



DMMDRV 2017 Software User Manual

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1 General Software Safety Precautions

- The user and operator should review all appropriate software, drive and motor manuals before operation.
- Do not open multiple instances of the DMMDRV program on the same PC computer.
- After every operation or button press, make sure the program has completed the current operation before giving another command.
- Do not disconnect the tuning cable during program operation or when motor is running.
- Do not modify or disassemble the tuning cable, servo drive, servo motor or encoder.
- Only use tuning cable provided by DMM.
- Ensure that the correct servo drive and servo motor is connected as outlined by section *3.3 Applicable Servo Drives and Servo Motors*.
- (Version FE 328.1) The program does not recognize servo drive model or servo motor capacity, make sure the parameters and command speed/acceleration is within drive and motor operation limits.

1.1 DYN2 System Safety

- Ensure the DC power into the DYN2 servo drive is the correct polarity before powering ON.
- The peak speed of the servo motor depends on the DC voltage input into the DYN2 servo drive. Ensure the command speed is appropriate relative to the achievable motor speed. The servo drive will alarm if command speed is outside operation limit.
- Do not use the DYN4 servo setting screen to read/write to the DYN2 servo drive.
- Do not disconnect the tuning cable during program operation or when motor is running.

1.2 DYN4 System Safety

- The tuning cable should be connected into DYN4 drive JP2. Do not connect the D-Sub9 serial cable into DYN4 JP5 port (Encoder Output).
- Do not use the DYN2 servo setting screen to read/write to the DYN4 servo drive.
- Do not disconnect the tuning cable during program operation or when motor is running.

1.3 Servo Motor Safety

- The DMMDRV software can command the servo motor to rotate at high speeds. An emergency switch must be connected at all times.
- If servo motor is mounted onto machine, take note of machine travel limits and ensure the servo motor does not over-travel.
- Keep away all loose clothing and objects from servo motor or any moving mechanical components.

2 PC Requirements

Operating System	Windows XP SP3 or higher Recommended: Windows 7 (32-bit / 64-bit)
Processor	Pentium 1 GHz or higher
RAM	512 MB or more
Framework	.NET Framework 4 or higher
Minimum disk space	60MB

3 Component Requirements

The DMMDRV program can connect to a DYN servo drive using either the RS232 cable or the USB cable. For computers without an RS232 port, a RS232 to USB converter can also be used.

3.1 RS232 Cable

Part#: CA-MRS232-6
Description: 6ft RS232 to Molex 7pin DYN drive tune up cable



3.2 USB Cable

Part#: CA-MTUSB-F5
Description: USB to Molex 7pin DYN drive tune up cable



3.3 Applicable Servo Drives and Servo Motors

Servo Drive


- DYN2-TL
- DYN2-T1
- DYN4-L01
- DYN4-H01
- DYN4-T01

*For legacy DYN2-H, DYN2-B and DYN3-H and DYN3-T servo drive models, the parameter setting functionality can be used. Test Movement, Motor Monitor and Waveform modules may vary in performance due to feedback speed and encoder resolution.

Servo Motor

All servo motor models compatible with the above servo drive can be used.


4 Installation

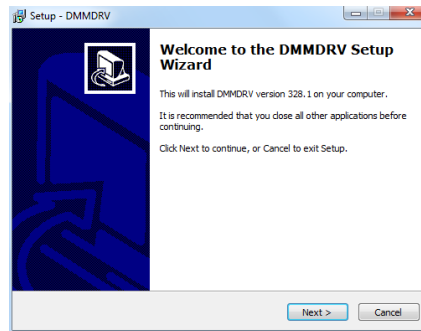
On PC computers with .NET Framework 4 or higher already installed, the user can simply download and copy the DMMDRV.exe program onto any directory and launch the program: .

Otherwise, the installation package can be used. The installation package will install the DMMDRV program as well as all other necessary components including .NET Framework 4 and other required packages.

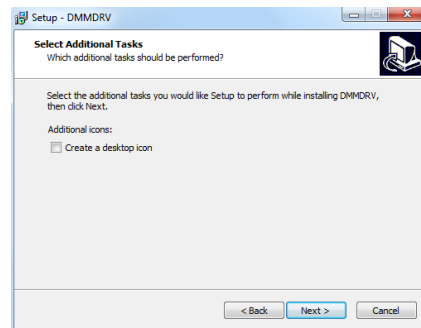
Installation Package Procedures:

*Note: The appearance and menu options may be different depending on the operating system

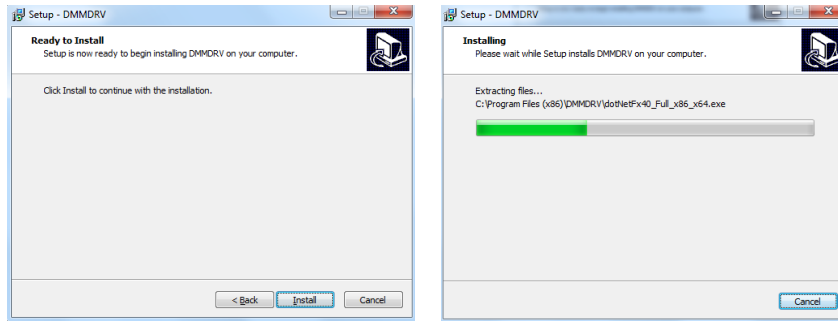
1. Download the DMMDRVSetup.exe package. 
2. Double click the program to launch the installer.
3. The first window shows the software name and version. Select **Next** to continue.



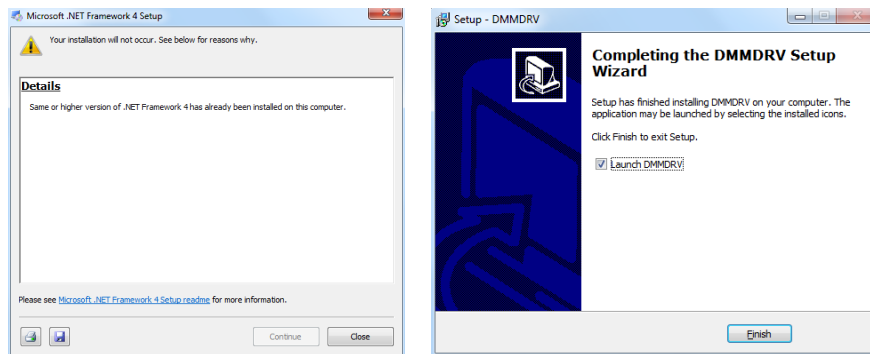
4. Select if a desktop icon for DMMDRV should be created, then select **Next**.



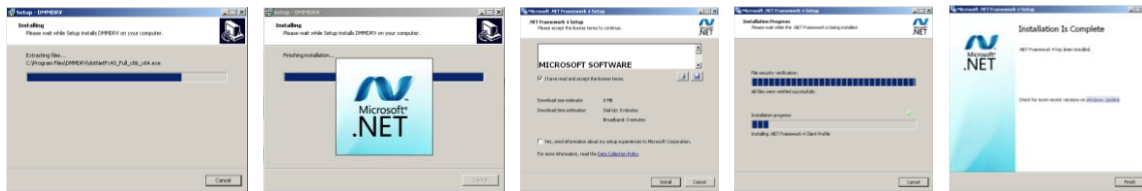
5. Select **Install** to begin installation. The installation begins.



6. If .NET Framework 4 or higher already installed the program will notify accordingly. Select **Close** to proceed. Select if the program should be launched now, then select **Finish** to complete installation.



7. If .NET Framework 4 is not installed, follow the on-screen instructions to install .NET Framework 4.

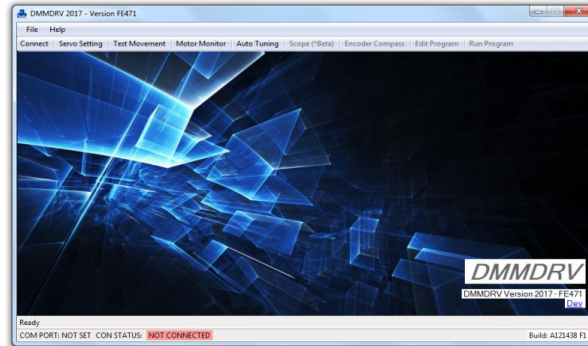


5 Operation

Power ON the servo drive and make sure the tuning cable is securely connected from the servo drive JP2 into the PC.

When the program is first launched, the main window will display the software version and other program information. The bottom left corner (1) displays the program initialization status (*Initializing* or *Ready*) along with the COM Port number and Con Status (Connection Status).

If the COM Port has not been set, the COM PORT will display *NOT SET* and CON STATUS will display *NOT CONNECTED*. The first procedure is to set the COM port. This will tell the DMMDRV program which port the tuning cable, and servo drive is connected to.

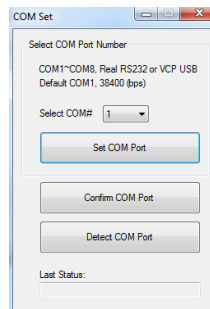


DMMDRV Main Window

The COM Port must be set first before proceeding with any other operations in the program.

5.1 Drive Communication (Connect)

1. Select **Connect**. The COM Set window opens. There is an operation indicator at the bottom of the window labeled "Last Status" that displays to the user the last operation or message from the program.



COM Set window

2. If the COM port number is already known, select the number from the dropdown (COM1~8) and select **Set COM Port**. If correctly set, the program will automatically close the COM Set window.

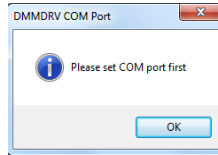
If the COM port number is not known, select **Detect COM Port** and the program will recursively scan all COM ports on the PC to find the tuning cable and connected servo drive.

3. The user can verify if the servo COM port is correctly set by selecting **Confirm COM Port**.
4. After the COM port is correctly set, the main window updates the COM port number and the connection status.

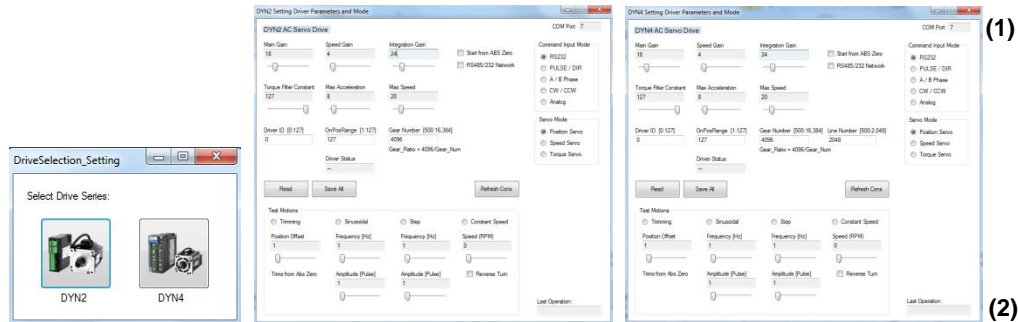


5.2 Setting and Reading Parameters (Servo Setting)

1. From the main window, select **Servo Setting**.
2. If the COM Port has not been set, the program will notify to set the COM Port first.

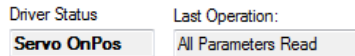


3. Select the connected servo drive model. The DYN2 or DYN4 *Setting Driver Parameters and Mode* window opens. The top right corner displays the COM Port number **(1)**. The bottom right corner displays the last operation or message from the program **(2)**.



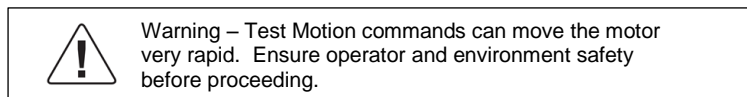
The window initializes with the program default parameters. Note these program default parameters are not the default parameters that should be used with the servo drive and motor combination.

4. Select **Read** to read out the connected servo drive parameters. The program reads the servo drive parameters and updates the on-screen values. The *Driver Status* indicates *Servo OnPos* (Servo On Position). The *Last Operation* indicates *All Parameters Read*.

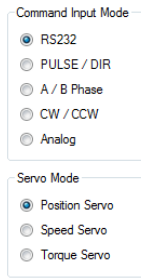


If the servo motor is coupled to a load, or if the *OnPosRange* parameter is set low, the *Driver Status* may indicate *Servo OffPos* (Servo Off Position). Meaning the encoder position error is outside the On Position Range – refer to servo drive manual for parameter definition.

5. Each parameter can be adjusted on-screen using the sliders or text box. Select **Save All** to save all parameters into the servo drive. If the user set parameters are not within range of the allowed values, an error will be indicated.
6. To confirm that the save operation was successful, select **Refresh Cons**. This will refresh the on-screen parameters to the program default values. Then select **Read** to read out the servo drive parameters and verify that the new saved values can be correctly read out.
7. Motor operation can be tested using the *Test Motions* module at the bottom of the window.



The servo drive must be set and saved into *RS232 Command Input Mode* and *Position Servo* to operate the Test Motions. See Appendix C for Test Motion details.

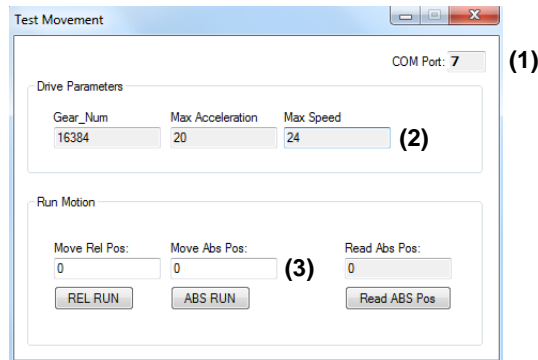


8. Select the appropriate command input mode and servo mode to begin operation with host controller.

5.3 Test Positioning (Test Movement)

The *Test Movement* module is used to move the servo motor to a target position. This function can be used to measure motor and machine accuracy and repeatability. It can also be used to position the motor in actual application. The servo drive must be set and saved into *RS232 Command Input Mode* and *Position Servo*.

The window initializes to display the COM Port **(1)** and reads out the Gear_Num, Max Acceleration and Max Speed parameters **(2)** from the connected servo drive. When sending position commands, the servo motor's acceleration and speed is determined by these 3 parameters. Use the *Setting Driver Parameters and Mode* window to change these values.



Enter a relative (incremental) or absolute position value **(3)**, then select **REL RUN** or **ABS RUN** to run the servo motor to position. The position value entered is with respect to the full resolution of the encoder. For the 16-bit ABS-16 encoder, 1 revolution is 16bits or 65,536points. Entering 65536 into the *Move Rel Pos* value, then selecting **REL RUN** will rotate the servo motor 1 revolution. The speed and acceleration is calculated as:

$$\text{Gear Ratio} = \frac{4,096}{\text{GEAR NUMBER}}$$

$$\text{Maximum Motor Speed [rpm]} = \frac{(\text{MaxSpd}+3)*(\text{MaxSpd}+3)}{16} * 12.21 * \text{Gear Ratio}$$

$$\text{Maximum Motor Acceleration [rpm/s]} = \text{MaxAcl} * 635.78 * \text{Gear Ratio}$$

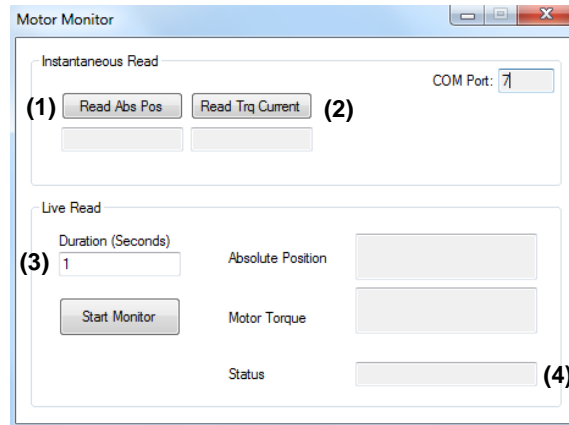
Where GEAR NUMBER = Gear_Num, MaxAcl = Max Acceleration and MaxSpd = Max Speed parameters.

5.4 Position and Torque Monitor (Motor Monitor)

The motor monitor window can be used to instantaneously or in real time read and update the motor absolute position and torque. This module can be used in all servo settings. For example, the servo drive can take command from a PULSE/DIR host controller, and this window can be used concurrently to monitor the position and torque output.

The position is displayed as 16-bit encoder absolute position. The torque is displayed as a relative current output from -700 to 700. A reading of 700 means the drive is outputting the peak torque in the positive direction. A reading of -350 means the drive is outputting half peak torque in the negative direction. Refer to the servo drive manual to calculate the current output according to model number. The torque can be calculated using the servo motor Torque Coefficient specification.

Torque Reading Example 1: Servo drive used = DYN2-TL. Servo drive peak torque = 20A. Servo motor used = 640-DST-A6TK1. Servo motor torque coefficient = 0.181Nm/A. If the torque reading is 400, the drive is outputting $400/700 * 20 = 11.43A$ in the positive (CW) direction. $11.43A * 0.181Nm/A = 2.07Nm$ torque output from motor in CW direction.



Instantaneous Read

- Select **Read Abs Pos** to read the instantaneous motor position (1).
- Select **Read Trq Current** to read the instantaneous motor torque (2).

Live Read

1. Enter an integer time value into the Duration text box (3).
2. Select Start Monitor to begin live monitor. The Absolute Position and Motor Torque will display the live readings for the duration set into (3).
3. The Status indicates the live monitor status (4).



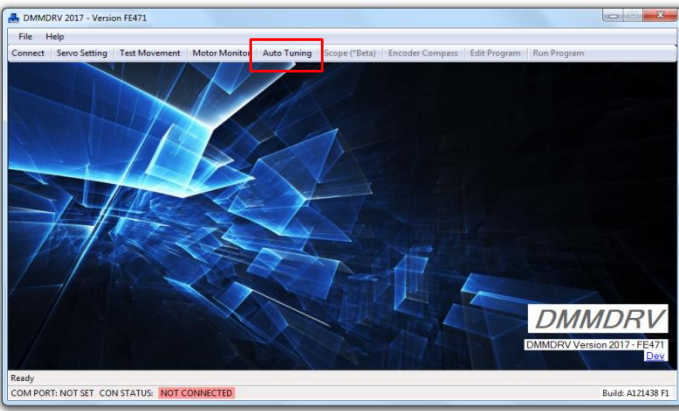
5.5 Auto Tuning Module

The full auto tuning module can be used to automatically let the DMMDRV program run motions on the motor to detect the optimal Gain and torque filter settings for the drive. The DYN servo drive also has built-in real-time Adaptive Tuning technology so after the auto tuning procedure is completed, even if there are high variances in the load or motion characteristics, the drive can still maintain consistent performance.

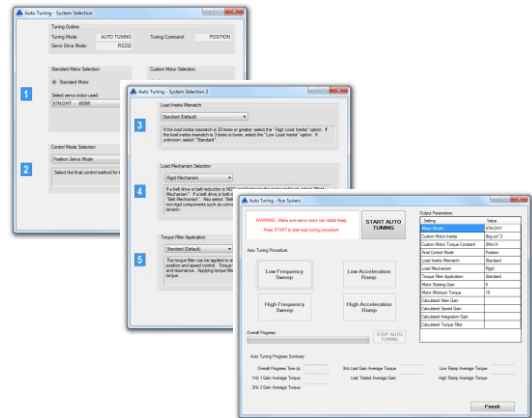
The auto tuning process runs the motor between +/-5 revolutions of travel so make sure the motor and machine can be freely moved within this range. Make sure the motor is tightly coupled to the load so the program can accurately determine the load characteristics.

Open the auto tuning module from the main screen and follow the on-screen instructions to run the auto tuning procedure.

Open Auto Tuning Module



Follow instructions to complete auto tuning



After the auto tuning process is finished, the Gain and torque filter parameters are saved into the drive. The calculated parameters are displayed in the output Parameters Column.

Output Parameters:	
Column1	Column2
Motor Model	880-DST
Custom Motor Inertia	0
Custom Motor Torque Constant	0
Final Control Mode	Position
Load Inertia Mismatch	Standard
Load Mechanism	Rigid
Torque Filter Application	Standard
Motor Starting Gain	8
Motor Minimum Torque	10
Calculated Main Gain	24
Calculated Speed Gain	24
Calculated Integration Gain	1
Calculated Torque Filter	100

User input auto tuning settings

Auto tuning calculated Main Gain, Speed Gain, Integration Gain and Torque Filter Constant

Appendix A Cable Drivers

The USB tuning cable (CA-MTUSB-F5) installs the cable driver automatically upon connection. The user can manually download and install the driver from the following link:

<http://www.ftdichip.com/Drivers/VCP.htm>

A cable driver is not needed if connecting the serial tuning cable directly into the PC's D-Sub9 serial port. When using the serial tuning cable with a serial to USB converter, refer to the converter's manufacturer for the appropriate driver.

Appendix B Serial Port Specification

All specification common between DYN2 and DYN4 servo drives.

Servo Drive Port: JP2
 Connector Type: 2.54mm Pitch Rectangular
 Drive Header: Molex 70553-0041
 Plug Connector: Molex 50-57-9407
 Recommended Wire Gauge: 0.3mm² (AWG22)

Servo Drive JP2 Pinout:

Pin. 1	Gnd
Pin. 2~4	Reserved
Pin. 5	RS232 RxD signal input to Drive, CMOS/TTL level signal
Pin. 6	RS232 TxD signal output from Drive, CMOS/TTL level signal
Pin. 7	+5VDC output from Drive

Communication Format

Baud Rate	38,400bps
Start/Stop Bit	1
Off/Even Verify Bit	0
Data	8-bit Full Duplex Asynchronous (UART)
Voltage	TTL/CMOS

Appendix C Test Motion Details

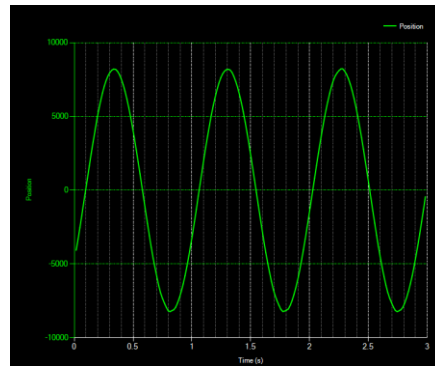
Trimming

The motor position can be trimmed up to 180° from current position. Max displacement depends on motor parameters. Moving the slider up rotates the motor in positive direction (CW as viewed from shaft side). Moving the slider down rotates the motor in negative direction (CCW as viewed from shaft side). Motor trimming speed depends on slider movement speed.

Sinusoidal

The servo drive generates a continuous sinusoidal motion path according to the frequency and amplitude set by the user. The calculated path is continuous acceleration/deceleration.

The frequency is the frequency of oscillation. Maximum frequency is 30Hz. The amplitude is the peak to peak displacement. Maximum amplitude is 16,384 or 90°. If the frequency and amplitude is set too high, the motor might not be able reach full peak to peak amplitude.



Frequency = 1Hz, Amplitude = 16,384

Step

The servo drive generates an instantaneous step motion path according to the frequency and amplitude set by the user. The calculated and commanded path is instantaneous acceleration/deceleration to target position.

The frequency is the frequency of oscillation. Maximum frequency is 30Hz. The amplitude is the peak to peak displacement. Maximum amplitude is 16,384 or 90°. If the frequency and amplitude is set too high, the motor might not be able reach full peak to peak amplitude.



Frequency = 2Hz, Amplitude = 8,192

Manual Revision History

Date	Revision No.	Int. Ref.	Details
December 2015	A1050	--	First Edition
December 2017	A1324	FE471	Updated with version 471 new features.

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DMM Technology Corp.
120 - 21320 Gordon Way
Richmond, British Columbia V6W1J8
Canada

Tel: +1 (604) 370-4168 | Fax: +1 (604) 285-1989
Sales: sales@dmm-tech.com | Info: info@dmm-tech.com

www.dmm-tech.com

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