Revision 1.3

July 2005 DEALER SERVICE MANUAL COX RAPID HEAT TRANSFER STERILIZER MODEL 6000 INSTRUMENT STERILIZER

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THIS SERVICE MANUAL IS FOR THE SOLE USE OF AUTHORIZED COX STERILE PRODUCTS, INC. DEALERS AND THEIR QUALIFIED EQUIPMENT SERVICE AND REPAIR PERSONNEL.

OPERATIONAL REVIEW

Ensure that the sterilizer is plugged into a 110 V 60 Hz (or alternatively into a 220 V 50 Hz) outlet fused at 15 amps. Push on/off/standby switch to activate the sterilizer. This will start the fans and heater system and also prompt a beeper and LED test when first turned on whereby the audio/visual indicators can be verified as operative. The sterilizer will heat up but will not show any temperature display until the internal heat of the sterilization chamber reaches 260 deg. F (127 deg. C). The sterilizer will continue to heat up until it reaches and then hovers at 375 deg. F (190 deg. C) as indicated on the temperature display. It will take the sterilizer about 10 minutes to reach 375 deg. F (190 deg. C) after being activated.

Once the temperature is at 375 deg. F (190 deg. C) any of the three different timing cycles can be initiated. They may be initialed any time after the sterilizer has been activated but will not commence their time countdown cycle until the temperature has reached 375 deg. F (190 deg. C). The different cycles are as follows:

Cycle 1	-	6 minutes -	unpackaged instruments
Cycle 2	-	8 minutes	hand pieces
Cycle 3		12 minutes -	packaged instruments

The cycles will show the time remaining as the cycle counts down and will give a "C" for "Complete" indication on the time display at the conclusion of a cycle. A longer time cycle can be imposed over a shorter time cycle but a shorter time cycle cannot override a longer time cycle that is still counting down. The sterilizer cannot be turned off during a timing cycle. Also, at the conclusion of each cycle the beeper will give a short audio indication.

The sterilizer is deactivated by pressing the on/off/standby switch which will turn off the temperature/time displays and turn off the heater system. The fans will continue to run for 10 additional minutes in order to cool the unit down.

The electronic controller, (Part No. E-5-100CS) has programming diagnostic codes built into it. These codes will identify lack of performance to pre-determined specifications. These codes cannot always be interpreted as absolute indicators of faulty components but rather as a clue to where the problem may lie. For example, an error code that indicates an open thermocouple probe may indeed be indicative of a faulty probe, but may also simply indicate that the solderless connector has come loose from the tab on the electronic controller. As with any other apparatus, to identify servicing requirements, the simplest possible problems should be looked at first and only after a logical progression of testing first the power source, then fuses, then connections, then components, should the determination of remedial action occur.

TO DISPLAY THE SERIAL NUMBER OF THE STERILIZER SIMPLY DEACTIVATE THE STERILIZER BY DEPRESSING THE ON/OFF/STANDBY SWITCH WHICH WILL SEND THE STERILIZER INTO ITS 10 MINUTE COOL DOWN CYCLE. AT ANY TIME DURING THIS CYCLE, THE STERILIZER WILL DISPLAY ITS SERIAL NUMBER IN THE TEMPERATURE AND TIME WINDOWS WHEN THE CYCLE 1 AND CYCLE 2 SWITCHES ARE PUSHED SIMULTANEOUSLY.

SERVICE PARTS IDENTIFICATION AND FUNCTION

Iter	m Part No,	Description	Function	
1	E-5-100	Electronic Contro	oller	Controls all operational functions and displays results by LED. Diagnoses functional errors and displays them as error codes.
2.	E-1-100CS	Membrane Swite	ch	Interfaces with operator to initiate functions.
3.	Blower-120v	Blower Assemb	bly	Recirculates internal air within sterilizer through heater element and through jet plate to effectively make the air a heat transfer medium. Controlled by electronic controller.
4.	Heater-12v-com	Heater Element	Assembly	Heats recirculating internal air to sterilizing temperature of (375 degF-(190 deg. C). Controlled by electronic controller.
5.	T-125-304-S	Thermocouple	Probe	Measures temperature of recirculating air inside the sterilization chamber.
6.	RC-A12M15HTB	Muffin Fan		Introduces room air into the electronics housing and around inside of outer skin to maintain suitable operating temperatures.
7.	E-3-23-3CS	Fuse Holder		Holds main power fuse on hot side of incoming power.
8.	E-3-23-6-CS	Fuse/15 amp		Protects sterilizer and operator from dead short and over amperage conditions.
9.	115154	Power Cord and	l Plug Set	Provides hospital grade connection to building power supply.
10.	H-4-23CS	Drawer Ga	sket	Provides seal between outer skin of sterilizer and inner drawer face to prevent sterilization heat from escaping. Seals drawer firmly to sterilization chamber.
11	.H-5-28CS	Drawer Ha	andle	Provides grip for transporting drawer.
12	. 23-W Rubber F	oot (6)		Four bottom feet lift sterilizer above work surface, two feet on back ensure proper space allowance at rear for muffin fan intake.

4. DIAGNOSTIC TESTING PROCEDURES.

To prevent unnecessary service work being performed:

Any sterilizer that displays an error code or "flashes" the digital displays should be unplugged and then plugged back in to re-boot the error detect logic. If the error code comes up again, a service investigation to determine the probable cause is appropriate.

The Cox Rapid Heat Transfer Sterilizer has built-in, self-diagnostic tests that will display error codes in the time window if not performing correctly.

There are four basic error code groups in the sterilizer. All errors will turn off the TRIAC control to the heater and the relay controlling all AC power devices. This means the fans, as well as the heater, will be shut off. The error code will flash and the beeper will sound in time to the flashing display. The temperature display Will *continue to* show *the current* temperature, *however, this reading may* be *false* depending on the error type. The sterilizer will remain in this state until the operator turns off the sterilizer.

Pushing the on/off/standby switch simply disables the beeper and the error code is displayed continuously instead of flashing. Unplugging the sterilizer resets the error detection logic and the sterilizer will start as if there were no error when it is plugged *back in*. Should *the error be detected again, then it* will *go into the error* state again as described above. The error codes are as follows:

Error Code	Description	Probable Service Requirement
E12	Switch failure	This error code is displayed when the electronic controller detects a short in one of the control buttons of the membrane switch. If it is verified that there is a short in the membrane switch, it must be replaced (Part No. E-1-100CS).

Note: The E12 error code may display if the switch is depressed by the operator continuously for 5 seconds.

E20	Open probe	This error code indicates a break in the thermocouple probe or simply that one leg of this probe is not plugged into the electronic controller. If this probe is properly plugged into the electronic controller, then test this probe by unplugging it from the electronic controller and checking across the two leads for ohmeric continuity. If not present, replace the thermocouple probe (Part No. T-125-304-S).
E21	Reasonableness check	This error code indicates rapidly changing or erratic temperature readings. Check the thermocouple probe continuity as described under error code E20 and replace if faulty (Part No. T-125-304-S). If this probe is good, replace the electronic controller (Part No. E-5-100CS).
E30	Overheat	This error code indicates that the thermo- couple probe is sensing an unacceptably high temperature. The upper limit of the program is 395 deg. F (202 deg. C). Thus the E30 error code will be displayed at this temperature and turn the sterilizer off.
		The first check, after a suitable cool down time, is to restart the unit and ensure, by looking into the sterilization chamber from the front, that the recirculating blower fan is working at speed.

The blower assembly must be investigated for extraneous material or misalignment that could be affecting rotation of the blower fan blade.

An ungrounded thermocouple probe can also cause an E30 code. Accordingly, if the first check fails to identify a problem, the thermocouple probe should be checked for continuity to the chassis of the sterilizer. If not found to have continuity, ensure the compression fitting has a brass washer on the ferrule and tighten to obtain grounding.

If the blower fan is running correctly and the thermocouple probe is found to be good but the E30 code continues to be displayed the problem is likely a failed TRIAC and the electronic controller (Part No. E-5-100CS) must be replaced.

E31 Underheat: This error code indicates that the temperature probe in the sterilization chamber is not registering a rise in temperature to 375 deg. F (190 deg. C) against preprogrammed set points.

The most likely cause for this is a failed heater element assembly, *which must* be replaced (Part No. HEATER-120V-COM).

A heater element in proper working order has a resistance of 10 or 11 ohms - this may be checked without removing the heater by measuring across the heater element leads.

General Notes: The electronic controller will not power up if the incoming line voltage is not adequate. It also protects itself from erratic behavior due to voltage fluctuations. It is common to see dust on the electronic controller after use in the field. This in no way will affect the operation of the electronic controller.

Do not oil *the* blower motor.

An ungrounded thermocouple probe can also cause an E31 code. Accordingly, if the first check fails to identify the problem the thermocouple probe should be checked for continuity to the chassis of the sterilizer. If not found to have continuity, ensure the compression fitting has a brass washer on the ferrule and tighten to obtain grounding."

The error detect logic function of the electronic controller, which displays as error codes in the "Time" window, indicates erratic or improper behavior. Due to the sensitivity of the error detect logic, interference or fluctuations in the incoming power supply may cause an error code to be displayed. This is most likely to be an isolated and uncommon occurrence.

In addition to self-diagnosed service problems, the sterilizer may not perform due to other types of component failure, such as an open fuse. The following troubleshooting chart will assist you in resolving these problems.

Problem Probable Causes

- 1) Sterilizer 1) Power cord not plugged will not turn on.
- 2.) Power cord not plugged in to suitable outlet.
- 3.) Outlet is dead.
- 4.) Open power fuse on back panel of sterilizer.
- 5.) Open internal fuse on electronic controller.

Recommended Actions:

- 1) Ensure sterilizer is plugged in to a suitably rated working outlet.
- 2) Check power fuse.
- 3) Check electronic controller power connections are made.
- 4) Check membrane switch ribbon connector is plugged in to electronic controller.
- 6) Membrane switch not plugged in to electronic controller correctly or not at all.
- 7) Loose power connection on electronic controller.

Sterilizer
vibrates or
is noisy.1) Extraneous material has been sucked into blower assembly.2) Fan blower is loose or mislocated on blower assembly shaft
and hitting fan housing during rotation.

- 3) Fan blower and shaft are out of balance.
- 3) Replace blower assembly.
- 4) Broken or bent mount on blower assembly motor.
- 4) Blower must be replaced.

• Note: Proper blower fan blade alignment and location of set screw is critical to the operation of the sterilizer. The blower fan must be centered in the fan housing and the set screw tightened down onto the flat section of the motor shaft. If blower assembly has been damaged, it must be replaced.

- 1) Remove extraneous material from fan blower assembly including under the heater element and jet plate.
- 2) Realign fan blower and tighten set screw on shaft. *
- 3. Drawer does not fit.
 are out of alignment, * probably due to a shock, such as being dropped.
 1) Realign by hand to fit snug to face of unit.

• An ill-fitting drawer may produce unnecessary vibration or noise and allow internal heat to escape, increasing the outside surface temperature of the sterilizer and the temperature of the room. It will also make the sterilizer work harder to maintain its internal temperature for sterilization.

 4. Outside skin is hot.
 1) Refer to Item 3 above (proper drawer fit). Check to ensure internal insulation jacket is properly fastened. Ensure muffin fan (Part No. RC-A12M15HTB) is working and blowing air into the rear cavity of the sterilizer.

2) Ensure that the 6 rubber feet (4 bottom, 2 back) have not been removed and that the air space these provide around the sterilizer has not been blocked.

5. COMPONENT REPLACEMENT:

If it is determined that one of the components is not operable and must be replaced, the following procedures must be followed.

1. To replace membrane switch (Part No. E-1-100CS);

- A. Unplug sterilizer.
- B. Remove back panel.
- C. Unplug membrane switch ribbon connector on electronic controller.
- D. Peel of faulty membrane switch ensuring all layers are removed down to base metal. Do not use solvent but rather scrape all adhesive from metal to avoid contamination of electronic components.
- E. Peel paper backing from new membrane switch.
- F. Insert ribbon connector through slot in metal ensuring that it goes over the top of the electronic controller.
- G Align and adhere membrane switch to metal.
- H. Plug in ribbon connector to electronic controller.
- I. Replace back panel.

CAUTION: Ensure ribbon connector is not pinched.

2. To replace electronic controller (Part No. E-5-100CS);

- A. Unplug sterilizer.
- B. Remove back panel.
- C. Disconnect all connectors on electronic controller.
- D. Remove the three screws located at each end and the middle of the electronic controller.
- E. Remove faulty electronic controller.
- F. Locate new electronic controller on mounting studs and secure with three screws.
- G. Replace back panel.

3. To replace thermocouple probe (Part No. T-125-304-S);

A. Unplug sterilizer.

- B. Remove back panel_
- C. Unplug thermocouple probe leads from electronic controller.
- D. Unfasten and peel back Velcro-fastened back panel of insulation cover.
- E. Loosen compression fitting holding thermocouple probe.
- F. Remove faulty thermocouple probe, compression ring and nut.
- G. Locate new thermocouple probe, compression ring and nut. Ensure cold junction protrudes 1/2" through grommet in insulation jacket.
- H. Guide thermocouple leads through hole in reflex cover and connect to electronic controller (blue bottom, red top).
- I. Reaffix insulation cover, assuring that the barrel of the thermocouple probe protrudes $\frac{1}{2}$ " outside the hole in the insulation cover.
- J. Replace back panel.

When replacing a thermocouple ensure that the compression fitting is tight and that there is continuity between the thermocouple body and the chassis of the sterilizer.

4. To replace muffin fan (Part No. RC-A12M15HTB);

- A. Unplug sterilizer.
- B. Remove back panel.
- C. Remove power leads from connector tabs on fan.
- D. Remove 4 mounting screws of fan screen, includes ground wire.
- E Remove 4 mounting screws from faulty fan body.
- F. Locate new fan and fix to back panel with 4 mounting screws. Ensure proper direction of air flow into the unit.
- G. Replace ground wire and fan screen with 4 mounting screws.
- H. Reconnect power leads to connector tabs on fan.
- I. Replace back panel.

5. To replace heater element assembly (Part No. Heater-120v-com);

Note: It may make access to the heater element easier if the thermocouple *probe* leads are also disconnected and pushed out of the way while the heater element is removed. Be sure to reconnect the thermocouple probe leads to the appropriate tabs on the electronic controller. Also, ensure that the barrel of the thermocouple probe protrudes ½" outside the hole in the insulation jacket.

- A. Unplug sterilizer.
- B. Remove back panel.
- C. Unfasten and peel back Velcro-fastened back panel of reflex cover.
- D. Disconnect heater element power leads at heater element.
- E. Remove 4 sheet metal screws holding heater element into chamber. Remove faulty heater element. Note: Be sure to remove all old silicone.
- G. Locate new heater element, replace mounting screws.
- H. Reaffix insulation cover assuring that heater element power leads are routed thru the appropriate slit in the insulation cover.

6. To replace blower assembly (Part No. Blower-120v) or to remove extraneous material from blower fan;

- A. Unplug sterilizer.
- B. Remove back panel and remove wire ties on wire bundle.
- C. Disconnect blower assembly power leads from electronic controller.
- D. Disconnect ground wires from ground stud.
- E. Disconnect thermocouple probe leads from electronic controller.
- F. Disconnect heater element leads from electronic controller.
- G. Remove 6 nuts holding blower motor support bracket to bottom panel of outer skin.
- H. Remove bottom and back motor mount nuts of blower housing assembly.
- I. Remove motor support bracket from sterilizer.
- J. Unfasten and peel back Velcro-fastened back panel of reflex cover, remove by pulling cover over motor body.
- K. Remove 5 nuts holding blower assembly to inner chamber.
- L. Remove entire blower assembly. This assembly will include blower and heater element. Remove 4 sheet metal screws to pull out heater element.
- M. To disassemble blower assembly, remove remaining 114-20 nuts on motor mounting studs.
- N. To disassemble blower motor, loosen set screw on hub of fan and pull off of shaft. Loosen blower motor mounting bracket and remove motor.

To re- assemble reverse the above steps ensuring that the following criteria of tolerances are met:

- 1. Motor shaft cannot extend beyond front face of blower housing.
- 2. Blower fan is centered in blower housing and set screw is firmly seated on flat portion of shaft.
- 3. Blower housing is resealed to back panel and heater element assembly is resealed to blower housing, both using Dow Corning RTV sealant or equivalent. (HEATER ELEMENTS ARE SUPPLIED WITH A REUSABLE SILICONE GASKET. THERE IS NO NEED TO APPLY DOW CORNING RTV SEALANT TO THESE HEATER ELEMENTS.
- 4. Thermocouple probe leads must be reconnected in the correct positions (blue bottom; red top).

7. To replace drawer gasket (Part No. H-4-23CS);

- A. Remove old gasket by pulling one corner and slipping the gasket off of the drawer plate.
- B. Feed new gasket on to three sides of the drawer plate ensuring that magnet (wider) portion is to the inside.
- C. Very gently pull and stretch gasket over remaining side. If too much force is used, gasket will split.

8. GENERAL:

A discoloration of the outside surface of the sterilization especially around the sterilization chamber entrance throat can be caused by excessive lubrication of instruments before sterilization, melting of unsuitable, usually disposable plastics, and the use of improper packaging material. Instruments should be lubricated after sterilization. While many grades of plastic are capable of being sterilized caution should be used with plastic and rubber goods. Evidence of the introduction of unsuitable plastics can be seen as stains on the jet plate in the sterilization chamber and stains or deposits on the drawer basket.

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