

GeneChip™ Hybridization Oven 645i

USER GUIDE

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The Hybridization Oven 645i

Introduction

The Applied Biosystems GeneChip™ Hybridization Oven 645i (Figure 1) is a general purpose laboratory oven with a rotating rotisserie designed for hybridization of Applied Biosystems GeneChip™ cartridge arrays. Electronic controls accurately govern the oven temperature and provide visible status information to the operator.



Figure 1 The GeneChip™ Hybridization Oven 645i.

Key features of the oven include:




- Programmable temperature range from 30.0°C to 70.0°C
- Programmable rotation rate range from 10 rpm to 80 rpm
- Keypad programming
- Excellent temperature accuracy and uniformity
- Ergonomic design for ease of use
- Holds up to 64 GeneChip™ cartridge arrays
- Pause / Jog control
- Highly visible status indicators
- Status information available via RS232 serial port
- Stackable (2 units high)
- Error detection and shutdown in case of malfunction

The oven has a glass door for observing samples during processing. Interior surfaces are of stainless steel for high durability and low maintenance.

Quick reference guide

The hybridization oven is very simple to operate (Table 1).

Table 1 Quick reference guide for the Hybridization Oven 645i


If you want to:	Then do this:	Description
Turn on/off power.	<ol style="list-style-type: none"> 1. Press the front, left I/O button. 2. Press PAUSE to view the current settings and operate the oven. 	 <p>Controls line power to the unit.</p>
Adjust rotisserie motor speed, pause the motor or jog the motor.	<ol style="list-style-type: none"> 1. Press the UP or DOWN button until the set point blinks to access the set point. 2. Press the UP or DOWN button to set the speed (rpm). 3. Press PAUSE to pause the rotisserie. 4. Press PAUSE again to take the unit out of pause to program and run the oven. 5. When the door is open, you can use the PAUSE button as the JOG button. 	 <p>These controls adjust the speed of the rotisserie motor.</p>
Adjust the oven temperature.	<ol style="list-style-type: none"> 1. Press the UP or DOWN button until the set point blinks to access the set point. 2. Press the UP or DOWN button to set the temperature (centigrade). 	 <p>These controls are associated with the heating function.</p>

Safety information

These instructions contain important operating and safety information. You must carefully read and understand these instructions before using the hybridization oven.

 **CAUTION!** If you use this instrument in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired and the warranty may be voided.

Applied Biosystems has designed the hybridization oven to optimize function, reliability, safety, and ease of use. It is your responsibility to install and use the hybridization oven properly.

 **WARNING!** The oven weight is approximately 67 pounds (30 kg). To avoid injury, use 2 persons when lifting the oven.

Follow these safety instructions regarding the hybridization oven:

- This equipment is for indoor use only.
- Connect the unit to a properly grounded electrical outlet of the correct voltage and current handling capacity. Check the nameplate on the back of the unit for the voltage and current rating.
- Do not remove or modify the grounded power plug. Use only properly grounded outlets to avoid a shock hazard.
- If replacing fuses, note that the oven employs double pole fusing. The power entry module, located on the rear panel of the unit, contains two fuses, one for each side of the AC power circuit. Replace these only with 5x20 mm F6.3A (fast acting) 250V rated fuses, as marked on the rear panel of the oven. (See ["Replacing the fuses" on page 22.](#))
- Disconnect the unit from the power outlet before performing any cleaning, maintenance, or service.
- The power cord is the disconnect device. Do not position the equipment so that it is difficult to operate the disconnecting device.
- Always verify that the rotisserie has stopped turning before reaching into the oven.
- The interior of the oven and its contents can reach temperatures that can cause burns. Avoid immediate contact with the oven interior upon opening the door, or wear protective gloves. The interior of the unit will remain hot without visual indication for some time after the door is open or power is switched off.
- If you plan to use the unit with any procedure that will give off fumes, be sure to operate the unit in a fume hood or with proper ventilation.
- The hybridization oven is not intended for use with flammable materials. If used with flammable materials, fire or explosion hazard may result.
- If radioactive materials are used in processing, user must comply with all regulations regarding the acquisition, use, and disposal of such materials.

- Do not continue to use the oven if the temperature or rotisserie controllers fail, as evidenced by errors E01 through E12 being displayed (see the section, "[Error codes and troubleshooting](#)" on page 21). Contact Thermo Fisher Scientific Technical Support.
- Use appropriate hand and eye protection when handling hazardous chemicals.
- Replace the fuses with same type (see the section, "[Replacing the fuses](#)" on page 22).



CAUTION! DOUBLE POLE NEUTRAL FUSING. The power entry module located on the rear of the unit contains two fuses, one located in each side of the AC line.

NOTE: Verify that 115/230V switch is set correctly:

- 115 for Americas and Japan
- 230 for EU and most of the world

Standard IEC 320 power entry with fuse compartment on rear panel of oven

NEMA 5-15P (US standard) cord supplied with unit.

Local power cord must be supplied for EU, rest of world

IMPORTANT! In case of power interruption, if the interruption is no longer than 10 seconds, the oven will restart automatically at the originally programmed temperature set point and rotation rate. If the interruption lasts longer than 10 seconds, the oven will restart in PAUSE mode, in which both heating and rotation are suppressed. You must press the PAUSE button to reactivate the oven. If you experience frequent power interruptions in your locality, consider purchasing an uninterruptible power supply (UPS).

Unpacking and setup

Each hybridization oven is shipped in a single carton. When unpacking the unit, check each item against the packing list below. If something is missing, contact Thermo Fisher Scientific Technical Support.

The GeneChip™ Hybridization Oven 645i accessories include:

- Rotisserie
- Eight plastic GeneChip™ cartridge carriers (Two are included in each box.)
 - Four red (Part No. 90-0356)
 - Four white (Part No. 90-0359)
- Eight spring steel carrier retaining clips (Part No. 10-0458)
- RS232 communications cable, 5 meters long, for serial port—workstation communication
- Oven power cord (US NEMA 5-15P style standard)



WARNING! The oven is heavy. Two people are required to lift the oven.



Locating the oven

- Use a strong, level table or laboratory bench capable of supporting the weight of the oven. The oven weighs approximately 67 pounds (30 kg).
- Provide an adequate source of electrical power within reach of the power cord. The oven operates on AC voltages from 100 to 240 volts nominal, 50/60 Hz, and draws currents below 5 Amperes.
- Provide minimum clearance as follows: 0.5 inch (13 mm) from top, 2 inches (50 mm) from the back and each side, and 18 inches (460 mm) for door swing at the front of the unit. Note that there is an air intake fan located in the rear panel. Do not block this vent.
- Provide adequate bench clearance for cartridge preparation, loading and unloading cartridge carriers.
- Avoid extreme ambient temperatures and locations close to heaters or air conditioning vents.
- Keep the oven dry—avoid locations close to sinks or bulk liquid dispensers and storage.

Unpacking the oven

NOTE: The oven is packaged in a corrugated shipping crate that can be reuse if you need to return the oven for service. However, if the crate has suffered significant crushing, cutting or structural damage, and you need to return the oven to Thermo Fisher Scientific, we recommend that you discard the crate and use new shipping materials.

1. Remove the oven from its corrugated box and styrofoam protectors.
2. Place it on a sturdy table or laboratory bench.
3. Remove protective wrappings.
4. Pull on the handle to open the oven door and remove the box of accessories.
5. Verify that the oven chamber is free of paper, cardboard or other debris.
6. Push the door closed. It latches automatically.

Rear panel items

The following items are located on the rear panel (Table 2).

Table 2 Rear panel items.

Item	What it does	How to use
Power entry module / line filter / fuse holder	<p>Accepts power cord for providing line power to unit. Filters incoming and outgoing power line noise. Holds fuses for overcurrent protection.</p>	<p>Plug mating end of power cord into this connector. Plug other end into suitable power outlet.</p> <p>Use your fingers or a screwdriver to open the fuse holder to replace the two fuses (See the section, "Replacing the fuses" on page 22).</p>
Voltage selector	<p>You can manually change the oven voltage from 115V to 230V.</p>	<p>With a screwdriver, flip the switch to select the required voltage.</p> <p>Caution! Take care to set the correct voltage for the oven. An incorrect voltage setting will damage the oven.</p>
Serial port	<p>The serial port allows communication with the workstation.</p>	<p>Connect the oven with the serial port of the computer (RS-232).</p>

Operating the door

1. The door is hinged on the left of the unit and latches on the right. It opens with a firm pull on its handle, located at the right side of the door.
2. When the door unlatches, if the oven is ON, the Door Open indicator will illuminate, rotisserie rotation will stop and the heater will shut off.
3. The door swings open up to 180°, allowing easy access to the oven interior. Take care not to forcefully overextend the door and ensure that the bench is clear of objects that may be hit by the door.
4. Take care when opening the door while the oven is operating. The interior is hot. Avoid immediate contact with the interior or wear protective gloves.
5. To close the door, swing it shut and press the door until it latches. Normal operation will resume.

Using the rotisserie

Installing the rotisserie into the oven

Follow this procedure to install a rotisserie into the oven.

1. Set the power switch off and open the oven door.
2. Remove the rotisserie from the accessory box. Note that one end is equipped with a rubber “foot” (Figure 2). The other end is equipped with a gear (Figure 5).
3. Place the rotisserie into the oven with the rubber mounted shaft end on the left (Figure 4).



Figure 2 Detail of the left rotisserie axle, rubber foot.

4. Insert the shaft into the holder. Line up the left side of the shaft with the pivot point, then push the rotisserie to the left against the spring. Press the rotisserie axle into the receptacle with sufficient force to displace the socket (Figure 3 and Figure 4).



Figure 3 Detail of the spring-loaded socket.



Figure 4 Installing the rotisserie into the left socket.

5. Mount the right axle of the rotisserie into the right holder. Place the geared end of the axle into the right-side drive socket (Figure 5). Turn the rotisserie until the axle clicks into place. Release the rotisserie to allow the shaft to be seated into the socket. Gently rotate the shaft to verify that it moves freely and is installed correctly (Figure 6).



Figure 5 Installing the rotisserie on the right holder.

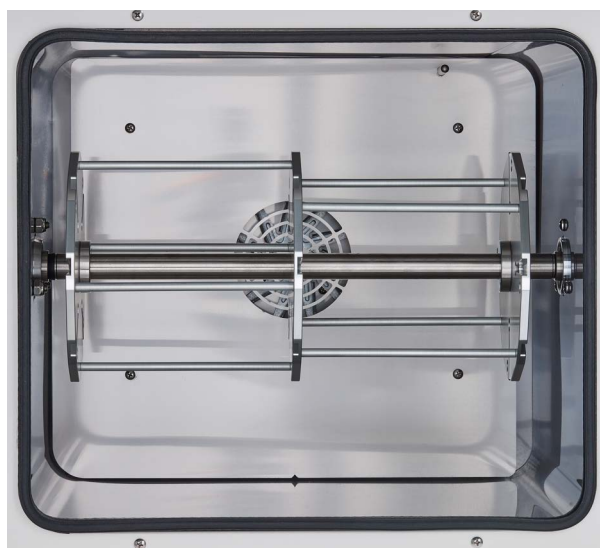


Figure 6 The rotisserie installed in the oven.

Electrical power supply and voltage selection

- Determine the electrical voltage and style of appropriate grounded line cord for your location.
- On the rear panel of the oven, locate the red 115/230 voltage selector switch ([Figure 7](#)).



Figure 7 The red 115/230 voltage selector.

- If the switch is set correctly for your location, no adjustment is necessary. If you must set the voltage switch, then using a small flat-bladed screwdriver, move the switch so that “115” or “230” is visible and this number matches the electrical supply employed in your location.
- **NOTE:** Ovens shipped from the factory have a small label covering the power entry receptacle, warning the user to select the proper voltage:



WARNING! Voltage selection is factory preset to 230V. Select the proper voltage for your location before connecting power cord. Operation with improper voltage selection will damage the unit.

- The oven comes equipped with a US NEMA 5-15P style power cord with a ground pin for use in the Americas. If you are using the oven outside the Americas, substitute an approved grounded power cord for your location. (For example, within the EU, employ a “Schuko” style CEE 7/7 grounded cord.)

- After correct voltage and power cord are selected, remove the label covering the power entry receptacle and connect the power cord to the oven and an electrical power outlet (Figure 8).



Figure 8 The 3-pronged plug power receptacle.

Operating the oven

The front panel

The operation of the oven is intuitive and simple. The front panel contains all user controls (Figure 9).

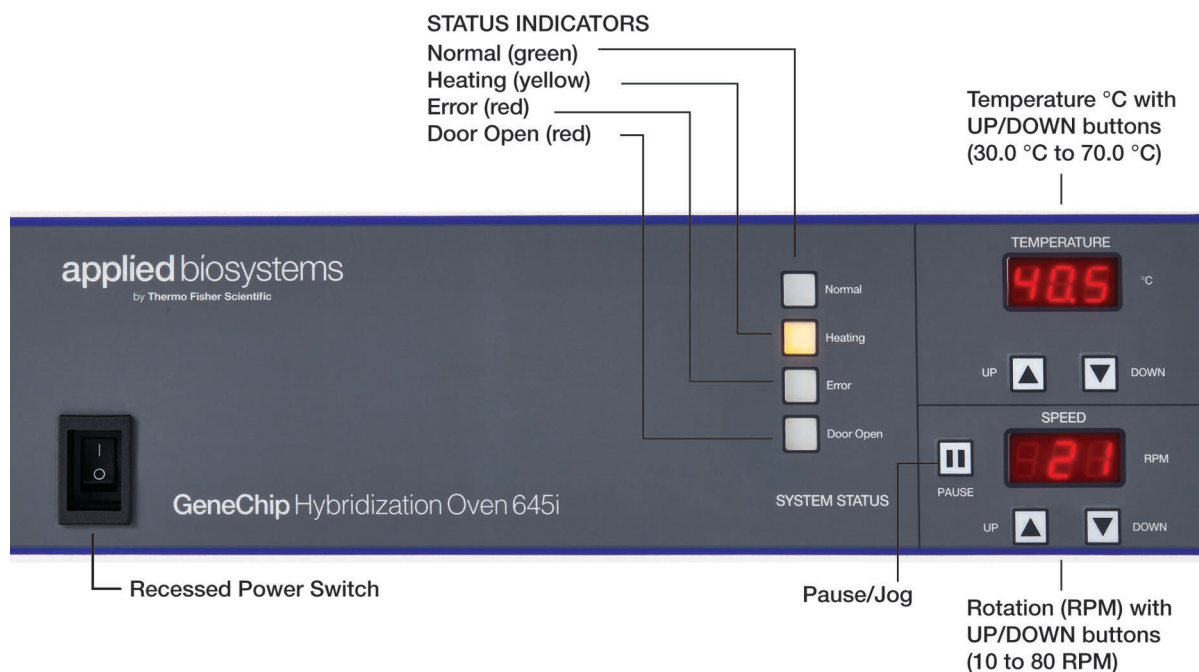


Figure 9 The front panel indicators and controls.

System status indicators

The front panel of the oven contains the system status indicator ([Figure 10](#)). Yellow indicates that the set point has not yet reached the set value. Green indicates that the set point has been reached and that the oven is operating normally. The indicator monitors the following items:

- **Normal** – the green indicator illuminates when the oven temperature is near its programmed set point.
- **Heating** – the yellow indicator illuminates whenever Normal status has not yet been achieved. When started cold, this indicator will remain illuminated while the oven is warming up (typically about 30 minutes).
- **Error** – the red indicator illuminates if a functional error has been detected. An audible alarm will sound and an error code will appear on one of the alphanumeric displays. For example, if the oven doesn't reach temperature in a reasonable amount of time, you will get an E02 error and a red Error light. Refer to the section, "[Error codes and troubleshooting](#)" on [page 21](#) for a list of error codes and their meaning.
- **Door Open** – the red indicator illuminates whenever the door is open. When the door is open, the rotisserie will stop and the heater will shut off. When the door is closed, both functions will resume.

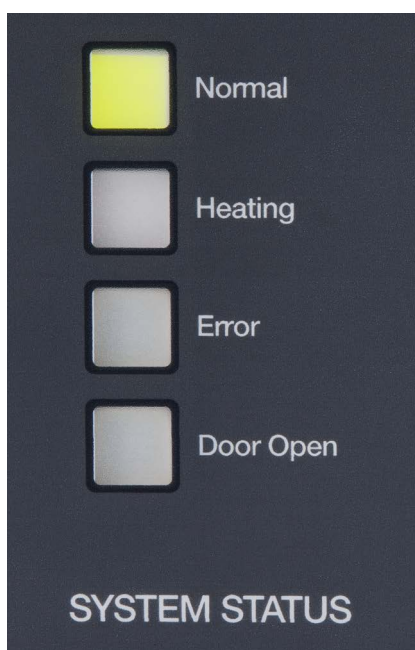


Figure 10 The system status indicator lights.

Applying power and programming the oven

1. Verify that the rotisserie is installed and the door is closed.
2. On the left side of the front panel, locate the recessed power switch (the I/O switch as shown in [Table 1](#) on page 5). The power is OFF when the lower “O” end is pushed in. The power is ON when the upper “I” end is pushed in.
3. Push the upper end of the switch in to turn power ON. There will be an audible beep, the two alphanumeric displays will illuminate and briefly display status information, then scroll “PAUSE”. At this point, the rotisserie is halted and the oven heater is off.
4. Locate and press the PAUSE key. The scrolling PAUSE indications will disappear. The current temperature and rotation set points will appear, blinking in the displays, followed by the actual temperature and rotation status. The rotisserie may start to turn.
5. Locate the rpm display and UP/DOWN keys ([Figure 11](#)). Press the UP and DOWN keys to change the desired rotisserie rotation rate. Note that the range is 10 rpm to 80 rpm and that programming below 10 rpm turns the controller OFF, halting the rotisserie. When the UP and DOWN keys are released, the desired rotation rate blinks for five seconds, then the actual rotation rate is displayed.



Figure 11 The rpm display and UP/DOWN keys.

6. Press the PAUSE key to halt rotisserie rotation. Press it again to restart rotisserie rotation.
7. Locate the temperature °C display and UP/DOWN keys ([Figure 12](#)). Press the UP and DOWN keys to change the oven set point - the desired temperature. Note that the set point range is 30.0°C to 70.0°C and that programming below 30.0°C turns the temperature set point OFF and turns off the oven heater. When the UP and DOWN keys are released, the set point value blinks for 5 seconds, then the actual oven temperature is displayed in degrees centigrade.



Figure 12 The temperature °C display and UP/DOWN keys.

Loading the rotisserie

8. Note that the oven may take about 30 minutes to reach the set point temperature.
9. If power is turned off, when restarted the oven remembers the temperature set point and rpm rate.

1. Load GeneChip™ array cartridges into cartridge carriers. The drive mechanism of the oven works best under balanced loads, so best practice is to distribute the cartridges in approximately equal numbers among an even number of carriers. That is, you should arrange the carriers 180° apart to balance the rotisserie (Figure 17).

2. Open the oven door. If the oven is in operation, take care that the interior may be hot.

NOTE: Do not manually rotate the rotisserie. Use the jog (PAUSE) button.

3. While the door is open, the PAUSE button changes to a JOG function. Pressing PAUSE will cause the rotisserie to slowly rotate. Use this jog feature to rotate the rotisserie to new positions.

NOTE: There is no on/off button for the rotisserie. You can stop the rotisserie by opening the door or pressing the Pause button. When the door is open, you can use the rotisserie Pause button to jog the rotisserie. Do not manually rotate the rotisserie. For best operation, you should load the cartridge carriers symmetrically to balance the rotisserie.

4. Use the jog feature to rotate the rotisserie so that an empty position faces the front of the unit. Install the cartridge carrier then press the carrier retaining clip until it snaps in place.
5. Install the carrier retaining clips onto the approximate center of crossbars (Figure 13). These clips are needed to retain each carrier in the rotisserie. One clip is needed for each carrier.

NOTE: After you install the carrier retainers, they should remain in the oven for reuse. They simply clip onto the rotisserie crossbar when no carriers are present.



Figure 13 Installing the carrier retaining clips at the center of the crossbars.

6. Slide in a cartridge carrier. Only one direction is possible. (Figure 14)



Figure 14 Slide the carrier into the rotisserie.

7. Clip the carriage retainer over the crossbars and the carrier (Figure 15).



Figure 15 Clip the carrier retainer over the crossbars and the carrier.

8. Snap tight the carrier retainer on to the carrier (Figure 16).

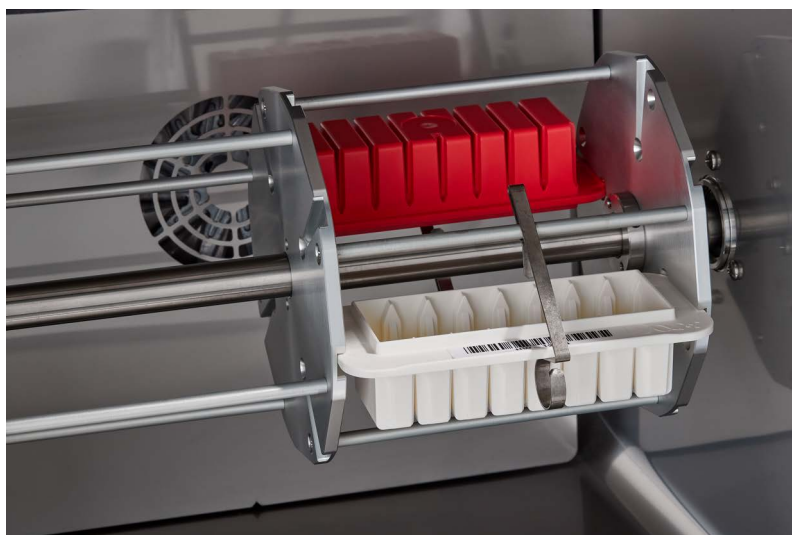


Figure 16 Snap tight the carrier retainer on to the carrier.

9. The rotisserie operates best when the load is balanced. For example, place carriers at opposing (180°) positions (that is, 3 o'clock and 9 o'clock) on one side of the rotisserie. If additional carriers are loaded, do the same on the other side. Up to 8 carriers may be loaded. Temperature accuracy and uniformity are not affected by array or carrier placement (Figure 17).

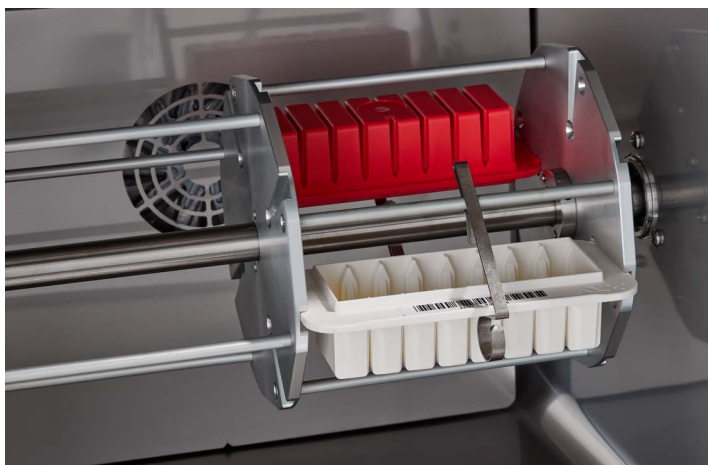


Figure 17 Installed cartridge carriers with the retaining clips set on the carriers. Note that the carriers are placed 180° apart to balance the rotisserie.

10. Close the oven door, set the temperature and set the rotisserie speed if needed.
11. At the conclusion of processing, open the oven door. The rotisserie stops and the heater shuts off. Wait for the oven surfaces to cool to a comfortable temperature, then unload the rotisserie.

Unloading the rotisserie

- Open the door and use the rotisserie motor pause button to jog the rotisserie so that a carrier faces the front of the unit. The temperature warning light turns on. This can be ignored.
- Pull on the ring of the retainer clip to release the carrier. Pull it straight out of the rotisserie.
- Use the jog feature and repeat.
- The retainer clips can remain on the rotisserie. They do not need to be removed.
- The oven is ready for a new load of arrays. If the oven will not be used immediately, turn the power switch off.

Communicating with the oven

Serial communication

The Hybridization Oven 645i is equipped with a 9 pin connector RS-232 serial port, located on the rear panel. One 5 meter cable is provided in the oven accessory kit. Tx, Rx and GND are the active pins employed by the oven. This cable may be connected to any standard RS-232 COM port on a computer workstation. The communications protocol is governed by the following rules:

- To communicate with the oven, employ any communication utility (i.e., Hyperlink) set up with a Baud rate of 9600 bits/ second, 8 data bits, no parity and one stop bit (9600, 8, N, 1).
- Communications will occur in half-duplex mode - the oven will accept only one query and will not accept new queries while acting on a current query.
- All query strings must be no more than 32 characters.
- Each query string starts with a "." (ASCII hex 2E) character, followed by a three-character query, ending with a carriage return (ASCII hex 0D).
- Each reply will end with a single byte checksum in hex format and a carriage return character. The checksum is simply the byte-wise addition of all preceding characters in the response string.
- Communications are case-sensitive. All queries employ upper case characters.

Queries and responses:

- QSS - Query System Status
 - The response is "Eaa,bbb,ccc,dd,ee,f,gg"
 - aa = error code. If no error condition exists, this string is "00"
 - bbb = temperature set point in tenths degree Celsius
 - ccc = actual chamber temperature in tenths degree Celsius
 - dd = rotation set point in rpm
 - ee = actual rotation rpm
 - f = door state (0 = open, 1 = closed)
 - gg = hex checksum byte
- QSN - Query Serial Number
 - The response is "1829aaaaaaaa"
 - aaaaaaaaa = the last nine digits of the oven serial number
- QSV - Query Software Version
 - The response is "a.aa,bb"
 - a.aa = software version number
 - bb = hex checksum byte
- In case of a syntax error in a query, the oven will reply with the communication error string "E22"

Error codes and troubleshooting

Note that the oven contains no user repairable parts. Only qualified field service engineers should open any panels on the oven. Do not attempt to repair the oven yourself.

In cases of an internal error or incorrect setup, the oven displays the following error codes on its front panel. These errors also appear in the response string to a "Query System Status" command on the RS-232 port ([Table 3](#)).

Table 3 Error codes and problems, descriptions and corrective actions

Problem/Error code	Description	Corrective action
E01, E02, E06 or E11	Each of these error codes indicate a specific failure in the oven temperature control system.	Discontinue use of the oven and contact Thermo Fisher Scientific Technical Support for further assistance.
E12	Failure of the rotisserie rotation drive.	Verify that the rotisserie is not being blocked from rotating, then contact Thermo Fisher Scientific Technical Support for further assistance.
E13	Imbalanced rotisserie load. This error may be posted if cartridge carriers are not distributed in a balanced manner on the rotisserie.	Redistribute the carriers to opposing locations (i.e., 3 o'clock and 9 o'clock) on the rotisserie. If the problem persists, contact Thermo Fisher Scientific Technical Support.
E22	Communications error.	This error will only occur in case of a syntax error in a serial port inquiry. It will be posted in the RS-232 reply and will not appear on the front panel displays.
No power—oven does not operate, displays are not illuminated	Verify that the power cord is plugged into an outlet and into the power receptacle on the rear of the oven. Verify that the 115/230 switch is set correctly. Verify that the front panel power switch is on.	
Blown fuse	Fuses should blow only in case of misapplied power or a severe internal electrical failure. If replacing fuses, note that the oven employs double pole fusing. The power entry module, located on the rear panel of the unit, contains two fuses, one for each side of the AC power circuit. Replace these only with 5 x 20 mm F6.3A (fast acting) 250V rated fuses, as marked on the rear panel of the oven (See the section, " Replacing the fuses " on page 22).	
Rotisserie does not turn	Verify that the system is not in PAUSE mode (press the PAUSE button to change this mode) and that the rpm is not set to OFF. Verify that rotisserie rotation is not blocked by objects inside the oven chamber.	
rpm reading is high	This is typically caused by a mildly imbalanced load. Redistribute the carriers to opposing locations (i.e., 3 o'clock and 9 o'clock) on the rotisserie. More severely imbalanced loads may cause an "E13" error.	

Oven maintenance

Cleaning

All of the oven chamber walls are stainless steel to retard corrosion.

NOTE: Remove saline solution spills with a damp cloth.


Clean the interior of the oven regularly to keep the stainless steel from corroding. The exterior of the unit is painted metal and plastic. Clean the exterior with a damp cloth. Use a mild cleaning solution if necessary.

Follow these guidelines when cleaning the unit:

- Unplug the unit, leave the door open, then allow the oven to cool before cleaning.
- Clean all surfaces with a damp cloth, employing a mild detergent (such as a dish washing detergent) and warm water when necessary.
- Do not scrub any surface with steel wool or abrasive cleansers.
- Where there is a heavy coating of residue on the stainless surfaces, or where there is evidence that corrosion is beginning, use a stainless steel cleaner.
- Wipe all surfaces with a clean damp cloth, then allow to air dry.
- Inspect the interior of the oven prior to further use, to ensure that no cloth or other debris is left inside the oven.

Replacing the fuses

There are two fuses located in the power entry module on the rear of most units.

 **WARNING!** Double pole neutral fusing!

To replace the fuses:

1. Turn the power switch to the off position and pull the power cord out of the module.
2. Fit a thin blade screwdriver under the top portion of the fuse holder ([Figure 18](#)).



Figure 18 Use a screwdriver to remove the fuse holder located under the 3-pronged plug.

3. Using a screwdriver and fingers, gently pry out and slide the fuse holder out of the module ([Figure 19](#)).



Figure 19 Removing the fuse holder

4. Replace the defective fuses.
5. Slide the fuse holder back into the module until it snaps in place ([Figure 20](#)).



Figure 20 Returning the fuse holder

GeneChip™ Hybridization Oven 645i specifications

Applied Biosystems GeneChip™ Hybridization Oven 645i

Applied Biosystems Part Number 00-0331

Manufactured by Thermo Fisher Scientific, Model 308-1CEAFFY

The GeneChip™ Hybridization Oven 645i is a General Purpose Laboratory Instrument.

Physical dimensions

The following dimensions are approximate, $\pm 5\%$.

- Width: ~18 inches (~46 cm)
- Height: ~20 inches (~51 cm)
- Depth: ~21 inches (~53 cm)
- Weight: ~67 pounds (~30 kg)

Power requirements

Input Voltage:

- 100 to 120VAC, 5A max. (with selector switch set to “115”)
- 220 to 240VAC, 2.5A max. (with selector switch set to “230”)

50 to 60Hz

Input voltage selector switch is located on the rear panel.

Environmental requirements

Operating Temperature Range: 15°C to 30°C

Relative Humidity Range: 20% to 80% RH non-condensing.

Installation Category (overvoltage) II in accordance with IEC 664.

Pollution Degree 2 in accordance with IEC 664.

Altitude limit: 2,000 meters.

Storage: -25°C to 65°C; 10% to 85% relative humidity.

Performance

Rotisserie Rotation Speed: 10 rpm to 80 rpm, programmable to 1 rpm

Oven Set Point Programmable Range: 30°C to 70°C, or ambient +5°C

Oven Temperature is programmable to 0.1°C.

Time to Temperature: 30 minutes from ambient to 60°C.

Oven Temperature Accuracy is $\pm 2.0^\circ\text{C}$ from 35°C to 60°C.

Communications

Nine pin RS-232 port, 9600 Baud rate. This monitors and reports oven temperature, rotisserie rotation rate and oven status.

Regulatory requirements

The oven conforms to the following regulatory standards, or applicable equivalents, for the United States, Canada, and the European Union:

- Product Safety for “Electrical Equipment for Measurement, Control, and Laboratory Use,” Pollution Degree 2, Over-voltage Category II:
 - North American standards harmonized to IEC 61010-1
CAN/CSA-C22.2 No. 61010-1-04 (Canada)
UL 61010-1 (USA)
 - Low Voltage Directive 2014/35/EU
EN 61010-1, General requirements
- Electromagnetic Conformity for “Industrial, Scientific and Medical” (ISM) equipment, Group I, Class A, industrial locations:
 - EMC Directive 2014/30/EU
EN 61326
 - ICES-003, Industry Canada, Interference-Causing Equipment Standard, Digital Apparatus, Class A (Canada)
 - FCC Part 15 Radio Frequency Emissions for Class A Equipment (USA)
- Restriction on Hazardous Materials (RoHS) - exemption under Category 9 (RoHS Directive 2011/65/EU and amendment 2015/863)
- Compliant with EU Directive 2012/19/EU for Waste from Electrical and Electronic Equipment (WEEE)



China RoHS Restriction of Hazardous Substances compliance

Manufacturers of Electronic Information products (EIPs) that are sold to the People's Republic of China, are required to provide information about lead, cadmium, mercury, hexavalent chromium, polybrominated biphenyls and polybrominated diphenyl ethers contained within.

In accordance with the Chinese RoHS (Restriction of Hazardous Substances), [Table 4](#) contains information identifying the specific hazardous material(s) and the components/parts in which they are found.

Table 4 Table containing names and contents of toxic or hazardous materials
Instrument: Applied Biosystems GeneChip™ Hybridization Oven 645i

Component/part categories	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent Chromium (Cr 6)	Polybrominated Biphenyls (PBBs)	Polybrominated Diphenyl Ethers (PBDEs)
Printed circuit boards	X	O	O	O	O	O
Rubber and plastic parts	O	O	O	O	O	X
Electrical components	X	O	X	X	O	O
Internal metal parts	O	O	O	O	O	O
External metal parts	O	O	O	O	O	O
Labels	O	O	O	O	O	O
Packaging/shipping materials	O	O	O	O	O	O
Internal lasers, optics, and sensors	O	O	O	O	O	O
Adhesives	O	O	O	O	O	O
Internal power supplies	O	O	O	O	O	O
Motors and pumps	O	O	O	O	O	O

X = Indicates that the toxic or hazardous substance contained is above the limit of 1,000 ppm for Lead and Hexavalent Chromium; or above 100 ppm for Cadmium.

O = Indicates that the toxic or hazardous substance contained is below the limit of 1,000 ppm for lead, mercury, hexavalent chromium, polybrominated biphenyls and polybrominated diphenyl ethers; and below 100 ppm for cadmium.

China RoHS Restriction of Hazardous Substances compliance

SJ/T11364-2006 电子信息产品污染控制标识要求

目前许多电子信息产品由于功能、性能或生产技术的需要，仍含有大量如铅（Pb）、汞（Hg）、镉（Cd）、六价铬 [Cr（VI）]、多溴联苯（PBB）和多溴二苯醚（PBDE）等有毒有害物质或元素。这些含有毒有害物质或元素的电子信息产品在废弃之后，如处置不当，不仅会对环境造成污染，也会造成资源的浪费。因此，为了达到节约资源、保护环境的目的，以有毒有害物质或元素的减量化、替代为主要任务的电子信息产品污染控制工作已经提到政府主管部门的议事日程。为此，信息产业部等七部委以“从源头抓起，立法先行”的思路和原则，制定了《电子信息产品污染控制管理办法》（信息产业部 39 号部长令，简称《管理办法》），以立法的形式，推动电子信息产品污染控制工作，旨在从电子信息产品的研发、设计、生产、销售、进口等环节限制或禁止使用上述六种有毒有害物质或元素。

为了进一步落实《管理办法》并达到限制有毒有害物质或元素在电子信息产品中使用的目标，必须有配套使用的统一的标识方法标准。因此，为了配合中华人民共和国《管理办法》的实施，同时也为中华人民共和国信息产业界对六种有毒有害物质或元素铅（Pb）、汞（Hg）、镉（Cd）、六价铬 [Cr（VI）]、多溴联苯（PBB）和多溴二苯醚（PBDE）的测试提供一个统一的标识方法，特制定本标准（表 Table 5）。

Table 5 有毒有害物质或元素名称及含量^a

仪器：Affymetrix GeneChip Hybridization Oven 645

部件名称	铅（Pb）	汞（Hg）	镉（Cd）	六价铬 [Cr（VI）]	多溴联苯（PBB）	多溴二苯醚（PBDE）
印制电路板	X	O	O	O	O	O
橡胶和塑料元件	O	O	O	O	O	X
电子元件	X	O	X	X	O	O
内部金属零件	O	O	O	O	O	O
外部金属零件	O	O	O	O	O	O
标签	O	O	O	O	O	O
组装 / 装货资料	O	O	O	O	O	O
内部激光, 光学器件和传感器	O	O	O	O	O	O
胶粘剂	O	O	O	O	O	O
内部电源	O	O	O	O	O	O
马达和唧筒	O	O	O	O	O	O

^aX：表示该有毒有害物质至少在该部件的某一均质材料中的含量超出 1000 ppm 铅（Pb），1000 ppm 六价铬 [Cr（VI）]，100 ppm 镉（Cd）的标准规定的限量要求。

O：表示该有毒有害物质在该部件所有均质材料中的含量均在 1000 ppm 铅（Pb），1000 ppm 汞（Hg），六价铬 [Cr（VI）]，多溴联苯（PBB），多溴二苯醚（PBDE），100 ppm 镉（Cd）的标准规定的限量要求以下。

电子信息产品污染控制标识要求（Marking for Control of Pollution Caused by Electronic Information Products）
SJ/T11364-2006

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Note: For SDSs for reagents and chemicals from other manufacturers, contact the manufacturer.

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