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Find the *Engineering Laboratory Design 403 (LS)* at our website: *Click HERE*

**Wind Tunnel Verification Test Data**

**Engineering Laboratory Design**

**Date:** 3/16/2001

**Organization:** Agere Systems, Inc. **Engineer:** KAB

**Project:** 12" Low-Speed, Variable Temperature, Recirculating Wind Tunnel

**Model No.:** Modified 403 **Temp (C):** 20 **Start:** 3/16/01 9:36

**Serial No.:** 34301 **Pressure(mbarrs):** 1020 **Finish:** 3/16/01 10:45

**PO No.:** ST0044706 **Humidity (%):** 40

**Fan Type:** TCF/Aerovent 355(14) BIA-CBD

**HP:** 0.5 HP

**Pitot Tube:** United Sensor Model PCE-12-MW

**Transducer:** MKS 223B-15456

**Readout:** Fluke 8810

**Frequency Sweep:** **"$H_2O$/VDC:** 1.995350

| | | | | | | Motor | Motor (Amps) | | | | | Process Temp (F) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency(Hz) | VDC | ΔP("$H_2O$) | u (m/s) | u(fps) | u(fpm) | RPM | L1 | L2 | L3 | dBA1* | dBA2* | Thermo (C) | 989 | %H or C*** |
| 60 | 0.0565 | 0.11274 | 6.837 | 22.432 | 1345.905 | 1774 | 1.25 | 1.27 | 1.15 | 67 | 68 | 20.5 | 69 | -16 |
| 55 | 0.046 | 0.09159 | 6.163 | 20.218 | 1213.100 | 1627 | 1.18 | 1.17 | 1.18 | 65 | 66 | 20 | 68 | -7 |
| 50 | 0.036 | 0.07223 | 5.473 | 17.955 | 1077.319 | 1479 | 1.14 | 1.14 | 1.16 | 65 | 66 | 20 | 69 | -16 |
| 45 | 0.027 | 0.05387 | 4.727 | 15.507 | 930.405 | 1331 | 1.13 | 1.13 | 1.12 | <65 | 65 | 20 | 68 | -4 |
| 40 | 0.020 | 0.03991 | 4.068 | 13.346 | 800.765 | 1183 | 1.11 | 1.09 | 1.1 | <65 | <65 | 20 | 69 | -14 |
| 35 | 0.019 | 0.03771 | 3.954 | 12.974 | 778.433 | 1034 | 1.05 | 1.06 | 1.05 | <65 | <65 | 20 | 69 | -12 |
| 30 | 0.013 | 0.02554 | 3.254 | 10.677 | 640.612 | 887 | 1 | 1 | 1 | <65 | <65 | 20 | 68 | -7 |
| 25 | 0.009 | 0.01756 | 2.698 | 8.853 | 531.167 | 738 | 0.93 | 0.96 | 0.95 | <65 | <65 | 20 | 69 | -11 |
| 20 | 0.006 | 0.01117 | 2.153 | 7.062 | 423.725 | 590 | 0.88 | 0.89 | 0.85 | <65 | <65 | 20 | 69 | -15 |
| 15 | 0.003 | 0.00579 | 1.549 | 5.082 | 304.922 | 442 | 0.74 | 0.74 | 0.74 | <65 | <65 | 20 | 69 | -14 |
| 10 | n/a | n/a | n/a | n/a | n/a | 290 | 0.52 | 0.53 | 0.54 | <65 | <65 | 20 | 69 | -10 |
| 5 | n/a | n/a | 0.452 | 1.484 | 89.021 | 145 | 0.3 | 0.23 | 0.3 | <65 | <65 | 26 | 79 | -100 |
| 3 | n/a | n/a | 0.244 | 0.800 | 48.000 | 86 | 0.06 | 0.06 | 0.12 | <65 | <65 | 24 | 75 | -100 |
| 2.5** | n/a | n/a | 0.159 | 0.522 | 31.304 | 71 | 0.06 | 0.06 | 0.08 | <65 | <65 | 23 | 74 | -100 |
| 2.0** | n/a | n/a | 0.100 | 0.327 | 19.608 | 56 | 0.06 | 0.06 | 0.08 | <65 | <65 | 20 | 68 | -100 |
| 60 | 0.060 | 0.12052 | 7.069 | 23.193 | 1391.581 | 1774 | 1.3 | 1.24 | 1.17 | 67 | 68 | 20 | 69 | -7 |
| 45 | 0.032 | 0.06445 | 5.170 | 16.961 | 1017.633 | 1330 | 1.11 | 1.13 | 1.11 | <65 | 65 | 20 | 69 | -10 |
| 60 | 0.059 | 0.11773 | 6.987 | 22.923 | 1375.359 | 1774 | 1.25 | 1.13 | 1.3 | 67 | 68 | 20 | 69 | -17 |
| 50 | 0.039 | 0.07862 | 5.710 | 18.732 | 1123.927 | 1481 | 1.16 | 1.17 | 1.14 | 65 | 66 | 20 | 69 | -14 |
| 15 | 0.002 | 0.00359 | 1.220 | 4.004 | 240.230 | 441 | 0.74 | 0.73 | 0.71 | <65 | <65 | 20 | 68 | -7 |

* dBA1 measured with motor cover in place. 3ft from motor.

* dBA2 measured without motor cover. 3ft from motor.

** measured using smoke traces.

*** Positive values represent Heating, Negative values represent Cooling.

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**Agere Systems, Inc.**

12" Low Speed, Variable Temperature, Recirculating Wind TunnelUniformity Survey

**Uniformity Survey**

| | |
|---|---|
| Pitot Tube: | United Sensor Model PCE-12-MW |
| Transducer: | MKS 223B-15456 |
| Readout: | Fluke 8810 |

**Pressure Field**

Pitot-static tip Located Approximately 4.375" from Test Section Entrance

Pressures in VDC

| Position | -5.00 | -4.00 | -3.00 | -2.00 | -1.00 | 0.00 | 1.00 | 2.00 | 3.00 | 4.00 | 5.00 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5.00 | 0.057 | 0.056 | 0.056 | 0.057 | 0.056 | 0.056 | 0.056 | 0.056 | 0.056 | 0.056 | 0.056 | 5.00 |
| 4.00 | 0.056 | 0.056 | 0.056 | 0.056 | 0.056 | 0.056 | 0.056 | 0.056 | 0.056 | 0.057 | 0.057 | 4.00 |
| 3.00 | 0.057 | 0.057 | 0.056 | 0.056 | 0.056 | 0.056 | 0.056 | 0.056 | 0.057 | 0.057 | 0.057 | 3.00 |
| 2.00 | 0.056 | 0.056 | 0.057 | 0.056 | 0.056 | 0.056 | 0.056 | 0.056 | 0.056 | 0.057 | 0.057 | 2.00 |
| 1.00 | 0.057 | 0.057 | 0.057 | 0.056 | 0.056 | 0.056 | 0.056 | 0.056 | 0.057 | 0.057 | 0.058 | 1.00 |
| 0.00 | 0.057 | 0.057 | 0.057 | 0.057 | 0.056 | 0.057 | 0.057 | 0.057 | 0.057 | 0.057 | 0.057 | 0.00 |
| -1.00 | 0.057 | 0.057 | 0.058 | 0.057 | 0.058 | 0.057 | 0.058 | 0.058 | 0.058 | 0.058 | 0.058 | -1.00 |
| -2.00 | 0.058 | 0.058 | 0.058 | 0.058 | 0.057 | 0.057 | 0.058 | 0.058 | 0.058 | 0.058 | 0.058 | -2.00 |
| -3.00 | 0.058 | 0.058 | 0.058 | 0.058 | 0.058 | 0.058 | 0.058 | 0.058 | 0.058 | 0.058 | 0.058 | -3.00 |
| -4.00 | 0.058 | 0.058 | 0.058 | 0.058 | 0.058 | 0.058 | 0.058 | 0.058 | 0.058 | 0.058 | 0.058 | -4.00 |
| -5.00 | 0.058 | 0.058 | 0.058 | 0.058 | 0.058 | 0.058 | 0.058 | 0.058 | 0.058 | 0.058 | 0.058 | -5.00 |
| | -5.00 | -4.00 | -3.00 | -2.00 | -1.00 | 0.00 | 1.00 | 2.00 | 3.00 | 4.00 | 5.00 | Position |

Test Data:

| | |
|---|---|
| Start Time: | 3/16/01 12:55 |
| End Time: | 3/16/01 13:15 |
| Start Temp (F): | 68 |
| End Temp. (F): | 69 |
| Fequency (Hz): | 60 |
| Ambient Pressure (mbarrs): | 1020 |
| Ambient Temp. (C) | 20 |
| Relative Humidity: | 40 |
| Motor Current L1: | 1.12 |
| L2: | 1.11 |
| L3: | 1.13 |

**Velocity Field**

rho: 1.2 kg/m^3 "$H_2O$/VDC: 1.995350

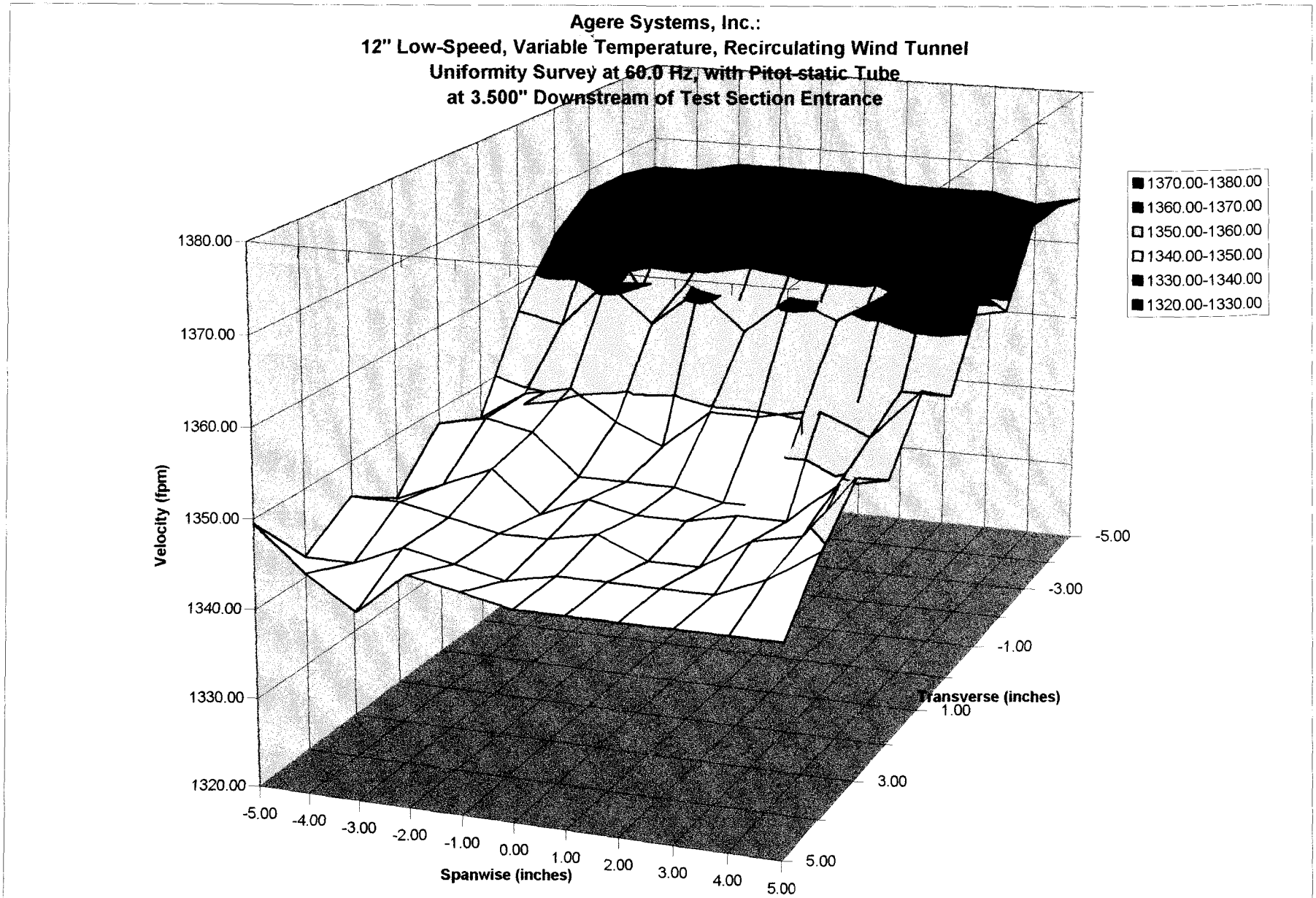
Velocity in fpm

| Position | -5.00 | -4.00 | -3.00 | -2.00 | -1.00 | 0.00 | 1.00 | 2.00 | 3.00 | 4.00 | 5.00 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5.00 | 1349.47 | 1344.71 | 1341.13 | 1345.90 | 1344.71 | 1343.52 | 1343.52 | 1343.52 | 1343.52 | 1343.52 | 1343.52 | 5.00 |
| 4.00 | 1342.33 | 1342.33 | 1344.71 | 1343.52 | 1342.33 | 1343.52 | 1343.52 | 1343.52 | 1343.52 | 1345.90 | 1349.47 | 4.00 |
| 3.00 | 1345.90 | 1345.90 | 1344.71 | 1343.52 | 1343.52 | 1344.71 | 1342.33 | 1342.33 | 1345.90 | 1347.10 | 1354.22 | 3.00 |
| 2.00 | 1342.33 | 1344.71 | 1347.10 | 1342.33 | 1344.71 | 1343.52 | 1343.52 | 1344.71 | 1344.71 | 1349.47 | 1350.66 | 2.00 |
| 1.00 | 1348.28 | 1349.47 | 1348.28 | 1343.52 | 1343.52 | 1343.52 | 1342.33 | 1342.33 | 1354.22 | 1351.85 | 1357.76 | 1.00 |
| 0.00 | 1345.90 | 1349.47 | 1350.66 | 1347.10 | 1344.71 | 1349.47 | 1349.47 | 1350.66 | 1349.47 | 1354.22 | 1354.22 | 0.00 |
| -1.00 | 1356.58 | 1355.40 | 1361.30 | 1356.58 | 1361.30 | 1356.58 | 1361.30 | 1358.94 | 1362.48 | 1367.18 | 1363.65 | -1.00 |
| -2.00 | 1363.65 | 1366.00 | 1357.76 | 1358.94 | 1354.22 | 1356.58 | 1357.76 | 1357.76 | 1361.30 | 1357.76 | 1358.94 | -2.00 |
| -3.00 | 1367.18 | 1366.00 | 1366.00 | 1363.65 | 1363.65 | 1364.83 | 1368.35 | 1364.83 | 1367.18 | 1367.18 | 1367.18 | -3.00 |
| -4.00 | 1367.18 | 1367.18 | 1366.00 | 1366.00 | 1367.18 | 1368.35 | 1368.35 | 1367.18 | 1367.18 | 1367.18 | 1367.18 | -4.00 |
| -5.00 | 1366.00 | 1366.00 | 1367.18 | 1367.18 | 1367.18 | 1367.18 | 1366.00 | 1366.00 | 1366.00 | 1364.83 | 1366.00 | -5.00 |
| | -5.00 | -4.00 | -3.00 | -2.00 | -1.00 | 0.00 | 1.00 | 2.00 | 3.00 | 4.00 | 5.00 | Position |

| | | | |
|---|---|---|---|
| average (fps): | 1354.1041 | | |
| high (fps): | 1368.3479 | %high | 1.05 |
| low (fps): | 1341.1321 | %low | 0.96 |



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3/16/2001

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**Wind Tunnel Verification Test Data** — **Engineering Laboratory Design**

Date: 3/16/2001
Org.: Agere Systems, Inc.
Engineer: kab
Project: 12" Low-Speed, Variable Temperature, Recirculating Wind Tunnel

Model No.: Modified 403
Serial No.: 34301
PO No.: ST0044706

Room Temp (C): 20
Pressure(mbarrs): 1020
Humidity (%): 40

Fan Type: TCF/Aerovent 355(14) BIA-CBD
HP: 0.5 HP

Start: 1:15 PM
Finish: 2:08 PM

Heaters: 6ea, Watlow 1350W Finbar Heaters
Relay: Watlow Din-a-mite SCR
Controller: Watlow 989

Heating Capacity:
Set Point Temp. (C):
Freq.: 60Hz

| Time | Process | % | Thermo | Amperage | | |
|---|---|---|---|---|---|---|
| (min) | Temp. | Heat | Temp | L1 | L2 | L3 |
| 0 | 20.00 | 0 | 20.5 | 0.11 | 2.59 | 2.59 |
| 0.5 | 20.56 | 100 | 21.0 | 27.83 | 28.9 | 2.6 |
| 1 | 22.78 | 100 | 23.0 | | | |
| 1.5 | 24.44 | 100 | 24.0 | | | |
| 2 | 26.11 | 100 | 26.0 | | | |
| 2.5 | 28.33 | 100 | 28.0 | | | |
| 3 | 30.56 | 100 | 30.0 | | | |
| 3.5 | 32.22 | 100 | 32.0 | | | |
| 4 | 33.89 | 100 | 33.0 | | | |
| 4.5 | 35.56 | 100 | 35.0 | | | |
| 5 | 36.67 | 100 | 36.0 | 27.6 | 28.9 | 2.44 |
| 6 | 39.44 | 100 | 39.0 | | | |
| 7 | 41.67 | 100 | 41.5 | | | |
| 8 | 43.89 | 100 | 43.5 | | | |
| 9 | 45.56 | 100 | 45.0 | | | |
| 10 | 47.22 | 100 | 47.0 | 27.73 | 28.51 | 2.41 |
| 11 | 50.00 | 100 | 49.5 | | | |
| 12 | 51.11 | 100 | 50.5 | | | |
| 13 | 51.67 | 100 | 51.5 | | | |
| 14 | 53.33 | 100 | 52.5 | | | |
| 15 | 54.44 | 100 | 54.0 | 27.37 | 28.71 | 2.53 |
| 16 | 55.56 | 100 | 55.0 | | | |
| 17 | 56.67 | 100 | 56.0 | | | |
| 18 | 57.78 | 100 | 58.0 | | | |
| 19 | 58.89 | 100 | 58.0 | | | |
| 20 | 60.00 | 100 | 59.0 | 28.2 | 28.56 | 2.43 |
| 21 | 60.56 | 100 | 60.0 | | | |
| 22 | 61.67 | 100 | 61.0 | | | |

| Time | Process | % | Thermo | Amperage | | |
|---|---|---|---|---|---|---|
| (min) | Temp. | Heat | Temp | L1 | L2 | L3 |
| 23 | 62.22 | 100 | 61.5 | | | |
| 24 | 63.33 | 100 | 62.5 | | | |
| 25 | 63.89 | 100 | 63.0 | 28.21 | 28.72 | 2.4 |
| 26 | 64.44 | 100 | 64.0 | | | |
| 27 | 65.00 | 100 | 64.5 | | | |
| 28 | 65.56 | 100 | 65.0 | | | |
| 29 | 66.11 | 100 | 66.0 | | | |
| 30 | 67.22 | 100 | 66.5 | 27.46 | 28.7 | 2.32 |
| 31 | 67.78 | 100 | 67.0 | | | |
| 32 | 68.33 | 100 | 67.5 | | | |
| 33 | 68.33 | 100 | 68.0 | | | |
| 34 | 68.89 | 100 | 68.5 | | | |
| 35 | 69.44 | 100 | 69.0 | 27.43 | 28.55 | 2.34 |
| 36 | 70.00 | 100 | 70.0 | | | |
| 37 | 70.56 | 100 | 70.0 | | | |
| 38 | 70.56 | 100 | 70.5 | | | |
| 39 | 71.67 | 100 | 71.0 | | | |
| 40 | 71.67 | 100 | 71.5 | 27.62 | 28.64 | 2.31 |
| 41 | 72.22 | 100 | 72.0 | | | |
| 42 | 72.78 | 100 | 72.5 | | | |
| 43 | 72.78 | 100 | 73.0 | | | |
| 44 | 73.33 | 100 | 73.0 | | | |
| 45 | 73.89 | 100 | 73.5 | 27.74 | 28.81 | 2.44 |
| 46 | 73.89 | 100 | 74.0 | | | |
| 47 | 74.44 | 100 | 74.0 | | | |
| 48 | 75.00 | 100 | 75.0 | | | |
| 49 | 75.56 | 100 | 75.0 | | | |
| 50 | 75.56 | 100 | 75.5 | 28.43 | 28.89 | 2.28 |

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**Wind Tunnel Verification Test Data** — **Engineering Laboratory Design**

**Date:** 3/19/2001
**Engineer:** KAB

**Organization:** Agere Systems, Inc.
**Project:** 12" Low-Speed, Variable Temperature, Recirculating Wind Tunnel

**Model No.:** Modified 403
**Serial No.:** 34000
**PO No.:** 63412630

**Room Temp (C):** 20
**Pressure(mbarrs):** 1030
**Humidity (%):** 45

**Fan Type:** TCF/Aerovent 355(14) BIA-CBD
**HP:** 0.5 HP

**Start:** 12:28 PM
**Finish:** 12:53 PM

**Heat Ex:** Super Radiator Coils, 30 x 30-1R-58/48
**Mod. Valve:** SVF 1" R6166TTSE
**Positioner:** SVF E300-W-5-EC
**Controller:** Watlow 989A-10CF-ARGG

**Water Supp:** Neslab M150D
**Approx(C) :** 5

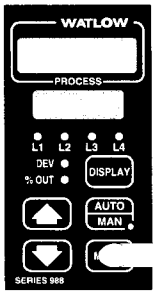
**Cooling Capacity:** **Set Point:** 4.444 **Freq (Hz):** 60

| | Process | | Thermo | Amperage | | |
|---|---|---|---|---|---|---|
| Time (min) | Temp (C) | %Cooling | Temp (C) | L1 | L2 | L3 |
| 0 | 21 | -100 | 21.0 | | | |
| 0.5 | 20 | -100 | 20.0 | | | |
| 1 | 19 | -100 | 18.5 | 0.5 | 2.67 | 2.81 |
| 2 | 18 | -100 | 18.5 | | | |
| 3 | 17 | -100 | 17.0 | | | |
| 4 | 16 | -100 | 16.0 | | | |
| 5 | 16 | -100 | 16.0 | | | |
| 6 | 15 | -100 | 15.0 | 0.1 | 2.55 | 2.55 |
| 7 | 14 | -100 | 14.0 | | | |
| 8 | 14 | -100 | 14.0 | | | |
| 9 | 14 | -100 | 14.0 | | | |
| 10 | 14 | -100 | 14.0 | | | |
| 11 | 14 | -100 | 13.5 | 0.1 | 2.6 | 2.6 |
| 12 | 14 | -100 | 13.0 | | | |
| 13 | 13 | -100 | 13.0 | | | |
| 14 | 13 | -100 | 13.0 | | | |
| 15 | 13 | -100 | 13.0 | | | |
| 16 | 13 | -100 | 13.0 | 0.1 | 2.6 | 2.6 |
| 17 | 13 | -100 | 13.0 | | | |
| 18 | 13 | -100 | 12.5 | | | |
| 19 | 13 | -100 | 12.5 | | | |
| 20 | 13 | -100 | 12.5 | | | |
| 21 | 13 | -100 | 12.5 | 0.1 | 2.6 | 2.6 |
| 22 | 13 | -100 | 12.5 | | | |
| 23 | 13 | -100 | 12.5 | | | |
| 24 | 13 | -100 | 12.5 | | | |
| 25 | 13 | -100 | 12.5 | Assumed Low Temperature Limit of Cooling Water Source | | |

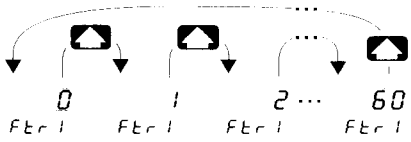
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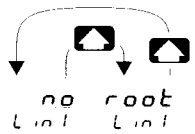
# Setup-Input

## Reaching the Input Menu



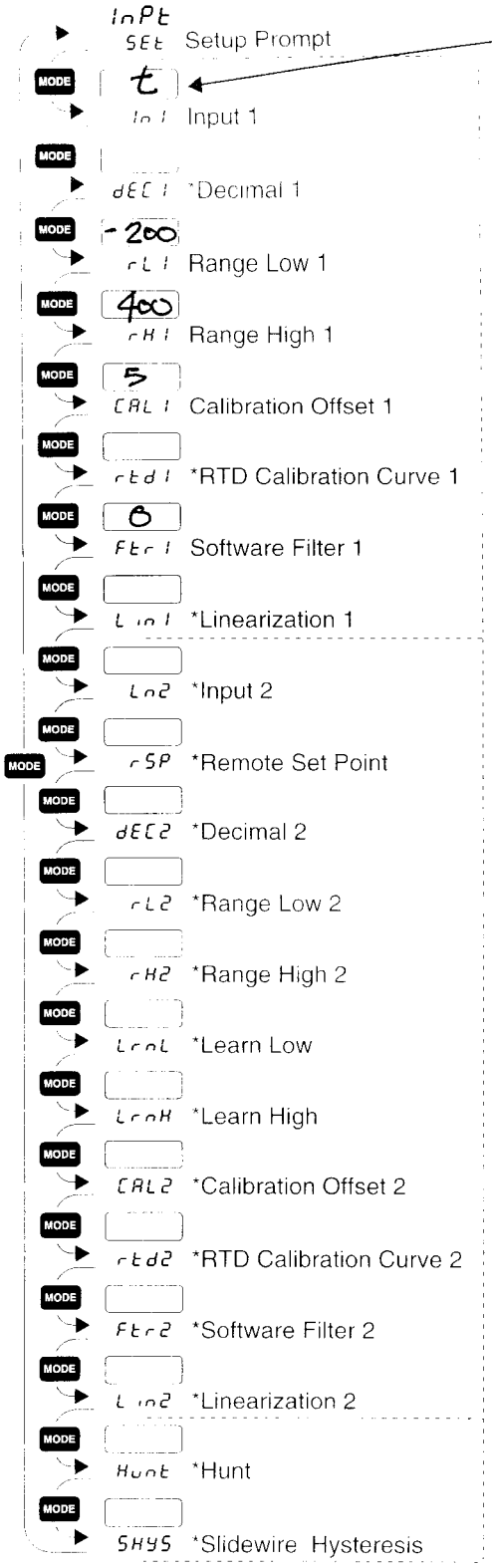

❸ Select the Input Menu, then press the Mode key MODE to step through the prompts.




❹ Press the Up-arrow key ▲ or the Down-arrow key ▼ to select one of the prompt values.

***Prompts may not appear, depending on controller configuration.**




Enter your settings, from the controller's upper display.

Input 1 (p. 4.3)

Input 2 (p. 4.9)

Slidewire (p. 4.16)

Figure 4.2 -
The Input Menu.

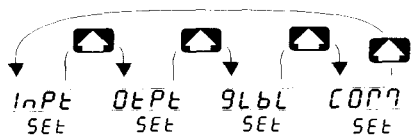


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# Setup-Output

## Reaching the Output Menu

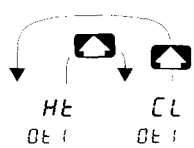
❶ Begin in the Display Loop, and press the Up-arrow and Down-arrow keys simultaneously for three seconds to reach the Setup Menus.

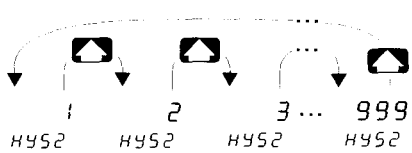



| Input Menu | Output Menu | Global Menu | Communications Menu |
|---|---|---|---|
| p. 4.2 | p. 4.18 | p. 4.34 | p. 4.44 |

❷ Press the Up-arrow key to select one of the Setup Menus.

❸ Press the Mode key MODE to step through the prompts.

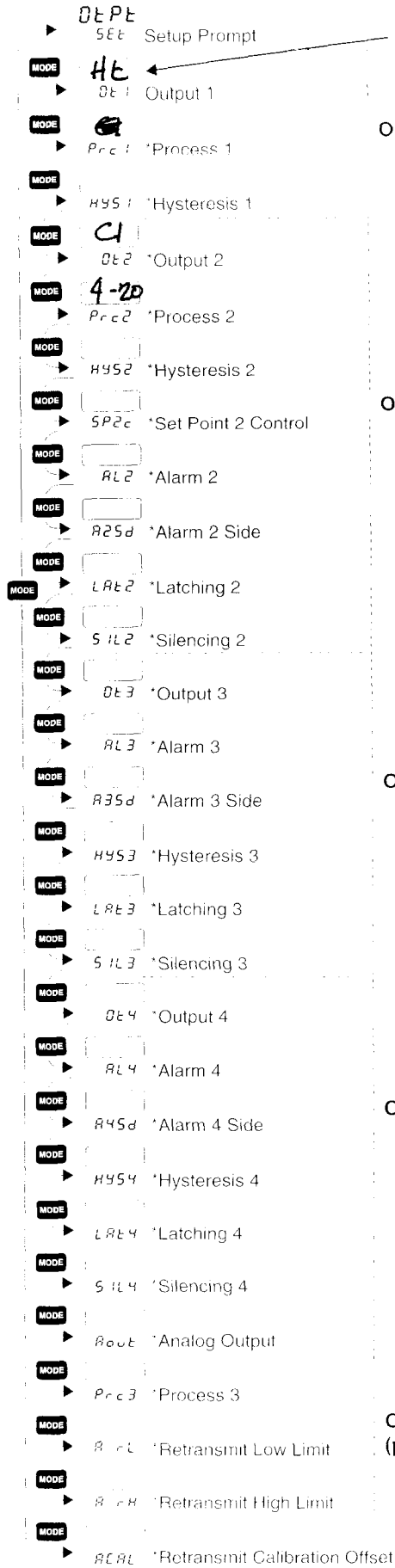



❹ Press the Up-arrow key or the Down-arrow key to select one of the prompt values.

*Prompts may not appear, depending on controller configuration.

Figure 4.18 - Navigating the Output Menu.



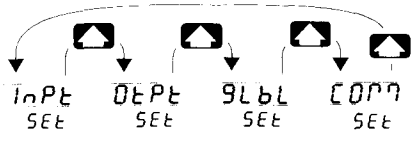



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# Setup-Global

## Reaching the Global Menu

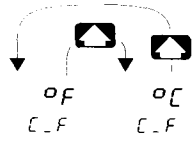
❶ Begin in the Display Loop, and press the Up-arrow key and Down-arrow key simultaneously for three seconds to reach the Setup Menus.

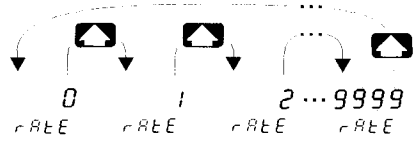



| Input Menu | Output Menu | Global Menu | Communications Menu |
|---|---|---|---|
| p. 4.2 | p. 4.18 | p. 4.34 | p. 4.44 |

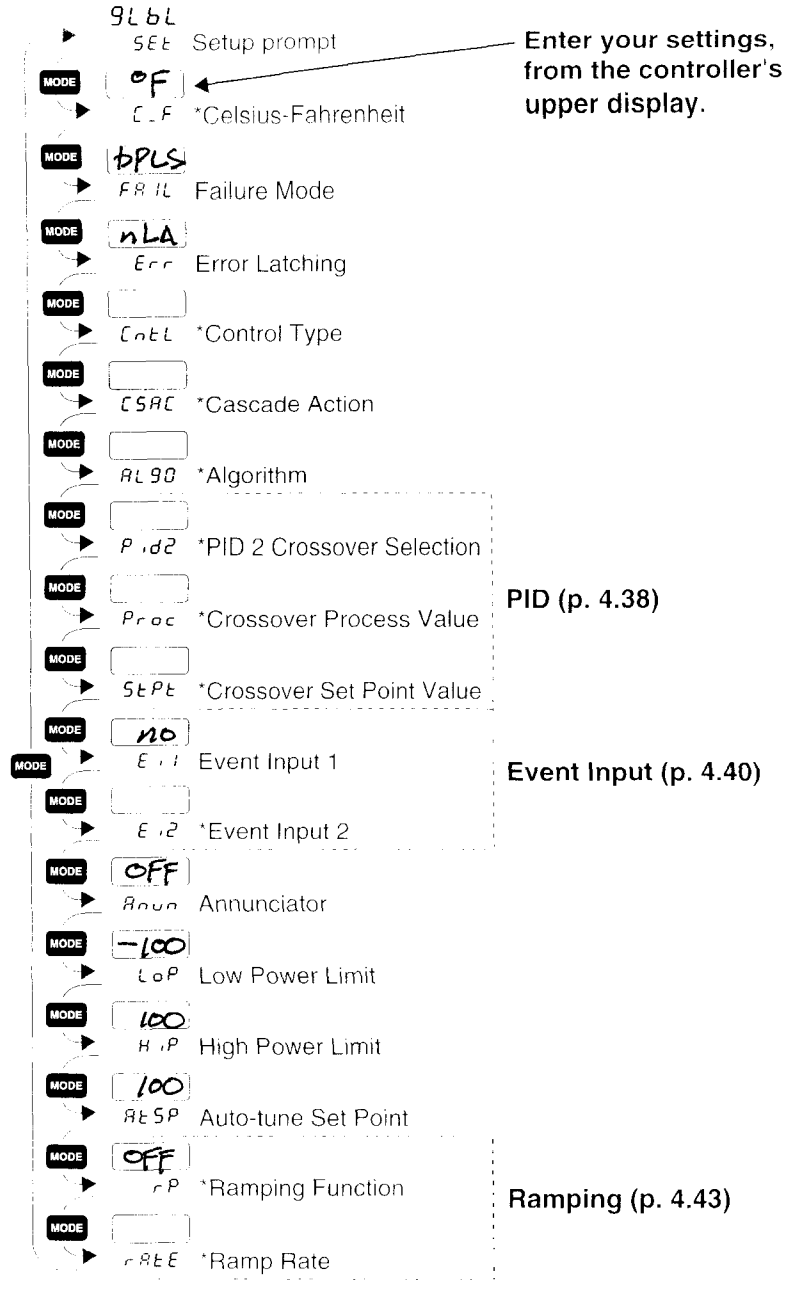
❷ Press the Up-arrow key to select one of the Setup Menus.

❸ Press the Mode key to step through the prompts.




❹ Press the Up-arrow key or the Down-arrow key to select one of the prompt values.




***Prompts may not appear, depending on controller configuration.**

**Figure 4.34 - Navigating the Global Menu.**

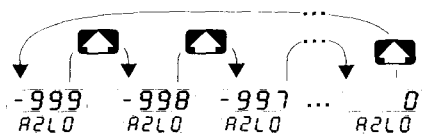


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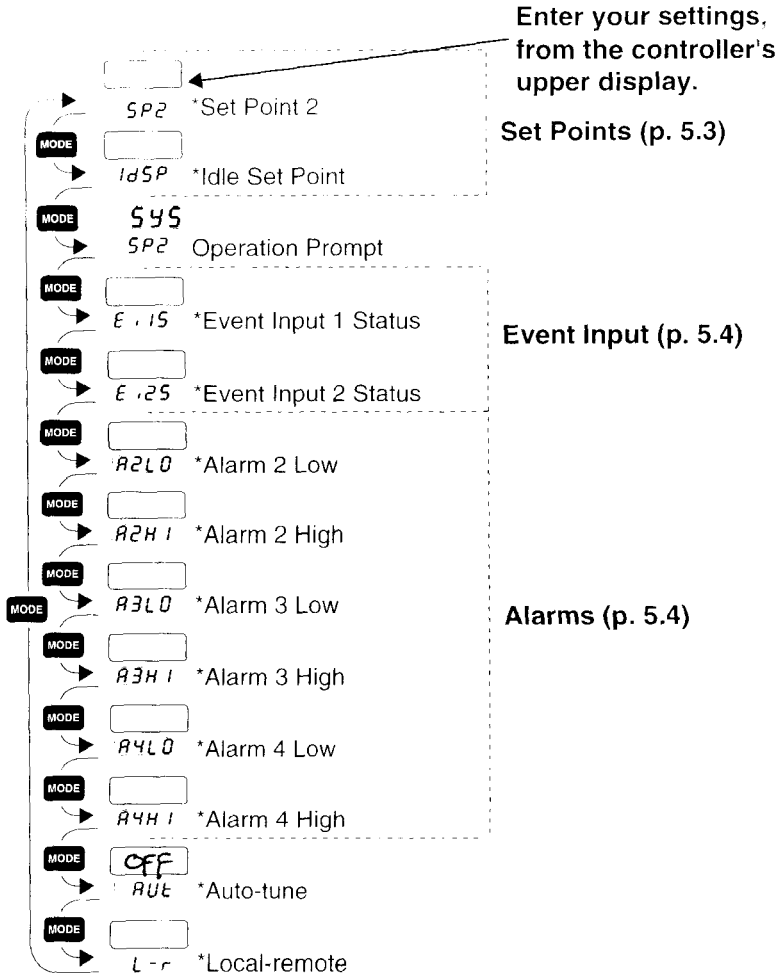
## Reaching the System Menu




❸ Select the System Menu, then press the Mode key MODE to step through the prompts.




❹ Press the Up-arrow key ▲ to step through the prompt values. The Down-arrow key ▼ backs through the values.




***Prompts may not appear, depending on controller configuration.**

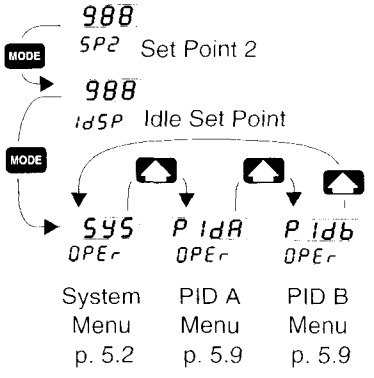
**Figure 5.2 -**
**The System Menu.**



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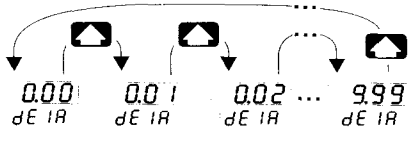
## Reaching the PID Menus

❶ Begin in the Display Loop, and press the Mode key MODE to reach the Set Point 2 prompt SP2, the Idle Set Point prompt idSP, or the System Menu SYS.



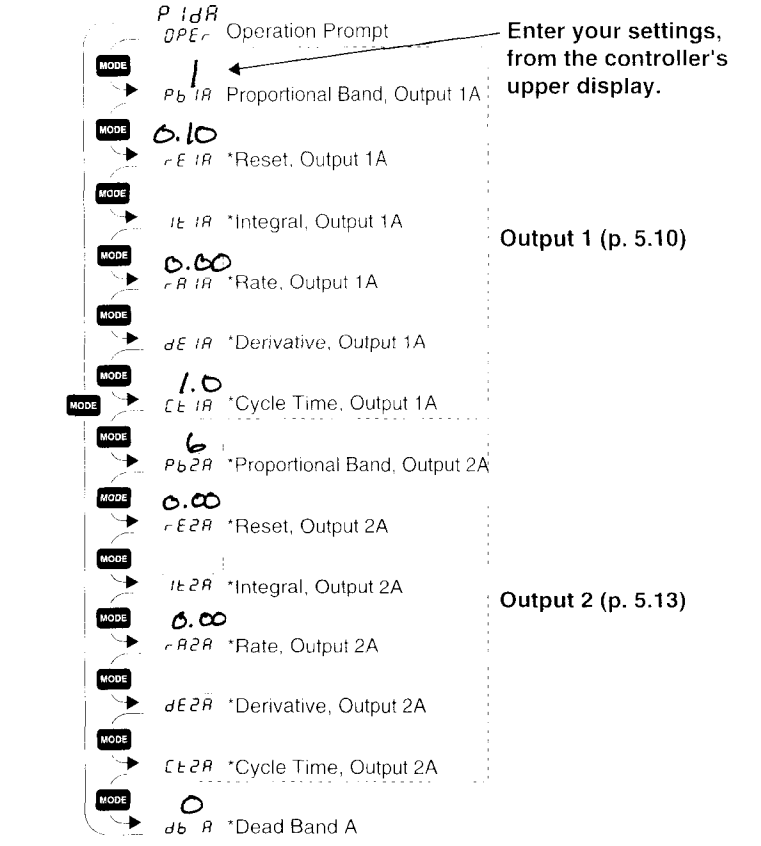

❷ Use Mode key MODE to step past the Set Point 2 prompt SP2 and the Idle Set Point prompt idSP, if they appear (see prompt information). Upon reaching the Operation Menu prompt OPEr use the Up-arrow key to select a menu.

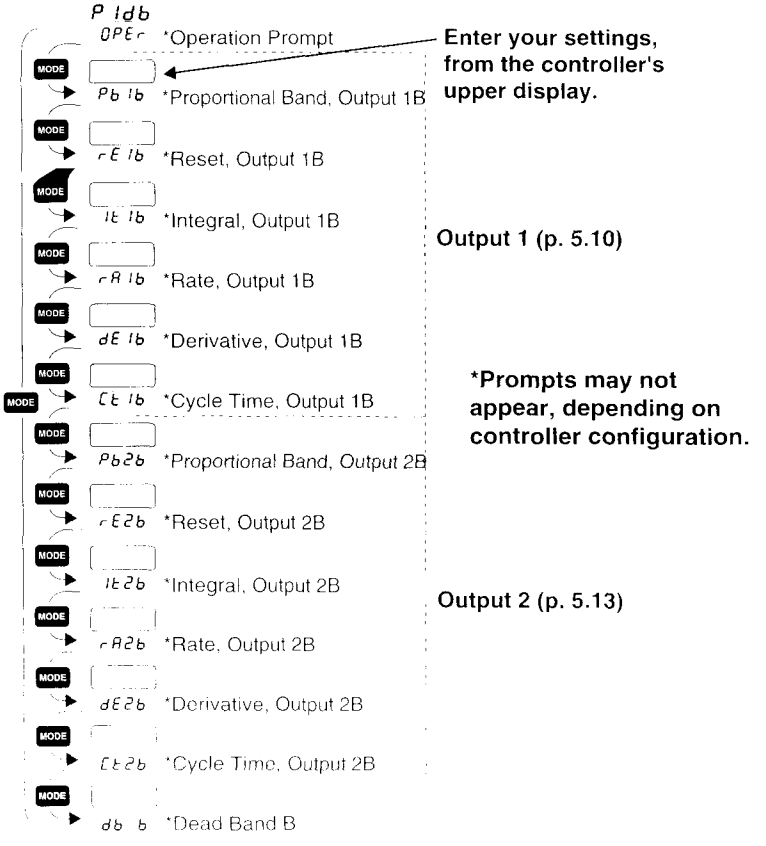
❸ Press the Mode key MODE to step through the prompts.




❹ Press the Up-arrow key to step through the prompt values. The Down-arrow key backs through the values.

**Figure 5.9 - The PID Menus.**






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# 12" Low-Speed, Variable Freestream Temperature, Recirculating Wind Tunnel

## List of Components

| Component | Manufacturer | Model/Part No. | Serial No. |
|---|---|---|---|
| 1. Fan Belt | Browning Manufacturing | AX46 | |
| 2. Fan, In-line Centrifugal | TCF Aerovent Company | 14-CBD-1241-0.5 | 01344342-1-1 |
| 3. Fuse, Heaters (2), 35A | Bussman Cooper Industries | JKS 35 | |
| 4. Fuse, High Limit (2), 0.1A | Bussman Cooper Industries | FNQ 1/10 | |
| 5. Fuse, Main Power (3), 45A | Bussman Cooper Industries | LPJ 45SP | |
| 6. Fuse, Mercury Relay (2), 0.1A | Bussman Cooper Industries | FNQ 1/10 | |
| 7. Fuse, Motor (2), 6A | Bussman Cooper Industries | FNQ 6 | |
| 8. Fuse, Set Pt. Controller(2),0.1A | Bussman Cooper Industries | FNQ 1/10 | |
| 9. Fuse, Valve (2), 0.25A | Bussman Cooper Industries | FNQ 1/4 | |
| 10. Heat Exchanger Valve | SVF | 1" R61166TTSE | |
| 11. Heating Elements (6) | Watlow Electric Man., Co. | FSP3210WHF | |
| 12. High Temp. Limit Control | Watlow Electric Man., Co. | 146E-2629-3000 | 010398 |
| 13. Inverter Operator Interface | Toshiba, International | S7-OIS | 390026100 |
| 14. Mercury Relay, 35A | Watlow Electric Man., Co. | HG35-9LD2-0000 | |
| 15. Motor, Fan | Leeson Electric Corp. | 110032 | C6T17NB3E |
| 16. SCR Relay, 30A | Watlow Electric Man., Co. | DC1C-5024-C000 | 070132 |
| 17. Set Point Controller | Watlow Electric Man., Co. | 989A-10CF-ARGG | 0988116894 |
| 18. Sheave, Fan | Browning Manufacturing | AK39H x 5/8 | |
| 19. Sheave, Motor | Browning Manufacturing | AK54 x 3/4 | |
| 20. Valve Control | Indelac Controls, Inc. | E300-W-4-E-C | 01B-1868 |
| 21. Variable Frequency Inverter | Toshiba, International | VFS9-2004PM-AN | 805007020317 |
| 22. Water Chiller | Neslab Instruments, Inc. | M150 STD 208/60 PD2 | 101040061 |

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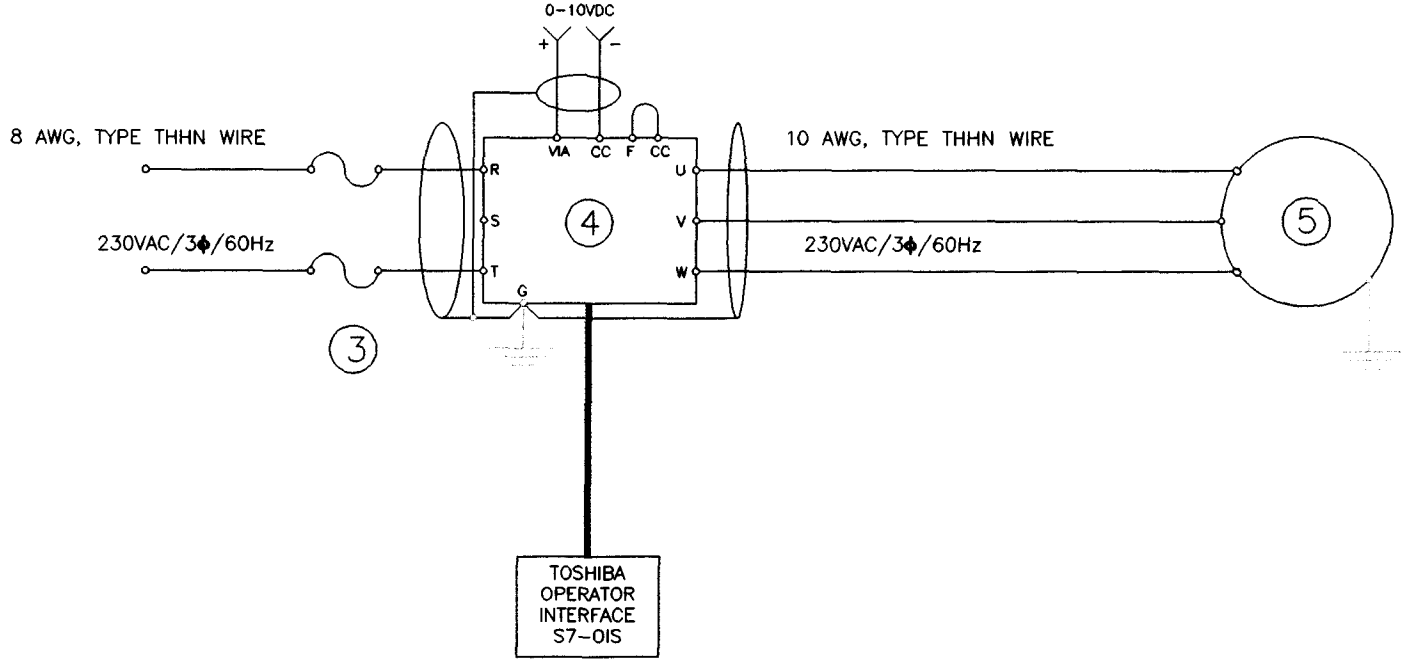
## SERVICE CENTERS

| Company: | Component(s): | Local Representative: | Telephone No.: | Fax No.: |
|---|---|---|---|---|
| Neslab Instruments, Inc. | Recirculating Water Chiller | Neslab Instruments, Inc.<br>P.O. Box 1178<br>Portsmouth, NH 03802-1178 | (800) 258-0830 | (603) 436-8411 |
| TCF/ Aerovent, Inc. | In-line Centrifugal Fan | TCF/Aerovent, Inc.<br>5959 Trenton Lane<br>Minneapolis, MN 55442 | (612) 551-7500 | (612) 551-7501 |
| Toshiba, International | Variable Frequency Inverter | Toshiba International, Corp.<br>Industrial Division<br>13131 West Little York Road<br>Houston, TX 77041 | (800) 231-1412 | (713) 466-8773 |
| Watlow Electric Man.. Co. | Finbar Heaters<br>Din-a-Mite SCR<br>High Temperature Limit Control<br>Mercury Relay<br>Set Point Controller | Watlow Electric Man., Co.<br>1241 Bundy Boulevard<br>Winona, MN 55987 | (507) 454-5300 | (507) 452-4507 |

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| No. | Component | Manufacturer | Part No. |
|---|---|---|---|
| 3 | Pump Motor Fuses, 6A Class J | Bussman | FNQ 6 |
| 4 | Variable Frequency Inverter | Toshiba International | VFS9S-2004PM |
| 5 | 0.5HP, TENV Motor | Leeson Electric Corp. | 110032 |




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PROJECT: 12" LOW SPEED, VARIABLE FREESTREAM TEMPERATURE RECIRCULATING WIND TUNNEL FAN WIRING DIAGRAM

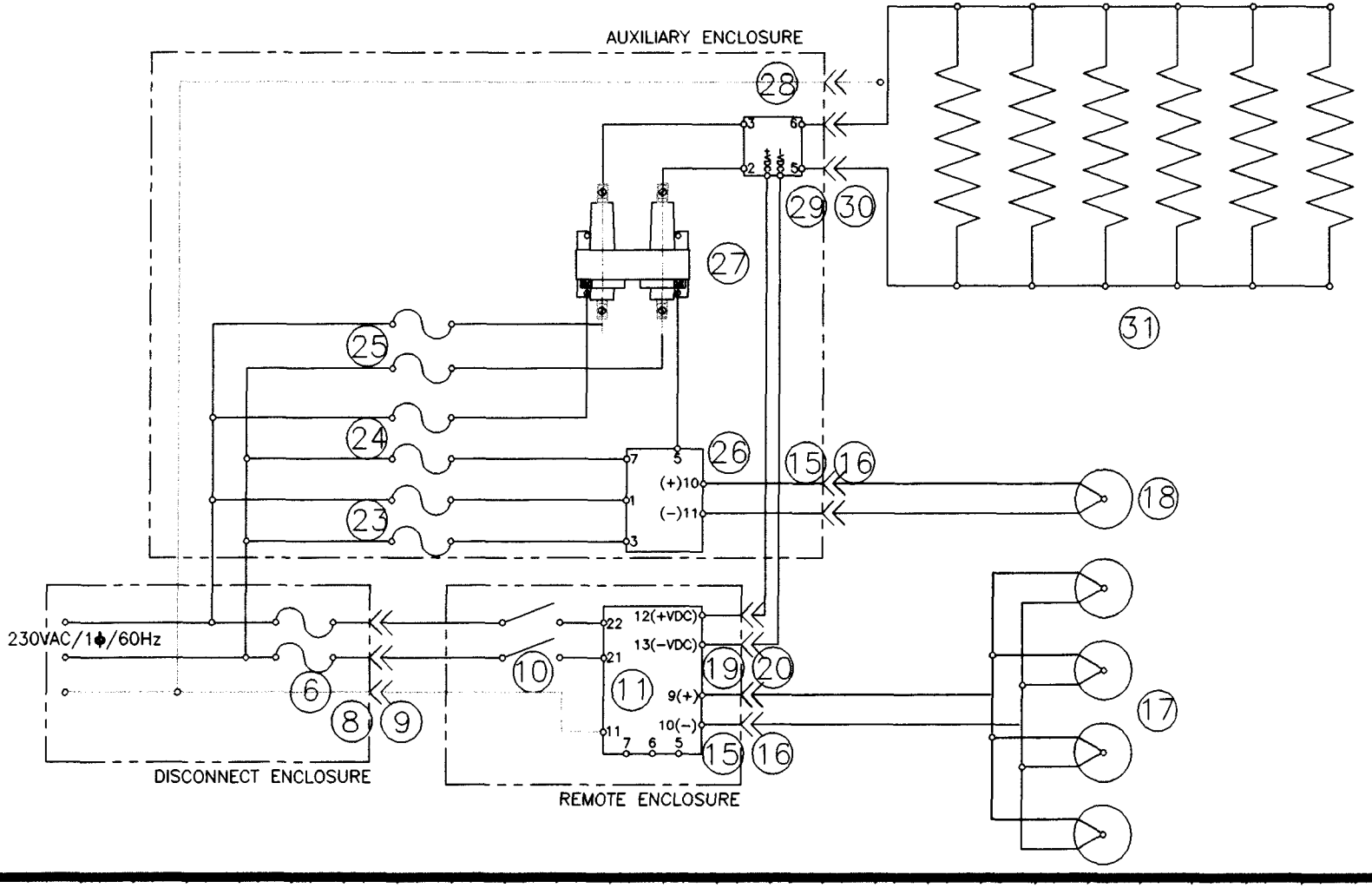
ORGANIZATION: AGERE SYSTEMS, INC.

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| P.O. NO. ST0044706 | 03/17/01 | NTS |

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| No. | Component | Manufacturer | Part No. |
|---|---|---|---|
| 6 | Fuse, Set Pt Controler, 0.1A Class J, 2 | Bussman | FNQ 1/10 |
| 8 | Recp't, Flanged, 15A, 250VAC, 2P/3W | Hubbell | HBL4585C |
| 9 | Plug, 15A, 250VAC, 2P/3W | Hubbell | HBL4570C |
| 10 | Switch, DPST | Carlingswitch | 0035 |
| 11 | Temp. Set Point Controller | Watlow Controls | 989A-10CF-ARGG |
| 15 | Connector, Socket, Type T Thermocouple | Omega | RSJ-T-R |
| 16 | Connector, Plug, Type T Thermocouple | Omega | OST-T-M |
| 17 | Thermocouple, Type T, Set Point | N/A | N/A |
| 18 | Thermocouple, Type T, High Limit | N/A | N/A |
| 19 | Connector, Socket, 9 Pin Twist Lock | Amp | 206705-1 |

| No. | Component | Manufacturer | Part No. |
|---|---|---|---|
| 20 | Connector, Plug, 9 Pin Twist Lock | Amp | 206708-1 |
| 23 | Fuse, High Limit, 0.1A, Class J, 2 | Bussman | FNQ 1/10 |
| 24 | Fuse, Mercury Relay, 0.15A, Class J, 2 | Bussman | FNQ 15/100 |
| 25 | Fuse, Heater, 35A, Class J, 2 | Bussman | JKS 35 |
| 26 | High Temperature Limit Control | Watlow Controls | 146E-2629-3000 |
| 27 | Mercury Relay, 35A, DPST | Watlow Controls | HG35-9LD2-0000 |
| 28 | Silicon Control Rectifier (SCR), 50A | Watlow Controls | DC1C-5024-C000 |
| 29 | Recp't, flanged, 50A, 250VAC, 2P/3W | Hubbell | CS8275 |
| 30 | Plug, 50A, 250VAC, 2P/3W | Hubbell | CS8264 |
| 31 | 1350W Finbar Heaters, 6 | Watlow Controls | FSP3210WMF |




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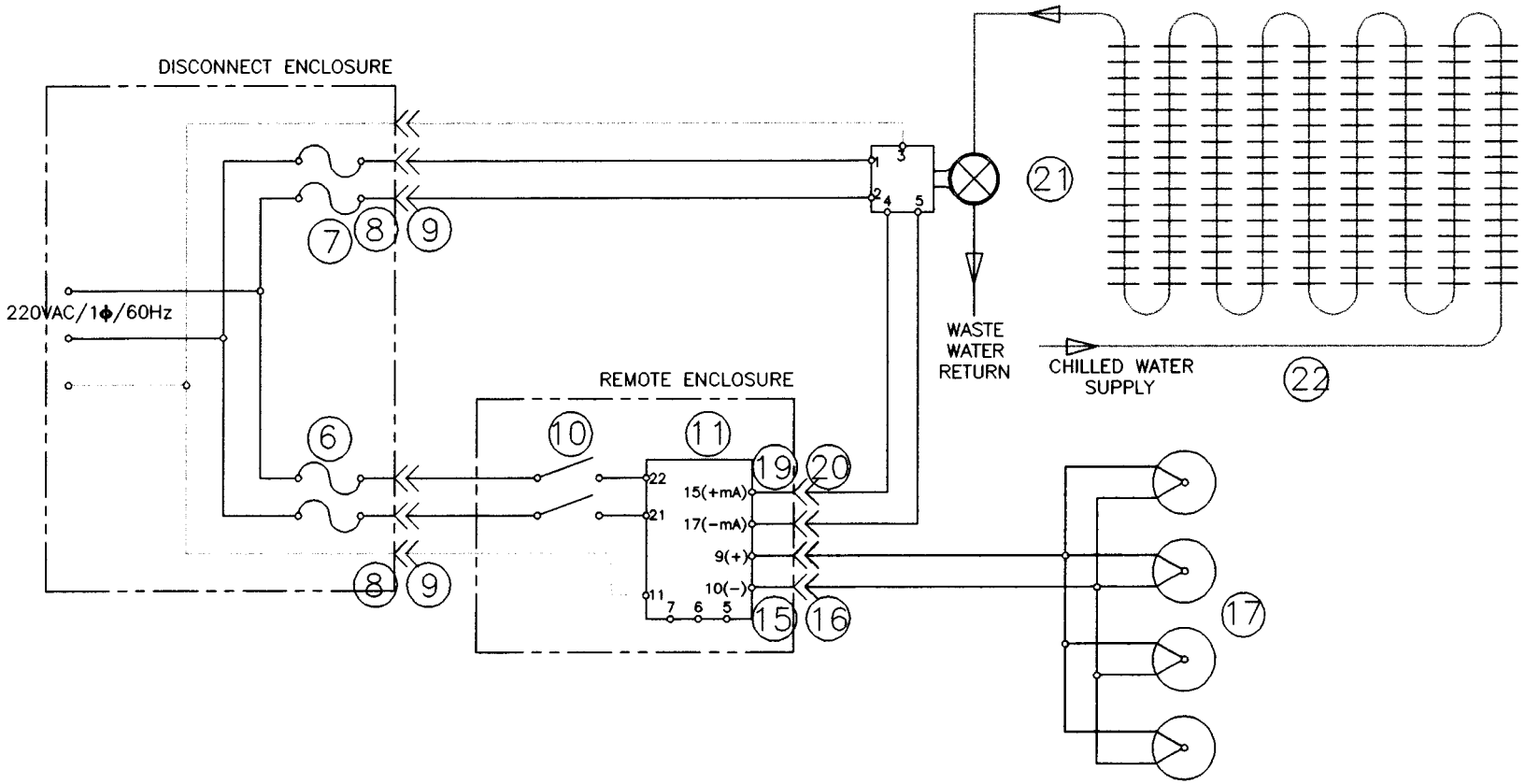
PROJECT: 12" LOW SPEED, VARIABLE FREESTREAM TEMPERATURE RECIRCULATING WIND TUNNEL HEATER WIRING DIAGRAM

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| No. | Component | Manufacturer | Part No. |
|---|---|---|---|
| 6 | Fuse, Set Pt Controler, 0.1A Class J | Bussman | FNQ 1/10 |
| 7 | Fuse, Modulating Valve, 0.25A Class J | Bussman | FNQ 1/4 |
| 8 | Recp't, Flanged, 15A, 250VAC, 2P/3W | Hubbell | HBL4585C |
| 9 | Plug, 15A, 250VAC, 2P/3W | Hubbell | HBL4570C |
| 10 | Switch, DPST | Calingswitch | 0035 |
| 11 | Temp. Set Point Controller | Watlow Controls | 989A-10CF-ARGG |
| 15 | Connector, Socket, Type T Thermocouple | Omega | RSJ-T-R |
| 16 | Connector, Plug, Type T Thermocouple | Omega | OST-T-M |
| 17 | Connector, Socket, 9 Pin Twist Lock | Amp | 206705-1 |
| 19 | Connector, Plug, 9 Pin Twist Lock | Amp | 206708-1 |
| 20 | Type T Thermocouple | N/A | N/A |
| 21 | Electronic Modulating Valve | SVF | 1" R61166TTSE |
| 22 | Chilled Water Heat Exchanger | Super Radiator Coils | 30x30-AR-58/48 |





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PROJECT: 12" LOW SPEED, VARIABLE FREESTREAM TEMPERATURE RECIRCULATING WIND TUNNEL VALVE WIRING DIAGRAM

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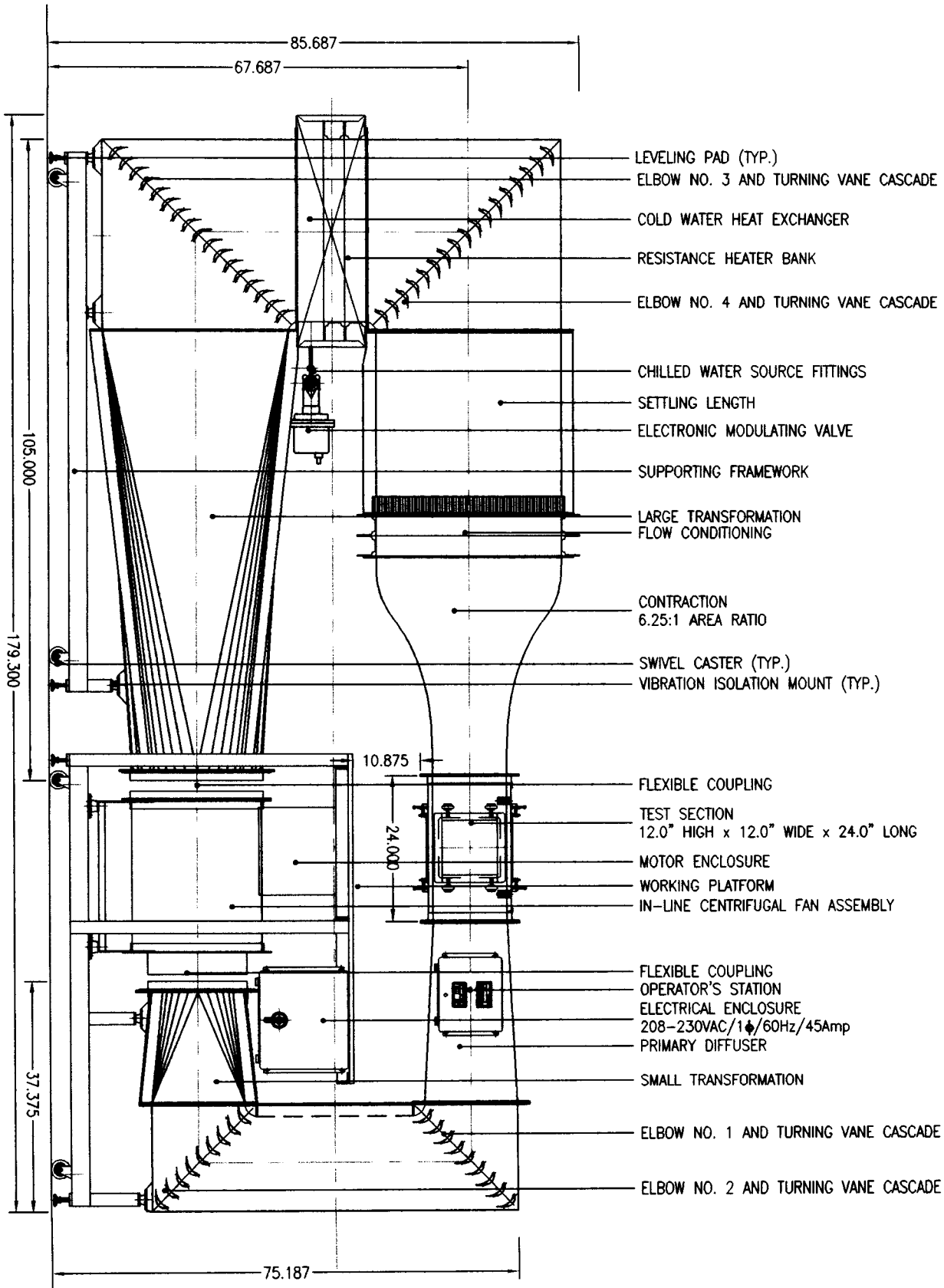
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ORGANIZATION: AGERE SYSTEMS, INC.

REFERENCE: P.O. NO. ST0044706

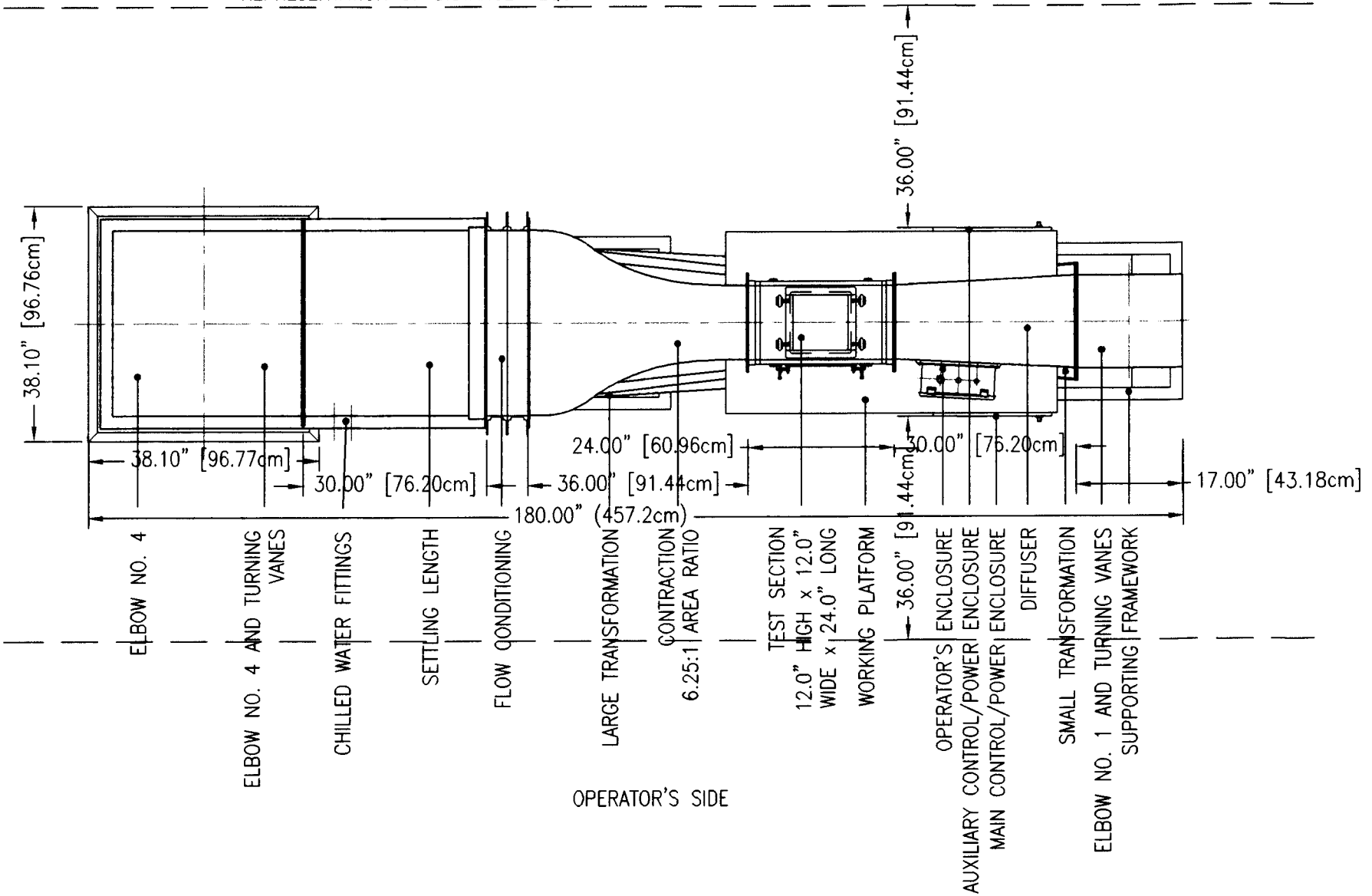
DATE: 01/25/01

SCALE: 0.5" = 1'-0"




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