
18.0 WARRANTY

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ELECTROMATIC Equipment Co., Inc.
600 Oakland Ave. Cedarhurst, NY 11516—USA
Tel: 1-800-645-4330/ Tel: 516-295-4300/ Fax: 516-295-4399

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To avoid damage, do not move the center roller by hand. Tensions that exceed the tension range of the instrument by more than 100% may cause permanent damage to the measuring spring and must be avoided under any circumstances

1.0 INTRODUCTION

The CHECK•LINE® ETM2 Electronic Tension Meter is designed to accurately measure the running line tension of yarns, fibers and specialty filaments. It is supplied with miniature precision rollers at the end of special extended “fingers” which permit the user to measure tensions in areas with very limited access space. This manual provides operating instructions for the ETM2 and ETMP2(supplied with non-rotating ceramic pins) tension meters.

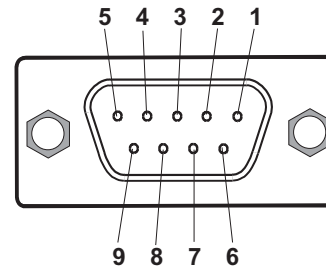
2.0 CONTENTS OF COMPLETE KIT

Tension Meter with 9 volt long-life battery
 Open end wrench (4mm jaw width)
 Screwdriver (1.5mm blade width)
 Operating manual
 Carrying case

17.0 APPENDIX -PIN ASSIGNMENTS

Pin Assignment and Signals of the Interface

(9-pin female D-sub connector)

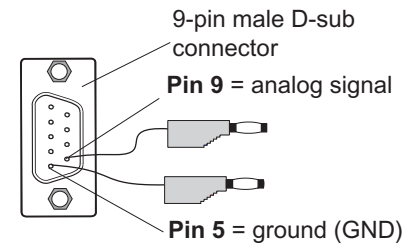


Pin No.	Signal	Description
1		Not assigned
2	TXD	Transmitted data
3	RXD	Received data
4		Not assigned
5	GND	Ground
6		Not assigned
7	RTS	Ready to send
8		Not assigned
9	2 volt DC	Analog signal

Signal	RS-232C
Data Bit	8 bit
Stop Bit	1 bit
Parity	None
Baud Rate	19200

Pin Assignment and Signals of the Analog Cable

(Option ETM2-CA)



16.0 SPECIFICATIONS

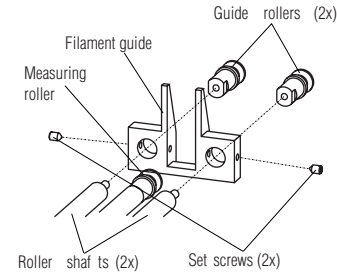
Calibration	According to factory procedure
Units of Measure	c/N / g, user selectable
Accuracy	$\pm 1\%$ FS* ± 1 digit (typically $\pm 0.5\%$ FS*)
Overrange	10% FS*, without accuracy guarantee
Overload Protection	200% FS*
Measuring Principle	Strain gauge bridge
Roller Deflection	0.5mm max
Signal Processing	Digital 12 bit A/D converter
Damping	Adjustable electronically (averaging)
Measuring Frequency	Approx. 5 kHz internally
Display Update Time	2x per second or higher
Display	4-digit LCD, 11mm high
Memory	Last, average, maximum, minimum, MAX _{PEAK} , MIN _{PEAK}
Temperature Coefficient	Gain: less than $\pm 0.01\%$ FS*/°C
Analog Output Signal	0—2 VDC (linearized) R _{load} > 1KOhm \pm approx 1% Converter frequency 30 Hz
Digital Output Signal	RS-232 (9600, 8, N, 1)
Temperature Range	10—45 °C
Air Humidity	85% RH, max
Auto Power Off	Automatically after approx 3 minutes of non-use
Power Supply	9 volt E block, e.g., long life 9 V lithium for approx 80 hours continuous use
Housing Material	Aluminum profile with plastic outer casing (PVC)
Housing Dimensions	230mm x 62mm x 48mm (LxWxH)
Weight	370 g (net) 1050 g (gross)

*FS = Full Scale

3.0 REMOVING & MOUNTING THE FILAMENT GUIDE

The tension meter is supplied with a filament guide for fast and easy material acquisition. For application in hard-to-reach areas with limited access space, you can remove the filament guide.

3.1 Removing the Filament Guide



- Loosen the Hexagon screws (2x) with the supplied screwdriver (blade width 1.5mm).



Do not unscrew the center measuring roller. Removing the measuring roller may alter the calibration of the instrument or cause permanent damage to the measuring spring.

- Unscrew and remove the guide rollers (2x) with the supplied open end wrench (jaw width 4mm).
- Slip the filament guide off the roller shafts.
- Screw the guide rollers (2x) back on to the roller shafts and carefully tighten them using the supplied open end wrench (jaw width 4mm) until handtight.

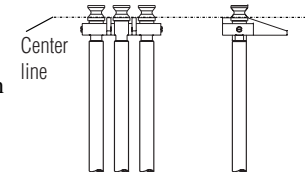
3.2 Mounting the Filament Guide

- Unscrew and remove the guide rollers (2x) with the supplied open end wrench (jaw width 4mm).

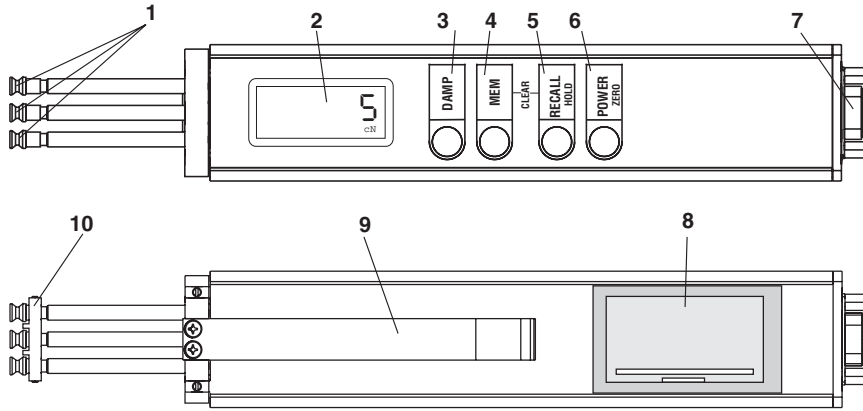


Do not unscrew the center measuring roller. Removing the measuring roller may affect the accuracy of the instrument or cause permanent damage to the measuring spring.

- Slip the filament guide onto the roller shafts. Make sure the rollers do not rub against the filament guide and that the process material can slide unhindered from the filament guide to the rollers (see figure at right, center line).
- Carefully tighten the Hexagon screws (2x) with the supplied screwdriver (blade width 1.5 mm) until hand-tight.
- Screw the guide rollers (2x) back on to the roller shafts and carefully tighten them using the supplied open end wrench (jaw width 4 mm) until handtight.




4.0 OPERATING ELEMENTS



- | | |
|---------------------------|-----------------------|
| 1 Rollers or ceramic pins | 6 POWER / ZERO key |
| 2 DISPLAY | 7 Interface |
| 3 DAMP key | 8 Battery compartment |
| 4 MEM key | 9 Lever |
| 5 RECALL / HOLD key | 10 Filament guide |

4.1 Battery Insertion

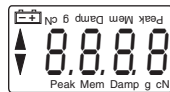
Before first use of your tension meter, you need to insert the battery. If the  symbol is shown on the display the battery has to be replaced.

- Open the battery compartment (8) which is located on the rear side of the tension meter.
- Insert a 9-volt battery (E block) into the battery compartment. Please ensure proper polarity. Close the battery compartment.

NOTE: Used batteries must be disposed of in compliance with local regulations. If the instrument will not be used for a longer period of time, the battery should be removed.

4.2 Power On

Press the POWER key (6) until all symbols are shown on the display. When you release the key, the display momentarily shows the tension range and the software version, e.g. E 1.0, followed by random values or “0.”



4.3 Switch-Off

Auto Power Off: ETM2 switches off automatically after 3 minutes of non-use.
Manual Power Off: Press and hold the POWER key (6) for 5 seconds.

15.0 PC COMMUNICATION (RS-232C INTERFACE)

The measured values and the memory contents can be transmitted over the RS-232 interface to a personal computer. You can connect the computer to the connector of the ETM2 by using the ETM2-CC special cable which is available as an accessory. The pin assignment of the connector is described in the Appendix.

Requirement: A communication program, such as Terminal or HyperTerminal (provided on MS Windows Version 3.0 or later) must be installed and configured on the computer.

Commands for communication with a PC (polling)

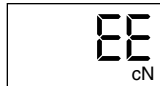
ASCII Code	Function	Description
D	Continuous transmission	Continuous transmission of readings, press any key to stop transmission
d	Send	Transmit current reading to PC once
m	Save	Start logging of measured data. Stopping data logging is carried out in the set memory mode.
r	Output	Output the memory contents to PC.
c	Clear memory	Delete the memory contents
a	Damping ON/OFF	Switch damping on or off.
z	Zero	Carry out zero adjustment of the instrument
u	Toggle unit of measure	Switch from g to cN and vice versa.

If the verification of the calibration according to section 12.0 shows a deviation beyond the allowable tolerance and a reliable operation is no longer allowed, the instrument has to be returned to the factory for recalibration. Please contact Electromatic.

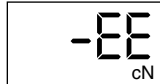
14.1 Error Messages during calibration

The following error messages might be displayed during the calibration of the tension meter

The weight suspended from the material is too heavy.



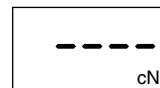
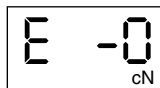
The weight suspended from the material is too light.



14.2 Restoring the factory calibration

You can restore the factory calibration at any time with the following procedure:

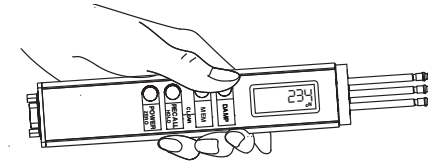
- Switch off the tension meter.
 - Press and hold the MEM and POWER keys until the display appears as shown.
 - Release the POWER key first, then release the MEM key.
 - Press and hold the DAMP and RECALL keys, then additionally press and hold MEM until the display shows
- The factory calibration is restored.
- Press the POWER key. The instrument switches off.



5.0 REVERSING THE DISPLAY

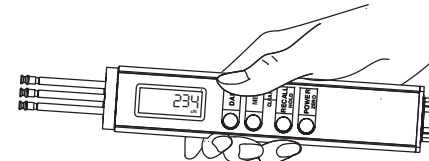
When you shift the tension meter from the right to the left hand, you can rotate the readings on the display by 180° to make them easier to read.

- Switch off the tension meter.



- Press and hold the DAMP and POWER keys until the DISPLAY shows the readings the other way around.

Restoring default orientation (right hand)



- Switch off the tension meter.
- Press and hold the DAMP and POWER keys until the DISPLAY shows the readings in the default orientation.

NOTE: The selected display orientation remains stored in the ETM2 memory even after the instrument is switched off.

6.0 SELECTING THE UNITS OF MEASURE

You can set the ETM2 to cN or g unit of measure, depending on the required tension range. The default setting is cN.

To select the unit of measure:

- Make sure that the tension meter switched off.
- Press and hold the RECALL and POWER keys until the new unit of measure is indicated on the display

NOTE: The selected display orientation remains stored in the ETM2 memory even after the instrument is switched off.

7.0 PERFORMING A ZERO ADJUSTMENT (AUTO ZERO)

The tension meter is calibrated according to the factory procedure for a vertical material path. If a different material path is required, you need to carry out zero adjustment for the new measuring position directly after switch-on. This procedure is necessary to compensate for the weight of the measuring roller in the new measuring position. The zero adjustment for the new material path only remains effective until the instrument is switched off.



Zero adjustment must be carried out whenever the material path is changed or the tension meter does not display "0". The process material must not yet be inserted.

- Switch on the tension meter and select the appropriate unit of measure (see section 6.0).
- Hold the ETM2 in the desired measuring position. Be careful to hold the instrument absolutely steady. Press the POWER key. The momentarily shows four zeros, then switches to a single zero.

The ETM2 is now adjusted for the new material path and is ready to measure.

2nd calibration point:

Suspend a weight which corresponds to 50% of the tension range from the measured material, vertically, as shown in figure for 1st calibration point,

- Press the lever down all the way.
- Thread the process material through the measuring rollers.
- Slowly release pressure on the lever until the outer rollers return to their original position.
- Press the MEM key. As long as the MEM key is pressed, the display shows a decimal value which is higher by approximately 800 than the second decimal value. The decimal value may vary from instrument to instrument.

1800
cN

- Release the MEM key when the value shown on the display is fairly stable.
- The instrument shows E-90

E-90
cN

- If the display shows E-15 again, the value was not accepted. Check the suspended weight and the material path between the measuring roller and repeat the procedure.

E-50
cN

3rd calibration point:

Suspend a weight which corresponds to 90% of the tension range from the measured material, vertically, as shown in figure for 1st calibration point,

- Press the lever down all the way.
- Thread the process material through the measuring rollers.
- Slowly release pressure on the lever until the outer rollers return to their original position.

- Press and release the MEM key. The display shows

The new calibration has been stored

cN

- If the display shows E-90 again, the value was not accepted. Check the suspended weight and the material path between the measuring roller and repeat the procedure.

E-90
cN

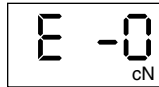
- Press the POWER key. The instrument switches off. Verify the new calibration, following the directions in section 12.0. If this procedure shows a deviation, you can recalibrate the tension meter again or restore the factory calibration as described in section 12.3.

14.0 STATIC CALIBRATION OF THE ETM2

The ETM2 is factory calibrated for a vertical material path. Recalibration must also be carried out with a vertical material path. One cN weight each, corresponding to 10%, 50% and 90% of the tension range, must be provided. No process material inserted. Tension meter switched off.

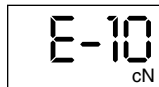
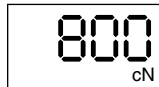
To select the calibration mode:

- Press and hold the MEM and POWER keys until the display appears as shown.
- Release the POWER key first and then the MEM key.



To calibrate the zero point mode:

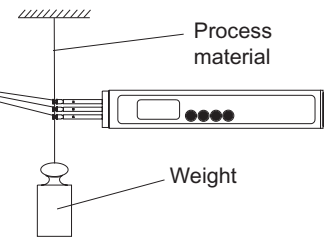
- Press and hold the MEM key. As long as the MEM key is pressed, the display shows a random decimal value between 500 and 1200 (see example at right). This decimal value may vary from instrument to instrument. Write down the decimal value
- Release the MEM key when the value shown on the display is fairly stable (the reading might fluctuate greatly). The display appears as shown at right.



1st calibration point:

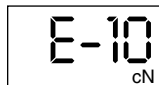
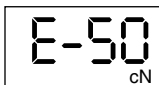
Suspend a weight corresponding to 10% of the tension range from the measured material, vertically, as shown in the figure.

- Press the lever down all the way.
- Thread the process material through the measuring rollers
- **Slowly** release pressure on the lever until the outer rollers return to their original position.
- Press the MEM key. As long as the MEM key is pressed, the display shows a decimal value which is higher by approx 200 than the first decimal value. This decimal value may vary from instrument to instrument.
- Release the MEM key when the value shown on the display is fairly stable.



NOTE: The weight must not swing.

- The display shows E-50:
- If the display shows E-10 again, the value was not accepted. Check the suspended weight and the material path between the measuring roller and repeat the procedure.

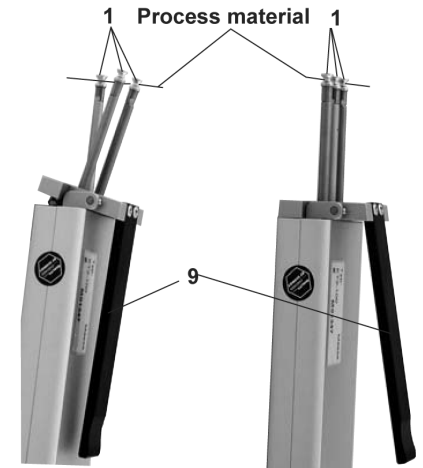


8.0 OPERATING PROCEDURE

- Switch on the tension meter and select the appropriate unit of measure.
- If needed, perform a Zero Adjustment, see Section 7.0

8.1 To insert the process material

- Press the lever (9) to tilt the outer guide rollers sideways.
- Thread the process material through the measuring rollers.
- Slowly release pressure on the lever until the outer rollers return to their original position.



- The display now shows the measured tension value.

NOTE: It is important to make sure that the process material runs smoothly between the measuring rollers (1).

8.2 To remove the process material

- Press the lever (9) and remove the process material
- Slowly release pressure on the lever until the outer rollers return to their original position.

9.0 SWITCHING ON THE DAMPING MODE

The ETM2 is equipped with an electronic damping which ensures steady readings when tension fluctuates. This is achieved by averaging the measured values at the set update rate. *Before switching on the damping mode, it is recommended that you measure the first values without damping enabled.*

- Before switching on the Damping Mode, process material must be correctly inserted and the first tension reading visible on the display.

To switch on Damping:

- Press the DAMP key. The display shows the set damping factor.
- Release the DAMP key. DAMP appears below the currently measured value

To switch off Damping:

- Press the DAMP key. DAMP disappears and only the currently measure value remains visible
- Release the DAMP key.

9.1 Changing the Damping Factor

The ETM2 is factory preset to a factor of 04. The tension values are thereby averaged for the display in the following way:

$$\frac{07 \text{ old values} + 9 \text{ new values}}{16}$$

The damping factor can be modified in 15 steps from

01 = **low damping**:

$$\frac{01 \text{ old value} + 15 \text{ new values}}{16}$$

to 15 = **high damping**

$$\frac{15 \text{ old values} + 1 \text{ new value}}{16}$$

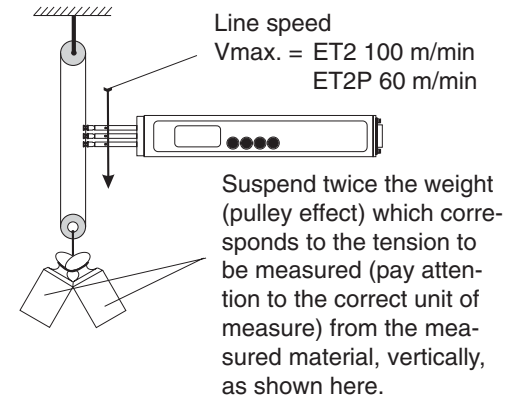
To change the Damping Factor:

- With the tension meter turned on, press and hold the DAMP key. The display shows the set damping factor. To increase the damping factor press the MEM key. To decrease the damping factor, press the RECALL key

NOTE: The selected damping factor remains stored in the ETM2 memory even after the instrument is switched off.

13.0 DYNAMIC CALIBRATION OF THE ETM2

All tension meters are calibrated with standard materials, such as polyamide monofilament (PA), according to the Electromatic factory procedure. Any difference in process material size and rigidity from the standard material may cause a deviation of the accuracy. In 95% of all industrial applications, the Electromatic calibration has been proven to provide the best results and is used for comparative purposes.



NOTE: Please remember to include the weight of the lower deflection pulley when you calculate the suspended weight, Pay attention to the correct unit of measure.

The tension meter has been calibrated dynamically according to the Electromatic factory procedure. Therefore, differences may occur between static and dynamic readings.

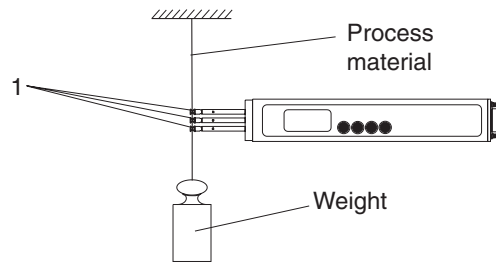
12.0 STATIC VERIFICATION OF MEASURING ACCURACY

All tension meters are calibrated with standard materials, such as polyamide monofilament (PA), according to the Electromatic factory procedure. Any difference in process material size and rigidity from the standard material may cause a deviation of the accuracy. In 95% of all industrial applications, the Electromatic calibration has been proven to provide the best results and is used for comparative purposes.

The ETM2 is factory calibrated for a vertical material path. If a different material path is required, you need to carry out zero adjustment as described in section 6.0. The required reference weight must be provided.

NOTE: The tension meter has been calibrated dynamically according to the Electromatic factory procedure. Therefore, differences may occur between static and dynamic readings. The required reference weight must be provided.

Verification Procedure: Tension meter must be switched on before beginning.



- Suspend a weight which corresponds to the tension to be measured (pay attention to the correct unit of measure) from the measured material, vertically, as shown in the figure above.
- Press the lever down all the way. Thread the process material through the measuring rollers as described in section 8.1. **Slowly** release pressure on the lever until the outer rollers return to their original position.
- The tension value shown on the display should be equal to the value of the suspended weight. (Pay attention to the units.)
- If this procedure shows a deviation, you can recalibrate the instrument following the directions in section 11.1

10.0 SAVING THE TENSION VALUES

The tension meter features a datalogger which saves the following data obtained during a measuring period:

- Average value
- Last value
- Maximum value (MAX),
- Minimum value (MIN),
- Minimum peak value (MIN PEAK) (lowest single value measured),
- Maximum peak value (MAX PEAK) (highest single value measured)

The measured data remain stored in the ETM2 memory even after the instrument is switched off.

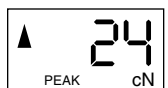
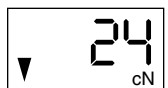
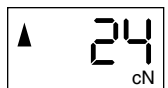
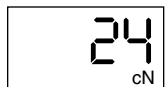
To save the tension values:

- Turn on the ETM2 and insert process material as described in Section 7.0.
- Press the MEM key to start the measuring period. While the tension data are being saved, the MEM indicator blinks on the display and the currently measured value is shown.
- When you want to end the measuring period, press the MEM key once again. Datalogging stops. The MEM indicator stops blinking and the current reading is displayed.

10.1 Recalling the saved tension values

You can end the recall at any time by pressing the POWER key.

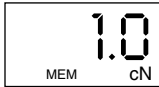
- Press the RECALL key. The display blinks, showing the **average value** of the measuring period and the double triangle symbol.
- Press the RECALL key. The display blinks, showing the **last value** of the measuring period.
- Press the RECALL key. The display blinks, showing the **maximum value** of the measuring period and the up triangle symbol.
- Press the RECALL key. The display blinks, showing the **minimum value** of the measuring period and the down triangle symbol.
- Press the RECALL key. The display blinks, showing the **maximum peak value** of the measuring period, the up triangle symbol and PEAK.



- Press the RECALL key. The display blinks, showing the **minimum peak value** of the measuring period, the down triangle symbol and PEAK.



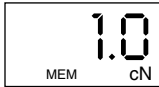
- Press the RECALL key. The tension meter switches back to the measuring mode and displays the current reading.



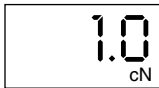
NOTE: The tension meter is now ready to begin new a measuring period. The previously saved tension values will then be overwritten with new values.

10.2 Clearing the ETM2 memory

If values are stored in the ETM2 memory, the display shows the MEM indicator.



- To clear the memory, simultaneously press the MEM and RECALL keys. The MEM indicator will disappear, indicating that all values stored in memory have been deleted.

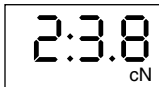


10.3 Memory Function HOLD

When the tension meter memory is empty, you can retain the last reading on the display by using the memory function HOLD.

To retain the last reading:

- Press the RECALL / HOLD key for about 1 second. The display shows 2:3.0 the last reading and the colon symbol.



To switch back to measuring mode:

- Press the RECALL / HOLD key 5 for about 1 second. The tension meter switches back to measuring mode.

11.0 ERROR MESSAGES

Error message 1:

The upper limit of the unit was exceeded by more than 10%. Reduce the line tension.

OR

AUTO ZERO is no longer possible. Recalibrate the instrument following the directions in section 12.1.

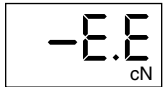


Error message 2:

The lower limit of the tension range was fallen below by more than 10%. Properly insert the process material.

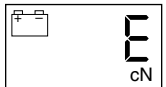
OR

AUTO ZERO is no longer possible. Recalibrate the instrument following the directions in SECTION 12.1



Error message 3:

The battery is low; the tension meter will power off soon. Operating the tension meter with a low battery may cause measurement errors.



ETM2 & ETMP2 TENSION METERS



Model ETMP2

Model ETM2



ELECTROMATIC
EQUIPMENT CO., INC.

600 Oakland Ave., Cedarhurst, NY 11516-U.S.A.
TEL: 516-295-4300 • FAX: 516-295-4399

Operating Instructions