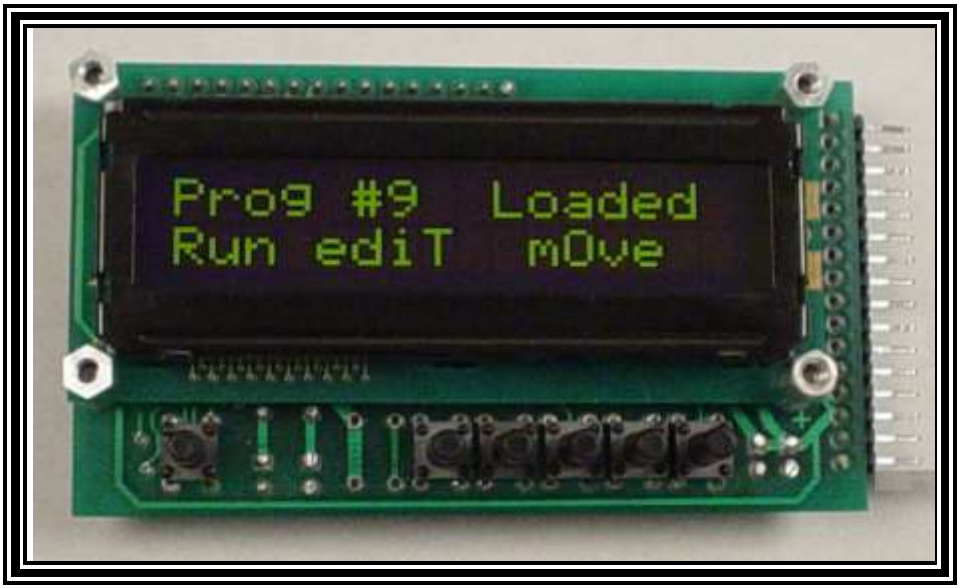
STP1-S02 USER MANUAL

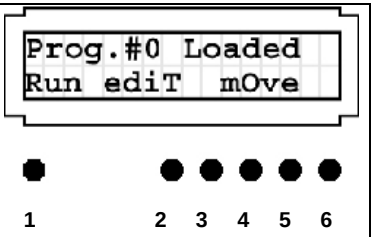


This Stand alone Stepper Motor Controller is a true stand alone controller; no computer or serial cable are required. There are no programming languages or codes to enter. Only 14 self-explain screens for you to enter NUMBER and YES or NO, it's very simple to use. So, let start to look at each of the screens.

Main Screen :

When first turn on the controller, main screen will displays the program number of the last run before turned off. It then waits for you to select 1 of 4 options.

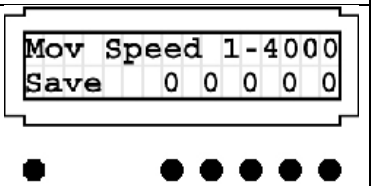
1. **RUN** a program (press button 1)
2. **EDIT** a program (press button 2)
3. **MOVE** manually to left or right (press button 4
4. **Change** program number from 1 to 9 (press button 6)



Notice the active buttons are under the Capitalized letters (button 1, 2 and 4)

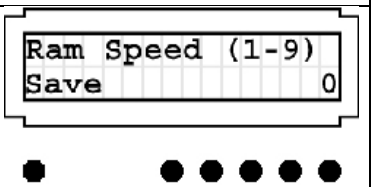
Screen #01:

Press button under T for edit, then this screen will display. Here you can enter Moving Speed. Any speed from 8 to 4000. The number is relative to time, from 100 Hz up to 20 kHz. The smaller the number, the higher the speed.
Experiment to get best speed for your system



Screen #02:

Enter Ramping speed from 1 to 9. 1 is the fastest and 9 is the slowest. The ramping STEP is automatic calculated by the moving speed. Usually you would select fast ramping speed for slow moving speed and slow ramping speed for fast moving speed (normally 2 to 4 on most system).



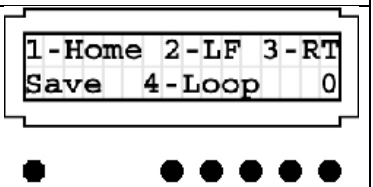
Experiment with different speed and select the speed that works best for your system.

Screen #03:

This screen gives you 4 selections for the movement.

1_ Move Head home
2_ Move Head to Left
3_ Move Head to Right
4_ Move Head in Continuous Loop

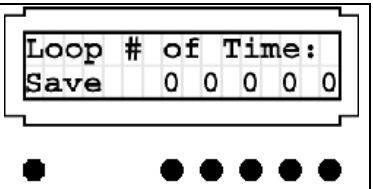
Enter your selection then press SAVE button



Select 2 or 3 will go to screen #14
Select 4 will go to screen #04

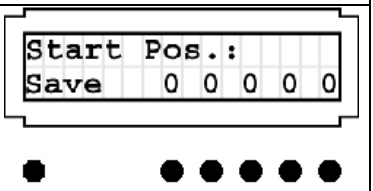
Screen #04:

Enter number of time for looping (1 – 65534). Looping will move the head from start to stop then from stop to start number of times. You will have an option to choose whether OPEN-LOOP or CLOSED-LOOP on screen #10.



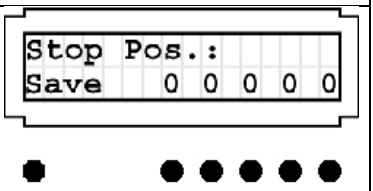
Screen #05:

Enter Start-Position from 1 to 65534 for Move Left, move Right or Looping.
Press SAVE when done



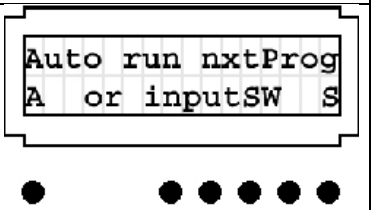
Screen #06:

Enter Stop-Position from 1 to 65534 for Move Left, move Right or Looping.
Press SAVE when done



Screen #07:

A for **A**uto jump to next program and run. **S** to manually set the **S**witch combination. The switch combination will store in this program and will be comparing to the switch combination logic when this program stop. If the logic on the switches matches the combination stored in this program then next program will be load and run.
Press **A** for auto and go to screen #08.

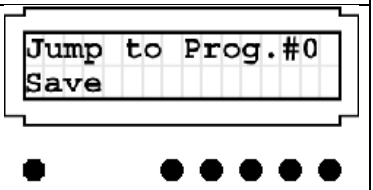


Press S for manual and go to screen13.

Screen #08:

Jump to program # (1 – 9) and run after this program done. If you want next program to run after this program done then enter 1 to 9. If not then enter #0, the program will stop when done.

Program #0 is not used; it's for entering ramping and moving speed when you want to move the Head manually with very slow speed for seeking an unknown Position.

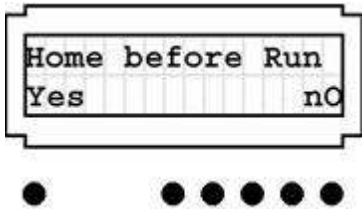


Any program from 1 to 9 can be a next program to jump, including itself.

Screen #9:

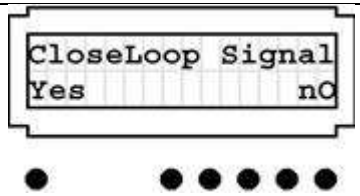
Enter Yes or No for this screen.
Each program has an option whether Go-Home before Run or not. It's good practice to tell the controller to Go-Home before each RUN.

Note: It will always go to home position before Looping.



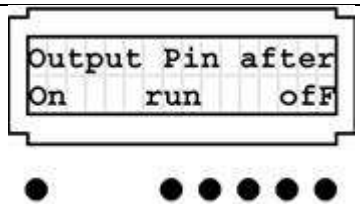
Screen #10:

Close-Loop when you want the controller output Busy/Ready signal when it run; In return the system output ACK signal when it wants the controller to run.
If YES then the controller will wait for ACK (Low) signal from system. It will not run until ACK signal goes LOW on pin 1 of connector 1. If NO then the controller will run as soon as you press RUN button.



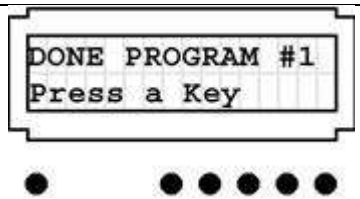
Screen #11:

One programmable Output-Pin can be set to Hi or LOW on this screen.
Select On for Hi
Select Off for LOW
After program Run and the motor comes to stop, the controller will set this pin On or Off depends on this setup.



Screen #12:

After all information's you have put in, the screen then prompts you that there is no more information needed.
Just press any button to go to main screen.



All input information is saving in the memory for future use.
Z-Motions designed this Controller to make complex programming be a simple task. User can enter all information in under one minute, while other controller may take hours.

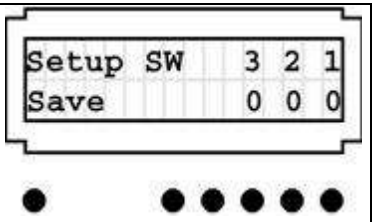
User question: Can other controller on the market program a program less than 1 minute with out a PC?
Z-Motions answer: No, they will need specific software in the PC and a serial cable to program the controller and an engineer.

Screen #13:

This screen for Controller with option S.

On screen08 if press S you will get to this screen for setup switch combination. See true table below.

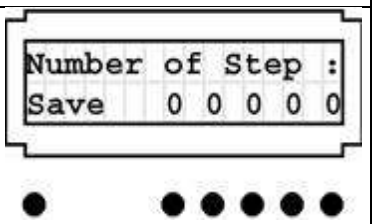
SW3	SW2	SW1	
0	0	0	= 0
0	0	1	= 1
0	1	0	= 2
0	1	1	= 3
1	0	0	= 4
1	0	1	= 5
1	1	0	= 6
1	1	1	= 7



When done setup switches, press Save to go to screen 07.

Screen #14:

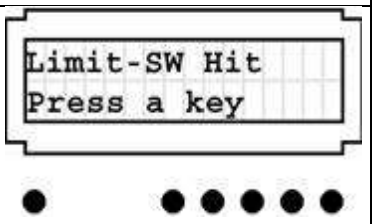
When select to move Left or move Right, The controller will ask you to input Number Of Step to move.
Just input a number between 1 and 65534
Then press SAVE. This will bring you back to screen # 05



Error Screens

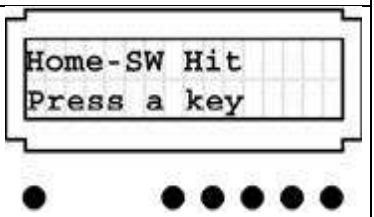
Screen #15: Error warning

This screen display only when an error occurs. Such as during move from one position to another and the HEAD is hitting the Limit-Switch. Press any key and correct the problem.



Screen #16: Error warning

This screen display only when an error occurs. Such as during move from one position to another and the HEAD is hitting the Home-Switch. Press any key and correct the problem.



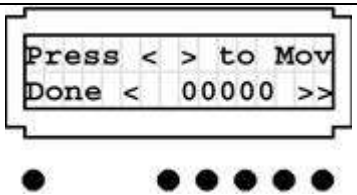
Manual Move Screen

Screen #17:

If you select button under **O for move** from Main Screen, then this screen will display current position and ready for jogging.
On this screen user can move the head left or right with the preprogrammed Move-Speed. User can move the head from home to end limit.

Use button 2 and 6 to move.

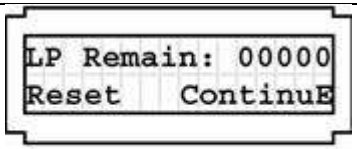
Press Done when finish to return to Main Screen.



Interactive Screens

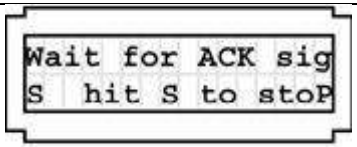
Screen #23:

If, the STOP button was press during Looping, this screen will display. It gives you two options, whether **R**eset to stop or Continu**E** to loop where it stops. The remaining loop will not loose.
If Reset, it will go to Main Screen with previous program # and wait for 1 of 4 action.
If continue the head will go home, go to start-Pos. and continue with the previous loop number



Screen #27:

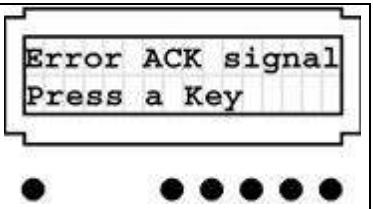
If you were selected Close-Loop Signal from screen10, then before running next program the controller will wait for ACK signal from the system. As soon as ACK signal appeared on pin 1 of connector 1, the controller will output BUSY (Low) signal on pin 2, BUSY signal will stay LOW until the head reach Stop-Position. The system can do something, when the system done, it must bring ACK signal LOW for the controller to run next program.
For any reasons you want to STOP. Press button 1 (under S) to stop.



NOTE: The controller will wait for ACK signal to go LOW before it run next program.

Screen #28:

This screen only displays when the controller time-out from waiting for ACK signal. When programmed to be Closed-Loop from screen11, the controller is expected a LOW logic on ACK pin (pin #1 of connector 1) before it start to run next program.

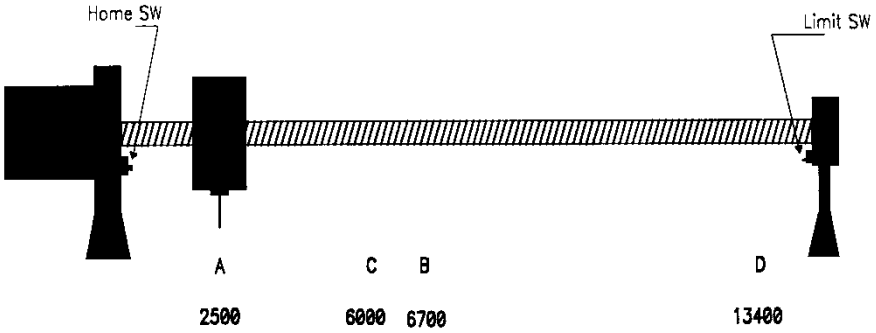


Press any key to return to screen01 and solve the problem.

EXAMPLES

Let set up 2 programs that will do the following motions.

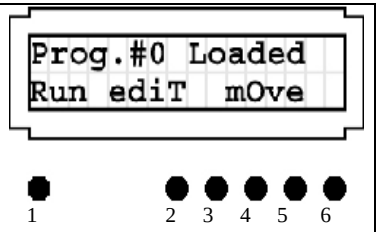
We want the drill to drills 10 holes at point A and 10 holes at point B, then go HOME, go to C. Drill 35 hole at C and 35 holes at D.



If, the controller is not ON, turn it on. We should see screen #01

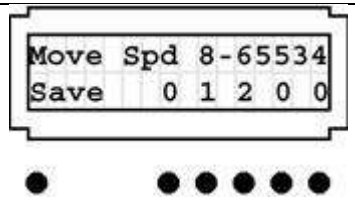
Program #x could be any # from 0 to 9, if this is the first time we turn on.
Press on button #6 to change the program #x to 1. We will program our motions in program #1 and program #2.

Press button under capital **T** for edi**T** (button #2). We will edit program #1 with new parameters

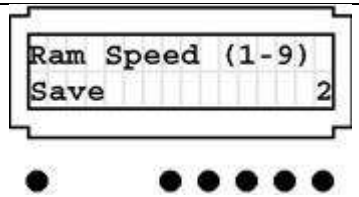


After press on button under **T** (for edi**T**) we will see this screen. It's asking for moving speed.
We will put in 1200 (for starting we put 1200. You can chose different speeds, experiment with them to get the speed that run best for your system).

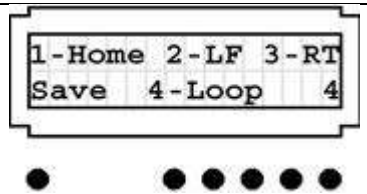
Press **Save** when done.



Use button #6 to enter Ramping Speed. For now, we will use 2 for Ramping.
Ramping speed can vary from system to system; depend on moving speed, friction, mass and motor size. Keep in mind that; faster moving speed needs longer ramping time and slower moving speed need faster ramping time.



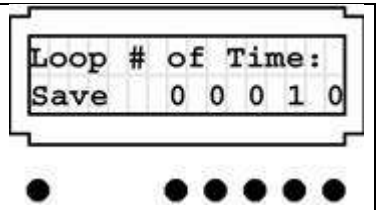
In this example, we want the drill to move from A to B then from B to A 10 times. So, we will chose option #4 for Looping.
Press button #6 until we see 4 at the right lower corner. Then press Save to go to next screen.

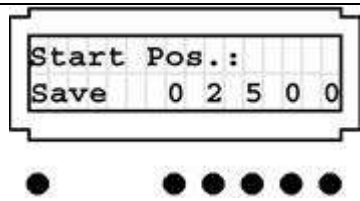
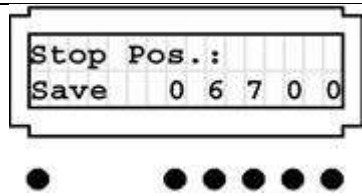
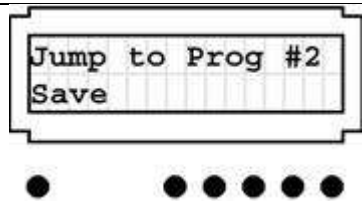
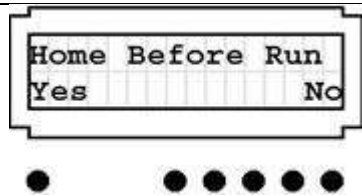
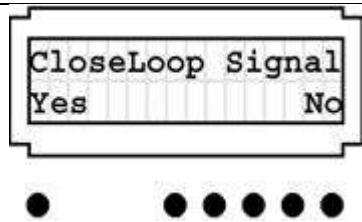


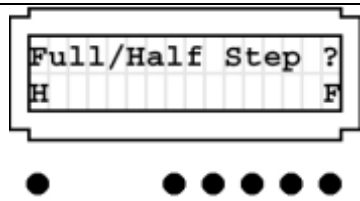
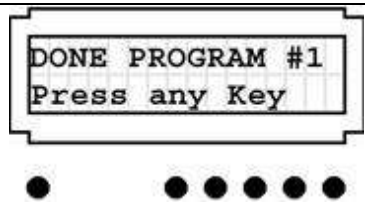
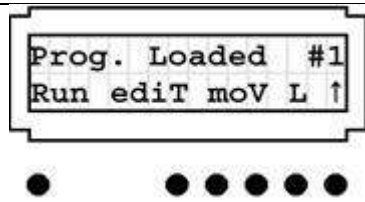
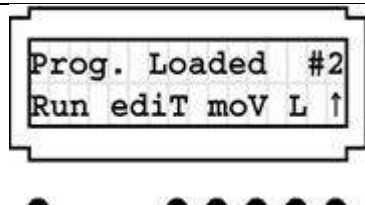
Input number 10 for 10 times.

Note: When you press the button, the number increase upward. Keep press until the correct number display on the LCD.

Press Save button to save into memory and go to next screen.



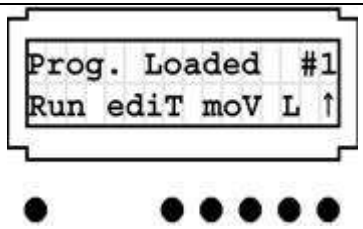
Now is time to put in Start-Position. Input number 2500 then press Save and go to next screen.	
Input number 6700 for Stop-Position (at point B) Press Save and go to next screen.	
Now the controller is ask for what program will jump to after program #1 in done. Any program from 1 to 9 we can use (including it own) to jump to. In this case, we use program #2 to hold the information to move the drill from C to D and from D to C 35 times. Press button #6 until we get #2. Press Save to store program information in memory.	
This screen gives you an option of whether the drill should seek home position or not before run. It is good practice to let the drill go home before run, that way the drill will go to same position every times.	
We will enter Yes for closed loop, because we want to let the system know that the drill is in position to drill. We Also want to have ACK signal to send back to the controller to tell the controller that's OK to move. Press button 1 for Yes.	

Depend on your system, whether it has Full Step and Half Step options. In this example, we use FULL step. Press button 6 (**F**) for Full Step. If your controller does not have this option then skips to next screen.	
This screen lets you know you are about done programming program #1 and ask you to press any key. Press any key to go to screen #01.	
Screen #01 is HOME screen. Here, you can **RUN** a program, **EDIT** an existing program (or enter new program), **MOVE** manually or press **L** to put the controller into **LEARNING** mode. You can move the drill to any position from Home to end Limit. Use move feature to determine step position in number of step. For full step, each 2000 step is equal 1 inch. We already did enter program #1 parameters. Next, we will enter information's for program #2.	
Press button 6 to change from Prog #1 to Prog #2. Entering information of program #2 in the same way as we enter information for program #1. Let enter the following parameters for program #2. Move speed = 1400, Ram speed = 5, 4 for Looping, Loop # of time = 35, Start-Pos = 6000, Stop-Pos = 13400, Jump to Prog #1, Home before Run = Yes, CloseLoop signal = Yes and Full/Half Step = F	

After you enter all information, the controller will bring you back to main screen.

Press button 6 to change to Prog #1
Press on button # 1 for RUN.

That is all. Programming the STP-S03 is so easy; each program should take about 1 minute.



SPECIFICATIONS

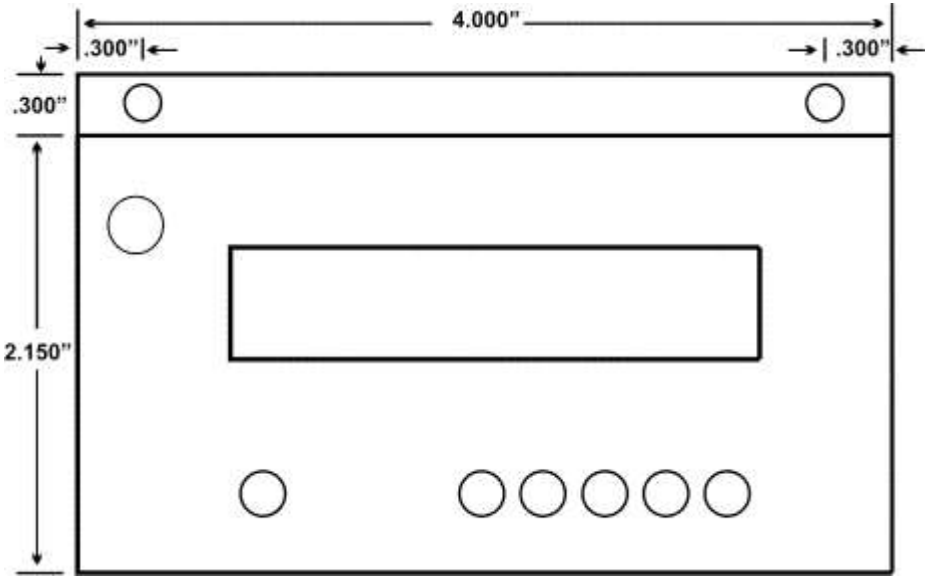
ELECTRICAL

Input Voltage on pin 14 _____ + 5 VDC (+/- .5V)
Voltage on any pin with respect to GND _____ - .3V to (Vcc +.3V)
Maximum current Sourced or Sunk on any I/O pin _____ +/- 20mA
Maximum current Draw _____ 250mA
Step Frequency (Min) _____ 100 Hz
Step Frequency (Max) _____ 30 KHz

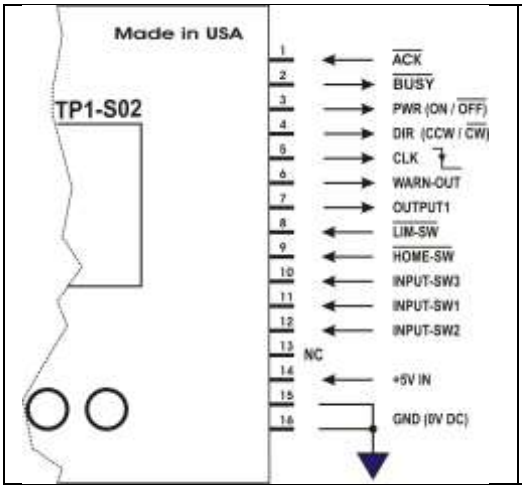
TEMPERATURE

Operating _____ 0^C to 50^C
Storage _____ - 20^C to 80^C

MECHANICAL DIMENSIONS



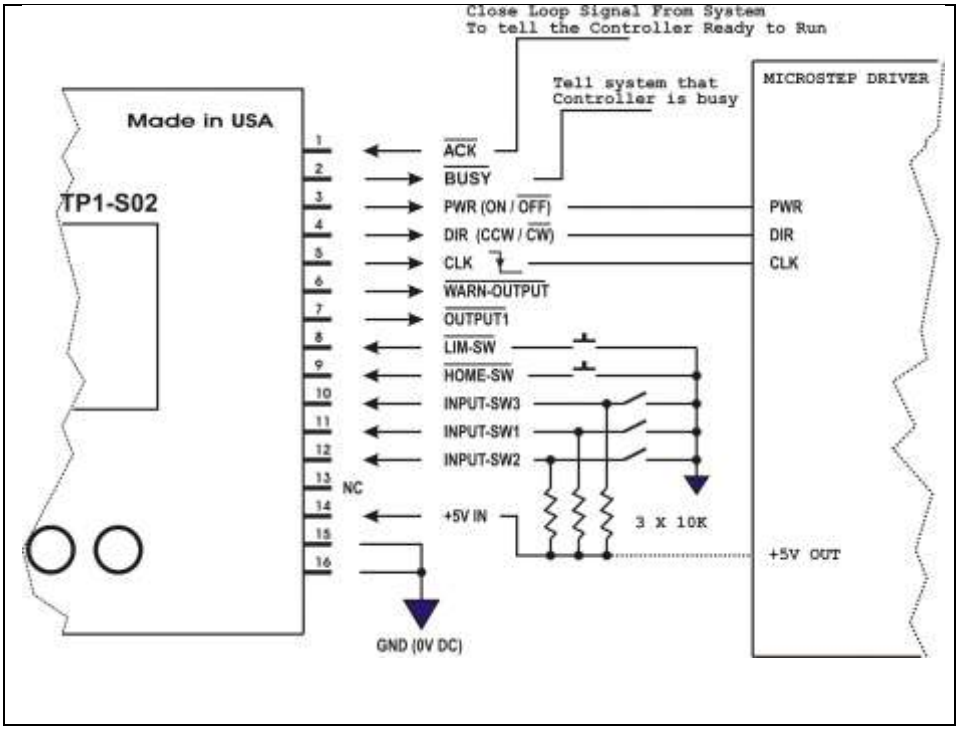
PIN FUNCTIONS



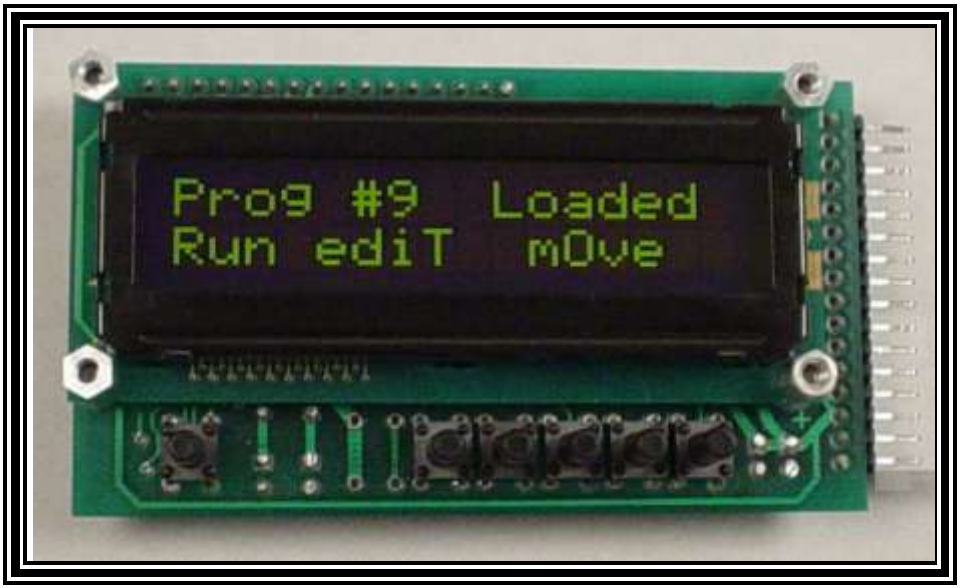
Input SW True table

SW3	SW2	SW1	VALUE
0	0	0	0
0	0	1	1
0	1	0	2
0	1	1	3
1	0	0	4
1	0	1	5
1	1	0	6
1	1	1	7

TYPICAL SYSTEM CONNECTIONS



STP1-S02 Assembly Instructions



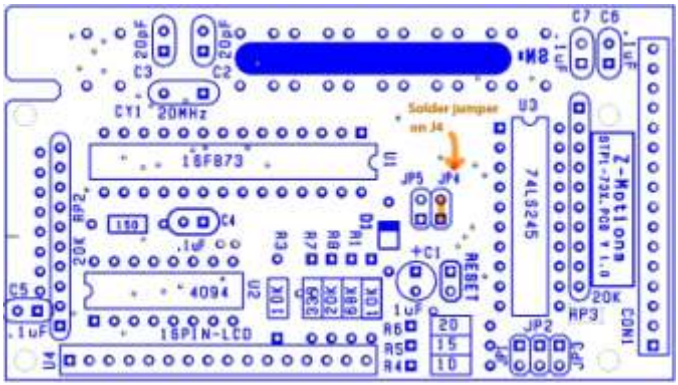
BOM for this kit:			
Name	Qty	Descriptions	Comments
U1	1	PIC16F873 (or PIC18F242)	Or PIC18F252 depends
U2	1	CD4049	
U3	1	74HC245	
CY1	1	20MHz crystal	
CAP	5	.1uF capacitors	
CAP	2	20pF capacitors	
D1	1	1N4001	
R1	1	68K	
R4	1	10 Ohms	
R5	1	15 Ohms	
R6	1	20 Ohms	
R7	1	330 Ohms	
	1	150 Ohms	Not label on PCB, next to C4
	1	10K	Not label on PCB next to R1
RP2, RP3	2	10K Resistor Packs, 10 pins	Or 5.6K
	1	28 pins socket DIP	Socket for U1
PCB	1	PCB for STP-S02	
LCD	1	16x2 LCD	
U4	1	16 pin header	Straight
CON1	1	16 pin header	Right Angle
SW1-SW7	6	TAC switch	Push button

Bottom Silk Screen

Install all components as show on the bottom silk screen.
Notes: Pin 1 are squared.

C1 is replaced with 0.1uF capacitor (on silk screen shown 1uF)
CON1 is a 16 pins right angle header
U4 is a 16 pins straight header
R4-R5-R6 for LED back light intensity. R5 (15 Ohms) is best for this LCD. Solder a jumper on JP2 to select R5.

Put jumper on J4 as shown below if the trace from pin1 to pin2 of J4 is broken.



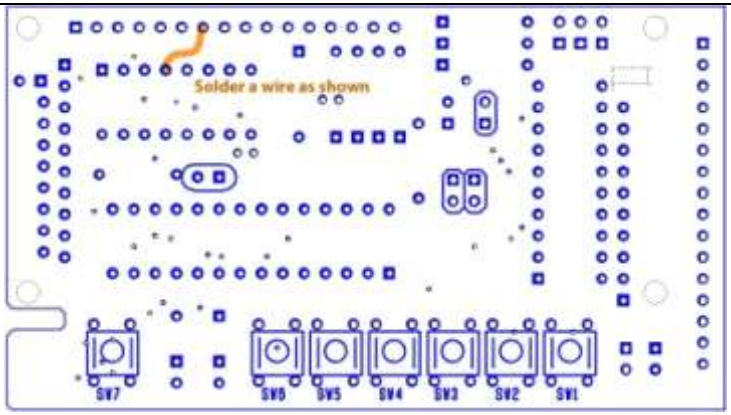
Complete Bottom Assembly. R4 (10 Ohms) is used

Top Silk Screen

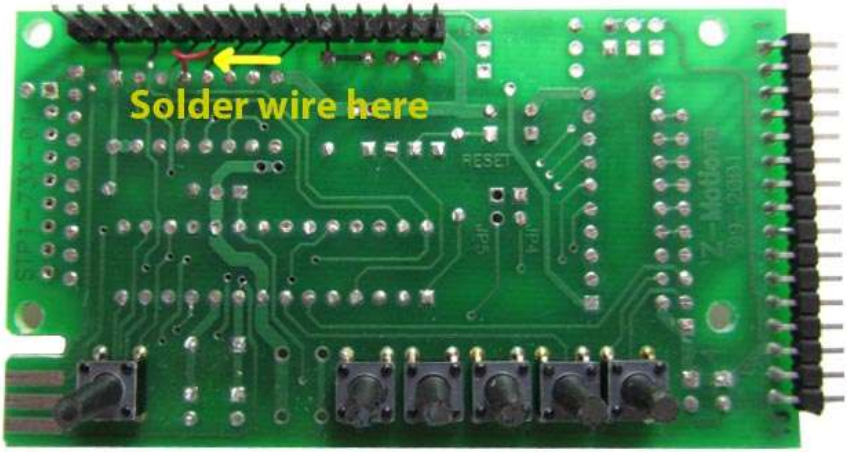
Only 6 TAC switches are used. SW6 is not used on this version.

Solder SW7, SW5-SW1 on the TOP PCB as shown.

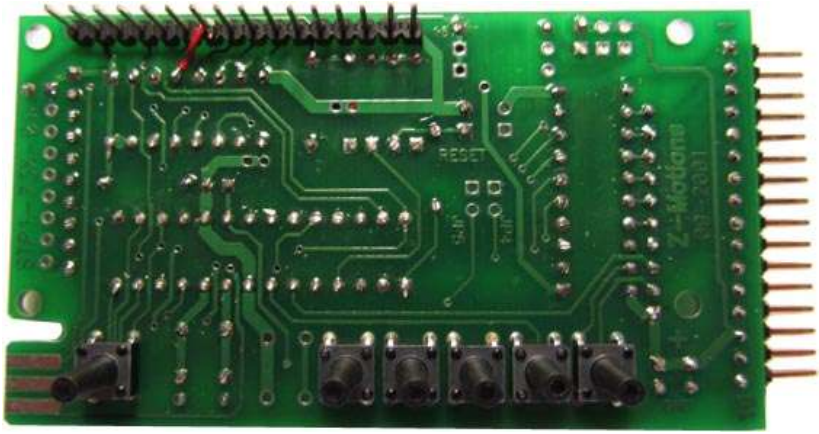
Also a jumper wire must be solder from U2 pin2 to U4 pin7 (U4 is 16 pin header)



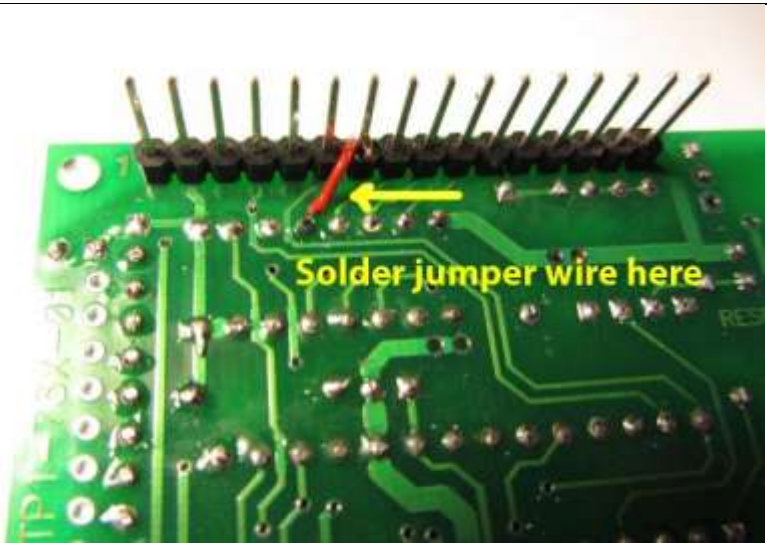
Complete Top Assembly with jumper wire under the header



Or solder jumper wire like in this picture



One end of the wire on the header pin



Close up

Complete TOP and BOT assembly

Insert LCD module into the header. Make sure the bottom of the

LCD not touching the top PCB
Solder LCD to 16 pins connector

Complete unit assembly

SPECIFICATIONS

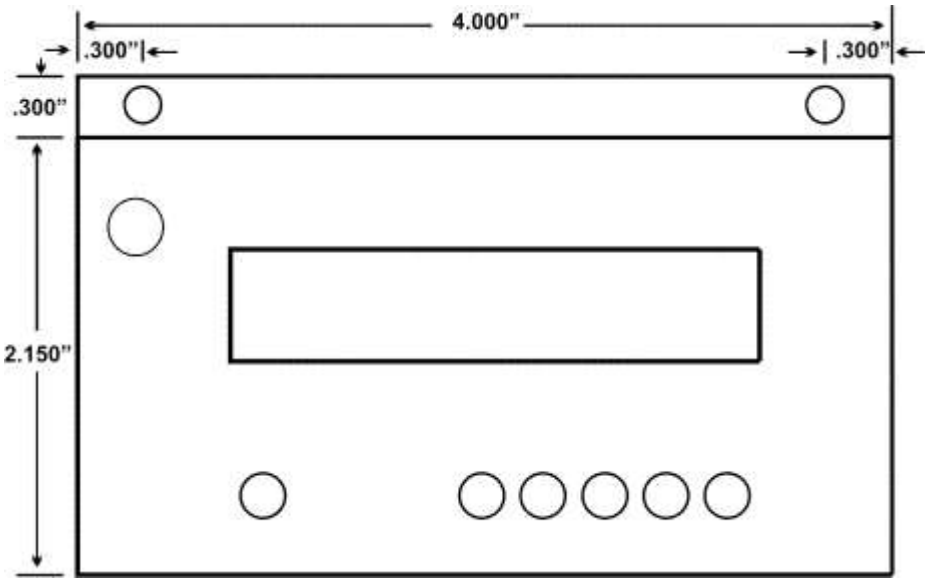
ELECTRICAL

Input Voltage on pin 14 _____ + 5 VDC (+/- .5V)
Voltage on any pin with respect to GND _____ - .3V to (Vcc +.3V)
Maximum current Sourced or Sunk on any I/O pin _____ +/- 20mA
Maximum current Draw _____ 250mA
Step Frequency (Min) _____ 100 Hz
Step Frequency (Max) _____ 30 KHz

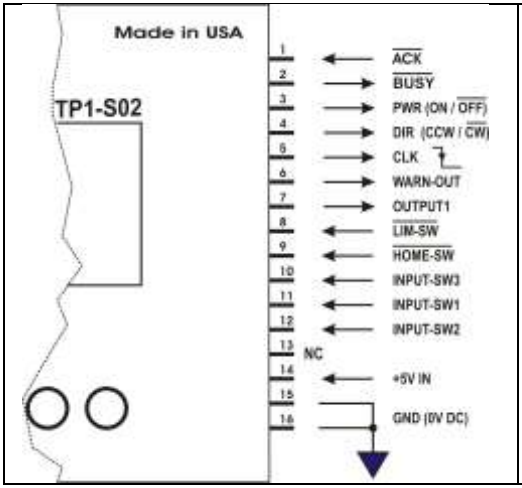
TEMPERATURE

Operating _____ 0^C to 50^C
Storage _____ - 20^C to 80^C

MECHANICAL DIMENSIONS



PIN FUNCTIONS



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TYPICAL SYSTEM CONNECTIONS