
PICARRO

SAM-C Preventive Maintenance Manual

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1. Introduction

The objective of this manual is to document the preventive maintenance service instructions on the individual items listed on the SAM spare parts list.

Any block diagrams and hardware implementation description shown in this document are intended to provide background for the maintenance service.

2. Product Safety Warnings and Hazards

2.1. Advisory Notice – General Use

The SAM and integrated analyzers are not intended to process hazardous materials at levels higher than 25% of their TLV or LEL. The system is only suitable for connection of non-HPM calibration and reference gases.

2.2. Potential Hazards

2.2.1. Hazardous Voltage

The main power input panel, power distribution box, and pump terminal block present a potential voltage hazard. Contact may cause electric shock or burn if live power is not turned off and locked out before servicing.

The main power input panel presents a voltage hazard because it remains live after EMO is engaged. The main disconnect (main circuit breaker) must be turned off and locked out before servicing.

The main disconnect (main circuit breaker) must be locked out with protection padlock P/N 24435 prior to servicing.



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2.2.2. Heavy Lifting

The analyzers and sampling manifold boxes are heavy. Lifting during removal and installation is a two-person task and must be performed with proper lifting techniques to avoid muscle strain or back injury.

2.2.3. Hot Surfaces

The surfaces of the sample pump and analyzer pumps are hot during operation and remain hot after power is turned off. To avoid possible skin burns, disconnect and lockout power and allow surface to cool before servicing.

2.2.4. Asphyxiation

There is a potential asphyxiation hazard where a possible oxygen deficient atmosphere may occur within the chassis. To avoid the hazard, lockout all non-air gases and shut off all isolation valves at the supply. Remove all covers prior to entering and servicing.

2.2.5. Noise

Noise levels between 70 dBA and 75 dBA were measured with the panels off. Troubleshooting while the unit is powered on must be limited to 30 minutes.

3. Product Manual

For detailed instructions on the operation of the SAM-C, please refer to the user manual P/N 40-0080.

4. Preventive Maintenance Spare Parts

4.1. Sampler Pump (SKU S3064)

PM frequency: The recommended maintenance schedule for the sampler pump is to replace the unit every 10,000 hours.

There are two sampler pumps in the SAM-C. Follow the instructions below to remove and replace the pumps from the SAM-C.

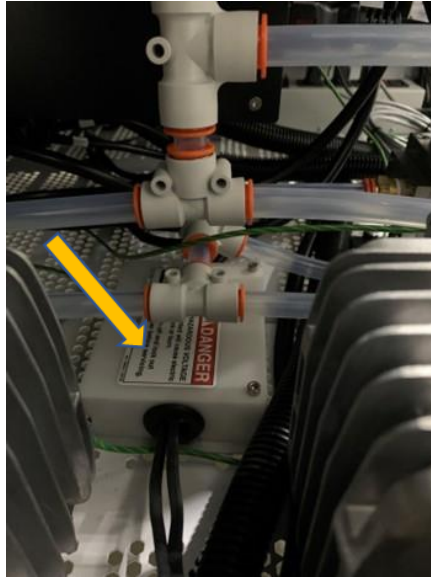
1. Make sure the SAM is powered off, the AC power cord is unplugged, and the circuit breaker is locked out.
2. Remove the right-side panel (looking from the front).
3. Open the front door.
4. Disconnect the quick-connect style connector for the pump fan, located by the cable duct.



5. Remove the pump fan bracket by removing the four M6 screws with a 4mm hex driver and set them aside.
6. Open the rear doors of the SAM-C.
7. Reach in and disconnect the 1/2" OD PFA tubing from the elbow fittings attached to both pumps (labeled IN and OUT). Depress the circular orange tab on the fittings and pull on the tubing to disconnect.



8. Remove the cover from the terminal block located between the pumps and set it aside. The terminal block is accessible from the side.



9. Remove the wire terminations on the pump side from the terminal block. Reattach the screws to the terminal block after removal to prevent from losing them.
10. Use a 3mm hex driver to remove the M4 screws securing the pumps to the chassis and set them aside.
11. Make sure the pumps are cool to the touch before carefully removing them from the base.
12. Put the replacement pumps in place and repeat the steps above in reverse order.

4.2. Sampler 0.2µm Particulate Filter (SKU S2250)

PM frequency: The recommended maintenance schedule for the sampler particulate 0.2µm filter is to replace it every 6 months or per visual inspection.

Follow the instructions below to remove and replace the particulate filter from the SAM-C.

1. Remove the left-side panel of the SAM-C (looking from the front) or open the rear door.
2. Reach in behind the power distribution box and locate the particulate filter.



3. Depress the circular orange tab on the push-to-connect fitting and pull the filter out along with the yellow plastic tubing.
4. Replace the filter along with a new yellow plastic tubing. The filter and yellow tubing should come pre-attached.
5. Discard the used filter and yellow plastic tubing.

4.3. Chassis Fans (SKU S3079 & SKU S3080)

PM frequency: The recommended maintenance schedule for the chassis fan kit is to replace them every 2 years.

Follow the instructions below to remove and replace the chassis fans from the SAM-C.

1. There is a total of twelve chassis fans in the SAM-C: three on each side of the chassis (SKU S3079), three on the front door (SKU S3079), and three mounted on brackets at the rear of the chassis (SKU S3080).
2. **To replace the three rear mounted fans, it is easier to remove the individual brackets from the chassis.**
3. Make sure the SAM-C is powered off completely, the AC power cord is unplugged, and the circuit breaker is locked out.



4. **A stepladder may be required for this task.**
5. Remove the top side panel on both sides of the SAM-C.
6. Remove the fan cable from the cable duct until the quick-connect style connectors are located. Disconnect the quick-connect style connectors.
7. Remove the three M3 button head screws holding the bracket with a 2mm hex driver.
8. Carefully remove the fan bracket assembly from the chassis.
9. Remove the fan from the bracket by unfastening the M4 screws and nuts with a 2.5mm hex driver and 7mm wrench.
10. Reattach the replacement fan with the existing screws and nuts and reinstall the fan bracket assembly into the chassis.
11. Repeat for the remaining two rear mounted fans.
12. **To replace the six side mounted fans, it is necessary to remove the filter cover on each fan to expose the screws.**
13. Open the front door.
14. Slowly remove the fan cable from the cable management rail until the quick-connect style connector is located. Disconnect the quick-connect style connector.



15. Remove the side mounted fan by removing the four M4 screws and nuts with a 2.5mm hex driver and 7mm wrench.
16. Once removed, set the fan guard and screws aside to avoid losing them.
17. Carefully remove the fan.
18. Replace with a new fan by repeating the steps above in reverse order.
19. Repeat for the remaining five side mounted chassis fans.
20. Replace the three fans on the front panel.

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4.4. Pump Fans (SKU S3080)

PM frequency: The recommended maintenance schedule for the pump fan kit is to replace them every 2 years.

Follow the instructions below to remove and replace the pump fans from the SAM-C.

1. There is a maximum of five pump fans in the SAM-C, depending on the number of analyzers.
2. Make sure the SAM-C is completely powered off, the AC power cord is unplugged, and the circuit breaker is locked out.
3. Open the front door of the SAM-C.
4. Remove the right-side panel.
5. Remove the fan cables from the cable duct until the quick-connect style connectors are located. Disconnect the quick-connect style connectors.



6. **To replace the pump fans, it is easier to remove the individual fan brackets from the chassis.**
7. Remove the fan bracket by removing the four M6 screws with a 4mm hex driver and set them aside.
8. Remove the pump fan by removing the four M4 screws and nuts with a 2.5mm hex driver and 7mm wrench.
9. Set aside the fan guard and hardware to avoid misplacing them.
10. Replace with a new fan using the existing hardware.
11. Mount the fan bracket back onto the chassis with the existing hardware.
12. Repeat for the remaining pump fans.

4.5. Sampler Module (SKU S3069, S3070, S3115, S3116)

PM frequency: The recommended maintenance schedule for the sampler module is to replace the unit every 4 years.

Follow the instructions below to remove and replace the sampler module from the SAM-C.

1. Make sure the SAM-C is completely powered off, the AC power cord is unplugged, and the circuit breaker is locked out.
2. **A stepladder may be required for this task.**
3. Remove the top side panel on both sides of the SAM-C.
4. Reach in and loosen the nuts of the PTFE bulkhead fittings on the interior side of the rear panel.



5. Use a small flat head screwdriver (3.5mm) to loosen the screws securing the power entry connector on the back of the sampler module and remove. Unplug the USB connection as well.
6. Use a flat head screwdriver to loosen the ground lug on the back of the sampler module. Remove the ground wire.
7. Loosen the nut of the PTFE elbow fitting labeled “SAMPLE OUT” and remove the ½” OD PFA tubing.
8. Depress the circular orange tabs on the push-to-connect bulkhead fittings labeled “BYPASS” and “CLEAN” and pull on the attached fittings to detach them from the back of the sampler module.
9. Open the front door of the SAM-C.



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10. Remove the four M4 screws securing the sampler module to the chassis with a 2.5mm hex driver and set them aside.
11. Carefully slide the sampler module out of the chassis. It is recommended to have another person support the sampler module during the removal process.
12. Slide in a replacement sampler module and repeat the steps in reverse order.

4.6. Rack Mounted PC (SKU S3061)

Follow the instructions below to remove and replace the rack mounted PC from the SAM-C. The PC is not routinely serviced as part of the PM cycle, but may need to be replaced upon failure.

1. Make sure the SAM-C is completely powered off, the AC power cord is unplugged, and the circuit breaker is locked out.
2. Open the rear door of the SAM-C.
3. Unplug every USB, USB-C, RJ45, and power connection on the back of the PC.



4. Open the front door of the SAM-C and locate the tabs on either side.



5. Lift the tabs to access the Phillips-head screws – one on each side - and remove screws.



6. Carefully slide the PC out from the rails.
7. Slide in a replacement rack mounted PC and secure it to the chassis.
8. Reconnect every connection on the back of the PC.

4.7. KVM Switch (SKU S3117)

Follow the instructions below to remove and replace the rack mounted KVM switch from the SAM-C.

The switch is not routinely serviced as part of the PM cycle, but may need to be replaced upon failure.

1. Make sure the SAM-C is completely powered off, the AC power cord is unplugged, and the circuit breaker is locked out.
2. Open the rear door of the SAM-C.
3. Remove the left side panel (looking from the front) and set it aside.
4. The KVM switch is located underneath the rack mounted PC.



5. Unplug all the connections on the back of the KVM switch.
6. Once the connections are removed, unfasten the four M6 screws securing the KVM switch to the chassis with a 4mm hex driver.
7. Support the bottom of the KVM switch when the screws are being unfastened to prevent it from falling.
8. Slide the KVM switch out from the chassis and replace with a new unit.
9. Secure the new KVM switch to the chassis with the four M6 screws while supporting the bottom of the unit.
10. Reattach all the connections on the back of the KVM switch.

4.8. Ethernet Switch (SKU S3068)

Follow the instructions below to remove and replace the ethernet switch from the SAM-C. The switch is not routinely serviced as part of the PM cycle, but may need to be replaced upon failure.

1. Make sure the SAM-C is completely powered off, the AC power cord is unplugged, and the circuit breaker is locked out.
2. Remove the left side panel (looking from the front) and set it aside.
3. The ethernet switch is mounted on the side of a shelf within the chassis.



4. Unplug all the RJ45 connections and power barrel plug on the ethernet switch.
5. Slowly and firmly lift the ethernet switch from the mounting bracket.
6. Replace with a new ethernet switch and slide it into the bracket, making sure the ethernet switch is properly seated all the way.
7. Reattach all the connections on the ethernet switch.
8. Make sure the power button on the ethernet switch is toggled to the ON position.

4.9. USB Hub (SKU S3077)

Follow the instructions below to remove and replace the USB hub from the SAM-C. The hub is not routinely serviced as part of the PM cycle, but may need to be replaced upon failure.

1. Make sure the SAM-C is completely powered off, the AC power cord is unplugged, and the circuit breaker is locked out.
2. Open the rear door of the SAM mobile rack.
3. The USB hub is mounted to the chassis rails at the top just below the top shelf.



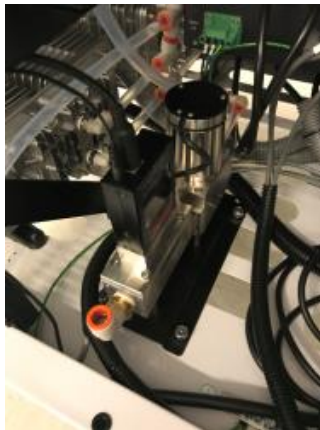
4. Unplug the power connector and all the USB connections on the USB hub.
5. Remove the two M6 screws securing the USB mounting bracket to the chassis with a 4mm hex driver.
6. Remove the USB hub and the mounting bracket from the chassis.
7. Remove the four M3 screws securing the USB hub to the bracket with a 2mm hex driver and set them aside.
8. Attach a replacement USB hub to the mounting bracket and secure with the two M3 screws.
9. Mount the bracket along with the USB hub back onto the chassis and secure with the two M6 screws.
10. Reattach the power connector and all the USB connections.

4.10. Mass Flow Controller (SKU S3066)

Follow the instructions below to remove and replace the MFC from the SAM-C.

The MFC is not routinely serviced as part of the PM cycle, but may need to be replaced upon failure.

1. Make sure the SAM-C is completely powered off, the AC power cord is unplugged, and the circuit breaker is locked out.
2. Open the rear doors of the SAM-C.
3. The MFC is located on the bottom panel of the chassis.
4. Unplug the power plug and 8-pin RS232 connector from the MFC.



5. Disconnect the PFA tubes from each side of the MFC by depressing the circular orange tab on the push-to-connect fittings and pulling on the tube.
6. The MFC is mounted onto a base plate that is removable from the top.
7. Unfasten the four captive screws on the MFC base plate either by hand or with a Phillips screwdriver.
8. Remove the MFC along with the base plate from the chassis.
9. Remove the push-to-connect fittings from the MFC.
10. Flip the base plate over and unfasten the four 8-32 screws that secure the MFC to the base plate with a 9/64" hex driver.
11. Replace with a new MFC and secure it back onto the base plate with the four 8-32 screws.
12. Attach the two push-to-connect fittings onto the new MFC.
13. Position the base plate over the PEM nuts on the bottom panel of the chassis and secure it by tightening the four captive screws.
14. Reconnect the 1/2" OD PFA tubing on both sides of the MFC.
15. Reconnect the power barrel plug and the 8-pin RS232 connector.

4.11. Clean Pressure Regulator (SKU S3063)

Follow the instructions below to remove and replace the clean pressure regulator from the SAM-C. The Regulator is not routinely serviced as part of the PM cycle, but may need to be replaced upon failure.

1. Make sure the SAM-C is completely powered off, the AC power cord is unplugged, and the circuit breaker is locked out.
2. Remove the left side top panel (looking from the front).
3. The pressure regulator is mounted on the top shelf behind the manifold boxes.



4. Trace the wires from the pressure regulator and detach them from the terminal block. Use a small flat head screwdriver to depress the lock on the terminal block for wire removal.
5. Open the rear door of the SAM-C.
6. To expose the two 10-32 screws securing the pressure regulator to the shelf, the USB hub needs to be removed.
7. Unfasten the two M6 screws securing the USB hub mounting bracket to the chassis rail with a 4mm hex driver.
8. Move the USB hub aside to expose the two 10-32 screws on the bottom of the top shelf.
9. Unfasten the two 10-32 screws with a 1/8" hex driver and put them aside.
10. Disconnect the PFA tubing on both sides of the pressure regulator by depressing the circular orange tab on the push-to-connect fittings and pulling on the tubing.
11. Remove the pressure regulator from the chassis and remove the two 10-32 standoffs.
12. Remove the push-to-connect fittings from the pressure regulator.
13. Replace with a new pressure regulator and reattach the 10-32 standoffs.
14. Reattach the push-to-connect fittings. The straight fitting goes to Port 1 and the elbow fitting goes to Port 2.
15. Reconnect the PFA tubing on both sides.
16. Secure the pressure regulator to the top shelf by fastening the two 10-32 screws on the bottom.
17. Reconnect the pressure regulator wires to the terminal block.
18. Reattach the USB hub mounting bracket onto the chassis rail by fastening the two M6 screws.

4.12. Power Distribution Box (SKU S3142)

Follow the instructions below to remove the power distribution box from the SAM-C. The Power Distribution Box is not routinely serviced as part of the PM cycle, but may need to be replaced upon failure.

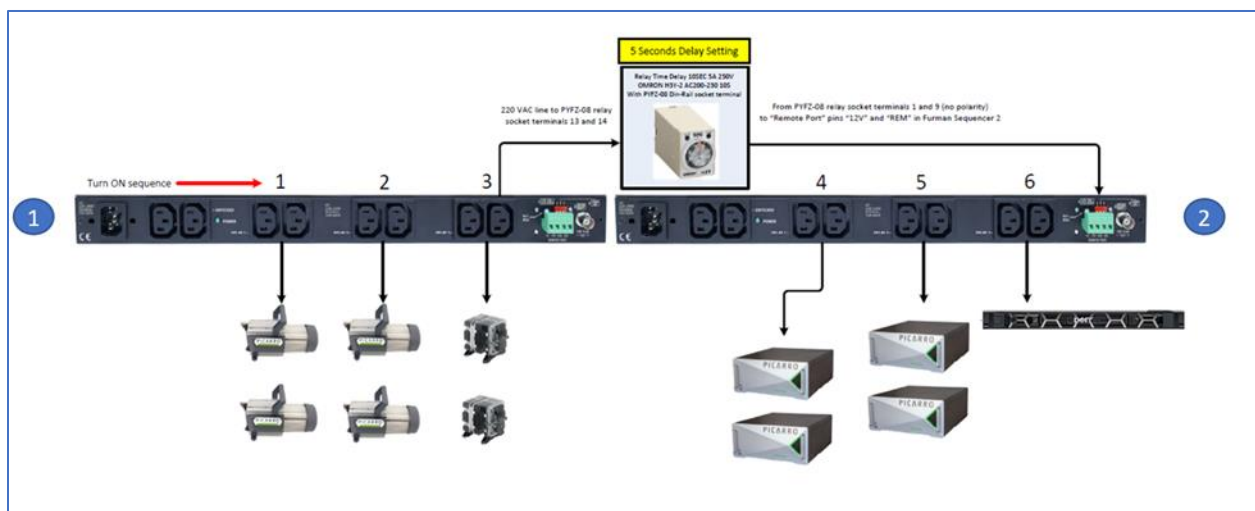
1. Make sure the SAM-C is completely powered off, the AC power cord is unplugged, and the circuit breaker is locked out.
2. Remove the left side panel (looking from the front).
3. Open the rear doors of the SAM-C.
4. Disconnect all power connections from the rear of the power distribution box. The bayonet-style connectors must be turned counter-clockwise to be removed.
5. Use a flat head screwdriver to loosen the ground lug and remove the ground wire.
6. Depress the circular orange tab on the panel mounted push-to-connect fittings and remove the PFA tubing by pulling on them.
7. Disconnect the USB connector.



8. Once all rear connections are disconnected, open the front door of the SAM-C.
9. From the front of the SAM-C, remove the four M6 screws securing the power distribution box to the chassis with a 4mm hex driver. Slide the power distribution box out.
10. Reverse steps after installing the new power distribution box, and make sure the circuit breaker on the rear of the power distribution box is in the ON position (lever point up) before powering up the unit.



Turn On Sequence



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