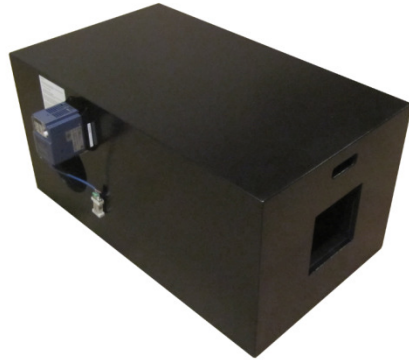


# MAE111 Wind Generator User Manual

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The MAE111 Wind Generator is designed for acoustic wind noise testing, typically with microphones and audio processing algorithms. One of the important factors for wind noise testing is that the acoustic noise floor is much less than the wind noise generated by the system being tested. Typical home fans are not appropriate to use for such testing because the noise generated by the fan blades are typically loud and very tonal in nature. These acoustic tones can dominate the noise spectrum and give misleading wind noise results. An industrial blower eliminates the tonal noise problem by having a broad band acoustic noise spectrum, but they are sufficiently loud to compete with the wind noise, especially at the lower wind speeds.

The MAE111 addresses these noise problems by enclosing an industrial blower in a large, vibration treated silencer. The blower is vibration isolated from the silencer, and the silencer is treated with vibration damping material. The result is a design that optimizes the reduction of acoustic and vibration born noise with an enclosure that's as small as possible.

The MAE111 uses a Fuji digital motor controller to allow for a continuously adjustable wind speed from 0 to 25 MPH. The digital control allows for test conditions to be fully repeatable. The drive has an RS232 connector that allows for remote control from a PC.

## **Using the MAE111**

To use the MAE111 Wind Generator, first verify the power requirements of the unit and plug it into the appropriate 110V or 220V power outlet. Then turn the power switch on to provide power to the Fuji digital frequency drive controller.

The Fuji digital controller adjusts the motor speed by varying the drive frequency. The drive frequency can be set by turning the controller's potentiometer or by setting it through remote RS232 commands. The program "MAE Wind Generator Controller.exe" can be used for performing remote control operations.

### **Local Control**

When the controller is in local control, pressing the RUN button will cause the motor to start. Turning the potentiometer will adjust the drive frequency which will control the fan speed. Pressing STOP will cause the motor to stop. The digital drive frequency display allows for accurate and repeatable test conditions.

If the controller is not responding to local controls, the controller may be in Remote Control mode. If this is the case, register H30 must be set to 0 (see below for how to do this). If that doesn't work, it may be that some of the registers have been changed. See the default register settings sections.

### **Remote Control**

The Fuji digital drive allows for the blower speed to be set using remote RS232 commands. The program "MAE Wind Generator Controller.exe" can be used to perform this function. Writing your own code to perform the remote operation is not a trivial exercise. See the online manuals for the "Fuji FRENIC-Mini" user's manual or instruction manual for details.

### **Manually setting H30 for Local Control**

The Fuji controller's behavior is set through numerous registers. These are designated by a letter followed by a number such as "E10", "Y01", etc. Register H30 controls whether the drive controller is in local or remote control state. An H30 value of 0 is for local control, and an H30 value of 1 is for remote control. If you want to turn the motor on/off using the RUN/STOP buttons or set the drive frequency using the potentiometer, the device must be in local control mode. If the drive controller is not responding to these commands, you may need to place it in local control mode. This can be done using the "MAE Wind Generator Controller.exe" program, or the H30 register can be set manually using the drive controller's control panel.

To set the H30 register, press the PRG button so the register letters appear, such as 1.E, 1.F, etc. Use the up and down arrows to advance the register letter to 1.H. Press the FUNC button so an H register

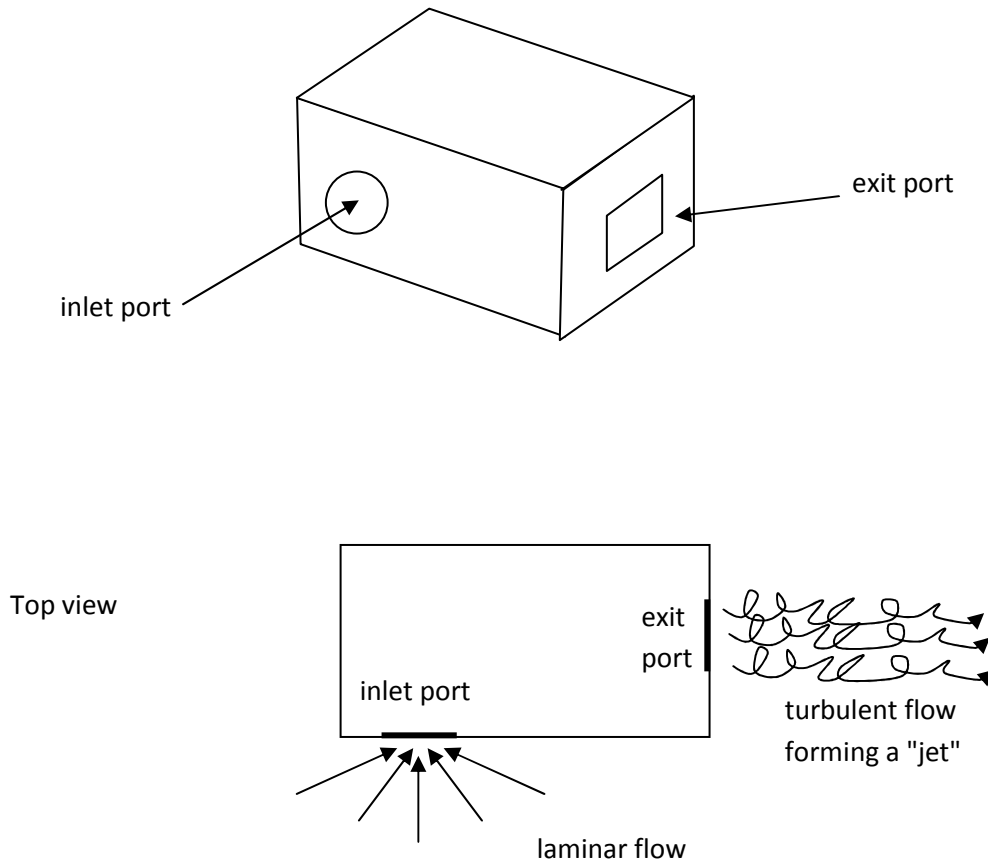
number appears such as "H 01". Use the up/down buttons to advance the register number to 30. The display should read "H 30". Press the FUNC button to advance to the H30 register value. Use the up/down arrows to set the value to 0. Press the FUNC button to save the value. Press the PRG button to toggle to the manual frequency drive mode where it responds to the RUN/STOP buttons and potentiometer.

## Fuji Manuals

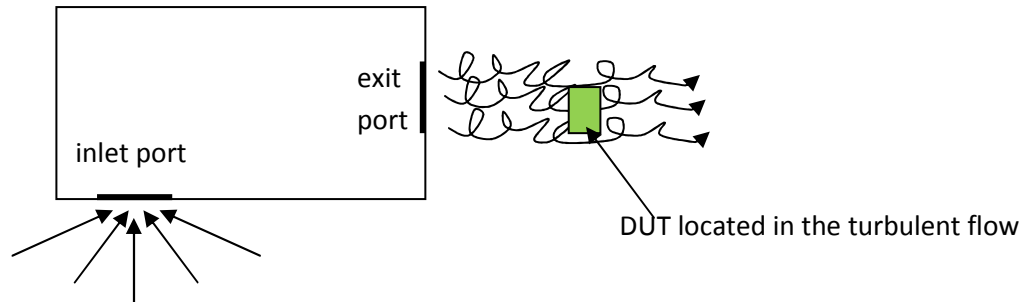
The Fuji digital drive controller's manuals are available online. See the online manuals for the "Fuji FRENIC-Mini" user's manual or instruction manual. The model used with the MAE111 is the Fuji Model # FRNF50C1S-6U.

## Turbulent Flow Testing

In general, when air is "sucked" into a port, the air flow into the port is laminar. However, when air is blown out of a port, it is usually turbulent. This is the case for the MAE111 Wind Generator. The inlet and exit ports and the laminar and turbulent flows for the MAE111 are sketched below.



The MAE111 is designed for testing in turbulent flow, so a DUT (Device Under Test) should be placed in the turbulent flow.



While the MAE111's exit port is relatively large (7"x7"), there will be air flow speed variations across that area, especially close to the enclosure. For best and repeatable results, find a location 9 to 12 inches away from the exit and measure the air flow velocity with a wind speed meter. For performing the wind speed measurements, a hot wire anemometer such as the Extech 407123 is recommended, but a device such as a Kestrel 3000 would work as well.

From this data, build a table of Drive Frequency vs. Wind Speed MPH. This table can then be used to set the wind speed. This table can be directly entered into the "MAE Wind Generator Controller.exe" program which will use the table to extrapolate the best drive frequency to achieve the MPH entered into the program.

### **Turbulent vs. Laminar Flow**

In general, testing in turbulent flow will result in more wind noise than testing in laminar flow at the same wind speeds. However, it is much more difficult to build a wind generator for laminar flow testing because laminar flow will only exist for a relatively short distance inside of an intake tube. To avoid a significant increase in the local velocity around the DUT, the diameter of the intake tube will need to be several times the largest dimension of the DUT. For a 12" tablet, this would result in an intake port of 3 feet or more. For most audio testing labs, this size of intake port would be impractical.

For this reason, turbulent flow is a more practical choice. However, not all turbulent flow has the same physical characteristics even if the air flow has the same velocity. For this reason, to have good correlation between wind noise measurements, an identical wind generator will need to be used.

## Specifications

Dimensions: 36" long, 21" wide, and 18" high

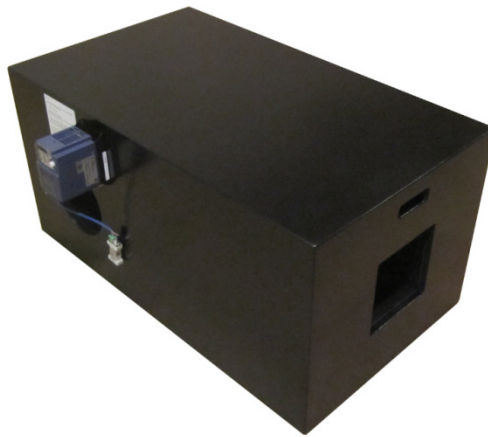
Weight: approximately 110 pounds.

Wind speed: 0 - 25 MPH fully

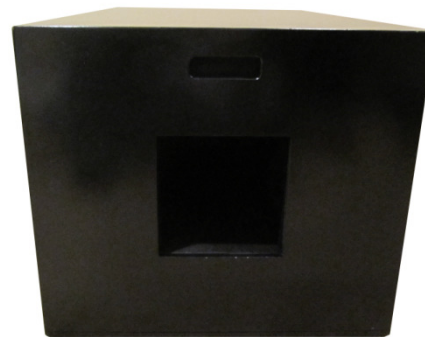
Exit size: 7"x7"

Entry size: 7" round

Two recessed handles at either end of the enclosure.



inlet and digital controller



exit port

## MAE Fuji FRNF50C1S-6U Factory Register Values

The table below gives the default register values for the Fuji digital controller as shipped from MAE. If the controller is not behaving properly, check to make sure that the values have not been changed.

|     |      |     |      |     |        |     |      |
|-----|------|-----|------|-----|--------|-----|------|
| c1  | 2.2  | p2  | 0.4  | h3  | 0      | f0  | 0    |
| c2  | 0    | p3  | 2.13 | h4  | 0      | f1  | 4    |
| c3  | 0    | p9  | 0    | h5  | 5      | f2  | 2    |
| c4  | 4    | p14 | 0    | h6  | 0      | f3  | 60   |
| c5  | 60   | p99 | 0    | h7  | 1      | f4  | 60   |
| c6  | 70   |     |      | h12 | 1      | f5  | 0    |
| c7  | 60   | j1  | 0    | h26 | 0      | f7  | 1    |
| c8  | 0    | j2  | 0    | h27 | 1.6    | f8  | 0.3  |
| c9  | 0    | j3  | 0.1  | h30 | 0      | f9  | 6    |
| c10 | 0    | j4  | 0    | h42 | 1302   | f10 | 1    |
| c11 | 0    | j5  | 0    | h43 | 0      | f11 | 2.13 |
| c20 | 0    | j6  | 0.5  | h50 | 0      | f12 | 5    |
| c21 | 0    |     |      | h51 | 0      | f14 | 1    |
| c30 | 4    | y1  | 1    | h54 | 6      | f15 | 80   |
| c32 | 100  | y2  | 0    | h64 | 2      | f16 | 0    |
| c33 | 0.05 | y3  | 2    | h69 | 0      | f18 | 0    |
| c34 | 100  | y4  | 2    | h70 | 999    | f20 | 0    |
| c37 | 100  | y5  | 0    | h71 | 1      | f21 | 0    |
| c38 | 0.05 | y6  | 0    | h80 | 0.2    | f22 | 0    |
| c39 | 100  | y7  | 1    | h89 | ?????? | f23 | 1    |
| c50 | 0    | y8  | 0    | h95 | 0      | f25 | 0.2  |
| c51 | 0    | y9  | 0.5  | h96 | 0      | f26 | 15   |
| c52 | 0    | y10 | 0    | h97 | 0      | f27 | 0    |
|     |      | y99 | 0    | h98 | 3      | f30 | 100  |
| c1  | 2.2  |     |      |     |        | f31 | 0    |
| c2  | 0    | p2  | 0.4  |     |        | f37 | 1    |
| c3  | 0    | p3  | 2.13 |     |        | f43 | 0    |
| c4  | 3    | p9  | 0    |     |        | f44 | 200  |
| c5  | 60   | p14 | 0    |     |        | f50 | 999  |
| c6  | 70   | p99 | 0    |     |        | f51 | 0    |
| c7  | 60   |     |      |     |        |     |      |
| c8  | 0    | e1  | 0    |     |        |     |      |
| c9  | 0    | e2  | 7    |     |        |     |      |
| c10 | 0    | e3  | 8    |     |        |     |      |
| c11 | 0    | e10 | 6    |     |        |     |      |
| c20 | 0    | e11 | 6    |     |        |     |      |
| c21 | 0    | e20 | 0    |     |        |     |      |
| c30 | 4    | e27 | 1099 |     |        |     |      |

|     |      |     |      |
|-----|------|-----|------|
| c32 | 100  | e31 | 60   |
| c33 | 0.05 | e34 | 2.13 |
| c34 | 100  | e35 | 10   |
| c37 | 100  | e39 | 0    |
| c38 | 0.05 | e40 | 100  |
| c39 | 100  | e41 | 0    |
| c50 | 0    | e43 | 0    |
| c51 | 0    | e45 | 0    |
| c52 | 0    | e46 | 0    |
|     |      | e47 | 5    |
|     |      | e48 | 0    |
|     |      | e50 | 30   |
|     |      | e52 | 0    |
|     |      | e60 | 0    |
|     |      | e61 | 0    |
|     |      | e62 | 0    |
|     |      | e98 | 98   |
|     |      | e99 | 99   |