Welcome to Somatics, the World's Leader in ECT Innovation and Sales

Somatics manufactures and distributes the Thymatron® integrated brief-pulse electroconvulsive therapy (ECT) instrument (the world's most advanced unit for this treatment), accessories, supplies, books, patient information, and educational videotapes.

Somatics was founded in 1983 by two internationally recognized ECT experts and Professors of Psychiatry for the purpose of manufacturing and distributing the Thymatron® brief-pulse electroconvulsive therapy instrument. In just a few years Somatics became the leading manufacturer of this equipment world-wide, incorporating patent after patent into the design until, at present, Thymatron® instruments, accessories, and supplies are protected by 12 U.S. patents (foreign patents granted and pending).

The present goal of Somatics is to continue to improve the quality of ECT practice worldwide through extensive physician and nurse education and regular upgrades of its products.
ANESTHESIA DEPTH MONITOR NOW INCLUDED!

When the anesthetic Brevital© (methohexital) suddenly became unavailable in late 2001, many doctors switched to propofol (which is now used in many if not most ECT units worldwide). Propofol is more problematic to use than methohexital because it has a biphasic action and can shorten seizures. Because of this an increasing number of doctors—especially anesthesiologists—have been using costly OR monitors to measure depth of anesthesia for ECT (e.g., the Aspect© monitors, which incorporate their patented Bispectral Index©, or BIS©).

The good news is that Somatics has now incorporated an EEG Anesthesia Depth Monitor into the Thymatron® System IV at no increase in price. This feature allows the doctor to select a continuous display in the 8-character LED of one of 3 monitoring measures: 95% Spectral Edge Frequency (SEF-95), relative delta power (% delta), or median frequency (MF), each of which has been shown in several studies to correlate with anesthesia depth and with the BIS© (Billard et al, 1997; Alkire, 1998; Hirota et al, 1999; McDonald et al, 1999; Sakai et al, 1999; Singh et al, 1999; Hans et al, 2001; Kuizenga et al, 2001; Koitabashi et al, 2002).

Of the 3 measures, the SEF-95 (which is the EEG frequency below which 95% of the EEG power is contained) has been most thoroughly documented and remains widely-used throughout the world today; it is useful with all anesthetic agents.

This remarkable new upgrade is a prime example of how Somatics is continually improving its products in response to the needs of practicing clinicians—it is the latest in a long series of important upgrades introduced for the Thymatron® System IV, during which time Mecta has not introduced any new features for its Spectrum machine.
MECTA SPECTRUM NO IMPROVEMENT OVER SR-1

In a recent study of ECT-device seizure efficacy Krystal et al (2000) found they had to set their old Mecta SR-1 machine to the maximum dose in 15% of their patients in order to get a barely acceptable seizure, and even at this dose, the MECTA failed to produce adequate seizures 5% of the time.

If you were hoping to improve this poor performance by trading in your old SR-1 towards a new Spectrum you will certainly be disappointed. Krystal and Weiner (2001) repeated their study using a Spectrum and got even worse results than with their SR-1 despite the Spectrum's somewhat longer stimulus: 30% of patients now required the maximum dose and 10% failed to obtain adequate seizures.

MECTA SR-1 FORCES USE OF INEFFICIENT STIMULI

You knew the MECTA SR-1 was discontinued several years ago, but did you know it was already long obsolete? If your hospital owns an SR-1 the most efficient stimulus you can deliver has a 2-second duration and 1 msec pulsewidth, and it’s just not good enough—here’s why.

The Washington University study of Isenberg et al (1996) illustrates this point decisively, because these authors actually compared the MECTA SR-1 with the Thymatron® DGx for efficiency in stimulus induction in a sample of 403 patients. They used the Thymatron® to deliver a 0.5 msec pulse for the longest possible duration (up to 8 sec), and the MECTA to deliver a 1 - 2 msec pulse for up to its 2-second maximum. It was no contest: 80% of patients receiving unilateral ECT with the Thymatron® had seizures with 50 mC or less, compared with only 37% of patients treated with the MECTA. For bilateral ECT, the results were even more dramatic: 100% of Thymatron®-treated patients seized at 100 mC or less (thresholds are higher with bilateral ECT), compared with only 29% of patients treated with the MECTA.

Striking confirmation of this result comes from a recent report that titrated seizure thresholds to bilateral ECT were significantly higher with the MECTA SR-1 than the Thymatron® DGx in 79% of patients studied, averaging 61% higher overall despite careful matching of stimuli and patient titration increments (Chanpattana, 2001). [See DOWNLOAD page for PDF file of article]

As these studies abundantly demonstrate, inefficient electrical stimuli require higher doses to produce seizures, and unfortunately, higher doses cause more memory and cognitive side-effects without enhancing therapeutic potency (Abrams, 2002). Moreover, because the MECTA SR-1 limits stimulus duration to a maximum of 2 seconds, doctors using it are forced to select the highly-inefficient 2 msec pulsewidth in order to deliver
the higher dosages needed for elderly patients or to administer unilateral ECT in the recommended range of 6 times threshold (Sackeim et al, 2000).

Incredibly, the Mecta Spectrum is hardly any improvement over the SR-1: you still have to use a 1 or 2 msec pulsewidth to deliver the maximum dose.

The amply documented inefficiency of the MECTA SR-1 is doubtless also responsible for its recently reported failure to produce adequate seizures in 5 of every hundred patients treated, and for the necessity of employing the maximum dosage in 72 out of 471 patients (Krystal et al, 2000).

It was already suspected over a decade ago that longer stimuli and shorter pulsewidths were most effective for ECT, which is when Somatics first introduced the Thymatron® DGx with its 8-second maximum stimulus and 0.5 msec minimum pulsewidth. Since then, the greater efficacy of longer-duration and shorter-pulsewidth stimuli has been repeatedly confirmed (Swartz and Larson, 1989; Rasmussen et al, 1994; Isenberg et al, 1996; Devanand et al, 1998; Swartz and Manly, 2000; Chanpattana, 2001).

The fact is, Somatics Thymatron® instruments are the only ones capable of delivering a 0.5 ms or even a 0.25 msec stimulus over the entire standard dosage range, and the only ones with stimulus durations up to 8 seconds. And, with the new Optimal Charge Rate programs, a single button press assures you of always automatically delivering the most efficient stimulus (Swartz, 1994) at any dose you select

Isn’t It Time To Upgrade To A Thymatron®?

MECTA SPECTRUM PROVIDES USELESS SEIZURE MEASURE

According to the MECTA’s Instruction Manual for the Spectrum 5000, a "stimulus adequacy" measure is available as a costly optional extra.

This measure ranges from 0-99%. MECTA claims that “higher numbers [are] associated with a greater likelihood of seizure adequacy”. But is this true?

Mecta admits that “The stimulus adequacy measure provides an estimation, for both unilateral and bilateral ECT, of the likelihood that the induced seizure differs from that associated with barely suprathreshold unilateral ECT (a type of ECT shown by Sackeim and colleagues to be subtherapeutic).”

Indeed. Sackeim and colleagues (1987) achieved only a 17% response rate to barely suprathreshold unilateral ECT, lower than response rates reported for sham ECT (Abrams, 1997). Thus, MECTA’s measure actually describes inadequacy: how much the seizure is better than no seizure at all.
Because higher numbers reflect only a lesser degree of seizure inadequacy, even a result of 99% would just mean that the seizure was 99% less inadequate than no seizure or a subtherapeutic seizure.

In marked contrast, the Postictal Suppression Index of Thymatron® instruments (US Pat. #5269302) truly reflects seizure adequacy. A recent study (Petrides et al, 2000) obtained an 85% remission rate in major depressives with a Thymatron®. The average Postictal Suppression Index for these remitters was 87%, significantly higher than for the 15% of patients who failed to achieve remission.

The authors concluded: “These data support that higher PSI values (more abrupt ending of ictal EEG) are correlated with better clinical outcome of ECT in depression. This putative marker of seizure generalization may be useful as an index of treatment adequacy.”

Thymatron® SAFETY VERIFIED BY MRI SPECTROSCOPY

Ende et al (2000) recently used proton magnetic resonance spectroscopic imaging to study hippocampal effects of ECT given with a Thymatron® instrument. In 17 patients receiving either unilateral or bilateral ECT (all of whom improved with treatment), no differences were found from 30 control subjects in hippocampal N-acetylaspartate signals, supporting numerous earlier studies failing to find evidence for central nervous system abnormalities after ECT (Abrams, 1997).

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What does the single-neuron action potential tell us about ECT stimulus efficacy?

For an ECT stimulus to induce a seizure, it has to start by discharging individual neurons, so the most effective way to stimulate neurons is also the most effective way to induce clinical seizures.

The neurophysiological key to neuronal discharge is the chronaxie of the neuron, which is the time it takes for a twice-threshold stimulus to discharge the neuron. Because human cerebral neurons have a chronaxie of around 0.2 msec, ECT pulses that are much wider than 0.2 msec are delivering unnecessary electricity that contributes only to the memory side-effects of the treatment.

The Thymatron® System IV can deliver its maximum dose using a pulsewidth as small as 0.25 msec, whereas the Mecta Spectrum has to use a 1.0 or 2.0 msec pulse to deliver its maximum dose, effectively wasting most of it and needlessly causing memory loss.
What is bifrontal ECT, and how do its efficacy and side-effects compare with those of bitemporal and unilateral ECT?

Bifrontal ECT is a modification of conventional bitemporal ECT in which the stimulus electrodes are moved anteriorly, over the forehead, to a position 2 inches above the lateral angle of each orbit; it is thus a form of bilateral ECT.

Well-designed controlled studies at 2 research centers have demonstrated bifrontal ECT to be at least as effective as bitemporal ECT in relieving the symptoms of major depression, and to have fewer memory and cognitive side-effects (Lawson et al, 1990; Letemendia et al, 1993; Bailine et al, 2000). One of the study sites included a unilateral ECT control group (Letemendia et al, 1993) that unexpectedly also exhibited a smaller antidepressant response, and more memory and cognitive side-effects, than the bifrontal ECT group.

An additional potential advantage of bifrontal ECT is that, like bitemporal ECT, it is effective when administered modestly above the seizure threshold (Bailine et al, 2000), which means that it does not share the problematic dose-sensitivity of unilateral ECT.

If these results are confirmed by one or two additional well-controlled studies, it is quite conceivable that bifrontal electrode placement could become the method of choice for ECT.

What is ECT seizure quality and how is it measured?

The quality of the ECT-induced seizure is a reflection of the degree to which the seizure is generalized throughout the brain. Traditionally, seizure quality is evaluated by examining the paper EEG record for signs of high amplitude, rhythmic discharge patterns, symmetry, and a sharp voltage drop (postictal suppression) at seizure termination (Fink and Abrams, 1998). In recent years, computer programs have been developed that perform these analyses automatically while the seizure is in progress and print the results when the treatment ends.

The Thymatron® System IV provides several patented, computer-automated, end-of-treatment reports of seizure amplitude (Maximum Sustained Power, Seizure Energy Index), symmetry (Maximum Sustained Coherence), and termination (Postictal Suppression Index), providing immediate feedback on several key aspects of seizure quality.
What is the importance of being able to deliver the maximum ECT dosage using stimulus parameters in the physiological range?

Younger patients with their low seizure thresholds are relatively easy to treat, even with inefficient stimuli. It is the increasing number of older, high seizure threshold patients that present the greatest challenge, and many of these will require maximum device dosage. Because seizure thresholds are lower with short-pulsewidth, long-duration stimuli (Swartz and Larson, 1989; Isenberg et al, 1996; Chanpattana, 2001), such stimuli will also be most effective in obtaining seizures in patients who require the maximum dose.

The Thymatron® System IV can deliver its maximum dose with the shortest pulsewidths (0.25 or 0.5 msec) and longest stimulus train duration (8 sec) of any available ECT device.

What is transcranial magnetic stimulation, and is it likely to replace ECT?

Transcranial magnetic stimulation (TMS) uses high-energy magnetic fields to induce electric currents in the brain. Thus, like ECT, TMS is a brain electrical stimulation treatment method. Such stimulation can be administered at doses too low to induce a seizure (nonconvulsive TMS) or at seizure-inducing levels (convulsive TMS).

Neither form of TMS is yet FDA-approved, but controlled research studies have shown that nonconvulsive TMS, which does not require anesthesia, can be an effective treatment for some forms of depression, with a therapeutic yield similar to that obtained with antidepressant drugs (Abrams, 2002). Nonconvulsive TMS may possibly receive FDA approval within a few years, at which time it is likely to be a useful addition to available treatment choices for depression; however it seems unlikely that it will ever replace ECT in the more severe (e.g., melancholic) forms of depression.

Convulsive TMS has only been used in one human experiment in which several costly high-energy magnetic boosters were required to induce a seizure similar to that obtained with ECT. It is likely to be many years before convulsive TMS could receive FDA approval, and little chance that it could exhibit greater therapeutic potency than ECT.

Patients and their Family
Can ECT Cause Brain Damage?

The available evidence speaks strongly against this possibility. Patients receiving ECT show no elevation of brain enzymes and proteins that are released into the bloodstream when brain damage occurs, such as after a stroke. Carefully-controlled animal studies have shown no evidence of brain damage from brief seizures as given with ECT, and sensitive brain-imaging studies performed months after ECT have shown no structural changes. The amount of electricity used in ECT raises brain temperature far less than 1/10 of a degree and cannot cause electrical injury.

Does ECT Cause Permanent Memory Loss?

Not in most people. Most importantly, ECT does not interfere with the ability to learn, and many studies have shown better learning after ECT than before it, probably because of improved concentration from relief of depression. A few patients, however, still have not regained some specific personal memories when tested six months or longer after receiving a form of treatment called bilateral ECT. Generally these memories are for events in the months immediately preceding ECT. No long-term or persistent effects of ECT on intellectual abilities or memory capacity have been shown to occur. Indeed, memory problems in patients with psychiatric illness result more often from medications, incompletely-treated illness, and aging.

Hasn't ECT Been Replaced by Medication Therapy?

Medication helps many patients who might otherwise require ECT, but for over 30,000 U.S. patients each year ECT is the most effective treatment. Some patients do not respond to medications, others cannot tolerate the side-effects, and still others--those whose illness has made them seriously suicidal, for example--urgently require the reliable symptom relief that only ECT can provide.

How Does ECT Work?
Although it is necessary for the brain cells to interact with each other chemically and electrically for ECT to work, exactly how this interaction is therapeutic needs further investigation. We believe that patients with melancholia have a severe biochemical disorder of the nervous system that ECT corrects. A number of rigorously-designed research projects are under way to study this question.

**How is ECT Given?**

With the patient reclining, a sleeping medication is injected in a vein and the patient rapidly falls asleep. A muscle-relaxing medication is then injected, while the patient breathes pure oxygen. When the patient's muscles are relaxed, a brief electrical charge is applied to the scalp, stimulating the brain into rhythmical activity that lasts about a minute and is accompanied by release of chemicals from nerves in the brain. Mild contractions of the muscles occur during this "convulsion." When it is over, the patient is taken to a recovery area and observed by trained staff until he awakens, usually within 20 minutes.

**How Many Treatments Are Given and How Often?**

ECT is usually given two or three times a week for a total of 6 to 12 treatments. A few patients may require more than 12 treatments for maximum benefit.

**How Safe is ECT?**

A 1999 study from California found about one death per 50,000 treatments, which is far below the risk of childbirth. Other studies have shown that death from heart attack and other causes is less frequent among depressed patients who received ECT than among those who did not. With modern anesthesia, fractures and oxygen deprivation virtually never occur, and most patients with high blood pressure or heart conditions can now safely receive ECT.

**Is ECT a Frightening Procedure?**
The dramatization of ECT in movies like "One Flew Over the Cuckoo's Nest" bears no resemblance to modern ECT, which is neither painful nor a punishment. Most patients surveyed after ECT say that it is no worse than going to the dentist, and many find ECT less stressful.

**Is ECT Considered a Standard Psychiatric Treatment?**

Yes, one that has been used for over 60 years. A blue-ribbon panel convened in 1985 by the U.S. Government's National Institutes of Mental Health found that ECT was "demonstrably effective for a narrow range of severe psychiatric disorders", including depression, mania and schizophrenia. In 1990 and in 2001, the American Psychiatric Association reaffirmed ECT as effective for all types of major depression and manic-depressive illness, and for some instances of schizophrenia.

**Is ECT Curative?**

ECT is an exceptionally effective medical treatment, helping 90% of patients who take it. Most patients remain well for many months afterwards. The tendency to relapse after a favorable treatment outcome can often be countered by medication taken for up to a year after ECT. Permanent cures for psychiatric illnesses are rare, however, regardless of the treatment given.

**Must a Patient Give Permission for ECT?**

Virtually always, just as with any medical procedure. Most states require that informed consent for ECT be obtained in writing after an explanation of the procedure, its potential benefits, risks and side-effects, and a description of available alternative treatments. Of course, the patient can withdraw consent at any time. Treatment of patients who have been declared incompetent by a court of law may require professional legal guidance.

**What About Talk Therapy or Psychotherapy?**
Psychotherapy employs techniques of education, suggestion and persuasion to help many people adjust to stress and emotional situations. Although it is usually not very helpful in treating the more serious illnesses that lead to hospitalization, psychotherapy may be useful once ECT has relieved the illness.

**What are the Indications for ECT?**

Severe depression (melancholia) is the most frequent indication for ECT. Patients with this illness experience sadness and despair, have difficulty concentrating, lose appetite and weight, sleep poorly, blame themselves, are unable to enjoy life, and often think of suicide. Mania and schizophrenia are other illnesses that can be helped by ECT.

**What Are the Main Side-Effects of ECT?**

On awakening from ECT, it is customary for patients to experience some confusion, which generally clears within an hour. Although most patients consider their memory function significantly improved after ECT, memory for some recent events, dates, names of friends, public events, addresses and telephone numbers may not be as good. In most patients the memory disturbance goes away within a few days or weeks, but it occasionally continues in a mild form for a period of months, or longer. Many patients will find that their memories are somewhat hazy for the time that they were ill; the same problem is frequently experienced by depressed patients who do not receive ECT. Memory disturbances are not needed for ECT to work, and doctors use special techniques (such as brief pulse and right unilateral ECT) to minimize or avoid any effects on memory.

**What is Electroconvulsive Therapy?**

Electroconvulsive therapy (ECT) is a modern medical treatment for certain illnesses that have mental or emotional symptoms. In this treatment, the patient goes to sleep under general anesthesia, receives muscle relaxants and oxygen, and then receives a brief electrical stimulation to the scalp. The resultant nerve-cell activity releases chemicals in the brain and helps restore normal functioning. ECT resembles cardioversion, a common medical procedure in which the heart is stimulated electrically in order to restore normal functioning, but ECT uses a much smaller amount of electricity.
Who Gives ECT, and Where?

ECT is given by a treatment team of doctors, nurses, and nursing assistants, including an anesthesia specialist. Virtually all ECT is given in hospitals or ambulatory care centers, in a specially-equipped area, either on an inpatient or outpatient basis.

Why Does ECT's Public Image Suffer?

Just as with other medical treatments, from appendectomy to penicillin, ECT was used excessively in the past, mostly in large, understaffed mental hospitals in the 1940s. The drama of mental illness has also been exploited by fictional movies such as "The Snake Pit" that included stark and exaggerated portrayals of ECT to emphasize a story. More recently, quasi-religious groups have received media attention for unsubstantiated claims that all medical approaches to psychiatric illness are undesirable. This pamphlet is intended to provide the facts about ECT in order to further understanding of its value.
The Thymatron® System IV has just become the first ECT device in history to feature an Anesthesia Depth Monitor. The recent unavailability of the anesthetic Brevital© (methohexital) has required many doctors to switch to other less-familiar agents, including especially propofol, whose biphasic action and seizure-shortening properties require special care in its use.

The new Anesthesia Depth Monitor provides a continuous front-panel display of your choice of 3 measures shown to correlate highly with anesthesia depth and with the Bispectral Index© (BIS©): 95% Spectral Edge Frequency (SEF-95), relative Delta power (% Delta), and Median Frequency (MF). Although these measures are presently available only on OR monitors costing in the range of US$10-20,000 they are now included with the Thymatron® System IV at no additional cost (upgrades to existing Thymatron® System IV units will also be made available, price to be announced).
NEW PALM© SOFTWARE

The Thymatron® System IV now includes new software that lets you use a Palm© pocket-size computer (not included) to enter clinical patient information, store treatment data—including digital EEG analysis results—for up to 40 ECTs, and transfer all data to other computers at your convenience. There's no need to bring a bulky or costly computer to the ECT room or leave it there overnight: You can use the pocket-sized Palm© computer.

STATE-OF-THE-ART MONITOR/PRINTER

Allows you to monitor EEG1, EEG2, EKG, and EMG (or, choose 4 channels of EEG), plus 2 derived channels: digital heart rate and anesthesia depth index, while providing hard-copy documentation for the patient's chart.

IMPROVED FRONT-PANEL FLEXDIAL© SELECTOR

Lets you select all the traditional Thymatron® functions plus important new ones, including an Ultra-brief (0.25 msec) pulse and programs that automatically set the most effective combination of stimulus parameters at any stimulus dose you have selected.

EXTENDED LOWER STIMULUS RANGE

Pulsewidth and frequency settings to 0.25 msec and 20 Hz allow you to deliver stimuli up to 8 seconds long, to optimize treatment in accordance with research showing greater efficacy of short-pulsewidth, low-frequency, extended-duration stimuli (Isenberg et al, 1996; Chanpattana, 2001).

EXPANDED, COMPREHENSIVE END-OF-TREATMENT REPORT

Now includes, in addition to the familiar Thymatron® DGx measures, your choice of the following new measures unique to the Thymatron® System IV (U.S. pat. #5,871,517):
EEG COHERENCE MEASURES of maximum sustained coherence and time to peak coherence, interhemispheric cross-correlation measures reported to reflect seizure quality and clinical impact (Roemer et al, 1990-91; Krystal & Weiner, 1994; Krystal et al, 1995; Krystal, 1998; Perera et al, 2002).

EEG AMPLITUDE MEASURES of maximum sustained EEG power, and time to peak power, with separate values for early, mid- and postictal seizure phases, found by the Columbia and Duke University groups to be important correlates of seizure quality and efficacy (Nobler et al, 1993, 2000; Krystal & Weiner, 1994; Krystal et al, 1995; Suppes et al, 1996; Krystal, 1999; Perera et al, 2002).

HEART RATE MEASURES, including peak heart rate, a key measure of cerebral seizure duration and quality (Larson, Swartz, & Abrams, 1984; Swartz, 1993; 1996) that reflects the autonomic (brainstem) response to ECT. This is supplemented by continuous digital heart rate monitoring for safety and seizure generalization, with the result printed each second on the recording strip.

**A POWERFUL 32-BIT INTERNAL COMPUTER**

Employs Power Spectral Analysis (FFT) to process and store up to 10 minutes of digitized EEG for the special features described here. You can send this data to any IBM PC-compatible or Palm computer via a rear-panel serial port for further comprehensive EEG analysis.

**DIGITAL EEG MACHINE FUNCTIONS**

The Thymatron® System IV has all the functions of a sophisticated 4-CHANNEL DIGITAL EEG MACHINE with frequency, coherence, asymmetry, and power spectral analytic programs. These allow you to record and analyze EEGs in your ECT patients between treatments to measure ECT-induced frontal EEG slowing and other EEG manifestations reported to reflect treatment impact and efficacy (Fink & Kahn, 1957; Roemer et al, 1990-91; Sackeim et al, 1996).

Because each ECT treatment session is STORED IN MEMORY, you can retrieve it if you run out of paper during a treatment -- just slip in another roll after the treatment and press a button for a complete printout.

**PATENTED INDEPENDENT SAFETY MONITOR CIRCUIT AND ALARM**
Prevents the patient from receiving an excessive electrical dose regardless of the operation of the regular circuits.

TRUE EMG RECORDING OF THE MOTOR SEIZURE

Unlike simple movement detectors, the Thymatron® System IV's EMG can measure seizure muscle activity that is not visible to the naked eye, and which typically continues substantially longer than visible movements (Couture et al, 1988).

JUST SET ACCORDING TO AGE AND TREAT

Setting the Thymatron® System IV according to the patient's age facilitates easy selection of a stimulus charge for unilateral, bitemporal, or bifrontal ECT that is in the preferred range (Beale et al, 1994; Petrides & Fink, 1996).

EASY UPGRADES

Because the special computer-automated programs of the Thymatron® System IV are stored on REPLACEABLE MICROCHIPS, future system updates (there have been 4 already) can easily be accomplished via chip replacement.

POSTICTAL SUPPRESSION INDEX

The PATENTED Postictal Suppression Index reports the degree of EEG flattening immediately following the seizure, which has been reported to correlate with clinical efficacy (Nobler et al, 1993; Krystal & Weiner, 1994; Krystal et al, 1995; Krystal, 1998; Suppes et al, 1996; Petrides et al, 2000; Perera et al, 2002).

SEIZURE ENERGY INDEX

**PRINTOUT OF SEIZURE DURATION BY EEG, EMG, AND EKG CRITERIA**

The Thymatron® System IV measures the EEG, EMG, and EKG, and automatically prints the corresponding seizure duration estimates with precision and reliability Larson, Swartz and Abrams, 1984; Swartz et al, 1994; Krystal et al, 1995).

**THE PATENTED AUDIBLE EEG©**

Also provides continuous EEG monitoring even if the recording paper runs out. It correlates highly with the visual EEG and keeps you constantly aware of the progress of the EEG seizure without having to watch the recording (Swartz & Abrams, 1986).

**EXTENDED SEIZURE ALERT**

Because longer seizures generate more cognitive side-effects, may clinicians prefer to terminate seizures that exceed 120 to 180 seconds on the EEG (Abrams, 2002). To advise the clinician that this point has been reached, the Thymatron® System IV provides an intermittent click tone when a user-selected interval has elapsed after the stimulus and monitoring has not been terminated.

**RAPID STIMULUS TITRATION**

Is facilitated with the Thymatron® System IV using a simple method-of-limits procedure (McCall et al, 1993; Rasmussen et al, 1994).
Thymatron® System IV

Specifications

Stimulus Output

Current: 0.9 A constant, isolated from line current
Frequency: 10 to 70 Hz in 10 Hz increments (to 140 Hz for 0.25 ms pulse)
Pulsewidth: 0.25 to 1.5 ms in 0.25 ms increments
Duration: 0.14 to 8.0 s in increments of equal charge
Maximum: 504 mC (99.4 J @ 220 ohm); 1008 mC (188.8 J @ 220 ohm) with double-dose option (where available)

Recording
8 user-selectable gain positions for EEG channels (10, 20, 50, 100, 200, 500, and 2000 µV/cm) and EMG/ECG channels (50, 100, 250, 500, 1000, 2500, 5000 and 10,000 µV/cm)

Requirements

100-130 volts A.C., 60 Hz, single phase. 100 VA./220-240 volts, 50/60 Hz switchable.

Approvals

CSA, CE, ISO 9000, TUV, FDA, IEC 601
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Upload Treatment Data to Palm© Computer: No

Ultrabrief Pulse Therapy: No

Upgrade by Changing Microchip: No

Maximum Sustained EEG Power: No

Continuous Digital Heart Rate Display & Printout: No

Baseline and Peak Heart Rate Printout: No

Seizure Duration from Heart Rate: No

EEG Coherence Analysis: No

Seizure Energy Index: No
Postictal Suppression Index   No

Computer-Determined EEG Seizure Duration   No

Computer-Determined Motor Seizure Duration   No

True EMG Monitor   No

EEG Ictal Line Seizure Indicator   No

Light-Emitting Elapsed Time Display   No

Up to 8 Seconds of Stimulation   No

Select Preferred Waveform without Altering Chosen Dose   No

Disposable stimulus electrodes and oral protectors   No

Audible EEG© monitor   No
Instant Impedance Test

Extended Seizure Alert
Advantages of the Thymatron® System IV over the MECTA Spectrum™

ANESTHESIA DEPTH MONITOR

Only the Thymatron® System IV features an Anesthesia Depth Monitor to provide important feedback through a continuous front-panel display of the 95% Spectral Edge Frequency (plus 2 other measures) to facilitate use of the newer anesthetic agents (e.g., propofol) that have become widely used since Brevital® became unavailable earlier this year. Although Anesthesia Depth Monitors have so far only been available on OR monitors costing US$10-20,000 this remarkable new feature is now included at no additional cost.

Of course, no such upgrade is available for the Mecta Spectrum, which has not been upgraded since its introduction several years ago.
4-Channel Monitor/Printer

The Thymatron® System IV monitors and prints 4 channels (EEG1, EEG2, EKG, EMG), whereas the Spectrum retains the same old 2-channel printer used for the model SR-1.

Moreover, although an oscilloscopic display creates a "high-tech" appearance, further thought reveals it to be of dubious value because anything displayed on the Spectrum's screen disappears forever before you have had a chance to examine and evaluate it.

(In contrast, the real-time, large-screen display of the Thymatron® System IV recording channels via the Genie© IV can be played over and over again and stopped for closer examination whenever you wish.)

Computer-determined Seizure Duration Estimates by EEG, EMG, and ECG

Only the Thymatron® System IV automatically tells the doctor when the seizure has ended. In addition to the patented EEG and EMG endpoint measures of the Thymatron® DGx, the Thymatron® System IV now adds a seizure duration estimate derived from the heart rate, providing unique new information on this critical measure of subcortical ECT response.

Continuous Digital Heart Rate Monitor

Only the Thymatron® System IV monitors and prints digital heart rate each second right on the treatment strip, and also prints the Baseline and Peak Heart Rates—important measures that reflect seizure quality—in the end-of-treatment report.

EEG Coherence Analysis, Seizure Energy Index, Postictal Suppression Index, and Maximum Sustained EEG Power

Only the Thymatron® System IV analyzes and prints out these patented reflections of ECT seizure quality and generalization.

Delivers Maximum Dose with Physiological Pulsewidth
Only the Thymatron® System IV can deliver its maximum dose (504 mC) using pulsewidths in the physiological range of 0.25 to 0.5 msec. In contrast, the Mecta Spectrum cannot deliver its maximum dose without using unphysiological pulsewidths of 1 - 2 msec (Mecta Corporation, 1998). In fact, the maximum dose the Spectrum can deliver at its 0.5 ms pulsewidth setting is only 288 mC.

This difference is critically important when giving unilateral ECT to older, high-threshold patients, most of whom will not develop a therapeutically active seizure at maximum dose unless the stimulus is physiologically efficient.

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**Duke University EEG Quality Measures**

The Thymatron® System IV also prints out the 3 EEG seizure quality measures developed by the Duke University group (Krystal & Weiner, 1994).

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**Storage and Playback of Entire Treatment Record**

Only the Thymatron® System IV digitizes and stores in memory the complete treatment—including the EEG, EKG, and EMG—thus allowing you to play it back afterwards (e.g., in case the paper ran out during treatment), or send it to a computer for further analysis via the included Genie IV program for EEG data acquisition, processing, and storage.

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**Power Spectral EEG Analysis**

Only the Thymatron® System IV performs a Fast Fourier Transform (FFT), the basis for all digital EEG analysis. Not only can the System IV actually print the power spectral EEG array in the end-of-treatment report if desired, the included Genie IV software and rear-panel RS232 port support a real-time display of all 4 channels of recording on your PC computer screen, with data storage for later analysis.

The Mecta Spectrum has no such capability. Its costly "EEG data analysis" option only allows the user to toggle on or off the printout of the useless "seizure adequacy" measure, described in the News & Notes section of this website.

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**Four Channel Digital EEG Machine Features**
The Thymatron® System IV therefore has all the functions of a 4-channel digital EEG machine, allowing you to record, store, and analyze EEGs between treatments in order to measure the prognostically-favorable frontal EEG delta activity reported by several investigators (Fink & Kahn, 1957; Roemer et al, 1990-1991; Sackeim et al, 1996) to predict the response to ECT.

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**Optimized Stimulus Programs**

Only the Thymatron® System IV allows the user to select a stimulus parameter combination that maximizes the efficacy for any stimulus dose selected, using either a ¼ msec or ½ msec pulsewidth. These programs automatically adjust frequency to maximize stimulus duration, consistent with the recent recommendations from Sackeim’s laboratory (Devanand et al, 1998).

Two studies have shown the greater efficacy of the Thymatron®'s short-pulsewidth, long-duration stimulus compared with the long-pulsewidth, short-duration stimulus of the Mecta (Isenberg et al, 1996; Chanpattana, 2001).

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**EMG Monitor**

Every Thymatron® System IV includes a genuine EMG monitor—the Spectrum offers only an extra-cost optical motion sensor that merely reflects gross physical movements, which typically stop while the EMG is still going (Couture et al, 1988).

Worse yet, the SPECTRUM's optical motion sensor can give false movement readings in response to changes in ambient light levels, and if the room is sunny, it may not work at all (MECTA Corporation, 1998).

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**Ultrabrief pulse**

Only the Thymatron® System IV provides an Ultrabrief (0.25 msec) pulse, which is closest to the published range reported for more efficient, physiological stimulation (Devanand et al, 1998); the Spectrum’s smallest pulsewidth is twice this value.

Ultrabrief pulse unilateral ECT has recently been reported to be as effective as standard-pulsewidth unilateral ECT but with much less memory losses (Sackeim et al, 2001).

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**Single Front-Panel FlexDial for all Choices**
Only the Thymatron® System IV has a single "turn-and-press" dial for selection of all stimulus variables and monitoring features—the Spectrum makes you scan through up to 9 different touchscreens of data, and retains the same 4 dials of the old SR-1 that must be individually adjusted to set the desired stimulus combination.

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**Up to 8 Seconds of Stimulation**

Only the Thymatron® System IV provides up to 8 sec of continuous stimulation for difficult cases—33% longer than the Spectrum.

This is critical in older, high-threshold patients because increasing the stimulus duration is the most effective way to increase the likelihood of obtaining a seizure (Swartz and Larson, 1989; Devanand et al, 1998).

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**Easy Stimulus Titration**

Only the Thymatron® System IV allows easy stimulus titration in equal-increment steps: one dial, 3 steps, for >95% of patients (McCall et al, 1993; Rasmussen et al, 1994).

In contrast, stimulus titration with the Spectrum requires the operator to set 4 separate dials for each step in the titration procedure (MECTA Corporation, 1998).

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**EEG Ictal Line Seizure Indicator**

Only the Thymatron® System IV prints a simple, continuous black line at the top of the strip to show the doctor when the seizure is in progress and when it has ended. No EEG expertise required!

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**EEG Reliability**

The great reliability of the Thymatron®'s EEG has been confirmed by investigators at several different centers (Swartz et al, 1994; Krystal & Weiner, 1995; Rosenquist et al, 1998).

In contrast, MECTA EEG tracings have been characterized as unreliable by more than one research group (Ries, 1985; Guze et al, 1989).
Change Waveform without Altering Preferred Dose

Only the Thymatron® System IV allows the doctor to adjust pulsewidth, frequency, and duration without altering the desired dose, whereas changing any of these variables on the Spectrum changes the dose.

Extended Seizure Alerting Signal

Only the Thymatron® System IV has this important safety feature that automatically alerts the doctor if the seizure has lasted longer than he has specified.

Audible EEG monitor

Only the Thymatron® System IV has this patented feature, which allows the doctor to monitor the EEG from anywhere in the treatment area, even if the paper runs out.

Light-Emitting Elapsed Time Displays

Only the Thymatron® System IV has large L.E.D.s with bright red letters that can be easily read from any angle, which include a timer to instantly show how long the seizure has been going on. The Spectrum’s display is hard to read without bending over directly in front of it.

Instant Impedance Test

Only the Thymatron® System IV lets you test patient impedance and then treat immediately without waiting—the Spectrum can make the doctor wait as long as 10 seconds when it requires a "system override".

No overrides are ever required with the Thymatron® System IV.

International Acceptance

The Thymatron® is the most widely-used ECT instrument in the world. In fact, there are many countries (Germany, United Kingdom, Australia, Denmark, Japan, China, to name just a few) where the ratio of Thymatrons® to MECTAs approaches 100 to 1.
Easy Chip Upgrades

Because the special computer-automated programs of the Thymatron® are stored on replaceable microchips, updates are easily accomplished on-site just by changing a chip. Somatics has provided System IV owners 4 advanced microchip upgrades in just 2 years: the Ultrabrief 0.25 msec pulsewidth program, the Palm® computer software connection, the real-time digital EEG monitoring component of the Genie® IV, and, most recently, the Anesthesia Depth Monitor upgrade.

In contrast, if Mecta ever offers any Spectrum upgrades (there have been none in the several years since the Spectrum was introduced) they will require returning the machine to the factory (Mecta Corporation, 1998).
This sample ECT report of the Thymatron® System IV shows that the doctor set the % Energy dial to the patient’s age of 45 years, yielding a 308 mC stimulus charge. The Optimal Charge Rate Program selected a 1/4 msec pulsewidth, 70 Hz frequency stimulus delivered over 7.2 sec. Prior to stimulus administration the impedance measured a safe 1440 ohms, which dropped to 260 ohms during stimulus delivery.

The EEG seizure lasted 48 seconds. Peak seizure amplitude was reached at 31 sec, with a Midictal Amplitude of 264 µV, a Maximum Sustained Power of 77841 µV², and an Average Seizure Energy Index of 72µV² all reflecting strong seizure intensity.

Peak Interhemispheric Coherence reached at 33 sec was consistent with the seizure amplitude peak at 31 sec. The Maximum Sustained Coherence value of 95% reflected synchronous participation of both hemispheres in the seizure. The rapid drop of EEG seizure amplitude to 10 µV postictally yielded a high Postictal Suppression Index of 96%. Power Spectral Analysis was not enabled.

In summary, the record shows a synchronous, high-intensity, well-developed, and well-generalized EEG seizure pattern with a strong mid-ictal phase, pronounced postictal suppression, and a substantial tachycardia response—which is to say, an ECT-induced seizure of high expected clinical efficacy (Abrams, 2002).
Thymatron® System IV - Integrated ECT Instrument

Accessories & Supplies
Educational Videotapes on ECT

Produced and distributed exclusively by Somatics in conjunction with internationally-recognized ECT experts Drs. Max Fink, Richard Abrams, and Conrad Swartz, these three videotapes cover all aspects of ECT, including patient and family orientation, history and theoretical principles, and step-by-step modern treatment technique.
Informed ECT for Patients and Families
by Fink M.

Informed ECT for Health Professionals
by Fink M.

The Technique of ECT
by Abrams R., Swartz C.

Books on ECT

Electroconvulsive Therapy
by Abrams R.
4rd Edition, 2002
Oxford University Press
ISBN: 0195148207
Oxford's price: $65
Somatics' price: $55

Handbook of ECT
by Kellner C.H., Pritchett
J.T., Beale M.D., Coffey
C.E.
1997
American Psychiatric Press

contact a Somatics dealer near you
New: Safe, Easy-to-Use, Disposable Mouth Protector for ECT

Introducing the Ventil-A™ single-use mouth protector for ECT (US patent 6,039,046), the natural complement to modern ECT.

Unlike skimpy cardboard-and-foam products that lack an air channel and cover only a few molars, the Ventil-A™’s thick 100% closed-cell foam construction (contains no cardboard) protects all the teeth. (And, even though the Ventil-A is made of premium material, it costs 40% less than the cardboard-and-foam product.)

The unique design with internal non-collapsible air channel allows free flow of oxygen and fits under any anesthesia mask—no other disposable does this.

Its dimensions are based on measurements of dozens of dental impressions of men and women of all ages—we guarantee it to fit >98% of adults.

Its one-piece design provides dimensional stability, ensuring reliable application without slippage; its looped end facilitates easy insertion and
removal.

As with Somatics’ Thymapad™ disposable stimulus electrodes (more than one million sold), the Ventil-A™ mouth protector saves the time and expense of washing and sterilization, and eliminates the risk of cross-infection that occurs with re-usable products.

See also MouthGuard™
Thymapads™

Used on over 70,000 patients since 1989.

Somatics' patented adherent stimulus electrodes for bilateral or unilateral ECT remain exactly where applied without slipping or sliding. No exposed metal surfaces to give accidental shocks; single-use design prevents contamination and cross-infection. Used on over 70,000 patients since 1989.

The good news for MECTA users is that Thymapads™ are now available for use with all MECTA machines. For almost a decade hundreds of users of MECTA machines have asked us to configure our patented Thymapad™ adherent stimulus electrodes for use with their equipment. Now, we are pleased to announce the availability of Thymapads™ that fit ALL Mecta stimulus cables, including the Spectrum's cables and have the correct impedance needed to pass the "self-test" procedure without requiring an "override".

contact Somatics now for a FREE trial supply
Somatics' uniquely designed autoclavable rubber MouthGuard™

In 2 sizes to fit all patients, Somatics' uniquely designed autoclavable rubber MouthGuard™ oral protectors with integral airway provide the thickness and elasticity to prevent tooth fracture or tongue bite. Lifetime warranty against cracking or crumbling. Latex-free.

Sterilization Information for Somatics Mouth Guards™:

- Steam autoclave to 143°C for 4 minutes with a 15 minute dry
- Use any liquid sterilization soak - gas sterilization acceptable

see also Ventil-A™ disposable mouth protectors
Electrodes

EEG/EMG/ECG Adherent Recording Electrodes

Easy and quick to use, "the pregelled electrodes provided in the Thymatron® DG Starter kit...reduce preparation time" (Convulsive Therapy 2:53, 1986), compared to metal electrodes and ordinary disposable paper EEG electrodes.

Their small size facilitates bifrontal or fronto-mastoid application without interfering with treatment electrode placement.

Ideal for recording EEG, EKG, and EMG, they are conveniently packaged 5 per strip -- just right for all monitoring configurations (one channel each of EEG and EKG or EMG, plus ground). Instantly adherent, they will remain in place throughout the seizure.
The MicroStim™ nerve-muscle stimulator

This hand-held, solid state, peripheral nerve stimulator weighs only 7 oz. It applies a pulsed 0.2 msec square-wave stimulus through surface electrodes to precisely determine the point at which a safe degree of succinylcholine-induced muscle relaxation has been achieved. The operator has the option of selecting continuous (tetanus) or intermittent (twitch) stimulus modes. Battery powered (9 volt alkaline), it comes in a soft carrying case that clips to a pocket or belt. 2.4"x1.0"x3.8"
EctoBrain™ II

Does your ECT device deliver the dose you specify?

Do you train doctors or nurses in ECT quality?
Device malfunction can cause ineffective ECT treatments or excessive side-effects. Now you can check your ECT device yourself with Somatics’ easy-to-use, patented EctoBrain™ II, which performs the same output check professional engineers use. A single button press instantly tells you if your ECT device is operating safely — providing reassurance and peace of mind. EctoBrain™ II works with any Thymatron® or MECTA device.

EctoBrain™ II also features a Patient Simulator mode that generates EEG, ECG, and EMG signals derived from real patients for testing up to 4 channels of your monitor/printer tracing display and for training and demonstration purposes. Both good- and poor-quality seizures can be selected.

The good-quality seizure shows a high amplitude EEG followed by electrical silence at termination, with a pronounced tachycardia response and a high-amplitude EMG that terminates shortly before EEG termination. The poor-quality recording exhibits a low-amplitude abortive-type EEG seizure lasting only 10 sec, followed by continued but lower-amplitude EEG fluctuations after termination; there is no tachycardia response, and an initial low-amplitude EMG response lasts only a few seconds.

A device checkup can cost $600 to $800 but real costs are more. How often does the question arise in treating a difficult patient whether the ECT device is stimulating properly or the EEG tracing recording correctly? Most ECT units sent to us for presumed malfunction have nothing wrong with them! EctoBrain™ II can quickly determine whether or not the device is working. It can reveal problems in technique (e.g., recording electrode application) that are correctable on site or with user-replaceable parts (e.g., leadwires). Just connect the stimulus and recording cables and press the TREAT button as for a patient.

The chart recorder of your ECT device will display samples of EEG, ECG, and EMG tracings as described above. The printed report will show the values of the stimulus parameters and other printed variables of your ECT device, including the measured stimulus charge output in mC.

SPECIAL PRICING WHEN ORDERED TOGETHER WITH THE THYMATRON® SYSTEM IV

SPECIAL PRICING WHEN ORDERED TOGETHER WITH THE Thymatron® System IV
References


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Sakai T, Singh H, et al (1999): Hypnotic endpoints vs. the bispectral index, 95% spectral edge frequency and median frequency during propofol infusion with or without fentanyl. Eur J Anaesthesiol 16:47-52


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