TRIMMASTER

EMX-2
Electronic Metering Device and Equipment Controller

INSTALLATION

and

OPERATING INSTRUCTIONS

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Dear Customer,

TrimMaster is pleased that you have selected our EMX-2 electronic metering device. When installed and connected properly, your unit should give you years of reliable service. Please read through the entire installation instructions before connecting or using your unit.

Please retain the carton in which the control box was shipped. This will ensure proper packaging should a return for service become necessary.

If, after reading these instructions and installing your unit, you have any questions, please call for assistance on our toll free line 1-800-356-4237.

Again, thank you for your purchase.

TrimMaster

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OVERVIEW

The TrimMaster Model EMX-2 is an electronic metering device that meters elastic or binding on practically any sewing machine. It is also a function controller with the ability to control external devices such as a cutter, the sewing machine motor, a venturi, a stacker, etc. It has all these capabilities because it is based on a small, fast microcontroller (computer chip).

The EMX-2 stores up to 45 different tension settings. Once programmed, these settings may be kept indefinitely for future use.

The metering mechanism in the EMX-2 uses a stepper motor. This is a special kind of motor that advances in small steps (400 steps per revolution) in response to discrete signals from the control box. Likewise, the EMX-2 control box reads discrete pulses (120 per revolution) generated by a synchronizer mounted on the sewing machine handwheel. By using these pulses, the EMX-2 guarantees that the rollers in the metering mechanism precisely follow the motion of the sewing machine, no matter what the sewing machine speed is.

Often sewing machines produce slightly longer stitches when they operate at high speeds than they produce at low speeds. Therefore, the EMX series of metering devices features sewing machine speed compensation. Without speed compensation, metering devices tend to feed either too much elastic at slow speeds or not enough at high speeds to maintain consistent gathering. When a compensation percentage is programmed into the EMX-2, the unit feeds elastic slightly more slowly at machine speeds below 1,200 RPM.

To control other external devices the EMX-2 uses signals from a photo eye to detect “cover events” and “uncover events”. These terms refer to a small piece of reflective material placed under the photo eye that is covered and uncovered as work pieces pass through the sewing machine.

A cover event usually indicates that the leading edge of a work piece is passing under the needle while an uncover event means the trailing edge has passed the needle. The EMX-2 can keep track of “first” and “second” cover and uncover events. This can be useful when left and right or front and back panels need to be sensed separately by the photo eye.

Using the same synchronizer pulses used for metering, the EMX-2 can count stitches after cover and uncover events and then turn on, turn off, or send a pulse to a device plugged into the unit. This is helpful when activating a cutter placed behind the needle. The stitch counts that begin with a cover or uncover event are independent of one another and can overlap in any desirable pattern.

The EMX-2 further takes into account an especially important aspect of controlling external devices: they take time to actuate. An air-operated cutter attached to the EMX-2 is

a good example. When an electrical signal is given to a cutter to cut, first a solenoid valve has to open, then an air cylinder has to pressurize, and then the blade has to swing from its open position to its cut position. To the human eye these actions appear virtually instantaneous, but they are slow enough to matter.

If a cutter takes 25 milliseconds to operate (a typical value), and if it is used on a sewing machine set for 10 stitches per inch, then if the machine is operated at 6,000 RPM, the cut will be 1/4 inch past the point where it would be if the machine were operated very slowly.

Usually this kind of error is eliminated by either slowing the machine to “cut speed” and adjusting the cutter to cut at the proper time, or by asking the operator to always sew at the same speed. The EMX-2 eliminates the error by keeping track of machine speed and compensating for it. The machine may be operated at any speed and the cut comes out the same.

COMPONENTS

Your TrimMaster EMX-2 includes the following:

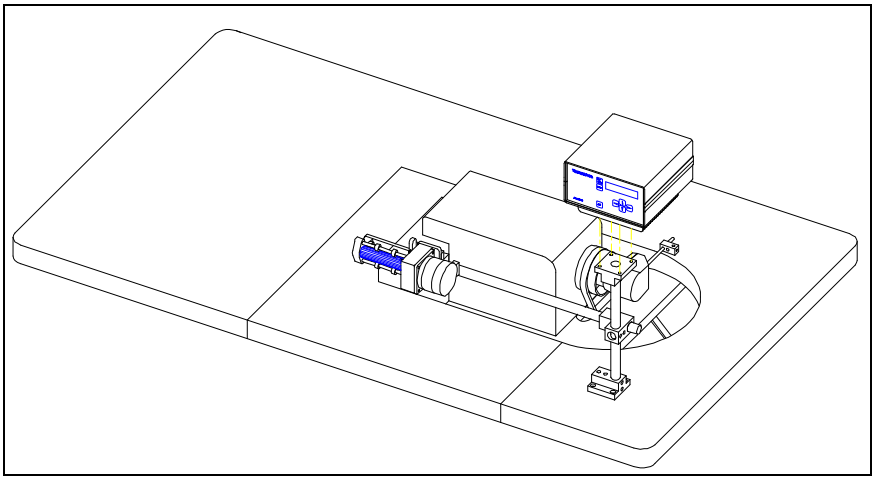
- Metering mechanism with motor and motor cord
- EMX Control Box with EMX-2 program chip
- Synchronizer
- Photo Eye assembly
- Power Cord
- Mounting Hardware
- Hardware for securing the Synchronizer.
- Installation and Operating Instruction manual
- Warranty Registration Form

In addition, if your sewing machine requires the use of a handwheel adapter, it will be included (there is an additional charge for adapters). Certain Union Special and Rimoldi sewing machines require the use of a modified handwheel. In these cases a modified handwheel is included and a “core charge” is added to the invoice. Upon replacement of the handwheel, the old one can be returned for a full credit of the core charge.

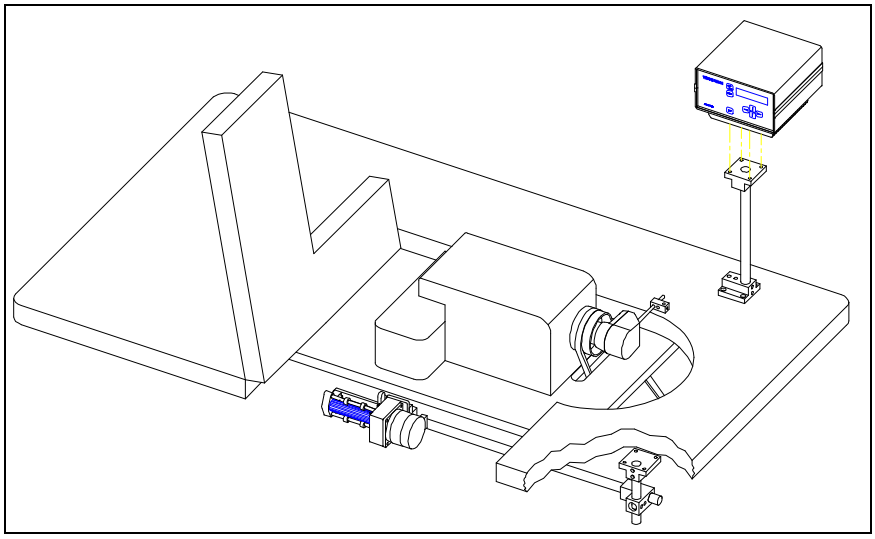
INSTALLATION

Metering Mechanism and Control Box

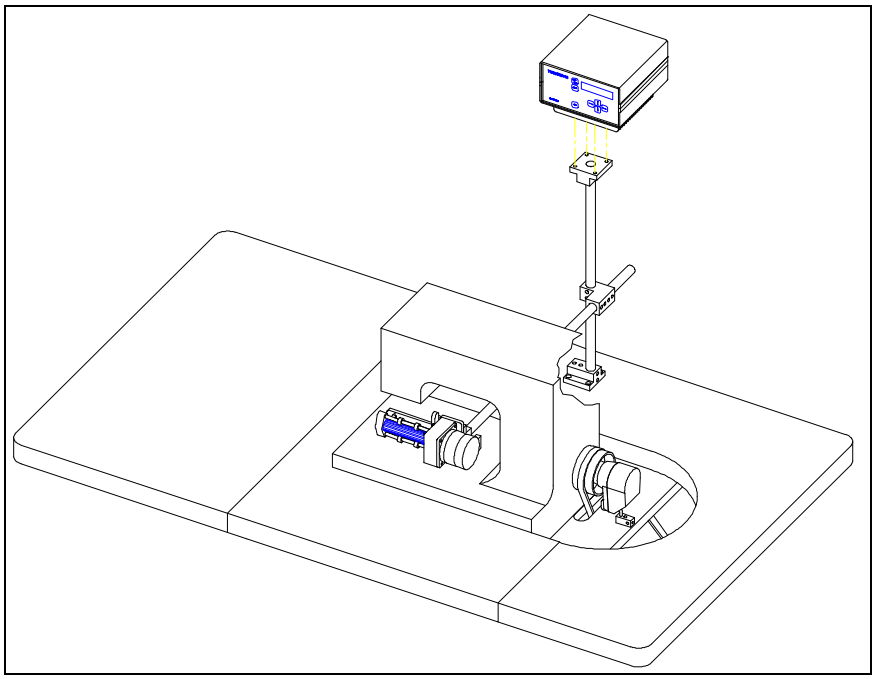
- The following illustrations show three typical methods of mounting the EMX metering mechanism and control box. Mounting components are supplied based on the type of installation specified on your order for the EMX-2.



Top metering device on overlock machine



Bottom metering device on overlock machine



Top metering device on flatbed machine

Synchronizer

- As the above illustrations show, the synchronizer must be secured using the "L" shaped bar included with the mounting hardware. The synchronizer may be mounted at any angle, but it must be prevented from turning when the sewing machine is in motion. If your sewing machine is already equipped with a synchronizer, please contact TrimMaster for specific instructions before proceeding.
- The synchronizer cord is connected to the synchronizer input connector on the rear panel of the control box.
- **Note:** Power ***must*** be turned off to the control box when connecting or disconnecting any interface cords or the power cord.

Photo Eye Assembly

- The photo eye included with the EMX-2 should be mounted on the sewing machine pointing down toward a short piece of reflective tape (also included).
- Depending on the operation to be performed, the photo eye typically has to sense when a work piece is about to pass under the needle or just past this point.
- The photo eye assembly includes some double sided tape for mounting the photo eye. Often this suffices. If this mounting option is not appropriate to your installation, the photo eye may be mounted using the bracket packaged with the photo eye.

Power Cord

- The power cord provided must be wired into the switch box on the sewing machine stand. The proper voltage can be determined by checking the voltage requirement indicated on the rear panel of the control box.

! ! ! ! WARNING ! ! ! !

- A shock hazard exists when connecting into the switch box on your sewing machine stand. Be sure all power is removed before attempting to make the following connections.

! ! ! ! WARNING ! ! ! !

- **220 Volt, 3-Phase:** The white and black wires must connected to the two low legs between the switch and the sewing machine motor. This will ensure that when power is switched off to the sewing machine, it will also be switched off to the control box. The green wire must be connected to ground. Use the existing ground connection inside the switch box.
- **110 Volt, Single-Phase:** The power cord should be wired into your switch box (if the switch box allows for additional connections) or to the sewing machine motor terminal strip. The black wire should be connected to the live (“hot”) supply line, the white to the neutral supply line, and the green to earth ground.

Motor Cord

- The end of the motor cord with the black boot is connected to the metering mechanism motor at the factory. Notice that the cord and connector are secured to the metering mechanism with three cable ties. It is important to replace these ties if the connection is disturbed. The connector on the end of the cord is not designed to withstand strain on the cord by itself.

  If you do have to reconnect the motor cord, notice that the plug is keyed so that it can be fastened to the motor in only one way. The other end of the motor cord is connected to the motor connector on the rear panel of the control box.
- **Important:** When installing the EMX-2, secure the motor cord to the mounting hardware with cable ties. Be sure not to place any strain on the wire, and be sure to secure the cord out of the way of any moving parts.
- **Note:** The motor plug can be inserted into the control box in two ways (two directions). The plug direction controls the direction of rotation of the motor. See System Check below.

SYSTEM CHECK

The following steps will ensure that your EMX-2 has been installed properly and will be ready for setting the system to your specific application:

- Disconnect the power cord from the EMX-2.
- Re-connect power that had been disconnected when wiring the power cord into the switch box.
- Turn on sewing machine motor switch to ensure connections in the switch box are correct.
- Turn off the sewing machine motor switch.
- Re-connect the EMX-2 power cord to the control box.
- Turn on the sewing machine motor switch again.
- Turn on the EMX-2 power switch. The LCD screen should glow and the startup display should appear.
- Momentarily press the jog key on the front panel of the control box.. The metering rollers should rotate. Press the jog key again and insure that the rollers are rotating in the proper direction. If the rollers are turning in the wrong direction turn off the power and disconnect the motor cord from the control box. Rotate the motor cord plug 180 degrees and re-insert it into the control box. Turn the power back on. Momentarily press the jog key to ensure the rollers are turning in the correct direction.
- With power still turned on, depress the sewing machine treadle to start the sewing machine. The metering rollers should rotate in the proper direction.

OPERATING BASICS

The EMX-2 is always in one of two modes: “set mode” or “run mode”. It must be in set mode when settings are entered, and it must be in run mode when the machine is in operation.

In run mode the EMX-2 maintains consistent elastic tension by metering at a fixed ratio to the sewing machine speed. The display shows the tension setting number and the actual tension setting. The tension setting has no explicit meaning because the amount of stretch imparted to the elastic depends on both the EMX setting and stitch length. A formula for setting the tension is described under the “Control Panel Display” and sample settings are shown in Appendix A.

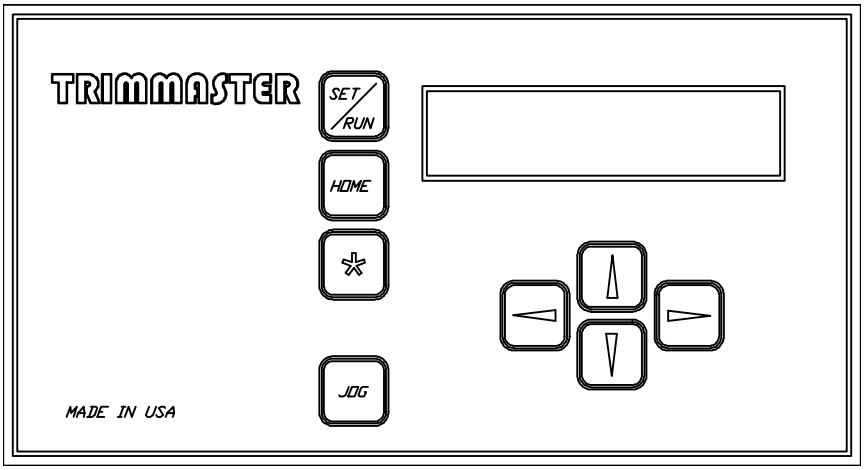
The EMX-2 is not designed for spot gathering (the EMX-3 is available for this purpose), but you can advance from one tension setting to the next by using a knee switch (not included but available as an option) or the control panel. You can advance from one setting to the next like this only when the sewing machine is stopped. This feature might be

used in situations where binding is attached to two panels of the same garment, each on a different bias. With the ability to switch between two tension settings via a knee switch, the binding can be applied to one after the other with built in compensation for different sewing characteristics on each seam.

Any number of settings can be grouped together by simply leaving adjoining settings set to zero. For example, if setting number 7 is “0000”, and there are settings in numbers 8 through 12, and setting number 13 is “0000”, then knee presses can cycle through the settings in 8 through 12 repeatedly.

CONTROL PANEL DISPLAY

The TrimMaster EMX-2 front control panel looks like this:



EMX front panel

The unit is controlled using the keys shown and the 2-line LCD (Liquid Crystal Display) screen in the upper right corner.

When the EMX-2 is first turned on, a screen like the following appears The screen shows the software version number instead of "n.nn" as shown. Make a note of the software version number when calling the factory for assistance.

```
   TrimMaster
EMX-2       n.nn
```

After approximately 3 seconds, the screen above is replaced by the following screen. This is how the display appears in run mode.

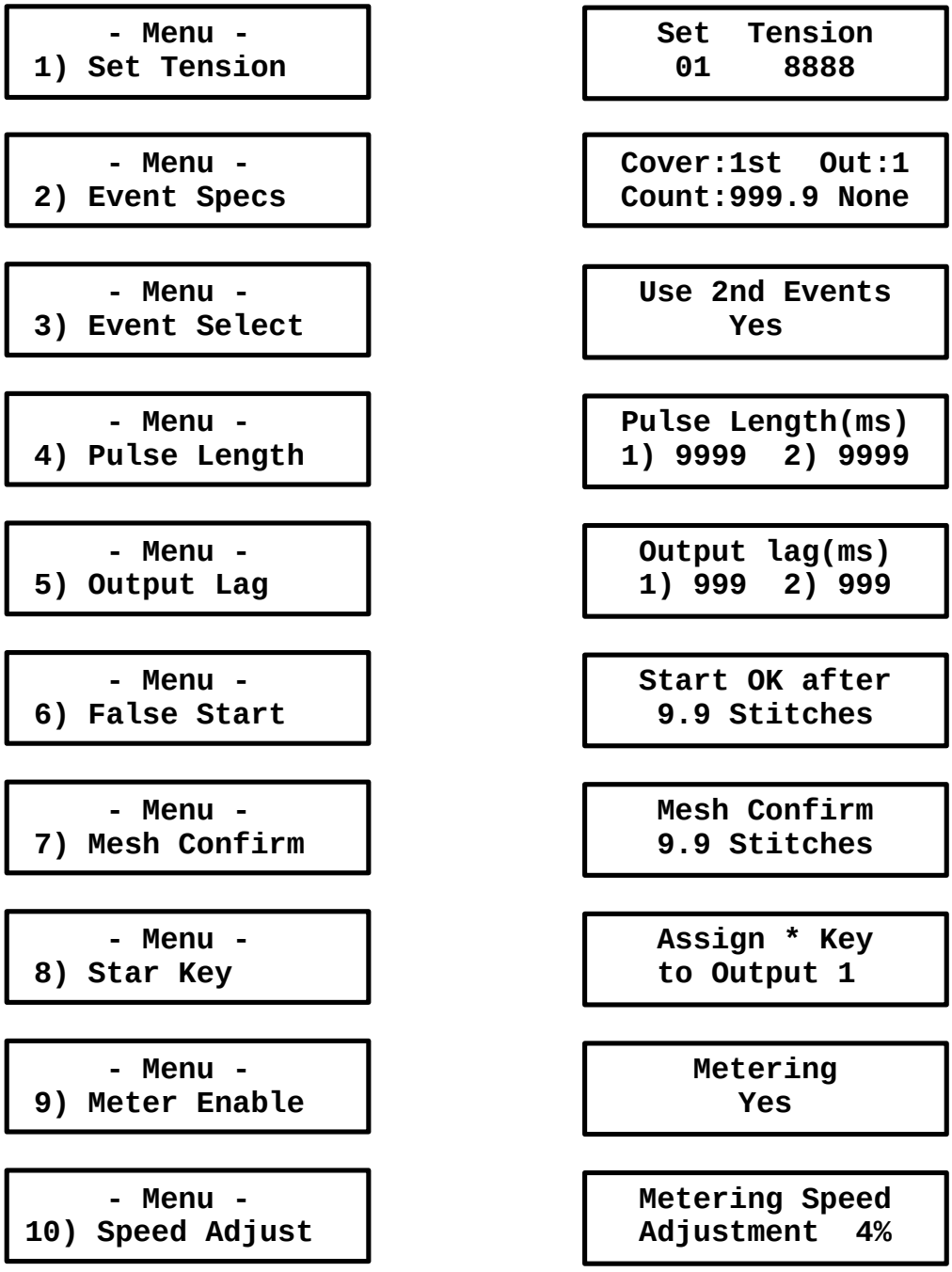
```
 01 8888   Ph: 1
 .. .. .. ..  --
```

The contents of this screen are described below under “Run Mode Screen”.

Pressing the key marked "Set/Run" toggles the EMX-2 between run mode and set mode. Since the unit must be in run mode to operate, the EMX-2 starts up in run mode and it automatically switches to run mode if the sewing machine starts to run. The sewing machine must be stopped and the EMX-2 put in set mode for the unit to be programmed.

SET MODE SCREENS

When the EMX-2 is put in set mode by pressing the "Set/Run" key, the first menu screen (Set Tension) appears. There are ten menu screens, and they look like the following in the left column:



Use the up and down keys to view the menu screens. The screens in the right column are the screens that appear when the menu on the left is selected. Press the "Home" key or a left or right arrow to make a menu selection. Use the left, right, up, and down arrow keys to enter data on a screen, and press the "Home" key again to go back to the menu.

Again: The "Set/Run" key toggles between "run mode" and "set mode". In set mode the "Home" key toggles between the menu and the menu selections.

Set Tension Screen

```
Set  Tension
 01    8888
```

This screen is used to enter tension settings. On the left, under "Set", you can enter a two-digit tension setting number. This can be 01 through 45. Each tension setting number refers to a stored tension setting, so 45 tension settings can be saved.

Under "Tension" you can enter the tension setting. This number controls how much the elastic is stretched when it is metered. The number has no direct meaning since the tension imparted to the elastic is a function of this setting **and** stitch length.

The table in Appendix A shows sample tension settings for various amounts of gathering and various stitch lengths. The formula for the tension setting is:

$$\text{Tension} = 10511 - \frac{180.956 \times \text{stitches per inch} \times \text{stretched length}}{\text{gathered length}}$$

When setting tension, remember that a higher number makes the metering mechanism go faster - thus decreasing the tension:

Higher number ➞ faster ➞ less tension
Lower number ➞ slower ➞ more tension

Event Specs Screen

```
Cover:1st  Out:1
Count:999.9 None
```

This screen is used to program one or both of the two EMX-2 outputs. The EMX-2 Set-Up Sheet at the end of this booklet is designed to organize the information entered via this screen and others.

As can be seen on the worksheet, the EMX-2 recognizes four “Photo Eye Events”. These are:

1) Covered first time,
2) Uncovered first time,
3) Covered second time, and
4) Uncovered second time.

Four events are useful when the photo eye is covered and uncovered as pairs of panels are sewn to make one garment (front and back or left and right). Otherwise only two events are needed. The selection made on the “Event Select” screen (described below) determines whether this screen is enabled for two or four events. The EMX-2 comes from the factory set for two events.

The top line of this screen controls which of the four events is being programmed and which output it is to control. The cursor can be positioned in only two places on the top line. To the left, the up and down arrow keys toggle among the four photo eye events listed above (or between two events if only two are enabled). On the right side of the top line, the up and down arrow keys toggle between Output-1 and Output-2.

The bottom line of this screen controls the action that is to be taken after the event defined on the top line happens. The left side of the bottom line, after “Count: “, provides a place to enter a stitch count to the nearest one tenth stitch.

The action to take after the stitch count is selected on the right side of the bottom line. Pressing the up or down arrows toggles among the following selections:

- “None” means take no action.

- “Plse” means send a pulse. The length of the pulse is controlled by the “Pulse length” menu selection.

- “On” means turn the indicated output on.

- “Off” means turn the indicated output off.

- “IOPO” means “Immediate On, Pulse Off”. This selection causes the indicated output to turn on immediately when the event occurs, and then pulse off after the indicated number of stitches are counted.

  The IOPO feature is provided mainly to allow a “label stop”. If the output is connected to the sewing machine motor, a “cover” event can start the motor. Then the pulse can stop the motor momentarily so the operator knows to stop and insert a label. Then the motor is enabled again. A later “uncover” event should be used to stop the motor at the end of the work piece.

Event Select Screen

```
Use 2nd Events
     Yes
```

This screen is used to enable or disable the second set of events. The second set of events are “Covered second time” and “Uncovered second time”. The up and down arrow keys toggle between “Yes” and “No”.

This setting has to be “Yes” for the Event Specs Screen to allow programming of the second events, and for the Run Screen to display the status of second events.

Pulse Length Screen

```
Pulse Length(ms)
1) 9999  2) 9999
```

This screen provides a way to control the lengths of pulses sent to Outputs-1 and -2. The lengths are expressed in milliseconds (ms). There are 1,000 milliseconds in one second. These values are set to 25 when the unit comes from the factory or if the unit is reset to factory values (see Reset Key in the Back Panel secton below). 25 milliseconds is a typical value required to activate an air-operated cutter like TrimMaster’s PCD cutter.

The pulse length should be lengthened if, in operation, a cutter does not go through its full stroke. The pulse length should be shortened if material bunches up behind a cutter after it is cut.

These pulse lengths are used only if “Plse” or “IOPO” is selected as an action to take on the Event Specs Screen.

Output Lag Screen

```
Output lag(ms)
1) 999  2) 999
```

This screen is used to enter the amount of time it takes for a device connected to an output to operate. The term “lag” refers to the time between sending a signal to a device and when the device completes its operation.

When the EMX-2 is programmed with a lag value, it can coordinate sewing machine speed with the output device so that the device completes its operation at the same location on the sewn piece every time. For cutters, lag time typically can be set to the same value as pulse length. A typical lag value for a cutting device is 20 to 25 milliseconds (ms).

Increasing a lag value causes the EMX-2 to activate an output earlier. Decreasing a lag value causes the EMX-2 to activate the output later. How much earlier and later depends on sewing machine speed.

The lag feature on the EMX-2 only works well when the operating time of the connected device is a fairly constant. A air-operated cutter has a constant operating time as long as the air pressure is relatively constant. Using an output to start and stop the sewing machine motor is certainly possible, but the stop time on most motors is a function of speed before stopping and therefore not constant.

The lag feature is influenced by acceleration or deceleration just prior to output activation. The EMX-2 constantly samples sewing machine speed, so during acceleration and deceleration its speed reading is always just a little behind. The best results will be achieved if the sewing machine is run at a fairly constant speed when the outputs are activated.

False Start Screen

```
Start OK After
9.9 Stitches
```

Sometimes it is useful to allow the operator some latitude in starting a work piece. If the EMX-2 is used to control the sewing machine motor, it is necessary to have the photo eye aimed a little ahead of the presser foot so that covering the reflective tape can start the sewing machine when the work piece is in place. Especially with this kind of setup, it is common for the operator to move the work piece in such a way that the reflective tape is seen by the photo eye as covered and uncovered multiple times. The False Start screen can be used to prevent these motions from being misinterpreted.

Normally after a cover event, the EMX-2 is counting stitches and preparing to take a programmed action. For example, it might be counting stitches before activating a cutter to trim the leading edge for a work piece. At this stage, the EMX-2 is expecting the next event to be an uncover event that has it's own programmed action.

However, when there is a false start, when the work piece is inadvertently wiggled a little under the photo eye, an uncover should mean "reverse the action taken from the previous cover event".

After a cover event, the EMX-2 counts stitches (in tenths). If fewer than the number of stitches entered on this screen have been counted, the EMX-2 interprets an uncover as meaning "reverse the previous cover event". Reversing the previous cover event means turn off the outputs and reset the stitch counts to zero. After the number of stitches entered on this screen has been counted, an uncover event is handled normally.

This setting comes from the factory set to 5.0 stitches. If it is set to 0.0 stitches, false start detection is turned off.

Mesh Confirm Screen

```
Mesh Confirm
0.5 Stitches
```

Some sewing operations involve mesh fabric that allows the photo eye to "see" through the material as openings pass over the reflective tape. This effect can send the EMX-2 false "uncover" signals.

This screen provides a place to enter a stitch count, from 0.0 to 9.9. If the EMX-2 senses the reflective tape has been uncovered for this number of stitches or fewer, it ignores the signal. On regular material this setting should be left on 0.0.

Note: is both False Start and Mesh Confirm settings are programmed, False Start has higher priority. An uncover signal to the control box in fewer than the False Start number of stitches will always set the EMX-2 back to expecting the previous cover signal next.

Caution should be used if the mesh confirm feature is ever used with an IOPO (Immediate On, Pulse Off) action programmed for an uncover event. In practice this will rarely be used, but if it is, the "Immediate On" nature of IOPO overrides the mesh confirm feature. The "Pulse Off" stitch count however, can be influenced. The results can be unpredictable.

Assign Star Screen

```
Assign * Key
to Output 1
```

This screen allows you to control which output is activated by pressing the "*****" key. The factory setting is Output-1. Output-1, Output-2, or both may be selected.

Typically used for "manual cut", the "*****" key simply turns on the selected output while the key is pressed and turns the output off when the key is released.

Meter Enable Screen

```
Metering
Yes
```

This screen allows you to turn off metering. Sometimes you may want to use the EMX-2 for sewing that does not involve metering. Running the metering mechanism without any fabric between the rollers puts excessive wear on the rollers, so if metering is not being used it is best to turn it off.

This screen positions the cursor on the bottom line, and the up and down arrows toggle between Yes and No.

When metering is turned off, the run mode screen appears like this:

```
Mtrg Off   Ph: 1
 .. .. .. ..  --
```

Speed Adjust Screen

```
Metering Speed
Adjustment  4%
```

Use this screen to enter a speed adjustment percentage between 0 and 9. This percentage is used when the sewing machine is running below 1,200 RPM. It compensates for the sewing machine's tendency to generate slightly shorter stitches at low speed.

The speed adjustment percentage can be set using trial and error, or it can be calculated. If you set this value to 0 and then sew two pieces, one at low speed and one with the treadle fully depressed, you can count the stitches in equal lengths of each and use this formula:

$$\text{Percent} = \frac{(\text{Slow stitch count} - \text{Fast stitch count}) \times 100}{\text{Fast stitch count}}$$

RUN MODE SCREEN

In run mode the screen looks like this:

```
 01 8888   Ph: 1
 .. .. .. ..  --
```

or, if metering has been turned off using the “Meter Enable” screen, like this:

```
 Mtrg Off   Ph: 1
 .. .. .. ..  --
```

The "01" on the top line is the tension setting number. It can be 01 through 45. The "8888" is the tension setting. See the section above entitled “Set Tension Screen” for an explanation of tension settings.

The “Ph: 1” in the upper right corner means Phase 1. As the photo eye is covered and uncovered the phase cycles from 1 to 2 or 1 through 4 and back to 1 again. There are two phases if “Use 2nd Events” is set to “No”, otherwise there are four.

The symbols on the bottom line give an indication of what the EMX-2 control box has detected and what is pending. When the photo eye is covered the first time, the leftmost two dots change to “CC”. They stay C’s while the EMX-2 is counting stitches that start with the first cover event.

The left “C” means the box is counting stitches before taking an action assigned to Output-1. The right “C” means the box is counting stitches before taking an action assigned to Output-2. No “C” appears if a stitch count for the first cover event is set to zero or such a small number that the “C” does not have time to appear before the stitches are counted. The “C” symbols change back to dots as soon as the stitches have been counted.

The next two dots change to “UU” when the first uncover event occurs. Like the C’s, the U’s appear while stitches are counted after the uncover event.

If “Use 2nd Events” has been set to “Yes”, a second set of four dots appears after the first four dots. Like the first four dots, these four dots change to C’s and U’s in response to the second set of cover and uncover events.

In the lower right corner of the screen are to dashes (- -). These change to asterisks (*****) when outputs are turned on. The left symbol applies to Output-1 and the right one to Output-2. A display of “-*****” indicates Output-1 is off and Output-2 is on.

This display of output status is limited to occurrences that last for approximately 100 milliseconds or more, so if a pulse shorter than approximately 100 ms is assigned to an output, it does not last long enough to be seen on the screen.

CONTROL PANEL KEYS

The keys on the control panel perform functions that, in several cases, depend on whether the EMX-2 is in set mode or run mode. Their functions are:

Set/Run — Pressing this key has an effect only when the sewing machine is stopped. Each press "toggles" between run mode and set mode. If the EMX-2 is in run mode pressing Set/Run changes to set mode, and if the EMX-2 is in set mode pressing Set/Run changes to run mode.

Home — Set mode: In set mode the Home key toggles the EMX-2 between the menu and the screen selected from the menu.

Run mode: In run mode the Home key sets the tension setting number back to the beginning of the current series of settings. A series of settings is defined by settings of 0000 before and after a group of consecutive entries.

***** — The "*****" key is active only in run mode. It provides a manual cut if a cutter is attached to the EMX-2. This key turns one or both outputs on when it is pressed, and turns them off when it is released. The Assign Star Screen controls which output(s) are controlled by this key.

Jog — The Jog key works at any time. As the name implies, it jogs (runs) the motor in the metering mechanism for as long as the key is pressed.

Arrows — Set mode: In set mode the arrow keys control the information entered into the EMX-2. The left and right arrows move the underline cursor. The up and down arrows change the value of a digit up or down or select among available options.

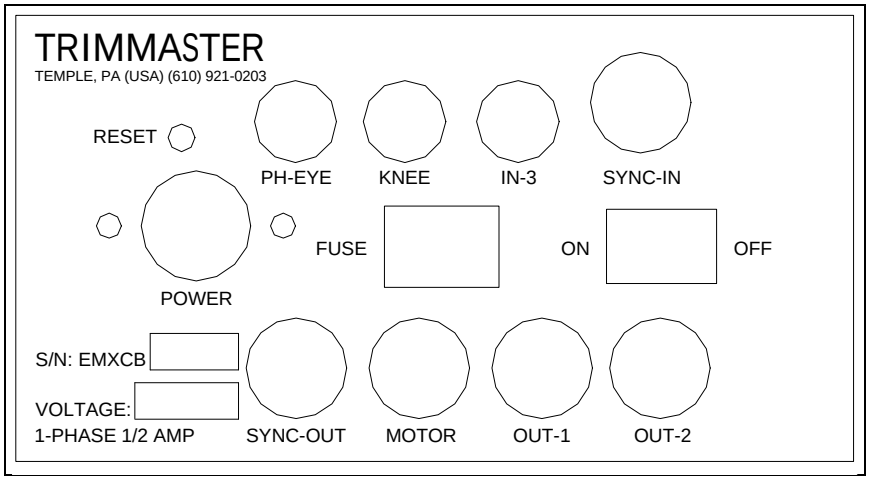
Run mode: In run mode the up and down arrows advance through settings in a series. The left and right arrow keys have no effect. A series of settings is defined by settings of 0000 before and after a group of consecutive entries.

Holding the arrow keys in causes the cursor to move or the contents of a digit to keep changing as long as the key is held.

In set mode, when the cursor is moved to its limit, either left or right, pressing the arrow again "wraps" the cursor around to the other extreme. Likewise, pressing the up or down arrow can "wrap" digits from 0 to 9 and 9 to 0.

BACK PANEL

The EMX-2 back panel looks like this:



EMX back panel

The connectors on the back are for the following:

PH-EYE Photo-Eye - This connection is used to connect the photo eye.

KNEE Knee Switch - This is the plug for connecting an optional knee switch or other suitable device.

In run mode this switch can be used to advance through tension settings in a series. A series of settings is defined by settings of 0000 before and after a group of consecutive entries.

IN-3 Input 3 - This connection is not used on the EMX-2.

SYNC-IN Synchronizer-In - This is the plug for the synchronizer supplied with the EMX-2.

POWER Power - This plug is for connecting power. The unit operates at 110 or 220 volts as indicated on the unit label. A power cord with the proper mating connector is supplied with the EMX-2.

SYNC-OUT Synchronizer-Out - This plug allows you to use the synchronizer to control other equipment in addition to the EMX-2. There are restrictions on how this signal can be used. Pleas consult the factory before attempting to use this output.

MOTOR Motor - This plug is for connecting the motor in the metering mechanism. Note that the motor plug may be inserted in two directions. Reversing the direction of the plug reverses the direction of rotation of the metering mechanism.

OUT-1 Output-1 - This connection is used to control an external device. Typically this connector is used to attach a cutter.

This output can be configured either to source a 24 volt DC signal or to provide "logic level" output. The output type is configured at the factory. Changing the output type involves changing jumpers inside the EMX-2 control box. A technical reference document is available from TrimMaster for customers who feel qualified to match electrical and electronic equipment.

OUT-2 Output-2 - This connection is used to control an external device.

This output can be configured either to source a 24 volt DC signal or to provide "logic level" output. The output type is configured at the factory. Changing the output type involves changing jumpers inside the EMX-2 control box. A technical reference document is available from TrimMaster for customers who feel qualified to match electrical and electronic equipment.

Other items on the back are for the following:

RESET Reset - Inside this small hole is a system reset switch. This reset should be used only if the unit is not operating at all or operating erratically. This may happen after long periods (months) of being turned off. Turn the power off and then use a ball point pen or other slender object to push in this switch momentarily. Resetting in this manner restores factory settings. It erases all user settings!

FUSE The main fuse is located inside the fuse holder. Gently press down and pull out the cover to gain access to fuses. One spare fuse in included inside the fuse holder. All fuses are 1/2 amp.

ON/OFF On/off switch.

PROGRAMMING

The worksheets at the end of these instructions are recommended for organizing and documenting use of the EMX-2.

To program the EMX-2:

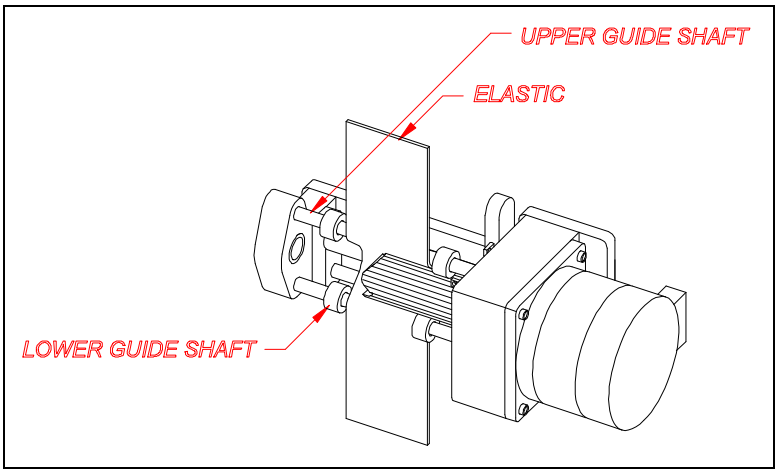
- Turn the power on.
- Wait for the run mode screen (approximately 3 seconds).
- Press the Set/Run key to put the EMX-2 in set mode.
- Use the up and down arrows to view the menu screens.
- Make a menu selection by pressing the “Home” key or a left or right arrow key.
- Using the left and right arrow keys, position the cursor under each digit or option that you want to modify. Use the up and down arrow keys to change the digit or option.
- Press the “Home” key to return from a data entry screen to the menu.
- Press the “Set/Run” key to change from set mode to run mode.

  NOTE: If the sewing machine is started at any time during programming, the EMX-2 will immediately change to run mode. To complete programming uninterrupted, make sure the sewing machine handwheel does not turn.
- At the end of the work day the EMX-2 can be switched off or power disconnected without affecting the settings programmed in the unit. The EMX-2 memory will last several months without power.

OPERATING THE EMX-2

Before starting on production goods, it is a good idea to become familiar with the operation of the EMX-2 controls. Have a small supply of scrap material available to test run the unit.

Route the elastic through the metering mechanism as shown below. It is not necessary to open the metering rolls to insert the elastic. Instead, bring the end of the elastic to the feed rollers and press the jog key on the front panel of the control box. The rollers will feed the elastic as long as the jog key is pressed.



Elastic threaded in metering mechanism
(cut-away view)

The tension setting displayed on the front panel of the control box is set to 8888 when the EMX-2 is shipped from the factory and whenever the unit is reset using the reset key on the back of the control box. The 8888 setting is used to make it clear that the unit has probably been reset, it is not necessarily a typical setting.

A tension setting of 8000 is a good starting point for average tensioning of elastic. Sew a sample piece and note the amount of gathering obtained. Reset the tension setting to 8700. When making a tension setting change, it is necessary to sew out a couple of inches of elastic in order to transition to the new tension on the elastic. Now sew another sample piece and note the difference of tensioning on the elastic. You may wish to repeat the above test with the tension setting set at 7300 to see the results obtained with a lower tension setting.

It is important to understand that if you wish the garment to finish larger than the previously obtained results, you must increase the tension setting. Conversely if you wish the garment to finish smaller than previously obtained, you must decrease the tension setting. It is also important to understand that if the garments to which you are attaching the elastic are not of equal length, then the finish measurement will also not be of equal length.

Also, if you move the EMX-2 from one sewing machine to another, the tension setting will not necessarily yield exactly the same degree of gathering. This is because the stitch lengths on the sewing machines are not set exactly the same.

We suggest you document desired settings on the EMX-2 Worksheet. You can store up to 45 different settings and come back to them whenever returning to the same style garment. In most cases if pattern sizes are graded, a change in tension setting will not be necessary for changes in sizes.

It is not necessary or desirable to hold back on the garment when sewing. The tension setting will accurately feed the amount of elastic required.

Before putting the EMX-2 into production, it is recommended that you determine the proper EMX-2 speed compensation percentage and enter it into the unit. To do this, sew two test pieces without using the metering mechanism. Sew one very slowly and the other with the treadle fully depressed. Make them several inches long.

Then count the stitches in equal lengths. Avoid the first and last few stitches in each seam, and count stitches over five or six inches. Then use this formula to find the speed compensation percentage:

$$\text{Percent} = \frac{(\text{Slow stitch count} - \text{Fast stitch count}) \times 100}{\text{Fast stitch count}}$$

Enter this percent number using the “Speed Adjust” menu selection.

As is the case with any machinery, if the machine will be unattended for any length of time, the power should be turned off. If the EMX-2 power cord has been wired into the sewing machine switch properly, power to the control box will also be turned off when the sewing machine is turned off. In this case it is not necessary to turn off the power on the EMX control box unless you wish to use the sewing machine without it.

APPENDIX A

Sample EMX Metering Device Tension Settings

Stretched/	Stitches per Inch																
Gathered	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1.00	9787	9606	9425	9244	9063	8882	8701	8520	8340	8159	7978	7797	7616	7435	7254	7073	6892
1.20	9642	9425	9208	8991	8774	8557	8340	8122	7905	7688	7471	7254	7037	6820	6602	6385	6168
1.40	9498	9244	8991	8738	8484	8231	7978	7724	7471	7218	6964	6711	6458	6204	5951	5698	5444
1.60	9353	9063	8774	8484	8195	7905	7616	7326	7037	6747	6458	6168	5879	5589	5299	5010	4720
1.80	9208	8882	8557	8231	7905	7580	7254	6928	6602	6277	5951	5625	5299	4974	4648	4322	3997
2.00	9063	8701	8340	7978	7616	7254	6892	6530	6168	5806	5444	5082	4720	4359	3997	3635	3273
2.20	8919	8520	8122	7724	7326	6928	6530	6132	5734	5336	4938	4539	4141	3743	3345	2947	2549
2.40	8774	8340	7905	7471	7037	6602	6168	5734	5299	4865	4431	3997	3562	3128	2694	2259	1825
2.60	8629	8159	7688	7218	6747	6277	5806	5336	4865	4395	3924	3454	2983	2513	2042	1572	1101
2.80	8484	7978	7471	6964	6458	5951	5444	4938	4431	3924	3418	2911	2404	1898	1391	884	377
3.00	8340	7797	7254	6711	6168	5625	5082	4539	3997	3454	2911	2368	1825	1282	739	197	

A tension setting may be calculated using the following formula:

$$\text{Tension} = 10511 - \frac{180.956 \times (\text{stitches per inch}) \times (\text{stretched length})}{(\text{gathered length})}$$

Users of older style TrimMaster EMD metering devices can convert old EMD settings to new EMX tension settings using the following formula:

$$\text{New (EMX) tension setting} = 10{,}511 - \frac{2{,}560{,}000}{\text{Old (EMD) tension setting}}$$

APPENDIX B

EMX-2 Trouble Shooting Checklist

If you experience difficulty with your EMX-2, please use this checklist before calling the factory.

I. Setting machine - Check feed dogs and elastic guide to be sure the machine is set to handle elastic.

A. Check feed dogs.

1. Height should be 3/4 tooth.
2. On differential machines:
   a) Front and read feed dogs should be level to start, set on “0” differential (straight feed).
   b) Chaining feed dog should be 1/4 tooth lower than rear feed.
3. On non-differential machines the feed dog should have a slight tilt (5-10°).
4. On overlock machines three rows of feed dogs are needed to handle elastic.
5. On machines with mechanical pullers:
   a) If puller is over-pulling the feed dogs, consistent sizing CANNOT be maintained.
   b) To accurately check stitch length setting, produce a sample while running your sewing machine at full RPM.
      (1) With the puller raised from the work, set the stitch length at 1/2 stitch more than length desired.
   c) With the puller lowered onto the work, set the stitch length as desired.

      Example: When the specs call for 7 spi.
      with puller raised - set for 7.5 spi.
      with puller engaged - set for 7.0 spi.

B. Check elastic guide - In setting the guide, care must be taken that the elastic, under tension does not lift the front of the presser foot.

II. Power source - check for correct connection.

A. 220 volt, single phase AC, nominal 2 low legs:

1. Take voltage reading between 1st leg and ground _____ volts.
2. Take voltage reading between 2nd leg and ground _____ volts.
3. Take voltage reading between 1st and 2nd leg _____ volts.
4. Check ground. The unit must be grounded to the existing power source ground.

B. 110 volt, single phase AC

1. Take voltage reading at connection point _____ volts.
2. Check ground. The unit must be grounded to the existing power source ground.

III. Metering roller assembly - Check for proper installation.

A. Check the idle roller adjustment:

1. Use the following test to be sure that the idle (small) roller is parallel with the driver roller.
2. Cut a piece of writing paper 1/4” wide by 2” long to make a test strip.
3. Open the idle roller and insert test strip on the left side. Release idle roller. Hold driver roller with thumb and pull up on test strip. Repeat for right side.
4. The left and right tests should show the same tension. If they do not, adjust the idle roller to meet the driver roller squarely.
5. After adjustment, check that the idle roller can spin freely when moved away from the driver roller.

B. Check the spring tension.

1. Measure the length of the spring when the rollers are together.
2. The length should be 7/8” with a tolerance of ±1/8”.

C. Check the metering mechanism location.

1. Viewed from directly overhead, measure distance from the rear of the driver roller to the front of the presser foot (nominal: one inch).
2. The driver roller should be at least one inch in front of the presser foot to prevent the elastic from lifting the presser foot.