



Model 622  
**Automatic Airflow Test Stand**

Dimensions: 67" H x 57" W x 42" D  
1702mm H x 1448mm W x 1067mm D

## **GAS TURBINE AND JET ENGINE COMPONENT TESTING**

### **Mass Airflow Test Stand**

### **PRODUCT REQUIREMENTS**

Multiple manufacturers in the Aerospace industry required Airflow Test Stands to calculate Mass Airflow and test equations. Flow test sequences, called "circuits," can automatically flow air with multiple test steps and various airflow equations (such as specialized reduced airflow measurements). CCDI was first in the industry to offer such test equations, and has continued to do so for over 40 years. The Automatic Airflow Test Stand is now available in the Model 622.

### **A VERSATILE SOLUTION**

CCDI has been developing Airflow Test Stands since 1976 and automated units since 1986. The years of experience resulted in a refined design of a product that considers the fast-paced nature of the industry. CCDI continues to satisfy customers by adding new test requirements from various turbine manufacturers.

### **FEATURES**

- Accuracy: +/- .50% Standard
- Repeatability: +/- 0.25% Standard
- Latest version of Windows Based Software
- Preloaded with your manufacturers Test Specs and Formulas, automatic correction
- 6 Nozzle design with ability to combine nozzle brings maximum measuring range
- Internal air volume reduction for fast production and realistic testing time
- Circuit switching, pressure control and acceptance, fully automatic
- EDI feature for piping data to network systems
- Will operate on Notebook Computer
- Configurations Available: 622L, 622M, 622H, 622XH

**SYSTEM SPECIFICATIONS**

NIST Traceable Air flow Measurement  
Flow Measurement Accurate to +/- .50%  
Flow Measurement Repeatable to +/- 0.25%  
GE, PW, ABB, Honeywell, Siemens, Rolls-Royce, and Solar Parts Testing  
Automatic Flow Correction Equations according to mfg specs.  
15 to 30 Seconds per Flow Test  
Manual/Automatic Operation  
Internal Sonic Nozzles (4 to 6)  
Automatic Single or Double Nozzle Select  
Part Test Profiles  
English and SI Units  
MS Windows Based Part Test Software  
QC Report, Label and Data Acquisition File  
Can also flow small Effective Flow Area measurements  
Data Acquisition File compatible with Excel  
Operator Training, Testing and Certification  
Dual Monitor Display optional  
Two-Year Warranty on Parts and Labor

**Options**

Additional Flow Ports B & E  
Low Pressure P3 0-2 PSIG, 0-55" H2O (0-13.8 kPa)  
Bar Code Reader  
Label Printer and Bar Code Software Output  
Printer  
Enhanced Report Software (8.5 x 11" or A4)  
Wireless Network Option  
Dew point Meter w/Warning  
Data Conversion  
Low Pressure Warning  
Lockout Box  
Side Table (Left or Right)  
Statistical Software (with additional monitor)  
Networked Results Server  
LED Display on ergonomic mounts  
External Verification Master Nozzles  
Air Dryer Systems available as an option  
300 Gal. Accumulator tanks sold in pairs as an option  
Lifetime annual calibration packages available

**Flow Capabilities**

0.000119 to 0.154153 Pounds per Second, 0.000054 to 0.069922 kg/s (Greater range with XH Series)  
0.000189 to 0.244840 Flow Parameter  $W \cdot \sqrt{T} / \text{Pa}$   
Sonic Nozzle P1/P2 pressures are monitored during testing and provide a real time "Not-Sonic" message if the nozzle is not in a "choked" state.

## FACILITY REQUIREMENTS

Electrical Power and Air	100-250 VAC Single Phase, 50-60 Hz, 5A Service Pressurized air at 100 psig, dry to 0° F Dew Point		
Pressure Range	0.5 to 50 PSIG – Standard 0-50 Inches Water Gauge – Optional		
Temperature Ranges	T1 Upstream Temperature	46-120°F	(8- 49 °C)
	T3 Part Downstream Temperature	46-120°F	(8- 49 °C)
Internal Gauges-Specification	P1 Upstream Pressure	0-100 PSIG (0-690 kPa)	0.10% FS
	P2 Downstream Pressure	0-100 PSIG (0-690 kPa)	0.25% FS
	P3 Part Pressure	0-50 PSIG (0-345 kPa)	0.10% FS
	P4 Probe Pressure	0-30 PSIG (0-207 kPa)	0.10% FS*
	PB Barometric Pressure	26-32"HgA	0.10% FS
	T1 Upstream Temp	46-120°F (8- 49 °C)	+/- 1Deg F
	T1 Downstream Temp	46-120°F (8- 49 °C)	+/- 1 Deg F

\*Probe pressure is optional

## SOFTWARE

CCDI Airflow Test Stands have basic operation screens and a calibration screen.

Test Screen - Users operate the machine from this screen.

Setup Screen - Contains the machine configuration and calibration data.

Diagnostic Screen - Displays state of valves and nozzles used.

**CCDI Mass Airflow Test Screen**  
Select Edit Setup Diagnostics Quit Help About Print Screen Version 6.55G

Part ID: <NEW> Find Cust: Op/Date: DRB/15Mar07  
Circuit: <NEW> Assy: Order:  
Stage: Serial: Track #:  
Apply Recall Old Test

Circuit	S1	S2	R1	R2	R3	S
<NEW>	0.00	0.00	0.000	0.000	0.000	0.000
<NEW>	0.00	0.00	0.000	0.000	0.000	0.000

P1: 0.00 P3: 0.00  
P4: 0.00 PB: 0.00  
T1: 0.0 T3: 0.0

Equation: 0 R1max: 0.0000000  
Scale: 0=Norm 0 R1min: 0.0000000  
1=Water Gauge 0 R2max: 0.0000000  
Std Baro: 0.00 R2min: 0.0000000  
Std Temp: 0.00 R3max: 0.0000000  
Set 1: 0.00000 R3min: 0.0000000  
Set 2: 0.00000 R-typical: 0.0000000  
Apply Detail -F3

Filename: testrec.dat Apply ☒ PID Rst -1.0 -0.1 -0.01 -0.001 +0.001 +0.01 +0.1 +1.0 Tm DC DC 0.000

Message: Clear

XXX	ID BOX	TST BOX	TST (A)	TST (B)	ACCEPT	PRINT	TST (C)	TST (D)	TST (E)	SAVE	RSLT BX
F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12

Status: Check T3 - Low Readings

Test Screen

**Menu Bar** - Allows navigation to other screens, selection of part test programs, finding information.

**Identification Box** - In the upper left corner box, fill in details associated with the airflow test that gets recorded and printed. This information is also kept with files that can be transmitted to a network.

**Test/Log Box** - CCDI machines can have up to 64 test sequences (or increased as needed) for a single part. The first box (short) is the real time results box that shows the test data in operation. The second box (long) is the log of the test results. Some software versions have three result boxes for parts that use "Exit Flow" measurements. The log provides a summary of test data.

**Gauge Displays** - Gauge measurement readings. They are automatically converted to units that match the parts being measured.

**Test Parameters Box** - Right corner box allows the test parameters and limits to be entered. Selecting "Detail", which will open the detail box, you can enter even more information.

**Filename** - This allows selection of a filename for the test data. The filename can be stored in the part "profile" - A file recipe in the hard drive for the next time you test.

**PID Control Box** - Displays activity of the pressurization controller and allows user to adjust values.

**Message and Status Boxes** - Messages from the system and operator instructions can be posted here.

**Function Key Menu** - Our test screen can be operated by mouse or function key.

**Flow Test Details & Special Commands**

☐ Enable PID Multiplier:

Accept Band:  %

☐ Auto Timer:  Seconds

☐ Auto Step (at finish) to Next Circuit

☐ Keep air flowing for next flow test

☐ Startup Pressure Delay:  Seconds

☐ Manual Nozzles: Noz #'s:

☐ Require Serial Number

Force Flow Port: \*

User Instructions:

Test Data in [8.3] Filename:

Profile name: test.tst

**Master Part Limits**

R1 Max:  R2 Max:  R3 Max:

R1 Min:  R2 Min:  R3 Min:

☐ Perform Master Checking ☐ Disable testing on fail

Circuit No: 01

**Detail Box**

From this screen, you can adjust percent error allowed on set points and the "Auto Timer" to shut off the air for a certain period of time. This will end the test after the pressure is consistent for the selected time interval.

Auto-step allows the next flow sequence to proceed automatically. The Startup Delay makes time at the beginning of the test to stabilize.

Manual Nozzle allows the user to select the nozzles. The system defaults to set point and flow limit information. The Master Parts Limits section is to be completed by the user as well.

The PID Control (Pressurization) can be finely tuned for the most demanding production lines. Note: Fixtures/Tooling varies in volume. These parameters are adjustable to achieve the best response

### **Flow Testing Features**

- CCDI Airflow machines were the first machines on the market with automatic sequencing.
- If you test a part in various manufacturing stages, the old data can be recalled at a later time to fill-in the blanks.
- Automatic or Manual, Single or Dual Nozzle Selection Available
- Two-stage cancel button can temporarily stop a test and restart; a second cancel can discard the results to start over.
- Beginning of a test can be paused for a specified number of seconds.
- Test results record all gauges and K values making analysis simple for auditing.
- In a Flow Restriction Test, the PID control can be turned off in order to monitor for flow restriction cause by external tooling.
- The program has leak tests that check for internal and external leaks at various stages
  - Our leak testing sequences can be automated
  - Volume based leak tests allow for fixed volume entry in testing parameters.
- The Diagnostic screen is great tool for technicians and makes understanding of the equipment easy for maintenance

**Setup Screen - CCDI Mass Airflow**

Utilities Save Setup Return to Test Screen Print Screen Change Password

Sonic Nozzle K Form		System Configuration		Machine SN: 644-01-1234		Sensor/Transducer Calib.	
Nozzle 1	Dia: 0.021	Max. Shop Press:	85.00	Leak Test Delay:	08	P1 Sensor	Read
PSIA	K	Accept Band %:	0.30	Nozzle Count:	09	PSIG	% F.S.
41.009	0.000187164	Xducer Input/Range:	10+100	System Series:	622	0.00	0.000 C
42.990	0.000187296	Acquisition Device:	5141	Display COM:	1	10.00	27.500 C
44.974	0.000187572	PID Reset Time:	10	Acquis. COM:	2	20.00	35.410 C
50.000	0.000187926	Dual Nozzle Selection:	<input checked="" type="checkbox"/>	High Speed 232:	<input type="checkbox"/>	30.00	43.340 C
55.004	0.000188645	Disable PID Control:	<input type="checkbox"/>	Master Checking:	<input type="checkbox"/>	40.00	51.280 C
60.005	0.000188912	Invert Digital Outputs:	<input type="checkbox"/>	PID 2level Disable:	<input type="checkbox"/>	50.00	59.200 C
64.980	0.000189519	Audit Flow Test:	<input type="checkbox"/>	P3 Low Option:	<input type="checkbox"/>	60.00	67.120 C
74.991	0.000190227	Blank Serial on Save:	<input type="checkbox"/>	Don't forget to Save:	<input type="checkbox"/>	70.00	75.070 C
84.993	0.000190812	Separate DATA Folder:	<input checked="" type="checkbox"/>	Already Mastered:	<input type="checkbox"/>	85.00	86.940 C
89.998	0.000191529	Record Starting Voltage:	<input type="checkbox"/>	Part Recall Reset:	<input type="checkbox"/>	100.00	98.810 C
Date:	12-Sep-06	Printout Title:				Date:	11-Dec-06
Calib. By:		Printout 2nd:	CCDI Mass Airflow Stand - SN: 644-34-1920			Cal. By:	cls
Sonic Ratio:	1.50					S/N:	1095159
S/N:	644-27-021					Prev	Next
Prev	Next	Apply				Apply	

Pressurization PID Control	
PID Control for:	P3 - Nozzle 1
Prop. Gain:	0.250
Int. Gain:	0.100
Der. Gain:	0.010
Samp. Rate:	0.500
Next	Apply

Setup Errors / Notes / Warnings

**Setup Screen:** Contains nozzle calibration, transducer calibration, system configuration data, and built-in pressurization tuning information.

**Diagnostic Screen - CCDI Mass Airflow**

Utilities Emerg. Vent Reset I/O Return to Test Screen Print Screen

Digital Output		Diagnostic Leaktest	
<input type="checkbox"/> System Air Off - 1	622/620 Digital Output Control	Actuate on Start:	
<input type="checkbox"/> #6 Nozzle Flow - 4	<input type="checkbox"/> Rt. Lower Flow Port A - 11	Pressurize and Deactuate:	
<input type="checkbox"/> #5 Nozzle Flow - 5	<input type="checkbox"/> Lt. Lower Flow Port C - 12	Pressure (PSIG):	
<input type="checkbox"/> #4 Nozzle Flow - 6	<input type="checkbox"/> Rt. Upper Flow Port B - 13	Time to test:	
<input type="checkbox"/> #3 Nozzle Flow - 7	<input type="checkbox"/> Lt. Upper Flow Port D - 14	Start	Stop
<input type="checkbox"/> #2 Nozzle Flow - 8		Test Info:	
<input type="checkbox"/> #1 Nozzle Flow - 9			
<input type="checkbox"/> Engage P3 Low - 18			
<input type="checkbox"/> Vent Transducers - 19			
Foot Pedal:	Up		

Analog In - Scaled Units		E/P Control (Electric / Pressure)	
Upstream Pressure P1:	0.000	Absolute Pressure PB:	0.000
Downstream Pressure P2:	0.000	Flow Sensor % F1:	0.0000
Part Pressure P3:	0.000	Upstream Temp. T1:	0.000
Probe/Exit Pressure P4:	0.000	Part Temperature T3:	0.000
		Up/down Voltage Step Size:	1.0
			1.0 0.1 0.01 0.001
		Enter Value: 0-10.000 VDC	
		Up	Down
		Apply	

Analog I/O Communications Data Buffers: Out: #3 In: \$AD0FFFFFFF

### Diagnostic Screen

From the Diagnostic Screen, you can operate the valves, take pressure measurements, check data-communications, and control output pressure. Very useful for troubleshooting.

## DRAWINGS

