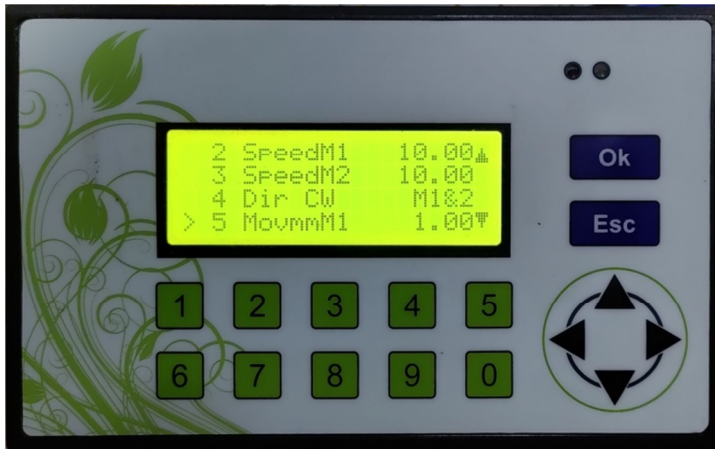




## 2-Axes Motion Controller – TNC-G22



**Document: Operation Manual**  
**Document #: TNC-G22-1**  
**Document Rev: 1**  
**Product: TNC-G22**  
**(2-Axes Motor Controller)**  
**Product Rev: 1.0**  
**Created: 01-2023**  
**Updated: Initial**

**This manual contains information for installing and operating the following product:**

- TNC-G22 , Two Axes Programmable General Purpose Motion Controller

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## GENERAL DESCRIPTION

TNC-G22 is two axes programmable motion controller intended to replace PLC and HMI in many applications at lower cost. Each Axis support linear as well as rotary mode. Rotary or Division command is intended to control rotary tables but can also be used to perform many custom operations. In circular motion (i.e. division mode), there is no accumulation of error (i.e. the error is distributed along whole circle motion if the programmed motion cannot be achieved exactly due step angle not exactly divisible).

As NESTED LOOPS are also supported, the programs can do a lot of complex operations.

The following commands are supported: (see Program edit section for details)

**Motion Setup: Dir CW, Dir CCW, SpeedMx, AccelMx, SetDivMx**

**Motion Commands: MovmmMx, MovDivMx**

**Control Commands: Waitfor [INx, Mx, M1&M2], SKonIN[INx], SKP End**

**Check Keypad: Waitfor Arrowkey**

**I/O Manipulation: OutLow[OUTx, RLYx], OutHigh[OUTx, RLYx], In=>Out[Ix->Ox]**

**Recursion: PrgmEnd[Stop, Repeat], LoopFor[count,Lx], LoopEnd**

**Dwell Command : Wait\_mS**

**Process Counting: Count++[Cx, C1&C2]**

**Home Commands : Home, Go Zero**

**No Operation : NOP**

## SPECIFICATION/FEATURES:

- **Supply Voltage:** 90V to 250V AC 50Hz/60Hz
- **Pulse Rate:** 100 KHz
- **Overall Size:** 165mm x 102mm x 76 mm
- **Mounting:** Panel Cutout 155mmx92mm
- **Inputs:** 6 NPN NO Inputs (IN1 dedicated to Program Run/Pause)
- **Outputs:** 4 Differential outputs for Motors Step/Direction,  
3 Open collector 24V relay driver, 3 inbuilt 7A relays
- **Display:** 20x4 Line alphanumeric
- **Temperature:** 55 Degree C Max operation temperature

## **Keypad Functions**

### **1. NUMERIC KEYS (0-9)**

Numeric keys are used for entering the numeric values in edit mode. In some modes, these serve some alternate functions.

### **2. NAVIGATION KEYS PANEL (UP, DOWN, RIGHT, LEFT)**

In edit mode, these keys are used to navigate the cursor. In some modes, these serve some alternate functions.

### **3. OK & Esc**

Press OK to enter in edit mode. In edit mode, pressing this key saves the modified values in Internal Storage. Press Esc to back out of menus/mode, and pressing repeatedly returns the control to the main menu.

### **4. LCD DISPLAY (20x4)**

This LCD indicates all the information related to MENUS or MODES.

### **5. LEDs**

RED LED indicates the activity and GREEN LED indicates long key press.

**REMOVABLE BLOCK TERMINALS:**



**Pin Number (From Left to Right)**

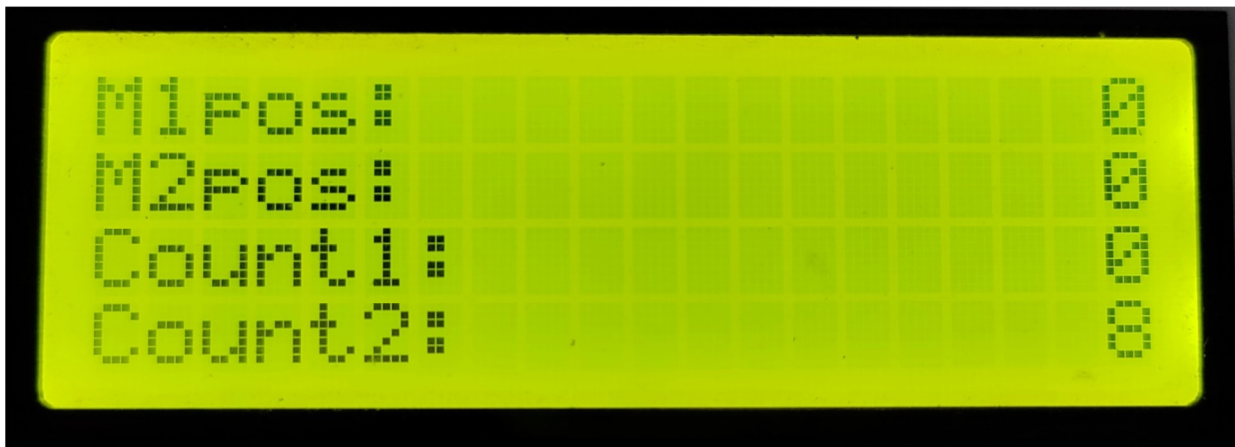
1-3	Power Supply Input (90V to 260V) AC 50Hz/60Hz & Earth
4-7	Differential Step/Direction Driver for Motor 1
8-11	Differential Step/Direction Driver for Motor 2
12,13,14	Open Collector Driver for Driving Relay or Controller Inputs
15	24VDC supply output, can be used for relays/Sensor etc, Max current 200 mA
16	Common/Ground for 24v supply or inputs
17-22	General Purpose NPN NO inputs, In1 and In2 can be used for homing as well
23	Active Low Program-Run/Pause Input (short to Ground to run program)
24-29	Switch Contacts for 3 internal Relay (Max 7Amp/220VAC or Max 2Amp/24VDC)

## Operation Screens

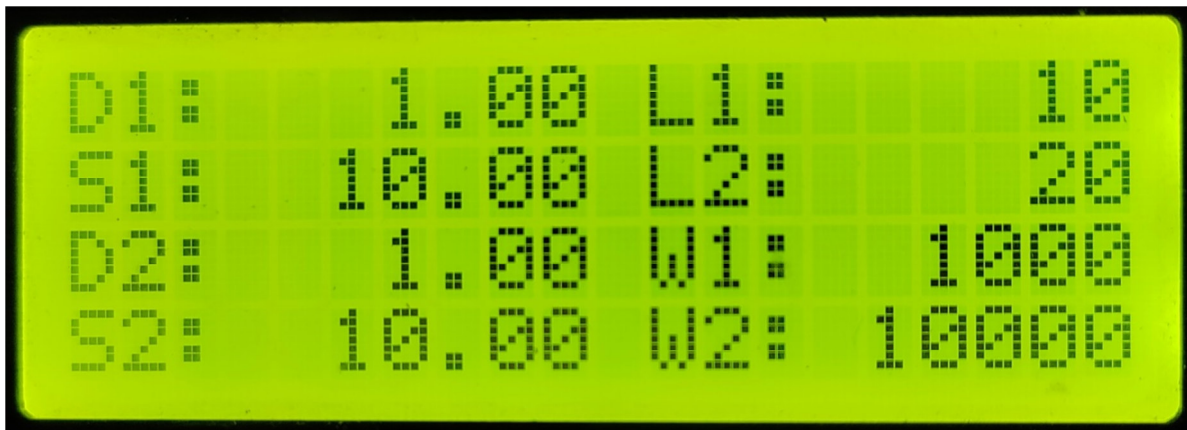
RUN Screen: Press "1" key to display the screen below



POSITION Screen: Press "2" key to display the screen below



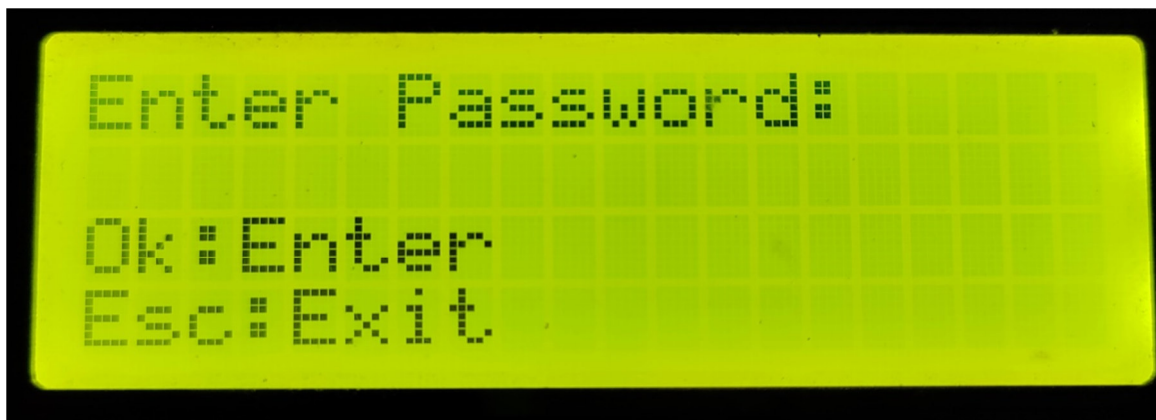
VARIABLE Screen: Press "3" key to display the screen below



Any of the screens can be selected to be visible at any time by pressing corresponding numeric keys (1-2-3) while not in Menu or Program Edit modes. First two screens displays current data and 3<sup>rd</sup> screens show variables.

Pressing “Ok” key is used to enter Variable editing mode, Editing is on screen and can be done any time, and no password is required as these are meant to be altered by the machine operator.

Long press “Ok” key is used to Enter “Settings” and “Program Edit” mode. For entering this mode password is needed so these are not altered mistakably by the machine operator, default password is “2626”



After the password is entered, press “Ok” to edit settings or any of the 4 programs:  
Key (1-4): To edit the respective Program, Key (5): To edit the Settings



## Settings



Following settings can be changed from this menu:

SN	Setting Name	Description	Range / Allowed Values / Selectable Options
1	M1 Type	Motor 1 Type	Linear or Rotary
2	M2 Type	Motor 2 Type	Linear or Rotary
3	M1 Dir	Motor 1 Default Direction	CW or CCW
4	M2 Dir	Motor 2 Default Direction	CW or CCW
5	M1 Gearing	Gear Ratio for Motor1	0.01 to 9999.99
6	M2 Gearing	Gear Ratio for Motor2	0.01 to 9999.99
7	M1 Stp/mm	Steps per [mm/Rotation] for Motor 1	0.01 to 9999.99 (Displayed "/mm" or "/Rot" depending on type)
8	M2 Stp/mm	Steps per [mm/Rotation] for Motor 2	0.01 to 9999.99 (Displayed "/mm" or "/Rot" depending on type)
9	M1 mm/Sec	Speed [mm/Rotation] per Sec for Motor 1	0.01 to 9999.99 (Displayed "mm/" or "Rot/" depending on type)
10	M2 mm/Sec	Speed [mm/Rotation] per Sec for Motor 2	0.01 to 9999.99 (Displayed "mm/" or "Rot/" depending on type)
11	M1 Accel	Acceleration for Motor1	1 to 999999
12	M2 Accel	Acceleration for Motor2	1 to 999999
13	PulseWidth	Step pulse width(both Motors)	1 to 999999 micro seconds
14	M1 HomSped	Motor 1 Homing Speed	1 to 999999 [steps/Rotation] per Second (Limited to Motor 1 Speed)
15	M2 HomSped	Motor 2 Homing Speed	1 to 999999 [steps/Rotation] per Second (Limited to Motor 2 Speed)
16	M1 JogSped	Motor 1 Jogging Speed	1 to 999999 [steps/Rotation] per Second (Limited to Motor 1 Speed)
17	M2 JogSped	Motor 2 Jogging Speed	1 to 999999 [steps/Rotation] per Second (Limited to Motor 2 Speed)
18	RunProgram	Program number to Run	Program [1-4] when IN-Run input is asserted
19	FactoryRst	Reset Settings or Programs	Select "Settings" or "Programs" to defaults
20	Ucnt	Lifetime Motion Counter	Displays number of programs executed so far (Not resettable by user)
21	TNC-G22 V	Displays Software version	Only of information about the controller

## Program Command / Program Editing

To Enter Program Edit mode:

Long Press "Ok" => Enter Password => Press "Ok" => Select Program 1- 4



- ">" Means currently editing command (or **selected command**), use Up/Down Arrow key to move ">" to any command in the program, when at the ending command, pressing Down key adds a new command.
- When ">" is at the last row on the screen, Down key scrolls the program upward, same way use Up key to scroll program downward when you reach at the top line in the screens.
- Pressing and holding a key is called "Long Press", long press is indicated by Green indicator
- Long press of arrow keys can be used for continuous scrolling of menus, Jogging Motors or incrementing/decrementing values while editing.
- Selected command can be deleted by "Long Pressing" "0" Key.
- A "NOP" command can be inserted above selected command by "Long Pressing" "1" Key
- Use Left/Right Arrow Keys to Scroll through available commands till you find the command you are looking for and then use up/down key to move to another location. Repeat till all programs is finished.
- When the command have editable Parameter, press "Ok" and scroll through available options the same way, if you select editable parameter, just start typing number keys and press ok.
- For List of command /parameter see List on the next page

## Executing the Program

The selected program number in Settings is executed by asserting IN-Run input to the controller, if the input is removed program is paused and can be resumed by again giving the IN-Run input.

- Current program number, current State and current Command is displayed on "Run" Screen.
- When program is not started "Stop" State is displayed on Run screen.
- When Program is running "Run" State is displayed, if paused "Hold" State is displayed.
- Program in "Hold" state can be cancelled and restarted by pressing "Esc" key on the Run screen.



## Supported Commands

<b>SN</b>	<b>Command</b>	<b>Parameters Supported</b>	<b>Comments</b>
1	Nop	No Operation	Place holder command, to be changed into other command at later stage, or for adding a very small delay in the program.
2	Dir CW , Dir CCW	M1 M2 M1&M2	Set motor direction, affects all future moves. Single motor or both motors can be set using this command
3	SpeedM1, SpeedM2	S1 S2 0.01 – 9999.99	Set motor Speed (units/sec) as per motor type. Affects all future moves
4	AccelM1, AccelM2	1 - 999999	Set motor acceleration / deceleration
5	SetDiv1, SetDiv2	W1 W2 1 – 999999	Set number of divisions per rotation. Affects all future “MvDivMx” (move by division) moves, only allowed for a Rotary axis.
6	MovmmM1, MovmmM2	D1 D2 0.01 – 9999.99	Move command for motor. Steps or Rotations as per motor Type.
7	MvDivM1, MvDivM2	D1 D2 0.01 – 9999.99	Moves motor by selected Divisions out of total divisions set for per rotation (see example) Please enter whole number only, rounded off to whole number if any decimal value is entered
8	Rst Pos	M1 M2 M1&M2	Resets internal motor position counter to zero, does not move a motor.
9	MT On	M1 M2 M1&M2	Start continuous motion for Motor(s)
10	MT Off	M1 M2 M1&M2	Stops continuous motion for Motor(s)
11	Home	M1 M2 M1&M2	Initiate “Homing” sequence for the motor. “IN1-Home” is sensor input for Motor 1 “IN2-Home” is sensor input for Motor 2
12	Go Zero	M1 M2 M1&M2	Move motor(s) to Zero position(s)
13	Waitfor	IN1 IN2 IN3 IN4 IN5 IN6 AROWKEY M1 M2 M1&2	Program is paused and waits for some event : - Wait for one Input (1-6) to be triggered - Wait for an “Arrow Key” to be pressed - Wait for Motor (M1 or M2) move to be completed - Wait for Both motor move to be completed
14	Wait_mS	1 – 999999	Wait for time (in milliseconds)

<b>SN</b>	<b>Command</b>	<b>Parameters Supported</b>	<b>Comments</b>
<b>15</b>	<b>Count++</b>	C1 C2 C1&C2	Increment counter C1 or C2 or Both C1 & C2. Displayed on Position Screen Retained during powerfail Can be reset on long press "1, 2, 0" keys
<b>16</b>	<b>Out Low</b>	OUT1 OUT2 OUT3 RLY1 RLY2 RLY3	Activate Output or Activate Relay
<b>17</b>	<b>Out Hig</b>	OUT1 OUT2 OUT3 RLY1 RLY2 RLY3	Deactivates Output or Deactivate Relay
<b>18</b>	<b>In=&gt;Out</b>	I1->O1 I1->O2 I1->O3 I2->O1 I2->O2 I2->O3 I3->O1 I3->O2 I3->O3	Copies an input state to output pin Example "I1>O3" copies Input 1 state to Output 3
<b>19</b>	<b>LoopFor</b>	L1 L2 1 - 999999	Repeat command till next "Loopend" See Example
<b>19</b>	<b>LoopEnd</b>		Used along with "LoopFor" (See Example)
<b>20</b>	<b>SKPonIN</b>	IN1 IN2 IN3 IN4 IN5 IN6	
<b>21</b>	<b>SKP End</b>		Used along with "SKP End" (See Example)
<b>22</b>	<b>PrgmEnd</b>	Stop Repeat	Marks Program End "Repeat" parameter makes program to reset and repeat over from the beginning "Stop" makes program to run only once

## Program Structure and Sample Programs

This section explains program structure and later shows small sections of code for achieving a particular function. These small fragments can be combined into a larger program to realize complex custom machines.

### Program Structure:

*Command 1*  
*Command 2*  
*Command 3*

*LoopFor XX*  
*Command 4*  
*Command 5*  
*Loop End*

*Command 8*  
*PrgmEnd Repeat*

- Commands are executed from top to bottom
- LoopFor command repeats the command in the “LoopFor” and “Loop End” block, XX times
- In the example on the left :
  - o Command 1, 2, 3 executed once
  - o Command 4,5 executed XX times
  - o Command 8 is executed once, after Loop ends
  - o PrgmEnd with “Repeat” then repeats the whole program again, forever

### Sample Programs

**Toggle Relay-1, ON for 1 Sec, with a delay of 2 Sec in Between, repeat 5 times:**

*Loop For 5*  
*OutHig RLY1*  
*Wait\_mS 1000*  
*OutLow RLY1*  
*Wait\_mS 2000*  
*Loop End*  
*PrgmEnd Stop*

**Toggle Relay-1, ON for 1 Sec, with a delay of 2 Sec in Between, repeat endlessly:**

*OutHig RLY1*  
*Wait\_mS 1000*  
*OutLow RLY1*  
*Wait\_mS 2000*  
*PrgmEnd Repeat*

**Switch On Relay-1 when a Switch is pressed, ON time 1 Sec, repeat endlessly:**

*WaitFor IN1*  
*OutHig RLY1*  
*Wait\_mS 1000*  
*OutLow RLY1*  
*PrgmEnd Repeat*

**Move Motor1 1000 Steps at a Speed of 1000 Steps/Sec  
and Motor2 500 Steps at a Speed of 200 Steps/Sec :**

```
AccelM1 500  
AccelM2 500  
SpeedM1 1000  
SpeedM2 200  
MovmmM1 1000  
MovmmM2 500  
WairFor M1&M2  
PrgmEnd Stop
```

**Move Motor1 1000 Steps at a Speed of 1000 Steps/Sec  
after then move Motor2 500 Steps at a Speed of 200 Steps/Sec :**

```
AccelM1 500  
AccelM2 500  
SpeedM1 1000  
SpeedM2 200  
MovmmM1 1000  
WaitFor M1  
MovmmM2 500  
WaitFor M2  
PrgmEnd Stop
```

**Nested Loops Example:**

- Outer loop is executed 2 times, so output 1 is toggles 2 times.
- Inner loop is executed 3 times and it toggles output 2 for 3 times
- In the Outer loop Program toggles Output 1 once and then Output 2 thrice
- So the Output 1 will toggle 2 times and output 2 will toggle 6 times when this program is run
- Note : Indentation is just for the readability in this manual

```
LoopFor 2  
    OutHig 1  
    Wait_mS 100  
    OutLow 1  
    LoopFor 3  
        OutHig 2  
        Wait_mS 100  
        OutLow 2  
    LoopEnd  
LoopEnd  
PrgmEnd Stop
```

## Using Variables:

Screen 3 on the Controller shows eight variables that can be edited by pressing "Ok" key. Using these variables in the program command can make the programs versatile.

### Toggle Relay-1, ON for 1 Sec, with a delay of 2 Sec in Between, repeat "L1" times:

```
Loop For L1
OutHig RLY1
Wait_mS 1000
OutLow RLY1
Wait_mS 2000
Loop End
PrgmEnd Stop
```

In above program the loop count is not fixed but taken at runtime from the Variables screen that operator can set anytime. This way operator need not know the underlying logic of program but only can see and edit the runtime parameters.

Same way other variables can be used for Speed, distance, division count, wait time etc. See command table for details of what variable is supported for particular command.

## Skip Command

SkipOnInx command is used to skip a command block depending on the input status of a pin. In the following example,

- program repeats endlessly
- waiting for IN1 input
- when the input is active it drive the Relay1
- After that, IN2 is checked
- If IN2 is found active, it skips all commands till "Skip End"
- Otherwise execute normally, in this case if input is not active it disables the Realy1 and enables Relay2

```
Waitfor IN1
OutHig RLY1
SkiponIN2
    OutLow RLY1
    OutHih RLY2
Skip End
PrgmEnd Repeat
```

In above program the loop count is not fixed but taken at runtime from the Variables screen that operator can set anytime. This way operator need not know the underlying logic of program but only can see and edit the runtime parameters.

## Connection Diagram

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