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Hyfrecator 2000 user manual

1 Serving the Physician Since 1937 2 For Technical Service or Return Authorization Phone: 303-699-7600 / 1-800-552-0138 Extension 5274 Fax 303-699-1628 3 For Customer Service or to order parts phone: 1-800-448-6506 / 315-797-8375 / Fax 315-735-6235 or contact your CONMED Representative. 4 European Authorized Representative MDSS GmbH Burckhardtstr 1 D - 30163 Hannover 5 Table of Contents Section Title Page GENERAL INFORMATION ..... . .1 Foreword . Page 4 2000 Section Title Page 3.3.4.1.4 Power Adjustment .....16 3.3.4.1.5 Setting Storage . 2000 Section Title Page 4.4.8.3 HV Supply Problems .....45 4.4.8.4 Switch Isolator Problems . Page 6 2000 This page intentionally left blank. 7 Hyfrecator ^{®} 2000 Electrosurgical Unit (ESU) up to original factory specifications. CONMED Corporation reserves the right to alter the specifications of the Hyfrecator ^{®} 2000. It is important to have access to the Operator's Manual supplied with each unit in order to restore original specifications. 8 The warranty period for the CONMED HYFRECATOR ^{®} 2000 is twelve (12) months to the product's original owner. NOTE: The warranty card must be returned by the original owner to CONMED within ten (10) days of receipt of the invoice. 9 2.0 PRODUCT DESCRIPTION This Section contains relevant "Quick Start" excerpts of the technical data supplied in the Hyfrecator ^{®} 2000 Operator's Manual, Cat. No. 7-900-OM-ENG. Refer to that document for further details. 10 2.1 Controls, Displays and Connectors The Hyfrecator ^{®} 2000 controls are marked with IEC and ISO symbols which should be familiar to an experienced biomedical technician. 11 BI: Two 0.25" (6 mm) jacks for connection to a two-conductor bipolar active accessory cord. These connections are not referenced to earth or the P/P connector. 12 2.1.1 Power Setting Storage Upon each power-up, the power settings for all three modes are returned to the values previously stored. During use, settings are automatically stored to non-volatile memory (EEPROM) each time the following sequence occurs: 2000 Environmental: Operation: 50 F to 104 F (10 C to 40 C); 10-95% Relative Humidity, non-condensing Storage: -40 F to 158 F (-40 C to 70 C); 0 -95% Relative Humidity, non-condensing Output Ratings: Mode, Power, Load, Voltage, Pulse Rate, Ohms KV(p-p) 1000... Page 12 13 • Component Replacement: Replacement components should be as specified in the parts lists in Section 5 of this manual. Consult CONMED Technical Services for custom components or acceptable substitutes. 14 • Housing fasteners: To avoid stripping threads during reassembly, rotate housing screws counterclockwise with light pressure to find the original threads in housing bosses. 2000 15 2.4 Mains Voltage Strapping This unit may be field-strapped to any of the rated mains voltages shown in Section 2.2 of this 1. Remove zero-ohm resistors from the A2 PWB and reinstall them for the desired mains rating according to Table 1 in Figure 5.8. The Hyfrecator 2000's fault detection and code displays help with troubleshooting, but understanding how it works is essential for fixing less common issues. This section provides that background information. The unit runs on 50-60 Hz AC power from the mains at one of four strappable voltage ratings, with the factory selection shown on the nameplate. The mains voltage can be changed using jumpers JP1-5 on the A2 Power PWB (see Figure 5.8 and Table 2). The RF output is generated by converting DC power to radio frequency power through the RF Power Amp, which is coupled to the patient circuits. The output power depends on the gate pulse width and frequency, as well as the high-voltage supply. Fault detection includes issues like stuck buttons or incorrect waveforms, while fail-safe RF shutdown features include stuck activation or power adjust buttons. The A1 PWB has various signals, including rotary encoder outputs for power adjustment, IIC serial EEPROM data and clock signals, and a three-state analog signal representing the Service jumper's presence. In Run Mode, the unit executes a Power On Self Test cycle when powered up with the Service Jumper open-circuited. After completing the POST cycle, the Power display shows the last power setting for the selected Mode as read from the Control microcontroller's EEPROM. This information is essential during troubleshooting and diagnostic procedures. The PSET Transfer process involves the Control microcontroller sending an 8-bit code to the Monitor microcontroller during the LED blanking period. This code contains critical data, including the current operating mode, power setting, and fault condition codes. The Monitor microcontroller relies on this transfer to access vital information for proper functioning. When the unit is inactive, the Control microcontroller forces all drive signals to inactive states, and the Monitor microcontroller holds /HVENA high to keep the ACTIVE LED X3 dark and the HV Regulator idle. However, GATENA remains high, allowing the Monitor to detect activation through the /GATE.M signal. The PA gate drive waveforms originate in the Control microcontroller as /GATEPWM, with each Mode having its own waveform period and ON-time (T). These parameters do not vary with power setting or calibration adjustments. Understanding these waveforms is crucial for proper unit operation. Figures 3.1 and 3.2 provide essential information about Service Mode functions and calibration variable selection. The Service Mode allows users to adjust output power, pseudo-run without fault detection, or display last fault codes. Calibration variables can be adjusted while the unit is deactivated using the Mode Selector switch and power buttons or encoder. It is essential to note that excessive gain and offset adjustments can cause HVPWM duty cycle to reach 100%, resulting in RF output dropping to zero. If this occurs, restoring output by reducing the CAl variable indicates the need for repairs. The Service Last Fault Recovery Mode pulls up the last fault code presented from Monitor EEPROM and displays it, serving as a useful troubleshooting aid if the user's complaint did not mention prior fault codes. Control-detected faults display an "E" symbol. The one's digit indicates the specific fault each detects. A list of fault codes and descriptions can be found in Appendix A. 2000 4.0 MAINTENANCE This section outlines procedures for periodic maintenance, testing, and recalibration to ensure the Hyfrecator 2000 operates within factory specifications. Guidance on troubleshooting and repair is provided to quickly return the unit to service if it fails a test or doesn't meet performance expectations. During calibration, use 2000 markings sparingly. Ensure thorough drying of the unit and cords before applying power. 4.2.2 DC Isolation Tests This test verifies the patient output jacks are isolated from earth and one another to prevent electrical shock. Refer to Section 4.4.3 for corrective action if a Fault Code appears or the normal POST sequence is not observed. 5. Before making any power changes, note the as-delivered position of the Mode Selector switch and stored power settings in each mode. These tests can be performed using a biomedical electrical safety tester or by constructing a custom setup according to IEC 60601-1, Clause 19.4 e). ESU Tester Inputs Test Load Mode Power Output (W) Output (mA) BI 1 BI 2 1000 31.5 38.5 BI 1 BI 2 15.3 18.7 Table 4.1 RF Output Power Test Limits Figure 4.1 RF Output Power Test Setup 4. Set the unit's controls to 35W BI and connect the test setup per Figure 4.2b. Verify less than 42 mA. Low readings from HI indicate a shorted capacitor, while high readings suggest an open capacitor. 4.3 Recalibration of RF Output Power This section describes how to adjust RF output power to original Hyfrecator 2000 factory specifications. Recalibration should be done in specific circumstances, including when recalibration is not part of normal PM checks. Target Rated Load, Ohms Power, W 1000 (HI) 500 (LO) Using Fault Codes and Signal Tracing for Hyfrecator Repair If your unit displays target powers different from those shown above, you can compute target current using It (mA) = 1000 x √(Pt / Rl), where Pt is displayed power in Watts, and Rl is load resistance in ohms. For repair purposes, a complete printed wiring board (PWB) replacement may be faster than sending the unit for service. Spare PWBs can also be ordered from CONMED for this method. Additionally, expert advice and instructions on returning a unit for factory or warranty service are available from the CONMED Technical Services Department. Fault Codes to Check The Hyfrecator's fault codes include microcontroller failure and shorts on the PSET or LED buses. To troubleshoot, verify that both +5C and +5M are present and correct on the A1 PWB. Then attempt entry into Service Pseudo-Run mode. Signal Tracing Method This method involves injecting a signal at or near the input end of a suspected signal chain and looking for the expected effect farther down the chain. The choice of which chain to investigate depends on the technician's hypothesis of which part of the system could fail in such a way to explain all known symptoms. Stocking Spare PWBs If your service organization has responsibility for twenty or more Hyfrecator 2000 units, it may be effective to stock at least one set of spare PWBs to allow for rapid turnaround. Additionally, having one known-good Hyfrecator unit can aid in the repair process. Correcting +5V Problems If +5 voltage is incorrect, check the 5V regulator for faults. If +12V or +24U are low or noisy, check the corresponding regulator for faults as well. Separate +5V regulators are used for each microcontroller. If +5 power exceeds +6.5V, the regulator has probably failed and the microcontroller is likely damaged. Correcting GATE Period Errors If the GATE period appears incorrect, verify that it matches on /GATEPWM. Check the U1 oscillator frequency (Section 4.4.7.1) if necessary. If the Y1 frequency error exceeds 20 KHz, replace Y1. Similarly, if the GATEMON frequency differs from /GATEPWM, replace A2U1. 1. Over control of power display: Refer to Section 3.3.5.3 for a detailed description of POST tests, which should confirm each segment's ability to be turned on and off for both digits. 2. Disabling the Mode Selector switch: When A1 is dismounted, the switch is disabled, and LO Mode will be forced unless there are electrical faults present. 3. Accessory Push-Button Problems: - The handswitching accessory has three normally-open push-buttons that must be isolated from internal circuitry due to a common return line with the RF output. 4. A2 Power PWB Problems: - The A2 PWB operates at high voltages and currents, increasing the risk of component failure compared to the A1 PWB. - If symptoms include a Fault Code and normal POST display, then the problem is likely on the A2 PWB. Repair and Replacement Guidelines... Control microprocessor process errors. If A1U1 power adjust overflow is detected, it may be due to user error. Check if the issue can't be duplicated and if mode changes during power slew. Fault Codes: - Fault Code Meaning: Possible Remedies - In Service Last Fault only: Unit has never declared a fault or stored a fault code. POST (Power On Self Test) detected low HV (High Voltage). Try to repair the unit. If HV is low, then verify HVSENS = VCON x 0.8 to 0.84. - PSET & LED scan rate incorrect: Check LED1S and LED10S with an oscilloscope. Verify that 1S high for 4 msec, then both low, then 10s high 4 msec, then both low in continuous cycle. Verify both swing 0 to +5V. - REF. DES. CONMED P/N: Provides parts list, interconnect, and functional block diagrams with detailed assembly instructions. Key Components: - HYFRECATOR 2000: Bipolar 100V HYF - ASSY.,PWB, DISPLAY,A1: Assy A3 - ASSY,PWR PWB, A2: 100V HYF 2000 Bipolar - BRIDGE RECTIFIER 400V , 1.5A, WO4G - RES, 7.5, 1/4, 5%