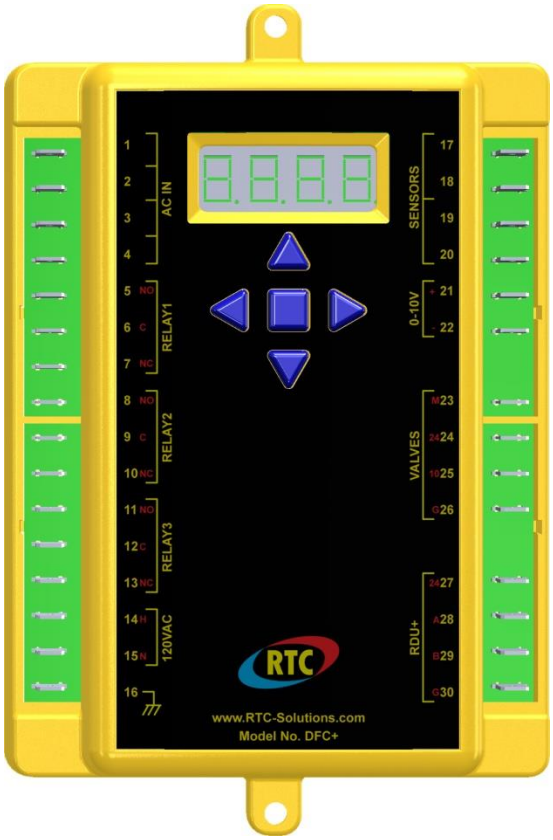
Model No. DFC+ R2

Support 877-351-4702

Integrated Digital Gas Fired Heating Control with Freeze and Outside Air Thermostat



This manual covers the following product:

DFC+ Direct Fired Control +

WARNING:
De-energize equipment before servicing!
MISE EN GARDE:
Déconnectez l'électricité avant tout service !

RECOGNIZED COMPONENT
120V, 60 Hz, 1A Max
Intertek
Conforms to UL 873
Certified to CSA C22.2#24

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Ph. (877) 351-4702
Fax (919) 400-4165
www.RTC-Solutions.com
Email: info@RTC-Solutions.com
4370 Oakes Road, Suite 700
Davie, FL 33314

Overview

The Direct Fired Control+ (DFC+) is an integrated digital gas fired heating control. The control has a simple five button interface with a four digit LED display. All programmable parameters can be accessed through the user menu with the five button interface and LED display. The DFC+'s setpoint temperature sensing operation ranges from 40°F (4°C) to 250°F (121°C). There is a built in Freeze Stat control, with an adjustable delay timer, that can be disabled or enabled. The DFC+ provides communications output for the RDU+ (Remote Display Unit+), which interacts and updates the DFC+ remotely. User parameters are stored in non-volatile memory, and are retained even during a power outage. Also, the DFC+ is powered by 120V AC.

The DFC+ has the following inputs and outputs:

- Four 120V AC switch inputs for Airflow, Alarm, Fan, and Clogged Filter
- Three relay output switches
- Two temperature sensor inputs provide discharge and inlet temperatures
- One 0-10V DC input.
- Two modulating outputs that power both a 0-24V DC and a 0-10V DC valve

Normal Operation

The DFC+ will always display the current discharge air temperature. Press any arrow key to change the discharge setpoint temperature. Once an arrow key is pressed, the LED will display the text for the current setpoint temperature. Use the UP▲ or DN▼ key in order to set a new discharge temperature. Then press the ENT key to save the changes made. If a key is not pressed for 10 seconds, the DFC+ will exit without saving. When adjusting the setpoint range, the setpoint cannot surpass the set Low and High values. For instance, if "Lo" is set to 80°F and "hi" is set to 150°F, the setpoint is then only adjustable between 80°F to 150°F.

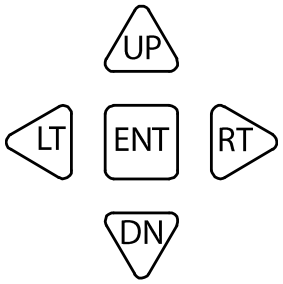

Figure 1: DFC+ Keys

Programming

To enter program mode, hold the ENT key down for 3 seconds. If the control is password protected the display will show "PASS", otherwise the display will show "Lo", the first programmable parameter. If password protected, no menu settings may be altered until the password is entered. Press the ENT key and use the UP▲ and DN▼ keys to set the display to the factory set password (21). Press the ENT key again to access the Menu Map (Refer to page 4 for this section). Once in the program mode, use the UP▲ and DN▼ keys to navigate to the desired menu parameter as shown in column 1. To edit a menu parameter, press the RT▶ key once on the desired parameter, and the display will show the current value of that parameter as shown in column 2. Use the UP▲ and DN▼ keys again to edit the parameters for column 2. Press the ENT key to save the changes made or the LT◀ key to cancel without saving and return to column 1. To enable the password, navigate to the PASS parameter and set to EnAb, and dAbl to disable. If a key is not pressed for 10 seconds the control will default back to normal mode or hold down the ENT key for 3 seconds in program mode to also return to normal mode too. Different parameters are as follows:

1. "Lo": Sets the lowest point the user can adjust the temperature to, outside of programming mode. Low (Lo) can be set from 40°F - 240 °F and must be at least 10°F less than the High.
2. "hi": Sets the highest point the user can adjust the temperature to, outside of programming mode. High (hi) can set be from 50°F - 250°F and must be at least 10°F greater than the Low.
3. "SP": Adjusts the discharge setpoint. Setpoint (SP) may be adjusted within the menu map or on the main screen with the up and down arrows, then pressing enter to save the selected setpoint. When adjusting the discharge setpoint temperature above the outside air temperature, it will result in turning the burner on and modulating the system at that specified setpoint.
4. "htr": Limits how high the temperature can rise from the inlet sensor to the discharge sensor.
5. "HTL": Sets the high temperature limit. If the temperature goes above this limit, the burner will shut off.

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6. "C02": When enabled, C02 is monitored. When the C02 level reaches 4000ppm, a warning is given. At this point the high temperature rise begins to proportionally drop from programmed htr down to 25. Once the C02 level reaches 5000ppm, the burner shuts off.
7. "FSEn": Set to either Enable or Disable the Freeze Stat.
8. "FSSP": Adjusts the temperature limit for the Freeze Stat Setpoint. Freeze Stat Setpoint (FSSP) will start the timer to shut down the burner and blower when the system continues to blow cold inlet air below the setpoint.
9. "FSti": Adjusts the time limit for the Freeze Stat in minutes. Freeze Stat Time (FSti), in minutes, is when the system will shut down the flow of outside air after passing the time limit specified.
10. "Pid": Selects the desired aggression/speed of the PID curve for the valve (P1,P2,P3,P4). P1 is the slowest/least aggressive and P4 is the fastest/most aggressive.
11. "oFS": Set a temperature offset to correct for things like duct losses or sensor calibration errors.
12. "vLo": Valve Minimum Output (vLo), controls the percentage the valve will operate when in the closed position.
13. "vhi": Valve Maximum Output (vhi), controls the percentage the valve will operate when in the open position.
14. "ForC": Sets the control to convert the temperature to display either °F or °C.
15. "PASS": Enable or disable password protection. When enabled the password is 21.
16. "VER": View the current software version.

Features

Freeze Stat Control:

The DFC+ includes an adjustable Freeze Stat. The freeze stat prevents freezing air from entering the building in the event of burner failure. However, the freeze stat is optional and can be enabled or disabled in the DFC+ programmable settings. When enabled, the freeze stat setpoint temperature and time limit can be adjusted. The freeze stat setpoint allows the user to specify the cutoff temperature to shut down the burner and blower. If the systems inlet temperature rises back above the freeze stat setpoint, then the system will restart automatically. The freeze stat timer provides a time delay for the discharge temperature to rise above the setpoint. If it does not rise above the setpoint within the freeze stat time setting, the fan and burner will turn off. Once the freeze stat is tripped it can be reset remotely using the RDU+ or by cycling the power.

Automatic Thermostat:

The DFC+ also includes an automatic inlet thermostat with adjustable heat and cool deadband. The range of the deadband is programmable from 2°F - 10°F. The burner turns on when the inlet temperature falls below the setpoint minus the heating deadband range. The cooling turns on when the inlet temperature rises above the setpoint plus the cooling deadband range. This allows for the system to save energy and use the outside temperature in order to cool or heat. After the system turns on there is an automated hysteresis of two degrees before the system turns off again.

For example, the system setpoint is at 70°F and both the heat and cool deadband are set to 3°F.

Parameters set: System Setpoint 70°F, Heating deadband 3°F, Cooling deadband 3°F.

If the inlet temperature reaches 74°F then the cooling will turn on because of the set deadband range. If the inlet temperature reaches 66°F then the heating will turn on because of the set deadband range.

Inlet temperature rises above 70°F + 3°F = 73°F, at 74°F cooling on.
Inlet temperature falls below 70°F - 3°F = 67°F, at 66°F heating on.

With the systems 2°F hysteresis the burner or cooling will not turn back off until the discharge temperature reaches 71°F or 69°F.

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Email: info@RTC-Solutions.com
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Inlet temperature with hysteresis 74°F - 2°F = 72°F, at 71°F cooling off.
Inlet temperature with hysteresis 66°F + 2°F = 68°F, at 69°F heating off.

AC Input Switches:

Airflow → Input from air proving switch. Inhibits heat output and sends alarm message to RDU+.
Alarm → Input from Flame Safety Control. Sends alarm message to RDU+.
Fan → Override switch to turn fan on. Allows interlock with exhaust system or field service.
Clogged Filter → Input from clogged filter pressure switch. Sends signal to RDU+.

Modulating Valve Outputs:

The DFC+ has the ability to power either a 24V DC or a 10V DC modulating valve. Only one valve at a time may be connected. Please refer to "Valve Connections" on page 5 for proper valve connections.

23	PWM For Solenoid Valve
24	24VDC Valve Output
25	0-10VDC Valve Output
26	Valve Ground

Connection for 0-24V DC use terminals 23 and 24

Connection for 0-10V DC use terminals 24, 25, and 26

Figure 2: DFC+ Modulating Output Terminals

Alarms:

Error messages on the DFC+ will be scrolled across the display with a detailed message. This will allow users to realize the issue in order to resolve the error faster. Below are the list of errors and their meanings.

"dFtS oPEn" – There is no Discharge Temperature Sensor connected to the DFC+. Therefore, no discharge temperature reading can be made.
"dFtd oPEn" – The user has the Remote ("rE") parameter on the RDU+ enabled, but no external control is found to take a reading.
"dFts ShortEd" – There is a short in the connection of the Discharge Temperature Sensor.
"dFtd ShortEd" – The user has the Remote ("rE") parameter on the RDU+ enabled and there is a short in the connection.

To resolve an issue check the wiring connections. Please refer to "Installation" on page 6 for proper terminal connections.

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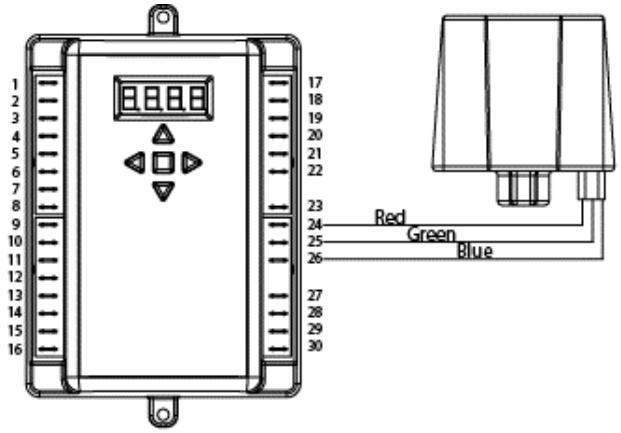
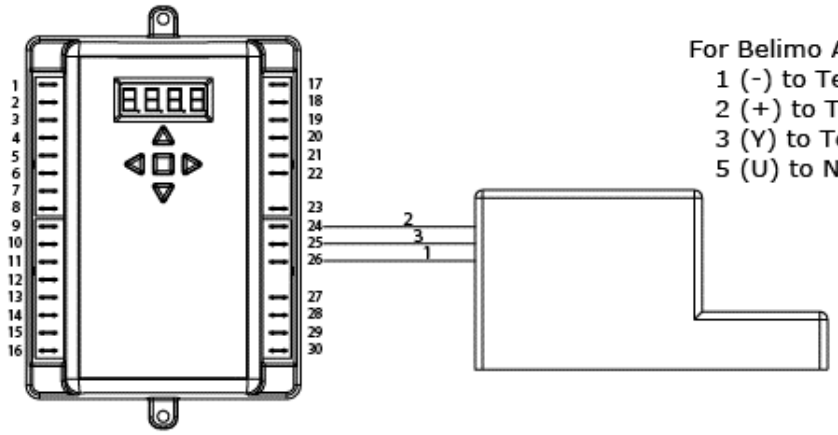
Valve Connections

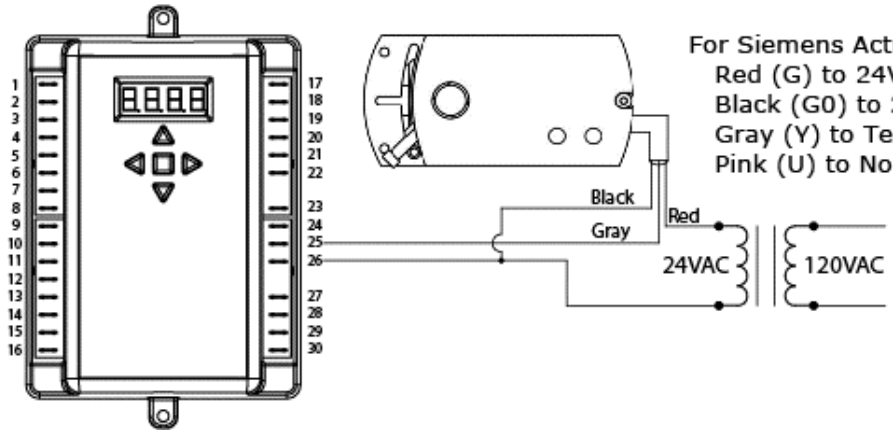
DFC+	Solenoid	ACT-4.0	Belimo	Siemens
Term 23: PWM	PWM			
Term 24: 24VDC	24VDC	Red: 24VDC	2: 24VDC	Red: 24VAC
Term 25: 0-10V Output		Green: 0-10V Input	3: 2-10V Input	Gray: 0-10V Input
Term 26: Ground		Blue: Ground	1: Ground	Black: Ground



For Enolgas Actuator
Red to Terminal 24 (24VDC)
Blue to Terminal 26 (Ground)
Green to Terminal 25 (0-10VDC Input)
Pink to No Connect (0-10VDC Output)



For Belimo Actuator
1 (-) to Terminal 26 (Ground)
2 (+) to Terminal 24 (24VDC)
3 (Y) to Terminal 25 (2-10VDC Input)
5 (U) to No Connect (2-10VDC Output)



For Siemens Actuator
Red (G) to 24VAC Transformer (24VAC)
Black (G0) to 24VAC Transformer & Terminal 26 (Ground)
Gray (Y) to Terminal 25 (0-10VDC Input)
Pink (U) to No Connect (0-10VDC Output)

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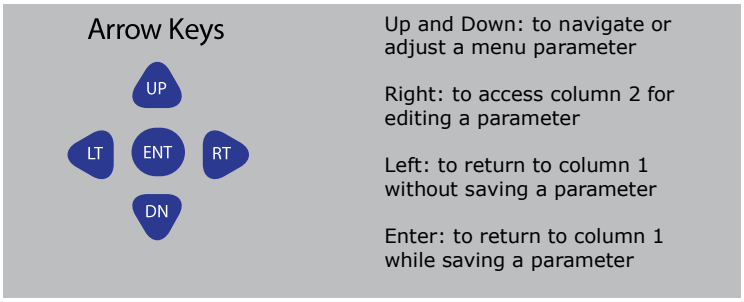

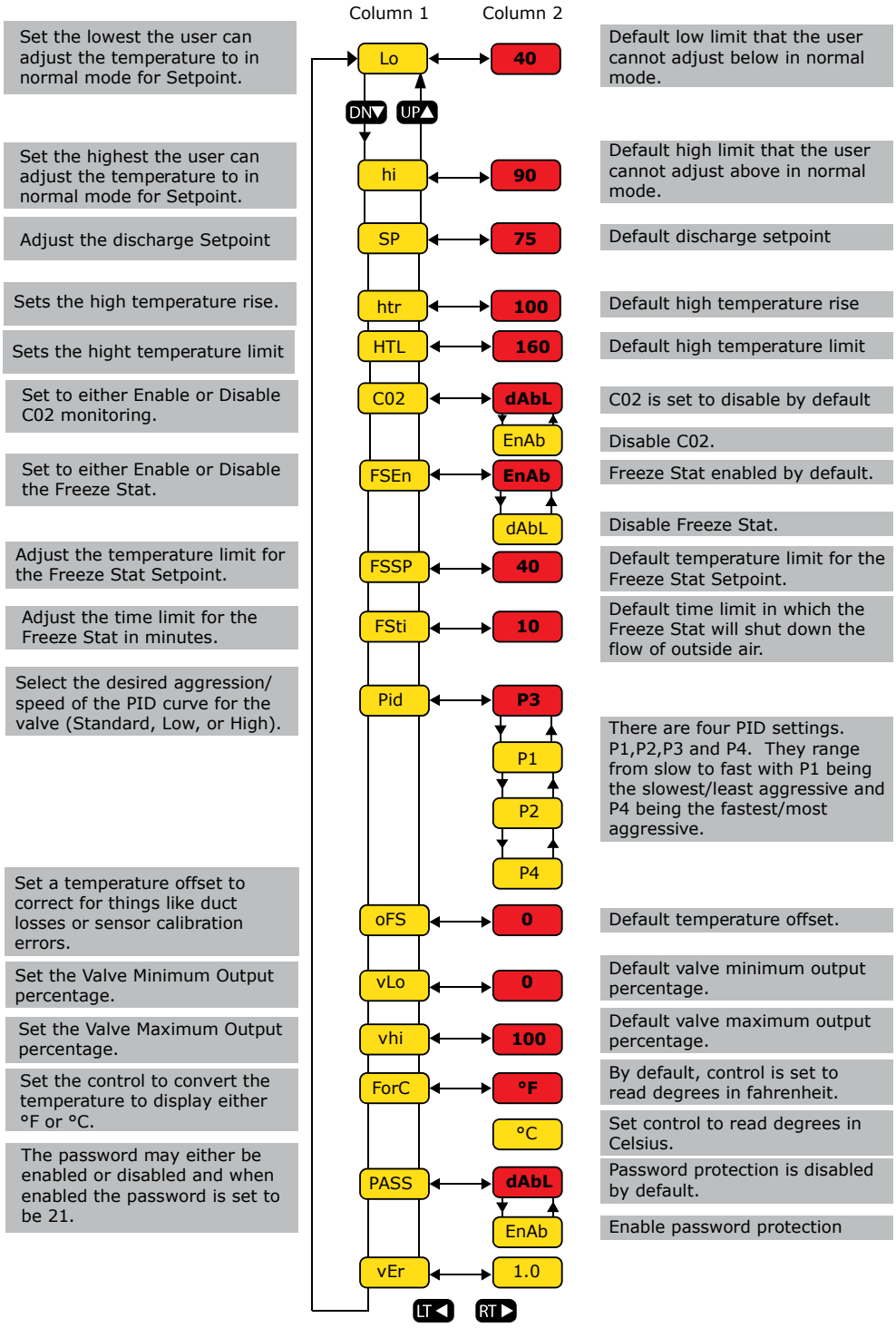

DFC+ Menu Map

(Red indicates default parameter)

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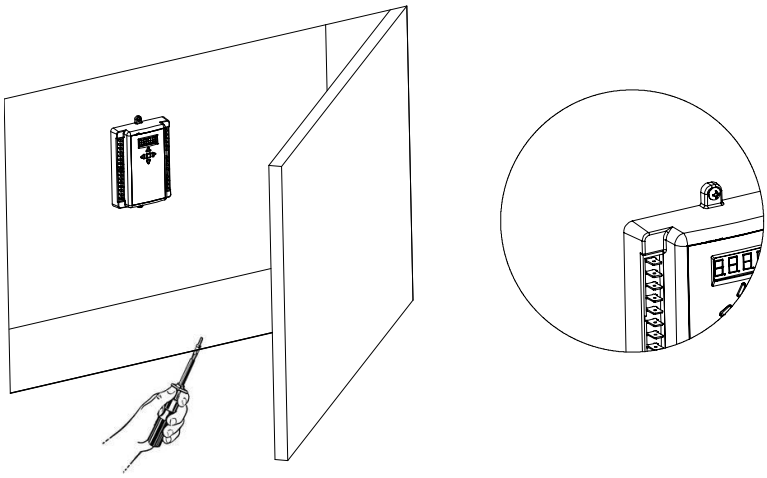
Specifications

Power Requirements	
Current Rating Relays	120V AC
Current Rating 24V Output	3A at 125V AC
DFC+ Ambient Temperature Limits Operating	0.5A
Accuracy	-40°F-250°F (4-48°C)
	+/-3°F (1°C)

Installation



CAUTION:

The DFC+ has exposed high voltage terminals. The control must be installed in an enclosure requiring tool access for servicing!

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Wiring for the DFC+ is convenient for the user with easy access to all terminal connections.

Figure 3: DFC+ Front Panel with dimensions (inches)

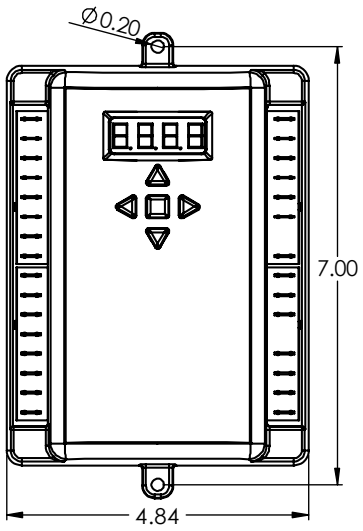


Figure 4: DFC+ Side View with dimensions (inches)

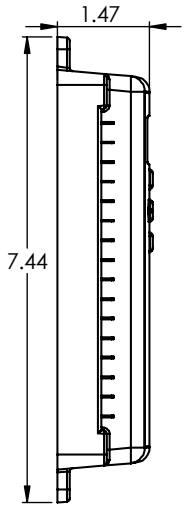
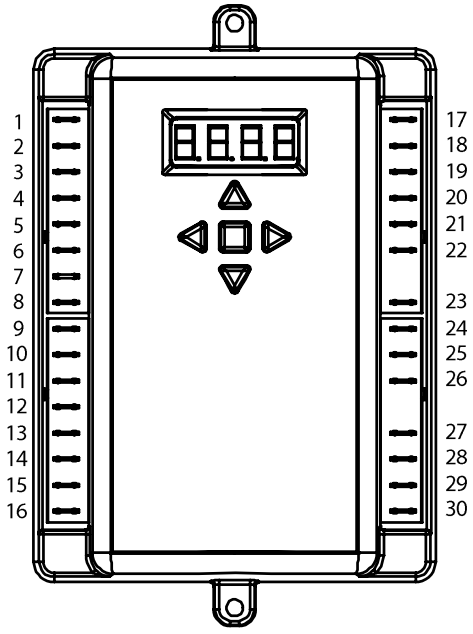


Figure 5: DFC+ Terminal Number Layout



1	Airflow proving switch input
2	System alarm input
3	Fan override input
4	Clogged filter input
5	NO relay fan output
6	C relay fan output
7	NC relay fan output
8	NO relay heat output
9	C relay heat output
10	NC relay heat output
11	NO relay cooling output
12	C relay cooling output
13	NC relay cooling output
14	Hot 120VAC
15	Neutral 120VAC
16	Earth Ground

17	Discharge Temp Sensor
18	Discharge Temp Sensor
19	Inlet Temp Sensor
20	Inlet Temp Sensor
21	0-10V Input
22	0-10V Input
23	PWM For Solenoid Valve
24	24VDC Valve Output
25	0-10VDC Valve Output
26	Valve Ground
27	24VDC RDU+ Output
28	RS485 "A"
29	RS485 "B"
30	RDU+ Ground

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