

Sys*Stim[®] 226

Maintenance Manual



1333 S. Claudina Street • Anaheim, CA 92805 U.S.A.
Call toll free: (800) 854-9305 (U.S.A.) • Tel: 1 (714) 533-2221
FAX: 1 (714) 635-7539

Web site: www.mettlerelectronics.com • Email: mail@mettlerelectronics.com

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Section 1—Introduction

Sys*Stim 226 servicing should be done at the factory.

If it is not possible to return the Sys*Stim 226 to the factory, this service manual may be used to troubleshoot to the major subassembly level. Discrepant subassemblies can then be repaired by ordering them from the factory as an alternative to returning the complete system.

This manual is intended for service technicians who perform preventive and corrective maintenance on medical devices using appropriate electronic test and measurement equipment. It should be read in its entirety before attempting to service the Sys*Stim 226.

For technical assistance, call our Service Department at:

Toll Free: (800) 854-9305, USA
Phone: (714) 533-2221
FAX: (714) 635-7539
Email: service@mettlerelectronics.com



Figure 1.1—Sys*Stim 226 and Accessories

Section 2—Symbol Glossary and List of Abbreviations

2.1 Symbol Glossary



Time display



Channel timer indicator LED's. Example: Indicator LED for channel 1 will be lit when the time displayed is for channel 1 in the 2-timer mode. Both indicators will be lit when the time displayed applies to both channels. Channel 1 or 2 LEDs will blink to indicate “adjust intensity the selected channel” in the reciprocation and surge modes.



These LED's will illuminate to prompt the clinician to input either time in seconds or microseconds or frequency in Hz. The time or the frequency will be displayed in the numeric time display.



Time display LED's. Displays treatment time and numeric values for frequency, phase duration and on/off times.



Numeric keypad for time, frequency or phase duration entry.



Starts treatment, stimulation output activated.



Stops treatment in the channel displayed in timer window or acts as an “Enter” button during treatment setup.



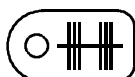
Stops all stimulation output from both channels.



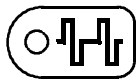
Interferential waveform selector—LED is illuminated when this function is activated.



Premodulated waveform selector—LED is illuminated when this function is activated.



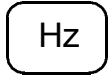
Medium frequency waveform selector—LED is illuminated when this function is activated.



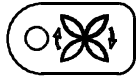
Symmetrical biphasic waveform selector—LED is illuminated when this function is activated.



Phase duration control selector—Press this button during a biphasic treatment to display phase duration.



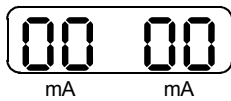
Frequency control selector—Press this button during a biphasic treatment to display frequency.



Amplitude modulation, used for interferential waveform only. LED is illuminated when this function is activated.

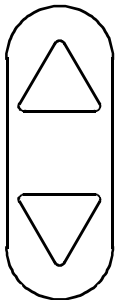


Stimulation output being displayed

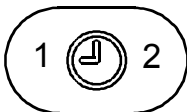


LED's that display the output intensity during a treatment. When the unit is in the "Hold" mode, "-- --" will be displayed.

Stimulation output intensity controls—intensity may be adjusted at any time with the continuous mode for all waveforms. It may be adjusted up or down during the "On" phase of the surge and recip modes. And it may be adjusted down at any time when vector rotation is active in the interferential mode.



- Increase output intensity
- Decrease output intensity



Switches timer display and programming control from channel 1 to channel 2 or vice versa when the two timer option is selected (LED on).



Continuous stimulation, no amplitude modulation selector—LED is illuminated when this function is activated.




Amplitude modulation (surge) selector—Press this button during a treatment to display surge "on / off" times. LED is illuminated when this function is activated.



Reciprocation selector (two channels only) —Press this button during a treatment to display reciprocation "on / off" times. LED is illuminated when this function is activated.



Use two timers. Allows clinician to program two different treatment protocols under the control of two different timers. LED is illuminated when this function is activated.

I	Mains On.
O	Mains Off.
	Refer to instruction manual for directions.

2.2 List of Abbreviations

AC	—	alternating current
cm ²	—	square centimeters
DC	—	direct current
DVM	—	digital voltmeter
Hz	—	Hertz (pulses per second)
Kohm	—	Kilo-ohm (1000 ohms)
LED	—	Light Emitting Diode
mA	—	milliampere (1/1000 ampere)
min	—	minutes
ms	—	millisecond (1/1000 second)
mW	—	milliwatt (1/1000 watt)
Recip	—	Reciprocation
s	—	seconds
S/N	—	Serial Number
μs	—	microsecond (1/1,000,000 second)
Vdc	—	Voltage direct current
Vac	—	Voltage alternating current
W	—	watts

2.3 Labels

The Food and Drug Administration (FDA) requires that medical devices be uniquely identifiable. To comply with this requirement, the Sys*Stim 226 has a serialized label unique to each unit.

Please be careful not to damage these labels, especially during servicing actions such as removing and replacing enclosures.

Include serial numbers when requesting technical assistance.

Section 3—Specifications

3.1 General Specifications:

Input:	115 VAC \pm 10%, 50/60 Hz, 0.4 Amp Max
Weight:	4.8 pounds
Dimensions:	4.3 in (H) x 6 in (D) x 13.4 in (L)
Operating Temperature:	+50°F to +131°F
Humidity:	Operating, 30% to 75% Relative Humidity at 104°F Nonoperating, up to 90% Relative Humidity at 149°F
Storage Temperature:	-40°F to 167°F
Treatment timer: Indicator:	Treatment time counts down to zero when time is set, or up to 60 minutes when no time is set. The digital timer indicates time in minutes and seconds. The timer also indicates the remaining or elapsed treatment time during the “Hold” period.
Accuracy:	\pm 5%
Maximum treatment time:	60 minutes

3.2 Waveform Specifications:

Interferential Mode

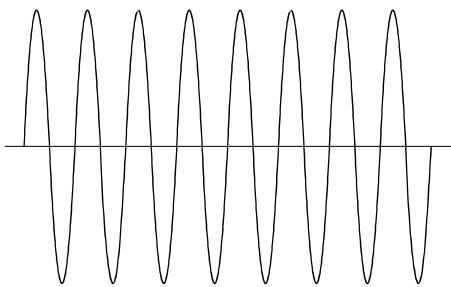


Figure 3.1—Interferential Waveform (Sine Wave)

Waveform Type:	Sine wave
Volts:	0–65 volts, 1 Kohm load
Current:	0–65 mA RMS, 1 Kohm load
Average current at maximum intensity and frequency:	65 mA RMS
Maximum current density under 2" diameter electrode.	3.2 mA/cm ²
Frequency:	Channel 1 = 4000 Hz Channel 2 = 4000 to 4250 Hz variable frequency sine wave
Frequency Modulation:	1–15 Hz 80–150 Hz 1–150 Hz xx-xx Hz, <i>xx=any value from 1 to 250 Hz</i>

Phase Duration:	125 μ s
Available Amplitude	
Modulation Options:	Vector rotation
Two Timer Option:	No

Premodulated Mode

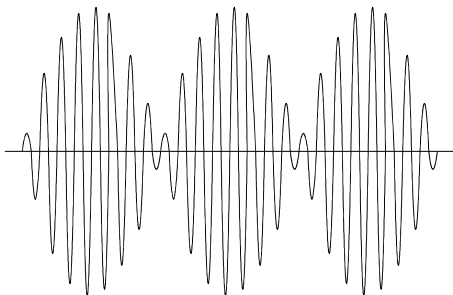


Figure 8.2—Premodulated Waveform

Waveform Type:	Frequency modulated sine wave
Volts:	0–50 volts RMS, 1 Kohm load
Current:	0 –50 mA RMS, 1 Kohm load
Average current at maximum intensity and frequency:	50 mA RMS
Maximum current density under 2" diameter electrode.	2.5 mA/cm ²
Frequency:	1–250 Hz
Frequency Modulation:	1–15 Hz 80–150 Hz 1–150 Hz xx-xx Hz, <i>xx=any value from 1 to 250 Hz</i>
Phase Duration:	125 μ s internal sine wave 4–1000 ms beat envelope
Available Amplitude	
Modulation Options:	Continuous Surge Reciprocation
Two Timer Option:	Yes

Medium Frequency Mode

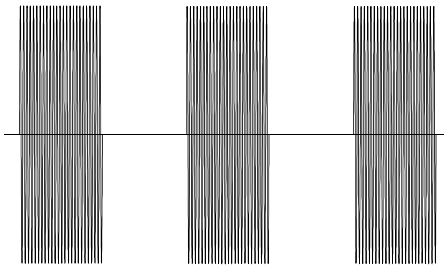


Figure 8.3—Medium Frequency Waveform (Russian)

Waveform Type:	Amplitude modulated sine wave
Volts:	0–50 volts RMS, 1 Kohm load
Current:	0–50 mA RMS, 1 Kohm load
Average current at maximum intensity and frequency:	50 mA RMS
Maximum current density under 2" diameter electrode.	2.5 mA/cm ²
Frequency:	2500 Hz, Amplitude modulated at 10 ms on and 10 ms off
Frequency Modulation:	No
Phase Duration:	200 μs
Available Amplitude Modulation Options:	Continuous Surge Reciprocation
Two Timer Option:	Yes

Biphasic Mode

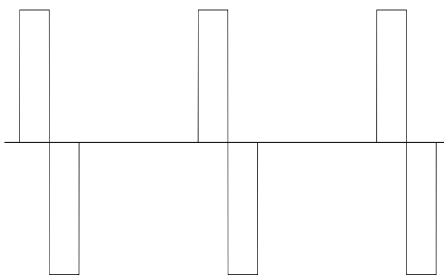


Figure 8.4 Biphasic Waveform

Waveform Type:	Symmetrical biphasic square wave
Volts:	99 volts peak, 1 Kohm load
Current:	0 –99 mA peak, 1 Kohm load
Average current at maximum intensity and frequency:	7.2 mA
Maximum current density under 2" diameter electrode.	0.36 mA/cm ²
Frequency:	1–120 Hz
Frequency Modulation:	No
Phase Duration:	50–300 μs
Available Amplitude Modulation Options:	Continuous Surge Reciprocation
Two Timer Option:	Yes

3.3 Amplitude Modulation Specifications:

Vector rotation:	<i>Interferential Mode Only,</i>
	$\pm 50\%$ amplitude modulation in anti phase with an eight second modulation period.
Two timer option	No
Surge Mode:	<i>Premodulated, Medium Frequency and Biphasic Pulsed Modes</i>
Up ramp:	3 seconds
Down ramp:	2 seconds
Preset on/off times:	10 seconds on, 10 seconds off 10 seconds on, 20 seconds off 10 seconds on, 30 seconds off 10 seconds on, 40 seconds off 10 seconds on, 50 seconds off 10 seconds on, 60 seconds off
Programmable On time:	1–240 seconds
Programmable Off time:	1–240 seconds
Two timer option:	Yes
Reciprocation mode:	<i>Premodulated, Medium Frequency and Biphasic Pulsed Modes</i>
Up and down ramps:	1 second, <i>reciprocation only</i>
Reciprocation time:	2–240 seconds, (On time = off time)
Combine with Surge:	Use up and down ramps of surge program Use on/off times of surge program.
Two timer option:	No

Section 4—Precautions

1. Line supply voltage is present inside the enclosure, and present on exposed components after back housing is removed if line cord is connected to the line supply. DISCONNECT LINE CORD PRIOR TO REMOVING BACK COVER.
2. Qualified technicians using appropriate calibrated test equipment should perform servicing.
3. Use grounded wall outlets only.
4. Adhere to standard safety practices for troubleshooting and servicing electronic equipment.
5. To insure continued conformance to specifications and applicable safety standards, the Sys*Stim 226 should be performance checked and safety tested at least once each year.
6. USE OF CONTROLS OR ADJUSTMENTS OR PERFORMANCE OF PROCEDURES OTHER THAN THOSE SPECIFIED HEREIN MAY RESULT IN HAZARDOUS EXPOSURE TO ELECTRICAL ENERGY.
7. Do not operate the Sys*Stim 226 in close proximity with operating shortwave or microwave diathermies.
8. Replace line fuses with same type and rating as specified in the list of specifications and on the printed circuit board next to the fuses to avoid risk of fire and component damage.
9. Primary circuit components must be replaced with factory- specified components to insure compliance with UL-544 Safety Standard for Medical and Dental Equipment.
10. Inspect electrodes before use to insure that they do not have damaged areas, which could cause excessive tissue current densities.
11. Properly monitor patient responses to treatment at all times. Discontinue treatment if there are any signs of patient discomfort or distress.
12. Refer to the Instruction Manual for a more complete listing of precautions, warnings, contraindications and side effects/adverse reactions.

Section 5— Equipment Description

The Sys*Stim 226 is a portable, microprocessor controlled, digital, dual channel, electrical neuromuscular stimulator that offers a choice of four pulse output modes. Additional features such as surge options and reciprocation are also available.

The injection molded ABS plastic enclosure is divided into two halves, a front half and a back half. Electronics circuitry and indicator subassemblies are assembled into the front enclosure half. The back enclosure half provides a protective cover and base that is removed by means of four Phillips head screws.

There are two printed circuit boards in the Sys*Stim 226: the main circuit board with the displays and the power supply board. The power supply board holds the two primary fuses. Each of these subassemblies is described in the Theory of Operation section of this manual.

The membrane touch control panel incorporates multilayer laminated design pushbutton switches with international symbols for maximum readability. There are no knobs or dials, which facilitates equipment operation.

Displays consist of 7-segment LED's, green status indicator LED's, and an audible beeper signal to indicate control operation, end of treatment time, and output cutoff.

The Sys*Stim 226 is constructed and safety tested in compliance with UL-544, "Medical and Dental Equipment Standard for Safety" and international standards for electrical safety and electromagnetic compatibility.

Section 6—Theory of Operation

The Sys*Stim 226 is a sophisticated microprocessor controlled, variable frequency, variable amplitude, multichannel muscle stimulation signal generator. It takes line voltage, which is transformed down to lower voltages and converts this voltage to regulated DC voltages, which are used internally for powering the circuitry. This function is performed by the circuitry on the power supply circuit board.

The mains supply voltage enters the instrument by means of a 3 prong IEC standard power connector from the hospital grade line cord supplied with the instrument. After passing through two line fuses, the power switch, and an AC line RFI filter, the line voltage is applied to an isolation step down transformer. The low AC output voltage of the transformer is rectified and filtered and converted to unregulated DC of about ± 18 VDC which is used to power the output power amplifiers and is also down regulated to ± 12 VDC and ± 5 VDC for the low level analog and digital circuitry. These voltages are delivered from the power supply circuit board to the main circuit board by means of a 10-conductor ribbon cable.

The main circuit board is mounted immediately behind the front panel and is connected to three cable assemblies. The previously mentioned 10-conductor ribbon cable delivers DC from the power supply board. The membrane switch signals are connected to the main board by mini ribbon cable to a ZIF connector. The output signals are connected by means of a 4-conductor cable to the output connectors.

The main board mounts 8 seven-segment LED displays for time and output indications behind the front panel display filters. A display driver chip interfaced to the main microprocessor data buss drives the individual mode indicator displays and seven segment displays.

The main system processor, an MC68HC11 microprocessor operating at 8 MHz executes instructions contained in read only memory. It scans the keyboard for user inputs and executes instructions in response to these user inputs. It communicates with a second microprocessor, which is used to generate the actual waveforms. These waveforms are programmed into the second microprocessor's read only memory. All signals are digitally synthesized using sophisticated waveform generation algorithms thereby eliminating the circuit drift and performance limitations of analog waveform generating circuitry.

Amplitude and frequency selections are sent to a dual channel power amplifier which couples these signals through an output isolation transformer to the patient connected electrodes. Voltages and currents delivered to the transformer primary are closely monitored by the main microprocessor. Unintended changes in voltage or current delivered to the transformer are sensed and corrective action is taken by the microprocessor. Error messages are generated on the display to alert the user to these conditions. In certain cases the output is disconnected from the patient by breaking the secondary circuit of the output isolation transformer. The transformer can only couple AC voltages to a patient. A transformer cannot couple a DC voltage.

While primary circuit monitoring is very effective in limiting output current and voltage, there is no way that the muscle stimulator can know or sense the conditions of the electrodes or the patient skin to electrode conditions. For these reasons it is important to monitor the electrode quality and patient properly.

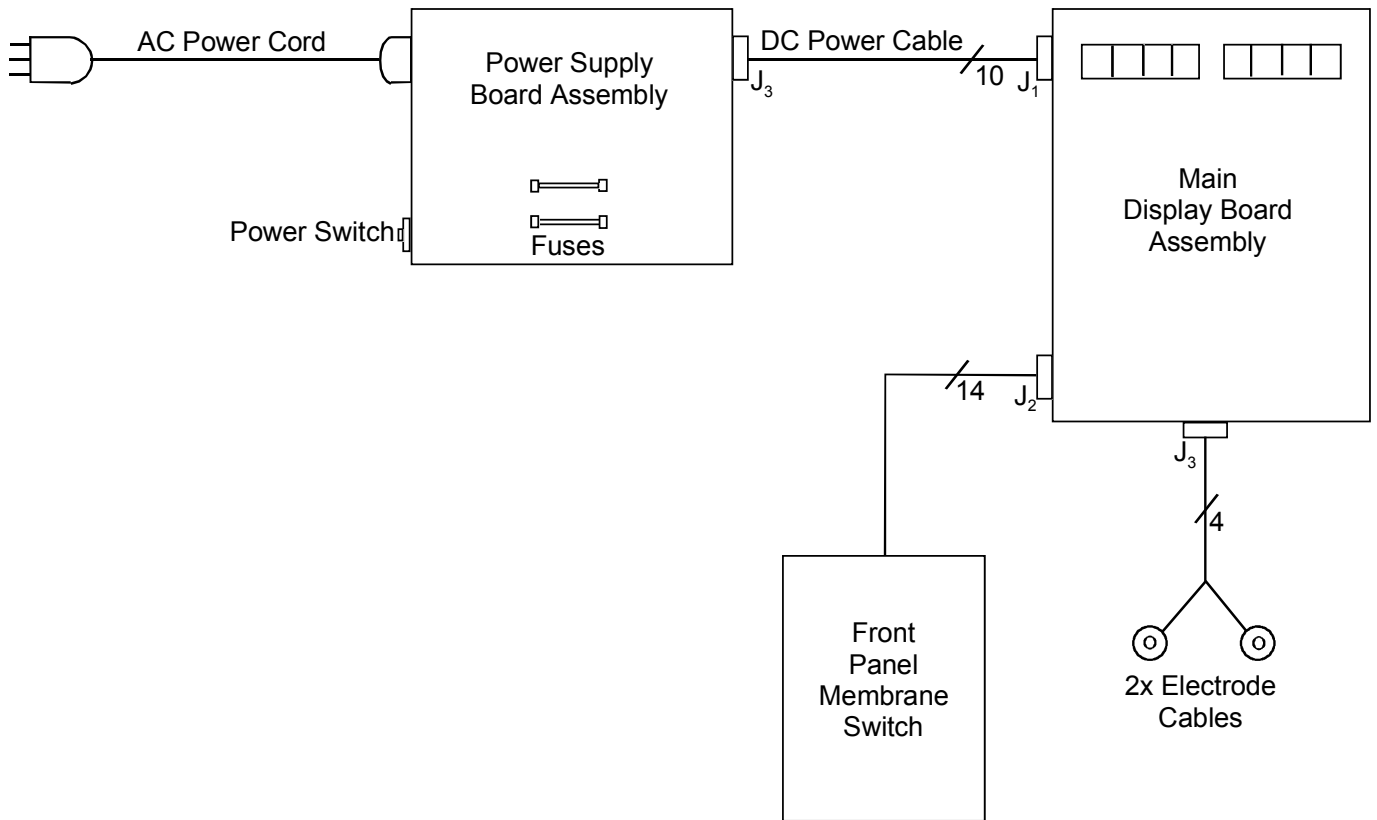


Figure 6.1—Sys*Stim 226 Block Diagram

Section 7—Installation

3.1 Installation Instructions

1. Connect the line cord to the bottom of the Sys*Stim 226. (See Figure 3.1)
2. Plug the line cord into a grounded wall outlet that has 115 VAC 50/60 Hz. Your power supply must match the voltage requirements listed on the serial number label of your device. **Do not connect the Sys*Stim 226 to a power supply rated differently than that described above.**
3. The line cord comes equipped with a standard 3-prong plug. This plug provides grounding for the Sys*Stim 226. Do not defeat its purpose by using 3-to-2 prong adapters or any other means of attaching to a wall outlet.
4. The Sys*Stim 226 may be susceptible to interference originating from shortwave diathermy units operating in close proximity to it. Avoid operating the Sys*Stim 226 adjacent to and simultaneously with operating shortwave devices.
5. **Do not use sharp objects to operate the membrane panel switches.** If the tough outer layer of the membrane is broken, moisture may leak into the switches resulting in switch failure.

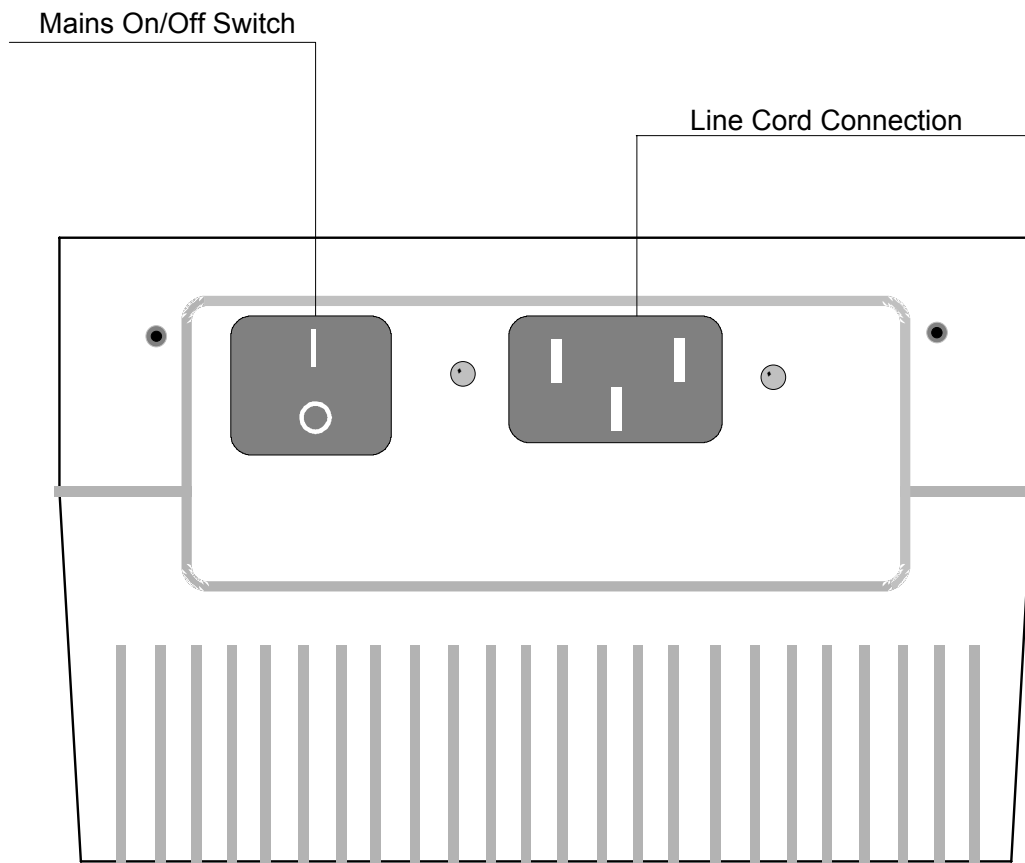


Figure 7.1—Sys*Stim 226, Bottom view, Mains Power Switch and Line cord connections

Section 8—Operating Instructions

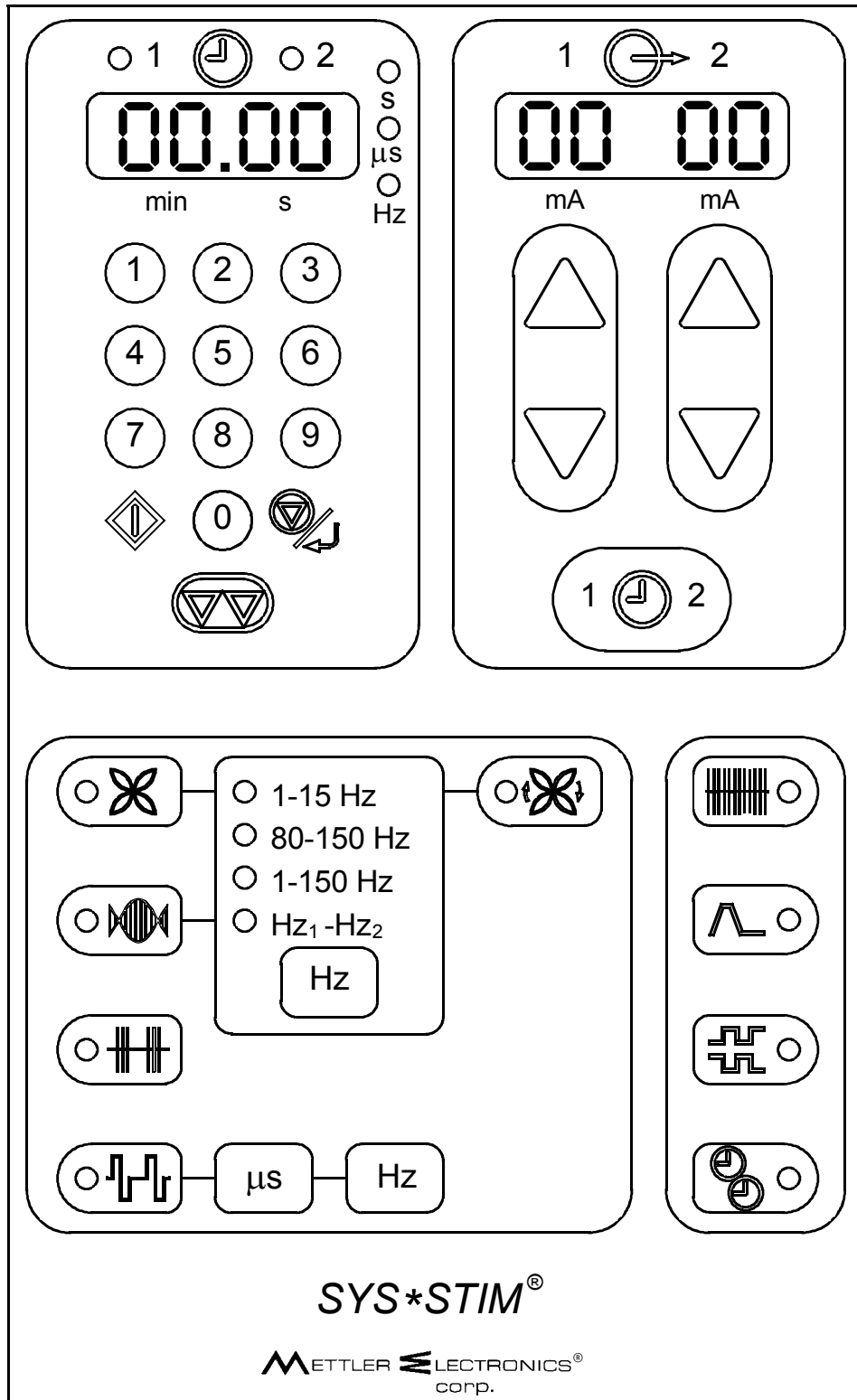
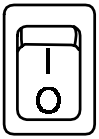


Figure 8.1—Front membrane panel and LED indicators

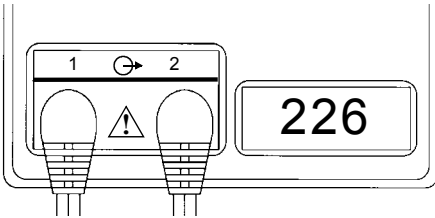
8.1 General Operating Instructions:

Before you start.

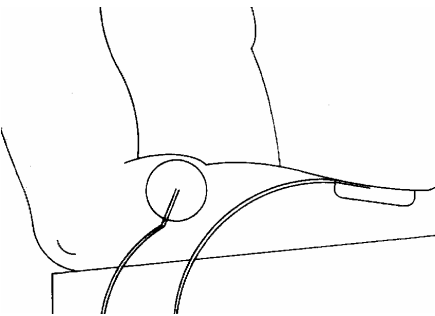
- a) Review precautions, contraindications and side effects/adverse reactions listed in Section 5 of the Sys*Stim 226 Instruction Manual.
- b) Use Mettler Electronics electrodes to ensure safe and effective operation.
- c) Verify connection of the line cord to a grounded wall receptacle and the Sys*Stim 226.
- d) Note: Descriptions of the symbols used on controls are in Section 2.



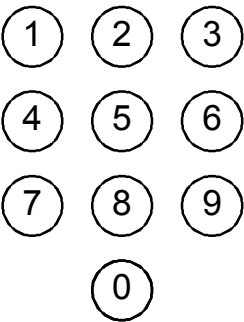
1. Turn on the mains power switch by pressing “I” icon on switch.



2. Insert the connector attached to the electrode cables (ME 2260) into the electrode cable receptacles illustrated on the left.

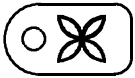


3. Attach electrodes to electrode cables. Apply the electrodes to the patient after reviewing “A Note About Electrodes”.



4. Select the desired treatment time by pressing a number(s) on the numeric keypad. Unit beeps when a button is pressed. Only whole minutes may be selected. Treatment times from 1 to 60 minutes are valid. Time is displayed in the time window. During a treatment time remaining is displayed in minutes and seconds.

To treat without a set time, do not enter a time value. The timer will count up to indicate time elapsed since the beginning of the session.

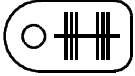


• Interferential

5. Select the waveform for this treatment session. The default waveform is the interferential waveform.



• Premodulated
(Bipolar)



• Medium
Frequency
(Russian)



• Biphasic

1-15 Hz
 80-150 Hz
 1-150 Hz
 Hz₁-Hz₂

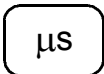
• Interferential
• Premodulated
(Bipolar)

6. Set treatment phase duration (*biphasic only*) and frequency. Please note: *Medium frequency has a fixed phase duration and frequency so no adjustments are necessary.*



Hz

- Select frequency modulation for the Interferential or Premodulated modes by pressing the button labeled “Hz” until the LED to the left of the desired selection is illuminated. For “Hz₁-Hz₂” input any value from 0–250 for Interferential mode or 1–250 for Premodulated mode using the numeric key pad and then press . Repeat the same procedure for the second frequency in the range. For a fixed treatment frequency, input the same value twice.

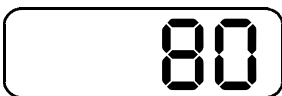
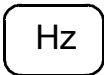


• Biphasic



µs

- Select phase duration in µs. Enter any value from 50–300 µs using the numeric key pad and then press . The Sys*Stim 226 stores the value of the last phase duration used and displays it in the timer window. If the displayed value is the one you want either press or the button labeled “µs”.



Hz

- Select frequency in Hz. Enter any value from 1–120 Hz using the numeric keypad and then press . The Sys*Stim 226 stores the value of the last frequency used and displays it in the timer window. If the displayed value is the one you want either press or the button labeled “Hz”.



• Continuous




7. Select the amplitude modulation method for this treatment session for the Premodulated, Medium Frequency and Biphasic modes only. The default is

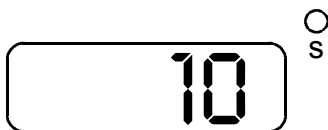
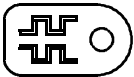
• Surge





continuous.

⇒ **Surge Mode**

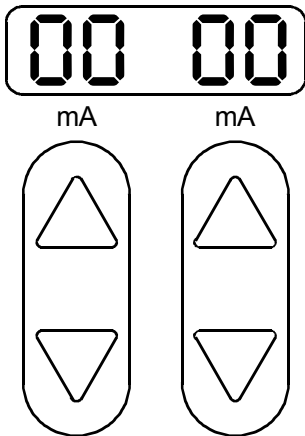
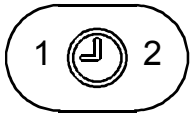
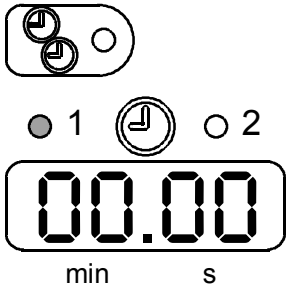
- Press the “Surge” button to select on and off times. The up and down ramps are fixed to 3 seconds up and 2 seconds down. The preset on/off times (*in seconds*) are: 10 on/10 off, 10 on/20 off, 10 on/30 off, 10 on/40 off, 10 on/50 off and 10 on/60 off. On/Off times are displayed in the timer window.
- Continue pressing the “Surge” button until the desired on/off time is displayed in the timer window. Then Press  to enter that on/off time.
- To select a custom on/off time, press the “Surge” button one more time after “10 60” is displayed. A single number is displayed in the timer window. This is the on time. Use the numeric keypad to select an on time in seconds from 1 to 240. Press  to enter the on time. A second single number is displayed in the timer window. This is the off time. Use the numeric keypad to select an off time in seconds from 1 to 240. Press  to enter the off time.
- To review an on/off time during a treatment, press the “Surge” button. Surge on/off time will be displayed briefly in the timer window.







⇒ **Reciprocation Mode**

- Press the “Reciprocation” button to select reciprocation times between channels one and two. The up and down ramps are fixed at 1 second. A single number is displayed in the timer window. Use the numeric keypad to select a reciprocation time in seconds from 2 to 240. Press  to enter the reciprocation time. Each channel will be on and off for the time set in a reciprocal fashion.
- To review an on/off time during a treatment, press the “Reciprocation” button. Reciprocation time will be displayed briefly in the timer window.
- For reciprocation with unequal on and off times first press the reciprocation button and then press . Press the surge button and then follow the instructions to set on/off times in the surge mode. First channel one will be on for the set on time and then channel two will come on during the set off time.

- To review an on/off time during a treatment, press the “Reciprocation” button. Reciprocation time will be displayed briefly in the timer window.



- Use the two timer option to use two different treatment protocols or two different treatment times simultaneously. Individual treatments can be setup, started and stopped independently. This option is available with the premodulated, medium frequency and biphasic modes. Use the two timer mode with the “Continuous” and “Surge” amplitude modulation options. The indicator LED will be lit for the channel that is being displayed at any one time. Program the single channel just like you would program the Sys*Stim 226 for two-channel operation.
 - To switch between the two channels either during setup or during a treatment press the button shown at the left. The time and the treatment protocol are displayed for the channel whose indicator LED is lit.
- Press  after all treatment parameters have been set to begin treatment.
- “-- --“ is displayed in the mA display followed by double zeroes indicating that the channels are active. *In the two timer mode of operation, the active channels will display 00’s. If either channel is off its display will show “--“.* Press the “Up” or “Down” arrows to adjust treatment intensity. The numbers in the display will increase as the “Up” arrow is depressed. If you press an arrow one time the intensity will increase or decrease in small increments. If you hold an arrow down, the Sys*Stim 226 will beep three times and then the intensity will increase rapidly until the button is released.
 - In the “Surge” mode, the Sys*Stim 226 allows you to adjust the treatment intensity before beginning the “On/Off” cycle that you selected. The green LED’s above the time window will blink on and off to alert you to adjust treatment intensity. Use the “Up” or “Down” arrows for both channels to adjust intensity to the desired level. Then press  again to initiate the treatment cycle. The intensity may be adjusted only during the “On” part of the “Surge” cycle.
 - In the “Reciprocation” mode, The Sys*Stim 226 will prompt you to adjust the intensity in Channel 1. Once you have made the adjustment press . You will then be prompted to adjust the intensity

in Channel 2 by the flashing LED for that channel. Adjust the intensity and then press . The mA in Channel 2 will ramp down and the reciprocation mode will begin cycling with Channel 1 active first. Again, the output intensity in mA is displayed in the output window.

- In the “two timer” mode the LED above the channel that is active will be on or blinking to guide you through adjusting the treatment intensity.



11. In the “Interferential” mode you may choose to activate the vector control button after the intensities for both channels have been set to patient comfort. You can adjust the treatment intensity down at any time in small increments. You can adjust the intensity up in a channel only at the peak intensity in the display for that channel. By adjusting the intensity in either channel, you can change the interferential field to target the area being treated.

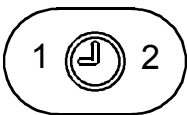


12. Press either of these two buttons to hold treatment at any time and stop all output to the patient. Time remaining or time elapsed will display in the timer window. “-- --” will display in the output window.

- In the single timer mode, both buttons will stop treatment in both channels.
- In the “Two timer” mode, pressing the upper button stops treatment only for the channel indicated by the illuminated green LED above the time window.
- In the “Two Timer” mode, pressing the lower button stops treatment in both channels.



13. In the “Two Timer” mode, use this button to either program or view the time remaining for the other channel. The output display remains active for both channels regardless of which channel is selected by this control.



14. At the end of treatment, the Sys*Stim 226 will beep three long beeps to indicate the end of treatment. The output to the patient will stop. The timer display will show “00.00” and the mA display will show “-- --”.

8.2 Electrode Positioning

1. General information:
Placement of electrodes may be by the quadpolar,

bipolar or monopolar techniques. Proper positioning and contact will insure treatment comfort and efficiency. Electrodes should never be placed in such a manner as to produce current flow through the cardiac area.

2. Preparation of the skin prior to electrode application:

To insure the efficient current conduction necessary for proper treatment, certain preparations must be made. Cleaning or wetting should eliminate any impairment to current conduction on the patient's skin such as an oily or dry surface, or excessive hair coverage. Shaving may be necessary depending upon the density of hair coverage. **Failure to provide for maximum current conduction efficiency could result in skin irritation relating to an increase in current density at the electrode site.**

Using reusable electrodes for longer periods of time than those recommended by the package insert could result in ineffective treatments or cause skin irritation. Care should be taken to ensure application of the total electrode surface area to the patient's skin prior to commencing treatment.

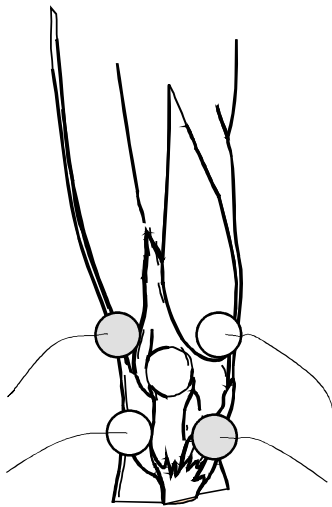


Figure 8.2—Quadropolar Electrode Placement Technique

3. Quadropolar electrode application technique:

Quadropolar techniques should be used with the “Interferential” waveform. The electrodes from Channel 1 are placed diagonally from each other. While the electrodes from Channel 2 are placed diagonally across from each other to form an “X” over the treatment area. The zone of maximum interference between the two channels occurs roughly in the center of the “X”.

Adjusting the intensity levels of the two channels will change the apparent interference pattern felt by the patient. Pressing the “Vector, amplitude modulation” control during treatment will modulate the intensity of the outputs of the two channels during treatment, increasing the area covered by the interference pattern.

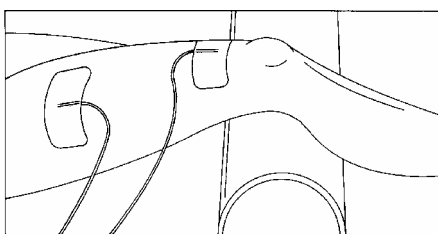


Figure 8.3—Bipolar

4. Bipolar electrode placement techniques:

Bipolar electrode placement techniques should be used to provide stimulation to larger muscle groups, such as the quadriceps or the hamstrings. The symmetrical waveforms of the “Premodulated”, “Medium Frequency” and “Biphasic” waveforms are usually applied to the body using the bipolar

Electrode Placement Technique

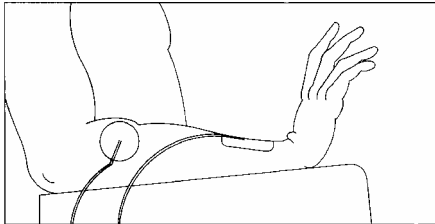


Figure 8.4—Monopolar
Electrode Placement
Technique

technique.

Equal size electrodes are placed at each end of the muscle or muscle group. Current concentration is over the entire length of that muscle or muscle group and especially effective on weak musculature. Electrode placement should be at opposite ends of the limb or muscle group. Care should be taken to insure that electrodes are not placed too close together which could produce current concentration along the edges of the pads. This is the so-called “edging effect” which can cause patient discomfort. The figure on the left shows a pad set up for stimulation of the quadriceps.

5. Monopolar electrode application techniques:

Monopolar techniques may be used with the “Premodulated”, “Medium Frequency” and “Biphasic” waveforms. The smaller, active, electrode (black and negative) is placed over the muscle motor point. In treatments designed to relieve pain, the active electrode is placed over the painful area. The larger, dispersive, electrode (red and positive) is placed on the same side of the body at some point distal to the active electrode. The dispersive pad is generally three to four times larger than the active electrode so that current density is too low to cause muscle contractions under the dispersive electrode. Never place the dispersive electrode over the antagonist muscle.

The monopolar electrode placement technique has been found to be especially useful for muscle stimulation of the upper extremities and small muscle groups. This technique helps concentrate the stimulation effect on the muscle under the smaller electrode. The figure on the left illustrates one possible electrode placement for muscle stimulation of the forearm.

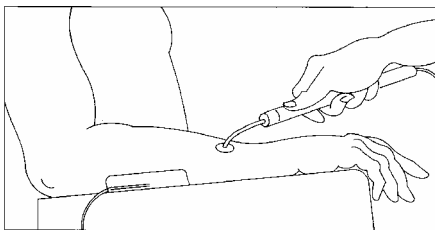


Figure 8.5—Using the
Pencil Electrode

6. Using the pencil electrode:

The pencil electrode is used for the stimulation of small muscles or painful areas. It is also useful to help identify the exact motor point of a muscle or muscle group. The pencil electrode may be used with the “Premodulated”, “Medium Frequency” or “Biphasic” waveforms.

Attach the pencil electrode to the black electrode cable using a pin to banana adapter. Attach the red electrode cable to a dispersive pad. Apply dispersive electrode in such a manner to prevent transthoracic

stimulation

Pressing the switch located on the pencil electrode will allow treatment currents to be delivered to the patient. Four tips of different sizes are included with the pencil electrode. The figure on the left shows an application of the pencil electrode.



7. Additional information about electrode placement:
 Motor point charts are available as guides from Mettler Electronics Corp. These points may vary from patient to patient, and at time of injury, may vary in the same patient. "Functional Electrical Stimulation - A Practical Clinical Guide" by Benton, Baker, Bowman and Walters: published by Rancho Los Amigos of Downey, California is an excellent guide for electrode placement for muscle stimulation. "Clinical Transcutaneous Electrical Nerve Stimulation" by Mannheimer and Lampe is a good source for electrode placement techniques for pain management.

8.3 Combination Therapy Using the Sys*Stim 226 and the Sonicator

Application of simultaneous therapeutic ultrasound and electrical neuromuscular stimulation can be accomplished using the pulsed waveforms from the Sys*Stim 226 with a Sonicator therapeutic ultrasound unit from Mettler Electronics Corp.

In this technique, the ultrasound applicator delivers the ultrasonic energy and becomes the active electrode for muscle stimulation. **WARNING:** Apply dispersive electrode in such a manner to prevent transthoracic stimulation. Follow the instructions below to administer combination therapy.

Instructions for Combination Therapy:

Combination therapy may be performed by plugging in the black lead wire with a pin to banana adapter attached from Channel 1 or Channel 2 into the receptacle on the bottom of the Sonicator 705, 706, 715, 716, 710, 720 or 730. The other lead wire from Channel 1 is attached to a treatment electrode, which is then applied to the patient to complete the electrical circuit. (Avoid transthoracic stimulation!) When electrical output is generated by the Sys*Stim 226, it will be passed through the metal ring on the Sonicator applicator.

NOTE: It is necessary to use a preparation such as Sonigel, which conducts both electric currents as well as ultrasonic energy, as a couplant for combination therapy. Non conductive materials such as mineral oil are not suitable for this application.

It is not necessary to input time on the Sys*Stim 226. The Sonicator controls all timing. Do not use the "Interferential" mode for combination therapy. Place the Sys*Stim 226 into the "Continuous" mode. When all treatment parameters have been set on both units, press "◊" on the Sys*Stim 226. Apply the ultrasound applicator to the gelled treatment area on the patient and adjust the stimulation intensity on the Sys*Stim 226. Then press "Go" on the Sonicator and adjust ultrasound output on the

Sonicator intensity control. When the selected time has elapsed on the Sonicator and the end-of-treatment buzzer sounds, press “Hold” on the Sys*Stim 226 before removing the applicator from the patient to stop electrical stimulation output.

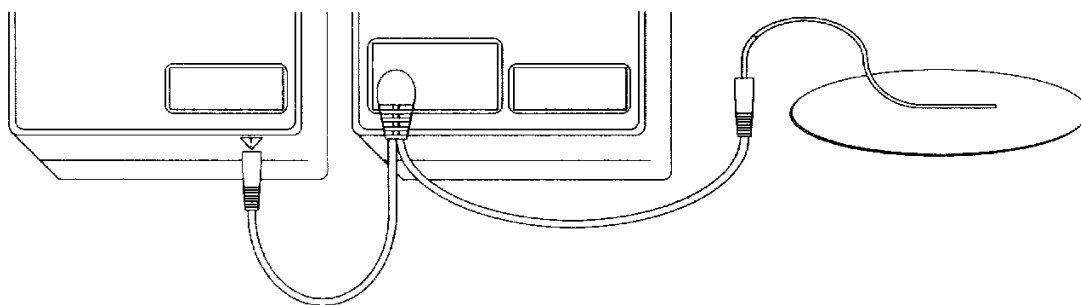


Figure 8.6—Combination Therapy

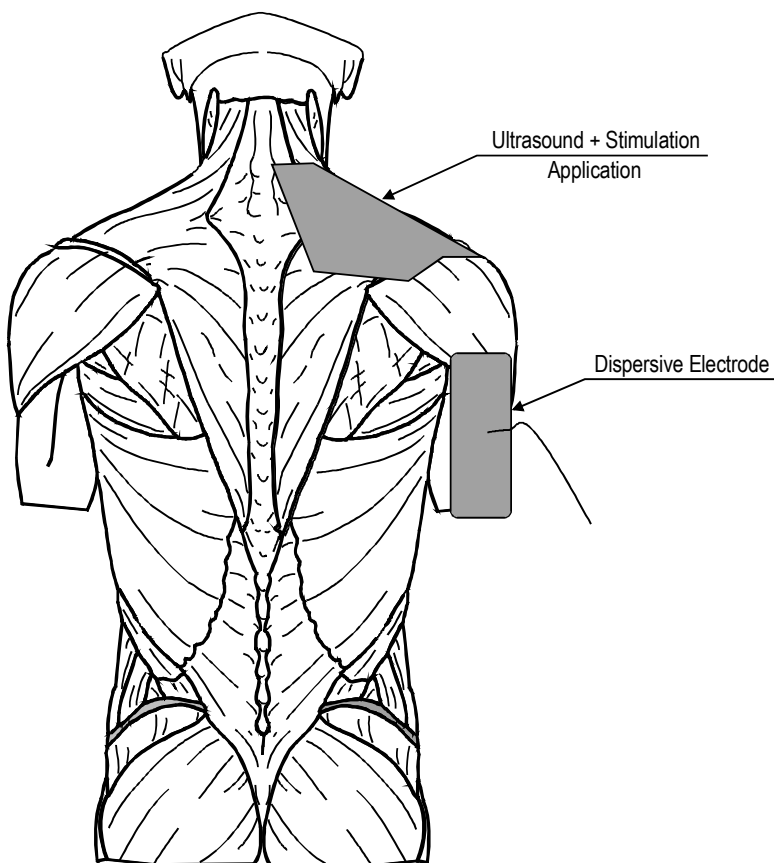


Figure 8.7—Combination Therapy Application

Section 9—Maintenance and Troubleshooting

9.1 Cleaning the Sys*Stim 226

1. The Sys*Stim 226 can be wiped off with a damp cloth. The power cord should be disconnected from the unit before this is done. In the case of stubborn dirt a gentle household cleaner can be sprayed on the cloth and then wiped on the unit. If this method is used, remove any cleaner residue with a damp cloth. Do not spray cleaner into the vents of the unit.
2. Follow the EZ Trode package insert for the use and care of the electrodes supplied with the Sys*Stim 226.
3. For routine cleaning of the electrode cables use soap and water. Thoroughly dry after cleaning.

9.2 Routine Maintenance

1. Standard medical electrical safety checks should be performed annually by qualified biomedical engineers or technicians trained to perform these procedures.
2. Inspect electrode cables and associated connectors for damage.

9.3 Troubleshooting the Sys*Stim 226

Symptom	Action
1. Nothing lights when main power switch is turned on.	Is line cord connected to outlet? Does the outlet have power? Check the primary fuses inside the case. Unit may require servicing if none of the above resolves the problem.
2. "E_01" displayed in Time window.	Computed checksum for EPROM microcode is in error or there is a stuck key in the keyboard. Unit requires servicing.
3. "E_02" displayed in Time window.	Communication error between main microprocessor and waveform generator microprocessor. If powering unit OFF and restarting does not remove error, unit requires servicing.
4. "E_03" displayed in Time window.	Output voltage error, deviation from preset or expected value. If powering unit OFF and restarting does not remove error, unit requires servicing.

5. “E_05” displayed in Time window. Output overcurrent detected. Current exceeded 70 mA RMS for interferential, premodulated, and medium frequency or 100 mA peak for biphasic. Remove current short or shunt and restart instrument. If error persists even without a patient connection or load, unit requires servicing.
6. “E_07” displayed in Time window. Inadequate patient connection—patient connection impedance is increasing because of electrodes drying out or lifting from patient or from an inadequate connection to the electrode cables. This impedance increase is beyond the voltage range of the Sys*Stim 226 to deliver the specified current. In the continuous treatment modes the output voltage is reduced while the unit monitors the impedance of the patient connection. If the unit is in amplitude modulated modes, such as recip or surge, this patient connection error causes the unit to go into the HOLD mode. All patient connection errors should be investigated to determine their cause.
7. “FF08” displayed in Time window. If this error code is displayed when you turn on the unit, it indicates an error in the output channel test. This test includes testing of the output relays. Turn off the power to the unit and turn it back on. If the Sys*Stim 226 continues to display this error code, remove the electrode cables from the unit and turn the unit off and then back on again. If the Sys*Stim continues to display this error code, it requires service. If the “FF08” does not display, then reattach the electrode cables and turn on the unit. If the error code reoccurs then the impedance is too low in the electrode cable circuit. Check to see if the electrodes are touching each other. If not, call for additional assistance.
8. “FF01” through “FF07” displayed in Time window. The Sys*Stim 226 may require service. Call for additional information.

If problem is not addressed above, or if additional troubleshooting guidance is desired, call (800) 854-9305 or contact our Service Department via email at service@mettlerelectronics.com.

The distributor who sold the Sys*Stim 226 should be able to assist you with a loaner unit during warranty service.

Section 10— Test and Calibration Procedure

10.1 Equipment Required:

1. Digital Volt Meter (DVM)
2. Dual Channel Scope
3. Two 10x probes
4. 10 MHz min. Frequency Counter
5. True RMS ammeter
6. Leakage Current Tester
7. Hipot Tester
8. Variac
9. Two (2) 1 Kohm 20 watt resistive loads
10. *And*, one (1) 1.5K load made up of a 1K and a 0.5K in series
11. *Or*, two switched test loads part number, XK7-06.

10.2 Before Testing Units:

1. Review Safety Instructions.
2. Review Operating Instructions.
3. Review Keyboard Symbol Definitions.

10.3 Basic Functional Tests:

10.3.1 Visual Check:

Check unit for proper construction. Check primary wiring and fuses. (DOM, CUL: 400 mA) Verify that transformer primary on power supply board is strapped for the correct line voltage *W1 and W3 installed*. Verify that all cable connectors are properly installed

10.3.2 Power Supply Test:

10.3.2.1 Disconnect the Power Supply cable at J1 on the Main Bd. Connect the unit to a Variac. Adjust Variac for 115VAC out. Turn on power. Check for proper power supply voltages on the Power Supply Bd.

+18v PS Bd.	J3-7	(19.0 to 23.0 VDC)
-18v PS Bd.	J3-9	(-19.0 to -23.0 VDC)
+12v PS Bd.	J3-1	(11.8 to 12.2 VDC)
+5v PS Bd.	J3-3	(4.9 to 5.1 VDC)
-5v PS Bd.	J3-5	(-4.8 to -5.2 VDC)
Gnd PS Bd.	J3-2	

If any power supply voltages are out of range, replace the power supply board. Turn power off.

10.3.3 User Interface:

10.3.3.1 Connect power cable between J1 on the Main Bd., 19030, and J3 on the Power Bd., 19034.

Turn the power switch ON, verify:

- a. 7 Segment LED's are centered in window and are clear and bright.
- b. Green LED's are centered in their windows and are equally bright.

10.3.3.2 Press the keys 0–9, verify the correct digits are displayed and that they scroll in right to left in the time window.

If any digit segments are defective or display errors occur, replace the main board.

10.3.4 Calibration: Required if the main board is replaced.

10.3.4.1 On the Main Bd., turn all four potentiometers, R47, R64–66, completely clockwise.

10.3.4.2 Insert a 1K load in series with an ammeter into CH1.

10.3.4.3 Select INTERFERENTIAL, 1–15Hz, enter 10 minutes in the time window.

10.3.4.4 Press GO, adjust CH1 current to 30 mA on the ammeter. Adjust R65 to correlate the front panel CH1 mA display to the ammeter ± 2 mA. Press HOLD.

10.3.4.5 Insert a 1K load in series with an ammeter into CH2.

10.3.4.6 Press GO, adjust CH2 current to 30 mA on the ammeter. Adjust R66 to correlate the front panel CH2 mA display to the ammeter ± 2 mA. Press HOLD.

10.3.4.7 Select Premodulated 80–150 Hz, enter 10 minutes in the time window.

10.3.4.8 Press GO, adjust CH1 current to 30 mA on the ammeter. Adjust R47 to correlate the front panel CH1 mA display to the ammeter ± 2 mA. Press HOLD.

10.3.4.9 Insert a 1K load in series with an ammeter into CH2.

10.3.4.10 Press GO, adjust CH2 current to 30 mA on the ammeter. Adjust R64 to correlate the front panel CH2 mA display to the ammeter ± 2 mA. Press HOLD.

10.4 Single Timer Mode

10.4.1 Interferential

10.4.1.1 Connect 1K loads to CH1 and CH2. Connect a 10X scope probe to each of the 1K loads.

10.4.1.2 Select INTERFERENTIAL, select Hz₁–Hz₂, enter 1, and then RETURN, twice. Press GO, adjust output to 20 mA on both channels. Measure 4000 Hz on CH 1 and 4001 on CH2.

- 10.4.1.3 Press HOLD, select Hz₁-Hz₂, enter 250, and then RETURN twice. Press GO, adjust output to 10 mA on CH2. Measure 4250 ± 15 Hz on CH2.
- 10.4.1.4 Press HOLD, select 1-15Hz, enter 20 minutes on time, connect a frequency counter to CH2, press GO, and adjust CH2 output to 10 mA. Measure 1-15 Hz sweep ± 3 Hz.
- 10.4.1.5 Measure sweep time to be 14 seconds ± 1 second.
- 10.4.1.6 Connect a 1K load in series with an ammeter to each channel as required.
- Verify the output current as follows:
 - Current at 10 mA displayed, s/b 10 mA ±2 mA
 - Current at 20 mA displayed, s/b 20 mA ±4 mA
 - Current at 30 mA displayed, s/b 30 mA ±6 mA
 - Current at 40 mA displayed, s/b 40 mA ±8 mA
 - Current at 50 mA displayed, s/b 50 mA ±10 mA
 - Current at 60 mA displayed, s/b 60 mA ±12 mA
 - Press HOLD.
- 10.4.1.7 Set output current to 20 mA, press ROTATE, verify that the current decreases to 10-15 mA and increases to 25-30 mA.
- 10.4.1.8 Verify rotate time is 8 ±1 sec. Press HOLD.

10.4.2 Premodulated (Premod):

- 10.4.2.1 Connect 1K loads to CH1 and CH2. Connect a 10X scope probe to each of the 1K loads.
- Select PREMOD, select Hz₁-Hz₂, enter 1, and then RETURN twice. Press GO, adjust output to 20 mA on both channels. Measure a base frequency of 4000± 1 Hz, amplitude modulated by 1 Hz.
- 10.4.2.2 Press HOLD, select Hz₁-Hz₂, enter 250 and then RETURN, twice. Press GO, adjust output to 20 mA on both channels. Measure the base frequency and verify that it is 4000 Hz in amplitude and modulated by 243 ±3 Hz.
- 10.4.2.3 Press HOLD, select 1-15 Hz sweep. Verify the modulation frequency sweeps from 1 to 15 ±3 Hz.
- 10.4.2.4 Verify the sweep time to be 14 ±1 second.
- 10.4.2.5 Connect a 1K load in series with an ammeter to each channel.
- Verify the output current as follows:
 - Current at 10 mA displayed, s/b 10 mA ±2 mA
 - Current at 20 mA displayed, s/b 20 mA ±4 mA
 - Current at 30 mA displayed, s/b 30 mA ±6 mA
 - Current at 40 mA displayed, s/b 40 mA ±8 mA
 - Current at 50 mA displayed, s/b 50 mA ±10 mA
 - Press HOLD.

10.4.3 Medium Frequency

- 10.4.3.1 Connect 1K loads to CH1 and CH2. Connect a 10X scope probe to each of the 1K loads.
- Select MEDIUM FREQUENCY. Press GO, adjust output to 20 mA on both channels. Measure a base frequency of 2500 Hz with a duty cycle of 10ms ON and 10 ms OFF on both channels.
- 10.4.3.2 Connect a 1K load in series with an ammeter to each channel as required.
- Verify the output current as follows:
 - Current at 10 mA displayed, s/b 10 mA \pm 2 mA
 - Current at 20 mA displayed, s/b 20 mA \pm 4 mA
 - Current at 30 mA displayed, s/b 30 mA \pm 6 mA
 - Current at 40 mA displayed, s/b 40 mA \pm 8 mA
 - Current at 50 mA displayed, s/b 50 mA \pm 10 mA
 - Press HOLD.

10.4.4 Biphasic

- 10.4.4.1 Connect 1K loads to CH1 and CH2. Connect a 10X scope probe to each of the 1K loads.
- Select BIPHASIC, set to 150 μ s and 120 Hz.
 - Adjust R47 (Ch 1) and R64 (Ch2) fully clockwise
 - Start treatment.
 - Adjust outputs until amplitudes of positive pulses are 50 volts.
 - Adjust R47 and R64 until output displays read 48-50 mA.
- 10.4.4.2 Adjust outputs to 20 mA.
- Verify outputs are biphasic square waves.
 - Positive pulse width should be 150 \pm 15 μ s.
 - Pulse frequency should be 120 \pm 1 Hz.
- 10.4.4.3 With scope probes still connected press Start and verify the following voltages both outputs in both the negative and positive directions:
- Current at 10 mA displayed, s/b 10 mA \pm 2 mA
 - Current at 20 mA displayed, s/b 20 mA \pm 4 mA
 - Current at 40 mA displayed, s/b 40 mA \pm 8 mA
 - Current at 60 mA displayed, s/b 60 mA \pm 12 mA
 - Current at 80 mA displayed, s/b 80 mA \pm 16 mA
 - Current at 99 mA displayed, s/b 99 mA \pm 20 mA
 - Press HOLD.

10.4.5 Reciprocate (channels alternately on and off)

- 10.4.5.1 Select MEDIUM FREQUENCY.
- 10.4.5.2 Set Recip time to 5 seconds.
- 10.4.5.3 Start treatment.
- 10.4.5.4 Adjust both channels to 20 mA.

- Verify up and down ramps are 1 second
- Verify that each channel is alternately on and off for 5 seconds.
- Press HOLD.

10.4.6 Surge (both channels going up and down together)

- 10.4.5.1 Select PREMODULATED MODE, 80-150 Hz sweep
- 10.4.5.2 Set Surge time to 5 seconds on and 5 seconds off
- 10.4.5.3 Start treatment
- 10.4.5.4 Adjust both channels to 20 mA.
 - Verify up ramps are 3 seconds.
 - Verify down ramps are 2 seconds.
 - Verify that channels are on together for 5 seconds and off for 5 seconds.
 - Press HOLD.

10.4.7 Constant Current Test

- 10.4.7.1 Turn unit on and off to reset the unit.
 - Install 1000 ohm + 500 ohm load on each channel.
 - Select PREMODULATED mode, 80-150 Hz.
- 10.4.7.2 Start treatment
 - Adjust outputs to 20mA.
 - Short out 500 ohm resistor on both channels. Displayed current increases.
 - Verify current gradually decreases back to 20-22 mA.
- 10.4.7.3 Press HOLD
 - Remove shorts from 500 ohm resistors.
 - Select BIPHASIC mode at 50 μ s, 30 Hz.
- 10.4.7.4 Start treatment
 - Adjust outputs to 40 mA on both channels.
 - Short out 500 ohm resistor on both channels. Displayed current increases.
 - Verify that the current gradually decreases back to 40-43 mA.
- 10.4.7.5 Press HOLD and remove test loads.
 - Verify that channel 1 continues to treat correctly.
 - Short out 500 ohm resistor on both channels. Displayed current increases.
 - Verify that the current gradually decreases back to 40-43 mA.

10.5 Dual Timer Mode

10.5.1 Connect 1K loads to CH1 and CH2. Connect a 10X scope probe to each of the 1K loads.

- 10.5.1.1 Select DUAL TIMER mode.

- Select Premodulated mode
 - 1-15 Hz sweep
 - Adjust output to 20 Ma.
 - Verify waveform and sweep
- 10.5.1.2 Press timer select for Channel 2 in Premodulated Mode, 80-150 Hz sweep.
- Adjust output to 20 mA
 - Verify waveform and sweep.
 - Verify Channel 1 continues to treat correctly
- 10.5.1.3 Stop Channel 1
- Select Medium Frequency mode for Channel 1
 - Adjust output to 20 mA.
 - Verify waveform.
 - Verify that Channel 2 continues to treat correctly.
- 10.5.1.4 Stop Channel 2
- Select Biphasic mode for Channel 2 at 300 μ s, 5 Hz
 - Adjust output to 20 mA.
 - Verify waveform and frequency.
 - Verify Channel 1 continues to treat correctly
- 10.5.1.5 Stop Channel 1.
- Select Biphasic mode for Channel 2 at 200 μ s, 60 Hz.
 - Adjust output to 20 mA.
 - Verify waveform and frequency.
 - Verify Channel 2 continues to treat correctly
- 10.5.1.6 Stop both channels.

10.6 Protection Circuitry

Caution: The following tests are made with hazardous voltages exposed in the chassis. Exercise caution so as not touch fuse holders or primary wiring. These tests are only required to verify protection circuitry operation if the main board is replaced. Use 1K loads for the following tests.

- 10.6.1 Watchdog Timer Reset:** repeat paragraph 10.4.1.1 & 2. Momentarily short U6 pins 13 and 14, verify the unit resets. (FF08 occurs)
- 10.6.2 Overvoltage Shutdown:** repeat paragraph 10.4.1.1 & 2. Momentarily short TP10 for CH1 to TP1. Verify E 03 is displayed in the time window, outputs go to 0 volts and no additional keypad entries are recognized. Turn power OFF, wait two seconds, turn power ON. Repeat test for CH2 using TP13.
- 10.6.3 Overcurrent Shutdown:** repeat paragraph 10.4.1.1 & 2, momentarily short TP11 to TP1. Verify E 05 is displayed in the time window, outputs go to 0 volts and no additional keypad entries are recognized. Turn power OFF, wait two seconds, turn power ON. Repeat test for CH2 using TP14.

10.6.4 High Impedance (part A): repeat paragraph 10.4.1.1 & 2 without the 1K loads installed, verify as each channel's intensity is brought up the unit beeps twice, the appropriate CH LED blinks and E 07 is displayed in the time window.

10.6.4.1 High Impedance (part B): repeat paragraph 10.4.1.1 & 2 with the 1K loads installed. Remove the 1K loads and verify as CH1's displayed intensity is brought 0, the unit beeps twice, the CH1 LED blinks and E 07 is displayed in the time window. Repeat test for CH2.

10.7 Burn In Tests:

This test is only required if the power supply or main board is replaced.

10.7.1 Repeat paragraph 10.4.1.2, except set intensity to maximum and do not enter any time. Press GO, verify unit runs for 60 minutes. After burn-in repeat paragraphs 10.4.1 through 10.4.4 and 10.4.7.

10.8 Safety Tests:

These tests should be performed annually. Failure of any of these test parameters requires return of the system to the factory for repair.

10.8.1 Hipot Test. (Perform on both channels.)

10.8.1.1 Install 1 Kohm loads in both outputs and turn unit on.

10.8.1.2 Clip red hipot lead across power plug parallel blades.

10.8.1.3 Clip black hipot lead to power plug ground pin.

10.8.1.4 Hipot test to 1500 VAC for 1 second.

10.8.1.5 Remove black hipot lead and connect it to load in CH1.

11.8.1.6 Test to 3000 VAC for 1 second.

11.8.1.7 Move black hipot lead to load in CH2.

11.8.1.8 Test to 3000 VAC for 1 second.

10.8.2 Leakage Current Test. (Perform on both channels.)

10.8.2.1 Plug 226 into leakage tester.

10.8.2.2 Hold red lead on CH1 load.

10.8.2.3 Test leakage current in NORMAL and CLOSED, NORMAL and OPEN, REVERSE and CLOSED, and REVERSE and OPEN modes. Reading must be less than 50 microamps.

10.8.2.4 Hold red lead on CH2 load.

10.8.2.5 (Same as 10.8.2.3)

10.8.2.6 Hold red lead on metal plate at end of unit.

10.8.2.7 (Same as 10.8.2.3, except reading must be less than 100 microamps.)

10.8.3 Grounding Continuity.

- 10.8.3.1 Measure continuity with DVM between ground pin and exposed metal power bracket and vent shields.
- 10.8.3.2 Screws in rubber feet are isolated.

Section 11—Parts List

Description	Part #
Main Board Assembly ME-226	QT1-02
Power Supply Board Assembly	QT1-03
Fuse, 250 VAC, 400 mA	FB1-17
Case, Front	WKR1-17
Membrane Switch	HG1-19
“226” Label	PA7-71
Handle	WKR2-03
Output Jacks Label	PA7-70
Case, Back	WKR4-18
Rubber Foot	KA1-03
Hanger Stud	LB1-08
Power Cord Assembly (<i>Domestic</i>)	ME 7293
Case Screw 6-32 x 3/4"	JB3-08
Standoff, Aluminum Spacer	KL1-23
Power Supply Cable Assembly	QT2-05
Output Jacks And Cable Assembly	CH1—QT2-08
	CH2—QT2-09
Power Entry Bracket And Switch Assembly	QT2-02
Center Metal Shield	LJ3-01
Bottom Metal Shield	LJ3-03
Screw 6 x 1/4" Plastic, Shield Mounting	JJ1-01
Switched test load	XK7-06

Section 12—Accessories

12.1 Ordering Information:

Therapy products and accessories are available from Mettler Electronics authorized Distributors. For information regarding either Mettler products or a distributor near you, please call toll free, (800) 854-9305 or phone (714) 533-2221 in areas outside the continental United States. Ask for Customer Service. Mettler Electronics is open from 7 AM until 5 PM Pacific Time for your convenience. You may also reach Customer Service via email at mail@mettlerelectronics.com.

12.2 Sys*Stim 226 Accessories

Catalogue #	Item Description
107	Travel bag—Ideal for carrying the Sys*Stim to the patient. Holds one Sys*Stim 226 and its accessories
1004	Sonicator mounting plate, complete with three wood screws (Fits all Sonicator and Sys*Stim units)
1844	Sonigel—salt free colloidal water couplant, case of 12, 9.5 oz. tubes
1851	Sonigel clear gel couplant, (12 x 250 ml)
1852	Sonigel clear gel couplant, (1 x 5 liters)
1853	Sonigel clear gel couplant, (4 X 5 liters)
1863	Sonigel Lotion with Aloe Vera, 1 gallon with pump and pour off bottle
1864	Sonigel Lotion with Aloe Vera, 4 X 1 gallon individually packaged
2000	4 Sponge electrodes (2" x 2")
2001	24 Sponge inserts (2" x 2")
2002	4 Sponge electrodes (4" x 4")
2003	24 Sponge inserts (4" x 4")
2004	1 Sponge electrode (3.5" x 7")
2005	12 Sponge inserts (3.5" x 7")
2006	1 Sponge electrode (8" x 10")
2007	12 Sponge inserts (8" x 10")
2008	4 Electrode straps (24")
2009	4 Electrode straps (48")

2023	Pencil electrode set with push button stimulation control, (includes handle, 4 different sizes of stainless steel spot electrode tips, and carrying case)
2027	Pin to banana adapter plug set to be used with ME 2026, 2030 or 2221 electrode cables. Four each, gray.
2030	Bifurcation cable set, 2 cables, one red and one black, pin termination
2260	Electrode cable for the Sys*Stim 226 with pins
2221	EZ Trode – 2" diameter round self-adhering, reusable electrodes with lead wires; case of ten packages (four electrodes/pkg.)
2222	EZ Trode – 3" diameter round self-adhering, reusable electrodes with lead wires; case of ten packages (four electrodes/pkg.)
2223	EZ Trode – 2" x 5" self-adhering, reusable electrodes with lead wires, case of 10 packages (2 electrodes/pkg.)
2224	EZ Trode – 2" square self-adhering, reusable electrodes with lead wires; case of ten packages (four electrodes/pkg.)
2702	V Trode –2" diameter round electrodes with lead wires, case of ten packages (four electrodes/pkg.)
2703	V Trode –2.75" diameter round electrodes with lead wires, case of 10 packages (four electrodes/pkg.)
2704	V Trode –2" x 4" oval electrodes with lead wires, case of 10 packages (four electrodes/pkg.)
2705	V Trode –2" square electrodes with lead wires, case of 10 packages (four electrodes/pkg.)
73	Mobile cart—Can hold any Sonicator therapeutic ultrasound with the Sys*Stim 226, side by side. Has two additional shelves to hold additional supplies.
7293	Detachable U.L. listed, hospital-grade line cord