 | 1.510   | 40.62  | 0.000 |
| 8.00  | 26.14 | 1.456   | 43.52  | 0.000 |
| 9.00  | 26.35 | 1.457   | 41.34  | 0.000 |
| 10.00 | 26.64 | 1.530   | 40.43  | 0.000 |
| 11.00 | 26.50 | 1.530   | 40.39  | 0.000 |
| 12.00 | 26.77 | 1.502   | 39.50  | 0.000 |
| 13.00 | 26.60 | 1.542   | 39.62  | 0.000 |
| 14.00 | 26.57 | 1.531   | 39.92  | 0.000 |
| 15.00 | 26.62 | 1.471   | 39.73  | 0.000 |
| 16.00 | 26.60 | 1.542   | 39.05  | 0.000 |
| 17.00 | 26.74 | 1.477   | 40.22  | 0.000 |
| 18.00 | 26.66 | 1.557   | 39.96  | 0.000 |
| 19.00 | 26.76 | 1.502   | 40.04  | 0.000 |
| 20.00 | 26.66 | 1.502   | 40.22  | 0.000 |
| 21.00 | 26.92 | 1.569   | 40.15  | 0.000 |
| 22.00 | 26.31 | 1.507   | 40.66  | .195  |
| 23.00 | 25.02 | 1.495   | 54.00  | .273  |
| 24.00 | 25.60 | 1.441   | 59.35  | .343  |
| 25.00 | 25.55 | 1.466   | 62.33  | .343  |
| 26.00 | 25.29 | 1.447   | 63.76  | .343  |
| 27.00 | 25.10 | 1.466   | 64.50  | .343  |
| 28.00 | 25.22 | 1.464   | 65.03  | .343  |
| 29.00 | 25.03 | 1.464   | 65.24  | .343  |
| 30.00 | 24.06 | 1.441   | 65.36  | .343  |
| 31.00 | 25.24 | 1.437   | 65.53  | .343  |
| 32.00 | 25.39 | 1.435   | 65.57  | .343  |
| 33.00 | 25.12 | 1.461   | 65.61  | .343  |
| 34.00 | 24.93 | 1.465   | 65.77  | .343  |
| 35.00 | 25.04 | 1.426   | 65.73  | .343  |
| 36.00 | 25.07 | 1.403   | 65.77  | .343  |
| 37.00 | 25.17 | 1.456   | 65.05  | .343  |
| 38.00 | 24.69 | 1.404   | 65.90  | .343  |
| 39.00 | 25.12 | 1.419   | 66.02  | .343  |
| 40.00 | 24.77 | 1.306   | 66.06  | .343  |
| 41.00 | 24.99 | 1.410   | 66.06  | .343  |

FIGURE 1

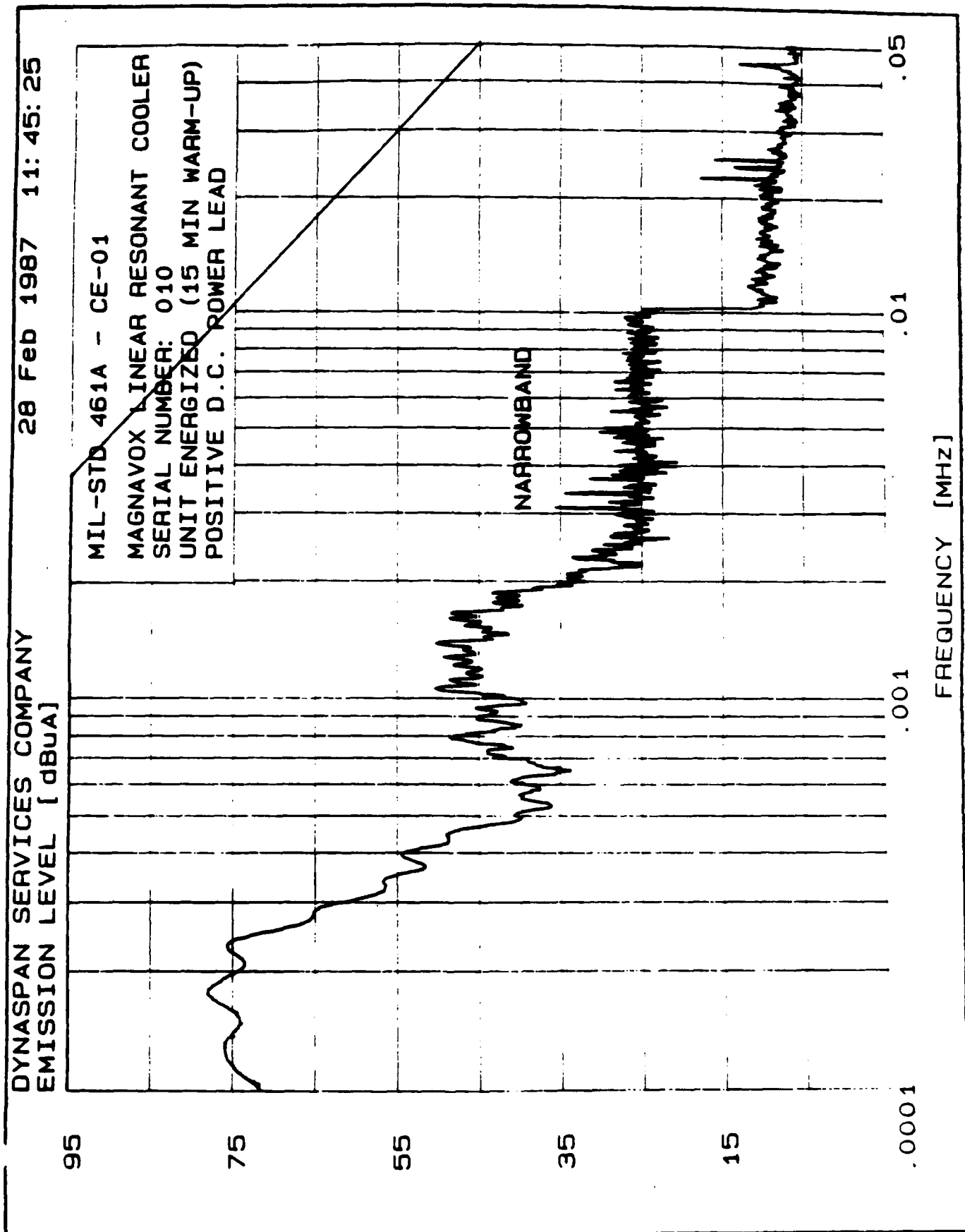
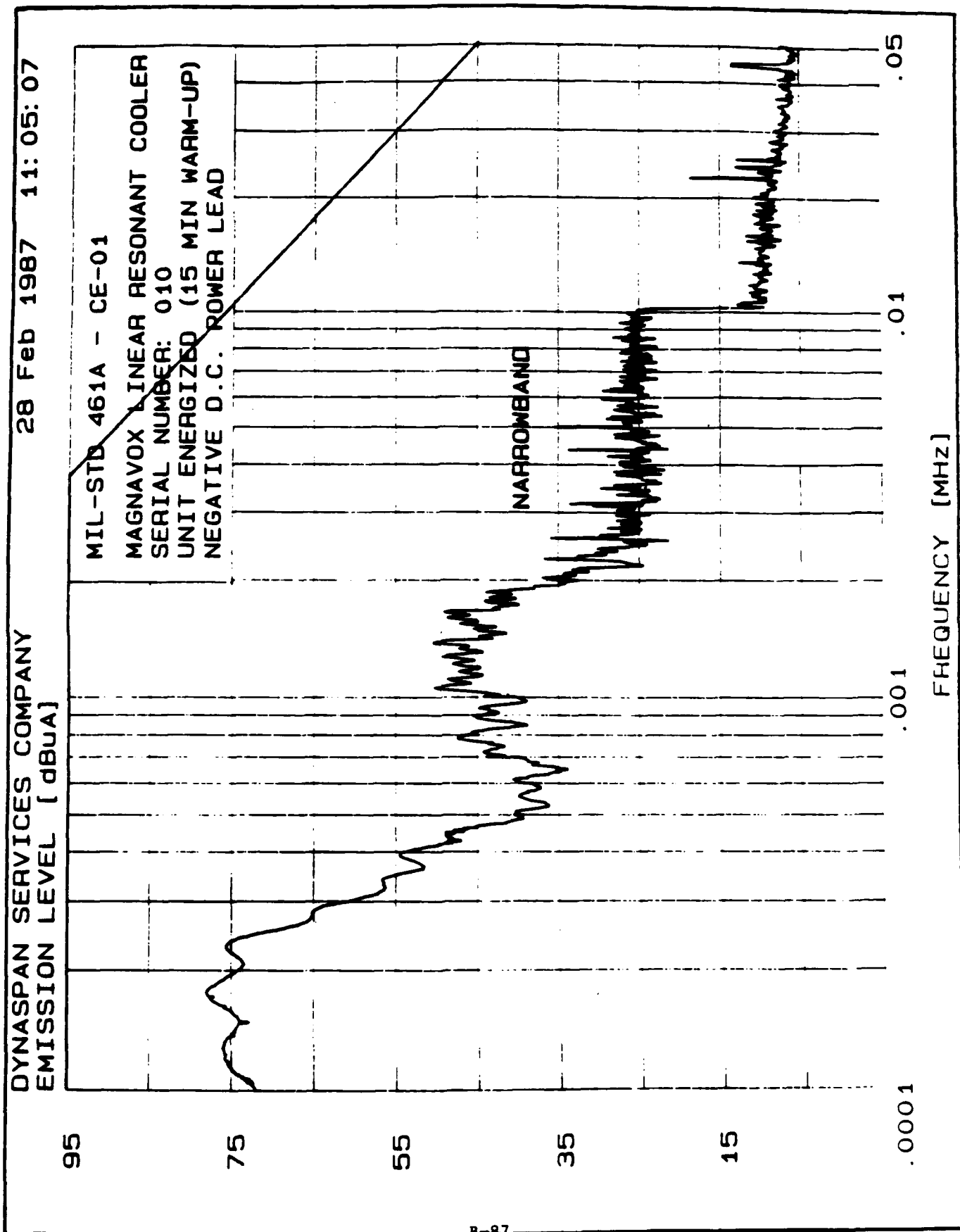


FIGURE 2.



FIGL E 3.

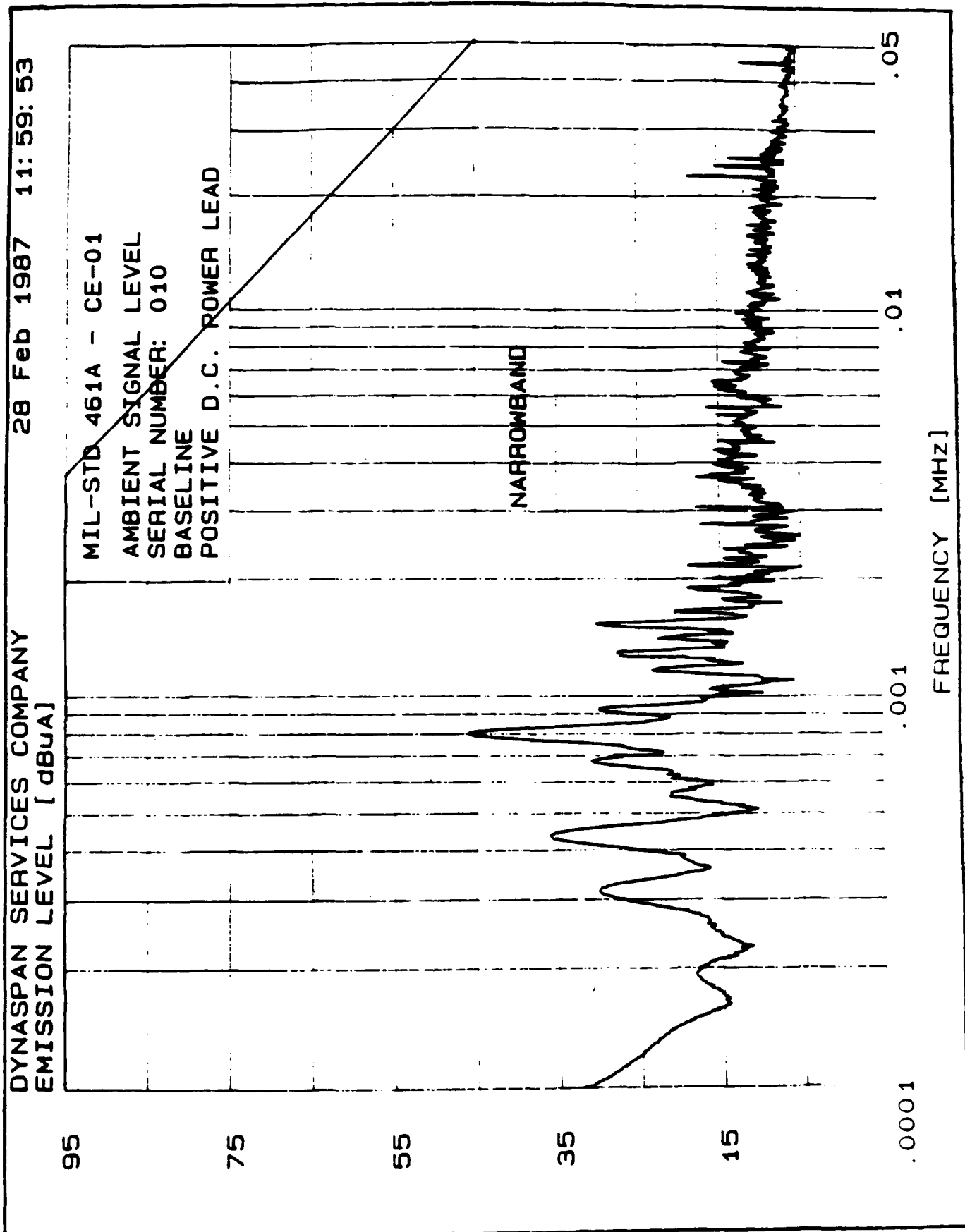


FIGURE 4.

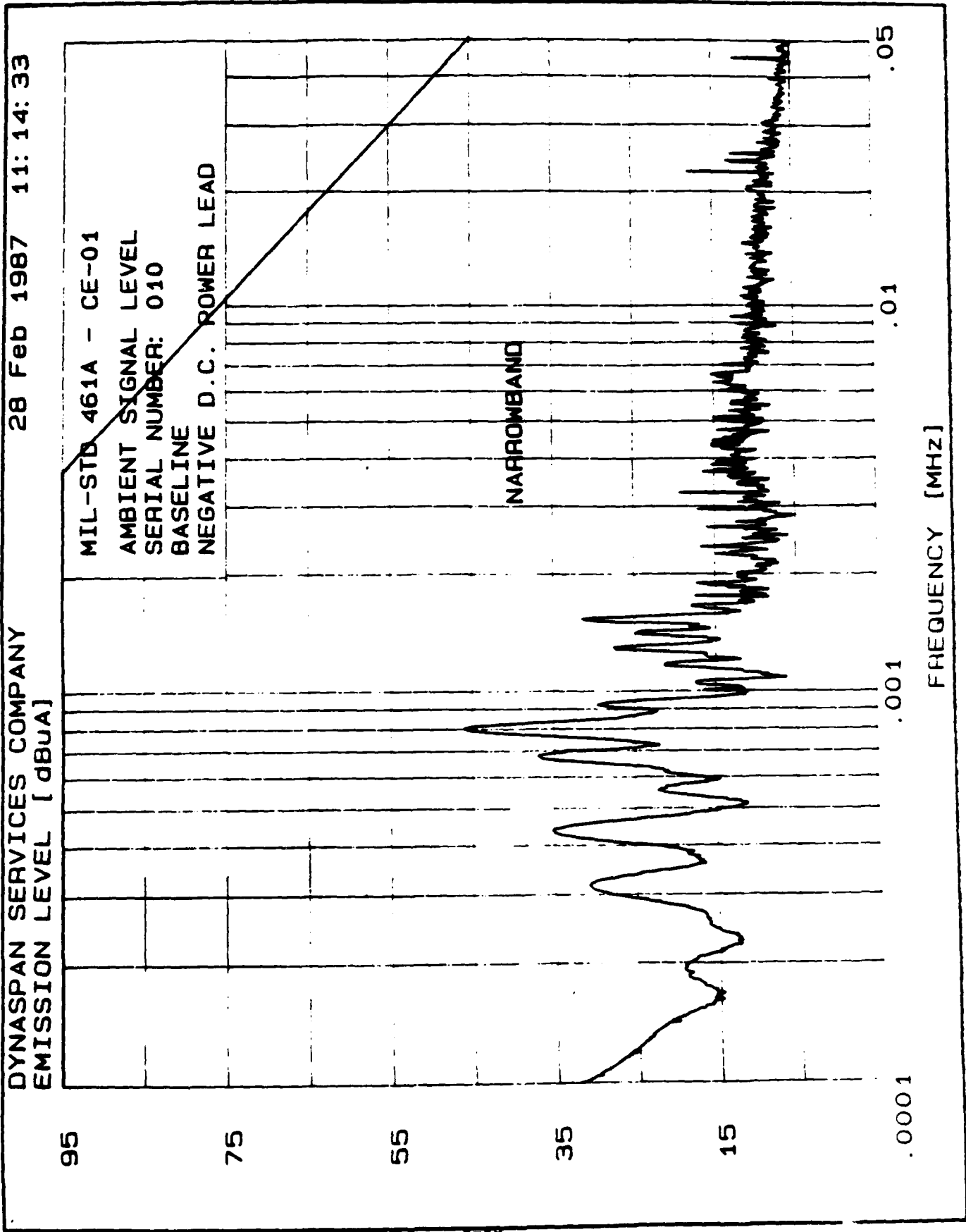
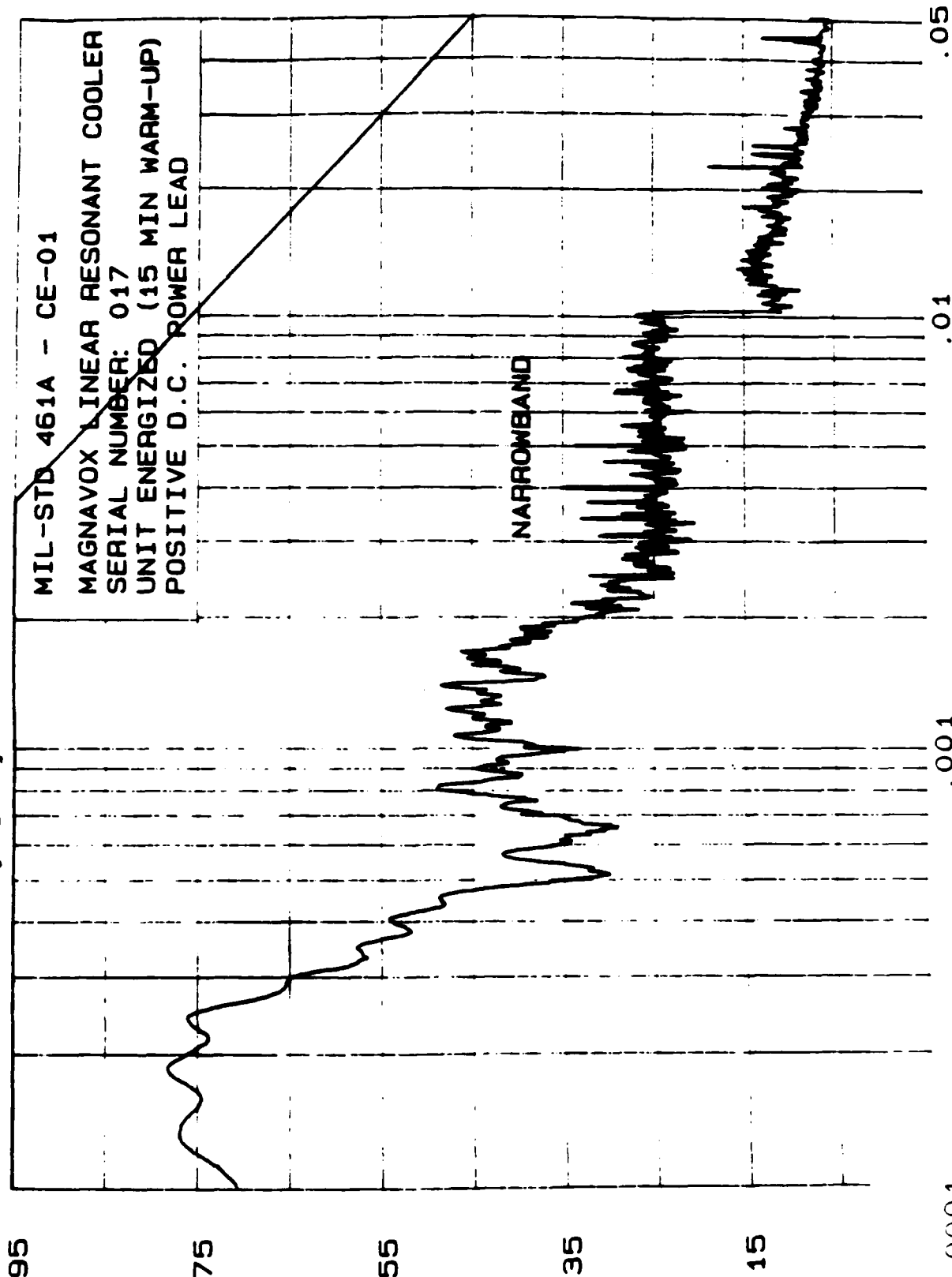


FIGURE 5.

DYNASPAR SERVICES COMPANY  
EMISSION LEVEL [dBuA]

28 Feb 1987 09:35:01



FIGU E 6.

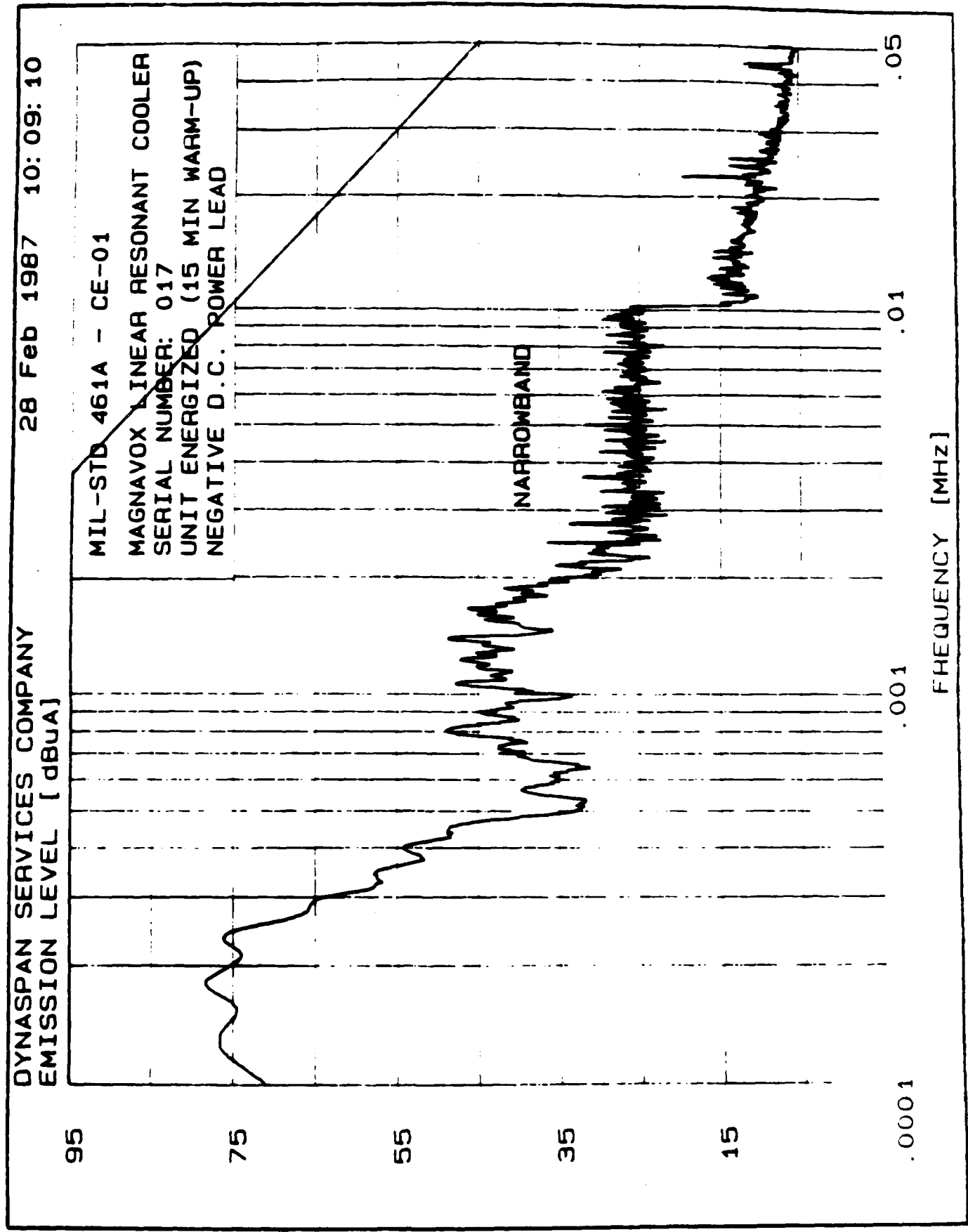
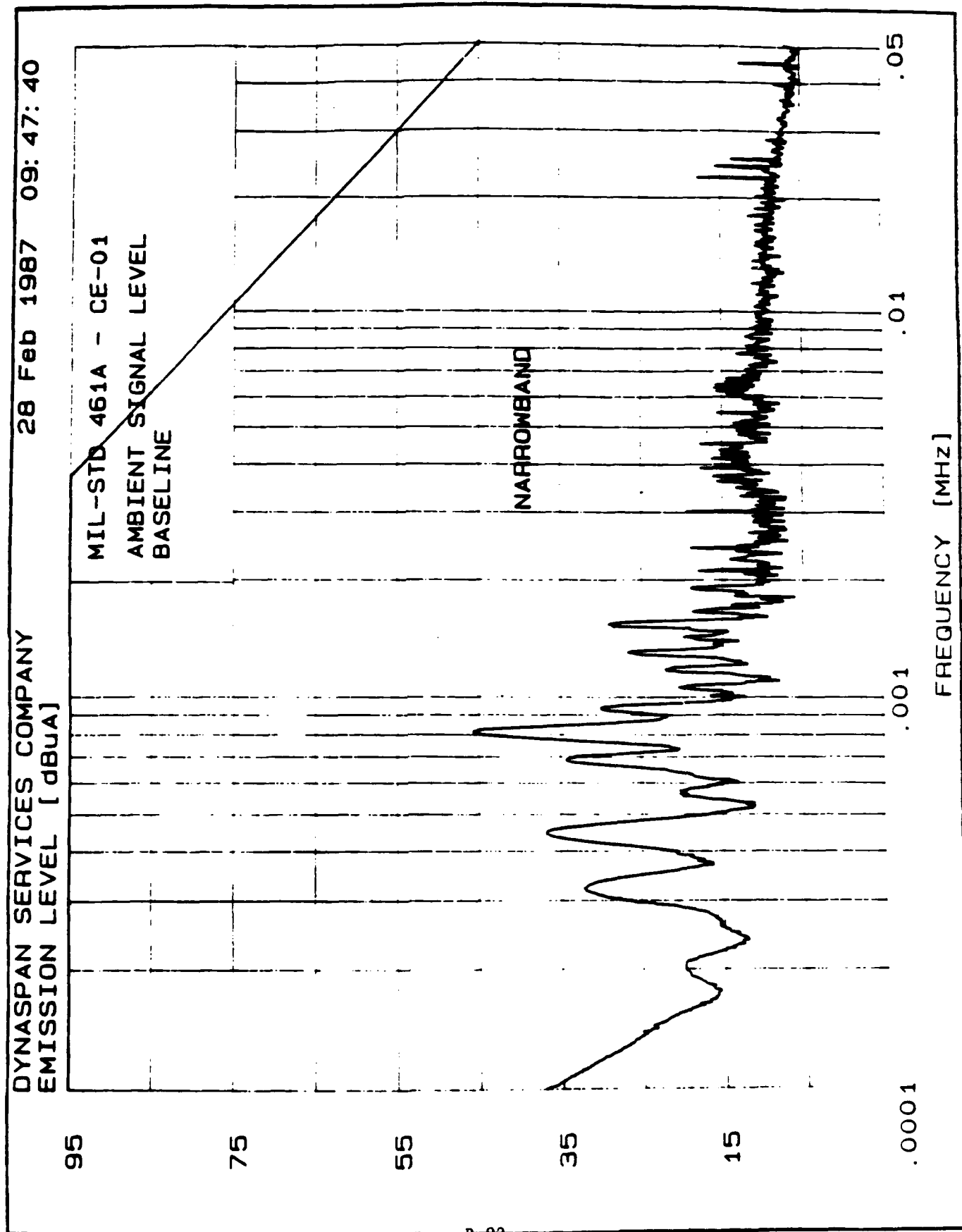


**FIGURE 7.**



FIGUR 8.

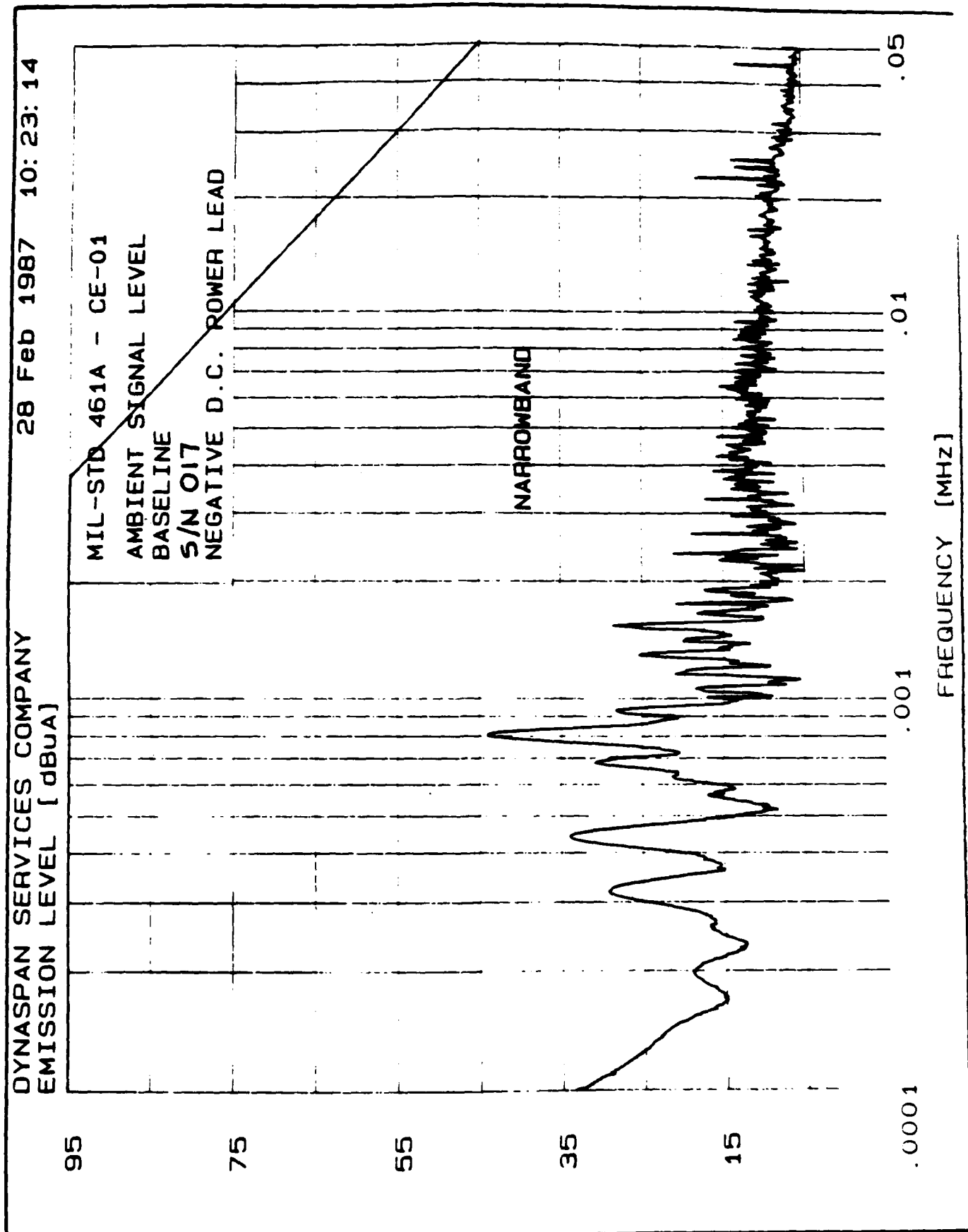
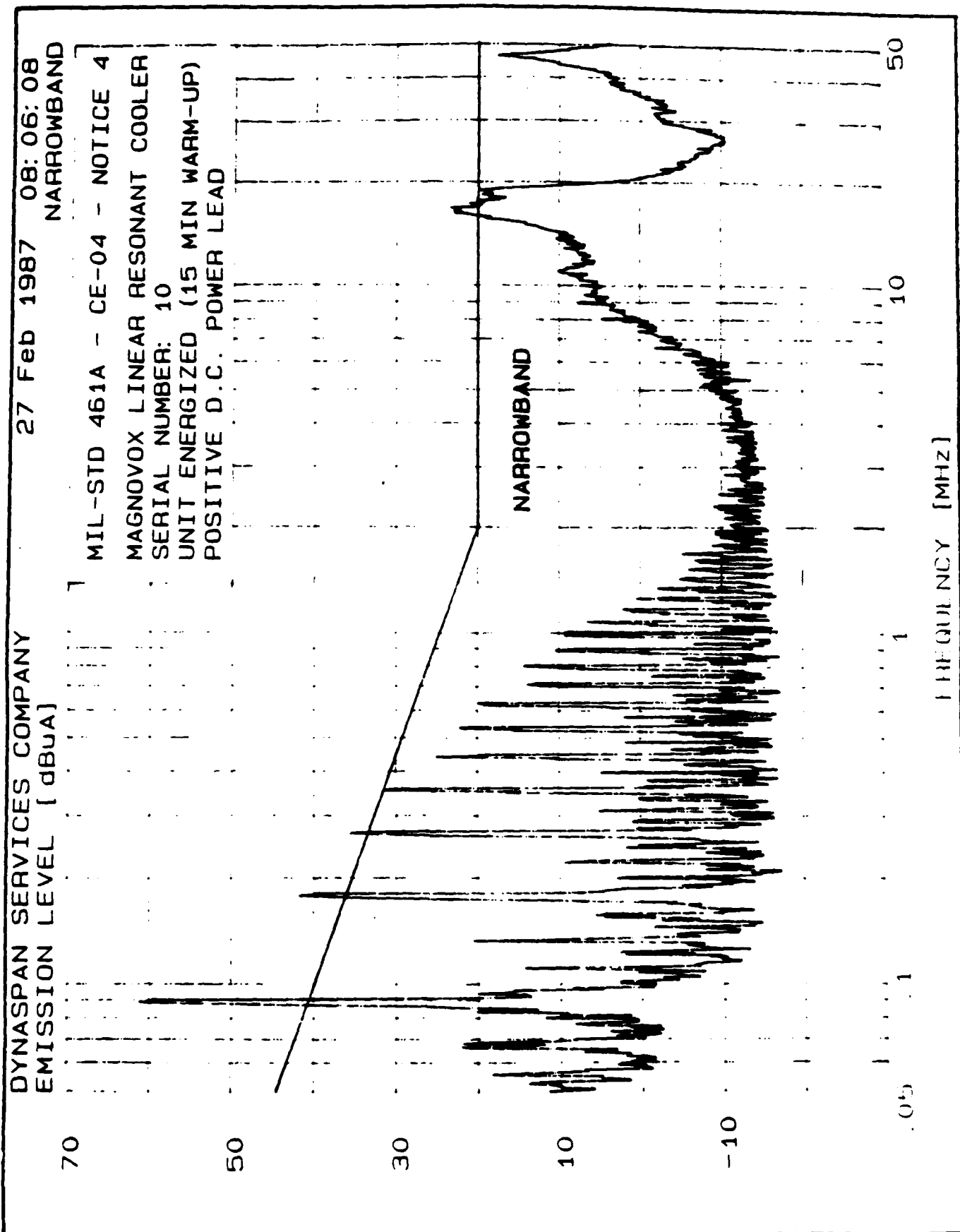


FIGURE 9



FIGUR 10.

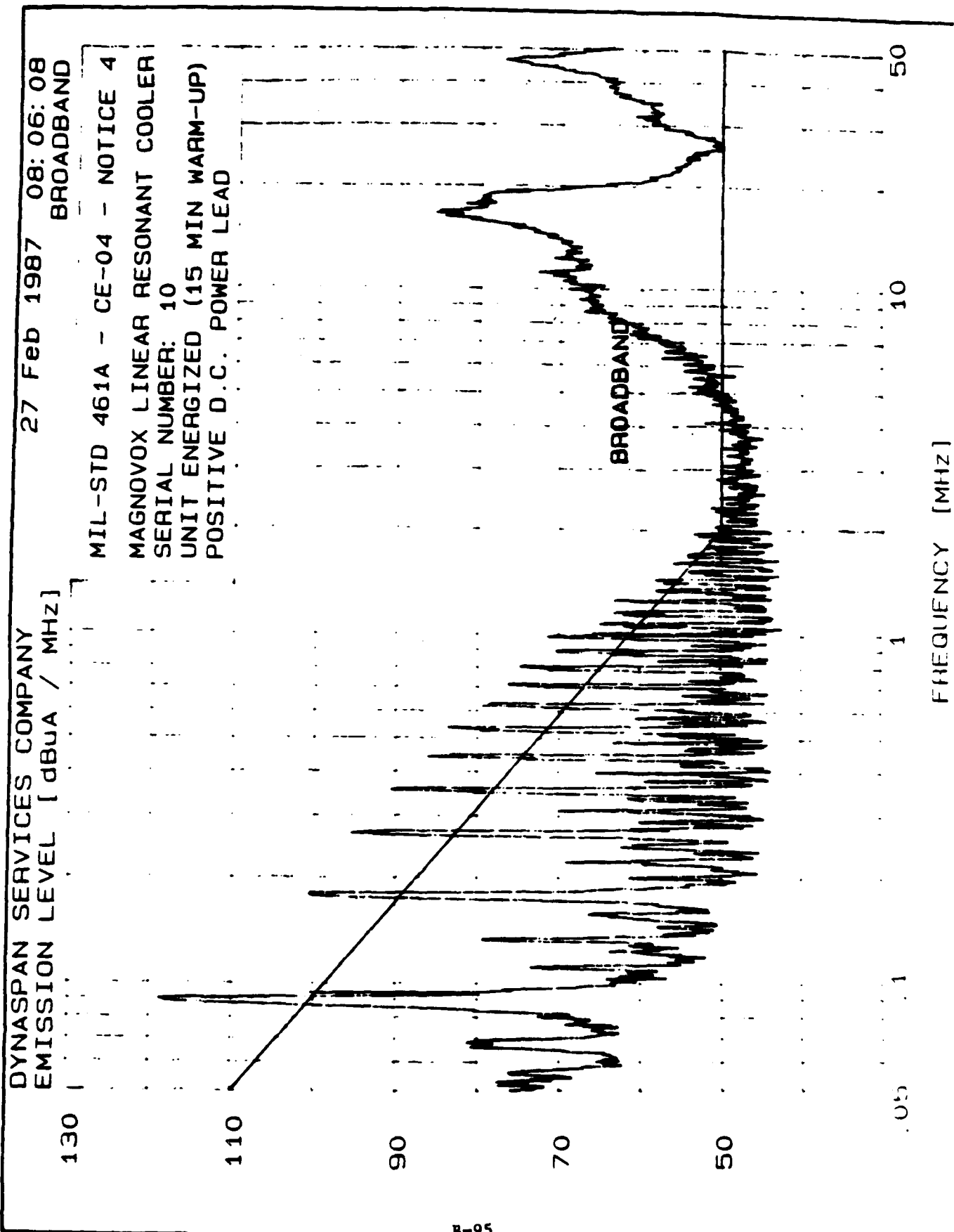


FIGURE 11.

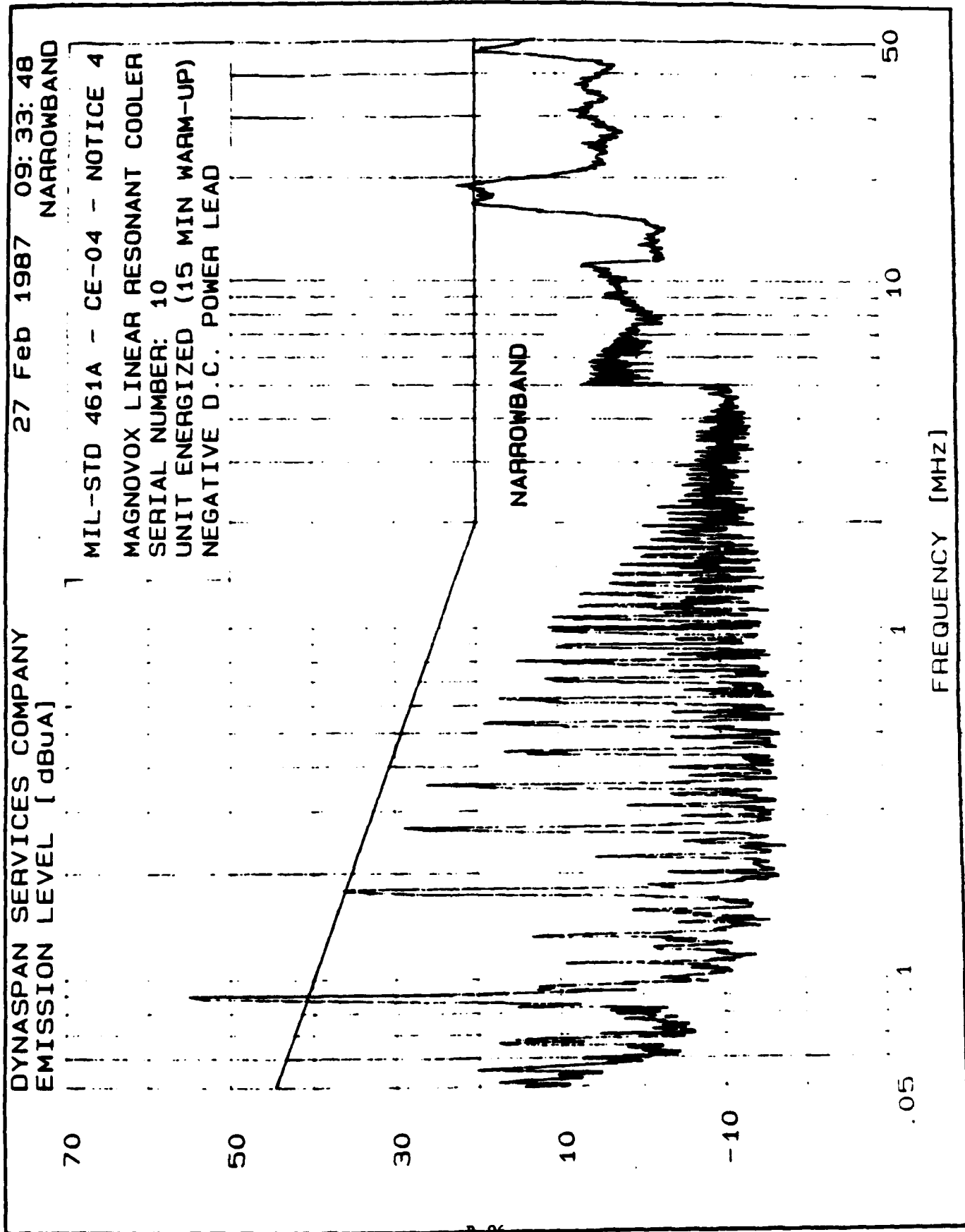


FIGURE 12

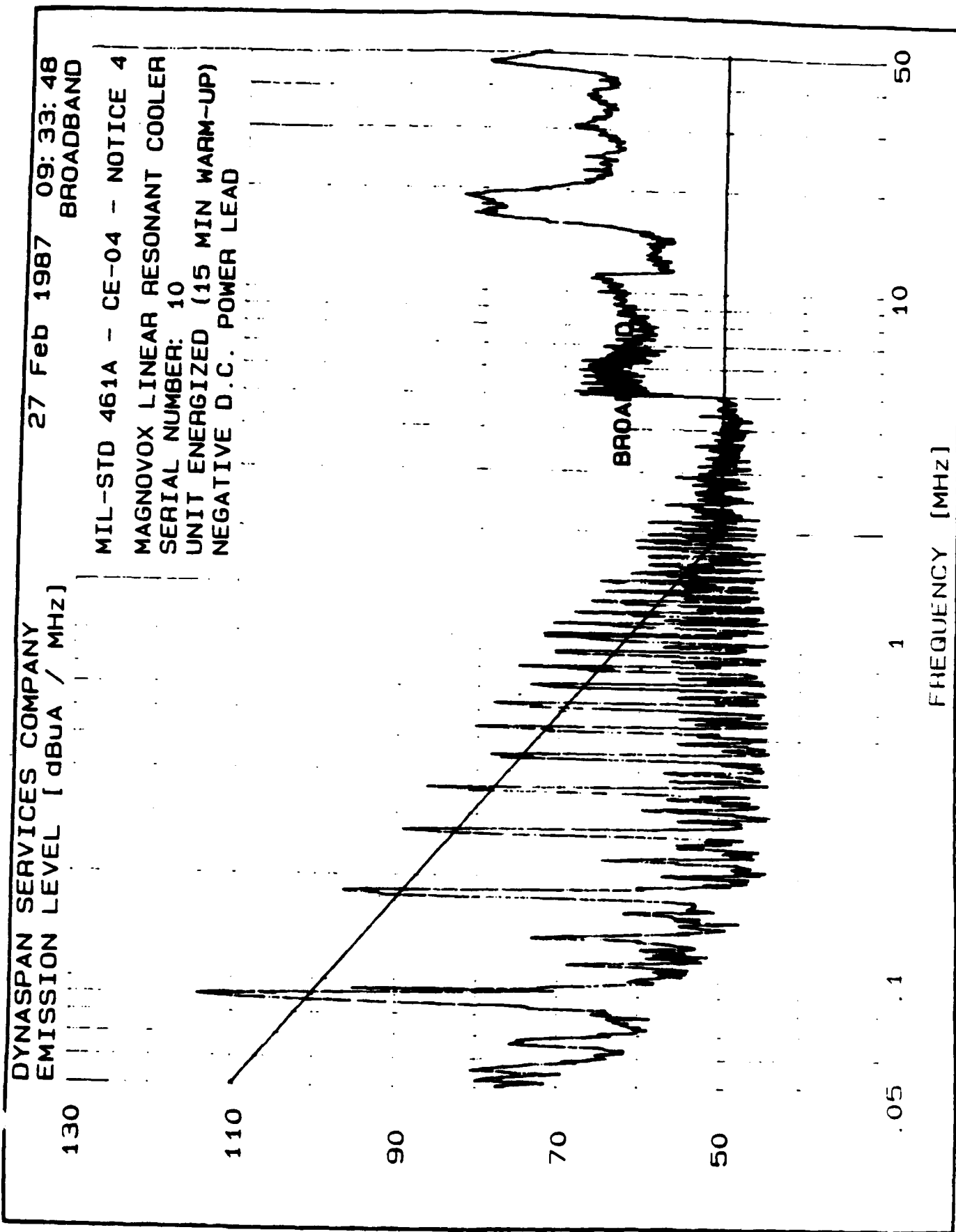


FIGURE 13

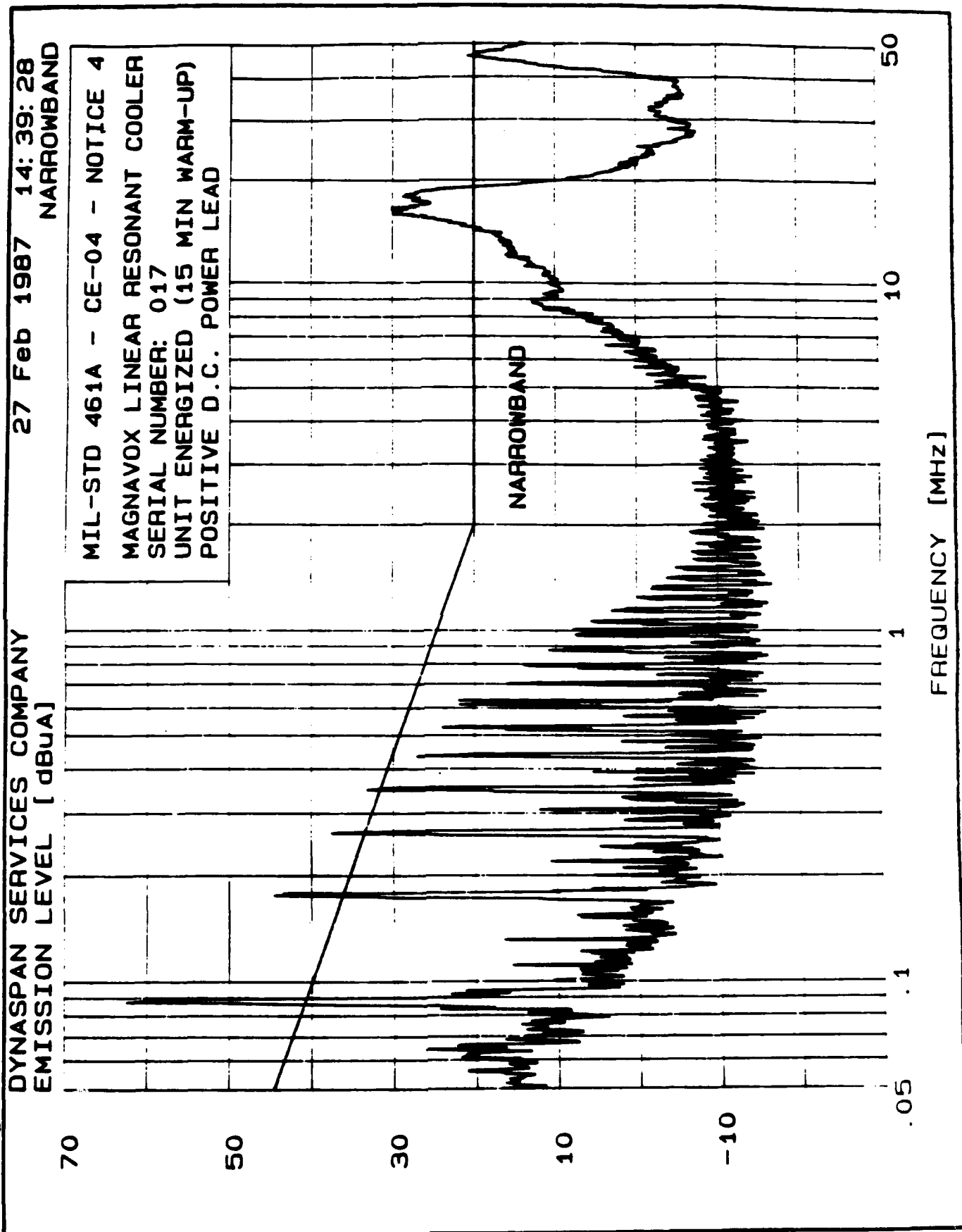


FIGURE 4.

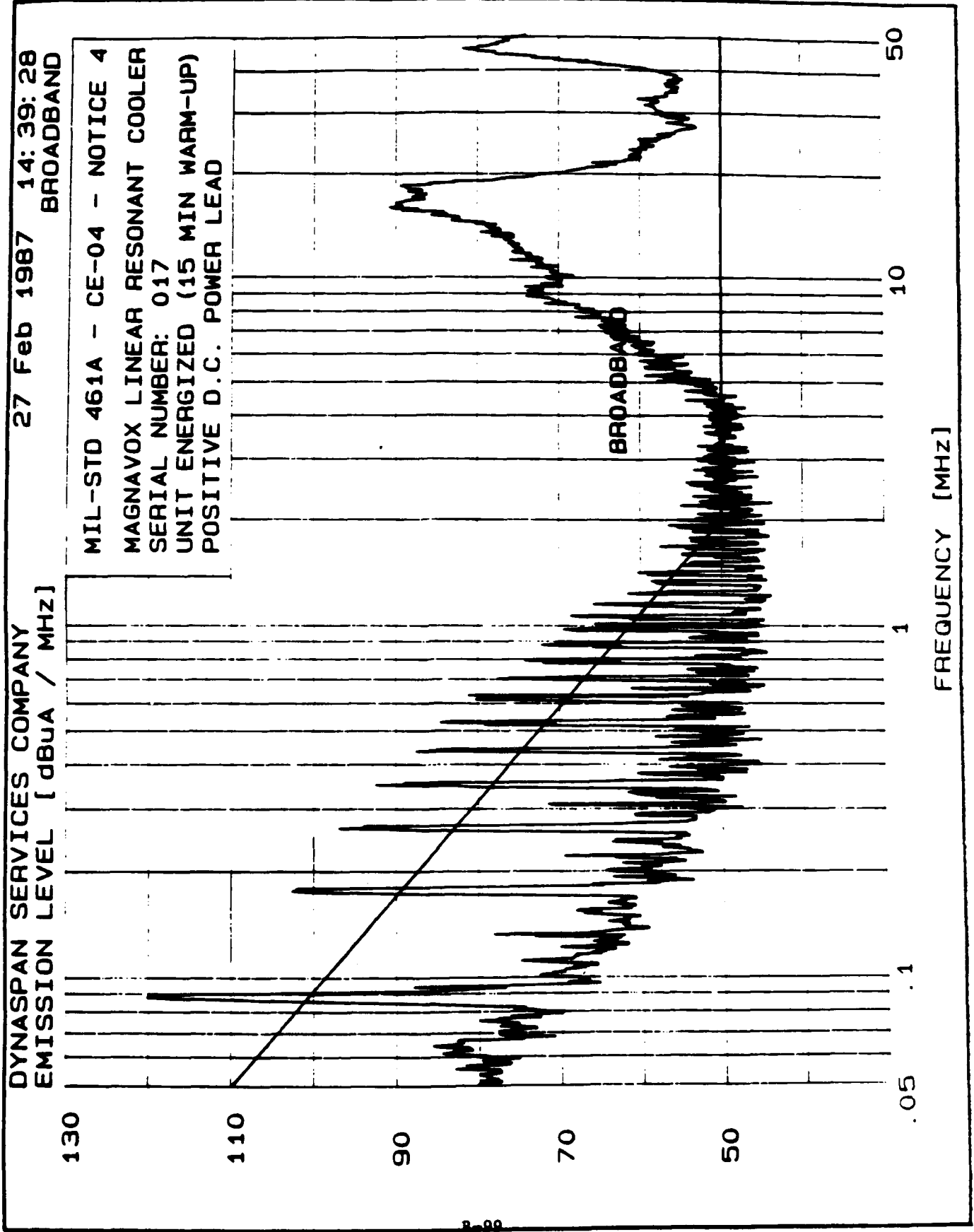
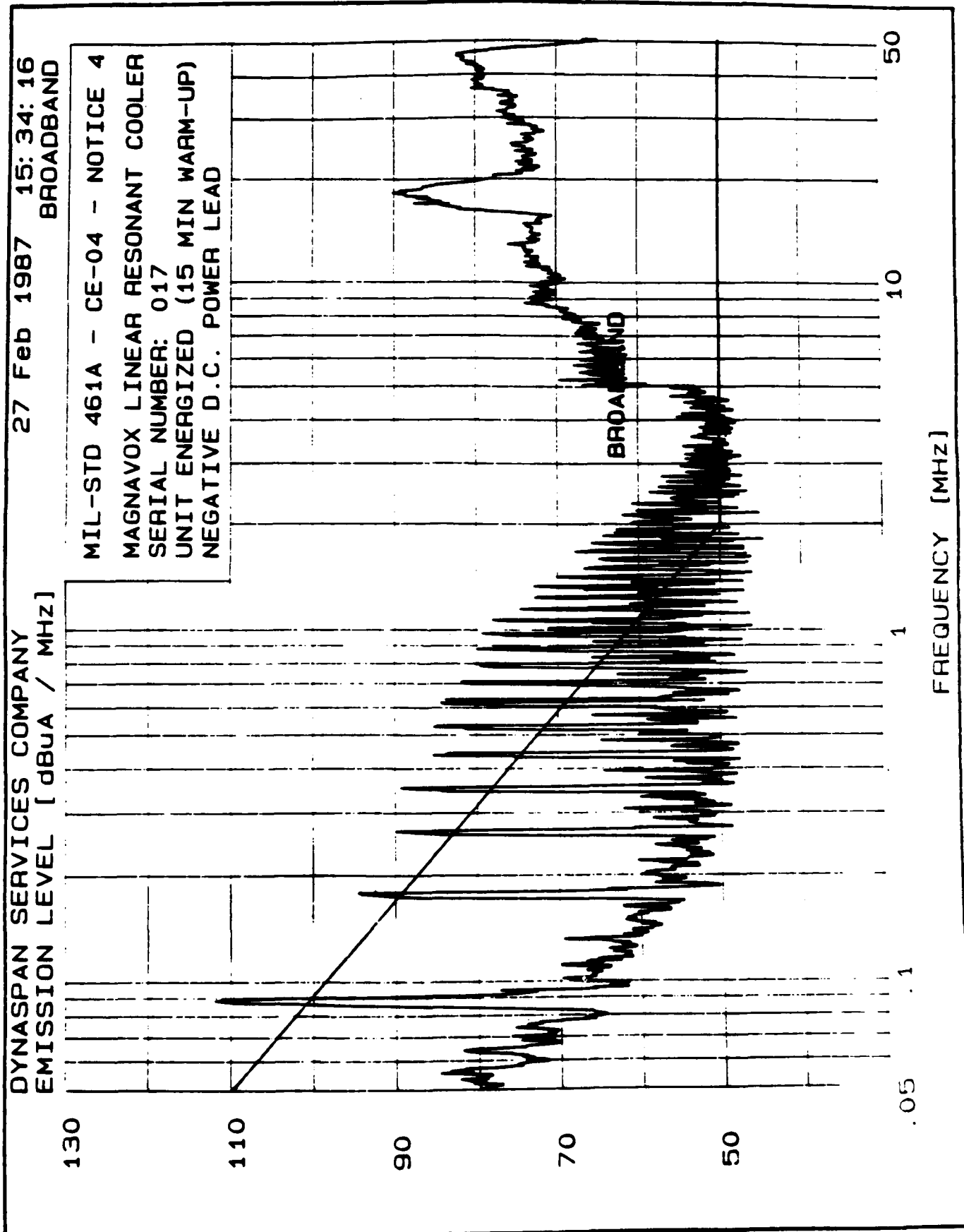


FIGURE 15.



# FIG RE 16.

DYNASPAR SERVICES COMPANY  
EMISSION LEVEL [dBuA] 27 Feb 1987 15:34:16  
NARROWBAND

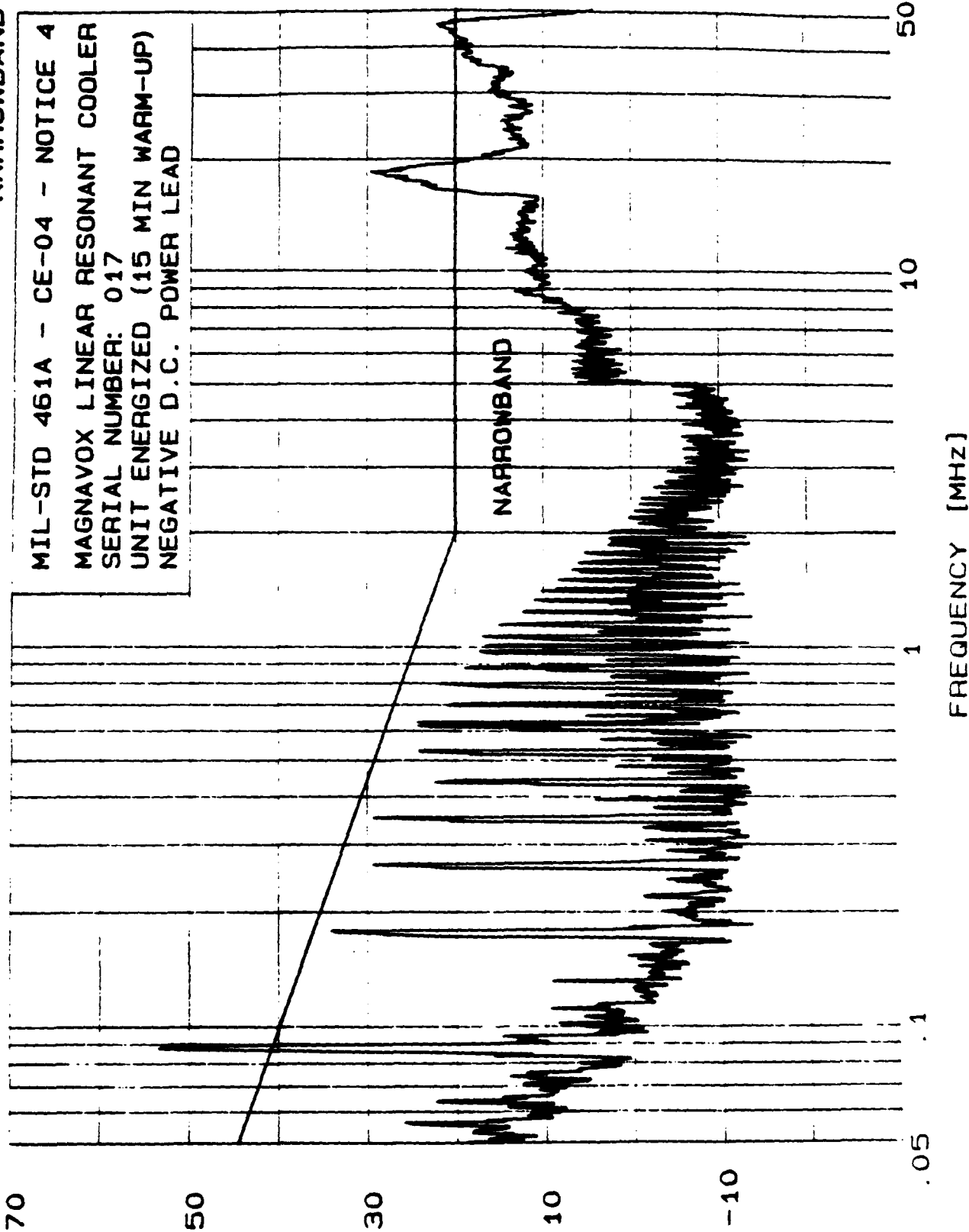


FIGURE 1.

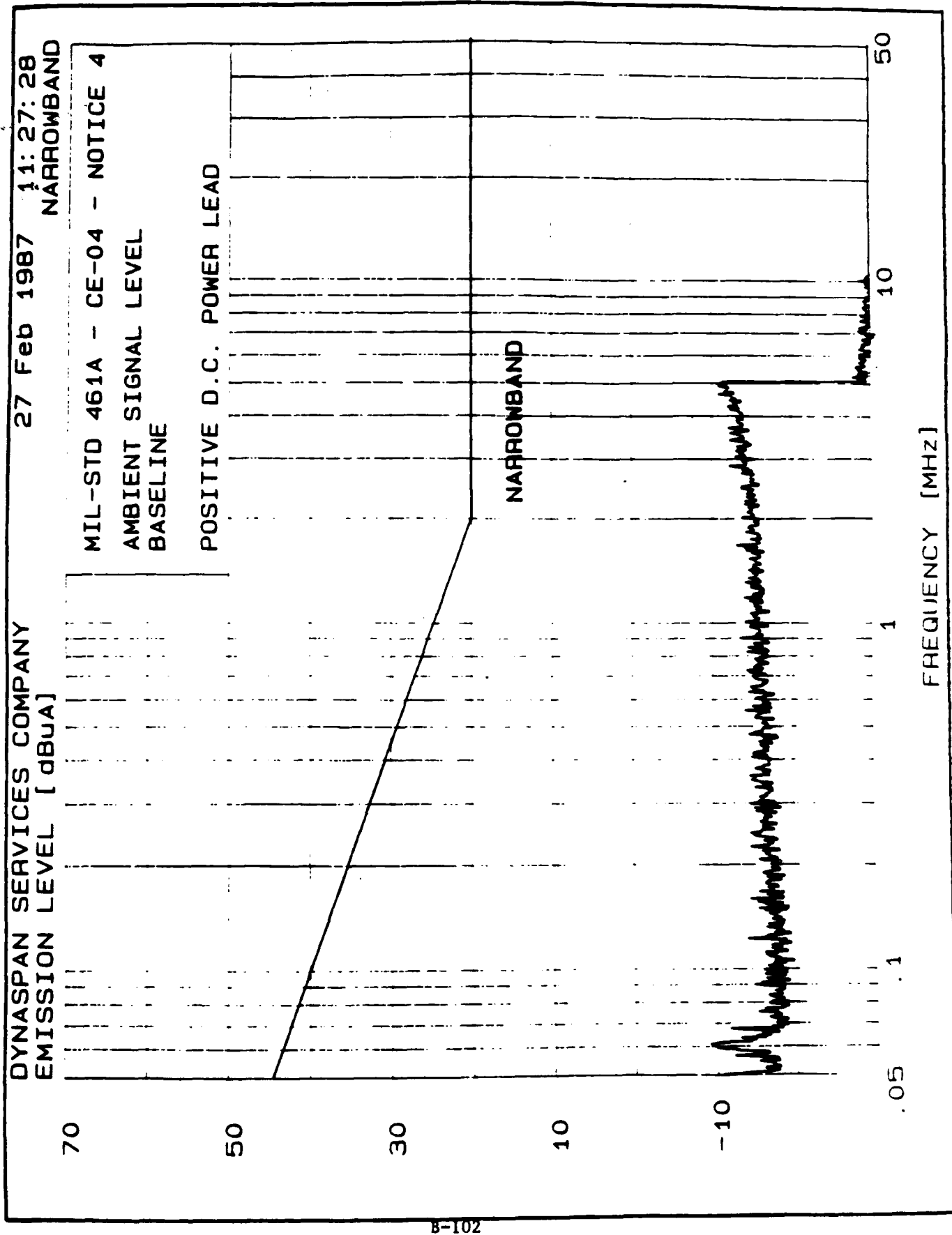


FIGURE 18.

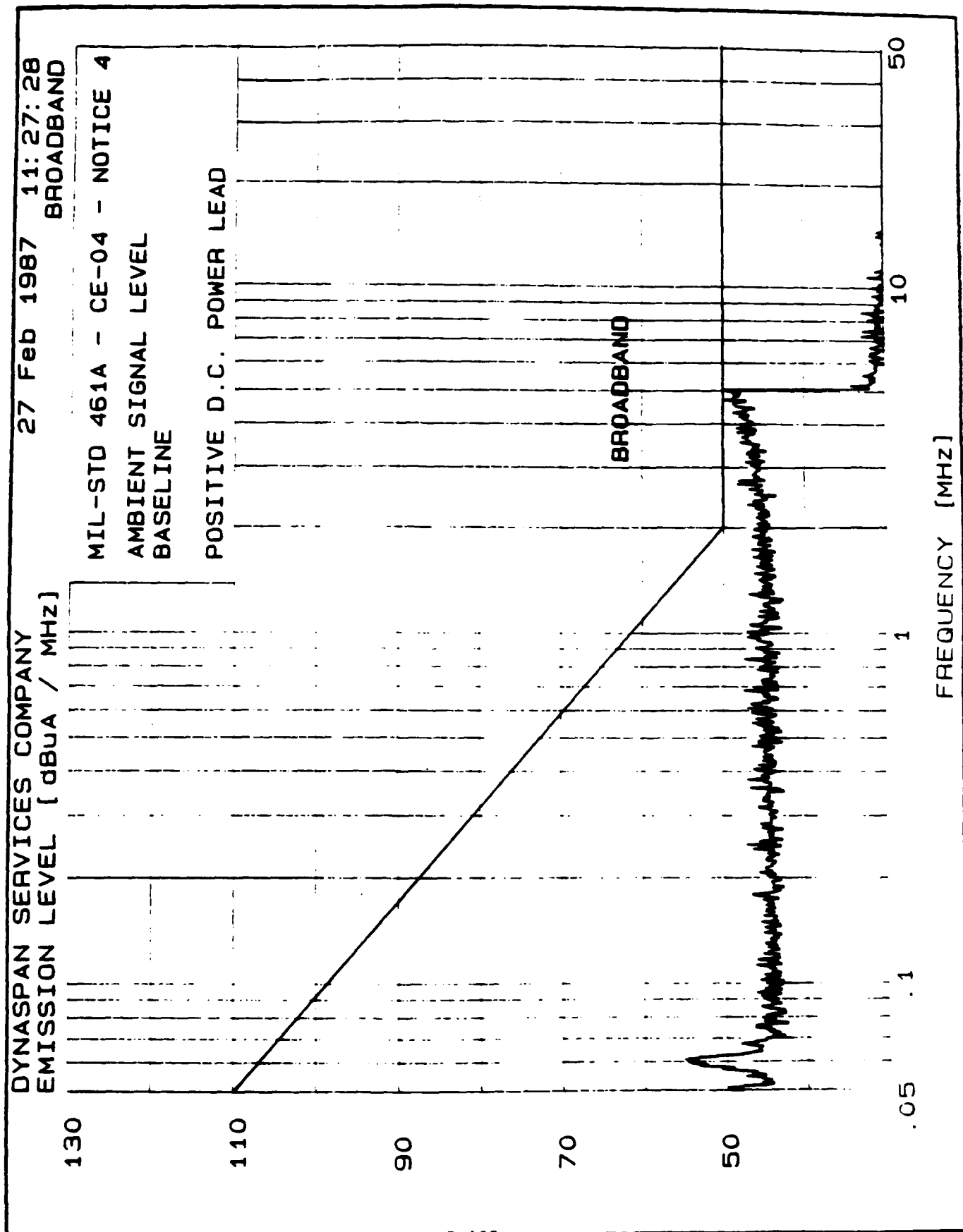


**FIGURE 19.**

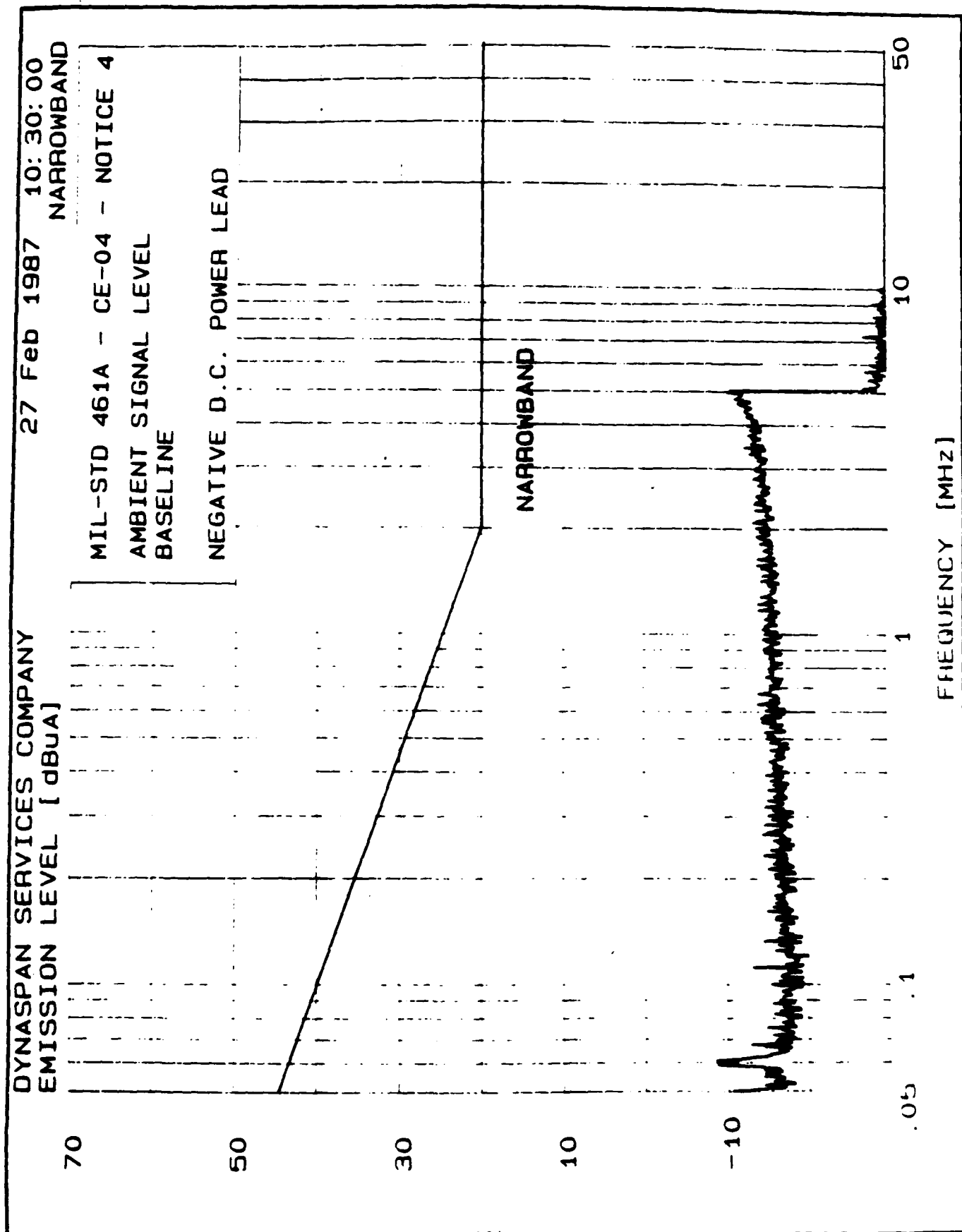
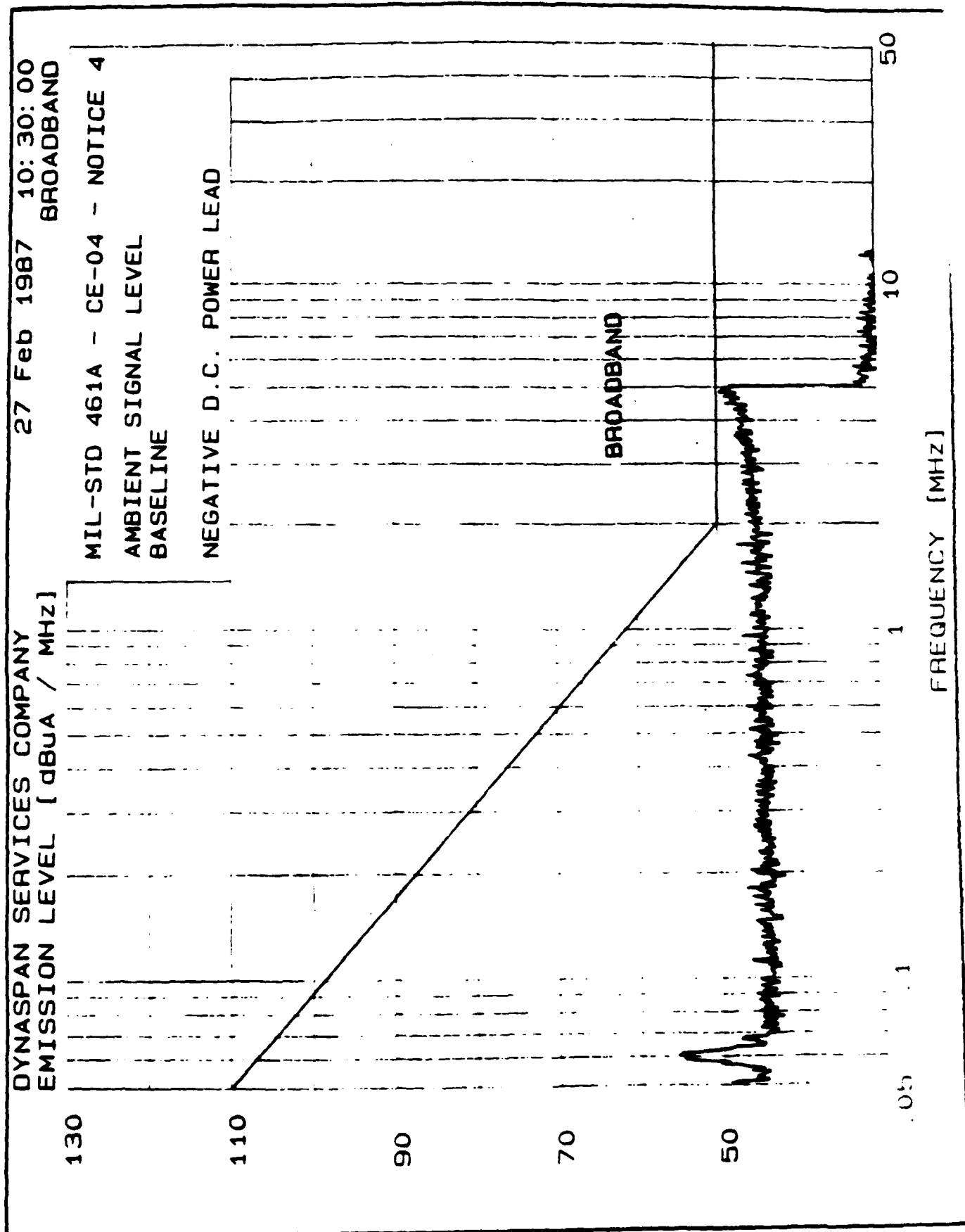


**FIGURE 20.**



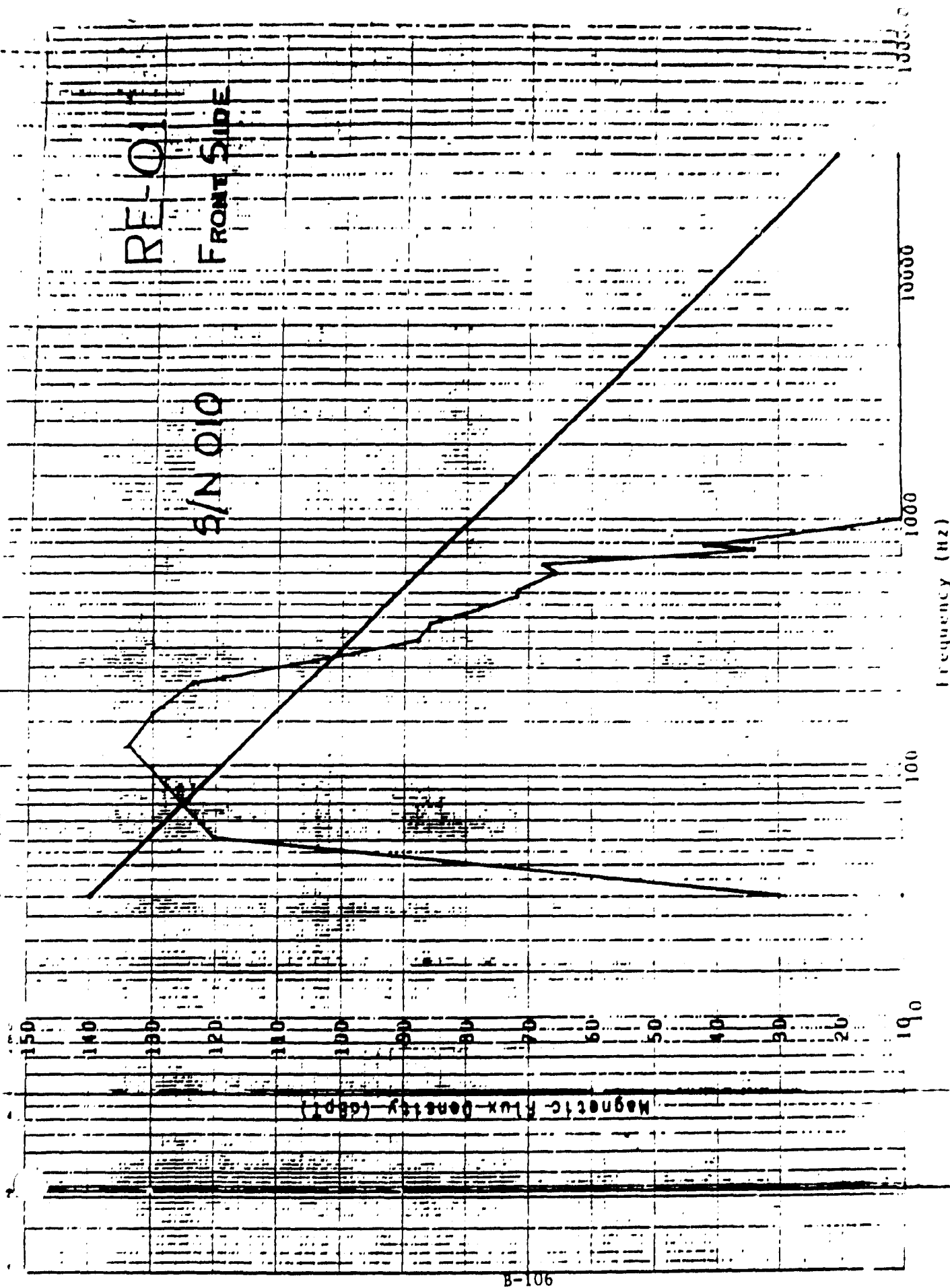


FIGURE 21.

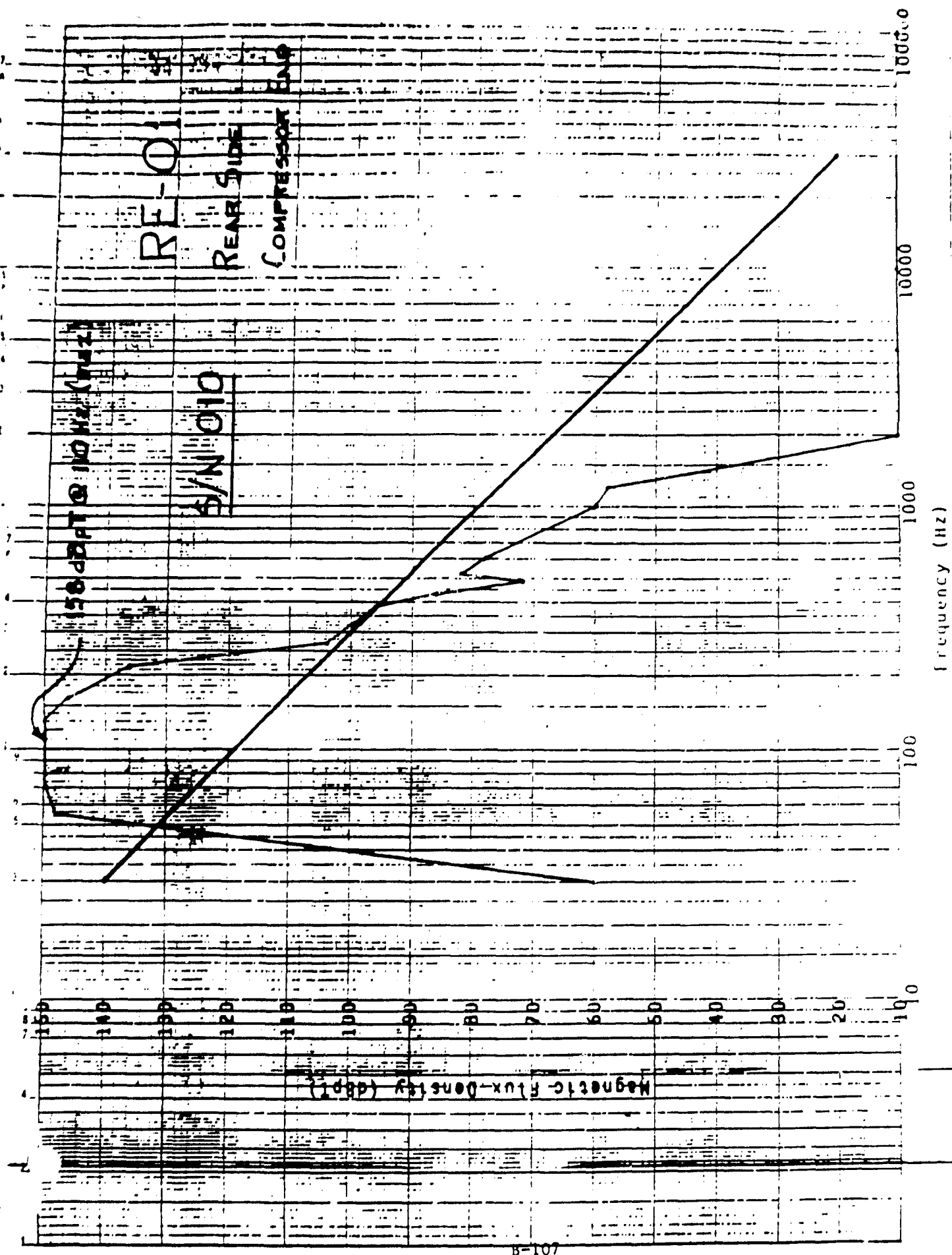
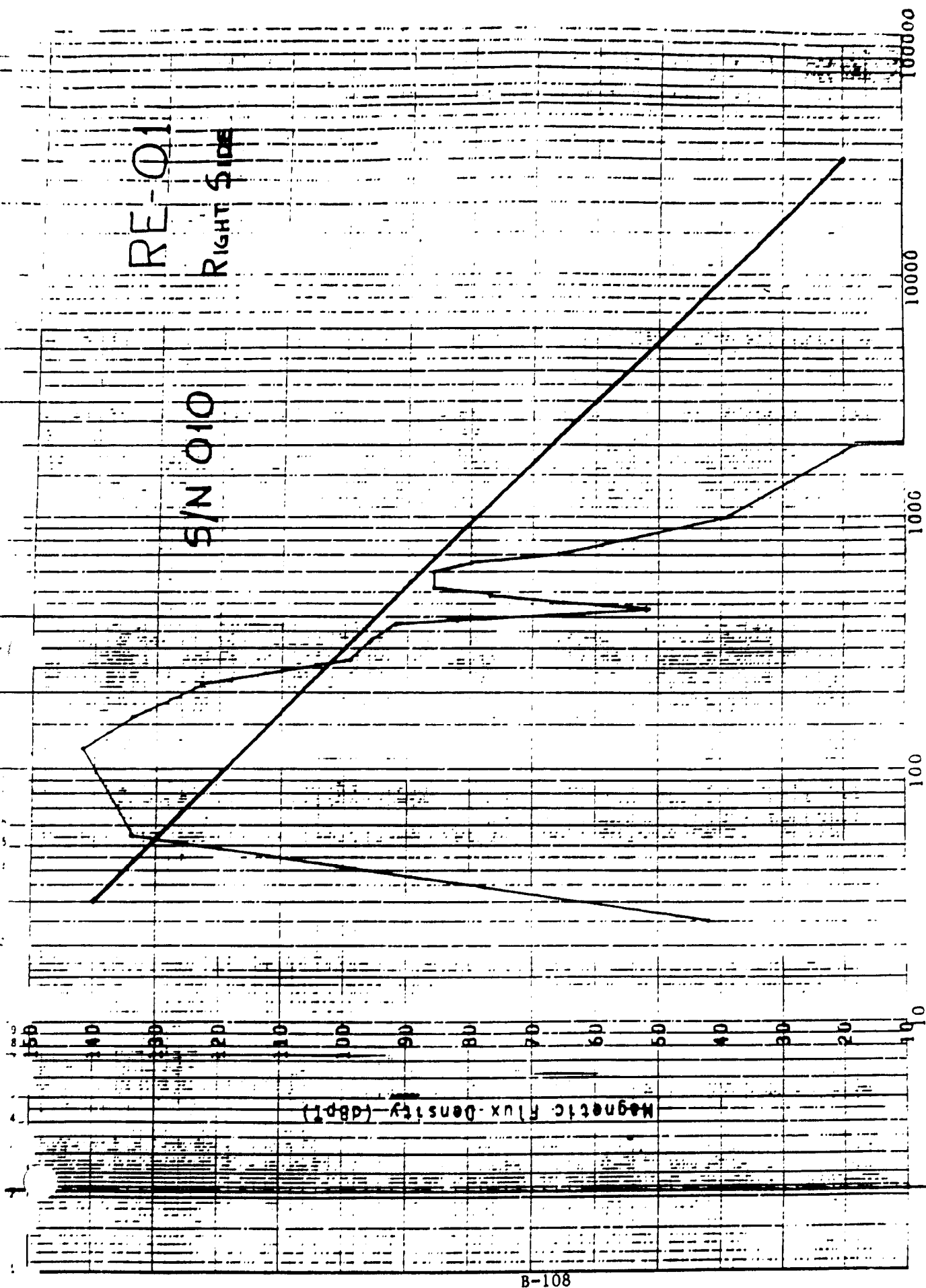


FIGURE 22.



B-108

FIGURE 23.

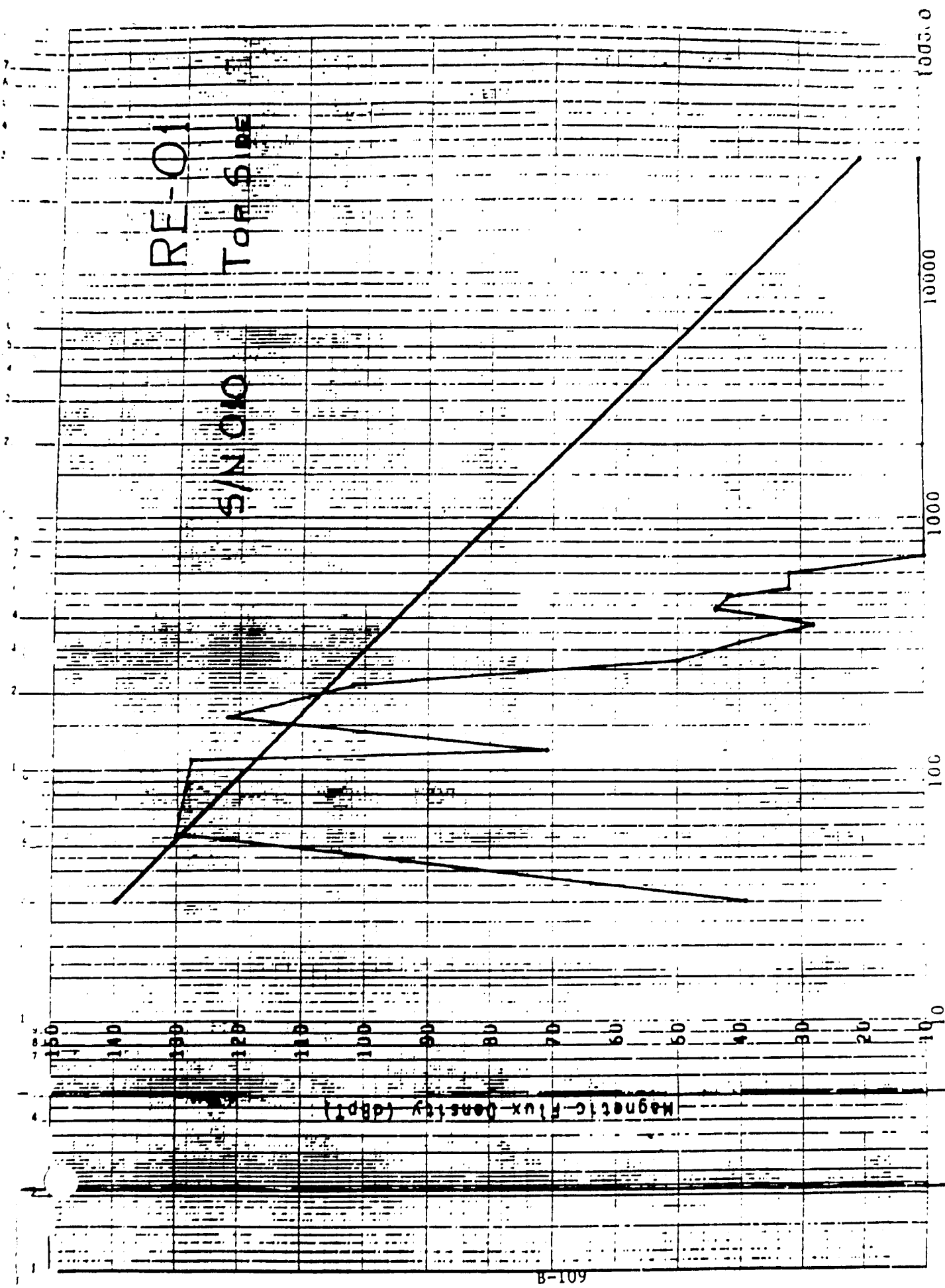


FIGURE 24.

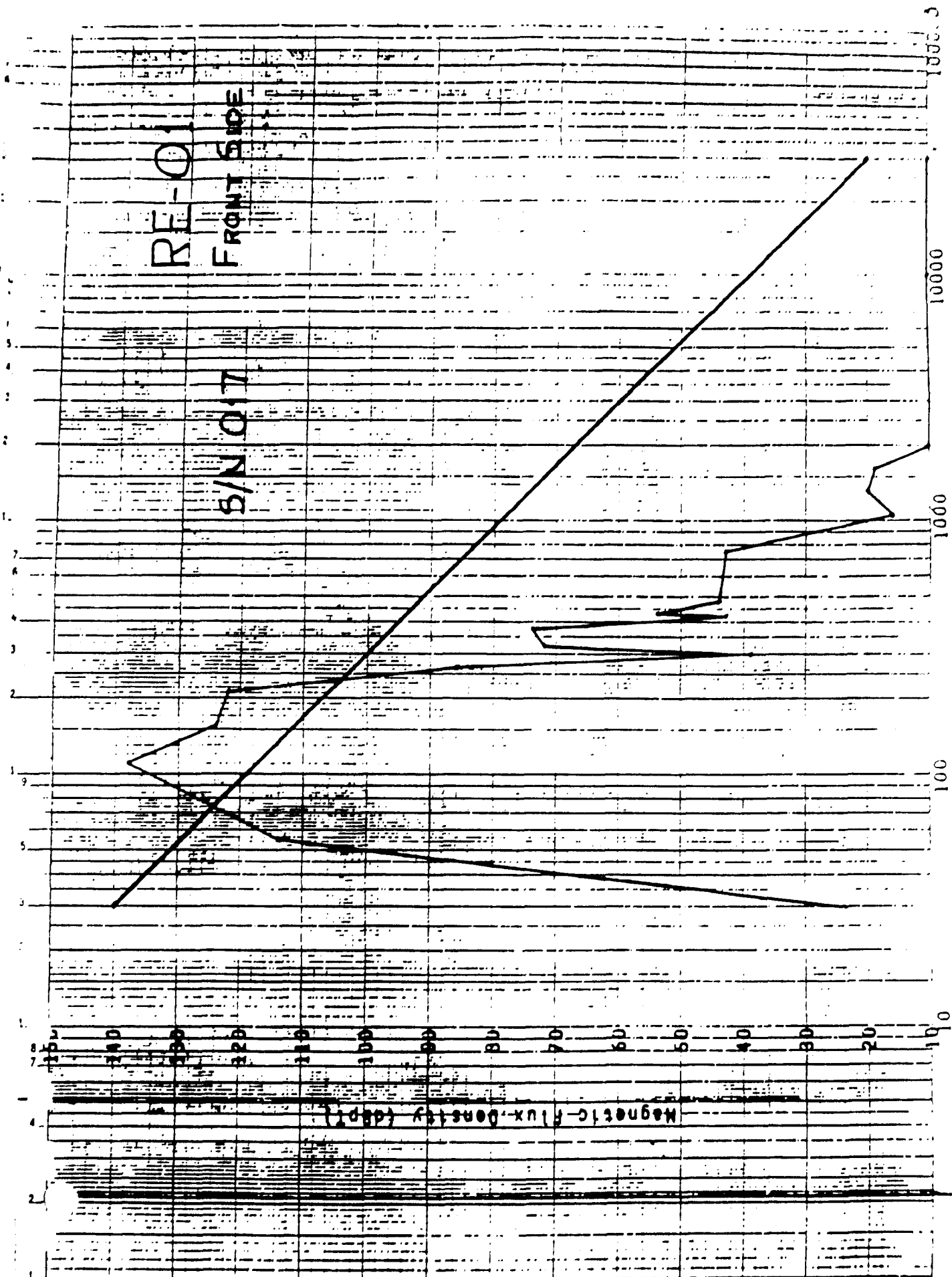


FIGURE 25.

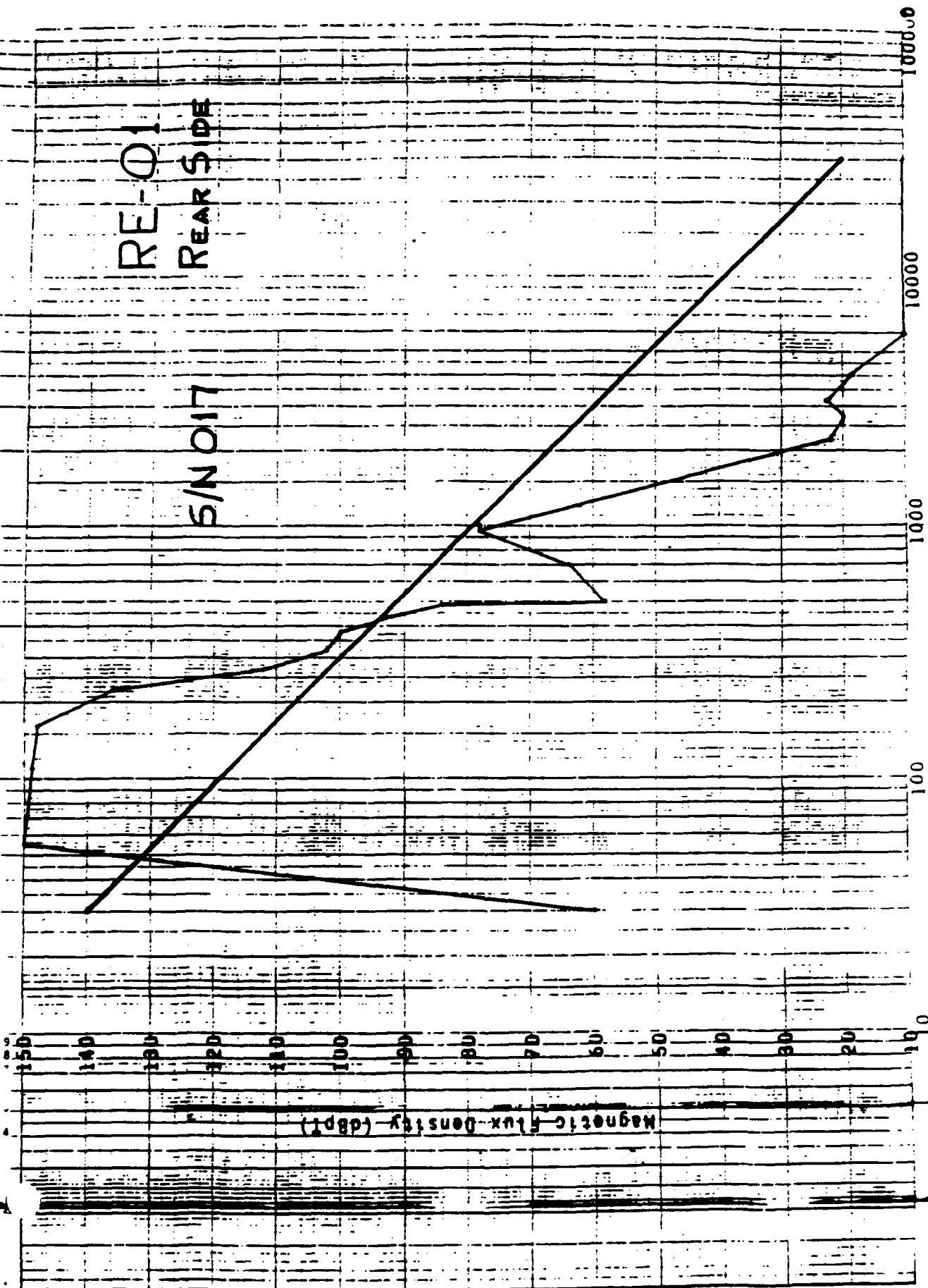
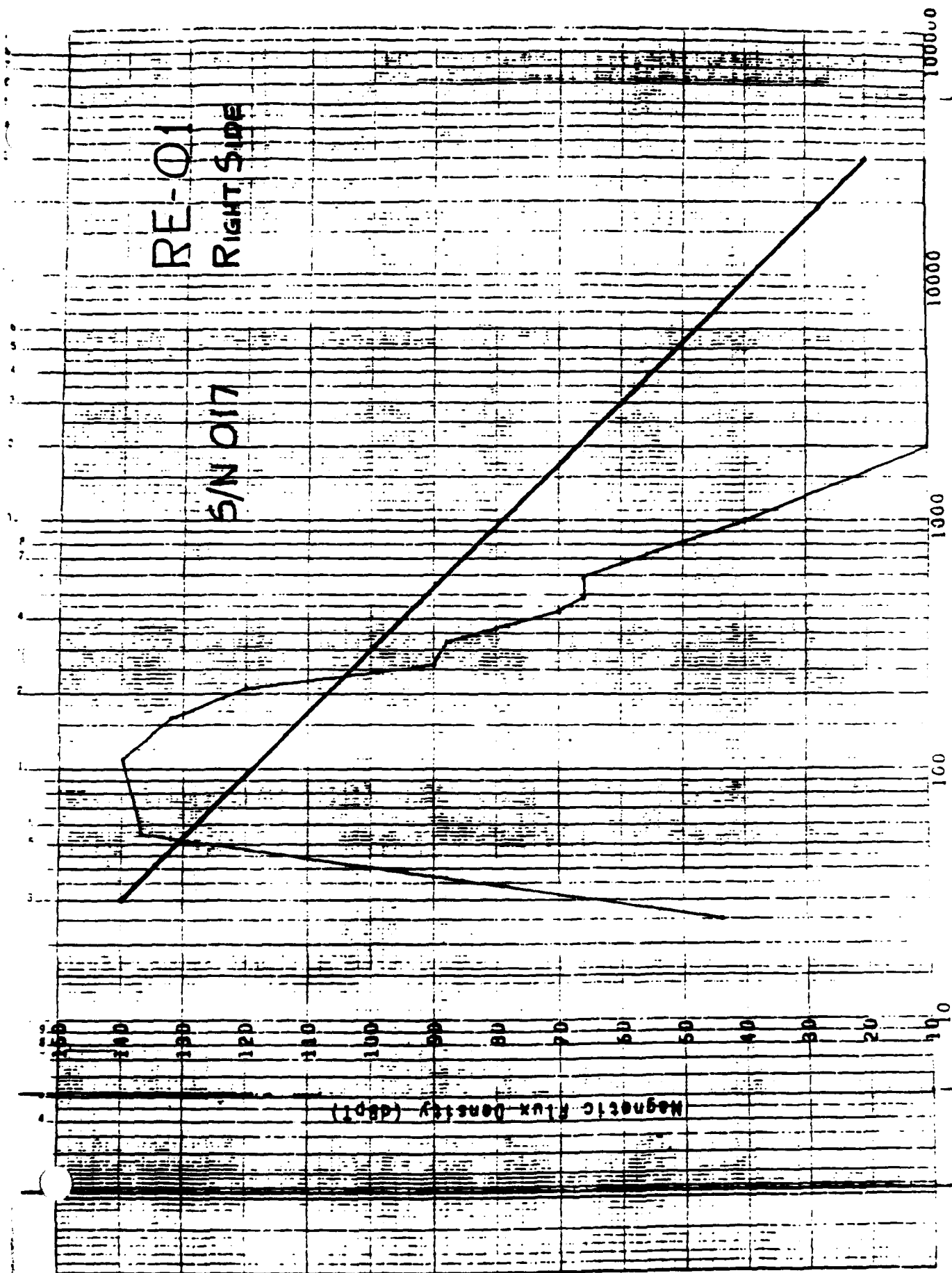


FIGURE 26



B-112

FIGURE 27.

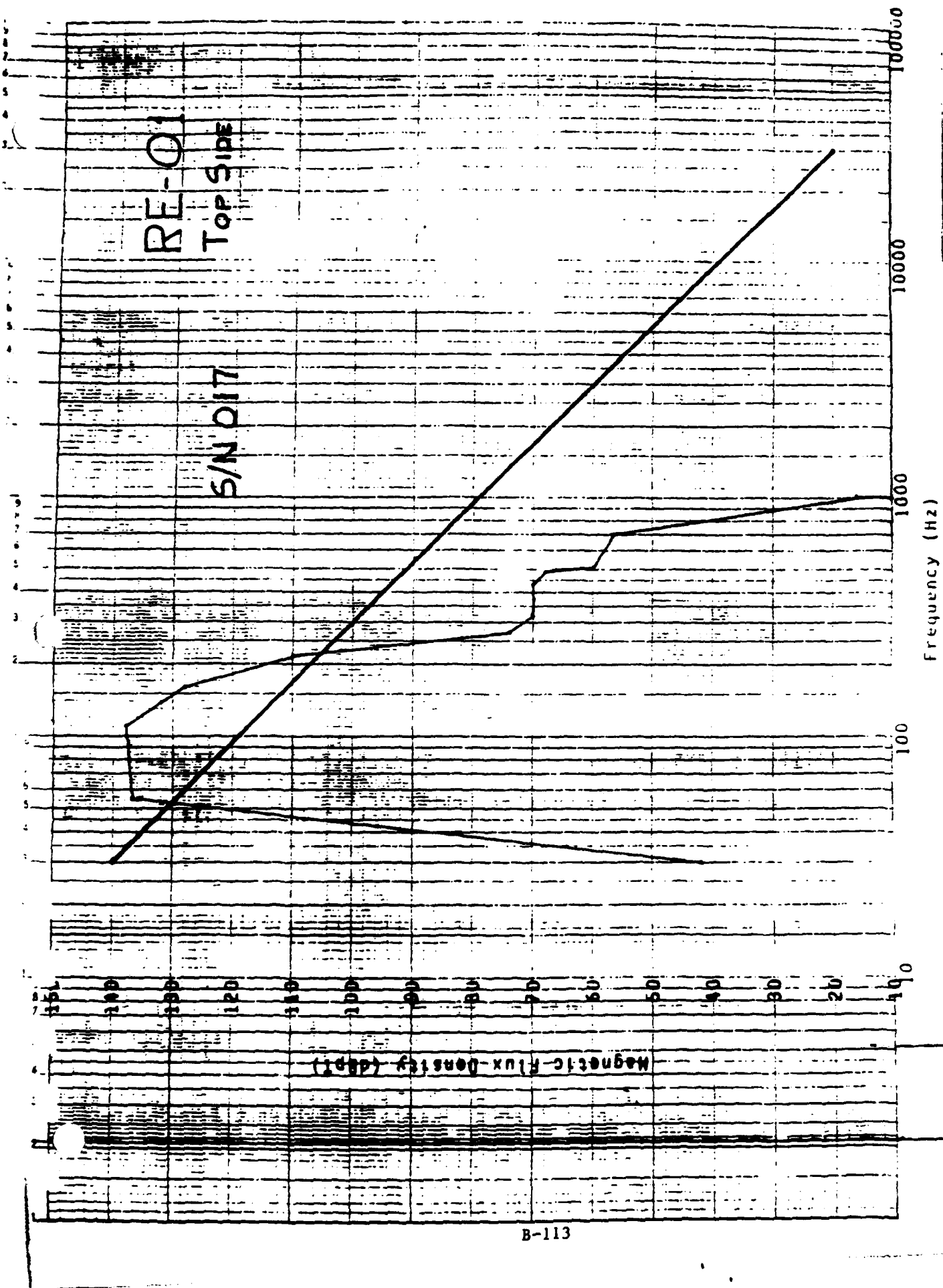
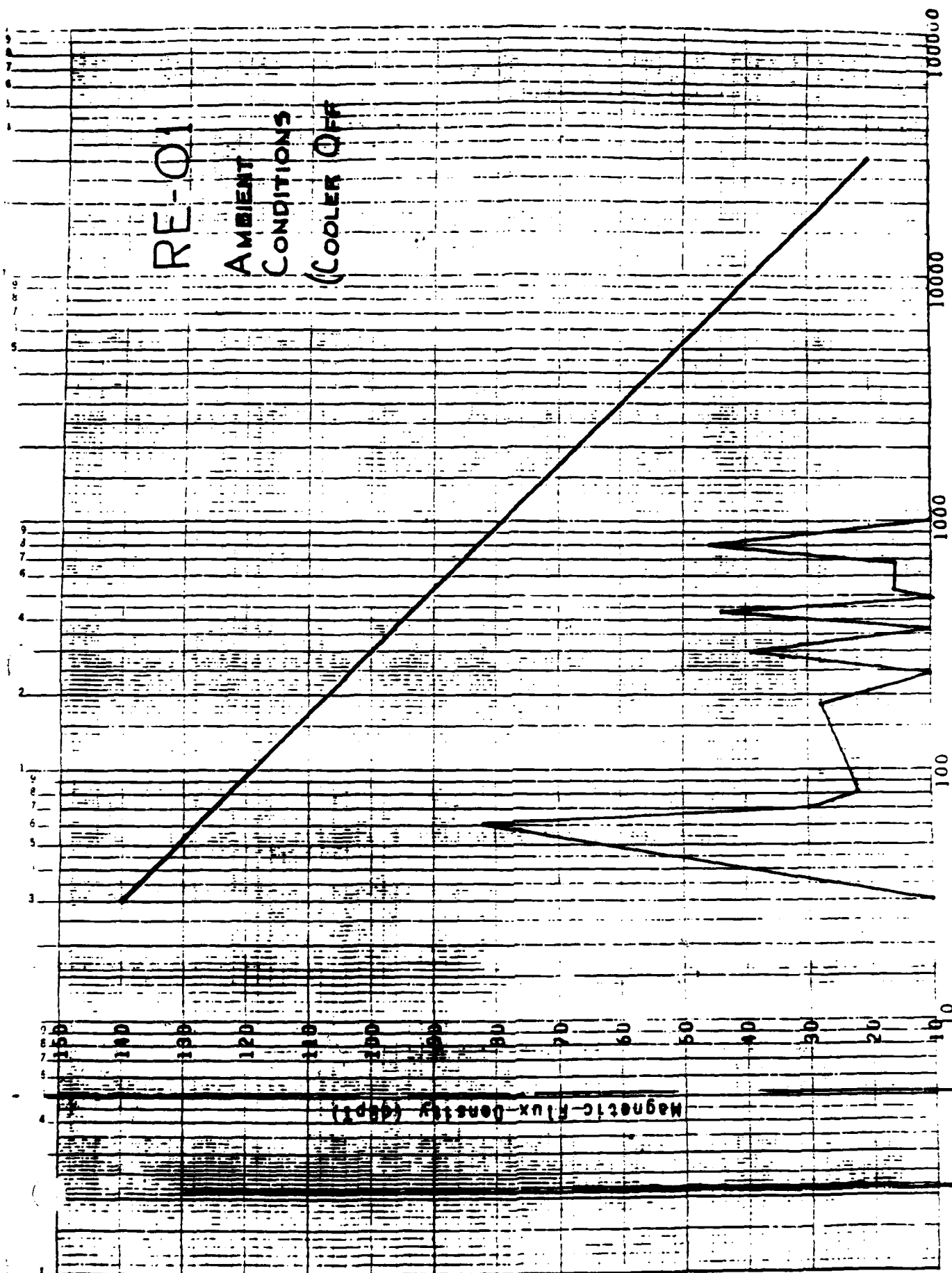


FIGURE 28.



Frequency (Hz)  
 FIGURE 29.

FIGURE 30.

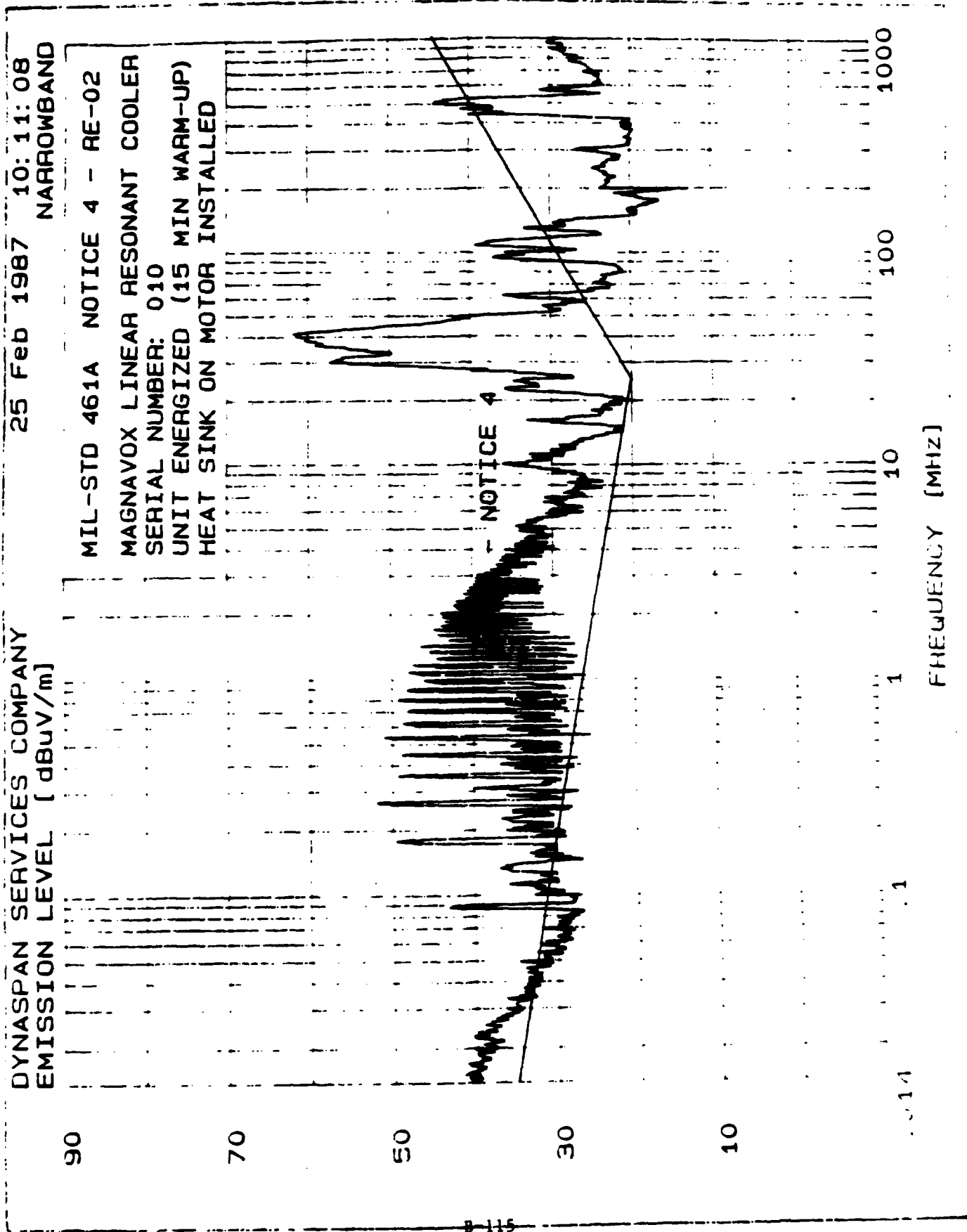
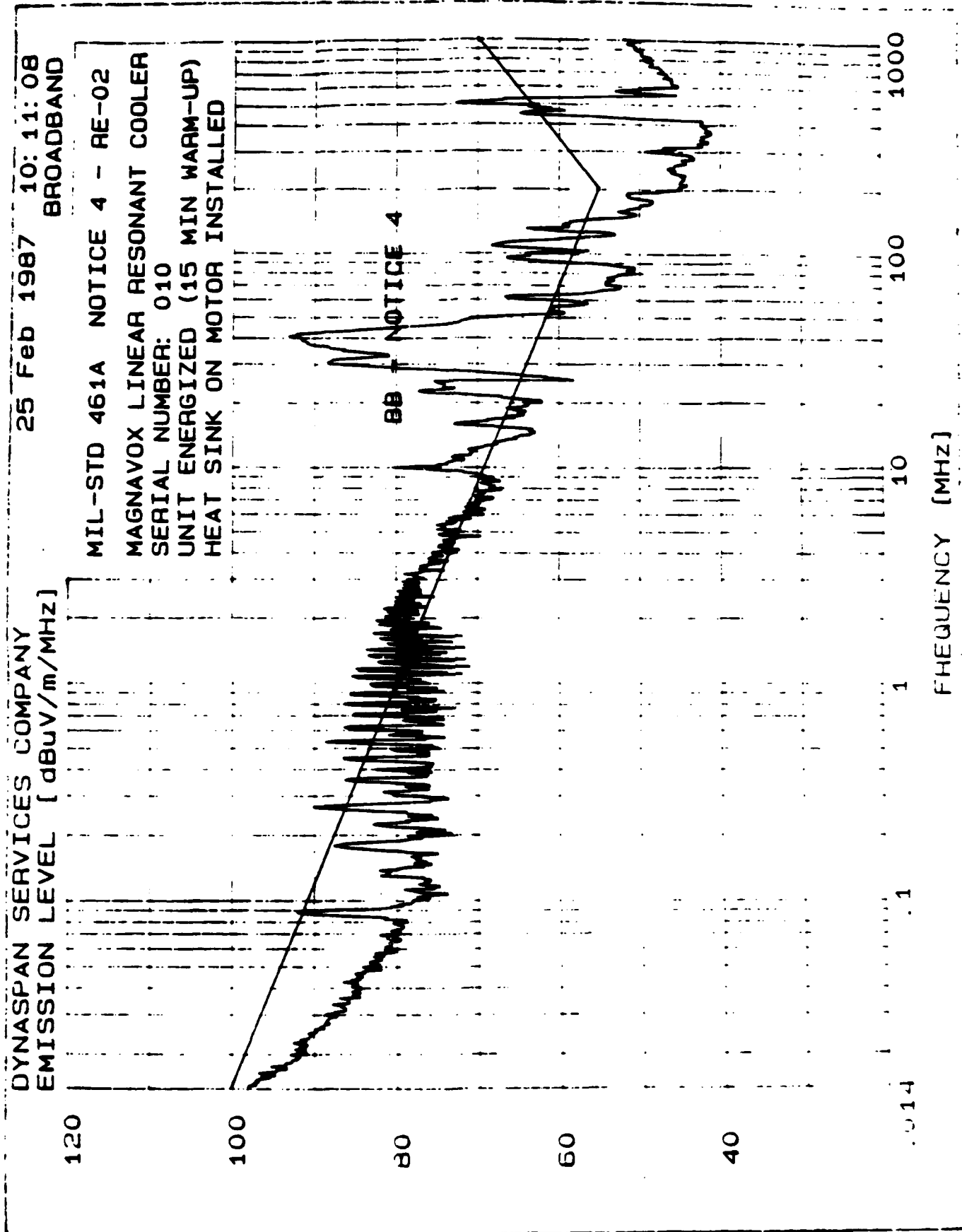
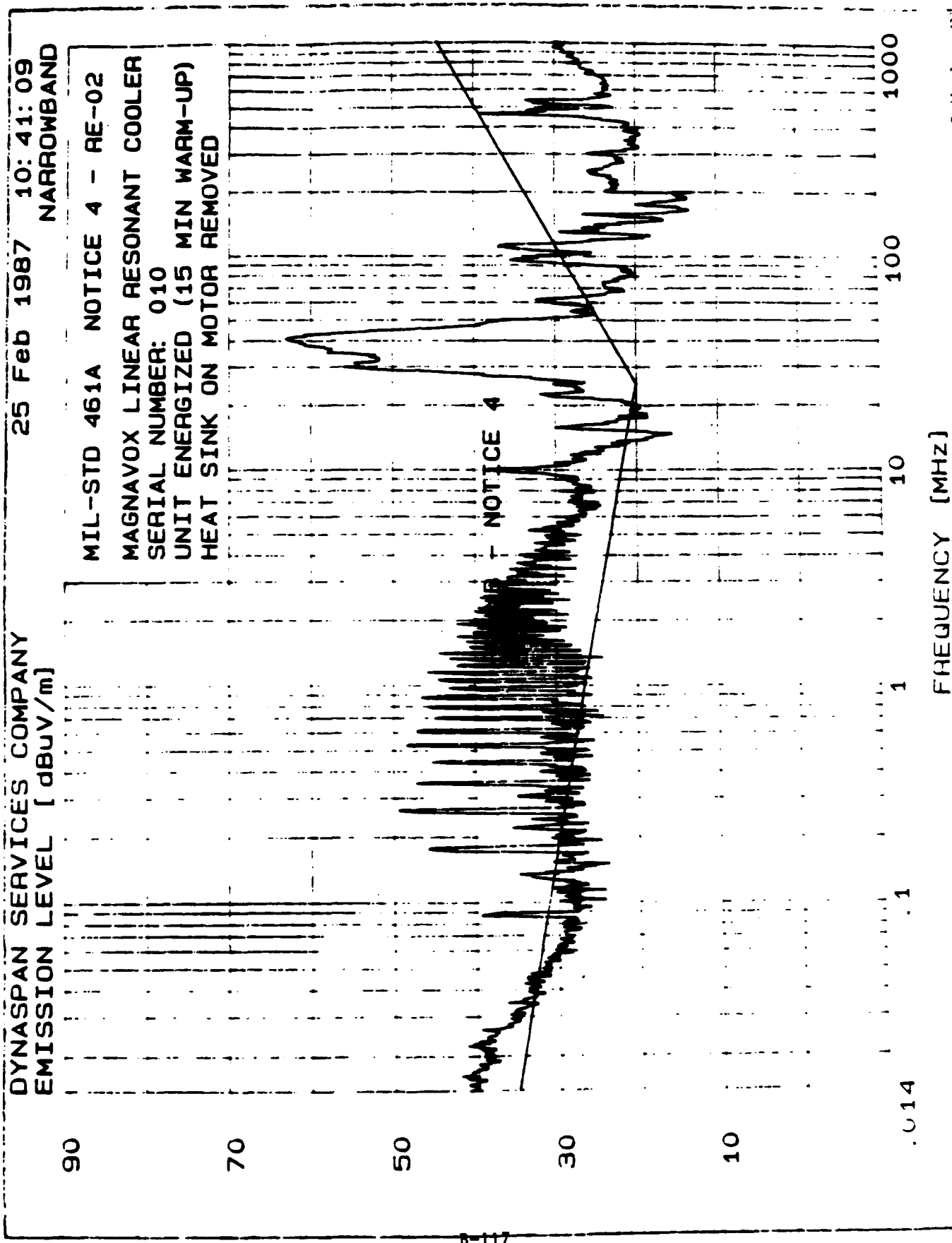


FIG RE 31.



# FIG. E 32.



# FIGURE 33.

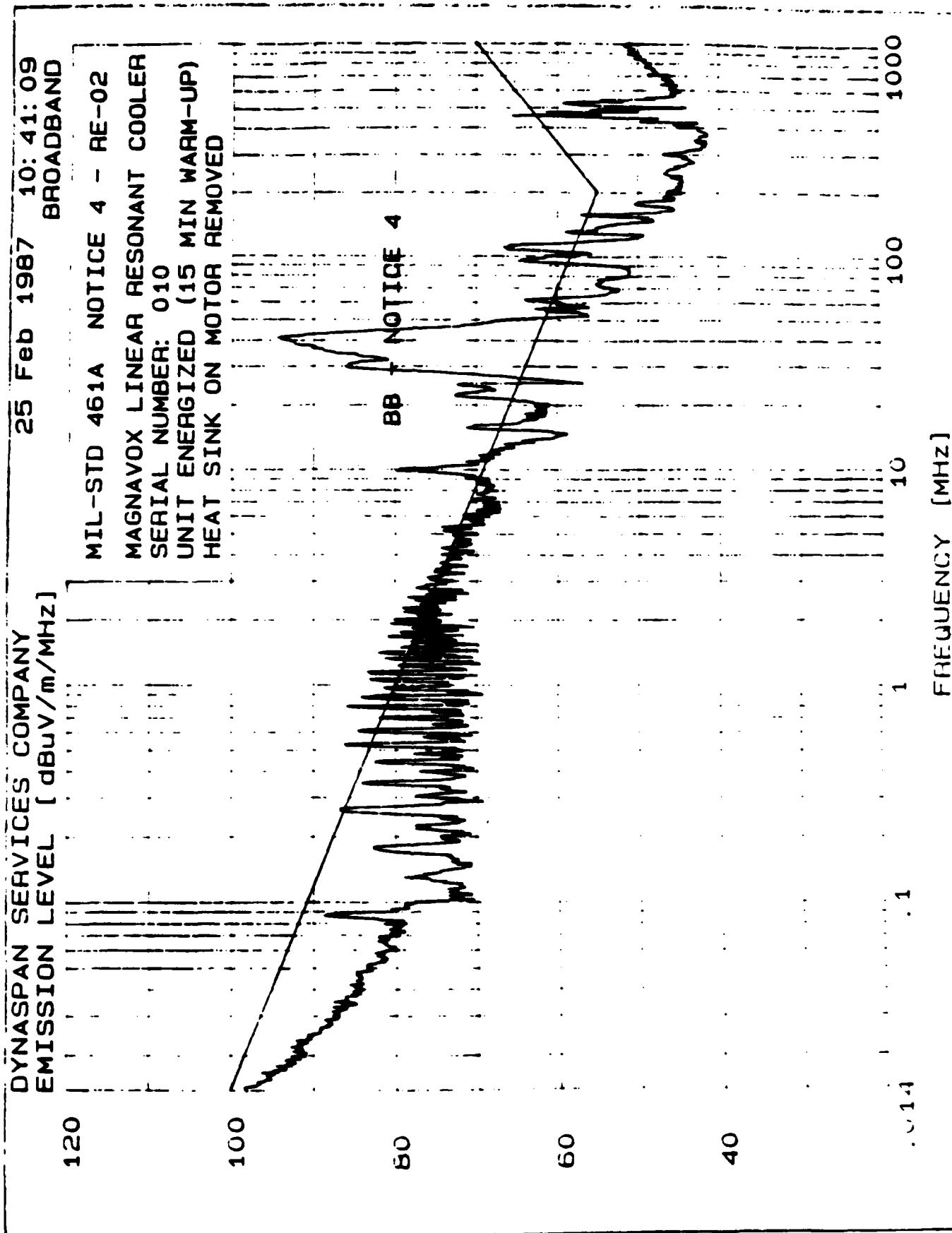


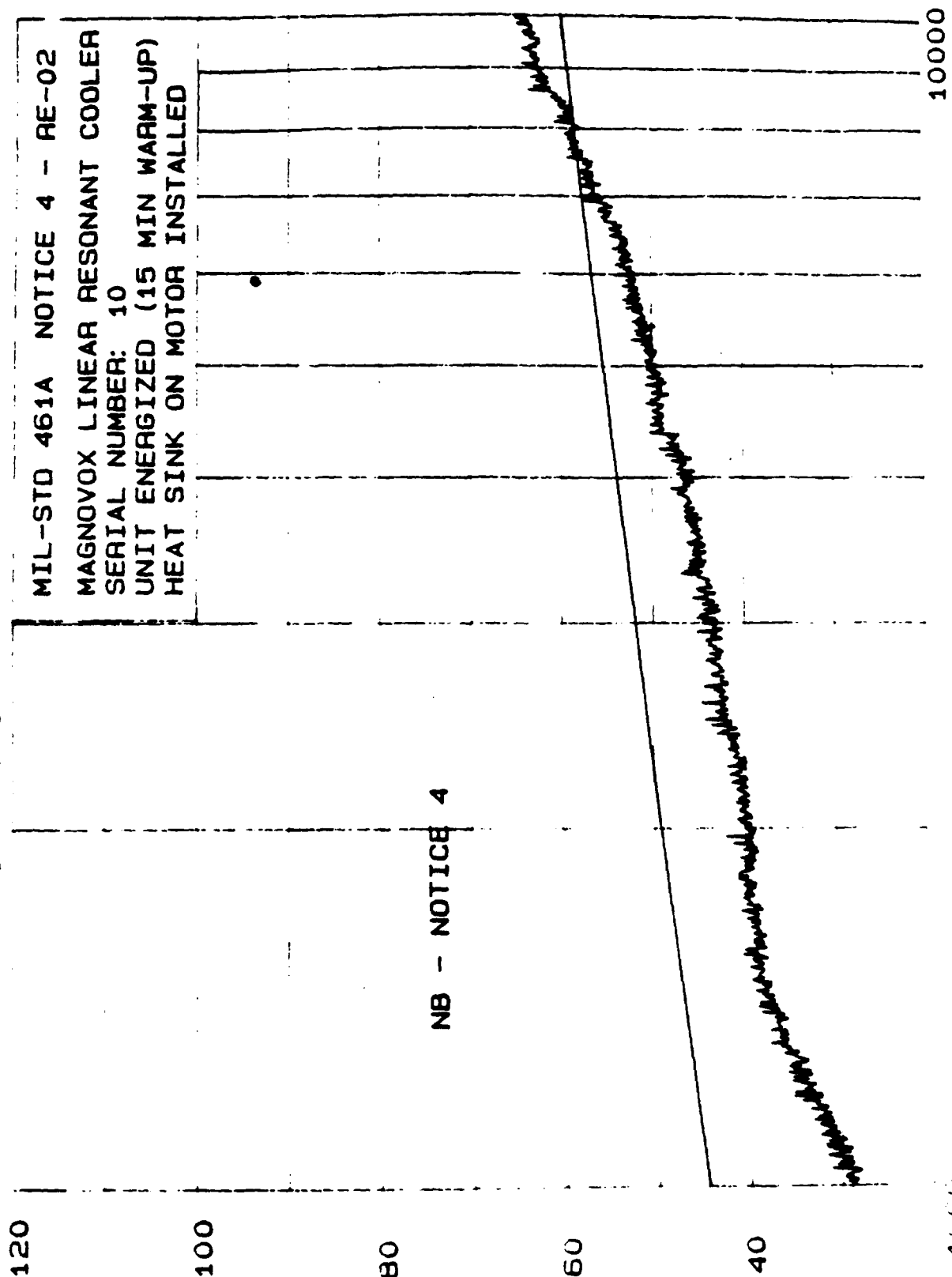
FIGURE 34.

THIS SHEET INTENTIONALLY  
LEFT BLANK

# FIGURE 35.

DYNASPAR SERVICES COMPANY  
EMISSION LEVEL [dBuV/m]

25 Feb 1987 15:58:56



NB - NOTICE 4

FREQUENCY [MHz]

FIGURE 36

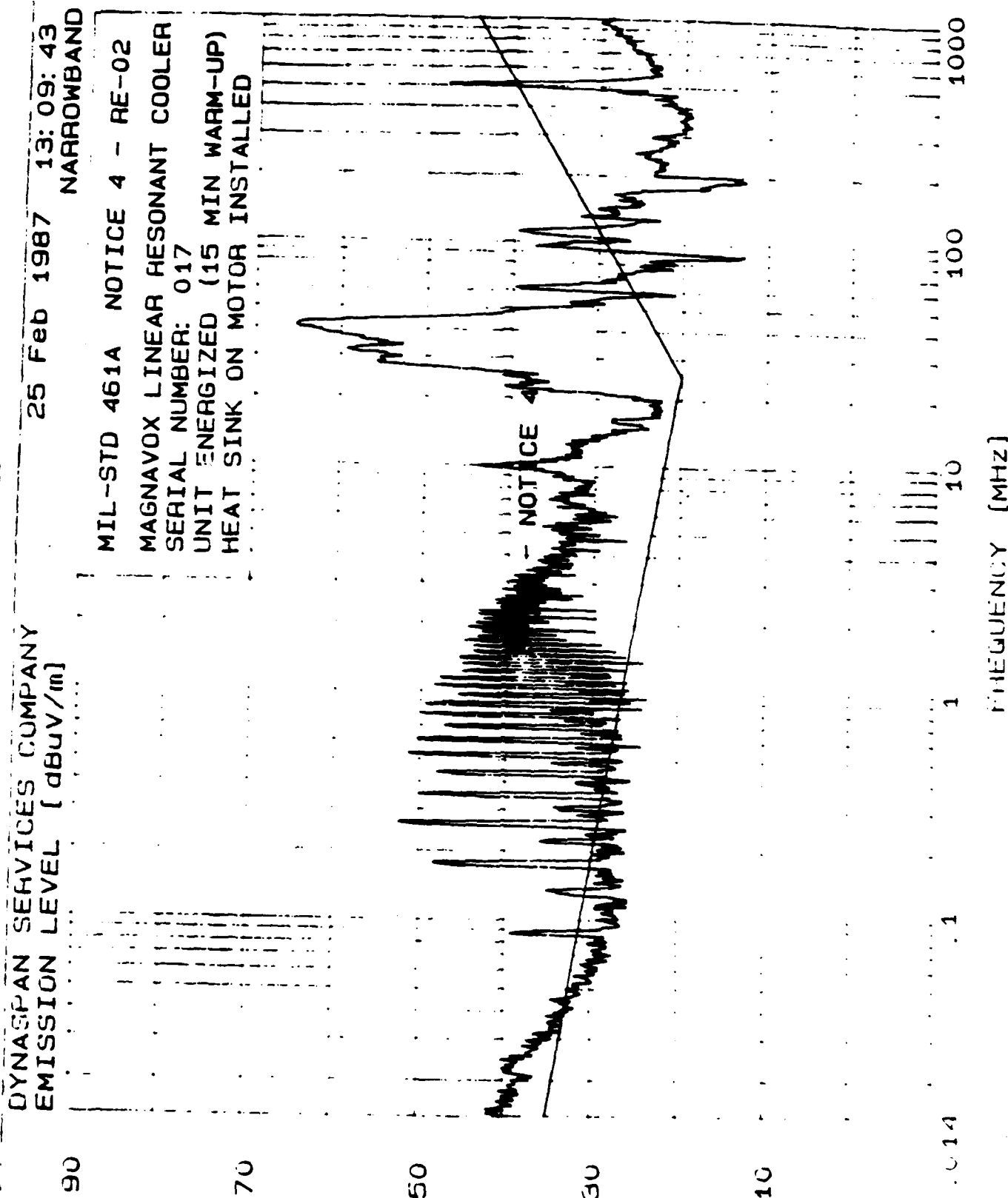
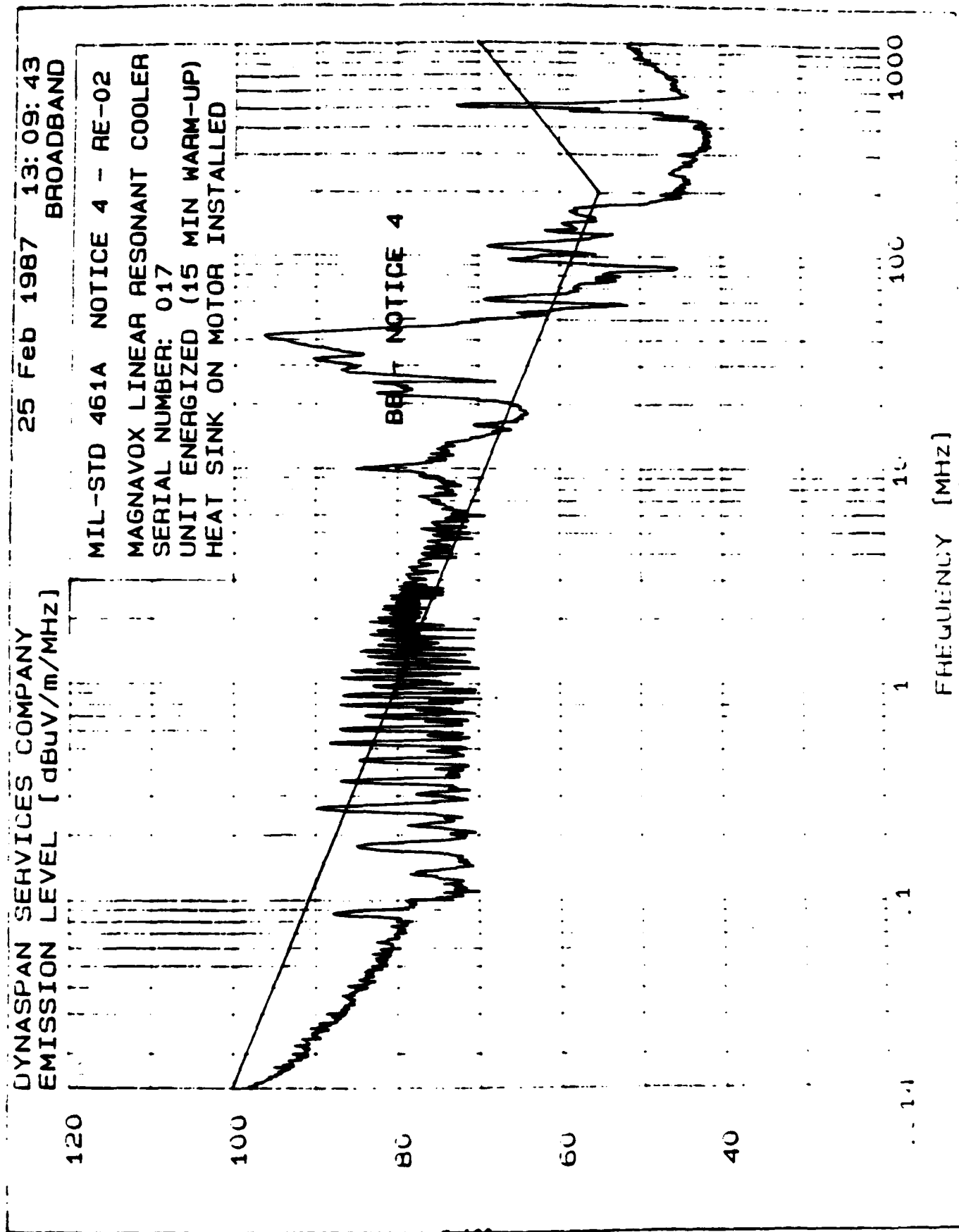


FIGURE 37.



# FIGURE 38.

DYNASPAR SERVICES COMPANY  
EMISSION LEVEL [dBuV/m]

25 Feb 1987 15:26:09

120

100

80

60

40

1000

10000

NB - NOTICE 4

MIL-STD 461A NOTICE 4 - RE-02  
MAGNAVOX LINEAR RESONANT COOLER  
SERIAL NUMBER: 017  
UNIT ENERGIZED (15 MIN WARM-UP)  
HEAT SINK ON MOTOR INSTALLED

FREQUENCY [MHz]

FIGURE 39.

DYNASPAR SERVICES COMPANY  
EMISSION LEVEL [dBuV/m]

25 Feb 1987 09:38:10  
NARROWBAND

MIL-STD 461A NOTICE 4 - RE-02  
AMBIENT SIGNAL LEVEL  
BASELINE

NB - NOTICE 4

FREQUENCY [MHz]

90

70

50

30

10

1

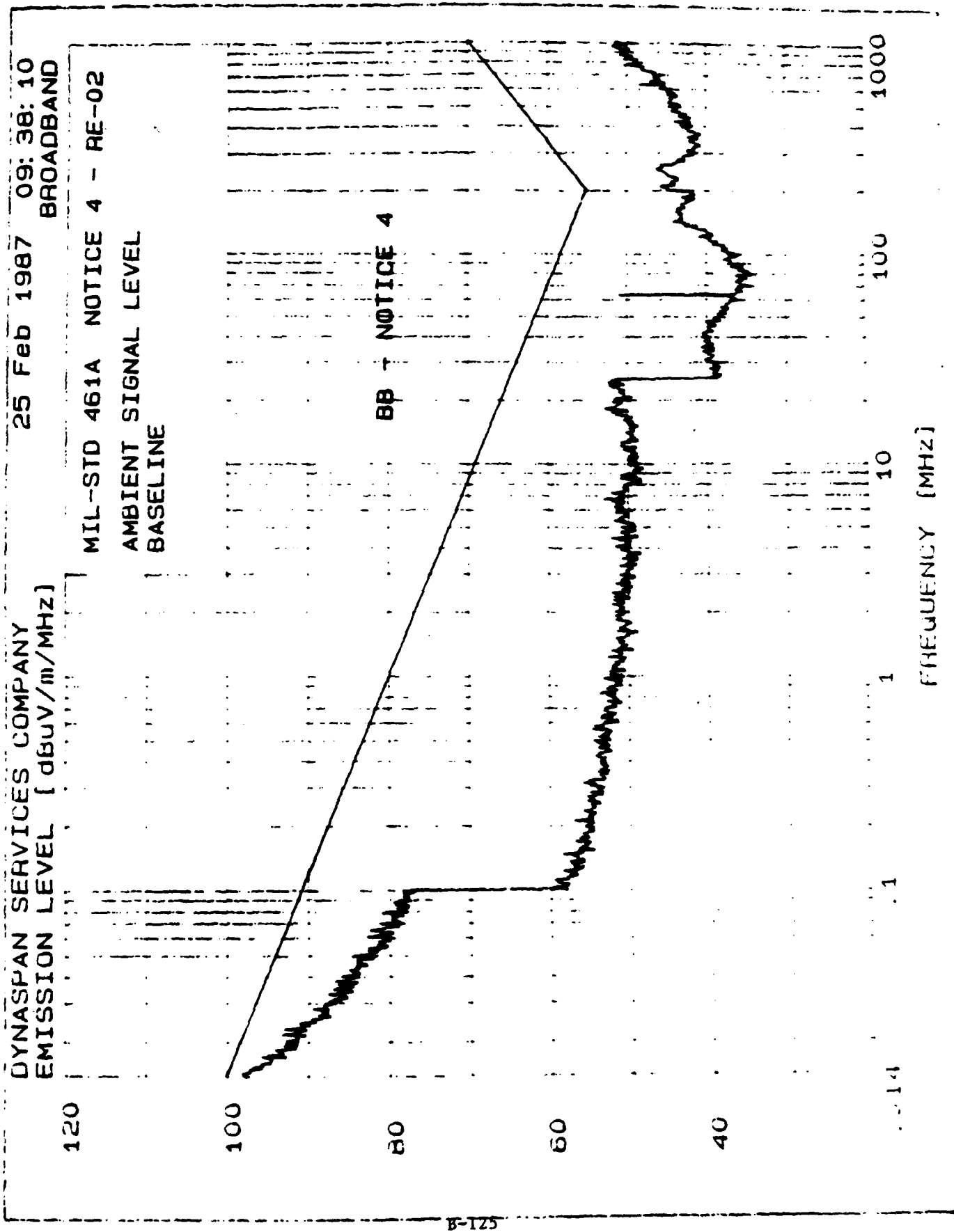
1

10

100

1000

FIGURE 40.



# FIGURE 41

DYNASpan SERVICES COMPANY  
EMISSION LEVEL [dBuV/m]

25 Feb 1987 15:35:49

MIL-STD 461A NOTICE 4 - RE-02  
AMBIENT SIGNAL LEVEL  
BASELINE

NB - NOTICE 4

FREQUENCY [MHZ]

120

100

80

60

40

1000

10000

RS-03  
EMR TEST ENVIRONMENT

| <u>FREQUENCY</u><br><u>(MHz)</u> | <u>CRITERIA</u><br><u>FIELD (V/m)</u> | <u>POLARIZATION</u> | <u>MODULATION</u> |
|----------------------------------|---------------------------------------|---------------------|-------------------|
| 0.14                             | 10                                    | V                   | A,B               |
| 0.750                            | 10                                    | V                   | A,B               |
| 2.175                            | 50                                    | V                   | A,B               |
| 3.7                              | 50                                    | V                   | A,B               |
| 5.3                              | 50                                    | V                   | A,B               |
| 7.75                             | 50                                    | V                   | A,B               |
| 10.46                            | 50                                    | V                   | A,B               |
| 13.964                           | 50                                    | V                   | A,B               |
| 20.12                            | 50                                    | V                   | A,B,C             |
| 34.5                             | 50                                    | V                   | A,B,C             |
| 46.0                             | 50                                    | V/H                 | A,B,C             |
| 60.0                             | 50                                    | V/H                 | A,B,C             |
| 76.0                             | 50                                    | V/H                 | A,B,C             |
| 94.0                             | 50                                    | V/H                 | A,B,C             |
| 122.0                            | 50                                    | V/H                 | A,B,C             |
| 153.6                            | 50                                    | V/H                 | A,B,C             |
| 195.7                            | 10                                    | V/H                 | A,B               |
| 241.5                            | 10                                    | V/H                 | A,B               |
| 355                              | 10                                    | V/H                 | A,B               |
| 403                              | 10                                    | V/H                 | A,D               |
| 590.8                            | 10                                    | V/H                 | A,D               |
| 798                              | 10                                    | V/H                 | A,D               |
| 1042                             | 10                                    | V/H                 | A,D               |
| 1250                             | 10                                    | V/H                 | A,D               |
| 1450                             | 10                                    | V/H                 | A,D               |
| 16500                            | 10                                    | V/H                 | A,D               |
| 20000                            | 10                                    | V/H                 | A,D               |

- = CONTINUOUS WAVE
- = 50% MODULATED WAVE WITH 1000 Hz ( $\pm 5$  Hz) MODULATION FREQUENCY
- = FM MODULATED WITH 8 kHz ( $\pm 1.5$  kHz) DEVIATION AND 1000 Hz ( $\pm 5$  Hz) MODULATION FREQUENCY
- = PM WITH 10 us ( $\pm 1$  us) PULSE WIDTH  $\pm 10\%$  AND 800 Hz ( $\pm 5$  Hz) PRF

FIGURE 42.

**Magnavox**

ELECTRO-OPTICAL SYSTEMS

MM&T  
LIFE TEST  
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 011

DRAWING NO. SM-D-5005842

| DATE    | AMB<br>TEMP<br>°C | TIME<br>TO 80°K<br>MINUTES | HEAT<br>LOAD<br>WATTS                       | COLD<br>STATION<br>°K | COOLER<br>INPUT<br>CURRENT<br>AMPS | COOLER<br>POWER<br>WATTS<br>@17.5VDC | ETI<br>READING | CUM<br>HOURS | INITIALS |
|---------|-------------------|----------------------------|---------------------------------------------|-----------------------|------------------------------------|--------------------------------------|----------------|--------------|----------|
| 9-25-87 | 22.2              | —                          | .280                                        | 90.20                 | 2.65                               | 46.37                                | 9640.0         | 6332.8       | 0840 Rm  |
|         | -32.0             | —                          | .280                                        | 94.10                 | 2.75                               | 48.12                                | 9644.1         | 6336.9       | 1250     |
|         | -32.0             | —                          | .208                                        | 74.90                 | 2.78                               | 48.65                                | 9644.5         | 6337.4       | 1310     |
|         | 52.0              | —                          | .290                                        | 98.90                 | 2.40                               | 42.00                                | 9647.4         | 6337.8       | 1600     |
|         | 52.0              | —                          | .232                                        | 92.20                 | 2.40                               | 42.00                                | 9647.9         | 6338.3       | 1630     |
| 9-28-87 | 21.7              | 10.40                      | —                                           | 50.6                  | 2.65                               | 46.37                                | 9699.2         | 6388.6       | 0700     |
|         | 21.7              | —                          | .350                                        | 97.90                 | 2.60                               | 45.50                                | 9699.7         | 6389.1       | 0730     |
|         | 21.4              | —                          | .280                                        | 93.60                 | 2.56                               | 44.80                                | 9699.4         | 6389.8       | 0810     |
|         | 51.7              | —                          | .290                                        | 105.10                | 2.45                               | 42.87                                | 9707.1         | 6397.5       | 1600     |
|         | 52.6              | —                          | .232                                        | 96.70                 | 2.45                               | 42.87                                | 9708.6         | 6398.0       | 1630     |
| 1-29-87 | 21.6              | 12.1                       | —                                           | 50.70                 | 2.60                               | 45.50                                | 9718.2         | 6408.6       | 0655     |
|         | 21.6              | —                          | .350                                        | 106.7                 | 2.50                               | 43.75                                | 9718.8         | 6409.2       | 0730     |
|         | 22.3              | —                          | .280                                        | 96.6                  | 2.56                               | 44.80                                | 9719.2         | 6409.6       | 0756     |
|         | -32.1             | —                          | .280                                        | 105.8                 | 2.90                               | 50.75                                | 9724.4         | 6414.8       | 1304     |
|         | -32.1             | —                          | .208                                        | 94.3                  | 2.95                               | 51.62                                | 9724.8         | 6415.2       | 1326     |
| 9-30-87 | 22.1              | 12.2                       | —                                           | 52.3                  | 2.65                               | 46.37                                | 9738.3         | 6428.7       | 0700     |
|         | 22.1              | —                          | .350                                        | 113.2                 | 2.56                               | 44.80                                | 9739.3         | 6429.2       | 0800     |
|         | 22.0              | —                          | .280                                        | 98.7                  | 2.60                               | 45.50                                | 9740.0         | 6430.4       | 0842     |
|         | -32.0             | —                          | .280                                        | 110.5                 | 2.90                               | 50.75                                | 9744.2         | 6434.6       | 1300     |
|         | -32.0             | —                          | .208                                        | 89.3                  | 3.00                               | 52.50                                | 9744.8         | 6435.2       | 1333     |
|         |                   |                            |                                             |                       |                                    |                                      |                |              |          |
|         |                   |                            |                                             |                       |                                    |                                      |                |              |          |
| SPEC    | INFO<br>ONLY      | 10 MIN<br>@ 23°C           | .208: -32°<br>.280: 23°<br>.232: 52°<br>MIN | 80°K<br>MAX           | 1.72A<br>MAX<br>@ 17.5V            | 30 WATTS<br>MAX                      | INFO<br>ONLY   | INFO<br>ONLY |          |

PERFORMED BY \_\_\_\_\_

APPROVED BY [Signature]DATE 10-2-87

9-25 AMMETER NEEDLE IS ERRATIC AT ALL AMBIENT TEMPERATURES.

**Magnavox**

ELECTRO-OPTICAL SYSTEMS

MM&amp;T

LIFE TEST

DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 011

DRAWING NO. SM-D-5005842

| DATE    | AMB<br>TEMP<br>°C | TIME<br>TO 80°K<br>MINUTES | HEAT<br>LOAD<br>WATTS                       | COLD<br>STATION<br>°K | COOLER<br>INPUT<br>CURRENT<br>AMPS | COOLER<br>POWER<br>WATTS<br>@17.5VDC | ETI<br>READING | CUM<br>HOURS | INITIALS |
|---------|-------------------|----------------------------|---------------------------------------------|-----------------------|------------------------------------|--------------------------------------|----------------|--------------|----------|
| 9-21-87 | -31.9             | —                          | .280                                        | 85.40                 | 2.50                               | 43.75                                | 9558.2         | 6220.8       | 1030 RM  |
|         | -31.8             | —                          | .208                                        | 72.50                 | 2.50                               | 43.75                                | 9558.7         | 6221.3       | 1100     |
|         | 52.0              | —                          | .290                                        | 98.90                 | 2.30                               | 40.25                                | 9561.1         | 6223.7       | 1325     |
|         | 52.0              | —                          | .232                                        | 91.20                 | 2.34                               | 40.95                                | 9561.8         | 6224.4       | 1405     |
| 9-22-87 | -32.3             | —                          | .280                                        | 85.50                 | 2.50                               | 43.75                                | 9579.3         | 6241.9       | 0740     |
|         | -32.9             | —                          | .208                                        | 72.70                 | 2.56                               | 44.80                                | 9580.5         | 6243.1       | 0850     |
| 9-23-87 | 22.5              | 10.30                      | —                                           | 48.30                 | 2.60                               | 45.50                                | 9598.8         | 6261.4       | 0700     |
|         | 22.6              | —                          | .348                                        | 100.10                | 2.56                               | 44.50                                | 9599.8         | 6262.4       | 0800     |
|         | 22.6              | —                          | .280                                        | 89.00                 | 2.60                               | 45.50                                | 9600.2         | 6262.8       | 0830     |
|         | -32.1             | —                          | .280                                        | 90.70                 | 2.65                               | 46.37                                | 9604.7         | 6267.3       | 1300     |
|         | -32.1             | —                          | .208                                        | 73.60                 | 2.72                               | 47.60                                | 9605.2         | 6267.8       | 1330     |
|         | 52.1              | —                          | .290                                        | 98.90                 | 2.40                               | 42.00                                | 9607.4         | 6300.0       | 1545     |
|         | 53.2              | —                          | .232                                        | 90.30                 | 2.40                               | 42.00                                | 9607.7         | 6300.3       | 1600     |
| 9-24-87 | 22.4              | 10.30                      | —                                           | 48.40                 | 2.70                               | 47.25                                | 9618.6         | 6311.2       | 0700     |
|         | 22.5              | —                          | .350                                        | 98.50                 | 2.56                               | 44.80                                | 9619.4         | 6312.0       | 0745     |
|         | 21.8              | —                          | .280                                        | 89.50                 | 2.60                               | 45.50                                | 9619.6         | 6312.2       | 0800     |
|         | -32.1             | —                          | .280                                        | 91.90                 | 2.70                               | 47.25                                | 9624.4         | 6317.2       | 1300     |
|         | -32.1             | —                          | .208                                        | 73.90                 | 2.72                               | 47.60                                | 9624.8         | 6317.6       | 1325     |
|         | 52.2              | —                          | .290                                        | 98.90                 | 2.40                               | 42.00                                | 9627.7         | 6320.5       | 1604     |
|         | 52.8              | —                          | .232                                        | 91.90                 | 2.40                               | 42.00                                | 9628.0         | 6320.8       | 1620     |
| 9-25-87 | 22.3              | 10.40                      | —                                           | 50.10                 | 2.80                               |                                      | 9638.3         | 6331.1       | 0700     |
|         | 22.3              | —                          | .351                                        | 97.80                 | 2.60                               | 45.50                                | 9639.4         | 6332.2       | 0807     |
| SPEC    | INFO<br>ONLY      | 10 MIN<br>@ 23°C           | .208: -32°<br>.280: 23°<br>.232: 52°<br>MIN | 80°K<br>MAX           | 1.72A<br>MAX<br>@ 17.5V            | 30 WATTS<br>MAX                      | INFO<br>ONLY   | INFO<br>ONLY |          |

PERFORMED BY [Signature]APPROVED BY [Signature]DATE 9/21 - 9/26/87

**Magnavox**

ELECTRO-OPTICAL SYSTEMS

MM&amp;T

LIFE TEST

DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 011

DRAWING NO. SM-D-5005842

| DATE    | AMB<br>TEMP<br>°C | TIME<br>TO 80°K<br>MINUTES | HEAT<br>LOAD<br>WATTS                       | COLD<br>STATION<br>°K | COOLER<br>INPUT<br>CURRENT<br>AMPS | COOLER<br>POWER<br>WATTS<br>@17.5VDC | ETI<br>READING | CUM<br>HOURS | INITIALS |
|---------|-------------------|----------------------------|---------------------------------------------|-----------------------|------------------------------------|--------------------------------------|----------------|--------------|----------|
| 9-9-87  | 20.0              | 8.60                       | —                                           | 46.60                 | 2.30                               | 40.25                                | 9470.0         | 6133.4       | 070024   |
|         | 20.4              | —                          | .348                                        | 91.10                 | 2.25                               | 39.40                                | 9470.8         | 6134.2       | 0750     |
|         | 21.4              | —                          | .280                                        | 80.20                 | 2.30                               | 40.25                                | 9472.3         | 6135.7       | 0950     |
|         | -32.8             | —                          | .280                                        | 82.00                 | 2.45                               | 42.90                                | 9475.6         | 6139.0       | 1310     |
|         | -32.8             | —                          | .208                                        | 68.30                 | 2.50                               | 43.75                                | 9476.0         | 6139.4       | 1335     |
| 9-10-87 | 19.9              | 9.10                       | —                                           | 47.10                 | 2.50                               | 43.75                                | 9490.4         | 6153.8       | 0840     |
|         | 19.8              | —                          | .348                                        | 94.10                 | 2.25                               | 39.40                                | 9491.0         | 6154.4       | 0917     |
|         | 19.1              | —                          | .280                                        | 82.70                 | 2.40                               | 42.00                                | 9491.7         | 6155.1       | 1000     |
|         | -32.1             | —                          | .280                                        | 84.20                 | 2.50                               | 43.75                                | 9494.7         | 6158.1       | 1301     |
|         | -32.1             | —                          | .208                                        | 70.70                 | 2.54                               | 44.45                                | 9495.2         | 6158.6       | 1330     |
|         | 52.0              | —                          | .290                                        | 93.40                 | 2.32                               | 40.60                                | 9497.7         | 6159.1       | 1600     |
|         | 52.0              | —                          | .232                                        | 84.70                 | 2.35                               | 41.12                                | 9498.1         | 6159.5       | 1615     |
| 9-11-87 | 21.9              | 9.00                       | —                                           | 47.60                 | 2.50                               | 43.75                                | 9508.6         | 6170.5       | 0700     |
|         | 21.7              | —                          | .348                                        | 93.10                 | 2.40                               | 42.00                                | 9509.3         | 6171.2       | 0730     |
|         | 22.3              | —                          | .280                                        | 85.00                 | 2.30                               | 40.25                                | 9510.3         | 6172.2       | 0830     |
|         | -32.0             | —                          | .280                                        | 84.20                 | 2.50                               | 43.75                                | 9514.7         | 6176.6       | 1300     |
|         | -32.0             | —                          | .208                                        | 70.10                 | 2.54                               | 44.45                                | 9515.2         | 6177.1       | 1330     |
|         | 52.0              | —                          | .290                                        | 94.10                 | 2.30                               | 40.25                                | 9517.6         | 6179.5       | 1600     |
|         | 52.0              | —                          | .232                                        | 84.60                 | 2.32                               | 40.60                                | 9518.0         | 6179.9       | 1615     |
| 9-21-87 | 21.8              | 10.30                      | —                                           | 48.60                 | 2.60                               | 45.50                                | 9558.9         | 6217.8       | 0812     |
|         | 21.8              | —                          | .347                                        | 97.20                 | 2.32                               | 40.60                                | 9556.2         | 6219.8       | 0930     |
|         | 21.9              | —                          | .279                                        | 85.50                 | 2.45                               | 42.90                                | 9556.7         | 6219.3       | 0900     |
| SPEC    | INFO<br>ONLY      | 10 MIN<br>@ 23°C           | .208: -32°<br>.280: 23°<br>.232: 52°<br>MIN | 80°K<br>MAX           | 1.72A<br>MAX<br>@ 17.5V            | 30 WATTS<br>MAX                      | INFO<br>ONLY   | INFO<br>ONLY |          |

PERFORMED BY [Signature]APPROVED BY [Signature]

DATE

9/9 - 9/21/87

TEST PERFORMED WITH FULL HEAT LOAD AND AT 20%  
REDUCTION AT ALL AMBIENT TEMPERATURES.

# Magnavox

ELECTRO-OPTICAL SYSTEMS

MM&amp;T

LIFE TEST

DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 011

DRAWING NO. SM-D-5005842

| DATE    | AMB<br>TEMP<br>°C | TIME<br>TO 80°K<br>MINUTES | HEAT<br>LOAD<br>WATTS                       | COLD<br>STATION<br>°K | COOLER<br>INPUT<br>CURRENT<br>AMPS | COOLER<br>POWER<br>WATTS<br>@17.5VDC | ETI<br>READING | CUM<br>HOURS | INITIALS |
|---------|-------------------|----------------------------|---------------------------------------------|-----------------------|------------------------------------|--------------------------------------|----------------|--------------|----------|
| 8-27-87 | 21.5              | 8.0                        | —                                           | 46.8                  | 2.10                               | 36.75                                | 9324.0         | 5991.2       | 0700 KM  |
| 8-27-87 | 23.2              | —                          | .355                                        | 89.3                  | 2.20                               | 38.50                                | 9326.0         | 5993.2       | 0700 KM  |
|         | -32.0             | —                          | .356                                        | 91.6                  | 2.35                               | 41.20                                | 9329.6         | 5994.3       | 1200 KM  |
| 8-27-87 | 22.8              | —                          | .298                                        | 92.6                  | 2.25                               | 39.40                                | 9333.0         | 5997.0       | 1200 KM  |
| 8-29-87 | 22.0              | 8.8                        | —                                           | 49.2                  | 2.20                               | 38.50                                | 9344.0         | 6008.6       | 0700 KM  |
|         | 22.9              | —                          | .295                                        | 84.0                  | 2.20                               | 38.50                                | 9344.7         | 6009.3       | 0700 KM  |
|         | 22.8              | —                          | .350                                        | 89.5                  | 2.20                               | 38.50                                | 9345.3         | 6010.0       | 0800 KM  |
|         | -32               | —                          | .355                                        | 92.0                  | 2.32                               | 39.60                                | 9349.7         | 6014.4       | 1245 JRM |
| 8-31-87 | 20.9              | 8.50                       | —                                           | 51.7                  | 2.35                               | 41.20                                | 9415.7         | 6030.4       | 0700 KM  |
|         | 20.9              | —                          | .295                                        | 80.7                  | 2.35                               | 41.20                                | 9416.2         | 6030.6       | 0740 KM  |
|         | 20.9              | —                          | .351                                        | 89.7                  | 2.35                               | 41.20                                | 9417.0         | 6031.4       | 0825 KM  |
|         | -30.3             | —                          | .351                                        | 91.1                  | 2.35                               | 41.20                                | 9421.3         | 6035.7       | 1200 KM  |
|         | 57.3              | —                          | .293                                        | 92.6                  | 2.25                               | 39.40                                | 9424.6         | 6039.0       | 1200 KM  |
| 9-1-87  | 20.9              | 8.60                       | —                                           | 51.7                  | 2.35                               | 41.20                                | 9435.8         | 6100.2       | 0700 KM  |
|         | 20.9              | —                          | .296                                        | 81.6                  | 2.25                               | 39.40                                | 9436.3         | 6100.7       | 0737 KM  |
|         | 20.9              | —                          | .354                                        | 89.8                  | 2.35                               | 41.20                                | 9437.3         | 6101.7       | 0840 KM  |
|         | -31.7             | —                          | .355                                        | 93.6                  | 2.35                               | 41.20                                | 9441.3         | 6105.7       | 1232 JRM |
|         | 52.2              | —                          | .296                                        | 93.2                  | 2.25                               | 39.40                                | 9444.7         | 6108.1       | 1200 KM  |
| 9-2-87  | 20.1              | 8.6                        | —                                           | 47.4                  | 2.40                               | 42.00                                | 9459.7         | 6123.1       | 0700     |
| <hr/>   |                   |                            |                                             |                       |                                    |                                      |                |              |          |
| SPEC    | INFO<br>ONLY      | 10 MIN<br>@ 23°C           | .208: -32°<br>.280: 23°<br>.232: 52°<br>MIN | 80°K<br>MAX           | 1.72A<br>MAX<br>@ 17.5V            | 30 WATTS<br>MAX                      | INFO<br>ONLY   | INFO<br>ONLY |          |

PERFORMED BY

APPROVED BY

DATE

9-9-87

Foldback/Input Power  
5 Day Data Collection  
Unit S/N 011

6/19/87

Cooldown Time to 100 K 7.0 min.  
" " " " 85 K 7.8 min.

| <u>20°C</u>  | <u>VDC</u>      | <u>I</u>        | <u>WATTS</u>     | <u>FBV</u>      | <u>°K</u>       | <u>H.L.</u>     |
|--------------|-----------------|-----------------|------------------|-----------------|-----------------|-----------------|
|              | 17.5            | 2.10            | 36.75            | 0.0             | 79.8            | .350            |
|              | 17.5            | 1.98            | 34.65            | 1.50            | 80.5            | .350            |
|              | 17.5            | <del>1.74</del> | <del>30.45</del> | <del>1.20</del> | <del>80.2</del> | .280            |
|              | 17.5            | 2.04            | 35.70            | 0.0             | 72.0            | .280            |
| <u>-32°C</u> | 17.5            | 1.96            | 34.30            | 0.0             | 78.7            | .350            |
|              | 17.5            | 1.93            | 33.78            | 0.94            | 80.1            | .350            |
|              | 17.5            | <del>1.67</del> | <del>29.88</del> | <del>1.30</del> | <del>80.4</del> | .280            |
|              | 17.5            | 1.98            | 34.65            | 0.0             | 68.9            | .280            |
| <u>52°C</u>  | 17.5            | 2.04            | 35.70            | 0.0             | 82.4            | .290            |
|              | 17.5            | ----            | -----            | ---             | ----            | .290            |
|              | <del>17.5</del> | 1.87            | <del>32.73</del> | <del>1.07</del> | <del>80.5</del> | <del>.280</del> |
|              | 17.5            | 2.07            | 36.23            | 0.0             | 75.4            | .232            |

Foldback/Input Power  
5 Day Data Collection  
Unit S/N 011

6/17/87

Cooldown Time to 100 K 6.8 min.  
" " " " 85 K 7.6 min.

| <u>20 C</u>  | <u>VDC</u> | <u>I</u> | <u>WATTS</u>     | <u>HBV</u>      | <u>K</u>        | <u>H.L.</u>     |
|--------------|------------|----------|------------------|-----------------|-----------------|-----------------|
|              | 17.5       | 2.00     | 35.00            | 0.0             | 79.8            | .350            |
|              | 17.5       | 1.97     | 34.47            | 1.90            | 80.4            | .350            |
|              | 17.5       | 1.72     | <del>30.10</del> | <del>3.23</del> | <del>80.2</del> | .280            |
|              | 17.5       | 2.03     | 35.52            | 0.0             | 71.3            | .280            |
| <u>-32 C</u> | 17.5       | 1.95     | 34.12            | 0.0             | 79.7            | .350            |
|              | 17.5       | 1.92     | 33.60            | 1.35            | 80.5            | .350            |
|              | 17.5       | 1.66     | 29.05            | <del>3.30</del> | <del>80.2</del> | <del>.280</del> |
|              | 17.5       | 1.97     | 34.47            | 0.0             | 68.9            | .280            |
| <u>52 C</u>  | 17.5       | 2.05     | 35.88            | 0.0             | 82.0            | .290            |
|              | 17.5       | ----     | -----            | ---             | ----            | .290            |
|              | 17.5       | 1.87     | <del>32.72</del> | <del>3.08</del> | <del>80.0</del> | <del>.232</del> |
|              | 17.5       | 2.07     | 36.23            | 0.0             | 75.3            | .232            |

6/18/87

|              |                 |                 |                  |                 |                 |      |
|--------------|-----------------|-----------------|------------------|-----------------|-----------------|------|
| <u>20 C</u>  | 17.5            | 2.00            | 35.00            | 0.0             | 79.8            | .350 |
|              | 17.5            | 1.97            | 34.47            | 1.89            | 80.4            | .350 |
|              | <del>17.5</del> | 1.72            | <del>30.10</del> | <del>3.23</del> | <del>80.2</del> | .280 |
|              | 17.5            | 2.03            | 35.52            | 0.0             | 71.2            | .280 |
| <u>-32 C</u> | 17.5            | 1.95            | 34.12            | 0.0             | 80.3            | .350 |
|              | 17.5            | ----            | -----            | ---             | ----            | .350 |
|              | <del>17.5</del> | <del>1.66</del> | <del>29.05</del> | <del>3.27</del> | <del>80.6</del> | .280 |
|              | 17.5            | 1.97            | 34.47            | 0.0             | 69.0            | .280 |
| <u>52 C</u>  | 17.5            | 2.04            | 35.70            | 0.0             | 82.3            | .290 |
|              | 17.5            | ----            | -----            | ---             | ----            | .290 |
|              | <del>17.5</del> | <del>1.87</del> | <del>32.72</del> | <del>3.08</del> | <del>80.0</del> | .232 |
|              | 17.5            | 2.07            | 36.23            | 0.0             | 75.3            | .232 |

Foldback/Input Power  
5 Day Data Collection  
Unit S/N 011

+526 Juc  
6/15/87

Cooldown Time to 100 K 6.8 min.  
" " " " 85 K 7.6 min.

| <u>20°C</u>  | <u>VDC</u> | <u>I</u> | <u>WATTS</u> | <u>FBV</u> | <u>° K</u> | <u>H.L.</u> |
|--------------|------------|----------|--------------|------------|------------|-------------|
|              | 17.5       | 1.98     | 34.65        | 0.0        | 79.5       | .350        |
|              | 17.5       | 1.96     | 34.30        | 1.96       | 80.4       | .350        |
|              | 17.5       | 1.72     | 30.10        | 3.19       | 80.0       | .280        |
|              | 17.5       | 2.02     | 35.35        | 0.0        | 71.5       | .280        |
| <u>-32°C</u> | 17.5       | 1.96     | 34.30        | 0.0        | 80.5       | .350        |
|              | 17.5       | ----     | ----         | ---        | ----       | .350        |
|              | 17.5       | 1.66     | 29.05        | 3.29       | 80.5       | .280        |
|              | 17.5       | 1.98     | 34.65        | 0.0        | 68.7       | .280        |
| <u>52°C</u>  | 17.5       | 2.05     | 35.88        | 0.0        | 82.5       | .290        |
|              | 17.5       | ----     | ----         | ---        | ----       | .290        |
|              | 17.5       | 1.88     | 32.90        | 3.05       | 80.2       | .232        |
|              | 17.5       | 2.07     | 36.83        | 0.0        | 75.7       | .232        |

|                |                 |                 |       |      |      |      |
|----------------|-----------------|-----------------|-------|------|------|------|
| <u>6/16/87</u> |                 |                 |       |      |      |      |
| <u>20°C</u>    | 17.5            | 2.00            | 35.00 | 0.0  | 79.8 | .350 |
|                | 17.5            | 1.97            | 34.47 | 1.90 | 80.4 | .350 |
|                | 17.5            | 1.72            | 30.10 | 3.23 | 80.4 | .280 |
|                | 17.5            | 2.03            | 35.52 | 0.0  | 71.3 | .280 |
| <u>-32°C</u>   | 17.5            | 1.95            | 34.12 | 0.0  | 78.7 | .350 |
|                | 17.5            | 1.91            | 33.42 | 1.50 | 80.4 | .350 |
|                | 17.5            | 1.68            | 29.40 | 3.27 | 80.1 | .280 |
|                | 17.5            | 1.97            | 34.47 | 0.0  | 68.9 | .280 |
| <u>52°C</u>    | 17.5            | 2.04            | 35.70 | 0.0  | 83.0 | .290 |
|                | 17.5            | ----            | ----  | ---  | ---- | .290 |
|                | <del>17.5</del> | <del>1.87</del> | 32.72 | 3.04 | 80.3 | .232 |
|                | 17.5            | 2.07            | 36.23 | 0.0  | 75.9 | .233 |

**Magnavox**

ELECTRO-OPTICAL SYSTEMS

MM&amp;T

LIFE TEST

DATA SHEET

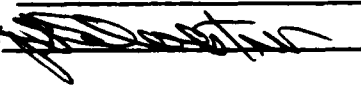
COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 011

DRAWING NO. SM-D-5005842

| DATE    | AMB<br>TEMP<br>°C | TIME<br>TO 80°K<br>MINUTES | HEAT<br>LOAD<br>WATTS                       | COLD<br>STATION<br>°K | COOLER<br>INPUT<br>CURRENT<br>AMPS | COOLER<br>POWER<br>WATTS<br>@17.5VDC | ETI<br>READING | CUM<br>HOURS | INITIALS |
|---------|-------------------|----------------------------|---------------------------------------------|-----------------------|------------------------------------|--------------------------------------|----------------|--------------|----------|
| 6-8-87  | 20.5              | 7.70                       | —                                           | 56.40                 | 1.92                               | 33.60                                | 7747.6         | 4454.5       | 1138 RM  |
|         | 20.1              | —                          | .305                                        | 73.00                 | 1.92                               | 33.60                                | 7748.0         | 4454.9       | 1200 RM  |
| 6-15-87 | -32.6             | —                          | .278                                        | 68.9                  | 1.97                               | 33.40                                | 7889.1         | 4596.0       | 1123 RM  |
| 7-2-87  | -19.6             | —                          | .350                                        | 79.9                  | 1.97                               | 34.90                                | 8205.3         | 4912.2       | 1312 RM  |
| 7-6-87  | -23.3             | —                          | .297                                        | 71.6                  | 1.97                               | 32.4                                 | 8285.6         | 4992.5       | 1326 RM  |
| 7-13-87 | -24.2             | —                          | .294                                        | 74.4                  | 2.00                               | 35.0                                 | 8420.8         | 5127.7       | 0940 RM  |
| 7-20-87 | 20.1              | —                          | .293                                        | 74.9                  | 2.10                               | 36.75                                | 8568.0         | 5274.9       | 1600 RM  |
| 8-3-87  | 22.3              | 8.4                        | —                                           | 56.70                 | 2.10                               | 36.75                                | 8842.7         | 5509.6       | 1040 RM  |
| 8-11-87 | -16.0             | —                          | .300                                        | 74.30                 | 2.25                               | 39.40                                | 9005.9         | 5672.8       | 1350 RM  |
| 8-12-87 | 36.8              | —                          | .299                                        | 81.90                 | 2.10                               | 36.75                                | 9028.4         | 5695.3       | 1615 RM  |
| 8-18-87 | 20.2              | —                          | .301                                        | 78.40                 | 2.00                               | 35.00                                | 9140.3         | 5807.2       | 0813 RM  |
| 8-18-87 | -32.0             | —                          | .299                                        | 77.10                 | 2.40                               | 42.00                                | 9145.7         | 5812.6       | 1315 RM  |
| 8-19-87 | 40.1              | —                          | .299                                        | 85.00                 | 2.20                               | 38.50                                | 9168.5         | 5835.1       | 1623 RM  |
| 8-19-87 | 52                | —                          | .299                                        | 90.4                  | 2.20                               | 38.5                                 | 9169.6         | 5836.5       | 1730 RM  |
| 8-20-87 | 22.2              | —                          | .305                                        | 79.1                  | 2.16                               | 37.8                                 | 9189.9         | 5847.8       | 0845 RM  |
| 8-20-87 | -32.0             | —                          | .302                                        | 77.7                  | 2.35                               | 41.2                                 | 9185.7         | 5853.0       | 1300 RM  |
| 8-25-87 | 21.60             | 8.40                       | —                                           | 54.10                 | 2.15                               | 37.5                                 | 9279.9         | 5947.2       | 0700 RM  |
| 8-25-87 | 31.30             | —                          | .299                                        | 80.00                 | 2.20                               | 38.50                                | 9288.1         | 5955.4       | 1511 RM  |
| 8-26-87 | 23.1              | —                          | .297                                        | 80.4                  | 2.20                               | 38.50                                | 9305.4         | 5972.7       | 0832 RM  |
| 8-26-87 | -32.0             |                            | .299                                        | 79.5                  | 2.35                               | 41.20                                | 9309.6         | 5976.9       | 1245 RM  |
| 8-26-87 | 51.2              |                            | .296                                        | 92.5                  | 2.25                               | 39.40                                | 9313.0         | 5980.9       | 1604 RM  |
| SPEC    | INFO<br>ONLY      | 10 MIN<br>@ 23°C           | .208: -32°<br>.280: 23°<br>.232: 52°<br>MIN | 80°K<br>MAX           | 1.72A<br>MAX<br>@ 17.5V            | 30 WATTS<br>MAX                      | INFO<br>ONLY   | INFO<br>ONLY |          |

PERFORMED BY

APPROVED BY 

DATE

9-9-87

**Magnavox**

ELECTRO-OPTICAL SYSTEMS

MM&amp;T

LIFE TEST

DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 011

DRAWING NO. SM-D-5005842

| DATE    | AMB<br>TEMP<br>°C | TIME<br>TO 80°K<br>MINUTES | HEAT<br>LOAD<br>WATTS                       | COLD<br>STATION<br>°K | COOLER<br>INPUT<br>CURRENT<br>AMPS | COOLER<br>POWER<br>WATTS<br>@17.5VDC | ETI<br>READING | CUM<br>HOURS | INITIALS |
|---------|-------------------|----------------------------|---------------------------------------------|-----------------------|------------------------------------|--------------------------------------|----------------|--------------|----------|
| 4-13-87 | 20.4              | —                          | .345                                        | 74.9                  | 1.86                               | 32.55                                | 6704.0         | 3412.9       | 1052 RM  |
|         | -32               | —                          | .357                                        | 75.1                  | 1.81                               | 31.6                                 | 6706.5         | 3415.4       | 1323 RM  |
| 4-14-87 | 20.3              | —                          | .351                                        | 74.9                  | 1.86                               | 32.55                                | 6722.0         | 3430.9       | 0854 RM  |
|         | -32               | —                          | .345                                        | 74.2                  | 1.81                               | 31.6                                 | 6726.3         | 3435.2       | 1313 RM  |
| 4-15-87 | 20.0              | —                          | .345                                        | 74.7                  | 1.86                               | 32.55                                | 6749.2         | 3458.1       | 1605 RM  |
|         | 58.0              | —                          | .285                                        | 76.4                  | 1.90                               | 33.25                                | 6751.0         | 3459.9       | 18.00 RM |
| 4-16-87 | 17.0              | —                          | .344                                        | 74.4                  | 1.85                               | 32.3                                 | 6767.6         | 3472.5       | 1053 RM  |
|         | -32               | —                          | .350                                        | 74.3                  | 1.85                               | 32.3                                 | 6766.7         | 3475.6       | 1338 RM  |
| 4-16-87 | 52                | —                          | .280                                        | 76.7                  | 1.91                               | 34.4                                 | 6770.4         | 3479.3       | 1715 RM  |
| 4-17-87 | 20                | —                          | .346                                        | 75.3                  | 1.77                               | 32.9                                 | 6793.7         | 3492.6       | 1034 RM  |
| 4-20-87 | -32               | —                          | .296                                        | 67.6                  | 1.78                               | 32.9                                 | 6846.4         | 3553.3       | 1318 RM  |
| 4-22-87 | 20                | —                          | .300                                        | 69.8                  | 1.86                               | 33.8                                 | 6881.1         | 3588.0       | 0800 RM  |
| 4-27-87 | -32               | —                          | .297                                        | 68.2                  | 1.82                               | 33.1                                 | 6986.3         | 3693.2       | 1311 RM  |
| 4-29-87 | -32               | —                          | .284                                        | 68.1                  | 1.82                               | 33.1                                 | 7026.6         | 3733.5       | 1329 RM  |
| 5-4-87  | -4.5              | —                          | .284                                        | 66.6                  | 1.86                               | 33.8                                 | 7124.7         | 3831.6       | 1137 RM  |
| 5-6-87  | 20.3              | —                          | .286                                        | 69.4                  | 1.87                               | 34.2                                 | 7161.0         | 3867.9       | 0755 RM  |
| 5-11-87 | 20.3              | —                          | .293                                        | 70.1                  | 1.87                               | 34.2                                 | 7261.0         | 3967.9       | 0755 RM  |
| 5-13-87 | 20.1              | —                          | .293                                        | 70.4                  | 1.87                               | 34.2                                 | 7301.7         | 4008.6       | 0835 RM  |
| 5-15-87 | 20.1              | —                          | .298                                        | 70.6                  | 1.87                               | 34.2                                 | 7341.1         | 4048.0       | 0804 RM  |
| 5-19-87 | -9.3              | —                          | .296                                        | 67.9                  | 1.87                               | 34.2                                 | 7385.6         | 4092.5       | 1320 RM  |
| 6-21-87 | -32               | —                          | .302                                        | 67.5                  | 1.82                               | 33.8                                 | 7427.4         | 4134.3       | 1508 RM  |
| 5-26-87 | -33.1             | —                          | .299                                        | 70.2                  | 1.85                               | 34.4                                 | 7526.6         | 4233.5       | 1424 RM  |
| SPEC    | INFO<br>ONLY      | 10 MIN<br>@ 23°C           | .208: -32°<br>.280: 23°<br>.232: 52°<br>MIN | 80°K<br>MAX           | 1.72A<br>MAX<br>@ 17.5V            | 30 WATTS<br>MAX                      | INFO<br>ONLY   | INFO<br>ONLY |          |

4414.2

PERFORMED BY

APPROVED BY

DATE

6-2-87

**Magnavox**

ELECTRO-OPTICAL SYSTEMS

MM&amp;T

LIFE TEST

DATA SHEET

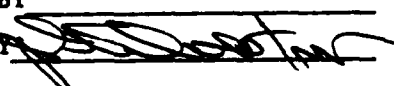
COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 011

DRAWING NO. SM-D-5005842

| DATE    | AMB<br>TEMP<br>°C | TIME<br>TO 80°K<br>MINUTES | HEAT<br>LOAD<br>WATTS                       | COLD<br>STATION<br>°K | COOLER<br>INPUT<br>CURRENT<br>AMPS | COOLER<br>POWER<br>WATTS<br>@17.5VDC | ETI<br>READING | CUM<br>HOURS | INITIALS |
|---------|-------------------|----------------------------|---------------------------------------------|-----------------------|------------------------------------|--------------------------------------|----------------|--------------|----------|
| 3-14-87 | -32               | —                          | .354                                        | 73.                   | 1.76                               | 30.8                                 | 6207.3         | 2916.2       | DMB04    |
|         | 20                | 6.5                        | —                                           | 46.6                  | 1.86                               | 32.6                                 | 6221.6         | 2930.5       | 0731 Rm  |
|         | -32               | —                          | .340                                        | 73.2                  | 1.76                               | 30.8                                 | 6227.6         | 2936.5       | 1313 Rm  |
| 3-23-87 | 20                | —                          | .348                                        | 69.7                  | 1.83                               | 32.0                                 | 6281.6         | 2990.5       | 0739 Rm  |
|         | -32               | —                          | .343                                        | 73.0                  | 1.76                               | 30.8                                 | 6287.3         | 2996.2       | 1313 Rm  |
| 3-24-87 | 20                | 6.5                        | —                                           | 47.4                  | 1.90                               | 33.2                                 | 6301.6         | 3010.5       | 0727 Rm  |
|         | 20                | —                          | .349                                        | 72.6                  | 1.82                               | 31.85                                | 6304.9         | 3013.8       | 1020 Rm  |
| 3-25-87 | 20                | 6.7                        | —                                           | 48.2                  | 1.90                               | 33.2                                 | 6321.6         | 3030.5       | 0717 Rm  |
| 3-26-87 | 20                | —                          | .343                                        | 74.3                  | 1.82                               | 31.85                                | 6341.8         | 3050.7       | 0741 Rm  |
| 3-27-87 | 20                | —                          | .347                                        | 72.6                  | 1.83                               | 32.0                                 | 6361.6         | 3070.5       | 0931 Rm  |
| 3-30-87 | 20                | —                          | .355                                        | 73.5                  | 1.83                               | 32.0                                 | 6421.9         | 3130.8       | 0747 Rm  |
| 3-31-87 | 20                | —                          | .353                                        | 73.7                  | 1.83                               | 32.0                                 | 6444.3         | 3153.2       | 0012 Rm  |
| 3-31-87 | -12               | —                          | .358                                        | 72.4                  | 1.91                               | 31.6                                 | 6448.1         | 3157         | 01402 Rm |
| 4-2-87  | 20                | —                          | .346                                        | 73.9                  | 1.83                               | 32.0                                 | 6482.9         | 3191.8       | 0848 Rm  |
| 4-3-87  | 20                | —                          | .351                                        | 73.7                  | 1.83                               | 32.0                                 | 6501.9         | 3210.8       | 0749 Rm  |
| 4-3-87  | 18                | —                          | .353                                        | 72.8                  | 1.83                               | 32                                   | 6509.3         | 3218.2       |          |
| 4-6-87  | -28.3             | —                          | .341                                        | 73.2                  | 1.82                               | 31.85                                | 6566.3         | 3275.2       | 1315 Rm  |
| 4-7-87  | 20                | 6.8                        | —                                           | 48.4                  | 1.92                               | 33.60                                | 6581.6         | 3290.5       | 0832 Rm  |
| 4-8-87  | 20.2              | —                          | .347                                        | 74.3                  | 1.84                               | 32.20                                | 6582.5         | 3291.4       | 0925 Rm  |
| 4-8-87  | 20                | —                          | .350                                        | 74.2                  | 1.85                               | 32.4                                 | 6602.0         | 3310.9       | 0856 Rm  |
| 4-9-87  | 20                | —                          | .353                                        | 74.4                  | 1.85                               | 32.4                                 | 6623.4         | 3332.3       | 1018 Rm  |
| 4-9-87  | -27               | —                          | .353                                        | 73.3                  | 1.82                               | 31.8                                 | 6626.2         | 3335.1       | 1307 Rm  |
| SPEC    | INFO<br>ONLY      | 10 MIN<br>@ 23°C           | .208: -32°<br>.280: 23°<br>.232: 52°<br>MIN | 80°K<br>MAX           | 1.72A<br>MAX<br>@ 17.5V            | 30 WATTS<br>MAX                      | INFO<br>ONLY   | INFO<br>ONLY |          |

PERFORMED BY

APPROVED BY DATE 4-10-87

**Magnavox**

ELECTRO-OPTICAL SYSTEMS

MM&amp;T

LIFE TEST

DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 011

DRAWING NO. SM-D-5005842

| DATE    | AMB<br>TEMP<br>°C | TIME<br>TO 80°K<br>MINUTES | HEAT<br>LOAD<br>WATTS                       | COLD<br>STATION<br>°K | COOLER<br>INPUT<br>CURRENT<br>AMPS | COOLER<br>POWER<br>WATTS<br>@17.5VDC | ETI<br>READING | CUM<br>HOURS | INITIALS |
|---------|-------------------|----------------------------|---------------------------------------------|-----------------------|------------------------------------|--------------------------------------|----------------|--------------|----------|
| 3-10-87 | 52                | —                          | .282                                        | 73.9                  | 1.85                               | 32.4                                 | 6035.9         | 2749.4       | 1710     |
| 3-11-87 | 20                | 6.4                        | —                                           | 46.2                  | 1.85                               | 32.4                                 | 6046.5         | 2760         | 0742     |
|         | 20                | —                          | .339                                        | 71.7                  | 1.79                               | 31.3                                 | 6048.9         | 2762.4       | 1010     |
| 3-11-87 | 52                | —                          | .280                                        | 73.6                  | 1.84                               | 32.2                                 | 6050.8         | 2764.3       | 1650     |
| 3-12-87 | 20                | 6.4                        | —                                           | 46.3                  | 1.85                               | 32.4                                 | 6062.0         | 2775.5       | 0755     |
|         | 20                | —                          | .343                                        | 71.5                  | 1.77                               | 31.0                                 | 6064.0         | 2777.5       | 0955     |
|         | -32               | —                          | .340                                        | 71.2                  | 1.75                               | 30.6                                 | 6067.4         | 2780.9       | 1320     |
| 3-12-87 | 52                | —                          | .285                                        | 73.7                  | 1.85                               | 32.4                                 | 6070.8         | 2784.3       | 1640     |
| 3-13-87 | 20                | 6.4                        | —                                           | 46.4                  | 1.85                               | 32.4                                 | 6081.7         | 2795.2       | 0734     |
|         | 20                | —                          | .341                                        | 71.9                  | 1.78                               | 31.2                                 | 6084.5         | 2798.0       | 1025     |
|         | -32               | —                          | .340                                        | 71.6                  | 1.75                               | 30.6                                 | 6086.9         | 2800.4       | 1245     |
| 3-13-87 | 52                | —                          | .282                                        | 74.1                  | 1.85                               | 32.4                                 | 6090.9         | 2804.4       | 1645     |
| 3-16-87 | 20                | 6.5                        | —                                           | 46.4                  | 1.86                               | 32.6                                 | 6141.7         | 2855.2       | 0730     |
|         | 20                | —                          | .343                                        | 71.8                  | 1.79                               | 31.3                                 | 6144.4         | 2857.9       | 1015     |
|         | -32               | —                          | .341                                        | 71.8                  | 1.76                               | 30.8                                 | 6147.4         | 2860.9       | 1315     |
| 3-16-87 | 52                | —                          | .287                                        | 74.3                  | 1.86                               | 32.6                                 | 6151.1         | 2864.6       | 1700     |
| 3-17-87 | 20                | 6.5                        | —                                           | 46.8                  | 1.85                               | 32.4                                 | 6161.6         | 2875.1       | 0732     |
|         | 20                | —                          | .348                                        | 72.2                  | 1.80                               | 31.5                                 | 6164.4         | 2877.9       | 1020     |
|         | -32               | —                          | .345                                        | 72.0                  | 1.76                               | 30.8                                 | 6167.4         | 2880.9       | 1320     |
| 3-17-87 | 52                | —                          | .286                                        | 73.9                  | 1.86                               | 32.6                                 | 6170.6         | 2884.1       | 1630     |
| 3-18-87 | 20                | 6.5                        | —                                           | 46.8                  | 1.86                               | 32.6                                 | 6181.6         | 2895.1       | 0730     |
| 3-19-87 | 20                | —                          | .339                                        | 72.6                  | 1.80                               | 31.5                                 | 6202.1         | 2915.6       | 0758     |
| SPEC    | INFO<br>ONLY      | 10 MIN<br>@ 23°C           | .208: -32°<br>.280: 23°<br>.232: 52°<br>MIN | 80°K<br>MAX           | 1.72A<br>MAX<br>@ 17.5V            | 30 WATTS<br>MAX                      | INFO<br>ONLY   | INFO<br>ONLY |          |

PERFORMED BY

APPROVED BY

DATE 3-20-87

**Magnavox**

ELECTRO-OPTICAL SYSTEMS

MM&amp;T

LIFE TEST

DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 011

DRAWING NO. SM-D-5005842

| DATE    | AMB<br>TEMP<br>°C | TIME<br>TO 80°K<br>MINUTES | HEAT<br>LOAD<br>WATTS                       | COLD<br>STATION<br>°K | COOLER<br>INPUT<br>CURRENT<br>AMPS | COOLER<br>POWER<br>WATTS<br>@17.5VDC | ETI<br>READING | CUM<br>HOURS | INITIALS  |
|---------|-------------------|----------------------------|---------------------------------------------|-----------------------|------------------------------------|--------------------------------------|----------------|--------------|-----------|
| 3-3-87  | 20                | 6.3                        | —                                           | 47.0                  | 1.84                               | 32.2                                 | 5996.6         | 2600.1       | J.M. 1744 |
|         | 20                | —                          | .1343                                       | 71.5                  | 1.76                               | 30.4                                 | 5988.4         | 2601.9       | 0439 J.M. |
|         | -32               | —                          | .343                                        | 71.4                  | 1.74                               | 30.5                                 | 5992.3         | 2605.8       | 1330 J.M. |
|         | 52                | —                          | .281                                        | 73.0                  | 1.81                               | 31.7                                 | 5995.5         | 2609.0       | 1645 J.M. |
| 3-4-87  | 20                | 6.4                        | —                                           | 46.1                  | 1.84                               | 32.2                                 | 5906.6         | 2620.1       | 0747 J.M. |
|         | 20                | —                          | .343                                        | 71.3                  | 1.76                               | 30.8                                 | 5908.9         | 2622.4       | 1010 J.M. |
|         | -32               | —                          | .341                                        | 71.2                  | 1.73                               | 30.3                                 | 5912.2         | 2625.7       | 1330 J.M. |
| 3-4-87  | 52                | —                          | .284                                        | 73.5                  | 1.82                               | 31.9                                 | 5915.9         | 2629.4       | 1710 J.M. |
| 3-5-87  | 20                | 6.4                        | —                                           | 46.2                  | 1.85                               | 32.3                                 | 5926.6         | 2640.1       | 0747 J.M. |
|         | 20                | —                          | .348                                        | 70.9                  | 1.77                               | 31.0                                 | 5929.1         | 2642.6       | 1015 J.M. |
|         | -32               | —                          | .343                                        | 71.3                  | 1.74                               | 30.5                                 | 5932.0         | 2645.5       | 1315 J.M. |
| 3-6-87  | 20                | 6.4                        | —                                           | 46.0                  | 1.86                               | 32.5                                 | 5946.6         | 2660.1       | 0747 J.M. |
|         | 20                | —                          | .345                                        | 71.4                  | 1.76                               | 30.8                                 | 5949.4         | 2662.9       | 1035 J.M. |
|         | -32               | —                          | .340                                        | 71.5                  | 1.74                               | 30.5                                 | 5952.0         | 2665.5       | 1315 J.M. |
| 3-6-87  | 52                | —                          | .280                                        | 73.5                  | 1.82                               | 31.9                                 | 5955.7         | 2669.2       | 1700 J.M. |
| 3-9-87  | 20                | 6.4                        | —                                           | 46.4                  | 1.85                               | 32.3                                 | 6006.5         | 2720         | 0745 J.M. |
|         | 20                | —                          | .342                                        | 71.4                  | 1.77                               | 31.0                                 | 6008.9         | 2722.4       | 1010 J.M. |
|         | -32               | —                          | .337                                        | 70.3                  | 1.76                               | 30.8                                 | 6012.2         | 2725.7       | 1330 J.M. |
| 3-9-87  | 52                | —                          | .281                                        | 73.9                  | 1.84                               | 32.2                                 | 6015.6         | 2729.1       | 1650 J.M. |
| 3-10-87 | 20                | 6.4                        | —                                           | 56.1                  | 1.85                               | 32.3                                 | 6026.5         | 2740.0       | 0745 J.M. |
|         | 20                | —                          | .340                                        | 71.7                  | 1.78                               | 31.2                                 | 6028.7         | 2742.2       | 0955 J.M. |
| 3-10-87 | -22               | —                          | .339                                        | 70.8                  | 1.76                               | 30.8                                 | 6032.0         | 2745.5       | 1315 J.M. |
| SPEC    | INFO<br>ONLY      | 10 MIN<br>@ 23°C           | .208: -32°<br>.280: 23°<br>.232: 52°<br>MIN | 80°K<br>MAX           | 1.72A<br>MAX<br>@ 17.5V            | 30 WATTS<br>MAX                      | INFO<br>ONLY   | INFO<br>ONLY |           |

PERFORMED BY

APPROVED BY J.M. 1744DATE 3-10-87

# Magnavox

ELECTRO-OPTICAL SYSTEMS

MM&T  
LIFE TEST  
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 011

DRAWING NO. SM-D-5005842

| DATE    | AMB<br>TEMP<br>°C | TIME<br>TO 80°K<br>MINUTES | HEAT<br>LOAD<br>WATTS                       | COLD<br>STATION<br>°K | COOLER<br>INPUT<br>CURRENT<br>AMPS | COOLER<br>POWER<br>WATTS<br>@17.5VDC | ETI<br>READING | CUM<br>HOURS | INITIALS |
|---------|-------------------|----------------------------|---------------------------------------------|-----------------------|------------------------------------|--------------------------------------|----------------|--------------|----------|
| 2-20-87 | -32               | —                          | .343                                        | 70.5                  | 1.70                               | 29.8                                 | 5672.3         | 2385.8       | 1330     |
| 2-20-87 | 52                | —                          | .286                                        | 72.3                  | 1.78                               | 31.2                                 | 5675.7         | 2389.2       | 1700     |
| 2-23-87 | 20                | —                          | .343                                        | 70.6                  | 1.72                               | 30.1                                 | 5727.8         | 2441.3       | 0900     |
|         | -32               | —                          | .346                                        | 70.2                  | 1.71                               | 29.9                                 | 5732.3         | 2445.8       | 1330     |
| 2-23-87 | 52                | —                          | .286                                        | 72.3                  | 1.79                               | 31.3                                 | 5735.5         | 2449.0       | 1645     |
| 2-24-87 | 20                | 6.3                        | —                                           | 45.0                  | 1.80                               | 31.5                                 | 5746.7         | 2469.2       | 0744     |
|         | 20                | —                          | .348                                        | 70.5                  | 1.71                               | 29.9                                 | 5749.2         | 2462.7       | 1030     |
|         | -32               | —                          | .348                                        | 70.5                  | 1.71                               | 29.9                                 | 5752.0         | 2465.5       | 1315     |
| 2-24-87 | 52                | —                          | .282                                        | 72.8                  | 1.79                               | 31.3                                 | 5755.8         | 2469.3       | 1700     |
| 2-25-87 | 20                | 6.3                        | —                                           | 45.4                  | 1.82                               | 31.85                                | 5766.4         | 2479.9       | 0745     |
|         | 20                | —                          | .343                                        | 70.9                  | 1.74                               | 30.5                                 | 5768.7         | 2482.2       | 0955     |
|         | -32               | —                          | .340                                        | 70.8                  | 1.71                               | 29.9                                 | 5772.0         | 2485.5       | 1315     |
| 2-25-87 | 52                | —                          | .280                                        | 72.9                  | 1.80                               | 31.5                                 | 5775.5         | 2489.0       | 1645     |
| 2-26-87 | 20                | 6.3                        | —                                           | 45.5                  | 1.82                               | 31.8                                 | 5786.4         | 2499.9       | 0745     |
| 2-27-87 | 20                | 6.3                        | —                                           | 45.7                  | 1.83                               | 32.                                  | 5806.4         | 2519.9       | 0744     |
|         | 20                | —                          | .345                                        | 70.9                  | 1.71                               | 29.9                                 | 5809.1         | 2522.6       | 1030     |
|         | -32               | —                          | .340                                        | 71.0                  | 1.72                               | 30.1                                 | 5812.0         | 2525.5       | 1315     |
|         | 52                | —                          | .280                                        | 73.3                  | 1.81                               | 31.7                                 | 5815.7         | 2529.2       | 1700     |
| 3-2-87  | 20                | 6.3                        | —                                           | 46.0                  | 1.84                               | 32.2                                 | 5866.4         | 2579.9       | 0745     |
|         | 20                | —                          | .344                                        | 70.9                  | 1.73                               | 30.3                                 | 5869.2         | 2582.7       | 1025     |
|         | -32               | —                          | .343                                        | 71.1                  | 1.72                               | 30.1                                 | 5872.2         | 2585.7       | 1325     |
| 3-2-87  | 52                | —                          | .284                                        | 73.3                  | 1.82                               | 31.9                                 | 5875.6         | 2589.1       | 1655     |
| SPEC    | INFO<br>ONLY      | 10 MIN<br>@ 23°C           | .208: -32°<br>.280: 23°<br>.232: 52°<br>MIN | 80°K<br>MAX           | 1.72A<br>MAX<br>@ 17.5V            | 30 WATTS<br>MAX                      | INFO<br>ONLY   | INFO<br>ONLY |          |

PERFORMED BY

APPROVED BY [Signature]DATE 3-2-87

# Magnavox

ELECTRO-OPTICAL SYSTEMS

MM&amp;T

LIFE TEST

DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 011

DRAWING NO. SM-D-5005842

| DATE    | AMB<br>TEMP<br>°C | TIME<br>TO 80°K<br>MINUTES | HEAT<br>LOAD<br>WATTS                       | COLD<br>STATION<br>°K | COOLER<br>INPUT<br>CURRENT<br>AMPS | COOLER<br>POWER<br>WATTS<br>@17.5VDC | ETI<br>READING | CUM<br>HOURS | INITIALS |
|---------|-------------------|----------------------------|---------------------------------------------|-----------------------|------------------------------------|--------------------------------------|----------------|--------------|----------|
| 2-12-87 | -32               | —                          | .352                                        | 69.7                  | 1.67                               | 29.2                                 | 5511.8         | 2225.3       | 1300     |
|         | 52                | —                          | .288                                        | 70.9                  | 1.76                               | 30.8                                 | 5515.7         | 2229.2       | 1650     |
| 2-13-87 | 20                | 6.2                        | —                                           | 44.7                  | 1.76                               | 30.8                                 | 5526.5         | 2240.0       | 0746     |
| 2-13-87 | -32               | —                          | .69 <sup>347</sup>                          | 69.7                  | 1.67                               | 29.2                                 | 5532.2         | 2245.7       | 1326     |
| 2-16-87 | 20                | 6.1                        | —                                           | 44.9                  | 1.78                               | 31.1                                 | 5586.5         | 2300.0       | 0744     |
|         | 20                | —                          | .350                                        | 70.1                  | 1.71                               | 29.9                                 | 5589.2         | 2302.7       | 1025     |
|         | -32               | —                          | .349                                        | 69.8                  | 1.69                               | 29.6                                 | 5592.2         | 2305.7       | 1325     |
| 2-16-87 | 52                | —                          | .286                                        | 72.0                  | 1.77                               | 31.0                                 | 5595.8         | 2309.3       | 1700     |
| 2-17-87 | 20                | 6.3                        | —                                           | 45.1                  | 1.50                               | 31.5                                 | 5606.5         | 2320.0       | 0743     |
|         | 20                | —                          | .347                                        | 70.4                  | 1.71                               | 29.9                                 | 5608.8         | 2322.3       | 1000     |
|         | -32               | —                          | .344                                        | 70.3                  | 1.67                               | 29.2                                 | 5612.3         | 2325.9       | 1330     |
| 2-17-87 | 52                | —                          | .285                                        | 71.1                  | 1.76                               | 30.9                                 | 5615.5         | 2329.0       | 1645     |
| 2-18-87 | 20                | 6.3                        | —                                           | 45.1                  | 1.40                               | 31.5                                 | 5626.5         | 2340.0       | 0742     |
|         | 20                | —                          | .350                                        | 70.1                  | 1.73                               | 30.2                                 | 5628.7         | 2342.2       | 0454     |
|         | -32               | —                          | .340                                        | 70.1                  | 1.70                               | 29.8                                 | 5632.2         | 2345.7       | 1325     |
| 2-18-87 | 52                | —                          | .285                                        | 72.2                  | 1.77                               | 31.0                                 | 5635.6         | 2349.1       | 1650     |
| 2-19-87 | 20                | 6.3                        | —                                           | 45                    | 1.8                                | 31.5                                 | 5646.5         | 2360.0       | 0742     |
|         | 20                | —                          | .345                                        | 70.3                  | 1.72                               | 30.1                                 | 5649.2         | 2362.7       | 1030     |
|         | -32               | —                          | .343                                        | 70.2                  | 1.69                               | 29.6                                 | 5652.2         | 2365.7       | 1330     |
| 2-19-87 | 52                | —                          | .284                                        | 72.2                  | 1.77                               | 31.0                                 | 5655.5         | 2369.0       | 1645     |
| 2-20-87 | 20                | 6.3                        | —                                           | 45.5                  | 1.80                               | 31.5                                 | 5666.5         | 2380.0       | 0742     |
| 2-20-87 | 20                | —                          | .350                                        | 70.4                  | 1.72                               | 30.1                                 | 5669.0         | 2382.5       | 1015     |
| SPEC    | INFO<br>ONLY      | 10 MIN<br>@ 23°C           | .208: -32°<br>.280: 23°<br>.232: 52°<br>MIN | 80°K<br>MAX           | 1.72A<br>MAX<br>@ 17.5V            | 30 WATTS<br>MAX                      | INFO<br>ONLY   | INFO<br>ONLY |          |

PERFORMED BY

APPROVED BY

DATE

2-20-87

**Magnavox**

ELECTRO-OPTICAL SYSTEMS

MM&amp;T

LIFE TEST

DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 011

DRAWING NO. SM-D-5005842

| DATE    | AMB<br>TEMP<br>°C | TIME<br>TO 80°K<br>MINUTES | HEAT<br>LOAD<br>WATTS                       | COLD<br>STATION<br>°K | COOLER<br>INPUT<br>CURRENT<br>AMPS | COOLER<br>POWER<br>WATTS<br>@17.5VDC | ETI<br>READING | CUM<br>HOURS | INITIALS |
|---------|-------------------|----------------------------|---------------------------------------------|-----------------------|------------------------------------|--------------------------------------|----------------|--------------|----------|
| 2.5.87  | -31               | —                          | .353                                        | 69.0                  | 1.55                               | 27.1                                 | 5371.9         | 2085.4       | 1322 DM  |
|         | 52                | —                          | .290                                        | 71.8                  | 1.75                               | 30.6                                 | 5375.7         | 2089.2       | 1700 DM  |
| 2.6.87  | 20                | 6.0                        | —                                           | 44.5                  | 1.75                               | 30.6                                 | 5386.4         | 2099.9       | 0740 DM  |
|         | 20                | —                          | .348                                        | 69.8                  | 1.68                               | 29.4                                 | 5389.4         | 2102.9       | 1040 DM  |
|         | -32               | —                          | .346                                        | 69.0                  | 1.64                               | 28.7                                 | 5392.3         | 2105.8       | 1330 DM  |
|         | 52                | —                          | .286                                        | 71.6                  | 1.75                               | 30.6                                 | 5395.5         | 2109.0       | 1645 DM  |
|         | 20                | —                          | .348                                        | 70.0                  | 1.69                               | 29.6                                 | 5398.8         | 2112.3       | 2000     |
| 2.9.87  | 20                | —                          | —                                           | 44.7                  | 1.76                               | 30.8                                 | 5446.4         | 2159.9       | 0740 MT  |
|         | 20                | —                          | .347                                        | 69.9                  | 1.70                               | 29.75                                | 5449.4         | 2162.9       | 1040 MT  |
|         | -32               | —                          | .351                                        | 69.4                  | 1.66                               | 29.1                                 | 5452.1         | 2165.6       | 1320 MT  |
|         | 52                | —                          | .292                                        | 71.6                  | 1.76                               | 30.8                                 | 5455.5         | 2169.0       | 1645 MT  |
|         | 20                | —                          | .348                                        | 70.1                  | 1.68                               | 29.4                                 | 5458.8         | 2172.3       | 2000     |
| 2.10.87 | 20                | —                          | —                                           | 44.5                  | 1.76                               | 30.8                                 | 5466.4         | 2179.9       | 0730 MT  |
|         | 20                | —                          | .350                                        | 69.6                  | 1.70                               | 29.75                                | 5469.4         | 2182.9       | 1030 Ru  |
|         | -32               | —                          | .349                                        | 69.2                  | 1.67                               | 29.2                                 | 5471.8         | 2185.3       | 1300 MT  |
|         | 52                | —                          | .286                                        | 72.0                  | 1.76                               | 30.8                                 | 5475.6         | 2189.1       | 1650 MT  |
| 2.11.87 | 20                | —                          | —                                           | 44.8                  | 1.76                               | 30.8                                 | 5486.4         | 2199.9       | 0736 MT  |
|         | 20                | —                          | .345                                        | 70.2                  | 1.70                               | 29.75                                | 5489.1         | 2202.6       | 1019 Ru  |
|         | -32               | —                          | .346                                        | 69.6                  | 1.67                               | 29.2                                 | 5492.1         | 2205.6       | 1320 MT  |
|         | 52                | —                          | .289                                        | 71.9                  | 1.76                               | 30.8                                 | 5495.8         | 2209.3       | 1700 MT  |
| 2.12.87 | 20                | 6.2                        | —                                           | 44.8                  | 1.76                               | 30.8                                 | 5506.5         | 2220.0       | 0745 MT  |
| 2.12.87 | 20                | —                          | .346                                        | 69.9                  | 1.70                               | 29.8                                 | 5509.3         | 2222.8       | 1030 MT  |
| SPEC    | INFO<br>ONLY      | 10 MIN<br>@ 23°C           | .208: -32°<br>.280: 23°<br>.232: 52°<br>MIN | 80°K<br>MAX           | 1.72A<br>MAX<br>@ 17.5V            | 30 WATTS<br>MAX                      | INFO<br>ONLY   | INFO<br>ONLY |          |

PERFORMED BY

APPROVED BY [Signature]DATE 2.12.87

**Magnavox**

ELECTRO-OPTICAL SYSTEMS

MM&amp;T

LIFE TEST

DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 011

DRAWING NO. SM-D-5005842

| DATE    | AMB<br>TEMP<br>°C | TIME<br>TO 80°K<br>MINUTES | HEAT<br>LOAD<br>WATTS                       | COLD<br>STATION<br>°K | COOLER<br>INPUT<br>CURRENT<br>AMPS | COOLER<br>POWER<br>WATTS<br>@17.5VDC | ETI<br>READING | CUM<br>HOURS | INITIALS |
|---------|-------------------|----------------------------|---------------------------------------------|-----------------------|------------------------------------|--------------------------------------|----------------|--------------|----------|
| 1-29-87 | 20                | 6.0                        | —                                           | 44.3                  | 1.75                               | 30.6                                 | 5226.5         | 1940.0       | 0742 DM  |
|         | 20                | —                          | .348                                        | 69.6                  | 1.66                               | 29.1                                 | 5228.8         | 1942.3       | 1000 DM  |
|         | 20                | —                          | .350                                        | 69.7                  | 1.68                               | 29.4                                 | 5229.2         | 1942.7       | 1023 AC  |
|         | -32               | —                          | .349                                        | 69.0                  | 1.63                               | 28.5                                 | 5232.2         | 1945.7       | 1325 AC  |
|         | 52                | —                          | .290                                        | 71.5                  | 1.74                               | 30.5                                 | 5235.7         | 1949.2       | 1655 DM  |
| 1-30-87 | 20                | —                          | —                                           | 44.5                  | 1.74                               | 30.5                                 | 5246.5         | 1960.0       | 0940 DM  |
|         | -32               | —                          | .355                                        | 68.9                  | 1.63                               | 28.5                                 | 5252.4         | 1965.9       | 1337 DM  |
|         | 52                | —                          | .290                                        | 71.6                  | 1.74                               | 30.5                                 | 5255.8         | 1969.3       | 1700 DM  |
| 2-2-87  | 20                | 6.1                        | —                                           | 44.4                  | 1.75                               | 30.6                                 | 5306.4         | 2019.9       | 0740 DM  |
|         | 20                | —                          | .352                                        | 69.8                  | 1.67                               | 29.2                                 | 5309.2         | 2022.7       | 1025 DM  |
|         | -32               | —                          | .349                                        | 69.1                  | 1.65                               | 28.8                                 | 5311.9         | 2025.4       | 1305 DM  |
|         | 52                | —                          | .288                                        | 71.6                  | 1.74                               | 30.5                                 | 5315.8         | 2029.3       | 1700 DM  |
| 2-3-87  | 20                | 6.1                        | —                                           | 44.5                  | 1.75                               | 30.6                                 | 5326.4         | 2039.9       | 0739 DM  |
|         | 20                | —                          | .348                                        | 69.7                  | 1.68                               | 29.4                                 | 5329.1         | 2042.6       | 1020 DM  |
|         | -30               | —                          | .348                                        | 68.9                  | 1.65                               | 28.8                                 | 5332.1         | 2045.6       | 1317 DM  |
|         | 52                | —                          | .287                                        | 71.5                  | 1.75                               | 30.6                                 | 5335.4         | 2048.7       | 1640 DM  |
| 2-4-87  | 20                | 6.0                        | —                                           | 44.8                  | 1.76                               | 30.8                                 | 5346.4         | 2059.9       | 0740 DM  |
|         | 20                | —                          | .350                                        | 69.9                  | 1.68                               | 29.4                                 | 5349.0         | 2062.5       | 1020 DM  |
|         | -32               | —                          | .347                                        | 68.9                  | 1.65                               | 28.9                                 | 5352.2         | 2065.7       | 1326 DM  |
|         | 52                | —                          | .288                                        | 71.5                  | 1.75                               | 30.6                                 | 5355.8         | 2069.3       | 1700 DM  |
| 2-5-87  | 20                | 6.0                        | —                                           | 44.2                  | 1.76                               | 30.8                                 | 5366.4         | 2079.9       | 0740 DM  |
| 2-5-87  | 20                | —                          | .352                                        | 69.6                  | 1.70                               |                                      | 5368.7         | 2082.2       | 0959 DM  |
| SPEC    | INFO<br>ONLY      | 10 MIN<br>@ 23°C           | .208: -32°<br>.280: 23°<br>.232: 52°<br>MIN | 80°K<br>MAX           | 1.72A<br>MAX<br>@ 17.5V            | 30 WATTS<br>MAX                      | INFO<br>ONLY   | INFO<br>ONLY |          |

PERFORMED BY

APPROVED BY [Signature]DATE 2-5-87

# Magnavox

ELECTRO-OPTICAL SYSTEMS

MM&T  
LIFE TEST  
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 011

DRAWING NO. SM-D-5005842

| DATE    | AMB<br>TEMP<br>°C | TIME<br>TO 80°K<br>MINUTES | HEAT<br>LOAD<br>WATTS                       | COLD<br>STATION<br>°K | COOLER<br>INPUT<br>CURRENT<br>AMPS | COOLER<br>POWER<br>WATTS<br>@17.5VDC | ETI<br>READING | CUM<br>HOURS | INITIALS |
|---------|-------------------|----------------------------|---------------------------------------------|-----------------------|------------------------------------|--------------------------------------|----------------|--------------|----------|
| 1-21-87 | 20                | 6.0                        | —                                           | 43.7                  | 1.75                               | 30.6                                 | 5066.8         | 1775.8       | 0747 DM  |
|         | 21                | —                          | .350                                        | 70.2                  | 1.69                               | 29.5                                 | 5068.8         | 1777.8       | 0949 DM  |
|         | -20               | —                          | .348                                        | 68.9                  | 1.63                               | 28.5                                 | 5073.0         | 1782.0       | 1400 DM  |
|         | 52                | —                          | .291                                        | 70.9                  | 1.74                               | 30.5                                 | 5075.7         | 1784.7       | 1655 DM  |
|         | 20                | —                          | .350                                        | 69.1                  | 1.55                               | 27.1                                 | —              | —            | 2000     |
| 1-22-87 | 20                | 6.0                        | —                                           | 45.0                  | 1.73                               | 30.2                                 | 5086.5         | 1795.5       | 0745 DM  |
|         | 20                | —                          | .348                                        | 69.0                  | 1.71                               | 29.9                                 | 5088.9         | 1797.9       | 1005 DM  |
|         | -32               | —                          | .346                                        | 68.2                  | 1.64                               | 28.7                                 | 5092.2         | 1801.2       | 1325 DM  |
| 1-23-87 | 20                | 6.0                        | —                                           | 45.0                  | 1.73                               | 30.2                                 | 5106.7         | 1815.7       | 0745 DM  |
|         | -32               | —                          | .343                                        | 68.1                  | 1.61                               | 28.2                                 | 5112.3         | 1821.3       | 1329 DM  |
| 1-26-87 | 20                | —                          | .347                                        | 69.0                  | 1.66                               | 29.05                                | 5167.1         | 1876.1       | 0920 DM  |
|         | 20                | —                          | .347                                        | 69.1                  | 1.66                               | 29.1                                 | 5169.1         | 1878.1       | 1020 DM  |
|         | -32               | —                          | .345                                        | 68.3                  | 1.62                               | 28.4                                 | 5172.2         | 1881.2       | 1327 DM  |
|         | 52                | —                          | .288                                        | 70.9                  | 1.74                               | 30.5                                 | 5175.8         | 1884.8       | 1700 DM  |
| 1-27-87 | 20                | —                          | —                                           | 44.4                  | 1.74                               | 30.5                                 | 5186.5         | 1895.5       | 0743 DM  |
|         | 20                | —                          | .342                                        | 69.4                  | 1.66                               | 29.1                                 | 5189.2         | 1898.2       | 1023 DM  |
|         | -32               | —                          | .342                                        | 68.5                  | 1.62                               | 28.4                                 | 5192.2         | 1901.2       | 1327 DM  |
|         | 52                | —                          | .286                                        | 70.9                  | 1.74                               | 30.5                                 | 5195.6         | 1904.6       | 1650 DM  |
| 1-28-87 | 20                | 6.0                        | —                                           | 45.0                  | 1.74                               | 30.5                                 | 5206.5         | 1915.5       | 0740 DM  |
|         | 20                | —                          | .343                                        | 69.0                  | 1.67                               | 29.2                                 | 5209.2         | 1918.2       | 1023 DM  |
|         | -32               | —                          | .344                                        | 68.3                  | 1.62                               | 28.4                                 | 5212.2         | 1921.2       | 1327 DM  |
| 1-28-87 | 52                | —                          | .284                                        | 70.8                  | 1.74                               | 30.5                                 | 5215.6         | 1929.1       | 1650 DM  |
| SPEC    | INFO<br>ONLY      | 10 MIN<br>@ 23°C           | .208: -32°<br>.280: 23°<br>.232: 52°<br>MIN | 80°K<br>MAX           | 1.72A<br>MAX<br>@ 17.5V            | 30 WATTS<br>MAX                      | INFO<br>ONLY   | INFO<br>ONLY |          |

PERFORMED BY

APPROVED BY

DATE 1-28-87

**Magnavox**

ELECTRO-OPTICAL SYSTEMS

MM&amp;T

LIFE TEST

DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 011

DRAWING NO. SM-D-5005842

| DATE    | AMB<br>TEMP<br>°C | TIME<br>TO 80°K<br>MINUTES | HEAT<br>LOAD<br>WATTS                       | COLD<br>STATION<br>°K | COOLER<br>INPUT<br>CURRENT<br>AMPS | COOLER<br>POWER<br>WATTS<br>@17.5VDC | ETI<br>READING | CUM<br>HOURS | INITIALS  |
|---------|-------------------|----------------------------|---------------------------------------------|-----------------------|------------------------------------|--------------------------------------|----------------|--------------|-----------|
| 1-14-87 | 20                | 6.1                        | —                                           | 45.0                  | 1.72                               | 30.1                                 | 4927.3         | 1636.3       | 0815 D.M. |
|         | 20                | —                          | .1354                                       | 70.2                  | 1.65                               | 28.8                                 | 4928.9         | 1537.9       | 0957 D.M. |
|         | -32               | —                          | .347                                        | 69.4                  | 1.60                               | 28.0                                 | 4932.7         | 1646.7       | 0155 D.M. |
|         | 20                | —                          | .1350                                       | 70.1                  | 1.56                               | 27.3                                 | —              | —            | 2000      |
| 1-15-87 | 20                | 6.0                        | —                                           | 44.7                  | 1.72                               | 30.1                                 | 4946.8         | 1655.8       | 0747 D.M. |
|         | 20                | —                          | .1350                                       | 70.1                  | 1.66                               | 29.1                                 | 4949.1         | 1658.1       | 1005 D.M. |
|         | -32               | —                          | .349                                        | 69.5                  | 1.60                               | 28.0                                 | 4952.5         | 1661.5       | 1330 D.M. |
|         | 41                | —                          | .290                                        | 68.4                  | 1.69                               | 29.5                                 | 4955.2         | 1664.2       | 1615 D.M. |
|         | 20                | —                          | .1350                                       | 70.4                  | 1.56                               | 27.3                                 | —              | —            | 2000      |
| 1-16-87 | 20                | 6.0                        | —                                           | 45.0                  | 1.74                               | 30.45                                | 4966.8         | 1675.8       | 0745 D.M. |
|         | 20                | —                          | .1357                                       | 70.3                  | 1.66                               | 29.1                                 | 4968.5         | 1672.5       | 0920 D.M. |
|         | -30               | —                          | .1356                                       | 69.4                  | 1.61                               | 28.1                                 | 4972.6         | 1681.6       | 1335 D.M. |
|         | 52                | —                          | .295                                        | 71.3                  | 1.72                               | 30.1                                 | 4976.1         | 1685.1       | 1700 D.M. |
|         | 20                | —                          | .1350                                       | 70.1                  | 1.56                               | 27.3                                 | —              | —            | 2000      |
| 1-14-87 | 20                | 6.1                        | —                                           | 44.8                  | 1.74                               | 30.4                                 | 5026.8         | 1725.8       | 0745 D.M. |
|         | 20                | —                          | .1356                                       | 70.1                  | 1.66                               | 29.1                                 | 5028.8         | 1737.8       | 0948 D.M. |
|         | -30               | —                          | .1350                                       | 68.6                  | 1.61                               | 28.1                                 | 5032.7         | 1741.7       | 0340 D.M. |
|         | 52                | —                          | .292                                        | 71.2                  | 1.73                               | 30.3                                 | 5035.9         | 1744.9       | 1655 D.M. |
| 1-20-87 | 20                | 6.0                        | —                                           | 44.2                  | 1.73                               | 30.3                                 | 5046.8         | 1755.8       | 0746 D.M. |
|         | 20                | —                          | .1349                                       | 69.3                  | 1.66                               | 29.1                                 | 5048.4         | 1757.4       | 0947 D.M. |
|         | -32               | —                          | .1356                                       | 68.6                  | 1.61                               | 28.2                                 | 5062.5         | 1761.5       | 1330 D.M. |
| 1-20-87 | 52                | —                          | .290                                        | 71.6                  | 1.74                               | 30.5                                 | 5055.9         | 1764.9       | 1655 D.M. |
| SPEC    | INFO<br>ONLY      | 10 MIN<br>@ 23°C           | .208: -32°<br>.280: 23°<br>.232: 52°<br>MIN | 80°K<br>MAX           | 1.72A<br>MAX<br>@ 17.5V            | 30 WATTS<br>MAX                      | INFO<br>ONLY   | INFO<br>ONLY |           |

PERFORMED BY

APPROVED BY

DATE 1-20-87

**Magnavox**

ELECTRO-OPTICAL SYSTEMS

MM&amp;T

LIFE TEST

DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 011

DRAWING NO. SM-D-5005842

| DATE    | AMB<br>TEMP<br>°C | TIME<br>TO 80°K<br>MINUTES | HEAT<br>LOAD<br>WATTS                       | COLD<br>STATION<br>°K | COOLER<br>INPUT<br>CURRENT<br>AMPS | COOLER<br>POWER<br>WATTS<br>@17.5VDC | ETI<br>READING | CUM<br>HOURS | INITIALS  |
|---------|-------------------|----------------------------|---------------------------------------------|-----------------------|------------------------------------|--------------------------------------|----------------|--------------|-----------|
| 1-7-87  | 23                | 6.2                        | —                                           | 45.0                  | 1.72                               | 30.1                                 | 4789.1         | 1498.1       | 1257 D.M. |
|         | -31               | —                          | .337                                        | 69.9                  | 1.63                               | 28.5                                 | 4792.4         | 1506.4       | 1412 D.M. |
| 1-8-87  | 20                | 6.0                        | —                                           | 47.6                  | 1.72                               | 30.1                                 | 4806.9         | 1515.9       | 0755 D.M. |
|         | 41.1              | —                          | .340                                        | 75.4                  | 1.70                               | 29.25                                | 4806.9         | 1577.4       | 0955 D.M. |
|         | 23                | —                          | .340                                        | 70.9                  | 1.65                               | 24.1                                 | 4809.9         | 1518.9       | 1050 D.M. |
|         | -32               | —                          | .340                                        | 70.4                  | 1.60                               | 28.0                                 | 4812.4         | 1526.4       | 1324 D.M. |
|         | 52                | —                          | .277                                        | 72.4                  | 1.73                               | 30.3                                 | 4816.6         | 1525.6       | 1730 D.M. |
|         | 23                | —                          | .340                                        | 71.3                  | 1.52                               | 26.6                                 | —              | —            | —         |
| 1-9-87  | 23                | 6.1                        | —                                           | 47.1                  | 1.72                               | 30.1                                 | 4822.1         | 1536.1       | 0804 D.M. |
|         | 20                | —                          | .335                                        | 71.2                  | 1.65                               | 24.1                                 | 4824.4         | 1537.4       | 0920 D.M. |
|         | -32               | —                          | .337                                        | 70.3                  | 1.60                               | 28.0                                 | 4832.4         | 1541.4       | 1320 D.M. |
|         | 52                | —                          | .279                                        | 72.0                  | 1.72                               | 30.1                                 | 4836.5         | 1545.5       | 1730 D.M. |
|         | 20                | —                          | .337                                        | 70.5                  | 1.5                                | 26.2                                 | —              | —            | 2000      |
| 1-12-87 | 20                | 6.1                        | —                                           | 46.1                  | 1.72                               | 30.1                                 | 4886.9         | 1595.9       | 0755 D.M. |
|         | 20                | —                          | .343                                        | 70.3                  | 1.65                               | 28.9                                 | 4889.5         | 1598.5       | 1030 D.M. |
|         | -32               | —                          | .337                                        | 69.9                  | 1.59                               | 27.8                                 | 4892.6         | 1601.6       | 1335 D.M. |
|         | 52                | —                          | .273                                        | 71.9                  | 1.72                               | 30.1                                 | 4896.5         | 1605.5       | 1730 D.M. |
|         | 20                | —                          | —                                           | 70.6                  | 1.55                               | 27.1                                 | —              | —            | —         |
| 1-13-87 | 20                | 6.0                        | —                                           | 40.9                  | 1.74                               | 30.5                                 | 4906.9         | 1615.9       | 0755 D.M. |
|         | 20                | —                          | .337                                        | 70.3                  | 1.65                               | 28.9                                 | 4909.6         | 1618.6       | 1030 D.M. |
|         | -32               | —                          | .352                                        | 68.4                  | 1.61                               | 28.2                                 | 4913.0         | 1622.0       | 1400 D.M. |
| 1-13-87 | 52                | —                          | .288                                        | 71.9                  | 1.73                               | 30.3                                 | 4916.6         | 1625.6       | 1735 D.M. |
| SPEC    | INFO<br>ONLY      | 10 MIN<br>@ 23°C           | .208: -32°<br>.280: 23°<br>.232: 52°<br>MIN | 80°K<br>MAX           | 1.72A<br>MAX<br>@ 17.5V            | 30 WATTS<br>MAX                      | INFO<br>ONLY   | INFO<br>ONLY |           |

PERFORMED BY

APPROVED BY

DATE 1-13-87

**Magnavox**

ELECTRO-OPTICAL SYSTEMS

MM&amp;T

LIFE TEST

DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 011

DRAWING NO. SM-D-5005842

| DATE     | AMB<br>TEMP<br>°C | TIME<br>TO 80°K<br>MINUTES | HEAT<br>LOAD<br>WATTS                       | COLD<br>STATION<br>°K | COOLER<br>INPUT<br>CURRENT<br>AMPS | COOLER<br>POWER<br>WATTS<br>@17.5VDC | ETI<br>READING | CUM<br>HOURS | INITIALS  |
|----------|-------------------|----------------------------|---------------------------------------------|-----------------------|------------------------------------|--------------------------------------|----------------|--------------|-----------|
| 12-22-86 | 23                | 6.0                        | —                                           | 43.9                  | 1.72                               | 30.1                                 | 4467.3         | 1176.3       | 0740 J.M. |
|          | 23                | —                          | .340                                        | 70.1                  | 1.64                               | 28.7                                 | 4469.2         | 1178.2       | 0945 J.M. |
|          | -32               | —                          | .340                                        | 70.4                  | 1.58                               | 27.6                                 | 4472.6         | 1191.6       | 0830 J.M. |
|          | 23                | —                          | .340                                        | 70.9                  | 1.55                               | 27.1                                 | —              | —            | 2000      |
| 12-23-86 | 23                | —                          | —                                           | 48.2                  | 1.72                               | 30.1                                 | 4487.3         | 1196.3       | 0740 J.M. |
|          | 23                | —                          | .339                                        | 71.1                  | 1.64                               | 29.7                                 | 4499.0         | 1198.0       | 0938 J.M. |
|          | -32               | —                          | .337                                        | 70.3                  | 1.60                               | 28.0                                 | 4492.8         | 1201.8       | 1330 J.M. |
|          | 52                | —                          | .285                                        | 72.1                  | 1.72                               | 30.1                                 | 4497.0         | 1206.0       | 1730 J.M. |
| 12-24-86 | 23                | 6.1                        | —                                           | 42.4                  | 1.73                               | 30.3                                 | 4507.3         | 1216.3       | 0750 J.M. |
|          | 23                | —                          | .340                                        | 70.8                  | 1.64                               | 28.7                                 | 4509.0         | 1219.0       | 0930 J.M. |
|          | -32               | —                          | .336                                        | 70.3                  | 1.58                               | 27.7                                 | 4513.0         | 1232.0       | 1330 J.M. |
| 1-2-87   | +40               | —                          | —                                           | 50.1                  | 1.72                               | 30.1                                 | 4687.2         | 1396.2       | 0732 M.T. |
|          | +49.8             | —                          | .338                                        | 76.9                  | 1.7                                | 29.8                                 | 4688.9         | 1397.9       | 0925 M.T. |
|          | -21.6             | —                          | .338                                        | 68.4                  | 1.6                                | 28.0                                 | 4692.9         | 1401.9       | 1330 M.T. |
| 1-5-87   | 20.4              | 6.4                        | —                                           | 43.5                  | 1.74                               | 30.45                                | 4747.2         | 1456.2       | 0906 J.M. |
|          | 23                | —                          | .338                                        | 71.0                  | 1.69                               | 29.6                                 | 4749.4         | 1458.4       | 1050 J.M. |
|          | -20               | —                          | .336                                        | 68.6                  | 1.62                               | 28.3                                 | 4752.2         | 1461.2       | 1336 J.M. |
|          | 52                | —                          | .276                                        | 72.2                  | 1.71                               | 29.9                                 | 4756.1         | 1465.1       | 1730 J.M. |
| 1-6-87   | 20                | 6.6                        | —                                           | 43.8                  | 1.73                               | 30.2                                 | 4766.8         | 1475.8       | 0800 J.M. |
|          | 37                | —                          | .337                                        | 73.8                  | 1.67                               | 29.2                                 | 4767.9         | 1476.9       | 0930 J.M. |
|          | -14               | —                          | .333                                        | 68.2                  | 1.63                               | 28.5                                 | 4772.1         | 1491.1       | 1330 J.M. |
| 1-7-87   | 20                | 6.4                        | —                                           | 44.8                  | 1.72                               | 30.1                                 | 4786.9         | 1495.9       | 0828 J.M. |
| SPEC     | INFO<br>ONLY      | 10 MIN<br>@ 23°C           | .208: -32°<br>.280: 23°<br>.232: 52°<br>MIN | 80°K<br>MAX           | 1.72A<br>MAX<br>@ 17.5V            | 30 WATTS<br>MAX                      | INFO<br>ONLY   | INFO<br>ONLY |           |

PERFORMED BY

APPROVED BY

DATE 1-8-87

**Magnavox**

ELECTRO-OPTICAL SYSTEMS

MM&T  
LIFE TEST  
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 011

DRAWING NO. SM-D-5005842

| DATE     | AMB<br>TEMP<br>°C | TIME<br>TO 80°K<br>MINUTES | HEAT<br>LOAD<br>WATTS                       | COLD<br>STATION<br>°K | COOLER<br>INPUT<br>CURRENT<br>AMPS | COOLER<br>POWER<br>WATTS<br>@17.5VDC | ETI<br>READING | CUM<br>HOURS | INITIALS       |
|----------|-------------------|----------------------------|---------------------------------------------|-----------------------|------------------------------------|--------------------------------------|----------------|--------------|----------------|
| 12-15-86 | 52                | —                          | .270                                        | 71.1                  | 1.71                               | 29.9                                 | 4333.1         | 1046.1       | 1735 <i>MM</i> |
|          | 23                | —                          | .340                                        | 69.7                  | 1.55                               | 22.1                                 | —              | —            | 2000           |
| 12-16-86 | 83                | 6.6                        | —                                           | 45.3                  | 1.72                               | 30.1                                 | 4343.4         | 1056.4       | 0740 <i>DM</i> |
|          | 23                | —                          | .330                                        | 69.6                  | 1.63                               | 28.5                                 | 4344.4         | 1057.4       | 0900 <i>DM</i> |
|          | -32               | —                          | .330                                        | 68.8                  | 1.59                               | 27.8                                 | 4348.9         | 1061.9       | 1330 <i>DM</i> |
|          | 52                | —                          | .269                                        | 71.1                  | 1.71                               | 29.9                                 | 4353.0         | 1066.0       | 1730 <i>MM</i> |
|          | 23                | —                          | .330                                        | 69.6                  | 1.55                               | 27.1                                 | —              | —            | 2000           |
| 12-17-86 | 23                | 6.1                        | —                                           | 45.0                  | 1.71                               | 29.9                                 | 4363.4         | 1076.4       | 0740 <i>DM</i> |
|          | 23                | —                          | .340                                        | 70.7                  | 1.63                               | 28.5                                 | 4364.4         | 1077.9       | 0930 <i>DM</i> |
|          | -32               | —                          | .341                                        | 70.0                  | 1.59                               | 27.8                                 | 4369.4         | 1082.4       | 1355 <i>MM</i> |
|          | 52                | —                          | .280                                        | 71.8                  | 1.71                               | 29.9                                 | 4373.1         | 1086.1       | 1730 <i>MM</i> |
|          | 23                | —                          | .340                                        | 69.6                  | 1.55                               | 27.1                                 | —              | —            | 2000           |
| 12-18-86 | 23                | —                          | —                                           | 41.2                  | 1.72                               | 30.1                                 | 4387.3         | 1100.3       | 0740 <i>DM</i> |
|          | 23                | —                          | .342                                        | 71.1                  | 1.64                               | 28.7                                 | 4389.5         | 1102.5       | 0909 <i>DM</i> |
|          | -32               | —                          | .340                                        | 70.2                  | 1.58                               | 27.7                                 | 4392.8         | 1105.8       | 1320 <i>MM</i> |
|          | 52                | —                          | .280                                        | 72.2                  | 1.71                               | 29.9                                 | 4397.0         | 1110.0       | 1730 <i>MM</i> |
|          | 23                | —                          | .340                                        | 71.0                  | 1.55                               | 27.1                                 | —              | —            | 2000           |
| 12-19-86 | 23                | 6.1                        | —                                           | 45.2                  | 1.72                               | 30.1                                 | 4407.3         | 1120.3       | 0740 <i>DM</i> |
|          | 23                | —                          | .340                                        | 70.5                  | 1.64                               | 28.7                                 | 4409.4         | 1122.4       | 0955 <i>MM</i> |
|          | -32               | —                          | .340                                        | 70.2                  | 1.60                               | 28.0                                 | 4413.0         | 1126.0       | 1330 <i>MM</i> |
|          | 52                | —                          | .281                                        | 71.8                  | 1.71                               | 29.9                                 | 4417.0         | —            | 1730 <i>MM</i> |
| 12-19-86 | 23                | —                          | .340                                        | 71                    | 1.55                               | 27.1                                 | —              | —            | 2000           |
| SPEC     | INFO<br>ONLY      | 10 MIN<br>@ 23°C           | .208: -32°<br>.280: 23°<br>.232: 52°<br>MIN | 80°K<br>MAX           | 1.72A<br>MAX<br>@ 17.5V            | 30 WATTS<br>MAX                      | INFO<br>ONLY   | INFO<br>ONLY |                |

PERFORMED BY

APPROVED BY *[Signature]*DATE 12-22-86

**Magnavox**

ELECTRO-OPTICAL SYSTEMS

MM&T  
LIFE TEST  
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 011

DRAWING NO. SM-D-5005842

| DATE     | AMB<br>TEMP<br>°C                      | TIME<br>TO 80°K<br>MINUTES | HEAT<br>LOAD<br>WATTS                       | COLD<br>STATION<br>°K | COOLER<br>INPUT<br>CURRENT<br>AMPS | COOLER<br>POWER<br>WATTS<br>@17.5VDC | ETI<br>READING | CUM<br>HOURS | INITIALS  |
|----------|----------------------------------------|----------------------------|---------------------------------------------|-----------------------|------------------------------------|--------------------------------------|----------------|--------------|-----------|
| 12-9-86  | 23                                     | 6.1                        | —                                           | 55.1                  | 1.67                               | 29.2                                 | 4209.0         | 922          | 0740 D.M. |
|          | 23                                     | —                          | .341                                        | 71.5                  | 1.60                               | 29.0                                 | 4210.5         | 923.5        | 0930 D.M. |
|          | -32                                    | —                          | .342                                        | 71.3                  | 1.52                               | 26.6                                 | 4214.6         | 927.6        | 1327 D.C. |
|          | 52                                     | —                          | .280                                        | 72.1                  | 1.68                               | 29.4                                 | 4218.7         | 931.7        | 1730 J.S. |
|          | 23                                     | —                          | .340                                        | 71.1                  | 1.54                               | 26.95                                |                |              | 2000      |
| 12-10-86 | 23                                     | 6.0                        | —                                           | 45.8                  | 1.68                               | 29.4                                 | 4225.9         | 941.9        | 0740 D.M. |
|          | 23                                     | —                          | .342                                        | 72                    | 1.60                               | 28.0                                 | 4230.6         | 943.6        | 0930 D.M. |
|          | -32                                    | —                          | .340                                        | 72.7                  | 1.70                               | 29.8                                 | 4234.7         | 942.7        | 1330 D.M. |
|          | 52                                     | —                          | .279                                        | 73.5                  | 1.70                               | 29.8                                 | 4238.6         | 951.6        | 1730 J.S. |
|          | 23                                     | —                          | .340                                        | 72.3                  | 1.54                               | 26.9                                 |                |              | 2000      |
| 12-11-86 | 23                                     | 6.1                        | —                                           | 46.0                  | 1.69                               | 29.5                                 | 4244.9         | 961.9        | 0740 D.M. |
|          | 23                                     | —                          | .345                                        | 71.5                  | 1.62                               | 28.3                                 | 4250.5         | 963.5        | 0930 D.M. |
|          | -32                                    | —                          | .339                                        | 71.5                  | 1.54                               | 26.9                                 | 4254.3         | 967.3        | 1330 D.M. |
|          | 23                                     | —                          | .340                                        | 72.3                  | 1.54                               | 26.9                                 |                |              | 2000      |
| 12-12-86 | 23                                     | 6.0                        | —                                           | 46.6                  | 1.69                               | 29.5                                 | 4268.9         | 981.9        | 0740 D.M. |
|          | 12                                     | —                          | .344                                        | 70.6                  | 1.59                               |                                      | 4272.1         | 985.1        | 1100 J.S. |
|          | TEST STAND SHUT DOWN TO INSTALL RELAYS |                            |                                             |                       |                                    |                                      |                |              | 1730 J.S. |
|          | TEST STAND TURNED ON AT 1630 HRS       |                            |                                             |                       |                                    |                                      |                |              | 1730 J.S. |
| 12-12-86 | 52                                     | —                          | .276                                        | 70.8                  | 1.69                               | 29.5                                 | 4273.1         | 986.1        | 1730 J.S. |
| 12-15-86 |                                        |                            |                                             | 48.7                  | 1.69                               |                                      |                |              |           |
|          | 23                                     | —                          | .331                                        | 69.7                  | 1.62                               | 28.5                                 | 4325.4         | 1038.4       | 0955 J.S. |
| 12-15-86 | -32                                    | —                          | .332                                        | 69.1                  | 1.57                               | 27.5                                 | 4329.1         | 1042.1       | 1325 J.S. |
| SPEC     | INFO<br>ONLY                           | 10 MIN<br>@ 23°C           | .208: -32°<br>.280: 23°<br>.232: 52°<br>MIN | 80°K<br>MAX           | 1.72A<br>MAX<br>@ 17.5V            | 30 WATTS<br>MAX                      | INFO<br>ONLY   | INFO<br>ONLY |           |

PERFORMED BY

APPROVED BY J. J. J. J.DATE 12-15-86

**Magnavox**

ELECTRO-OPTICAL SYSTEMS

MM&T  
LIFE TEST  
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 011

DRAWING NO. SM-D-5005842

| DATE    | AMB<br>TEMP<br>°C | TIME<br>TO 80°K<br>MINUTES | HEAT<br>LOAD<br>WATTS                       | COLD<br>STATION<br>°K | COOLER<br>INPUT<br>CURRENT<br>AMPS | COOLER<br>POWER<br>WATTS<br>@17.5VDC | ETI<br>READING | CUM<br>HOURS | INITIALS  |
|---------|-------------------|----------------------------|---------------------------------------------|-----------------------|------------------------------------|--------------------------------------|----------------|--------------|-----------|
| 12-2-86 | -32               | —                          | 1344                                        | 70.9                  | 1.54                               | 27.0                                 | 4076.0         | 789.5        | 1330 J.M. |
|         | 52                | —                          | .279                                        | 71.9                  | 1.69                               | 29.6                                 | 4080.1         | 793.6        | 1730 J.M. |
|         | 23                | —                          | .340                                        | 70.7                  | 1.54                               | 26.6                                 |                |              | 2000      |
| 12-3-86 | 23                | 6.0                        | —                                           | 46.7                  | 1.65                               | 28.9                                 | 4090.3         | 803.8        | 0740 MT   |
|         | 23                | —                          | .340                                        | 71.0                  | 1.60                               | 28.0                                 | 4092.5         | 806.0        | 0955 MT   |
|         | -32               | —                          | .337                                        | 70.2                  | 1.53                               | 26.8                                 | 4096.0         | 809.5        | 1330 MT   |
|         | 52                | —                          | .277                                        | 71.7                  | 1.68                               | 29.4                                 | 4100.0         | 813.5        | 1730 J.M. |
| 12-4-86 | 23                | 6.0                        | —                                           | 46.2                  | 1.67                               | 29.2                                 | 4110.3         | 823.8        | 0735 MT   |
|         | 23                | —                          | .340                                        | 70.9                  | 1.60                               | 28.0                                 | 4112.5         | 826.0        | 0955 MT   |
|         | -32               | —                          | .342                                        | 70.2                  | 1.54                               | 27.0                                 | 4116.0         | 829.5        | 1330 MT   |
|         | 52                | —                          | .278                                        | 71.6                  | 1.69                               | 29.6                                 | 4120.1         | 833.6        | 1730 J.M. |
|         | 23                | —                          | .340                                        | 70.4                  | 1.52                               | 26.6                                 |                |              | 2000      |
| 12-5-86 | 23                | 6.0                        | —                                           | 44.8                  | 1.67                               | 29.2                                 | 4130.3         | 843.8        | 0735 MT   |
|         | 23                | —                          | .341                                        | 70.9                  | 1.60                               | 27.2                                 | 4132.4         | 845.9        | 0950 MT   |
|         | -32               | —                          | .336                                        | 70.3                  | 1.56                               | 27.3                                 | 4136.0         | 849.5        | 1330 MT   |
|         | 52                | —                          | .275                                        | 71.7                  | 1.69                               | 29.6                                 | 4140.0         | 853.5        | 1730 J.M. |
|         | 23                | —                          | .340                                        | 70.4                  | 1.52                               | 26.6                                 |                |              |           |
| 12-8-86 | 23                | 6.1                        | —                                           | 44.4                  | 1.66                               | 29.05                                | 4190.2         | 903.7        | 0740 J.M. |
| 12-8-86 | 23                | 6.2                        | —                                           | 43.4                  | 1.66                               | 29.05                                | 4191.7         | 904.7        | 1050 J.M. |
|         | 0                 | —                          | .337                                        | 70.1                  | 1.56                               | 27.3                                 | 4196.3         | 909.3        | 1516 J.M. |
|         | 52                | —                          | .278                                        | 72.8                  | 1.68                               | 29.4                                 | 4198.7         | 911.7        | 1730 J.M. |
| 12-8-86 | 23                | —                          | .340                                        | 71.5                  | 1.52                               | 26.6                                 |                |              | 2000      |
| SPEC    | INFO<br>ONLY      | 10 MIN<br>@ 23°C           | .208: -32°<br>.280: 23°<br>.232: 52°<br>MIN | 80°K<br>MAX           | 1.72A<br>MAX<br>@ 17.5V            | 30 WATTS<br>MAX                      | INFO<br>ONLY   | INFO<br>ONLY |           |

PERFORMED BY

APPROVED BY J. J. DwyerDATE 12-9-86

**Magnavox**

ELECTRO-OPTICAL SYSTEMS

MM&amp;T

LIFE TEST

DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 011

DRAWING NO. SM-D-5005842

| DATE     | AMB<br>TEMP<br>°C | TIME<br>TO 80°K<br>MINUTES | HEAT<br>LOAD<br>WATTS                       | COLD<br>STATION<br>°K | COOLER<br>INPUT<br>CURRENT<br>AMPS | COOLER<br>POWER<br>WATTS<br>@17.5VDC | ETI<br>READING | CUM<br>HOURS | INITIALS  |
|----------|-------------------|----------------------------|---------------------------------------------|-----------------------|------------------------------------|--------------------------------------|----------------|--------------|-----------|
| 11-21-86 | 23                | 6.0                        | —                                           | 45.5                  | 1.65                               | 29.4                                 | 3850.4         | 563.9        | 0740 D.M. |
|          | 23                | —                          | .332                                        | 70.8                  | 1.58                               | 27.7                                 | 3852.1         | 565.6        | 0930 D.M. |
|          | -32               | —                          | .330                                        | 70.0                  | 1.52                               | 26.6                                 | 3856.1         | 569.6        | 1330 D.M. |
|          | 52                | —                          | .283                                        | 71.2                  | 1.67                               | 29.2                                 | 3860.1         | 573.6        | 1730 D.M. |
| 11-24-86 | 23                | 6.0                        | —                                           | 43.6                  | 1.67                               | 29.2                                 | 3910.4         | 623.9        | 0740 D.M. |
|          | 23                | —                          | .336                                        | 70.8                  | 1.60                               | 28.0                                 | 3912.1         | 625.6        | 0930 D.M. |
|          | -32               | —                          | .343                                        | 70.8                  | 1.55                               | 27.1                                 | 3916.4         | 629.6        | 1330 D.M. |
| 11-25-86 | 23                | 6.0                        | —                                           | 43.6                  | 1.72                               | 30.1                                 | 3930.4         | 643.9        | 0740 D.M. |
|          | 23                | —                          | .336                                        | 70.8                  | 1.61                               | 28.1                                 | 3932.0         | 645.5        | 0930 D.M. |
|          | -32               | —                          | .336                                        | 69.3                  | 1.54                               | 26.9                                 | 3936.6         | 650.1        | 1330 D.M. |
|          | 40                | —                          | .283                                        | 71.1                  | 1.62                               | 29.3                                 | 3938.7         | 652.2        | 1630 D.M. |
| 11-26-86 | 23                | 6.0                        | —                                           | 46.6                  | 1.68                               | 29.4                                 | 3950.4         | 663.9        | 0740 D.M. |
|          | 23                | —                          | .337                                        | 70.4                  | 1.62                               | 28.3                                 | 3952.1         | 665.6        | 0925 D.M. |
|          | -32               | —                          | .337                                        | 69.6                  | 1.54                               | 26.9                                 | 3956.0         | 669.5        | 1330 D.M. |
|          | 52                | —                          | .276                                        | 71.5                  | 1.67                               | 29.2                                 | 3959.8         | 673.3        | 1730 D.M. |
| 11-26-86 | 23                | —                          | .100                                        | 50.5                  | 1.56                               | 27.3                                 |                |              | 2000      |
| 12-1-86  | 23                | 5.9                        | —                                           | 46.0                  | 1.68                               | 29.4                                 | 4050.3         | 763.8        | 0740 D.M. |
|          | 23                | —                          | .340                                        | 70.3                  | 1.61                               | 28.1                                 | 4052.1         | 765.6        | 0930 D.M. |
|          | -32               | —                          | .340                                        | 70.1                  | 1.54                               | 26.45                                | 4056.3         | 769.8        | 1330 D.M. |
|          | 52                | —                          | .280                                        | 71.9                  | 1.69                               | 29.6                                 | 4060.1         | 773.6        | 1735 D.M. |
|          | 23                | —                          | .340                                        | 70.6                  | 1.54                               | 26.95                                |                |              | 2000 D.M. |
| 12-2-86  | 23                | 6.0                        | —                                           | 43.6                  | 1.67                               | 29.2                                 | 4070.3         | 793.8        | 0740 D.M. |
| SPEC     | INFO<br>ONLY      | 10 MIN<br>@ 23°C           | .208: -32°<br>.280: 23°<br>.232: 52°<br>MIN | 80°K<br>MAX           | 1.72A<br>MAX<br>@ 17.5V            | 30 WATTS<br>MAX                      | INFO<br>ONLY   | INFO<br>ONLY |           |

PERFORMED BY

APPROVED BY [Signature]

DATE

12-2-86

**Magnavox**

ELECTRO-OPTICAL SYSTEMS

MM&amp;T

LIFE TEST

DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 011

DRAWING NO. SM-D-5005842

| DATE     | AMB<br>TEMP<br>°C | TIME<br>TO 80°K<br>MINUTES | HEAT<br>LOAD<br>WATTS                       | COLD<br>STATION<br>°K | COOLER<br>INPUT<br>CURRENT<br>AMPS | COOLER<br>POWER<br>WATTS<br>@17.5VDC | ETI<br>READING | CUM<br>HOURS | INITIALS  |
|----------|-------------------|----------------------------|---------------------------------------------|-----------------------|------------------------------------|--------------------------------------|----------------|--------------|-----------|
| 11-14-86 | 23                | 5.9                        | —                                           | 43.6                  | 1.54                               | 27.0                                 | 3710.6         | 424.1        | 0745      |
|          | 23                | —                          | .344                                        | 68.6                  | 1.57                               | 27.5                                 | 3712.3         | 425.8        | 0930      |
|          | -32               | —                          | .336                                        | 68.3                  | 1.49                               | 26.1                                 | 3716.1         | 429.6        | 1315      |
|          | 52                | —                          | .275                                        | 69.9                  | 1.67                               | 29.2                                 | 3720.5         | 434.0        | 1740      |
| 11-14-86 | 23                | —                          | .350                                        | 68.6                  |                                    |                                      |                |              |           |
| 11-15-86 | 17                | 6.9                        | —                                           | 41.1                  | 1.65                               | 28.9                                 | 3733.6         |              | 1140      |
| 11-17-86 | 23                | 5.9                        | —                                           |                       | 1.60                               | 28.0                                 | 3770.8         | 484.3        | 0801 P.H. |
|          | 23                | —                          | .338                                        | 69.4                  | 1.56                               | 27.3                                 | 3772.6         | 486.0        | 0955      |
|          | -32               | —                          | .340                                        | 68.3                  | 1.51                               | 26.4                                 | 3776.2         | 489.7        | 1335      |
| 11-17-86 | 52                | —                          | .283                                        | 70.2                  | 1.66                               | 29.1                                 | 3780.1         | 493.6        | 1730      |
| 11-18-86 | 23                | —                          | .348                                        | 68.9                  | 1.57                               | 27.5                                 | 3792.4         | 505.9        | 0950      |
|          | -32               | —                          | .338                                        | 69.2                  | 1.50                               | 26.3                                 | 3796.1         | 509.6        | 1335      |
| 11-      | 52                | —                          | .272                                        | 70.9                  | 1.67                               | 29.2                                 | 3800.1         | 513.6        | 1730      |
| 11-19-86 | 23                | 6.0                        | —                                           | 44.5                  | 1.68                               | 29.05                                | 3810.3         | 523.8        | 0741 P.H. |
|          | 23                | —                          | .347                                        | 70.2                  | 1.57                               | 27.5                                 | 3812.5         | 526.0        | 0955      |
|          | -32               | —                          | .340                                        | 69.9                  | 1.48                               | 25.9                                 | 3816.0         | 527.5        | 1335      |
|          | 52                | —                          | .279                                        | 71.3                  | 1.68                               | 29.4                                 | 3820.2         | 533.7        | 1735      |
| 11-20-86 | 23                | 6.0                        | —                                           | 45.4                  | 1.65                               | 28.8                                 | 3830.2         | 543.7        | 0740 P.H. |
|          | 23                | —                          | .347                                        | 69.7                  | 1.59                               | 27.8                                 | 3832.0         | 545.5        | 0930      |
|          | -32               | —                          | .336                                        | 69.8                  | 1.49                               | 26.1                                 | 3836.1         | 547.6        | 1330      |
|          | 52                | —                          | .276                                        | 71.5                  | 1.66                               | 29.1                                 | 3840.1         | 553.6        | 1730      |
| 11-20-86 | 23                | —                          | .331                                        | 70.2                  | 1.57                               | 27.5                                 | 3843.2         | 556.7        | 2035      |
| SPEC     | INFO<br>ONLY      | 10 MIN<br>@ 23°C           | .208: -32°<br>.280: 23°<br>.232: 52°<br>MIN | 80°K<br>MAX           | 1.72A<br>MAX<br>@ 17.5V            | 30 WATTS<br>MAX                      | INFO<br>ONLY   | INFO<br>ONLY |           |

PERFORMED BY

APPROVED BY

DATE 11-29-86

# Magnavox

ELECTRO-OPTICAL SYSTEMS

MM&amp;T

LIFE TEST

DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 011

DRAWING NO. SM-D-5005842

| DATE     | AMB<br>TEMP<br>°C | TIME<br>TO 80°K<br>MINUTES | HEAT<br>LOAD<br>WATTS                       | COLD<br>STATION<br>°K | COOLER<br>INPUT<br>CURRENT<br>AMPS | COOLER<br>POWER<br>WATTS<br>@17.5VDC | ETI<br>READING | CUM<br>HOURS | INITIALS       |
|----------|-------------------|----------------------------|---------------------------------------------|-----------------------|------------------------------------|--------------------------------------|----------------|--------------|----------------|
| 11.7.86  | 23                | —                          | .350                                        | 68.2                  | 1.56                               | 27.3                                 | 3572.3         | 285.8        | 0930 <i>SL</i> |
|          | -32               | —                          | .340                                        | 67.3                  | 1.48                               | 25.9                                 | 3576.0         | 289.5        | 1315 <i>SL</i> |
| 11.7.86  | 23                | —                          | .350                                        | 69.7                  | 1.51                               | 26.4                                 |                | 296.6        | 2000           |
| 11.10.86 | 23                | 5.9                        | —                                           | 45.6                  | 1.64                               | 28.7                                 | 3630.6         | 344.1        | 0746 <i>SL</i> |
|          | 23                | —                          | .352                                        | 68.6                  | 1.57                               | 27.5                                 | 3632.3         | 345.8        | 0930 <i>SL</i> |
|          | -32               | —                          | .341                                        | 67.6                  | 1.51                               | 26.4                                 | 3636.3         | 349.8        | 1330 <i>SL</i> |
| 11.10.86 | 52                | —                          | .281                                        | 69.7                  | 1.68                               | 29.4                                 | 3640.7         | 354.2        | 1750 <i>SL</i> |
| 11.11.86 | 23                | 5.9                        | —                                           | 44.4                  | 1.64                               | 28.7                                 | 3650.9         | 364.4        | 0805 <i>SL</i> |
|          | 23                | —                          | .336                                        | 68.9                  | 1.57                               | 27.5                                 | 3652.2         | 365.7        | 0920 <i>SL</i> |
|          | -32               | —                          | .344                                        | 68.0                  | 1.52                               | 26.6                                 | 3656.3         | 369.8        | 1330 <i>SL</i> |
|          | 52                | —                          | .280                                        | 68.4                  | 1.52                               | 26.6                                 |                | 373.8        | 1730           |
| 11.11.86 | 23                | —                          | .350                                        | 68.4                  | 1.52                               | 26.6                                 |                | 376.3        | 2000           |
| 11.12.86 | 23                | 5.9                        | —                                           | 44.4                  | 1.64                               | 28.7                                 | 3670.7         | 384.2        | 0851 <i>SL</i> |
|          | 23                | —                          | .338                                        | 68.5                  | 1.57                               | 27.5                                 | 3672.2         | 385.7        | 0925 <i>SL</i> |
|          | -32               | —                          | .350                                        | 67.2                  | 1.49                               | 26.1                                 | 3676.1         | 389.6        | 1315 <i>SL</i> |
|          | 52                | —                          | .277                                        | 69.8                  | 1.66                               | 29.1                                 | 3680.5         | 394.0        | 1740 <i>SL</i> |
| 11.12.86 | 23                | —                          | .350                                        | 68.5                  | 1.52                               | 26.6                                 |                | 396.3        | 2000           |
| 11.13.86 | 23                | 5.9                        | —                                           | 45.0                  | 1.64                               | 28.7                                 | 3690.6         | 404.1        | 0746 <i>SL</i> |
|          | 23                | —                          | .350                                        | 68.5                  | 1.57                               | 27.5                                 | 3692.3         | 405.8        | 0930 <i>SL</i> |
|          | -32               | —                          | .339                                        | 68.4                  | 1.50                               | 26.3                                 | 3696.3         | 409.8        | 1330 <i>SL</i> |
|          | 52                | —                          | .280                                        | 69.8                  | 1.67                               | 29.2                                 | 3700.3         | 413.8        | 1730 <i>SL</i> |
| 11.13.86 | 23                | —                          | .350                                        | 68.5                  | 1.52                               | 26.6                                 |                | 416.3        | 2000           |
| SPEC     | INFO<br>ONLY      | 10 MIN<br>@ 23°C           | .208: -32°<br>.280: 23°<br>.232: 52°<br>MIN | 80°K<br>MAX           | 1.72A<br>MAX<br>@ 17.5V            | 30 WATTS<br>MAX                      | INFO<br>ONLY   | INFO<br>ONLY |                |

PERFORMED BY *Donald V. Lukany*APPROVED BY *[Signature]*DATE 11/13/86

**Magnavox**

ELECTRO-OPTICAL SYSTEMS

MM&amp;T

LIFE TEST

DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 011

DRAWING NO. SM-D-5005842

| DATE     | AMB<br>TEMP<br>°C | TIME<br>TO 80°K<br>MINUTES | HEAT<br>LOAD<br>WATTS                       | COLD<br>STATION<br>°K | COOLER<br>INPUT<br>CURRENT<br>AMPS | COOLER<br>POWER<br>WATTS<br>@17.5VDC | ETI<br>READING | CUM<br>HOURS | INITIALS       |
|----------|-------------------|----------------------------|---------------------------------------------|-----------------------|------------------------------------|--------------------------------------|----------------|--------------|----------------|
| 10-31-86 | 23                | 5.6                        | —                                           | 43.3                  | 1.61                               | 28.2                                 | 3418.5         | 132.0        | 0741 <i>DL</i> |
|          | 23                | —                          | .347                                        | 67.8                  | 1.54                               | 27.0                                 | 3420.3         | 133.8        | 0930 <i>DL</i> |
|          | -32               | —                          | .340                                        | 66.9                  | 1.45                               | 25.4                                 | 3424.1         | 137.6        | 1320 <i>DL</i> |
|          | 52                | —                          | .279                                        | 68.8                  | 1.64                               | 28.7                                 | 3428.5         | 142.0        | 1740 <i>DL</i> |
| 11-3-86  | 23                | —                          | —                                           | 40.5                  | 1.64                               | 28.7                                 | 3490.5         | 204.0        | 0739 <i>DL</i> |
|          | 23                | —                          | .355                                        | 68.7                  | 1.54                               | 27.0                                 | 3492.3         | 205.8        | 0930 <i>DL</i> |
|          | -32               | —                          | .339                                        | 67.7                  | 1.47                               | 25.7                                 | 3496.1         | 209.6        | 1315 <i>DL</i> |
| 11-3-86  | 52                | —                          | .297                                        | 69.7                  | 1.66                               | 29.1                                 | 3500.3         | 213.8        | 1730 <i>DL</i> |
| 11-4-86  | 23                | 5.8                        | —                                           | 45.2                  | 1.62                               | 28.4                                 | 3510.6         | 224.1        | 0749 <i>DL</i> |
|          | 23                | —                          | .348                                        | 67.9                  | 1.55                               | 27.1                                 | 3512.4         | 225.9        | 0935 <i>DL</i> |
|          | -32               | —                          | .343                                        | 67.1                  | 1.47                               | 25.7                                 | 3516.3         | 229.8        | 1230 <i>DL</i> |
| 11-4-86  | 52                | —                          | .289                                        | 69.0                  | 1.62                               | 28.4                                 | 3520.4         | 233.9        | 1735 <i>DL</i> |
| 11-5-86  | 23                | 5.9                        | —                                           | 44.3                  | 1.60                               | 28.0                                 | 3530.7         | 244.2        | 0749 <i>DL</i> |
|          | 23                | —                          | .352                                        | 68.3                  | 1.55                               | 27.1                                 | 3532.3         | 245.8        | 0930 <i>DL</i> |
|          | -32               | —                          | .356                                        | 67.3                  | 1.47                               | 25.7                                 | 3536.5         | 250.0        | 1335 <i>DL</i> |
|          | 52                | —                          | .279                                        | 69.5                  | 1.65                               | 28.9                                 | 3540.6         | 254.1        | 1740 <i>DL</i> |
| 11-5-86  | 23                | —                          | .350                                        | 68.8                  | 1.51                               | 26.4                                 |                | 256.4        | 2000           |
| 11-6-86  | 23                | 5.9                        | —                                           | 45.8                  | 1.63                               | 28.5                                 | 3550.6         | 264.1        | 0748 <i>DL</i> |
|          | 23                | —                          | .350                                        | 68.1                  | 1.55                               | 27.1                                 | 3552.7         | 266.2        | 0955 <i>DL</i> |
|          | -32               | —                          | .343                                        | 67.1                  | 1.50                               | 26.3                                 | 3556.2         | 269.7        | 1320 <i>DL</i> |
| 11-6-86  | 52                | —                          | .281                                        | 69.4                  | 1.66                               | 29.1                                 | 3560.5         | 274.0        | 1740 <i>DL</i> |
| 11-7-86  | 23                | 5.9                        | —                                           | 44.3                  | 1.64                               | 28.7                                 | 3570.6         | 284.1        | 0748 <i>DL</i> |
| SPEC     | INFO<br>ONLY      | 10 MIN<br>@ 23°C           | .208: -32°<br>.280: 23°<br>.232: 52°<br>MIN | 80°K<br>MAX           | 1.72A<br>MAX<br>@ 17.5V            | 30 WATTS<br>MAX                      | INFO<br>ONLY   | INFO<br>ONLY |                |

PERFORMED BY *James V. Lukany*APPROVED BY *[Signature]*DATE 11/7/86

**Magnavox**

ELECTRO-OPTICAL SYSTEMS

MM&amp;T

LIFE TEST

DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 011

DRAWING NO. SM-D-5005842

| DATE     | AMB<br>TEMP<br>°C | TIME<br>TO 80°K<br>MINUTES | HEAT<br>LOAD<br>WATTS                       | COLD<br>STATION<br>°K | COOLER<br>INPUT<br>CURRENT<br>AMPS | COOLER<br>POWER<br>WATTS<br>@17.5VDC | ETI<br>READING | CUM<br>HOURS           | INITIALS |
|----------|-------------------|----------------------------|---------------------------------------------|-----------------------|------------------------------------|--------------------------------------|----------------|------------------------|----------|
| 10.24.86 | 33                | 5.5                        | —                                           | 49.4                  | 1.63                               | 28.5                                 | 3286.5         | RESTART<br>OFLIFE TEST | 1640.8   |
|          | 52                | —                          | .284                                        | 67.9                  | 1.62                               | 28.4                                 | 3288.1         | 1.6                    | 1820     |
| 10.24.86 | 23                | —                          | .350                                        | 68.9                  | 1.45                               | 25.4                                 |                | 3.3                    | 2000     |
| 10.27.86 | 23                | —                          | .350                                        | 66.9                  | 1.53                               | 26.8                                 | 3338.8         | 52.3                   | 0800     |
|          | 23                | —                          | .350                                        | 66.8                  | 1.53                               | 26.8                                 | 3340.4         | 53.9                   | 0930     |
|          | -32               | —                          | .341                                        | 65.6                  | 1.45                               | 25.4                                 | 3344.3         | 57.8                   | 1330     |
|          | 52                | —                          | .279                                        | 68.2                  | 1.62                               | 28.4                                 | 3348.4         | 61.9                   | 1735     |
| 10.27.86 | 23                | —                          | .350                                        | 67.8                  | 1.50                               | 26.3                                 |                | 64.3                   | 2000     |
| 10.28.86 | 23                | 5.7                        | —                                           | 42.4                  | 1.60                               | 28.0                                 | 3358.4         | 71.9                   | 0733     |
|          | 23                | —                          | .348                                        | 67.0                  | 1.53                               | 26.8                                 | 3360.4         | 73.9                   | 0930     |
|          | -32               | —                          | .346                                        | 65.6                  | 1.43                               | 25.0                                 | 3364.2         | 77.7                   | 1315     |
|          | 52                | —                          | .288                                        | 67.9                  | 1.62                               | 28.3                                 | 3368.5         | 82.0                   | 1740     |
| 10.29.86 | 23                | 5.6                        | —                                           | 42.4                  | 1.61                               | 28.2                                 | 3378.5         | 92.0                   | 0742     |
|          | 23                | —                          | .346                                        | 66.9                  | 1.53                               | 26.8                                 | 3380.3         | 93.8                   | 0930     |
|          | -32               | —                          | .350                                        | 65.8                  | 1.45                               | 25.4                                 | 3384.4         | 97.9                   | 1335     |
|          | 52                | —                          | .290                                        | 67.9                  | 1.62                               | 28.4                                 | 3388.4         | 101.9                  | 1735     |
| 10.29.86 | 23                | —                          | .350                                        | 67.1                  | 1.50                               | 26.3                                 |                | 104.3                  | 2000     |
| 10.30.86 | 23                | 5.6                        | —                                           | 42.4                  | 1.62                               | 28.4                                 | 3398.5         | 112.0                  | 0742     |
|          | 23                | —                          | .350                                        | 67.1                  | 1.53                               | 26.8                                 | 3400.6         | 114.1                  | 0945     |
|          | -32               | —                          | .348                                        | 66.1                  | 1.46                               | 25.6                                 | 3404.3         | 117.8                  | 1330     |
|          | 52                | —                          | .276                                        | 68.7                  | 1.63                               | 28.5                                 | 3408.3         | 121.8                  | 1730     |
| 10.30.86 | 23                | —                          | .350                                        | 70.1                  | 1.55                               | 27.1                                 |                | 124.3                  | 2000     |
| SPEC     | INFO<br>ONLY      | 10 MIN<br>@ 23°C           | .208: -32°<br>.280: 23°<br>.232: 52°<br>MIN | 80°K<br>MAX           | 1.72A<br>MAX<br>@ 17.5V            | 30 WATTS<br>MAX                      | INFO<br>ONLY   | INFO<br>ONLY           |          |

PERFORMED BY

APPROVED BY

DATE 10/30/86



**Magnavox**

ELECTRO-OPTICAL SYSTEMS

MM&T  
LIFE TEST  
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 015

DRAWING NO. SM-D-5005842

| DATE     | AMB<br>TEMP<br>°C | TIME<br>TO 80°K<br>MINUTES | HEAT<br>LOAD<br>WATTS                       | COLD<br>STATION<br>°K | COOLER<br>INPUT<br>CURRENT<br>AMPS | COOLER<br>POWER<br>WATTS<br>@17.5VDC | ETI<br>READING | CUM<br>HOURS | INITIALS  |
|----------|-------------------|----------------------------|---------------------------------------------|-----------------------|------------------------------------|--------------------------------------|----------------|--------------|-----------|
| 11-25-86 | -32               | —                          | .343                                        | 71.3                  | 1.39                               | 24.3                                 | 6243.5         | 1419.0       | 1330 D.M. |
|          | 40                | —                          | .346                                        | 66.9                  | 1.5                                | 26.2                                 | 6245.7         | 1426.2       | 1430 D.M. |
| 11-26-86 | 23                | 6.2                        | —                                           | 41.2                  | 1.55                               | 27.1                                 | 6247.3         | 1432.9       | 0740 D.M. |
|          | 23                | —                          | .344                                        | 69.2                  | 1.46                               | 25.5                                 | 6249.0         | 1434.5       | 0925 D.M. |
|          | -32               | —                          | .342                                        | 72.2                  | 1.4                                | 24.5                                 | 6302.9         | 1438.4       | 1330 D.M. |
|          | 52                | —                          | .282                                        | 69.6                  | 1.54                               | 27.0                                 | 6306.8         | 1442.3       | 1720 J.S. |
|          | 23                | —                          | .100                                        | 49.0                  | 1.52                               | 26.6                                 |                |              | 2000      |
| 12-1-86  | 23                | 6.1                        | —                                           | 41.1                  | 1.64                               | 26.7                                 | 6397.2         | 1532.7       | 0740 D.M. |
|          | 23                | —                          | .340                                        | 68.3                  | 1.54                               | 27.0                                 | 6399.0         | 1539.5       | 0930 D.M. |
|          | -32               | —                          | .346                                        | 73.9                  | 1.42                               | 24.9                                 | 6403.2         | 1539.7       | 1330 D.M. |
|          | 52                | —                          | .286                                        | 69.7                  | 1.59                               | 27.8                                 | 6407.1         | 1542.6       | 1735 J.S. |
|          | 23                | —                          | .340                                        | 69.1                  | 1.52                               | 26.6                                 |                |              | 2000 D.M. |
| 12-2-86  | 23                | 6.1                        | —                                           | 41.5                  | 1.64                               | 28.7                                 | 6417.2         | 1552.7       | 0740 D.M. |
|          | -32               | —                          | .340                                        | 74.7                  | 1.44                               | 25.2                                 | 6422.9         | 1558.4       | 1330 D.M. |
|          | 52                | —                          | .286                                        | 69.7                  | 1.61                               | 28.2                                 | 6427.0         | 1562.5       | 1730 J.S. |
|          | 23                | —                          | .340                                        | 69.2                  | 1.52                               | 27.0                                 |                |              | 2000      |
| 12-3-86  | 23                | 6.2                        | —                                           | 41.4                  | 1.61                               | 28.2                                 | 6437.2         | 1572.7       | 0740 M.T. |
|          | 23                | —                          | .340                                        | 69.0                  | 1.52                               | 26.6                                 | 6439.4         | 1574.9       | 0955 M.T. |
|          | -32               | —                          | .343                                        | 73.0                  | 1.47                               | 25.7                                 | 6442.9         | 1578.4       | 1330 M.T. |
| 12-3-86  | 52                | —                          | .283                                        | 69.4                  | 1.60                               | 28.0                                 | 6446.9         | 1582.4       | 1730 J.S. |
| 12-4-86  | 23                | 6.2                        | —                                           | 40.0                  | 1.66                               | 29.1                                 | 6457.2         | 1592.7       | 0735 M.T. |
| 12-4-86  | 23                | —                          | .344                                        | 69.1                  | 1.57                               | 27.5                                 | 6459.4         | 1594.9       | 0755 M.T. |
| SPEC     | INFO<br>ONLY      | 10 MIN<br>@ 23°C           | .208: -32°<br>.280: 23°<br>.232: 52°<br>MIN | 80°K<br>MAX           | 1.72A<br>MAX<br>@ 17.5V            | 30 WATTS<br>MAX                      | INFO<br>ONLY   | INFO<br>ONLY |           |

PERFORMED BY

APPROVED BY

DATE 12-8-86

**Magnavox**

ELECTRO-OPTICAL SYSTEMS

MM&amp;T

LIFE TEST

DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 015

DRAWING NO. SM-D-5005842

| DATE     | AMB<br>TEMP<br>°C | TIME<br>TO 80°K<br>MINUTES | HEAT<br>LOAD<br>WATTS                       | COLD<br>STATION<br>°K | COOLER<br>INPUT<br>CURRENT<br>AMPS | COOLER<br>POWER<br>WATTS<br>@17.5VDC | ETI<br>READING | CUM<br>HOURS | INITIALS |
|----------|-------------------|----------------------------|---------------------------------------------|-----------------------|------------------------------------|--------------------------------------|----------------|--------------|----------|
| 11-17-86 | 52                | —                          | .289                                        | 68.8                  | 1.51                               | 26.4                                 | 6127.0         | 1262.5       | 1730 JH  |
| 11-18-86 | 23                | —                          | .351                                        | 67.9                  | 1.43                               | 25.0                                 | 6139.3         | 1274.8       | 0950 JH  |
|          | -32               | —                          | .346                                        | 69.4                  | 1.40                               | 24.5                                 | 6143.1         | 1278.6       | 1335 JH  |
|          | 52                | —                          | .283                                        | 69.4                  | 1.54                               | 27.0                                 | 6147.0         | 1282.5       | 1730 JH  |
| 11-19-86 | 23                | 6.1                        | —                                           | 41.4                  | 1.52                               | 26.6                                 | 6157.2         | 1292.7       | 0748 JH  |
|          | 23                | —                          | .350                                        | 68.9                  | 1.42                               | 24.9                                 | 6159.4         | 1294.9       | 0955 JH  |
|          | -32               | —                          | .346                                        | 71.8                  | 1.37                               | 23.9                                 | 6162.4         | 1298.4       | 1335 JH  |
|          | 52                | —                          | .286                                        | 69.9                  | 1.53                               | 26.8                                 | 6167.1         | 1302.6       | 1735 JH  |
| 11-20-86 | 23                | 6.2                        | —                                           | 41.9                  | 1.52                               | 26.6                                 | 6172.1         | 1312.6       | 0740 JH  |
|          | 23                | —                          | .350                                        | 68.4                  | 1.43                               | 25.0                                 | 6179.0         | 1314.5       | 0930 JH  |
|          | -32               | —                          | .345                                        | 71.6                  | 1.39                               | 24.3                                 | 6183.0         | 1318.5       | 1330 JH  |
|          | 52                | —                          | .285                                        | 69.7                  | 1.54                               | 27.0                                 | 6187.0         | 1322.5       | 1730 JH  |
|          | 23                | —                          | .343                                        | 68.9                  | 1.42                               | 24.9                                 | 6190.1         | 1325.6       | 2030 JH  |
| 11-21-86 | 23                | 6.2                        | —                                           | 41.4                  | 1.55                               | 27.1                                 | 6147.3         | 1332.8       | 0740 JH  |
|          | 23                | —                          | .343                                        | 69.3                  | 1.44                               | 25.2                                 | 6199.0         | 1334.5       | 0930 JH  |
|          | -32               | —                          | .342                                        | 71.9                  | 1.37                               | 23.9                                 | 6203.0         | 1338.5       | 1330 JH  |
|          | 52                | —                          | .289                                        | 69.4                  | 1.52                               | 26.6                                 | 6207.0         | 1342.5       | 1730 JH  |
| 11-24-86 | 23                | 6.2                        | —                                           | 40.7                  | 1.56                               | 27.3                                 | 6257.3         | 1392.9       | 0740 JH  |
|          | 23                | —                          | .346                                        | 69.6                  | 1.44                               | 25.2                                 | 6259.0         | 1394.5       | 0930 JH  |
|          | -32               | —                          | .349                                        | 72.2                  | 1.4                                | 24.5                                 | 6263.0         | 1398.6       | 0330 JH  |
| 11-25-86 | 23                | 6.3                        | —                                           | 40.9                  | 1.61                               | 28.1                                 | 6277.3         | 1412.9       | 0740 JH  |
| 11-25-86 | 23                | —                          | .343                                        | 69.4                  | 1.46                               | 25.5                                 | 6278.4         | 1414.4       | 0930 JH  |
| SPEC     | INFO<br>ONLY      | 10 MIN<br>@ 23°C           | .208: -32°<br>.280: 23°<br>.232: 52°<br>MIN | 80°K<br>MAX           | 1.72A<br>MAX<br>@ 17.5V            | 30 WATTS<br>MAX                      | INFO<br>ONLY   | INFO<br>ONLY |          |

PERFORMED BY \_\_\_\_\_

APPROVED BY \_\_\_\_\_

DATE 11-25-85

**Magnavox**

ELECTRO-OPTICAL SYSTEMS

MM&amp;T

LIFE TEST

DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 015

DRAWING NO. SM-D-5005842

| DATE     | AMB<br>TEMP<br>°C | TIME<br>TO 80°K<br>MINUTES | HEAT<br>LOAD<br>WATTS                       | COLD<br>STATION<br>°K | COOLER<br>INPUT<br>CURRENT<br>AMPS | COOLER<br>POWER<br>WATTS<br>@17.5VDC | ETI<br>READING | CUM<br>HOURS | INITIALS |
|----------|-------------------|----------------------------|---------------------------------------------|-----------------------|------------------------------------|--------------------------------------|----------------|--------------|----------|
| 11-11-86 | -32               | —                          | .348                                        | 67.5                  | 1.42                               | 24.9                                 | 6003.2         | 1138.7       | 133000   |
|          | 52                | —                          | .280                                        | 66.4                  | 1.42                               | 24.9                                 |                | 1142.7       | 1730     |
| 11-11-86 | 23                | —                          | .350                                        | 66.8                  | 1.40                               | 24.5                                 |                | 1145.2       | 2000     |
| 11-12-86 | 23                | 6.0                        | —                                           | 39.5                  | 1.53                               | 26.8                                 | 6017.6         | 1153.1       | 0851     |
|          | 23                | —                          | .345                                        | 65.5                  | 1.42                               | 24.9                                 | 6019.2         | 1154.7       | 0925     |
|          | -32               | —                          | .353                                        | 66.9                  | 1.43                               | 25.0                                 | 6023.0         | 1158.5       | 1315     |
|          | 52                | —                          | .285                                        | 67.1                  | 1.52                               | 26.6                                 | 6027.4         | 1162.9       | 1740     |
| 11-12-86 | 23                | —                          | .350                                        | 66.4                  | 1.41                               | 24.7                                 |                | 1165.2       |          |
| 11-13-86 | 23                | 6.0                        | —                                           | 39.7                  | 1.52                               | 26.6                                 | 6037.5         | 1173.0       | 0746     |
|          | 23                | —                          | .352                                        | 65.5                  | 1.43                               | 25.0                                 | 6039.2         | 1174.7       | 0930     |
|          | -32               | —                          | .346                                        | 69.0                  | 1.38                               | 24.2                                 | 6043.2         | 1178.7       | 1330     |
|          | 52                | —                          | .285                                        | 67.6                  | 1.51                               | 26.4                                 | 6047.2         | 1182.7       | 1730     |
| 11-13-86 | 23                | —                          | .350                                        | 66.3                  | 1.40                               | 24.5                                 |                | 1185.2       | 2000     |
| 11-14-86 | 23                | 6.1                        | —                                           | 40.4                  | 1.50                               | 26.3                                 | 6057.5         | 1199.0       | 0745     |
|          | 23                | —                          | .349                                        | 66.8                  | 1.42                               | 24.9                                 | 6059.2         | 1194.7       | 0930     |
|          | -32               | —                          | .344                                        | 69.2                  | 1.43                               | 25.0                                 | 6063.0         | 1198.5       | 1315     |
|          | 52                | —                          | .275                                        | 67.6                  | 1.52                               | 26.6                                 | 6067.4         | 1202.9       | 1740     |
| 11-14-86 | 23                | —                          | .350                                        | 66.9                  |                                    |                                      |                |              |          |
| 11-15-86 | 17                | 7.2                        | —                                           | 38.5                  | 1.50                               | 26.3                                 | 6080.5         |              | 1100     |
| 11-17-86 | 23                | 6.1                        | —                                           |                       | 1.45                               | 25.37                                | 6117.7         | 1253.2       | 0801     |
|          | 23                | —                          | .346                                        | 68.3                  | 1.41                               | 24.7                                 | 6119.4         | 1254.9       | 0955     |
| 11-17-86 | -32               | —                          | .347                                        | 69.6                  | 1.39                               | 24.3                                 | 6123.1         | 1258.6       | 1335     |
| SPEC     | INFO<br>ONLY      | 10 MIN<br>@ 23°C           | .208: -32°<br>.280: 23°<br>.232: 52°<br>MIN | 80°K<br>MAX           | 1.72A<br>MAX<br>@ 17.5V            | 30 WATTS<br>MAX                      | INFO<br>ONLY   | INFO<br>ONLY |          |

PERFORMED BY

APPROVED BY

DATE 11-11-86

**Magnavox**

ELECTRO-OPTICAL SYSTEMS

MM&amp;T

LIFE TEST

DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 015

DRAWING NO. SM-D-5005842

| DATE     | AMB<br>TEMP<br>°C | TIME<br>TO 80°K<br>MINUTES | HEAT<br>LOAD<br>WATTS                       | COLD<br>STATION<br>°K | COOLER<br>INPUT<br>CURRENT<br>AMPS | COOLER<br>POWER<br>WATTS<br>@17.5VDC | ETI<br>READING | CUM<br>HOURS | INITIALS       |
|----------|-------------------|----------------------------|---------------------------------------------|-----------------------|------------------------------------|--------------------------------------|----------------|--------------|----------------|
| 11.4.86  | 23                | —                          | .350                                        | 65.6                  | 1.39                               | 24.3                                 | 5859.3         | 994.8        | 0935 <i>SL</i> |
|          | -32               | —                          | .347                                        | 66.2                  | 1.34                               | 23.5                                 | 5863.3         | 998.8        | 1330 <i>SL</i> |
| 11.4.86  | 52                | —                          | .290                                        | 66.0                  | 1.50                               | 26.3                                 | 5867.3         | 1002.8       | 1735 <i>SL</i> |
| 11.5.86  | 23                | 6.0                        | —                                           | 44.8                  | 1.48                               | 25.9                                 | 5877.6         | 1013.1       | 0749 <i>SL</i> |
|          | 23                | —                          | .353                                        | 65.9                  | 1.39                               | 24.3                                 | 5879.3         | 1014.8       | 0920 <i>SL</i> |
|          | -32               | —                          | .354                                        | 66.8                  | 1.41                               | 24.7                                 | 5883.4         | 1018.9       | 1335 <i>SL</i> |
|          | 52                | —                          | .286                                        | 67.0                  | 1.50                               | 26.3                                 | 5887.5         | 1023.0       | 1745 <i>SL</i> |
| 11.5.86  | 23                | —                          | .350                                        | 66.6                  | 1.45                               | 25.4                                 |                | 1025.3       | 2000 <i>SL</i> |
| 11.6.86  | 23                | 6.0                        | —                                           | 39.8                  | 1.49                               | 26.1                                 | 5897.5         | 1033.0       | 0748 <i>SL</i> |
|          | 23                | —                          | .352                                        | 65.6                  | 1.42                               | 24.9                                 | 5899.7         | 1035.2       | 0955 <i>SL</i> |
|          | -32               | —                          | .347                                        | 66.8                  | 1.43                               | 25.0                                 | 5903.2         | 1038.7       | 1325 <i>SL</i> |
| 11.6.86  | 52                | —                          | .286                                        | 66.4                  | 1.51                               | 26.4                                 | 5907.5         | 1043.0       | 1740 <i>SL</i> |
| 11.7.86  | 23                | 6.0                        | —                                           | 39.7                  | 1.53                               | 26.8                                 | 5917.5         | 1053.0       | 0748 <i>SL</i> |
|          | 23                | —                          | .351                                        | 65.4                  | 1.42                               | 24.9                                 | 5919.2         | 1054.7       | 0930 <i>SL</i> |
|          | -32               | —                          | .346                                        | 67.2                  | 1.43                               | 25.0                                 | 5923.0         | 1058.5       | 1315 <i>SL</i> |
| 11.7.86  | 23                | —                          | .350                                        | 67.5                  | 1.45                               | 25.4                                 |                | 1065.3       | 2000 <i>SL</i> |
| 11.10.86 | 23                | 6.0                        | —                                           | 39.9                  | 1.53                               | 26.8                                 | 5977.5         | 1113.0       | 0746 <i>SL</i> |
|          | 23                | —                          | .353                                        | 66.5                  | 1.42                               | 24.8                                 | 5979.2         | 1114.7       | 0930 <i>SL</i> |
|          | -32               | —                          | .347                                        | 67.5                  | 1.43                               | 25.0                                 | 5983.2         | 1118.7       | 1330 <i>SL</i> |
| 11.10.86 | 52                | —                          | .286                                        | 66.3                  | 1.54                               | 27.0                                 | 5987.6         | 1123.1       | 1750 <i>SL</i> |
| 11.11.86 | 23                | 6.0                        | —                                           | 39.9                  | 1.53                               | 26.8                                 | 5997.8         | 1133.3       | 0805 <i>SL</i> |
| 11.11.86 | 23                | —                          | .345                                        | 66.5                  | 1.43                               | 25.0                                 | 5999.1         | 1134.6       | 0920 <i>SL</i> |
| SPEC     | INFO<br>ONLY      | 10 MIN<br>@ 23°C           | .208: -32°<br>.280: 23°<br>.232: 52°<br>MIN | 80°K<br>MAX           | 1.72A<br>MAX<br>@ 17.5V            | 30 WATTS<br>MAX                      | INFO<br>ONLY   | INFO<br>ONLY |                |

PERFORMED BY *Francis L. Remy*APPROVED BY *[Signature]*DATE 11/11/86

**Magnavox**

ELECTRO-OPTICAL SYSTEMS

MM&amp;T

LIFE TEST

DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 015

DRAWING NO. SM-D-5005842

| DATE     | AMB<br>TEMP<br>°C | TIME<br>TO 80°K<br>MINUTES | HEAT<br>LOAD<br>WATTS                       | COLD<br>STATION<br>°K | COOLER<br>INPUT<br>CURRENT<br>AMPS | COOLER<br>POWER<br>WATTS<br>@17.5VDC | ETI<br>READING | CUM<br>HOURS | INITIALS |
|----------|-------------------|----------------------------|---------------------------------------------|-----------------------|------------------------------------|--------------------------------------|----------------|--------------|----------|
| 10.28.86 | 23                | -                          | .347                                        | 64.3                  | 1.46                               | 25.6                                 | 5707.3         | 842.8        | 0930     |
|          | -32               | -                          | .347                                        | 64.3                  | 1.37                               | 24.0                                 | 5711.1         | 846.6        | 1315     |
|          | 52                | -                          | .289                                        | 65.8                  | 1.51                               | 26.4                                 | 5715.4         | 850.9        | 1740     |
| 10.29.86 | 23                | 5.8                        | —                                           | 39.7                  | 1.52                               | 26.6                                 | 5725.5         | 861.0        | 0742     |
|          | 23                | -                          | .347                                        | 65.3                  | 1.44                               | 25.2                                 | 5727.3         | 862.8        | 0930     |
|          | -32               | -                          | .349                                        | 65.0                  | 1.38                               | 24.2                                 | 5731.4         | 866.9        | 1335     |
|          | 52                | -                          | .289                                        | 65.1                  | 1.51                               | 26.4                                 | 5735.4         | 870.9        | 1735     |
| 10.29.86 | 23                | -                          | .350                                        | 65.1                  | 1.45                               | 25.4                                 |                | 873.3        | 2000     |
| 10.30.86 | 23                | 5.7                        | —                                           | 39.2                  | 1.52                               | 26.6                                 | 5745.5         | 881.0        | 0742     |
|          | 23                | -                          | .350                                        | 65.1                  | 1.43                               | 25.0                                 | 5747.5         | 883.0        | 0945     |
|          | -32               | -                          | .348                                        | 65.2                  | 1.41                               | 24.7                                 | 5751.2         | 886.7        | 1330     |
|          | 52                | -                          | .282                                        | 66.3                  | 1.51                               | 26.1                                 | 5755.3         | 890.8        | 1730     |
| 10.30.86 | 23                | -                          | .350                                        | 67.6                  | 1.45                               | 25.4                                 |                | 893.3        | 2000     |
| 10.31.86 | 23                | 5.8                        | —                                           | 43.7                  | 1.52                               | 26.6                                 | 5765.4         | 900.9        | 0741     |
|          | 23                | -                          | .350                                        | 65.8                  | 1.44                               | 25.2                                 | 5767.3         | 902.8        | 0930     |
|          | -32               | -                          | .347                                        | 66.4                  | 1.38                               | 24.2                                 | 5771.1         | 906.6        | 1320     |
|          | 52                | -                          | .286                                        | 66.3                  | 1.51                               | 26.4                                 | 5775.4         | 910.9        | 1740     |
| 11.3.86  | 23                | -                          | —                                           | 37.5                  | 1.54                               | 27.0                                 | 5837.4         | 972.9        | 0739     |
|          | 23                | -                          | .355                                        | 66.5                  | 1.46                               | 25.6                                 | 5839.2         | 974.7        | 0930     |
|          | -32               | -                          | .346                                        | 66.3                  | 1.39                               | 24.3                                 | 5843.0         | 978.5        | 1315     |
| 11.3.86  | 52                | -                          | .295                                        | 66.1                  | 1.51                               | 26.4                                 | 5847.3         | 982.8        | 1730     |
| 11.4.86  | 23                | 6.0                        | —                                           | 40.1                  | 1.45                               | 25.4                                 | 5857.6         | 993.1        | 0749     |
| SPEC     | INFO<br>ONLY      | 10 MIN<br>@ 23°C           | .208: -32°<br>.280: 23°<br>.232: 52°<br>MIN | 80°K<br>MAX           | 1.72A<br>MAX<br>@ 17.5V            | 30 WATTS<br>MAX                      | INFO<br>ONLY   | INFO<br>ONLY |          |

PERFORMED BY R. L. L. L. L.APPROVED BY R. L. L. L. L.DATE 11.4.86

# Magnavox

ELECTRO-OPTICAL SYSTEMS

MM&T  
LIFE TEST  
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 05

DRAWING NO. SM-D-5005842

| DATE     | AMB<br>TEMP<br>°C | TIME<br>TO 80°K<br>MINUTES | HEAT<br>LOAD<br>WATTS                       | COLD<br>STATION<br>°K | COOLER<br>INPUT<br>CURRENT<br>AMPS | COOLER<br>POWER<br>WATTS<br>@17.5VDC | ETI<br>READING | CUM<br>HOURS | INITIALS |
|----------|-------------------|----------------------------|---------------------------------------------|-----------------------|------------------------------------|--------------------------------------|----------------|--------------|----------|
| 10-21-86 | -32               | —                          | .350                                        | 65.3                  | 1.34                               | 23.5                                 | 5570.2         | 705.4        | 1725     |
|          | 52                | —                          | .290                                        | 65.3                  | 1.50                               | 26.3                                 | 5574.3         | 708.8        | 1725     |
| 10-22-86 | 23                | 5.9                        | —                                           | 39.3                  | 1.54                               | 27.0                                 | 5584.4         | 719.9        | 0737     |
|          | 23                | —                          | .350                                        | 65.0                  | 1.44                               | 25.2                                 | 5586.2         | 721.5        | 1725     |
|          | -32               | —                          | .350                                        | 64.3                  | 1.36                               | 23.8                                 | 5590.2         | 725.7        | 1725     |
|          | 52                | —                          | .284                                        | 66.2                  | 1.50                               | 26.3                                 | 5594.2         | 729.7        | 1725     |
| 10-22-86 | 23                | —                          | .350                                        | 65.2                  | 1.45                               | 25.4                                 |                | 732.3        | 2000     |
| 10-22-86 | 23                | 5.7                        | —                                           | 39.4                  | 1.54                               | 27.0                                 | 5604.4         | 739.9        | 0737     |
|          | 23                | —                          | .352                                        | 64.5                  | 1.44                               | 25.2                                 | 5606.3         | 741.8        | 0935     |
|          | -32               | —                          | .351                                        | 64.7                  | 1.35                               | 23.6                                 | 5610.3         | 745.8        | 1335     |
|          | 52                | —                          | .289                                        | 66.1                  | 1.51                               | 26.4                                 | 5614.3         | 749.8        | 1735     |
| 10-24-86 | 23                | 5.9                        | —                                           | 39.4                  | 1.54                               | 27.0                                 | 5624.4         | 759.9        | 0737     |
|          | 23                | —                          | .349                                        | 64.3                  | 1.46                               | 25.6                                 | 5626.3         | 761.8        | 0935     |
|          | -32               | —                          | .351                                        | 64.8                  | 1.36                               | 23.8                                 | 5630.4         | 765.9        | 1335     |
|          | 52                | —                          | .286                                        | 65.9                  | 1.51                               | 26.4                                 | 5635.1         | 770.6        | 1820     |
| 10-24-86 | 23                | —                          | .350                                        | 66.9                  | 1.45                               | 25.4                                 |                | 772.3        | 2000     |
| 10-27-86 | 23                | —                          | .350                                        | 64.3                  | 1.46                               | 25.6                                 | 5685.8         | 821.3        | 0800     |
|          | 23                | —                          | .350                                        | 64.6                  | 1.46                               | 25.6                                 | 5687.3         | 822.8        | 0930     |
|          | -32               | —                          | .345                                        | 64.6                  | 1.41                               | 24.7                                 | 5691.3         | 826.8        | 1330     |
|          | 52                | —                          | .283                                        | 66.5                  | 1.50                               | 26.3                                 | 5695.4         | 830.9        | 1735     |
| 10-27-86 | 23                | —                          | .350                                        | 65.9                  | 1.45                               | 25.4                                 |                | 833.3        | 2000     |
| 10-28-86 | 23                | 5.9                        | —                                           | 39.3                  | 1.52                               | 26.6                                 | 5705.4         | 840.9        | 0733     |
| SPEC     | INFO<br>ONLY      | 10 MIN<br>@ 23°C           | .208: -32°<br>.280: 23°<br>.232: 52°<br>MIN | 80°K<br>MAX           | 1.72A<br>MAX<br>@ 17.5V            | 30 WATTS<br>MAX                      | INFO<br>ONLY   | INFO<br>ONLY |          |

PERFORMED BY

APPROVED BY

DATE

10/28/86

**Magnavox**

ELECTRO-OPTICAL SYSTEMS

MM&amp;T

LIFE TEST

DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 015

DRAWING NO. SM-D-5005842

| DATE       | AMB<br>TEMP<br>°C                                                                                        | TIME<br>TO 80°K<br>MINUTES | HEAT<br>LOAD<br>WATTS                       | COLD<br>STATION<br>°K | COOLER<br>INPUT<br>CURRENT<br>AMPS | COOLER<br>POWER<br>WATTS<br>@17.5VDC | ETI<br>READING | CUM<br>HOURS | INITIALS       |
|------------|----------------------------------------------------------------------------------------------------------|----------------------------|---------------------------------------------|-----------------------|------------------------------------|--------------------------------------|----------------|--------------|----------------|
| 10.15.86   | -32                                                                                                      | —                          | .350                                        | 64.8                  | 1.37                               | 24.0                                 | 5466.5         | 602.0        | 1315 <i>SA</i> |
| 10.15.86   | 52                                                                                                       | —                          | .287                                        | 65.6                  | 1.50                               | 26.3                                 | 5470.9         | 606.1        | 1740 <i>SA</i> |
| 10.15.86   | 23                                                                                                       | —                          | .350                                        | 65.5                  | 1.45                               | 25.4                                 |                | 2000         |                |
| 10.16.86   | 23                                                                                                       | 5.8                        | —                                           | 39.4                  | 1.52                               | 26.6                                 | 5480.9         | 616.4        | 0740 <i>SA</i> |
|            | 23                                                                                                       | —                          | .347                                        | 64.2                  | 1.43                               | 25.0                                 | 5482.4         | 617.9        | 0910 <i>SA</i> |
|            | -32                                                                                                      | —                          | .351                                        | 64.6                  | 1.35                               | 23.6                                 | 5486.6         | 622.1        | 1320 <i>SA</i> |
|            | 52                                                                                                       | —                          | .290                                        | 65.3                  | 1.50                               | 26.3                                 | 5490.9         | 626.4        | 1740 <i>SA</i> |
| 10.16.86   | 23                                                                                                       |                            | .350                                        | 65.0                  | 1.45                               | 25.4                                 |                | 2000         |                |
| 10.17.86   | 23                                                                                                       | 5.8                        | —                                           | 39.0                  | 1.52                               | 26.6                                 | 5500.9         | 636.4        | 0740 <i>SA</i> |
|            | 23                                                                                                       | —                          | .351                                        | 64.1                  | 1.44                               | 25.2                                 | 5502.9         | 638.4        | 0935 <i>SA</i> |
|            | -32                                                                                                      | —                          | .344                                        | 65.1                  | 1.35                               | 23.6                                 | 5506.5         | 642.0        | 1315 <i>SA</i> |
|            | 52                                                                                                       | —                          | .283                                        | 65.5                  | 1.50                               | 26.3                                 | 5510.7         | 646.2        | 1739 <i>SA</i> |
| 10.20.86   | 23                                                                                                       | 5.8                        | —                                           | 39.0                  | 1.52                               | 26.6                                 | 5544.5         | 680.0        | 0740 <i>SA</i> |
| * 10.20.86 | Power failure occurred between Fri 10.17 (1130) and Monday 10.20 (0700). System reset at 0740. <i>SA</i> |                            |                                             |                       |                                    |                                      |                |              |                |
| 10.20.86   | 23                                                                                                       | —                          | .349                                        | 64.3                  | 1.45                               | 25.4                                 | 5546.2         | 681.7        | 0925 <i>SA</i> |
|            | -32                                                                                                      | —                          | .348                                        | 65.3                  | 1.35                               | 23.6                                 | 5550.2         | 685.7        | 1325 <i>SA</i> |
|            | 52                                                                                                       | —                          | .284                                        | 66.3                  | 1.50                               | 26.3                                 | 5554.3         | 689.8        | 1730 <i>SA</i> |
| 10.20.86   | 23                                                                                                       | —                          | .350                                        | 65.1                  | 1.4                                | 24.5                                 |                | 2000         |                |
| 10.21.86   | 23                                                                                                       | 5.8                        | —                                           | 39.1                  | 1.52                               | 26.6                                 | 5564.4         | 699.9        | 0740 <i>SA</i> |
| 10.21.86   | 23                                                                                                       | —                          | .345                                        | 65.4                  | 1.45                               | 25.0                                 | 5566.4         | 701.9        | 0910 <i>SA</i> |
| SPEC       | INFO ONLY                                                                                                | 10 MIN @ 23°C              | .208: -32°<br>.280: 23°<br>.232: 52°<br>MIN | 80°K MAX              | 1.72A MAX @ 17.5V                  | 30 WATTS MAX                         | INFO ONLY      | INFO ONLY    |                |

PERFORMED BY *[Signature]*APPROVED BY *[Signature]*DATE 10.21.86

**Magnavox**

ELECTRO-OPTICAL SYSTEMS

MM&amp;T

LIFE TEST

DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 015

DRAWING NO. SM-D-5005842

| DATE     | AMB<br>TEMP<br>°C | TIME<br>TO 80°K<br>MINUTES | HEAT<br>LOAD<br>WATTS                       | COLD<br>STATION<br>°K | COOLER<br>INPUT<br>CURRENT<br>AMPS | COOLER<br>POWER<br>WATTS<br>@17.5VDC | ETI<br>READING | CUM<br>HOURS | INITIALS |
|----------|-------------------|----------------------------|---------------------------------------------|-----------------------|------------------------------------|--------------------------------------|----------------|--------------|----------|
| 10.8.86  | -32               | —                          | .347                                        | 65.3                  | 1.34                               | 23.5                                 | 5326.5         | 462.0        | 1315 JAL |
|          | -52               | —                          | .285                                        | 66.5                  | 1.48                               | 25.9                                 | 5330.8         | 466.3        | 1730 JAL |
|          | 23                | —                          | .350                                        | 65.0                  | 1.4                                | 24.5                                 |                | 468.8        | 2000 JAL |
| 10.9.86  | 23                | 5.8                        | —                                           | 39.6                  | 1.5                                | 26.3                                 | 5340.8         | 476.3        | 0740 JAL |
|          | 23                | —                          | .352                                        | 64.8                  | 1.42                               | 24.9                                 | 5343.5         | 479.0        | 1015 JAL |
|          | -32               | —                          | .352                                        | 64.8                  | 1.35                               | 23.6                                 | 5346.7         | 482.2        | 1320 JAL |
|          | -52               | —                          | .291                                        | 65.6                  | 1.48                               | 25.9                                 | 5350.7         | 486.2        | 1725 JAL |
| 10.10.86 | 23                | 5.8                        | —                                           | 39.4                  | 1.5                                | 26.3                                 | 5360.8         | 496.3        | 0740 JAL |
|          | 23                | —                          | .353                                        | 64.3                  | 1.42                               | 24.9                                 | 5362.7         | 498.2        | 0925 JAL |
|          | -32               | —                          | .347                                        | 64.6                  | 1.36                               | 23.8                                 | 5366.8         | 502.3        | 1320 JAL |
|          | -52               | —                          | .291                                        | 65.6                  | 1.48                               | 25.9                                 | 5370.8         | 506.3        | 1730 JAL |
| 10.13.86 | 23                | 5.8                        | —                                           | 39.4                  | 1.51                               | 26.1                                 | 5420.8         | 556.3        | 0740 JAL |
|          | 23                | —                          | .351                                        | 64.0                  | 1.44                               | 25.2                                 | 5422.4         | 557.9        | 0905 JAL |
|          | -32               | —                          | .344                                        | 64.6                  | 1.36                               | 23.8                                 | 5426.5         | 562.0        | 1310 JAL |
|          | 38                | —                          | .343                                        | 68.2                  | 1.47                               | 25.6                                 | 5431.3         | 566.8        | 1803 JAL |
| 10.14.86 | 23                | 5.8                        | —                                           | 39.5                  | 1.52                               | 26.6                                 | 5440.8         | 576.3        | 0730 JAL |
|          | 23                | —                          | .349                                        | 64.5                  | 1.44                               | 25.2                                 | 5442.3         | 577.8        | 0905 JAL |
|          | -32               | —                          | .344                                        | 64.6                  | 1.35                               | 23.6                                 | 5447.9         | 583.4        | 1330 JAL |
|          | -52               | —                          | .290                                        | 65.4                  | 1.50                               | 26.3                                 | 5450.7         | 586.2        | 1725 JAL |
|          | 23                | —                          | .350                                        | 64.8                  | 1.4                                | 24.5                                 |                | 588.8        | 2000 JAL |
| 10.15.86 | 23                | 5.8                        | —                                           | 39.1                  | 1.54                               | 27.0                                 | 5460.8         | 596.3        | 0730 JAL |
| 10.15.86 | 23                | —                          | .351                                        | 64.1                  | 1.46                               | 25.6                                 | 5462.9         | 598.4        | 0935 JAL |
| SPEC     | INFO<br>ONLY      | 10 MIN<br>@ 23°C           | .208: -32°<br>.280: 23°<br>.232: 52°<br>MIN | 80°K<br>MAX           | 1.72A<br>MAX<br>@ 17.5V            | 30 WATTS<br>MAX                      | INFO<br>ONLY   | INFO<br>ONLY |          |

PERFORMED BY Quinn V. LukersmithAPPROVED BY [Signature]DATE 10/15/86

**Magnavox**

ELECTRO-OPTICAL SYSTEMS

MM&amp;T

LIFE TEST

DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

DRAWING NO. SM-D-5005842

SERIAL NO. 015

| DATE    | AMB<br>TEMP<br>°C | TIME<br>TO 80°K<br>MINUTES | HEAT<br>LOAD<br>WATTS                       | COLD<br>STATION<br>°K | COOLER<br>INPUT<br>CURRENT<br>AMPS | COOLER<br>POWER<br>WATTS<br>@17.5VDC | ETI<br>READING | CUM<br>HOURS | INITIALS |
|---------|-------------------|----------------------------|---------------------------------------------|-----------------------|------------------------------------|--------------------------------------|----------------|--------------|----------|
| 10.1.86 | 23                | -                          | .350                                        | 64.5                  | 1.4                                | 24.5                                 |                | 328.7        | 2000     |
| 10.2.86 | 23                | 5.7                        | -                                           | 39.1                  | 1.49                               | 26.1                                 | 5200.9         | 336.4        | 0740     |
|         | 23                | -                          | .352                                        | 64.7                  | 1.39                               | 24.3                                 | 5201.7         | 337.2        | 0830     |
|         | -32               | -                          | .349                                        | 64.6                  | 1.32                               | 23.1                                 | 5206.5         | 342.0        | 1315     |
|         | 52                | -                          | .289                                        | 65.4                  | 1.42                               | 24.9                                 | 5210.9         | 346.4        | 1735     |
| 10.2.86 | 23                | -                          | .350                                        | 64.1                  | 1.4                                | 24.5                                 |                | 348.8        | 2000     |
| 10.3.86 | 23                | 5.7                        | -                                           | 39.2                  | 1.49                               | 26.1                                 | 5220.9         | 356.4        | 0740     |
|         | 23                | -                          | .351                                        | 64.3                  | 1.41                               | 24.7                                 | 5222.4         | 357.9        | 0905     |
|         | -32               | -                          | .352                                        | 64.9                  | 1.33                               | 23.3                                 | 5226.5         | 362.0        | 1315     |
|         | 52                | -                          | .291                                        | 65.8                  | 1.46                               | 25.6                                 | 5230.9         | 366.4        | 1735     |
| 10.6.86 | 23                | 5.7                        | -                                           | 39.6                  | 1.48                               | 25.9                                 | 5280.9         | 416.4        | 0740     |
|         | 23                | -                          | .352                                        | 64.1                  | 1.40                               | 24.5                                 | 5282.5         | 418.0        | 0915     |
|         | -32               | -                          | .344                                        | 64.9                  | 1.33                               | 23.3                                 | 5286.5         | 422.0        |          |
|         | 52                | -                          | .285                                        | 65.6                  | 1.46                               | 25.6                                 | 5290.8         | 426.3        | 1735     |
| 10.6.86 | 23                | -                          | .350                                        | 64.6                  | 1.40                               | 24.5                                 |                | 428.8        | 2000     |
| 10.7.86 | 23                | 5.8                        | -                                           | 39.3                  | 1.48                               | 25.9                                 | 5300.8         | 436.3        | 0740     |
|         | 23                | -                          | .348                                        | 65.1                  | 1.40                               | 24.5                                 | 5303.2         | 438.7        | 0955     |
|         | -32               | -                          | .347                                        | 65.3                  | 1.33                               | 23.3                                 | 5306.5         | 442.0        | 1315     |
|         | 52                | -                          | .286                                        | 65.6                  | 1.47                               | 25.7                                 | 5310.8         | 446.3        | 1735     |
| 10.7.86 | 23                | -                          | .350                                        | 65.0                  | 1.40                               | 24.5                                 |                | 448.8        | 2000     |
| 10.8.86 | 23                | 5.8                        | -                                           | 39.5                  | 1.49                               | 26.1                                 | 5320.8         | 456.3        | 0740     |
| 10.8.86 | 23                | -                          | .348                                        | 65.0                  | 1.42                               | 24.9                                 | 5322.4         | 457.9        | 0915     |
| SPEC    | INFO<br>ONLY      | 10 MIN<br>@ 23°C           | .208: -32°<br>.280: 23°<br>.232: 52°<br>MIN | 80°K<br>MAX           | 1.72A<br>MAX<br>@ 17.5V            | 30 WATTS<br>MAX                      | INFO<br>ONLY   | INFO<br>ONLY |          |

PERFORMED BY Dani V. LukampAPPROVED BY [Signature]DATE 10-8-86

**Magnavox**

ELECTRO-OPTICAL SYSTEMS

MM&T  
LIFE TEST  
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 015

DRAWING NO. SM-D-5005842

| DATE    | AMB<br>TEMP<br>°C | TIME<br>TO 80°K<br>MINUTES | HEAT<br>LOAD<br>WATTS                       | COLD<br>STATION<br>°K | COOLER<br>INPUT<br>CURRENT<br>AMPS | COOLER<br>POWER<br>WATTS<br>@17.5VDC | ETI<br>READING | CUM<br>HOURS | INITIALS |
|---------|-------------------|----------------------------|---------------------------------------------|-----------------------|------------------------------------|--------------------------------------|----------------|--------------|----------|
| 9.25.86 | 23                | —                          | .350                                        | 64.8                  | 1.4                                | 24.5                                 |                | 208.8        | 2600     |
| 9.26.86 | 23                | 5.9                        | —                                           | 41.6                  | 1.48                               | 25.9                                 | 5080.9         | 216.4        | 0740     |
|         | 23                | —                          | .347                                        | 66.8                  | 1.35                               | 23.6                                 | 5081.6         | 217.1        | 0820     |
|         | 23                | —                          | .348                                        | 64.7                  | 1.37                               | 25.3                                 | 5083.8         | 219.3        | 1030     |
|         | -37               | —                          | .348                                        | 65.0                  | 1.30                               | 22.8                                 | 5086.6         | 222.1        | 1320     |
|         | -32               | —                          | .348                                        | 65.0                  | 1.32                               | 23.1                                 |                |              |          |
|         | 52                | —                          | .288                                        | 65.1                  | 1.50                               | 26.3                                 | 5090.9         | 226.4        | 1730     |
| 9.29.86 | 23                | 5.8                        | —                                           | 40.5                  | 1.44                               | 25.2                                 | 5140.9         | 276.4        | 0740     |
|         | 23                | —                          | .350                                        | 64.0                  | 1.39                               | 24.3                                 | 5142.3         | 277.8        | 0900     |
|         | 23                | —                          | .350                                        | 64.3                  | 1.39                               | 24.3                                 | 5143.8         | 279.3        | 1030     |
|         | -32               | —                          | .351                                        | 63.8                  | 1.33                               | 23.3                                 | 5146.6         | 282.1        | 1320     |
|         | 52                | —                          | .290                                        | 64.5                  | 1.49                               | 26.1                                 | 5150.9         | 286.4        | 1735     |
| 9.29.86 | 23                | —                          | .350                                        | 64.1                  | 1.4                                | 24.5                                 |                | 288.8        | 2600     |
| 9.30.86 | 23                | 5.8                        | —                                           | 39.2                  | 1.51                               | 26.4                                 | 5160.9         | 296.4        | 0740     |
|         | 23                | —                          | .347                                        | 64.1                  | 1.39                               | 24.3                                 | 5162.2         | 297.7        | 0855     |
|         | -32               | —                          | .349                                        | 63.8                  | 1.34                               | 23.5                                 | 5166.4         | 301.9        | 1310     |
| 9.30.86 | 52                | —                          | .289                                        | 64.8                  | 1.48                               | 25.9                                 | 5170.8         | 306.3        | 1730     |
| 10.1.86 | 23                | 5.7                        | —                                           | 39.1                  | 1.49                               | 26.1                                 | 5180.9         | 316.4        | 0740     |
|         | 23                | —                          | .351                                        | 64.1                  | 1.42                               | 24.9                                 | 5182.1         | 317.6        | 0845     |
|         | 23                | —                          | .351                                        | 64.0                  | 1.40                               | 24.5                                 | 5183.5         | 319.0        | 1015     |
|         | -32               | —                          | .350                                        | 64.2                  | 1.33                               | 23.3                                 | 5186.5         | 322.0        | 1315     |
| 10.1.86 | 52                | —                          | .29                                         | 65.0                  | 1.47                               | 25.7                                 | 5190.9         | 326.3        | 1737     |
| SPEC    | INFO<br>ONLY      | 10 MIN<br>@ 23°C           | .208: -32°<br>.280: 23°<br>.232: 52°<br>MIN | 80°K<br>MAX           | 1.72A<br>MAX<br>@ 17.5V            | 30 WATTS<br>MAX                      | INFO<br>ONLY   | INFO<br>ONLY |          |

PERFORMED BY

APPROVED BY

DATE 10-3-86

**Magnavox**

ELECTRO-OPTICAL SYSTEMS

MM&amp;T

LIFE TEST

DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 015

DRAWING NO. SM-D-5005842

| DATE    | AMB<br>TEMP<br>°C | TIME<br>TO 80°K<br>MINUTES | HEAT<br>LOAD<br>WATTS                       | COLD<br>STATION<br>°K | COOLER<br>INPUT<br>CURRENT<br>AMPS | COOLER<br>POWER<br>WATTS<br>@17.5VDC | ETI<br>READING | CUM<br>HOURS | INITIALS |
|---------|-------------------|----------------------------|---------------------------------------------|-----------------------|------------------------------------|--------------------------------------|----------------|--------------|----------|
| 9.19.86 | 52                | —                          | .290                                        | 66.2                  | 1.42                               | 24.9                                 | 4950.7         | 86.2         | 1725 JAL |
| 9.19.86 | 23                | —                          | .350                                        | 65.9                  | 1.35                               | 23.6                                 |                | 88.8         | 2000 JAL |
| 9.22.86 | 23                | 5.8                        | —                                           | 41.1                  | 1.44                               | 25.2                                 | 5001.0         | 136.5        | 0740 JAL |
| 9.22.86 | 23                | —                          | .349                                        | 64.2                  | 1.36                               | 23.8                                 | 5002.2         | 137.7        | 0900 JAL |
| 9.22.86 | -32               | —                          | .347                                        | 67.4                  | 1.35                               | 23.6                                 | 5006.7         | 142.2        | 1325 JAL |
| 9.22.86 | 23                | —                          | .350                                        | 66.8                  | 1.30                               | 22.8                                 |                | 148.8        | 2000 JAL |
| 9.23.86 | 23                | 5.8                        | —                                           | 41.5                  | 1.44                               | 25.2                                 | 5021.0         | 156.5        | 0740 JAL |
|         | 23                | —                          | .350                                        | 64.6                  | 1.36                               | 23.8                                 | 5021.8         | 157.3        | 0830 JAL |
|         | -32               | —                          | .345                                        | 64.3                  | 1.32                               | 23.1                                 | 5026.7         | 162.2        | 1320 JAL |
|         | 52                | —                          | .285                                        | 66.3                  | 1.43                               | 25.0                                 | 5030.9         | 166.4        | 1735 JAL |
| 9.23.86 | 23                | —                          | .350                                        | 66.6                  | 1.35                               | 23.6                                 |                | 168.8        | 2000 JAL |
| 9.24.86 | 23                | 5.3                        | —                                           | 40.6                  | 1.49                               | 26.0                                 | 5041.0         | 176.5        | 0740 JAL |
|         | 23                | —                          | .345                                        | 64.6                  | 1.36                               | 23.8                                 | 5042.3         | 177.8        | 0900 JAL |
|         | 23                | —                          | .346                                        | 65.4                  | 1.35                               | 23.6                                 | 5044.0         | 179.5        | 1035 JAL |
|         | -32               | —                          | .345                                        | 64.2                  | 1.34                               | 23.5                                 | 5046.5         | 182.0        | 1315 JAL |
|         | 52                | —                          | .285                                        | 65.5                  | 1.45                               | 25.4                                 | 5050.9         | 186.4        | 1735 JAL |
| 9.24.86 | 23                | —                          | .350                                        | 64.6                  | 1.4                                | 24.5                                 |                | 188.8        | 2000 JAL |
| 9.25.86 | 23                | 5.8                        | —                                           | 40.9                  | 1.44                               | 25.2                                 | 5060.9         | 196.4        | 0740 JAL |
|         | 23                | —                          | .346                                        | 64.9                  | 1.35                               | 23.6                                 | 5062.5         | 198.0        | 0910 JAL |
|         | -32               | —                          | .346                                        | 66.7                  | 1.33                               | 23.3                                 | 5066.8         | 202.3        | 1335 JAL |
| 9.25.86 | 52                | —                          | .289                                        | 65.4                  | 1.45                               | 25.4                                 | 5070.8         | 206.3        | 1730 JAL |
| SPEC    | INFO<br>ONLY      | 10 MIN<br>@ 23°C           | .208: -32°<br>.280: 23°<br>.232: 52°<br>MIN | 80°K<br>MAX           | 1.72A<br>MAX<br>@ 17.5V            | 30 WATTS<br>MAX                      | INFO<br>ONLY   | INFO<br>ONLY |          |

PERFORMED BY Diane V. LukanyAPPROVED BY [Signature]DATE 9/26/86

**Magnavox**

ELECTRO-OPTICAL SYSTEMS

MM&amp;T

LIFE TEST

DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 015

DRAWING NO. SM-D-5005842

| DATE    | AMB<br>TEMP<br>°C | TIME<br>TO 80°K<br>MINUTES | HEAT<br>LOAD<br>WATTS                       | COLD<br>STATION<br>°K | COOLER<br>INPUT<br>CURRENT<br>AMPS | COOLER<br>POWER<br>WATTS<br>@17.5VDC | ETI<br>READING | CUM<br>HOURS | INITIALS              |
|---------|-------------------|----------------------------|---------------------------------------------|-----------------------|------------------------------------|--------------------------------------|----------------|--------------|-----------------------|
| 9/15/86 | 23                | 5.7                        | —                                           | —                     | —                                  | —                                    | 4864.5         |              | START OF<br>LIFE TEST |
|         | 23                | —                          | .350                                        | 63.5                  | 1.3                                | 22.8                                 | 4865.3         | .8           | SL                    |
|         | 23                | —                          | .350                                        | 64.1                  | 1.3                                | 22.8                                 | 4866.1         | 2.1          | SL                    |
|         | -31               | —                          | .347                                        | 63.0                  | 1.3                                | 22.8                                 | 4870.3         | 5.7          | SL                    |
| 9/15/86 | 52                | —                          | .291                                        | 64.6                  | 1.4                                | 24.5                                 | 4874.1         | 9.6          | SL                    |
| 9/16/86 | 23                | 5.7                        | —                                           | —                     | —                                  | —                                    | 4884.3         | 19.8         | SL                    |
|         | 23                | —                          | .353                                        | 63.6                  | 1.34                               | 23.5                                 | 4884.8         | 20.3         | SL                    |
|         | -32               | —                          | .346                                        | 61.7                  | 1.29                               | 22.6                                 | 4890.0         | 25.5         | SL                    |
| 9/16/86 | 52                | —                          | .290                                        | 66.0                  | 1.40                               | 24.5                                 | 4894.0         | 29.5         | SL                    |
| 9/17/86 | 23                | 5.8                        | —                                           | 40.4                  | —                                  | —                                    | 4904.4         | 39.9         | SL                    |
|         | 23                | —                          | .347                                        | 63.5                  | 1.32                               | 23.1                                 | 4905.1         | 40.6         | SL                    |
|         | -32               | —                          | .343                                        | 63.8                  | 1.29                               | 22.6                                 | 4910.0         | 45.5         | 13.35 SL              |
| 9/17/86 | 52                | —                          | .290                                        | 63.1                  | 1.45                               | 25.4                                 | 4914.1         | 49.6         | 1740 SL               |
| 9/17/86 | 23                | —                          | .350                                        | 63.3                  | 1.35                               | 23.6                                 |                | 51.9         | 2000                  |
| 9/18/86 | 23                | 5.8                        | —                                           | 41.1                  | 1.42                               | 24.9                                 | 4924.4         | 59.9         | 0740 SL               |
|         | 23                | —                          | .351                                        | 62.4                  | 1.35                               | 23.6                                 | 4925.9         | 61.4         | 0910 SL               |
|         | -32               | —                          | .342                                        | 61.7                  | 1.34                               | 23.5                                 | 4930.1         | 65.6         | 1325 SL               |
|         | 52                | —                          | .289                                        | 63.0                  | 1.45                               | 25.4                                 | 4934.0         | 69.5         | 1720 SL               |
| 9/18/86 | 23                | —                          | .350                                        | 62.8                  | 1.35                               | 23.6                                 |                | 72.2         | 2000                  |
| 9/19/86 | 23                | 5.8                        | —                                           | 40.9                  | 1.44                               | 25.2                                 | 4941.0         | 76.5         | 0740 SL               |
|         | 23                | —                          | .350                                        | 66.0                  | 1.32                               | 23.1                                 | 4942.2         | 77.7         | 0850 SL               |
| 9/19/86 | -32               | —                          | .349                                        | 63.7                  | 1.31                               | 22.9                                 | 4946.7         | 82.2         | 1320 SL               |
| SPEC    | INFO<br>ONLY      | 10 MIN<br>@ 23°C           | .208: -32°<br>.280: 23°<br>.232: 52°<br>MIN | 80°K<br>MAX           | 1.72A<br>MAX<br>@ 17.5V            | 30 WATTS<br>MAX                      | INFO<br>ONLY   | INFO<br>ONLY |                       |

PERFORMED BY  
APPROVED BY

DATE

B-168

## PERFORMANCE TEST

## DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC.  
DRAWING NO. SM-D-5005863/SM-D-5005842

SERIAL NO. C15

| TEST<br>PLAN PARA | PARAMETER                                                                  | MEASURED             | UNITS      | LIMITS |                      |
|-------------------|----------------------------------------------------------------------------|----------------------|------------|--------|----------------------|
|                   |                                                                            |                      |            | MIN    | MAX                  |
| 3.10              | Calibration Check                                                          |                      | -          | Comply |                      |
| 4.1.1             | Inspection to SM-D-5005863/5005842                                         |                      | -          | Comply |                      |
| 4.1.2             | Weight                                                                     | 2.34                 | Lbs        | -      | 2.5                  |
| 4.1.3.1           | Pressurization                                                             | 330                  | PSIG       | Info   | Only                 |
| 4.1.3.2           | Leakage Rate                                                               | $1.8 \times 10^{-1}$ | STP CC/SEC | -      | $2.7 \times 10^{-1}$ |
| 4.2.2             | Test at 23°C Horiz; Turn-on Current                                        | 4.5                  | Amps       | Info   |                      |
| 4.2.2             | Cooldown Time to 100°K                                                     | 5.3                  | Minutes    | -      | 7.5                  |
| 4.2.2             | Cooldown Time to 80°K                                                      | 6.0                  | Minutes    | -      | 10                   |
| 4.2.2             | Minimum Temp                                                               | 39.5                 | °K         | Info   | 80                   |
| 4.2.2.1           | Stabl. Temp. with 0.35 Watt Heat Load                                      | 67.7                 | °K         | -      | 80                   |
| 4.2.2.2           | Temp. after 1/2 Hour Operation                                             | 67.9                 | °K         | -      | 80                   |
| 4.2.2.3           | Cold Finger warm end temp                                                  | 34                   | °C         | Info   | Only                 |
| 4.2.2.4           | Input Volt. 17 VDC Current <u>1.42</u> ADC<br>Power <u>24.14</u>           | 24.1                 | Watts      | -      | 30                   |
| 4.2.2.5           | Stabl. Temp with 0.35 Watt Heat Load                                       | 72.3                 | °K         | -      | 80                   |
| 4.2.2.5           | Cold Finger Warm End Temp                                                  | 34                   | °C         | Info   | Only                 |
| 4.2.2.5           | Input Volts 32 VDC Current <u>0.71</u> ADC<br>F.B. OK Power <u>24.6</u>    | 24.6                 | Watts      | -      | 30                   |
| 4.2.3             | Test at -40°C Horiz; Turn-on Current                                       | 6.25                 | Amps       | Info   |                      |
| 4.2.3.1           | Cooldown Time to 100°K                                                     | 6.6                  | Minutes    | -      | 7.5                  |
| 4.2.3.1           | Cooldown Time to 80°K                                                      | 7.3                  | Minutes    | -      | 10                   |
| 4.2.3.2           | Stabl. Temp with 0.2 Watt Heat Load                                        | 46.7                 | °K         | -      | 80                   |
| 4.2.3.2           | Temp after 1/2 Hour                                                        | 46.8                 | °K         | -      | 80                   |
| 4.2.3.3           | Cold Finger Warm End Temp                                                  | -31                  | °C         | Info   | Only                 |
| 4.2.3.4           | Input Volts 17 VDC Current <u>1.53</u> ADC<br>Stablized Power <u>26.01</u> | 26.0                 | Watts      | -      | 30                   |
| 4.2.3.5           | Temp with 0.2 Watt Head Load                                               | 47.3                 | °K         | -      | 80                   |
| 4.2.3.5           | Cold Finger Warm End Temp                                                  | -31                  | °C         | Info   | Only                 |
| 4.2.3.5           | Input Volts 32 VDC Current <u>0.82</u> ADC<br>F.B. OK Power <u>26.24</u>   | 26.2                 | Watts      | -      | 30                   |
| 4.2.4             | Test at 71°C Horiz; Turn-on Current                                        | 1.10                 | Amps       | Info   |                      |
| 4.2.4.1           | Cooldown Time to 100°K                                                     | 5.9                  | Minutes    | -      | 7.5                  |
| 4.2.4.1           | Cooldown Time to 80°K                                                      | 6.9                  | Minutes    | -      | 10                   |
| 4.2.4.1           | Stabl. Temp. with 0.2 Watt Heat Load                                       | 69.1                 | °K         | -      | 80                   |
| 4.2.4.1           | Temp after 1/2 hour                                                        | 67.2                 | °K         | -      | 80                   |
| 4.2.4.2           | Cold Finger Warm End Temp                                                  | 31                   | °C         | Info   | Only                 |
| 4.2.4.3           | Input Volts 17 VDC Current <u>1.52</u> ADC<br>F.B. OK Power <u>25.84</u>   | 25.9                 | Watts      | -      | 35                   |
| 4.2.4.4           | Stabl. Temp with 0.2 Watt Head Load                                        | 68.2                 | °K         | -      | 80                   |
| 4.2.4.4           | Cold Finger Warm End Temp                                                  | 32                   | °C         | Info   | Only                 |
| 4.2.4.4           | Input Volts 32 VDC Current ADC<br>Power <u>27.5</u>                        | 27.5                 | Watts      | -      | 35                   |

PERFORMED BY: Edna V. Lukin

## PERFORMANCE TEST

## DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC  
DRAWING NO. SM-D-5005863/SM-D-5005842

SERIAL NO. 015

| TEST<br>PLAN PARA | PARAMETER                                                                | MEASURED             | UNITS      | LIMITS |                      |
|-------------------|--------------------------------------------------------------------------|----------------------|------------|--------|----------------------|
|                   |                                                                          |                      |            | MIN    | MAX                  |
| 4.2.5             | Test at 23°C Vertical; Turn-on Current                                   | 1.0                  | Amps       | Info   |                      |
| 4.2.5.1           | Cooldown Time to 100°K                                                   | 5.3                  | Minutes    | -      | 7.5                  |
| 4.2.5.1           | Cooldown Time to 80°K                                                    | 6.1                  | Minutes    | -      | 10                   |
| 4.2.5.1           | Minimum Temp                                                             | 39.7                 | °K         |        | 80                   |
| 4.2.5.2           | Stabl. Temp with 0.35 Watt Heat Load                                     | 43.4                 | °K         | -      | 80                   |
| 4.2.5.3           | Temp After 1/2 Hour With Heat Load                                       | 48.4                 | °K         | Info   | 80                   |
| 4.2.5.4           | Cold Finger Warm End Temp                                                | 34                   | °C         | Info   | Only                 |
| 4.2.5.5           | Input Volts 17 VDC Current <u>1.37</u> ADC<br>E.B.-OK Power <u>23.29</u> | 23.3                 | Watts      | -      | 30                   |
| 4.2.5.6           | Stabl. Temp. with 0.35 Watt Heat Load                                    | 69.4                 | °K         |        | 80                   |
| 4.2.5.6           | Cold Finger Warm End Temp                                                | 34                   | °C         | Info   | Only                 |
| 4.2.5.6           | Input Volt 32 VDC Current <u>1.77</u> ADC<br>Power <u>24.64</u>          | 24.6                 | Watts      | -      | 30                   |
| 4.2.6             | Leakage Rate                                                             | $2.3 \times 10^{-7}$ | STP CC/SEC | -      | $2.7 \times 10^{-7}$ |

PERFORMED BY [Signature]

DATE 7/16/80 23°C

WITNESSED BY [Signature]

Q.A. MAGNAVOX

WITNESSED BY [Signature]

Q.A. CUSTOMER

**Magnavox**

ELECTRO-OPTICAL SYSTEMS

MM&amp;T

LIFE TEST

DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 016

DRAWING NO. SM-D-5005842

| DATE    | AMB<br>TEMP<br>°C | TIME<br>TO 80°K<br>MINUTES | HEAT<br>LOAD<br>WATTS                       | COLD<br>STATION<br>°K | COOLER<br>INPUT<br>CURRENT<br>AMPS | COOLER<br>POWER<br>WATTS<br>@17.5VDC | ETI<br>READING | CUM<br>HOURS | INITIALS |
|---------|-------------------|----------------------------|---------------------------------------------|-----------------------|------------------------------------|--------------------------------------|----------------|--------------|----------|
| 1-5-87  | 23                | —                          | .340                                        | 64.2                  | 1.50                               | 26.3                                 | 6223.9         | 1338.8       | 1050 JH  |
|         | -20               | —                          | .338                                        | 67.9                  | 1.44                               | 25.2                                 | 6226.6         | 1341.5       | 1336 JH  |
|         | 52                | —                          | .282                                        | 62.8                  | 1.68                               | 29.4                                 | 6230.6         | 1345.5       | 1730 JH  |
| 1-6-87  | 20                | 5.2                        | —                                           | 38.8                  | 1.54                               | 26.45                                | 6241.3         | 1356.2       | 0800 JH  |
|         | 37                | —                          | .340                                        | 66.8                  | 1.5                                | 26.2                                 | 6242.4         | 1357.3       | 0930 JH  |
|         | -14               | —                          | .336                                        | 65.0                  | 1.41                               | 24.6                                 | 6246.5         | 1361.4       | 1330 JH  |
| 1-7-87  | 20                | 5.1                        | —                                           | 38.7                  | 1.55                               | 27.1                                 | 6261.4         | 1376.3       | 0828 JH  |
|         | 23                | 5.0                        | —                                           | 38.8                  | 1.55                               | 27.1                                 | 6263.6         | 1378.5       | 1257 JH  |
|         | -31               | —                          | .340                                        | 62.3                  | 1.43                               | 25.0                                 | 6266.9         | 1381.8       | 1412 JH  |
| 1-8-87  | 20                | 5.0                        | —                                           | 41.0                  | 1.55                               | 27.1                                 | 6281.4         | 1396.3       | 0755 JH  |
|         | 40                | —                          | .344                                        | 68.1                  | 1.55                               | 27.1                                 | 6293.4         | 1398.3       | 0955 JH  |
|         | 23                | —                          | .342                                        | 65.7                  | 1.46                               | 25.6                                 | 6284.4         | 1399.3       | 1050 JH  |
|         | -32               | —                          | .342                                        | 72.3                  | 1.40                               | 24.5                                 | 6286.9         | 1401.8       | 1325 JH  |
|         | 52                | —                          | .282                                        | 63.4                  | 1.66                               | 29.1                                 | 6291.1         | 1406.0       | 1730 JH  |
|         | 23                | —                          | .342                                        | 62.1                  | 1.5                                | 26.2                                 | —              | —            | 2000     |
| 1-9-87  | 23                | 5.1                        | —                                           | 39.3                  | 1.58                               | 27.6                                 | 6301.6         | 1416.5       | 0909 JH  |
|         | 20                | —                          | .338                                        | 64.0                  | 1.50                               | 26.2                                 | 6302.8         | 1417.7       | 0921 JH  |
| 1-9-87  | -32               | —                          | .340                                        | 38.0                  | 1.00                               | —                                    | 6306.8         | —            | 1320 JH  |
| 1-13-87 | 23                | 5.0                        | —                                           | 38.5                  | 1.64                               | 28.7                                 | 6306.8         | 1417.7       | PH JH    |
|         | 52                | —                          | .289                                        | 62.4                  | 1.64                               | 28.7                                 | 6308.2         | 1419.1       | 1735 JH  |
|         | 20                | —                          | .340                                        | 62.3                  | 1.5                                | 26.25                                | —              | —            | 2000     |
| 1-14-87 | 20                | 5.1                        | —                                           | 39.4                  | 1.55                               | —                                    | 6318.8         | 1429.7       | 0816 JH  |
| SPEC    | INFO<br>ONLY      | 10 MIN<br>@ 23°C           | .208: -32°<br>.280: 23°<br>.232: 52°<br>MIN | 80°K<br>MAX           | 1.72A<br>MAX<br>@ 17.5V            | 30 WATTS<br>MAX                      | INFO<br>ONLY   | INFO<br>ONLY |          |

PERFORMED BY \_\_\_\_\_

APPROVED BY J. J. JesterDATE 1-14-87

# Magnavox

ELECTRO-OPTICAL SYSTEMS

MM&T  
LIFE TEST  
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 016

DRAWING NO. SM-D-5005842

| DATE     | AMB<br>TEMP<br>°C | TIME<br>TO 80°K<br>MINUTES | HEAT<br>LOAD<br>WATTS                       | COLD<br>STATION<br>°K | COOLER<br>INPUT<br>CURRENT<br>AMPS | COOLER<br>POWER<br>WATTS<br>@17.5VDC | ETI<br>READING | CUM<br>HOURS | INITIALS       |
|----------|-------------------|----------------------------|---------------------------------------------|-----------------------|------------------------------------|--------------------------------------|----------------|--------------|----------------|
| 12-18-86 | 52                | —                          | .284                                        | 60.5                  | 1.72                               | 30.1                                 | 5871.5         | 986.8        | 1730 <i>JS</i> |
|          | 23                | —                          | .340                                        | 61.2                  | 1.50                               | 26.2                                 | —              | —            | 2000           |
| 12-14-86 | 23                | 5.0                        | —                                           | 36.2                  | 1.63                               | 28.5                                 | 5981.8         | 997.1        | 0740 <i>DM</i> |
|          | 23                | —                          | .340                                        | 61.5                  | 1.54                               | 26.9                                 | 5983.9         | 999.2        | 0935 <i>DM</i> |
|          | -32               | —                          | .342                                        | 66.9                  | 1.46                               | 25.6                                 | 5887.5         | 1002.8       | 1330 <i>JS</i> |
|          | 52                | —                          | .286                                        | 60.8                  | 1.71                               | 29.9                                 | 5891.5         | 1006.8       | 1730 <i>JS</i> |
|          | 23                | —                          | .340                                        | 61.2                  | 1.5                                | 26.2                                 | —              | —            | 2000           |
| 12-22-86 | 23                | 5.1                        | —                                           | 36.4                  | 1.63                               | 29.0                                 | 5941.8         | 1052.1       | 0740 <i>DM</i> |
|          | 23                | —                          | .342                                        | 61.5                  | 1.54                               | 26.9                                 | 5943.7         | 1059.0       | 0945 <i>DM</i> |
|          | -32               | —                          | .343                                        | 64.3                  | 1.46                               | 25.6                                 | 5942.1         | 1062.4       | 1330 <i>DM</i> |
|          | 23                | —                          | .342                                        | 62.2                  | 1.50                               | 26.2                                 | —              | —            | 2000           |
| 12-23-86 | 23                | —                          | —                                           | 36.7                  | 1.64                               | 28.7                                 | 5981.8         | 1077.1       | 0750 <i>DM</i> |
|          | <del>23</del>     | —                          | .342                                        | 61.2                  | 1.54                               | 26.9                                 | 5983.5         | 1078.8       | 0930 <i>DM</i> |
|          | -32               | —                          | .340                                        | 64.3                  | 1.46                               | 25.6                                 | 5982.3         | 1082.6       | 1330 <i>DM</i> |
|          | 52                | —                          | .283                                        | 60.6                  | 1.71                               | 29.9                                 | 5971.5         | 1086.8       | 1730 <i>JS</i> |
| 12-24-86 | 23                | 5.0                        | —                                           | 36.7                  | 1.64                               | 28.7                                 | 5981.8         | 1097.1       | 0750 <i>DM</i> |
|          | 23                | —                          | .343                                        | 62.1                  | 1.54                               | 26.9                                 | 5983.5         | 1098.4       | 0930 <i>DM</i> |
|          | -32               | —                          | .338                                        | 69.4                  | 1.44                               | 25.2                                 | 5987.5         | 1102.4       | 1330 <i>JS</i> |
| 1-2-87   | 40.1              | —                          | —                                           | 39.2                  | 1.67                               | 29.2                                 | 6161.7         | 1276.6       | 0732 <i>MT</i> |
|          | 49.8              | —                          | .342                                        | 64.6                  | 1.65                               | 28.9                                 | 6163.4         | 1278.3       | 0923 <i>MT</i> |
|          | -21.6             | —                          | .340                                        | 63.6                  | 1.45                               | 25.4                                 | 6167.4         | 1282.3       | 1330 <i>MT</i> |
| 1-5-86   | 20.3              | 5.3                        | —                                           | 37.5                  | 1.65                               | 28.8                                 | 6221.7         | 1336.6       | 0806 <i>DM</i> |
| SPEC     | INFO<br>ONLY      | 10 MIN<br>@ 23°C           | .208: -32°<br>.280: 23°<br>.232: 52°<br>MIN | 80°K<br>MAX           | 1.72A<br>MAX<br>@ 17.5V            | 30 WATTS<br>MAX                      | INFO<br>ONLY   | INFO<br>ONLY |                |

PERFORMED BY \_\_\_\_\_

APPROVED BY *[Signature]*DATE 1-8-87

**Magnavox**

ELECTRO-OPTICAL SYSTEMS

MM&amp;T

LIFE TEST

DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 016

DRAWING NO. SM-D-5005842

| DATE     | AMB<br>TEMP<br>°C                                | TIME<br>TO 80°K<br>MINUTES | HEAT<br>LOAD<br>WATTS                       | COLD<br>STATION<br>°K | COOLER<br>INPUT<br>CURRENT<br>AMPS | COOLER<br>POWER<br>WATTS<br>@17.5VDC | ETI<br>READING | CUM<br>HOURS | INITIALS       |
|----------|--------------------------------------------------|----------------------------|---------------------------------------------|-----------------------|------------------------------------|--------------------------------------|----------------|--------------|----------------|
| 12-12-86 | 12                                               | —                          | .344                                        | 61.7                  |                                    |                                      | 5750.6         | 865.9        | 1100 <i>MM</i> |
|          | TEST STAND SHUT DOWN TO INSTALL INTERLOCK RELAYS |                            |                                             |                       |                                    |                                      |                |              |                |
|          | TEST STAND TURNED ON AT 1630 HRS                 |                            |                                             |                       |                                    |                                      |                |              |                |
| 12-12-86 | 52                                               | —                          | .279                                        | 60.1                  | 1.67                               | 29.2                                 | 5751.6         | 866.9        | 1730 <i>MM</i> |
| 12-15-86 |                                                  |                            |                                             | 41.2                  | 1.62                               |                                      |                |              |                |
|          | 23                                               | —                          | .334                                        | 63.7                  | 1.46                               | 25.6                                 | 5803.9         | 919.2        | 0950 <i>MM</i> |
|          | -32                                              | —                          | .334                                        | 62.9                  | 1.47                               | 25.7                                 | 5807.6         | 922.9        | 1325 <i>MM</i> |
|          | 52                                               | —                          | .275                                        | 60.4                  | 1.71                               | 29.9                                 | 5811.6         | 926.9        | 1735 <i>MM</i> |
|          | 23                                               | —                          | .340                                        | 60.6                  | 1.61                               | 26.4                                 |                |              | 2000 <i>MM</i> |
| 12-16-86 | 23                                               | 5.5                        | —                                           | 36.3                  | 1.65                               | 28.8                                 | 5821.9         | 937.2        | 0740 <i>MM</i> |
|          | 23                                               | —                          | .333                                        | 60.3                  | 1.55                               | 27.1                                 | 5823.4         | 938.7        | 0920 <i>MM</i> |
|          | -32                                              | —                          | .332                                        | 64.9                  | 1.46                               | 25.5                                 | 5827.4         | 942.7        | 1330 <i>MM</i> |
|          | 52                                               | —                          | .274                                        | 59.9                  | 1.74                               | 30.5                                 | 5831.4         | 946.7        | 1730 <i>MM</i> |
|          | 23                                               | —                          | .333                                        | 60.5                  | 1.52                               | 26.6                                 | —              | —            | 2000 <i>MM</i> |
| 12-17-86 | 23                                               | 6.0                        | —                                           | 37.3                  | 1.14                               | 29.7                                 | 5841.8         | 957.1        | 0740 <i>MM</i> |
|          | 23                                               | —                          | .342                                        | 61.6                  | 1.54                               | 26.9                                 | 5843.4         | 958.7        | 0930 <i>MM</i> |
|          | -32                                              | —                          | .343                                        | 64.5                  | 1.47                               | 25.7                                 | 5847.9         | 963.2        | 1355 <i>MM</i> |
|          | 52                                               | —                          | .285                                        | 61.4                  | 1.71                               | 29.9                                 | 5851.6         | 966.9        | 1730 <i>MM</i> |
|          | 23                                               | —                          | .340                                        | 63.5                  | 1.5                                | 26.2                                 |                |              |                |
| 12-18-86 | 23                                               | 5.0                        | —                                           | 36.2                  | 1.63                               | 28.5                                 | 5861.8         | 977.1        | 0740 <i>MM</i> |
|          | 23                                               | —                          | .343                                        | 61.1                  | 1.54                               | 26.9                                 | 5864.0         | 979.3        | 0959 <i>MM</i> |
| 12-18-86 | -32                                              | —                          | .342                                        | 64.6                  | 1.45                               | 25.4                                 | 5867.3         | 982.6        | 1320 <i>MM</i> |
| SPEC     | INFO<br>ONLY                                     | 10 MIN<br>@ 23°C           | .208: -32°<br>.280: 23°<br>.232: 52°<br>MIN | 80°K<br>MAX           | 1.72A<br>MAX<br>@ 17.5V            | 30 WATTS<br>MAX                      | INFO<br>ONLY   | INFO<br>ONLY |                |

PERFORMED BY \_\_\_\_\_

APPROVED BY *[Signature]*DATE 12-19-86

**Magnavox**

ELECTRO-OPTICAL SYSTEMS

MM&amp;T

LIFE TEST

DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 016

DRAWING NO. SM-D-5005842

| DATE     | AMB<br>TEMP<br>°C | TIME<br>TO 80°K<br>MINUTES | HEAT<br>LOAD<br>WATTS                       | COLD<br>STATION<br>°K | COOLER<br>INPUT<br>CURRENT<br>AMPS | COOLER<br>POWER<br>WATTS<br>@17.5VDC | ETI<br>READING | CUM<br>HOURS | INITIALS  |
|----------|-------------------|----------------------------|---------------------------------------------|-----------------------|------------------------------------|--------------------------------------|----------------|--------------|-----------|
| 12-5-86  | 52                | —                          | .271                                        | 60.8                  | 1.74                               | 30.5                                 | 5618.7         | 734.0        | 1730 JAS  |
|          | 23                | —                          | .340                                        | 61.8                  | 1.52                               | 26.6                                 |                |              |           |
| 12-9-86  | 23                | 5.0                        | —                                           | 36.5                  | 1.64                               | 29.7                                 | 5669.1         | 784.4        | 0740 D.M. |
| 12-9-86  | 23                | 4.9                        | —                                           | 36.8                  | 1.62                               | 29.3                                 | 5670.2         | 795.5        | 1050 D.M. |
|          | 0                 | —                          | .234                                        | 62.3                  | 1.46                               | 25.5                                 | 5674.8         | 790.1        | 1516 D.M. |
|          | 52                | —                          | .277                                        | 62.1                  | 1.73                               | 30.3                                 | 5677.1         | 792.4        | 1730 JAS  |
|          | 23                | —                          | .340                                        | 62.7                  | 1.52                               | 26.6                                 |                |              | 2000      |
| 12-9-86  | 23                | 5.1                        | —                                           | 39.4                  | 1.54                               | 26.9                                 | 5687.4         | 802.7        | 0740 D.M. |
|          | 23                | —                          | .340                                        | 66.4                  | 1.47                               | 25.7                                 | 5689.9         | 804.2        | 0930 D.M. |
|          | -32               | —                          | .342                                        | 67.8                  | 1.41                               | 24.7                                 | 5693.1         | 808.4        | 1327 JAS  |
|          | 52                | —                          | .280                                        | 67.8                  | 1.62                               | 28.4                                 | 5697.1         | 812.4        | 1730 JAS  |
|          | 23                | —                          | .340                                        | 636                   | 1.5                                | 26.25                                |                |              | 2000      |
| 12-10-86 | 23                | 5.0                        | —                                           | 37.1                  | 1.65                               | 29.8                                 | 5707.4         | 822.7        | 0740 D.M. |
|          | 23                | —                          | .346                                        | 62.4                  | 1.54                               | 27.0                                 | 5709.0         | 824.3        | 0930 D.M. |
|          | -32               | —                          | .339                                        | 67.7                  | 1.5                                | 26.26                                | 5712.1         | 825.4        | 1330 D.M. |
|          | 52                | —                          | .277                                        | 62.1                  | 1.74                               | 30.5                                 | 5717.1         | 832.4        | 1730 JAS  |
|          | 23                | —                          | .340                                        | 63.1                  | 1.50                               | 26.25                                |                |              | 2000      |
| 12-11-86 | 23                | 5.1                        | —                                           | 39.3                  | 1.64                               | 28.7                                 | 5727.4         | 842.7        | 0740 D.M. |
|          | 23                | —                          | .345                                        | 62.8                  | 1.54                               | 26.9                                 | 5729.0         | 844.3        | 0930 D.M. |
|          | -32               | —                          | .340                                        | 64.3                  | 1.46                               | 25.5                                 | 5732.8         | 848.1        | 1330 D.M. |
|          | 23                | —                          | .340                                        | 63.1                  | 1.50                               | 26.2                                 |                |              | 2000      |
| 12-12-86 | 23                | 5.0                        | —                                           | 36.9                  | 1.65                               | 29.4                                 | 5747.4         | 862.7        | 0740 D.M. |
| SPEC     | INFO<br>ONLY      | 10 MIN<br>@ 23°C           | .208: -32°<br>.280: 23°<br>.232: 52°<br>MIN | 80°K<br>MAX           | 1.72A<br>MAX<br>@ 17.5V            | 30 WATTS<br>MAX                      | INFO<br>ONLY   | INFO<br>ONLY |           |

PERFORMED BY \_\_\_\_\_

APPROVED BY JASDATE 12-19-86

# Magnavox

ELECTRO-OPTICAL SYSTEMS

MM&amp;T

LIFE TEST

DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 016

DRAWING NO. SM-D-5005842

| DATE     | AMB<br>TEMP<br>°C | TIME<br>TO 80°K<br>MINUTES | HEAT<br>LOAD<br>WATTS                       | COLD<br>STATION<br>°K | COOLER<br>INPUT<br>CURRENT<br>AMPS | COOLER<br>POWER<br>WATTS<br>@17.5VDC | ETI<br>READING | CUM<br>HOURS | INITIALS  |
|----------|-------------------|----------------------------|---------------------------------------------|-----------------------|------------------------------------|--------------------------------------|----------------|--------------|-----------|
| 11-26-86 | 23                | —                          | .100                                        | 44.9                  | 1.54                               | 26.9                                 |                |              | 2000      |
| 12-1-86  | 23                | 5.0                        | —                                           | 36.5                  | 1.66                               | 29.0                                 | 5528.9         | 644.8        | 0740 B.M. |
|          | 23                | —                          | .1336                                       | 61.2                  | 1.56                               | 27.3                                 | 5530.7         | 646.6        | 0930 B.M. |
|          | -32               | —                          | .340                                        | 65.7                  | 1.43                               | 25.0                                 | 5534.9         | 650.8        | 1330 B.M. |
|          | 52                | —                          | .280                                        | 60.8                  | 1.72                               | 30.1                                 | 5538.8         | 654.7        | 1735 B.M. |
|          | 23                | —                          | .340                                        | 61.8                  | 1.52                               | 26.6                                 |                |              | 2000 B.M. |
| 12-2-86  | 23                | 5.0                        | —                                           | 35.9                  | 1.63                               | 29.5                                 | 5544.9         | 664.8        | 0740 B.M. |
|          | -32               | —                          | .340                                        | 65.2                  | 1.47                               | 25.7                                 | 5554.8         | 670.7        | 1330 B.M. |
|          | 52                | —                          | .276                                        | 61.8                  | 1.70                               | 29.8                                 | 5558.7         | 674.6        | 1730 B.M. |
|          | 23                | —                          | .340                                        | 61.8                  | 1.50                               | 26.3                                 |                |              | 2000      |
| 12-3-86  | 23                | 5.0                        | —                                           | 38.0                  | 1.58                               | 27.7                                 | 5568.9         | 684.8        | 0740 M.T. |
|          | 23                | —                          | .340                                        | 62.0                  | 1.55                               | 27.1                                 | 5571.1         | 687.0        | 0955 M.T. |
|          | -32               | —                          | .336                                        | 67.6                  | 1.45                               | 25.4                                 | 5574.6         | 690.5        | 1330 M.T. |
|          | 52                | —                          | .274                                        | 61.3                  | 1.74                               | 30.5                                 | 5578.6         | 694.5        | 1730 B.M. |
| 12-4-86  | 23                | 5.0                        | —                                           | 36.2                  | 1.62                               | 28.4                                 | 5588.9         | 704.8        | 0735 M.T. |
|          | 23                | —                          | .339                                        | 62.1                  | 1.53                               | 26.8                                 | 5591.1         | 707          | 0955 M.T. |
|          | 32                | —                          | .341                                        | 66.0                  | 1.45                               | 25.4                                 | 5594.6         | 710.5        | 1330      |
|          | 52                | —                          | .275                                        | 62.5                  | 1.70                               | 29.8                                 | 5598.7         | 714.6        | 1730 B.M. |
|          | 23                | —                          | .340                                        | 63.3                  | 1.50                               | 26.3                                 |                |              | 2000      |
| 12-5-86  | 23                | 5.0                        | —                                           | 36.5                  | 1.64                               | 28.7                                 | 5608.9         | 724.2        | 0735 M.T. |
|          | 23                | —                          | .342                                        | 61.8                  | 1.55                               | 26.4                                 | 5611.0         | 726.3        | 0950 M.T. |
|          | -32               | —                          | .336                                        | 66.4                  | 1.47                               | 25.7                                 | 5614.6         | 728.9        | 1330 M.T. |
| SPEC     | INFO<br>ONLY      | 10 MIN<br>@ 23°C           | .208: -32°<br>.280: 23°<br>.232: 52°<br>MIN | 80°K<br>MAX           | 1.72A<br>MAX<br>@ 17.5V            | 30 WATTS<br>MAX                      | INFO<br>ONLY   | INFO<br>ONLY |           |

PERFORMED BY

APPROVED BY [Signature]

DATE

12-8-86

**Magnavox**

ELECTRO-OPTICAL SYSTEMS

MM&amp;T

LIFE TEST

DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 016

DRAWING NO. SM-D-5005842

| DATE     | AMB<br>TEMP<br>°C | TIME<br>TO 80°K<br>MINUTES | HEAT<br>LOAD<br>WATTS                       | COLD<br>STATION<br>°K | COOLER<br>INPUT<br>CURRENT<br>AMPS | COOLER<br>POWER<br>WATTS<br>@17.5VDC | ETI<br>READING | CUM<br>HOURS | INITIALS  |
|----------|-------------------|----------------------------|---------------------------------------------|-----------------------|------------------------------------|--------------------------------------|----------------|--------------|-----------|
| 11-19-86 | -32               | —                          | .342                                        | 66.9                  | 1.47                               | 25.7                                 | 5294.6         | 410.6        | 13358/17  |
|          | 52                | —                          | .280                                        | 62.5                  | 1.70                               | 29.8                                 | 5298.8         | 414.8        | 17358/17  |
| 11-20-86 | 23                | 5.0                        | —                                           | 38.3                  | 1.62                               | 28.3                                 | 5308.8         | 424.8        | 0740 B.A. |
|          | 23                | —                          | .349                                        | 62.0                  | 1.55                               | 27.1                                 | 5310.7         | 426.7        | 0930 B.A. |
|          | -32               | —                          | .339                                        | 65.0                  | 1.50                               | 26.3                                 | 5314.7         | 430.7        | 1330 B.A. |
|          | 52                | —                          | .276                                        | 62.1                  | 1.72                               | 30.1                                 | 5318.7         | 434.7        | 1730 B.A. |
|          | 23                | —                          | .333                                        | 62.3                  | 1.54                               | 27.0                                 | 5321.8         | 437.8        | 2030 B.A. |
| 11-21-86 | 23                | 5.1                        | —                                           | 38.1                  | 1.65                               | 28.9                                 | 5329.0         | 445.0        | 0740 B.A. |
|          | 23                | —                          | .335                                        | 62.1                  | 1.56                               | 27.3                                 | 5330.7         | 446.7        | 0930 B.A. |
|          | -32               | —                          | .322                                        | 67.1                  | 1.48                               | 25.9                                 | 5334.7         | 450.7        | 1320 B.A. |
|          | 52                | —                          | .286                                        | 61.2                  | 1.73                               | 30.3                                 | 5338.7         | 454.7        | 1730 B.A. |
| 11-24-86 | 23                | 5.0                        | —                                           | 37.6                  | 1.64                               | 28.7                                 | 5349.0         | 505.1        | 0740 B.A. |
|          | 23                | —                          | .339                                        | 62.7                  | 1.55                               | 27.1                                 | 5390.7         | 506.7        | 0930 B.A. |
|          | -32               | —                          | .346                                        | 65.8                  | 1.48                               | 25.9                                 | 5394.7         | 510.7        | 1330 B.A. |
| 11-25-86 | 23                | 5.0                        | —                                           | 39.0                  | 1.64                               | 29.5                                 | 5409.0         | 525.0        | 0740 B.A. |
|          | 23                | —                          | .336                                        | 63.0                  | 1.56                               | 27.3                                 | 5410.7         | 526.7        | 0930 B.A. |
|          | -32               | —                          | .337                                        | 65.9                  | 1.46                               | 25.5                                 | 5415.4         | 531.3        | 1330 B.A. |
|          | 40                | —                          | .282                                        | 60.5                  | 1.59                               | 27.6                                 | 5417.3         | 533.2        | 1430 B.A. |
| 11-26-86 | 23                | 5.0                        | —                                           | 37.6                  | 1.66                               | 29.0                                 | 5429.0         | 544.9        | 0740 B.A. |
|          | 23                | —                          | .339                                        | 61.8                  | 1.56                               | 27.3                                 | 5430.7         | 546.6        | 0925      |
|          | -32               | —                          | .332                                        | 64.6                  | 1.48                               | 25.9                                 | 5434.6         | 550.5        | 1330 B.A. |
| 11-26-86 | 52                | —                          | .274                                        | 61.2                  | 1.74                               | 30.5                                 | 5438.5         | 554.4        | 1730 B.A. |
| SPEC     | INFO<br>ONLY      | 10 MIN<br>@ 23°C           | .208: -32°<br>.280: 23°<br>.232: 52°<br>MIN | 80°K<br>MAX           | 1.72A<br>MAX<br>@ 17.5V            | 30 WATTS<br>MAX                      | INFO<br>ONLY   | INFO<br>ONLY |           |

PERFORMED BY

APPROVED BY

DATE 11-26-86

**Magnavox**

ELECTRO-OPTICAL SYSTEMS

MM&amp;T

LIFE TEST

DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 016

DRAWING NO. SM-D-5005842

| DATE     | AMB<br>TEMP<br>°C | TIME<br>TO 80°K<br>MINUTES | HEAT<br>LOAD<br>WATTS                       | COLD<br>STATION<br>°K | COOLER<br>INPUT<br>CURRENT<br>AMPS | COOLER<br>POWER<br>WATTS<br>@17.5VDC | ETI<br>READING | CUM<br>HOURS | INITIALS       |
|----------|-------------------|----------------------------|---------------------------------------------|-----------------------|------------------------------------|--------------------------------------|----------------|--------------|----------------|
| 11-12-86 | 52                | —                          | .277                                        | 57.9                  | 1.76                               | 30.8                                 | 5155.4         | 271.4        | 1740 <i>JS</i> |
| 11-12-86 | 23                | —                          | .350                                        | 58.7                  | 1.52                               | 26.6                                 |                | 273.7        | 2000           |
| 11-13-86 | 23                | 5.0                        | —                                           | 35.7                  | 1.62                               | 28.4                                 | 5169.4         | 285.4        | 0746 <i>JS</i> |
|          | 23                | —                          | .353                                        | 58.6                  | 1.55                               | 27.1                                 | 5170.9         | 286.9        | 0930 <i>JS</i> |
|          | -32               | —                          | .341                                        | 60.9                  | 1.52                               | 26.6                                 | 5174.9         | 290.9        | 1330 <i>JS</i> |
|          | 52                | —                          | .277                                        | 58.4                  | 1.75                               | 30.6                                 | 5179.0         | 295.0        | 1730 <i>JS</i> |
| 11-13-86 | 23                | —                          | .350                                        | 58.7                  | 1.52                               | 26.6                                 |                | 297.5        | 2000           |
| 11-14-86 | 23                | 5.0                        | —                                           | 35.0                  | 1.53                               | 26.8                                 | 5189.2         | 305.2        | 0745 <i>JS</i> |
|          | 23                | —                          | .346                                        | 58.4                  | 1.56                               | 27.3                                 | 5190.9         | 306.9        | 0930 <i>JS</i> |
|          | -32               | —                          | .338                                        | 61.3                  | 1.52                               | 26.6                                 | 5194.7         | 310.7        | 1315 <i>JS</i> |
|          | 52                | —                          | .275                                        | 58.4                  | 1.75                               | 30.6                                 | 5199.1         | 316.1        | 1740 <i>JS</i> |
| 11-14-86 | 23                | —                          | .350                                        | 58.7                  |                                    |                                      |                |              | 2000           |
| 11-15-86 | 17                | 5.8                        | —                                           | 34.6                  | 1.64                               | 28.7                                 | 5212.2         |              | 1100 <i>JS</i> |
| 11-17-86 | 23                | 5.1                        | —                                           |                       | 1.58                               | 27.65                                | 5219.4         | 345.4        | 0801 PM        |
|          | 23                | —                          | .341                                        | 60.8                  | 1.55                               | 27.1                                 | 5251.1         | 367.1        | 0955 <i>JS</i> |
|          | -32               | —                          | .342                                        | 64.0                  | 1.47                               | 25.7                                 | 5254.8         | 370.8        | 1330 <i>JS</i> |
| 11-17-86 | 52                | —                          | .285                                        | 60.3                  | 1.72                               | 30.1                                 | 5258.7         | 374.7        | 1730 <i>JS</i> |
| 11-18-86 | 23                | —                          | .350                                        | 60.3                  | 1.55                               | 27.1                                 | 5271.0         | 387.0        | 0950 <i>JS</i> |
|          | -32               | —                          | .338                                        | 68.1                  | 1.47                               | 25.7                                 | 5274.8         | 390.8        | 1335 <i>JS</i> |
|          | 52                | —                          | .273                                        | 61.7                  | 1.74                               | 30.5                                 | 5278.7         | 394.7        | 1730 <i>JS</i> |
| 11-19-86 | 23                | 5.0                        | —                                           | 37.9                  | 1.68                               | 28.5                                 | 5289.9         | 404.9        | 0744 P.M.      |
| 11-19-86 | 23                | —                          | .351                                        | 62.5                  | 1.55                               | 27.1                                 | 5291.1         | 407.1        | 0950 <i>JS</i> |
| SPEC     | INFO<br>ONLY      | 10 MIN<br>@ 23°C           | .208: -32°<br>.280: 23°<br>.232: 52°<br>MIN | 80°K<br>MAX           | 1.72A<br>MAX<br>@ 17.5V            | 30 WATTS<br>MAX                      | INFO<br>ONLY   | INFO<br>ONLY |                |

PERFORMED BY \_\_\_\_\_

APPROVED BY *[Signature]*DATE 11-19-86

**Magnavox**

ELECTRO-OPTICAL SYSTEMS

MM&amp;T

LIFE TEST

DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 016

DRAWING NO. SM-D-5005842

| DATE                                                       | AMB<br>TEMP<br>°C | TIME<br>TO 80°K<br>MINUTES | HEAT<br>LOAD<br>WATTS                       | COLD<br>STATION<br>°K | COOLER<br>INPUT<br>CURRENT<br>AMPS | COOLER<br>POWER<br>WATTS<br>@17.5VDC | ETI<br>READING | CUM<br>HOURS | INITIALS       |
|------------------------------------------------------------|-------------------|----------------------------|---------------------------------------------|-----------------------|------------------------------------|--------------------------------------|----------------|--------------|----------------|
| 11.6.86                                                    | 23                | 5.0                        | —                                           | 47.8                  | 1.61                               | 28.2                                 | 5034.0         | 150.0        | 0748 <i>DL</i> |
|                                                            | 23                | —                          | .353                                        | 57.8                  | 1.55                               | 27.1                                 | 5036.1         | 152.1        | 0955 <i>DL</i> |
|                                                            | -32               | —                          | .344                                        | 60.5                  | 1.54                               | 27.0                                 | 5039.6         | 155.6        | 1320 <i>DL</i> |
| 11.6.86                                                    | 52                | —                          | .342                                        | 62.6                  | 1.72                               | 30.1                                 | 5043.9         | 159.9        | 1740 <i>DL</i> |
| 11.7.86                                                    | 23                | 5.0                        | —                                           | 38.6                  | 1.64                               | 28.7                                 | 5054.0         | 170.0        | 0748 <i>DL</i> |
|                                                            | 23                | —                          | .351                                        | 57.9                  | 1.57                               | 27.5                                 | 5055.7         | 171.7        | 0930 <i>DL</i> |
|                                                            | -32               | —                          | .341                                        | 60.8                  | 1.53                               | 26.8                                 | 5059.4         | 175.4        | 1345 <i>DL</i> |
| 11.7.86                                                    | 23                | —                          | .350                                        | 59.3                  | 1.51                               | 26.4                                 |                | 182.2        | 2000 <i>DL</i> |
| 11.10.86                                                   | 23                | 5.0                        | —                                           | 38.7                  | 1.64                               | 28.7                                 | 5114.0         | 230.0        | 0746 <i>DL</i> |
|                                                            | 23                | —                          | .353                                        | 58.7                  | 1.57                               | 27.5                                 | 5115.7         | 231.7        | 0930 <i>DL</i> |
|                                                            | -32               | —                          | .342                                        | 61.2                  | 1.56                               | 27.3                                 | 5119.7         | 235.7        | 1330 <i>DL</i> |
| 11.10.86                                                   | 52                | —                          | .280                                        | 58.0                  | 1.80                               | 31.5                                 | 5124.1         | 240.1        | 1700 <i>DL</i> |
| 11.11.86                                                   | 23                | 5.0                        | —                                           | 37.9                  | 1.64                               | 28.7                                 | 5134.3         | 250.3        | 0805 <i>DL</i> |
|                                                            | 23                | —                          | .339                                        | 58.5                  | 1.57                               | 27.5                                 | 5135.6         | 251.6        | 0920 <i>DL</i> |
|                                                            | -32               | —                          | .345                                        | 61.8                  | 1.54                               | 27.0                                 | 5139.7         | 255.7        | 1330 <i>DL</i> |
|                                                            | 52                | —                          | .280                                        | 58.4                  | 1.52                               | 26.6                                 |                | 257.7        | 1730 <i>DL</i> |
| 11.11.86                                                   | 23                | —                          | .350                                        | 58.3                  | 1.52                               | 26.6                                 |                | 262.2        | 2000 <i>DL</i> |
| 11.12.86                                                   |                   |                            |                                             |                       |                                    |                                      | 5154.1         | 270.1        |                |
| S/N 016 REMOVED FROM LIFE TEST FOR ACOUSTIC NOISE TESTING. |                   |                            |                                             |                       |                                    |                                      |                |              |                |
| 11.12.86                                                   | 23                | 5.1                        | —                                           | 34.4                  | 1.63                               | 28.5                                 | 5154.1         | 270.1        | 1620 <i>DL</i> |
| 11.12.86                                                   |                   |                            |                                             |                       |                                    |                                      |                |              |                |
| SPEC                                                       | INFO<br>ONLY      | 10 MIN<br>@ 23°C           | .208: -32°<br>.280: 23°<br>.232: 52°<br>MIN | 80°K<br>MAX           | 1.72A<br>MAX<br>@ 17.5V            | 30 WATTS<br>MAX                      | INFO<br>ONLY   | INFO<br>ONLY |                |

PERFORMED BY \_\_\_\_\_

APPROVED BY *[Signature]*DATE 11-12-86

**Magnavox**

ELECTRO-OPTICAL SYSTEMS

MM&amp;T

LIFE TEST

DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 016

DRAWING NO. SM-D-5005842

| DATE     | AMB<br>TEMP<br>°C | TIME<br>TO 80°K<br>MINUTES | HEAT<br>LOAD<br>WATTS                       | COLD<br>STATION<br>°K | COOLER<br>INPUT<br>CURRENT<br>AMPS | COOLER<br>POWER<br>WATTS<br>@17.5VDC | ETI<br>READING | CUM<br>HOURS          | INITIALS |
|----------|-------------------|----------------------------|---------------------------------------------|-----------------------|------------------------------------|--------------------------------------|----------------|-----------------------|----------|
| 10.30.86 | 23                | 5.0                        | —                                           | 37.4                  | 1.58                               | 27.7                                 | 4884.0         | START OF<br>LIFE TEST | 0950     |
|          | 23                | —                          | .351                                        | 60.1                  | 1.44                               | 25.2                                 | 4884.7         | 0.7                   | 1025     |
|          | -32               | —                          | .348                                        | 66.4                  | 1.56                               | 27.3                                 | 4887.7         | 3.7                   | 1330     |
|          | 52                | —                          | .273                                        | 60.4                  | 1.66                               | 29.1                                 | 4891.7         | 7.7                   | 1730     |
| 10.30.86 | 23                | —                          | .350                                        | 62.2                  | 1.55                               | 27.1                                 |                | 10.2                  | 2000     |
| 10.31.86 | 23                | 4.9                        | —                                           | 39.6                  | 1.60                               | 28.0                                 | 4901.9         | 17.9                  | 0741     |
|          | 23                | —                          | .347                                        | 59.4                  | 1.54                               | 27.0                                 | 4903.7         | 19.7                  | 0930     |
|          | -32               | —                          | .340                                        | 63.9                  | 1.54                               | 27.0                                 | 4907.6         | 23.1                  | 1320     |
|          | 52                | —                          | .276                                        | 59.9                  | 1.66                               | 29.1                                 | 4911.9         | 27.4                  | 1740     |
| 11.3.86  | 23                | —                          | —                                           | 36.3                  | 1.64                               | 28.7                                 | 4973.9         | 89.9                  | 0739     |
|          | 23                | —                          | .358                                        | 60.8                  | 1.52                               | 26.6                                 | 4975.7         | 91.7                  | 0930     |
|          | -32               | —                          | .339                                        | 64.5                  | 1.53                               | 26.8                                 | 4979.5         | 95.5                  | 1315     |
| 11.3.86  | 52                | —                          | .297                                        | 60.3                  | 1.69                               | 29.6                                 | 4983.7         | 99.7                  | 1730     |
| 11.4.86  | 23                | 5.0                        | —                                           | 42.7                  | 1.58                               | 27.7                                 | 4994.0         | 110.0                 | 0749     |
|          | 23                | —                          | .351                                        | 61.7                  | 1.53                               | 26.8                                 | 4995.8         | 111.8                 | 0935     |
|          | -32               | —                          | .344                                        | 69.6                  | 1.50                               | 26.3                                 | 4999.7         | 115.7                 | 1330     |
| 11.4.86  | 52                | —                          | .289                                        | 60.3                  | 1.70                               | 29.8                                 | 5003.8         | 119.8                 | 1735     |
| 11.5.86  | 23                | 5.0                        | —                                           | 40.3                  | 1.56                               | 27.3                                 | 5014.1         | 130.1                 | 0749     |
|          | 23                | —                          | .355                                        | 60.2                  | 1.52                               | 26.6                                 | 5015.7         | 131.7                 | 0930     |
|          | -32               | —                          | .355                                        | 63.3                  | 1.52                               | 26.6                                 | 5019.9         | 135.9                 | 1335     |
|          | 52                | —                          | .276                                        | 59.5                  | 1.70                               | 29.8                                 | 5023.9         | 139.9                 | 1740     |
| 11.5.86  | 23                | —                          | .350                                        | 60.5                  | 1.51                               | 26.4                                 |                | 142.2                 | 2000     |
| SPEC     | INFO<br>ONLY      | 10 MIN<br>@ 23°C           | .208: -32°<br>.280: 23°<br>.232: 52°<br>MIN | 80°K<br>MAX           | 1.72A<br>MAX<br>@ 17.5V            | 30 WATTS<br>MAX                      | INFO<br>ONLY   | INFO<br>ONLY          |          |

PERFORMED BY

APPROVED BY

DATE

B-179



Sheet 1 of 2

Contract No. DAAK20-84-C-0440

PERFORMANCE TEST

Project No. 24407

DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC

SERIAL NO. 016

DRAWING NO. SM-D-5005842

| TEST<br>PLAN PARA | PARAMETER                                              | MEASURED             | UNITS      | LIMITS |                      |
|-------------------|--------------------------------------------------------|----------------------|------------|--------|----------------------|
|                   |                                                        |                      |            | MIN    | MAX                  |
| 3.10              | Calibration Check                                      | COMPLY               | -          | Comply |                      |
| 4.1.1             | Inspection to SM-D-5005842                             | COMPLY               | -          | Comply |                      |
| 4.1.2             | Weight                                                 | 2.35                 | Lbs        | -      | 2.5                  |
| 4.1.3.1           | Pressurization                                         | 330                  | PSIG       | Info   | Only                 |
| 4.1.3.2           | Leakage Rate                                           | $6.0 \times 10^{-7}$ | STP CC/SEC | -      | $2.7 \times 10^{-7}$ |
| 4.2.2             | Test at 23°C Horiz; Turn-on Current                    | N/A                  | Amps       | Info   |                      |
| 4.2.2             | Cooldown Time to 100°K                                 | 4.2                  | Minutes    | -      | 7.5                  |
| 4.2.2             | Cooldown Time to 80°K                                  | 4.4                  | Minutes    | -      | 10                   |
| 4.2.2             | Minimum Temp                                           | 35.5                 | °K         | Info   | 80                   |
| 4.2.2.1           | Stabl. Temp. with 0.35 Watt Heat Load                  | 59.5                 | °K         | -      | 80                   |
| 4.2.2.2           | Temp. after 1/2 Hour Operation                         | 61.0                 | °K         | -      | 80                   |
| 4.2.2.3           | Cold Finger warm end temp                              | 39                   | °C         | Info   | Only                 |
| 4.2.2.4           | Input Volt 17 VDC Current 1.42 ADC<br>Power            | 24.14                | Watts      | -      | 30                   |
| 4.2.2.5           | Stabl. Temp with 0.35 Watt Heat Load                   | 63.1                 | °K         | -      | 80                   |
| 4.2.2.5           | Cold Finger Warm End Temp                              | 39                   | °C         | Info   | Only                 |
| 4.2.2.5           | Input Volts 32 VDC Current .88 ADC<br>Power            | 28.16                | Watts      | -      | 30                   |
| 4.2.3             | Test at -40°C Horiz; Turn-on Current                   | N/A                  | Amps       | Info   |                      |
| 4.2.3.1           | Cooldown Time to 100°K                                 | 3.8                  | Minutes    | -      | 7.5                  |
| 4.2.3.1           | Cooldown Time to 80°K                                  | 4.1                  | Minutes    | -      | 10                   |
| 4.2.3.2           | Stabl. Temp with 0.2 Watt Heat Load                    | 49.3                 | °K         | -      | 80                   |
| 4.2.3.2           | Temp after 1/2 Hour                                    | 49.2                 | °K         | -      | 80                   |
| 4.2.3.3           | Cold Finger Warm End Temp                              | -30                  | °C         | Info   | Only                 |
| 4.2.3.4           | Input Volts 17 VDC Current 1.16 ADC<br>Stablized Power | 21.82                | Watts      | -      | 30                   |
| 4.2.3.5           | Temp with 0.2 Watt Head Load                           | 50.7                 | °K         | -      | 80                   |
| 4.2.3.5           | Cold Finger Warm End Temp                              | -30                  | °C         | Info   | Only                 |
| 4.2.3.5           | Input Volts 32 VDC Current .86 ADC<br>Power            | 27.52                | Watts      | -      | 30                   |
| 4.2.4             | Test at 71°C Horiz; Turn-on Current                    | N/A                  | Amps       | Info   |                      |
| 4.2.4.1           | Cooldown Time to 100°K                                 | 4.7                  | Minutes    | -      | 7.5                  |
| 4.2.4.1           | Cooldown Time to 80°K                                  | 5.5                  | Minutes    | -      | 10                   |
| 4.2.4.1           | Stabl. Temp. with 0.2 Watt Heat Load                   | 60.0                 | °K         | -      | 80                   |
| 4.2.4.1           | Temp after 1/2 hour                                    | 65.0                 | °K         | -      | 80                   |
| 4.2.4.2           | Cold Finger Warm End Temp                              | 89                   | °C         | Info   | Only                 |
| 4.2.4.3           | Input Volts 17 VDC Current 1.73 ADC<br>Power           | 29.41                | Watts      | -      | 35                   |
| 4.2.4.4           | Stabl. Temp with 0.2 Watt Head Load                    | 63.2                 | °K         | -      | 80                   |
| 4.2.4.4           | Cold Finger Warm End Temp                              | 89                   | °C         | Info   | Only                 |
| 4.2.4.4           | Input Volts 32 VDC Current 1.02<br>Power               | 32.64                | Watts      | -      | 35                   |

Performed By: P. HARTMANN

Date: 10-23-86

Witnessed By: [Signature] B-100

Q. A. Magnavox

Witnessed By: [Signature] 1 OCT 1986

Q. A. Customer



Contract: DAAK20-84-C-0440

PERFORMANCE TEST

Project: 24407

DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC  
DRAWING NO. SM-D-5005842

SERIAL NO. 016

| TEST<br>PLAN PARA | PARAMETER                                           | MEASURED             | UNITS      | LIMITS |                      |
|-------------------|-----------------------------------------------------|----------------------|------------|--------|----------------------|
|                   |                                                     |                      |            | MIN    | MAX                  |
| 4.2.5             | Test at 23°C Vertical; Turn-on Current              | N/A                  | Amps       | Info   |                      |
| 4.2.5.1           | Cooldown Time to 100°K                              | 4.1                  | Minutes    | -      | 7.5                  |
| 4.2.5.1           | Cooldown Time to 80°K                               | 4.7                  | Minutes    | -      | 10                   |
| 4.2.5.1           | Minimum Temp                                        | 35.5                 | °K         | -      | 80                   |
| 4.2.5.2           | Stabl. Temp with 0.35 Watt Heat Load                | 59.2                 | °K         | -      | 80                   |
| 4.2.5.3           | Temp After 1/2 Hour With Heat Load                  | 60.1                 | °K         | Info   | 80                   |
| 4.2.5.4           | Cold Finger Warm End Temp                           | 32                   | °C         | Info   | Only                 |
| 4.2.5.5           | Input Volts 17 VDC Current <u>1.49</u> ADC<br>Power | 25.33                | Watts      | -      | 30                   |
| 4.2.5.6           | Stabl. Temp. with 0.35 Watt Heat Load               | 62.5                 | °K         | -      | 80                   |
| 4.2.5.6           | Cold Finger Warm End Temp                           | 33                   | °C         | Info   | Only                 |
| 4.2.5.6           | Input Volt 32 VDC Current <u>.89</u> ADC<br>Power   | 28.48                | Watts      | -      | 30                   |
| 4.2.6             | Leakage Rate                                        | 6.0x10 <sup>-7</sup> | STP CC/SEC | -      | 2.7x10 <sup>-7</sup> |

PERFORMED BY P. HARTMANN

DATE 10-24-86

WITNESSED BY [Signature] Q.A. MAGNAVOX

WITNESSED BY [Signature] Q.A. CUSTOMER

31 OCT 1986

APPENDIX C

FAILURE REPORTS

**Magnavox**  
GOVERNMENT & INDUSTRIAL ELECTRONICS COMPANY  
**RELIABILITY & QUALITY**  
**ASSURANCE DEPT.**

Page 1 of 18

F.R. No. 24407-002

**FAILURE REPORT**

| Name & Type                                                         | Part or Dwg. No.      | Serial No.          | Circuit Symbol | Manufacturer           |
|---------------------------------------------------------------------|-----------------------|---------------------|----------------|------------------------|
| Equipment<br>COOLER, LINEAR<br>SPLIT CYCLE, HD-1045V/UA<br>Assembly | SM-D-5005842          | 011                 |                | MAGIEC<br><br>MAGNAVOX |
| Part                                                                |                       |                     |                |                        |
| Test Environment<br>-32 C Life Test                                 | Spec No.<br>EOSR 1314 | Data Sheet Item No. |                |                        |

|                                  |
|----------------------------------|
| Failure Date<br>9-26-86          |
| Report Date<br>10-16-86          |
| Customer<br>NVEOC                |
| Contract No.<br>DAAK20-84-C-0440 |
| Project No.<br>24407             |
| Running Time<br>217 Hours        |

**DESCRIPTION OF FAILURE** (Include Symptoms, readings, deviations from Specs) On Returns: quote Customer complaint; describe MAGIEC test findings  
On September 25, 1986 after 202 hours of operation the coldfinger temperature had risen to 81.6K at -32 C ambient. The cooler had been operating with a full specification heat load of .350 watts, not the 80% load allowed for life test. The heat load was then changed to the life test 80% load, and the cooler was operated for another day. The coldfinger temperature was then 72.5 K at 23 C ambient with a heat load of .280 watts. Although this is still within the life test limits, Magnavox felt this early degradation of performance is not, and cannot be accepted as, typical of our coolers. Accordingly, the cooler was removed from life test at 217 hours of operation.

**CAUSE OF FAILURE:** A combination of gas contamination, contamination of the regenerator, and fit of the regenerator/coldfinger: Part numbers SM-C-5005937 and SM-C-5005939.

**REPAIR ACTION**

The unit was purged and recharged. The Displacer Assembly (SM-C-5005937) and the Cold finger Cylinder Assembly (SM-C-5005939) were replaced.

|                                             |                                                 |                                               |                                                           |
|---------------------------------------------|-------------------------------------------------|-----------------------------------------------|-----------------------------------------------------------|
| Disposition of removed part <u>Scrapped</u> |                                                 |                                               |                                                           |
| Failure Found During:                       | Acceptance Test <input type="checkbox"/>        | Design Approval Test <input type="checkbox"/> | Reliability Test <input checked="" type="checkbox"/>      |
|                                             |                                                 |                                               | Field Use <input type="checkbox"/> Other <u>Life Test</u> |
| Reported by<br><i>[Signature]</i>           | Reviewed by (Engineering)<br><i>[Signature]</i> | Project Manager<br><i>[Signature]</i>         | Quality Assurance<br><i>[Signature]</i>                   |

**FAILURE ANALYSIS REPORT 2-27-87**

**ANALYSIS:** The following steps were taken in determining the cause for the degradation in performance:

1. The performance found during life test was confirmed in the cryogenics engineering lab. (See data, Attachment 1).
2. The cooler was taken to a gas analysis lab to have the gas analyzed, since the symptoms hinted at the possibility of gas contamination. (See Attachment 2).

The gas analysis indicated a helium purity of slightly over 98%. This is significantly less than the 99.999% purity that Magnavox uses in charging its coolers.

3. Based on the results of the gas analysis in 2. above; the cooler was vacuum baked, purged, charged, and then run through a performance test. Cooler performance improved, but not significantly. (See data attachment 3). This left other causes to be explored to determine the cause for loss in cold production.

C-1

Cont'd./2..

|                                                                                                                                           |                                   |                                       |                                         |                  |
|-------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------------------|-----------------------------------------|------------------|
| Analysis by<br><i>[Signature]</i>                                                                                                         | Engineering<br><i>[Signature]</i> | Project Manager<br><i>[Signature]</i> | Quality Assurance<br><i>[Signature]</i> | Date<br>11/17/87 |
| Copies: J. R. Casamento, S. Cacioppo, R. Christiansen, D. Coffin, W. Galbo, D. Lehrfeld, R. Narayan, W. Schubert. Contracts: J. Lynch (3) |                                   |                                       |                                         |                  |
| NVEOC: H. Dunmire, S. Pomeroy. DCAS: R. Rothstein                                                                                         |                                   |                                       |                                         |                  |

## FAILURE REPORT

F.R. No.24407-002

## ANALYSIS (Cont'd..)

4. The expander was then disassembled; and the regenerator was removed. The pieces were examined and cleaned of a minimal amount of accumulated particulates. The unit was then re-assembled and retested with no improvement in performance. (See data, Attachment 4). The cooler did not meet the performance requirements.
5. The coldfinger assembly was again removed, and a coldfinger and displacer from another unit were then fitted to the compressor of SN 11. The test results indicated the cooler met the specification performance requirements with a comfortable margin. (See data Attachment 5).
6. The coldfinger and regenerator removed from SN 11 were inspected dimensionally. The coldfinger was within specification requirements. The regenerator dimensions indicated a clearance to the coldfinger wall greater than the design limits.
7. The SN 11 regenerator rulon was removed; new rulon was applied and remachined.
8. SN 11 compressor was then tested using its original coldfinger and regenerator, with the remachined rulon. Cooler performance met the specification requirements, but with little margin, which is not typical. (See data, Attachment 6).
9. A new coldfinger and regenerator were then fitted to SN 11. The unit was subjected to and passed a full acceptance test, and then returned to the life test. (See ATP data, Attachment 7).
10. In order to substantiate gas impurity as a contributing factor in this situation; an attempt was made to duplicate the gas impurity level found in the analysis of SN 11. Cooler SN 13 was evacuated to -7 psi to maintain the impurity level measured during the gas analysis. (Refer to Attachment 2) and then charged and tested. The performance was somewhat similar to that of SN 11. (See data, Attachment 8).

Based on the steps taken, it is concluded that the following separate factors contributed to the degradation in cold production of SN 11:

- a) Gas contamination
- b) Partial contamination of the regenerator
- c) Poor regenerator rulon/coldfinger fit.

## CORRECTIVE ACTION:

- a) Gas contamination: The contamination in the gas of SN 11 is felt to be the result of an improper technique. Incomplete purging prior to charging the cooler was likely. The procedures to be followed have been made more detailed and operators retrained, removing the need for esoteric judgements on the part of the operators.
- b) Partial Contamination of the Regenerator: When the coldfinger was disassembled, a small amount of particles was observed. These were predominantly the wear products from the regenerator clearance seal. Particles and other contaminants that entered the original displacer were easily be trapped within the regenerator mesh, making it impossible to clean completely. This contributed to the poor cooler performance after initial reassembly.

## FAILURE REPORT

F.R. No.24407-002

## CORRECTIVE ACTION (Cont'd..)

- c) Poor Regenerator Rulon/Cold finger Fit: It is believed, after reviewing events with assembly personnel, that the assembly of the original SN 11 coldfinger was accomplished using a burnishing procedure on the displacer rulon. It is felt that excessive burnishing during this procedure left only a minimal amount of material at a few high spots to affect a seal. Hence the rapid degradation in performance and early accumulation of particles. Manufacturing process sheets have been prepared which clearly define the step-by-step assembly technique and highlights the fact that burnishing is no longer to be performed. Once regenerator/coldfinger dimensions are within drawing requirements, no other fitting actions are required nor permitted. The regenerator/coldfinger assembly presently in SN 11 were assembled using the latter technique.

As of the date of this final report: February 27, 1987, cooler SN 11 has accumulated 2,530 hours of failure-free operation.

No other action is deemed necessary regarding this report.

TEST AFTER Pull out of LIFE TEST CHAMBER

①

ATTACHMENT NO. 1

Sheet 1 of 2

## PERFORMANCE TEST

## DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC  
DRAWING NO. SM-D-5005863/SM-D-5005842

SERIAL NO. 011

| TEST PLAN PARA     | PARAMETER                                        | MEASURED           | UNITS      | LIMITS |                      |
|--------------------|--------------------------------------------------|--------------------|------------|--------|----------------------|
|                    |                                                  |                    |            | MIN    | MAX                  |
| 3.10               | Calibration Check                                |                    | -          | Comply |                      |
| 4.1.1              | Inspection to SM-D-5005863/5005842               |                    | -          | Comply |                      |
| 4.1.2              | Weight                                           |                    | Lbs        | -      | 2.5                  |
| 4.1.3.1            | Pressurization                                   | 330                | PSIG       | Info   | Only                 |
| 4.1.3.2            | Leakage Rate                                     | $2 \times 10^{-1}$ | STP CC/SEC | -      | $2.7 \times 10^{-1}$ |
| 4.2.2              | Test at 23°C Horiz; Turn-on Current              |                    | Amps       | Info   |                      |
| 4.2.2              | Cooldown Time to 100°K                           | 5.1                | Minutes    | -      | 7.5                  |
| 4.2.2              | Cooldown Time to 80°K                            | 6.0                | Minutes    | -      | 10                   |
| 4.2.2              | Minimum Temp                                     | 57.7               | °K         | Info   | 80                   |
| 4.2.2.1            | Stabl. Temp. with 0.35 Watt Heat Load            | 77.8               | °K         | -      | 80                   |
| 4.2.2.2            | Temp. after 1/2 Hour Operation                   | 77.6               | °K         | -      | 80                   |
| 4.2.2.3            | Cold Finger warm end temp                        | 35                 | °C         | Info   | Only                 |
| 4.2.2.4            | Input Volt 17.5 VDC Current 1.42 ADC             |                    |            |        |                      |
|                    | Power                                            | 24.85              | Watts      | -      | 30                   |
| <del>4.2.2.5</del> | <del>Stabl. Temp. with 0.35 Watt Heat Load</del> |                    | °K         |        | 80                   |
| <del>4.2.2.5</del> | <del>Cold Finger Warm End Temp</del>             |                    | °C         | Info   | Only                 |
| <del>4.2.2.5</del> | <del>Input Volts 17.5 VDC Current 1.42 ADC</del> |                    |            |        |                      |
|                    | Power                                            |                    | Watts      | -      | 30                   |
| 4.2.3              | Test at -32 C Horiz; Turn-on Current             |                    | Amps       | Info   |                      |
| 4.2.3.1            | Cooldown Time to 100°K                           | 5.3                | Minutes    | -      | 7.5                  |
| 4.2.3.1            | Cooldown Time to 80°K                            | 6.3                | Minutes    | -      | 10                   |
| 4.2.3.2            | Stabl. Temp. with 350 Watt Heat Load             | 84.4               | °K         | -      | 80                   |
| 4.2.3.2            | Temp after 1/2 Hour                              | 84.5               | °K         | -      | 80                   |
| 4.2.3.3            | Cold Finger Warm End Temp                        | -20                | °C         | Info   | Only                 |
| 4.2.3.4            | Input Volts 17.5 VDC Current 1.25 ADC            |                    |            |        |                      |
|                    | Stabilized Power                                 | 21.875             | Watts      | -      | 30                   |
| <del>4.2.3.5</del> | <del>Temp with 0.2 Watt Heat Load</del>          |                    | °K         |        | 80                   |
| <del>4.2.3.5</del> | <del>Cold Finger Warm End Temp</del>             |                    | °C         | Info   | Only                 |
| <del>4.2.3.5</del> | <del>Input Volts 17.5 VDC Current 1.25 ADC</del> |                    |            |        |                      |
|                    | Power                                            |                    | Watts      | -      | 30                   |
| 4.2.4              | Test at -32 Horiz; Turn-on Current               |                    | Amps       | Info   |                      |
| 4.2.4.1            | Cooldown Time to 100°K                           | 5.5                | Minutes    | -      | 7.5                  |
| 4.2.4.1            | Cooldown Time to 80°K                            | 6.5                | Minutes    | -      | 10                   |
| 4.2.4.1            | Stabl. Temp. with 200 Watt Heat Load             | 75.6               | °K         | -      | 80                   |
| 4.2.4.1            | Temp after 1/2 hour                              | 75.7               | °K         | -      | 80                   |
| 4.2.4.2            | Cold Finger Warm End Temp                        | 67                 | °C         | Info   | Only                 |
| 4.2.4.3            | Input Volts 17.5 VDC Current 1.55 ADC            |                    |            |        |                      |
|                    | Power                                            | 24.125             | Watts      | -      | 35                   |
| <del>4.2.4.4</del> | <del>Stabl. Temp. with 0.2 Watt Heat Load</del>  |                    | °K         |        | 80                   |
| <del>4.2.4.4</del> | <del>Cold Finger Warm End Temp</del>             |                    | °C         | Info   | Only                 |
| <del>4.2.4.4</del> | <del>Input Volts 17.5 VDC Current 1.55 ADC</del> |                    |            |        |                      |
|                    | Power                                            |                    | Watts      | -      | 35                   |

PERFORMED BY: P. HARTMANN  
 DATE: 7-29-86  
 WELDED YES/NO: Yes

## ATTACHMENT NO. 1

Page 2 of 2

## PERFORMANCE TEST

## DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC  
DRAWING NO. SM-D-5005863/SM-D-5005842

SERIAL NO. 011

| TEST<br>PLAN PARA  | PARAMETER                                       | MEASURED | UNITS      | LIMITS |                      |
|--------------------|-------------------------------------------------|----------|------------|--------|----------------------|
|                    |                                                 |          |            | MIN    | MAX                  |
| 4.2.5              | Test at 23°C Vertical; Turn-on Current          |          | Amps       | Info   |                      |
| 4.2.5.1            | Cooldown Time to 100°K                          | 5.0      | Minutes    | -      | 7.5                  |
| 4.2.5.1            | Cooldown Time to 80°K                           | 5.8      | Minutes    | -      | 10                   |
| 4.2.5.1            | Minimum Temp                                    | 49.1     | °K         | -      | 80                   |
| 4.2.5.2            | Stabl. Temp with 0.35 Watt Heat Load            | 77.3     | °K         | -      | 80                   |
| 4.2.5.3            | Temp After 1/2 Hour With Heat Load              | 77.4     | °K         | Info   | 80                   |
| 4.2.5.4            | Cold Finger Warm End Temp                       | 39       | °C         | Info   | Only                 |
| 4.2.5.5            | Input Volts 17.5VDC Current 1.72 ADC            |          |            |        |                      |
|                    | Power                                           | 24.85    | Watts      | -      | 30                   |
| <del>4.2.5.6</del> | <del>Stabl. Temp with 0.35 Watt Heat Load</del> |          | °K         |        | 80                   |
| <del>4.2.5.6</del> | <del>Cold Finger Warm End Temp</del>            |          | °C         | Info   | Only                 |
| <del>4.2.5.6</del> | <del>Input Volts 17.5VDC Current 1.72 ADC</del> |          |            |        |                      |
|                    | <del>Power</del>                                |          | Watts      |        | 30                   |
| 4.2.6              | Leakage Rate                                    |          | STP CC/SEC | -      | 2.7x10 <sup>-7</sup> |

49.1 - 53.2 °K

PERFORMED BY P. HARTMANN

DATE 9-29-86

WITNESSED BY Q.A. MAGNAVOX

WITNESSED BY Q.A. CUSTOMER

|         |                                       |       |      |      |      |
|---------|---------------------------------------|-------|------|------|------|
| 4.2.3   | Test at -32°C Horiz; Turn-on Current  |       | Amps | Info |      |
| 4.2.3.1 | Cooldown Time to 100°K                | 4.9   | Min  | -    | 7.5  |
| 4.2.3.1 | Cooldown Time to 80°K                 | 6.0   | Min  | -    | 10   |
| 4.2.3.2 | Stabl. Temp with 0.250 Watt Heat Load | 71.5  | °K   | -    | 80   |
| 4.2.3.2 | Temp after 1/2 Hour                   | 73.3  | °K   | -    | 80   |
| 4.2.3.3 | Cold Finger Warm End Temp             | -20   | °C   | Info | Only |
| 4.2.3.4 | Input Volts 16.5VDC Current .79 ADC   | 13.22 |      | -    | 30   |

Min. Temp

62.3 °K

ATTACHMENT NO. 2 SHEET 1 OF 2

**Gollob Analytical Service**

MOLININI/GOLLOB A DIVISION OF ENSECO INCORPORATED

47 INDUSTRIAL ROAD, BERKELEY HEIGHTS, NEW JERSEY 07922 • TEL. (201) 464-3331

TO Mr. Ram Narayan, Ph.D.  
Magnavox  
46 Industrial Avenue  
Mahwah, NJ 07430

G.A.S. REPORT No. 61985

Date Requested: 10/2/86  
Date Reported: 10/3/86  
P.O. No. S4727

MATERIAL SUBMITTED: 1 (One) Cooler

INFORMATION REQUESTED: Mass Spectrometry & Gas Chromatography Analyses

NOTEBOOK REFERENCE: 1207, Pg. 18

RESULT OF INVESTIGATION: All data are presented in the attached table.

n 10386

By

  
GOLLOB ANALYTICAL SERVICE

C-6

AIHA CERTIFIED MASS SPECTROMETRY GAS ANALYSIS GAS CHROMATOGRAPHY LIQUID CHROMATOGRAPHY

ATTACHMENT NO. 2 SHEET 2

THIS IS G.A.S. NO. 61985

CONCENTRATION, PER CENT BY VOLUME

P/N - SM-D 5005842

S/N - 011

|                |       |
|----------------|-------|
| NITROGEN       | 1.40  |
| OXYGEN         | .25   |
| ARGON          | .0190 |
| CARBON DIOXIDE | .0165 |
| HYDROGEN       | ND    |
| HELIUM         | 98 +  |
| ORGANICS       | ND    |

WATER \* .0012

TOTAL AMT. OF GAS, cc 2200

\* PERFORMED BY ELECTROLYTIC HYGROMETER

ND=NONE DETECTED, LESS THAN .0004

The mass spectrometer was scanned from mass 2 to mass 150 and no other constituents were detected. The detection threshold for most constituents is .0004 per cent.

The temperature of the sample was maintained at room temperature during analysis.

# NEW GAS ATTACHMENT NO. 3 BAKED, PURGED, CHARGED PERFORMANCE TEST

Sheet 1 of 2

(5)

## DATA SHEET

 COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC  
 DRAWING NO. SM-D-5005863/SM-D-5005842
SERIAL NO. 011

| TEST PLAN PARA | PARAMETER                                  | MEASURED             | UNITS      | LIMITS |                      |
|----------------|--------------------------------------------|----------------------|------------|--------|----------------------|
|                |                                            |                      |            | MIN    | MAX                  |
| 3.10           | Calibration Check                          |                      | -          | Comply |                      |
| 4.1.1          | Inspection to SM-D-5005863/5005842         |                      | -          | Comply |                      |
| 4.1.2          | Weight                                     |                      | Lbs        | -      | 2.5                  |
| 4.1.3.1        | Pressurization                             | 330                  | PSIG       | Info   | Only                 |
| 4.1.3.2        | Leakage Rate                               | $7.5 \times 10^{-7}$ | STP CC/SEC | -      | $2.7 \times 10^{-7}$ |
| 4.2.2          | Test at 23°C Horiz; Turn-on Current        |                      | Amps       | Info   |                      |
| 4.2.2          | Cooldown Time to 100°K                     | 5.7                  | Minutes    | -      | 7.5                  |
| 4.2.2          | Cooldown Time to 80°K                      | 6.5                  | Minutes    | -      | 10                   |
| 4.2.2          | Minimum Temp                               | 48.3                 | °K         | Info   | 80                   |
| 4.2.2.1        | Stabl. Temp. with 0.35 Watt Heat Load      | 73.8                 | °K         | -      | 80                   |
| 4.2.2.2        | Temp. after 1/2 Hour Operation             | 76.4                 | °K         | -      | 80                   |
| 4.2.2.3        | Cold Finger warm end temp                  | 33                   | °C         | Info   | Only                 |
| 4.2.2.4        | Input Volt 17 VDC Current <u>1.13</u> ADC  |                      |            |        |                      |
|                | Power                                      | 24.31                | Watts      | -      | 30                   |
| 4.2.2.5        | Stabl. Temp with 0.35 Watt Heat Load       | 78.8                 | °K         | -      | 80                   |
| 4.2.2.5        | Cold Finger Warm End Temp                  | 13.4                 | °C         | Info   | Only                 |
| 4.2.2.5        | Input Volts 32 VDC Current <u>.81</u> ADC  |                      |            |        |                      |
|                | Power                                      | 25.92                | Watts      | -      | 30                   |
| 4.2.3          | Test at -40°C Horiz; Turn-on Current       |                      | Amps       | Info   |                      |
| 4.2.3.1        | Cooldown Time to 100°K                     | 6.3                  | Minutes    | -      | 7.5                  |
| 4.2.3.1        | Cooldown Time to 80°K                      | 7.7                  | Minutes    | -      | 10                   |
| 4.2.3.2        | Stabl. Temp with 0.2 Watt Heat Load        |                      | °K         | -      | 80                   |
| 4.2.3.2        | Temp after 1/2 Hour                        | 99.2                 | °K         | -      | 80                   |
| 4.2.3.3        | Cold Finger Warm End Temp                  | -33                  | °C         | Info   | Only                 |
| 4.2.3.4        | Input Volts 17 VDC Current <u>1.24</u> ADC |                      |            |        |                      |
|                | Stablized Power                            |                      | Watts      | -      | 30                   |
| 4.2.3.5        | Temp with 0.2 Watt Head Load               | 101.8                | °K         | -      | 80                   |
| 4.2.3.5        | Cold Finger Warm End Temp                  | -23                  | °C         | Info   | Only                 |
| 4.2.3.5        | Input Volts 32 VDC Current <u>.72</u> ADC  |                      |            |        |                      |
|                | Power                                      |                      | Watts      | -      | 30                   |
| 4.2.4          | Test at 71°C Horiz; Turn-on Current        |                      | Amps       | Info   |                      |
| 4.2.4.1        | Cooldown Time to 100°K                     | 6.3                  | Minutes    | -      | 7.5                  |
| 4.2.4.1        | Cooldown Time to 80°K                      | 7.4                  | Minutes    | -      | 10                   |
| 4.2.4.1        | Stabl. Temp. with 0.2 Watt Heat Load       | 62.8 ↑               | °K         | -      | 80                   |
| 4.2.4.1        | Temp after <del>1/2</del> hour operation   | 70.9                 | °K         | -      | 80                   |
| 4.2.4.2        | Cold Finger Warm End Temp                  | 82                   | °C         | Info   | Only                 |
| 4.2.4.3        | Input Volts 17 VDC Current <u>1.67</u> ADC |                      |            |        |                      |
|                | Power                                      | 28.39                | Watts      | -      | 35                   |
| 4.2.4.4        | Stabl. Temp with 0.2 Watt Head Load        | 71.9                 | °K         | -      | 80                   |
| 4.2.4.4        | Cold Finger Warm End Temp                  | 82                   | °C         | Info   | Only                 |
| 4.2.4.4        | Input Volts 32 VDC Current ADC <u>.96</u>  |                      |            |        |                      |
|                | Power                                      | 30.72                | Watts      | -      | 35                   |

 INFORMED BY: P. HARTMAN  
 DATE: 10-6-86 - 10-7-86  
 WELDED YES/NO: Yes Qual. Univ.

ATTACHMENT NO. 3

Page 2 of 2

## PERFORMANCE TEST

## DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC  
DRAWING NO. SM-D-5005863/SM-D-5005842SERIAL NO. 011

| TEST<br>PLAN PARA | PARAMETER                                           | MEASURED | UNITS      | LIMITS |                      |
|-------------------|-----------------------------------------------------|----------|------------|--------|----------------------|
|                   |                                                     |          |            | MIN    | MAX                  |
| 4.2.5             | Test at 23°C Vertical; Turn-on Current              |          | Amps       | Info   |                      |
| 4.2.5.1           | Cooldown Time to 100°K                              | 5.6      | Minutes    | -      | 7.5                  |
| 4.2.5.1           | Cooldown Time to 80°K                               | 6.5      | Minutes    | -      | 10                   |
| 4.2.5.1           | Minimum Temp                                        | 44.9     | °K         |        | 80                   |
| 4.2.5.2           | Stabl. Temp with 0.35 Watt Heat Load                |          | °K         | -      | 80                   |
| 4.2.5.3           | Temp After 1/2 Hour With Heat Load                  | 73.0     | °K         | Info   | 80                   |
| 4.2.5.4           | Cold Finger Warm End Temp                           | 33       | °C         | Info   | Only                 |
| 4.2.5.5           | Input Volts 17 VDC Current <u>1.44</u> ADC<br>Power | 24.48    | Watts      | -      | 30                   |
| 4.2.5.6           | Stabl. Temp. with 0.35 Watt Heat Load               | 75.9     | °K         |        | 80                   |
| 4.2.5.6           | Cold Finger Warm End Temp                           | 33       | °C         | Info   | Only                 |
| 4.2.5.6           | Input Volt 32 VDC Current <u>.83</u> ADC<br>Power   | 26.56    | Watts      | -      | 30                   |
| 4.2.6             | Leakage Rate                                        |          | STP CC/SEC | -      | 2.7X10 <sup>-7</sup> |

PERFORMED BY P. HARTMANNDATE 10-6-86 - 10-7-86

WITNESSED BY \_\_\_\_\_ Q.A. MAGNAVOX

WITNESSED BY \_\_\_\_\_ Q.A. CUSTOMER

ATTACHMENT No. 4

## PERFORMANCE TEST

## DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC  
DRAWING NO. SM-D-5005863/SM-D-5005842SERIAL NO. 011

| TEST<br>PLAN PARA | PARAMETER                                           | MEASURED | UNITS      | LIMITS |                      |
|-------------------|-----------------------------------------------------|----------|------------|--------|----------------------|
|                   |                                                     |          |            | MIN    | MAX                  |
| 4.2.5             | Test at 23°C Vertical; Turn-on Current              |          | Amps       | Info   |                      |
| 4.2.5.1           | Cooldown Time to 100°K                              | 5.8      | Minutes    | -      | 7.5                  |
| 4.2.5.1           | Cooldown Time to 80°K                               | 6.6      | Minutes    | -      | 10                   |
| 4.2.5.1           | Minimum Temp                                        | 43.1     | °K         |        | 80                   |
| 4.2.5.2           | Stabl. Temp with 0.35 Watt Heat Load                | 73.2     | °K         | -      | 80                   |
| 4.2.5.3           | Temp After 1/2 Hour With Heat Load                  | 73.2     | °K         | Info   | 80                   |
| 4.2.5.4           | Cold Finger Warm End Temp                           | 32       | °C         | Info   | Only                 |
| 4.2.5.5           | Input Volts 17 VDC Current <u>1.15</u> ADC<br>Power | 21.65    | Watts      | -      | 30                   |
| 4.2.5.6           | Stabl. Temp. with 0.35 Watt Heat Load               | 74.7     | °K         |        | 80                   |
| 4.2.5.6           | Cold Finger Warm End Temp                           | 32       | °C         | Info   | Only                 |
| 4.2.5.6           | Input Volt 32 VDC Current <u>.89</u> ADC<br>Power   | 26.88    | Watts      | -      | 30                   |
| 4.2.6             | Leakage Rate                                        |          | STP CC/SEC | -      | 2.7X10 <sup>-7</sup> |

PERFORMED BY P. HARTMANNDATE 10-9-86

WITNESSED BY \_\_\_\_\_ Q.A. MAGNAVOX

WITNESSED BY \_\_\_\_\_ Q.A. CUSTOMER

TEST AFTER CLEANING w/ ORIGINAL C.F.

## PERFORMANCE TEST

## DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC  
DRAWING NO. SM-D-5005863/SM-D-5005842

SERIAL NO. 011W/ C.F. FROM 3/N 016

| TEST<br>PLAN PARA | PARAMETER                                                     | MEASURED             | UNITS      | LIMITS |                      |
|-------------------|---------------------------------------------------------------|----------------------|------------|--------|----------------------|
|                   |                                                               |                      |            | MIN    | MAX                  |
| 3.10              | Calibration Check                                             |                      | -          | Comply |                      |
| 4.1.1             | Inspection to SM-D-5005863/5005842                            |                      | -          | Comply |                      |
| 4.1.2             | Weight                                                        |                      | Lbs        | -      | 2.5                  |
| 4.1.3.1           | Pressurization                                                | 330                  | PSIG       | Info   | Only                 |
| 4.1.3.2           | Leakage Rate                                                  | $1.5 \times 10^{-8}$ | STP CC/SEC | -      | $2.7 \times 10^{-7}$ |
| 4.2.2             | Test at 23°C Horiz; Turn-on Current                           | N/A                  | Amps       | Info   |                      |
| 4.2.2             | Cooldown Time to 100°K                                        | 2.7                  | Minutes    | -      | 7.5                  |
| 4.2.2             | Cooldown Time to 80°K                                         | 4.3                  | Minutes    | -      | 10                   |
| 4.2.2             | Minimum Temp                                                  | 36.0                 | °K         | Info   | 80                   |
| 4.2.2.1           | Stabl. Temp. with 0.35 Watt Heat Load                         |                      | °K         | -      | 80                   |
| 4.2.2.2           | Temp. after 1/2 Hour Operation                                | 65.6                 | °K         | -      | 80                   |
| 4.2.2.3           | Cold Finger warm end temp                                     |                      | °C         | Info   | Only                 |
| 4.2.2.4           | Input Volt 17 VDC Current <u>1.50</u> ADC<br>Power            | 25.5                 | Watts      | -      | 30                   |
| 4.2.2.5           | Stabl. Temp with 0.35 Watt Heat Load                          |                      | °K         | -      | 80                   |
| 4.2.2.5           | Cold Finger Warm End Temp                                     |                      | °C         | Info   | Only                 |
| 4.2.2.5           | Input Volts 32 VDC Current <u>    </u> ADC<br>Power           |                      | Watts      | -      | 30                   |
| 4.2.3             | Test at -40°C Horiz; Turn-on Current                          | N/A                  | Amps       | Info   |                      |
| 4.2.3.1           | Cooldown Time to 100°K                                        |                      | Minutes    | -      | 7.5                  |
| 4.2.3.1           | Cooldown Time to 80°K                                         | 3.5                  | Minutes    | -      | 10                   |
| 4.2.3.2           | Stabl. Temp with 0.2 Watt Heat Load                           | 4.1                  | °K         | -      | 80                   |
| 4.2.3.2           | Temp after 1/2 Hour                                           | 49.2                 | °K         | -      | 80                   |
| 4.2.3.3           | Cold Finger Warm End Temp                                     |                      | °C         | Info   | Only                 |
| 4.2.3.4           | Input Volts 17 VDC Current <u>1.40</u> ADC<br>Stablized Power | 23.8                 | Watts      | -      | 30                   |
| 4.2.3.5           | Temp with 0.2 Watt Head Load                                  |                      | °K         | -      | 80                   |
| 4.2.3.5           | Cold Finger Warm End Temp                                     |                      | °C         | Info   | Only                 |
| 4.2.3.5           | Input Volts 32 VDC Current <u>    </u> ADC<br>Power           |                      | Watts      | -      | 30                   |
| 4.2.4             | Test at 71°C Horiz; Turn-on Current                           | N/A                  | Amps       | Info   |                      |
| 4.2.4.1           | Cooldown Time to 100°K                                        | 4.3                  | Minutes    | -      | 7.5                  |
| 4.2.4.1           | Cooldown Time to 80°K                                         | 5.1                  | Minutes    | -      | 10                   |
| 4.2.4.1           | Stabl. Temp. with 0.2 Watt Heat Load                          |                      | °K         | -      | 80                   |
| 4.2.4.1           | Temp after 1/2 hour                                           | 64.0                 | °K         | -      | 80                   |
| 4.2.4.2           | Cold Finger Warm End Temp                                     |                      | °C         | Info   | Only                 |
| 4.2.4.3           | Input Volts 17 VDC Current <u>1.71</u> ADC<br>Power           | 29.1                 | Watts      | -      | 35                   |
| 4.2.4.4           | Stabl. Temp with 0.2 Watt Head Load                           |                      | °K         | -      | 80                   |
| 4.2.4.4           | Cold Finger Warm End Temp                                     |                      | °C         | Info   | Only                 |
| 4.2.4.4           | Input Volts 32 VDC Current <u>    </u> ADC<br>Power           |                      | Watts      | -      | 35                   |

MIN Temp -41°C

PERFORMED BY: S. CACIOPPO  
DATE: 10-15-86  
WELDED YES/NO: Yes

New Run On Seal

## ATTACHMENT NO. 6

Sheet 1

## PERFORMANCE TEST

## DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC  
DRAWING NO. SM-D-500586J/SM-D-5005842

SERIAL NO. 011

| TEST<br>PLAN PARA | PARAMETER                                    | MEASURED | UNITS      | LIMITS |                      |
|-------------------|----------------------------------------------|----------|------------|--------|----------------------|
|                   |                                              |          |            | MIN    | MAX                  |
| J.10              | Calibration Check                            | -        | -          | Comply |                      |
| 4.1.1             | Inspection to SM-D-500586J/5005842           | -        | -          | Comply |                      |
| 4.1.2             | Weight                                       | -        | Lbs        | -      | 2.5                  |
| 4.1.3.1           | Pressurization                               | 330      | PSIG       | Info   | Only                 |
| 4.1.3.2           | Leakage Rate                                 | -        | STP CC/SEC | -      | 2.7x10 <sup>-7</sup> |
| 4.2.2             | Test at 23°C Horiz; Turn-on Current          | -        | Amps       | Info   |                      |
| 4.2.2             | Cooldown Time to 100°K                       | 4.9      | Minutes    | -      | 7.5                  |
| 4.2.2             | Cooldown Time to 80°K                        | 5.8      | Minutes    | -      | 10                   |
| 4.2.2             | Minimum Temp                                 | 46.8     | °K         | Info   | 80                   |
| 4.2.2.1           | Stabl. Temp. with 0.35 Watt Heat Load        | 73       | °K         | -      | 80                   |
| 4.2.2.2           | Temp. after 1/2 Hour Operation               | 75.1     | °K         | -      | 80                   |
| 4.2.2.3           | Cold Finger warm end temp                    | 32       | °C         | Info   | Only                 |
| 4.2.2.4           | Input Volt 17 VDC Current 1.44 ADC<br>Power  | 124.48   | Watts      | -      | 30                   |
| 4.2.2.5           | Stabl. Temp with 0.35 Watt Heat Load         | 77.4     | °K         | -      | 80                   |
| 4.2.2.5           | Cold Finger Warm End Temp                    | 132      | °C         | Info   | Only                 |
| 4.2.2.5           | Input Volts 32 VDC Current .84 ADC<br>Power  | 26.88    | Watts      | -      | 30                   |
| 4.2.3             | Test at -40°C Horiz; Turn-on Current         | -        | Amps       | Info   |                      |
| 4.2.3.1           | Cooldown Time to 100°K                       | 3.9      | Minutes    | -      | 7.5                  |
| 4.2.3.1           | Cooldown Time to 80°K                        | 4.7      | Minutes    | -      | 10                   |
| 4.2.3.2           | Stabl. Temp with 0.2 Watt Heat Load          | 53.7     | °K         | -      | 80                   |
| 4.2.3.2           | Temp after 1/2 Hour                          | 52.9     | °K         | -      | 80                   |
| 4.2.3.3           | Cold Finger Warm End Temp                    | -35      | °C         | Info   | Only                 |
| 4.2.3.4           | Input Volts 17 VDC Current 1.42 ADC<br>Power | 24.14    | Watts      | -      | 30                   |
| 4.2.3.5           | Temp with 0.2 Watt Heat Load                 | 55.9     | °K         | -      | 80                   |
| 4.2.3.5           | Cold Finger Warm End Temp                    | -35      | °C         | Info   | Only                 |
| 4.2.3.5           | Input Volts 32 VDC Current .81 ADC<br>Power  | 25.92    | Watts      | -      | 30                   |
| 4.2.4             | Test at 71°C Horiz; Turn-on Current          | -        | Amps       | Info   |                      |
| 4.2.4.1           | Cooldown Time to 100°K                       | 6.5      | Minutes    | -      | 7.5                  |
| 4.2.4.1           | Cooldown Time to 80°K                        | 7.9      | Minutes    | -      | 10                   |
| 4.2.4.1           | Stabl. Temp. with 0.2 Watt Heat Load         | 75.5     | °K         | -      | 80                   |
| 4.2.4.1           | Temp after 1/2 hour                          | 76.1     | °K         | -      | 80                   |
| 4.2.4.2           | Cold Finger Warm End Temp                    | 74       | °C         | Info   | Only                 |
| 4.2.4.3           | Input Volts 17 VDC Current 1.69 ADC<br>Power | 28.73    | Watts      | -      | 35                   |
| 4.2.4.4           | Stabl. Temp with 0.2 Watt Heat Load          | 80.9     | °K         | -      | 80                   |
| 4.2.4.4           | Cold Finger Warm End Temp                    | 80       | °C         | Info   | Only                 |
| 4.2.4.4           | Input Volts 32 VDC Current 1.03<br>Power     | 32.96    | Watts      | -      | 35                   |

PERFORMED BY: P. HARTMAN, D. MASTRASANO  
 DATE: 10-21-86  
 WELDED YES/NO: YES



## ATTACHMENT No. 7

Sheet 1 of 2

Contract No. DAAK20-84-C-0440

PERFORMANCE TEST

Project No. 24407

DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC  
DRAWING NO. SM-D-5005842SERIAL NO. 011

| TEST<br>PLAN PARA | PARAMETER                                                     | MEASURED              | UNITS      | LIMITS |                      |
|-------------------|---------------------------------------------------------------|-----------------------|------------|--------|----------------------|
|                   |                                                               |                       |            | MIN    | MAX                  |
| 3.10              | Calibration Check                                             | COMPLY                | -          | Comply |                      |
| 4.1.1             | Inspection to SM-D-5005842                                    | COMPLY                | -          | Comply |                      |
| 4.1.2             | Weight                                                        | 2.35                  | Lbs        | -      | 2.5                  |
| 4.1.3.1           | Pressurization                                                | 330                   | PSIG       | Info   | Only                 |
| 4.1.3.2           | Leakage Rate                                                  | 1.6x 10 <sup>-7</sup> | STP CC/SEC | -      | 2.7x10 <sup>-7</sup> |
| 4.2.2             | Test at 23°C Horiz; Turn-on Current                           | N/A                   | Amps       | Info   |                      |
| 4.2.2             | Cooldown Time to 100°K                                        | 4.7                   | Minutes    | -      | 7.5                  |
| 4.2.2             | Cooldown Time to 80°K                                         | 5.5                   | Minutes    | -      | 10                   |
| 4.2.2             | Minimum Temp                                                  | 45.2                  | °K         | Info   | 80                   |
| 4.2.2.1           | Stabl. Temp. with 0.35 Watt Heat Load                         | 60.0                  | °K         | -      | 80                   |
| 4.2.2.2           | Temp. after 1/2 Hour Operation                                | 69.7                  | °K         | -      | 80                   |
| 4.2.2.3           | Cold Finger warm end temp                                     | 37                    | °C         | Info   | Only                 |
| 4.2.2.4           | Input Volt 17 VDC Current <u>1.47</u> ADC<br>Power            | 24.99                 | Watts      | -      | 30                   |
| 4.2.2.5           | Stabl. Temp with 0.35 Watt Heat Load                          | 71.9                  | °K         | -      | 80                   |
| 4.2.2.5           | Cold Finger Warm End Temp                                     | 37                    | °C         | Info   | Only                 |
| 4.2.2.5           | Input Volts 32 VDC Current <u>.87</u> ADC<br>Power            | 27.84                 | Watts      | -      | 30                   |
| 4.2.3             | Test at -40°C Horiz; Turn-on Current                          | N/A                   | Amps       | Info   |                      |
| 4.2.3.1           | Cooldown Time to 100°K                                        | 4.2                   | Minutes    | -      | 7.5                  |
| 4.2.3.1           | Cooldown Time to 80°K                                         | 4.9                   | Minutes    | -      | 10                   |
| 4.2.3.2           | Stabl. Temp with 0.2 Watt Heat Load                           | 55.4                  | °K         | -      | 80                   |
| 4.2.3.2           | Temp after 1/2 Hour                                           | 55.7                  | °K         | -      | 80                   |
| 4.2.3.3           | Cold Finger Warm End Temp                                     | -31                   | °C         | Info   | Only                 |
| 4.2.3.4           | Input Volts 17 VDC Current <u>1.10</u> ADC<br>Stablized Power | 23.80                 | Watts      | -      | 30                   |
| 4.2.3.5           | Temp with 0.2 Watt Head Load                                  | 57.5                  | °K         | -      | 80                   |
| 4.2.3.5           | Cold Finger Warm End Temp                                     | -31                   | °C         | Info   | Only                 |
| 4.2.3.5           | Input Volts 32 VDC Current <u>.83</u> ADC<br>Power            | 26.56                 | Watts      | -      | 30                   |
| 4.2.4             | Test at 71°C Horiz; Turn-on Current                           | N/A                   | Amps       | Info   |                      |
| 4.2.4.1           | Cooldown Time to 100°K                                        | 5.5                   | Minutes    | -      | 7.5                  |
| 4.2.4.1           | Cooldown Time to 80°K                                         | 6.5                   | Minutes    | -      | 10                   |
| 4.2.4.1           | Stabl. Temp. with 0.2 Watt Heat Load                          | 64.2                  | °K         | -      | 80                   |
| 4.2.4.1           | Temp after 1/2 hour                                           | 67.1                  | °K         | -      | 80                   |
| 4.2.4.2           | Cold Finger Warm End Temp                                     | 85                    | °C         | Info   | Only                 |
| 4.2.4.3           | Input Volts 17 VDC Current <u>1.57</u> ADC<br>Power           | 26.69                 | Watts      | -      | 35                   |
| 4.2.4.4           | Stabl. Temp with 0.2 Watt Head Load                           | 71.9                  | °K         | -      | 80                   |
| 4.2.4.4           | Cold Finger Warm End Temp                                     | 85                    | °C         | Info   | Only                 |
| 4.2.4.4           | Input Volts 32 VDC Current ADC <u>.99</u><br>Power            | 31.60                 | Watts      | -      | 35                   |

Performed By: P. HARTMANNDate: 10-23-86Witnessed By: [Signature]

Q. A. Magnavox

Witnessed By: [Signature]

Q. A. Customer

C-13

OCT 21 1986



## ATTACHMENT No 7 Page 2 of 2

Contract: DAAK20-84-C-0440

PERFORMANCE TEST

Project: 24407

DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC  
DRAWING NO. SM-D-5005842SERIAL NO. 011

| TEST<br>PLAN PARA | PARAMETER                                           | MEASURED             | UNITS      | LIMITS |                      |
|-------------------|-----------------------------------------------------|----------------------|------------|--------|----------------------|
|                   |                                                     |                      |            | MIN    | MAX                  |
| 4.2.5             | Test at 23°C Vertical; Turn-on Current              | N/A                  | Amps       | Info   |                      |
| 4.2.5.1           | Cooldown Time to 100°K                              | 4.7                  | Minutes    | -      | 7.5                  |
| 4.2.5.1           | Cooldown Time to 80°K                               | 5.4                  | Minutes    | -      | 10                   |
| 4.2.5.1           | Minimum Temp                                        | 44.8                 | °K         | -      | 80                   |
| 4.2.5.2           | Stabl. Temp with 0.35 Watt Heat Load                | 69.6                 | °K         | -      | 80                   |
| 4.2.5.3           | Temp After 1/2 Hour With Heat Load                  | 70.6                 | °K         | Info   | 80                   |
| 4.2.5.4           | Cold Finger Warm End Temp                           | 39                   | °C         | Info   | Only                 |
| 4.2.5.5           | Input Volts 17 VDC Current <u>1.44</u> ADC<br>Power | 29.48                | Watts      | -      | 30                   |
| 4.2.5.6           | Stabl. Temp. with 0.35 Watt Heat Load               | 73.2                 | °K         | -      | 80                   |
| 4.2.5.6           | Cold Finger Warm End Temp                           | 39                   | °C         | Info   | Only                 |
| 4.2.5.6           | Input Volt 32 VDC Current <u>.87</u> ADC<br>Power   | 29.48                | Watts      | -      | 30                   |
| 4.2.6             | Leakage Rate                                        | $2.5 \times 10^{-7}$ | STP CC/SEC | -      | $2.7 \times 10^{-7}$ |

PERFORMED BY P. HARTMANNDATE 10-21-86WITNESSED BY [Signature] Q.A. MAGNAVOXWITNESSED BY [Signature] CUSTOMER

## ATTACHMENT NO. 8

Sheet 1 of 4

## PERFORMANCE TEST

CONTAMINATED GAS

## DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC  
DRAWING NO. SM-D-5005863/SM-D-5005842SERIAL NO. 013

| TEST<br>PLAN PARA | PARAMETER                                                            | MEASURED | UNITS      | LIMITS |                      |
|-------------------|----------------------------------------------------------------------|----------|------------|--------|----------------------|
|                   |                                                                      |          |            | MIN    | MAX                  |
| 3.10              | Calibration Check                                                    |          | -          | Comply |                      |
| 4.1.1             | Inspection to SM-D-5005863/5005842                                   |          | -          | Comply |                      |
| 4.1.2             | Weight                                                               |          | Lbs        | -      | 2.5                  |
| 4.1.3.1           | Pressurization                                                       | 330      | PSIG       | Info   | Only                 |
| 4.1.3.2           | Leakage Rate                                                         |          | STP CC/SEC | -      | $2.7 \times 10^{-7}$ |
| 4.2.2             | Test at 23°C Horiz; Turn-on Current                                  |          | Amps       | Info   |                      |
| 4.2.2             | Cooldown Time to 100°K                                               | 5.4      | Minutes    | -      | 7.5                  |
| 4.2.2             | Cooldown Time to 80°K                                                | 6.3      | Minutes    | -      | 10                   |
| 4.2.2             | Minimum Temp                                                         | 56.7     | °K         | Info   | 80                   |
| 4.2.2.1           | Stabl. Temp. with 0.35 Watt Heat Load                                | 76.2     | °K         | -      | 80                   |
| 4.2.2.2           | Temp. after 1/2 Hour Operation                                       | 89.4     | °K         | -      | 80                   |
| 4.2.2.3           | Cold Finger warm end temp                                            |          | °C         | Info   | Only                 |
| 4.2.2.4           | Input Volt <del>10.2</del> Current 1.75 ADC<br>10.2 Power            | 17.85    | Watts      | -      | 30                   |
| 4.2.2.5           | Stabl. Temp with 0.35 Watt Heat Load                                 |          | °K         | -      | 80                   |
| 4.2.2.5           | Cold Finger Warm End Temp                                            |          | °C         | Info   | Only                 |
| 4.2.2.5           | Input Volts 32 VDC Current <del>1.75</del> ADC<br>Power              |          | Watts      | -      | 30                   |
| 4.2.3             | Test at -40°C Horiz; Turn-on Current                                 |          | Amps       | Info   |                      |
| 4.2.3.1           | Cooldown Time to 100°K                                               | 5.0      | Minutes    | -      | 7.5                  |
| 4.2.3.1           | Cooldown Time to 80°K                                                | 5.7      | Minutes    | -      | 10                   |
| 4.2.3.2           | Stabl. Temp with 0.2 Watt Heat Load                                  | 66.3     | °K         | -      | 80                   |
| 4.2.3.2           | Temp after 1/2 hour                                                  | 65.1     | °K         | -      | 80                   |
| 4.2.3.3           | Cold Finger Warm End Temp                                            | -29.4    | °C         | Info   | Only                 |
| 4.2.3.4           | Input Volts <del>10.2</del> Current 2.35 ADC<br>Stabilized 9.6 Power | 22.56    | Watts      | -      | 30                   |
| 4.2.3.5           | Temp with 0.2 Watt Heat Load                                         |          | °K         | -      | 80                   |
| 4.2.3.5           | Cold Finger Warm End Temp                                            |          | °C         | Info   | Only                 |
| 4.2.3.5           | Input Volts 32 VDC Current <del>1.75</del> ADC<br>Power              |          | Watts      | -      | 30                   |
| 4.2.4             | Test at 71°C Horiz; Turn-on Current                                  |          | Amps       | Info   |                      |
| 4.2.4.1           | Cooldown Time to 100°K                                               | 6.3      | Minutes    | -      | 7.5                  |
| 4.2.4.1           | Cooldown Time to 80°K                                                | 7.7      | Minutes    | -      | 10                   |
| 4.2.4.1           | Stabl. Temp. with 0.2 Watt Heat Load                                 | 78.4     | °K         | -      | 80                   |
| 4.2.4.1           | Temp after 1/2 hour                                                  | 79.1     | °K         | -      | 80                   |
| 4.2.4.2           | Cold Finger Warm End Temp                                            | 84.2     | °C         | Info   | Only                 |
| 4.2.4.3           | Input Volts <del>10.2</del> Current 1.58 ADC<br>10.6 Power           | 16.75    | Watts      | -      | 35                   |
| 4.2.4.4           | Stabl. Temp with 0.2 Watt Heat Load                                  |          | °K         | -      | 80                   |
| 4.2.4.4           | Cold Finger Warm End Temp                                            |          | °C         | Info   | Only                 |
| 4.2.4.4           | Input Volts 32 VDC Current <del>1.75</del> ADC<br>Power              |          | Watts      | -      | 35                   |

PERFORMED BY: P. FlanneryDATE: 1-13-87WELDED YES/NO: NO

ATTACHMENT NO. 8

Page 2 of 4

## PERFORMANCE TEST

## DATA SHEET

**CONTAMINATED  
GAS**COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC  
DRAWING NO. SM-D-5005863/SM-D-5005842SERIAL NO. 013

| TEST<br>PLAN PARA | PARAMETER                                                | MEASURED    | UNITS      | LIMITS |                      |
|-------------------|----------------------------------------------------------|-------------|------------|--------|----------------------|
|                   |                                                          |             |            | MIN    | MAX                  |
| 4.2.5             | Test at 23°C Vertical; Turn-on Current                   |             | Amps       | Info   |                      |
| 4.2.5.1           | Cooldown Time to 100°K                                   | <u>5.6</u>  | Minutes    | -      | 7.5                  |
| 4.2.5.1           | Cooldown Time to 80°K                                    | <u>6.5</u>  | Minutes    | -      | 10                   |
| 4.2.5.1           | Minimum Temp                                             | <u>53.0</u> | °K         |        | 80                   |
| 4.2.5.2           | Stabl. Temp with 0.35 Watt Heat Load                     | <u>79.5</u> | °K         | -      | 80                   |
| 4.2.5.3           | Temp After 1/2 Hour With Heat Load                       | <u>84.2</u> | °K         | Info   | 80                   |
| 4.2.5.4           | Cold Finger Warm End Temp                                |             | °C         | Info   | Only                 |
| 4.2.5.5           | Input Volts <u>10.2</u> Current <u>1.73</u> ADC<br>Power |             | Watts      | -      | 30                   |
| 4.2.5.6           | Stabl. Temp. with 0.35 Watt Heat Load                    |             | °K         |        | 80                   |
| 4.2.5.6           | Cold Finger Warm End Temp                                |             | °C         | Info   | Only                 |
| 4.2.5.6           | Input Volt 32 VDC Current ADC<br>Power                   |             | Watts      | -      | 30                   |
| 4.2.6             | Leakage Rate                                             |             | STP CC/SEC | -      | 2.7X10 <sup>-1</sup> |

PERFORMED BY

P. Hartmann

DATE

1-13-87

WITNESSED BY

Q.A. MAGNAVOX

WITNESSED BY

Q.A. CUSTOMER

## ATTACHMENT NO. 8

Sheet 3 of 4

## PERFORMANCE TEST

## DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC  
DRAWING NO. SM-D-5005863/SM-D-5005842

SERIAL NO. 013

| TEST PLAN PARA | PARAMETER                                                            | MEASURED  | UNITS      | LIMITS |                      |
|----------------|----------------------------------------------------------------------|-----------|------------|--------|----------------------|
|                |                                                                      |           |            | MIN    | MAX                  |
| 3.10           | Calibration Check                                                    |           | -          | Comply |                      |
| 4.1.1          | Inspection to SM-D-5005863/5005842                                   |           | -          | Comply |                      |
| 4.1.2          | Weight                                                               |           | Lbs        | -      | 2.5                  |
| 4.1.3.1        | Pressurization                                                       | 330       | PSIG       | Info   | Only                 |
| 4.1.3.2        | Leakage Rate                                                         |           | STP CC/SEC | -      | $2.7 \times 10^{-7}$ |
| 4.2.2          | Test at 23°C Horiz; Turn-on Current                                  |           | Amps       | Info   |                      |
| 4.2.2          | Cooldown Time to 100°K                                               | 4.7       | Minutes    | -      | 7.5                  |
| 4.2.2          | Cooldown Time to 80°K                                                | 5.5       | Minutes    | -      | 10                   |
| 4.2.2          | Minimum Temp                                                         | 59.2-65.1 | °K         | Info   | 80                   |
| 4.2.2.1        | Stabl. Temp. with 0.35 Watt Heat Load                                | 77.7      | °K         | -      | 80                   |
| 4.2.2.2        | Temp. after 1/2 Hour Operation                                       | 77.9      | °K         | -      | 80                   |
| 4.2.2.3        | Cold Finger warm end temp                                            | 39.3      | °C         | Info   | Only                 |
| 4.2.2.4        | Input Volt <del>1.58</del> Current 1.58 ADC<br>10.2 Power            | 16.12     | Watts      | -      | 30                   |
| 4.2.2.5        | Stabl. Temp with 0.35 Watt Heat Load                                 |           |            |        |                      |
| 4.2.2.5        |                                                                      |           |            |        |                      |
| 4.2.2.5        |                                                                      |           |            |        |                      |
| 4.2.3          | Test at -40°C Horiz; Turn-on Current                                 |           | Amps       | Info   |                      |
| 4.2.3.1        | Cooldown Time to 100°K                                               | 4.5       | Minutes    | -      | 7.5                  |
| 4.2.3.1        | Cooldown Time to 80°K                                                | 5.1       | Minutes    | -      | 10                   |
| 4.2.3.2        | Stabl. Temp with 0.2 Watt Heat Load                                  | 66.1      | °K         | -      | 80                   |
| 4.2.3.2        | Temp after 1/2 Hour                                                  | 65.4      | °K         | -      | 80                   |
| 4.2.3.3        | Cold Finger Warm End Temp                                            | -33.3     | °C         | Info   | Only                 |
| 4.2.3.4        | Input Volts <del>1.81</del> Current 1.81 ADC<br>Stabilized 9.6 Power | 17.38     | Watts      | -      | 30                   |
| 4.2.3.5        | Temp with 0.2 Watt Heat Load                                         |           |            |        |                      |
| 4.2.3.5        |                                                                      |           |            |        |                      |
| 4.2.3.5        |                                                                      |           |            |        |                      |
| 4.2.4          | Test at 71°C Horiz; Turn-on Current                                  |           | Amps       | Info   |                      |
| 4.2.4.1        | Cooldown Time to 100°K                                               | 5.9       | Minutes    | -      | 7.5                  |
| 4.2.4.1        | Cooldown Time to 80°K                                                | 6.9       | Minutes    | -      | 10                   |
| 4.2.4.1        | Stabl. Temp. with 0.2 Watt Heat Load                                 | 75.4      | °K         | -      | 80                   |
| 4.2.4.1        | Temp after 1/2 hour                                                  | 76.3      | °K         | -      | 80                   |
| 4.2.4.2        | Cold Finger Warm End Temp                                            | 85.9      | °C         | Info   | Only                 |
| 4.2.4.3        | Input Volts <del>1.87</del> Current 1.87 ADC<br>10.6 Power           | 19.82     | Watts      | -      | 35                   |
| 4.2.4.4        | Stabl. Temp with 0.2 Watt Heat Load                                  |           |            |        |                      |
| 4.2.4.4        |                                                                      |           |            |        |                      |
| 4.2.4.4        |                                                                      |           |            |        |                      |

PERFORMED BY:

P. HARTMAN

DATE:

1-14-87

WELDED YES/NO:

No

ATTACHMENT NO. 8

Page 4 of 4

## PERFORMANCE TEST

## DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC  
DRAWING NO. SM-D-5005863/SM-D-5005842SERIAL NO. 013

| TEST<br>PLAN PARA | PARAMETER                                                       | MEASURED  | UNITS      | LIMITS |                      |
|-------------------|-----------------------------------------------------------------|-----------|------------|--------|----------------------|
|                   |                                                                 |           |            | MIN    | MAX                  |
| 4.2.5             | Test at 23°C Vertical; Turn-on Current                          |           | Amps       | Info   |                      |
| 4.2.5.1           | Cooldown Time to 100°K                                          | 4.8       | Minutes    | -      | 7.5                  |
| 4.2.5.1           | Cooldown Time to 80°K                                           | 5.5       | Minutes    | -      | 10                   |
| 4.2.5.1           | Minimum Temp                                                    | 59.2-61.0 | °K         | -      | 80                   |
| 4.2.5.2           | Stabl. Temp with 0.35 Watt Heat Load                            | 75.5      | °K         | -      | 80                   |
| 4.2.5.3           | Temp After 1/2 Hour With Heat Load                              | 76.8      | °K         | Info   | 80                   |
| 4.2.5.4           | Cold Finger Warm End Temp                                       | 31.6      | °C         | Info   | Only                 |
| 4.2.5.5           | Input Volts <del>22</del> 24V AC Current 1.59 ADC<br>10.2 Power | 16.22     | Watts      | -      | 30                   |
| 4.2.5.6           | Stabl. Temp with 0.35 Watt Heat Load                            |           |            |        | 80                   |
| 4.2.5.6           |                                                                 |           |            |        |                      |
| 4.2.5.6           |                                                                 |           |            |        |                      |
| 4.2.6             | Leakage Rate                                                    |           | STP CC/SEC | -      | 2.7X10 <sup>-1</sup> |

PERFORMED BY

P. HARTMANN

DATE

1-14-87

WITNESSED BY

Q.A. MAGNAVOX

WITNESSED BY

Q.A. CUSTOMER

**Magnevox**

GOVERNMENT &amp; INDUSTRIAL ELECTRONICS COMPANY

**RELIABILITY & QUALITY  
ASSURANCE DEPT.****FAILURE REPORT**

PAGE 1 OF 2

F.R. No. 24407-003

| Name & Type                                                     | Part or Dwg. No. | Serial No. | Circuit Symbol      | Manufacturer       |
|-----------------------------------------------------------------|------------------|------------|---------------------|--------------------|
| Equipment<br>COOLER, LINEAR SPLIT<br>CYCLE, HD-1045<br>Assembly | SM-D-5005842     | 016        |                     | MAGIEC<br>MAGNAVOX |
| Part                                                            |                  |            |                     |                    |
| Test Environment                                                |                  | Spec No.   | Data Sheet Item No. |                    |

|              |                  |
|--------------|------------------|
| Failure Date | 11-6-86          |
| Report Date  | 12-1-86          |
| Customer     | NVEOC            |
| Contract No. | DAAK20-84-C-0440 |
| Project No.  | 24407            |

52 C Life Test

EOSR 1314

DESCRIPTION OF FAILURE (Include Symptoms, readings, deviations from Specs) On Returns: quote Customer complaint: describe MAGIEC test finding

At 160 hours of operation in the life test, while at the 52 C plateau, input power to SN 016 exceeded the specification limit of 30 watts. Input power was 30.1 watts.

**CAUSE OF FAILURE**

See analysis.

**REPAIR ACTION**

See analysis.

|                             |                                          |                                               |                                           |                                    |                                |
|-----------------------------|------------------------------------------|-----------------------------------------------|-------------------------------------------|------------------------------------|--------------------------------|
| Disposition of removed part |                                          |                                               |                                           |                                    |                                |
| Failure Found During:       | Acceptance Test <input type="checkbox"/> | Design Approval Test <input type="checkbox"/> | Reliability Test <input type="checkbox"/> | Field Use <input type="checkbox"/> | Other <input type="checkbox"/> |
| Reported by                 | Reviewed by (Engineering)                | Project Manager                               | Quality Assurance                         |                                    |                                |
|                             | Ram Narayan                              |                                               |                                           |                                    |                                |

**FAILURE ANALYSIS REPORT**

ANALYSIS: Although the power specification requirement was exceeded, this cannot be defined as a failure in the typical sense. While the input power was slightly above the limit, the cold production was exceptionally good. (It should be noted that the full specification heat load was used, and not the 80% load allowed for the life test). A tabulation of input power versus cold production at 52 C ambient is presented in Figure 1.

It is easily understood how this condition was not detected during acceptance testing. Acceptance test, high temperature plateau is 71 C, with an input power limit of 35 watts. No testing is required at the 52 C life test temperature, therefore, the marginal power condition at 52 C was masked. The cooler was tested for and passed all the acceptance test temperature requirements.

In the setup of the cooler drive voltage, during the initial manufacturing/assembly tests; the goal is to achieve a balance between cold production and power consumption. Had the marginal power at 52 C been detected earlier, this condition could have been easily corrected opening the cooler and making an internal adjustment setup. Unfortunately to open and adjust the cooler at this point in time is not easy to accomplish; nor is it realistically necessary & desirable.

C-19

|                                                                                                                                           |             |                 |                   |         |
|-------------------------------------------------------------------------------------------------------------------------------------------|-------------|-----------------|-------------------|---------|
| Analysis by                                                                                                                               | Engineering | Project Manager | Quality Assurance | Date    |
|                                                                                                                                           | Ram Narayan |                 |                   | 3/12/87 |
| Copies: J. R. Casamento, S. Cacioppo, R. Christiansen, D. Coffin, W. Galbo, D. Lehrfeld, R. Narayan, W. Schubert. Contracts: J. Lynch (3) |             |                 |                   |         |
| NVEOC: H. Dunmire, S. Pomeroy. DCAS: R. Rothstein                                                                                         |             |                 |                   |         |

## FAILURE REPORT

24407-003

## Analysis (Cont'd..)

As of this date, Dec. 1, 1986, the cooler has over 665 hours of operation. The amount by which the power exceeded the requirement is minimal. With normal operational variations, the power drifts in and out of the specification limit, as shown in Figure 1.

A review of the data and circumstances leads to a conclusion that this anomaly is the result of a marginal adjustment technique during the assembly test phase, and is not relevant as a design failure in the life test. It is therefore recommended that this not be considered a chargeable failure and that SN 016 be continued in life test.

| OPERATING<br>HOURS | CF TEMP<br>DEG K | INPUT<br>POWER<br>WATTS | APPLIED<br>HEAT LOAD<br>WATTS |
|--------------------|------------------|-------------------------|-------------------------------|
| 8                  | 60.4             | 29.1                    | .290                          |
| 27                 | 59.9             | 29.1                    | *                             |
| 100                | 60.3             | 29.6                    | *                             |
| 120                | 60.3             | 29.8                    | *                             |
| 140                | 59.5             | 29.8                    | *                             |
| 160                | 62.6             | 30.1                    | *                             |
| 240                | 58.0             | 31.5                    | *                             |
| 260                | 58.4             | 26.6                    | *                             |
| 271                | 57.9             | 30.8                    | *                             |
| 295                | 58.4             | 30.6                    | *                             |
| 315                | 58.4             | 30.6                    | *                             |
| 375                | 60.3             | 30.1                    | *                             |
| 395                | 61.7             | 30.5                    | *                             |
| 415                | 62.5             | 29.8                    | *                             |
| 435                | 62.1             | 30.1                    | *                             |
| 455                | 61.2             | 30.3                    | *                             |
| 555                | 61.2             | 30.5                    | *                             |
| 655                | 60.8             | 30.1                    | .290                          |

FIGURE 1: SN 016 TIME/CF TEMP/INPUT POWER  
AT 52 C AMBIENT

## CORRECTIVE ACTION

Not applicable at this time.

# Magnavox

GOVERNMENT & INDUSTRIAL ELECTRONICS COMPANY

## RELIABILITY & QUALITY ASSURANCE DEPT.

### FAILURE REPORT

F.R. No. 24407-005

| Name & Type                                                     | Part or Dwg. No.      | Serial No.          | Circuit Symbol | Manufacturer |
|-----------------------------------------------------------------|-----------------------|---------------------|----------------|--------------|
| Equipment<br>COOLER, LINEAR SPLIT<br>CYCLE, HD-1045<br>Assembly | SM-D-5005842          | 016                 |                | MAGIEC       |
| ELECTRONICS ASSEMBLY<br>Part                                    | SM-D-5005849          | 007                 |                | MAGNAVOX     |
| INVERTER HYBRID<br>Test Environment                             | SM-A-5005947          | 013                 |                | TELEDYNE     |
| -32 C LIFE TEST                                                 | Spec No.<br>EOSR 1314 | Data Sheet Item No. |                |              |

|                                  |
|----------------------------------|
| Failure Date<br>1-9-87           |
| Report Date<br>3-17-87           |
| Customer<br>NVEOC                |
| Contract No.<br>DAAK20-84-C-0440 |
| Project No.<br>24407             |

Running Time 1417 Hours

DESCRIPTION OF FAILURE (Include Symptoms, readings, deviations from Specs) On Returns: quote Customer complaint; describe MAGIEC test findings  
At 1417 hours of operation in the life test, while at the -32C plateau, input power to SN 016 was observed to be extremely low. The cooler was not operating.  
The input current was .1 amperes. (Power: 1.8 watts). Normal input current was approximately 1.5 amperes at this temperature. (Power: 26.2 watts).

#### CAUSE OF FAILURE

Electronics Assembly, PN SM-D-5005849 had become inoperative. An intermittent wire bond connection on the Inverter Hybrid section (part number SM-A-5005947) of the Electronics Assembly.

REPAIR ACTION : The compressor rear cap was cut open and the electronics package was removed for troubleshooting. The Inverter Hybrid was taken to a hybrid manufacturing laboratory to have the lead rebonded. Two other bonds looked marginal; they were rebonded as well, for good measure.

#### Disposition of removed part

|                       |                                          |                                               |                                           |                                    |                                |
|-----------------------|------------------------------------------|-----------------------------------------------|-------------------------------------------|------------------------------------|--------------------------------|
| Failure Found During: | Acceptance Test <input type="checkbox"/> | Design Approval Test <input type="checkbox"/> | Reliability Test <input type="checkbox"/> | Field Use <input type="checkbox"/> | Other <input type="checkbox"/> |
| Reported by           | Reviewed by (Engineering)                | Project Manager                               | Quality Assurance                         |                                    |                                |

### FAILURE ANALYSIS REPORT

ANALYSIS : The initial condition observed at the -32 C plateau was confirmed in the cryogenics engineering test area. Many trials at room temperature and then low temperature were made. The cooler functioned at room, but not at cold. During one of the cycles, while at room temperature, the cooler was rapped mechanically, and the problem reappeared. This brought to light the fact that mechanical shock as well as temperature cycling could cause the effect. This immediately raised the flag of a possible loose or poor connection.

The electronics package was then given a thorough microscopic inspection. The inspection revealed one lead was unbonded on the Inverter Hybrid. The services of a nearby hybrid manufacturing lab were enlisted to rebond the lead. During the rebonding, two other leads on the inverter appeared to have marginal bonds, they were also rebonded as a precautionary measure. After rebonding the leads, and re-installing the electronics assembly in the cooler, the cooler was subjected to several temperature cycles (23 C, -32 C, 23 C) without a single failure. It is therefore concluded that the cause of the failure was the poor wire bond connection.

Cont'd../2

|             |                                                                                                                                 |                 |                   |          |
|-------------|---------------------------------------------------------------------------------------------------------------------------------|-----------------|-------------------|----------|
| Analysis by | Engineering                                                                                                                     | Project Manager | Quality Assurance | Date     |
|             | Nam Narayan                                                                                                                     |                 |                   | 10/23/87 |
| Copies:     | D. Coffin, R. Dav, W. Galbo, S. Isgro, D. Lehrfeld, F. Mollo, R. Narayan.<br>NVEOC: H. Dunmire, S. Pomeroy. DCAS: R. Rothstein. |                 |                   |          |

C-21

**CORRECTIVE ACTION:**

Since this was one of the early, engineering assembled, hybrids it is felt the problem was caused by incompletely defined cleaning procedures, bonding process schedule, and defluxing processes. The engineering lab, due to the developmental/design oriented nature of their operation; the necessary rework, trial and retrial of components and techniques, does not always produce a product consistent with the high quality provided by the production department. Every operation in the production department is completely documented and controlled. Bonding schedules, assembly and cleaning processes are fully evaluated before implementation. All these highly disciplined activities along with 100% visual inspection, and source inspection are routinely accomplished by the vendor's production facility. Accordingly, there is no further corrective action required, since all future units will come out of the production group.

| Name & Type                                         | Part or Dwg. No. | Serial No. | Circuit Symbol | Manufacturer |
|-----------------------------------------------------|------------------|------------|----------------|--------------|
| Equipment<br>Cooler, Linear Split<br>Cycle, HD-1045 | SM-D-5005842     | 011        | -              | Magnavox     |
| Assembly<br>Piston Rulon Assembly                   | SM-C-5005853     | -          | -              | Magnavox     |
| Part                                                |                  |            |                |              |

|              |                  |
|--------------|------------------|
| Failure Date | 9-30-87          |
| Report Date  | 2-8-88           |
| Customer     | CNVEO            |
| Contract No. | DAAK20-84-C-0440 |
| Project No.  | 24407            |

| Test Environment | Spec No.  | Data Sheet Item No. |
|------------------|-----------|---------------------|
| -32 C Life Test  | EOSR 1314 |                     |

Running Time 6435 Hrs

**DESCRIPTION OF FAILURE** (Include Symptoms, readings, deviations from Specs) On Returns: quote Customer complaint: describe MAGIEC test find

The cooler had been placed into life test on October 24, 1986. It had been subjected to continuous cyclical operation in accordance with the profile of Figure 1. The cooler provided in-spec operation for approximately 2500 hours at -32 C and 23 C. At 2500 hours the input power was 30.1 watts at -32 C, and 30.3 watts at 23 C. The input power at 52 C was 30.1 watts at 1210 hours. This was discussed with CNVEO representatives, and with their concurrence, the test continued. (The marginal power condition is the result of an assembly/test adjustment which balances power consumption versus cold production). The cooler was operating in full cooling mode, not using the fold-back (refrigeration control mode). The cooler continued to run in full cooling mode, maintaining less than 80 K cold station temperature, with the life test heat load. (For plots of the data, and heat loads used, see Figures 2 through 4). Input power increased to a maximum of 35.9 watts (52 C plateau) at 4550 hours. At 4596 hours, using the refrigeration control mode, the cooler was brought to virtual specification performance:

| AMB TEMP | VDC  | I    | WATTS | COLD TIP K | HEATLOAD MW |
|----------|------|------|-------|------------|-------------|
| 23C      | 17.5 | 1.72 | 30.1  | 80.0       | 280         |
| -32C     | 17.5 | 1.66 | 29.1  | 80.5       | 280         |
| 52C      | 17.5 | 1.88 | 32.9  | 80.2       | 232         |

Beyond 4600 hours, cold finger temperature and power rose steadily and could not be brought into spec with the fold-back (refrigeration control) circuit. It was decided, with CNVEO concurrence, to run the cooler beyond this point for informational purposes. On September 30, 1987 after 6435 hours of operation, the cold finger temperature had risen to 111 K and the input power to the cooler was 50.8 watts, at -32 C ambient. The cooler had been operating with the specified heat load of .280 watts. It was felt any further operation of the cooler would not provide additional useful data. Accordingly, the cooler was removed from life test at 6435 hours of operation. Figures 2 through 4 are plots of the cooler performance data over the nearly 6500 hour life test.

#### CAUSE OF FAILURE:

Post-test analysis revealed that performance degradation resulted from increase in the clearance space between the piston rulon (part No. SM-C-5005853) and the inner yoke bore (part No. SM-D-5005918), due to wear. This caused excessive "blow-by" of the refrigerant gas, resulting in loss of cold production and an increase in power input.

#### REPAIR ACTION:

Replaced piston-rulon assembly, part number SM-C-5005853.

Disposition of removed part CRYO LAB

|                       |                                          |                                               |                                                      |                                    |                                |
|-----------------------|------------------------------------------|-----------------------------------------------|------------------------------------------------------|------------------------------------|--------------------------------|
| Failure Found During: | Acceptance Test <input type="checkbox"/> | Design Approval Test <input type="checkbox"/> | Reliability Test <input checked="" type="checkbox"/> | Field Use <input type="checkbox"/> | Other <input type="checkbox"/> |
| Reported by           | Reviewed by (Engineering)                | Project Manager                               | Quality Assurance                                    |                                    |                                |
| <i>Robert Hartman</i> | <i>Ram Narayan</i>                       | <i>[Signature]</i>                            | <i>[Signature]</i>                                   |                                    |                                |

**FAILURE ANALYSIS REPORT**

PAGE 2

**ANALYSIS**

In order to determine the cause for the reduced performance, a thorough investigation and analysis was performed.

1. Upon removal from the life test station, the cooler was leak checked, the data was  $0.9 \times 10^{-9}$ ; well within specification limits. (Spec:  $2.7 \times 10^{-7}$ ).
2. The cooler was taken to a gas analysis lab to have the gas analyzed. The refrigerant gas was not contaminated. (See report, Figure 5).
3. After the gas analysis in 2 above; the cooler was vacuum baked, purged, charged, and then run through a full ATP. Cooler performance improved, but not significantly. (See data Figure 6).
4. The expander was then disassembled; and the regenerator was removed. The pieces were examined and cleaned of a minimal amount of accumulated particulates. (See photos Figures 7 through 10). The unit was then re-assembled and retested with no improvement in performance. (See data, Figure 11). The cooler still did not meet the performance requirements.
5. At this point, the compressor was cut open and the electronics assembly was removed to be tested separately. The cooler was tested with AC drive to the motor. The cooler did not meet specification requirements. (See data, Figure 12). The electronics package was found to be within specification limits.
6. The vibration absorber/piston-coil assembly was removed and inspected. No contamination worthy of note was found. The piston run on O.D. and the inner yoke I.D. were checked dimensionally. The data revealed a clearance of .0023" to .0033". This is a substantial increase from the specification clearance limits of .0004" to .0009". Figure 13 presents the post life test measurements and the specification limits.
7. Having found the anomaly, the piston was removed and a new piston was installed.
8. SN 11 was then re-assembled, purged, charged, and AC tested using all original components except for the new piston-run on assembly. Cooler performance met the specification requirements. (See data, Figure 14).
9. After the AC test, the original electronics package was installed in SN 11. The unit was subjected to and passed a full acceptance test. (See data, Figure 15).
10. In conclusion, it was both impressive and gratifying to find the minimal amount of particulate matter in the cooler; and to be able to return the cooler to full performance with only a replacement of the piston-run on assembly, after nearly 6500 hours of operation. The findings were significant in that they appear to answer the question "what is a suggested refurbishment philosophy applicable to the Magnavox long-life line cooler?"

**CORRECTIVE ACTION**

None required.

|                                                                                                                                                                                         |                                   |                                       |                                         |                 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------------------|-----------------------------------------|-----------------|
| Analysis By<br><i>[Signature]</i>                                                                                                                                                       | Engineering<br><i>[Signature]</i> | Project Manager<br><i>[Signature]</i> | Quality Assurance<br><i>[Signature]</i> | Date<br>3/16/88 |
| Copies: S. Cacioppo, R. Day, W. Garbo, S. Isgrò, D. Lenfield, R. Martins, F. Mollo, R. Naraya<br>R. Prather, R. Rothstein (DCAS), E. Ryerson.<br>Contracts/CNVEO: H. Dunlap, S. Pomeroy |                                   |                                       |                                         |                 |

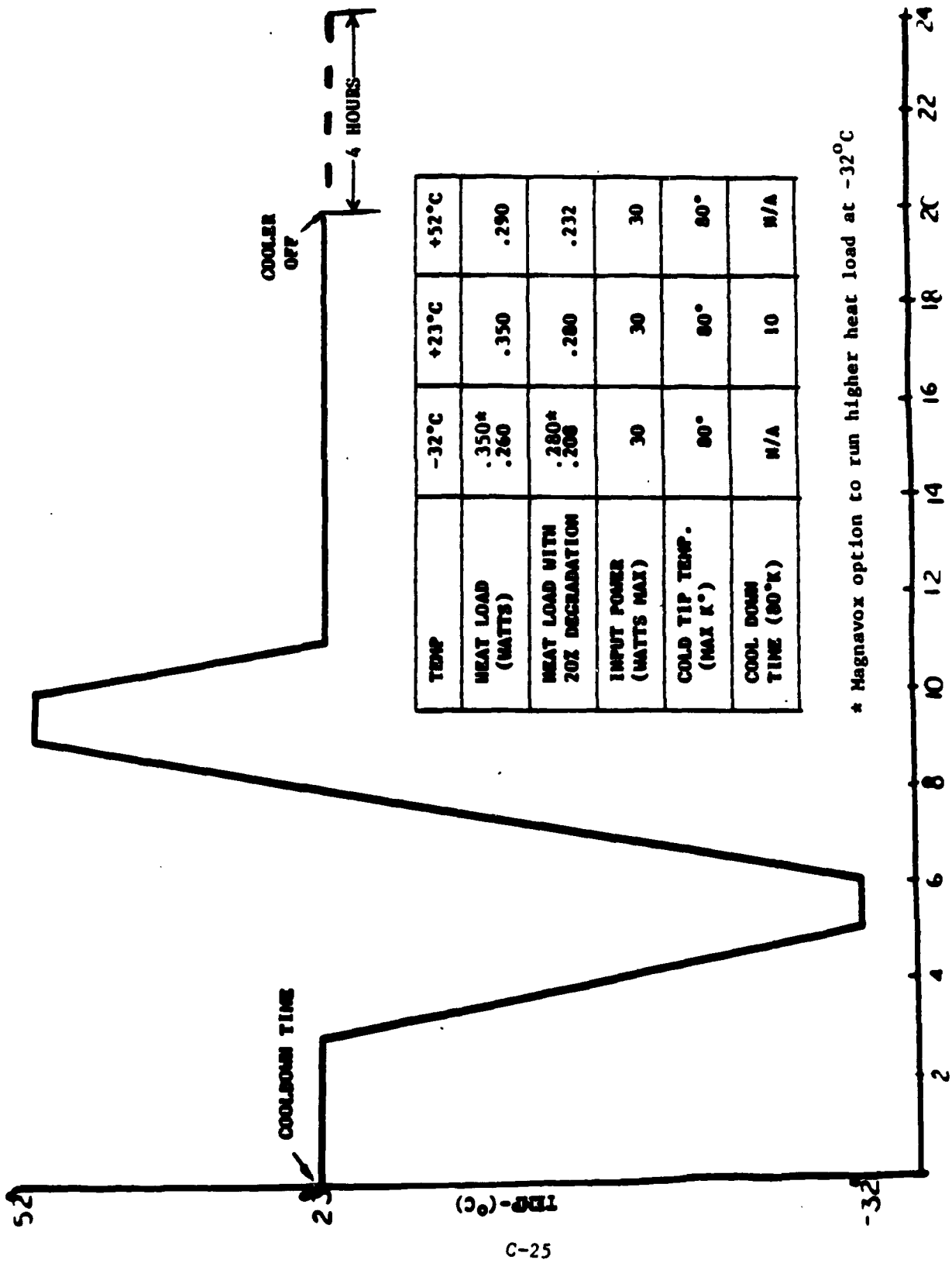


FIGURE 1. Test Profile

# MMT COOLER LIFE TEST

SN 11 PERFORMANCE AT -32 DEGREES C

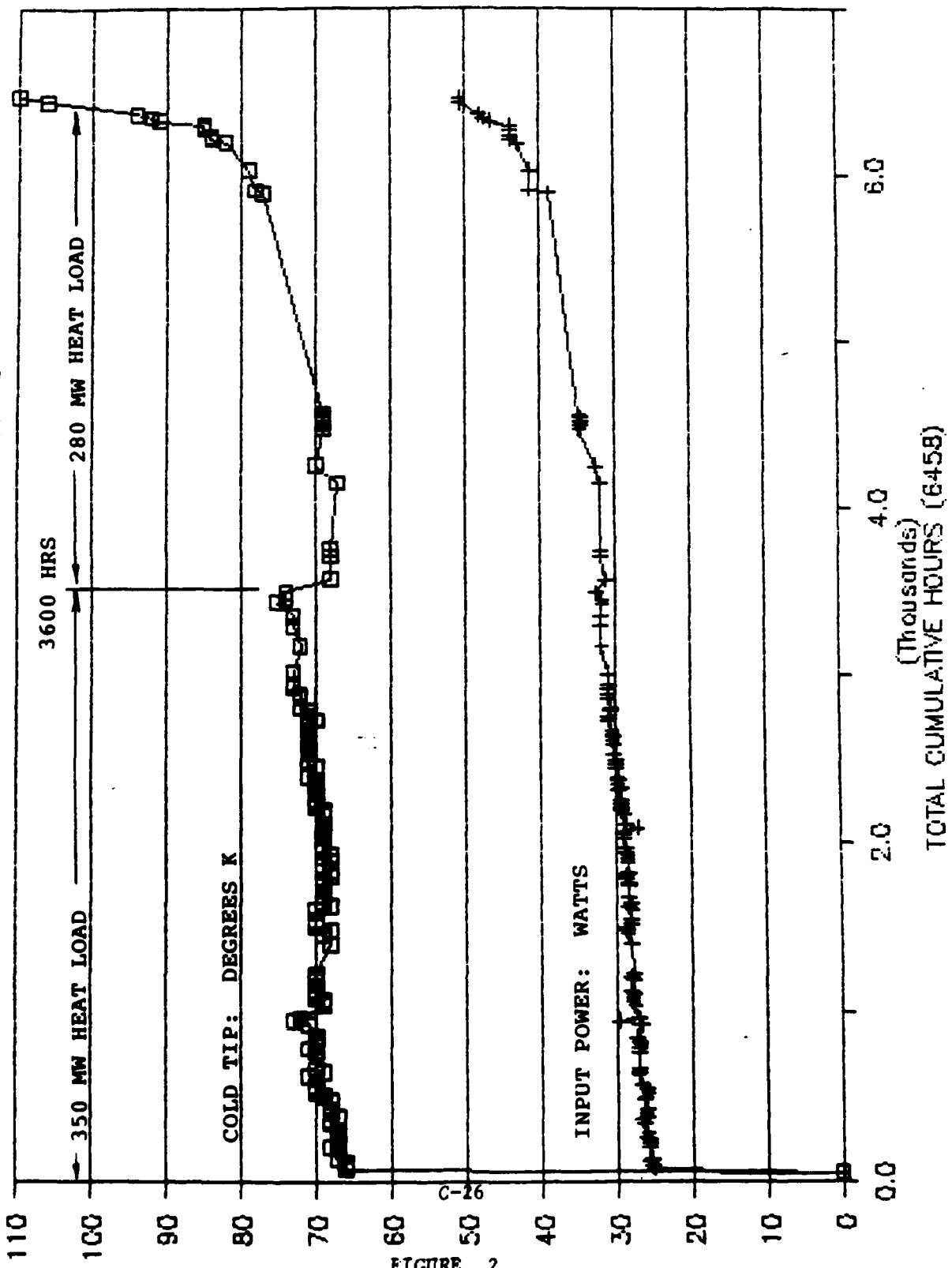


FIGURE 2

# MMT COOLER LIFE TEST

SN 11 PERFORMANCE AT 23 DEGREES C

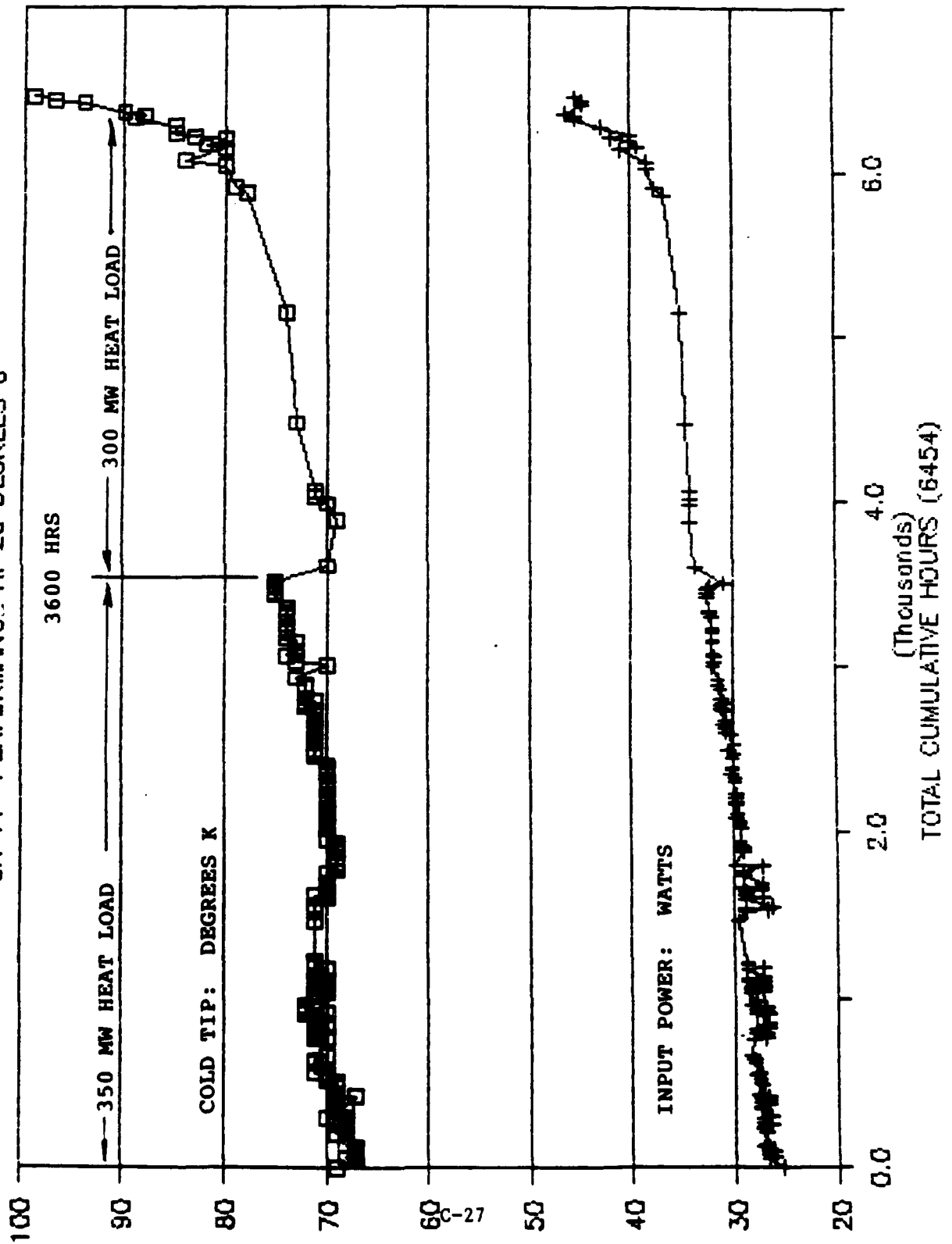


FIGURE 3

# MMT COOLER LIFE TEST

SN 11 PERFORMANCE AT 52 DEGREES C

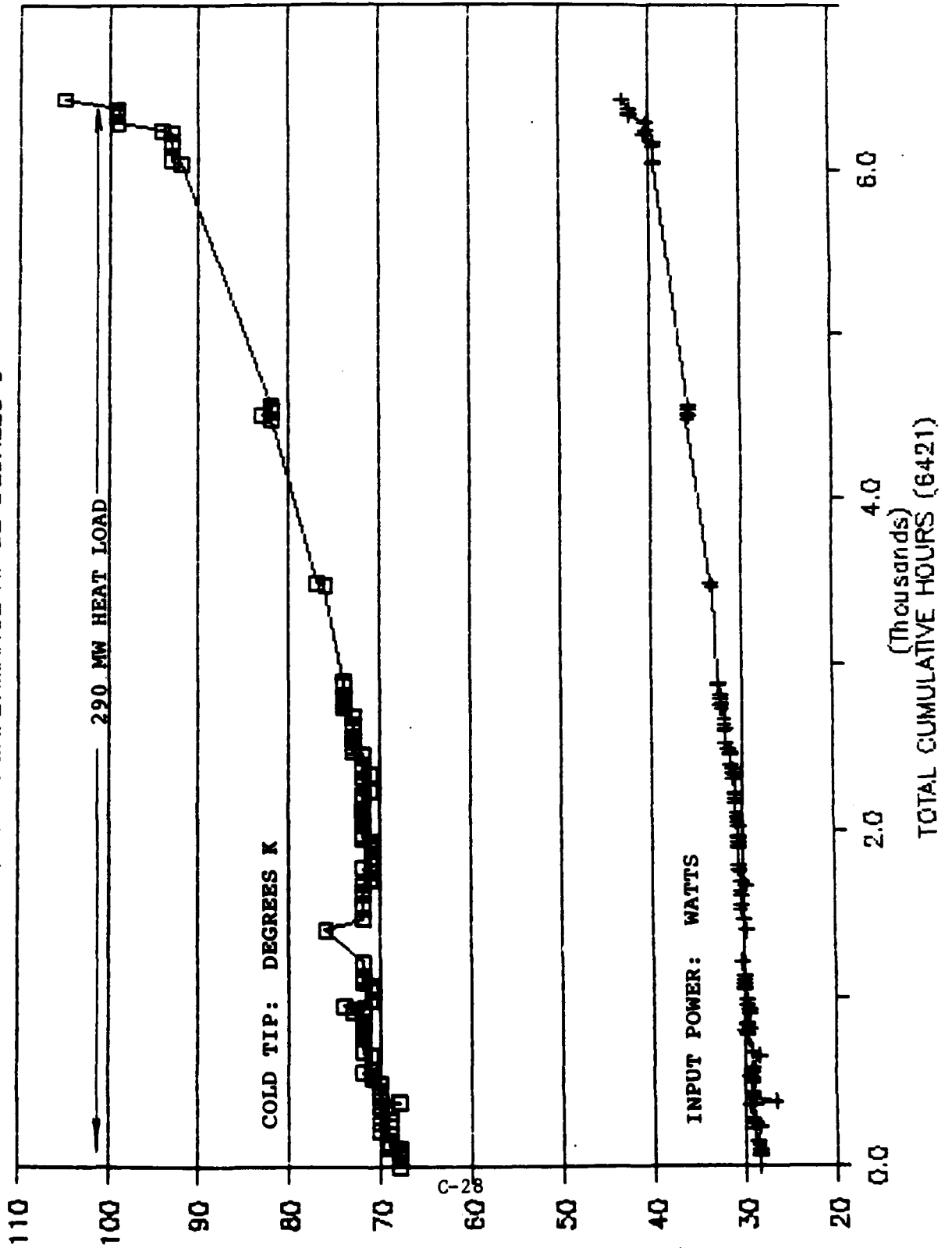


FIGURE 4

# Gollob Analytical Service

MOLININI/GOLLOB (A DIVISION OF) ENECO (INCORPORATED)

47 INDUSTRIAL ROAD, BERKELEY HEIGHTS, NEW JERSEY 07922 • TEL. (201) 464-3331

TO: Mr. Hank Meehan  
Magnavox  
Electro Optical Systems  
46 Industrial Avenue  
Mahwah, NJ 07430

G.A.S. REPORT No. 65202

Date Requested: 10/20/87

Date Reported: 10/21/87

P.O. No. S5205

MATERIAL SUBMITTED: 1 (One) Cooler

INFORMATION REQUESTED: Mass Spectrometry &amp; Electrolytic Hygrometer Analyses

NOTEBOOK REFERENCE: 1286, Pg. 46 &amp; KD0, #1

## RESULT OF INVESTIGATION

Concentration, % by VolumeSample Identity:S/N 11 P/N SMD 5005842Mass Spectrometry AnalysisConstituents

|                       |         |
|-----------------------|---------|
| Nitrogen              | 0.0063  |
| Oxygen                | ND      |
| Argon                 | ND      |
| Carbon Dioxide        | 0.019   |
| Hydrogen              | 0.066   |
| Helium                | Balance |
| Halogenated Compound* | 0.0006  |

Electrolytic Hygrometer Analysis

Water (ppm by Volume) 11

ND=None detected

\*Possibly a "Freon" type compound.

This sample was scanned from mass 2 through mass 150 and no other constituents were detected. The detection threshold for most constituents is .0004%.

n 102187

C-29

GOLLOB ANALYTICAL SERVICE

Contract No. \_\_\_\_\_ PERFORMANCE TEST  
Project No. 24407-000 DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC, RX7045L  
DRAWING NO. SM-D-5005842

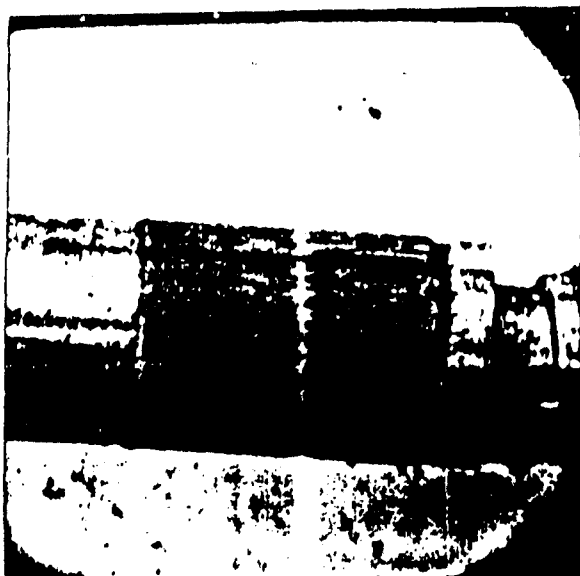
SERIAL NO. 011

POST GAS ANALYSIS TEST

| TEST PLAN PARA | PARAMETER                                                             | MEASURED              | UNITS       | LIMITS |                      |
|----------------|-----------------------------------------------------------------------|-----------------------|-------------|--------|----------------------|
|                |                                                                       |                       |             | MIN    | MAX                  |
| 3.10           | Calibration Check                                                     | Complete              | -           | Comply |                      |
| 4.1.1          | Inspection                                                            |                       | -           | Comply |                      |
| 4.1.2          | Weight                                                                |                       | Lbs         | -      | 2.5                  |
| 4.1.3.1        | Pressurization                                                        | 330                   | PSIG        | Info   | Only                 |
| 4.1.3.2        | Leakage Rate                                                          | 0.9(10) <sup>-9</sup> | STP CC/SEC  | -      | 2.7x10 <sup>-7</sup> |
| 4.2.2          | Test at 23°C                                                          |                       |             |        |                      |
| 4.2.2          | Cooldown Time to 100°K                                                | 11.1                  | Minutes     | -      | 7.5                  |
| 4.2.2          | Cooldown Time to 80°K                                                 | 13.2                  | Minutes     | -      | 10                   |
| 4.2.2          | Minimum Temp                                                          | 56.2                  | °K          | Info   | 80                   |
| 4.2.2.1        | Stabl. Temp. with 0.33 Watt Heat Load                                 | 124.70                | °K (106.70) | (290)  | 80                   |
| 4.2.2.2        | Temp. after 1/2 Hour Operation                                        | 126.70                | °K (109.20) | (290)  | 80                   |
| 4.2.2.3        | Cold Finger Warm End Temp                                             | 26.40                 | °C          | Info   | Only                 |
| 4.2.2.4        | Input V <u>17.5</u> VDC Current <u>2.50</u> ADC<br>Power <u>43.75</u> | 43.75                 | Watts       | -      | 30                   |
| 4.2.2.5        | Stabl. Temp with 0.33 Watt Heat Load                                  |                       | °K          | -      | 80                   |
| 4.2.2.5        | Cold Finger Warm End Temp                                             |                       | °C          | Info   | Only                 |
| 4.2.2.5        | Input Volts 32 VDC Current _____ ADC<br>Power _____                   |                       | Watts       | -      | 30                   |
| 4.2.3          | Test at -40°C                                                         |                       |             |        |                      |
| 4.2.3.1        | Cooldown Time to 100°K                                                | 9.7                   | Minutes     | -      | 7.5                  |
| 4.2.3.1        | Cooldown Time to 80°K                                                 | 11.5                  | Minutes     | -      | 10                   |
| 4.2.3.2        | Stabl. Temp with 0.2 Watt Heat Load                                   | 98.60                 | °K (93.30)  | 208    | 80                   |
| 4.2.3.2        | Temp after 1/2 Hour                                                   | 99.00                 | °K (93.40)  | 208    | 80                   |
| 4.2.3.3        | Cold Finger Warm End Temp                                             | -32.90                | °C          | Info   | Only                 |
| 4.2.3.4        | Input V <u>17.5</u> VDC Current <u>2.80</u> ADC<br>Power <u>49.00</u> | 49.00                 | Watts       | -      | 30                   |
| 4.2.3.5        | Temp with 0.2 Watt Head Load                                          |                       | °K          | -      | 80                   |
| 4.2.3.5        | Cold Finger Warm End Temp                                             |                       | °C          | Info   | Only                 |
| 4.2.3.5        | Input Volts 32 VDC Current _____ ADC<br>Power _____                   |                       | Watts       | -      | 30                   |
| 4.2.4          | Test at 71°C                                                          |                       |             |        |                      |
| 4.2.4.1        | Cooldown Time to 100°K                                                | 14.1                  | Minutes     | -      | 7.5                  |
| 4.2.4.1        | Cooldown Time to 80°K                                                 | 16.2                  | Minutes     | -      | 10                   |
| 4.2.4.1        | Stabl. Temp. with 0.2 Watt Heat Load                                  | 104.10                | °K (96.30)  | 232    | 80                   |
| 4.2.4.1        | Temp after 1/2 hour                                                   | 106.20                | °K (98.70)  | 232    | 80                   |
| 4.2.4.2        | Cold Finger Warm End Temp                                             | 77.60                 | °C          | Info   | Only                 |
| 4.2.4.3        | Input V <u>17.5</u> VDC Current <u>2.60</u> ADC<br>Power <u>45.50</u> | 45.50                 | Watts       | -      | 35                   |
| 4.2.4.4        | Stabl. Temp with 0.2 Watt Head Load                                   |                       | °K          | -      | 80                   |
| 4.2.4.4        | Cold Finger Warm End Temp                                             |                       | °C          | Info   | Only                 |
| 4.2.4.4        | Input Volts 32 VDC Current _____ ADC<br>Power _____                   |                       | Watts       | -      | 35                   |
| 4.2.5          | Test at 23°C                                                          |                       |             |        |                      |
| 4.2.5.1        | Cooldown Time to 100°K                                                | 14.5                  | Minutes     | -      | 7.5                  |
| 4.2.5.1        | Cooldown Time to 80°K                                                 | 18.1                  | Minutes     | -      | 10                   |
| 4.2.5.1        | Minimum Temp                                                          | 57.20                 | °K (57.20)  | -      | 80                   |
| 4.2.5.2        | Stabl. Temp with 0.33 Watt Heat Load                                  | 125.30                | °K (104.6)  | (290)  | 80                   |
| 4.2.5.3        | Temp After 1/2 Hour With Heat Load                                    | 124.70                | °K (108.2)  | Info   | 80                   |
| 4.2.5.4        | Cold Finger Warm End Temp                                             | 25.8                  | °C          | Info   | Only                 |
| 4.2.5.5        | Input V <u>17.5</u> VDC Current <u>2.56</u> ADC<br>Power <u>44.80</u> | 44.80                 | Watts       | -      | 30                   |
| 4.2.5.6        | Stabl. Temp. with 0.33 Watt Heat Load                                 |                       | °K          | -      | 80                   |
| 4.2.5.6        | Cold Finger Warm End Temp                                             |                       | °C          | Info   | Only                 |
| 4.2.5.6        | Input Volt 32 VDC Current _____ ADC<br>Power _____                    |                       | Watts       | -      | 30                   |
| 4.2.6          | Leakage Rate                                                          | 0.8(10) <sup>-9</sup> | STP CC/SEC  | -      | 2.7x10 <sup>-7</sup> |

PERFORMED BY [Signature]  
WITNESSED BY [Signature] Q.A. MAGNAVOX  
WITNESSED BY \_\_\_\_\_ C-30 Q.A. CUSTOMER

DATE 10/29/87



WEAR PRODUCTS ON SEAL  
& SURROUNDING AREA

S/N 011

10/30/87

FIGURE 7

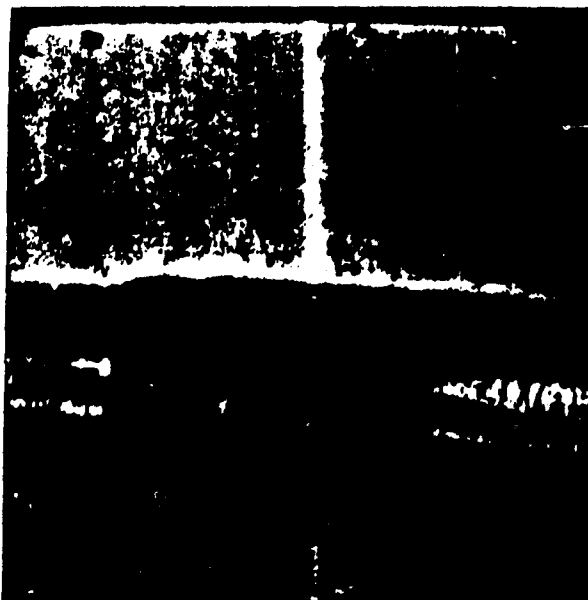


WEAR PRODUCTS ON  
SPRING & KEEPER

S/N 011

10/30/87

FIGURE 8

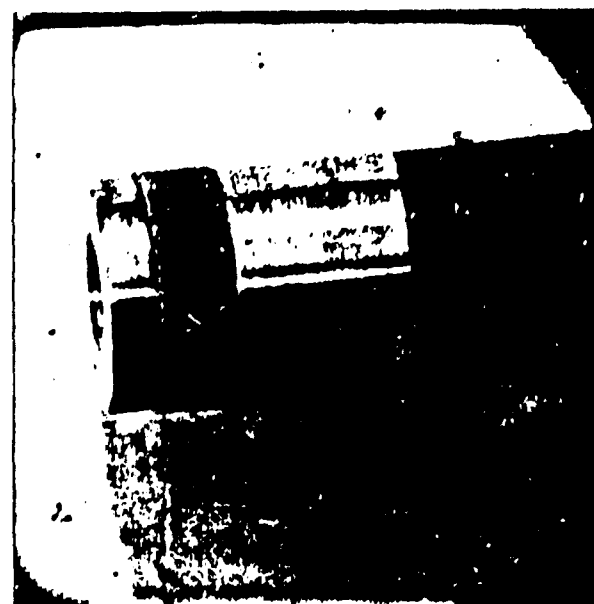


RUB MARKS ON SEAL

S/N 011

10/30/87

FIGURE 9



FRONT RELATIVELY  
CLEAN

S/N 011

10/30/87

FIGURE 10

Contract No. 24407-000 PERFORMANCE TEST  
Project No. 24407-000 DATA SHEET

CWILER, 1/4 WATT LINEAR RESONANT CRYOGENIC, RX7045L  
DRAWING NO. SM-D-5005842

SERIAL NO. 011

POST COLDFINGER INSPECTION TEST

| TEST PLAN PARA | PARAMETER                                                             | MEASURED               | UNITS       | LIMITS |                      |
|----------------|-----------------------------------------------------------------------|------------------------|-------------|--------|----------------------|
|                |                                                                       |                        |             | MIN    | MAX                  |
| 3.10           | Calibration Check                                                     |                        | -           | Comply |                      |
| 4.1.1          | Inspection                                                            |                        | -           | Comply |                      |
| 4.1.2          | Weight                                                                |                        | Lbs         | -      | 2.5                  |
| 4.1.3.1        | Pressurization                                                        | 330                    | PSIG        | Info   | Only                 |
| 4.1.3.2        | Leakage Rate                                                          | 1.1 (10) <sup>-7</sup> | STP CC/SEC  | -      | 2.7x10 <sup>-7</sup> |
| 4.2.2          | Test at 23°C                                                          |                        |             |        |                      |
| 4.2.2          | Cooldown Time to 100°K                                                | 11.5                   | Minutes     | -      | 7.5                  |
| 4.2.2          | Cooldown Time to 80°K                                                 | 13.1                   | Minutes     | -      | 10                   |
| 4.2.2          | Minimum Temp                                                          | 56.80                  | °K          | Info   | 80                   |
| 4.2.2.1        | Stabl. Temp. with 0.35 Watt Heat Load                                 | 71.60                  | °K (99.80)  | 280    | 80                   |
| 4.2.2.2        | Temp. after 1/2 Hour Operation                                        | 114.60                 | °K (101.60) | 280    | 80                   |
| 4.2.2.3        | Cold Finger warm end temp                                             | 26.40                  | °C          | Info   | Only                 |
| 4.2.2.4        | Input V <u>17.5</u> VDC Current <u>2.60</u> ADC<br>Power <u>45.50</u> | 45.50                  | Watts       | -      | 30                   |
| 4.2.2.5        | Stabl. Temp with 0.35 Watt Heat Load                                  |                        | °K          | -      | 80                   |
| 4.2.2.5        | Cold Finger Warm End Temp                                             |                        | °C          | Info   | Only                 |
| 4.2.2.5        | Input Volts 32 VDC Current <u>    </u> ADC<br>Power <u>    </u>       |                        | Watts       | -      | 30                   |
| 4.2.3          | Test at -40°C                                                         |                        |             |        |                      |
| 4.2.3.1        | Cooldown Time to 100°K                                                | 10.2                   | Minutes     | -      | 7.5                  |
| 4.2.3.1        | Cooldown Time to 80°K                                                 | 10.6                   | Minutes     | -      | 10                   |
| 4.2.3.2        | Stabl. Temp with 0.2 Watt Heat Load                                   | 110.50                 | °K (89.80)  | (209)  | 80 (85.40) -200      |
| 4.2.3.2        | Temp after 1/2 Hour                                                   | 98.40                  | °K (91.70)  | (208)  | 80 (86.00) -200      |
| 4.2.3.3        | Cold Finger Warm End Temp                                             |                        | °C          | Info   | Only                 |
| 4.2.3.4        | Input V <u>17.5</u> VDC Current <u>2.80</u> ADC<br>Power <u>49.00</u> | 49.00                  | Watts       | -      | 30                   |
| 4.2.3.5        | Temp with 0.2 Watt Heat Load                                          |                        | °K          | -      | 80                   |
| 4.2.3.5        | Cold Finger Warm End Temp                                             |                        | °C          | Info   | Only                 |
| 4.2.3.5        | Input Volts 32 VDC Current <u>    </u> ADC<br>Power <u>    </u>       |                        | Watts       | -      | 30                   |
| 4.2.4          | Test at 71°C                                                          |                        |             |        |                      |
| 4.2.4.1        | Cooldown Time to 100°K                                                | 13.8                   | Minutes     | -      | 7.5                  |
| 4.2.4.1        | Cooldown Time to 80°K                                                 | 15.9                   | Minutes     | -      | 10                   |
| 4.2.4.1        | Stabl. Temp. with 0.2 Watt Heat Load                                  | 100.20                 | °K (94.30)  | (232)  | 80 (89.60) -200      |
| 4.2.4.1        | Temp after 1/2 hour                                                   | 100.60                 | °K (94.80)  | (232)  | 80 (90.10) -200      |
| 4.2.4.2        | Cold Finger Warm End Temp                                             | 77.20                  | °C          | Info   | Only                 |
| 4.2.4.3        | Input V <u>17.5</u> VDC Current <u>2.60</u> ADC<br>Power <u>45.50</u> | 45.50                  | Watts       | -      | 35                   |
| 4.2.4.4        | Stabl. Temp with 0.2 Watt Heat Load                                   |                        | °K          | -      | 80                   |
| 4.2.4.4        | Cold Finger Warm End Temp                                             |                        | °C          | Info   | Only                 |
| 4.2.4.4        | Input Volts 32 VDC Current <u>    </u> ADC<br>Power <u>    </u>       |                        | Watts       | -      | 35                   |
| 4.2.5          | Test at 23°C                                                          |                        |             |        |                      |
| 4.2.5.1        | Cooldown Time to 100°K                                                | 11.5                   | Minutes     | -      | 7.5                  |
| 4.2.5.1        | Cooldown Time to 80°K                                                 | 13.4                   | Minutes     | -      | 10                   |
| 4.2.5.1        | Minimum Temp                                                          | 57.10                  | °K          | -      | 80                   |
| 4.2.5.2        | Stabl. Temp with 0.35 Watt Heat Load                                  | 114.60                 | °K (103.3)  | (290)  | 80                   |
| 4.2.5.3        | Temp After 1/2 Hour With Heat Load                                    | 115.10                 | °K (104.8)  | Info   | 80                   |
| 4.2.5.4        | Cold Finger Warm End Temp                                             |                        | °C          | Info   | Only                 |
| 4.2.5.5        | Input V <u>17.5</u> VDC Current <u>2.60</u> ADC<br>Power <u>45.50</u> | 45.50                  | Watts       | -      | 30                   |
| 4.2.5.6        | Stabl. Temp. with 0.35 Watt Heat Load                                 |                        | °K          | -      | 80                   |
| 4.2.5.6        | Cold Finger Warm End Temp                                             |                        | °C          | Info   | Only                 |
| 4.2.5.6        | Input Volt 32 VDC Current <u>    </u> ADC<br>Power <u>    </u>        |                        | Watts       | -      | 30                   |
| 4.2.6          | Leakage Rate                                                          |                        | STP CC/SEC  | -      | 2.7x10 <sup>-7</sup> |

PERFORMED BY [Signature]

DATE 11/3 - 11/4/87

WITNESSED BY [Signature] Q.A. MAGNAVOX

WITNESSED BY [Signature] C-32 Q.A. CUSTOMER

Contract No. \_\_\_\_\_ PERFORMANCE TEST

Project No. 24407-000 DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC, RX7045L

SERIAL NO. 011

DRAWING NO. \_\_\_\_\_ Post CUT OPEN TEST AC 5442

| TEST PLAN PARA | PARAMETER                                                    | MEASURED       | UNITS      | LIMITS       |                      |
|----------------|--------------------------------------------------------------|----------------|------------|--------------|----------------------|
|                |                                                              |                |            | MIN          | MAX                  |
| 3.10           | Calibration Check                                            | <u>Pass</u>    | -          | Comply       |                      |
| 4.1.1          | Inspection                                                   |                | -          | Comply       |                      |
| 4.1.2          | Weight                                                       |                | Lbs        | -            | 2.5                  |
| 4.1.3.1        | Pressurization                                               | <u>33.0</u>    | PSIG       | Info         | Only                 |
| 4.1.3.2        | Leakage Rate <u>(0.2149)</u>                                 | <u>12/10-8</u> | STP CC/SEC | -            | $2.7 \times 10^{-7}$ |
| 4.2.2          | Test at 23°C                                                 |                |            |              |                      |
| 4.2.2          | Cooldown Time to 100°K                                       | <u>12.40</u>   | Minutes    | -            | 7.5                  |
| 4.2.2          | Cooldown Time to 80°K                                        | <u>15.30</u>   | Minutes    | -            | 10                   |
| 4.2.2          | Minimum Temp                                                 | <u>56.80</u>   | °K         | Info         | 80                   |
| 4.2.2.1        | Stabl. Temp. with 0.35 Watt Heat Load                        | <u>121.30</u>  | °K         | <u>(280)</u> | 80                   |
| 4.2.2.2        | Temp. after 1/2 Hour Operation                               | <u>122.40</u>  | °K         | <u>(280)</u> | 80                   |
| 4.2.2.3        | Cold Finger Warm End Temp                                    |                | °C         | Info         | Only                 |
| 4.2.2.4        | Input V <u>10.20</u> VDC Current <u>3.29</u> ADC Power _____ | <u>33.6</u>    | Watts      | -            | 30                   |
| 4.2.2.5        | Stabl. Temp with 0.35 Watt Heat Load                         |                | °K         | -            | 80                   |
| 4.2.2.5        | Cold Finger Warm End Temp                                    |                | °C         | Info         | Only                 |
| 4.2.2.5        | Input Volts 32 VDC Current _____ ADC Power _____             |                | Watts      | -            | 30                   |
| 4.2.3          | Test at -40°C                                                |                |            |              |                      |
| 4.2.3.1        | Cooldown Time to 100°K                                       | <u>11.30</u>   | Minutes    | -            | 7.5                  |
| 4.2.3.1        | Cooldown Time to 80°K                                        | <u>12.40</u>   | Minutes    | -            | 10                   |
| 4.2.3.2        | Stabl. Temp with 0.25 Watt Heat Load                         | <u>115.30</u>  | °K         | <u>(280)</u> | 80                   |
| 4.2.3.2        | Temp after 1/2 Hour                                          | <u>116.30</u>  | °K         | <u>(280)</u> | 80                   |
| 4.2.3.3        | Cold Finger Warm End Temp                                    | <u>-33.0</u>   | °C         | Info         | Only                 |
| 4.2.3.4        | Input V <u>9.60</u> VDC Current <u>4.30</u> ADC Power _____  | <u>41.30</u>   | Watts      | -            | 30                   |
| 4.2.3.5        | Temp with 0.2 Watt Head Load                                 |                | °K         | -            | 80                   |
| 4.2.3.5        | Cold Finger Warm End Temp                                    |                | °C         | Info         | Only                 |
| 4.2.3.5        | Input Volts 32 VDC Current _____ ADC Power _____             |                | Watts      | -            | 30                   |
| 4.2.4          | Test at 71°C                                                 |                |            |              |                      |
| 4.2.4.1        | Cooldown Time to 100°K                                       | <u>14.60</u>   | Minutes    | -            | 7.5                  |
| 4.2.4.1        | Cooldown Time to 80°K                                        | <u>17.10</u>   | Minutes    | -            | 10                   |
| 4.2.4.1        | Stabl. Temp. with 0.25 Watt Heat Load                        | <u>108.60</u>  | °K         | <u>(280)</u> | 80                   |
| 4.2.4.1        | Temp after 1/2 hour                                          | <u>110.20</u>  | °K         | <u>(280)</u> | 80                   |
| 4.2.4.2        | Cold Finger Warm End Temp                                    |                | °C         | Info         | Only                 |
| 4.2.4.3        | Input V <u>10.60</u> VDC Current <u>3.52</u> ADC Power _____ | <u>37.37</u>   | Watts      | -            | 35                   |
| 4.2.4.4        | Stabl. Temp with 0.2 Watt Head Load                          |                | °K         | -            | 80                   |
| 4.2.4.4        | Cold Finger Warm End Temp                                    |                | °C         | Info         | Only                 |
| 4.2.4.4        | Input Volts 32 VDC Current ADC Power _____                   |                | Watts      | -            | 35                   |
| 4.2.5          | Test at 23°C                                                 |                |            |              |                      |
| 4.2.5.1        | Cooldown Time to 100°K                                       | <u>12.20</u>   | Minutes    | -            | 7.5                  |
| 4.2.5.1        | Cooldown Time to 80°K                                        | <u>15.30</u>   | Minutes    | -            | 10                   |
| 4.2.5.1        | Minimum Temp                                                 | <u>56.80</u>   | °K         | -            | 80                   |
| 4.2.5.2        | Stabl. Temp with 0.35 Watt Heat Load                         | <u>122.60</u>  | °K         | <u>(280)</u> | 80                   |
| 4.2.5.3        | Temp After 1/2 Hour With Heat Load                           | <u>124.10</u>  | °K         | Info         | 80                   |
| 4.2.5.4        | Cold Finger Warm End Temp                                    |                | °C         | Info         | Only                 |
| 4.2.5.5        | Input V <u>10.20</u> VDC Current <u>3.22</u> ADC Power _____ | <u>33.90</u>   | Watts      | -            | 30                   |
| 4.2.5.6        | Stabl. Temp. with 0.35 Watt Heat Load                        |                | °K         | -            | 80                   |
| 4.2.5.6        | Cold Finger Warm End Temp                                    |                | °C         | Info         | Only                 |
| 4.2.5.6        | Input Volt 32 VDC Current _____ ADC Power _____              |                | Watts      | -            | 30                   |
| 4.2.6          | Leakage Rate                                                 |                | STP CC/SEC | -            | $2.7 \times 10^{-7}$ |

PERFORMED BY [Signature]

DATE 11-9-87

WITNESSED BY [Signature] Q.A. MAGNAVOX

WITNESSED BY \_\_\_\_\_ C-33 Q.A. CUSTOMER

SHEET \_\_\_\_\_ OF \_\_\_\_\_  
R.R. \_\_\_\_\_  
DATE 11-6-87

# QUALITY ASSURANCE DEPARTMENT DIMENSIONAL CHECKLIST

VENDOR CRYO TEST, LIFE TEST

P.O. NO.

PROJECT NO. 24497

PART DESCRIPTION MNT COOLER, SN 911

PART NO SM-D-5005843

INSPECTOR W. SHIRND

| DEFECT CLASSIFICATION                 | I.D.S. CODE | DIMENSION | TOLERANCE | SERIAL OR LOT NUMBERS | INNER | YOKE | SMALLER | PISTON | SM-C-5005843 | Q 34 | 0" | 70" | MAX CLEARANCE | SPEC CLEARANCE | B/P SECTION |
|---------------------------------------|-------------|-----------|-----------|-----------------------|-------|------|---------|--------|--------------|------|----|-----|---------------|----------------|-------------|
| DIMENSIONAL CHECK OF PISTON RULON AND |             |           |           |                       |       |      |         |        |              |      |    |     |               |                |             |
| INNER YOKE BORE                       |             |           |           |                       |       |      |         |        |              |      |    |     |               |                |             |
|                                       |             |           |           |                       |       |      |         |        |              |      |    |     |               |                |             |
| PISTON FROM STEM END                  |             |           |           |                       |       |      |         |        |              |      |    |     |               |                |             |
| .399 .690 1.99 1.75                   |             |           |           |                       |       |      |         |        |              |      |    |     |               |                |             |
| .3777 .3778 .3778 .3778               |             |           |           |                       |       |      |         |        |              |      |    |     |               |                |             |
| RULON SECTION                         |             |           |           |                       |       |      |         |        |              |      |    |     |               |                |             |
| 4 3 2 1 1 = SLOT END                  |             |           |           |                       |       |      |         |        |              |      |    |     |               |                |             |
| .3744 .3747 .3753 .3745               |             |           |           |                       |       |      |         |        |              |      |    |     |               |                |             |
| .3751 .3751 .3757 .3754               |             |           |           |                       |       |      |         |        |              |      |    |     |               |                |             |
| .9523 .9531 .9525 .9533               |             |           |           |                       |       |      |         |        |              |      |    |     |               |                |             |
| MIN: .0004                            |             |           |           |                       |       |      |         |        |              |      |    |     |               |                |             |
| MAX: .0009                            |             |           |           |                       |       |      |         |        |              |      |    |     |               |                |             |
|                                       |             |           |           |                       |       |      |         |        |              |      |    |     |               |                |             |
|                                       |             |           |           |                       |       |      |         |        |              |      |    |     |               |                |             |

Contract No. 24407-000 PERFORMANCE TEST  
Project No.                      DATA SHEET

AC TEST 54 Hz

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC, RX7045L SERIAL NO. 011  
DRAWING NO. SM-D-5001842 TEST AFTER PISTON REPLACEMENT.

| TEST PLAN PARA | PARAMETER                                                 | MEASURED               | UNITS      | LIMITS |                      |
|----------------|-----------------------------------------------------------|------------------------|------------|--------|----------------------|
|                |                                                           |                        |            | MIN    | MAX                  |
| 3.1.0          | Calibration Check                                         | Complies               | -          | Comply |                      |
| 4.1.1          | Inspection                                                |                        | -          | Comply |                      |
| 4.1.2          | Weight                                                    |                        | Lbs        | -      | 2.5                  |
| 4.1.3.1        | Pressurization                                            | 33.0                   | PSIG       | Info   | Only                 |
| 4.1.3.2        | Leakage Rate (0 Rings)                                    | 1.4 (10) <sup>-7</sup> | STP CC/SEC | -      | 2.7x10 <sup>-7</sup> |
| 4.2.2          | Test at 23°C                                              |                        |            |        |                      |
| 4.2.2          | Cooldown Time to 100°K                                    | 4.60                   | Minutes    | -      | 7.5                  |
| 4.2.2          | Cooldown Time to 80°K                                     | 5.50                   | Minutes    | -      | 10                   |
| 4.2.2          | Minimum Temp                                              | 40.9                   | °K         | Info   | 80                   |
| 4.2.2.1        | Stabl. Temp. with 0.35 Watt Heat Load                     | 62.40                  | °K         | -      | 80                   |
| 4.2.2.2        | Temp. after 1/2 Hour Operation                            | 67.80                  | °K         | -      | 80                   |
| 4.2.2.3        | Cold Finger warm end temp                                 | 30.0                   | °C         | Info   | Only                 |
| 4.2.2.4        | Input V <u>10.20 VAC</u> Current <u>1.73 APC</u><br>Power | 17.64                  | Watts      | 0-32   | 30                   |
| 4.2.2.5        | Stabl. Temp with 0.35 Watt Heat Load                      |                        | °K         | -      | 80                   |
| 4.2.2.5        | Cold Finger Warm End Temp                                 |                        | °C         | Info   | Only                 |
| 4.2.2.5        | Input Volts 32 VDC Current <u>          </u> ADC<br>Power |                        | Watts      | -      | 30                   |
| 4.2.3          | Test at -40°C                                             |                        |            |        |                      |
| 4.2.3.1        | Cooldown Time to 100°K                                    | 4.40                   | Minutes    | -      | 7.5                  |
| 4.2.3.1        | Cooldown Time to 80°K                                     | 5.30                   | Minutes    | -      | 10                   |
| 4.2.3.2        | Stabl. Temp with 0.2 Watt Heat Load                       | 51.5                   | °K         | -      | 80                   |
| 4.2.3.2        | Temp after 1/2 Hour                                       | 50.5                   | °K         | -      | 80                   |
| 4.2.3.3        | Cold Finger Warm End Temp                                 | -33.0                  | °C         | Info   | Only                 |
| 4.2.3.4        | Input V <u>9.61 VAC</u> Current <u>1.95 APC</u><br>Power  | 17.80                  | Watts      | 0-24   | 30                   |
| 4.2.3.5        | Temp with 0.2 Watt Heat Load                              |                        | °K         | -      | 80                   |
| 4.2.3.5        | Cold Finger Warm End Temp                                 |                        | °C         | Info   | Only                 |
| 4.2.3.5        | Input Volts 32 VDC Current <u>          </u> ADC<br>Power |                        | Watts      | -      | 30                   |
| 4.2.4          | Test at 71°C                                              |                        |            |        |                      |
| 4.2.4.1        | Cooldown Time to 100°K                                    | 5.6                    | Minutes    | -      | 7.5                  |
| 4.2.4.1        | Cooldown Time to 80°K                                     | 6.5                    | Minutes    | -      | 10                   |
| 4.2.4.1        | Stabl. Temp. with 0.2 Watt Heat Load                      | 66.8                   | °K         | -      | 80                   |
| 4.2.4.1        | Temp after 1/2 hour                                       | 68.8                   | °K         | -      | 80                   |
| 4.2.4.2        | Cold Finger Warm End Temp                                 | 30.0                   | °C         | Info   | Only                 |
| 4.2.4.3        | Input V <u>10.40 VAC</u> Current <u>2.06 APC</u><br>Power | 21.80                  | Watts      | 0-17.7 | 35                   |
| 4.2.4.4        | Stabl. Temp with 0.2 Watt Heat Load                       |                        | °K         | -      | 80                   |
| 4.2.4.4        | Cold Finger Warm End Temp                                 |                        | °C         | Info   | Only                 |
| 4.2.4.4        | Input Volts 32 VDC Current <u>          </u> ADC<br>Power |                        | Watts      | -      | 35                   |
| 4.2.5          | Test at 23°C                                              |                        |            |        |                      |
| 4.2.5.1        | Cooldown Time to 100°K                                    | 4.70                   | Minutes    | -      | 7.5                  |
| 4.2.5.1        | Cooldown Time to 80°K                                     | 5.40                   | Minutes    | -      | 10                   |
| 4.2.5.1        | Minimum Temp                                              | 30.40                  | °K         | -      | 80                   |
| 4.2.5.2        | Stabl. Temp with 0.35 Watt Heat Load                      | 66.90                  | °K         | -      | 80                   |
| 4.2.5.3        | Temp After 1/2 Hour With Heat Load                        | 65.20                  | °K         | Info   | 80                   |
| 4.2.5.4        | Cold Finger Warm End Temp                                 | 30.0                   | °C         | Info   | Only                 |
| 4.2.5.5        | Input V <u>10.20 VAC</u> Current <u>1.71 APC</u><br>Power | 17.44                  | Watts      | 0-3.1  | 30                   |
| 4.2.5.6        | Stabl. Temp. with 0.35 Watt Heat Load                     |                        | °K         | -      | 80                   |
| 4.2.5.6        | Cold Finger Warm End Temp                                 |                        | °C         | Info   | Only                 |
| 4.2.5.6        | Input Volt 32 VDC Current <u>          </u> ADC<br>Power  |                        | Watts      | -      | 30                   |
| 4.2.6          | Leakage Rate                                              |                        | STP CC/SEC | -      | 2.7x10 <sup>-7</sup> |

PERFORMED BY

*Robert Martinez*

DATE 12/1/87

WITNESSED BY

*J. A. Magnavox*

Q.A. MAGNAVOX

WITNESSED BY

C-35

Q.A. CUSTOMER

ETCHING 1A

**Magnavox**

ELECTRO-OPTICAL SYSTEMS  
P.O. BOX 600, 40 INDUSTRIAL AVENUE, JAMAICA, N.Y. 11432-0600  
TEL: (516) 522-1700 FAX: (516) 522-1070

FAILURE REPORT 24407-006

PAGE 14

Contract No. \_\_\_\_\_

PERFORMANCE TEST

Project No. 24407-000

DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC, RX7043L

SERIAL NO. 011

DRAWING NO. \_\_\_\_\_

HYBRID INSTALLED. D.C. POWER

| TEST<br>PLAN PARA | PARAMETER                                                | MEASURED      | UNITS      | LIMITS |                      |
|-------------------|----------------------------------------------------------|---------------|------------|--------|----------------------|
|                   |                                                          |               |            | MIN    | MAX                  |
| 3.10              | Calibration Check                                        | <i>Comply</i> | -          | Comply |                      |
| 4.1.1             | Inspection                                               |               | -          | Comply |                      |
| 4.1.2             | Weight                                                   |               | Lbs        | -      | 2.5                  |
| 4.1.3.1           | Pressurization                                           | 330           | PSIG       | Info   | Only                 |
| 4.1.3.2           | Leakage Rate                                             |               | STP CC/SEC | -      | $2.7 \times 10^{-7}$ |
| 4.2.2             | Test at 23°C                                             |               |            |        |                      |
| 4.2.2             | Cooldown Time to 100°K                                   | 5.20          | Minutes    | -      | 7.5                  |
| 4.2.2             | Cooldown Time to 80°K                                    | 6.10          | Minutes    | -      | 10                   |
| 4.2.2             | Minimum Temp                                             | 38.80         | °K         | Info   | 80                   |
| 4.2.2.1           | Stabl. Temp. with 0.35 Watt Heat Load                    | 64.70         | °K         | -      | 80                   |
| 4.2.2.2           | Temp. after 1/2 Hour Operation                           | 65.00         | °K         | -      | 80                   |
| 4.2.2.3           | Cold Finger warm end temp                                | 26.0          | °C         | Info   | Only                 |
| 4.2.2.4           | Input V <u>17.0</u> VDC Current <u>1.35</u> ADC<br>Power | 22.95         | Watts      | -      | 30                   |
| 4.2.2.5           | Stabl. Temp with 0.35 Watt Heat Load                     | 66.20         | °K         | -      | 80                   |
| 4.2.2.5           | Cold Finger Warm End Temp                                | 26.0          | °C         | Info   | Only                 |
| 4.2.2.5           | Input Volts 32 VDC Current <u>.80</u> ADC<br>Power       | 25.6          | Watts      | -      | 30                   |
| 4.2.3             | Test at -40°C                                            |               |            |        |                      |
| 4.2.3.1           | Cooldown Time to 100°K                                   | 4.80          | Minutes    | -      | 7.5                  |
| 4.2.3.1           | Cooldown Time to 80°K                                    | 5.00          | Minutes    | -      | 10                   |
| 4.2.3.2           | Stabl. Temp with 0.2 Watt Heat Load                      | 50.30         | °K         | -      | 80                   |
| 4.2.3.2           | Temp after 1/2 Hour                                      | 50.50         | °K         | -      | 80                   |
| 4.2.3.3           | Cold Finger Warm End Temp                                | 37.0          | °C         | Info   | Only                 |
| 4.2.3.4           | Input V <u>17.0</u> VDC Current <u>1.23</u> ADC<br>Power | 20.91         | Watts      | -      | 30                   |
| 4.2.3.5           | Temp with 0.2 Watt Heat Load                             | 55.30         | °K         | -      | 80                   |
| 4.2.3.5           | Cold Finger Warm End Temp                                | 37.0          | °C         | Info   | Only                 |
| 4.2.3.5           | Input Volts 32 VDC Current <u>.72</u> ADC<br>Power       | 23.04         | Watts      | -      | 30                   |
| 4.2.4             | Test at 71°C                                             |               |            |        |                      |
| 4.2.4.1           | Cooldown Time to 100°K                                   | 5.60          | Minutes    | -      | 7.5                  |
| 4.2.4.1           | Cooldown Time to 80°K                                    | 6.50          | Minutes    | -      | 10                   |
| 4.2.4.1           | Stabl. Temp. with 0.2 Watt Heat Load                     | 65.90         | °K         | -      | 80                   |
| 4.2.4.1           | Temp after 1/2 hour                                      | 66.60         | °K         | -      | 80                   |
| 4.2.4.2           | Cold Finger Warm End Temp                                | 76.00         | °C         | Info   | Only                 |
| 4.2.4.3           | Input V <u>17.0</u> VDC Current <u>1.49</u> ADC<br>Power | 25.33         | Watts      | -      | 35                   |
| 4.2.4.4           | Stabl. Temp with 0.2 Watt Heat Load                      | 68.70         | °K         | -      | 80                   |
| 4.2.4.4           | Cold Finger Warm End Temp                                | 77.00         | °C         | Info   | Only                 |
| 4.2.4.4           | Input Volts 32 VDC Current <u>.89</u> ADC<br>Power       | 28.48         | Watts      | -      | 35                   |
| 4.2.5             | Test at 23°C                                             |               |            |        |                      |
| 4.2.5.1           | Cooldown Time to 100°K                                   | 4.60          | Minutes    | -      | 7.5                  |
| 4.2.5.1           | Cooldown Time to 80°K                                    | 5.20          | Minutes    | -      | 10                   |
| 4.2.5.1           | Minimum Temp                                             | 38.30         | °K         | -      | 80                   |
| 4.2.5.2           | Stabl. Temp with 0.35 Watt Heat Load                     | 64.30         | °K         | -      | 80                   |
| 4.2.5.3           | Temp After 1/2 Hour With Heat Load                       | 64.60         | °K         | Info   | 80                   |
| 4.2.5.4           | Cold Finger Warm End Temp                                | 26.0          | °C         | Info   | Only                 |
| 4.2.5.5           | Input V <u>17.2</u> VDC Current <u>1.32</u> ADC<br>Power | 22.44         | Watts      | -      | 30                   |
| 4.2.5.6           | Stabl. Temp. with 0.35 Watt Heat Load                    | 66.10         | °K         | -      | 80                   |
| 4.2.5.6           | Cold Finger Warm End Temp                                | 25.0          | °C         | Info   | Only                 |
| 4.2.5.6           | Input Volt 32 VDC Current <u>.79</u> ADC<br>Power        | 25.28         | Watts      | -      | 30                   |
| 4.2.6             | Leakage Rate                                             |               | STP CC/SEC | -      | $2.7 \times 10^{-7}$ |

PERFORMED BY [Signature] C-36DATE 12/3 - 12/4/87WITNESSED BY [Signature] Q.A. MAGNAVOX