

INSTRUCTIONS for INSTALLATION, OPERATION and MAINTENANCE

SLO-SYN[®] TRANSLATOR MODULE TYPE STM101

CAUTION

Since this product will be used in applications beyond the control of The Superior Electric Company, the system designer is advised to incorporate protection features which will insure user and equipment safety.

INSPECTION

When unpacking the SLO-SYN Translator Module, examine it carefully for any shipping damage. The "Damage and Shortage" instruction packed with the unit outlines the proper procedure to follow if any parts are damaged or missing. Check to see that the following items have been received.

1. **STM101 Translator Module**, Superior Electric part number A205916-G1
2. **22-pin edge connector**, Amphenol number 143-022-12-103, Superior Electric part number DM144654-G4
3. **500K ohm CCW log potentiometer**, Superior Electric part number BM144664-G1
4. **1K ohm, 10 watt resistor**, Superior Electric part number BD21834-G11
5. **10 Microfarad, 150 VDC capacitor**, Superior Electric part number BR103872-G11
6. **Instruction Sheet**, Superior Electric part number MS2105-G220

DESCRIPTION

The STM101 is a printed circuit board containing the logic elements for bidirectional control of a SLO-SYN stepping motor. The unit can be triggered by pulses from an internal oscillator or from an external pulse source. A 22-pin edge connector, a 500K ohm speed control potentiometer and a suppression

network consisting of a 1Kohm, 10 watt resistor and a 10 mfd. capacitor are supplied. A separate 24VDC power supply is also required.

MOUNTING

The translator module should be mounted vertically with the 6½" (165mm) dimension in the horizontal plane to assure maximum convection flow of air for cooling. The module can be operated in ambient temperatures from 0° C to +50° C. The board dimensions are 4¼" (108mm) x 6½" (165mm). Dimensional drawings of the 22-pin edge connector and of the potentiometer provided for speed control are shown to aid in the mounting of these devices.

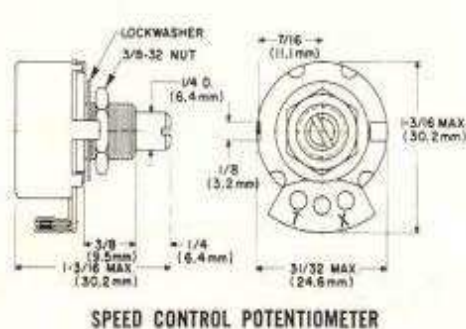
CAUTION: When mounting the translator module, a nonconductive support should be provided for the end of the circuit board to hold the board in its receptacle and to prevent damage from vibration.

POWER SUPPLY

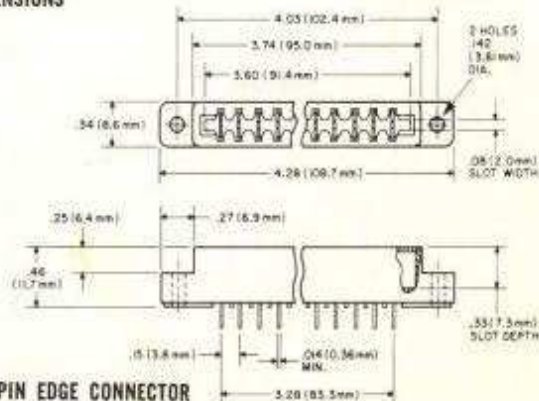
The STM101 requires a separate 24VDC ±10% power supply capable of providing up to 6 amperes current. Power supply ripple must not exceed 10% peak to peak. Two power supplies are available from Superior Electric and are recommended for use with STM101. The MPS3000 operates from 120VAC ±10%, 60 hertz power and the MPS3000X requires a 220/240 VAC ±10%, -15%, 50 hertz source.

TRIGGERING REQUIREMENT

The STM101 can be triggered from an external pulse source connected as shown in the wiring diagram. Triggering is accomplished by a change in voltage at the CW Pulse or the CCW Pulse terminal from logic level 1 (2.4 to 5.5VDC) to logic level



DIMENSIONS



THE SUPERIOR ELECTRIC COMPANY
Bristol, Connecticut 06010

TRIGGERING REQUIREMENT *continued*

0 (0 to 0.4VDC). The unit will trigger on the leading edge of the logic 1 to logic 0 transition. Complete triggering signal requirements are as follows:

Logic 1 Level	2.4 to 5.5 VDC
Logic 0 Level	0 to 0.4 VDC
Minimum Pulse Width	10 microseconds
Maximum Fall Time	1 microsecond
Maximum Rise Time	10 microseconds
Loading	5mA maximum. With an open collector TTL device, a 4.7K ohm $\pm 10\%$ pull-up resistor to 5 volts is required.

DIRECTION OF MOTOR ROTATION

In the connection diagram and throughout the text of this instruction, direction of motion is referred to as either clockwise (CW) or counterclockwise (CCW). These terms define the direction of motor shaft rotation as determined facing the nameplate end of the motor.

INSTALLATION WIRING

External connections to the 22-pin connector of the STM101 are shown in the connection diagram. Specific instructions for each phase of the external connections follow:

Power Supply

As shown in the diagram, the +24VDC from the supply connects to terminal P and ground goes to ground terminals K and L. The suppression network components which are supplied (1K ohm, 10 watt resistor; 10 microfarad, 150 volt capacitor) are connected as shown between terminal M and the +24 volt line from the power supply.

Motor Connections

Motor connections to the 22-pin connector are shown in the

connection diagram. Be sure dropping resistors of the correct rating are installed in the two common motor leads. Ratings of the dropping resistors used with each motor are shown in the Dropping Resistor chart. Impedance of the motor leads must not exceed 60 milliohms (equivalent to 15 feet of #16 wire). If leads longer than 15 feet are necessary, larger wire must be used to assure impedance does not exceed 60 milliohms.

DROPPING RESISTORS

MOTOR	STEP INCREMENT	DROPPING RESISTOR		HS SERIES EQUIVALENT
		RATING	PART NUMBER	
M061-FC08 M061-FD08	1.8°	7.5 ohm $\pm 5\%$, 100 watt	DR103788-G16	NONE
M062-FC03 M062-FD03	1.8°	11 ohm $\pm 5\%$, 50 watt	BM102088-G14	HS25
M063-FC08 M063-FD06	1.8°	7 ohm $\pm 5\%$, 100 watt	DR103788-G15	NONE
M091-FC06 M091-FD06	1.8°	7 ohm $\pm 5\%$, 100 watt	DR103788-G15	NONE
M092-FC08 M092-FD08	1.8°	7 ohm $\pm 5\%$, 100 watt	DR103788-G15	HS50
M093-FC07 M093-FD07	1.8°	6.5 ohm $\pm 5\%$, 100 watt	DR103788-G14	HS50L
M112-FD08 M112-FJ08	1.8°	6 ohm $\pm 5\%$, 100 watt	DR103788-G9	NONE

HS Series Motor Replacements

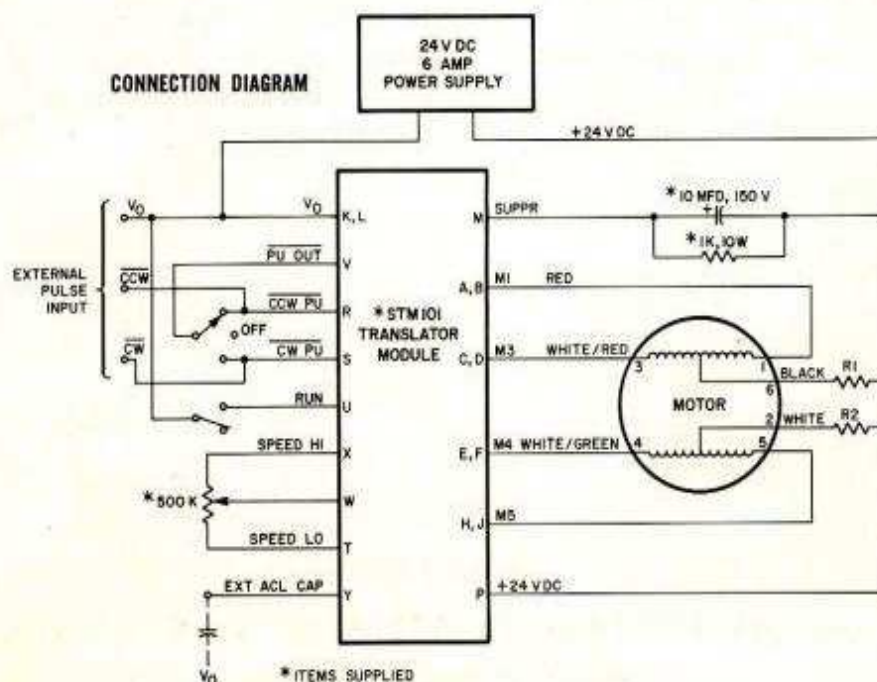
Many of the MS Series stepping motors are direct mechanical and electrical replacements for earlier HS series motors. The Dropping Resistor chart also shows the equivalent HS series motor for each M series type.

Direction Control

Direction control for operation from the internal oscillator requires a single-pole, three position switch. Connections for this switch are shown in the Connection Diagram.

Run Switch

A single-pole, two-position switch can be used. When terminal K is shorted to terminal U, the internal oscillator **will not** be operating. Opening this connection will start the oscillator, which will then ramp up to the selected speed.



Speed Control Potentiometer

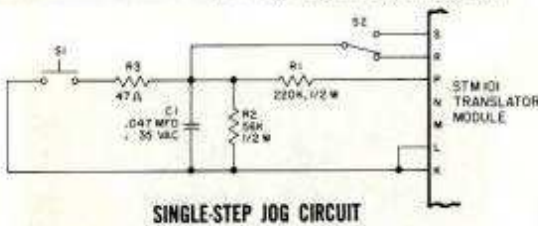
The 500K ohm potentiometer should be connected as shown in the Connection Diagram. Turning the potentiometer knob should cause a smooth, approximately linear change in oscillator speed. Should the control not provide a linear change in speed, reverse the connections to pins X and T of the connectors.

External Pulse Input

The Connection Diagram shows the correct connections for triggering the translator module with pulses from an external source. Triggering pulses must meet the specifications previously given in the paragraph titled "Triggering Requirements."

Single-Step Jog Circuit

It is possible to jog the motor one step at a time using the circuit shown in the Single Step Jog Circuit diagram.



SINGLE-STEP JOG CIRCUIT

External Acceleration Capacitor

Normally, the internal oscillator will ramp from zero up to the maximum running rate of 1000 steps per second in approximately 100 milliseconds after the RUN switch is opened. Approximately 100 milliseconds is also required to ramp down to zero after the RUN switch is closed.

This acceleration and deceleration time can be increased by adding a tantalum type capacitor having a 35 VDC rating between terminals Y and K. The positive side of the capacitor must be connected to terminal Y and the negative side to terminal K. A 10 microfarad capacitor will increase the ramping time at 1000 steps per second to approximately 325 milliseconds.

SPEED

The curves show typical speed vs. torque characteristics for all applicable motors when driven by STM101 translator modules. When operated from the internal oscillator the translator module will automatically accelerate and decelerate the motor to and from these speeds to prevent the motor from missing steps. Ramping of the pulse rate may also be necessary when the translator module is operated from pulses supplied by an external source.

The part of each curve represented with a dotted line is an area of possible motor resonance. Depending on the load driven, the motor may not operate satisfactorily at the speeds shown in the dotted area. If poor performance is experienced at these speeds, the speed should be increased to avoid the area of possible resonance.

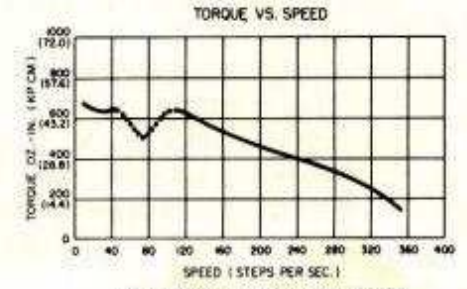
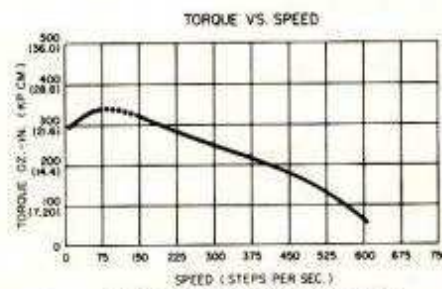
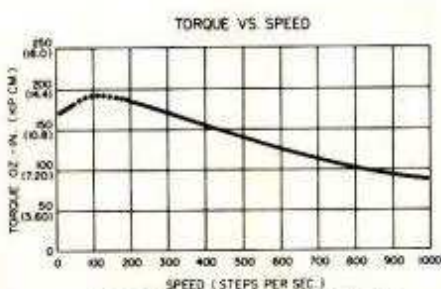
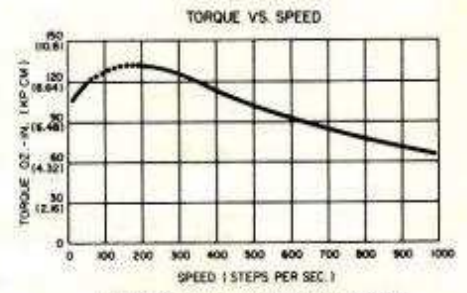
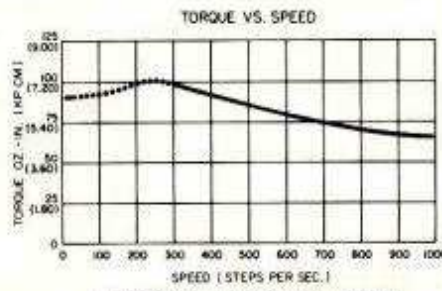
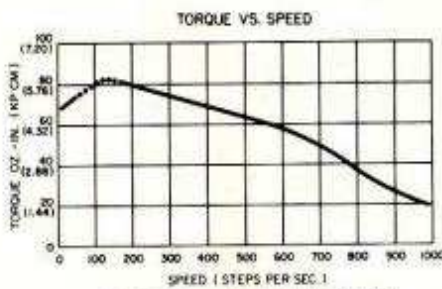
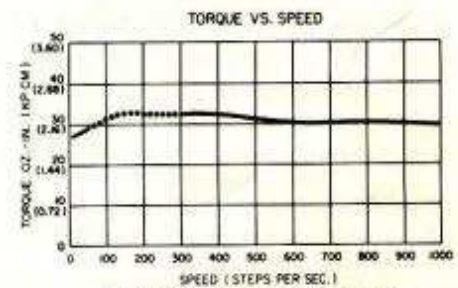
OPERATION

Operating From Internal Oscillator

The procedure given below must be followed when operating from the internal oscillator.

1. Short terminals U and K by closing the RUN switch.
2. Energize the translator module.
3. Select the direction of motor rotation on the DIRECTION switch.

SPEED VS. TORQUE CHARACTERISTICS



OPERATION *continued*

4. Open the RUN switch, thereby opening the connection between terminals U and K. The oscillator will start and will ramp the motor up to the speed selected on the SPEED potentiometer.
5. Stop the motor by placing the RUN switch in the closed position. The oscillator will decelerate the motor to a halt.
6. Place the DIRECTION switch in the OFF position.

NOTE: If the RUN switch is open when the direction is selected, the motor may stall since acceleration to operating speed will not be provided.

Operating From External Pulse Source

1. Place the DIRECTION switch in the OFF position and energize the translator module.
2. Apply pulses to terminal R or to terminal S. Pulses applied to terminal R will cause the motor to operate in the counterclockwise direction while those applied to terminal S will result in motion in the clockwise direction. Pulses must comply with the specifications listed under Triggering Requirements and ramping of the pulse rate will be necessary to allow starting and stopping the motor without losing steps.

Using the JOG Switch

1. Energize the translator.
2. Select the direction on switch S2.
3. Close and release switch S1. The translator module will drive the motor one step in the selected direction each time switch S1 is closed.

Monitoring Pulses

Should it be necessary to monitor the pulses from the internal oscillator in order to keep track of position, this can be done as follows:

1. Connect the ground of the pulse monitoring oscilloscope or counting device to terminal K.
2. Connect the probe of the pulse monitoring device to terminal S for CW pulses or to terminal R for CCW pulses. These terminals can sink 3.2 milliamperes maximum when operating from the internal oscillator.

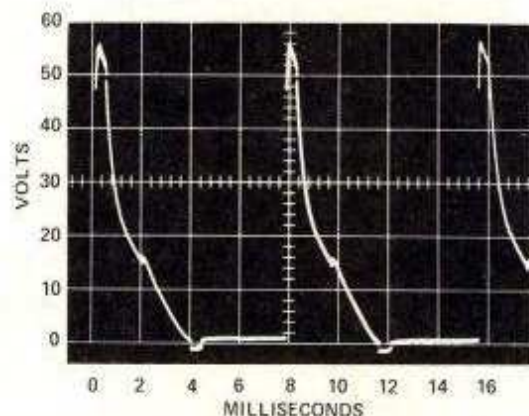
TROUBLE SHOOTING

The SLO-SYN Translator Module requires no regular maintenance and should provide long service with no attention. Should the unit fail to step the motor properly, perform the following checks:

1. Check all installation wiring carefully for wiring errors or poor connections.
2. Verify that dropping resistors of the correct value have been installed in the motor common leads.
3. Verify that +24VDC is available at terminal P.
4. Be sure that the proper sequence of operations is being followed.

5. Verify that triggering pulses are being supplied to either terminal S or terminal R and that the pulses are of the proper magnitude and duration. Pulses must not occur at terminals R and S simultaneously.
6. Verify with a d-c voltmeter that the voltage to the four motor windings is being switched on and off. The windings are connected to terminals A and B, C and D, E and F and H and J of the edge connector. Each winding should be energized for two steps and deenergized for the next two steps. Perform this check at a very low speed or use the single-step jog circuit.

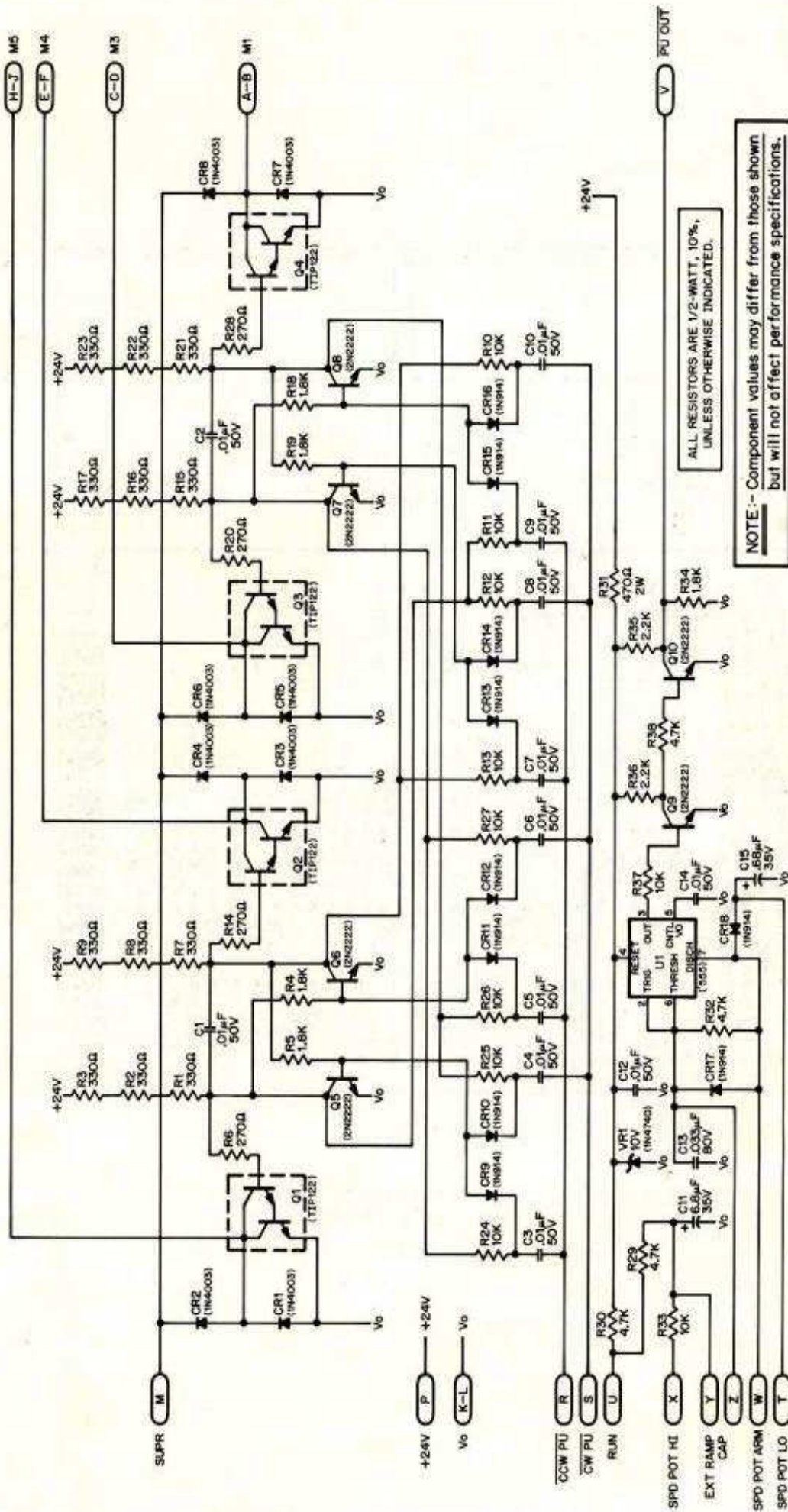
At higher stepping rates, an oscilloscope can be used to check the collector to emitter waveform of the four power transistors. Connect the scope ground to terminal K. Connect the scope probe to terminals A, C, E and H, one at a time, and observe the waveform at each of these terminals. A typical waveform for an M063-FC06 or M063-FD06 motor at 500 steps per second is shown.



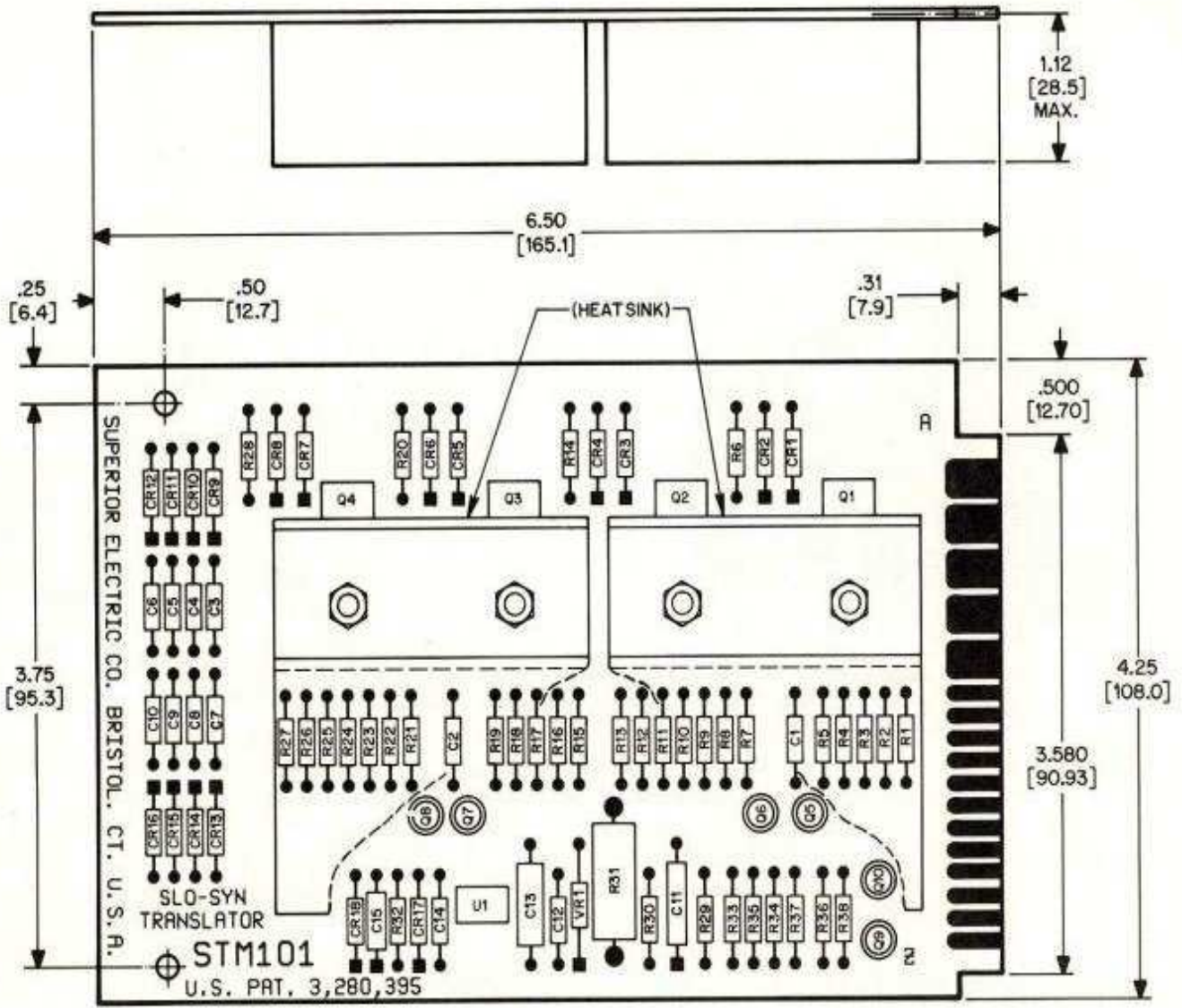
TYPICAL WAVEFORM FOR M063-FC06 OR M063-FD06 MOTOR AT 500 STEPS PER SECOND (2 Milliseconds per division)

7. If the motor will not drive the load at the desired speed and the preceding checks show the translator module is operating correctly, the combination of friction load and inertia may be too great for the motor to overcome. This situation can usually be overcome by reducing the operating speed. In severe cases, it may be necessary to use a motor having a higher torque rating or to drive the load through a speed reduction gear train.

If any unusual problems are encountered in the installation or operation of the SLO-SYN Translator Module, contact the factory or the nearest Superior Electric sales office.



SCHEMATIC DIAGRAM



DIMENSIONS AND COMPONENT LOCATIONS

WARRANTY AND LIMITATION OF LIABILITY

The Superior Electric Company (the "Company"), Bristol, Connecticut, warrants to the first end user purchaser (the "purchaser") of equipment manufactured by the Company that such equipment, if new, unused and in original unopened cartons at the time of purchase, will be free from defects in material and workmanship under normal use and service for a period of one year from date of shipment from the Company's factory or a warehouse of the Company in the event that the equipment is purchased from the Company or for a period of one year from the date of shipment from the business establishment of an authorized distributor of the Company in the event that the equipment is purchased from an authorized distributor.

THE COMPANY'S OBLIGATION UNDER THIS WARRANTY SHALL BE STRICTLY AND EXCLUSIVELY LIMITED TO REPAIRING OR REPLACING, AT THE FACTORY OR A SERVICE CENTER OF THE COMPANY, ANY SUCH EQUIPMENT OR PARTS THEREOF WHICH AN AUTHORIZED REPRESENTATIVE OF THE COMPANY FINDS TO BE DEFECTIVE IN MATERIAL OR WORKMANSHIP UNDER NORMAL USE AND SERVICE WITHIN SUCH PERIOD OF ONE YEAR. THE COMPANY RESERVES THE RIGHT TO SATISFY SUCH OBLIGATION IN FULL BY REFUNDING THE FULL PURCHASE PRICE OF ANY SUCH DEFECTIVE EQUIPMENT. This warranty does not apply to any equipment which has been tampered with or altered in any way, which has been improperly installed or which has been subject to misuse, neglect or accident.

THE FOREGOING WARRANTY IS IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, and of any other obligations or liabilities on the part of the Company; and no person is authorized to assume for the Company any other liability with respect to equipment manufactured by the Company. The Company shall have no liability with respect to equipment not of its manufacture. **THE COMPANY SHALL HAVE NO LIABILITY WHATSOEVER IN ANY EVENT FOR PAYMENT OF ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING, WITHOUT LIMITATION, DAMAGES FOR INJURY TO ANY PERSON OR PROPERTY.**

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IF FOR ANY REASON ANY OF THE FOREGOING PROVISIONS SHALL BE INEFFECTIVE, THE COMPANY'S LIABILITY FOR DAMAGES ARISING OUT OF ITS MANUFACTURE OR SALE OF EQUIPMENT, OR USE THEREOF, WHETHER SUCH LIABILITY IS BASED ON WARRANTY, CONTRACT, NEGLIGENCE, STRICT LIABILITY IN TORT OR OTHERWISE, SHALL NOT IN ANY EVENT EXCEED THE FULL PURCHASE PRICE OF SUCH EQUIPMENT.

Any action against the Company based upon any liability or obligation arising hereunder or under any law applicable to the sale of equipment, or the use thereof, must be commenced within one year after the cause of such action arises.

The right to make engineering refinements on all products is reserved. Dimensions and other details are subject to change.



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