SonoScape

L741 Linear Array

Transducer

User Manual

SonoScape Co., Ltd.

Yizhe Building, Yuquan Road, Nanshan, Shenzhen,
518051, P.R. China
Tel: +86-755-26722890
Fax: +86-755-26722850
Email: sonoscape@sonoscape.net
http://www.sonoscape.com

SonoScape Co., Ltd. **P/N: 4890-0063-01A**

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1 Introduction

This m anual includes inform ation for using L741 linear array ultrasonic transducer.

This transducer is designed to work with SSI-8000, SSI-6000, SSI-5000 and S8 series ultrasound systems.

Read chapter ***2 Safety Information*** for important information on safety.

1.1 Contact Information

If you have any enquires concerning using the probes, please do not hesitate to contact us.

Address: Yizhe Building, Yuquan Road, Nanshan Shenzhen, P.R. China
Zip Code: 518051
Tel: **+86-**400–678–8019
Fax: +86–755–26722850
Website: http://www.sonoscape.com
E-mail: sonoscape@sonoscape.net

2 Safety Information

Read this chapter thoroughly and m ake sure that inform ation in this chapter has been properly understood before connecting probes to your ultrasound system.

2.1 Symbols used

Symbol	Description
	Insulated patient application part (Type BF)
	Warning! Follow these instructions to avoid system damage or personal injury.

2.2 Electrical safety considerations

Please refer to the ultrasound system 's *operator's manuals* for safety classification information and safe use of the probes. Make sure that the *chapter 1: System Safety and Maintenance* has been read and properly understood.

Degrees of protection against harmful liquid: IPX7, from acoustic window to junction line; IPX1, for other parts of the probe that may contact with the patient or the operator (excluding the probe connector).

⚠ Warning!

- Check the compatibility of the local voltage level (including frequency and voltage) with the ultrasound system before turning the ultrasound system on.
- Do not modify the probe without SonoScape's authorization!
- Servicing and repairing should be carried out by authorized personnel only!
- Only accessories approved by SonoScape should be connected/used with this transducer.

2.3 Acoustic power

Keep the power levels and the exposure time as low as possible in accordance with the ALARA principle, as long as a satisfactory diagnosis has been achieved.

User should be aware of various possible biological effects of the ultrasound beam, especially the thermal and mechanical effects on human tissues and bones. E.g. for fetal application, thermal effects on embryo bone must be taken into consideration; thus in addition to limit the scanning time and acoustic power, the TIB value should be closely monitored during the scanning.

For acoustic output powers of the L741 transducer, refer to *Chapter 6: Acoustic Output Tables*.

2.4 Environmental conditions

	Operation	**Storage and Transport**
Relative humidity	30%~75%, no condensation	20%~90%, no condensation
Ambient temperature	10°C~40°C	-20°C~55°C
Barometric pressure	700hPa~1060hPa	700hPa~1060hPa

Please also refer to the ultrasound system's *operator's manuals* to check the environmental conditions for operation, storage and transport of the ultrasound system.

2.5 Operating safety considerations

⚠ Warning!

- Always follow safety instructions in this manual and in the operator's manual of your ultrasound system.
- If any abnormality occurs, turn off the ultrasound system completely, disconnect the power supply. Inform your SonoScape representative immediately.
- The equipment must not be used in the presence of inflammable gases (e.g. anesthetic gases and nitrous oxide) to avoid explosion hazard.
- The L741 transducer does not provide protection against high frequency interference. User has the full responsibility to ensure that necessary measures have been taken to minimize the adverse effects of interference.
- Use only the legally marketed coupling gel/couplant and probe sheath. Read the manufacturer's instructions carefully before using them.

⚠ Warning!

- The probes listed in this manual should be connected and used with only the ultrasound systems produced by SonoScape. To find the probe models supported by your ultrasound system, consult your operator's manuals.
- Improper handling can easily damage the probe! Avoid any kind of collisions or mechanical vibrations.
- If any cracks on the transducer surface and/or wear on the probe cable are observed, stop using the transducer immediately to avoid electric shock hazard. Contact your SonoScape representative for servicing.
- When connecting or disconnecting a transducer, make sure the system is either in freeze mode (from real time scanning mode, press Freeze key to activate) or preparation mode (from real time scanning mode, press MENU key to activate).

3 Probe Information

3.1 Applications and Specifications

Intended applications and specifications of the L741 are listed in the following table.

L741 Linear Array Transducer	
Type	Linear array
Applications	Vascular, Small parts, Musculoskeletal
Scan width	max. 46mm
Frequency range	5.0 - 12.0 MHz

3.2 Probe parts

The probe can be con sidered as consisting of the following parts : transducer, probe cable and pr obe connector. Biopsy guides are optional.

4 Preparing and Using the Probes

4.1 Inspection and connection

Inspecting probes

After each use, or before first use after long-time period storage of the probe, the probe must be examined for any damages listed in the table below. Stop using the probe if any da mage is found. Contact SonoScape or the local repres entative of SonoScape for repairing/replacing of the probe.

Possible damage types
Cracks on the probe handle (user section).
Cracks on the probe head (applied section).
Scratches on the probe head (acoustic window surface).
Swell of the acoustic window material.
Cracks or wear on the probe cable.
Cracks on the probe connector or any other kinds of visible damage.
Deformed pins or broken pins existing inside the probe connectors.

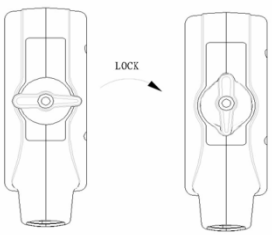
Connecting probes

It is unnecessary to turn off the system in order to connect/disconnect the probes.

Before you connect or disconnect a probe, the probe must not be active scanning, you should either

- use the Freeze key to activate the freeze mode.
- or press the MENU key to activate the preparation mode.

Disconnecting a probe while it is active scanning may cause software error. If this happens, restart the system (turn off the system and later turn it on).



Instructions

1. Plug the probe connector straight into the probe socket on the ultrasound system.
2. Turn the knob clockwise to lock the connector in position.
3. You may hang the excessive cables on the probe cable hook on the ultrasound system.

4.2 Preparing the probes for scanning

⚠ Warning!

- An effective acoustic coupling does not require inordinate pressure, but it does require coupling gel and patient contact.
- Check the expiration date of the probe sheath and the coupling gel. Never use expired probe sheath and coupling gel.
- Latex or natural rubber contained inside medical equipments or accessories can cause severe allergic reactions in some individuals. It's suggested by FDA that the user should identify the latex-sensitive patients and be prepared to treat allergic reactions promptly.
- Only water-soluble coupling gel should be applied to the probe head surface. Avoid contact with the mineral oil.

Put an adequate amount of coupling gel either on the probe head (acoustic window) or the patient skin.

If disease transmission is a concern, use of the sterile probe sheath is highly recommended. Refer to instructions below to cover the probe surface with probe sheath.

Mounting biopsy guide (optional)

Follow instructions in the biopsy guide operation manual to mount the biopsy guide and install the biopsy needle.

4.3 Scanning

Please follow instructions in the operator's manuals of your SonoScape ultrasound system to select the probe and the imaging modes, adjust the parameters, and perform scanning.

Read the operator's manual of the ultrasound system thoroughly before performing the scanning. Make sure that the warning and caution messages inside the manuals have been read and properly understood.

4.4 Cleaning and disinfection

Surface probes should be cleaned after every use.

If biopsy guide is used, follow instructions in the biopsy guide operation manual to clean and disinfect the biopsy guide.

5 Probe Maintenance

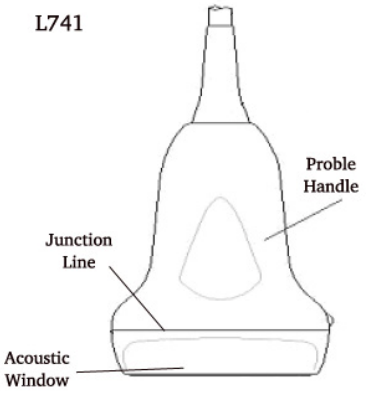


Figure 1 Surface probe: L741

5.1 Probe cleaning and disinfection

Clean the transducer and the probe handle after each use.

Disinfect the transducer periodically.

Keep a log of maintenance (inspection, cleaning and disinfection) and malfunction.

Probe immersion level

For surface probes, do not immerse the probe beyond its junction line (refer to figure 1).

⚠ Warning!

- DONOT use solutions containing alcohol, mineral oil for cleaning and/or disinfecting probes.
- Wear medical sterile gloves to prevent potential disease transmission. Wear protective goggle if necessary.
- DONOT apply solutions containing ethyl oxides on the probe.

Cleaning instructions

1. Disconnect the probe from the ultrasound system. Remove the biopsy guide if it is attached to the probe.
2. Remove all the coupling gel and clean the probe with soft cloth and flowing potable water.
3. If the probe surface carries too much residue, remove all visible residue with wet cloth soaked in mild soap water. Use wet soft cloth to scrub the surface if dried residue exists. Remove all soap water residue with damp cloth soaked in potable water.
4. Air dry or dry with a soft cloth.

Disinfection instructions

The level of disinfection is directly related to the duration of contact with the germicide. High level of disinfection[1] is recommended for surface probes. Legally marketed liquid chemical germicides (e.g. Cidex) are highly recommended. Prepare and use the germicides following the manufacturer's instructions.

[1] Refer to the germicide manufacturer's instruction to perform high level disinfection.

⚠ Warning!

- DO NOT use high pressure steam to disinfect the probe.
- DO NOT use thermal disinfection! Temperatures higher than 66°C or 150°F will damage the probe.

1. Ensure that all visible residues have been removed.
2. Prepare the germicide solutions according to the manufacturer's instructions. Please also follow the manufacturer's instructions for storage and disposal of the germicide.
3. Immerse the probe head into the germicide for a time interval specified by the germicide manufacturer. The immersion level should be kept below the binding line. High level disinfection is recommended for surface probes and required for intracavitary probes. Note that you may need to rotate and shake the transducer in order to remove the air bubbles between the transducer surface and the germicide solution.
4. After removing the probe from the germicide solution, rinse it thoroughly with clean, potable water to remove all visible germicide. Dry the probe with a soft cloth.

5.2 Biopsy guide cleaning and disinfection

Refer to the biopsy guide operation manual to clean and disinfect the biopsy guide.

6 Acoustic Output Tables

The following tables list the acoustic output reports for the L741 transducer.

Transducer Model: L741 Flat Linear Array **Operating Mode: B mode**

Index Label			MI	TIS			TIB	TIC
				scan	non-scan		non-scan	
					$A_{aprt} \leq 1$	$A_{aprt} > 1$		
Global Maximum Index Value			1.004	2.250	#	#	#	(b)
Assoc Acoustic Parameter	$P_{r.3}$	(MPa)	2.560					
	W_o	(mW)		72.6	#		#	#
	min of $[W_{.3}(z_1), I_{TA.3}(z_1)]$	(mW)				#		
	z_1	(cm)				#		
	z_{bp}	(cm)				#		
	z_{sp}	(cm)					#	
	z@ $PII_{.3max}$	(cm)	1.848					
	$d_{eq}(z_{sp})$	(cm)					#	
	f_c	(MHz)	6.507	6.507	#	#	#	#
	Dim of A_{aprt}	X (cm)		2.304	#	#	#	#
		Y (cm)		0.500	#	#	#	#
Other Information	PD	(μsec)	0.183					
	PRF	(Hz)	9108					
	p_r@PII_{max}	(MPa)	3.879					
	d_{eq}@PII_{max}	(cm)					#	
	Focal Length	FL_x(cm)		2.0	#	#		#
		FL_y(cm)		2.0	#	#		#
	$I_{PA.3}$@ MI_{max}	(W/cm^2)	227.218					
Operating Control Conditions	Mode		B	B	#	#	#	#
	Focus	(cm)	2	2	#	#	#	#
	PRF	(kHz)	9	9	#	#	#	#
	Power	(%)	100	100	#	#	#	#

Notes: (a) This index is not required for this operating mode.
See section 4.1.3.1. of the Output Display Standard (NEMA UD-3)
(b) This probe is not intended for transcranial or neonatal cephalic uses.
(c) This formulation for TIS is less than that for an alternate formulation in this mode.
No data are reported for this operating condition since the global maximum index value is not reported for the reason listed.

Transducer Model: L741 Flat Linear Array Operating Mode: B/M mode

Index Label			MI	TIS			TIB	TIC
				scan	non-scan		non-scan	
					$A_{aprt} \leqslant 1$	$A_{aprt} > 1$		
Global Maximum Index Value			1.125	1.004	#	0.328	0.478	(b)
Assoc Acoustic Parameter	$P_{r.3}$	(MPa)	2.838					
	W_o	(mW)		72.6	#		53.4	#
	min of $[W_{.3}(z_1), I_{TA.3}(z_1)]$	(mW)				10.8		
	z_1	(cm)				1.978		
	z_{bp}	(cm)				1.814		
	z_{sp}	(cm)					1.978	
	z@ $PII_{.3max}$	(cm)	1.978					
	$d_{eq}(z_{sp})$	(cm)					0.047	
	f_c	(MHz)	6.367	6.507	#	6.367	6.367	#
	Dim of A_{aprt}	X (cm)		2.304	#	4.600	4.600	#
		Y (cm)		0.500	#	0.500	0.500	#
Other Information	PD	(μsec)	0.200					
	PRF	(Hz)	200					
	p_r@PII_{max}	(MPa)	4.384					
	d_{eq}@PII_{max}	(cm)					0.047	
	Focal Length	FL_x(cm)		2.0	#	2.0		#
		FL_y(cm)		2.0	#	2.0		#
	$I_{PA.3}$@ MI_{max}	(W/cm^2)	263.504					
Operating Control Conditions	Mode		M	B	#	M	M	#
	Focus	(cm)	2	2	#	2	2	#
	PRF	(kHz)	0.2	9	#	0.2	0.2	#
	Power	(%)	100	100	#	100	100	#

Notes: (a) This index is not required for this operating mode.
See section 4.1.3.1. of the Output Display Standard (NEMA UD-3)

(b) This probe is not intended for transcranial or neonatal cephalic uses.

(c) This formulation for TIS is less than that for an alternate formulation in this mode.

No data are reported for this operating condition since the global maximum index value is not reported for the reason listed.

Transducer Model: L741 Flat Linear Array Operating Mode: THI mode

Index Label			MI	TIS			TIB	TIC
				scan	non-scan		non-scan	
					$A_{aprt} \leq 1$	$A_{aprt} > 1$		
Global Maximum Index Value			1.167	1.133	#	#	#	(b)
Assoc Acoustic Parameter	$P_{r.3}$	(MPa)	2.843					
	W_o	(mW)		40.1	#		#	#
	min of $[W_{.3}(z_1), I_{TA.3}(z_1)]$	(mW)				#		
	z_1	(cm)				#		
	z_{bp}	(cm)				#		
	z_{sp}	(cm)					#	
	z@ $PII_{.3max}$	(cm)	1.825					
	$d_{eq}(z_{sp})$	(cm)					#	
	f_c	(MHz)	5.932	5.932	#	#	#	#
	Dim of A_{aprt}	X (cm)		2.304	#	#	#	#
		Y (cm)		0.500	#	#	#	#
Other Information	PD	(μsec)	0.204					
	PRF	(Hz)	9108					
	p_r@PII_{max}	(MPa)	4.132					
	d_{eq}@PII_{max}	(cm)					#	
	Focal Length	FL_x(cm)		2.0	#	#		#
		FL_y(cm)		2.0	#	#		#
	$I_{PA.3}$@ MI_{max}	(W/cm^2)	286.589					
Operating Control Conditions	Mode		THI	THI	#	#	#	#
	Focus	(cm)	2	2	#	#	#	#
	PRF	(kHz)	9	9	#	#	#	#
	Power	(%)	100	100	#	#	#	#

Notes: (a) This index is not required for this operating mode.
See section 4.1.3.1. of the Output Display Standard (NEMA UD-3)

(b) This probe is not intended for transcranial or neonatal cephalic uses.

(c) This formulation for TIS is less than that for an alternate formulation in this mode.

No data are reported for this operating condition since the global maximum index value is not reported for the reason listed.

Transducer Model: L741 Flat Linear Array Operating Mode: B/COLOR mode

Index Label			MI	TIS			TIB	TIC
				scan	non-scan		non-scan	
					$A_{aprt} \leq 1$	$A_{aprt} > 1$		
Global Maximum Index Value			1.004	0.704	#	#	#	(b)
Assoc Acoustic Parameter	$P_{r.3}$	(MPa)	2.560					
	W_o	(mW)		32.1	#		#	#
	min of $[W_{.3}(z_1), I_{TA.3}(z_1)]$	(mW)				#		
	z_1	(cm)				#		
	z_{bp}	(cm)				#		
	z_{sp}	(cm)					#	
	z@ $PII_{.3max}$	(cm)	1.815					
	$d_{eq}(z_{sp})$	(cm)					#	
	f_c	(MHz)	4.607	4.607	#	#	#	#
	Dim of A_{aprt}	X (cm)		2.304	#	#	#	#
		Y (cm)		0.500	#	#	#	#
Other Information	PD	(μsec)	0.878					
	PRF	(Hz)	27720					
	p_r@PII_{max}	(MPa)	1.889					
	d_{eq}@PII_{max}	(cm)					#	
	Focal Length	FL_x(cm)		2.0	#	#		#
		FL_y(cm)		2.0	#	#		#
	$I_{PA.3}$@ MI_{max}	(W/cm^2)	101.823					
Operating Control Conditions	Mode		B/COLOR	B/COLOR	#	#	#	#
	Focus	(cm)	2	2	#	#	#	#
	PRF	(kHz)	28	28	#	#	#	#
	Power	(%)	100	100	#	#	#	#

Notes: (a) This index is not required for this operating mode.
See section 4.1.3.1. of the Output Display Standard (NEMA UD-3)

(b) This probe is not intended for transcranial or neonatal cephalic uses.

(c) This formulation for TIS is less than that for an alternate formulation in this mode.

No data are reported for this operating condition since the global maximum index value is not reported for the reason listed.

Transducer Model: L741 Flat Linear Array **Operating Mode:** PW mode

Index Label			MI	TIS			TIB	TIC
				scan	non-scan		non-scan	
					$A_{aprt} \leqslant 1$	$A_{aprt} > 1$		
Global Maximum Index Value			0.420	#	#	0.132	1.080	(b)
Assoc Acoustic Parameter	$P_{r.3}$	(MPa)	1.036					
	W_o	(mW)		#	#		9.8	#
	min of $[W_{.3}(z_1), I_{TA.3}(z_1)]$	(mW)				4.6		
	z_1	(cm)				1.815		
	z_{bp}	(cm)				1.814		
	z_{sp}	(cm)					1.815	
	z@ $PII_{.3max}$	(cm)	1.815					
	$d_{eq}(z_{sp})$	(cm)					0.102	
	f_c	(MHz)	6.090	#	#	6.090	6.090	#
	Dim of A_{aprt}	X (cm)		#	#	4.600	4.600	#
		Y (cm)		#	#	0.500	0.500	#
Other Information	PD	(μsec)	0.631					
	PRF	(Hz)	16000					
	p_r@PII_{max}	(MPa)	1.518					
	d_{eq}@PII_{max}	(cm)					0.102	
	Focal Length	FL_x(cm)		#	#	2.0		#
		FL_y(cm)		#	#	2.0		#
	$I_{PA.3}$@ MI_{max}	(W/cm^2)	54.5					
Operating Control Conditions	Mode		PW	#	#	PW	PW	#
	Focus	(cm)	2	#	#	2	2	#
	PRF	(kHz)	16	#	#	16	16	#
	Power	(%)	100	#	#	100	100	#

Notes: (a) This index is not required for this operating mode.
See section 4.1.3.1. of the Output Display Standard (NEMA UD-3)

(b) This probe is not intended for transcranial or neonatal cephalic uses.

(c) This formulation for TIS is less than that for an alternate formulation in this mode.

No data are reported for this operating condition since the global maximum index value is not reported for the reason listed.

Transducer Model: L741 Flat Linear Array **Operating Mode:** B/COLOR/PW mode

Index Label			MI	TIS			TIB	TIC
				scan	non-scan		non-scan	
					$A_{aprt} \leq 1$	$A_{aprt} > 1$		
Global Maximum Index Value			1.004	0.704	#	0.222	1.257	(b)
Assoc Acoustic Parameter	$P_{r.3}$	(MPa)	2.560					
	W_o	(mW)		32.1	#		16.4	#
	min of $[W_{.3}(z_1), I_{TA.3}(z_1)]$	(mW)				7.6		
	z_1	(cm)				1.815		
	z_{bp}	(cm)				1.814		
	z_{sp}	(cm)					1.815	
	z@ $PII_{.3max}$	(cm)	1.815					
	$d_{eq}(z_{sp})$	(cm)					0.146	
	f_c	(MHz)	4.607	4.607	#	6.093	6.093	#
	Dim of A_{aprt}	X (cm)		2.304	#	4.600	4.600	#
		Y (cm)		0.500	#	0.500	0.500	#
Other Information	PD	(μsec)	0.878					
	PRF	(Hz)	27720					
	p_r@PII_{max}	(MPa)	1.889					
	d_{eq}@PII_{max}	(cm)					0.146	
	Focal Length	FL_x(cm)		2.0	#	2.0		#
		FL_y(cm)		2.0	#	2.0		#
	$I_{PA.3}$@ MI_{max}	(W/cm^2)	101.823					
Operating Control Conditions	Mode		B/COLOR	B/COLOR	#	PW	PW	#
	Focus	(cm)	2	2	#	2	2	#
	PRF	(kHz)	28	28	#	16	16	#
	Power	(%)	100	100	#	100	100	#

Notes: (a) This index is not required for this operating mode.
See section 4.1.3.1. of the Output Display Standard (NEMA UD-3)

(b) This probe is not intended for transcranial or neonatal cephalic uses.

(c) This formulation for TIS is less than that for an alternate formulation in this mode.

No data are reported for this operating condition since the global maximum index value is not reported for the reason listed.