RCS40 and RCS90 Refrigerated Cooling Systems

Q Series™ Getting Started Guide

Revision H
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Notice

The material contained in this manual, and in the online help for the software used to support this instrument, is believed adequate for the intended use of the instrument. If the instrument or procedures are used for purposes other than those specified herein, confirmation of their suitability must be obtained from TA Instruments. Otherwise, TA Instruments does not guarantee any results and assumes no obligation or liability. TA Instruments also reserves the right to revise this document and to make changes without notice.

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Notes, Cautions, and Warnings

This manual uses NOTES, CAUTIONS, and WARNINGS to emphasize important and critical instructions.

A NOTE highlights important information about equipment or procedures.

A CAUTION emphasizes a procedure that may damage equipment or cause loss of data if not followed correctly.

A WARNING indicates a procedure that may be hazardous to the operator or to the environment if not followed correctly.

Regulatory Compliance

Safety Standards

RCS90 Safety Standards

For Canada:

CAN/CSA-22.2 No. 1010.1-92 Safety requirements for electrical equipment for measurement, control, and laboratory use, Part 1: General Requirements + Amendments.

For the European Economic Area: (In accordance with Council Directive 73/23/EEC of 19 February 1973 on the harmonization of the laws of Member States relating to electrical equipment designed for use within certain voltage limits.)

EN61010-1: 1993 Safety requirements for electrical equipment for measurement, control, and laboratory use, Part 1: General Requirements + Amendments.

For the United States:

UL3101-1 Electrical Equipment for Laboratory Use; Part 1: General Requirements.

RCS40 Safety Standards

For the European Economic Area: (In accordance with Council Directive 73/23/EEC of 19 February 1973 on the harmonization of the laws of Member States relating to electrical equipment designed for use within certain voltage limits.)

EN61010-1: 2001, Rev 9/19/03, Safety requirements for electrical equipment for measurement, control, and laboratory use, Part 1: General Requirements.

For the United States and Canada:

CSA/UL 61010-1, Second Edition, Rev 7/22/05, Electrical Equipment for Laboratory Use; Part 1: General Requirements.

Electromagnetic Compatibility Standards

RCS90 Electromagnetic Compatibility Standards

For Australia and New Zealand:

AS/NZS 2064: 1997 Limits and methods of measurement of electronic disturbance characteristics of industrial, scientific and medical (ISM) radiofrequency equipment.

For Canada:

ICES-001 Issue 3 March 7, 1998 Interference-Causing Equipment Standard: Industrial, Scientific, and Medical Radio Frequency Generators.

For the European Economic Area: (In accordance with Council Directive 89/336/EEC of 3 May 1989 on the approximation of the laws of the Member States relating to electromagnetic compatibility.)

EN61326-1: 1997 Electrical equipment for measurement, control, and laboratory use-EMC requirements-Part 1: General Requirements + Amendments (for class A equipment).

For the United States:

CFR Title 47 Telecommunication Chapter I Federal Communications Commission, Part 15 Radio frequency devices (FCC regulation pertaining to radiofrequency emissions).

RCS40 Electromagnetic Compatibility Standards

For Australia and New Zealand:

AS/NZS 2064: 1997 Limits and methods of measurement of electronic disturbance characteristics of industrial, scientific and medical (ISM) radiofrequency equipment.

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EN61326-1: 1997 Electrical equipment for measurement, control, and laboratory use-EMC requirements-Part 1: General Requirements + Amendments (for class A equipment).

For the United States:

CFR Title 47 Telecommunication Chapter I Federal Communications Commission, Part 15 Radio frequency devices (FCC regulation pertaining to radiofrequency emissions).

Safety

CAUTION: The operator of this instrument is advised that if the equipment is used in a manner not specified in this manual, the safety protection designed into the equipment may be impaired.

CAUTION: Due to the size and weight of the cooling accessory, the RCS should always be lifted by two people to prevent injury. Do not slide the RCS as this may damage the feet on the unit. Use two people to lift the RCS when moving it to another position.

CAUTION: The cooling head assembly contains coated fiberfrax material. Excessive handling of this material could cause fiberfrax particles to be emitted into the air. See http://www.tainstruments.com for MSDS sheet for safety information.

CAUTION: The RCS contains hazardous materials (*i.e.,* flammable refrigerants). Contact TA Instruments prior to packaging for shipment.

CAUTION: The manufacturer's documentation shall state which potentially poisonous or injurious gases can be liberated, and the quantities. These gases are as follows:

RCS40/FC40: Isceon 89, Approximately 175G
RCS90/FC100: 1st Stage R1270, (Propylene), approximately 14G
2nd Stage (Blend) R1150 (Ethylene) & R290 (Propane), approximately 22G

Electrical Safety

You must unplug the instrument before doing any maintenance or repair work; voltages as high as 120/240 volts AC are present in this system.

WARNING: High voltages are present in this instrument. Maintenance and repair of internal parts must be performed only by TA Instruments or other qualified service personnel.

Water Condensation

WARNING: Some of the DSC and RCS surfaces get cold during use of the RCS. The cold surfaces can cause condensation and, in some cases, frost to build up. This condensation may drip to the floor. Provisions to keep the floor dry should be made. A slipping hazard may result if the condensation is not cleaned up.

Thermal Safety

The cell surfaces can be hot enough to burn the skin during a sample run. If you are conducting a subambient test on the DSC, cold could also cause injury. After running any type of experiment, you must allow the DSC cell to return to room temperature before you touch the inner cell surfaces.

CAUTION: Some surfaces of the RCS and DSC system may get extremely cold during the use of the RCS for cooling experiments. This presents a danger to exposed skin coming in contact with and adhering to the cold surfaces. We recommend that you do not remove the DSC lids when the instrument is at subambient temperatures to prevent moisture buildup in the system. However, if you do remove the lids or handle any cold surfaces, use forceps or gloves to prevent injury.

Temperature Range

WARNING: Do not exceed 100°C with the RCS cooling head installed and the RCS power off. Serious damage and/or injury could occur.

CAUTION: Do not use the RCS when running isothermal experiments above 400°C. Damage to the unit can occur if used at high temperatures for extended periods.

Chapter 1
Introducing the RCS

Overview

The Refrigerated Cooling Systems (RCS) are used to perform DSC cooling experiments. There are two different models offered by TA Instruments—the RCS90 and the RCS40. Both models have a cooling head, which is made up of an internal heat exchanger, anti-condensate heaters, and various other components. The cooling head fits over the DSC cell. The RCS coolers are not compatibile with the Q20P or Q10P or the DSC pressure cell.

CAUTION: The RCS coolers are not compatible with the accessory outlets on the back of the instrument due to power requirements.

- The RCS90 (shown in the figure to the right) consists of a two-stage, cascade, vapor compression refrigeration system with an attached cooling head. The RCS90 can be used for experiments requiring cooling within an operating range of -90°C to 550°C. The maximum rate of cooling depends on the temperature range of your experiment.

RCS90 with DSC Q1000

- The RCS40 (shown in the figure below) consists of a single-stage vapor compression refrigeration system with an attached cooling head. The RCS40 can be used for experiments requiring cooling within an operating range of -40°C to 400°C. The maximum rate of cooling depends on the temperature range of your experiment. (NOTE: The RCS40 is compatible with the DSC Q2000, Q200, and Q20 only.)

RCS40

Specifications

The specifications in Tables 1 and 2 apply to the Refrigerated Cooling System.

Table 1
Technical Specifications

Specification	RCS90	RCS40
Instrument Compatibility	DSC Q2000/Q200/Q20 DSC Q1000/Q100/Q10	DSC Q2000/Q200/Q20
Size Height Width Depth	 46 cm (18 in.) 26 cm (10 in.) 51 cm (20 in.)	 26 cm (10 in.) 26 cm (10 in.) 51 cm (20 in.)
Power Requirements	120 Vac/12 A/60 Hz 220 Vac/6 A/50 Hz	120 Vac/6.25 A/60 Hz 220 Vac/4 A/50 Hz
Weight	47.7 kg (105 lbs)	24.8 kg (55 lbs)
Cooling Capacity	–90°C	–40°C
Feed Hose	120 centimeters (4 ft) insulated from RCS to cooling head	120 centimeters (4 ft) insulated from RCS to cooling head
Refrigerants	1st Stage R1270, (Propylene), approximately 14G. 2nd Stage (Blend) R1150 (Ethylene) & R290 (Propane), approximately 22G.	Isceon 89, Approximately 175G.
Clearance	Additional clearance 45 to 60 cm (18 to 24 inches) is recommended above the RCS to allow routing of the cooling line to the instrument without putting undue stress on the line. Additional clearance 15 to 30 cm (6 to 12 inches) is also recommended at the back and on the two sides to allow adequate dissipation of heat from the RCS condenser.	
Operating Environment Conditions	Temperature: 15–30 °C Relative Humidity: 5–80 % (non-condensing) Installation Category II Pollution Degree 2 Maximum Altitude: 2000 m (6560 ft)	

Table 2, on the next page, shows the performance specifications for RCS/DSC cooling.

Table 2
RCS/DSC Performance Specifications

Specification	RCS90	RCS40
Temperature Range	–90°C to 550°C	–40°C to 400°C
Linear Cooling Rates	Cooling rates available will vary depending on the temperature range. As a general guideline, cooling rates greater than 45°C/min can be achieved over the range 400 to 100°C and cooling rates of 5°C/min can be achieved over the range 400 to –70°C.	Cooling rates available will vary depending on the temperature range. As a general guideline, cooling rates from 36°C/min to 10°C/min can be achieved over the range from 300 to 0°C and cooling rates from 10°C/min to 4°C/min can be achieved over the range 0 to –25°C.
Ballistic Cooling	Ambient to –90°C 15 to 18 minutes	Ambient to –40°C 12 to 15 minutes

CAUTION: We recommend that you do not use the RCS when running isothermal experiments above 400°C. Damage to the unit can occur if used at high temperatures for extended periods.

Chapter 2
Installing the RCS

Installation of the RCS includes mounting the cooling head assembly on the DSC cell, connecting a base purge gas to the DSC and conditioning the system to remove moisture. Each of these steps is described in the following sections.

CAUTION: Due to the size and weight of the cooling accessory, the RCS should always be lifted by two people to prevent injury. Do not slide the RCS as this may damage the feet on the unit. Use two people to lift the RCS when moving it to another position.

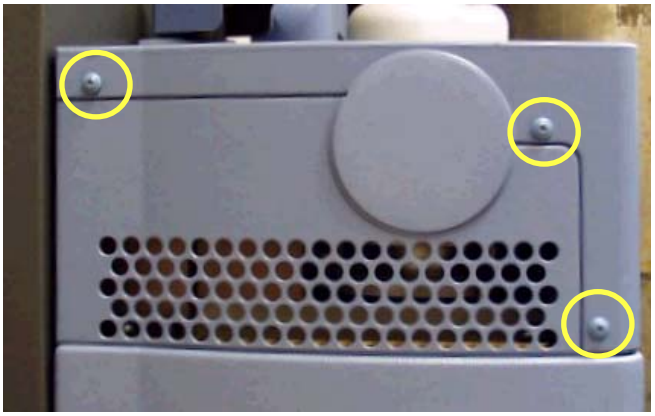
Mounting the RCS Cooling Head

The RCS unit connects to the DSC cell via a cooling head. This cooling head is made up of an internal heat exchanger, anti-condensate heaters, and various other components. The following steps describe the procedure for making the connection between the DSC and the RCS unit.

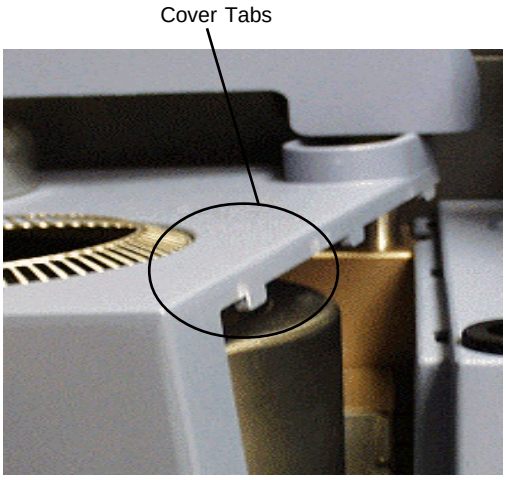
NOTE: Since the RCS creates cold surfaces that could serve as condensation sites for any moisture which is present, it is important that the conditioning procedure described on page 18 be followed when initially mounting the RCS cooling head or anytime the cooling head is removed and remounted.

1. Remove the lid(s). Manually remove the lids or select the Control/Lid/Open function to raise the AutoLid from the cell and move it out of the way.

2. Pull the plug on the side of the cover out to remove it. Then remove the screws attaching the cell cover to the unit cover (see the figure to the right). Three screws are located on the side (Q2000/Q1000) and one is located on the top. Retain the screws.



DSC Cover Screws



Autosampler Cover Tabs

3. If your instrument has an Autosampler installed, lift up the cover to release the tabs and pull the cover towards you to remove it fully (shown in the figure to the left).

If you do not have an Autosampler, you will have to remove additional screws to release the cover. Then pull the cover towards you to remove it fully. The cell will be exposed.

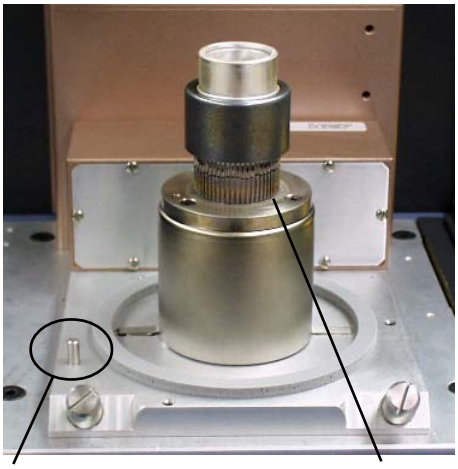
NOTE: For optimum performance it is important that the cell and RCS surfaces not be damaged or compromised.

4. Verify that the DSC cell's two surfaces on the top of the silver block are not damaged or compromised. If any irregularities such as dents, buildup, contaminants, or oxidation are observed in the silver, redress the surfaces until smooth, flat, and clean. (Contact your local TA Instruments Service Representative for details on redressing the cell.)

5. Verify that the DSC cell cooling flange and the matching surface of the RCS cooling head are not damaged or compromised. If any irregularities such as dents, buildup, contaminants, or oxidation are observed, redress the mating surfaces until smooth, flat, and clean. (Contact your local TA Instruments Service Representative for details on redressing the cell.)

6. Position the RCS refrigeration unit to the left of the DSC.

NOTE: For the most effective operation the RCS should be on a separate bench and at the same level as the DSC. Mounting the RCS below the level of the DSC will deteriorate cooling performance.



Exposed DSC Cell

7. Align the pin on the cell base (shown in the figure to the right) with the corresponding slot in the RCS cooling head and carefully lower the cooling head over the cell. Be particularly careful to avoid bumping the top surface of the cell with the cooling head. Any damage to the cell surface could adversely affect subsequent performance.

8. Make sure that the bottom of the cooling head fully seats on the cell base plate. If it does not, check the Teflon® ring in the cooling head for damage. Replace the ring, if needed.

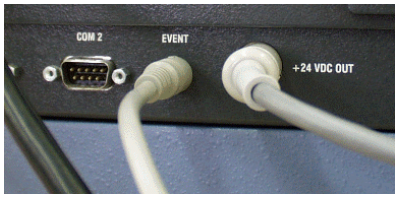
9. Obtain a long 5/32-inch hexagonal (Allen) wrench from the accessory kit.

10. Insert the tip of the wrench into any one of the three captive screws in the RCS plate while holding onto the cooling head. (See the figure to the right.) You will need to push down while you tighten the screw a few turns. DO NOT fully tighten yet.

Installing the Cooling Head

11. Repeat step 10 for the two remaining captive screws. After you have started each screw, go back and tighten down all three screws until you feel them touch the bottom. Do not over tighten.

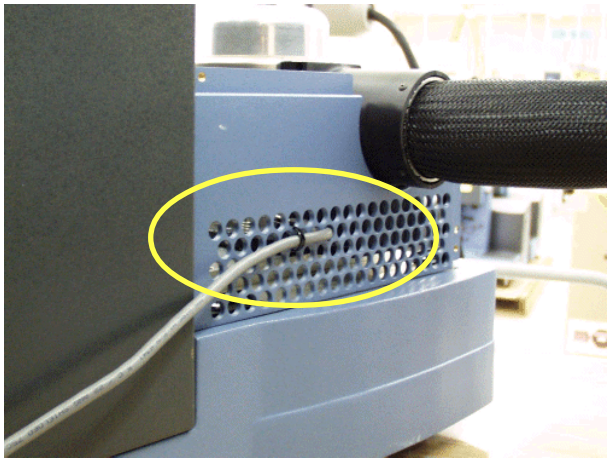
12. Obtain the RCS heater cable from the kit. Plug the connector into the +24 Vdc Out port on the back of the instrument as shown in the figure below.



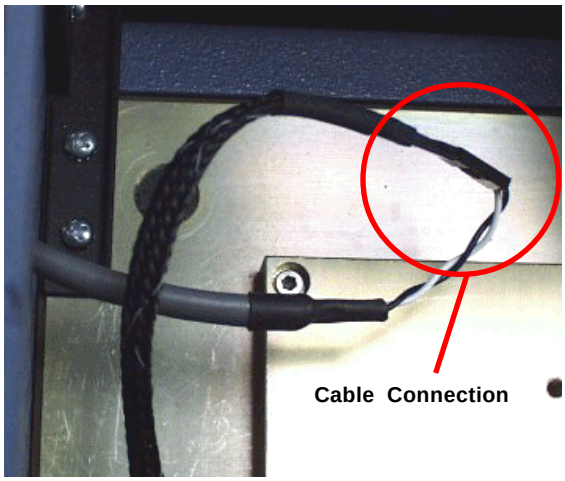
13. Route the cable around the side of the instrument and thread it through one of the holes in the cabinet side panel. We recommend using the second row of holes as shown in the figure to the right to allow ample space for the tie wrap.

14. Secure the cable to the side panel using the tie wrap found in the kit. Cut off the excess plastic on the inside of the panel.

15. Plug the heater connector into the cable connector as shown in the figure below.



Heater Cable Secured



16. Make sure that the insulated connection hose between the RCS and the cooling head is not sharply bent or folded. It should curve gently.

17. Slide the cover back over the cell and replace the screws removed originally.

18. Verify that the instrument control Event switch is set to "off."

19. Obtain access to the back of the RCS and the back of the instrument.

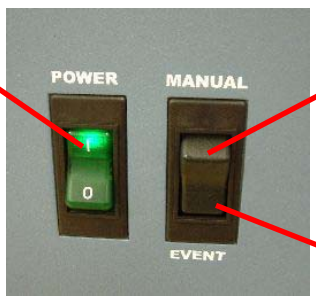
20. Connect the RCS Event Control port to the DSC Event Control port using the event cable. The red lead is connected to the red port on the left and the black lead is connected to the black port as shown in the figures to the right.

21. Plug the power cable into the back of the RCS and into a power outlet.

RCS90 Event Cable Connections

RCS40 Event Cable Connections

RCS90



RCS40

22. Set the RCS control switch to EVENT (see the figures to the left).

NOTE: The EVENT setting allows the RCS to be controlled by the system software. MANUAL keeps the RCS turned on continuously until it is manually shut off by the operator.

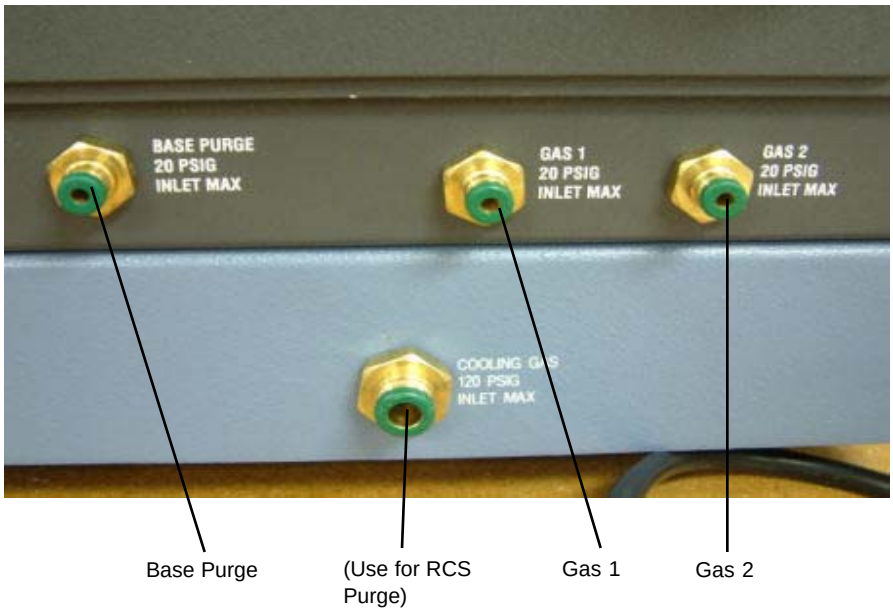
23. Check the AutoLid alignment and adjust, if needed. See "Aligning the AutoLid" in Chapter 3 of the *DSC Q Series™ Getting Started Guide* for the procedure.

24. Connect the base purge line as directed in the next section.

Connecting the Base and RCS Purge Lines

Two other purges are required in addition to the standard DSC cell purge when the Refrigerated Cooling System (RCS) is used. One purge, the Base Purge, is used to continuously purge the base of the cell. The other purge, the RCS Purge, is used to automatically purge the interior of the RCS cooling head when the cell is open during loading/unloading samples under DSC Autosampler control and during cell conditioning. Follow the instructions below to connect the lines for those purges.

1. Locate the Base Purge port. It is one of the four ports on the right rear of the instrument as shown in the figure below.



Four Ports on the Right Rear of the DSC

2. Make sure that the pressure of your gas source is regulated to 140 kPa gauge (20 psig). Dry nitrogen is the recommended gas.

3. Use 1/8-inch O.D. tubing to connect the gas source to the Base Purge. Teflon® TFE tubing is recommended. An orifice in the instrument will automatically regulate the flow rate (300 to 350 mL/min) for proper operation.

4. Locate the Cooling Gas port on the right rear of the instruments (as shown in the figure above). The RCS Purge will be connected to that port.

5. Make sure that the pressure of your gas source for the RCS Purge is also regulated to 140 kPa gauge (20 psig). Dry nitrogen should be used.

NOTE: Since both the Base Purge and RCS Purge could be exposed to temperatures below ambient, the gases used should be moisture-free. Nitrogen gas of 99.999% purity is recommended.

6. Use 1/4-inch O.D. tubing to connect the gas source to the Cooling Gas port for the RCS Purge. Teflon® TFE tubing with Swagelock fittings is recommended. A solenoid valve automatically regulated by the Advantage Q Series™ software determines when the RCS Purge is on. An orifice in the instrument automatically regulates the flow rate.

Starting the RCS

Once the RCS has been properly installed, follow the steps below to set up the instrument parameters and condition the RCS-DSC system for optimum performance.

1. Select the correct cooler type [*e.g.*, RCS (90) or RCS (40)] on the **Tools/Instrument Preferences/DSC Page** of the DSC instrument control software. (NOTE: The RCS40 is compatible with the DSC Q2000, Q200, and Q20 only.)

2. Verify that a source of dry nitrogen is connected to the Base Purge, Cooling Gas (RCS Purge), and Gas 1 ports on the back of the DSC instrument.

3. Dry the RCS system before turning on the RCS by following Step 1 of the conditioning procedure found in the next section, "Conditioning the RCS."

4. Verify that the RCS control switch on the RCS is set to EVENT (see page 15) and turn the power switch to ON (|). This will turn the compressor on and begin cooling the cell. Once the RCS second stage compressor has started (a few minutes later), the flange temperature will cool rapidly to its operating temperature.

   NOTE: The EVENT setting allows the RCS to be controlled by the instrument control software. MANUAL keeps the RCS turned on continuously until it is manually shut off. The EVENT setting allows the software to turn off the RCS in the event of a problem situation, thereby protecting against accidental moisture buildup.

5. Verify that the post-test conditions (accessed through the **Procedure Page** by clicking the **Post Test** button) are set as desired. A temperature window above ambient should be used to prevent the cell from cooling down between experiments (*e.g.*, typical values are 35 to 50°C). Once these conditions are verified, select the **Go To Standby Temp** from the **Control** menu to invoke the standby temperature specified.

   NOTE: The DSC cell should be covered when not loading samples and should not be opened below ambient temperatures.

6. Proceed to Step 2 of the conditioning procedure found in the next section, "Conditioning the RCS" to further stabilize the DSC-RCS system after installation. This cyclic experiment allows the DSC-RCS system to stabilize resulting in optimized baseline and calibration.

7. Recalibrate the DSC after conditioning the system.

   NOTE: When setting up experiments, be sure to verify the post-test conditions. A temperature window above ambient should be used to prevent the cell from cooling below ambient between experiments.

Conditioning the RCS System

Each time the RCS cooling head is installed on the DSC the following conditioning procedure should be run before calibration and experiments are performed. The first step of conditioning is used when the system is first installed and periodically thereafter to dry the system to remove moisture in the DSC cell and cooling head **BEFORE** turning on the RCS. The second step is used to stabilize the DSC-RCS system by cycling the system to optimize baseline performance.

Step 1: Drying the System

Follow the instructions below:

1. Verify that the DSC cell is empty and cover the cell. If an AutoLid mechanism is present, verify that the lids are seated properly. (Refer to "Aligning the AutoLid in the online help for instructions to align the lid, if needed.)

2. Access the **Tools/Instrument Preferences/Cooler** page of the DSC instrument control software. Verify that the correct cooler type (RCS40 or RCS90) is selected, check "Leave RCS on." (NOTE: The RCS40 is compatible with the DSC Q2000, Q200, and Q20 only.)

3. Check "Activate secondary purge when lid is opened (RCS and LNCS only)," if desired. The RCS Purge will automatically turn on whenever the cell is opened by the AutoLid. (NOTE: This feature is not applicable to DSC instruments that have manual lids.) It is strongly recommended that the cell lids be in place anytime that a sample is not being actively loaded or unloaded.

4. Select **Tools/Instrument Preferences/DSC** page of the DSC instrument control software and verify the desired "Standby Temperature."

5. If you have an Autosampler, select **Tools/Instrument Preferences/Autosampler** page and clear the "RCS (Event) Off" box (leave box blank) as a sequence stop option. This will allow the RCS event function to operate.

6. Using the DSC instrument control software, access the **Experimental View Summary Page**. Select the "Standard" mode, then select the "Cell/Cooler Conditioning" test template from the list. This test is performed with the RCS off.

7. Click on the **Procedure Page**.

8. Set the default conditions of 120 minutes at 75°C and select **Apply**. These conditions are suitable for typical situations.

9. Access the **Post Test Parameters** window and enter a temperature range window of 35 to 50°C to return the cell to slightly above ambient. Once the RCS is operating, it is very important that the cell is always kept slightly above ambient temperature before and after experiments.

10. Start the experiment.

11. Upon completion of this experiment, the base and cell purges must remain on continuously. If the purges do not remain on, the atmospheric moisture will contaminate the system and, depending on the time involved and relative humidity, the procedure may have to be repeated. The base purge is automatically active when the RCS is selected as the cooler type.

Step 2: Stabilizing the System

The following cyclic experiment is performed after the first step in order to allow the DSC-RCS system to stabilize, resulting in optimized baselines and calibration.

1. Select **Control/Event/On** from the menu. This will turn the compressor on and begin cooling the cell. Once the RCS second stage compressor has started (a few minutes later), the flange temperature will cool rapidly to its operating temperature.

2. Verify the instrument preferences and post-test conditions as outlined in steps 2 and 6 in the previous section "Drying the System."

3. Verify that the cell is emptied and cover the cell.

4. Observe the Signal Display pane. Verify that "Set Point Temperature" displayed is at the midpoint value of the Temperature Range specified on the **Post Test Parameters** window. This indicates that the post test temperature control is active. If the post test temperature control is not active (*i.e.*, the "Set Point Temperature" reads 0.00°C), select **Go to Standby Temp** from the **Control** menu to invoke the standby temperature set on the **Instrument Preferences/DSC Page**.

5. Create and save the following "Custom" method:

    1 Data Storage On
    2 Equilibrate 50°C
    3 Isotherm 60 minutes
    4 Mark end of cycle
    5 Equilibrate 400°C
    6 Mark end of cycle
    7 Isotherm 10 minutes
    8 Mark end of cycle
    9 Equilibrate –90°C (for RCS90) or Equilibrate –40°C (for RCS40)
    10 Mark end of cycle
    11 Isotherm 10 minutes
    12 Mark end of cycle
    13 Ramp 20°C/min to 400°C
    14 Mark end of cycle
    15 Isotherm 10 minutes
    16 Repeat segment 8 for 9 times

6. Start the experiment created in step 5 as soon as the flange temperature has decreased below 100°C. The flange temperature must be below 100°C when operating an RCS. If the run is started when the flange is above 100°C, then an error message will be posted and the run will be terminated. During normal operation the flange temperature should be less than –25°C at the start of a run.

After conditioning the RCS (by performing both the drying and stabilization steps), evaluate the last baseline run in the method above for any artifacts. Calibrate the DSC *before* running experiments using the RCS. See the DSC online help for details.

Chapter 3
Use & Maintenance

Guidelines When Using the RCS

Once the RCS is properly installed, the system conditioned and calibrated, the following guidelines should be maintained during standard experimental operation.

- Verify that the RCS switch is set to EVENT on the RCS unit. To turn on the RCS, select **Event/On** from the **Control** menu.
- A dry, moisture-free gas source is required as the base purge and RCS purge when using the RCS, in addition to the standard purge gas. Dry nitrogen is recommended for these purges. These gases must remain on continuously. If they do not, the atmospheric moisture will enter and contaminate the system.
- Access the **Tools/Instrument Preferences/Cooler** page of the DSC instrument control software. Verify that the correct cooler type (RCS40 or RCS90) is selected, check "Leave RCS on." (NOTE: The RCS40 is compatible with the DSC Q2000, Q200, and Q20 only.)
- Check "Activate secondary purge when lid is opened (RCS and LNCS only)," if desired. The RCS Purge will automatically turn on whenever the cell is opened by the AutoLid. (NOTE: This feature is not applicable to DSC instruments that have manual lids.) It is strongly recommended that the cell lids be in place anytime that a sample is not being actively loaded or unloaded.
- Select **Tools/Instrument Preferences/DSC** page of the DSC instrument control software and verify the desired "Standby Temperature."
- If you have an Autosampler, select **Tools/Instrument Preferences/Autosampler** page and clear the "RCS (Event) Off" box (leave box blank) as a sequence stop option. This will allow the RCS event function to operate. NOTE: Autosampler sequence stop options are invoked even for a one run sequence when the Autosampler is enabled.
- When setting up experiments, be sure to verify the post-test conditions. The temperature window should be enabled and a temperature range above ambient should be used to prevent the cell from cooling down between experiments.
- DO NOT open the DSC cell at below ambient temperatures.
- Once the DSC-RCS system has been conditioned, DO NOT turn off the RCS unless the system will not be used for an extended period of time (for more than 2 or 3 days). It is recommended that you do NOT turn off the RCS between runs or for overnight periods for optimal performance.
- Operating without an effective base purge, allowing the cell to remain at the lower temperature limit without heater power (*e.g.*, without post-test conditions) for extended periods of time, and/or removing the RCS from the cell when the flange temperature is below ambient can result in excessive moisture in the cell and requires extended conditions for drying such as performing Step 1 of the conditioning procedure found in the section, "Conditioning the RCS" on page 18. In those cases, the system must be dried for much longer times.

WARNING: Do not exceed 100°C with the RCS cooling head installed and the RCS power off. Serious damage and/or injury could occur.

CAUTION: Do not use the RCS when running isothermal experiments above 400°C. Damage to the unit can occur if used at high temperatures for extended periods.

NOTE: Once the cooling flange reaches operating temperature (–90°C for RCS90 or –40°C for RCS40), it condenses any moisture present. If the initial moisture level is too high, or if the atmosphere moisture subsequently entering the cooling head enclosure is not minimized, then artifacts can be observed in the heat flow signals. Typically, but not exclusively, the artifacts are observed between 0 and 100°C, which increase in intensity over time.

Maintaining the RCS

There is very little maintenance involved with the Refrigerated Cooling System. This section discusses general cleaning and fuse replacement, if there are problems with the RCS that this manual does not address, contact TA Instruments for service.

Cleaning the RCS

The only cleaning needed is on the outside of the unit. Wipe the surface of the unit with a damp cloth to remove any dust buildup. Make sure that the back of the RCS unit stays free of dust and debris to allow the proper ventilation of the unit. If necessary, vacuum the vents to remove any dirt or debris and allow the fans to operate freely.

Replacing the RCS Fuses

NOTE: If you feel that a fuse needs to be replaced, try the following first. Turn the power switch to the OFF position, then turn it back ON. The power switch on the RCS has an integral breaker. Overload will cause the breaker to trip. Moving the switch to the OFF position to reset the breaker will allow the unit to be turned on again if the cause of the overload has been eliminated. Operating the RCS at high temperatures is one thing that may cause an overload resulting in the breaker trip. If this does not solve the problem, proceed to replace the fuses as follows.

The Refrigerated Cooling System (RCS) may contain one or two fuses, depending upon whether you have the 120V/60 Hz model (USA) or the 230V/50Hz model.

Both fuses can be replaced by turning the fuse holder (shown to the right) counterclockwise to remove the holder. The fuse slips out easily. Insert a new fuse into the holder. Replace fuse with same type and rating only. Place the fuse holder back into the cabinet by turning it clockwise until it locks in place.

RCS90 Fuse Holder


RCS40 Fuse Holder

Parts List

Replacement parts for the RCS that are available from TA Instruments. See the table below when ordering parts.

Part Number	Description
205224.039	Fuse GLA for 120 V/60 Hz RCS90 or RCS40 (1.00 amp 250 V Slo Blo)
253827.000	Power Cord for 120 V/60 Hz RCS90 or RCS40
205224.035	Fuse GLA for 230 V/50 Hz RCS90 or RCS40 (0.75 amp 250 V Slo Blo)
270469.001	Power Cord w/o Plug for 230 V/50 Hz RCS90 or RCS40 (10 amp/220V 50 Hz)
970076.001	Heat Exchanger Centering Ring
920223.902	Event Cable

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