



Model 22

**EFA Scientific Comparator System**

Dimensions: 36" H x 36" W x 55" D  
914mm H x 914mm W x 1397mm D

**GAS TURBINE AND JET ENGINE COMPONENTS****Effective Flow Area Measurement****PRODUCT REQUIREMENTS**

Accurately analyzing airflow through jet engine and gas turbine components has been critical in the success of the aerospace industry. CCDI has satisfied manufacturers for over 30 years by offering quality airflow test equipment and part testing to GE, Garrett, Pratt and Whitney, Solar Turbine, and more.

**SOLUTION: TIME PROVEN DESIGN**

The Model 22 takes measurements of Barometric Pressure, Air Temperature and Humidity to reliably measure Effective Flow Area (EFA). The scientific comparator was originally designed as a reduced version of the Model 88 Effective Flow Area test stand. As a result, continuous improvement has been made on the technology for over 15 years, refining the design to optimize performance.

**FEATURES**

- Repeatability: +/- 0.1% or better
- Simple WYSIWYG Windows Based Software
- 0.25 to 14 sq. in. Measurement (1.6 to 90.3 cm<sup>2</sup>)
- Measures up to 25 sq. in. (63.5 cm<sup>2</sup>) at 5" H<sub>2</sub>O (Water Column), 1.012 pressure ratio
- Pressure Range: 0 to 20" H<sub>2</sub>O (Water Column), 1 to 1.049 pressure ratio
- Great for Segment Testing and Small Vane Rings
- Nacelle Leakage Measurement Attachments (Optional)



**The unit is equipped with two blowers, low range and high range. During high range, both blowers are activated. The clutch is manually operated.**

**SYSTEM SPECIFICATIONS**

- NIST traceable EFA
- All air density parameters are measured
  - Room and Plenum Temperatures
  - Barometric and Plenum Pressures (Both measured by same gauge)
  - Humidity (Using Dew Point Sensor)
- Vector Motor Controller with 1.0 to 4,999.9 RPM
- Two blowers, Low Range 0.25 to 4.5 sq. in. (0.6 to 11.4 cm<sup>2</sup>), High Range 2.0 to 15 sq. in. (5.1 to 38.1 cm<sup>2</sup>)
- Manual Clutch Operation, pneumatically controlled High Range shut off valve
- SI or English Units
- Less than one minute per EFA measurement
- NIST Traceable calibration orifice plates and ASME subsonic area masters
- Customer correlation table for each part
- Four QC reports and data acquisition file
- IBM Pentium computer
- Automatic data acquisition
- GE, Garrett, P&W and Solar Turbine part testing and more
- Can be assembled as a nacelle leakage tester
- Free operator training, testing and certification
- One-year warranty on parts and labor

**Flow Capabilities**

- Area: 0.25 to 14 sq. in. (1.6 to 90.3 cm<sup>2</sup>)
- Pressure: 0 to 20" Water Column Gauge, 1 to 1.049 pressure ratio

**FACILITY REQUIREMENTS**

Electrical Power	380 - 480 VAC 3-phase 21 Amps OR 240 VAC 3-phase 41 Amps, depending on power requirements for testing
Inlet Air Connection Pressure Range	30 to 100 PSIG (207 to 690 kpa) Pressurized Air Supply (filtered, compressed air at ambient temperature)

Temperature Range	50 - 100°F (10 - 38°C)
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**SOFTWARE**

**MEASURED EFA**  
0.000

**CUSTOMER AREA**  
0.000

**PART PRESSURE**  
0.000

**BLOWER STD-RPM**  
0.000

PRESS LMT, P-P%: 0.50 > 0.00 :  
TEMP LMT, P-P%: 0.50 > 0.00 :

**Identification**  
Part ID: NIST  
Engine: SUBSONIC 4.0  
Order:  
Oper/Date: DRB/13Mar08  
Serial:  
Comments:

**Test Parameters**  
Plenum Pressure: 5.00  
RPM: 3632.1  
#/Blowers: 1  
Operation Mode:  Vacuum  Pressure  
Interest Delay: 10  
Number of Tests: 5  
No. Warm-up Tests: 1

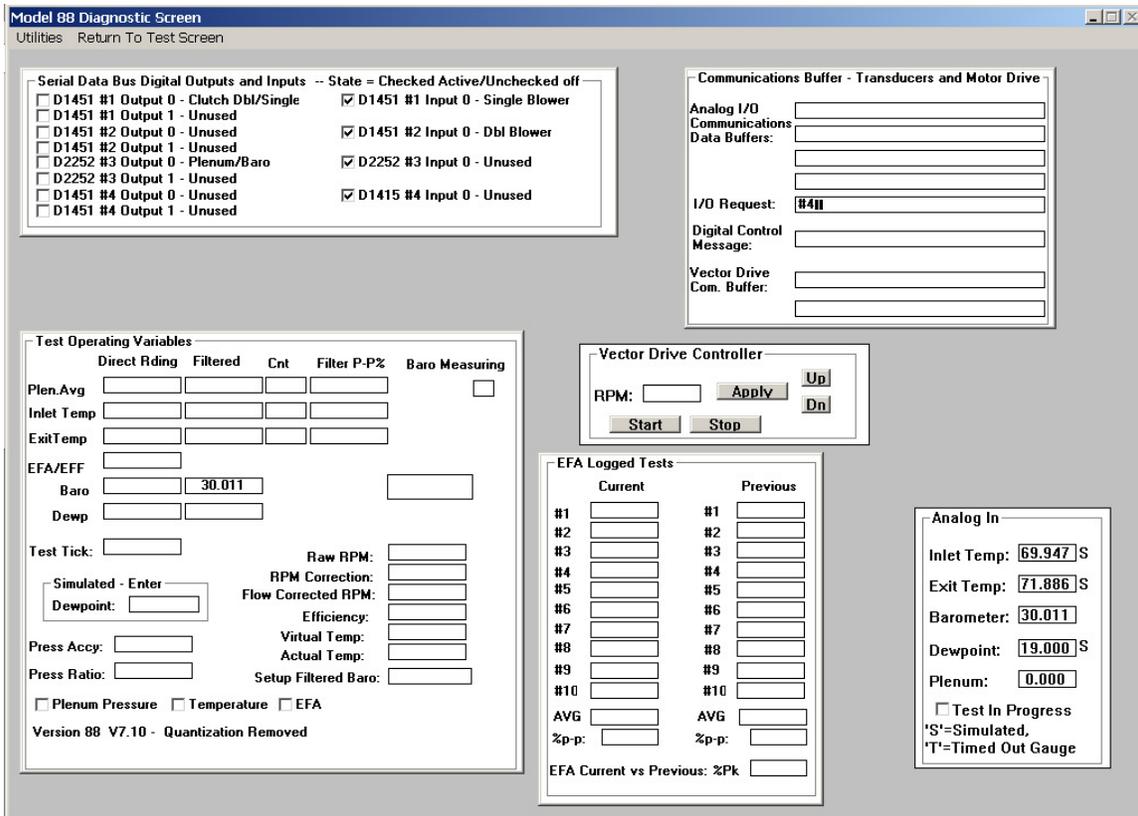
**Blower Efficiency Calibration**  
5S-QSV-WK20  
EFA STD-RPM EFF  
Low: COP1214Q 8.541 2451.17 0.910616  
Med: COP1216S 9.770 2767.40 0.922555  
High: COP1219V 11.597 3237.52 0.935951  
Coef's - Of: 0.992047 Slope: 0.738197 Curv: -1.177534

**Customer Area Correlation**  
NULL  
RPM MARKED MEAS  
L: LOW 100.0 1000.000 1.000  
M: MED 900.0 9000.000 9.000  
H: HIGH 1000.0 10000.000 10.000  
Coef's - Of: 0.000000 Slope: 1000.000 Curv: 0.000000  
Cust-EFA Adjust: 1.000000

Message: Incorrect calibration/correlation data.  
Status: Insert Test Information, APPLY and Begin Testing...  
Software Vers : 7.10 File: NIST40.DAT

Function Keys: F1 (ID BOX), F2 (TST BOX), F3 (RUN), F4 (ACCEPT), F5 (PRINT), F6 (RSLT BX)

**Test Screen:** Shows the Part Test, Orifice Plate Data, and Master Data in Interactive Dialog Boxes.



**Diagnostic Screen:** Interaction with Instrumentation and Internal Software Signal Processing Information

**Model 88 Setup Screen**  
 Utilities View Setup Print Setup Save Setup Return to Test Screen Change Passwords

<p><b>Blower &amp; hardware Info</b></p> <p>Number of Blowers Installed: <input type="text" value="2"/></p> <p>Automatic Clutch: (88 only) <input checked="" type="checkbox"/></p> <p>Test to Test RPM Limit %: <input type="text" value="25"/></p> <p>1st Blower: Cubic Inch/Rev</p> <p>Displacement: <input type="text" value="825"/></p> <p>S/N: <input type="text" value="N/A"/></p> <p>2nd Blower: Cubic Inch/Rev</p> <p>Displacement: <input type="text" value="825"/></p> <p>S/N: <input type="text" value="N/A"/></p> <p>Vector Drive (Motor)</p> <p>Model: <input type="text" value="GPD515"/></p> <p>Drive COM Port #: <input type="text" value="1"/></p> <p>Simulate (Not for Testing) <input type="checkbox"/></p> <p>Max RPM: <input type="text" value="4500"/></p> <p>Reverse: (some units) <input type="checkbox"/></p> <p>VCD Del.Rate: (ticks) <input type="text" value="3000"/></p> <p>Transducers (Press &amp; Temp)</p> <p>Gauge COM Port #: <input type="text" value="2"/></p> <p>Invert Digital Outputs <input type="checkbox"/></p> <p>Internal Tick Rate: <input type="text" value="15"/></p> <p>10000.00 Transducer Scale <input type="checkbox"/></p> <p><input type="button" value="Apply"/></p>	<p><b>System Defaults</b></p> <p>System Defaults</p> <p>Timing</p> <p>Measurement Stability Time: (sec) <input type="text" value="5"/></p> <p>Stability</p> <p>Plenum Press within Setpoint: % <input type="text" value="0.10"/></p> <p>Pressure Meas. Stable: % <input type="text" value="1.00"/></p> <p>Temperature Stable: % <input type="text" value="0.25"/></p> <p>Blower EFF &amp; Cust Area Calib.</p> <p>Repeats between Runs: % <input type="text" value="0.10"/></p> <p>PID Parameters - Pressurization Control</p> <p>PID Pressure On: (Typ 5-25) % <input type="text" value="25"/></p> <p>Proportional Gain: <input type="text" value="0.50"/></p> <p>Integral Gain: <input type="text" value="0.10"/></p> <p>Derivative Gain: <input type="text" value="0.01"/></p> <p>PID Update Interval: (sec) <input type="text" value="1"/></p> <p>PID Reset Interval: (sec) <input type="text" value="15"/></p> <p><input type="button" value="Apply"/></p>	<p><b>Sensor/Transducer Calib.</b></p> <p>Inlet Temp</p> <p>Device: D1451 Ch.1</p> <table border="1"> <thead> <tr> <th>Deg F</th> <th>Deg F</th> <th></th> </tr> </thead> <tbody> <tr> <td><input type="text" value="49.600"/></td> <td><input type="text" value="49.540"/></td> <td><input type="button" value="C"/></td> </tr> <tr> <td><input type="text" value="57.900"/></td> <td><input type="text" value="57.830"/></td> <td><input type="button" value="C"/></td> </tr> <tr> <td><input type="text" value="65.400"/></td> <td><input type="text" value="65.380"/></td> <td><input type="button" value="C"/></td> </tr> <tr> <td><input type="text" value="72.900"/></td> <td><input type="text" value="73.000"/></td> <td><input type="button" value="C"/></td> </tr> <tr> <td><input type="text" value="79.800"/></td> <td><input type="text" value="79.850"/></td> <td><input type="button" value="C"/></td> </tr> <tr> <td><input type="text" value="88.900"/></td> <td><input type="text" value="89.020"/></td> <td><input type="button" value="C"/></td> </tr> <tr> <td><input type="text" value="96.100"/></td> <td><input type="text" value="96.160"/></td> <td><input type="button" value="C"/></td> </tr> <tr> <td><input type="text" value="104.800"/></td> <td><input type="text" value="104.910"/></td> <td><input type="button" value="C"/></td> </tr> <tr> <td><input type="text" value="112.100"/></td> <td><input type="text" value="112.340"/></td> <td><input type="button" value="C"/></td> </tr> <tr> <td><input type="text" value="120.300"/></td> <td><input type="text" value="120.260"/></td> <td><input type="button" value="C"/></td> </tr> </tbody> </table> <p>Date: <input type="text" value="24-May-0"/></p> <p>Cal By: <input type="text" value="DRV"/></p> <p>S/N: <input type="text" value="INLET"/></p> <p><input checked="" type="checkbox"/> Simulate Transducer</p> <p><input type="button" value="Next"/> <input type="button" value="Apply"/></p>	Deg F	Deg F		<input type="text" value="49.600"/>	<input type="text" value="49.540"/>	<input type="button" value="C"/>	<input type="text" value="57.900"/>	<input type="text" value="57.830"/>	<input type="button" value="C"/>	<input type="text" value="65.400"/>	<input type="text" value="65.380"/>	<input type="button" value="C"/>	<input type="text" value="72.900"/>	<input type="text" value="73.000"/>	<input type="button" value="C"/>	<input type="text" value="79.800"/>	<input type="text" value="79.850"/>	<input type="button" value="C"/>	<input type="text" value="88.900"/>	<input type="text" value="89.020"/>	<input type="button" value="C"/>	<input type="text" value="96.100"/>	<input type="text" value="96.160"/>	<input type="button" value="C"/>	<input type="text" value="104.800"/>	<input type="text" value="104.910"/>	<input type="button" value="C"/>	<input type="text" value="112.100"/>	<input type="text" value="112.340"/>	<input type="button" value="C"/>	<input type="text" value="120.300"/>	<input type="text" value="120.260"/>	<input type="button" value="C"/>
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**Setup Screen:** Contains Transducer Calibration, Defaults, and Machine Specific Settings