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SERIES 1100 SERVO SYSTEM

LABEL REGISTRATION APPLICATION

Operating Manual

1. General.....	3
1.1 Unpacking and Inspection.....	3
1.2 Installation.....	3
1.3 Introduction	3
1.4 Initial Set Up	3
1.5 Description of Operation	3
1.6 General Alarm Conditions	3
2. Initial Screens and Setup.....	4
2.1 Splash Screen.....	4
2.2 Main Screen.....	6
2.3 Main Screen Password Entry.....	7
2.4 Setup Screen	8
2.5 Changing the Motor Resolution.....	9
2.6 Motor Parameters.....	10
2.7 Web Parameters	10
2.8 Encoder Resolution	11
2.9 Encoder Phasing	12
2.10 Motor Phasing	13
2.11 Verifying the Jog Speed	13
2.12 Check the I/O.....	14
2.13 Changing the Password.....	14
2.14 Accepting the New Parameters	15
3. Running the Machine.....	16
3.1 Main Screen.....	16
3.2 Entering/Changing the Product Length	17
3.3 Running The Motor.....	18
3.4 Turning Motors On/Off.....	19
3.5 Jogging the Draw Rollers	20
4. Setting and Running Register.....	21
4.1 Getting the Print in time with the Knife	21
4.2 Maintaining Register	22
4.3 Alarms.....	23
5. Front Panel.....	25
6. Emergency Telephone Number.....	26

1. General

1.1 Unpacking and Inspection

Although every precaution is taken to ensure the equipment is delivered in good condition, a careful inspection should be made. EMP makes every effort to individually box and label each component for easy identification of the shipment. Please report and shortage immediately.

1.2 Installation

While most EMP Servo Systems come with all installation bracketing, please request the installation manual from EMP for additional assistance. Contact

1.3 Introduction

The Servo Control System is designed to provide a reliable and economical solution to your machine's setup and control needs. Based on information provided, EMP has preprogrammed your equipment for your specific application. The program and equipment have been selected based on your machine and web speed.

1.4 Initial Set Up

For proper operation of the Servo System, the Initial Setup procedure must be completed. This one time setup provides vital information (Draw Roller Diameter, Reducer Ratio, Encoder and Motor Phasing) required for proper operation

1.5 Description of Operation

Once a length is entered and the servomotors are in the "Run" mode, the draw rollers are ready to follow the movement of the encoder. As the machine starts, the encoder will begin rotating, the servomotor will follow it with the correct ratio to pull the desired sheet length.

1.6 General Alarm Conditions

Following Error - The Controller system will shut down when a following error exists. When the relationship between the Motor's Resolver and the Knife's Encoder has been changed. To avoid an unexpected Motor movement, a Following Error stops the machine. The Machine must be set up again.

Machine Stop - An external hardware Machine stop has occurred. All the motors stop, and cannot be restarted until the external hardware releases the machine.

Emergency Stop - An E.Stop has occurred.

Command error - An unexpected program error has occurred, contact EMP.

2. Initial Screens and Setup

2.1 Splash Screen



On turning on the controller the Splash Screen above appears for a few seconds while communication is established between the Touch Screen and the multi-axes controller.

Splash screen with communication OK



Connection OK

This indicates proper communications between the Touch Screen and the Controller.

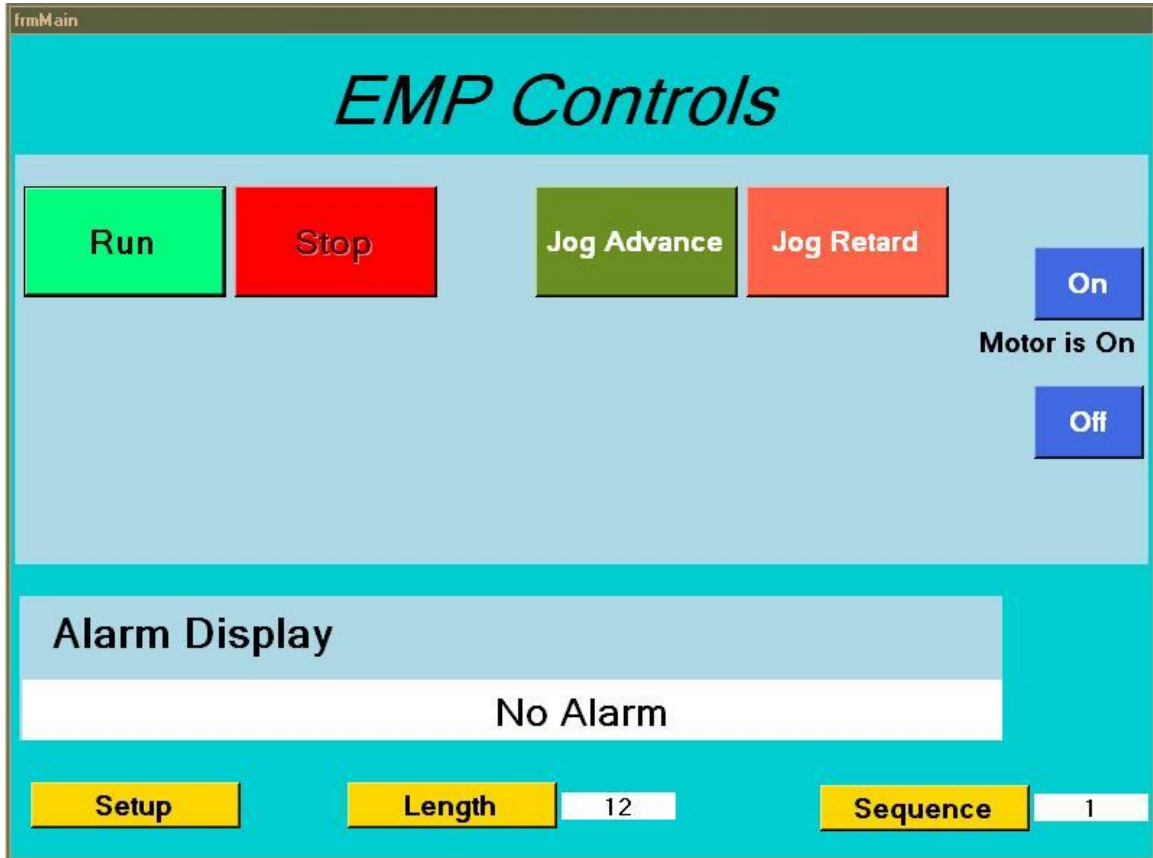
Press the OK button to make the main screen appear.

Splash screen with bad communication

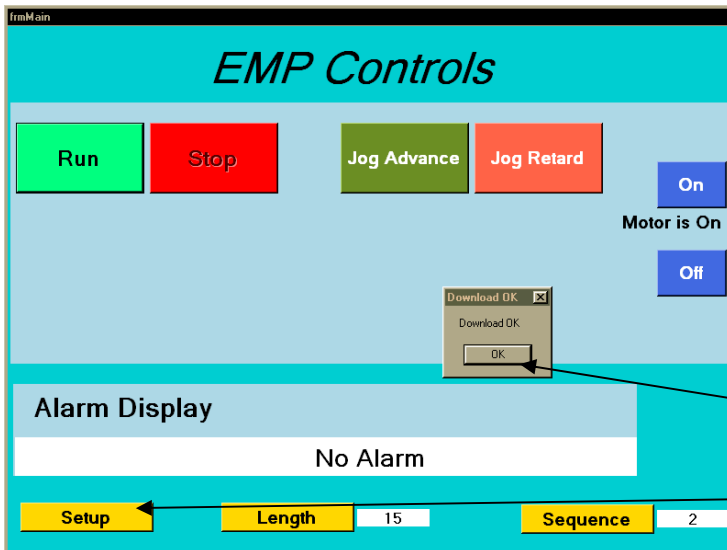


This indicates a communications problem. It can be caused by a faulty Ethernet cable or faulty hardware. Restart the control and if problem persists contact EMP.

2.2 Main Screen



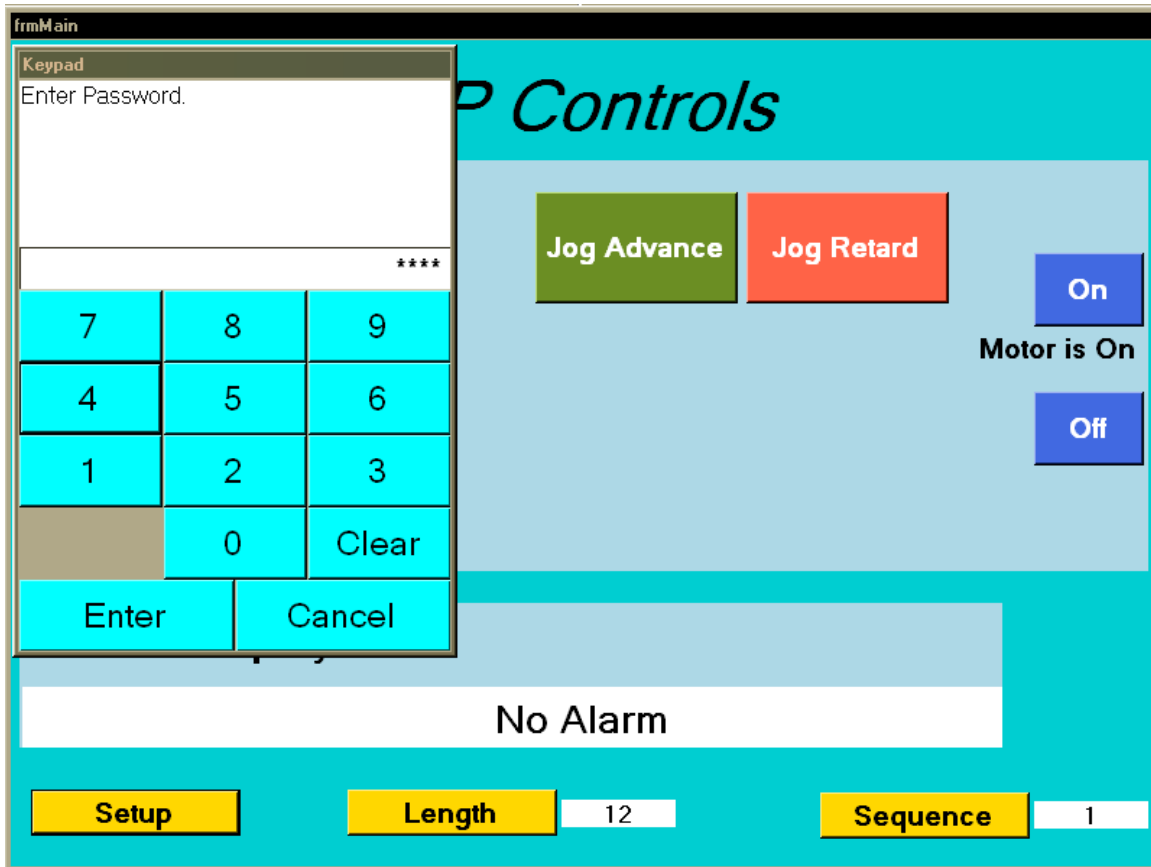
This is the Controller's Main Screen which is displayed after communication is established. Note the **Setup**, **Length** and **Sequence** buttons.



First accept the download

Then Press the setup Button to enter Password

2.3 Main Screen Password Entry



After pressing the Setup button, the Screen will look like this. Simply Enter the Password (1234) and press enter.

The controller will display the Setup screen.

Note: While the initial password is 1234, the password may be changed by the user. It is important to remember the new password if you decide to change it!!

2.4 Setup Screen

The screenshot shows a web-based setup interface for a servo system. It is divided into three main sections: Motor, General, and Web Variables. At the bottom, there are three large buttons: Save, Exit, and Save and Exit.

Motor	
Reducer Ratio	5
Draw Roll Dia	4
Jog Speed	3
Motor Resolution	2444
Jog Motor	Stop Motor
Run Motor	Motor Direction
Reset	0

General	
Encoder Position	0
Enc Resolution	2333
Enc Phase	Reset
Input 1 On	Input 5 On
Input 2 On	Input 6 On
Input 3 On	Input 7 On
Input 4 On	Input 8 Off
Toggle Alarms	
Change Password	

Web Variables			
Alm Cnt	6	Corr Lim	2.2
Tol Area	11	Len Fact	0.1
Act Area	21	Corr Fact	0.71

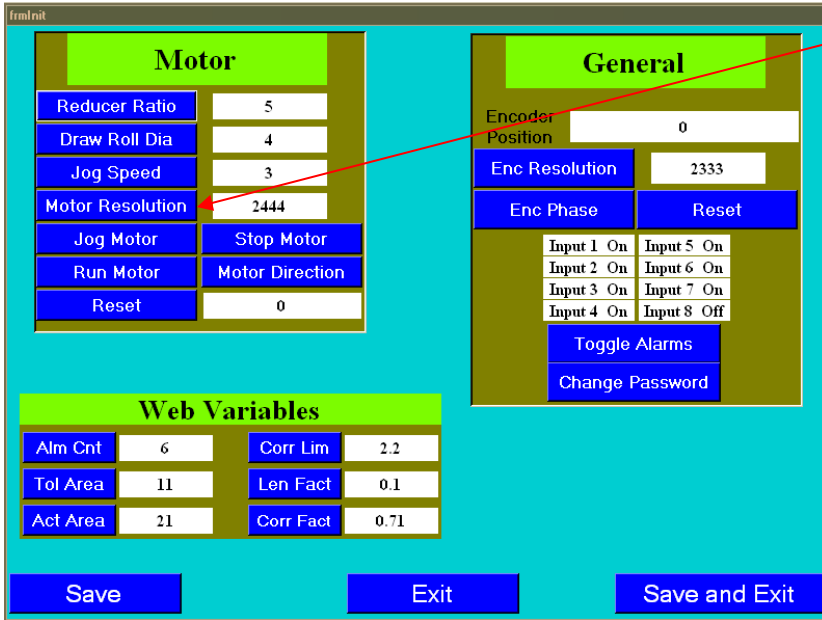
Save Exit Save and Exit

This is the Setup Screen which is used to enter the machine parameters, troubleshoot any problems on the machine, and correctly phase the Motors and Encoder. The Motor Parameters are Reducer Ratio, Draw Roll Diameter, Jog speed and Motor Resolution.

The web parameters are Width of Active Area, Tolerance Area, Alarm Count, Correction Factor, Length Factor and correction Limit.

The General category is used to monitor the state of the inputs, and toggle the outputs, as well as set the encoder resolution and phase.

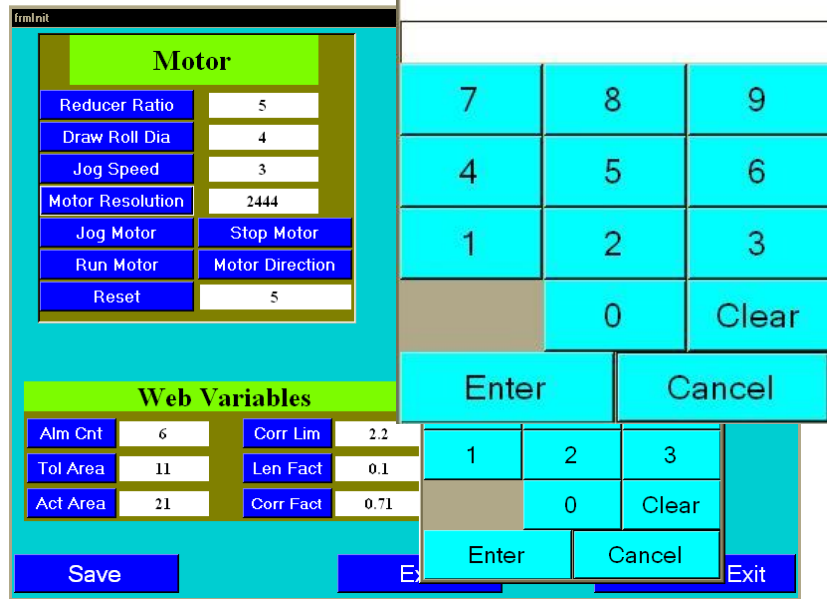
2.5 Changing the Motor Resolution



1. Press the **Motor Resolution** Button.
2. A popup Keypad appears.
3. Use the Keypad to enter the new Motor Resolution, then press enter. The acceptable range for the Parameter is displayed on the Keypad.

Keypad
Enter a Motor Resolution between 1000 and 50000.

A similar procedure is used to enter all the other Motor, Web and General Parameters. A description of the various parameters follows.



2.6 Motor Parameters

- **Reducer Ratio** - This is the Ratio between the Servo Motor and the Draw Rollers. It should include both the reducer on the front of the Servo Motor (if one is used) and any further reduction between the Servo motor and the Draw Rollers. Any value between 1 and 50 is allowed.
- **Roll Diameter** - This is the diameter of the roller that the EMP servo motor uses to advance the web, in **inches**. The controller uses this information, the reducer ratio information, and the encoder position to determine the required position of the motor. Values between 1 and 30 inches are allowed.
- **Jog Speed** - This is the speed at which the controller jogs the motor when commanded to do so. It is calibrated in Draw Roller RPM. Values between 1 and 100 rpm are allowed.
- **Motor Resolution** - This sets up the resolution of the Servo Motor Feedback. This parameter is usually factory set for your particular motor. Values between 1000 and 50000 are allowed.

2.7 Web Parameters

- **Active Area** - This is the distance before the mark that the controller actively seeks a mark. For example if the repeat Length is 12 inches and the width parameter is set to 30° , then the controller will start actively looking for a mark $12 \times 30 / 360 = 1$ inch before it arrives. Any value between 5 and 90 degrees is allowed.
- **Alarm Area** - This sets up a tolerance for the marks. If the mark does not occur within this tolerance of where it is expected it is counted as an alarm event and enough alarm events will cause an **Out Of Tolerance** alarm. If the mark does not occur in the Active Area it will cause a **No Register Mark** alarm. The allowed values are between 5° and 10° .
- **Alarm Count** - This sets up the Number of Alarm events required to cause an alarm. The Alarm events are no mark in the Alarm Area, and no mark in the Active area. The permitted values are between 4 and 20.
- **Correction Factor** - When the Controller determines that the web is out of position a correction is applied to bring it back in to position. Because machinery has cyclic errors (due to run out etc.) it is not always desirable to move the web

back into position. This factor determines how much correction is actually made. The amount of correction made = Measured Error x Correction Factor. For example an error of 0.020 inches with a CF of 0.6 makes a correction of 0.012 inches on the first pass leaving 0.008 inches. Then on the next pass it makes a correction of 0.0048 inches leaving 0.0032 inches and so on. The allowed values are between 0.2 and 1.

- **Length Factor** - During normal operation the ratio of encoder rotations to Motor Rotations will change to accommodate changes in tension, slippage at draw rollers, stretch in the web etc. This parameter changes the rate at which the ratio changes. It can take any value between 0 and 1. Note 0 turns off length correction.
- **Correction Limit** - This parameter controls the maximum correction that can occur. For example if the parameter is set at 2.5⁰ then the maximum correction will occur at 2.5⁰ and will equal 2.5⁰ multiplied by the correction factor. Errors larger than 2.5⁰ will receive the maximum correction

2.8 Encoder Resolution

- **Encoder Resolution** - This sets up the resolution of the auxiliary encoder. Note: For quadrature encoders, the resolution is equal to the line count x 4. So a 1024 line encoder has a resolution of 4096. This parameter is usually factory set for your particular encoder. Values between 1000 and 50000 are allowed.

2.9 Encoder Phasing

General

Encoder Position: -5612

Enc Resolution: 2333

Enc Phase | Reset

Input 1 On	Input 5 On
Input 2 On	Input 6 On
Input 3 On	Input 7 On
Input 4 On	Input 8 Off

Toggle Alarms

Change Password

Current position of encoder

Enc Phase button changes Encoder Phase

Enc Reset button resets the current position of the encoder (and motor) to 0

1. Reset the encoder's position to 0 by pushing the **Enc Reset** button.
2. Jog the Machine slightly to turn the encoder. The encoder position will change from 0 and may be read in the Encoder position display above. We require the encoder position to be positive and increasing as the machine turns.
3. The encoder position needs to be **Positive** and **increasing**, if it is not (as is the case shown above) change the encoder phase by pushing the **Enc Direction** button.
4. Check that the encoder position is positive and increasing by jogging the machine.

General

Encoder Position: 5660

Enc Resolution: 2333

Enc Phase | Reset

Input 1 On	Input 5 On
Input 2 On	Input 6 On
Input 3 On	Input 7 On
Input 4 On	Input 8 Off

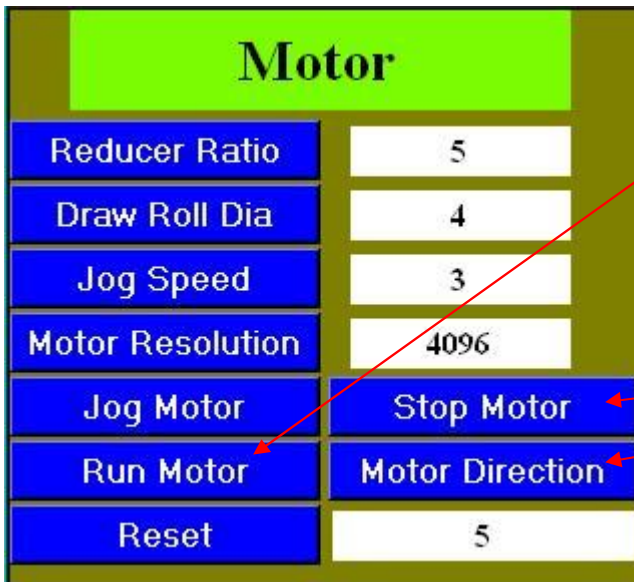
Toggle Alarms

Change Password

This is correct: the position is positive and increasing.

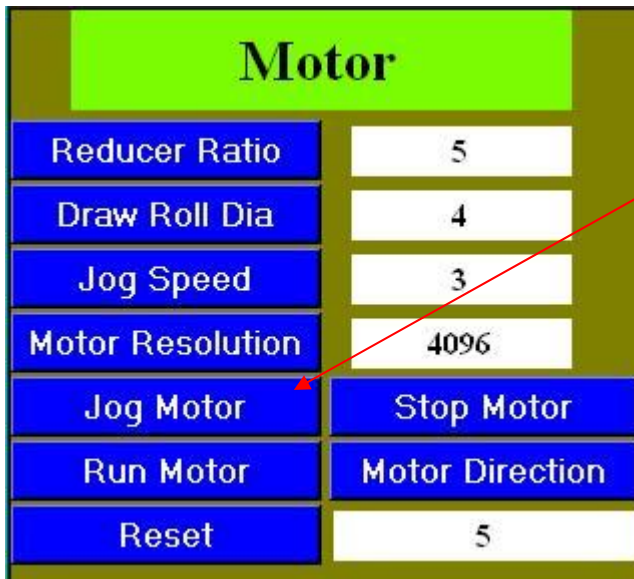
Note: The encoder should be phased before attempting to set the motor direction.

2.10 Motor Phasing



1. Push the **Run Motor** button.
The Servo motor will now follow the encoder position.
2. Jog the Machine and observe the direction of the Draw Roller. If the motor is rotating in the wrong direction:
3. Push the **Stop Motor** button.
4. Press the **Motor Direction** button to change the direction of rotation if necessary.

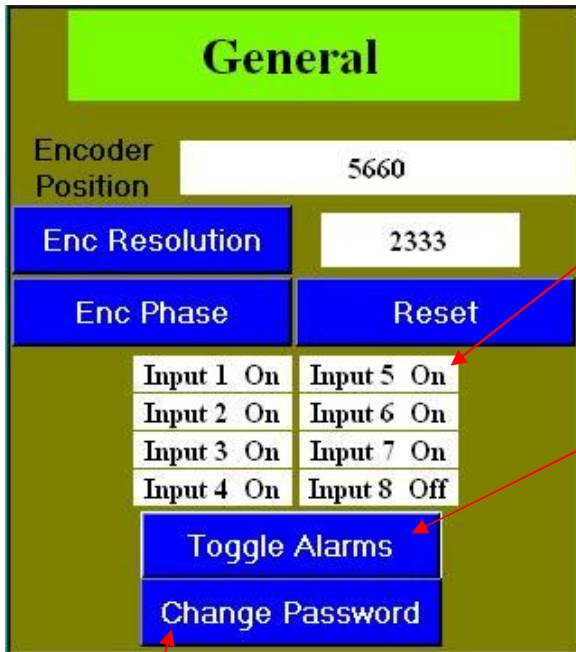
2.11 Verifying the Jog Speed



1. Push the **Jog Motor** Button. The draw rollers will turn continuously at the given Jog Speed.
2. Change the jog speed parameter to the desired speed. It is calibrated in Draw Roll rpm.

Note: Changing the jog motor speed has no effect unless the parameters are saved. This saves all parameters.

2.12 Check the I/O

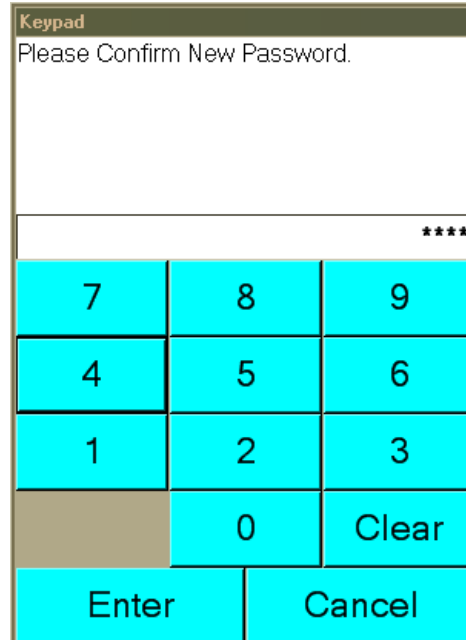


The States of the inputs may be monitored here.
Note Input 1 is the Scanner.

This toggles all outputs On/Off
This is useful for checking alarm circuitry

2.13 Changing the Password

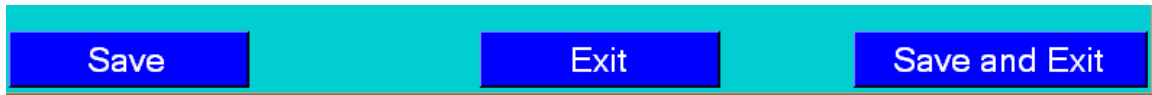
Press the Change Password button. The Password must be entered twice before it is accepted by the machine



2.14 Accepting the New Parameters

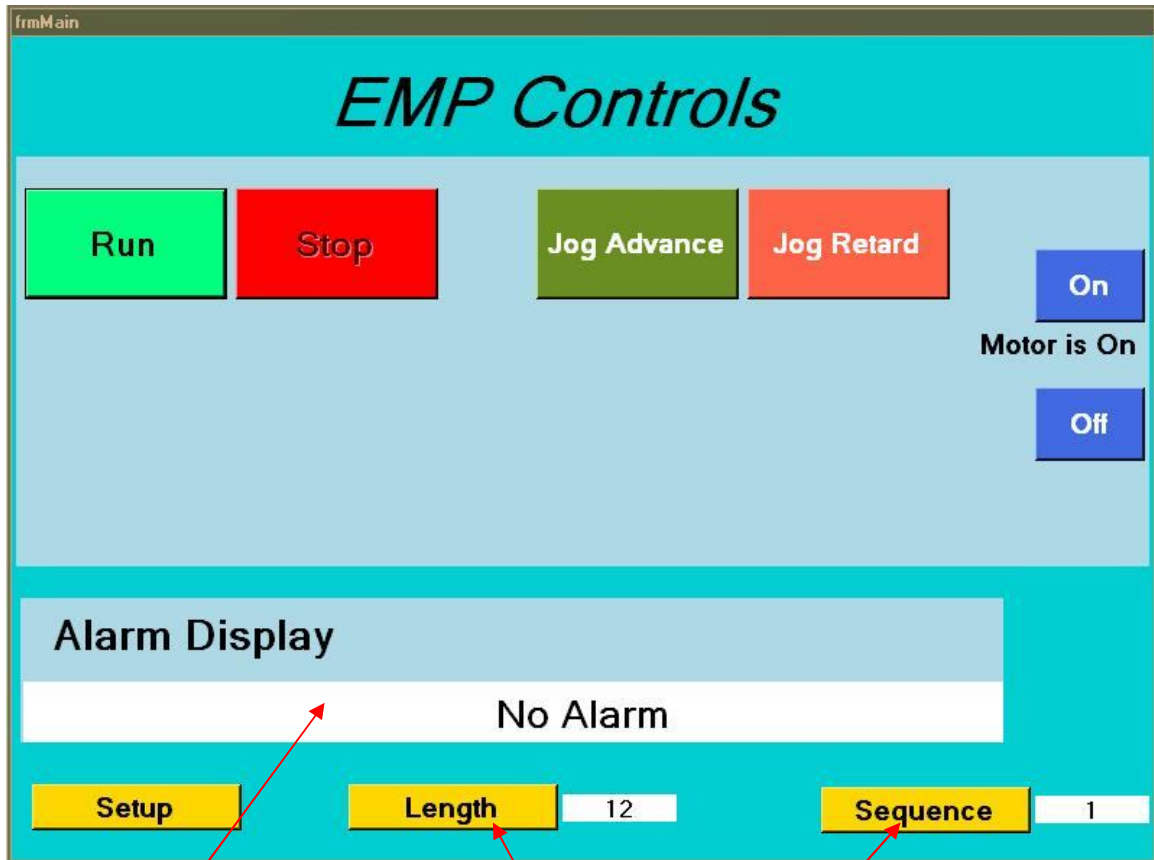
To make the new parameters permanent it is necessary to save them.

- **Save** saves the parameters and stays on the Setup Screen
- **Exit** returns to the main screen without Saving the parameters. System uses the old parameters
- **Save and Exit** returns to the main screen and saves the parameters.



3. Running the Machine

3.1 Main Screen

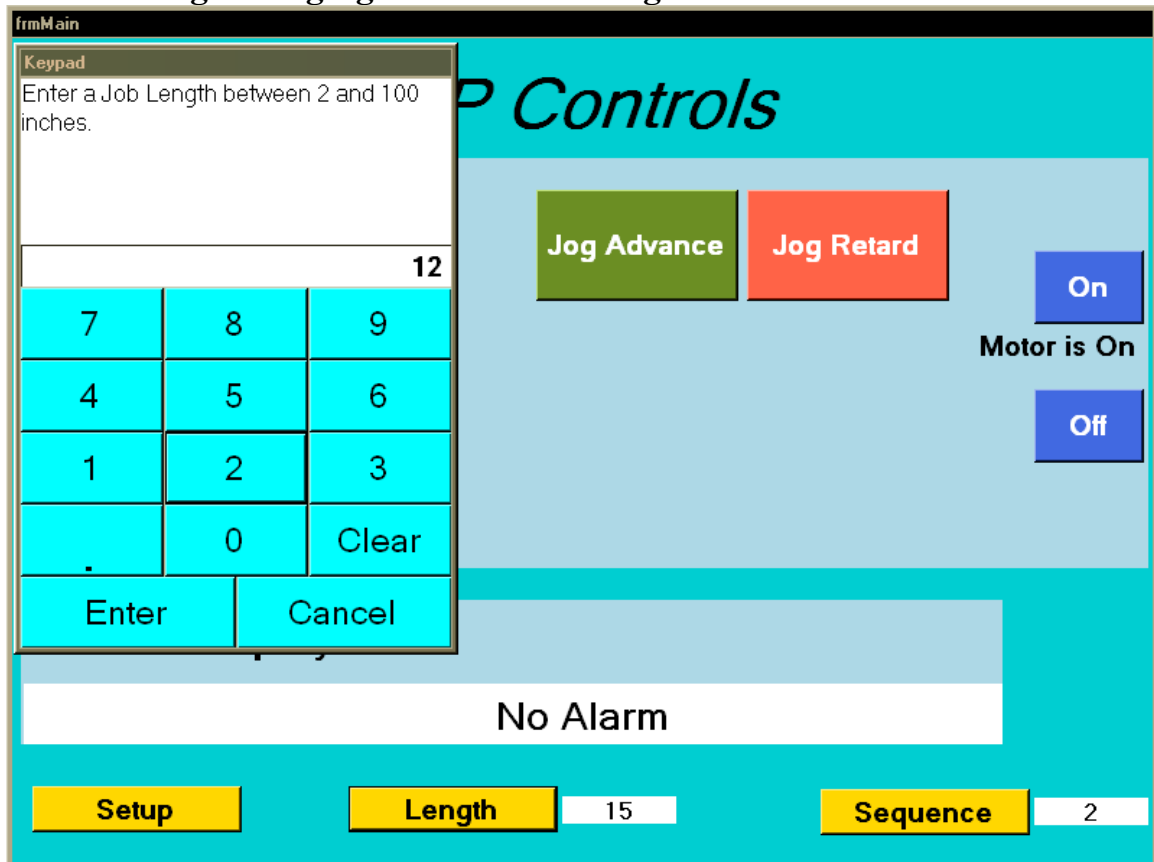


Alarm Panel

Product Length Button

Sequence Button

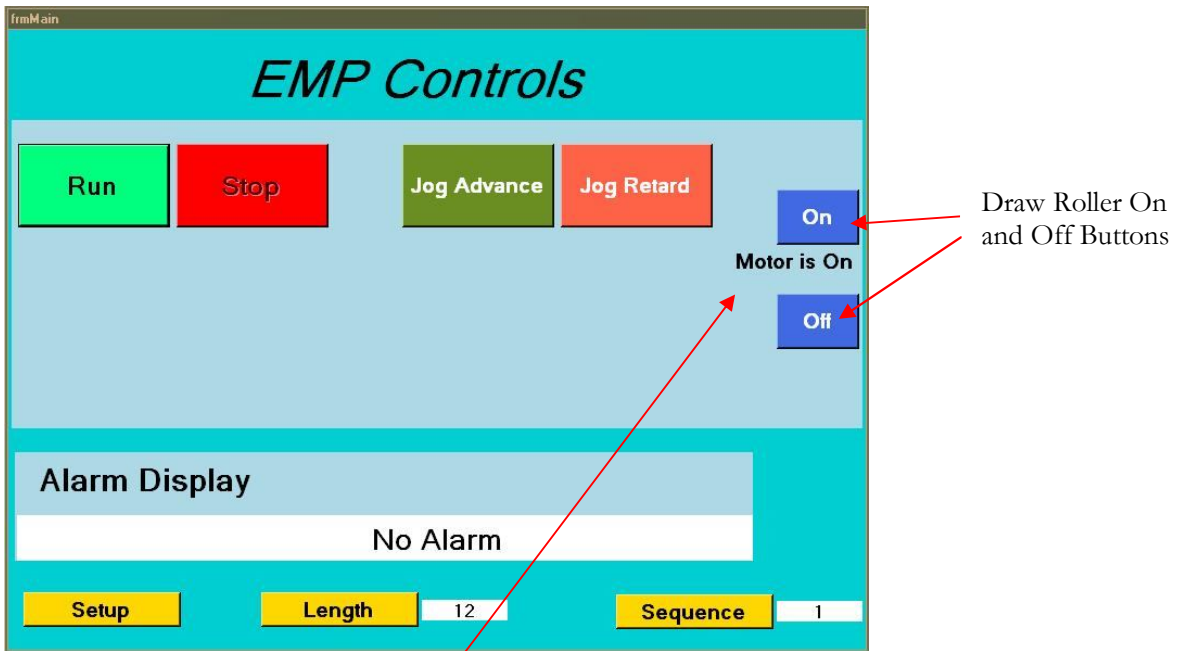
3.2 Entering/Changing the Product Length



Entering the Length

- Press the **Length** button and the Length Input screen appears
- Enter the Length in inches (min 2 inches max 100 inches) in the above screen and press enter.
- This will cause the draw-rollers to follow the encoder and deliver the required amount of web for each cycle of the machine.

3.3 Running The Motor



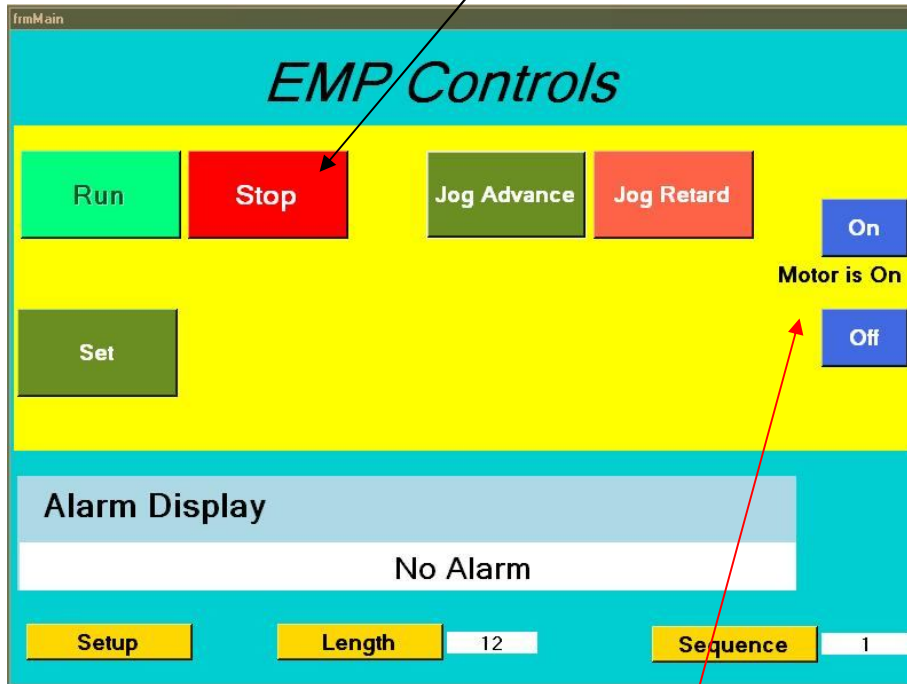
When the system is first turned on, the servo motor is stationary but powered on. The panel shows the motor is on. To run the motor simply press the **Run Button**. The motor will commence feeding film at the preprogrammed length

Note: If you want to enter the Setup Menu, change the Length or the Sequence, you must hit Stop first, otherwise the following message appears.



Motor Running -

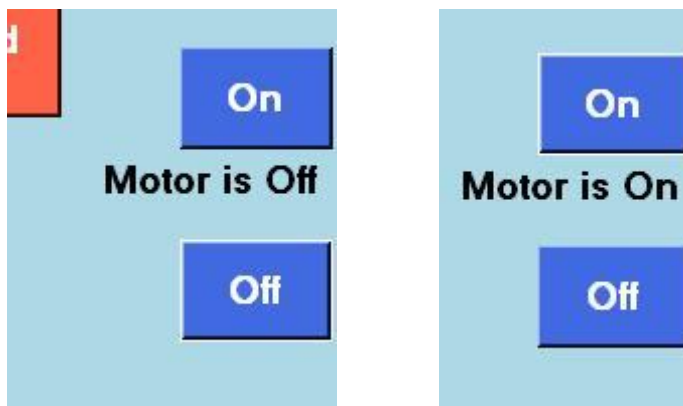
- Once you press the **Run** button, the screen look as it does below. The Yellow background demonstrates that the Motor is in Run mode.
- To Stop the motor simply push the **Stop** button, this stops the servo motor but leaves it turned on.



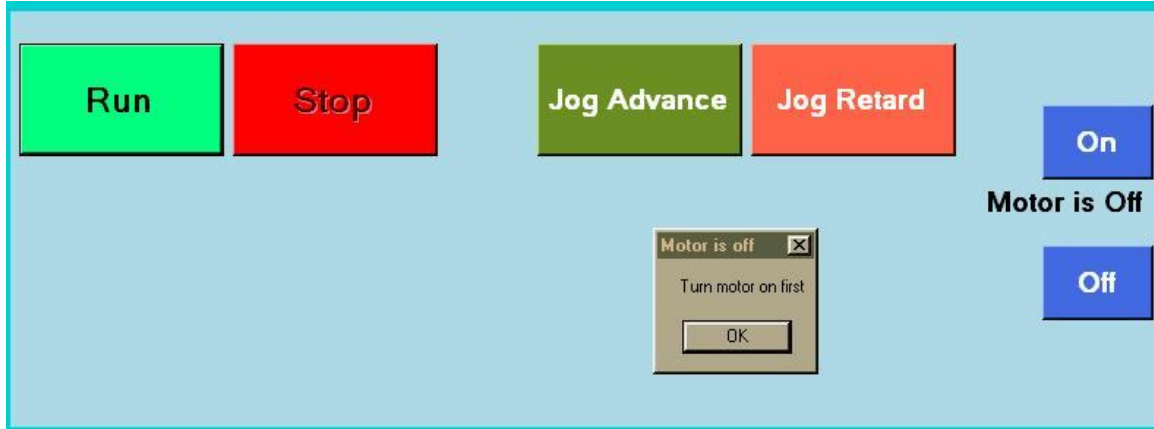
NOTE: The System is NOT in Register yet and will not issue corrections to the web.

3.4 Turning Motors On/Off

These buttons are used to turn the Motors On/Off

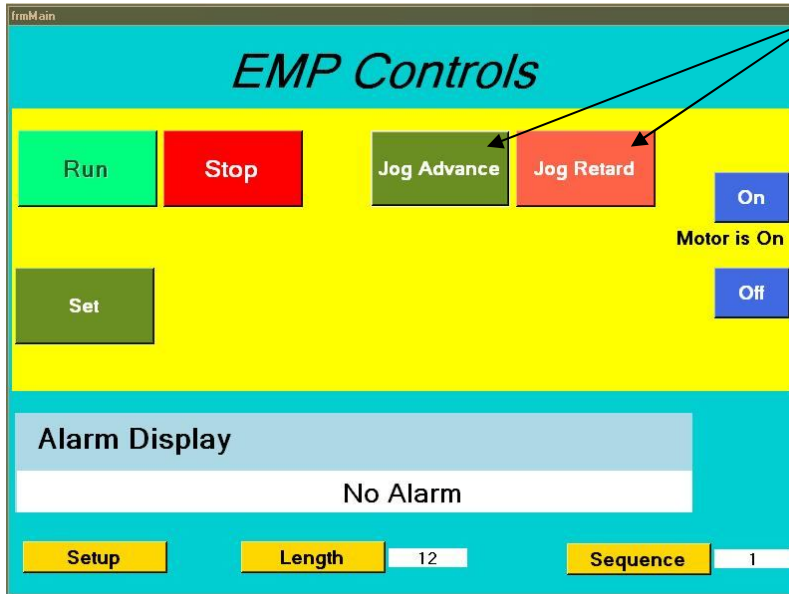


It is possible to turn the Servo Motors On or Off. This allows the Draw-rollers to be turned by hand, which can be useful in the case of a jam up. The current state of the Motor is displayed between the two buttons.



Note: The motors cannot be put in run mode when they are turned off. This Message appears to indicate that the motor should be turned on.

3.5 Jogging the Draw Rollers



Jog Buttons

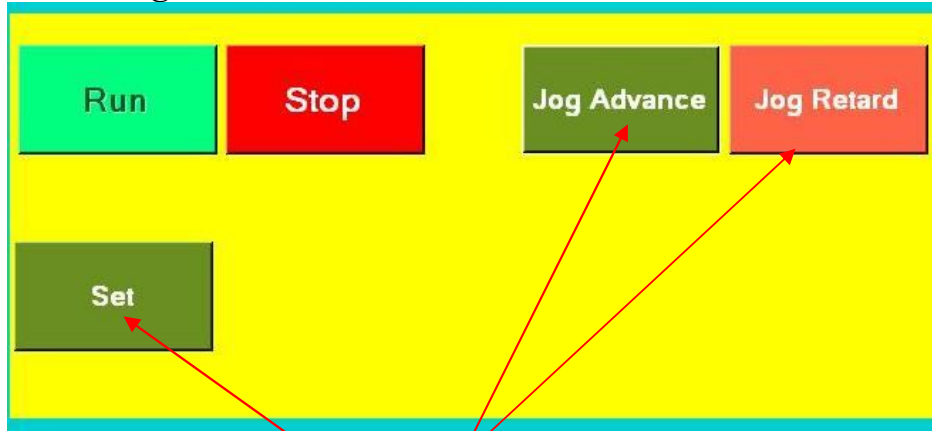
These buttons are used to jog the draw rollers. Note: the Servo Motor must be turned on before it can be jogged.

The motor may be jogged whether or not it is in Run Mode.

Jogging a motor in the Run Mode is useful to initially get the Web in time

4. Setting and Running Register

4.1 Getting the Print in time with the Knife



- First, use the **jog buttons** to get the web in time
- When the web is in time, press the **Set Button**

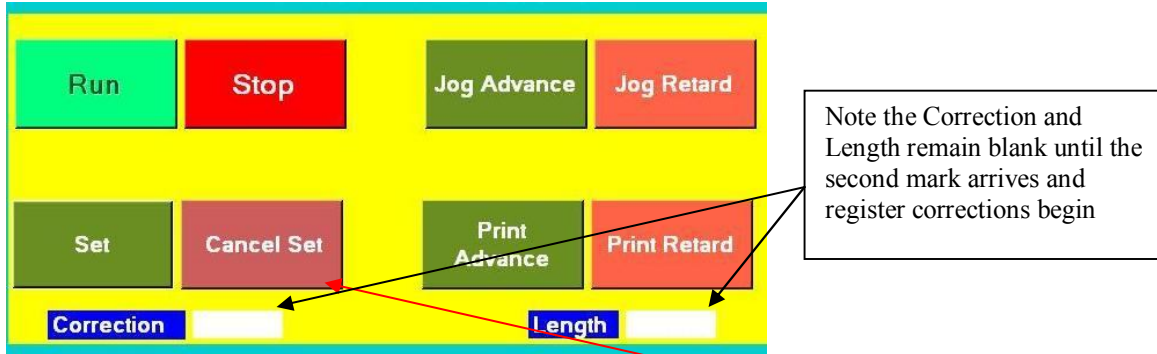


- The **Set button** starts to flash and changes color. It will continue flashing until the Scanner sees a Register Mark.
- The **Cancel Set button** allows the system to return to non-registered mode at any time.

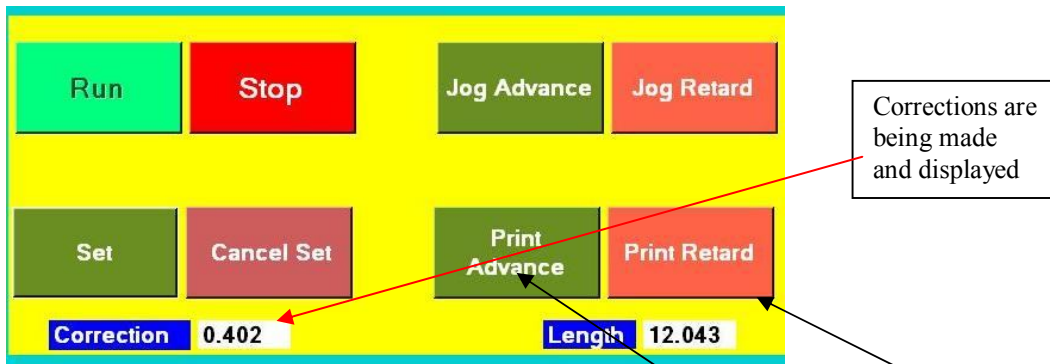
The Print is now in time with the knife and the control will use the register marks to maintain register.

4.2 Maintaining Register

The EMP Series 1100 will now accommodate for changes in tension and inaccuracies in print. If you want to manually improve the Register quality, it is possible to make adjustments manually.



- Large adjustments to the Register Timing should be made by Pressing **Cancel Set** (to return to non-registered mode), then using the **Jog** buttons to adjust the cut point. Then press the **Set** button again.



- Fine Adjustments to cut position can be made using the **Print Advance** and **Print Retard** Buttons
- The **Correction** and **Length** Labels show the size of the last correction in degrees, and the measured distance between the marks in inches. The Length tends to vary with web stretch and tension.

NOTE: The Jog Advance and Retard buttons do nothing while the machine is Running.

4.3 Alarms

Alarm Display	Clear Alarm
Out of Tolerance	

- **Out of Tolerance alarms** - This alarm occurs when the web is being cut outside of its predefined tolerance. The tolerance is defined by setting the alarm area. Note corrections are still made to reduce the error and this alarm may clear itself.

Alarm Display	Clear Alarm
Out of Register	

- **Out of Register alarm** - This alarm occurs when no marks are sensed in the Active Area. As no corrections will be made in this condition the web will not tend to self correct

System Alarm; Restart Controller	
Command Error	

- **Command Error** - A program bug has been detected. Cycling power to the control may allow the machine to run, but it is advisable to contact E.M.P.

System Alarm; Restart Controller

Position Error

- **Position Error** - A servo motor is not in its expected position (usually indicating a mechanical or electrical problem) and the system has been shut down. Recycling the power clears this fault. If you continue to receive this message, please call EMP to trouble shoot.

Alarm Display

Knife Disengaged

- **Knife Disengaged** - System has stopped feeding web because the knife is not ready to cut

5. Front Panel

- Power On** - Green Switch -Turns on the Servo System.
- Power Off** - Red Switch – Shuts power off to the Servo System.
- Active Area** - Red LED – Once “SET” is pressed, an active area is established. The active area LED will flash “ON” when the encoder is in its active area.
One Led for each web
- Scanner Pulse** - Green LED – Will flash when the scanner sees the register mark. The Scanner will also flash when seeing any other print in its path. These extra scanner pulses are outside the Active Area and do not generate corrections.

6. Emergency Telephone Number

EMP maintains a file by serial number of each Servo System sold. The serial number will supply details on the:

1. Servo Program
2. Motor Amplifier
3. Style of Alarm Relay and Components Used
4. Motor Type
5. Reducer Ratio

Before contacting EMP, please obtain the serial number.

The Serial Number can be obtained by checking the label on the door of the control panel.

EMP provides service assistance Monday to Friday 8:30 AM (EST) to 6:00 PM (EST).

After normal business hours, an emergency phone number, 917.215.4639, should be called. The EMP web site www.empregister.com also provides trouble shooting assistance.