Operating Manual

Model UF-100 GENECHECKER®
Ultra-Fast Thermal Cycler

Last Update: January 2018
REF. Version USA 1.1

Contents

1. General Information

This operating manual contains basic instructions that should be followed during operation and maintenance of Model UF-100 GENECHECKER® Ultrafast Thermal Cycler (catalog number: 001100). Accordingly, it is recommended that any user thoroughly reads this document before handling the instrument. This manual should be always kept at the operation site of the instrument for immediate reference when necessary.

For any inquiry which is not described in this manual, please contact your regional representative of Victory Scientific for support.

1.1 Product Description

Model UF-100 GENECHECKER® Ultra-Fast Thermal Cycler described in this manual is polymer chip based PCR (polymerase chain reaction) thermal cycler which is performing rapid thermal cycling of genomic templates with high yield.

Model UF-100 GENECHECKER® Ultra-Fast PCR System has a compact and portable design and can be carried to any location conveniently. This instrument adopts DC 12V power input and can be connected to general car power source when optional car power connection kit is equipped.

Key concepts of this instrument can be summarized as follows.

- Microfluidic chip based PCR for rapid thermal cycling
- Compactness and portability makes POC (Point of Care) tests possible

Model UF-100 GENECHECKER® Ultra-Fast Thermal Cycler is recommended for following applications.

- Life science research on molecular diagnostics technology
- Laboratory PCR in biochemical and molecular biological study
- Field applications for veterinarian diagnostics
- GMO and food analysis
- Environmental detection
- Pharmaceutical or biological quality control
- On-site pathogen detection (POCT)

Model UF-100 GENECHECKER® Ultra-Fast PCR System is intended for laboratory use and should not be used for clinical application.

1.2 Technical Specification

Model UF-100 GENECHECKER® Ultra-Fast Thermal Cycler	
Operating Mechanism	Precise Control of Peltier Element
Temperature Accuracy	± 0.5℃
Temperature Uniformity	± 0.5℃ (Well to Well)
Temperature Stability	± 0.5℃
Ramping up Rate	8.0℃ / second
Ramping down Rate	8.0℃ / second
Range of Temperature Setting	30 ~ 65℃ (1.0℃ Increment) for RT Step 20 ~ 99℃ (1.0℃ Increment) for PCR
Sample Format	Polymer Based 3-Dimensional Chip*
Number of Samples per Run	10 or 16
Required Sample Volume	10μl
Typical PCR Duration	Approx. 12 minutes for 30 cycles (without RT Step)
Display	4 Line Text LCD
Integrated Memory	Saves up to 12 protocols
Power	AC 100-230V/50/60Hz (Input Power : DC 12V)
Power Consumption	120 W
Dimension	200mm (w) x 200mm (d) x 127mm (h)
Weight	Instrument : 3.2kg (Instrument Only)

* Exclusive chip for GENECHECKER® named Rapi:chip™ or Rapi:chip/16™

Rapi:chip™ and Rapi:chip/16™ PCR Chip for GENECHECKER®	
Dimension	38mm (w) x 25mm (d) x 6 mm (h)
Weight	3.56 g
Number of Wells	10 Wells (Rapi:chip™), 16 Wells (Rapi:chip/16™)
Volume of Each Well	10 μL
Aperture Diameter	0.6mm
Channel Height	0.5mm

Channel Length	8.0mm
Channel Width	2.0mm
Material	Transparent Polymer
Transparency	More than 95%

1.3 Dimensional Information

Figure 1 Dimension of the instrument as drawer is closed

Figure 2 Dimension of instrument as drawer is opened

2. Safety Instructions

This instrument is equipped with Peltier element of which surface temperature is sometimes elevated during instrument operation.
Accordingly, caution is required to avoid possible damage caused by heat. This chapter of manual introduces general safety instructions and instrument user should comply with the instructions described in this chapter.

2.1 Safety symbols in this manual

GENECHECKER® Ultra-Fast PCR System is designed to meet recognized technical regulations and is built with state-of-the-art components. Nevertheless, risks to users, property and the environment can arise when this instrument is used carelessly or improperly. Safety instructions explained with following symbols represent danger to user:

 Danger symbol  High temperature symbol

Caution symbol - Risk of damage to the instrument is possible unless user comply with the instruction marked with this symbol.

2.2 User qualification and training

The users operating, servicing and inspecting the instrument should be equipped with appropriate qualification to properly handle the instrument. This manual assumes that the users of instrument know how to handle biological samples including DNA, RNA and any other analytics to be introduced to the instrument and prepare them for PCR applications. If the users do not have suitable knowledge to properly operate the instrument, they should be trained prior to use. Instrument supplier and manufacturer are not responsible for possible damage of instrument which is caused by inappropriate qualification of users. If necessary, instrument supplier can provide training for the users in order to have them have enough knowledge to operate the instrument.

2.3 Safety instruction for user

 This instrument includes heating plate in it of which temperature is elevated up to 100°C while the instrument is performing thermal cycling. In order to avoid possible damage caused by high temperature of heating plate, user should not open the chip drawer while the instrument is running. User can identify the status of instrument by LED indicator installed around jog-dial. If red LED is blinking, it means that the instrument is running and user should not open the chip drawer.

This instrument is a sensitive electronic device and should be protected against dust, water vapor condensation, high humidity, water, aggressive gases and liquids. Dust can block the air ventilation holes of the instrument, which will reduce the cooling efficiency of the heating plate. Keep air ventilation holes of the instrument clean.

This instrument is delicate and sensitive electronic device and should be protected against strokes or external shocks. When the instrument is being transported for on-site analysis, please make sure the instrument is sufficiently protected with the materials offering cushioning effect. Design of original packaging of the instrument is optimized for the instrument. We recommend users to keep the original packaging of instrument for the case of transportation or long-time storage.

Install the instrument on the flat area and do not move this while the instrument is running. Chip drawer is opened and closed by physical locking mechanism and external stress could cause unintended opening of the chip drawer.

Only the electricity described in the chapter 1 should be applied to the instrument.

The power of instrument should be switched off before disconnecting power cable from the instrument. Also, the power switch should be at "O" position before connecting the power cable to the instrument.

Do not handle the instrument with wet hands as this will cause electric shock to the user.

Do not open the DC adaptor of instrument because there is the risk of electric shock when the cover is opened.

This instrument should be used with exclusive chip (Rapi:chip™ or Rapi:chip/16™) only and any other material should not be installed on the heating plate of the instrument for any purpose.

This instrument is designed and manufactured for the purpose of thermal cycling using exclusive chip (Rapi:chip™ or Rapi:chip/16™). Any other use is considered improper and may result in damage to the instrument and/or unreliable result of amplification.

3. Getting Started

Congratulations on your purchase of Model UF-100 GENECHECKER® Ultra-Fast Thermal Cycler. This chapter of manual will introduce the way to have instrument ready from the point when the instrument is delivered. This chapter includes four topics:

- Unpacking of product
- Ins and outs of system
- Power and electrical considerations
- Cabling

Please get familiar with the contents of this chapter before actual use of the instrument.

3.1 Unpacking product

This instrument uses eco-friendly bio-degradable packaging materials made of corrugated paper sheet and no plastic cushioning material is used for packaging of instrument. Only anti-scratch films and plastic bags are used for packaging instrument accessories.

Figure 4 Outer packaging of Model UF-100

Figure 4 is the image of outer packaging of instrument. When the instrument is delivered, left and right side of upper surface are sealed with paper tape. Using office cutter knife, cut this tapes alongside two edges of the outer carton (red lines in Figure 4).

Figure 5 Opening outer carton

Like figure 5, simply pull the flip at the center of front surface of carton then carton can be opened.

Figure 6 Inside of outer carton – upper space

Inside the carton, you will find 1 PK of Rapi:chip/16™ PCR Chip for GENECHECKER® (Cat. No. : 002004), operating manual, power cable set and chip scrubbing cloth. Depending the country, Victory Scientific will enclose the appropriate power cord in the product package. If you have received the incorrect power cord, please contact your local representative.

Figure 7 Inside of outer carton - bottom space

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Taking out Rapi:chip/16™ and power cable, you will see final packaging of GENECHECKER®. Remove upper cover and carefully take out instrument.

Figure 8 All the components of GENECHECKER® included in the packaging

Please check if all the components listed below are included in the product package.

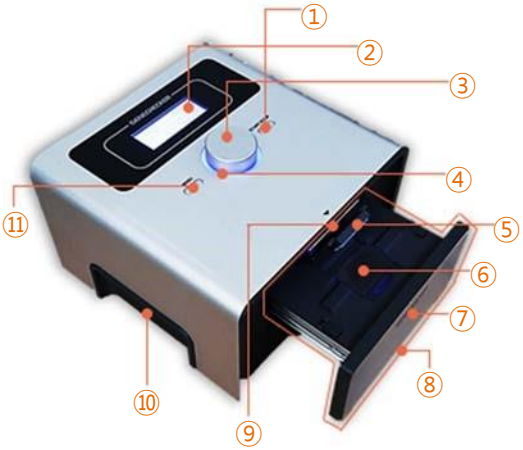
- 1 SET of GENECHECKER® Main Instrument
- 1 PK of Rapi:chip/16™ PCR Chip (Cat. No. : 002004)
- 1 EA of AC to DC Power Adaptor
- 1 EA of Power Cable Corresponding to Your Local Electricity
- 1 SET of Operating Manual
- 1 SET of Chip Scrubbing Cloth
- Packaging Materials

Three steps of inspection are performed at the manufacturer prior to shipping the instrument. However, for any possibility of missing or damaged components, it is highly recommend that you open the carton and check the components as soon as the instrument is delivered. In case any missing or damaged part is found, contact your local representative immediately for corrective actions.

3.2 Features of the Instrument

GENECHECKER® has intuitive and user-friendly interfaces for day-to-day PCR tasks in laboratory as well as on-site. However, it is recommended that you get more familiar with the functions of each part of GENECHECKER® through this topic before you operate the instrument and do the PCR job, in order to avoid possible mishandling of instrument.

Figure 9 Ins and Outs of GENECHECKER®



① RUN/STOP button
Selected PCR protocol is executed when this button is pressed. Currently performed PCR cycle is immediately stopped when this button is pressed while instrument is running.

② LCD display
4 line text LCD offers clear identification while protocol setting and status monitoring.

③ Jog dial
Rotating jog-dial rightwards or leftwards adjusts set values and pressing jog-dial selects what cursor indicates.

④ LED indicator
LED indicator is illuminated in two different colors, blue and red. Blue LED indicates that the instrument is idle and ready for use. Red LED indicates that the instrument is in use, i.e. PCR cycle is being performed.

⑤ Chip presser
Automatically presses upper surface of chip when the chip drawer is closed so that the bottom surface of the chip is securely in contact with heating plate.

⑥ Heating plate
The area where the chip is loaded for the PCR run. The Flat surface is heated and cooled during thermal cycling.

⑦ Air ventilation holes
The slats where the air flows through the instrument to help the thermal regulation.

⑧ Chip drawer
This part transports the chip into the instrument. The mechanically stable and robust design offers soft movement and maintenance-free features of this frequently used part.

⑨ PUSH bar
The chip drawer is gently opened and chip presser automatically moves up when this bar is pressed.

⑩ Groove for easy handling
This part is to enhance portable characteristic of this light compact instrument.

⑪ MENU button
Main menu screen is displayed when this button is pressed.

3.3 Power and electrical considerations

GENECHECKER® adopted DC power operation in order to apply instruments for use with versatile applications. In order to secure stable operation of instrument, your electrical preparation should meet the following requirements.

- Input Voltage : AC 100-240V (50/60Hz)
- Input Current : 2.0A

For your information, the output power of AC to DC adaptor to GENECHECKER® is as per following specification.

- Input Voltage : DC 12V
- Maximum Current : 10.0A

3.4 Cabling and Placement

As introduced in section 2.1, there are AC to DC power adaptor and general power cable compatible with your power consent in the instrument package. Connect power adaptor and power cable like Figure 10.

Figure 10 Connecting cable to DC adaptor

Figure 11 Connecting DC adaptor cable to instrument

Then, place the male 4-pin power jack of AC to DC adaptor to the female power socket at back side of instrument and apply slight pressure forward to connect to power jack to the instrument. Pay attention to the direction of power jack when you connect this to the instrument. Flat surface of power jack (with marked arrow) should face the bottom and round surface of power jack should face top. Applying pressure with wrong direction of power jack will damage the socket. For the communication with software, connect enclosed USB cable to the port located upper part of power socket. Round shaped tip of the cable should face top.

There should be more than 15cm of clearances around the sides of GENECHECKER® in order to adequately cool the system. Never block air ventilations holes at front and back side of instrument because this can lead to malfunction of instrument and cause physical damage to heating system of GENECHECKER®.

Now, GENECHECKER® is ready for operation.

Go to the next chapter to learn how to operate the instrument.

4. Operation

This chapter will describe what kinds of steps are needed to conduct experiments and how to set the instrument to properly perform ultra-fast PCR tasks. The following topics will be explained.

- Tools needed to start operation
- Sample and enzymes for PCR task with GENECHECKER®
- How to handle Rapi:chip/16™
- Collection of samples for additional treatment
- Setting and saving protocols
- How to use car power kit (option)
- Shut down and storage
- Alarming sounds of GENECHECKER®

4.1 Tools needed to start operation

GENECHECKER® requires several tools used for general biological experiments. Before starting PCR task, please check below items and have them ready.

Tools that should be ready before using GENECHECKER®		
Adjustable Volume Micropipette	Volume Range : 0.5-10μL	1 EA
Pipette Tip	Volume : 0.1~10μL	As required
Tweezers	Straight or Curved	1 EA
Parafilm or Tubes	To prepare sample mixture	As required
Vortex and/or Centrifuge	For mixing sample	1 EA

Based on the assumption that you are familiar with PCR preparation process, this manual doesn't describe the details how to prepare PCR samples. In order to mix samples with enzyme and etc., general micropipette and tips are needed for accurate volume handling and general small volume mixing tools like parafilm or tube (with centrifuge) is needed to mix the sample properly. Tweezers having straight or curved tip is needed to handle sealing tapes which

is quite thin and small to deal with finger. If you are equipped of these things, you are set to start experiment with GENECHECKER®.

4.2 Sample and enzyme for PCR tasks with GENECHECKER®

Nucleic acid extraction and purification

We do not require any specific method of sample preparation (extraction and purification) for use with GENECHECKER®. General methods of sample preparation used for conventional PCR task are acceptable for GENECHECKER®.

PCR Enzyme

As you may be familiar with, GENECHECKER® has key characteristics which are extremely fast thermal cycling. In order to make best use of these key features and minimize trial and errors in the enzyme selection, we recommend users to use following master mix supplied by Victory Scientific which are optimized for use with GENECHECKER®.

Cat. No.	Description	Pack Size
004003	Rapi:Amp Master Mix	2 x 1ml Tube

Series of master mixes of Victory Scientific are 2x concentrated, ready-to-use reaction cocktail containing all components, except primers and template, for ultra-fast PCR tasks. These premixes includes a novel antibody-mediated hot start DNA polymerases with improved speed compared to other commercial polymerases, as a standard.
For the customers who want to use their own enzymes for reaction, it is recommended to source that with similar features of what is supplied by Victory Scientific.

Recipe of sample mixture

There is no fixed recipe to create sample for PCR and it is recommended for users to find their own recipe optimized for GENECHECKER® through actual experiments. However, user can start with following example of sample recipe. Please note that final volume of sample should always be 10μL.

Item	Volume
Master Mix	5 μL
Primer (Reverse and Forward)	2 μL
Template	X μL
DNA/RNA Free Water	Adjust to final volume of 10μL

Size of DNA template

There is no fixed DNA size to be used with GENECHECKER® but it shows maximum (fastest) performance when the size of template is no longer than 500 bp. However, GENECHECKER® can run with up to 1,000 bp or larger DNA when the cycle time is set at maximum duration.

Concentration of Primer

Concentration of primer is one of key factors affecting to the quality of analysis. Annealing becomes inefficient if the concentration of primer is too low while primers can non-specifically bind to undesired section of the template or bind to each other if concentration of primer is too high. There is no recommended molar concentration of DNA template but it is recommended to start with 10 pmol concentration because well-designed primers that works perfectly with GENECHECKER® is in the range of concentration, 10 pmol or under.

4.3 How to handle Rapi:chip/16™

Rapi:chip/16™ is key component to achieve ultra-fast PCR result using GENECHECKER®. There are several tips to make best use of Rapi:chip/16™ without error or poor reaction outcome.

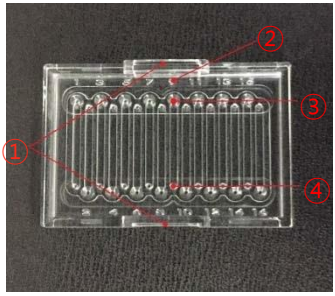
- Bottom surface is key part to achieve ultra-fast PCR result and this part should be always kept clean.

- Forget about PCR using conventional PCR instrument and try to get accustomed to new PCR concept with Rapi:chip/16™ which requires a little different pipetting technique. You should inject the sample into the wells of chip and never drop the sample on the chip surface. For this, you should insert end of pipette tip into the apertures of chip wells. This point is very important because Rapi:chip/16™ is small device and the distance between adjacent ports are very close, i.e. this chip is open to the possibility of cross contamination.

- Basically, user can freeze Rapi:chip/16™ containing samples in each well. However, please keep in mind that, in some cases, bottom surface can be burst while Rapi:chip/16™ gets frozen owing to volumetric expansion of sample existing in each well.

If you have kept in mind above tips, you are now set to start actual experiment with Rapi:chip/16™ in connection with GENECHECKER®. Please be familiar with each part of Rapi:chip/16™.

Figure 12 Getting familiar with Rapi:chip/16™



① Wings
These parts are used for picking up Rapi:chip/16™ with fingers or tweezers.

② Printed Well Numbers
Well numbers from "1" to "10" are printed on the upper surface of the chip. Odd numbers of well (1, 3, 5, 7 and 9) are printed on the top and even numbers of well (2, 4, 6, 8 and 10) are printed on the bottom of the well.

③ Inlet Hole
The holes neighboring with printed well numbers are inlet hole of each well where pipette tip is inserted for injecting PCR mixture into the well. In order to minimize the possibility of contamination, inlet holes with odd number are in upper area of the chip and those with even number are lower area of the chip.

④ Outlet Hole
The hole at opposite side of each well's inlet hole is outlet hole through which air existing inside the well is escaping while PCR mixture is loaded into the well. Excess volume of each well volume (10μl) run over through this hole.

Figure 13 Rapi:chip/16™ packaging

Figure 13 shows standard packaging of Rapi:chip/16™ (Cat. No. : 002004). This package contains 48 pcs in it but Rapi:chip/16™ is also supplied in different package as follows.

Cat. No.	Description	Pack Size
002004	Rapi:chip/16™ PCR Chip, Small Pack	48/PK
002005	Rapi:chip/16™ PCR Chip, Medium Pack	384/PK
002006	Rapi:chip/16™ PCR Chip, Large Pack	768/PK

Cat. no. 2005: medium pack comes with 8 PK of cat. no. 2004 and cat. no.2006 : large pack comes with 16 PK of cat. no. 2004. These options of purchase are available to extend volume purchase discount to the users.

Carton of Rapi:chip/16™ with wrapped with plastic film. You can open the carton after removing wrapping film.

Figure 14 Inside the Rapi:chip/16™ packaging

Rapi:chip/16™ is placed inside the rack in 4 rows and 12 chips are stacked in each row of the rack. Besides the chips, there are sealing tapes in each carton. Sealing tapes are used for sealing apertures of Rapi:chip/16™ after samples are loaded in each well. In order to seal 10 wells of Rapi:chip/16™, one piece of the tape is needed. Sealing tape is in white in color and the user can make a memo on it if necessary.

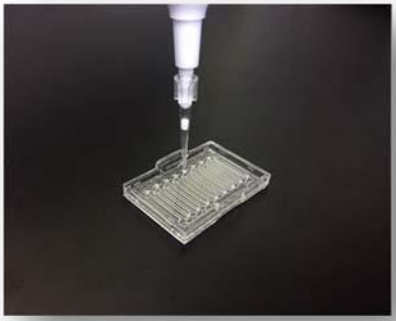
Figure 15 Peeling plastic film inside the package

Upper surface of stacked chips are sealed with plastic film in order to prevent possible contamination. This film can be easily peeled using fingers like shown in figure 15. For storage of remaining chips, you may seal the upper surface of the rack using the same film.

Figure 16 Picking up Rapi:chip/16™ out of the packaging

For easy transportation using tweezers or fingers, Rapi:chip/16™ has two wings at its sides. Using general tweezers (straight or curved), hold either side of wings and move the chip out of the packaging as Figure 16.

Figure 17 Sample loading into Rapi:chip/16™



After preparing sample mixture, aspirate this with pipette and vertically place the tip in the inlet hole like you see in Figure 17. Inlet hole is neighboring with printed well number and size of this hole is a bit bigger than outlet hole (Refer to Figure 12). The hole on the opposite side of the well is outlet whole where the air existing in the well and excess volume of sample is discharged. While sample loading, make sure that the end of tip is securely fit into the inlet hole of the well and apply slight force downward and then, slowly dispense the sample into the chip. You can observe the sample flow inside the well while loading.

Rapi:chip/16™ is designed to accommodate exact volume of 10μL in each well and the sample flow should stop without overflowing unless there is any error in pipetting process. If you observe that dispense of sample is not competed although the sample flow reaches opposite aperture of the well, you should stop dispensing sample.

Figure 18 Examples of wrong sample loading

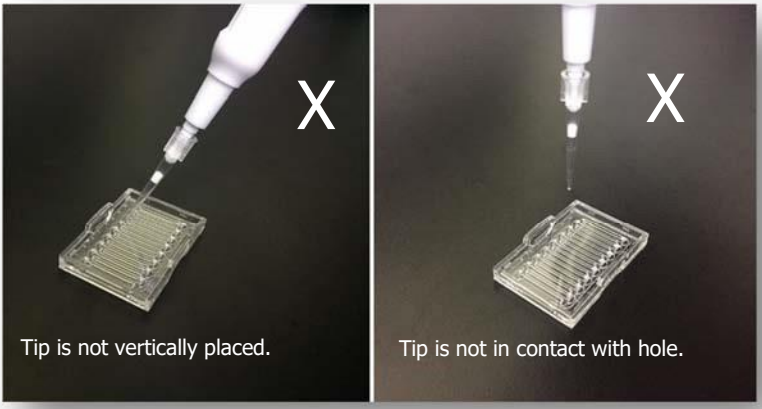
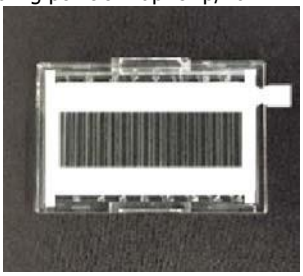


Figure 18 shows wrong examples of sample loading. As introduced earlier, pipette tip should be inserted to the aperture of Rapi:chip/16™ and its direction should be vertical.

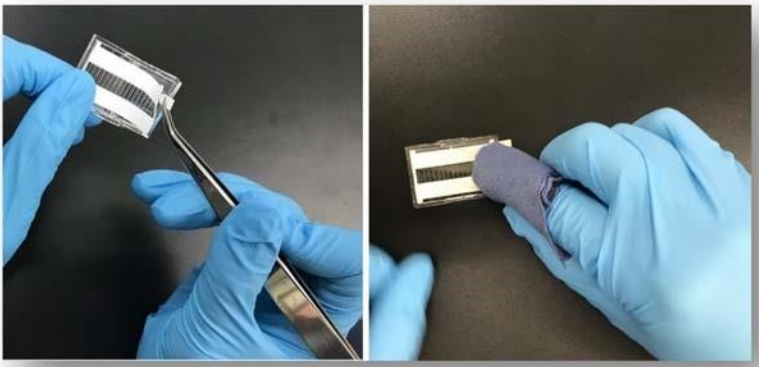
Figure 19 Sealing point of Rapi:chip/16™



After sample loading process, every hole of the wells should be sealed using enclosed sealing tapes. This is to prevent vaporization of samples while thermal cycling. Every hole of the chip should be sealed with one piece of tape like Figure 19.

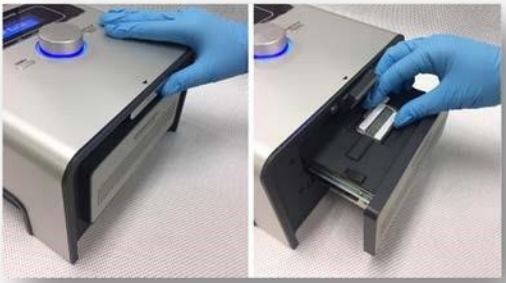
In the box of Rapi:chip/16™ (Cat. No. : 002004), there are 10 strips of sealing tape and each trip contains 5 pieces of sealing tape, i.e. total 50 pieces of sealing tape comes with Rapi:chip/16™ (actual quantity needed : 48 pieces based on 48 chips).
Taking out one strip of sealing tape from the plastic bag in the box, peel one piece of sealing tape from the strip using tweezers.

Figure 20 Sealing holes with sealing tape



Like Figure 20, place one end of sealing tape alongside chip end and seal entire holes. Then, scrub the surface of sealed points using finger or enclosed scrubbing cloth.

Figure 21 Loading samples on the heating plate



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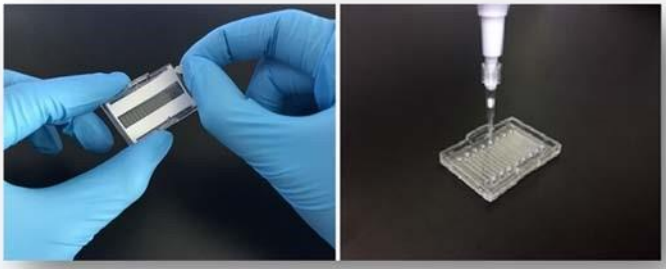
Once every aperture of Rapi:chip/16 is securely sealed with sealing tape, you can proceed with instrument loading process. Like Figure 21, gently push the button on the front side of instrument. Then, the instrument drawer is opened and you can find rectangular space at the center which is heating plate and the place to place prepared Rapi:chip/16™. Using finger or tweezers place the prepare Rapi:chip/16™ on the heating plate. Make sure that Rapi:chip/16 is

flatly loaded on the heating plate because failing which will not allow the door get closed properly and possibly damage the components inside the drawer. Then, close the drawer by pushing front surface of drawer until you hear the sound of "click" which indicates that the drawer is properly closed. Never try to open the drawer and withdraw the chip while instrument is performing thermal cycling. This can cause heat damage to user.

Now, you are set to start instrument operation. At the next chapter, you will be guided to set instrument and start operation.

4.4 Collection of samples for additional process

Figure 22 Retrieving samples for running gel electrophoresis



For retrieving samples from Rapi:chip/16™ for running gel electrophoresis after the reaction is finished, hold the handle on the right side of sealing tape and remove the tape from the Rapi:chip/16™. Then, vertically place pipette tip on the inlet hole of Rapi:chip/16™ and aspirate the sample. You should retrieve entire volume of the sample.

4.5 Setting and saving protocols

GENECHECKER® has simple user interface which enables user to intuitively set his or her own protocol and start operation. User can control GENECHECKER® with three parts which is jog dial, "MENU" button and "RUN/STOP" button. Refer to Figure 9 in page 11 to get familiar with the location of each part. Basic functions of these three control interfaces are as follows.

Jog Dial

- Rotating jog dial leftwards indicates upper menu in MENU screen.
- Rotating jog dial rightwards indicates below menu in MENU screen.
- Rotating jog dial leftwards decreases indicated number.
- Rotating jog dial rightwards increases indicated number.
- Pressing jog dial selects indicated menu

- Pressing jog dial sets indicated number and indicates the next parameter to set.
- Rotating jog dial leftwards or rightwards moves the screen to previous or next screen in case selected menu consist of multiple screens (ex. Protocol Setting or Load Protocol)
- Pressing lengthily saves the protocol in integrated memory.

MENU button

- Pressing this button at initial screen moves the screen to MENU screen.
- Pressing this button moves the screen to previous screen.
- Pressing this button while adjusting parameter escapes from the parameter that user was setting.

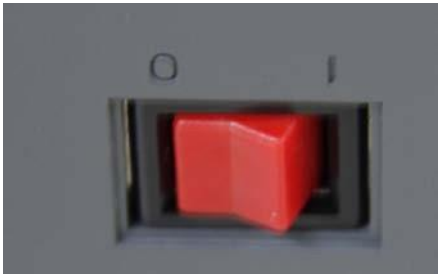
RUN/STOP button

- Pressing this button at initial screen moves the screen to MENU screen.
- Pressing this button starts instrument operation when this button is pressed at the protocol screen
- Pressing this button makes the screen display "Are you sure to stop?" when this button is pressed while instrument is running.
- Pressing this button stops instrument operation when this button is pressed while "Are you sure to stop?" is displayed in the screen.

Jog dial is surrounded by LED lamps which illuminates in different colors depending on instrument status. This is to have users to identify the status of LED from a distance without checking the screen.

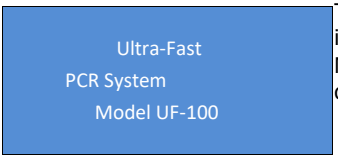
Lamp Color	Status
No	Instrument completed operation and now it is idle. LED lamp is turned on.
Blue	Instrument is idle and waiting for instruction.
Red (Blinking)	Instrument is running.

Figure 23 Power switch of GENECHECKER®



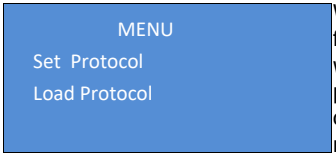
GENECHECKER® has its power switch on the back of instrument. The switch shown in Figure 23 is two position power switch. "O" is off position and "I" is on position. User can switch on GENEHCECKER® by setting the switch to "I" position and off GENECHECKER® by setting the switch to "O" position. Never touch the switch with wet hands.

Initial Display



This is displayed on the screen when the instrument is switched on.
Model number and instrument name is displayed.

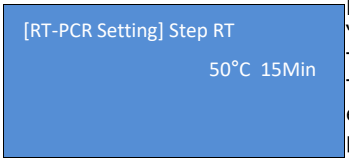
MENU



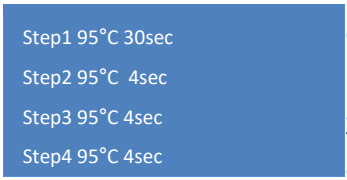
When "MENU" button or jog dial is pressed from initial display, screen displays the left where you can select the menu you want to perform. Blinking menu is what can be chosen once jog dial is pressed and you can move up and down by rotating jog dial leftwards or rightwards. Pressing jog dial selects the blinking menu and proceeds to next screen. This screen returns to initial screen unless there is user's adjustment for 30 seconds. Basic description of each menu is as follows and details on how to set is explained later.

- Set Protocol: You can program your own protocol in this menu. You can set temperature, time of each step and set number of cycles (denaturation – annealing – extension) to be repeated.
- Load Protocol: You can load the protocol which was saved in integrated memory of instrument.

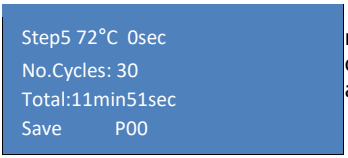
Setting Protocol



Left screen is displayed when you select "Set Protocol" from the menu screen. This screen is for setting RT (Reverse Transcriptase) PCR cycle when the experiment uses RNA template. If you press jog dial, the number 50 in left screen starts to blink.
This number is the temperature you can keep for RT-PCR cycle. You can adjust this number by rotating jog dial leftwards or rightwards. Range of number (temperature) you can set is from 35 to 65. If you press jog dial after temperature adjustment, adjusted number is set as temperature and the number 15 in left screen starts to blink. This number is the duration (minutes) for which you want to keep set temperature. User can adjust this number from 0 to 30. By pressing jog dial, adjusted number (duration) is set and the screen proceeds to next page. If you do not have to fulfill RT-PCR cycle, the time should be set at "0". Then, the step RT is skipped.



Left screen is displayed when you complete setting RT-PCR cycle. Step1 through step4 displayed in the screen represent pre-denaturation, denaturation, annealing and extension cycle respectively. Temperature and duration (second) can be adjusted and
set by the same method used in RT-PCR setting.



Left screen is displayed when you slightly rotate jog dial rightwards at initial screen of protocol setting or presses jog dial after adjusting temperature of step 4.
This screen includes step 5 which is the post extension cycle and this can be set by the same method described above. The range of temperature and duration that can be set for each step is as follows.

Step	Cycle	Temperature Rage	Duration
RT	Reverse Transcriptase	35~65 °C	0 ~ 30 minutes
1	Pre-denaturation	1~99 °C	1 ~ 900 seconds
2	Denaturation	1~99 °C	1 ~ 60 seconds
3	Annealing	1~99 °C	1 ~ 60 seconds
4	Extension	1~99 °C	0 ~ 60 seconds
5	Post-extension	1~99 °C	0 ~ 180 seconds

Step 4, extension step can be set at "0", which is to have this instrument perform 2-step thermal cycling when needed.

You can also set the time of repeating "denaturation – annealing – extension" cycle (step 2 through 4 of protocol setting screen). "Total" indicates total duration required to complete set protocol including melting cycle and this duration is calculated automatically.

"Save" is blinking if you complete setting number of cycles. If you desire to save set protocol in integrated memory, the screen proceeds to new screen by pressing jog dial, where you can save the set protocol. If you don't want to save, instrument immediately starts currently set protocol by pressing "START/STOP" button.

"P00" in the screen indicates the address where current protocol is saved. "P00" means that this protocol has no address and can be saved if user wants. If the protocol is loaded from integrated memory, the address of the loaded protocol is displayed in place of "P00" of the screen. GENECHECKER® has integrated memory where up to 12 protocols can be saved and its address is displayed in format of "POO" such as "P01", "P12" and so on.

Saving Protocol

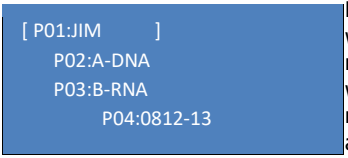
Left screen is an example of display which is shown when you press jog dial while "Save" of protocol setting screen is blinking. Cursor moves up and down by rotating jog dial and you can save the set protocol by pressing jog dial and staying for 3 seconds at the address which cursor indicates. Then, you can name the protocol by combination of following characters.

Item	Character
Alphabets	A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
Numbers	1 2 3 4 5 6 7 8 9 0
Signs	. ( ) * # -
Others	Spacing

By rotating jog dial, you can see above characters in order and set desired character by pressing jog dial. You can input up to 7 characters for naming and the protocol is automatically saved if you input the last 7th character.

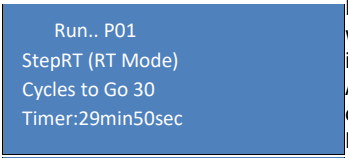
If you want to name the protocol with the characters less than 7, the protocol is saved by pressing jog dial and staying 3 seconds after entering last character. If you save the protocol in the address where other protocol already exists, old protocol is replaced by newly saved protocol.

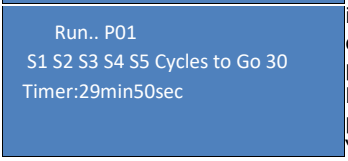
Loading Protocol



Left screen is an example of what is shown when you select "Load Protocol" from menu screen. You can select the protocol which already exists in each address of memory by locating the cursor with jog dial and select desired protocol by pressing jog dial. Once protocol is selected, selected protocol is displayed in the screen and you can start protocol by pressing "START/STOP" button. Parameter of protocol can be changed and newly saved with updated parameters.

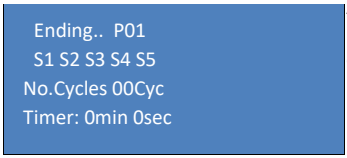
Starting and Stopping Operation





Left screen is an example of what is shown while RT-PCR cycle is performed. "StepRT" is blinked while this cycle is performed. After RT-PCR cycle is finished, the screen is changed to below screen which shows set PCR cycle consisting of 5 steps. You can identify which step GENECHECKER® is currently performing as currently performed step ("S1" through "S5") blinks. For example, "S2" blinks if instrument is performing step 2 - denaturation cycle. "Cycles to Go" means the total remaining cycles (denaturation – annealing – extension) to complete prompted PCR cycle and indicated time after "Timer" is total remaining time to finish entire PCR cycle being performed.

PCR Cycles is Completed



An alarm rings "beep-beep-beep-beep-beep" and the result of reaction is displayed on GeneRecorder software. This screen is kept until user intervention.

4.6 How to use car connection power kit (option)

GENECHECKER® adopted DC 12V power input which enables users to apply instrument to versatile PCR applications. GENECHECKER® can be operated using car power jack using car connection power kit (P/N : 003001). Car connection power kit has DC voltage regulator which stabilizes unstable output voltage from car power jack and supply appropriate power to GENECHECKER®. Simply connect car connection power kit to back of instrument and connect the other end to car power jack. Now it is ready to operate GENECHECKER® in the car. Just follow general method of using GENECHECKER® described earlier chapter. Drive anywhere and apply GENECHECKER® to your POCT applications.

4.7 Alarm sounds of GENECHECKER®

Sound	Status
Short "beep-beep"	Instrument is turned on
Short "beep" at high tone	MENU button or jog dial is pressed. Jog dial is rotated rightwards
Short "beep" at low tone	START/STOP button is pressed. Jog dial is rotated leftwards.
"Beep-beep-beep"	Prompted PCR cycle has been finished and Well-Viewer is going to be turned on after 8 seconds.
"Beep-beep-beep-beep-beep"	Well-viewer is turned off and instrument is waiting for user's intervention to proceed with other jobs.
Endless "beep-beep- …"	Peltier or temperature sensor is out of order. User should immediately contact your local representative.
Endless "beep----------"	Heat limit sensor is activated and instrument is shut down for protection.

4.8 Shut down and storage

In order to turn off GENECHECKER®, switch off instrument while GENECHECKER® is in idle status (When LED of jog dial has no color or is in blue color).

Simply set the switch on the back of instrument to "O" position then, every power connected to instrument will be shut off. For long term storage, it is recommended to disconnect power cord and put the instrument into original carton. It is recommended that the instrument is kept in dry and cold space in order to protect the instrument.

5. Maintenance

GENECHECKER® is maintenance free instrument which requires user's minimized actions to keep the instrument in good conditions. In order to ensure proper operation of GENECHECKER®, please read the followings and perform the recommended.

- The key parts to secure 100% of efficiency of instrument are heating plate and bottom surface of Rapi:chip/16™ and these two parts should kept always clean. In order to have entire bottom surface of Rapi:chip/16™ securely in contact with the surface of heating plate, remove dust or any other materials from the heating plate or bottom surface of Rapi:chip/16™ using manual air blower. Use soft cloth or dust-free wipes to clean heating plate. Never use alcohol or solvent to clean heating plate as it will damage the surface coating of heating plate. Only small volume of water is recommended for wiping surface of heating plate.

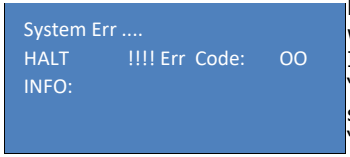
- GENECHECKER® has air ventilation holes at three faces which are front, bottom and the back. Air ventilation holes at front face are air Intake holes and the holes at other two faces are for exhausting air. Every hole should be kept always clean in order to secure efficiency of air ventilation.

- Please keep in mind of the details on alarming sound of GENECHECKER® introduced in chapter 4.7 and contact your local representative for service in case of any instrument failure.

- It is strictly prohibited for users to disassemble the instrument without prior approval of Victory Scientific. Disassembling or modifying the instrument without approval of Victory Scientific will void warranty.

6. Error screen and troubleshooting

- Error screen



Left image is error screen that is shown when the instrument has a fatal error in it. If the place where "OO" is shown indicates "F0" or "F2", it means that temperature sensor is damaged. If the place where "OO" is shown indicates the codes other than "F0" or "F2", it means that peltier is damaged. Please contact your supplier if this screen is displayed.

- Troubleshooting

Trouble	Cause	Solution
Nothing is indicated on the screen when instrument is switched on.	Power failure	Check if the lamp of DC adaptor is in green color Check if power jack is properly inserted (See the direction).
Chip drawer is not closed.	Error in chip loading	Place the chip on the heating plate flatly and securely.
Chart is not generated on the GeneRecorder.	Intended interval	Please wait until the chart is displayed as it takes some time depending on the PC performance.
The curve on GeneRecorder doesn't show any signal value.	Sample recipe and /or PCR protocol is not optimized.	Adjust the sample recipe and PCR protocol
Instrument is alarming	Component failure	Refer to chapter 4.7 for detail
Abnormal screen is shown	Component failure	Contact local representative.
Dots are shown in the wells when Rapi:chip/16™ is observed through GeneRecorder.	Bubbles are formed due to poor sealing of apertures. Sample is evaporated during thermal cycling. Sample volume is less than 10μL.	Securely seal the apertures by firmly scrubbing sealing tapes. Securely seal the holes by firmly scrubbing sealing tape. Dispense precise volume of sample into wells of Rapi:chip/16™
Chip is wetted after thermal cycling	Holes of Rapi:chip/16™ are sealed poorly.	Securely seal the holes by firmly scrubbing sealing tape.
Stains along the chip well position are shown on the heating plate.	Heat generated during thermal cycling	Wipe the plate. If it is not completely removed use as it is. It doesn't effect to instrument performance at all.

7. Service and Warranty

Warranty of GENECHECKER® is extended against defects of materials and/or workmanship and its period is 1 year from purchase. If any defect should occur during warranty period, Victory Scientific repairs defective part on the free

charge basis or replaces defective unit. However, warranty voids at the following cases.

- Disassembling GENECHECKER® without prior approval of Victory Scientific.
- Damage of warning labels that seal each part of instrument. - Defects caused by improper operation - Deliberate or accidental misuse.
- Damages caused by use of improper samples
- Damage caused by disasters

8. Instrument certifications

Model UF-100 GENECHECKER® Ultra-Fast PCR System comply with the requirements set forth in the technical standards below.

IEC 61326-1:2005	**EN 61326-1:2006**
CISPR 11:2009+A1:2010 Group1 Class A	EN 55011:2009+A1:2010 Group1 Class A
IEC 61000-3-2:2005+A1:2008+A2:2009	EN 61000-3-2:2006+A1:2009+A2:2009
IEC 61000-3-3:2008	EN 61000-3-3:2008
IEC 61000-4-2:2008	EN 61000-4-2:2009
IEC 61000-4-3:2006+A1:2007+A2:2010	EN 61000-4-3:2006+A1:2008+A2:2010
IEC 61000-4-4:2004+A1:2010	EN 61000-4-4:2004+A1:2010
IEC 61000-4-5:2005	EN 61000-4-5:2006
IEC 61000-4-6:2008	EN 61000-4-6:2009
IEC 61000-4-11:2004	EN 61000-4-11:2004

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:
(1)This device may not cause harmful interference.
(2) This device must accept any interference received, including interference that may cause undesired operation.

Applied standards : ANSI C63.4-2009
Rule parts : FCC Part 15 Subpart B – Unintentional radiators
ICES-003, Issue 5, August 2012
Equipment Class : Class A digital devices

CAUTION: Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed

to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

9. Ordering information

Cat. No.	Description	Pack
001100	Model UF-100 GENECHECKER® Ultra-Fast Thermal Cycler	1 SET
002001	Rapi:chip™ PCR Chip for GENECHECKER® – Small Pack	48/PK
002002	Rapi:chip™ PCR Chip for GENECHECKER® – Medium Pack	384/PK
002003	Rapi:chip™ PCR Chip for GENECHECKER® – Large Pack	768/PK
002004	Rapi:chip/16™ PCR Chip for GENECHECKER® – Small Pack	48/PK
002005	Rapi:chip/16™ PCR Chip for GENECHECKER® – Medium Pack	384/PK
002006	Rapi:chip/16™ PCR Chip for GENECHECKER® – Large Pack	768/PK
003001	Car Connection Power Kit	1 SET

10. Contact Information

For any technical questions on the instrument, please contact Victory Scientific using following contact details or its local representative.

Victory Scientific
305 Snowy Owl Court
Sewell, NJ 08080

Phone : 609-915-5371

Email : CS@victoryscientific.com
Website :http://www.VictoryScientific.com