

IMPORTANT

This is a supplement to the full Apricus MFC-1 Controller Manual provided available from the www.apricus.com website. Refer to the full manual for complete safety and operating instructions.

The controller must be set for USER menu once the system is commissioned. The end USER may only access and make changes to those settings contained in the USER menu. TECHNICIAN settings may only be changed by qualified persons.

Incorrect settings may result in unsafe system operation.

1. SOFTWARE PACK OVERVIEW

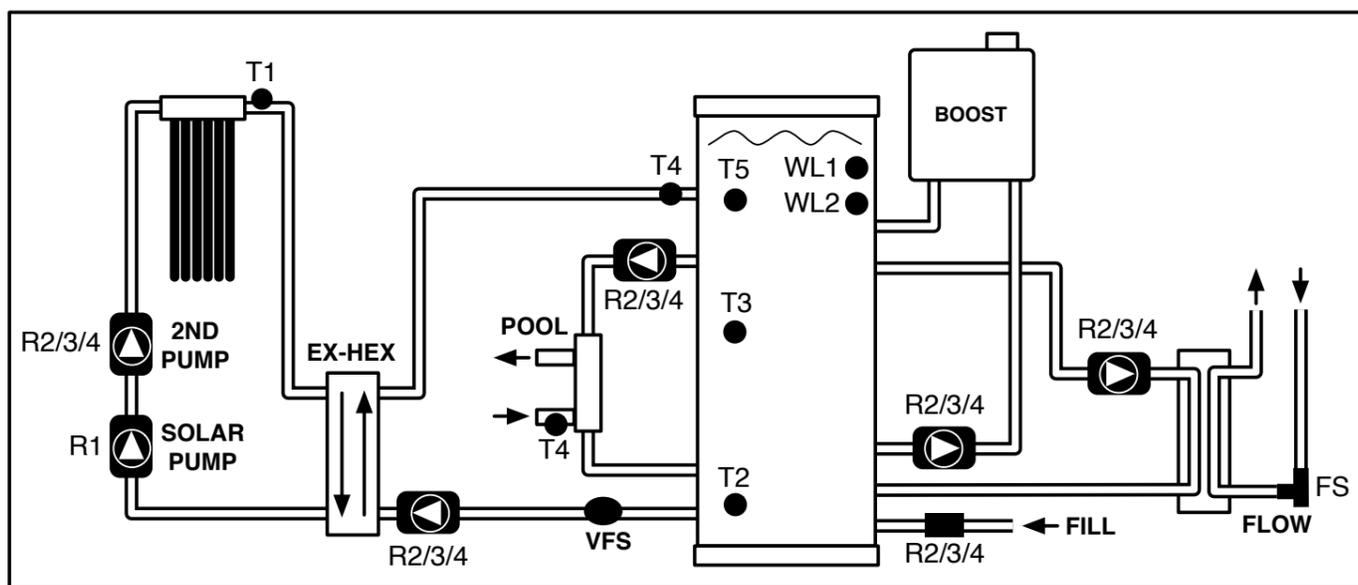
This software pack provides a set of standard functions suitable for atmospheric solar storage tanks. Functions are included to operate a drain back system configuration as well as closed loop systems.

Relay 1 (R1) is dedicated to the solar pump operation. The additional 3 relays (R2, 3 & 4) can be used to operate a number of additional pumps or valves using the following function selections:

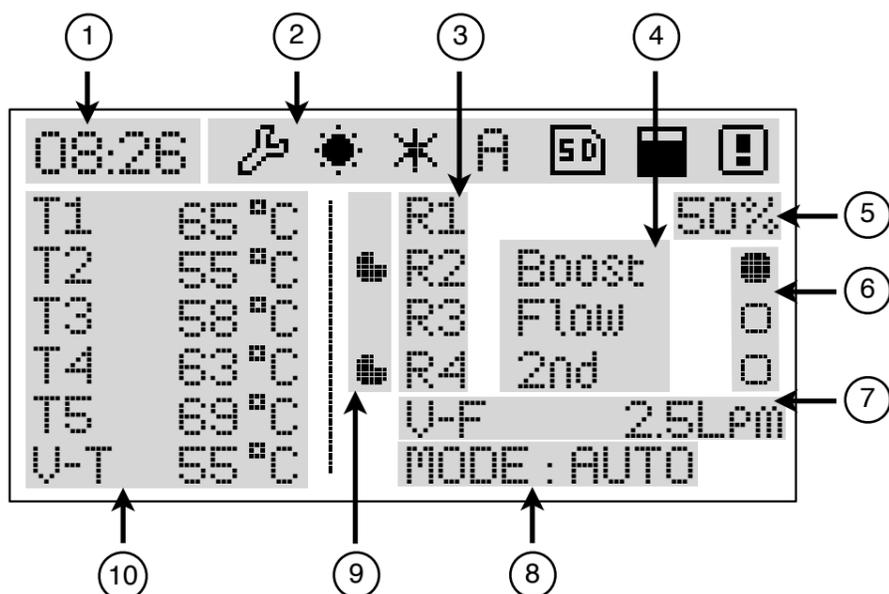
- **BOOST:** Runs pump for heating tank from auxiliary heat source.
- **FILL:** Run pump or opens valve to fill tank when water level drops
- **2ND:** Runs 2nd solar pump for extra head pressure.
- **EX-HEX:** Runs pump if using external HEX for solar loop.
- **FLOW:** Run a circulation pump when flow switch signal received.
- **POOL:** Runs pump for pool/hot-tub heating.
- **TIME:** Control relays simply based on timer settings

2. SYSTEM DIAGRAMS

The following diagram show the possible configurations that can be achieved. The complexity of the system is limited by the 5 sensors and 4 output relays. Certain functions cannot be used concurrently due to conflicting requirements for sensor placement (Eg. POOL and SOLAR IQ).



3. MAIN DISPLAY OVERVIEW



1. Current Time
 2. Icons
 3. Relays
 4. Relay 2,3 & 4 function
 5. Relay R1 % speed
 6. Relay 2,3 & 4 ON/OFF status
 7. Flow rate (VFS or calculated)
 8. Operation mode
 - ☐ = ON
 - = OFF
 9. Relay timer status
 - = timer active
 10. Temp sensor readings
- 🔧 Technician menu active
 - ☀ Solar energy available
 - * Freeze protection active
 - A or M Auto or Manual Boost Mode
 - SD SD card inserted
 - Water Level Status
 - ! Error(s) have occurred

4. INFORMATION SCREENS

Scroll through information screens by pressing ↑ or ↓ buttons.

4.1. MODE SCREEN:

- Choose from OFF, AUTO or MANUAL modes of operation.
- The controller will always start in OFF mode after a SOFTWARE UPDATE or SOFTWARE DEFAULT reset.
- Change to AUTO mode for normal controller operation.
- Use MANUAL mode to control relays and check variable speed pump operation.
- Always select EXIT and press SET to return to normal operation.

4.2. ERROR SCREEN:

- To review errors, press SET then ↑ or ↓ to scroll. If an error has occurred it will show the most recent occurrence date & time and total occurrences.
- To clear all errors, scroll to CLEAR ALL ERRORS, press SET, select YES then SET to confirm.
- To leave the ERRORS screen, scroll to the bottom and select EXIT.

4.3. RELAY, TEMP & ENERGY SCREENS:

These screens provide basic summary of the system operation. To reset the information choose RESET DATA in the SETUP menu.

08:26	☀	* A	SD	!
T1	140°F	R1	50%	
T2	120°F	R2	Boost	■
T3	125°F	R3	Flow	□
T4	138°F	R4	2nd	□
T5	150°F	U-F	46gpm	
U-T	138°F	MODE	AUTO	

MODE: MANUAL			
T1	140°F	R1	50%
T2	120°F	R2	On
T3	125°F	R3	Off
T4	138°F	R4	Off
T5	150°F	U-F	1.8gpm
U-T	138°F	EXIT	

ERRORS			
E10:	NONE		
E11:	05/03/2012	10:24	02
CLEAR ALL ERRORS			

RELAY ACTIVITY			
	1hour	24hour	Total
R1	25m	4h	290h
R2	15m	2h	45h
R3	5m	8h	90h
R4	0m	0h	0h

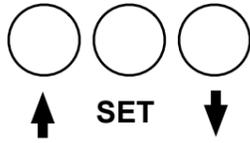
AVERAGE TEMPS			
	1hour	24hour	Total
T1	140°F	110°F	115°F
T2	120°F	120°F	120°F
T3	125°F	125°F	125°F
T4	138°F	138°F	138°F
T5	150°F	150°F	150°F

ENERGY OUTPUT			
Today			11kWh
7 days			65kWh
30 days			320kWh
Day Average			7.2kWh
Operating			55days

5. CONTROLLER OPERATION

5.1. CHANGING SETTINGS

- Press SET to enter function menu
- Press ↑ or ↓ to navigate menus
- Press SET to enter sub-menu
 - Press SET to edit setting
 - Press ↑ or ↓ to change value
 - Press SET to confirm
- Some functions can be turned OFF by exceeding the upper or lower range. They are identified by (↑↓) after the range.
- Press ↑ and ↓ together to **QUICK EXIT** to main screen



6. USER vs TECHNICIAN menus

USER menu allows the viewing and editing of **only basic** functions.

TECHNICIAN menu allows the viewing and editing of **all** functions.

- To change status, hold ↑ and ↓ together for 10 seconds
-  icon displayed on Main Screen for TECHNICIAN menu.
- Always return to USER menu when finished editing settings.

6.1. USER MENU

The following items are available in the USER menu.

- 6.1.1. TIME SET:** 24hour format. Set hours then minutes
- 6.2.2. DATE SET:** Select date format, then set date.
- 6.2.3. RESET DATA:** Reset quick display records (not SD card data).
- 6.2.4. DATA INTERVAL:** Set data recording interval (30sec - 60min).
- 6.2.5. BOOST:** Set AUTO or MANUAL boost operation.
 - Can also be toggled between AUTO or MANUAL settings by holding ↓ button for 5 seconds when at HOME screen.
 - Top of HOME screen shows A = Auto or M = Manual icon to indicate boost status.
 - To complete a single boost (or toggle ON/OFF) press and hold ↑ button for 5 seconds. Single boost will activate the relay and turn off once the BOOST OFF temperature setting has been reached.
 - Set to MANUAL boost mode when on holidays to avoid daily automatic boosting. SAFE BOOST and TANK MIN boosting will still operate in MANUAL mode.
- 6.2.6. BOOST TIME:** Only available if BOOST function configured.
 - Choose TIMER to set up to 2 daily timer periods for the BOOST operation. Only applicable when in AUTO boost mode.
 - Choose NOT SET to allow normal operation of the BOOST function.
 - Single Boost can be activated outside of set timer periods. It will run until BOOST OFF temperature is reached.

6.2. TECHNICIAN MENU

Following items (7 - 12) are only available in the TECHNICIAN menus.

7. SETUP

Software packs are available that provide different function sets allowing a wider variety of system configurations. All software packs share the following standard SETUP functions:

- 7.1. TIME SET:** 24 hour format. Set hours then minutes
- 7.2. DATE SET:** Select date format, then set date.
- 7.3. UNITS:** Select Metric (°C & Lpm) or US units (°F & Gpm).
- 7.4. ENERGY:** Select kWh or kBtu for energy recording.
- 7.5. SOFTWARE DEFAULT:** Reset controller to default settings.
- 7.6. RESET DATA:** Reset quick display records (not SD card data).
- 7.7. DATA INTERVAL:** Set frequency for data recording (5sec - 60min).
- 7.8. UPDATE SOFTWARE:** Upgrade to new/different software pack.
- 7.9. VER:** Displays the current installed software pack name.

8. SYSTEM - Relay function selection

- 8.1. RELAY 1:** Select YES if solar pump is installed.
- 8.2. R1 TYPE:** Select FIXED or VARIABLE speed pump control.
- 8.3. R1 SPEED:** Circulation pump speed based on R1 TYPE setting.
 - If VARIABLE, set minimum speed: Default: 50%, Range: 30~100%
 - If FIXED, set constant speed. Default: 100%
- 8.4. R1 FLOW:** Used to calculate solar energy output if no VFS is installed.
 - If VARIABLE, set Minimum and Maximum flow rates.
 - If FIXED, set constant flow rate.

8.5. R1 LIQUID: Select from WATER or OTHER. For OTHER liquids, such as glycol/water mixes, set an adjustment factor for the calculation of energy. The table below provides % values for glycol based liquids, refer to the full installation manual for more information.

- If OTHER set % value. Range: 50~100%

Glycol %	Adjustment %	Glycol %	Adjustment %
0% (plain water)	100%	30% glycol	95%
10% glycol	99%	40% glycol	92%
20% glycol	98%	50% glycol	89%

8.6. R1 TIMER: Set up to 2 daily operating periods (24hr time format).

8.7. RELAY 2/3/4: Select from BOOST, 2ND, EX-HEX, FLOW, FILL, POOL, TIME or NO (No function assigned)

8.8. R2,3,4 TIMER: Set up to 2 daily operating periods (24hr time format) for each relay.

8.9. VFS: Select VFS (Grundfos VFS flow meter) or NO.

- Select VFS model: 1-12, 2-40, 5-100, 10-200, 20-400

8.10. WATER LEVEL 1: Select from YES or NO for WL1 switch usage.

When water drops enough for WL1 float switch to provide signal, screen icon will change from  to  indicating water top-up is needed.

For automatic tank filling the FILL function must be assigned to a relay.

8.11. WATER LEVEL 2: Select from YES or NO for WL2 switch usage.

When water drops enough for WL2 float switch to provide signal, screen icon will change from constant  to flashing .

System shutdown occurs, Error 9 and 5 audible beeps will be sounded.

*Note on Relay Timers: Normal operation will **only** occur during timer periods. To disable timers, choose NOT SET.*

9. SOLAR - Settings to control solar collector circulation.

9.1. SOLAR: Settings to manage solar collector circulation.  icon will be displayed on the HOME screen once START TEMP is exceeded.

- **START:** If solar collector (T1) is above setting, monitor SOLAR-ON.
 - Default: 30°C / 86°F, Range: 20~80°C / 68~176°F (↑↓)
- **ON:** If T1-T2 ΔT is above setting, turn R1 solar pump ON.
 - Default: 8°C / 14°F, Range: 5~50°C / 9~90°F (↑↓)
- **OFF:** If T1-T2 ΔT is below setting, turn R1 solar pump OFF.
 - Default: 2°C / 4°F, Range: 2~40°C / 4~72°F (↑↓)

9.2. SOLAR IQ: Switches from reading collector temperature (T1) to return line (T4) for SOLAR ON/OFF operation after set period of solar pump (R1) operation.

- Set time delay to switch from T1-T2 to T4-T2 ΔT measurement.
 - Default: OFF, Range: 30~180 sec (↑↓)

Note: T4 must be installed close to tank on return (collector to tank) line. Not available if POOL function is used.

9.3. FREEZE: Circulates the solar pump to keep collector warm.

- **ON:** If T1 is below setting, turn R1 solar pump ON.
 - Default: OFF, Range: -20~4°C / -4~41°F (↑↓)
- **OFF:** If T1 is above setting, turn R1 solar pump OFF.
 - Default: OFF, Range: -10~20°C / 14~68°F (↑↓)

9.4. 2ND PUMP: Runs 2nd pump for set time period each time SOLAR ON activates R1 (For drain back systems)

- Set 2nd pump run time after R1 turns on.
 - Default: OFF, Range: 30~180sec

Note: If variable speed is active, 2nd pump will continue beyond run time if R1 is still at 100%, as siphon has not yet been achieved.

9.5. EX-HEX: After a set time delay turns ON tank side circulation pump for external HEX each time SOLAR ON activates R1.

- Set time delay before activating EX-HEX pump.
 - Default: OFF, Range: 5~60sec

9.6. COL MAX: Sets maximum operating temperature for solar loop.

- If solar collector (T1) is above 95°C / 203°F setting, turn solar operation OFF. Set below 100°C / 212°F for drain back systems.
 - Default: 95°C / 203°F, Range: 80~160°C / 176~320°F (↑↓)

10. TANK - Settings to control storage tank operation

10.1. TANK MAX: Solar input stops once this temperature is reached.

- If bottom of tank (T2) is above setting, turn solar operation OFF.
 - Default: 75°C / 167°F, Range: 65~85°C / 149~185°F (↑↓)
 - Rule: TANK MAX > BOOST OFF.

10.2. TANK MIN: Activates BOOST to prevent tank from freezing.

- If mid tank (T3) is below setting, BOOST ON.
 - Default: OFF, Range: 2~40°C / 35~104°F (↑↓)

Note: TANK MIN operates even outside TIMER periods and when MANUAL boost mode is active. Once ON, will turn OFF once BOOST OFF temperature (T3) setting is reached.

10.3. BOOST: External heat source boosting of storage tank.

- Choose from MANUAL or AUTO.
 - MANUAL: Only boosts by manual operation, refer to USER menu overview on page 1 for more details.
 - AUTO: Follows BOOST ON/OFF temperature settings.
- ON: If T3 below setting turn BOOST pump ON.
 - Default: 55°C / 131°F, Range: 40~70°C / 105~160°F
- OFF: If T3 active setting turn BOOST pump OFF.
 - Default: 65°C / 149°F, Range: 50~80°C / 120~180°F

11. POOL - Settings to control POOL heating (if assigned to relay)

11.1. POOL: Settings to control heating of pool. Required flow switch (pool flow) input to WL1 to start any pump activity. ~30sec delay before ON.

- START: If mid tank (T3) is above setting monitor POOL ON.
 - Default: 60°C / 140°F, Range: 40~70°C / 104~158°F
- ON: If pool flow (T4) is below setting, turn pump ON.
 - Default: 25°C / 86°F, Range: 20~45°C / 68~113°F
- OFF: If pool flow (T4) is above setting, turn pump OFF.
 - Default: 27°C / 80°F, Range: 22~50°C / 71~122°F

12. ERRORS - System error management

12.1. DISABLING ERRORS: Errors can be turned OFF if not used or not installed (i.e. Sensors T4 and T5 not used);

- E1-E6 have ON/OFF selection
- E7-E10 can be turned OFF by exceed the range temperatures.

12.2. ERROR OVERVIEW:

- **E1,2,3,4,5:** Failure of sensors T1,2,3,4,5 respectively, System Shutdown will occur & error recorded.
- **E6:** Failure of VFS input, System Shutdown will occur & E6 recorded.
- **E7 (TANK HIGH):** If tank (T2, T3 or T5) is above setting System Shutdown will occur and E7 recorded.
 - Default: 90°C / 194°F, Range: 65~95°C / 149~203°F
- **E8 (TANK LOW):** If mid tank (T3) is below setting E8 recorded.
 - Default: 10°C / 50°F, Range: 2~39°C / 36~102°F
- **E9 (LOW WATER):** If WL2 switch signal is provided E9 recorded and System Shutdown.

12.3. SYSTEM SHUTDOWN (SS): During System Shutdown:

- All relay activity is stopped
- Audible alarm for ~30 seconds
- Error message is displayed
- Backlit screen continually flashes.
- To return to normal operation all errors must be cleared in the Error Screen menu.

```

*IMPORTANT NOTICE*

SYSTEM HAS BEEN
SHUTDOWN
PLEASE CHECK ERRORS
PRESS SET TO EXIT
```

```

ERRORS
      ▲
E9: NONE
E10: 05/03/2012 10:24 01
CLEAR ALL ERRORS
      ▼
```

FUNCTION SETTINGS RECORD (FILL IN VALUES)

SYSTEM	
RELAY 1	
R1 TYPE	
R1 SPEED	
R1 FLOW (FIXED)	
R1 FLOW (MIN)	
R1 FLOW (MAX)	
R1 LIQUID	
% IF OTHER	
R1 TIMER 1 (ON-OFF)	
R1 TIMER 2 (ON-OFF)	
R2 RELAY USE	
R2 TIMER 1 (ON-OFF)	
R2 TIMER 2 (ON-OFF)	
R3 RELAY USE	
R3 TIMER 1 (ON-OFF)	
R3 TIMER 2 (ON-OFF)	
R4 RELAY USE	
R4 TIMER 1 (ON-OFF)	
R4 TIMER 2 (ON-OFF)	
VFS USE	
VFS MODEL	
WATER LEVEL 1	
WATER LEVEL 2	

SOLAR	
SOLAR START	
SOLAR ON	
SOLAR OFF	
SOLAR IQ	
FREEZE ON	
FREEZE OFF	
2ND PUMP	
EX-HEX TIME	
COL-MAX	
TANK	
TANK MAX	
TANK MIN	
BOOST (AUTO/MANUAL)	
BOOST ON	
BOOST OFF	
POOL	
POOL START	
POOL ON	
POOL OFF	

ERRORS	
ERROR 1 (T1 FAIL)	
ERROR 2 (T2 FAIL)	
ERROR 3 (T3 FAIL)	
ERROR 4 (T4 FAIL)	
ERROR 5 (T5 FAIL)	
ERROR 6 (VFS FAIL)	
ERROR 7 (TANK HIGH)	
ERROR 8 (TANK LOW)	
ERROR 9 (LOW WATER)	
CALIBRATE (SENSORS)	
CALIBRATE T1	
CALIBRATE T2	
CALIBRATE T3	
CALIBRATE T4	
CALIBRATE T5	