



Your Cold-Chain Partner®

## INSTRUCTION MANUAL

Portable Medical Refrigerator Units

MODEL BF-60-MIL-UPSD

*Including the*

*Detachable Battery Backup System (DBBS)*

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PLEASE READ ENTIRE INSTRUCTION MANUAL BEFORE USING THE BIOFRIDGE UNIT


# SECTION 1


## Introduction

The BF-60-MIL-UPSD has been designed to provide more flexibility, and therefore more options, for those who work within the requirements and protocol of cold-chain transport.

The Units can be used in the following manner and will run 24/7:

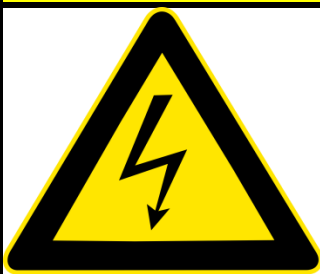
 In any mode of transportation, including vehicles, planes, boats, etc., Units can be plugged into a 12VDC to 28VDC supply (for example, vehicle's cigarette lighter).

 In a clinical setting, including temporary clinics or established hospitals, Units can be plugged into a 110VAC 60 Hz/240 VAC 50 Hz supply (a standard wall outlet).

 In any setting, when the Unit is connected to the Detachable Battery Backup System (DBBS) and the primary power source becomes lost, the Unit will *automatically* draw from the DBBS 12VDC supply. (DBBS must be pre-connected to the Unit.)

 See SECTION 5 for more information on the DBBS.

## Basic Operation

<h1>WARNING</h1>	
	<p><b>BioFridge portable refrigerators and freezers are powered by electric current; not taking proper steps to ensure safety can potentially injure or kill. ANY installation, cleaning, or troubleshooting must be conducted with the electrical power source disconnected from the BioFridge Unit. (110VAC, 12VDC)</b></p>

- After receiving the BioFridge unit from the shipper, **please wait 24 hours before turning it on.** The oil in the compressor needs time to settle. Ensure unit is upright and out of the box.

- Never operate the BioFridge unit at a tilt exceeding 30 degrees for an extended period of time. The oil reservoir will not lubricate the compressor motor properly at angles above 30 degrees and damage may result to the compressor.
- When the BioFridge is plugged into the Detachable Battery Backup System (DBBS) and running on the DBBS's 12VDC system, the Unit will operate for up to 18 hours as a portable refrigerator, and for up to 9 hours as a portable freezer.
- Whenever possible, pre-cool the refrigerator and its contents in advance using a 110-Volt AC power source (a typical wall outlet in the USA and Canada) before taking it off the AC power grid (unplugging it from the wall outlet).
- BioFridge units are equipped with a **GREEN** light indicator located on the control panel. The compressor is running when this light is illuminated.
- At least 4 inches of ventilation space around a BioFridge unit is recommended in order to properly dissipate heat. Keeping the unit well-ventilated will improve performance.
- Whenever possible, avoid operating the BioFridge unit in direct sunlight; doing so will decrease the unit's efficiency.
- Many factors can affect the efficiency of the Unit. Factors include:
  - the ambient temperature outside the Unit
  - the ventilation area around the Unit
  - the number of items inside the unit
  - the starting temperature of the items put in the unit.

Placing warm items inside the unit in hot ambient temperatures, and leaving the lid open, will negatively affect the performance.

- **Using the Unit is the best way to learn its capabilities.**

## SECTION 2

### Cleaning

- The recommended way to clean the BioFridge is with a container of warm water, a sponge, and a bottle of all-purpose cleaner. Never submerge a BioFridge unit in water.
- If the BioFridge is used as a freezer for long periods of time (approximately 2-3 months) the Unit should be periodically defrosted with its contents removed.
- Never empty water out of the Unit by turning it upside down. Doing so can cause water to collect in the top of the cowl. Remove excess water with a sponge.

### Storing

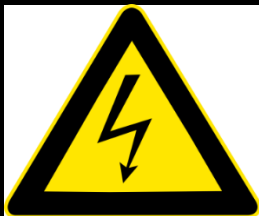
To store the Unit:

1. Ensure DBBS is plugged into the 110VAC (or wall outlet).
2. To ensure battery voltage does not drop to an excessively low voltage, leave the DBBS plugged into the 110VAC, whenever possible. If not available, power up once every 1 to 2 weeks.
3. Unplug the umbilical cord (between the BioFridge and DBBS).



4. Open the lid to defrost and vent the Unit.
5. Once defrosted, remove excess water with a sponge.
6. Store Unit with the lid slightly open.



#### WARNING






**BioFridge portable refrigerators and freezers are powered by electric current; not taking proper steps to ensure safety can potentially injure or kill. ANY installation, cleaning, or troubleshooting must be conducted with the electrical power source disconnected from the BioFridge Unit. (110VAC, 12VDC)**

# SECTION 3

## Basic Troubleshooting


Observation	Probable Cause (Work Down the List)	Remedy	Part Description & Number
AC power does not work	1. No Power from 110-volt AC outlet (standard wall outlet)	Confirm that the main Room switch is on, the 110-volt outlet has power, and that AC input is plugged in	
DC power does not work	Blue connector not secured properly 	Twist blue plug clockwise until it snaps into place	
	2. 12-volt DC supply has low voltage	Fix DC voltage to 12.0 volts or higher by changing batteries.	
	3. Blown fuse in DBBS DC circuit (in DBBS enclosure)	Replace inline fuse	ATC-15 amps E-123
	4. Blown internal fuse in DC circuit inside fridge (inside compressor compartment)	Replace internal fuse	ATC 15 amps E-123
	5. Loose connections at battery terminals in DBBS	Tighten all terminals	
Internal Fan not on	1. Fan only turns on when compressor is on	Normal Operations	
	2. Fan Blocked with debris 	Clean Fan	
	3. Fan connections loose (inside compressor compartment)	Replace crimp connectors (inside compressor compartment)	12v internal fan E193

Observation	Probable Cause (Work Down the List)	Remedy	Part Description & Number
Refrigerator not getting cold	1. Incorrect thermostat set-point setting St 1 	Reprogram St 1 (see Section 4)	
	2. Latch not secured completely 	secure	
	3. Ambient temperature too high	Move Unit to lower ambient temperatures, and away from direct sunlight.	
	4. DC power source low voltage	Recharge DBBS	
	5. Differential (P1) set too high 	P1=2	
	6.Worn lid seal	Replace lid seal	Seal G-107
	7.Refrigerant Leak	Factory Repair: Call (760) 233-8847	
Refrigerator getting too cold	1. Incorrect thermostat set-point setting St 1	Reprogram St 1 (see Section 4)	

<b>Observation</b>	<b>Probable Cause (Work Down the List)</b>	<b>Remedy</b>	<b>Part Description &amp; Number</b>
Refrigerator getting too cold (cont'd)	2. Very little load inside	Put in 1 to 2 water bottles to help buffer cycling interval	
	3. Differential (PI) too high	P1=2	
	4. Calibrate thermostat	Factory Support: Call (760) 233-8847	
E04 Message: High Temp Alarm	1. Door is not shut completely	Latch down and secure door	
	2. Using Unit as a refrigerator with alarm set for a freezer	Correct Alarm Settings (see Section 6)	
	3. Temperature set-point St 1 is set above high alarm (P 26) settings	Adjust set-point or high alarm setting  (see Section 6)	
	4. If probable cause 1, 2, or 3 is not the issue, relocate the vaccines and call BioFridge	Factory Support: Call (760) 233-8847	
E05 Message: Low Temp Alarm	1. Using unit as freezer with alarm set for a refrigerator	Correct Alarm settings (see Section 6)	
	2. Temperature set-point ST 1 is set below low alarm (P 25) settings	Adjust set-point or low alarm settings	
	3. If probable cause 1 or 2 is not the issue, relocate the vaccines and call BioFridge	Factory Support: Call (760) 233-8847	
Other Display Messages	Display is stuck on input readings: b1:Probe 1 b2:Probe 2 di1:digital input 1 di2:digital input 2 St1:set point 1 St2:set point 2 no: NO Access	To escape input readings: Scroll down to b1. Hold down the SET button until the blinking b1 disappears. When b1 disappears, the thermostat will display the current internal temperature reading	

## Basic Troubleshooting Continued

### DETACHABLE BATTERY BACKUP SYSTEM (DBBS)

Observation	Probable Cause (Work Down the List)	Remedy	Part Description & Number
On Board Power Supply Capacity Status Volt Meter is NOT illuminated.  	1) DBBS voltage is less than 11.6 volts.	1) Plug DBBS into 110VAC/240VAC to recharge, low voltage disconnect is open circuit	Part: ATC-15A, E-123
Charging status LEDs not on when plugged into 110VAC	1) No 110VAC power	1) Check power 2) Call factory: (760) 233-8847	
DBBS not running BioFridge for a minimum of 8 hours	1) DBBS not fully charged prior to plugging in BioFridge 2) High ambient temperature 3) Compressor speed is on HIGH	1) Charge DBBS 2) Remove Unit from high ambient temperature 3) Change compressor speed to LOW (certain models)	



# SECTION 4

## Programming the Thermostat

### Setting the Temperature Set-Point (St1):

1. Press and hold the Set button until the display shows “St1.”



2. Release the Set button and the present thermostat set-point will flash.
3. Press the up ▲ or down ▼ arrows to reach the desired thermostat set-point temperature.
4. Press the Set button to confirm. The display will show the present interior temperature.

**RECOMMENDED SET-POINT FOR REFRIGERATION IS 3.5°C TO 5°C**

**RECOMMENDED SET-POINT FOR FREEZER IS -16°C TO -18°C**

### Setting Parameters and Alarms in Celsius Description:

Initiate the Programming Mode by holding down Set and PRG together until 0 appears. Scroll up ▲ to “77” and press Set. The “c0” Parameter will appear. (To view the “c0” value, press Set again.) To reach the next desired Parameter, navigate using the up ▲ and down ▼ arrows. Press Set. Change the setting with the arrows and press Set again. Refer to Table 1 below (Page 10) for Parameters. Once all programming is done, hold down the PRG button for at least 5 seconds to confirm. **To silence an alarm, press PRG.**

Table 1

Parameter	Description	Value
CO	Relay Designation	1
C-18	Unit of Measure	0=Celsius 1=Fahrenheit
P1	Differential of Temperature Set-Point	1
P25 (E05)	Low Temperature Alarm*	Customer Set
P26 (E04)	High Temperature Alarm*	Customer Set
P27	Alarm Differential	0
P28	Alarm Time Offset in Minutes	Customer Set

\*Low and High Temperature Alarms should be set to Customer's required temperature range.

## Thermostat Master Reset:

If there is an error in the programming, or if the programming has been tampered with, reset the thermostat and reinitiate programming again.

### To Reset the Digital Thermostat

1. Unplug the BioFridge unit from all power sources.
2. Hold down the PRG button. Then, power up the unit while still holding the PRG button down.
3. Release the PRG button when "Std" appears on the display.



4. If "Std" does not appear, try again.

5. Initiate the Programming Mode by holding down Set and PRG together until 0 appears. Scroll up ▲ to “77” and press Set. The “c0” Parameter will appear. (To view the “c0” value, press Set again.) To reach the next desired Parameter, navigate using the up ▲ and down ▼ arrows. Press Set. Change the setting with the arrows and press Set again. Refer to Table 2 below for Parameters. Once all programming is done, hold down the PRG button for at least 5 seconds to confirm. **To silence an alarm, press PRG.**

Set Values According to Table 2 Below:

Table 2

Parameter	Refrigerator Value	Freezer Value	Function
CO	1	1	Relay Designation
P1	2	2	
C21	-12	-20	
C22	10	10	
P25	Customer Set	Customer Set	Low Temp Alarm
P26	Customer Set	Customer Set	High Temp Alarm
P27	0	0	Alarm Temp Offset
P28	Customer Set	Customer Set	Alarm Delay Minutes

After Thermostat is Reset:

After the Thermostat is reset, ensure the Set-Point is reset to the St1 value. Once the St1 value has been set and the Unit is reading the internal temperature, power cycle the Unit. Unplug from all power sources and plug back in.

## SECTION 5

### Detachable Battery Backup System (DBBS)

When the DBBS and BioFridge are connected to each other and each is connected to the 110VAC (wall outlet), the BioFridge has two power sources to draw from. The primary source will be the 110-Volt AC from the wall outlet. The secondary source will be the 12-Volt DC from the DBBS System. The BioFridge will run exclusively on 110-Volt AC until the power is interrupted (for example, by black or brown outs). When AC power is interrupted, the BioFridge will *automatically* switch to draw from the DBBS.

<b>DBBS Capacity:</b>	12 VDC	40 Amp Hours
<b>Output:</b>	11.5 VDC	13.8 VDC
<b>Input:</b>	110V 60Hz	240V 50Hz

Ambient Temperature Range: -18° Celsius to 55° Celsius

Note: The capacity of the DBBS may be reduced in extreme low ambient temperatures. For example, -18° Celsius ambient DBBS capacity will be reduced by 40%.

Service Life of DBBS = 2 years

#### Preventative Maintenance

DBBS to be changed out every 2-3 years;

Thermostat and Probe to be changed out every 5-6 years.

## Charging the DBBS

1) To charge the DBBS, insert 110VAC cord into input AC receptacle (standard wall outlet.)

2) Note: LED battery charge status **RED**, **GREEN**, or both LED's will illuminate.

**RED** = Bulk Charge Rate

**RED/GREEN** = Absorb Charge Rate

**GREEN** = Float Charge Rate

2) From a full discharge, 11.5 VDC, the Unit will take approximately 6 hours to recharge.

4) Once the battery charge status **GREEN** LED is illuminated, the DBBS is fully charged.

## Connection of the DBBS to the BioFridge

1) Place the BioFridge on top of the DBBS. (Note: the control end of the BioFridge must be in the same orientation as the control end of the DBBS.)

2) Fasten all 3 over-center latches from DBBS to BioFridge. Ensure latches are tight (adjust if necessary).

3) Using the 12VDC umbilical cord, connect one end to the input DC receptacle on DBBS. Connect the other end of the umbilical to the input DC on the BioFridge.

4) BioFridge is now powered by DBBS.

### 5) On Board Power Supply Capacity Status:

Voltmeter indicates the voltage of the DBBS (DC Volts)

13.2V – 12.1V = 100% - 35% capacity

12.1V – 11.8V = 35% - 10% capacity

11.8V – 11.6V = 10% - 0% capacity (Plug into AC power supply)

### RUN TIME\*

Refrigerator: 18 hours; -12° to 10° Celsius

Freezer: 9 hours; -18° Celsius

\*This run time is calculated in an ambient temperature of 75° Fahrenheit. Run time may be less in higher ambient temperatures.

### Using the BioFridge DBBS as a secondary power supply

- 1) Attach the BioFridge to the DBBS
- 2) Connect the 12VDC umbilical cord from DBBS into BioFridge



- 3) Connect one 110VAC cord to AC input receptacle on BioFridge
- 4) Connect one 110VAC cord to AC input receptacle on DBBS
- 5) The BioFridge will run off the 110VAC supply (wall outlet)

- 6) The DBBS will charge from the 110VAC supply and remain at 100% charge
- 7) If the AC power source is lost (for example in a black or brown out), the BioFridge will *automatically* switch to the 12VDC supply from the Detachable Battery Backup System.
- 8) Once 110VAC supply has been restored, the BioFridge will *automatically* switch back to drawing from the 110VAC supply.
- 9) No disconnection of AC or DC cords is required. AC and DC cords can stay connected to the BioFridge and DBBS.

#### RUN TIME\*




Refrigerator: 18 hours; -12<sup>o</sup> to 10<sup>o</sup> Celsius

Freezer: 9 hours; -18<sup>o</sup> Celsius

\*This run time is calculated in an ambient temperature of 75<sup>o</sup> Fahrenheit. Run time may be less in higher ambient temperatures.

# SECTION 6

## Table of Alarms

Message on display	Cause of the alarm	Saved to alarm queue (**)	Icon on display	Buzzer	Reset	Control action	Checks/solutions
E01	Probe B1 fault	x		OFF	automatic	Depends on parameter c10	Check probe connections
E04	The temperature measured by the probe has exceeded the threshold P26 for a time greater than P28.	x		ON	automatic	No effect on control	Check parameters P26,P27, P28,P29
E05	The temperature measured by the probe has fallen below threshold P25 for a time greater than P28.	x		ON	automatic	No effect on control	Check parameters P25,P27, P28,P29

(\*) exit the working cycle

(\*\*) for IR33 Universal with universal inputs only.

- The alarm relay is activated or not based on the operating mode and/or the DEPENDENCE setting  
The alarms that occur during the Auto-Tuning procedure are not put in the alarm queue.

**(E04 – High Temperature Alarm / E05 – Low Temperature Alarm)**



# SECTION 7

## Individual Model Specifications

### BioFridge BF-60-MIL-UPSD

Refrigerator Model	BF-60-MIL-UPSD
Primary Electrical Input (AC)	110 Volt AC 60Hz/240 VAC 50 Hz
Secondary Electrical Input (DC)	12 VDC / 24-28 VDC
With connection to the DBBS: Runtime at 4°C Set-Point (Refrigerator) Runtime at -18°C Set-Point (Fridge)	Approximately 18 Hrs. (Pre-Cooled) Approximately 9 Hrs. (Pre-Cooled)
Power Consumption	40 Watts Maximum
Payload Capacity	60 Liters
Payload Temperature Range (Programmable)	10°C to -12°C Refrigerator Mode 10°C to -20°C Freezer Mode
Max. Operating Ambient Temperature	40°C (or 104°F) Refrigerator Mode 32°C (or 90°F) Freezer Mode
Dimensions of Storage Space	19" Lx13" Wx15" H
Dimensions of Refrigerator	35" Lx19" Wx22" H
Dimensions of Refrigerator + DBBS	35" Lx19" Wx29" H
<b>DBBS SPECIFICATIONS:</b>	
Charger Model	208106
Electrical Input (AC)	90.VAC -250.VAC 50/60 1-13
Output AMPS	6 Amps 12.VDC
Battery Model	AGM-1240 T
Battery Capacity	40 Amp Hour
Voltage Output	11.5 v-13.2V
Max. Voltage Cut-In	13.2VDC
Min. Voltage Cut-Out	11.5VDC