

1. Application description

This application note describes how to create a TML function and call it from an RS232, a CANOpen or an EtherCAT master.

2. TML functions

The TML functions can be created and stored to the drive, using the EasyMotion Studio software, as follows:

- click on the “Functions” section, to open the “Functions” box (1);
- insert the name of the function that needs to be created (2);
- click on the “Add” button (3).

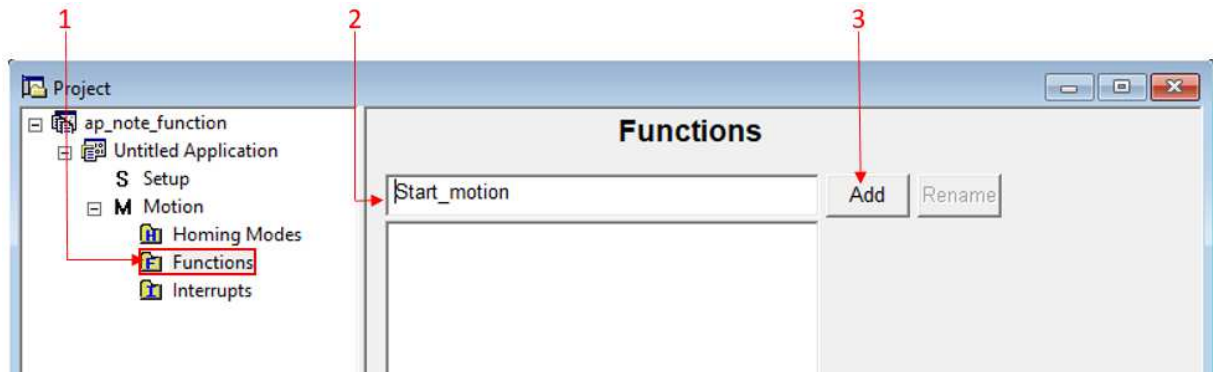


Figure 1. Creating a TML function

Once the new function is added, it will appear in the project window (left side), under the “Functions” section. To write the needed code into the function, click on its name and insert the needed TML instructions to the function body.

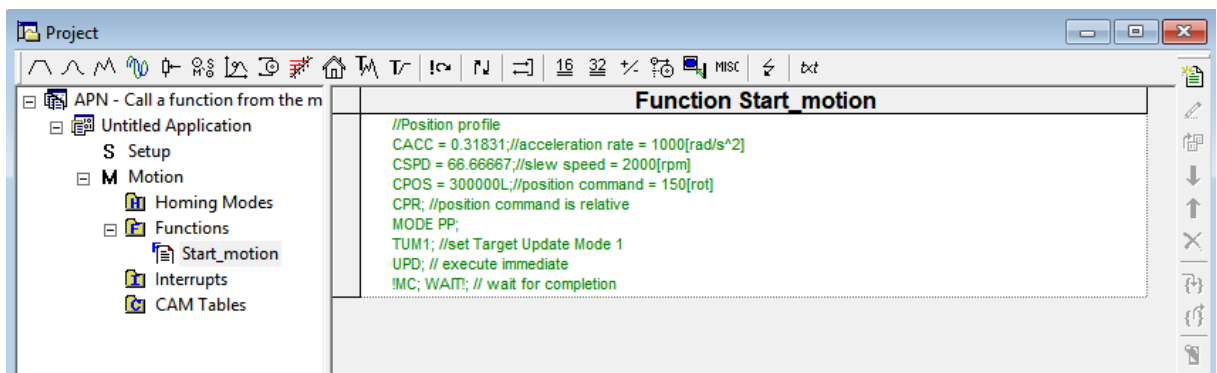


Figure 2. The Start_motion function body

In this example, the “Start_motion” function contains a trapezoidal position profile that turns the motor 150 rot, in the positive direction.

The function can be downloaded to the drive with the Application | Run menu command or with the Application | Motion | Download Program menu command. The Download Program is active only after the motion was built with Application | Motion | Build.

3. Calling a TML function from the RS232 master

To reduce the traffic on the communication line, the repetitive tasks (e.g. homing procedures, predefined movements, emergency procedures etc) can be implemented directly at the drive level, as TML functions. The master will trigger the execution of the respective functions instead of sending all the TML commands.

A function can be called by its address or using the “Function x” TML instruction, where “x” represents the function number (the order in which they are listed in EasyMotion Studio) and can have a value from 1 to 10.

The function address can be obtained in the “Command Interpreter” window from EasyMotion Studio, by typing the “*?function_name*” TML instruction.

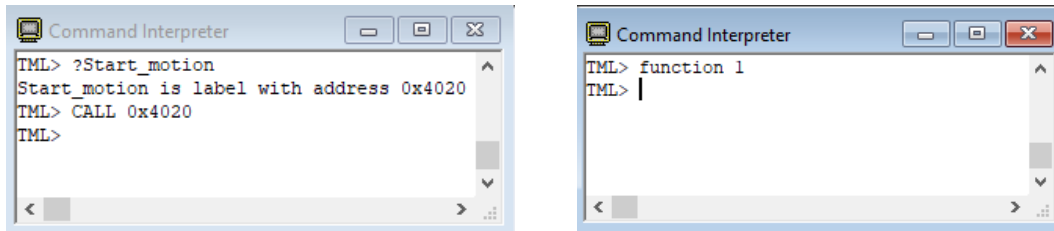


Figure 3. Check the address of a function and call it using the address and its number

Once the address of the function is known, it can be called using the “CALL *address_in_hex*” TML instruction.

Remark: If the program is modified, the function address may change, so is recommend to check the functions addresses after the application is completed.

The “Function x” instruction is not influenced by program changes. EasyMotion Studio updates the addresses of the functions when it builds the program.

The binary code of the “CALL” instruction can be generated using the “Binary Code Viewer” tool from EasyMotion Studio (Application | Binary Code Viewer).

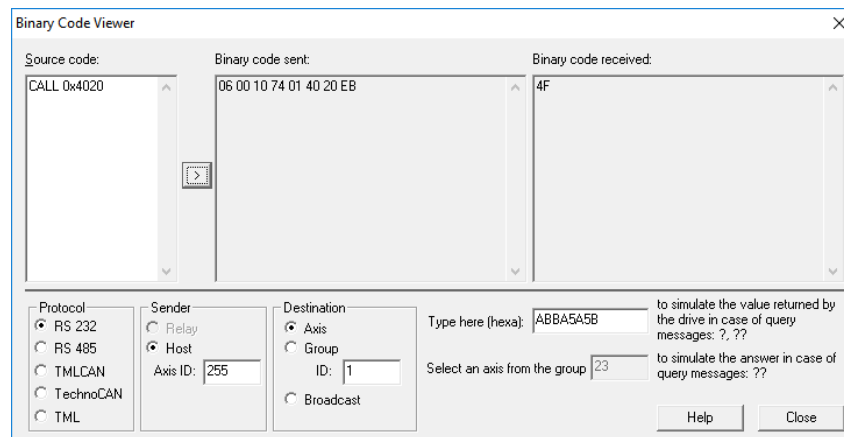


Figure 4. Conversion of TML code to binary code using “Binary Code Viewer” tool

A detailed description of the serial protocol can be found in the EasyMotion Studio help topics ([link](#)).

4. Calling a TML function from the CANopen / EtherCAT master

In CANopen / EtherCAT, a previously downloaded TML function can be executed using the object 2006h.

When a write is performed to the object 2006h, the TML function with the index specified in the provided value is called.

The first 10 TML functions defined in the EasyMotion Studio project can be called through this mechanism.

Remarks:

- the functions can be triggered only when the drive is in Operation Enable state.
- any attempt to call another function is signaled by the drive with an SDO abort code (0609 0030h - Value range of parameter exceeded).
- if a valid value is entered and no TML function is defined in that position, an SDO abort code will be issued (0800 0020h - Data cannot be transferred or stored to the application).
- it is not possible to call another TML function, while the previous one is still running. In case a function was called while another was still running, bits 7 (warning) from the StatusWord (6041h) and 14 (command error) from Motion Error Register (2000h) are set, and the function call is ignored.

The execution of any called TML function can be aborted by setting bit 13 in ControlWord.

A detailed description of the TML functions calling using the object 2006h, can be found in the “CANopen programming manual” (for CANopen) and “CoE programming manual” (for EtherCAT) available on the Technosoft website, under the “Downloads” page ([link](#)).

5. Conclusions

The TML functions, stored at the drive level, can be used to split the tasks between the master and the slave drives (the drive will execute the functions and inform the master when these are done).

This mechanism has the advantage that allows to implement complex applications in a simple way.

Distributing the intelligence between the devices will reduce the traffic on the communication channel. The application implementation time and the efforts are also reduced.

In case of the RS232 / TMLCAN masters or in case of some specific PLC devices, the application implementation can be even simpler, using the TML Motion libraries provided by Technosoft.

These libraries are collections of functions that allow to communicate with the drive, send motion commands, get automatic (or on request) information about the drive's status, read inputs and set outputs, check and modify its setup parameters etc.

More details can be found on the Technosoft website, under the “Software” page ([link](#)).