

EcoStruxure Machine Expert - Basic Example Guide

Drive Function Blocks and Remote
Graphic Display

xxSample_DriveFB+Display.smbe

12/2018

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All pertinent state, regional, and local safety regulations must be observed when installing and using this product. For reasons of safety and to help ensure compliance with documented system data, only the manufacturer should perform repairs to components.

When devices are used for applications with technical safety requirements, the relevant instructions must be followed.

Failure to use Schneider Electric software or approved software with our hardware products may result in injury, harm, or improper operating results.

Failure to observe this information can result in injury or equipment damage.

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Safety Information



Important Information

NOTICE

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, service, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.



The addition of this symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

DANGER

DANGER indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.

WARNING

WARNING indicates a hazardous situation which, if not avoided, **could result in** death or serious injury.

CAUTION

CAUTION indicates a hazardous situation which, if not avoided, **could result in** minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to physical injury.

PLEASE NOTE

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and its installation, and has received safety training to recognize and avoid the hazards involved.

BEFORE YOU BEGIN

Do not use this product on machinery lacking effective point-of-operation guarding. Lack of effective point-of-operation guarding on a machine can result in serious injury to the operator of that machine.

WARNING

UNGUARDED EQUIPMENT

- Do not use this software and related automation equipment on equipment which does not have point-of-operation protection.
- Do not reach into machinery during operation.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

This automation equipment and related software is used to control a variety of industrial processes. The type or model of automation equipment suitable for each application will vary depending on factors such as the control function required, degree of protection required, production methods, unusual conditions, government regulations, etc. In some applications, more than one processor may be required, as when backup redundancy is needed.

Only you, the user, machine builder or system integrator can be aware of all the conditions and factors present during setup, operation, and maintenance of the machine and, therefore, can determine the automation equipment and the related safeties and interlocks which can be properly used. When selecting automation and control equipment and related software for a particular application, you should refer to the applicable local and national standards and regulations. The National Safety Council's Accident Prevention Manual (nationally recognized in the United States of America) also provides much useful information.

In some applications, such as packaging machinery, additional operator protection such as point-of-operation guarding must be provided. This is necessary if the operator's hands and other parts of the body are free to enter the pinch points or other hazardous areas and serious injury can occur. Software products alone cannot protect an operator from injury. For this reason the software cannot be substituted for or take the place of point-of-operation protection.

Ensure that appropriate safeties and mechanical/electrical interlocks related to point-of-operation protection have been installed and are operational before placing the equipment into service. All interlocks and safeties related to point-of-operation protection must be coordinated with the related automation equipment and software programming.

NOTE: Coordination of safeties and mechanical/electrical interlocks for point-of-operation protection is outside the scope of the Function Block Library, System User Guide, or other implementation referenced in this documentation.

START-UP AND TEST

Before using electrical control and automation equipment for regular operation after installation, the system should be given a start-up test by qualified personnel to verify correct operation of the equipment. It is important that arrangements for such a check be made and that enough time is allowed to perform complete and satisfactory testing.

WARNING

EQUIPMENT OPERATION HAZARD

- Verify that all installation and set up procedures have been completed.
- Before operational tests are performed, remove all blocks or other temporary holding means used for shipment from all component devices.
- Remove tools, meters, and debris from equipment.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Follow all start-up tests recommended in the equipment documentation. Store all equipment documentation for future references.

Software testing must be done in both simulated and real environments.

Verify that the completed system is free from all short circuits and temporary grounds that are not installed according to local regulations (according to the National Electrical Code in the U.S.A, for instance). If high-potential voltage testing is necessary, follow recommendations in equipment documentation to prevent accidental equipment damage.

Before energizing equipment:

- Remove tools, meters, and debris from equipment.
- Close the equipment enclosure door.
- Remove all temporary grounds from incoming power lines.
- Perform all start-up tests recommended by the manufacturer.

OPERATION AND ADJUSTMENTS

The following precautions are from the NEMA Standards Publication ICS 7.1-1995 (English version prevails):

- Regardless of the care exercised in the design and manufacture of equipment or in the selection and ratings of components, there are hazards that can be encountered if such equipment is improperly operated.
- It is sometimes possible to misadjust the equipment and thus produce unsatisfactory or unsafe operation. Always use the manufacturer's instructions as a guide for functional adjustments. Personnel who have access to these adjustments should be familiar with the equipment manufacturer's instructions and the machinery used with the electrical equipment.
- Only those operational adjustments actually required by the operator should be accessible to the operator. Access to other controls should be restricted to prevent unauthorized changes in operating characteristics.

About the Book



At a Glance

Document Scope

This document describes how to configure the TMH2GDB Remote Graphic Display of the M221 Logic Controller and use the Drive function blocks introduced with EcoStruxure Machine Expert - Basic.

The example described in this document is intended for learning purposes only. It must not be used directly on products that are part of a machine or process.

WARNING

UNINTENDED EQUIPMENT OPERATION

Do not include any wiring information, programming or configuration logic, or parameter values from any of the examples in your machine or process without thoroughly testing your entire application.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

This document and its related EcoStruxure Machine Expert - Basic project file focus on specific instructions and function blocks provided with EcoStruxure Machine Expert - Basic, and on specific features available in EcoStruxure Machine Expert - Basic. They are intended to help you understand how to develop, test, commission, and integrate applicative software of your own design in your control systems.

The example is intended for new EcoStruxure Machine Expert - Basic users who already have some degree of expertise in the design and programming of control systems.

Validity Note

This document has been updated for the release of EcoStruxure™ Machine Expert - Basic V1.0.

Related Documents

Title of Documentation	Reference Number
ATV12 User Manual	<i>BBV28581 (ENG)</i> <i>BBV28580 (FRA)</i> <i>BBV28582 (GER)</i> <i>BBV28583 (SPA)</i> <i>BBV28585 (ITA)</i> <i>BBV28584 (CHS)</i>
EcoStruxure Machine Expert - Basic - Operating Guide	<i>EIO0000003281 (ENG)</i> <i>EIO0000003282 (FRA)</i> <i>EIO0000003283 (GER)</i> <i>EIO0000003284 (SPA)</i> <i>EIO0000003285 (ITA)</i> <i>EIO0000003286 (CHS)</i> <i>EIO0000003287 (POR)</i> <i>EIO0000003288 (TUR)</i>
EcoStruxure Machine Expert - Basic Generic Functions - Library Guide	<i>EIO0000003289 (ENG)</i> <i>EIO0000003290 (FRE)</i> <i>EIO0000003291 (GER)</i> <i>EIO0000003292 (SPA)</i> <i>EIO0000003293 (ITA)</i> <i>EIO0000003294 (CHS)</i> <i>EIO0000003295 (POR)</i> <i>EIO0000003296 (TUR)</i>
Modicon TMH2GDB Remote Graphic Display User Guide	<i>EIO0000003321 (ENG)</i> <i>EIO0000003322 (FRE)</i> <i>EIO0000003323 (GER)</i> <i>EIO0000003324 (SPA)</i> <i>EIO0000003325 (ITA)</i> <i>EIO0000003326 (CHS)</i> <i>EIO0000003327 (POR)</i> <i>EIO0000003328 (TUR)</i>
Modicon M221 Logic Controller Advanced Functions - Library Guide	<i>EIO0000003305 (ENG)</i> <i>EIO0000003306 (FRE)</i> <i>EIO0000003307 (GER)</i> <i>EIO0000003308 (SPA)</i> <i>EIO0000003309 (ITA)</i> <i>EIO0000003310 (CHS)</i> <i>EIO0000003311 (POR)</i> <i>EIO0000003312 (TUR)</i>

You can download these technical publications and other technical information from our website at <https://www.schneider-electric.com/en/download>

Product Related Information

WARNING

LOSS OF CONTROL

- The designer of any control scheme must consider the potential failure modes of control paths and, for certain critical control functions, provide a means to achieve a safe state during and after a path failure. Examples of critical control functions are emergency stop and overtravel stop, power outage and restart.
- Separate or redundant control paths must be provided for critical control functions.
- System control paths may include communication links. Consideration must be given to the implications of unanticipated transmission delays or failures of the link.
- Observe all accident prevention regulations and local safety guidelines.¹
- Each implementation of this equipment must be individually and thoroughly tested for proper operation before being placed into service.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

¹ For additional information, refer to NEMA ICS 1.1 (latest edition), "Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control" and to NEMA ICS 7.1 (latest edition), "Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable-Speed Drive Systems" or their equivalent governing your particular location.

WARNING

UNINTENDED EQUIPMENT OPERATION

- Only use software approved by Schneider Electric for use with this equipment.
- Update your application program every time you change the physical hardware configuration.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

WARNING

UNINTENDED EQUIPMENT OPERATION

Do not include any wiring information, programming or configuration logic, or parameter values from any of the examples in your machine or process without thoroughly testing your entire application.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Chapter 1

Example Description

What Is in This Chapter?

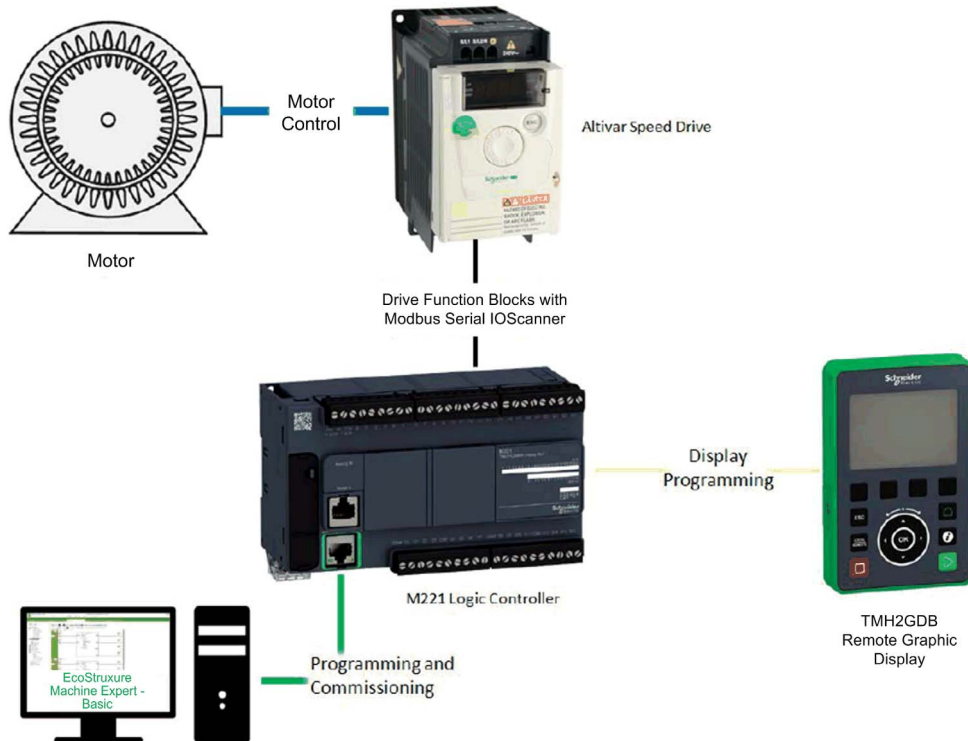
This chapter contains the following topics:

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Overview

General

This example guide and its corresponding project template, included with EcoStruxure Machine Expert - Basic, help you to implement the Drive function blocks and TMH2GDB Remote Graphic Display of the M221 Logic Controller in your application. This guide shows an example of how to use these features. The concept of this example is illustrated in the following graphic:

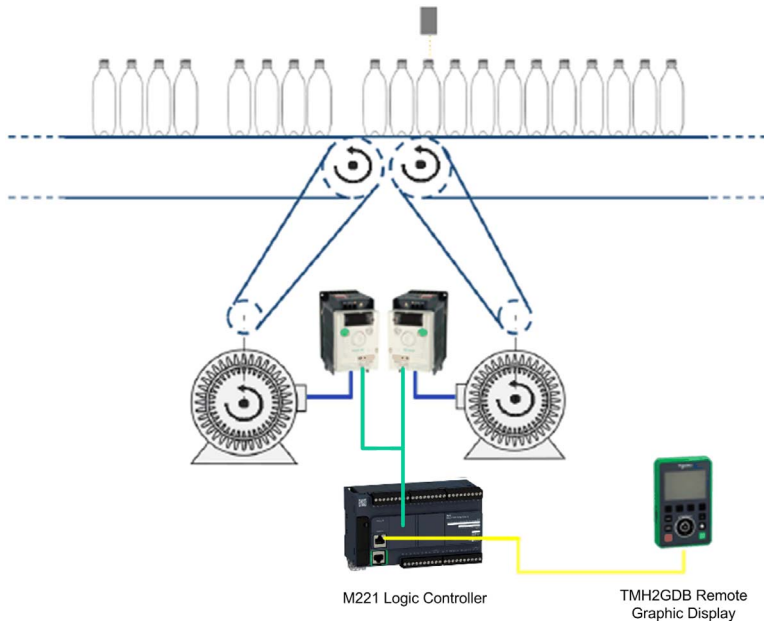


You can control ATV speed drives by using Drive function blocks. These Drive function blocks, implemented with EcoStruxure Machine Expert - Basic V1.0, communicate through the Modbus Serial IOScanner with an ATV speed drive, which is connected to a motor. This guide describes how to use Drive function blocks in the context of an EcoStruxure Machine Expert - Basic project template.

This guide also illustrates how to use a TMH2GDB Remote Graphic Display to monitor a machine, or allow more complex user interaction than electro-mechanical push buttons.

Setup Description

This project template is based on an industrial machine. This machine is used for grouping bottles together to facilitate packaging. This graphic illustrates the concept of the machine:



When a specified number of bottles has been detected, the motor on the right slows down to create a space between packs of bottles. These packs of bottles can then be packaged using a different machine.

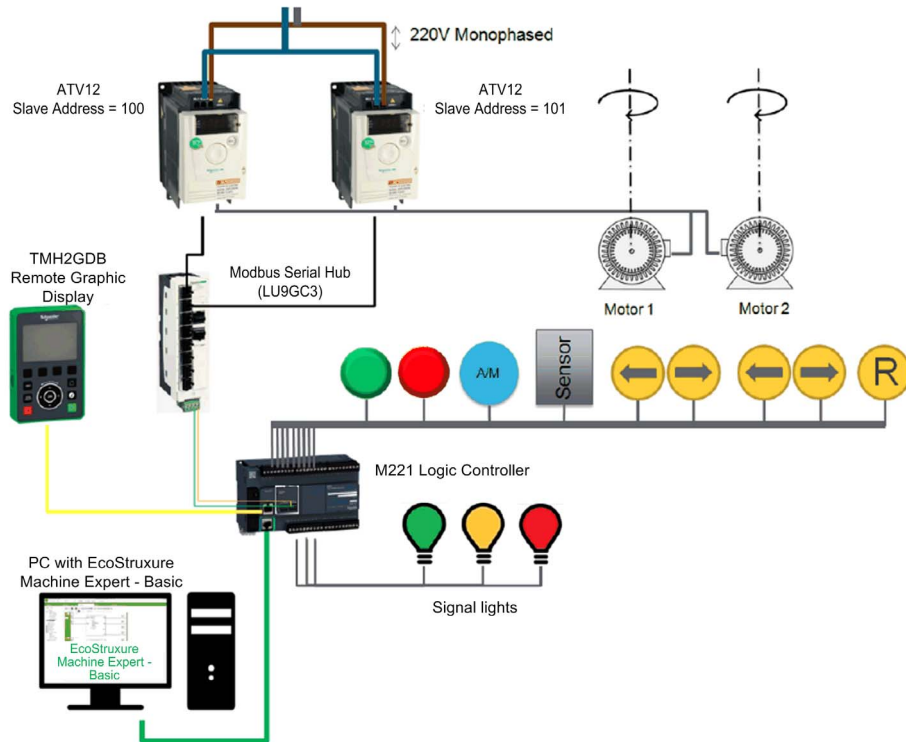
Using ATV speed drives, you can control the motor speeds and, in particular, slow down the second motor. As it is not necessary to stop the second motor, making it possible to achieve a greater production output.

The ATV speed drives are controlled by the M221 Logic Controller using Drive function blocks. These function blocks allow you to:

- Start and stop a motor.
- Control the speed of the motor and update it regularly.
- Monitor the states of the ATV speed drive and motor.
- Manage errors detected in the ATV speed drive.

The M221 Logic Controller is equipped in this application with a TMH2GDB Remote Graphic Display. This unit displays information during production, and also allows multiple production recipes to be handled.

A detailed illustration of this machine, excluding the conveyor belts, is shown below. It presents the wirings and the use of different inputs and ports.



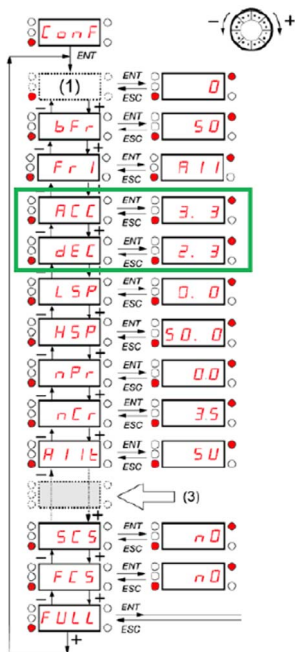
The purpose of each button and signal light is described in the program description ([see page 21](#)).

Configuring the ATV Speed Drives

ATV speed drives need to be configured for this machine. The following parameters must be modified to the values indicated here:

- Acceleration: 0.5 s
- Deceleration: 0.5 s
- Modbus address: 100 for Motor 1, 101 for Motor 2

These modifications can be carried out using either the integrated HMI on the ATV Drive or SoMove software. Refer to the ATV12 User Manual ([see page 10](#)) for more information on SoMove. You can access the acceleration and deceleration parameters using the integrated HMI:

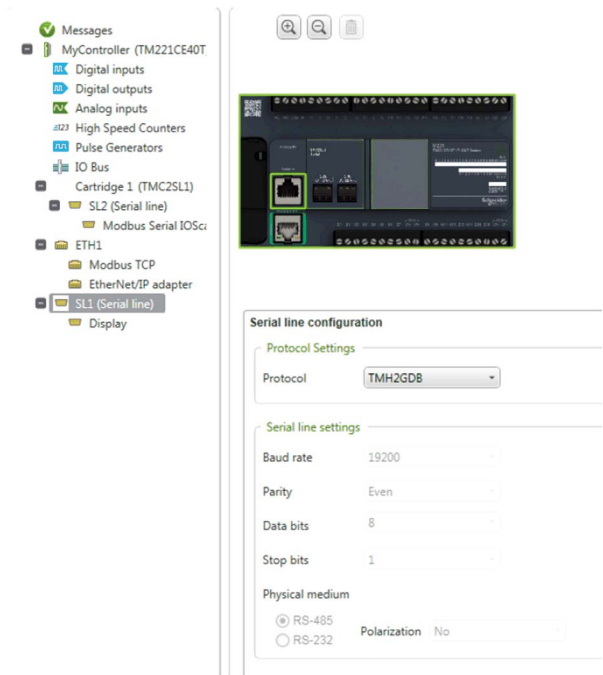


The Modbus settings can be modified by following the following steps from the integrated HMI:

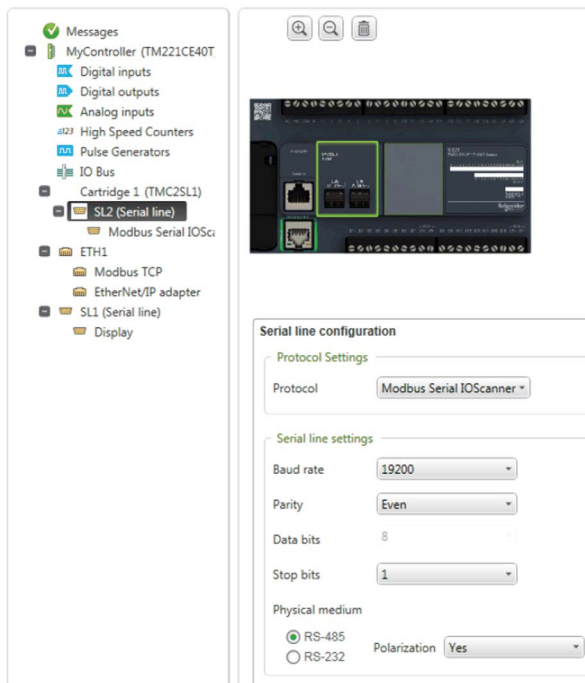


Configuring the M221 Logic Controller

This project needs an M221 Logic Controller with two serial ports, either added using a cartridge, or embedded such as with the TM221M32TK. The first serial port is used for communicating with the TMH2GDB Remote Graphic Display and needs to be configured to use the TMH2GDB protocol:



The second serial port is used for communicating with the ATV speed drives and needs to be configured as a Modbus Serial I/O Scanner:



Connect this serial port to the Modbus Serial Hub, as shown in the graphic in Setup Description ([see page 15](#)). The Modbus Serial Hub makes it possible to communicate with two ATV speed drives, which need to be added to the list of devices in the Modbus Serial I/O Scanner:



The initialization requests and the channels of these scanner devices are configured automatically so you do not need to add other channels or initialization requests.

Chapter 2

Project Template Description

Overview

- The project template is split into three parts for ease of understanding:
- 1. Rungs related to the TMH2GDB Remote Graphic Display are in the first POU
 - 2. Three Grafcet chart rungs that manage the machine process are in the POUs 2, 3, and 4:
 - The master Grafcet chart manages the two other Grafcet charts and the stop commands
 - The manual mode Grafcet chart manages the manual mode of the machine
 - The automatic production Grafcet chart executes automatic production using the machine
 - 3. POUs 5 and 6 implement the Drive function blocks.
- The project template is explained in the same order.

What Is in This Chapter?

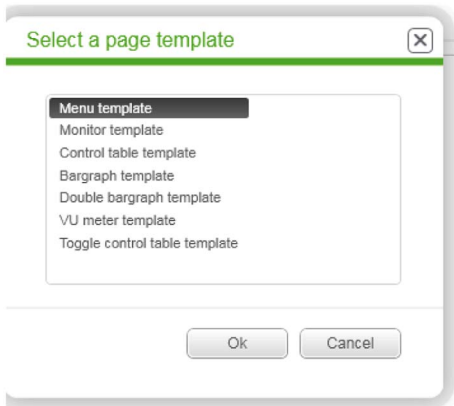
This chapter contains the following topics:

Topic	Page
TMH2GDB Remote Graphic Display	22
Grafcet Charts	28

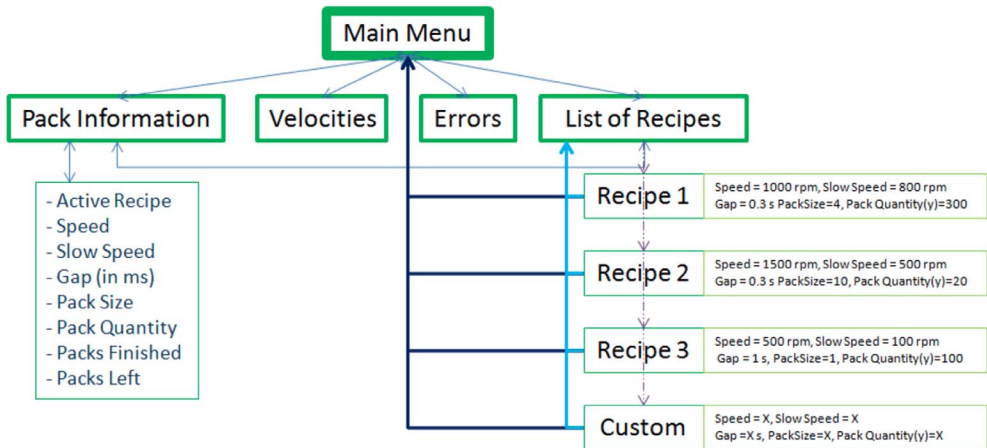
TMH2GDB Remote Graphic Display

Presentation

A TMH2GDB Remote Graphic Display is an HMI that is configured on the **Display** tab in EcoStruxure Machine Expert - Basic. You can create different pages following a structure tree that can be adapted to various applications. The different types of page that can exist are shown in the following graphic:



The menu template is used for navigating to other pages. In each page, there are at least two configurable buttons, R3 and R4, that can also be used for navigating. The structure tree of the TMH2GDB Remote Graphic Display used in the project template is given in the following graphic:



The Remote Graphic Display shows **Main Menu**. Pressing the **Home** button also redirects here. The **Main Menu** page is a Menu template from where you can access the other pages.

Pack Information

In this page, you can see information about the production state. The **Active Recipe** value is 0 when no recipe is chosen, 1 when the chosen recipe is recipe 1, or 4 when it is the custom recipe.

The elements of this page are updated continuously during production. **Packs Finished** is incremented each time a new pack is finished, that is, when the **PackSize** quantity is reached. Similarly, **PackLeft** is decremented each time a new pack is finished.

Velocities

This page is a Double bargraph template. It continuously displays the velocities of the two motors.

Errors:

This page can present the following three errors:

- Application Errors are the errors originating from this application such as choosing two recipes.
- M1 Errors correspond to the errors read from the ATV drive connected to the first motor (ATV1).
- M2 Errors correspond to the errors read from the ATV drive connected to the second motor (ATV2).

The M1 and M2 error values are identical to those produced by the ATV function blocks, and can be found in the Modicon M221 Logic Controller Advanced Functions Library Guide.

Application errors could be:

- 10 corresponds to choosing no recipes.
- 11 corresponds to choosing 2 recipes.

It is possible to reset the application errors by editing this value through the TMH2GDB Remote Graphic Display.

To reset the M1 and M2 errors, a Modbus request needs to be sent to the ATV drive producing the error. This can be done by using the buttons Reset M1 and/or Reset M2.

Details about how to use each page can be found by pressing the **Help** button:

Page properties

Title

Custom Recipe

Help text

Toggle the activation of this recipe with R2 "Toggle". You can edit the variables according to your application

Password protect

☐

Page index

8

The project template also includes two animation tables. With these animation tables, it is possible to monitor inputs and outputs and choose recipes and the other functions supported by the Remote Graphic Display:



Errors

This page can present the following three errors:

- Application Errors are the errors originating from this application such as choosing two recipes.
- M1 Errors correspond to the errors read from the ATV drive connected to the first motor (ATV1).
- M2 Errors correspond to the errors read from the ATV drive connected to the second motor (ATV2).

The M1 and M2 error values are identical to those produced by the ATV function blocks, and can be found in the Modicon M221 Logic Controller Advanced Functions Library Guide.

Application errors could be:

- 10 corresponds to choosing no recipes.
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Details about how to use each page can be found by pressing the **Help** button:

Page properties

Title	Custom Recipe
Help text	Toggle the activation of this recipe with R2 "Toggle". You can edit the variables according to your application
Password protect	<input type="checkbox"/>
Page index	8

The project template also includes two animation tables. With these animation tables, it is possible to monitor inputs and outputs and choose recipes and the other functions supported by the Remote Graphic Display:

  Animation tables

RECIPES

I/O

List of Recipes

In this page, you can see the list of recipes that you can choose from, including a custom recipe that you can create through the display. The **List of Recipes** page is a Menu template and thus from this page you can access the other recipes. You can use the button R4 to go back to the main menu. This applies for all the pages.

Recipe 1, 2, and 3:

These pages are Monitor templates. This template allows you to read and edit the values of variables. Each recipe has the same elements but use different values that are configured in rungs 1 to 3 of the Display Management POU.

Every recipe has the following parameters that modify the automatic production:

- Speed of the two motors: speed of both motors, except when the second motor (M2) slows down to create a gap.
- Slow Speed: speed that M2 changes to when the defined number of bottles (PackSize) is detected.
- Gap (in ms): period of time that M2 slows down for.
- PackSize: number of bottles in each pack. In other words, after reaching this number of bottles, M2 slows down.
- PackQuantity: number of packs of bottles to be processed before the Automatic mode deactivates.

Pressing the **Toggle** (R2) button chooses the recipe that is displayed, **Chosen?** changes to 1 indicating that you tried to choose this recipe. If there is no other recipe active at the same time, **Active?** also changes to 1, otherwise it stays at 0. To activate this recipe, every other recipe must be deactivated using the **Toggle** button available on each recipe page.

	Recipe 1	dd/MM/yyyy HH:mm:ss
Chosen?	%M401	
Active?	%M411	
Speed	%MW410	
M2 Slow Speed	%MW417	
Gap	%MW411	
Edit	Toggle	List Main

Once a recipe is active, the recipe parameters are copied to the active recipe parameters. Active recipe parameters are parameters that are taken into account by the automatic production and can be displayed in the **Bottle Pack Info** page:

Bottle Pack Info		ddMM/yyyy HH:mm:ss	
Active Recipe	%MW400	+	
Speed	%MW450		
M2 Slow Speed	%MW457		
Gap (in ms)	%MW451		
Pack Size	%MW452		
Edit	Alarm	List	Main

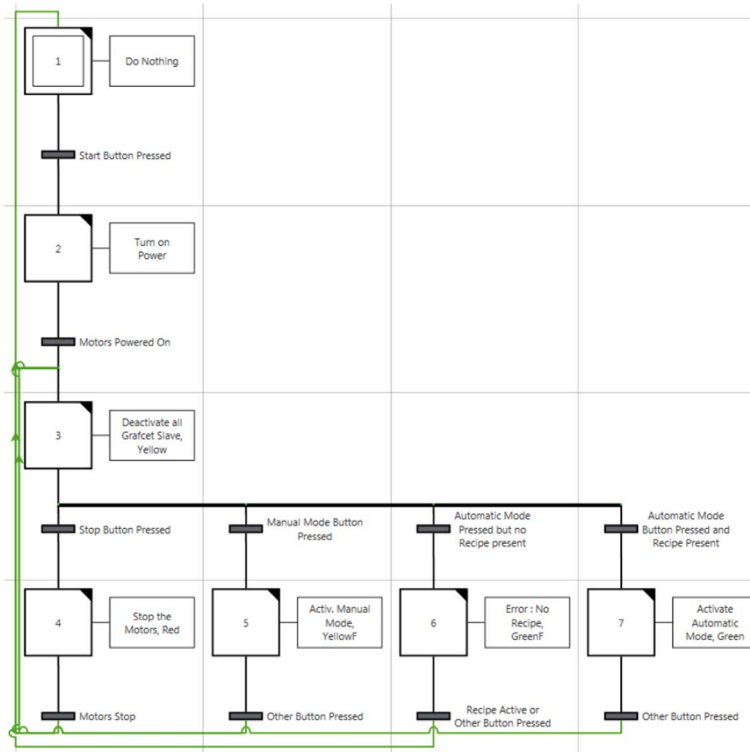
Custom Recipe:

This recipe page has the same operating principles as the previous ones, plus it is possible to modify the values and create a custom recipe through the TMH2GDB Remote Graphic Display.

Grafcet Charts

Master Grafcet Chart

There are three Grafcet charts in the program, which are linked to each other. Upon the start of the machine, the program starts at the initial step of each Grafcet chart. However, the next steps of the Automatic Production and Manual Mode Grafcet charts are activated by the Master Grafcet chart.



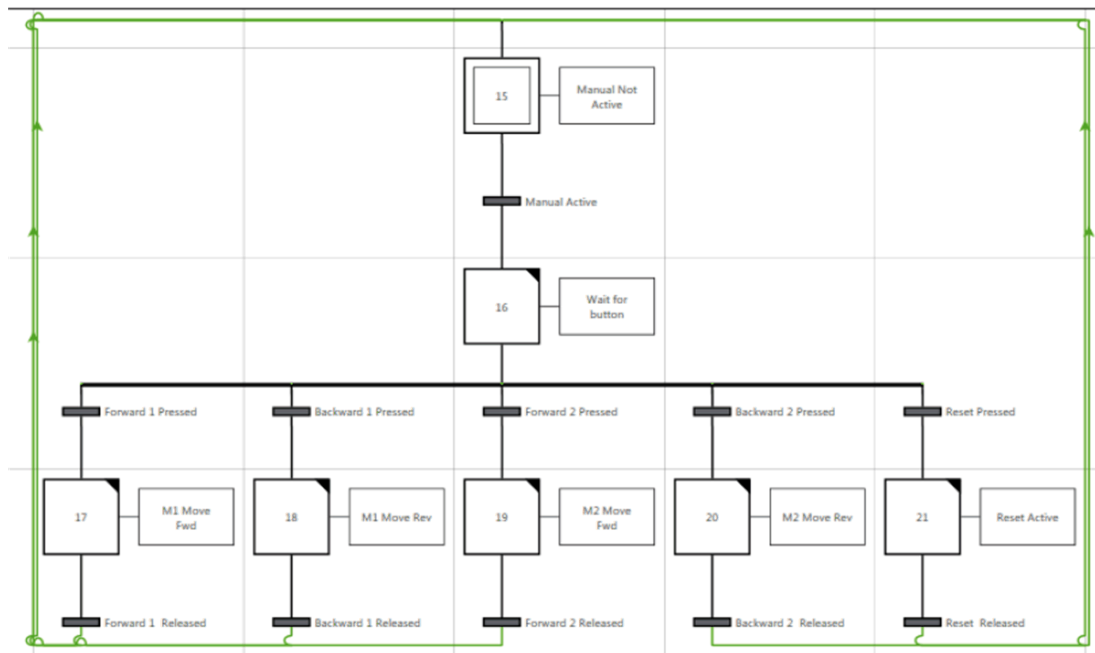
When the **Start** button is pressed, the power stages of the ATV drives are enabled. In this state, the yellow signal light is illuminated.

The choice between manual and automatic mode is done with a push button. The default mode of the machine is manual mode. The push button toggles the mode of the machine from manual to automatic mode. This means that the machine starts in manual mode and the yellow signal light starts flashing. In this state, the Manual Mode Grafcet chart is enabled.

Manual Mode Grafcet Chart

In manual mode, it is possible to control the two motors with the push buttons. Within the application, these push buttons correspond to `FWD_M1` and `BACK_M1` to turn motor 1 in forward or reverse directions respectively, with a fixed speed of 500 rpm. Likewise, `FWD_M2` and `BACK_M2` turn the motor 2 in forward or reverse directions respectively.

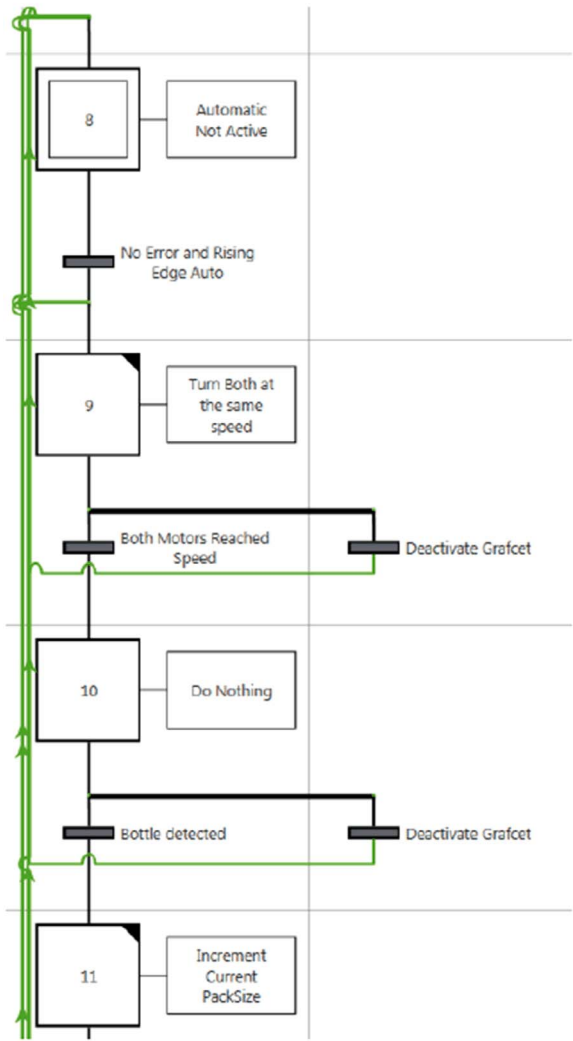
With the **RESET** button, you can reset the counter that counts the number of bottles in a pack. In this mode, you can calibrate the positions of the conveyor belts and reset the counter in case of an error without turning off the machine or accessing it with EcoStruxure Machine Expert - Basic:

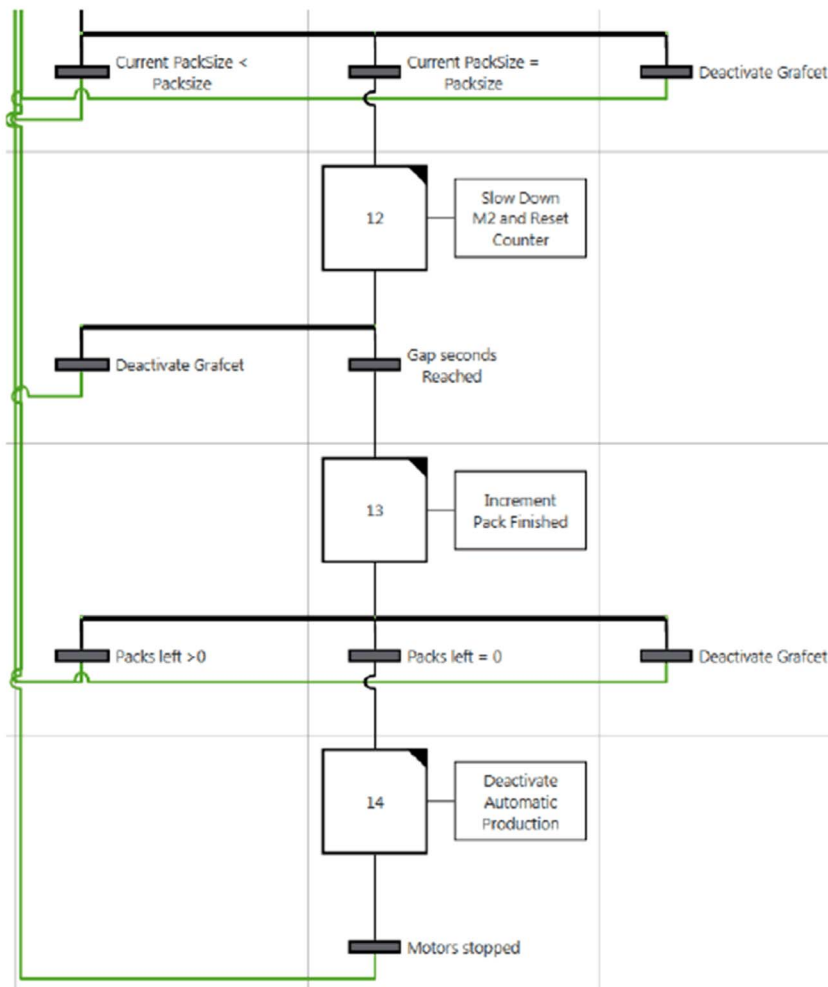


The Master Grafcet chart verifies whether you have chosen a recipe. If not, the green signal light flashes until you choose a recipe. When a recipe is chosen and is active, the Automatic Mode Grafcet chart is activated and automatic production begins. In any mode, if you press the **Stop** button, the ongoing process and the motors are stopped and the red signal light is illuminated.

Automatic Production Grafcet Chart

The automatic mode requires no manual intervention and executes actions automatically. When it is activated, the two motors start turning at the same speed. Whenever a bottle is detected, the pack size value is incremented and then compared with the `PackSize` requested by the recipe. When the value is reached, M2 slows down for the configured `Gap`. When a pack is finished (a gap is created), `Pack_Finished` is incremented until it reaches the `Pack_Quantity` value requested by the recipe. When this value is reached, the motors are stopped and the recipe selection is deactivated.





There is a transition that is present after each step, called Deactivate Grafcet chart. This transition checks for the value of memory word %M103, which is set to 1 by the Master Grafcet chart. If this bit is set to 0, it means that both automatic and manual modes should be deactivated, that is, returned to their initial state.

You can also see that no Modbus request is sent within these Grafcet charts: the Grafcet charts only set specific bits, which will subsequently trigger calls to the appropriate function blocks to make requests. These function blocks are called Drive function blocks and are explained in Drive Function Blocks ([see page 33](#)).

Chapter 3

Drive Function Blocks and Twido Drive Macros Comparison

What Is in This Chapter?

This chapter contains the following topics:

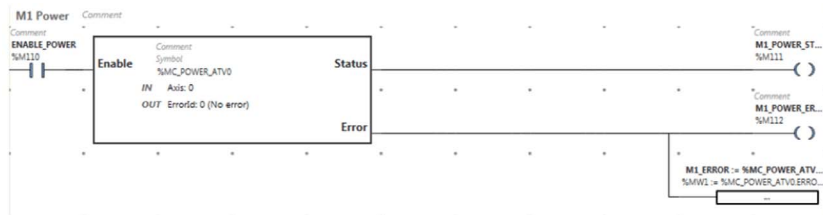
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Drive Function Blocks

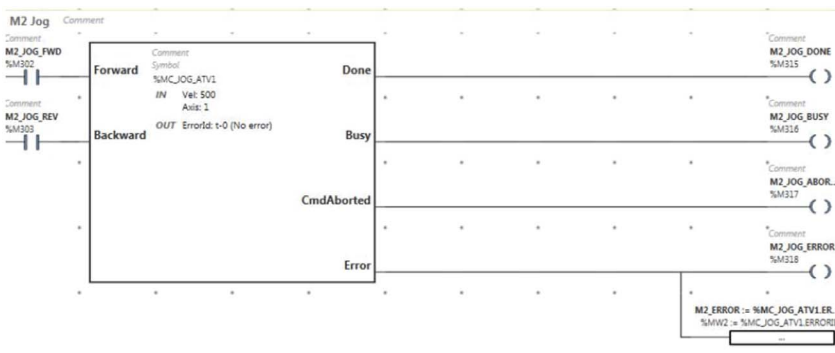
With EcoStruxure Machine Expert - Basic V1.0, it is possible to control ATV speed drives using Drive function blocks. These function blocks execute Modbus requests over Modbus Serial I/O Scanner. These function blocks are used in POU 5 and 6:

- POU 5 is used for monitoring; its values are not used within the application. It can also be used for error detection and debugging.
- POU 6 receives commands from the Grafcet charts and executes or enables the corresponding Drive function block.

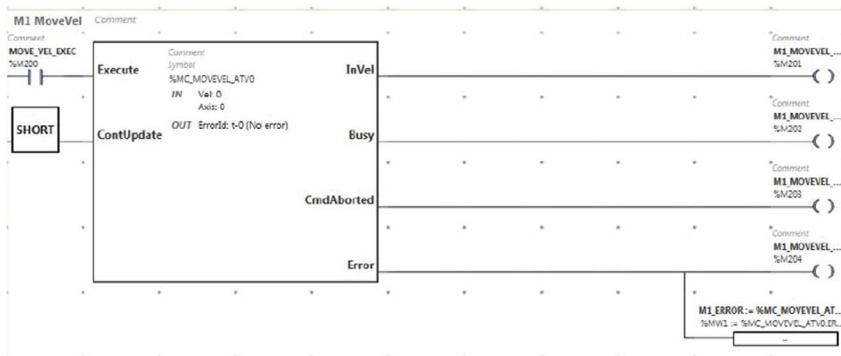
The `MC_POWER_ATV` function block is called in the startup of the machine. The Step 2 of the Master Grafcet chart (Turn on Power) needs to stay enabled to use `MC_JOG_ATV` and `MC_MOVEVELOCITY_ATV`. These function blocks send the commands for the ATV drive to go into the RUN state.



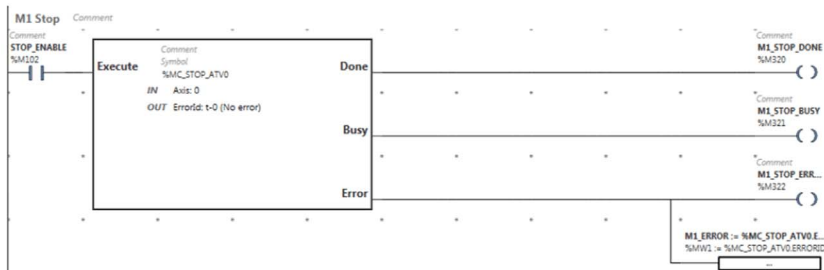
The `MC_JOG_ATV` function block is used with the Manual Mode Grafcet chart. The `Forward` or `Backward` input parameters turn the motor only if they are set to 1 (TRUE). Releasing the direction button stops the motor.



In automatic mode, the MC_MOVEVELOCITY_ATV function block controls the drive movements. Setting the **Execute** input to 1 (TRUE) sends a speed value. However, when the **ContUpdate** input is set to 1 (TRUE) before setting the **Execute** input to 1 (TRUE), you can update the velocity value within the application and it is taken into account by the MC_MOVEVELOCITY_ATV function block. Modifying this velocity value is how this template slows down M2 once the pack size is reached.



The MC_STOP_ATV function block stops the motors when the stop button is pressed and the associated bit is set to 1 (TRUE) by the Master Grafset chart. This function block can be executed when MC_VELOCITY_ATV or MC_JOG_ATV is active; it stops their execution and sets their **CmdAborted** pin to 1 (TRUE).



The MC_RESET_ATV function block can reset any errors detected by the ATV drive. Its execution is possible by using the **Errors** page of the Remote Graphic Display.

Drive Function Blocks and Twido Drive Macros Comparison

This example guide is also a continuation of the `xSample_Twido_Macro_Drive_Conversion` (*see page 10*) project template and Importing Twido Drive Macros to M221 (*see page 10*). Read this chapter to learn more on how to associate Twido Drive Macros with Drive function blocks.

D_Manager

The `D_Manager` macro is similar to `MC_POWER_ATV`. In Twido, the `D_Manager` macro needs to be called before any other macro whereas `MC_POWER_ATV` needs to be enabled only for `MC_JOG_ATV` and `MC_VELOCITY_ATV`.

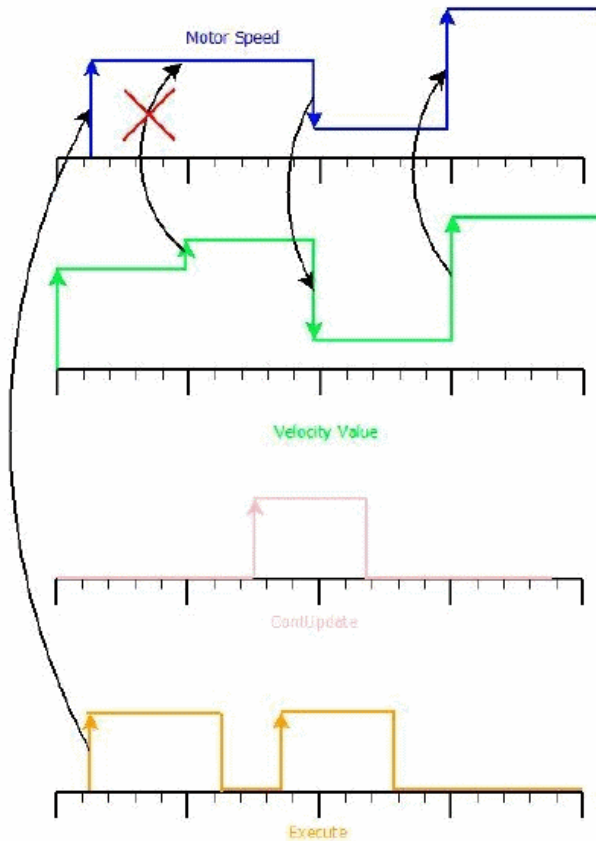
D_Select_Speed, D_Run_Fwd, D_Run_Rev

The `D_Select_Speed`, `D_Run_Fwd` and `D_Run_Rev` macros have no equivalent in Drive function blocks. However, they can be replaced by `MC_MOVEVELOCITY_ATV` and `MC_JOG_ATV`.

`D_Select_Speed` is integrated into the `MC_MOVEVELOCITY_ATV` and `MC_JOG_ATV` function blocks. There are two ways to modify the speed while the motors are turning:

- `MC_MOVEVELOCITY_ATV` sends a speed command when the `Execute` input is set to 1 (TRUE) and the motor can continue turning even if there is no more activity on the `MC_MOVEVELOCITY_ATV`. This means that the `Execute` input can be set to 0 (FALSE), the velocity modified, then `Execute` can be set to 1 (TRUE) and the motor speed changes without stopping the motor.
- Setting the `ContUpdate` input to 1 (TRUE) before the `Execute` input allows you to continuously modify the velocity value. Once the `Execute` input is set to 1 (TRUE), the function block takes the value of the `ContUpdate` input and this value is stored until the next rising edge of the `Execute` input. This means that once `ContUpdate` is set to 1 (TRUE) before `Execute` is set to 1 (TRUE), changing `ContUpdate` has no effect, or resetting `Execute` to 0 (FALSE).

This is also illustrated in the following graphic:



`D_RUN_FWD` and `D_RUN_REV` resemble the `MC_JOG_ATV` function block. This function block integrates these two macros; however it is not possible to change the speed while the Forward or Backward inputs of `MC_JOG_ATV` are set to 1 (TRUE).

`D_STOP`

The `D_STOP` macro is identical to the `MC_STOP_ATV` function block.

`D_CLEAR_ERR`

The `D_CLEAR_ERR` macro is identical to the `MC_RESET_ATV` function block.

Additionally, you can use `MC_READSTATUS` and `MC_READMOTIONSTATE` function blocks to obtain information provided by `D_STATE` or `D_ERROR` parameters.

