



GE Medical Systems

Technical Publications

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Rev 2

LOGIQ A1

Basic Service Manual

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Operating Documentation

DAMAGE IN TRANSPORTATION

Please check all the packages carefully when delivering the device. If there is any defect, please write the note “defect during transportation” on all the copy of freight bill or delivery bill by GE’s agent or the principal of hospital before deliver the goods. No matter the defect note is added or not, let the deliveryman know the situation of the device. The freight company is responsible of the goods within 14 days after receiving. If no claim is made within this period, the freight company will not pay for counterclaim.



GE Medical Systems

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Modification record

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CHAPTER 1 Introduction

1-1 System Overview

LOGIQ A1 is an advanced and high quality ultrasound diagnostic. It is a linear and convex scanning system with 3.5MHz C60 convex-array probe as standard configuration, 7.5MHz L700 linear array probe and 6.0MHz C14 micro-convex probe as optional ones. This system can be used for diagnosis of abdomen, OB/GYN and small parts etc.

1-2 Purpose of Service Manual

This Service Manual provides service information for the LOGIQ A1 Ultrasound Scanning System. It contains the following chapters:

Chapter 1 - Introduction: Contains a content summary and warnings.

Chapter 2 - Installation: Including electric request before installation and LOGIQ A1's installation process with whole bills of installation and examination.

Chapter 3 - System Outline: including the description of mechanical、electric、environment property, peripheries and accessories.

Chapter 4 – Functional Check: including function examination for repairing and regular maintenance after installation.

Chapter 5 – System Architecture: composing configuration of system.

Chapter 6 – Periodic Maintenance: offer the periodic maintenance process of LOGIQ A1.

1-3 Safety Considerations

1-3-1 Warning

Read below notes carefully before using the system.

1. Read LOGIQ A1 User Manual before using the system and put it in an easy-to-reach place.
2. Only the trained person can operate or repair LOGIQ A1. It is necessary to avoid the unwanted ultrasound radicalization although emissive energy of LOGIQ A1 transducer is within standard limitation. ,
3. Only specified power cord is allowed to avoid shock. Power pin needs to be connected to fixed socket with ground protection. Commutator is not allowed. System is required to work within the rating voltage.
4. Probes need to be maintained carefully. It is dangerous to use damaged probe on patient. Image quality is influenced by damaged probe too. The damaged probe must be discarded, using repaired probe is forbidden. Do not touch the probe surface with the speculate things or knock the probe.
5. Do not put any liquid over or on the top of mainframe. There might be current leakage if electric parts are touched by liquid. Only trained service representative can open the system mainframe to repair the system. Customer are not allowed to open the system mainframe.
6. Do not use electric vibrating generator while using LOGIQ A1.
7. Use the machine in the prescriptive condition, otherwise it might disturb radiogram and TV. In order to avoid this situation, please use the machine according to the User Manual and Service Manual.

1-3-1 Warning (Continued)

Fig1-1 describes the usage and position of safety labels and offers other important information of this machine.

Table 1-1 Warning labels

Label/Symbol	Description	Position
Nameplate and electrical parameter	<ul style="list-style-type: none"> • Manufacture and address • Manufacturing date • Type and serial number • Electrical parameter 	Back of mainframe
Type/grade label	Indicate the degree of safety and protection	Back of mainframe
Equipment authentication labels	Indicate to have passed the trial-produce register of national medicament government.	Back of mainframe
	Type BF device (Symbol is the person in the frame) indicate the type B device equipped with the type F applied parts(usually to hang some probes)	Exterior
	Class I equipment means the equipment not only has the basic insulation, but also has the grounded to provide protection against the electrical shock.	Pedestal (inside the system)
	Warning, high voltage	CRT, transformer
	Power is on.	Front panel (on the power switch)
	Power is off.	Front panel (on the power switch)

1-3-2 Classification

Anti-electrical shock type: Class **I** equipment *1

Level of anti-shock: Type BF equipment *2

1. Class **I** equipment*

This means the equipment not only has the basic level insulation, but also has the grounding to provide protection against the electrical shock. This additional protection can prevent the exposed metal to be electrification when insulated malfunction happens.

2. Type **BF** equipment*

The type B equipment equipped with the Type F applied parts can provide the protection against the electrical shock. When adding 1.1 times voltage between applied parts and ground, it will not pass the permissible leakage current in the singularity malfunction condition.

1-4 EMC (Electromagnetic Compatibility)

1-4-1 EMC performance

The electromagnetic interfere to other device through interspace transmission or the linked cable depends on the specialities of electric device. EMC glossary shows that the device has the capability not only to avoid the electromagnetism interfere from other device, but also has the capability not to affect others because of its own electromagnetism interfered.

This product is designed strictly according to EMC for medical electric device.

In order to guarantee EMC capability of device, please install the machine according to service manual. Pay attention to the Note 1-4-2.

If there is something wrong related to EMC, please resolve it according to the section

1-4-2 Notice upon installation of product

1. Use the power cord supplied or appointer by GE. The power pin must connect to the fixed power socket with ground.

2. Connect three-pin to three-pin socket, do not use the commutator of three-pin to two-pin.
3. Keep the machine far away from the other electrical-device.
4. Use the cable supplied or appointed by GE and connect it according to the installation process. For example, separate the power cord from signal cord.

1-4-3 General Notice

1. Only the appointed external devices can connect with this system and cannot affect EMC capability.
2. Note when doing the modification:
 - a) Do not change the collocation of this system. As such modification will worsen EMC capability.
 - b) Modification of collocation including:
 - Modification of cable (length, material, connection and so on.)
 - Modification of installation/composition of system
 - Modification of configuration/components.
 - Modification in the way to fix system/components (turn on or off the cover board, close the bolt of cover board)
3. Close all the cover boards when operating, if one cover board is on, make it off before continuing the operation in spite of any reason. It will affect EMC capability when the cover board is on.

1-4-4 Countermeasures against EMC related-issues

It is usually difficult to resolve EMC problems, it takes a lot of time and cost, and make the electromagnetism interfere to other device.

1. Keep the system far away from other device, that can decrease electromagnetism interfere.
2. Change the relative position between this system to other devices, that can decrease electromagnetism interfere.
3. Change the position of other device's power cord/signal cord, that can decrease electromagnetism interfere.
4. Change the power supply route of other device, that can decrease electromagnetism interfere.

1-4-5 Notice on service

Close the bolts after repairing, flexible bolts will depress EMC capability.

***Note:** The ultrasound system should be used far away from the electricity generator, cellphone, amphibious transceiver, broadcasting station and electromotion control toy etc to avoid the capability of LOGIQ A1 to pass the regulation. Turn off power supply when such device beside LOGIQ A1.*

***Note:** It is responsible for the service person of LOGIQ A1 to guide the technician who is related to system, patient and other persons to follow these regulations.*

1-5 Contact Information

If this equipment does not work as indicated in this service manual or in the User Manual, or if you required additional assistance, please contact the local distributor or appropriate support resource, as listed below.

Prepare the following information before your call:

- System ID serial number.
- Software version.

NEEDS Local Service Contact Info (e.g. 800 number) HERE!!

Contact below system manufacturer for advanced technical support.

GE Medical Systems (China) Co., Ltd.
U/S Technical Support

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CHAPTER 2 INSTALLATION

2-1 PRE-Installation

2-1-1 Overview

This section provides the information required to plan and prepare for the installation of a LOGIQ A1. Included are descriptions of the facility and electrical needs to be met by the purchaser of the unit.

2-1-2 Power line Requirements

Check the following wire's parameters a week before installation. It is better to use Drantez Model 605-3 power cord monitor with 101 options.

Parameter	Rating
Power requirement:	AC 220V±22V
Power consumption:	No greater than 130VA
Power supply frequency:	50Hz
Power supply twinkling change:	Less than 25% of regular peak value, less than 1ms of any instant-change status, including frequency、synchronization、asynchronism or non-seasonal status's change.
Attenuation surge:	Less than 15% of peak value voltage, less than 1ms.

2-1-3 Physical Specification

The weight of LOGIQ A1 is about 10Kg.

Working Condition

Table 2-1 Working condition

Conditions Parameter	Operation	Preservation	Transportation
Temperature	5°C ~ 40°C	-5°C ~ 40°C	-30°C ~ 55°C
Humidity	30%--80%, no condensation	Less than 80%, no condensation	Less than 95%, no condensation
Atmosphere pressure	86kPa ~ 106kPa	86kPa ~ 106kPa	50kPa ~ 106kPa

To patient:

It is better for patient to keep the room temperature in the range of 20°C - 26°C (68°F - 79°F), as the humidity 50% - 70%.

EMI

The radio frequency, magnetic field, space twinkling status and electrical net is easy to affect ultrasound device. The electrical equipment may cause the space electromagnetism interfere or electrical net electromagnetism interfere. The resource of the electromagnetism interfere including medical laser, cautery electron gun, computer, electric fan, Gel refiner, microwave oven and cellphone, and broadcaster, big truck also.

Read the following defend measurements carefully before installing the device:

1. Connect all the devices' power cord to the fixed power socket with ground.
2. Make sure to connect the place of equipment with the ground of building.
3. Keep the device far away from other electronic device.

If make sure or doubt that there is something wrong about EMI, deal with the jamming devices as follows:

1. Move the devices far away from jamming devices.
2. Change the position of device in the room.
3. Connect the power cord to another power socket.
4. Move the device's power cord and signal cord.

Make sure to screw down bolts after installing the device after repairing.

2-2 Installation

2-2-1 Overview

This section describes the steps to install LOGIQ A1.

2-2-2 Average installation time

It takes about 1 hour to install GE LOGIQ A1.

2-2-3 Checking the components

Check the device carefully when getting a new one, if there is hard up of parts, contact through the way in the Chapter 1.

Warning: *Connect LOGIQ A1 to the right grounded power socket to avoid electrical shock, do not use three-pin to two-pin commutator that will destroy the grounded safety.*

Warning: *There is no spare parts of an apparatus for operator. Do not open the outer frame or panel in order to avoid electrical shock. Only the service person can do the servicing when there is some wrong with the device except supply socket.*

Warning: *Make sure the back panel is well ventilated.*

Warning: *Do not hurt the rubber of probe surface, using of damaged probe is prohibited.*

Warning: *Although the emissive ultrasound energy is in the prescriptive range, it is better to avoid unnecessary ultrasound radiation.*

2-2-4 Unpacking LOGIQ A1

1. Snip the package cingulum around the box.
2. Remove the adhesive tape.
3. Open the paper box.
4. Take out the User manual, probe box, ultrasound gel and power cord.
5. Take the device out of the package.
6. Wipe off the plastic bag around device.

2-2-5 Assembling LOGIQ A1

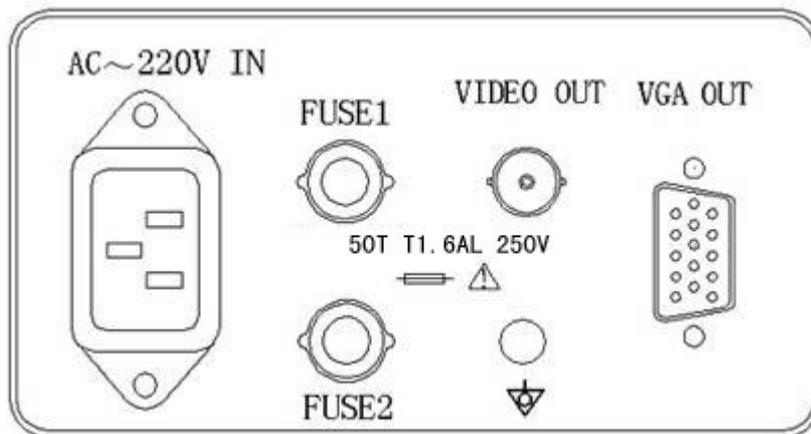
Assembling system

1. Get the probe out of package and put in into the special probe holder.
2. Make sure the mainframe off before connecting probe.
3. Make sure any probe connects to the following socket:
 - a. Turn the handle key to the position of 3 o'clock.
 - b. Connect the linker of probe to the probe socket of main unit.
 - c. Turn the handle key to the position of 12 o'clock.
4. Connect the inner pin to AC socket in the back panel of main unit, connect another pin to the hospital power socket with the regular press output, do not use three-pin to two-pin commutator, that will destroy the grounded safety.
5. Open the keyboard through the lock on the top of main unit.

Note: Do not move or institute mainframe when dropping the keyboard.

2-2-6 Installation of optional accessories

1. Connect VGP to suitable power socket, connect Video out port to Video In of VGP with BNC-BNC cable in the back panel of LOGIQ A1.



Install the accessories

Illustration 2-1

2-2-7 Adjustment of monitor contrast and brightness

Adjust contrast and brightness according to the brightness of room after turning on the main unit.

Note: Check the function in Chapter 4 before deliver the goods to customer.

2-3 Electrical safety tests

The following tests are performed at the factory and should be repeated at the sites as part of periodic maintenance. These tests are: grounding continuity, classis leakage current, probe leakage current. All measurements are made with an Electrical Safety Analyzer Model Dale 600/600E built by Dale Technology Corporation or equipment device.

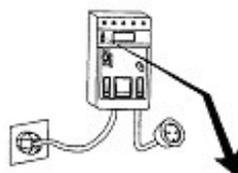
Recommended Tool

Table-2-2
Recommended Tool

Part Number	Name	Description
46-285652G1 (GE)	Electrical Safety Analyzer DALE 600	For 120V Units
46-328406G2(GE)	Electrical Safety Analyzer 600E	For 220V Units
2113015(GE)	Leakage Current Ultrasound Kit	For 120V and 220V Units

2-3-1 Outlet test wiring Arrangement

Test all outlets in the area for proper wiring arrangement by plugging in the Dale 600/600E and noting the combination of lights that are illuminated.



Combination of Lights	● ☉ ☉	☉ ☉ ●	● ☉ ●	● ● ●	☉ ● ☉
Condition	Correct Wiring	Reverse Polarity	Open Ground	Open Hot	Hot/Ground Reversed

Outlet test

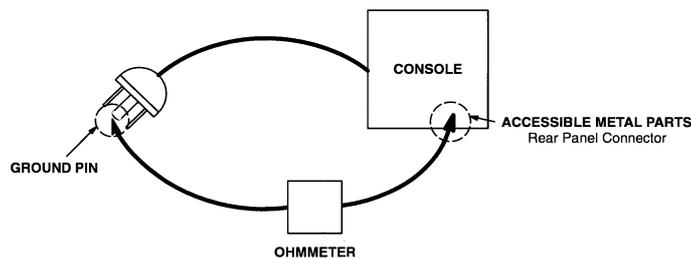
Illustration 2-2

Note: No outlet tester can detect the condition where the Neutral (grounded supply) conductor and the Grounding (protective earth) conductor are reversed. If later tests indicate high leakage currents, this should be suspected as a possible cause and the outlet wiring should be visually inspected.

2-3-2 Ground Continuity

Caution: The patient must not be contacted to the equipment during the test because it may cause electric shock.

Caution: Measure the resistance from the third pin of the attachment plug to the exposed metal parts of the case (See Illustration 2-3), this should be less than 0.2 ohms.



OHMMETER

Ground continuity test

Illustration 2-3

Meter Procedures

Follow these steps to test the ground wire resistance.

1. Turn the main unit LOGIQ A1.
2. Plug the unit into the meter, and the meter into the tested AC wall outlet. (Refer Illustration 2-3)
3. Plug the black chassis cable into the meter's "CHASSIS" connector and attach the black chassis cable clamp to an exposed metal part of LOGIQ A1.
4. Set the meter's "FUNCTION" switch to the RESISTANCE position.
5. Set the meter's "POLARITY" switch to the OFF (Center) position.
6. Measure the ground wire resistance and keep a record of the results with other hard copies of Preventive Maintenance (PM) data kept on site.

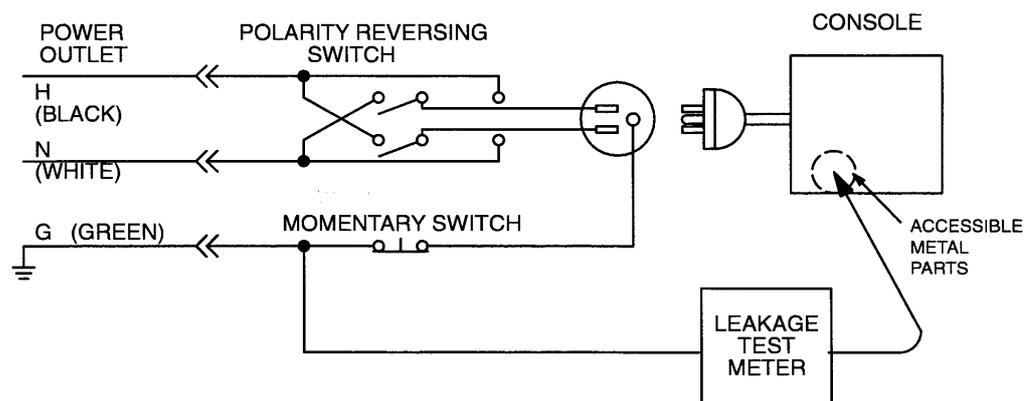
2-3-3 Chassis Leakage Current Test

Definition

Leakage current is the electrical current that could flow through the patient or sonographer should a ground wire break. The unit, the probes and all external peripherals must be tested.

The test verifies the isolation of the power line from the chassis. The testing meter is connected from accessible metal parts of the case to ground. Measurements should be made with the unit ON and OFF, with the power line polarity Normal and Reversed.

Record the highest reading of current.



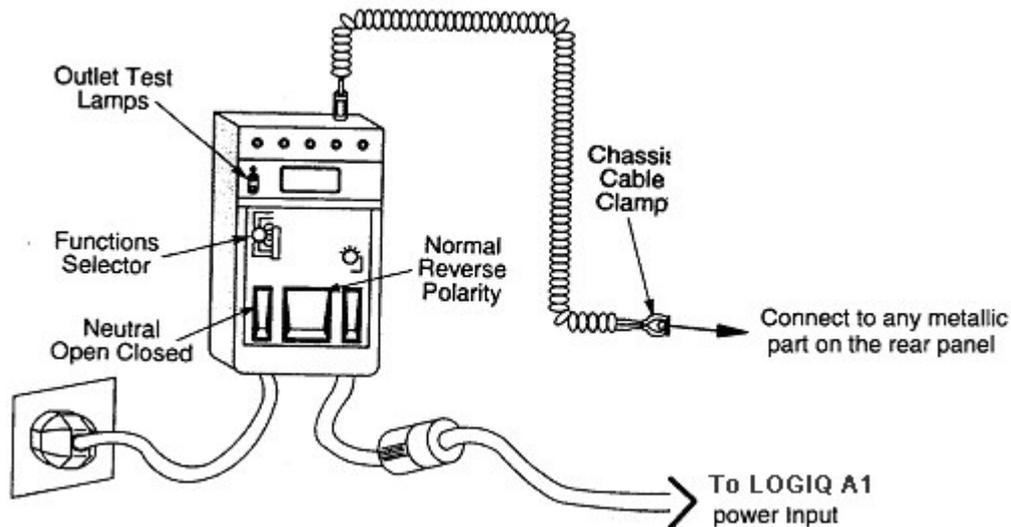
SETUP FOR CHASSIS SOURCE LEAKAGE CURRENT

Illustration 2-4

2-3-3 Chassis Leakage Current Test (Continued)

Meter Procedures

1. Follow these steps to test the unit for leakage current.
2. Turn the main unit of LOGIQ A1 off.
3. Plug the unit into meter, and the meter into the tested AC wall outlet.



GROUND AND CHASSIS LEAKAGE CURRENT TEST

Illustration 2-5

4. Plug the black chassis cable into the meter’s “CHASSIS” connector and attach the black chassis cable clamp to an exposed metal part of LOGIQ A1. (Refer Illustration 2-4)
5. Set the tester’s “Function” switch to CHASSIS position.
6. Take readings for various locations as mentioned in Table 2-3.

Table 2-3

CHASSIS LEAKAGE CURRENT TEST CONDITIONS

Test	Location
1	Mounting screw for probe receptacle
2	Rear Panel
3	Mounting screw on the handle
4	Mounting screw for peripheral plugged into unit

7. Keep a record of the results with other hand copies of PM data kept on site.

2-3-3 Chassis Leakage Current Test (Continued)

Date sheet for Chassis Source Leakage Current

Follow the foregoing test procedure. The test passes when all readings measure less than the value shown in Table 2-4 below.

Table 2-3
MAXIMUM ALLOWANCE LIMIT FOR CHASSIS SOURCE LEAKAGE CURRENT

Country	Normal Condition	Open Ground	Reverse Polarity	Open Neutral
USA	N/A	0.3mA	0.3mA	N/A
Others	0.1mA	0.5mA	0.5mA	0.5mA

Caution: When the meter's ground switch is OPEN, do not touch the unit to avoid possible electric shock.

Table 2-4
DATA SHEET FOR CHASSIS SOURCE LEAKAGE CURRENT

Unit Power	Tester POLARITY Switch	Tester NEUTRAL Switch	Test 1 Probe Connector	Test 2 Real Panel	Test 3 Mounting screw on the handle
ON	NORM	OPEN			
ON	NORM	CLOSED			
ON	REV	OPEN			
ON	REV	CLOSED			
OFF	NORM	OPEN			
OFF	NORM	CLOSED			
OFF	REV	OPEN			
OFF	REV	CLOSED			

2-3-4 Probe Leakage Current Test

Description

This test measures the current that would flow to the ground from any of the probes through a patient who is being scanned when he comes into contact with the ground surfaces.

Measurements should be made with the ground open and closed, with power line polarity normal and reversed and with the unit OFF and ON. For each combination, the probe must be active to find the worst case condition.

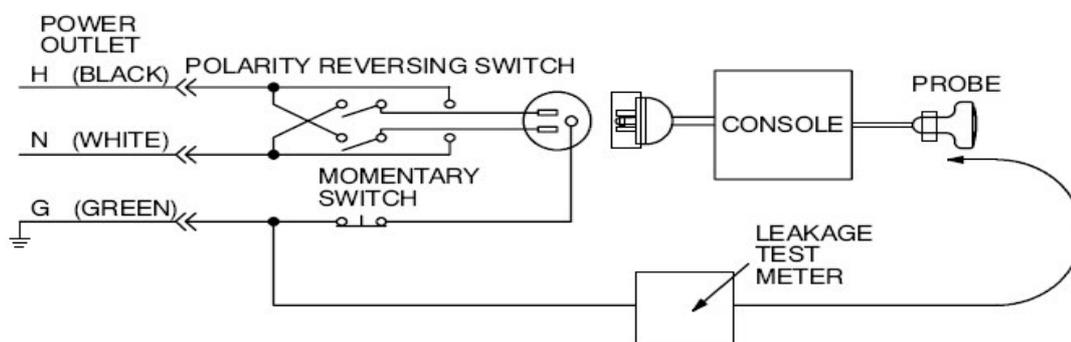


Illustration 2-6 SET UP for Probe Leakage Current

Note: Each probe will have some amount of leakage current, dependant on its design. Small variations in probe leakage currents are normal from probe to probe. Other variation will result from differences in line voltage and test lead placement.

Meter Procedure using Probe Adapter and Saline Bath

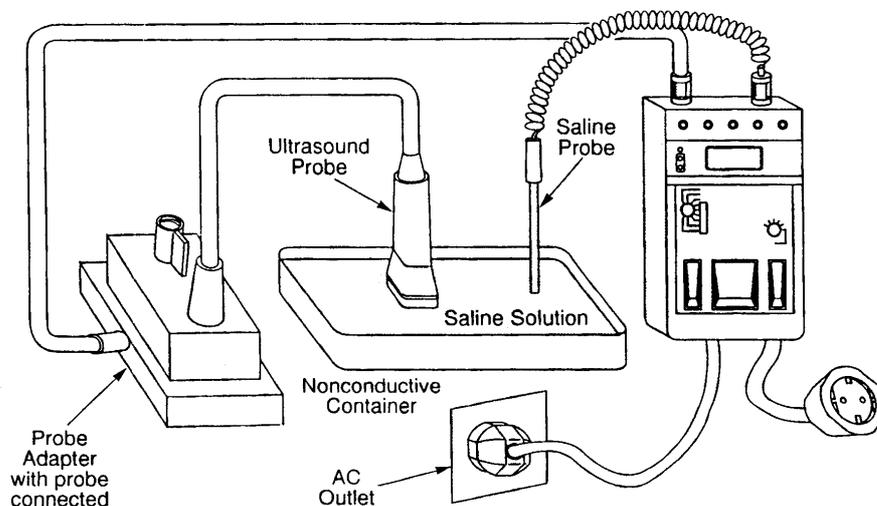
The dale 600/600E provides a method for testing probes independently from the system. The meter utilizes a probe adapter to apply common test potential to all connector pins. The probe's imaging area is immersed in a saline solution along with a grounding probe from the meter to complete the current path. Saline solution is a mixture of water and salt. The salt adds a free ion to the water, making it conductive. Normal saline solution is 0.9% salt or 1/2 gram salt per 1 liter of water. If saline is not available, a mixture of 1 quart water with one or more grams of table sale, mixed thoroughly, will substitute.

CAUTION: To avoid probe damaged and possible electric shock, do not immerse probes into any liquid beyond the level indicated in the operator's manual. Do not touch

the probe, conductive liquid or any part of the unit under test while the ISO TEST switch is depressed.

Follow these steps to test each probe for leakage current.

1. Turn the main unit of LOGIQ A1 OFF.
2. Plug the probe to be tested to the meter's appropriate adapter. (Refer Illustration 2-6)
3. Connect the probe to be tested to the meter's appropriate adapter. (Refer Illustration 2-6)
4. Plug the saline probe into the meter's CHASSIS connector. (Refer Illustration 2-6)



TRANSDUCER SOURCE LEAKAGE CURRENT TEST

Illustration 2-7

5. Plug the probe adapter into the meter's connector marked "EXTERNAL".
6. Set the meter's "FUNCTION" switch to EXTERNAL position.
7. Add the saline probe and the image area of the probe into the saline bath.
8. Have unit power ON for the first part; turn it OFF for the second half.
9. Depress the ISO TEST rocker switch and record the highest current reading.
10. Follow the test conditions described in TABLE 2-7 for every probe.
11. Keep a record of the results with other hand copies of PM data.

General Procedure

Follow these steps to test each probe for leaking current.

1. Turn the main unit of LOGIQ A1 OFF.

2. Plug the unit into the test meter, and the meter into the tested AC wall outlet.
3. Plug the external probe into the meter's EXTERNAL connector.
4. Set the meter's FUNCTION switch to EXTERNAL position.
5. Connect the probe for test with the connector of the console.
6. Apply a liberal amount of gel to the probe's lens.
7. Wrap the probe in aluminium foil, making sure there is good contact with its acoustic aperture.
8. Either suspend the probe by its cable or place it on an insulated surface.
9. Have unit power ON for the first part; turn it OFF for the second half.
10. Hold the external probe against the aluminium foil on the probe when the unit is ready to scan.
11. Depress the ISO TEST rocker switch and record when the unit is ready to scan.
12. Follow the test conditions described in the TABLE 2-7 for every probe.
13. Keep a record of the results with other hand copies of PM data.

Data sheet for Transducer Source Leakage Current

Follow the foregoing test procedure for every probe. The test passes when all readings measure less than the values shown in the table below:

Table 2-6

MAXIMUM ALLOWANCE LIMIT FOR PROBE LEAKAGE CURRENT

Country	Normal Condition	Open Ground	Reverse Polarity	Open Neutral
USA	0.05mA	0.05mA	0.05mA	0.05mA
Others	0.1 mA	0.5 mA	0.5 mA	0.5 mA

Table 2-7

DATA SHEET FOR PROBE SOURCE LEAKAGE CURRENT

Probe tested:

LOGIQ A1 Unit Power	Test Power Polarity	Tester Ground Switch	Measurement
ON	NORM	ON	
ON	NORM	CLOSED	
ON	REV	ON	

ON	REV	CLOSED	
CLOSED	NORM	ON	
CLOSED	NORM	CLOSED	
CLOSED	REV	ON	
CLOSED	REV	CLOSED	

2-3-5 When there's too much Leakage Current...

Chassis Fails

Check the ground on the power cord and plug for continuity. Ensure the ground is not broken, frayed, or intermittent. Replace any defective part.

Tighten all grounds.

Inspect wiring for bad crimps, poor connections, or damage.

Test the wall outlet and verify if it is grounded. Notify the user or owner to correct any deviations. Check the other outlets to see if they could be used instead.

***Note:** No outlet tester can detect the condition where the white neutral wire and the green grounding wire are reversed. If later tests indicate high leakage currents, this should be suspected as a possible cause and the outlet wiring should be visually inspected.*

Probe Fails

Replace the probe and try again.

Peripherals Fail

Tighten all ground connection screws.

Inspect wiring for bad crimps, poor connections, loose screws or damage.

Still Fails

Begin isolation by removing the probes, external peripherals, then the on board ones, one at a time while monitoring the leakage current measurement.

New Unit

If the leakage current measurement tests fail on a new unit and if situation cannot be corrected, submit a Safety Failure Report to document the system problem. Remove the unit from operation.

CHAPTER 3 SYSTEM OUTLINE

3-1 Overview

The outline and size of system is described in this chapter.

3-2 Structure

3-2-1 Structure

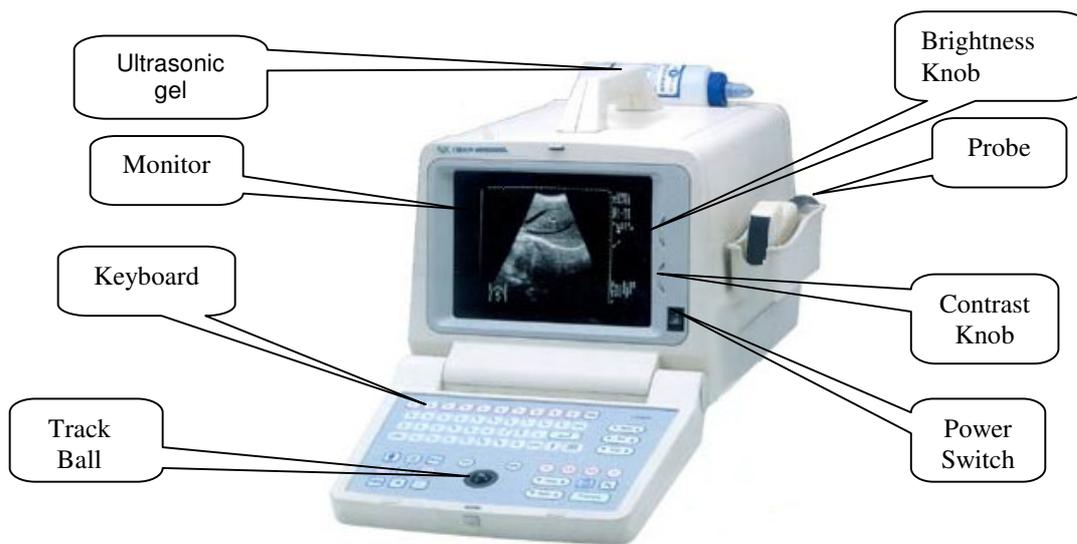


Illustration 3- 1 Outline of main unit

3-2-2 Size

450mm×280mm×300mm

3-2-3 Rear Panel

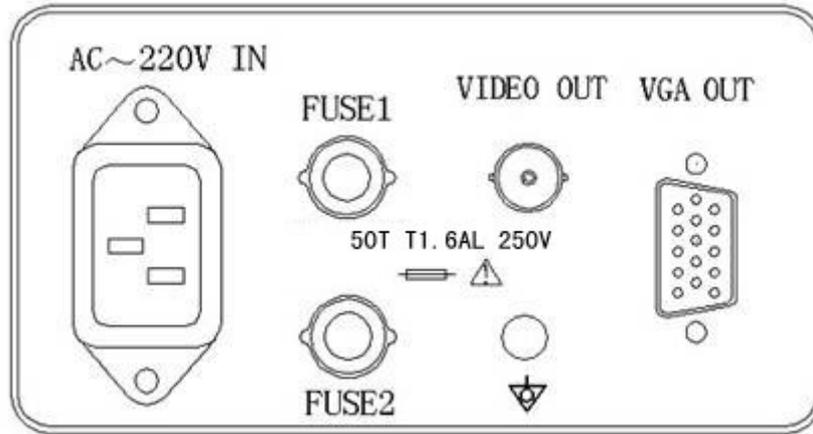
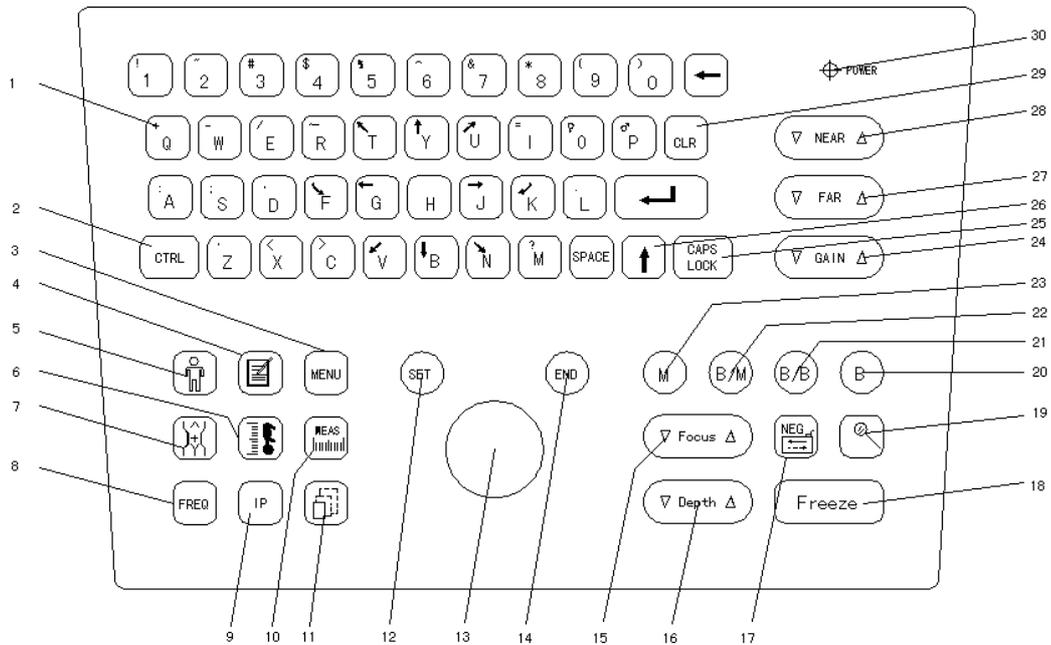


Illustration3-2 Rear Panel

3-2-4 Control Panel



- 1. Alphanumeric keys 2. Control key 3. Date and time key
- 4. Annotation key 5. Patient ID number key 6. Gynecological data table selection key

- 7. Body marks key 8. Frequency steps selection key 9. Image processing selecting key
- 10. Measuring key 11. Storage control key 12. Set key
- 13. Track ball 14. End key 15. Focus points selection key
- 16. Depth control key 17. White/black image reversing and scanning direction key
- 18. FREEZE key 19. Zooming key 20. B mode switching key
- 21. B/B mode switching key 22. B/M mode switching key 23. M mode switching key
- 24. Total gain selecting key 25. CAPSLOCK key 26. SHIFT key
- 27. Far gain selecting key 28. Near gain selecting key 29. Clear key
- 30. Power indicator light

Illustration3-3 Control Panel

3-3 Electric performance

Power cord, tie-in, box, output socket, breaker and switches should be installed before the mainframe of LOGIQ A1.

3-3-1 Power supply

All countries should install power cord according to their different requirements.

3-3-2 Electrical socket requirement

Separate electrical socket (220VAC) with 5A breaker is strongly recommended. This kind of socket should adapt to the country's criterion of power cord. It should be approved by IEC or other related departments.

3-4 Storage and operating requirements

LOGIQ A1 is transported in separate package. It is about 10kg. Please find Table 3-2 to see the temperature, atmospheric pressure and humidity range during transportation, installation and operation.

Table 3-2
Storage and operating requirements

Parameter	Storage	Operating
Temperature (°C)	-10 ~ 60	10 ~ 40
(°F)	14 ~ 140	50 ~ 104
Atmospheric pressure (hPa)	700 ~ 1060	700 ~ 1060
Humidity (%)	30 ~ 95	30 ~ 95
No condensation		

3-5 Options

Options could be connected to LOGIQ A1 through the linker on the back panel of system. Linkers are: VIDEO OUT linker and power supply linker and VGA OUT linker.

CHAPTER 4 FUNCTIONAL CHECK

4-1 Overview

In this chapter you will learn how to check all the main functions of LOGIQ A1 rapidly. Please read the user manual of LOGIQ A1 to see how to check the rest functions

4-2 Procedures of Functional Check

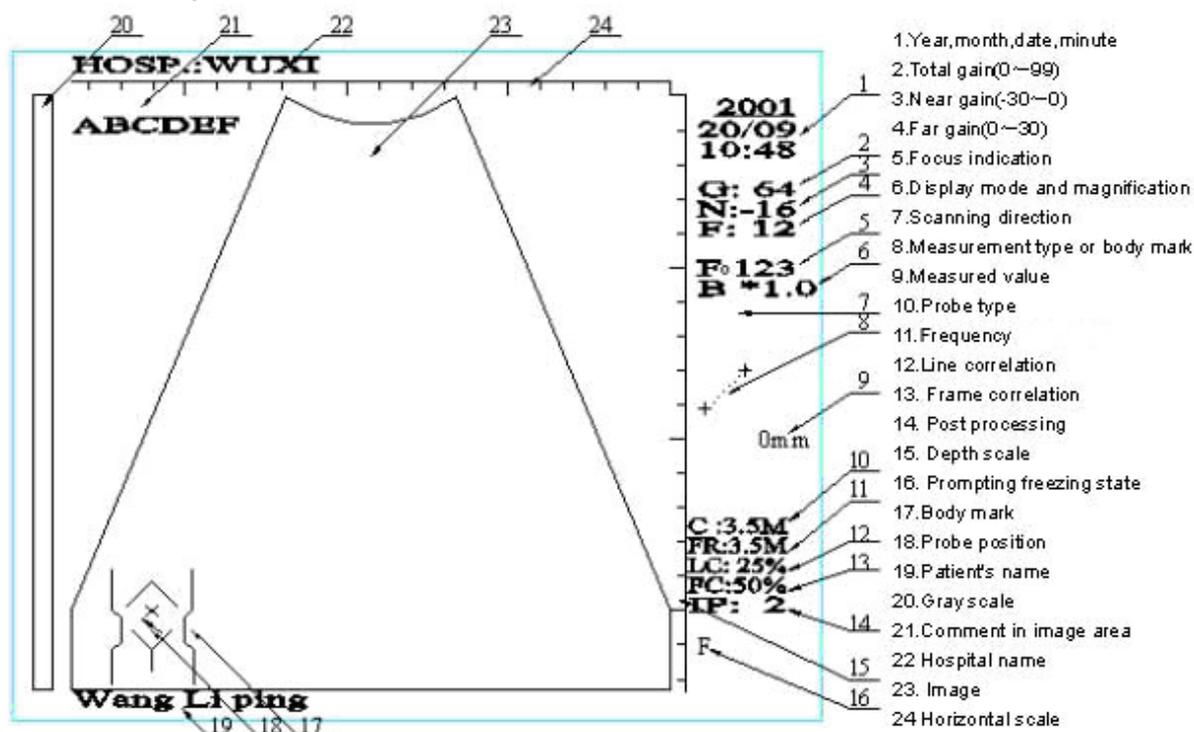
4-2-1 Monitor Display after turning on

The test is performed with the linear probe when installing. Check these function again when repairing the system.

The display of monitor is as follows (Refer Fig 4-1):

1. B mode image
2. Year, Month, Day, Hour, Minute
3. Total Gain (0—99)
4. Near Gain (-30—0)
5. Far Gain (0—30)
6. Focus points
7. Displaying mode and zooming
8. Scanning position
9. Measuring and Body marks
10. Measuring value
11. Probe kind
12. Frequency
13. Linear average
14. Frame average
15. Post-process
16. Depth control

17. Freeze
18. Body marks
19. Probe position
20. Patient name
21. Gray scale
22. Image annotation
23. Hospital name
24. Level surveyor's staff



**Monitor Display after turning-on
Installation 4-1**

4-2-2 Basic control

The basic control is described in the Table 4-1, it is useful to check the system when installing.

Table 4-1
BASIC CONTROL

Examination	Anticipant value
Connect probe to the linker at the right of the system's foundation	
Turn supply power on	Indicate B mode image.
Turn the knob of Gain	Brightness of image changes with the adjustment.
Adjust Near key	Adjust the brightness of Near Gain.
Adjust Far key	Adjust the brightness of Far Gain.
Adjust Depth key	Adjust the depth of image.
Adjust Reverse key once Press again	Indicate the image from left to right Image changes from right to left.
Press M key	Indicate M mode image
Press B/M key	Indicate B/M mode image(Move the scanning cursor with trackball)
Press B/B key	Indicate B/B mode image
Move Trackball	Scanning cursor changes with trackball, and the B/M mode image changes also.
Press Freeze key	Freeze image.

Others refer to User manual.

4-2-3 Tissue-imitated ultrasonic phantom examination

Check the quality of image and capability by KS107BD tissue-imitated ultrasonic phantom.

4-3 Diagnosis

4-3-1 Keyboard Test

Keyboard test

All the keys on the keyboard should be tested. In the test, you press the keys to see if they are working well. (It is an iterative step.)

Trackball Test

When the cursor is shown on the screen, you touch the trackball to make it move on the screen.

4-3-2 Image Memory Test

The image to be tested should be written on the memorizer and unscrambled then. We try to see if the unscrambled image effective or not through the test. If the image on the memorizer is not correctly displayed, it means the test is failed.

4-4 Maintenance and Adjustment

There is no extra spare part for maintenance and adjustment in the system of LOGIQ A1. When the system has problem, it is recommended to exchange the trouble unit instead of the spare part. For example, when the power supply has problem, you should exchange the whole unit of power supply instead of adjusting the voltage-allocator or exchange the fuse.

CHAPTER 5 SYSTEM ARCHITECTURE

5-1 Circuit Boards

The table below shows LOGIQ A1 system circuit boards.

Table 5-1 Circuit Boards

Circuit Boards of LOGIQ A1	
DSC	Digital Scan Convert board
TX	Transmission board
RV	Receiving board
Keyboard	Keyboard PCB board

CHAPTER 6 PERIODIC MAINTENANCE

6-1 Overview

It has been determined by engineering that your LOGIQ A1 system does not have any high wear components that fail with use, therefore no Periodic Maintenance Inspections are mandatory. Some Customers Quality Assurance Programs may require additional tasks and or inspections at a different frequency than listed in this manual.

6-2 Periodic Maintenance

Termly maintenance including eyeballing、 system capability examining and termly cleaning relevant key parts. One time maintenance every six months to insure systemic capability steady. Maintenance period is evaluated by operating equipment 40 hours every week.

6-3 Procedure

6-3-1 Visual inspection

1. Check if the cable is ruptured or fissured and the insulated layer of cable is abraded.
2. Check if the cable jacket and cable airproof packet / link implement clamp well.
3. Check if cables connect correctly.
4. Check if all the bolts are there.
5. Check if all cable plugs are connected to the corresponding sockets.
6. Check if all parts are fixed to appropriate location and without damnification.
7. Check if the keys and trackball on the keyboard work well and without mechanical damnification.
8. Check if the probe and probe cable is dilapidated or aging.
9. Check if the probe is dilapidated.

10. Check if has mechanical problems or keyboard problems.
11. Check the equipment to see if any hardware has missed.
12. Check the work of fan which is used to decrease temperature, and to ensure the air circulation.

6-3-2 Cleaning

The surface of all parts can use snug humid soft cloth to clean. It is better to use litmusless soap, but not alcohol generic liquid 、dissoluble substance or abrasive.

System

1. Cleaning CRT filtrate screen.
2. Use vacuum cleaner and scrubbing brush to clean fan and the mainframe of LOGIQ A1.
3. Before cleaning system, turn off the power supply first, and then start to do the cleaning.
4. Cleaning the place around mainframe and system shell.
5. Dab of the monitor with the soft humid cloth to dab, if it is too dirty, it is better to use humid cloth with scour, and then soft clean cloth.
6. Dab keyboard with soft humid cloth.
7. Dab keyboard with dry soft cloth.
8. Dab the Video frequency printer with dry soft cloth.

***Note:** Do not spill any liquid to get inside system when cleaning monitor, be carefully do not abrade monitor.*

Probe

Clean probe surface、cable and shell, examine probe whether damnification, in order no liquid coming into probe. If find any dilapidation, do not use that probe before recovered.

1. Wipe off the ultrasound gel with soft cloth or the running water.
2. Wipe off all the eyeable leftover with snug water soft sponge with litmusless soap、cotton yarn or cloth also. Do not use scour or abrasive to clean probe.
3. Wipe off all the soap leftover with distilled water.
4. Dry the probe with soft cloth or put the probe on the air.

5. Do not use liquid olefin, petroleum generic coupling liquid or other unapproved materials, as these materials can damage the probe.
6. Do not put probe into any proportion immerge or dunk in the any material's cleanser. Do not use autoclave、ultraviolet radiation、gas or heat treatment antiseptics techniques to antiseptising probe.
7. When probe is immerged appropriate industry antiseptic, use for clinic medicine applied registered EPA antiseptic. According to user operation's note proceeding、chroma、contiguity time、stockpile and deal with operation of antiseptising manufacture.
8. It is suggested to use 2% diacid aldehyde liquid without surface activation (for example Cidex) .
9. Do not use alcohol or any liquid like alcohol.
10. After use antiseptic to disinfect, use distilled water to wash all hangover in the probe.

6-3-3 Testing

1. Make sure that the hospital's power supply is regular.
2. Insure all power voltage is within the prescribe range. See chapter 4, function of maintain adjust procedure examine.
3. Carry out electric safety testing, the contents are as follows:
 - Hospital power socket (Test of fault of power connection)
 - All commutators (Test of commutator creep age)
 - Mainframe and external device (Test of creep age in shell and grounded anti-resistance)

6-4 Trackball maintenance

Keep the trackball clean to make it work well. If there is dust in, it might work abnormally or might be damaged.

Tools of trackball maintenance:

1. Trackball tool (tools for opening)
2. Cotton sticker、alcohol、propyl-alcohol or dry cloth.

6-4-1 Removal of the retainer ring of trackball

1. Turn off power supply, and pull out power plug of system
2. Infix one end of convexity substance of trackball to the guiding hole of retainer ring (2 holes).
3. Turn the trackball according to counter-clockwise slowly.
4. Take retainer ring out of keyboard.
5. Take out the trackball.

6-4-2 Cleaning the trackball

Wipe any oil or dust on the trackball with TFC dry cleaner or dry cloth.

Note: Keep retainer ring and trackball in certain place to avoid losing.

Note: When clean trackball tee, do not let any liquid into it (system/keyboard). Clean the trackball parts with alcohol, propyl alcohol. Don't use anyother impregnant to avoid damaging rubber and mechanical parts of trackball.

6-4-3 Fixing the trackball and retainer ring

1. Put in the trackball.
2. Put in the retainer ring.
3. Aim trackball to the guiding hole, then fix retainer ring according to clockwise.

Note: Don't use huge strength to fix the retainer ring to avoid damage.

Note: If there is need for maintenance tool or information of trackball, turn to sales' person or service person for help.

1. It is suggested to use 2% diacid aldehyde liquid without surface activation (for example Cidex) .
2. Do not use alcohol or any liquid like alcohol.
3. Wipe off any leftover in the probe with distilled water after antiseptising with antiseptic.