

DFM14E Series

Installation Instructions

DFM14E

System Requirements:
Win 95b/98/Me/2000/XP
Resolution: 1024 x 768
32MB RAM

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Read Before Installation

DFME Amplifier MUST be powered from it's own separate 24 VAC 40 VA transformer.

Proper DFME operation can only be achieved by completing a full setup routine before operation.

Before installing Temperature Controller and Software, read the entire installation instruction manual to ensure proper and successful operation.

DFME Product Description

Temperature Controller for use with Recirculating Direct Gas-Fired Modulating Air Heaters in accordance with applicable specifications of ANSI Z83.18.

DFM14E System Requirements

- ADFM14E Amplifier (Ambient Operating Temperatures: -40°F (-40°C) to 158°F (70°C))
- TDDFM14 Selector (40°F - 150°F)
- TS394-2B-4 Return Air Sensor
- TS394-2B-4 Outdoor Air Sensor
- TS194Q Discharge Air Sensor
- MT Series Mixing Tube
- M/MR212 Series Modulating Gas Valve
- Software CD-ROM
- Signal from Airflow Measuring Device or Outside Air Damper (not supplied)
- Laptop or PC with Windows 95b/98/Me/2000/XP (32 MB RAM minimum) (not supplied)
- Patch Cable w/ RJ45 connectors (both ends) (not supplied)
- Serial Cable (DB9M to DB9F) (not supplied)
- Separate 24 VAC 40 VA Power Supply (not supplied)

Accessories

- Airflow Measuring Device (available)
Note: Auto-Calibrate feature requires Airflow Measuring Device with 0-10 VDC output.

Features

- Low Fire Start Timer (standard on all versions)
- Mild Weather Thermostat (version 2.2)
 - 1-24 VDC N.O. Relay (1 W max) required (not supplied)
- Freeze Thermostat (version 2.3)
 - 1-24 VDC N.O. Relay (1 W max) required (not supplied)
- Mild Weather and Freeze Thermostats (version 2.4)
 - 2-24 VDC N.O. Relays (1 W max) required (not supplied)

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Step1: Hardware Installation Instructions

After each component has been located and mounted, set dipswitches and make wire connections according to **Diagrams 1 and 2**.

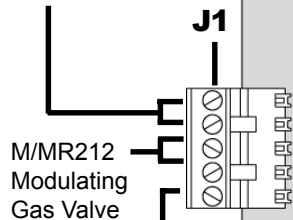
ADFM14E Connections

Diagram 1

Items Needed

- 3/16" Drill Bit
- Mounting Template (included)

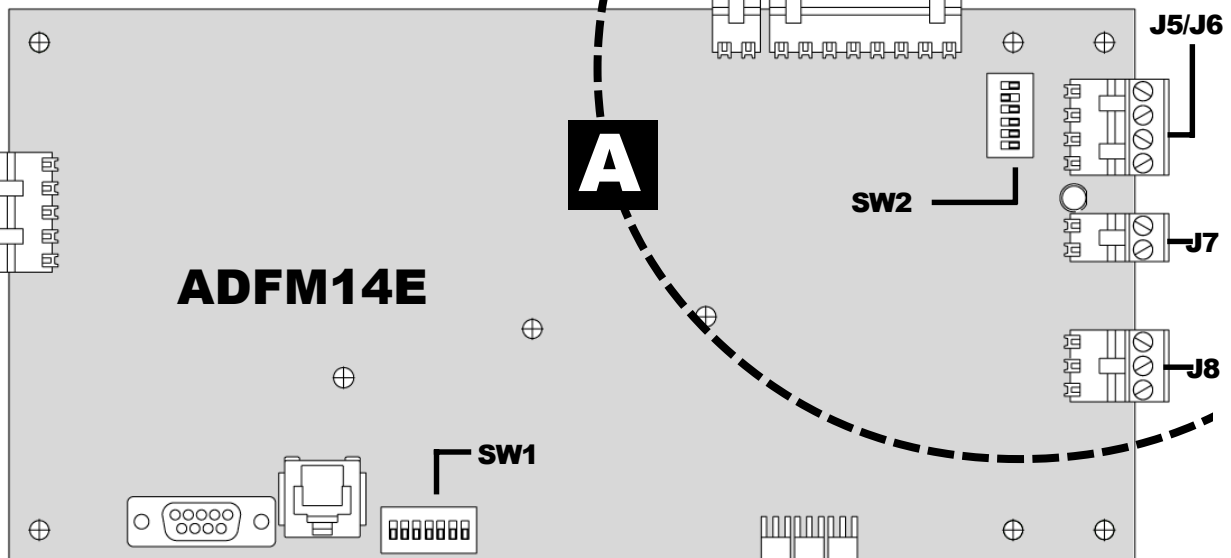
Separate Power Supply
24 VAC 40 VA
(See Note 1)



On Board
24 VDC Relay
Power Output
(See Note 3)

Serial Cable
Connection
to PC/Laptop
(12 ft maximum)

Patch Cable w/ RJ45
connection (both ends) to
TDDFM14 Selectrastat
(160 ft maximum)



SW1 #4 Timing

SW1 #4	Timing
ON	Timing begins when 24 VAC is present at J1.
OFF	Timing begins when 24 VAC is present at J7 and J1.

Note 1:

- Maxitrol ADFM14E amplifiers have full wave rectifiers (diodes). DO NOT connect any other external devices requiring 24 VAC to the same transformer powering the ADFM14E amplifier (J1) doing so will destroy the ADFM14E amplifier and void the warranty.
- 24 VAC supply power (J1) with customer supplied relay (1 W max) may be used as input (J7) to begin Low Fire Start Timer.

3

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Note Polarity

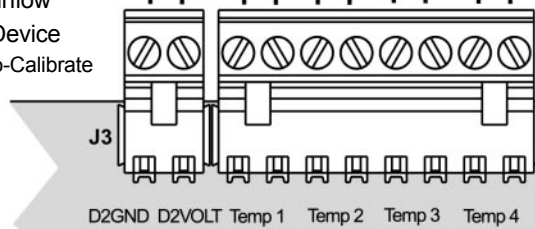
View A

A

0-10 VDC Airflow Measuring Device (used for Auto-Calibrate only)

Temperature Sensors

- 1
- 2
- 3
- 4



Damper Position Feedback or Continuous Airflow Measuring Device

Note Polarity

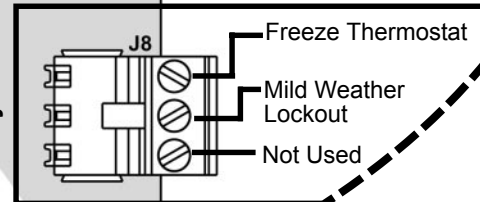
External Matching Resistor (see Note 2)

24 VAC Input to Low Fire Start Timer (see Note 1 & SW1)

- 1 = Not Used
- 2 = Return Air Temperature
- 3 = Outside Air Temperature
- 4 = Discharge Air Temperature

ADFM14E

Relay Drive



Switch SW2 is set as in chart for the Damper or Continuous Airflow Measuring Device feedback being used.

Note 3:
Max. Coil Power = 1 W.
The Relay drive (J8) is at ground (24 VDC) when Mild Weather Lockout Mode is inactive.

When properly connected, the resistance or voltage measured across the feedback connection (J5) should increase as the outside air damper opens. Similarly, the resistance or voltage should decrease as the outside air damper closes.

Signal	SW2
0 to 5V	#5, #6 ON
0 to 10V	#5 ON
4 to 20 mA	#4, #5 ON
135 ohm POT	#1 ON
500 ohm POT	#2 ON
10 K ohm POT	#3 ON
POT with EXT R	ALL OFF

Note 2:
If a damper feedback POT not having a value of 135, 500 or 10 K is used, an External Resistor equal to the POT value must be connected to the AMPLIFIER (J6). Diagram 1, View A. **ALL of SW2 should be OFF.**

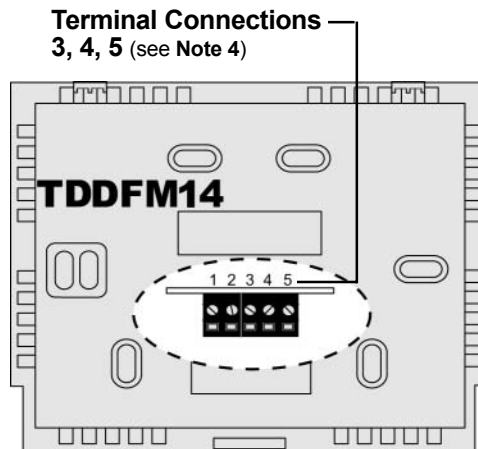
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Diagram 2



Note 4:

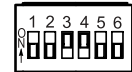
Terminal Connections for TDDFM14 SPDT ON-OFF-ON Switch 1A/24 V Max

3: Switch #1

4: Common

5: Switch #2

ADFM14E



SW1

Step 2: Installing Software

- 2.1 Insert DFME CD into CD-ROM drive. Note: CD will AUTO RUN.
- 2.2 Select the Console Programs to be installed.
- 2.3 After successful installation(s), select **Exit**.
If a "Version Conflict" message box appears during setup, select "NO TO ALL."



Setup Console
(Page 7)

Version

Step 3: Setup Console

- 3.1 Power ADFM14E Controller Board.
- 3.2 Select PC **Start... Programs... Maxitrol DFME... Maxitrol DFME Setup Console** to open program.
- 3.3 Select **ADFM14E... Begin Setup... Continue** and...

IMPORTANT: Wait for the data upload to be completed. "Data Upload Complete" will be indicated in the status bar along the bottom of the Setup Console window. If the status bar does not read "Data Upload Complete," select Upload/Reset and wait for upload to complete. (It may take several seconds for upload to begin.)

- 3.4a Select and change parameters (ie. Temp Mode, Gas Type, Mild Weather Lockout, etc...) as needed.
or
- 3.4b Select **Load Data from File**. Go to Step 4.
- 3.5 Select **Damper Setup**. Choose control type **A, B, C, D** or **E** and follow instructions.
- 3.6 Select **Setup Console**.
- 3.7 Select **Save Data to File** (if desired).
- 3.8 Select **Update Amplifier**. Amplifier **MUST** be updated for changes to take effect. Wait for status bar to indicate "Data Download Complete."
- 3.9 Select one of the following:
 - i. **Control Mode** to begin the amplifier control sequence,
 - ii. **Control Console** to monitor system (closes "Setup Console" and opens Control Console, 5.3)
 - iii. **Exit** to exit program and automatically begin the amplifier control sequence.
- 3.10 **IMPORTANT:** Disconnect the serial cable when prompted.
- 3.11 Go to **Step 5: Control Console**.

Step 4: Load Data from File

- 4.1 Select **Load Data from File**.
- 4.2 Select **Open Program**. Status bar indicates "File Load Complete."
- 4.3 Select **Update Amplifier**.
- 4.4 Return to Step 3.9.

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Setup Console

from Page 6

Adjust Discharge Air Sensitivity.
 + = Increases Sensitivity.
 - = Decreases Sensitivity.

Set Low Fire Start Timer Delay (max. 30 seconds).

Freeze Thermostat Setup.
 Check box to enable Setup.

If automatic upload of data does not occur successfully, select **Upload/Reset**.

Status Bar.
 Indicates status of data upload.



Select between **Fahrenheit & Celcius** mode.

Select between **Natural Gas and LPG Gas**.

Mild Weather Lockout Setup.
 Check box to enable Setup.

Save Setup Data to File.

Load Setup Data from File.

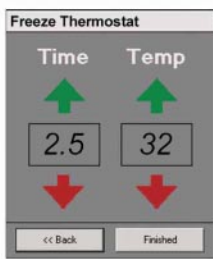
Update Amplifier.
 MUST be selected once changes have been made in order to update the amplifier.

Opens **Damper Setup** menu.

Exit the program. At message prompt unplug the serial cable.

Opens **Control Console**.

Control Mode.
 Begins the amplifier control sequence.



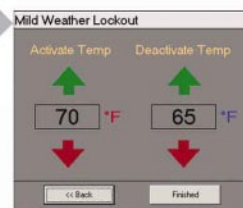
- 1 Set **Time** (0.5 to 5 min).
- 2 Set **Activate Temperature** (30°F to 60°F).
- 3 Select **Finished**.

Note 5:

Freeze Thermostat will remove 24 VDC (1 W max) to the relay (J1, J8 terminal) when the discharge air temperature does not exceed the Freeze Thermostat Set Temperature when measured after the set time. **ONLY AVAILABLE with DFM14 versions 2.3, 2.4 and E2.3, E2.4.**

Damper Setup

A
B
C
D
E
F



- 1 Set **Activate Temperature** (min. 40°F and max. 90°F).
- 2 Set **Deactivate Temperature** (min. 3°F less than Activate).
- 3 Select **Finished**.

Note 6:

Mild Weather Lockout will remove 24 VDC (1 W max) to the relay (J1, J8 terminal) when the outside air temperature reaches the Activate temperature. Relay power is restored when the Deactivate temperature is reached. 3°F min. separates the Activate and Deactivate temperatures. **ONLY AVAILABLE with DFM14 versions 2.2, 2.4 and E2.2, E2.4.**

A

Fixed Damper
(Page 8)

B

2 Position
(Page 8)

C

Continuous Airflow Measurement
(Page 9)

D

Variable Damper Setup
(Page 9)

E

Auto-Calibrate Damper Setup
(Page 10)

7

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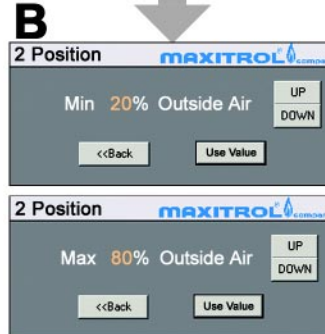
Fixed Damper Setup

2 Position

Requires 2 Place (Min & Max)
Damper Position Feedback



- 1 Set % of fixed outside air
- 2 Select **Use Value**.
- 3 Select **Back**.
- 4 Return to Step (3.6), page 6.



- 1 Set outside air damper to obtain minimum % outside air.
- 2 Set **Minimum % Outside Air**.
- 3 Select **Use Value**.
- 4 Set outside air damper to obtain maximum % of outside air.
- 5 Set **Maximum % Outside Air**.
- 6 Select **Use Value**.
- 7 Select **Back**.
- 8 Return to Step (3.6), page 6.

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Continuous Airflow Measurement

Requires Continuous Linear Airflow Measuring Device (See Note 7)



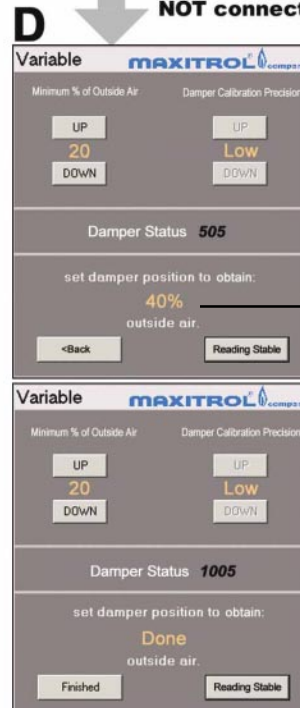
- 1 Set **Minimum Air** (outside).
- 2 Set outside air damper to obtain minimum % outside air.
- 3 Wait for **Airflow #** to stabilize (see **Note 8**).
- 4 Select **Set Minimum**.
- 5 Set outside air damper to obtain 100% outside air.
- 6 Wait for **Airflow #** to stabilize.
- 7 Select **Set Maximum**.
- 8 Select **Back**.
- 9 Return to Step (3.6), page 6.

Note 7: Select an airflow measuring device range (see device manual) that achieves an output "Display" differential of no less than 700 and with a maximum display of no more than 1022 at Maximum Outdoor Airflow. An airflow display of 1022 or greater prior to reaching Maximum Outdoor Airflow indicates that a larger range must be used. An airflow display differential (max flow # minus min flow #) of less than 700 at Maximum Outdoor Airflow indicates that a smaller airflow setting range is desired.

Note 8: Numbers displayed for "Damper Travel" and "Airflow" are used to indicate when the process is stable. The numbers are also used as an indication of minimum (0) to maximum (1024) damper travel or flow. The numbers are arbitrary and are not the actual percentages of flow or damper movement.

Variable Damper Setup

Requires Continuous Damper Position Feedback and Separate External Airflow Measuring Device which is NOT connected to ADFM14E.



Damper Status #
(See **Note 8**).

Program Records Damper Position Point at Specified % of Outside Air.

- 1 Select **Low** (up to 6 points), **Medium** (up to 11 points) or **High** (up to 21 points) to obtain the necessary level of Calibration Precision.
- 2 Set **Minimum % Outside Air**.
- 3 Set outside air damper to obtain minimum % outside air.
- 4 Wait for **Damper Status #** to stabilize then select **Reading Stable** (see **Note 8**).
- 5 Look to screen to determine next % outside air setting.
- 6 Set outside air damper to obtain prompted % of outside air.
- 7 Continue with steps 4, 5 and 6 until "Done" appears.
- 8 Select **Finished**.
- 9 Return to Step (3.6), page 6.

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Auto-Calibrate Damper Setup

Auto-Calibrate Setup Screen

E

Requires Continuous Damper Position Feedback and an Airflow Measuring Device 0-10 VDC (max) which is connected to ADFM14E.

Note: Airflow Measuring Device is for setup only. See Note 7, page 9.

DFME Auto-Calibrate

Damper Travel..... 0200 Minimum Air 15%
 Airflow..... 0230
 Minimum

Set outside air damper opening to obtain Minimum % of outside air and wait for 'Airflow' and 'Damper Travel' numbers to stabilize. Select 'Set Minimum'.

NOTE - DO NOT SELECT 'SET MAXIMUM' BEFORE 'SET MINIMUM'.

Set Minimum Awaiting minimum set.....
 Set Maximum
 Calibrate

< Back Chart Data

Set Minimum ✓ Minimum set complete!
 Set Maximum Awaiting maximum set.....
 Calibrate

< Back Chart Data

Set Minimum ✓ Minimum set complete!
 Set Maximum ✓ Maximum set complete!
 Calibrate Awaiting calibrate command.....

< Back Chart Data

DFME Auto-Calibrate

Damper Travel..... 0577 Minimum Air 15%
 Airflow..... 0494
 Minimum

Send the outside air damper from Minimum % position to the Maximum % of outside air and wait for 'Calibration Complete' to be displayed. Select 'Back' to return to Damper Setup or select 'Chart Data' to display curve and save to a file.

✓ Minimum set complete!
 ✓ Maximum set complete!
 Calibration in progress.....

< Back Chart Data

✓ Minimum set complete!
 ✓ Maximum set complete!
 Calibration Complete!

< Back Chart Data

Current Damper Profile

MAXITROL

Current Damper Profile

Percent Flow

Position (deg)

10/12/2002

<<Back Help Save Chart

Program Records Damper Position and the % of Outside Air Automatically.

- 1 Set **Minimum Air** (outside).
- 2 Set outside air damper to obtain minimum % of outside air and wait for **Airflow #** and **Damper Travel #** to stabilize (see **Note 8**, page 9).
- 3 Select **Set Minimum**.
- 4 Set outside air damper to obtain 100% of outside air and wait for **Airflow #** and **Damper Travel #** to stabilize.
- 5 Select **Set Maximum**.
- 6 Return outside air damper to step 2 position and wait for **Airflow #** and **Damper Travel #** to stabilize.
- 7 Select **Calibrate**.
- 8 Set outside air damper from step 2 Minimum % position to 100% outside air and wait for "Calibration Complete" to be displayed.
- 9a Select **Back** to return to Damper Setup.
or
- 9b Select **Chart Data** to display curve and save to a file. Note: Select Help for instructions on how to save chart data to an Excel file.
- 10 Return to Step (3.6), page 6.

10

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Step 5: Control Console

The Control Console is a monitor utility where changes to the Mild Weather Lockout, Freeze Thermostat and Sensitivity can be made.

- 5.1 Connect ADFM14E to the computer with serial cable.
- 5.2 Select PC **Start... Programs... Maxitrol DFME... Maxitrol DFME Setup Console** to open program.
- 5.3 Select **ADFM14E... Begin Control...**
- 5.4 If "DFME Mode Text Box" appears, select **Control Mode**. (It may take several seconds for monitoring to begin.)
- 5.5 Select and change **Mild Weather Lockout**, **Freeze Thermostat** and **Sensitivity** as needed.
- 5.6 **IMPORTANT:** Disconnect the serial cable connecting the computer to the ADFME board before exiting the Control Console.

The screenshot shows the 'DFME Series Control Console' window. It features several control panels: 'Set Point' with a large '100' display; 'Mild Weather Lockout' with 'Activate' (80) and 'Deactivate' (77) buttons; 'Freeze Thermostat' with 'Time' (2.5) and 'Temp' (32) buttons; a 'Sensitivity' slider between 'Decrease' and 'Increase' buttons; and 'Temperature Sensor Readings' for Return Air (65), Outside Air (20), and Discharge Air (100). Below these are '% Outside Air' (20), 'Input Air Temp' (56), 'Calculated Max Discharge Temp' (105), and 'Valve Drive' (10 V). The version '2.4.0' is shown in the bottom right. Two status lights are at the bottom left: a green light and a red light.

Mild Weather Lockout
Activate temperature.
(The Deactivate temperature will be adjusted accordingly as set in the Setup Console.)

Exit the Program.

Freeze Thermostat.

Activate Time.

Activate Temperature.

Discharge Air Sensitivity

Version

Light will be red indicating serial port is not available for connection.

Light will be green indicating serial port is available for connection.

Light will flash green indicating communication between ADFME board and DFME software.

