

Model 611

Mass Airflow Machine Test Stand

Dimensions: 33" H x 24" W x 36" D

838mm H x 610mm W x 559mm D

## GAS TURBINE AND JET ENGINE COMPONENT TESTING

## **Mass Airflow Capacity**

#### 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.

#### **EFFICIENT TESTING SOLUTION**

The Model 611 is a system designed to test the mass airflow capacity of one or two turbine engine components. The portable automatic test stand is one of the few machines to measure multiple components simultaneously, thus improving the efficiency of part testing.

## **FEATURES**

- Mass Flow Measurement Accurate to +/- .50%
- Mass Flow Measurement Repeatable to +/- 0.25%
- Ideal for Production Cells and Special Applications
- Configurations Available: 611, 611XH

#### SYSTEM SPECIFICATIONS

NIST Traceable Air flow Measurement, can also be used for EFA (inches H<sub>2</sub>O option)

15 to 30 Seconds per Part Test, Fast response

Manual Flow Valve Operation (Automatic Pressurization optional)

Flow Range Determined by Nozzle Size

Interchangeable Flow Nozzles (choice of 11)

Single/Dual Sonic Flow Nozzles (1 or 2)

Low Pressure Option: 0-2 PSIG (0-14 kPa), 0-50"H<sub>2</sub>O or High Pressure Testing: 0-50 PSIG (0-345 kPa)

English and SI Units IBM Pentium Computer

MS Windows Based Part Test Software

Cincinnati Control Dynamics, Inc 4924 Para Drive, Cincinnati, OH 45237 Ph: (513) 242-7300 Fax: (513) 242-5691 http://airflowmachines.com QC Report, Label and Data Acquisition File
Operator Training, Testing, Certification
Two-Year Warranty on Parts and Labor
Can also flow small Effective Flow Areas measurements (using Low Press. Option)
High Range Model Available for 0.353-0.707" (0.9-1.8 cm) dia. Sonic Nozzles

#### **Flow Capabilities**

0.000119 to 0.102682 Pounds per Second (0.000054 to 0.046575 kg/s), varies with nozzles purchased 0.000189 to 0.163089 Flow Parameter

## Airflow Flow Test Stand Flow Ranges (see nozzle sizes)

NOZZLE	Min Flow	Max Flow	Min	Max	Min	Max	Min	Max
DIA.IN.	lbs/sec	lbs/sec	FP	FP	EFA	EFA	EFA	EFA
					@5"H2O	@5"H2O	@10"H2O	@10"H2O
0.015	0.00014	0.00041	0.000222	0.000643	0.0018	0.0052	0.0013	0.0037
0.021	0.0003	0.0008	0.000437	0.001260	0.0035	0.0102	0.0025	0.0072
0.025	0.0004	0.0011	0.000619	0.001785	0.0050	0.0145	0.0036	0.0102
0.031	0.0006	0.0017	0.000951	0.002745	0.0077	0.0223	0.0055	0.0157
.021+.031	0.0009	0.0025	0.001388	0.004004	0.0113	0.0325	0.0080	0.0230
.025+.031	0.0010	0.0029	0.001571	0.004530	0.0127	0.0367	0.0090	0.0260
0.044	0.0012	0.0035	0.001917	0.005530	0.0155	0.0448	0.0110	0.0317
.021+.044	0.0015	0.0043	0.002354	0.006790	0.0191	0.0551	0.0135	0.0389
.025+.044	0.0016	0.0046	0.002537	0.007316	0.0206	0.0593	0.0146	0.0420
.031+.044	0.0018	0.0052	0.002868	0.008275	0.0233	0.0671	0.0165	0.0475
0.062	0.0024	0.0069	0.003807	0.010980	0.0309	0.0890	0.0218	0.0630
.062+.031	0.0030	0.0086	0.004759	0.013726	0.0386	0.1113	0.0273	0.0787
.062+.044	0.0036	0.0104	0.005724	0.016510	0.0464	0.1339	0.0328	0.0947
0.088	0.005	0.014	0.007668	0.022120	0.0622	0.1794	0.0440	0.1269
.088+.044	0.0060	0.0174	0.009585	0.027651	0.0777	0.2242	0.0550	0.1586
.088+.062	0.0072	0.0208	0.011475	0.033102	0.0931	0.2684	0.0658	0.1899
0.125	0.010	0.028	0.015473	0.044633	0.1255	0.3619	0.0888	0.2560
.125+.062	0.013	0.037	0.020232	0.058359	0.1641	0.4732	0.1161	0.3348
.125+.088	0.015	0.042	0.023141	0.066754	0.1876	0.5413	0.1327	0.3829
0.177	0.02	0.06	0.031024	0.089491	0.2516	0.7257	0.1780	0.5133
.177+.088	0.026	0.074	0.040609	0.117143	0.3293	0.9499	0.2329	0.6720
.177+.125	0.029	0.084	0.046497	0.134125	0.3770	1.0876	0.2667	0.7694
0.250	0.04	0.11	0.061891	0.178532	0.5019	1.4477	0.3550	1.0241
.250+.125	0.052	0.149	0.082123	0.236891	0.6659	1.9209	0.4711	1.3589
.250+.177	0.059	0.169	0.092915	0.268023	0.7534	2.1733	0.5330	1.5374

Notes: FP = Flow Parameter | lbs/sec \* Sqrt(Temperature) / Room Pressure

EFA = Square Inch Area Measurement - Requires Inches of water gauge option

# **FACILITY REQUIREMENTS**

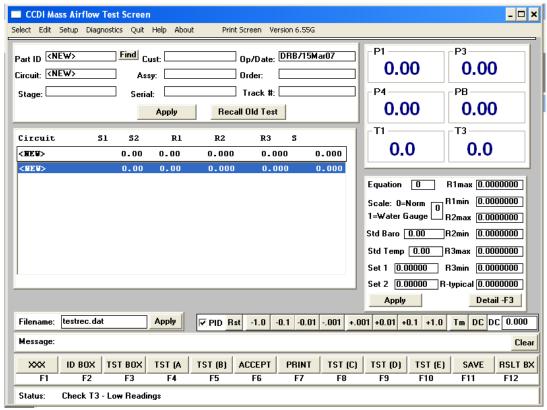
Electrical Power and Air	100-250 VAC Single Phase, 50-60 Hz, 5A Service Pressurized air at 100 psig, dry to 0° F Dew Point				
Pressure Range	0.5 to 50 PSIG – Standard 0-50 Inches Water Gauge – Optional				
Temperature Ranges	T1 Upstream Temperature 46-120°F (8- 49 °C)				
	T3 Part Downstream Temperature 46-120°F (8- 49 °C)				
Transducer Pressure Ranges	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)	+/- 1DegF		
	T3 Downstream Temp	46-120°F (8- 49 °C)	+/- 1 DegF		

## **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.



**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 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.

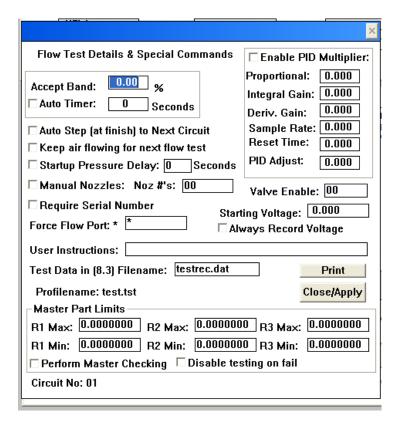
**Test Parameters Box** - Right corner box allows the test parameters and limits to be entered. More information can be entered by selecting "Detail," which will prompt the detail box.

**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.



**Detail Box** 

From this screen, you can adjust percent error allowed on setpoints 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.

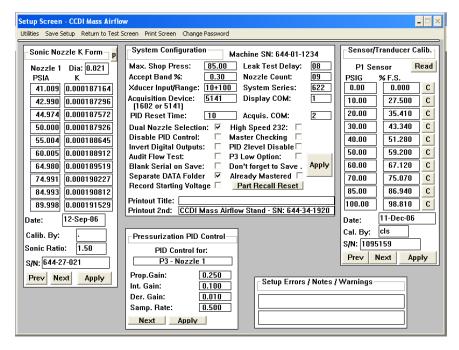
Auto-step allows the next flow sequence to proceed automatically. The Startup Delay makes time at the beginning of the test to stabilize.

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

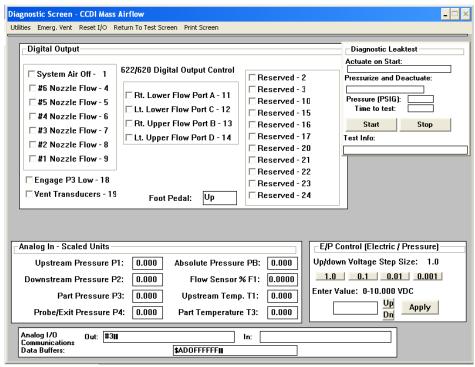
The PID Control (Pressurization) can be finely tuned for the most demanding production lines. Note: Fixtures/Tooling varies in volume. These parameters are adjustable to achieve the best response

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



**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.