

## Running Motion (Positioning) commands from PLC

Motion Controller and PLC running on myCNC controllers as independent tasks in Real Time multi-tasking environment. There is API to run motion commands from PLC. This features used for wide range of procedures like probing, homing, measure procedures etc.

Procedure **g0moveA** is used to send motion command from PLC to motion controller. Procedure has 3 parameters -

```
g0moveA(flags, axes_mask, distance);
```

- **flags**
  - bit 0 - absolute programming (0 - incremental, 1- absolute)
  - bit 1 - machine coordinates (0- program coordinates, 1- machine coordinates)
  - bit 7 - delayed start
- **axes\_mask**
  - bit 0 - X axis
  - bit 1 - Y axis
  - bit 2 - Z axis
  - bit 3 - A axis
  - bit 4 - B axis
  - bit 5 - C axis
- **distance** - distance to go - integer value in 0.01 units (mm or inch depends on CNC setup)

NOTE: Use the bit conversion:

bit	converted value
bit 0	0x01
bit 1	0x02
bit 2	0x04
bit 3	0x08
bit 4	0x10
bit 5	0x20
bit 6	0x40

Examples:

```
g0moveA(0,1,1000); // Move axis X to 10mm from current position (incremental)
g0moveA(1,4,0); // Move axis Z to Position =0 (absolute)
```

Easy to see that only 1 distance value programmed in **g0moveA** procedure. **Delayed start** is used to program motion in several coordinates. Delayed start bit tells to Motion controller to not start motion but just store distance position for future motion. Distance for several axes can be setup with delayed start bit, then the last procedure with no delayed start will start motion in all programmed positions.

Example

```
//need to move to absolute position (100,50,20)
g0moveA(0x81,1,10000); // Set X=100 (absolute, delayed start)
```

```
g0moveA(0x81,2,5000); // Set Y=50 (absolute, delayed start)
g0moveA(0x81,4,2000); // Set Z=20 (absolute, delayed start)
g0moveA(1,7,0);      // Start move to (100,50,20)
```

Motion command is asynchronous operation. Actual motion is started a few milliseconds after g0moveA code executed. PLC procedure usually should wait motion is finished or monitor some event (sensor triggered) while motion executed.

For this case PLC procedure can get current Motion Control State. Current Motion Control State is mapped to global variables array variable #6060. Return values while reading the variable are

Value	Description
0	Positioning motion (G0 code/ g0moveA running)
1	Line interpolation motion (G1 code)
2	Arc interpolation motion(G2/G3 code)
0x4d (symbol 'M')	Tech code running (M-code/PLC procedure)
0x57 (symbol 'W')	Wait/Idle mode

Example (Move Z up to 10mm, wait till finished): Example

```
move_up=10;
g0moveA(0,4,move_up*100); //Z axis;
timer=10; do{timer--;}while (timer>0); //wait 10ms , motion should start,
motion state will turn to **0**
do{ code=gvarget(6060); } while(code==0);
```

Global variable #7080 is mapped to positioning speed register. Writing to this register will change motion speed for future **g0moveA** calls. Speed value is integer value given in units per minute.

Example (setup positioning speed for g0moveA calls)

```
gvarset(7080,3000); //will set positioning speed to 30000 [mm/min]
```

**M02** procedure handler (which executed at the end of g-code file or when **Stop** button pressed) may contain lift spindle up before turning it OFF to prevent router bits overheat. A complete example of M02.plc is shown below

M02.plc

```
#include pins.h
#include vars.h
main()
{
    timer=0;

    if (proc==plc_proc_spindle)
    {
        if (lift_up>1)
        {
            gvarset(7080,speed_z); //set speed
```

```
g0moveA(absolute,4,lift_up*100);//absolute programming; Z axis;
timer=10; do{timer--;}while (timer>0);//wait till motion started
do { code=gvarget(6060); } while(code==0); //wait till
motion is stopped
};
};

portclr(OUTPUT_MIST);
portclr(OUTPUT_FLOOD);
gvarset(7372,0);//Reset Mist State
gvarset(7373,0);//Reset Flood State

dac01=0x0;

portclr(OUTPUT_SPINDLE);
portclr(OUTPUT_CCW_SPINDLE);
gvarset(7370,0);//Spindle State
gvarset(7371,0);//Spindle Speed Mirror register

command=PLC_MESSAGE_SPINDLE_SPEED_CHANGED;
parameter=0;
message=PLCCMD_REPLY_TO_MYCNC;
timer=10; do{timer--;}while (timer>0); //pause to push the message
with Spindle Speed data

proc=plc_proc_idle;
message=PLCCMD_MOTION_ABORT;
exit(99);
};
```

First block of this procedure check if spindle currently is 0, and **lift\_up** variable is positive value and the lift tool up for given value set in plc-variables.xml configuration file. For those who don't need this lifting can remove the lines and rebuild PLC (see rebuild buttons in [PLC Builder interface](#) )

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