



# ESR-Auto Plus® Operator's Manual

Model 505, v 4.0-6.0

**Streck**



# Welcome to Streck!



Thank you for choosing the ESR-Auto Plus®, the most accurate, reliable and user-friendly automated ESR analyzer available today! Our dedicated employees are here to make your ESR-Auto Plus experience as simple as possible.

This manual covers the operation and configuration of the ESR-Auto Plus Model 505, the ESR-657 Mixer and the ESR Barcode Scanner.

The following item is included with this manual for your convenience:

## QUICK REFERENCE GUIDE

A simple, condensed guide to the most common instrument functions.

### TECHNICAL SERVICE DEPARTMENT

800.843.0912 (ext. 7510)  
technicalservices@streck.com

The ESR-Auto Plus is supported by a staff of experienced Medical Laboratory Scientists who welcome the opportunity to assist you. Our on-site Technical Service Representatives have immediate access to the ESR-Auto Plus, and they are an excellent resource to answer your product questions.

Contact Streck for:

- Assistance with implementation of the ESR-Auto Plus
- Technical support for the entire ESR product line
- Processing ESR-Auto Plus correlation data

We want your relationship with our company to extend beyond being satisfied with our product. It is our privilege to serve you, and we are looking forward to your next call.

## STANDARD WARRANTY

Streck warrants the ESR-Auto Plus, ESR-657 Mixer and ESR Barcode Scanner to be free from defects in workmanship and materials during normal use for a period of one year from the date of purchase. If any defects occur during the warranty period, contact Streck Technical Service Department. This warranty does not cover defects or malfunctions which occur due to instrument abuse, improper maintenance or unauthorized repairs.

## INSTRUMENT RETURN POLICY

Any claim for credit or return of instruments for any reason must be made within 30 days of receipt of the instrument. Returns executed within 30 days of receipt will result in an automatic reassignment of the instrument title back to Streck. The customer will be responsible for return freight charges on all customer-initiated instrument returns. All instruments approved for return will be subject to a \$100 return fee.

- The customer must repackage the instrument(s) in its original packaging to ensure that the components do not shift during shipment. Refer to Section 9.7 for repackaging instructions.
- The customer must contact their Streck Sales Representative to obtain a return authorization number, which must be clearly marked on the outside of the package.

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Introduction



# Chapter 1

## Introduction



Figure 1a:  
ESR-Auto Plus



Figure 1b:  
ESR-657 Mixer



Figure 1c:  
ESR-Vacuum Tubes



Figure 1d:  
ESR Barcode Scanner

The ESR-Auto Plus® is designed to accurately and precisely measure the sedimentation rate of erythrocytes (red blood cells) in Streck ESR-Vacuum Tubes. The results are recorded as millimeters (mm) per hour (Westergren Method) by converting to the QuickMode method, a scientifically developed method for measuring ESR in only 30 minutes. The instrument compensates for temperatures above 26°C (79°F).

Results are automatically reported to an internal printer. The instrument may also be interfaced with a Laboratory Information System (LIS) or a computer. To reduce errors with patient identification and labeling, the instrument can be equipped with a barcode scanner.

The mixing process prior to evaluation of an ESR sample is critical. For this reason, the ESR-657 Mixer is available as an additional accessory. The ESR-657 Mixer operates using a slow 360° rotation, which ensures complete mixing and more accurate results.

The ESR-Auto Plus and ESR-657 Mixer are IVD Medical Instruments.

### 1.1 ESR Components

#### ESR-Auto Plus (Figure 1a)

The ESR-Auto Plus analyzer can process up to 20 samples per hour. Samples are read by infrared light using a measuring arm, which is controlled by a motor.

#### ESR-657 Mixer (Figure 1b)

The ESR-657 Mixer is designed to mix Streck ESR-Vacuum Tubes prior to evaluation. Its unique motion ensures proper mixing of samples. The ESR-657 Mixer can hold up to 10 ESR-Vacuum Tubes.

#### ESR-Vacuum Tubes (Figure 1c)

ESR-Vacuum Tubes are available in 1.2ml and 2.0ml vacuum draw sizes and are designed specifically for use with the ESR-Auto Plus, ESR-657 Mixer and ESR-10 Manual Rack. High Altitude and Safety Coated 1.2ml tube configurations are also available.

#### ESR Barcode Scanner (Figure 1d)

Symbol barcode scanner (catalog #240329, mfr. part #LS1902T-i000 or LS2208-SR20001) connects to the ESR-Auto Plus using a COM port cable, (mfr. part #25-55591-20). It is compatible with most available barcodes: EAN, UPC, Codabar, Code 39, Code 93, Code 128, Interleaved 2 of 5, and several more. The barcode scanners are considered to be Class 2 lasers that emit Class 2 laser light.



Figure 2a



Figure 2b



Figure 2c



Figure 3

## 1.2 Unpacking Instructions

Retain all packaging materials for shipping, moving or storing the instrument.

1. Open the box and remove the top foam piece, which contains accessories such as the ESR-657 Mixer, barcode scanner, power cords and paper.
2. Carefully lift the instrument out of the bottom foam piece and remove the anti-static shipping bag.
3. Install the ESR-Auto Plus and ESR-657 Mixer on a level, supported surface that is free from any vibrations or temperature fluctuations.



**Important!** Vibrations and temperature fluctuations may adversely affect ESR results. Refer to Section 8.4 for more information on the impact of temperatures on ESR results.

## 1.3 Barcode Scanner Installation

1. Line up holes in barcode scanner bracket with pre-drilled holes on the right side of the ESR-Auto Plus (Figure 2a).
2. Tighten the screws using the 3mm allen wrench (provided). Do not over-tighten screws (Figure 2a).
3. Connect the barcode scanner to the socket marked "Barcode Input" on the back of the instrument (Figure 2b).
4. Place the barcode scanner in the barcode scanner bracket as shown (Figure 2c).

## 1.4 Cable Connections (Figure 3)

1. Connect the external printer cable or mainframe computer cable (LIS) to the socket marked "COM 1" (optional).
2. Connect the AC power cord to the power inlet on the back of the ESR-Auto Plus.
3. Connect the 24V AC power cable to the ESR-657 Mixer. The mixer will rotate continuously when the power switch is on.



**Important!** Plug the instrument and mixer power cords into a power surge protector to guard against power surges and fluctuations.

## 1.5 Barcode Scanner Calibration

1. Scan a patient barcode three times to calibrate the barcode scanner.
2. If the barcode scanner is unplugged, scan a barcode three times to re-calibrate before scanning a patient sample.



**Important!** The barcode scanner has been pre-programmed and is ready to use. If you encounter any problems with the operation of the barcode scanner, contact Technical Service.



Figure 4

**i!** **Important!** Install paper before turning unit “ON” during initial instrument installation.

### 1.6 Installing Printer Paper (Figure 4)

1. Before installing the paper, remove any residual glue or tape sealing the new roll.
2. Press the printer lever to release the printer platen roller bar on the top of the printer. The roller bar will completely separate from the instrument.
3. Place a roll of paper in the paper holder and align the paper between the paper guides in the printer.
4. Insert the roller bar into the printer and press down firmly on the ends marked “Press Here” until a click is heard.

ESR-Auto Plus  
V000 (000000)

INITIATING  
MOTOR...

5. Turn the power switch “ON.” The display will show the software version for about 2 seconds before motor initiation begins. The instrument will automatically calibrate and reset the motor. Allow the motor initialization process to finish and the display will advance to standby mode.

6. Press the blue paper feed button next to the printer, or on the keypad, to advance the paper and verify the roller bar is installed correctly. If the paper does not feed properly, release the printer lever and reinsert the roller bar.

12:00  
NEXT SAMPLE...

7. The ESR-Auto Plus is in Standby mode and ready to accept new samples when “Next Sample” appears on the display.

**i!** **Important!** Streck thermal paper is specifically approved for use with the ESR-Auto Plus printer and should be used to prevent damage to the print head. Alternate paper may have different technical specifications that cause premature wear and tear.

### 1.7 Removing Paper

**!** **CAUTION!** Do not remove the paper by pulling the roll out backwards. Damage may occur.

1. Press the printer lever to release the roller bar.
2. Remove the paper and reinsert the roller bar into the printer.

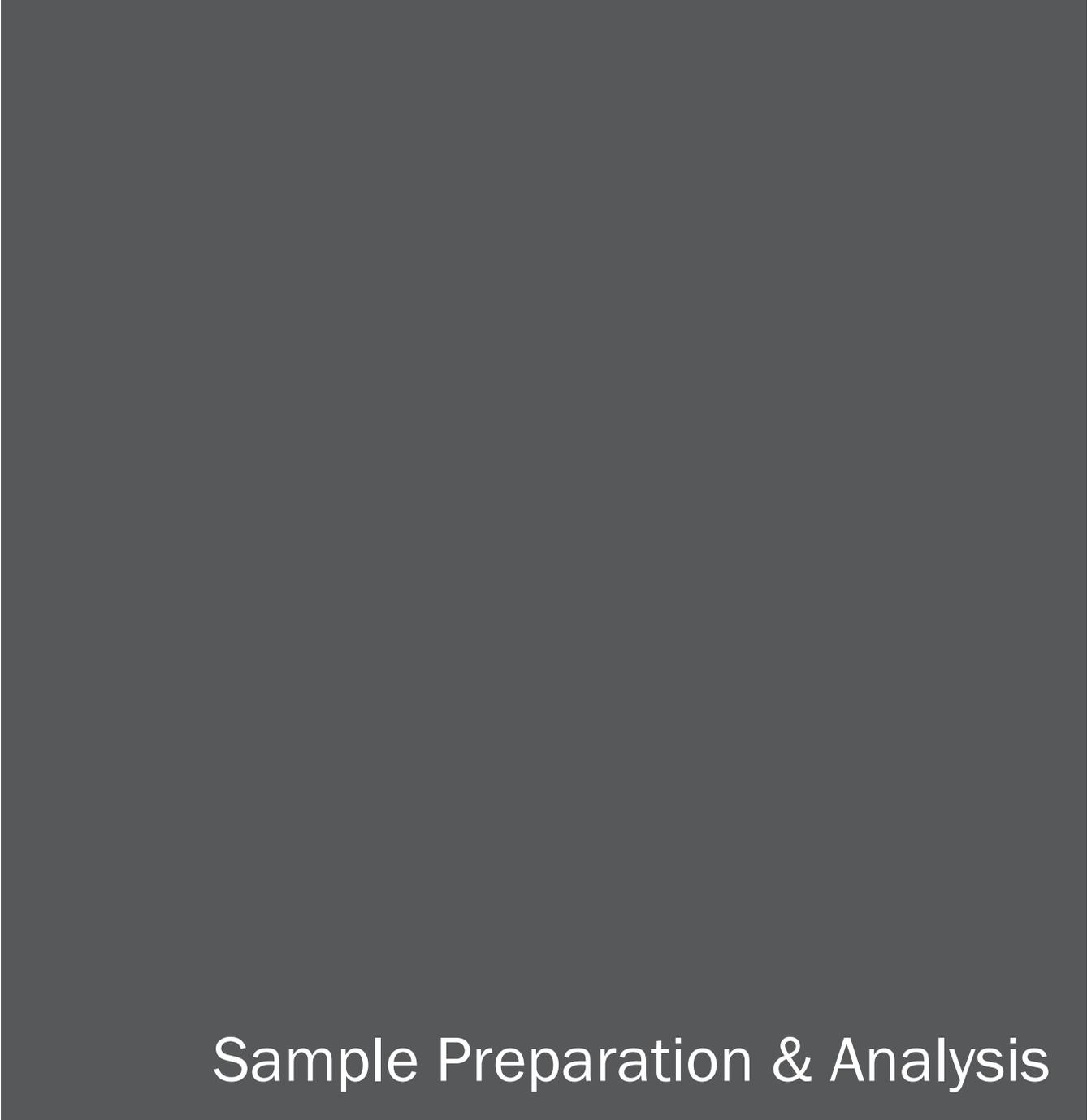
## 1.8 Instrument Set-up

This section outlines the menus to review before getting started. A thorough review of the Operator's Manual is strongly advised prior to reporting patient results. Refer to Chapter 3 for a menu diagram and an overview of the keypad.

1. **Date & Time:** Set the date and time in the User Configuration Menu (see Section 5.3). The default date format is YYYY-MM-DD. The default time format is 24-hour. Time can be displayed in a 12-hour (AM/PM) or 24-hour format.
2. **Print Style:** Set the print style in the User Configuration Menu (see Section 5.6). The default print setting is Autoprint in Ticket Style. Log or Ticket print styles are available.
3. **Register the Test Rack:** Register the test rack in the Service Menu (see Section 6.4).
4. **Tube Type Size:** Select an alternate tube size in the Service Menu (see Section 6.5). The default ESR-Vacuum Tube size is 1.2ml.
5. **Register QC Material:** Register a new lot of ESR-Chex control in the QC Menu (see Section 4.6.3).



2



Sample Preparation & Analysis



# Chapter 2

## Sample Preparation & Analysis



### 2.1 ESR-Vacuum Tubes

The ESR-Auto Plus is intended for use with Streck 1.2ml ESR-Vacuum Tubes. ESR-Vacuum Tubes are also available in High Altitude and Safety Coated 1.2ml configurations. 2.0ml ESR-Vacuum Tubes may be used by selecting the alternate tube size in the User Configuration Menu.

All Streck ESR-Vacuum Tubes preserve the integrity of the patient sample for up to 72 hours from the time of blood collection when transported or stored at 2-10°C, or up to 4 hours at 18-30°C.

Follow the Clinical Laboratory Standards Institute (CLSI) *Procedures for the Erythrocyte Sedimentation Rate Test*; Approved Standard, CLSI Document H02, for stability of specimens collected in EDTA tubes.

### 2.2 Sample Collection

Patient samples may be drawn directly into the Streck ESR-Vacuum Tube or transferred from an EDTA vacuum tube. When using an EDTA tube, transfer the well-mixed patient sample into the Streck ESR-Vacuum Tube. Do not remove the sodium citrate in the ESR-Vacuum Tube. Fill the ESR-Vacuum Tube to the fill line.

ESR-Vacuum Tubes contain liquid anticoagulant and must be thoroughly mixed with the blood sample immediately after the tube has filled. Failure to mix the sample completely and immediately may result in the formation of microscopic blood clots/aggregates that could alter results. Proper collection and preparation of the ESR sample is critical to obtain accurate results. Inaccurate results are most often a result of improper sample handling.



**CAUTION! Handle all biological samples and blood collection sharps according to your standard laboratory procedures. Seek medical attention in the case of exposure to biological specimens.**

Follow the CLSI *Procedures for the Collection of Diagnostic Blood Specimens by Venipuncture*; Approved Standard, CLSI document GP41, for guidance with sample handling.

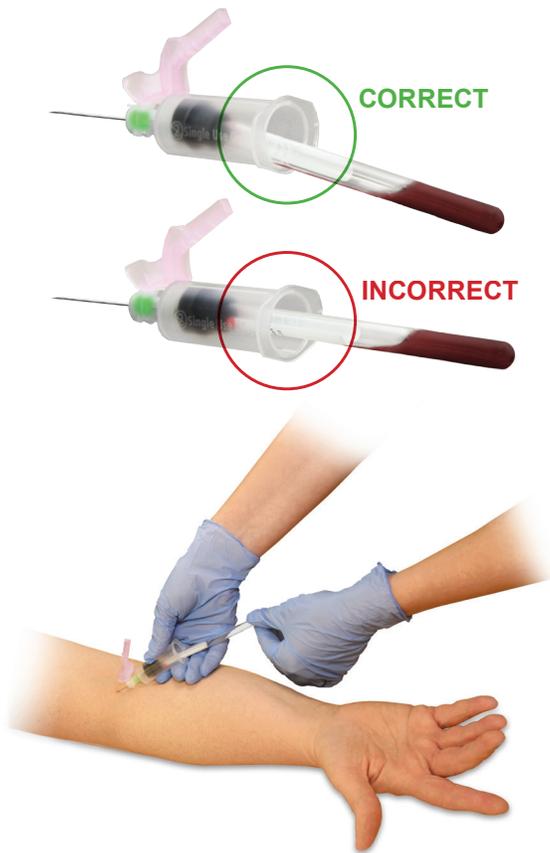


Figure 5a



Figure 5b

### 2.3 Phlebotomy Guideline

1. Insert the ESR-Vacuum Tube into the plastic holder (Figure 5a). Hold the tube so the cap is flush against the needle holder as the sample is collected.
2. Angle the tube so the blood stream hits the tube wall before mixing with the citrate solution to minimize the formation of bubbles.
3. Watch for an air bubble to rise in the sample as the tube fills to indicate the draw is complete and remove the tube immediately.
4. The ideal fill level and acceptable fill range are indicated on the tube.
  - 1.2ml ESR-Vacuum Tubes: 60mm  $\pm$  5mm
  - 2.0ml ESR-Vacuum Tubes: 100mm  $\pm$  8mm
5. It is especially important to mix Streck ESR-Vacuum Tubes thoroughly by inverting a minimum of 8 times due to their smaller tube diameter and draw volumes (1.2ml and 2.0ml) compared to an EDTA tube (Figure 5b).
6. Prior to analysis, thoroughly mix the sample again. Rotate the tubes on the ESR-657 Mixer for a minimum of three minutes, or hand-mix a minimum of 8 complete inversions.
7. Samples can be maintained from the time of blood collection for up to 72 hours prior to analysis when transported and stored at 2-10°C, or up to 4 hours at 18-30°C.
8. Refer to the ESR-Vacuum Tube Instructions For Use (IFU) for more details.



**Important:** The mixing procedure is very important! If the citrate is not properly mixed with the blood, clots/aggregates may form and cause a falsely elevated result.

### 2.4 Mixing a Sample

Samples must be thoroughly mixed prior to analysis. The ESR-657 Mixer is an optional accessory designed to accompany the ESR-Auto Plus (Figure 6). The automated mixer holds up to 10 ESR-Vacuum Tubes at one time.

1. Place the mixer on a level surface.
2. Stop the mixer to remove or add tubes. Gently snap ESR-Vacuum Tube samples into the numbered slots on the mixer.
3. Locate the power switch on the top of the mixer to turn the unit "on."
4. The ESR-657 Mixer operates using a slow 360° rotation to ensure complete mixing.
5. Allow the samples to rotate for a minimum of 3 minutes before analyzing.



Figure 6

## 2.5 Secondary Patient Labels

The ESR-Auto Plus reads the sample using infrared light. This light is very strong and can typically read through one layer of most commonly used labels.

Caution must be taken when applying additional patient labels to ESR-Vacuum Tubes. Excessive label thickness, wrinkling or flagging may increase the outer diameter of the tube enough to wedge it in the instrument. If the operator experiences resistance when inserting a tube containing a secondary label, remove the tube before it is fully inserted and remove the additional label before proceeding.

Secondary labels must be positioned correctly and completely adhered to the tube surface to prevent label fragments or label adhesive build-up in the instrument well, which could obstruct sample analysis.

**! Important:** Samples with a fill level outside the fill range alarm limits will abort immediately. Refer to Section 10.1.

### 1.2ml Tubes (Figure 7a)

The 1.2ml ESR-Vacuum Tube is the primary tube used in ESR-Auto Plus.

1. The ideal fill level of the 1.2ml tube is  $60\text{mm} \pm 5\text{mm}$  from the bottom of the tube. The ideal fill level and range are printed on the tube label. The fill range can extend to as much as  $\pm 9\text{mm}$  from the fill line without compromising the integrity of the sample.
2. Additional labels should be applied facing the same direction as the original label and as close to the cap as possible, leaving a label-free gap on the back of the tube.
3. Insert the tube in the ESR-Auto Plus with the label facing forward.

**! Important:** Leave a space of at least 3mm between the blood level in the tube and any additional labels to ensure accurate reading of the sample.

### 2.0ml Tubes (Figure 7b)

The 2.0ml ESR-Vacuum Tube can be used in the ESR-Auto Plus as long as the tube is inserted in the ESR-Auto Plus correctly and additional labels are applied correctly.

1. The ideal fill level of the 2.0ml tube is  $100\text{mm} \pm 8\text{mm}$ .
2. Do not place additional labels above the fill level printed at the top of the original label.
3. Place additional labels facing the same direction as the original label, creating a label-free gap on one side of the tube.

**! Important:** This gap is critical to allow accurate measurement of the level of blood in the tube.

4. Insert the tube in the ESR-Auto Plus with the label facing forward, leaving the label-free side at the rear to ensure accurate reading of the sample.

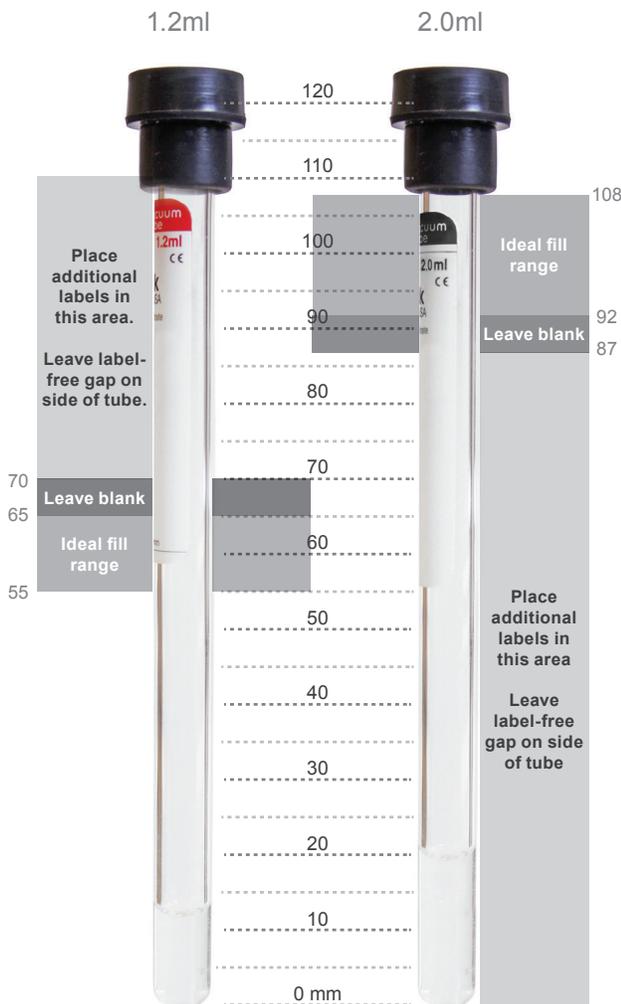


Figure 7a  
1.2ml label  
placement  
(to scale)

Figure 7b  
2.0ml label  
placement  
(to scale)

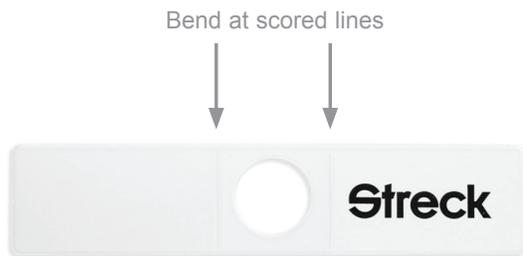


Figure 8a



Figure 8b



Figure 8c

## 2.6 ESR Tube Labeling Sleeves

ESR tube labeling sleeves (Streck part number 240363) are available to accommodate very long barcode labels. Such labels may obstruct the blood column during analysis, leading to inaccurate results. The labeling sleeves help reduce any errors and facilitate proper patient identification.

1. Remove all 5 labeling sleeves from the sheet by folding along the perforated edges. Separate the individual labeling sleeves by folding along the perforated lines between each sleeve.
2. Collect or transfer a valid blood specimen into an ESR-Vacuum Tube.
3. Bend both sides of the labeling sleeve by creasing the tabs along the scored lines (Figure 8a).
4. Insert the tube through the hole in the labeling sleeve with the tabs pointing up around the rubber stopper (Figure 8b).
5. Apply the patient-specific identification label across both tabs of the labeling sleeve (Figure 8c).



**Important:** The patient-specific identification label may extend beyond the end of the labeling sleeve, depending on the size of the patient label. Additional identification labels placed on the tube must be placed outside the scanning area of the tube. Refer to Section 2.5.

## 2.7 Starting a Sample

12:00  
NEXT SAMPLE...

The ESR-Auto Plus is ready to accept a sample when the “Next Sample” standby mode appears in the display window. Scan the patient barcode with the barcode scanner, or enter the sample ID code manually on the keypad. An ID code is required to run a sample.

ENTER ID:  
12345\_

An ID code may contain up to 13 digits. When manually entering an ID code, press **X** to delete incorrect digits and **✓** to confirm the code. The instrument will automatically add the **✓** signal when using the barcode scanner.

INSERT 12345  
IN FREE POSITION

After the barcode is scanned or the ID code is entered, insert the well-mixed, room temperature sample in any free position as indicated by a green light (Figure 9a). The position light will turn red and the ESR-Auto Plus will initiate testing.



Figure 9a

**i!** **Important!** All samples should be properly mixed and at room temperature before analyzing. A sedimented sample may require several minutes of mixing. Refer to Section 2.4.

## 2.8 Reporting Results

After measurement is complete, the ESR-Auto Plus automatically prints results on the internal printer and the COM port. It is good laboratory practice to visually correlate the level of sedimentation in the sample tube to the printed result. The internal printer can be configured in the software. Refer to Section 5.5.

## 2.9 Canceling a Sample

**i!** **Important!** Disturbing a sample during the analysis period may invalidate results. If a sample is moved during the analysis period, re-mix the sample and restart the test from the beginning.

To cancel a sample, remove the tube from its position or press and hold the keypad number corresponding to the tube position. Press **2<sub>b</sub>** to abort. Aborted samples will not be stored in the instrument log file.

- ABORT SAMPLE -  
POSITION A ABORTED

The display will show that the sample has been aborted. The red light will change to green on the position indicator and an ESR result will print with a blank ESR value and an error code of 512 (Figure 9b).

```
***** ESR RESULT *****  
YYYYMMDD HH:MM POS:A E0512 S0353  
  
PATIENT NAME: _____  
PATIENT ID : 123456789  
  
ESR: MM WESTERGREN(QM PAED TUBE)  
  
ALARMS:  
SAMPLE MANUALLY ABORTED
```

Figure 9b: Aborted Sample Printout

If a tube is removed from its position and the Abort Read prompt is not acknowledged, an ESR Result will print after 30 minutes with a blank ESR value and an error code of 512 (Figure 9b).





# Keypad & Menu Overview



# Chapter 3

## Keypad & Menu Overview

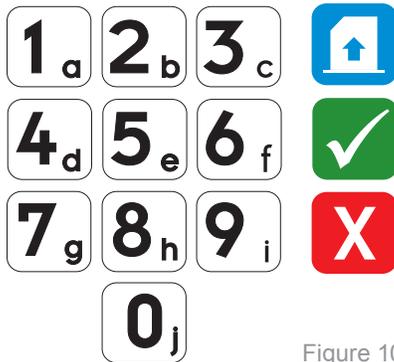


Figure 10

### 3.1 Keypad Overview (Figure 10)

The keypad consists of alpha numeric characters A-J and 0-9 which are used to manually input a specimen ID, and also to select various prompts as indicated in this manual.

Press and hold **0<sub>j</sub>** to select letters J-Z.

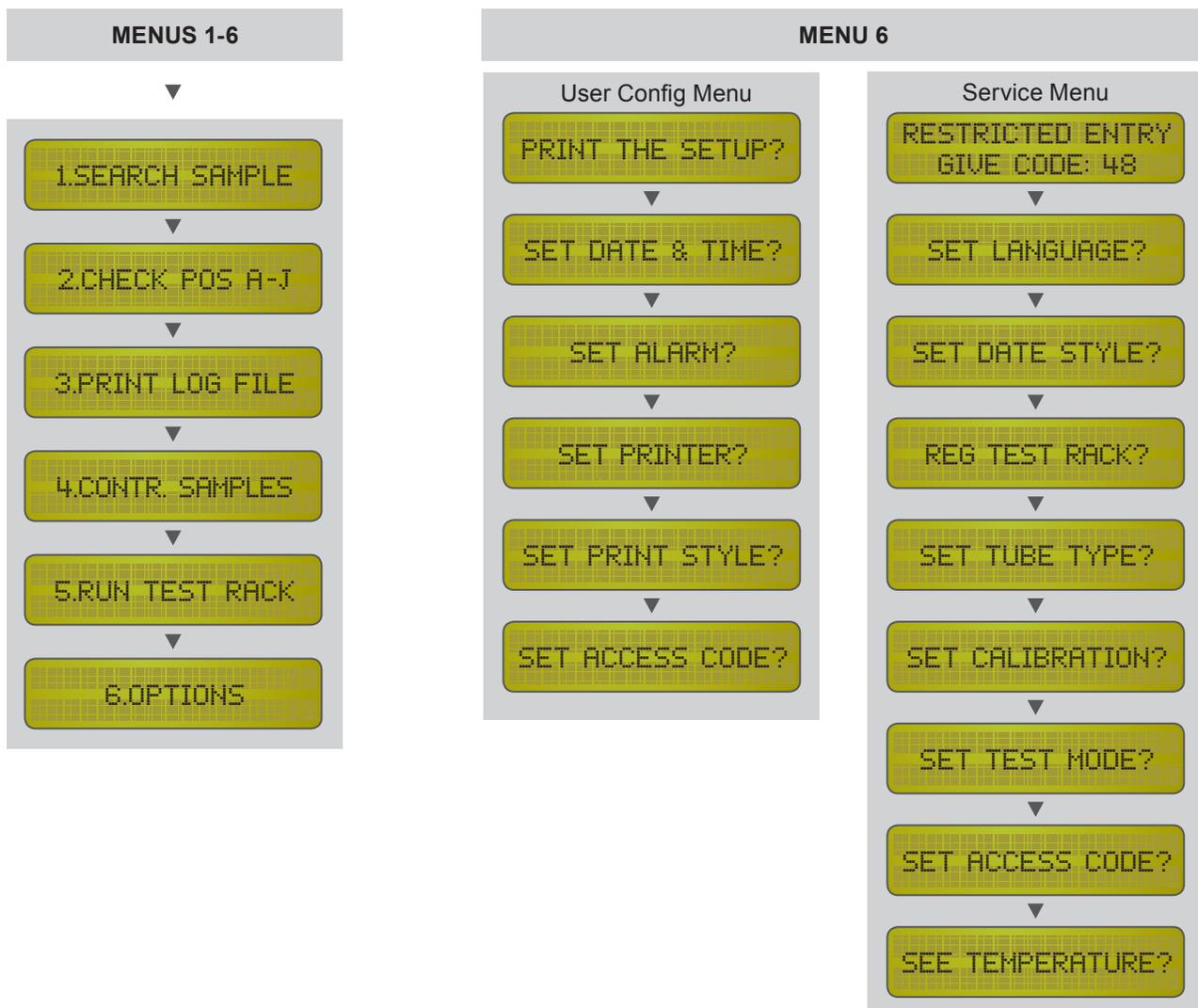
The **✓** is used to accept entries or view additional menu settings.

The **X** is used to change settings or move past the prompts.

Press and hold a keypad button to cycle from numeric to alphabetic characters.

### 3.2 Menu Diagram

This section provides a diagram of all the available instrument menus. Press and hold **X** to access the instrument menus. Menu Functions 1-5 are accessed directly through keys 1-5 on the keypad. Menu Function 6 contains both the User Configuration and Service Menus and is accessed through key 6 on the keypad.







**MAIN MENU  
DIAGRAM**

1.SEARCH SAMPLE



2.CHECK POSITION



3.PRINT LOG FILE



4.CONTROL SAMPLES



5.RUN TEST RACK

Menu Functions 1 - 5



# Chapter 4

## Menu Functions 1 - 5

### 4.1 Standby Menu



The instrument is ready to accept a new sample in standby mode. If the instrument is in a menu selection or in a different sequence of the program, press **X** to advance to the standby display.



From standby, press and hold **X** until you hear a beep to access the user menus. Enter the corresponding numeric value to select the desired menu function or press **✓** on the desired function as it appears on the display.

The available user menus will scroll on the display:

- 1 - SEARCH SAMPLE**
- 2 - CHECK POS A-J**
- 3 - PRINT LOG FILE**
- 4 - CONTR. SAMPLES**
- 5 - RUN TEST RACK**
- 6 - OPTIONS**

### 4.2 Menu 1: Search Sample

The ESR-Auto Plus will store a maximum of 500 sample records. It is advised that labs print the Log File regularly and purge data to avoid exceeding storage capacity. The ESR-Auto Plus searches all samples currently in process for an ID match before searching the sample log internal memory. The search results may be reprinted on the internal printer and/or COM port.



Press **1** to search for a sample result by sample ID.



Enter the sample ID code using the keypad or barcode scanner. Partial ID codes can be used, but they must be the start of the ID code. For example, to search for ID code 12345, enter 123 to return all ID codes starting with 123.

Press and hold the number keys to display the corresponding letters A-J. Press and hold the **0** key to search for patient ID numbers that begin with a letter greater than J. A blank search sample entry will display all samples contained in the log file on the LCD in ascending ESR scan order.

### 4.3 Menu 2: Check Position

Sample results may also be retrieved using the position where the sample was run. The results may be reprinted on the internal printer and/or COM port.



MENU  
2.CHECK POS A-J

Press **2<sub>b</sub>** to search for a sample result by lane position.



CHECK POS  
GIVE POS: A\_

Enter the position A-J as listed on the ESR-Auto Plus and press **✓**.

### 4.4 Sample Status

Search Sample and Check Position sample results are displayed in the same manner. Samples can have two different status options: In Process or Completed.

#### Sample In Process



A) 12345  
7 MINUTES LEFT.

If the sample is currently in process, the display will show the position of the sample, the sample ID and the time remaining until the sample is complete. After a few seconds, the second row of the display will show menu options.



A) 12345  
1.PREDICT RESULT

1.PREDICT RESULT, press **1<sub>o</sub>** to predict the sample result.



A) 12345  
2.ABORT READ

2.ABORT READ, press **2<sub>b</sub>** to cancel the measurement of the sample. Press **X** to continue to the next sample fitting the search criteria.



**Important!** Correlation to Westergren Method will decrease the earlier a sample is predicted. It is not recommended to predict a sample more than 15 minutes early. The predicted result should always be confirmed when the final result is available.

## Completed Sample



A) 12345 (1/5)  
030101 09:00 [OK]

If the sample is complete and results are available, the display will show position, sample ID, number of samples that fit the search criteria and the date/time for the most recently analyzed sample that fits the search criteria.



A) 12345 (1/5)  
ESR 110 ER1024

Press **X** to view the next matching sample or **✓** to view details of the current sample. The second row will show the result and any error code.



A) 12345 (1/5)  
REPRINT? [OK]

When prompted to reprint, press **✓** to reprint. Reprinted results will print in ticket style. To end the search sequence, press **X**.

### 4.5 Menu 3: Print Log File

The ESR-Auto Plus will store a maximum of 500 sample records. Storage of sample results continues on a first in, first out basis after 500 samples are recorded.

The message "Log File @ Limit" will appear on the display as a notification that old data will be purged as new runs are collected.



MENU  
3.PRINT LOG FILE

Press **3** to print all sample results stored in memory. The Log File header will repeat after every 50 samples (Figure 11).



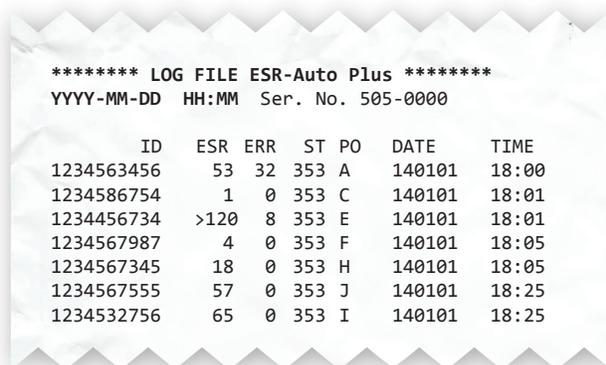
PRINT LOG FILE  
[OK] TO START

Press **✓** to print log file or **X** to advance to the clear log menu selection.  
Press **X** while printing to cancel print job.



LOG FILE  
CLEAR LOG?

Press **✓** to clear log file or **X** to exit the menu.



```
***** LOG FILE ESR-Auto Plus *****
YYYY-MM-DD HH:MM Ser. No. 505-0000

  ID   ESR  ERR  ST  PO   DATE    TIME
1234563456   53  32  353  A   140101  18:00
1234586754    1   0  353  C   140101  18:01
1234456734 >120  8  353  E   140101  18:01
1234567987    4   0  353  F   140101  18:05
1234567345   18   0  353  H   140101  18:05
1234567555   57   0  353  J   140101  18:25
1234532756   65   0  353  I   140101  18:25
```

Figure 11: Log File Printout

#### 4.6 Menu 4: Control Samples

The Control Sample Menu Function is designed to monitor commercially available bi-level quality control samples. The Control Sample Menu Function accepts two levels of control. Control samples are analyzed, compared to the registered assay value and stored in a control sample database.

 **Important!** Streck recommends running 2 levels of ESR-Chex controls daily to ensure the accuracy of the instrument.



MENU  
4.CONTR.SAMPLES

The Quality Control Menu contains 4 options:  
1. RUN CONTROL, 2. SHOW CONTROLS,  
3. REGISTER NEW CONTROL, 4. EDIT CONTROL RANGE  
Press the corresponding number or  when the desired menu function is displayed.

##### 4.6.1 Run Control

 **Important!** Samples with a fill level outside the fill range alarm limits will abort immediately. Refer to Section 10.1.



-CONTROLS MENU-  
1.RUN CONTROL

Once a control lot has been registered, press  “Run Control” in the Controls Menu to run a control sample.



-START CONTROL-  
LEVEL: \_

Enter the appropriate level, 1 or 2, and press . The ESR-Auto Plus will automatically identify the sample, the registered lot number and a sequence number. Press  to return to main screen. Press and hold  to exit back to the main menu.



INSERT 12345A/01  
IN FREE POSITION

For example, if this is the first sample analyzed for lot 12345A, the automatic ID number will be 12345A/01. The next sample of this level will be named 12345A/02, then 12345A/03, etc.

1. Refer to ESR-Chex control Instructions for Use (IFU) for important handling instructions.
2. Insert the control sample into any free position.
3. The ESR-Auto Plus will automatically start measuring the sample.

The control sample printout is similar to a ticket style patient sample printout. If the result is outside the expected range, an alarm message will be reported.

 **Important!** Deviations from the recommended mixing and handling instructions on the ESR-Chex control IFU may lead to variable results.

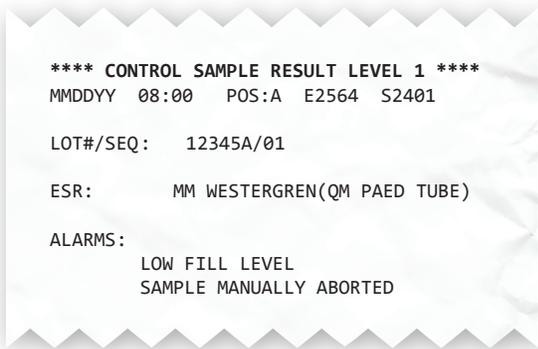


Figure 12: Control Example Printout

E is the error code and S is the status code reported on a control samples. The error and status codes to designate control samples are L1 = 2048; L2 = 4096. To identify the error or status, subtract the designated control code from the reported error or status code as follows. Refer to Section 10, Troubleshooting, for complete list of error and status codes.

L1 Example:	L2 Example:
3072 - 2048 = 1024, overfill	5120 - 4096 = 1024, overfill
2048 - 2048 = 0, no error	4096 - 4096 = 0, no error
2052 - 2048 = 4, low fill	4100 - 4096 = 4, low fill

**!** **Important!** QM PAED Tube = 1.2ml ESR-Vacuum Tube

#### 4.6.2 Show Control

Control samples are stored in a control log file, which holds up to 100 samples per level. Once the QC log file reaches the memory capacity of 100 runs per level, additional QC runs will be stored in memory on a first in, first out basis. The message "Log File @ Limit" will appear on the display as a notification that old data will be purged as new runs are collected. The ESR-Auto Plus can generate statistical reports or display control information on the LCD from the stored data.



Press **2<sub>b</sub>** "Show Control" in the Controls Menu to access the following options: 1. SHORT REPORT, 2. LONG REPORT, 3. SHOW ON LCD or 4. CLEAR QC LOG.

#### 1. Short Report



The Short Report will generate and print a statistical report for the specified level. Press **1<sub>a</sub>** to select the Short Report (Figure 13a).



Select level 1 or 2 and press **✓** to start the printout. Press **X** to return to the main screen. Press and hold **X** to return to the main menu.

#### 2. Long Report



The Long Report will generate and print a statistical report and the complete log file for the specified level. Press **2<sub>b</sub>** to select the Long Report (Figure 13b).



Select level 1 or 2 and press **✓** to start the printout. Press **X** to return to the main screen. Press and hold **X** to return to the main menu.

```

***** ESR CONTROL REPORT *****

LOT NO       : 12345A
LEVEL        : 1
EXPIRY DATE  : MM-DD-YY
EXP. RANGE   : 30-40

STATISTICS
POP. SIZE    : 10
AVERAGE     : 36
HIGHEST      : 42
LOWEST       : 34
SD           : 2.0
CV%          : 5.5

```

Figure 13a: Short Report

```

***** ESR CONTROL REPORT *****

LOT NO       : 12345A
LEVEL        : 1
EXPIRY DATE  : MM-DD-YY
EXP. RANGE   : 30-40

STATISTICS
POP. SIZE    : 10
AVERAGE     : 36
HIGHEST      : 42
LOWEST       : 34
SD           : 2.0
CV%          : 5.5

LOT#/SEQ    ESR  ERR  PO  DATE   TIME
123454A/10  38  4096 E  013111 12:00
123454A/09  34  4096 B  013011 12:00
123454A/08  36  4096 C  012911 12:00
123454A/07  39  4096 G  012811 12:00
123454A/06  39  4096 D  012711 12:00
123454A/05  39  4096 A  012611 12:00
123454A/04  39  4096 D  012511 12:00
123454A/03  34  4096 A  012411 12:00
123454A/02  39  4096 D  012311 12:00
123454A/01  42  4096 D  012211 12:00

```

Figure 13b: Long Report

### 3. Show on LCD

Control information can be viewed manually on the LCD and individual runs may be deleted.

```

-SHOW CONTROLS-
 3.SHOW ON LCD

```

Press **3<sub>c</sub>** to select Show on LCD function.

```

-SHOW VALUES-
 LEVEL: 1_

```

Select level 1 or 2 and press **✓** to view.  
 Press **X** to return to main screen.  
 Press and hold **X** to return to main menu.

```

E)12345A/10
 ESR:36 E:4096

```

The LCD will show the lane position, lot/sequence #, ESR result and associated error code for the most recent analysis of that level.

```

E)12345A/10
 1.REPRINT

```

After a few seconds, two options will scroll on the display.  
 1 - Reprint ticket for this sample.  
 2 - Delete this sample record.

```

E)12345A/10
 2.DELETE

```

Press **1<sub>a</sub>** to print or **2<sub>b</sub>** to delete the current record.  
 Press **X** to advance to the next sample.  
 Press and hold **X** for 1 second to exit the sequence.

#### 4. Clear QC Log File

All daily QC data contained in the QC log file may be deleted using the Clear QC Log function in the Show Controls Menu. Control lot information, such as lot number, expiration date, and min/max ranges, will not be affected by clearing the QC log file. Deleted data cannot be restored.

-SHOW CONTROLS-  
4.CLEAR QC LOG

Press **4** to select the Clear QC Log function.

-CLEAR QC LOG-  
CLEAR QC LOG?

Press **✓** to clear the QC log or **X** to exit the menu without clearing the QC log. A confirmation prompt "are you sure" will verify QC log deletion.

#### 4.6.3 Register New Control

Register the lot number and assay ranges before using a new lot of control material.

**i!** **Important!** Registering a new level of control lot will delete all data collected for the previous control lot of that level.

-CONTROLS MENU-  
3.REG NEW CONTR.

Press **3** "Register New Control" in the Controls Menu to register a new control.

-REG. NEW CONTR.-  
LEVEL: 1

Enter the desired control level 1 or 2 and press **✓**.  
Press **X** to return to the main screen.  
Press and hold **X** to return to the main menu.

**i!** **Important!** This operation will delete old statistics for this control level.

-STATS LEVEL 1-  
CLEAR OLD STATS?

Press **✓** to clear old values and register a new control lot.  
Press **X** to exit the control registration menu.

-NEW CONTROL(1)-  
LOT: 12345A

Enter the lot number stated on the control assay insert.  
Press and hold a numeric key for 1 second to enter the corresponding letter A-J.  
Press and hold **0** for letters J-Z.  
Press and hold **X** to clear the lot number entered.  
Press **X** when there is no lot number, to exit the control registration menu.

-NEW CONTROL(1)-  
EXPIRY: MM-DD-YY

Enter the expiration date stated on the control assay and press **✓**.

-NEW CONTROL(1)-  
RANGE(MIN): 30

Enter the minimum assay value as stated on the control assay IFU and press  (Figure 14). Enter the maximum assay value in a similar manner. Press  to return to the previous control registration menu.

NEW CONTROL ASSAY VALUES:  
YYYYMMDD 12:00

LOT NO : 12345A  
LEVEL : 1  
EXPIRY DATE : MM-DD-YY  
EXP. RANGE : 30-40

A report of the assay values will then be printed. Press  to accept the data. The new lot is now registered and ready to use (Figure 14).

 **Important!** ESR-Auto Plus stores up to 100 samples of control data per level. Additional QC runs will be stored on a first in, first out basis.

Figure 14: Control Report

#### 4.6.4 Edit Control Ranges

-CONTROLS MENU-  
4. EDIT CONT RANG

Press  "Edit Control Range" in the Controls Menu to edit the ranges.

-CONTROL (1)-  
RANGE (min):\_

Press  to accept the displayed value or  to delete the displayed value. Retype the new minimum value, 0-999 in mm/hr, and press  to accept the new value. Press  again to restore old minimum value.

-CONTROL (1)-  
RANGE (max):\_

Press  to accept the displayed value or  to delete the displayed value. Retype the new maximum value, 0-999 mm/hr, and press  to accept the new value. Press  again to restore old maximum value.

-CONTROL (2)-  
RANGE (min):\_

Press  to accept the displayed value or  to delete the displayed value. Retype the new minimum value, 0-999 mm/hr, and press  to accept the new value. Press  again to restore old minimum value.

-CONTROL (2)-  
RANGE (max):\_

Press  to accept the displayed value or  to delete the displayed value. Retype the new maximum value, 0-999 mm/hr, and press  to accept the new value. Press  again to restore old maximum value.



Figure 15: ESR-Auto Plus Test Rack

#### 4.7 Menu 5: Run Test Rack

The ESR-Auto Plus uses a special test rack to verify the proper function of each lane and ensure the accuracy of results throughout the reportable range (0-120 mm/hr). The test rack is designed to simulate a range of ESR levels. The instrument scans the test rack and compares the readings to the reference values stored in memory. The combined use of the test rack and Quality Control material verifies both the timing of the measurements and the algorithm for converting the measurements into ESR results. This system check ensures the accuracy of all reported ESR results throughout the reportable range.

**Important!** Streck recommends running the test rack at the beginning of each day that the ESR-Auto Plus is in use.



Press **5** to run the test rack.



This message appears if no test rack has been registered. See Section 6.4 for more details.



The display will prompt you to insert the test rack. Insert the test rack and press **✓** to start the procedure (Figure 15). Press **X** to return to the main screen.

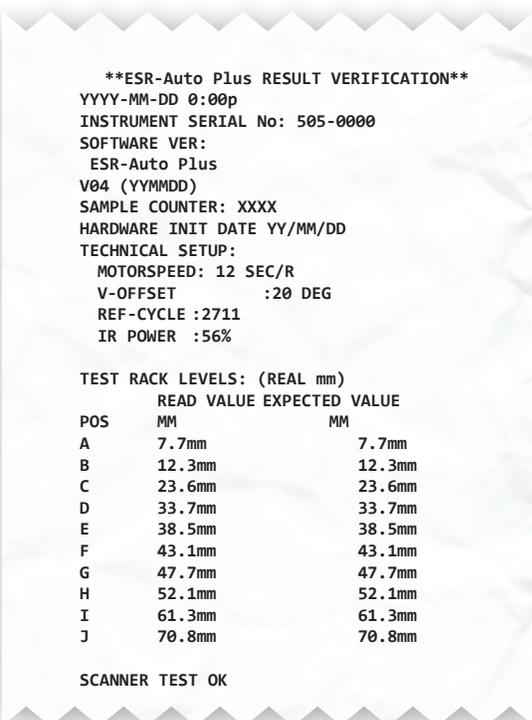


Figure 16: Test Rack Report

After the reading is complete, the results will print on the internal printer (Figure 16).

A  $\pm 2\text{mm}$  range from the registered test rack (Section 6.4) is acceptable. If the readings are outside the acceptable range compared to the expected values, the instrument will alert that the test failed and ask if you want to retry.

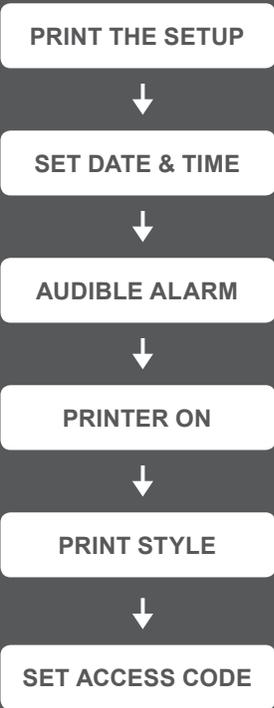
Press **✓** to retry or **X** to exit.

If the test rack fails a second time, re-register the test rack. See Section 6.4 or the Quick Reference Guide at the end of this manual for instructions.





**USER CONFIG  
MENU DIAGRAM**



**Menu Function 6**  
Options - User Configuration Menu



# Chapter 5

## Menu Function 6

Options - User Configuration Menu

### 5.1 Accessing Menu

The Options menu contains the User Configuration Menu and the Service Menu. Both sections can be protected by an access code to prevent unintended changes to the settings.



From standby, press and hold **X** to access the user menus.  
Press **6** to select the Options Menu.



Press **✓** to access the User Configuration Menu.

### 5.2 Print Set Up (Figure 17)

The system settings can be printed. Once your system is configured as desired, Streck recommends keeping a printout of the settings for reference.



Press **✓** to print the instrument settings.  
Press **X** to advance to the next menu selection.

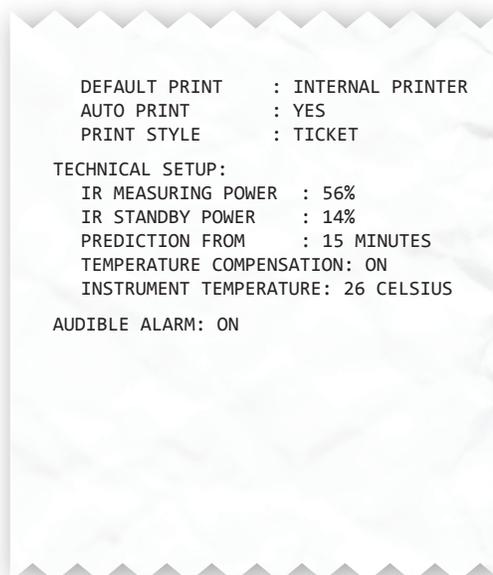
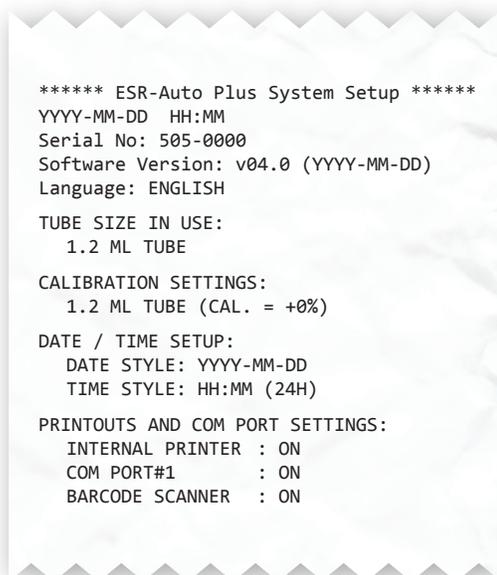


Figure 17: ESR System Setup. Each instrument is set individually.

### 5.3 Set Date and Time

The instrument has an internal real-time clock with battery backup. Date and time will be maintained when the instrument power is turned off. Date and time format can be changed to display different international standards. Refer to Section 6.3.



-USER CONFIG-  
SET DATE&TIME?

Press  to set the date or time.  
Press  to advance to the next menu selection.



DATE:YY-MM-DD  
OK?

Press  if the date is correct or  if the date is incorrect.  
The date format is displayed as set in the service menu.



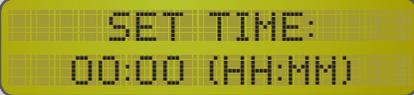
SET DATE:  
00-00-00 (Y-M-D)

Use the numeric keypad to change the date.  
Press  after the last digit to proceed to the time setting.  
Press  to go back one digit.



TIME:12:00:00  
OK?

Press  if the time is correct or  to change.



SET TIME:  
00:00 (HH:MM)

Use the numeric keypad to change the time.  
Press  to go back one digit.  
If the 12-hour format is selected, press  to change from AM to PM at the end of the four time digits.  
Press  to accept changes.

### 5.4 Audible Alarm

The audible alarm function can be activated or deactivated to signal the conclusion of each test result.



-USER CONFIG-  
SET ALARM?

Press  to access the Audible Alarm Menu.  
Press  to advance to the next menu selection.



-AUDIBLE ALARM-  
AUD. ALARM ON?

Press  to activate the audible alarm.  
Press  to turn it off and advance to the next menu selection.

### 5.5 Set Printer Function

Results will print automatically when auto print is enabled. If auto print is turned off, each printout must be selected manually using the reprint function.

```
-USER CONFIG-
SET PRINTER?
```

Press  to access the Set Printer Menu.  
Press  to advance to the next menu selection.

```
-USER CONFIG-
PRINTER ON?
```

Press  to turn the internal printer on or  to turn it off.

### 5.6 Set Print Style

The ESR-Auto Plus can print results on the internal printer in Ticket Style or Log Style printout. Reprinted results will print in ticket style, regardless of the print format selected.

```
-USER CONFIG-
SET PRINT STYLE?
```

Press  to access the Print Style menu.  
Press  to advance to the next menu selection.

```
PRINTOUTS
TICKET STYLE?
```

Press  to select Ticket Style printout (Figure 18a) or  to select Log Style printout (Figure 18b).

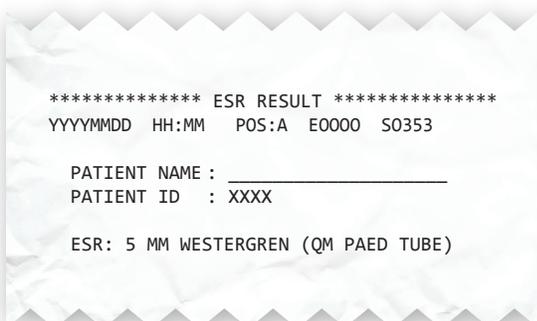


Figure 18a: Ticket Style Printout

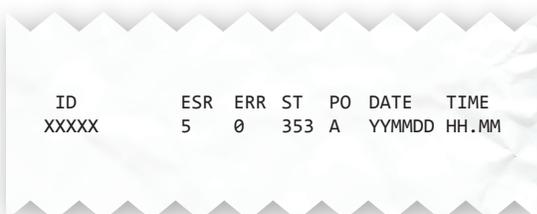


Figure 18b: Log File Printout

### Information included on ESR-Auto Plus Printout

<b>Date &amp; Time</b>	Date and time are displayed in the active format.
<b>SER. NO. (log only)</b>	ESR-Auto Plus instrument serial number.
<b>Patient Name (ticket only)</b>	Blank line for manually writing patient name on the ticket printout.
<b>Patient ID / ID</b>	The patient ID number entered or scanned for the sample.
<b>ESR</b>	Sample result in mm/hr.
<b>E/ERR/ERROR</b>	Error code. Refer to Section 10 for decoding the binary code.
<b>S/ST/STATUS</b>	Sample status code. Refer to Section 10 for decoding the binary code.
<b>POS / PO</b>	(A-J) position where the sample was measured.
<b>QM PAED/QM</b>	The ESR-Auto Plus uses one of two different methods to calculate the ESR value depending on system set-up and tube size. <b>NOTE: QM PAED = 1.2ml tube</b>

Log File printout is generally used when results are sent to a computer using the COM port. The Log File status and error messages are binary coded. Refer to Section 10 to decode binary error messages.

### 5.7 Set Access Code

An access code can be assigned to control access to the User Configuration Menu. The access code can be any number from 1 to 9999. If the code is set to 0, the function is disabled.



-USER CONFIG-  
SET ACCESS CODE?

Press  to set an access code.



-SET USER CONFIG-  
ACCESS CODE: \_

Press  to  to enter access code digits. Press  to erase a digit.

Press  to accept an access code.

Press  to abort entering an access code when the code entry is blank.



### SERVICE MENU DIAGRAM

RESTRICTED ENTRY  
GIVE CODE: 48



SET LANGUAGE



SET DATE STYLE



REGISTER TEST RACK



SET TUBE TYPE



SET CALIBRATION



SET TEST MODE



SET ACCESS CODE



SEE TEMPERATURE

# Menu Function 6

Options - Service Menu



# Chapter 6

## Menu Function 6

Options - Service Menu

### 6.1 Accessing Menu

The ESR-Auto Plus has many adjustable features and most can be accessed through the service menu. These operations should be used with great caution as the accuracy of results may be affected.



**Important! Contact Streck Technical Service before making changes to the service menu.**

-MENU-  
6.OPTIONS

From standby, press and hold **X** to access the user menus. Press **6** to select the Options Menu.

-OPTIONS-  
USER CONFIG?

Press **X** to move past the User Configuration Menu.

-OPTIONS-  
SERVICE MENU?

Press **✓** to select the Service Menu. Press **X** to return to the main screen.

RESTRICTED ENTRY  
GIVE CODE: 48\_

Enter restricted access code 48. Press **✓** to enter the Service Menu. Press **X** when there is no code to return to the main screen. Press **X** to delete a digit

### 6.2 Set Language

Multiple languages are available in the software.

-SERVICE MENU-  
SET LANGUAGE?

Press **✓** to enter Language Selection Menu. Press **X** to advance to the next menu selection.

LANGUAGE:  
ENGLISH?

Press **✓** to select the displayed language. Press **X** to scroll through the available languages.

### 6.3 Set Date and Time Style Formats

There are a number of display formats available.

-SERVICE MENU-  
SET DATE STYLE?

Press  to adjust the date format.  
Press  to advance to the next menu selection.

-DATE FORMAT-  
YYMMDD [OK]

Press  to select the displayed date format.  
Press  to scroll through the available date formats and then press  to select the desired format.

Date Formats	Example
YYMMDD	140125
YYYY-MM-DD	2014-01-25
YY-MM-DD	14-01-25
MMDDYY	012514
MM-DD-YYYY	01-25-2014
MM-DD-YY	01-25-14

-TIME FORMAT-  
HH:MM(24h) [OK]

Press  to select the displayed time format.  
Press  to scroll through the available time formats and then press  to select the desired format.

Time Formats	Example
HH:MM (24h)	18:50
H:MMp (12h)	6:50p

## 6.4 Registering Test Rack

The ESR-Auto Plus test rack is designed to simulate ESR levels. Each test rack is unique and its reference values must be registered in the ESR-Auto Plus where it will be used.

-SERVICE MENU-  
REG TEST RACK?

Press  to register the test rack.  
Press  to advance to the next menu selection.

-NEW TEST RACK-  
SURE?

Press  to proceed with the registration process.  
Press  to return to the service menu.

-NEW TEST RACK-  
INSERT RACK [OK]

Insert the test rack and press  to begin the registration process. The instrument will scan the test rack twice and print the results (Figure 19). Test rack results must be  $\pm 1$ mm from first read to second read. Test rack results must be  $\pm 2$ mm from predefined values.

After registering a test rack, a test rack verification will occur (see Section 4.7).

Press  to return to the service menu.



\* ESR-Auto Plus TEST RACK REGISTRATION \*

YYYY-MM-DD 12:00  
INSTRUMENT SERIAL No: 505-0000  
SOFTWARE VER:  
ESR-AUTO PLUS  
VER(0001)  
SAMPLE COUNTER: 2  
HARDWARE INIT DATE 00/01/01

TECHNICAL SETUP:

MOTOR SPEED	:	12 SEC/R
V-OFFSET	:	28 DEG
REF-CYCLE	:	2600
IR POWER	:	75%

TEST RACK LEVELS: (REAL mm)

POS	1ST READ MM	2ND READ MM
A	8.6 mm	8.6 mm
B	13.0 mm	13.0 mm
C	24.1 mm	24.1 mm
D	34.5 mm	34.5 mm
E	39.7 mm	39.7 mm
F	44.8 mm	44.8 mm
G	49.9 mm	49.9 mm
H	54.5 mm	54.5 mm
I	64.6 mm	64.6 mm
J	74.2 mm	74.2 mm

TEST RACK REGISTRATION OK

Figure 19: Test Rack Registration Report

### 6.5 Set Tube Type

The ESR-Auto Plus measures samples according to the QuickMode method, a scientifically developed method for measuring the ESR in only 30 minutes. ESR-Auto Plus can read 1.2ml, 2.0ml or both 1.2ml and 2ml ESR-Vacuum Tubes.

**i!** **Important!** If both tube sizes are enabled, the instrument will read tubes filled more than 69mm as 2.0ml tubes and all others as 1.2ml tubes.

-SERVICE MENU-  
SET TUBE TYPE?

Press  to set tube type or  to advance to the next menu selection.

-SET TUBE TYPE-  
1.2ml?

Press  to select 1.2ml tubes or  to advance to the next tube type.

-SET TUBE TYPE-  
2ml?

Press  to select 2.0ml tubes or  to advance to the next tube type.

-SET TUBE TYPE-  
BOTH 1.2ml & 2ml?

Press  to select both 1.2ml & 2.0ml tubes or  to return to the 1.2ml prompt.

### 6.6 Set Calibration

QuickMode results correspond to the original 200mm Westergren Method ESR. Since there are many different 200mm pipettes that produce slightly different results, QuickMode results can be calibrated.

At the time of delivery, the calibration factor will be set to +0%. Please contact Streck Technical Service before adjusting the calibration factor.

**i!** **Important!** The 2.0ml calibration menu option will only be available if 2.0ml tubes are enabled in Set Tube Type service menu option (Section 6.5). 1.2ml and 2.0ml tubes have separate calibration factors if "both tubes" are selected.

-SERVICE MENU-  
SET CALIBRATION?

Press  to adjust calibration or  to advance to the next menu selection.

2.0ml CALBR:  
+0\_% (0-99)

Press  to accept the 2.0ml calibration values and proceed to the next menu selection. Enter the desired calibration factor on the numeric keypad, -99 to 99. Press  to switch between positive calibrations and negative calibrations.

1.2ml CALIBR:  
+0\_\*(0-99)

Press  to accept the 1.2ml calibration values and proceed to the next menu selection. Enter the desired calibration factor on the numeric keypad, -99 to 99.  
Press  to switch between positive calibrations and negative calibrations.

### 6.7 Set Test Mode

The ESR-Auto Plus can be set to Test Mode for servicing and testing various instrument functions. The measuring time in Test Mode is approximately 5 minutes.



**Important! ESR results obtained in Test Mode are NOT valid. Test mode must be turned off when running patient samples.**

-SERVICE MENU-  
SET TEST MODE?

Press  to access the Test Mode Menu.  
Press  to advance to the next menu selection.

-SERVICE MENU-  
TESTMODE ON?

Press  to turn on Test Mode.  
Press  to turn off Test Mode for patient testing.

### 6.8 Set Access Code

If the user configuration code is forgotten, it can be displayed and reset through the Service Menu.

-SERVICE MENU-  
SET ACCESS CODE?

Press  to set a user configuration access code or  to advance to the next menu selection.

-SET USER CONFIG-  
ACCESS CODE: 0

The code will be displayed and can be reset to any number from 1 to 9999. If the code is set to 0, the function is switched off. Press  to delete digits.  
Press  when the code entry is blank to exit without changing the user access code.

### 6.9 See Temperature

-SERVICE MENU-  
SEE TEMPERATURE?

Press  to see the internal instrument operating temperature on the display in degrees Celsius.  
Press  to return to the main screen.

-TEMP SENSOR-  
RAW=22 CB=22

RAW: Uncalibrated temperature signal  
CB: Calibrated Temperature

## 6.10 RAM Reset

Operators can perform a RAM Reset to reset the instrument to its default factory settings.

**i!** **Important!** RAM Reset will erase all customized settings, QC and patient data. If possible, print the instrument setup, patient log file, and QC data before performing a RAM Reset.

-SETUP-  
RESET SYSTEM?

Turn off the instrument and wait at least 5 seconds. While pressing the **X** button on the keypad, turn on the instrument. Hold the **X** button until "Reset System" is displayed. Press **✓** to start the reset sequence. Press **X** to abort the RAM reset.

RESET ALL TO  
DEFAULT! SURE?

Press **✓** to clear RAM and reset to default settings. Wait a few seconds while the RAM is being cleared. Press **X** to abort the RAM reset and start the instrument as normal.

RAM CLEARED  
RESTART SYSTEM.

Turn off the instrument and wait at least 5 seconds. Turn on the instrument (DO NOT HOLD THE **X** BUTTON).

ESR-Auto Plus  
V0000 (YYMMDD)

Instrument will flash the software version number on the display.

NEW SOFTWARE  
[OK] FOR SETUP

Press **✓** to continue the RAM Reset.

-MOTOR SETUP-  
PLEASE WAIT...

The instrument will cycle and print out the system settings. This may take a few minutes.

-IR AUTO SET-  
REMOVE TUBES [OK]

Remove all tubes and the test rack. Press **✓** to calibrate the instrument.

-IR AUTO SET-  
CALIBRATING...

Instrument display during calibration.

RAM NOW RESET  
TO DEFAULT. [OK]

Press **✓** to complete RAM Reset and proceed to User Configuration Menu and Service Menu to customize settings, if desired (see Section 5). Press **X**, from the options prompts, to return to standby mode.



# Background of the ESR Test



# Chapter 7

## Background of the ESR Test



### 7.1 The History

Clinicians have long observed that the settling rate of erythrocytes in anticoagulated blood is affected by disease. Initially, the sed-rate test was used as a pregnancy test, but was later found to be unsatisfactory for that purpose. Instead, ESR gained its reputation in the battle against infections, particularly tuberculosis. Its use and importance as a marker of inflammation was highly enhanced by the standardized procedure established by Alf Vilhelm Westergren, a Swedish physician. His method is still considered “the gold standard.”

### 7.2 The Original 200mm System

The original Westergren method requires a 300mm long pipette of certain dimensions, filled to 200mm with a well-mixed solution consisting of 75% blood and 25% 0.25mmol/L citrate solution as an anticoagulant. The pipette is placed in an absolutely vertical position, protected from vibrations, temperature changes and sunlight. The sedimentation length of the red blood cells is measured at 60 minutes  $\pm$  1 minute and expressed in mm/hr.

If the ESR is measured again after the second hour, it is referred to as the “Extended ESR.” The Extended ESR provides an indication of influence from high hematocrit (HCT). Hematocrit is the volume of red blood cells as a percent of the total sample volume. A sample with an HCT of 70 means that 70% of the sample volume is red blood cells. An Extended ESR result is expressed as a fractional parameter. For example 10/15 or 40/40, which means 10mm during the first hour and another 5mm during the second, or 40mm during the first hour and 0mm during the second.

### 7.3 The 100mm Vacuum System

The risk associated with hepatitis virus and HIV infected blood has forced the attention to automatic blood sampling and processing systems. To reduce hazards, evacuated blood collection systems of different designs were introduced into the market during the 1980s.

### 7.4 BD Standard Scale v. QuickMode Method

In 1985, the Swedish nurse Barbro Hjalmarsson persuaded Becton Dickinson, the largest tube manufacturer in the world at that time, to promote her evacuated blood collection tube. The tube was manufactured in accordance with the BD vacuum tube standards and consisted of a 120mm evacuated tube, pre-filled with an adequate volume of anticoagulant. The diameter of this tube was larger than a Westergren tube, and the system required a conversion scale to produce results compatible with the reference method. The vacuum tube collected 100mm of blood and is often referred to as the 100mm ESR.

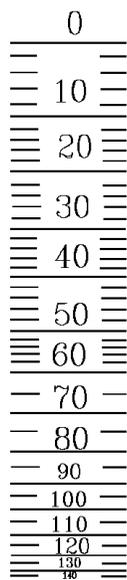


Figure 20: The 100mm standard conversion scale.

Due to the nature of the sedimentation reaction, a non-linear scale is used to convert results obtained with the 100mm tube method to an equivalent result from the 200mm tube method. BD developed the 100mm tube scale, which became the standard conversion scale for 100mm ESR tubes (Figure 20).

The long ESR test time of 60 minutes prompted researchers to develop alternative methods to reduce the measuring time of the ESR test. Early methods include holding tubes at different angles, changing angles during the reaction, and centrifuging samples, among others. The “Rapid-ESR” is an example of an early system where an ordinary 200mm ESR tube is placed at a 45° angle to produce a faster sedimentation reaction. The method does increase the speed of RBC sedimentation, but is inaccurate in the higher range.

The ESR-Auto Plus uses the QuickMode method to accelerate ESR measurement. QuickMode is faster than the “Rapid ESR” method described above and has better correlation to the reference method than the standard scale. QuickMode uses a special mathematical formula to convert the accelerated results.

### 7.5 The ESR-Vacuum Tube

In parallel with Hjalmarsson’s developments, another Swedish ESR tube was developed. This one was similar to the long Westergren pipette with a narrow bore, but with vacuum and the appropriate amount of pre-filled anticoagulant.

A special reagent was developed and added to the citrate to make the anticoagulant and blood mix easily. The reagent reduced the surface tension in the sample, but did not affect the sedimentation reaction. It also helps reduce the formation of blood foam, which is a common occurrence when drawing ESR samples. This tube became the Streck ESR-Vacuum Tube in 1996.

## THE SEDIMENTATION REACTION

### 7.6 A Typical ESR Reaction

In order to understand the advantages of the ESR-Auto Plus and the 30-minute method, it is important to understand the course of development of ESR.

A number of factors affect the sample during its reaction, which can make ESR quite unspecific; however, they also make ESR a wide screening marker for disease. The reaction contains several phases that affect the end result in various ways. Generally, the reaction can be divided into three basic phases: Aggregation, Sedimentation and Packing (Figures 21 and 22).

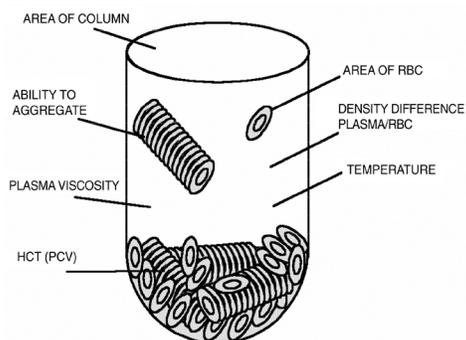


Figure 21: Before the ESR reaction has come to a stop, a number of factors have participated and affected the result.

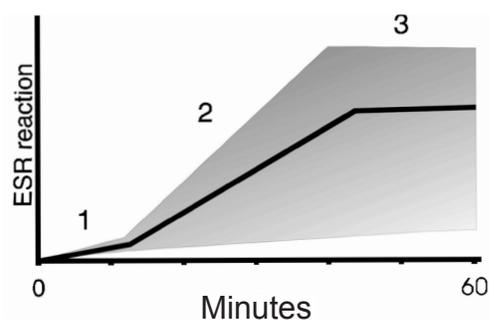


Figure 22: The ESR reaction can be divided into three phases: 1. Aggregation, 2. Sedimentation, and 3. Packing.

#### Aggregation

The Aggregation Phase occurs during the first 5 to 10 minutes of the reaction. The red blood cells aggregate. The reaction during this time is not known to correlate to any disease state. Almost no sedimentation of the red cells occurs during this phase. However, the degree of aggregated cells will determine the sedimentation rate during the second phase.

#### Sedimentation

Sedimentation of red blood cells occurs during the Sedimentation Phase since red blood cell aggregates are denser than plasma. The sedimentation rate is often linear during the major part of this phase.

#### Packing

As sedimented red blood cells reach a certain density, sedimentation will decrease and come to an end. This is the Packing Phase where the blood divides into distinct layers of red blood cells, white blood cells and plasma.

### 7.7 ESR Reference Ranges / Values

Guidelines for ESR Reference Values for the Westergren ESR Method\*: Normal 0-20 mm/hr

\* CLSI Approved Standard *Procedures for the Erythrocyte Sedimentation Rate Test*; Document H02.

Reference values should be established locally in accordance with the individual laboratory's accrediting agencies. Refer to CLSI document H02 for age and gender-specific Reference Values.





Performance &  
Technical Specifications



# Chapter 8

## Performance & Technical Specifications



### 8.1 Overview

Many automated ESR instruments analyze samples using similar methodology as manual ESR testing. The instruments collect readings at two different timepoints; the first is an initial timepoint to register the initial fill level in the tube, the second after a specified period of time to register the level of RBC sedimentation. These values are then converted to a standard ESR result in mm/hr.

The ESR-Auto Plus uses the QuickMode method which reads the RBC sedimentation level after 30 minutes and mathematically converts it to an equivalent Modified Westergren result in mm/hr.

### 8.2 Measuring Abnormal Samples

The clinical significance of an ESR result obtained from an abnormal sample, including but not limited to icteric, lipemic, cold agglutinins, anemic conditions, low hemoglobin concentrations, hemolysis, or any pathological condition that interferes or prevents a clear red blood cell to plasma interface, should be determined by the clinician ordering the test. Manual and automated ESR measurements in samples without a clear interface are subject to a high degree of variability. In the ESR-Auto Plus, the sample may go undetected or yield variable results. Visually inspect the sample at the conclusion of the test to confirm the presence of a clear interface.

### 8.3 Fill Level

1.2ml ESR-Vacuum Tubes are evacuated to draw a 60mm blood column. ESR-Vacuum Tubes will remain within the stated fill level limits through the expiration date. The fill level, expiration date and lot number are printed on the label of each tube.

### 8.4 Temperature Compensation

Ambient temperature affects the ESR result. In warmer conditions, the ESR reaction increases considerably. The ESR test should be performed at 20°C. Since this is impossible in some laboratories, a conversion scale was developed with the 100mm system.

Both scales are programmed in the ESR-Auto Plus and a temperature sensor mounted internally decides which scale to use. The scale automatically switches when the internal instrument temperature exceeds 26°C. When using QuickMode, a standard 10% is deducted from the result at temperatures above 26°C. This compensation prevents the reporting of falsely elevated results.



A small thermometer icon will appear in the display when the internal instrument temperature is > 26°C. When the instrument temperature is > 26°C and the temperature compensation function is in effect, the printout will read "Alarms: High Temperature Compensated." Temperature compensated results are valid.

### 8.5 ESR-Auto Plus Precision

#### Precision Study Test Protocol:

Ten ESR-Vacuum Tubes per level were filled with ESR-Chex control (10 tubes with level 1 and 10 tubes with level 2). The level 1 tubes were placed in each lane of the ESR-Auto Plus and all tubes were analyzed 10 times. The study was repeated with the level 2 samples. The mean, standard deviation and coefficient were calculated both within and across the lane designations.

#### Results:

The ESR-Auto Plus demonstrates uniform precision characteristics both within and across the 10 lane designations (i.e., lane A through lane J). Standard deviation ~ 1.0 for a level 1 ESR-Chex control mean recovery and standard deviation ~ 2.0 for a level 2 ESR-Chex control mean recovery.

### 8.6 Preventive Maintenance

#### Internal Printer:

Regularly check that the printer head on the internal printer is free from dust and remains from old printer paper. "Canned Air" should not be used to blow dust away from the printer as damage to the print head may occur.

### 8.7 Cleaning Instructions

Regularly clean the instrument surface using a damp, soft cloth or paper. Ethanol or isopropanol may be used.



**CAUTION: The main power must be turned "off" before cleaning with any liquids. Do not open or remove the ESR-Auto Plus cover during cleaning.**



Figure 23  
ESR Barcode Scanner

### 8.8 Barcode Scanner (Figure 23)

Symbol barcode scanner part #s LS1902T-i000, LS2208-SR20001

**!** **Important!** The barcode scanner has been pre-programmed and is ready for use. Contact Streck Technical Service before making changes to the barcode scanner.

The barcode reader is a scanning model and is available from your Streck representative. The barcode scanners are considered to be Class 2 lasers that emit Class 2 laser light. The barcode reader has several adjustable parameters.

Visit [www.motorola.com/enterprisemobility/manuals](http://www.motorola.com/enterprisemobility/manuals) for the latest version of the barcode scanner guide.

The barcode input is a COM port located on the back of ESR-Auto Plus. Sample IDs can contain any alphanumeric character and have a maximum length of 13 characters. No special start or stop characters are required. Non-printable or control characters are removed.

#### Accepted codes:

EAN, UPC, Codabar, Code 39, Code 93, Code 128, Interleaved 2 of 5, and more.

#### Port specification:

Type	COM port Female HP 9p D SUB
Baud Rate	9600
Data Bits	8
Parity	None
Flow Control	None

#### Pin assignments (nc=no connection):

1	nc	2	RX-Data from barcode reader
3	nc	4	+5 V for reader C TS
5	Ground	6	nc
7	nc	8	nc
9	+5V, 0.1 A max		

### 8.9 COM port Communication

Results are asynchronously transmitted to the COM ports located on the back of the ESR-Auto Plus. This is a unidirectional transmission of data. The data consists of ASCII characters and is the same data that is sent to the printer. At the end of the each line, a line feed character is sent (Hex 0D 0A). After the last line, 2 line feed characters are sent to advance the paper.

The printout can be configured from the software. Refer to Section 5.5.

#### Port specifications:

Baud Rate	9600
Data Bits	8
Stop Bits	1
Parity	None
Flow Control	None

#### Pin assignments:

1	nc	2	TX (Transmit)
3	RX (Read)	4	nc
5	GND	6	nc
7	nc	8	nc
9	nc		

## 8.10 Technical Specifications, ESR-Auto Plus

### Electrical specifications

The ESR-Auto Plus is provided in an auto-switching electrical configuration as noted below. The correct electrical configuration will be programmed at Streck prior to shipment.

<b>US / 110V input</b>	Input	110 VAC 60 Hz 24 VA
	Fuse	Littelfuse 312, 250V, 500mA
<b>International / 220V input</b>	Input	220 VAC 50 Hz 24 VA
	Fuse	Littelfuse 312, 250V, 250mA

Power cords		Current consumption (based on 110 VAC input)	
<b>U.S.</b>	Streck part number: 240389	<b>Total Watts</b>	33W max
<b>European</b>	Streck part number: 240390	<b>Total Amps</b>	300mA max
<b>Australian</b>	Streck part number: 240391	<b>Phase</b>	Single
<b>U.K.</b>	Streck part number: 240392	<b>Groundwire resistance limit</b>	0.1 ohm
		<b>Max. acceptable leakage current</b>	3.5mA

### Reading method

Infrared light, wavelength 950 nm. Values converted according to time consumed between bottom position and triggering point following trigonometric calculations.

### Capacity

In "QuickMode" (30 min): 20 samples / hour

Alarm limits				Analytical range
	1.2ml tubes	Both tubes	2.0ml tubes	0 - 120 mm/hr
Over Fill	690	1080	1080	<b>Serial port</b> COM port. Refer to Section 8.9 for details.
Low Fill	510	510	890	
No Fill	200	200	200	
PAED Trig	N/A	690	0	<b>Barcode specification</b> COM port. Refer to Section 8.8 for details.

<b>External printer cable</b>	
STANDARD SERIAL Cable (RS232), 2 meters, 9-pin male to 9-pin male.	
<b>Sound pressure level</b>	
Less than 55 dB at the highest sound pressure level.	
<b>Working environment</b>	
<b>Temperature range</b>	5°C to 40°C
<b>Relative humidity</b>	Max. 80% for temperatures up to 31°C, decreasing linearly to 50% relative humidity at 40°C.
<b>Storing environment</b>	
<b>Temperature range</b>	0°C to 40°C
<b>Relative humidity</b>	Max. 80% for temperatures up to 31°C, decreasing linearly to 50% relative humidity at 40°C.
<b>Ventilation requirements</b>	
Not specified, but one must be aware that the ESR reaction increases with higher temperature.	
<b>Dimensions</b>	<b>Weight</b>
272mm (width) x 224mm (depth) x 160mm (height)	10.4 pounds (4.7 kg)

### 8.11 Environmental Conditions

ESR-Auto Plus is designed to be safe under the following conditions:

- a. Indoor use
- b. Altitude up to 2,000 meters
- c. Temperature 5°C to 40°C
- d. Maximum relative humidity 80% for temperatures up to 31°C, decreasing linearly to 50% relative humidity at 40°C
- e. Main supply voltage fluctuations not to exceed +10% of the nominal voltage
- f. Transient over voltages according to installation category II

### 8.12 Transportation Environment

Temperature Range: -40°C to 55°C

### 8.13 Technical Specifications, ESR-657 Mixer

Electrical specifications	
The ESR-657 Mixer is provided in the electrical configurations as noted below.	
<b>US / 110V input</b>	US Adaptor with UL approval (Model: MW48-2401000A, JF48-2401000AU, Jameco 10102)
	UL/CUL plug-in AC/AC Adaptor
	Input: 110V~60Hz, Output is 6-foot cord + male 3.5 x 14mm plug
<b>International / 220V input</b>	International Adaptor with IEC C14 connection (Model: AP7974)
	CE approval wall mount AC/AC Adaptor
	Input: 220V~ 50Hz, Output is 6-foot cord + male 3.5 x 14mm plug
Power Cables	
International adaptor listed above should be used with one of the following power cables.	
<b>European</b>	Streck part number: 240390
<b>U.K.</b>	Streck part number: 240392
<b>Australian</b>	Streck part number: 240391
Current consumption	
Max. 29VA	
Sound pressure level	
Less than 55 dB at the highest sound pressure level.	
Ventilation requirements	
Not specified.	
Working environment	
Temperature range	5°C to 40°C
Relative humidity	Max. 80% for temperatures up to 31°C, decreasing linearly to 50% relative humidity at 40°C.
Storing environment	
Temperature range	5°C to 40°C
Relative humidity	Max. 80% for temperatures up to 31°C, decreasing linearly to 50% relative humidity at 40°C.
Dimensions	
180mm (width) x 90mm (depth) x 125mm (height)	
Weight	
1.8 pounds (0.79 kg)	

### 8.14 Disclaimer

The ESR-Auto Plus, ESR-657 Mixer and ESR Barcode Scanner are intended for use as specified in this manual. If used in ways other than specified in this manual, the protection provided by the equipment may be impaired. Streck cannot take any responsibility for injuries or accidents that might occur as a consequence of this action.



Safety Precautions



# Chapter 9

## Safety Precautions



### 9.1 User Precautions

All ESR-Auto Plus operators should follow Universal Precautions for handling potentially infectious materials analyzed in this instrument. Seek immediate medical attention in the case of exposure to biological specimens.

### 9.2 Electrical Equipment

The power supply of all electrical equipment is a potential source of danger. To avoid the risk of electrical shock and/or damage to the instrument, operators should not open the covers of live electrical parts of the instrument. Only authorized Streck service personnel may open the instrument to perform maintenance or repair. In addition, Streck recommends plugging the ESR-Auto Plus and mixer into a power surge protector for additional protection from power surges and fluctuations. Contact Streck Technical Service with any questions.

### 9.3 Disconnect Device

Turn the power switch off before removing or reinstalling any connectors on the ESR-Auto Plus.

To disconnect the instrument, turn the power switch to the "Off" position and unplug the power cable from the surge protector. It is not necessary to routinely disconnect the instrument when it is not in use.

ESR-Auto Plus operators should follow local regulations regarding disposal of electronic equipment.

### 9.4 Sample Analysis

The operator should consider all biological samples as potentially infectious. The operator should observe Universal Precautions and follow established laboratory safety regulations when handling all biological samples and blood collection sharps. Wipe up any specimen spilled on the instrument immediately and disinfect the contaminated surface with a 0.5% sodium hypochlorite (bleach) solution.

Biological fluids and liquid waste should not be disposed in general waste, but should be disposed with infectious medical waste. Compliance with waste disposal regulations is the responsibility of the operator.

### 9.5 Application of Secondary Labels

Caution must be taken when applying additional patient labels to ESR-Vacuum Tubes. Excessive label thickness, wrinkling or flagging may increase the outer diameter of the tube enough to wedge it in the instrument. If the operator experiences resistance when inserting a tube containing a secondary label, remove the tube before it is fully inserted and remove the additional label before proceeding.

### 9.6 Removal of ESR-Vacuum Tubes

Operators should be able to easily remove an ESR-Vacuum Tube from the ESR-Auto Plus at the conclusion of the test by grasping the stopper with their fingertips. Caution must be taken to lift the tube straight out of the instrument until the entire tube clears the top surface of the instrument. There is a greater risk of the stopper dislodging from a tightly fit or wedged tube, which could make tube removal difficult.

In the event that an ESR-Vacuum Tube becomes lodged or broken inside the instrument, the operator should not attempt to remove the tube. The operator should seal the affected tube channel with tape, place the instrument in a biohazard bag and contact Streck Technical Service at 800-843-0912 for instructions on how to return the instrument to Streck for repair and decontamination.

### 9.7 Repackaging Instructions

The ESR-Auto Plus contains delicate electrical components and needs to be properly packed in the approved foam inserts and carton before shipping (Figure 24). Contact Streck Technical Service to obtain the correct packaging materials.

**!** **Important! Only package the specific pieces of equipment (instrument, mixer and/or barcode scanner) authorized for return.**

1. Unplug the instrument. Remove the paper, test rack, cables, barcode scanner bracket and other accessories.
2. Wipe the outer surface of the instrument and test rack with ethanol or isopropanol. Do not wipe the printer with alcohol or other solvents.
3. Place the bottom foam piece in the shipping carton.
4. Insert the test rack into the ESR-Auto Plus and place the instrument inside the antistatic bag supplied with the approved packaging.
5. Place the instrument in the designated slot in the bottom foam piece.
6. Place the top foam piece in the shipping carton with the flat side down.
7. Place accessories such as paper and power adapter inside the top foam piece.
8. Fill any extra space with packing material before closing the box.
9. Seal the box and write the Return Authorization number provided by Streck on the outside of the package.
10. Always ship the instruments and components as "FRAGILE"!
11. Contact Streck Technical Service when the package is ready. Streck will make the pickup arrangements. No packing slip or label is required.

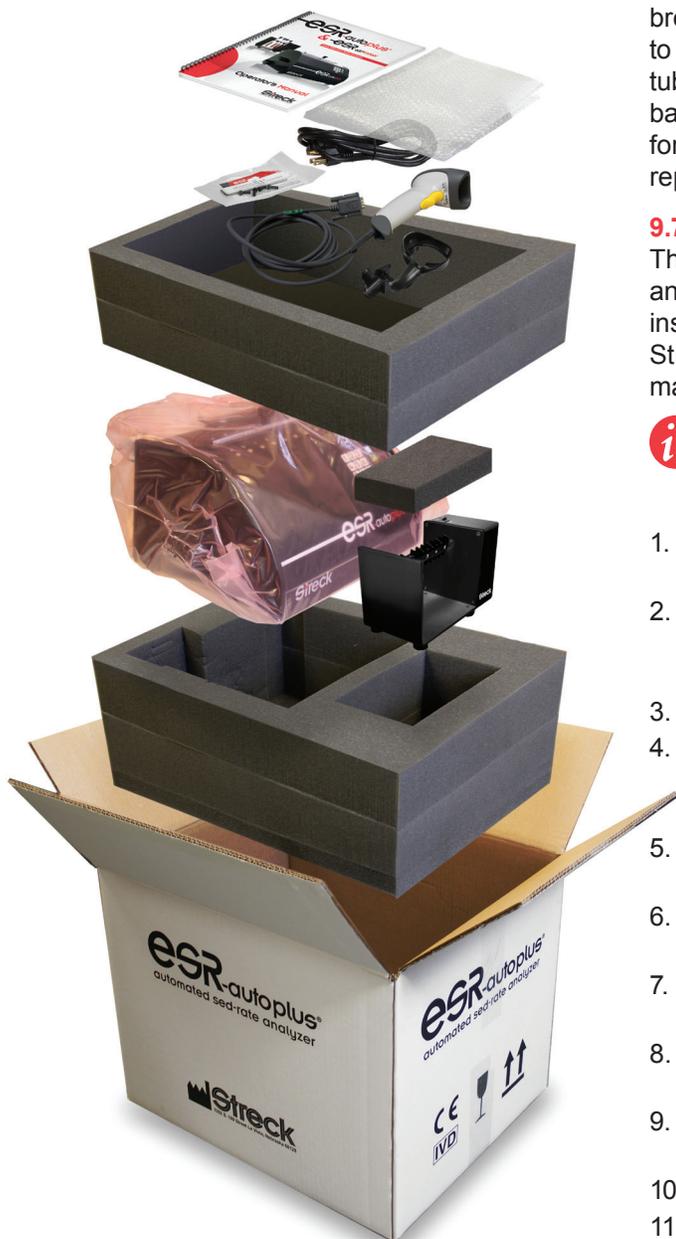


Figure 24

### 9.8 Glossary of Safety Symbols



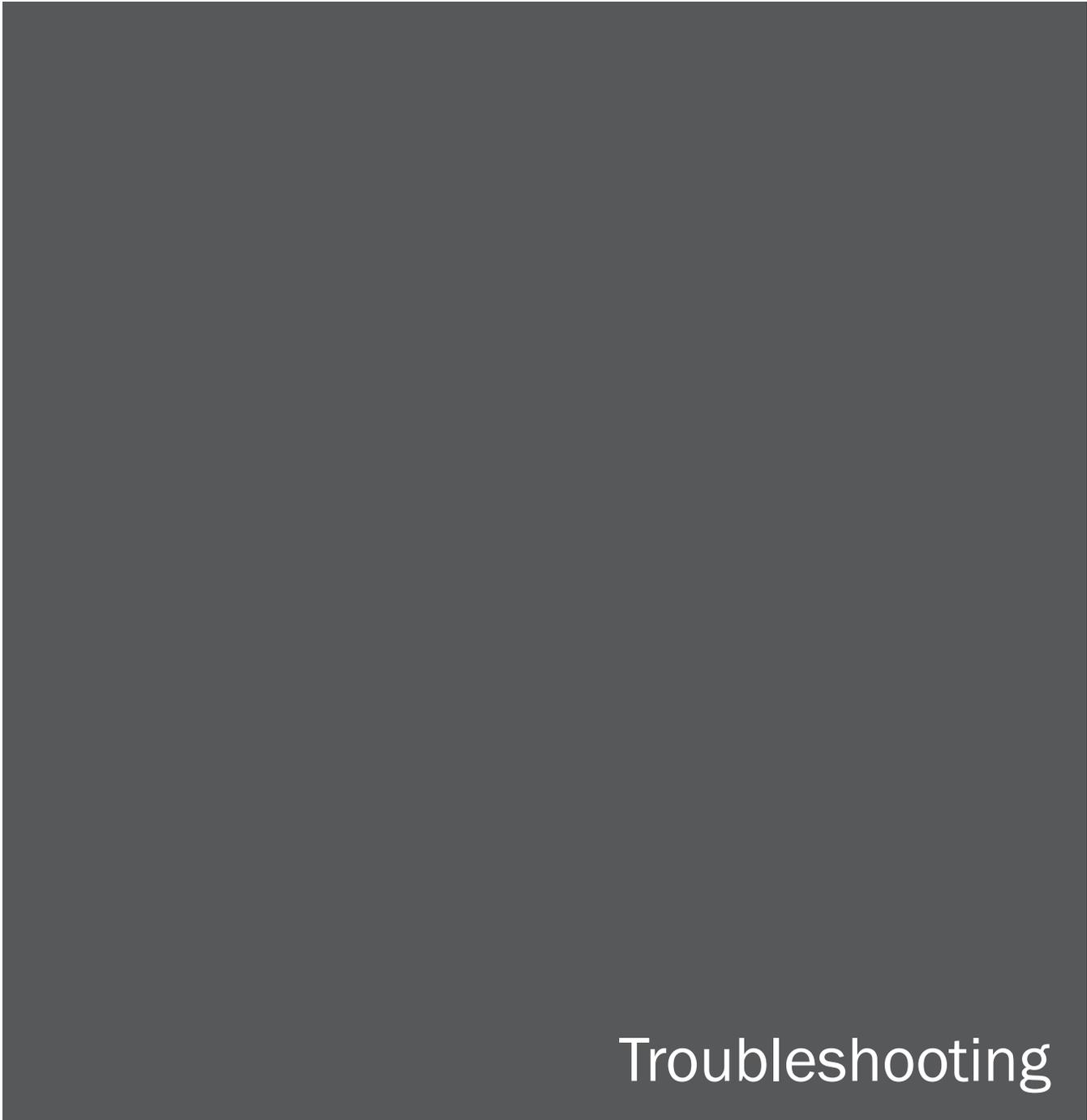
Biological Risk



Hazard



Protective Conductor  
Terminal Marking



Troubleshooting



# Chapter 10

## Troubleshooting



**Important!** Contact Streck Technical Services at 800.843.0912 (ext. 7510) or [technicalservices@streck.com](mailto:technicalservices@streck.com) for assistance with any of the items listed in this Troubleshooting section, or if any other system malfunctions are observed.

### 10.1 Error Codes

Error codes are printed in text on the ticket style printout and binary code on the log style printout and LCD display. The binary values, error codes and explanations are listed below.

Binary Value	Error Code	Cause / Remedy
1024	Sample overfilled / Label interference	Sample will abort immediately. 1. Verify secondary label does not interfere with meniscus. Remove label and rerun sample. 2. Sample fill level is greater than maximum fill level. Max. fill level: 1.2ml tube=69mm, 2.0ml tube=108mm. Prepare new tube if fill level is above maximum. Rerun sample.
512	Sample aborted	Appears when a sample is aborted before end of measuring time. Rerun sample.
256	Timing error	The timing of an ESR reading was wrong by more than 90 seconds. Rerun sample.
128	Test mode enabled-Result invalid	Test mode is enabled. Result is invalid. Disable test mode in service menu. Rerun sample.
64	Result not printed	Result not printed. Reprint result. Code 64 only appears on the LCD screen.
32	High temperature compensated	Internal operating temperature of the instrument is >26°C and result is temperature compensated. Result is valid. Test results will only be compensated if the internal instrument temperature is > 26°C <u>and</u> the temperature compensation feature is turned "on."
8	Out of range	The ESR value is outside of the instrument's reportable range of 0-120 mm/hr. Report as >120 mm/hr.
4	Low fill level	Sample will abort immediately. Sample fill level is less than minimum fill level. Min fill level: 1.2ml tube=51mm, 2.0ml tube=89mm. Prepare new tube if fill level is below minimum. Rerun sample.
2	No sample found	Sample started and removed without aborting or fill level is <20mm. Rerun sample.
1	No code	N/A

## 10.2 Decoding Error and Status Codes

To decode an alarm error code or status code, identify the largest value on the binary value table below that is equal to or smaller than code reported. Subtract the binary value from the error code reported. Continue the same process until you reach 0. Each binary value subtracted from the original number represents an error or status message that applies to the sample. See the samples in the table below.

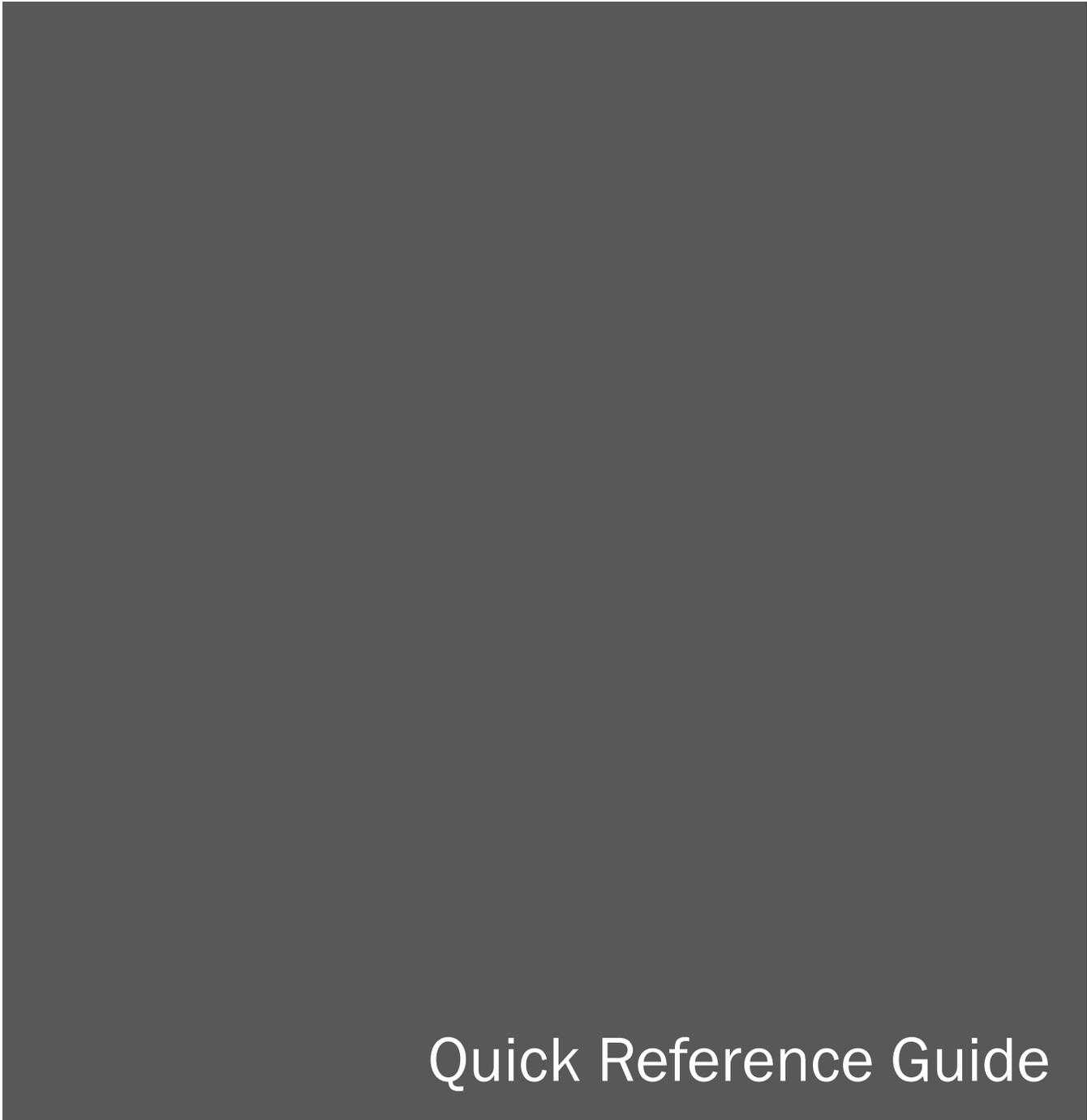
Binary Value	Error Code	Status Code
1024	Sample overfilled / Label Interference	No code
512	Sample manually aborted	Reprint sample
256	Timing error	This is a 1.2ml tube
128	Test mode enabled-Result invalid	No code
64	Result not printed	Auto print "on"
32	High temperature warning	Temperature compensation "on"
8	Out of range	No code
4	Low fill level	No code
2	No sample found	No code
1	No code	QuickMode enabled
	Error Code Example	Status Code Example
	<p>Reported Error Code = 1536.</p> <p>The largest binary value <math>\leq 1536</math> is 1024 (sample overfilled): <math>1536 - 1024 = 512</math>.</p> <p>The largest binary value <math>\leq 512</math> is 512 (sample manually aborted): <math>512 - 512 = 0</math>.</p> <p>Therefore, the error codes associated with the binary value 1536 are:</p> <p>1024 = Sample overfilled</p> <p>512 = Sample manually aborted</p> <p> <b>Important!</b> The error and status codes to designate control samples are L1=2048 and L2=4096. Subtract those values from the reported error and status codes to decode error and status codes on control samples.</p>	<p>Reported status code = 353</p> <p>The largest binary value <math>\leq 353</math> is 256 (pediatric tube): <math>353 - 256 = 97</math>.</p> <p>The largest binary value <math>\leq 97</math> is 64 (auto print on): <math>97 - 64 = 33</math>.</p> <p>The largest binary value <math>\leq 33</math> is 32 (temperature compensation on): <math>33 - 32 = 1</math>.</p> <p>The largest binary value <math>\leq 1</math> is 1 (Quickmode enabled): <math>1 - 1 = 0</math>.</p> <p>Therefore, the status codes associated with the binary value 353 are:</p> <p>256 = 1.2ml tube</p> <p>64 = auto print on</p> <p>32 = temperature compensation on</p> <p>1 = Quickmode enabled</p> <p> <b>Important!</b> A status code of 353 will be associated with most sample results.</p>

### 10.3 Troubleshooting Guide

Miscellaneous errors and conditions are summarized below.

Problem	Possible Cause(s)	Corrective Action
Control values outside of assay range	<ol style="list-style-type: none"> <li>1. Samples not mixed properly.</li> <li>2. Incorrect instrument settings.</li> </ol>	<ol style="list-style-type: none"> <li>1. Verify control lot # in use.</li> <li>2. Prepare a new aliquot from a new vial following the ESR-Chex IFU mixing directions.</li> <li>3. Verify that any additional labels are placed correctly on the tube (see Section 2.5). Rerun.</li> <li>4. If incorrect values persist, print System Setup and contact Streck Technical Services.</li> </ol>
Test rack verification fails	Values differ more than 2mm from the stored reference values.	<ol style="list-style-type: none"> <li>1. Clean wells with a cotton swab dipped in 10% bleach. Do not pour any solution in unit and only clean half-way down each well.</li> <li>2. Repeat test rack verification.</li> <li>3. If problem persists, re-register test rack in Service Menu (see Section 6.4).</li> </ol>
Low fill/overflow alarm	<ol style="list-style-type: none"> <li>1. Tube fill volume is incorrect.</li> <li>2. Instrument set to read wrong tube type.</li> <li>3. Label interference.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check to see if sample tube is under or overfilled (see Section 2.5).</li> <li>2. Verify correct tube type in User Configuration menu.</li> <li>3. Verify that any additional labels are placed correctly on the tube (see Section 2.5) and rerun.</li> </ol>
Printer malfunction	<ol style="list-style-type: none"> <li>1. Printer paper empty/paper jam.</li> <li>2. Printer port not activated in the set up.</li> <li>3. Paper roller bar not properly inserted.</li> </ol>	Power unit OFF, remove jam, reload paper, reinstall printer roller bar (see Section 1.5), power ON.
Instrument is frozen/ no response	<ol style="list-style-type: none"> <li>1. Motor malfunction.</li> <li>2. Software malfunction.</li> <li>3. Paper roller bar not properly inserted.</li> </ol>	<ol style="list-style-type: none"> <li>1. Power unit OFF, reload paper, reinstall printer rollerbar (see Section 1.5), power ON.</li> <li>2. Power unit OFF for a few minutes and then power ON. Run test rack.</li> <li>3. If problems persist, perform Ram Reset (see Section 6.10).</li> <li>4. If problems continue, contact Streck Technical Services.</li> </ol>
Barcode scanner does not read the barcode	<ol style="list-style-type: none"> <li>1. Scanner not properly connected to unit.</li> <li>2. Barcode type not activated in scanner.</li> </ol>	Verify that barcode scanner is tightly screwed into the correct port on the back of the unit. Scan a barcode 3 times to activate barcode scanner.
Thermometer icon on display/ High temperature compensated	Internal instrument temperature >26° C.	No corrective action needed. Results are being temperature compensated. Print system setup to view the internal instrument temperature.
Bio-contamination in instrument well	Patient specimen or control material spill in instrument well.	Contact Streck Technical Services.





Quick Reference Guide





### 11.1 Standby Screen

The ESR-Auto Plus is in standby mode and ready to run a patient sample when “NEXT SAMPLE...” appears in the display. For any other operation, such as looking up a result, predicting a sample currently in process, printing a result, running a control or changing instrument settings, press and hold **X** for one second to access the Main Menu.

### 11.2 Sample Mixing

**i!** **Important!** Do not remove anticoagulant from Streck ESR-Vacuum tube before transfer. Allow all refrigerated samples to come to room temperature before mixing and analyzing.

1. Transfer patient sample from an EDTA tube or collect sample directly into an ESR-Vacuum Tube.
2. For direct draw, invert the ESR-Vacuum Tube 8 to 10 times manually after blood collection.
3. Place the sample on the ESR-657 Mixer for at least 3 minutes to thoroughly mix sample.
4. When thoroughly mixed, load sample in the ESR-Auto Plus.

### 11.3 Run Test Rack

1. From standby, press and hold **X**.
2. Select number 5.Run Test Rack.
3. Insert the test rack and press **✓**.
4. Instrument will scan the test rack and generate a printout.
5. If the printout reads “OK”, proceed with QC controls.
6. If test rack reads “FAILED”, refer to Section 6.4 or 11.9 to Re-Register Test Rack.

### 11.4 Register New Lot of QC

**i!** **Important!** Registering a new lot will clear all existing QC data. Print existing QC data before registering a new lot.

1. From standby, press and hold **X**.
2. Select number 4.CONTR. SAMPLES.
3. Select number 3.REG NEW CONTRL.
4. Enter level and press **✓**.
5. Press **✓** to clear old data.
6. Enter lot number, expiration date and min/max ranges.
7. New control information will automatically print.
8. Press **✓** to accept or **X** to reject values.

### 11.5 Run QC Sample



**Important!** Register controls before running a QC sample.

1. From standby, press and hold **X**.
2. Select number 4.CONTR. SAMPLES.
3. Select number 1.Run Control.
4. Select either Level 1 or 2, and press **✓**.
5. Instrument reads: "Insert in a Free Position."
6. Insert QC sample in any open position, and the light will change from green to red.
7. In 30 minutes, the result will automatically print if autoprint is enabled, and the light will return to green.

### 11.6 Run Patient Sample

1. From standby, either enter patient ID on the keypad and press **✓**, or scan the patient barcode with the ESR Barcode Scanner.
2. Instrument reads: "Insert (patient ID) in Free Position."
3. Insert patient sample in any open position, and the light will change from green to red.
4. In 30 minutes, the result will automatically print if autoprint is enabled, and the light will return to green.

### 11.7 Cancel Measurement

1. To cancel a sample, remove the tube from its position or press and hold the keypad number corresponding to the desired tube position. Press 2 to abort.
2. The display will show that the sample has been aborted and the red light will change to green.

### 11.8 Predict Sample Result

1. To predict a sample, press and hold the keypad number corresponding to the desired tube position.
2. Alternatively, from standby, press and hold **X**. Press 1 to search sample by ID or 2 to search by position and enter the ID or position number.
3. The instrument will give an alarm sound and remaining time will appear on display.
4. After a few seconds, the second row will display 1.Predict Sample and 2.Abort Sample. Press 1 to predict sample results or 2 to abort sample. Press and hold **X** to end search sequence.

### 11.9 Re-Register Test Rack

1. Unplug the instrument. Wait at least 5 seconds and plug in the instrument.
  2. Instrument reads: "Initiating Motor..."
  3. Instrument reads: "Next Sample..." Press . Enter "6."
  4. Instrument reads: "User Config." Press .
  5. Instrument reads: "Service Menu." Press .
  6. Instrument reads: "Give Code." Enter "48." Press . Press  until the instrument reads "Reg Test Rack?"
  7. Instrument reads: "Reg Test Rack?" Press .
  8. Instrument reads: "Sure?" Press . The instrument will scan twice and print results. The printout should read "TEST RACK REGISTRATION OK."
  9. Instrument reads: "Set Tube Type?" Press .
  10. Instrument reads: "Set Calibration?" Press .
  11. Instrument reads: "Set Test Mode?" Press .
  12. Instrument reads: "See Temperature?" Press .
  13. Instrument reads: "Set Access Code?" Press .
  14. Instrument reads: "Next Sample..."
- The instrument is ready to run samples.







# Internet IFU Directions



Instructions for use can be obtained at [www.streck.com](http://www.streck.com) in the product's Resources section, by calling 402-333-1982, or by calling your local supplier.

## Bulgarian (Български)

Инструкциите за употреба можете да получите от [www.streck.com](http://www.streck.com) в секцията с източници на информация за продукта, като се обадите на 402-333-1982 или като се обадите на своя местен доставчик.

## Croatian (Hrvatski)

Upute za upotrebu možete dobiti posjetom internetne stranice [www.streck.com](http://www.streck.com) u razdjelku Resursi, pozivom na broj 402-333-1982 ili pozivom svog lokalnog dobavljača.

## Czech (Čeština)

Pokyny k použití lze získat na adrese [www.streck.com](http://www.streck.com) v části „Resources“ (Zdroje) daného produktu, telefonicky na čísle 402 333 1982, nebo telefonicky od místního dodavatele.

## Danish (Danske)

Brugsvejledning kan fås på [www.streck.com](http://www.streck.com) i produktets ressourceafdeling, ved at ringe til +1 402-333-1982 eller ved at ringe til din lokale leverandør.

## Estonian (Eesti keel)

Kasutusjuhendeid on võimalik leida internetiaadressilt [www.streck.com](http://www.streck.com) tootja ressursside (Resources) jaotisesest või helistades 402-333-1982 või võttes ühendust kohaliku endasimüüjaga.

## Finnish (Suomi)

Käyttöohjeet löydät osoitteesta [www.streck.com](http://www.streck.com) tuotteen resurssija käsittelevästä osiosta, soittamalla numeroon +1 402-333-1982 tai ottamalla yhteyttä paikalliseen toimittajaasi.

## French (Français)

Les instructions sont disponibles à l'adresse [www.streck.com](http://www.streck.com) dans la section Ressources du produit, en composant le 402-333-1982, ou en appelant votre fournisseur local.

## German (Deutsch)

Gebrauchsanweisungen erhalten Sie unter [www.streck.com](http://www.streck.com) im Produktressourcen-Abschnitt, unter der Telefonnummer +1 402-333-1982 oder durch einen Anruf bei Ihrem örtlichen Lieferanten.

## Greek (Ελληνικά)

Οδηγίες χρήσης μπορούν να ληφθούν από τη διεύθυνση [www.streck.com](http://www.streck.com), στην ενότητα Resources (Πόροι) του προϊόντος, είτε καλώντας στο 402-333-1982 είτε καλώντας τον τοπικό προμηθευτή σας.

## Hebrew (ת.ר.ב.)

רצומה לש (סיבאשמ) Resources רודמב , [www.streck.com](http://www.streck.com) ושיקב גישה תני שומישה תוארוה תא ,  
ךלש ימוקמה קפסה לא ופלטב רשקתהל וא , 1-402-333-1982 רפסמל ופלטב רשקתהל

## Hungarian (Magyar)

A használatra vonatkozó utasításokat megtalálja a [www.streck.com](http://www.streck.com) webhelyen a termék Resources (Forrásanyagok) című szakaszában, illetve kérheti a 402-333-1982 telefonszámon vagy a helyi beszállítótól.

## Italian (Italiano)

Per le Istruzioni per l'uso, consultare la sezione Risorse del prodotto sul sito [www.streck.com](http://www.streck.com) oppure telefonare al numero 402-333-1982 o al fornitore di zona.

## Latvian (Latviešu valodā)

Lietošanas instrukcijas pieejamas vietnes [www.streck.com](http://www.streck.com) izstrādājumu resursu sadaļā, zvanot 402-33-1982 vai zvanot vietējam piegādātājam.

## Lithuanian (Lietuvių)

Naudojimo instrukcijas rasite [www.streck.com](http://www.streck.com), produkto skiltyje „Resources“ (ištekliai). Be to, jų galite paprašyti paskambinę 402-333-1982 arba susisiekti su savo vietiniu tiekėju.

## Norwegian (Norsk)

Bruksanvisning kan fås på [www.streck.com](http://www.streck.com) i produktets Resources [ressurs]-avsnitt, ved å ringe +402-333-1982 eller ved å ringe til den lokale forhandler.

## Polish (Polski)

Aby uzyskać instrukcje użytkowania, należy odwiedzić sekcję Resources (Zasoby) na podstronie produktu pod adresem [www.streck.com](http://www.streck.com) lub skontaktować się telefonicznie, korzystając z numeru 402-333-1982 lub numeru lokalnego dostawcy.

## Portuguese (Português)

As instruções de utilização podem ser obtidas em [www.streck.com](http://www.streck.com) na secção de Recursos do produto através do número de telefone 402-333-1982, ou contactando o seu fornecedor local.

## Romanian (Română)

Instrucțiunile de utilizare sunt disponibile pe pagina [www.streck.com](http://www.streck.com), în secțiunea Resurse a produsului, sau telefonic la numărul 402-333-1982 sau contactând telefonic furnizorul local.

## Serbian (Српски)

Упутство за коришћење можете наћи на интернет сајту [www.streck.com](http://www.streck.com) под раздељком Ресурси, позивом на 402-333-1982 или позивом свог локалног добављача.

## Slovak (Slovenčina)

Pokyny na používanie nájdete na stránke [www.streck.com](http://www.streck.com) na podstránke produktu v časti Resources (zdroje) alebo zavolajte na číslo 402-333-1982, prípadne kontaktujte vášho miestneho dodávateľa.

## Spanish (Español)

Para obtener las instrucciones de uso, visite [www.streck.com](http://www.streck.com), en la sección de recursos del producto, o llame al número telefónico +1 402 333 1982 o al proveedor de su localidad.

## Swedish (Svenska)

Bruksanvisning finns på [www.streck.com](http://www.streck.com) i sektionen "Resources" för produkten, genom att ringa till +1-402-333-1982 eller genom att ringa närmaste leverantör.

## Turkish (Türkçe)

Kullanım talimatlarına ulaşmak için [www.streck.com](http://www.streck.com) internet adresinde ürünün Kaynaklar bölümüne bakabilir ya da 402-333-1982 telefon numarasını veya yerel tedarikçinizi arayabilirsiniz.

