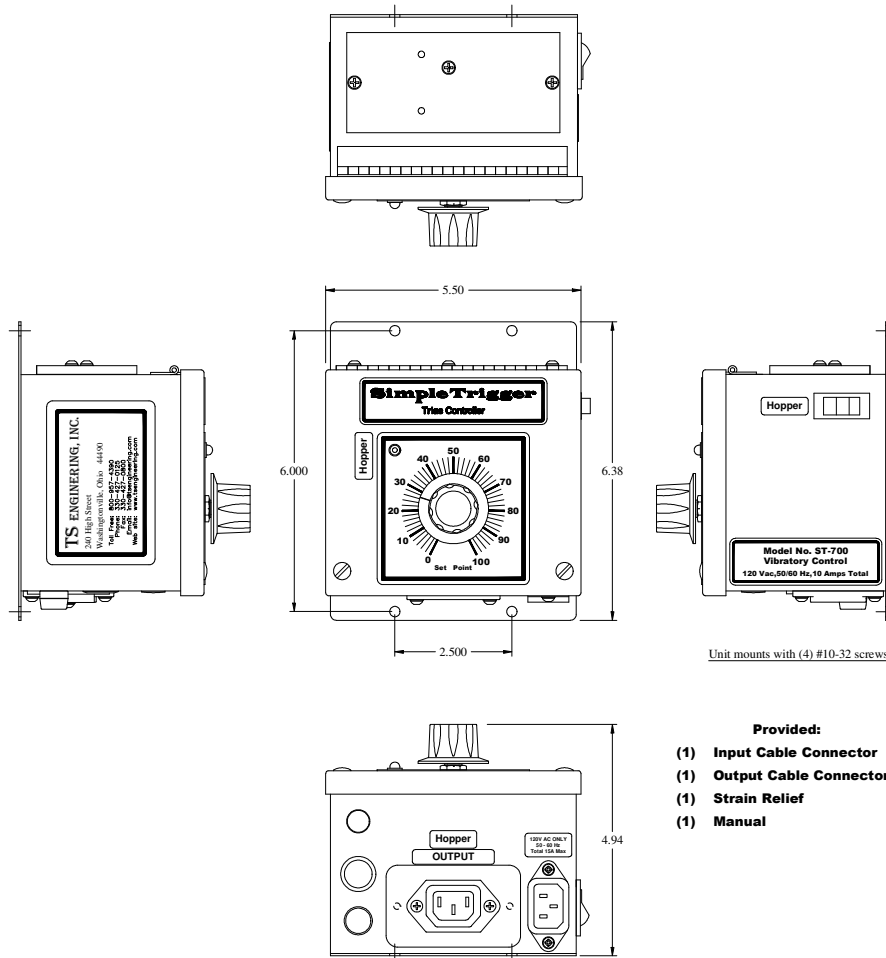


Simple Trigger

Digital Power-Tracking Controller

ST-700-1 and ST-700-2

By TS ENGINEERING, INC.



- Provided:**
- (1) Input Cable Connector
 - (1) Output Cable Connector
 - (1) Strain Relief
 - (1) Manual

Operations Manual

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Notations in this Manual

This manual uses two symbols to draw attention to or denote actions, which should be performed cautiously, or avoided altogether.



Means TAKE NOTE of this statement, or BE CAUTIOUS when performing this action.



Means DO NOT DO THIS, or DO NOT ALLOW THIS TO HAPPEN.

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Introduction

The **SimpleTrigger** by TS Engineering, Inc. is an intelligent vibratory feeder controller that is capable of delivering a uniform level of drive voltage to the feeder coils regardless of fluctuations in the source line. By monitoring both the amplitude and frequency of the input line the controller can perform on-the-fly adjustments to the trigger timing of the output alternistor and maintain the desired vibration intensity level. The unit can correct for input line fluctuations. The standard unit without sensor is considered a voltage regulating controller. The **SimpleTrigger** with the sensor option is considered an amplitude regulating control.

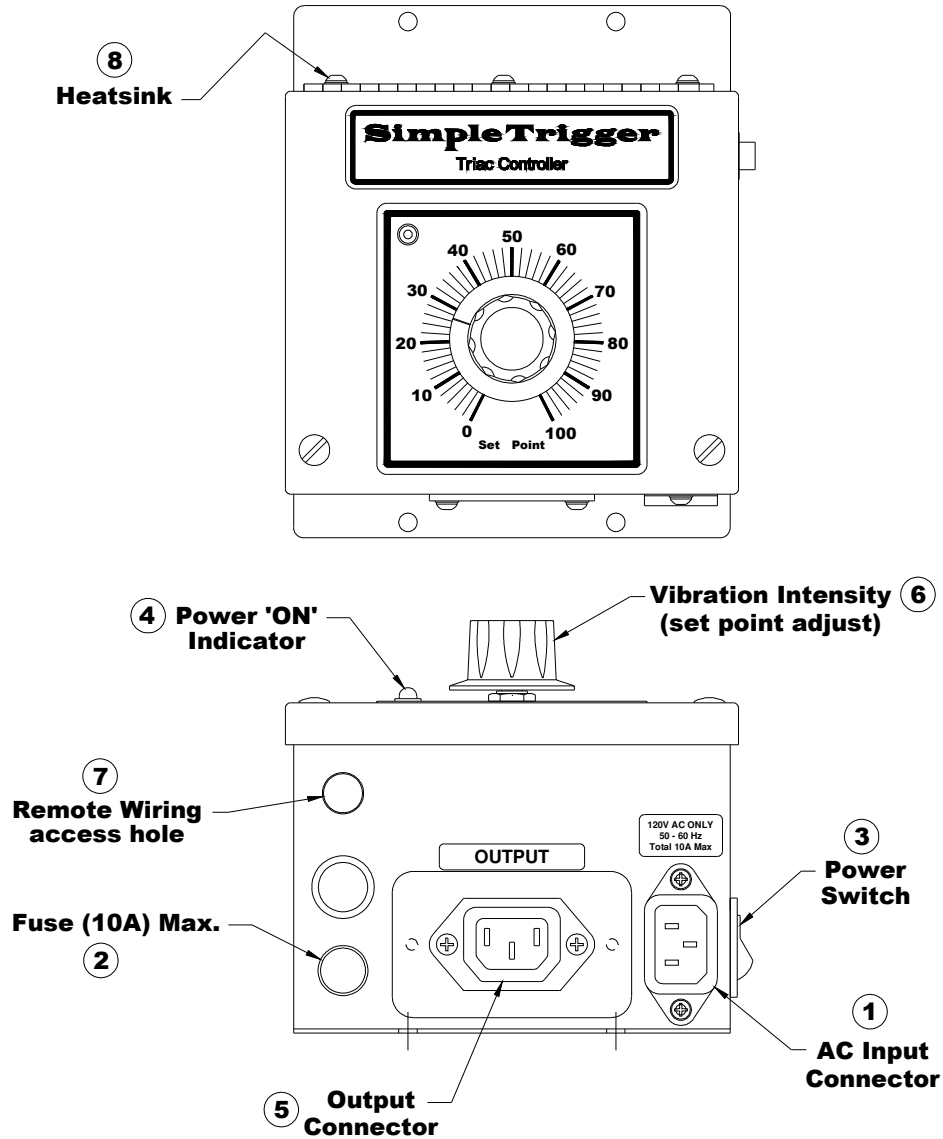


Figure 1. SimpleTrigger Digital Power-Tracking Controller

External Controls and Connections

1. **AC Input Connector** - (see Figure 1) A quick disconnect cord plugs into a standard 110 or 220 Volt AC outlet to power the controller. The controller requires between 95-140 Volts AC, 50/60 Hertz for the 110 volt unit and 190–250 Volts AC, 50/60 Hertz for the 220 volt unit.

⊗ USE OF AN INPUT VOLTAGE HIGHER THAN THE RATED MAXIMUM (140 VOLTS RMS FOR THE 110 UNIT AND 250 VOLTS RMS FOR THE 220 VOLT UNIT) CAN DAMAGE THE

CONTROLLER AND VOID YOUR WARRANTY!

2. **Fuse** – (see Figure 1) The Input fuse should be sized to accommodate the feeder requirements, but not to exceed 10 amps maximum.
3. **Power Switch** – (see Figure 1) Upon power up there is a 0.2-second pause for internal calibration that may be followed by a soft start delay of 0.8 seconds, depending on **DIP Switch** settings.



ALWAYS TURN POWER OFF BEFORE CONNECTING OR DISCONNECTING A FEEDER OR REPLACING THE INPUT FUSE!

4. **Power ‘ON’ Indicator** – (see Figure 1) Upon power on with the power switch, the power ‘ON’ lite will illuminate indicating that power is on providing the input fuse is good.
5. **Feeder Output Connector** – (see Figure 1) Supplies the output to drive the feeder coils. This is a variable power output. (connectors are different for 110 or 220 version)



ONLY A FEEDER’S MAGNET COILS SHOULD BE PLUGGED INTO THIS OUTLET!



USE OF AN INPUT VOLTAGE HIGHER THAN THE RATED MAXIMUM (140 VOLTS RMS FOR THE 110 UNIT AND 250 VOLTS RMS FOR THE 220 VOLT UNIT) CAN DAMAGE THE CONTROLLER AND VOID YOUR WARRANTY!

6. **Vibration Intensity (set point adjust)** – (see Figure 1) Selects the desired amplitude of vibration intensity.
7. **Remote Wiring access hole** – (see Figure 1) The unit is factory delivered with this hole covered by a metal snap-in cap. A cord grip may be installed for securing external wiring at this location. This is very useful when utilizing features such as interlocking, coupling of the Universal Input to a photocell or PLC output, etc.
8. **Heatsink** – (see Figure 1) Dissipates the heat generated by the electronics. It is specified for a continuous 15 Amp RMS bowl current in an ambient temperature environment of 45° Celsius.



AT HIGH VALUES OF CONTINUOUS LOAD CURRENT THE HEAT SINK MAY BE HOT TO THE TOUCH DO NOT BLOCK AIRFLOW AROUND THE HEATSINK DURING OPERATION! THE UNIT SHOULD BE MOUNTED WITH THE HEATSINK UPRIGHT TO ALLOW FOR PROPER COOLING.

Operation Setup

The controller is designed and factory preset to require very few adjustments. On most feeders only the following setup procedure should be required.

1. Plug the feeder power cord into the output connector on the bottom of the unit. At this time you may wish to replace the controller fuse (10 amps factory value) with one which is specific to the drive coils current rating to prevent accidentally over driving your feeder. **Do not use a fuse rated over 10Amps!**

2. Plug the controller into a standard outlet rated to deliver 95-140 Volts RMS AC @ 50/60 Hertz for the 110 volt unit and 190-250 Volts RMS AC @ 50/60 Hertz for the 220 volt unit.).



USE OF AN INPUT VOLTAGE HIGHER THAN THE RATED MAXIMUM (140 VOLTS RMS AC OR 250 VOLTS RMS AC) CAN DAMAGE THE CONTROLLER AND VOID YOUR WARRANTY!

3. Turn on the unit via the Power switch located on the right side of the unit.
4. Upon power up there is a 0.2-second pause for internal calibration that may be followed by a soft start delay of 0.8 seconds (depending on **DIP Switch** settings), after which the controller will begin normal operation.

At this point simply adjust the **Vibration Intensity (amplitude adjust)** knob to achieve the desired amplitude of vibration. The controller will then maintain this vibration intensity level independent of any line voltage fluctuations.

The Circuit Board



TO INSURE OPERATOR SAFETY, INTERNAL ADJUSTMENTS AND/OR FUSE SERVICING SHOULD ALWAYS BE DONE WITH THE SMARTTRIGGER TURNED OFF AND UNPLUGGED!

Located on the circuit board are three user serviceable trim-pots labeled **R14** (on delay), **R23** (off delay), **R34** (max. amplitude). The SW1 **DIP** Switches are for setting up the controller operating parameters. The Micro Controller has the stored operating program.

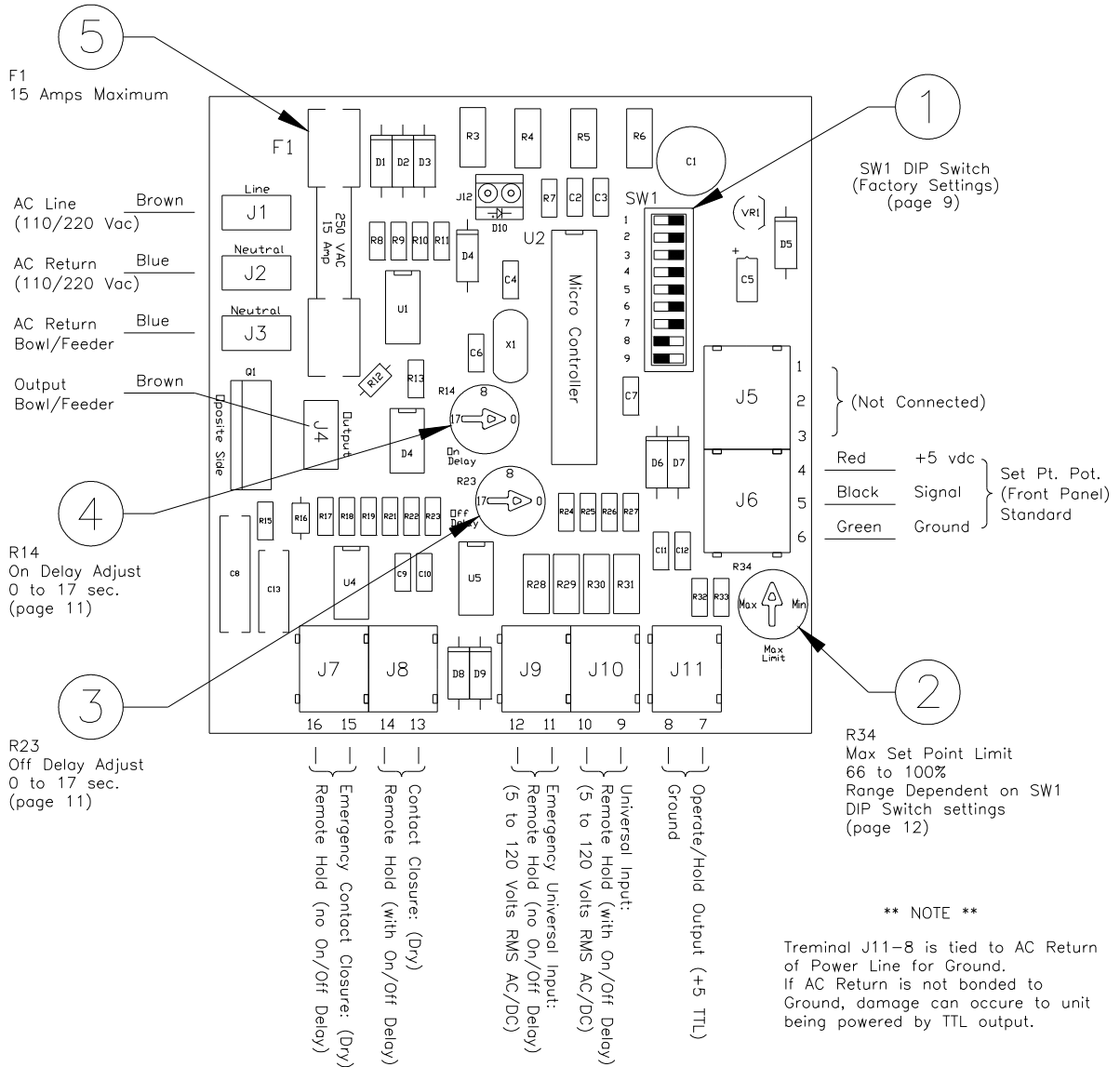


Figure 2. DIP switches and trim pot locations.

Operating the controller

This section describes some of the advanced features that are available for use with the unit as well as suggested adjustments to enhance feeder performance.

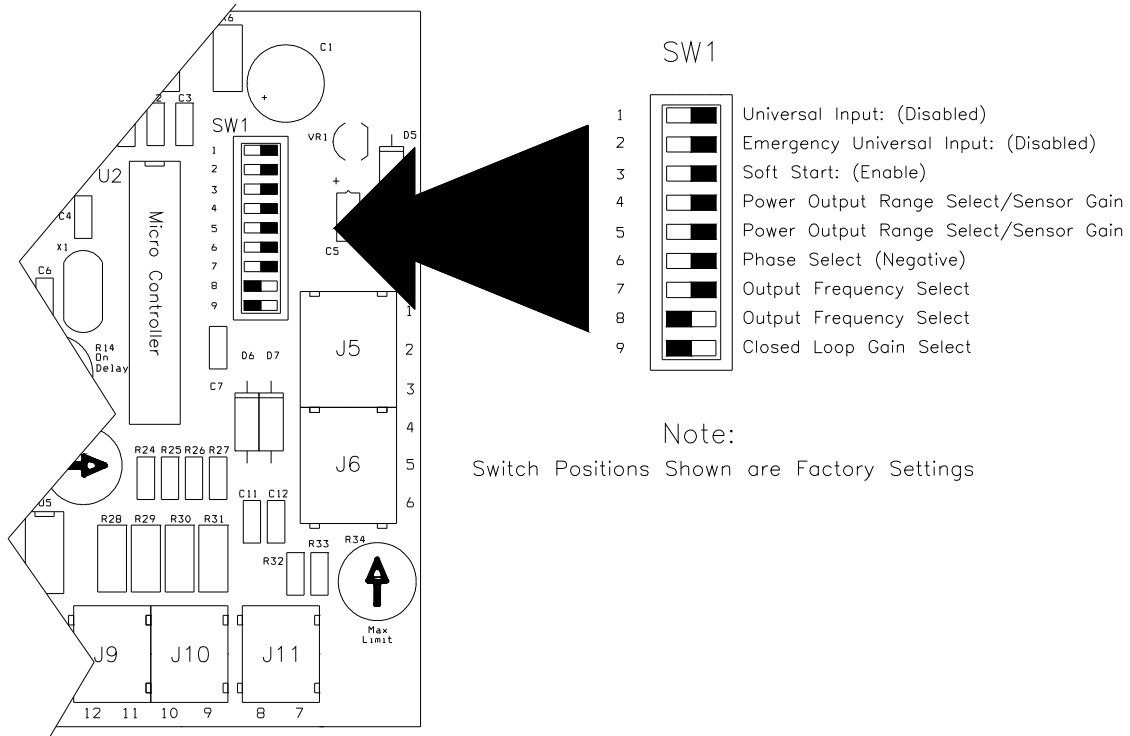


Figure 3. Dip Switch Location and Settings

Universal Input Enable for Operate / Hold (see Figure 3)

This enables the **Universal Input**. Any voltage, AC or DC, from 5 Volts RMS minimum to 120 Volts RMS maximum applied to terminals **5** and **6** of **TB3** will put the unit in **Operate** mode. A dry contact closure applied to terminals **7** and **8** of **TB3** will put the unit into **Hold** mode. The **ON** and **OFF** delay times will function normally. (see *Warning*)

- Switch 1 = **OFF** Universal Input enabled
- Switch 1 = **ON** **Universal Input disabled** *

Universal Input Enable for Emergency Operate / Hold (see Figure 3)

This enables the **Emergency Universal Input**. Any voltage, AC or DC, from 5 Volts RMS minimum to 120 Volts RMS maximum applied to terminals **9** and **10** of **TB3** will put the unit in **Operate** mode. A contact closure on terminals **11** and **12** of **TB3** will put the unit into **Hold** mode. All hold delay settings specified by trimpots **R14** (on delay) and **R23** (off delay) will be bypassed, and the controller will change operational states immediately. (see *Warning*)

- Switch 2 = **OFF**
- Switch 2 = **ON**

Emergency Universal Input enabled
Emergency Universal Input disabled *

Soft Start (see Figure 3)

Enabling the **Soft Start** causes power to the feeder bowl to ramp up to the setpoint over a period of approximately 0.8 seconds when switching from **Hold** to **Operate** mode. This is useful in preventing surges associated with state changes while running at high levels of current. Disabling the **Soft Start** causes the controller to return directly to the setpoint with no delay when switching from **Hold** to **Operate**.

Switch 3 = **OFF** Soft Start disabled
 Switch 3 = **ON** **Soft Start enabled** *

Power Output Range Select (see Figure 3)

In open-loop mode **DIP** Switches **SW4** and **SW5** control the maximum power to the feeder reducing from 100% to 75% to 50% to 37.5% of normal full scale. This improves resolution of the **Amplitude Adjust** potentiometer, as well as safely limits output power to devices that operate at much lower power requirements than what the controller is capable of delivering.

Switch 4 = **ON** **(100% - 66%)** *
 Switch 5 = **ON**

Switch 4 = **ON** **(75% - 50%)**
 Switch 5 = **OFF**

Switch 4 = **OFF** **(50% - 33%)**
 Switch 5 = **ON**

Switch 4 = **OFF** **(37.5% - 25%)**
 Switch 5 = **OFF**

Phase Select (see Figure 3)

This feature enables selection of which side (**phase**) of the line voltage the controller triggers off of on the 30 Hz and 60 Hz frequency output settings (25 Hz and 50 Hz on 50 Hz source lines). For example, if four 60 Hz feeders were being run simultaneously, it would be recommended to set two to the positive phase and two to the negative phase to effectively balance source utilization. This switch has no effect on 40 and 120 Hz output settings (33.3 Hz and 100 Hz on 50 Hz source lines).

Switch 6 = **OFF** Positive phase of line
 Switch 6 = **ON** **Negative phase of line** *

Output Frequency (see Figure 3)

Selects the frequency of the output to the feeder. Output frequencies are dependent on the frequency of the input line, as illustrated below.

Switch 7 = ON	60 Hz, Output = 120 Hz
Switch 8 = ON	50 Hz, Output = 100 Hz
Switch 7 = ON	60 Hz, Output = 60 Hz *
Switch 8 = OFF	50 Hz, Output = 50 Hz
Switch 7 = OFF	60 Hz, Output = 40 Hz
Switch 8 = ON	50 Hz, Output = 33.3 Hz
Switch 7 = OFF	60 Hz, Output = 30 Hz
Switch 8 = OFF	50 Hz, Output = 25 Hz

Factory Preset DIP Switch Values (see Figure 3)

- Switch 1 = ON
- Switch 2 = ON
- Switch 3 = ON
- Switch 4 = ON
- Switch 5 = ON
- Switch 6 = ON
- Switch 7 = ON
- Switch 8 = OFF
- Switch 9 = OFF

On Delay (R14) (see Figure 2)

Adjusting **R14** determines the amount of time from when the Remote Operate / Hold feature is switched from **Hold to Run** and the feeder begins to operate. The delay can be adjusted between 0 and 17 seconds. Rotating **R14** fully counterclockwise gives a delay of 17 seconds, and rotating **R14** fully clockwise gives no delay. This is a single turn pot. If the unit is placed from run to hold (either direction) the internal timers will reset and restart the countdown.

Off Delay (R23) (see Figure 2)

Adjusting **R23** determines the amount of time from when the Remote Operate / Hold feature is switched from **Run to Hold** and the feeder ceases operation. The delay can be adjusted between 0 and 17 seconds. Rotating **R23** fully counterclockwise gives a delay of 17 seconds, and rotating **R23** fully clockwise gives no delay. This is a single turn pot. If the unit is placed from run to hold (either direction) the internal timers will reset and restart the countdown.

Max Amplitude Limit (R34) *(see Figure 2)*

Adjusting **R34** limits the maximum amount of drive the unit can deliver to the feeder device. The adjustment range as a percentage of normal full scale is dependent on the settings of **DIP Switches SW4** and **SW5** (see *Power Output Range Select*, page 10, for adjusting the set point range). Rotating **R34** fully counterclockwise sets the maximum at 100% of the **DIP Switch** selected range, and rotating **R34** fully clockwise cuts the maximum to 66% of the **DIP Switch** selected range. This is a single turn pot.

Using the Remote Operate / Hold Feature

Contact Closure Activation (see Figure 2)



CONTACT CLOSURE IS A NON-POWERED DRY CONTACT. IF VOLTAGE IS APPLIED TO THE CONTACT CLOSURE INPUTS, SEVERE DAMAGE MAY OCCUR TO UNIT AND WILL VOID THE WARRANTY

Connecting a normally open switch across terminals **7** and **8** of **TB3** will provide the ability to switch between Operate and Hold conditions remotely. A switch closure will put the unit into **Hold** mode after the time delay (if any) determined by **R23**. A switch opening will put the unit into **Operate** mode after the time delay (if any) determined by **R14**. (See page 11 for setting delay time.) **DIP Switch SW1** must be ON to enable the Operate/Hold Contact Closure activation.



CONNECTING ANY VOLTAGE ACROSS THE CONTACT CLOSURE OPERATE / HOLD INPUTS (TERMINALS 7 and 8, TB3) MAY DAMAGE THE CIRCUIT AND VOID YOUR WARRANTY! THIS IS MEANT TO BE A SWITCH, CONTACT OR OTHER NON-POWERED CLOSURE.

Universal Input (see Figure 2)

The Universal Input enables remote operation of the Operate / Hold feature via a switchable voltage source. Any voltage, AC or DC, from 5 Volts RMS minimum to 120 Volts RMS maximum applied to terminals **5** and **6** of **TB3** will put the unit in **Operate** mode after the time delay (if any) specified by **R14**. A contact closure input applied to terminals **7** and **8** of **TB3** will put the unit into **Hold** mode after the time delay (if any) specified by **R23**. (See page 11 for setting delay time). **DIP Switch SW1** must be OFF to enable the Universal Input.

NOTE: If no voltage is applied to this input and Switch 1 is in the Off position, upon power up the unit will run until the off delay times out and the unit will then go into Hold mode. The contact closure input (terminals 7 and 8, TB3) will still function normally.

It is important to note that if either consecutive state change occurs on the contact closure or the **Universal Input** before the last delay timer has timed out, the previous request will be canceled. For example, suppose the OFF delay is set to 10 seconds and the unit is currently running. If the operator flips the switch to the **Hold** position, then to the **Operate** position within 5 seconds, the unit will continue to run without interruption.

Operate/Hold Out (Interlocking/Slaving) (see Figure 2)

By providing an output signal for **Operate** or **Hold** modes, several controllers may be connected together for interlocked operation. The output signal is +5V Dc for Operate mode, and 0V Dc for Hold mode on terminal **4** with respect to **3** of **TB3**. This output follows the actual status of the unit, which will include any delay in changing states as set by the **On** and **Off** delay settings (**R14** and **R23**). These connections can be used to the **Universal Hold** input or **Emergency Hold** input to control several different control units.

Using the Remote Emergency Operate / Hold Feature

Emergency Contact Closure Activation (see Figure 2)



CONTACT CLOSURE IS A NON-POWERED DRY CONTACT. IF VOLTAGE IS APPLIED TO THE CONTACT CLOSURE INPUTS, SEVERE DAMAGE MAY OCCUR TO UNIT AND WILL VOID THE WARRANTY

Connecting a normally open switch across terminals **11** and **12** of **TB3** will provide the ability to instantly switch between Emergency Operate and Hold conditions remotely. A switch closure will put the unit into **Hold** immediately, ignoring any time delays set by **R23**. A switch opening will put the unit into **Operate** mode immediately, ignoring any delays set by **R14**. **DIP Switch SW2** must be ON to enable the Emergency Operate/Hold contact closure activation.



CONNECTING ANY VOLTAGE ACROSS THE CONTACT CLOSURE EMERGENCY OPERATE / HOLD INPUTS (TERMINALS 11 AND 12, TB3) MAY DAMAGE THE CIRCUIT AND VOID YOUR WARRANTY! THIS IS MEANT TO BE A SWITCH, CONTACT OR OTHER NON-POWERED CLOSURE.

Emergency Universal Input (see Figure 2)

The Universal Input enables remote operation of the Emergency Operate/Hold feature via a switchable voltage source. Any voltage, AC or DC, from 5 Volts RMS minimum to 120 Volts RMS maximum applied to terminals **9** and **10** of **TB3** will put the unit into **Operate** mode. A contact closure input applied to terminals **11** and **12** of **TB3** will put the unit into **Hold** mode. **DIP Switch SW2** must be OFF to enable the Emergency Universal Input.

Note that the Emergency Operate/Hold function automatically bypasses all **On** and **Off** delay time settings. This means that the unit will change states immediately following an Emergency Hold or Operate request. The **Soft Start** feature *is not* automatically bypassed however, and if it is enabled switching from **Hold** to **Operate** will still cause the voltage to ramp up gradually over 0.8 seconds to the set point.

Simple Trigger Wiring Diagram

The wiring of the controller is as shown in **Figure 4**. The power connections for Line and Neutrals should be of sufficient gauge to handle the current being used by the controller and supplied to the feeder. The minimum wire gauge used should be 14 AWG. But this will depend on local codes and regulations. The power connections, **J1** thru **J4** are intended to use push-on terminal style connection. This is pre-wired from the factory in **ST-700** units.

Terminals **J5** are not used. Terminals **J6** (4, 5, 6) are pre-wired in **ST-700** units with a 20-22 gauge three conductor cable connected to the Set Point Potentiometer. The remaining connectors **J7** thru **J11** are all customer connections. The connectors will accept a wire size from 18 to 24 awg. The wire size will depend on local codes and restrictions. Connector J12 is for power lite LED connection. Unit will not operate without LED or jumper wire installed.

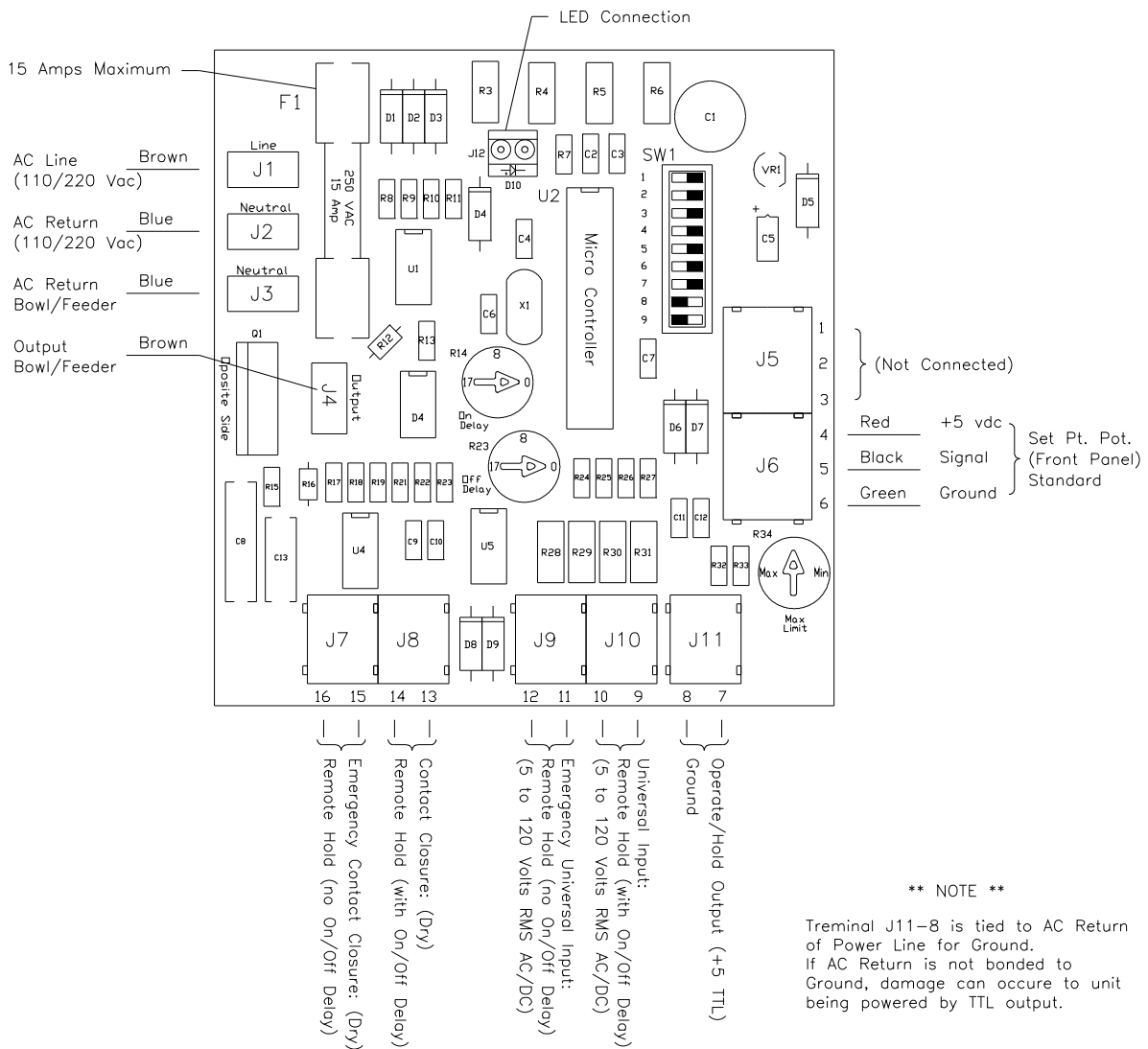


Figure 4. Circuit board wiring diagram

SW1-1 Universal Input for Operate/Hold

Switch 1 - Off Universal Input Enable
Switch 1 - On Universal Input Disable

SW1-2 Emergency Universal Input for Operate/Hold

Switch 2 - Off Emergency Universal Input Enable
Switch 2 - On Emergency Universal Input Disable

SW1-3 Soft Start

Switch 3 - Off Soft Start Disable
Switch 3 - On Soft Start Enable

SW1-4 Power Output Range Select

SW1-5 Power Output Range Select

Switch 4 - On
Switch 5 - On (Range: 100% - 66%)
Switch 4 - On
Switch 5 - Off (Range: 75% - 50%)
Switch 4 - Off
Switch 5 - On (Range: 50% - 33%)
Switch 4 - Off
Switch 5 - Off (Range: 33% - 25%)

SW1-6 Phase Select

Switch 6 - Off Positive Line Phase
Switch 6 - On Negative Line Phase

SW1-7 Output Frequency Select

SW1-8 Output Frequency Select

Switch 7 - On
Switch 8 - On Source: 50 - 60 Hz, Output: 100 - 120 Hz
Switch 7 - On
Switch 8 - Off Source: 50 - 60 Hz, Output: 50 - 60 Hz
Switch 7 - Off
Switch 8 - On Source: 50 - 60 Hz, Output: 33.3 - 40 Hz
Switch 7 - Off
Switch 8 - Off Source: 50 - 60 Hz, Output: 25 - 30 Hz

SW1-9 Not Functional

Potentiometer Adjustments

R14 On Delay Adjust
(0 to 17 Seconds)
R23 Off Delay Adjust
(0 to 17 Seconds)
R34 Maximum Limit Adjust
(66 to 100%)

Figure 5. ST-700 Switches and Adjustments