13.1 DMX512 Description

13.1.1 Introduction

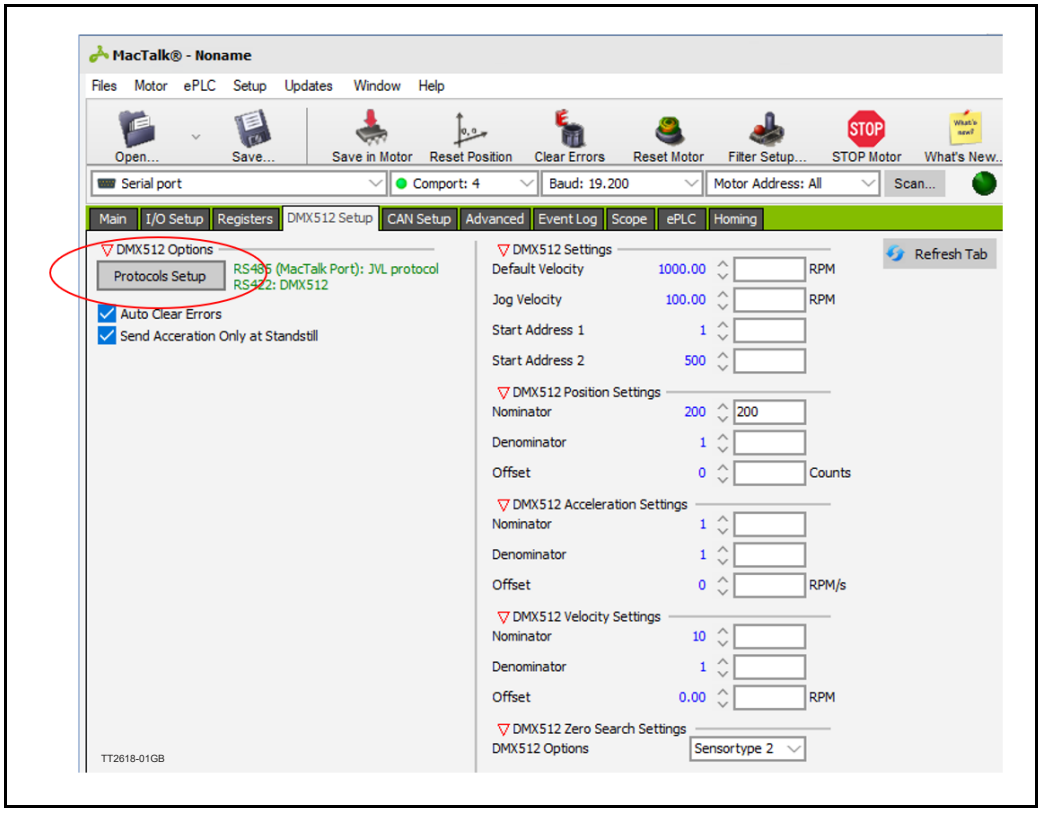
This document describes how to use the DMX512 protocol, widely used for theatre equipment, with the stepper motor. The DMX512 protocol is a standard feature in all MIS and MIL motors. (Working from Firmware version 5.03)

13.1.2 General description

The DMX interface supports control of Position, Mode, Acceleration and Velocity of the motor. It is intended to be used with a set of motors, sharing the same Acceleration and Velocity, but with different positions and separate mode control.

13.1.3 How to enable DMX 512

The DMX functionality is enabled be selecting the DMX 512 setup tab.
Click on the protocol setup button in the red circle in the figure.
Select the interface that should be used for DMX. Either RS485 or RS422.
Set the parameters requested for the application of the motor.
Save the settings in the motor.



13.1.4 DMX settings

To set up several motors to the same values, except the DMX start address, save the motor parameters to a .MAC file from MacTalk via the Save button, and then load that file into the next motor using the Open button.

13.1.5 Homing

The DMX homing uses the build in homing.
The following parameters need to be set up before using DMX homing.

- Torque if mechanical/Torque homing is used.
- Velocity search.
- Velocity Crawl if sensor homing is used.
- Homing sensor input if sensor homing is used.

See homing commands in the Control channel section Control channel, page 364.

13.1.6 DMX Address names

The DMX can address four values: Position value, Control channel, Acceleration and maximum Velocity.
Using the MacTalk program, two separate DMX start addresses must be configured.
Start Address 1 (called SA1 below) points to the three bytes holding Position (coarse + fine) and the Control Channel, which is used to select the motors operating mode to either Homing mode or Position mode.
Start Address 2 (SA2) points to the two bytes holding Acceleration and Velocity.

It is intended that each motor has separate values for SA1, but all motors share the value of SA2 and thus will use the same Acceleration and Velocity.

SA1 + 0 Position value (coarse)
SA1 + 1 Position value (fine)
SA1 + 2 Control channel
SA2 + 0 Acceleration
SA2 + 1 Maximum velocity

13.1.7 Scaling of parameters

The 16-bit position value and the 8-bit Acceleration and Velocity values must be scaled and possibly offset to fit their working range in motor counts.
This is done by multiplying each value by a separate fraction and then adding an offset.
All of these scaling parameters are configured in the MacTalk application with the DMX512 Setup Tab.
The formulas used are:

P_SOLL (Target position) =
DMX Position (16-bit) * DmxPosNom / DmxPosDen + DmxPosOffset (32-bit)

A_SOLL (Commanded acceleration/deceleration) =
DMX Acceleration (8-bit) * DmxAccNom / DmxAccDen + DmxAccOffset (16-bit)

V_SOLL (Commanded velocity) =
DMX Velocity (8-bit) * DmxVelNom / DmxVelDen + DmxVelOffset (16-bit)

Note that all of the three Offsets and the Nominators for Position and Velocity are signed values, while all Denominators and the Acceleration offset are unsigned. MacTalk will limit the ranges to prevent invalid entries, such as division by zero.

13.1.8 Control channel

Setting the MODE_REG is done using the DMX Control Channel in a special way.

00-09 Set Motor in Passive mode
60-69 Set motor in Position mode
180-189 Run homing
200-209 Reset error

The motor is kept in its configured start-up mode until 10 identical values in the range 180..189 have been received on the DMX Control Channel. Then the motor starts a homing operation, which is terminated when the homing is completed.
Homing will not be aborted if the value of the Control Channel is changed away from the 180..189 range after Homing was started. Homing can be repeated at any time.
The motor will then stay in Position mode until the next Homing operation is requested (or until an error occurs). The homing procedure can be disabled with the DMX512 tab in MacTalk. If the motor is with absolute encoder the homing should be disabled.
When the value of the Control Channel is anywhere in the range 60..69, the scaled values for Position, Acceleration and Velocity are transferred from the DMX bus to the basic motor every time a new value is detected on the DMX bus. When the Control Channel values are neither in the range 60..69 or 180..189, the motor is kept in Position mode, but no new values for Position/Acceleration/Velocity are transferred.
IF the setting “auto clear errors” is set, the motor will clear any errors before any DMX command is carried out. Note that if the source(s) of the error(s) are still present, the errors will be set again immediately.

13.1.9 Jogging using digital inputs

When input 1 is switched from Off to On, it will set the motor into Jogging (Velocity) mode at an initial speed of zero RPM and ignore any data from the DMX bus. It can be selected to also send a Reset Errors command at this time. While in Jogging mode, setting input 2 On will make the motor run at the velocity configured in MacTalk as Jog Velocity. Setting input 2 Off in jogging mode will set the velocity to zero. While in Jogging mode, setting input 3 On will make the motor run at the velocity configured in MacTalk as Jog Velocity, but in the opposite direction of input 2. Setting input 3 Off in jogging mode will set the velocity to zero.

IN1	IN2	IN3	Mode/Function
OFF	x	x	Passive mode
ON	OFF	OFF	Velocity mode - Velocity = 0
ON	ON	OFF	Velocity mode - Velocity (+) set for jogging in the DMX tab
ON	OFF	ON	Velocity mode - Velocity (-) set for jogging in the DMX tab

DMX512 can be configured to also send a Reset Errors command every time one of inputs 2 and 3 is switch On/Off state.
When input 1 is switched from On to Off, Jogging mode is ended, the maximum velocity is set to the value configured in MacTalk as Default Velocity.
The motors target position is set [close] to the actual position resulting from the jogging. The DMX must perform a Homing operation after jogging. This is done to prevent that the motor will start to move to its last received DMX target position as soon as the jogging enable, input 1, is set back to Off.

13.1.10 Other considerations

The DMX serial channel will accept either one or two stop bits per byte to be compatible also with DMX masters that send only one stop bit.
Only DMX packets with type zero will be used. Other packet types, like SIP (System Information Packets) will be ignored.
The firmware was tested during development using the freeware Windows application Q Light Controller Version 3.2.0-3 with a USB RS-485 adapter.

DMX512 can be configured so that the module will send new values for Velocity and Acceleration to the motor only when a new value for Position is received.
In other words, a new Position value will cause the values for Position, Velocity and Acceleration in the same DMX telegram to be sent to the motor as a set.
This is so a complete movement to one or more motors can be started and the motor will complete the movement using the same Velocity and Acceleration, even if other values are sent on the DMX bus to configure other motors to perform movements using other values for Velocity and/or Acceleration.