



Active Controlled Cooling System



User Manual

April 2011



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General Information

Safety

This manual contains important safety and operating instructions for the Active Controlled Cooling System (ACCS). Read all the instructions and cautions of this manual and on the label of the ACCS unit before using it.

To reduce the risk of electrical shock, fire, or injury operate ACCS in only the prescribed manner.

General Safety Guidelines:

- **While working on the ACCS and the system to be cooled, always wear protective clothing to cover all skin since the system may be hot after operation and there is a potential danger of burns.**
- **Always wear eye protection while adding or removing coolant.**
- **Always check all coolant hoses and fittings for possible leaks before turning on the ACCS.**
- **Replace coolant hoses if they seem to have cracks or appear to be brittle.**
- **Tighten the clamps on fittings if they have leaked or appear to be loose.**
- **Do not spill any fluid into the ACCS.**
- **Make sure a hose that leads to a drain is connected to the pressure release outlet in case the over-pressure valve opens.**
- **Do not use the ACCS with damaged power cords.**
- **Do not try to operate the ACCS if any visible damages can be seen on it.**

Introduction

The Active Controlled Cooling System (ACCS) is designed to cool electrical or mechanical systems that require a regulated temperature with coolant temperatures up to 105°C. Two versions are available for heat loads of 5kW (ACCS-5) or 10kW (ACCS-10). The rated amount of heat can be rejected over a temperature range of 60°C to 105°C. The coolant loop uses a finned radiator with powerful fans to reject the heat. The system can be controlled either through the easy to use front-panel interface or remotely through a USB computer interface.

The cooling system utilizes full digital control to allow tight regulation of the coolant flow rate and temperature. The controller senses the flow rate, the outlet and inlet pressure, and the outlet and inlet temperature. The system is designed for laboratory and industrial environments which require a tightly regulated coolant. The system features easy to access fill and drain ports, pressure relief valves, and large outlet and inlet ports. Additionally there are several measures taken to protect the unit from excessive pressure and to prevent boiling.

What's in the box?

Active Controlled Cooling System (ACCS-5 or ACCS-10)
CD with Computer Interface for Remote Operation
USB cable



Operation

System Setup

1. Connect all coolant lines between the ACCS and the system to be cooled:
 - a. Connect the coolant outlet of the ACCS to the coolant inlet of the system to be cooled
 - b. Connect the coolant inlet of the ACCS to the coolant outlet of the system to be cooled
 - c. Connect a hose that leads to a drain to the pressure release outlet of the ACCS
 - d. Make sure that the drain outlet of the ACCS is plugged securely
2. Follow the Filling Procedure (see below)
3. Run the Cooler (see Local Operation or Remote Operation below)

Filling Procedures

WARNING

DO NOT ATTEMPT TO FILL THE SYSTEM WITHOUT THE DEDICATED FILL-MODE, AS THE CLOSED LOOP FLOW SENSOR WILL NOT BE ABLE TO OPERATE CORRECTLY WHEN THERE IS STILL AIR IN THE SYSTEM, POTENTIALLY CAUSING INSTABILITY AND DAMAGE

1. Plug the power cord into a 120 Vac outlet.
2. Open the coolant reservoir by unscrewing the top screw.
3. Carefully fill the reservoir with coolant up to about $\frac{3}{4}$ of the way.
4. Turn on the ACCS and lower the flow rate setting until the display reads "Fill Mode".
5. Press the Pump Enable. The coolant will start to fill up the system to be cooled and the coolant hoses; therefore the reservoir coolant level will go down. As long as the coolant level keeps falling, continue refilling the reservoir until the coolant level stays constant. Note that the pump will turn off automatically if the coolant level drops below $\frac{1}{3}$ of the way. In that case more coolant needs to be added and the pump will resume running.
6. The filling procedure is done when the coolant comes back from the system to be cooled without air bubbles and the coolant level in the reservoir is about $\frac{3}{4}$ of the way. The reservoir can then be closed.

Local Operation

First check that the filling procedure has been done and that the coolant level of the ACCS shows that it is about $\frac{3}{4}$ full. Make sure that the Remote/Local switch is in Local mode. If the ACCS was not in Local mode and the ACCS was already turned on, turn it off, wait for 5 seconds, and move the Remote/Local switch to Local mode.

Turn on the ACCS by pressing the power switch on the lower left-hand side into the On-Position. After pressing "Pump Enable" the ACCS will pump coolant through the system. Adjust the flow rate and temperature set-point by pushing the respective buttons labeled with "+" or "-". If the display reads "Fill Mode", increase the flow set point to at least 6 LPM (liters per minute) for normal operation. It is recommended to enable the heater if the heat load is expected to be low compared to the heat load rating of 5kW (ACCS-5) or 10kW (ACCS-10). The internal heater will enable better temperature regulation of the cooler and allow the system to heat-up to higher temperatures more quickly. Note that the heater will not turn on if there is a fault and the flow rate is below 3 to 4 LPM or if the coolant level is lower than $\frac{1}{3}$. Check Figure 1: Front-Panel User Interface and Table 1: Interface Status for a picture and further information on the front-panel interface.

Front-Panel User Interface



Figure 1: Front-Panel User Interface

Display and Button Status Information

Function	Status	Physical Description	Interpretation
Power Switch	on	Toggle up / Red light on	Unit is powered up
	off	Toggle down / Light off	Wait 5 seconds for unit to turn off
Pump Enabled	on	Button is pushed in	Pump is enabled
	off	Button is pushed out	Pump is disabled
Heater Enabled	on	Button is pushed in	Heater is enabled
	off	Button is pushed out	Heater is disabled
Red LED	on	LED is ON	Heater is on
	off	LED is OFF	Heater is off
Temp	+	Increase/decrease Set Temperature	Screen displays Set: Temperature on the bottom center
	-		
Flow	+	Increase/Decrease Flow Rate	Screen displays Set: Flow rate on the bottom left
	-		
Toggle Switch	Remote	Toggle switch is up	When in this position use the USB PC Control port (System requires hard power reset for 5 seconds)
	Local	Toggle switch is down	When in this position use the chassis mounted interface (System requires hard power reset for 5 seconds)

Table 1: Interface Status

Coolant Connections

Figure 2 shows the rear panel of the cooler with the following connections for the coolant lines:

1. Coolant reservoir top screw
2. Coolant outlet (1/2" NPT)
3. Coolant inlet (1/2" NPT)
4. Pressure release outlet (1/2" NPT)
5. Coolant drain port (1/2" NPT)



Figure 2: Coolant Connections

Computer Setup for Remote Operation

1. Connect the ACCS and computer with a USB cable.
2. Wait until Windows asks for the driver of the detected new hardware.
3. For the driver location, point to the directory “USB driver” on the delivered CD.
4. Copy the folder “ApECOR ACCS” to any location of your computer.
5. Run ACCS.exe from within “ApECOR ACCS” that is now located on your computer.
6. If Windows shows an error message saying that it needs the .NET Framework installed, run the .NET Framework installer that is located on the CD in the folder “.NET Framework”. Follow the installation instructions and after it is finished, repeat Step 5. The software should now start up.

Remote Operation

Follow the instructions “Computer Setup for Remote Operation” shown above. Check that the filling procedure has been done and that the coolant level of the ACCS shows that it is about $\frac{3}{4}$ full. Make sure that the Remote/Local switch is in Remote mode. If the ACCS was not in Remote mode and the ACCS was already turned on, turn it off, wait for 5 seconds, and move the Remote/Local switch to Remote mode. Turn on the ACCS by pushing the power switch on the lower left-hand side into the On-Position. Connect a USB cable between the ACCS and the computer running the remote interface software. Start the software by executing ACCS.exe and in the bottom left-hand corner of the software interface select the COM port the cooler is connected to. After the right COM port was selected, the software will show that it is communicating to the cooler by showing the “Receiving” label in the bottom right-hand corner with a red background. The software interface is basically a copy of the front panel interface with the same controls and displays. The flow rate and temperature set point can be adjusted by clicking on the respective up or down buttons. See Figure 3 for a picture of the software. Refer to the chapter on “Local Operation” above for more information on the operation of the cooler.

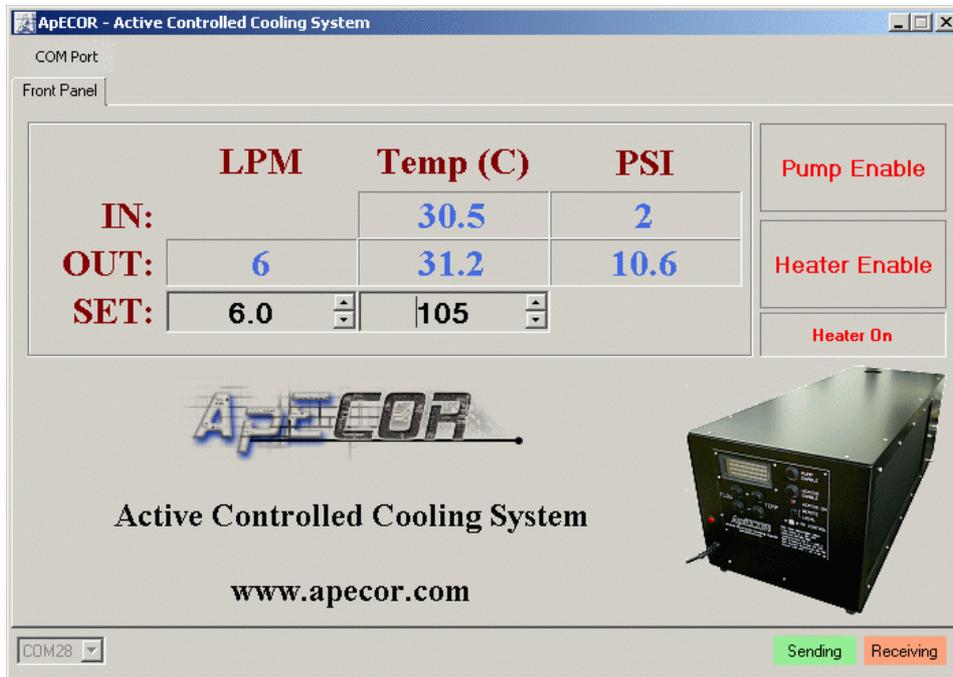


Figure 3: Software Interface



Trouble Shooting

<u>Condition</u>	<u>Possible Causes</u>	<u>Solutions</u>
Front panel display is off	Power switch is off	Turn on the power switch so that the light turns on.
	The unit is not connected to 120 Vac	Connect the power cord to Vac
Cooler does not respond to changes on the front panel	Unit is in Remote Operation	Follow the procedure in chapter "Local Operation"
Cooler does not respond to changes in the software interface	Unit is in Local Operation	Follow the procedure in chapter "Remote Operation"
	The software is not communicating to the cooler	Check if the USB cable is connected Check if the cooler is turned on
The pump does not turn on after pushing "Pump Enable"	The coolant level in the reservoir is too low	Follow the procedure in chapter "Filling Procedure"
The Heater LED does not turn on after pushing "Heater Enable"	The coolant level in the reservoir is too low	Follow the procedure in chapter "Filling Procedure"
	The flow rate is too low	If display reads "Fill Mode", increase flow set point to at least 6 LPM Check if the coolant lines are constricted anywhere in the system and fix possible problems
The measured flow rate does not reach the flow rate set point	The pressure drop in the system is too high	Use hoses with larger diameter and avoid tight bends
		Set the flow rate to lower values

Table 2: Trouble Shooting

Maintenance

The ACCS has no serviceable parts. The surfaces of the cooler can be cleaned with a damp non-abrasive cloth and allowed to air dry or wiped with a clean dry non-abrasive cloth.



Features

Flow Rate Control

The ACCS actively controls the flow rate to the set point specified by the user as long as the system temperature and pressure is within the maximum operating conditions.

Temperature Control

The ACCS actively limits the outlet coolant temperature to the temperature set point. Furthermore it actively regulates the temperature as long as the heater is enabled or the system to be cooled generates enough heat so that the temperature can be kept up to the set point. The ACCS-5 can dissipate 5kW and the ACCS-10 can dissipate 10kW over a temperature range from 60°C to 105°C while the flow rate can be anywhere between 6 and 15 LPM. If the heat load is less than the rated amount, the ACCS can cool down the system to below 60°C. If the heat load is higher than the rated amount, the fans will keep spinning at maximum speed. Therefore the user has to make sure that the ACCS is not overloaded with too much heat.

Over-Pressure Protection

The ACCS uses two protection devices in order to prevent excessive pressure build-up and to prevent coolant from boiling: A pressure accumulating chamber and a pressure release valve. The valve opens up when pressure exceeds 60 PSI in the system. The pressure accumulating chamber equalizes the pressure created by the coolant while it was heating up and cooling down.

Computer Interface

The cooler can be operated remotely with a computer interface using a USB cable. In chapter “Remote Control” it is described how to set up and use the computer interface. The computer interface has the same controls and displays the same information as the front-panel interface.



Technical Specifications

The absolute maximum ratings and recommended operating conditions are shown below. For further technical information please consult the datasheet of the ACCS.

Absolute Maximum Ratings

	Parameters	Max.	Units
V_{in}	Input Voltage	130	Vac
I_{in}	Input Current	20	Arms
I_o	System Pressure	60	PSI
T_A	Ambient Operating Temperature	35	°C
T_{out}	Outlet Coolant Temperature	105	°C
T_{in}	Inlet Coolant Temperature	132.6	°C

Table 3: Absolute Maximum Ratings

Recommended Operating Conditions

	Parameters	Min.	Typ.	Max.	Units	Conditions
V_{in}	Input Voltage	100	120	130	Vac	⁽¹⁾
F_r	Flow rate	6	-	15	LPM	
I	Heat Load	-	-	5	kW	ACCS-5
				10	kW	ACCS-10
T_{in}	Inlet Temperature	-	-	132.6	°C	
T_{out}	Outlet Temperature	60	-	105	°C	
	Coolant Type	30%	50%	70%	EGW	⁽²⁾
T_A	Ambient Operating Temperature	-	-	35	°C	
ΔP_{max}	Max Outlet Pressure Drop	-	-	15	PSI	⁽²⁾
P_{heater}	Auxiliary Heater Power	-	1000	-	W	

Table 4: Operating Characteristics

Notes:

⁽¹⁾ 240 Vac version available

⁽²⁾ 50% EGW, contact Apecor for other coolant options



Warranty Statement

The Active Controlled Cooling Unit is warranted to be free from defects in material and workmanship for a period of TWO (2) years from the date of shipment to the original end user. ApECOR will, at its option, repair or replace any such defective products.

Claim Procedure

- Before requesting warranty service, check the User Manual to be certain that there is a problem with the system. Contact ApECOR to request Returned Material Authorization (RMA). Return the defective product to your authorized ApECOR distributor with shipping charges prepaid. Provide proof of date and place of purchase.
- To obtain service under this warranty, the returned product must include the model, serial number and detailed reason for the failure. This information is critical to a rapid disposition of your warranty claim.
- ApECOR will pay the return shipping charges if the repairs are covered by the warranty.

Warranty Exclusions and Limitations

This warranty does not apply under the following conditions:

- Damage by accident, negligence, abuse or improper use.
- Unauthorized opening, modification, or attempted repair of the product.
- Damage occurring during shipment.

THE WARRANTY AND REMEDIES SET FORTH ABOVE ARE EXCLUSIVE AND IN LIEU OF ALL OTHERS, EXPRESSED OR IMPLIED. APECOR SPECIFICALLY DISCLAIMS ANY AND ALL IMPLIED WARRANTIES, INCLUDING, WITHOUT LIMITATION, WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

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