



ELECTROSURGICAL UNIT ANALYZER



ESU-2000A

USER MANUAL

**BC BIOMEDICAL
ESU-2000A
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WARNING - USERS

The ESU-2000A is for use by skilled technical personnel only.

WARNING - USE

The ESU-2000A is intended for testing only and should never be used in diagnostics, treatment or any other capacity where it could come in contact with a patient.

WARNING - USE

Never touch exposed metal surfaces on test leads or other current-carrying parts while the DUT is activated.

WARNING - CONNECTIONS

All connections to patients must be removed before connecting the DUT to the ESU-2000A. A serious hazard may occur if the patient is connected when testing with the ESU-2000A. Do not connect any leads from the patient directly to the ESU-2000A or DUT.

WARNING - MODIFICATIONS

The ESU-2000A is intended for use within the published specifications. Any application beyond these specifications or any unauthorized user modifications may result in hazards or improper operation.

WARNING - LIQUIDS

Do not submerge or spill liquids on the ESU-2000A. Do not operate the ESU-2000A if internal components not intended for use with fluids may have been exposed to fluid, as the internal leakage may have caused corrosion and be a potential hazard.

CAUTION - INSPECTION

The ESU-2000A should be inspected before each use for wear and should be serviced if any parts are in question.

CAUTION - ENVIRONMENT

Exposure to environmental conditions outside the specifications can adversely affect the performance of the ESU-2000A. Allow ESU-2000A to acclimate to specified conditions for at least 30 minutes before attempting to operate it.

CAUTION - SERVICE

The ESU-2000A is intended to be serviced only by authorized service personnel. Troubleshooting and service procedures should only be performed by qualified technical personnel. Never open the ESU-2000A while connected to the DUT, as a hazardous condition may exist.

CAUTION - FUSE

Only replace the ESU-2000A fuse with the specified type and rating.

CAUTION - VENTILATION

The ESU-2000A includes ventilation slots to help prevent overheating during operation and should not be blocked.

CAUTION - CLEANING

Do not immerse. The ESU-2000A should be cleaned by wiping gently with a damp, lint-free cloth. A mild detergent can be used if desired.

NOTICE – SYMBOLS

Symbol



Description

Caution
(Consult Manual for Further Information)

NOTICE – ABBREVIATIONS

A	Ampere(s)
C	Celsius
°	Degree(s)
DUT	Device Under Test
FS	Full Scale
Hz	Hertz
kg	kilogram(s)
lbs	pounds
M	Mega- (10^6)
MHz	Megahertz
m	milli- (10^{-3})
mA	milliamper(e)s
mm	millimeter(s)
Ω	ohm(s)
RF	Radio Frequency
RMS	Root Mean Square
s	second(s)
USA	United States of America
W	Watt(s)

NOTICE – PERFORMING TESTS

REFER TO DUT MANUFACTURER'S SERVICE MANUAL FOR
TEST PROCEDURES AND MEASUREMENT LIMITS.

NOTICE – DISCLAIMER

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NOTICE – CONTACT INFORMATION

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<p style="text-align: center;">BC BIOMEDICAL ESU-2000A ELECTROSURGICAL UNIT ANALYZER</p>

The Model ESU-2000A is a precision Electro-Surgery Unit Analyzer (ESU). It tests the RF power output of Electro-Surgery Units. The power reading is taken from a large 4-½ inch analog display. It offers six resistive loads for RF power testing from 50 to 500 ohms, along with a 200 ohm load for RF leakage current testing. The patient return electrode resistance simulation is adjustable in one ohm increments from 0 to 999 ohms.

The following are highlights of some of the main features:

- LARGE 4 ½ INCH ANALOG DISPLAY
- ± 2% OF FULL SCALE CURRENT ACCURACY
- 0-10 MHz BANDWIDTH
- RETURN CONTACT MONITOR TEST
- RF LEAKAGE TEST
- ISOLATED OSCILLOSCOPE OUTPUT
- PORTABLE
- EASY OPERATION
- NO BATTERIES OR POWER SUPPLY REQUIRED
- STANDARD ACCESSORY KIT INCLUDED
- HIGH IMPACT PLASTIC ENCLOSURE

STANDARD ACCESSORIES:

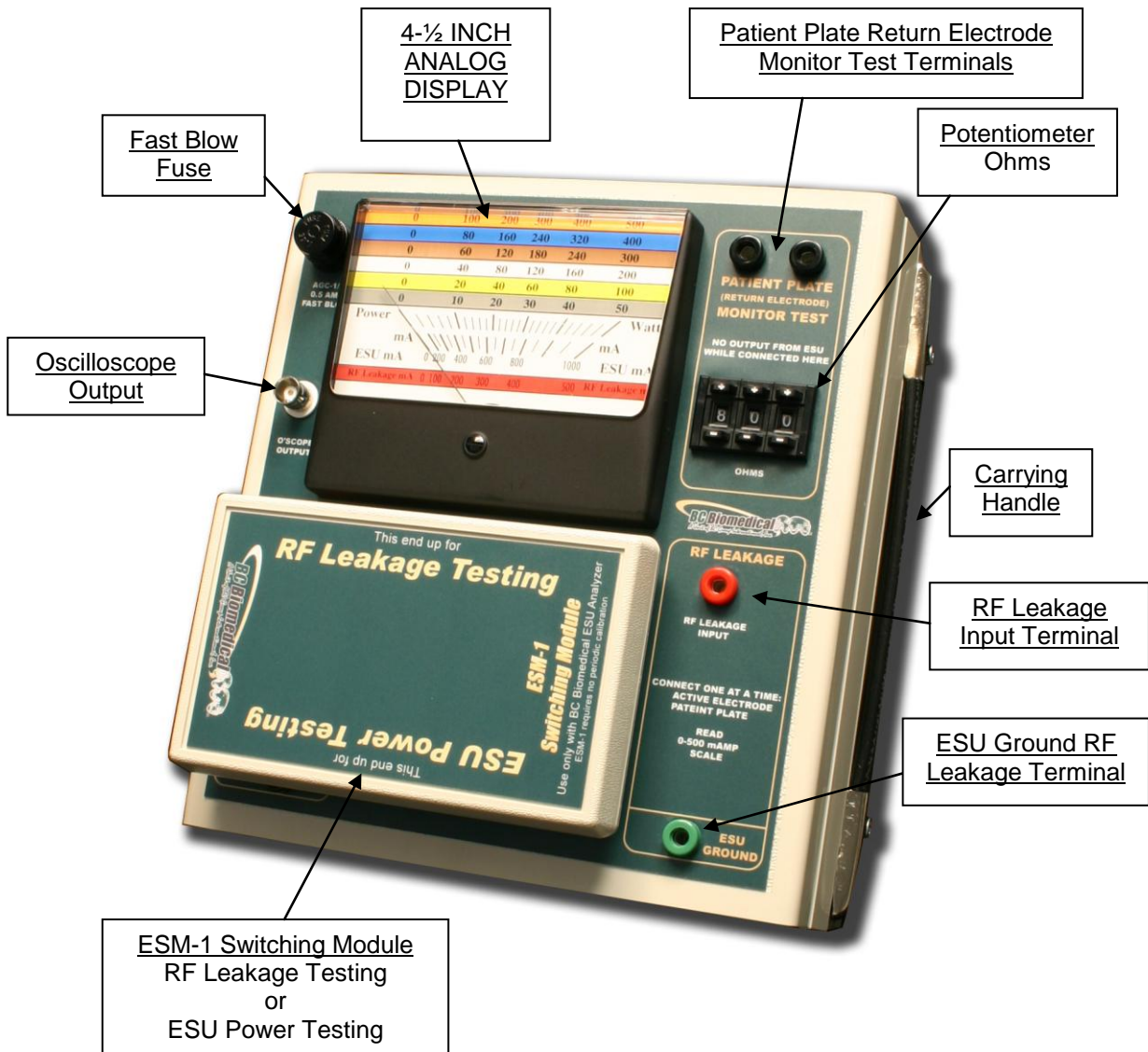
BC20 – 00120 ACCESSORY KIT (INCLUDES TEST LEADS,
ALLIGATOR CLIPS, AND REPLACEMENT FUSE)

OPTIONAL ACCESSORIES:

BC20 – 30108 SOFT CARRYING CASE

OVERVIEW

This section looks at the layout of the ESU-2000A and gives descriptions of the elements that are present.



OPERATING INSTRUCTIONS

NOTICE – PERFORMING TESTS

REFER TO DUT MANUFACTURER'S SERVICE MANUAL FOR
TEST PROCEDURES AND MEASUREMENT LIMITS.

DUT RF Power Measurements

1. Consult the DUT manufacturer's manual for load specifications.
2. Remove all connections between the DUT and the ESU-2000A Analyzer.
3. Install the Switching Module on the ESU-2000A front panel so that the words "ESU Power Testing" are right-side-up. When installed correctly, the Active Electrode connectors should be exposed, and the RF Leakage connectors should be inaccessible.
4. Connect a black banana test lead from the ESU-2000A terminal labeled "Patient Plate" to the DUT's Patient Plate or Return Electrode. (Note: In some instances, the DUT's Return Electrode may need to be shorted together to enable RF output)
5. Connect a red banana test lead from the DUT's RF Active Output to the desired load terminal of the ESU-2000A. The Active Electrode input connectors are color coded, and each corresponds to a color-coded range on the analog meter.
6. Set the DUT for proper output mode and power level, being careful that the power setting does not exceed the full-scale Power range selected on the ESU-2000A.
7. Activate the DUT output. The Analyzer will indicate both mA RMS and Power (W) on the appropriate color-coded wattage meter range.
8. Deactivate the DUT output before disconnecting from ESU-2000A, or before moving the Active Electrode test lead to a different input range connector.

DUT RF Leakage Current Measurements

1. Remove all connections between the DUT and the ESU-2000A Analyzer.
2. Install the Switching Module on the ESU-2000A front panel so that the words "RF Leakage Testing" are right-side-up. When installed correctly, the Active Electrode connectors should be inaccessible, and the RF Leakage connectors should be exposed.
3. Connect a red banana test lead from the ESU-2000A terminal labeled "RF Leakage" to the DUT's RF Active Output. **DO NOT MEASURE ACTIVE ELECTRODE LEAKAGE ON NON-ISOLATED ESUs with the ESU-2000A.** Damage may occur to

the ESU-2000A.

4. Connect a green banana test lead from the ESU-2000A terminal labeled “EARTH” to the DUT’s Earth Ground. If no accessible Earth Ground point exists on the DUT, it is acceptable in most cases to use Receptacle Earth.
5. Set the DUT for proper output mode and power level.
6. Activate the DUT output. The Analyzer will indicate the RF Leakage current from the DUT Active Electrode on the color-colored RF Leakage scale.
7. Deactivate the DUT output.
8. Repeat Active Output RF Leakage Testing for all available Output Modes and Output Electrodes as called for in the DUT Leakage Test Procedures.
9. Move the red test lead from the DUT’s RF Active Output to the DUT’s Patient Plate or Return Electrode. (Note: In some instances, the DUT’s Return Electrode may need to be shorted together to enable RF output)
10. Set the DUT for proper output mode and power level.
11. Activate the DUT output. The Analyzer will indicate the RF Leakage current from the DUT Active Electrode on the color-colored RF Leakage scale.
12. Deactivate the DUT output.
13. Repeat Return Output RF Leakage Testing for all available Output Modes and Output Electrodes as called for in the DUT Leakage Test Procedures.

DUT Patient Plate or Return Electrode Monitor Test

1. Remove all connections between the DUT and the ESU-2000A Analyzer.
2. Connect two banana test leads from the ESU-2000A terminals labeled “PATIENT PLATE” to the DUT Patient Plate or Return Electrode. If it is not possible to simply connect to the DUT Patient terminals directly, there exists an alternate method to fashion this connection as follows.
 - a. Acquire a DUT-compatible Disposable Split-Pad Return Electrode as would be used for a patient.
 - b. Cut off the Adhesive Split-Pad from the cord, then strip each individual wire.
 - c. Using the Alligator clips supplied in the ESU-2000A standard accessory kit, connect each banana test lead from the ESU-2000A to the individual wires of the Split-Pad Return Electrode.
 - d. Plug the fashioned return electrode into the DUT Patient Plate or Return Electrode Connection.
3. Adjust ESU-2000A Patient Plate Resistance as necessary to verify DUT Patient Plate or Return Electrode Monitor mode as specified by the DUT manufacturer.

MANUAL REVISIONS

<u>Revision #</u>	<u>Revisions Made</u>
Rev 01	New Manual Format
Rev 02	Accessory Fuse Updated
Rev 03	Notices Updated
Rev 04	Specifications Updated
Rev 05	Format Updated, Misc. Edits
Rev 06	Format Updated
Rev 07	Specifications Updated

LIMITED WARRANTY

WARRANTY: BC GROUP INTERNATIONAL, INC. WARRANTS ITS NEW PRODUCTS TO BE FREE FROM DEFECTS IN MATERIALS AND WORKMANSHIP UNDER THE SERVICE FOR WHICH THEY ARE INTENDED. THIS WARRANTY IS EFFECTIVE FOR TWELVE MONTHS FROM THE DATE OF SHIPMENT.

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REMEDIES: THE PURCHASER'S SOLE AND EXCLUSIVE REMEDY SHALL BE: (1) THE REPAIR OR REPLACEMENT OF DEFECTIVE PARTS OR PRODUCTS, WITHOUT CHARGE. (2) AT THE OPTION OF **BC GROUP INTERNATIONAL, INC.**, THE REFUND OF THE PURCHASE PRICE.

SPECIFICATIONS

RF MEASUREMENT			
RANGE	CURRENT	0 to 1000 mA RMS	
	POWER	0 to 500 W	
ACCURACY	CURRENT	$\pm 2\%$ FS	
	POWER	$\pm 5\%$ FS	
FREQUENCY	0 to 10 MHz		
FUSE	500 mA Fast-Blow FWH-1/2		
OSCILLOSCOPE OUTPUT	OUTPUT	Isolated Uncalibrated	
	CONNECTION	BNC (50 Ω)	
VARIABLE LOAD	VALUES	50 Ω 100 Ω 200 Ω 300 Ω 400 Ω 500 Ω	
	TYPE	Non-Inductive	
	ACCURACY	$\pm 2\% \pm 1 \Omega$	
	POWER RATING (MAX)	50 Ω	50 W
		100 Ω	100 W
		200 Ω	200 W
		300 Ω	300 W
		400 Ω	400 W
500 Ω		500 W	
DUTY CYCLE	10 seconds on, 20 seconds off		
LEAKAGE LOAD	VALUE	200 Ω	
	TYPE	Non-Inductive	
	ACCURACY	$\pm 2\% \pm 1 \Omega$	
	POWER RATING	50 W	
CONNECTIONS	4 mm Banana		

RETURN ELECTRODE MONITOR TEST LOAD	
RANGE	0 to 999 Ω
RESOLUTION	1 Ω
ACCURACY	$\pm 3\% + 3 \Omega$
CONNECTIONS	4 mm Banana

PHYSICAL & ENVIRONMENTAL		
DISPLAY	4-1/2" Analog Meter Color-coded display (W and mA)	
CONSTRUCTION	ENCLOSURE	ABS Plastic
	FACE PLATE	Back-printed Lexan
SIZE	5.36 x 8.68 x 9.10 Inches (136.1 x 220.5 x 231.1 mm)	
WEIGHT	≤ 4 Lbs (1.82 kg)	
OPERATING RANGE	15 to 30 $^{\circ}\text{C}$ (59 to 86 $^{\circ}\text{F}$) 20 to 80% RH, Non-Condensing	
STORAGE RANGE	-40 to 60 $^{\circ}\text{C}$ (-40 to 140 $^{\circ}\text{F}$)	

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