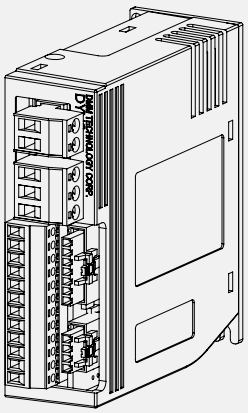
Dynamic Motor Motion
Technology Corporation

DYN2 Series

AC Servo Drive

Type - A General-Purpose Pulse/Analog
Specification Manual



Manual Code	: DYN2MS-01E-0814A1	Hardware Version	: AH10
Revision	: A1	Firmware Version	: AH10

This manual must be kept available for the user

Published In Canada

■ Safety Notice ■

The user or operator should read through this manual completely before installation, testing, operation, or inspection of the equipment. The DYN2 series AC Servo Drive should be operated under correct circumstances and conditions. Bodily harm or damage to equipment and system may result if specifications outlined in this document are not followed. Take extra precaution when the warning convention is used.

⚠ WARNING

■ Notations Used ■

All specification and units of measurement used in the manual are in METRIC:

Mass: Kilogram [kg]
Length: Millimeter [mm]
Time: Seconds [s]
Temperature: Celsius [C]

Product Manual Preface

The user or operator should read through this manual completely before installation, testing, operation, or inspection of the equipment. The DYN2 series AC Servo Drive should be operated under correct circumstances and conditions. Bodily harm or damage to equipment and system may result if specifications outlined in this document are not followed. Take extra caution at details when the warning convention is used.

This manual is available on the DMM Technology Corp. website. A physical copy or reference to the on-line availability must be kept convenient to the servo drive user or operator for references. Contact DMM Technology Corp. if the user or operator has any questions or concerns regarding use.

The DYN2 AC Servo Drive is not designed or certified to implement safety into a system and should not be used in applications where the servo drive maintains safety to personnel or machine.

To reflect improvements, additions, revisions, changes or corrections made to the product or manual, this document is updated accordingly and divided into revisions to reflect each version.

Manual Contents

A.1 Introduction

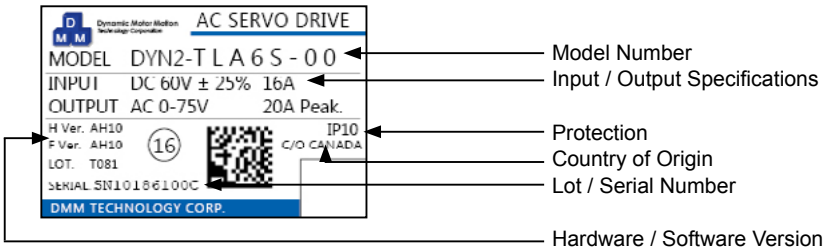
This manual documents all features and specifications for the DYN2 series AC Servo Drive Type A - General Purpose Pulse/Analog. The servo drive features standard pulse train and analog command input modes compatible with universal motion controllers, PLC's or CNC controllers. Control modes include position, speed or torque servo mode with standard signal connections and interfacing for seamless integration into any system. A high resolution 16-bit (65,536pulse/rev) encoder combined with outstanding 10ms instantaneous position response optimizes performance in high-demand applications.

Gain adjustment is simplified with 3 parameter tuning for fast and easy adjustments while maintaining critical application and response flexibility. All testing and tuning is done through a RS232 or USB interface with a host PC running DMMDRV GUI software for fast and easy set up. Drive status is internally monitored by 22 parameters for consistent and reliable performance.

Standard servo motor and encoder/motor power cable pair options available. Measuring only 32mm [W] x 85mm [H] x 75mm [D], the DYN2 AC Servo drive can power up to 0.75kW (7.1Nm) capacity. The perfect servo drive for any small to medium capacity application.

A.2 Name Plate

Note the name plate is region specific and may vary between each region model.



A.3 Servo Drive Model Number

DYN2 - T L A 6 S - 00

DMM Servo Drive Series
DYN2 AC Servo Drive Low Voltage DC Input

Voltage Class	
T	60V
H	48V
S	24V

Motor Capacity	
1	50W - 200W
L	400W - 750W

Command Type	
A	Pulse / Analog

Encoder	
4	14bit [16,384ppr]
6	16bit [65,536ppr]

Model Type	
S	Standard
**	Custom

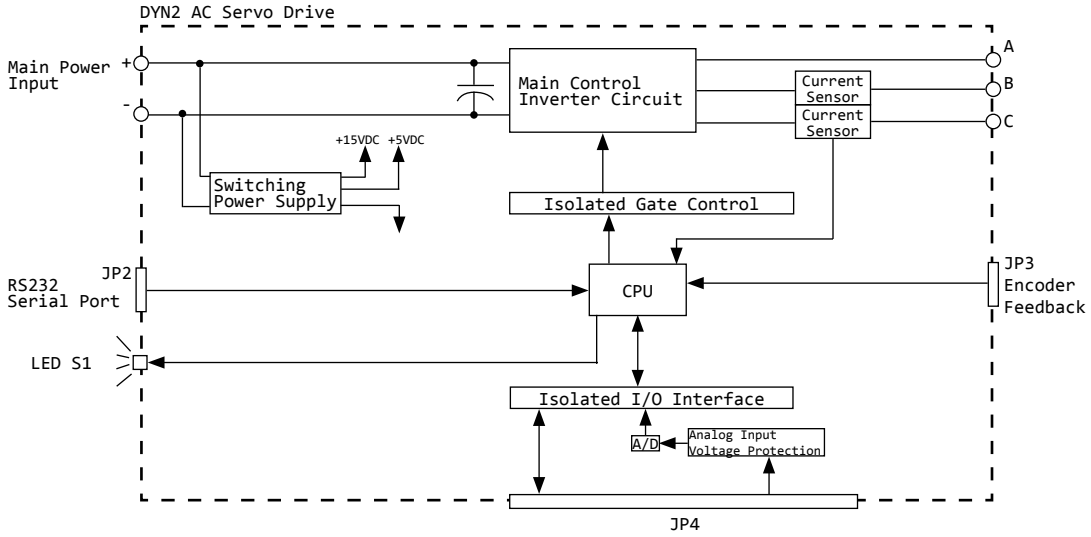
1 GENERAL SPECIFICATION

1.1 Drive Overall Specification

	Data	Specification
Input	Rated Voltage	60VDC ± 10%
	Permissible Input Voltage	24VDC ~ 75VDC
	Rated Current	16A
Output	Rated Voltage	Peak. +75VAC Between any two motor phase
	Rated Current	[L] Capacity Model: Peak. 20A [1] Capacity Model: Peak 10A From any single motor phase
	Motor Capacity	50W ~ 750W
Drive Interface Power Supply (JP2 Pin. 12)	Voltage	5VDC +/-%5
	Max. Current Draw	50mA
Control Method		SVPWM
Dynamic Brake		Integrated
Encoder Feedback		14/16-bit Single-Turn Absolute
Protection Functions		Current, Voltage, Temperature, Over Power, Position Lost Follow
Position Servo	Command Reference Pulse*1	Pulse+Sign, A/B Phase Quadrature 90° Phase Differential, CW+CCW
	Max. Input Frequency	500kHz
	Input Voltage	5VDC ± %5 (Higher voltage available as option) Over drive photocoupler diode
	Positioning Feedback	Z Index Pulse*2
Speed Servo	Speed Control Range	0:5000
	Input Reference Voltage	-10VDC ~ +10VDC ± %5 3,000rpm at ± 5VDC
	Max Input Voltage	± 12VDC
Torque Servo	Input Reference Voltage	-10VDC ~ +10VDC ± %5
	Max Input Voltage	± 12VDC
Environment	Protection	IP10
	Operation Temperature	0~55°C
	Storage Temperature	-20 ~ 65°C
	Max. Operation Humidity	95RH% (no dew)
	Max. Storage Humidity	95RH% (no dew)
Mass		0.2kg

1. CW+CCW command format available as option.
2. See section 4.5 for Z index pulse details

1.2 Control Block Diagram

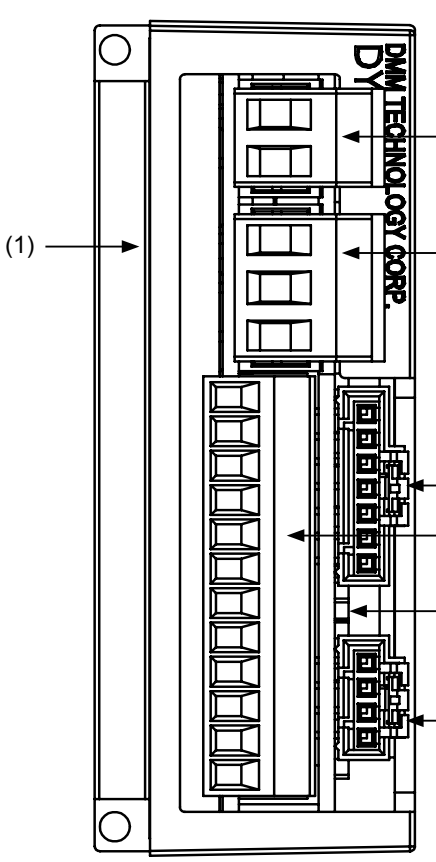


1.3 Encoder Specification

■ Model

Model Number	Type	Resolution	Data Type	Interface Type	Measurement	Voltage	Status
ABS-14-00	Absolute	14bit [16,384ppr]	4-Wire Serial	Differential Driver/ Receiver	Magnetic	+5VDC	A
ABS-16-00	Absolute	16bit [65,536ppr]	4-Wire Serial	Differential Driver/ Receiver	Magnetic	+5VDC	A

2.1 DYN2 Servo Drive Body Layout



■ JP1
Power Supply Input

■ JP5
Servo Motor Power

■ JP2
RS232 Port to PC

■ JP3
I/O Port

■ S1 Drive Status LED
[Green LED]

■ JP4
Encoder Feedback Port

(1) Drive Body Grounding Terminal
[M3 x 5mm Max.]
*Located on left side of body

■ Pin Layout

DO NOT reverse JP1 DC input polarity!

JP1	JP2	JP3	JP4	JP5
+	Gnd	12	Gnd	C
-	NC	11	S-	B
	NC	10	S+	A
	NC	9	+5V	
	RxD	8		
	TxD	7		
	+5V	6		
		5		
		4		
		3		
		2		
		1		

Top side of servo drive

Bottom side of servo drive

2.2 Connector and Signal Specification

▌JP1 - Power Supply Input

Connector Type: 5.00mm Pitch Terminal Block
Drive Header: Phoenix MSTBA 2,5/ 2-G
Plug Connector: Phoenix MSTB 2,5/ 2-ST
Recommended Wire Gauge: 0.8mm^2 (AWG18)

▌JP2 RS232 Port to PC

Connector Type: 2.54mm Pitch Rectangular
Drive Header: Molex 70553-0041
Plug Connector: Molex 50-57-9407
Recommended Wire Gauge: 0.3mm^2 (AWG22)
Signal Layout:

Pin 1: GND
Pin 2~4: NC
Pin 5: RS232 signal input, RxD, TTL/CMOS level.
Pin 6: RS232 signal output, TxD, TTL/CMOS level.
Pin 7: +5(V) output, <10(mA), generated in board.

In order to connect JP2 with PC's RS232 port, an intermediate cable with level shift buffer is necessary. Intermediate cable shipped with drive tuning cable [Model No. CA-MRS232-6].

▌JP3 I/O Port - Position Command Input

Connector Type: 3.5mm Pitch Terminal Block
Drive Header: Phoenix MC 1,5/12-G-3,5
Plug Connector: Phoenix MC 1,5/12-ST-3,5
Recommended Wire Gauge: 0.6mm^2 (20AWG)
Signal Layout:

Pin 1: GND (Bottom side of drive)
Pin 2: Analog Command Reference ±10VDC
Pin 3: DIR-, B-, CCW- Pulse Reference
Pin 4: DIR+, B+, CCW+ Pulse Reference
Pin 5: STEP-, A-, CW- Pulse Reference
Pin 6: STEP+, A+, CW+ Pulse Reference
Pin 7: Signal Common for Pin. 8, 9, 10, 11.
Pin 8: Alarm Output
Pin 9: OnPosition Output
Pin 10: Absolute Zero Position Index Output
Pin 11: Drive Disable Input
Pin 12: Drive Internal +5VDC Supply (Top side of drive nearest to JP5)

▌JP4 Encoder Feedback Port

Connector Type: 2.54mm Pitch Rectangular
Drive Header: Molex 70553-0038
Plug Connector: Molex 50-57-9404
Recommended Wire Gauge: 0.3mm^2 (AWG22)
Signal Layout:

Pin 1: +5VDC Supply
Pin 2: S+
Pin 3: S-
Pin 4: Gnd

▌JP5 Servo Motor Power

Connector Type: 5.00mm Pitch Terminal Block
Drive Header: Phoenix MSTBA 2,5/ 3-G
Plug Connector: Phoenix MSTB 2,5/ 3-ST
Recommended Wire Gauge: 0.8mm^2 (AWG18)
Signal Layout:

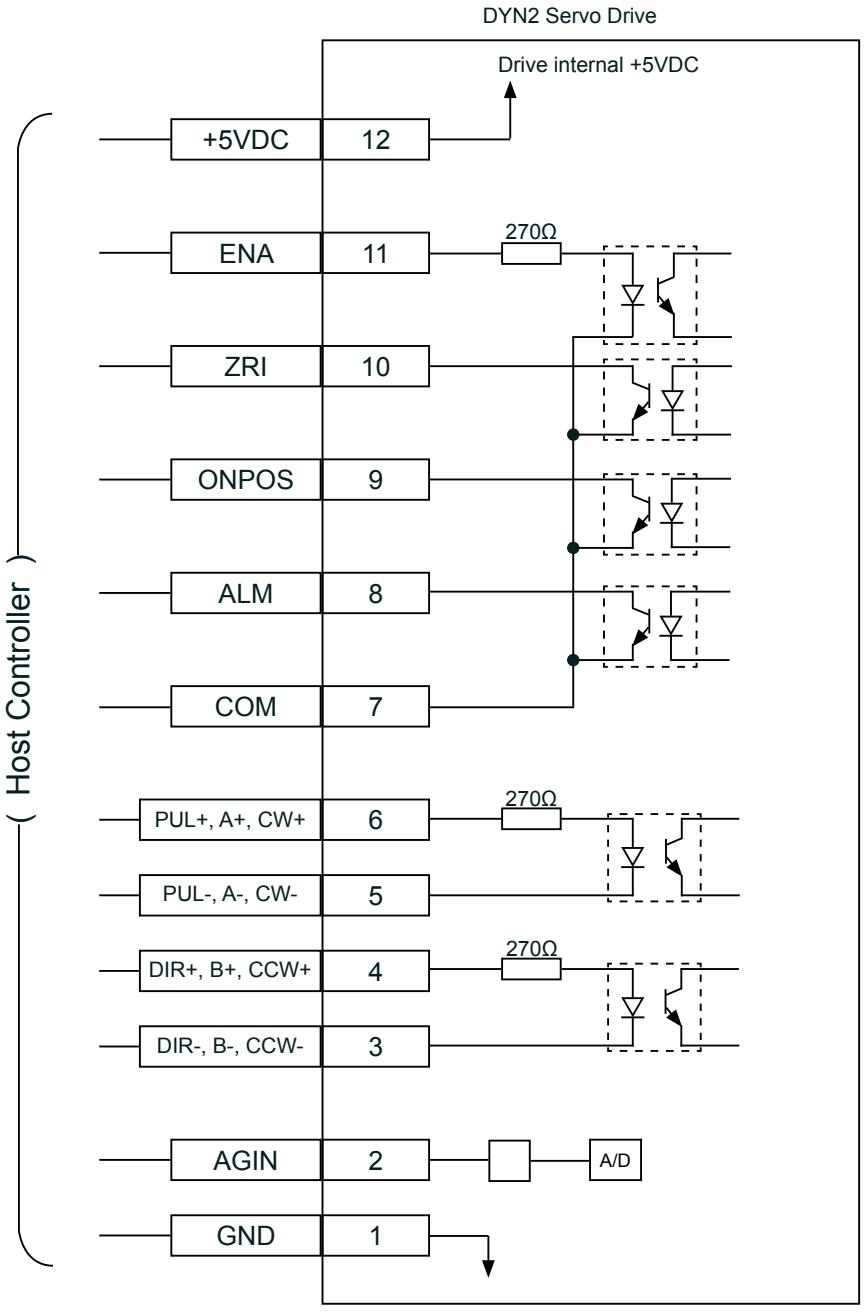
Pin 1: A Phase
Pin 2: B Phase
Pin 3: C Phase

Motor frame should be grounded through Drive Body Grounding Terminal [M3] located on heat sink side. Crimp an M3 terminal lug onto the servo motor frame wire (Yellow/Green) and attach the lug to the drive body grounding terminal. Do not use a screw longer than 5mm.

⚠ WARNING

● Note the directionality of the JP3 connector and pins before making connections. Pin1 is located nearest to the bottom of the servo drive. Pin12 is located nearest terminal JP5 (Servo Motor Power).

■ Terminal Layout



■ JP3 Signal Specification

Refer to Section 2.4 JP3 I/O Connection Circuit for example connection diagram. Standard I/O levels are +5VDC±%10. Contact DMM if the controller uses 12~24VDC level I/O.

Pin No.	Signal	Symbol	Type
12	Drive Internal +5VDC Supply	+5VDC	Output

Description	Connection Circuit
- Drive internal +5VDC output - Max Current Draw: 50mA - Relative ground side with JP3 Pin.1	N/A

Pin No.	Signal	Symbol	Type
11	Drive Disable Input	ENA	Input

Description	Connection Circuit
- Apply +5VDC between Pin.7 Common to Disable servo drive - Motor coasts when disabled (shaft free) - Disable clears all pulse/analog commands - Disable clears all position error - Max. Voltage: +5VDC±%10 - Max. Current: 20mA	[A] *See section 2.4

Pin No.	Signal	Symbol	Type
10	Absolute Zero Position Index Output	ZRI	Output

Description	Connection Circuit
- Transistor ON (Signal LOW) if servo on Zero Position. - Triggered at signal falling edge - Zero Position output fixed to one mechanical motor shaft position per revolution. Accuracy maintained by absolute encoder. - Used for precision zeroing, or indexing applications. - Max. Voltage: 30V - Max. Current: 30mA	[B] *See section 2.4

Refer to Section 2.4 JP3 I/O Connection Circuit for example connection diagram.

Pin No.	Signal	Symbol	Type
9	OnPosition Output	ONPOS	Output

Description	Connection Circuit
- Transistor ON (Signal LOW) if servo Off Position. - Transistor OFF (Signal HIGH) if servo On Position. - Servo On Position if motor position error within value set by *OnPosRange* parameter. - Max. Voltage: 30V - Max. Current: 30mA	[B] *See section 2.4

Pin No.	Signal	Symbol	Type
8	Servo Alarm	ALM	Output

Description	Connection Circuit
- Transistor ON (Signal LOW) if servo drive alarmed or faulted - Servo drive triggers protective alarm relative to Current, Voltage, Temperature, Over Power, Position Lost Follow - Max. Voltage: 30V - Max. Current: 30mA	[B] *See section 2.4

Pin No.	Signal	Symbol	Type
7	Common	COM	Output

Description	Connection Circuit
- JP3 I/O Pin. 8, 9, 10, 11 Control Signal Common.	[A] [B] *See section 2.4

Refer to Section 2.4 JP3 I/O Connection Circuit for example connection diagram.

Pin No.	Signal	Symbol	Type
6 5 4 3	STEP+, A+, CW+ Pulse Reference STEP-, A-. CW- Pulse Reference DIR+, B+. CCW+ Pulse Reference DIR-, B-. CCW- Pulse Reference	STEP+ STEP- DIR+ DIR-	Input

Description	Connection Circuit
- Position command reference pulse input - Compatible pulse form include: ♦ Pulse + Direction ♦ A/B phase quadrature with 90° phase differential ♦ CW + CCW - Max. input pulse frequency: 500kHz - Max. Voltage: +5VDC±%10 - Max. Current: 20mA - Line Drive / Open Collector circuit on Controller Side - Input pulse electronically scalable with *GEAR_NUM* parameter	[C] *See section 2.4

Pin No.	Signal	Symbol	Type
2 1	Analog Command Reference Ground	AGIN GND	Input N/A

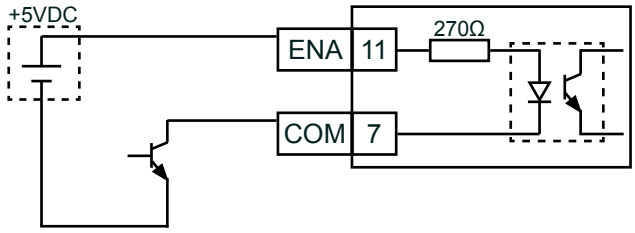
Description	Connection Circuit
- Analog command reference for Speed/Torque servo mode - Voltage reference ±10VDC - ±12VDC max input voltage - Max current: 0.6mA	[D] *See section 2.4

■ Type [A] Connection Circuit - General Input Circuit

Applicable Signals:

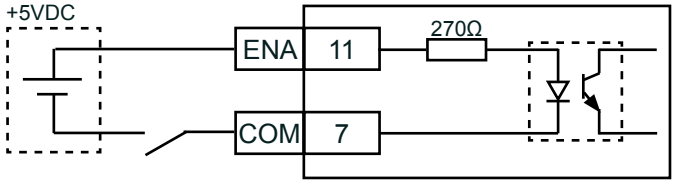
Pin No.	Signal	Symbol	Type
11	Drive Disable Input	ENA	Input

Open Collector



Notes:
- Sink circuit shown. Source circuit can also be used.

Relay/Switch

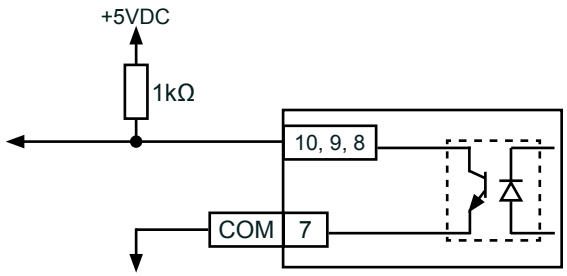
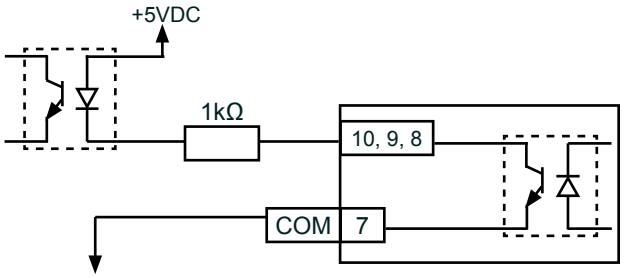
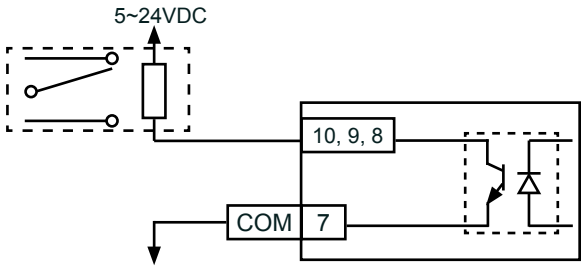


Notes:

■ Type [B] Connection Circuit - General Output Circuit

Applicable Signals:

Pin No.	Signal	Symbol	Type
10	Absolute Zero Position Index Output	ZRI	Output
9	OnPosition Output	ONPOS	Output
8	Servo Alarm	ALM	Output
7	Common	COM	N/A

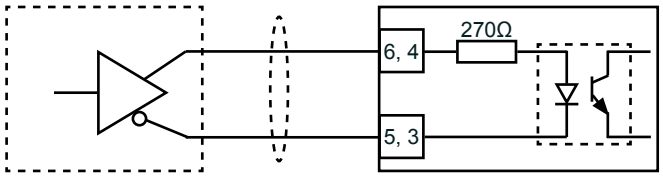
Collector Output 	Notes:
Photo Coupler 	Notes:
Relay 	Notes:

■ Type [C] Connection Circuit - Position Reference Pulse Input

Applicable Signals:

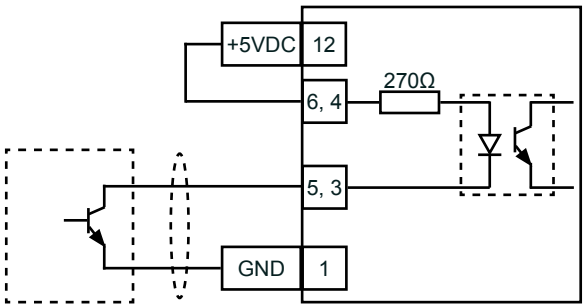
Pin No.	Signal	Symbol	Type
6 5 4 3	STEP+, A+, CW+ Pulse Reference STEP-, A-. CW- Pulse Reference DIR+, B+. CCW+ Pulse Reference DIR-, B-. CCW- Pulse Reference	STEP+ STEP- DIR+ DIR-	Input

Line Driver



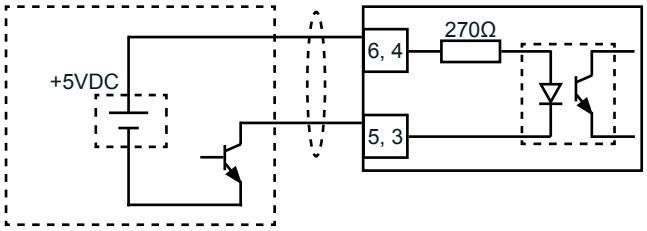
Notes:
- Twisted pair cable with shield grounded on receiver side.

Open Collector
(DYN2 Internal Power Supply)



Notes:
- Twisted pair cable with shield grounded on receiver side.

Open Collector
(External Power Supply)

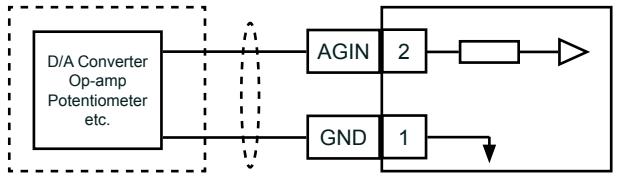


Notes:
- Power supply provided by host controller or external source.
- Twisted pair cable with shield grounded on receiver side.

■ Type [D] Connection Circuit - Analog Command Reference Input

Applicable Signals:

Pin No.	Signal	Symbol	Type
2 1	Analog Command Reference Ground	AGIN GND	Input N/A



Notes:
- Twisted pair cable with shield grounded on receiver side.

2.5 Main Power Supply Requirements

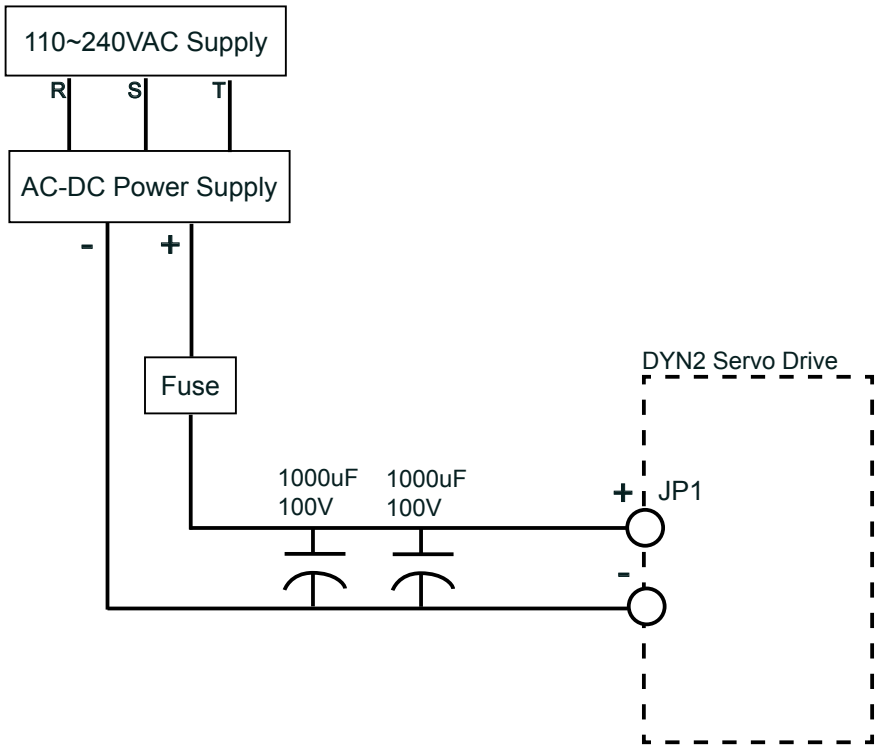
The DYN2 servo drive has a minimum operation input of +24VDC and max input of +75VDC. The servo drive's internal over-voltage alarm is triggered at +80VDC input and will shut down at this level. Consider the voltage/speed gradient of the servo motor when selecting power supplies.

A smoothing (reservoir) capacitor is recommended after the DC power supply. The recommended capacity is 100V 1,000uF. Connect a fuse before the servo drive according to the circuit size.

Servo Drive Model	Max. Motor Capacity	Recommended Fuse
DYN2-T1A6S-00	200W	20A
DYN2-TLA6S-00	750W	20A

⚠ WARNING

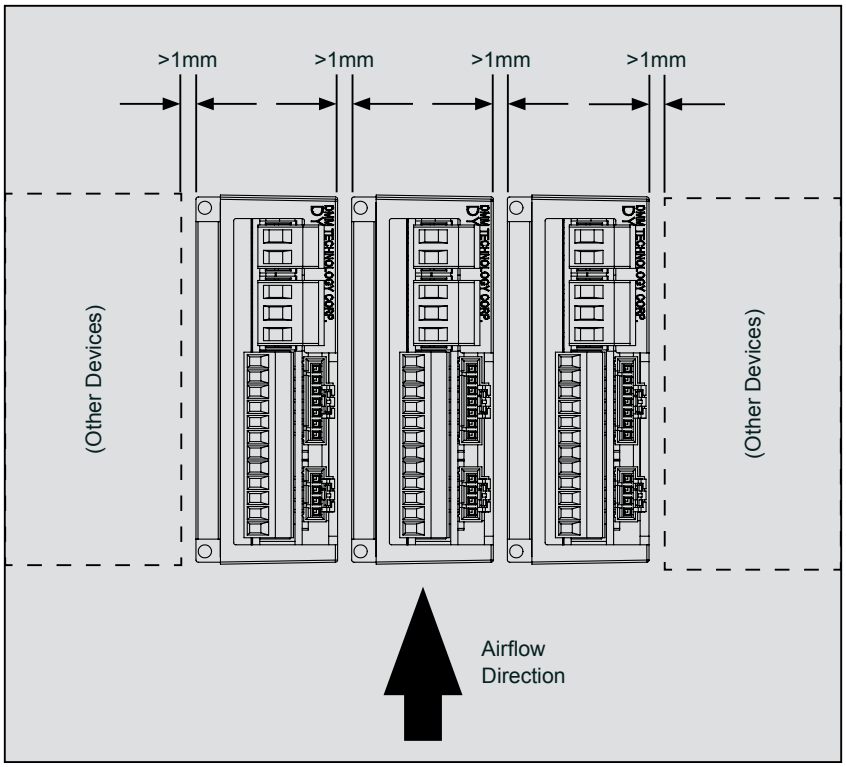
● DO NOT reverse the polarity of the DC input power. Reversing the polarity will permanently damage the servo drive and may cause electric shock. Ensure polarity is correct before powering ON the servo drive.



3.1 Mounting and Installation

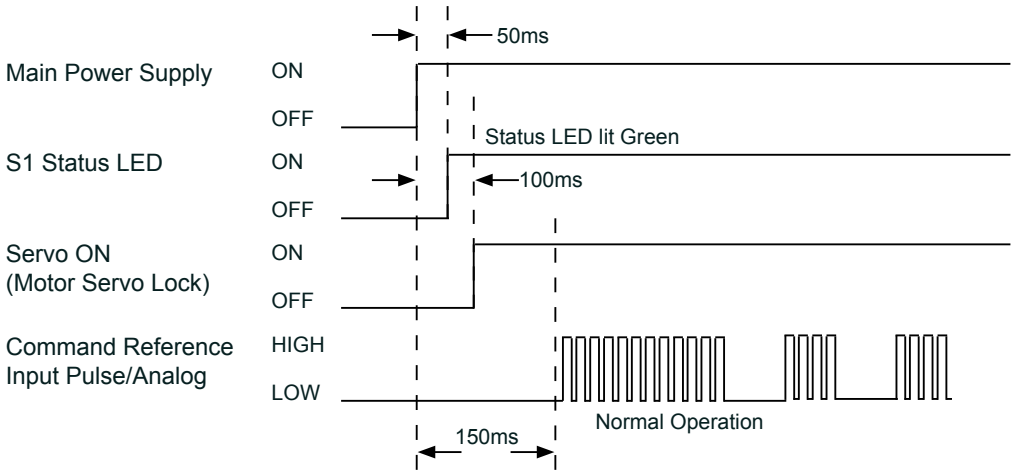
The DYN2 servo drive can be mounted vertically or horizontally (vehicle mount). The servo drives should be mounted by its rear chassis to an electrically conductive metal panel or plate. When mounting multiple servo drives, at least 1mm clearance should be left between each unit. The small size of the DYN2 servo drive is compatible with modular mounting. It can be placed adjacent to other devices with 1mm clearance. Also consider the size of the connectors and cables in front of the servo drive when mounting.

The control cabinet internal temperature should not exceed 40°C. If using a fan to cool the servo drives, the air flow should parallel the direction of the heat sink fin. The servo drive internally do not have a cooling fan.



■ Power ON Timing

After servo drive power ON, make sure there is at least 150ms time before sending pulse or analog command to servo drive.



♦ Main Power Supply Cycle

Do not cycle the main power supply quickly as internal power electronics may be permanently damaged. The main power should be turned on once during each operation cycle and should not be controllable by software.

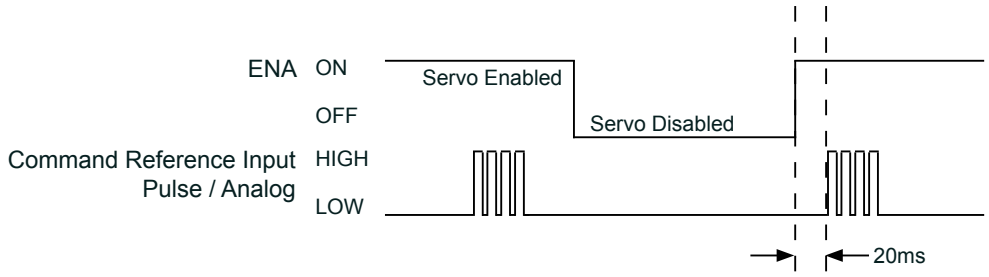
♦ Power Off Residual Voltage

After drive power off, the user should wait 60 seconds before touching the servo drive. A residual voltage may remain in the servo drive after immediate power off and 60 seconds is needed for full discharge. This time may be longer if a larger smoothing capacitor is connected to the input power line.

The residual voltage may cause the servo motor to rotate for a short period (<1 second) after immediate power off. Consider this effect for emergency situations and take safety precaution to prevent damage to personnel, equipment or machine.

■ Servo Disable / Enable Timing

When using the ENA signal to disable the servo drive to coast the servo motor, do not cycle this input rapidly ON/OFF. If the signal is cycled too fast, the servo drive will not have enough time to initialize the control program during Enable and can cause unwanted or dangerous results. Ensure that in the control program, the below timing is satisfied. Once Disabled, do not Enable the servo drive during motor coast or any time motor shaft is rotating, make sure motor shaft is completely stopped before Enable.



♦ PC Running Requirements

Win98/XP/2000/Vista/7
250Mhz CPU
64MB RAM
250MB Hard Disk Space

The servo drive should be powered up with the servo motor encoder feedback and motor power cables connected. The servo motor shaft will be servo-locked when powered ON. Connect the RS232 tuning cable from port JP2 to host PC.

♦ DMMDRV Start Up

1) Open the DMMDRV.exe executable
2) Select “COMSET“ --> “COM PORT“
3) Change the port number to the servo drive connected RS232 port, then select “OK”
4) Select “SERVO SETTING”
5) Select DYN2 -DRIVER
6) Press Read on the Setting driver parameters and mode dialogue box. After approximately 1~2 seconds, the on-screen parameters will change according to the current internal parameter settings of the connected servo drive. Ensure that the Driver Status indicates ServoOnPos to indicate that the drive has closed the position loop with the motor and is fully operational.

⚠ WARNING

● During Test movement procedures, the servo motor can rotate very quickly in either direction. Ensure that the servo motor is free to rotate and no objects are attached to or is near the motor shaft. Secure the motor by its flange.

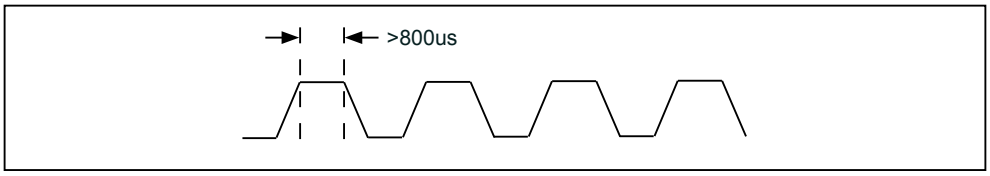
♦ Test Movements

1) Select “RS232” under the command input mode option, then click “SAVE ALL“ to save this setting.
2) Under the Test Motions menu, the user can select one of 4 test motions to JOG, STEP, SINE or TRIM the servo motor. Only one test motion profile can be run at a time, use the radio buttons below each section to select the movement profile.

4.1 Position Servo Mode

Pulse Specifications

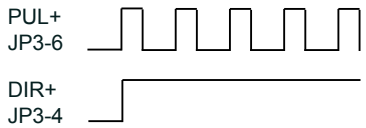
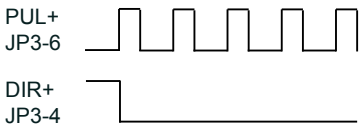
Voltage: +5VDC ± %10 (Contact DMM if higher level such as 12/24VDC is required)
Max pulse frequency: 500kHz
Minimum pulse width: 800us



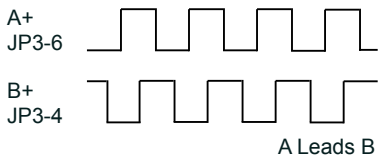
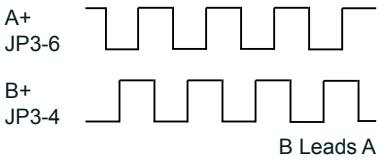
Reference Pulse Format

The DYN2 servo drive accepts FORWARD reference as CLOCKWISE motor shaft rotation as viewed from motor shaft side.

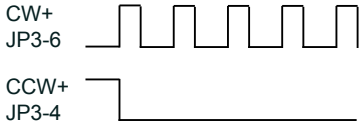
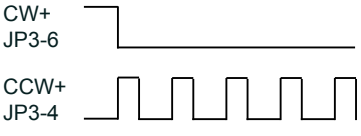
♦ Pulse + Direction

Forward Reference	Reverse Reference
	

♦ A/B phase quadrature with 90° phase differential

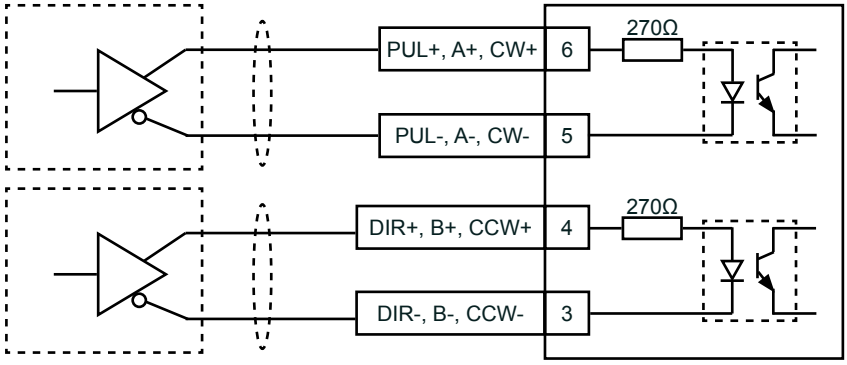
Forward Reference	Reverse Reference
	

♦ CW + CCW

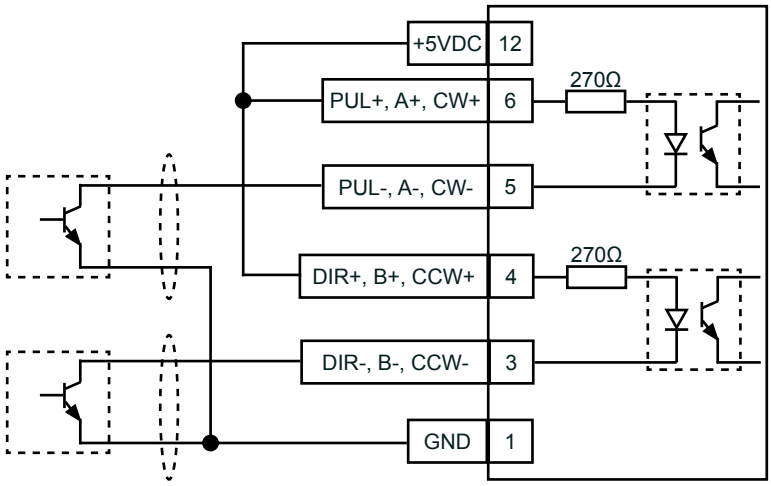
Forward Reference	Reverse Reference
	

Connection Example

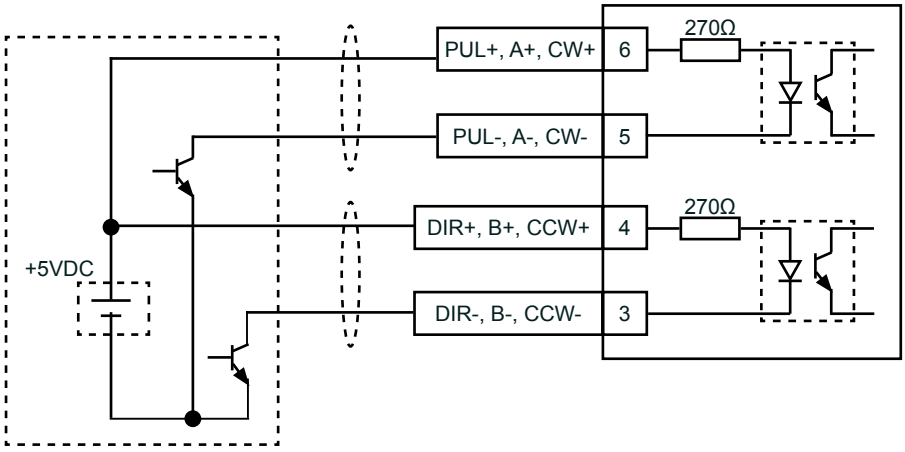
♦ Line Drive Output



♦ Open Collector Output - Internal Power Supply



♦ Open Collector Output - External Power Supply



Electronic Gearing (*GEAR_NUM* Parameter)

Gear number is set from 500 to 16,384, default value is 4,096. Gear number provides an electrical gear ratio: 4096 / Gear_Num, from 0.25 ~ 8.192. For example, if Gear number = 4,096, the 16,384 input counts from pulse will turn motor exactly one revolution. If Gear number = 500, 2,000 pulses will turn motor one revolution.

For analog input in position servo mode, the analog input is from 0~10VDC range, by using the Gear Number, 0~10VDC analog input can turn motor from 0~90*4,096/Gear number (degrees). The gear number has the same effect on the serial Point to Point movement or RS232 command input mode. Gear number parameter is only effective for position servo mode.

Servo In Position Output Specifications (*ONPOS)*

On position range is a value used for determining whether the motor have reached the commanded position or not. That on position range is selectable according to customer's requirement. Suppose the Pset is the commanded position, and Pmotor is the real motor position, if

|Pset - Pmotor|<=OnRange

it is said motor is ON the commanded position, otherwise not. That OnRange is set from 1~127. The real position on range is: OnRange * 360(deg)/16,384. Set mouse curser into the OnPosition edit box, input the desired on position value, then click the save button, On position value will be sent to the Drive with all other parameters. The ONPOS output (JP3-9) will be HIGH if motor in position and LOW if motor off position.

Servo Position Error Accumulation

The servo drive's internal position error decides the status of the On Position signal and the Lost Phase servo drive alarm.

The On Position signal is triggered (LOW) when the servo position error is within the OnPosRange set in the DMMDRV program. The Lost Phase alarm is triggered when the servo motor is physically 90° or more out of position for ~2 seconds.

The servo position error is cleared when the drive is disabled using the ENA input and does not accumulate when the drive is disabled.

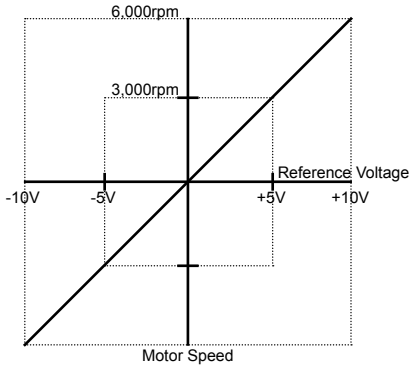
4.2 Speed Servo Mode

In speed servo mode, the DYN2 servo drive takes command from an external ±10VDC analog reference voltage from the host controller to drive a linear proportional motor speed.

In speed servo mode, the torque output depends on the load on the servo motor and determined by the motor feedback. Design the system so it can withstand the peak torque of the motor in use.

Control Reference

The DYN2 servo drive accepts FORWARD reference as CLOCKWISE motor shaft rotation as viewed from motor shaft side. Positive reference voltage rotates the servo motor in the FORWARD (CLOCKWISE) direction and negative reference voltage rotates the servo motor in the REVERSE (COUNTER CLOCK-WISE) direction.



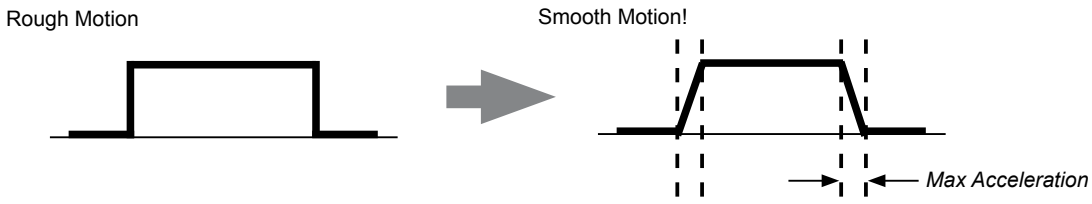
Reference Voltage	Motor Speed	Reference Direction	Motor Direction
+10V	6,000rpm	FWD	CW
+5V	3,000rpm	FWD	CW
-3V	1,800rpm	REV	CCW

Acceleration / Deceleration Soft Start

In Speed Servo Mode, the *Max Acceleration* parameter in the servo drive can be used to soft start/stop the servo motor. Since the speed command is sent as a rough step reference, it is often desirable to smooth out the servo motor's movement dynamics. Without soft start, the servo motor can accelerate/decelerate too instantaneously. Soft start creates a smooth s-curve motion.

The relation to physical acceleration / deceleration time is measured as the rise time from 10% of the target speed to 90% of the target speed.

Rise from 10% to 90% time = 59.98/(*Max Acceleration*)^2 seconds
Physical acceleration time = 1.2 * 59.98/(*Max Acceleration*)^2 seconds



Torque Filter Constant

TrqCons is a first order low-pass filter used to smooth torque delivery in speed servo mode which improves stability and accuracy of servo motor speed. The bigger value means wider frequency range of that filter. That filter can be expressed as:

a / (S + a), here a = 26*TrqCons ; if TrqCons = 100, then a = 2600.

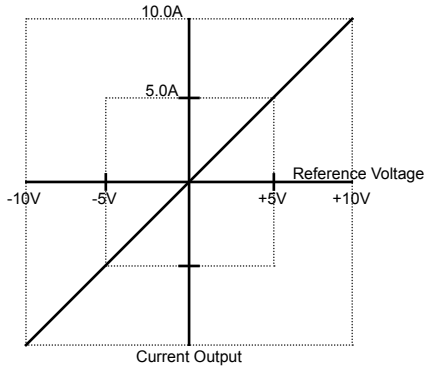
The filter is used to make the torque sent to the servo torque loop more smooth especially for the heavier load when bigger SpeedGain setting is used. If a very quick response servo with small load is desirable, the bigger value or even the value 127 should be used to ensure stability and fast dynamic follow.

The Torque Filter Constant parameter should only be used in speed servo mode. Leave this parameter at "127" in position servo mode.

In torque servo mode, the DYN2 servo drive takes command from an external ±10VDC analog reference voltage from the host controller to drive a linear proportional output current.

Control Reference - [1] Capacity Model: DYN2-T**1**

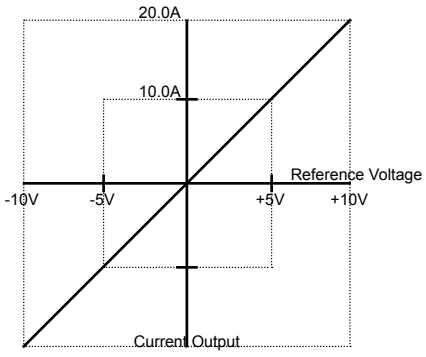
The DYN2 servo drive accepts FORWARD reference as CLOCKWISE motor shaft rotation as viewed from motor shaft side. Positive reference voltage rotates the servo motor in the FORWARD (CLOCKWISE) direction and negative reference voltage rotates the servo motor in the REVERSE (COUNTER CLOCK-WISE) direction.



Reference Voltage	Output Current	Reference Direction	Motor Direction
+10V	10.0A	FWD	CW
+5V	5.0A	FWD	CW
-3V	3.0A	REV	CCW

Control Reference - [L] Capacity Model: DYN2-T**L**

The DYN2 servo drive accepts FORWARD reference as CLOCKWISE motor shaft rotation as viewed from motor shaft side. Positive reference voltage rotates the servo motor in the FORWARD (CLOCKWISE) direction and negative reference voltage rotates the servo motor in the REVERSE (COUNTER CLOCK-WISE) direction.



Reference Voltage	Output Current	Reference Direction	Motor Direction
+10V	20.0A	FWD	CW
+5V	10.0A	FWD	CW
-3V	6.0A	REV	CCW

4.4 RS232 Command Input Mode

The RS232 port is always active after power on for DYN-series servo drive, that active RS232 port could be used for reading and setting Drive parameters and status, also could be used for sending point to point position command if the RS232 mode is selected for position command input.

If the position command input mode is selected as Pulse mode or Analog mode, the RS232 port is still active as mentioned above but it only can be used for reading and setting Drive parameters. The RS232 port could be easily accessed by using the GUI interface DMMDRV.exe after the connection between PC and the Drive's RS232 port. This is the easiest way to tune up the servo and make some test movements. The RS232 port could be accessed by other microcontroller, or DSP if sending and reading data by using DYN Drive's RS232 protocol.

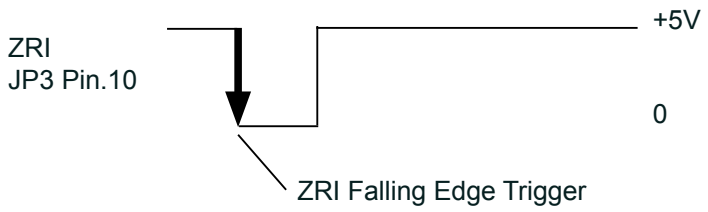
The PC or DSP is working as Master and the servo drive is always as slave. Several servo drives could be linked for a serial network integrated multi-axis control.

See (Appendix A) for DYN2 servo drive RS232 protocol definitions.

4.5 Absolute Zero Position Index Output (ZRI)

The ZRI signal is output once per motor revolution to facilitate servo homing and indexing functions. ZRI pulse can also be used to count motor revolutions or monitor servo motor speed. Accuracy of each pulse is maintained by 14/16-bit absolute encoder. The mechanical output position of ZRI may vary between each servo motor. It can also be used to compensate for mechanical or ball screw backlash. A calibration procedure is necessary to set the absolute ZRI position in the controller.

The user should calibrate the position of the ZRI output with respect to the target mechanical position. The falling edge of the ZRI output (JP3 Pin.10) should be used as the trigger. Pulse width and rising edge of ZRI should not be used as trigger.



5 PARAMETERS AND TUNING

5.1 Parameters Outline

The following parameters are adjustable by connection through RS232 or USB interface from the servo drive to the PC. No matter the command mode, the JP2 RS232 port is always active for parameter setting and drive configuration.

The Drive configuration and servo cons are stored in the EEPROM of servo drive when the save button is pushed or parameters setting is issued through the serial communication.

The guaranteed write cycle for the EEPROM is 1 million times. Do not use serial communication to constantly change the drive parameters as this will decrease servo drive life span. Major parameter change and setting should only be done during initial testing and tuning. Actual drive operation should not require constant parameter changes unless changing servo control modes on the fly through RS232.

Parameter Name	Setting Range	Details	Applicable Servo Mode
Main Gain	[1 : 127]	The main gain for the servo loop, usually to be increased as the motor load increases. The bigger value of MainGain means wider frequency range of servo loop relatively.	Position Speed Torque RS232
Speed Gain	[1 : 127]	The speed gain for the servo loop, usually to be increased as the motor load increases. The bigger value of speed Gain means narrower frequency range of servo loop relatively. Physically, heavier loads or higher inertia loads should have lower dynamic ability, so the servo loop frequency range should be more narrow by using bigger value of Speed Gain. If the Speed Gain is too high, there will be some loud noise because the torque command will be too coarse, not smooth, the smaller Torque Constant (see TrqCons) could be used to attenuate this noise.	Position Speed Torque RS232
Integration Gain	[1 : 127]	There is an integrator in the servo loop to ensure the error between position command and real position be zero during the steady state. Also that integrator will let servo have more ability to attenuate the outside disturbance torque. The bigger value of IntGain, the more ability of the servo to attenuate the outside disturbance torque. Integration Gain should be decreased for heavier loads or higher inertia loads.	Position Speed Torque RS232
Torque Constant	[1 : 127]	TrqCons is a first order filter constant, the bigger value means wider frequency range of that filter. That filter can be expressed as : a / (S + a), here a = 26*TrqCons, if TrqCons = 100, then a = 2600. That filter is used to make the torque sent to torque loop more smooth, especially for heavier loads when bigger SpeedGain is used. If a very quick response servo with small load is desirable, a bigger value or even the value 127 should be used to ensure the stability and dynamic performance.	Speed Torque RS232

Parameter Name	Setting Range	Details	Applicable Servo Mode
Max Acceleration	[1 : 127]	Determine the S-curve acceleration when using RS232 mode to make point to point motion linear/circular. Also controls the response time of the first order low pass filter in speed and torque servo control (soft start).	RS232 Speed Torque
Max Speed	[1 : 127]	Determine the S-curve max speed when using RS232 mode to make point to point motion linear/circular.	RS232
Driver ID	[1 : 126]	Every drive has a unique ID number, which can be assigned or read out by using ServoSetting dialog box. Applicable when RS485net box not checked and there is only one Drive connected through the RS232 port. The default ID number for every Drive is 0. That ID number can be used for the network connection of RS485 or for drive unit identification purposes. When RS485net box is checked and there are more than one Drive connected to the RS485/232 network, only the setting for the Drive with the indicated ID number in the ServoSetting dialog box can be read out or saved.	Position Speed Torque RS232/485
On Position Range	[1 : 127]	On position range is a value used for determining whether the motor have reached the command position or not. That on position range is selectable according to user's requirement. Suppose the Pset is the commanded position, and Pmotor is the real motor position, if |Pset - Pmotor|<=OnRange it is said motor is on the commanded position, otherwise not.	Position Speed Torque RS232
Gear Num	[500 : 16,384]	The amount of motor travel with reference to the number of input pulses is set using the parameter Gear_Num. The number of reference pulse needed for one complete motor revolution is calculated as, One motor revolution = 4xGEAR_NUM For example, if Gear_Num is set to 4096, then 16,384 pulses are needed from the host controller for the motor to make one complete revolution.	Position RS232

5.2 Servo Drive Gain Tuning

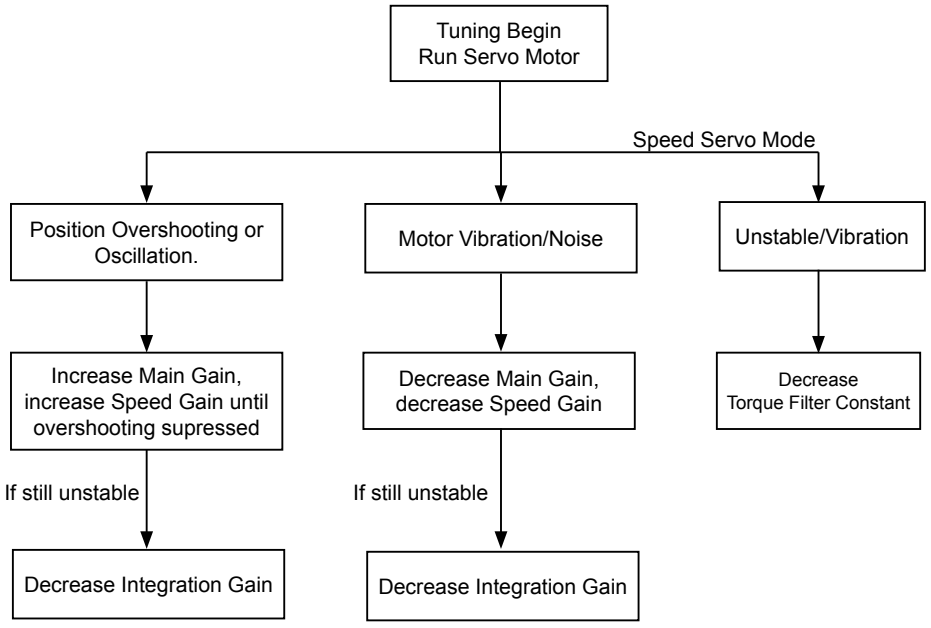
The DYN2 servo drive features simple 3 parameter Gain tuning to achieve optimized smooth performance. The user should adjust the servo gain parameters Main Gain, Speed Gain and Integration Gain until they achieve target response qualities. These parameters are all adjustable using the DMMDRV program.

The overall method of Gain tuning follows as load mass or load inertia increase, the Main Gain and Speed Gain parameters should be increased. If these are set too high, the servo may be over-tuned and start vibrating or become noisy. The parameters should be increased/decreased until the motor smoothly follows command without vibration, noise or oscillations. The user can then fine tune the parameters to make the motor “harder“ (faster response, more rigid motion) or “softer“ (slower response, smoother motion).

The servo motor should be coupled to the final machine before tuning. Make sure during tuning, the motor is running the load and speed of the final machine or design. The user should use a trial and error method to achieve the desired servo response.

In Speed servo mode, the Torque Filter Constant parameter can be adjusted to further smooth the torque delivery and improve motor speed accuracy.

♦ Gain Tuning Procedure Flow



Sample Load Type Tunings

♦ Ball Screw

Ball screw systems are mechanically very rigid and stiff. If high resolution pitch (e.g. 5mm or 10mm) the default setting could even be used. The servo drive can be easily tuned using Main Gain, Speed Gain, and Integration Gain. Increase Main Gain, Speed Gain and Integration Gain relative to load mass until target response achieved. Decrease Integration Gain if load inertia is big and system oscillates.

♦ Direct Mechanical Drive (Rigid systems, Robots)

Depending on load mass and inertia, increase Main Gain, Speed Gain and Integration Gain until target response achieved. Decrease Integration Gain if load inertia is big and system oscillates. In speed/torque servo mode, if relative load inertia is very high, the high Speed Gain might increase motor noise, then decrease the Torque Filter Constant to attenuate torque loop noise.

♦ Belt Drive / Pulley

Belt drive or pulley systems are low mechanical rigidity with slower response. Main Gain and Speed Gain should be increased with higher load mass and relative load inertia. Integration Gain should be decreased to give the position loop more time ro react to the low rigidity system.

6 MAINTENANCE

6.1 Alarm Specifications

The DYN2 servo drive is protected by 5 alarms. The S1 status indicator LED will flash to indicate when an alarm is triggered. The specific alarm status can be read using the DMMDRV program.

♦ Internal Driver Status Readout

(1) Connect the PC to the servo drive JP2 port using RS232 cable
(2) Press Read on the Setting driver parameters and mode main screen.
(3) The Driver Status box will display the current status of the Servo Drive.

Alarm	Cause	Recommended Correction
Over Voltage	The internal DC bus voltage has exceeded the allowed maximum levels. The input DC voltage is too high.	- Check and confirm the connections to the servo motor. - Check that the servo motor is driving a mass appropriate to its size. - Check for any mechanical irregularities that might be preventing the motors to move freely. - Add an external regenerative resistor
Over Temperature	The servo drive's protective thermal resistor has detected an unusually high temperature inside the drive. The control power transistor temperature is too high.	- Check that the drive's ventilation openings and heat sink are not being blocked. - Consult the servo drive's ambient temperature specifications and check if the operation conditions are met.
Lost Phase	The encoder has detected an irresolvable position error in the motor relative to the command signal.	- Check that the encoder feedback cable is securely plugged from the servo motor to the JP3 port of the servo drive. - Check for any mechanical irregularities that might be preventing the motors to move freely.
Over Power	The servo drive has experienced an output power exceeding the rated value relative to the average value.	- Check and confirm the connections to the servo motor. - Check that the servo motor is driving a mass appropriate to its size. - Check for any mechanical irregularities that might be preventing the motors to move freely.
Over Current	The servo motor cannot move to its command position and there is a backlog of current in the servo drive to try to move the servo motor.	- Check that the encoder feedback cable is securely plugged from the servo motor to the JP3 port of the servo drive. - Check for any mechanical irregularities that might be preventing the motors to move freely.

♦ Alarm Motor Stop

The power to the servo motor will be stopped when an alarm is triggered. Internal servo control turns off and servo motor shaft becomes free. Power still remains in the logic circuit for drive diagnostic and drive status reading. All commands including pulse, analog and RS232 will be ignored and will not accumulate the internal position error.

♦ Alarm Reset

Once servo drive triggers an alarm, the user should use the DMMDRV program to read out the alarm condition then inspect the machine, load or operation for cause to the alarm. The problem should be fixed before re-setting the servo drive and running again. The servo drive main power should be cycled to fully re-set and clear the servo alarm status.

⚠ WARNING

● If the servo motor is coupled to a vertical axis that can drop due to gravity when the shaft becomes free, take measure to prevent injury or damage when the drive alarm is triggered. A motor with brake option may be necessary to stop vertical axis, or any axis acted on by an external force, from dropping or crashing.

6.2 - Drive Maintenance

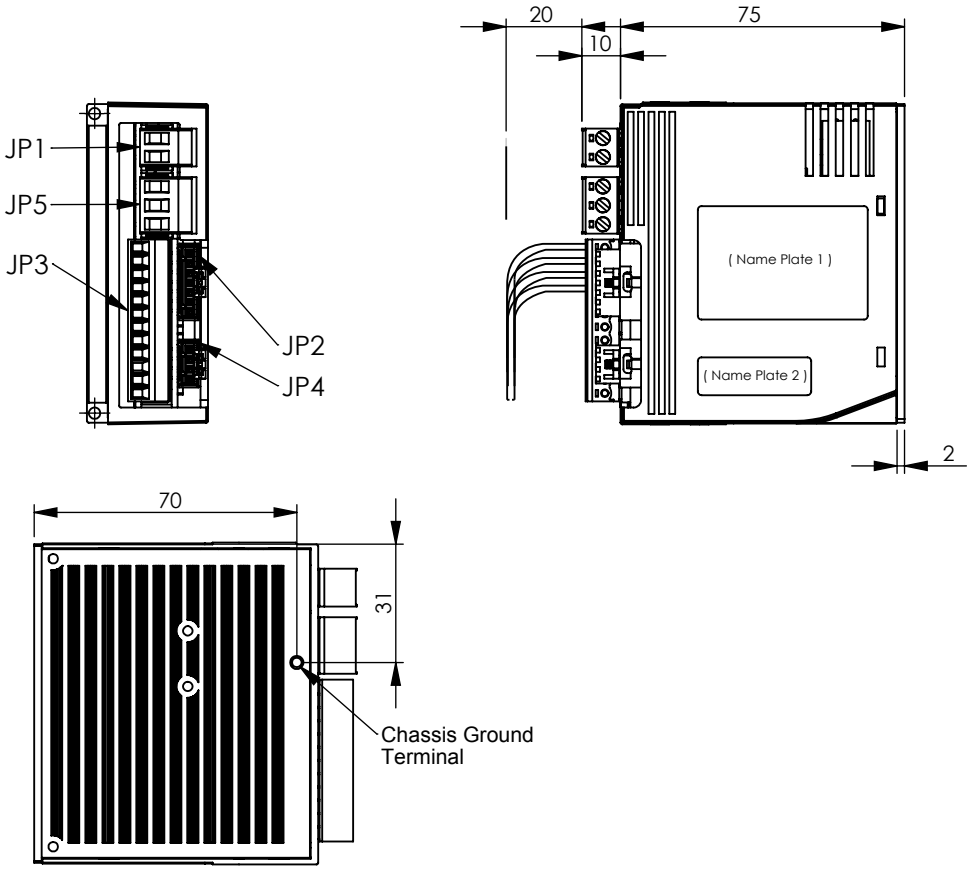
Do not perform maintenance on the servo drive unless instructed to do so by DMM. The servo drive cover or chassis should never be removed as high voltage components can cause electric short, shock or other damage upon contact. Disassembly, repairs or any other physical modification to the servo drive is not permitted unless approved by DMM.

♦ Regular Inspection

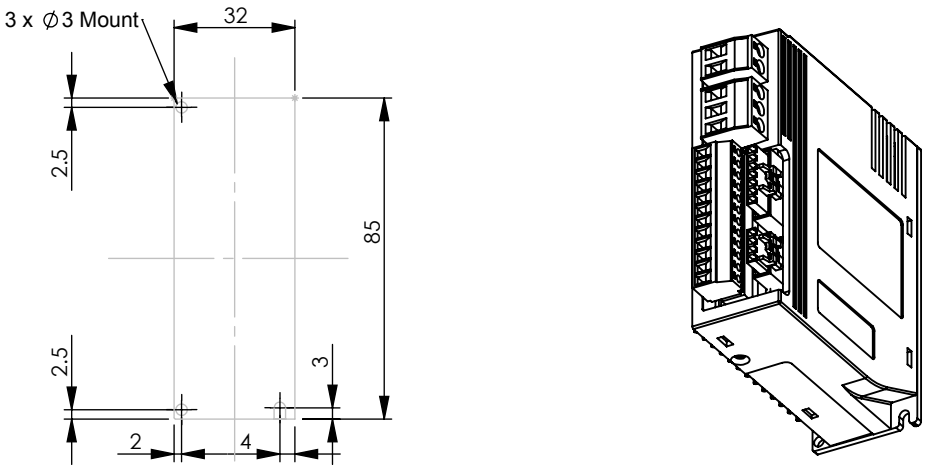
Inspect the servo drive regularly for:

- Dirt, dust or oil on the servo drive - make sure the servo drive cooling duct and heat sink are free from debris
- Environment - ambient temperature, humidity and vibration according to servo drive specification
- Loose screws
- Physical damage to servo drive or internal components

♦ Exterior Dimensions



♦ Mounting Footprint

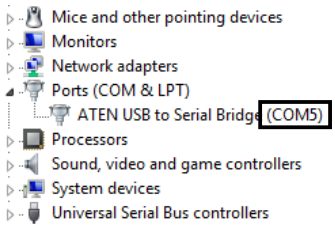


APPENDIX B - RS232 Protocol Definition

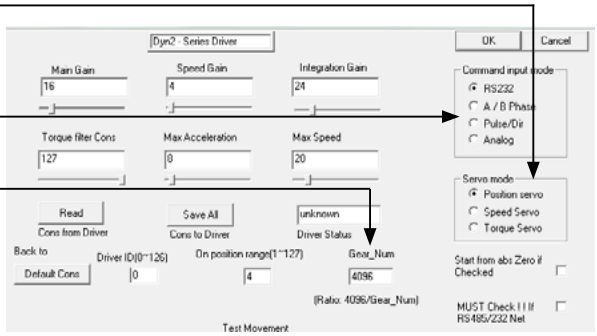
*NOT INCLUDED IN MANUAL REVISION. A1

Position Servo Mode - Ball Screw

1. Connect encoder feedback and motor power cable from servo drive to servo motor.
2. Connect RS232 tuning cable from servo drive JP2 to controller PC.
3. Power ON servo drive.
4. Open Windows Device Manager - Locate COM Port Number of RS232 tuning cable.



5. Open DMMDRV program.
6. Select COMSET --> COM PORT. Press “Change Port“ until RS232 tuning cable COM port number selected. Press “ok“.
7. Select ServoSetting --> DYN2-DRIVER. *Setting drive parameters and mode* main screen will open.
8. Press “Read” to read out the factory default or current setting of the servo drive. At any time, pressing “Save All“ will save the parameters into the servo drive.
9. Under Servo Mode, select “Position Servo”.
10. Under command input mode, select “Pulse/Dir”, “A/B Phase”, or “CW/CCW”.
11. Set GEAR_NUM parameter according to ball screw pitch and target travel speed.



Example:

Ball screw pitch = 10mm
Reduction = 2:1
Target Speed = 15m/min
Rated Motor Speed = 3,000rpm = 50rev/s
Controller Pulse Output Frequency = 100kHz = 100,000pulse/s

3,000rpm / 2 = 1,500rpm after reduction
1,500rpm * 10mm = 15,000mm/min = 15m/min

100,000pulse/s / 50rev/s = 2,000pulse/rev
2,000pulse/rev / 4 = 500
GEAR_NUM = 500

12. Tune Gain and OnPosition Range according to machine and operation requirements.
13. Click “Save All“ when finished adjustments.
14. The servo drive is ready to accept position pulse commands.

Warranty

Products from DMM Technology Corp. are supported by the following warranty.

- 1-year from the date of product received by customer or 14 months from the month of original invoice.

Within the warranty period, DMM Technology Corp. will replace or repair any defective product free of charge given that DMM Technology Corp. is responsible for the cause of the defect. This warranty does not cover cases involving the following conditions:

- The product is used in an unsuitable or hazardous environment not outlined in this manual, resulting in damages to the product.
- The product is improperly handled resulting in physical damage to the product. Including falling, heavy impact, vibration or shock.
- Damages resulting from transportation or shipping after the original factory delivery.
- Unauthorized alterations or modifications have been made to the product.
- Alterations have been made to the Name Plate of the product
- Damages resulting in usage of the product not specified by this manual.
- Damages to the product resulting from natural disasters.
- The product has cosmetic alterations.
- The product does not conform to the original factory manufactured standards due to unauthorized modifications.

Liability

Use, operation, handling and storage of the DYN2 AC Servo Drive is solely responsible by the customer. Any direct or indirect commercial loss, commercial profit, physical damage or mechanical damage caused by the DYN2 AC Servo Drive is not responsible by DMM Technology Corp. The features and functionality of the product should be used with full discretion by the customer.

Above terms are current as of August 2014

Disclaimer

DMM Technology Corp. constantly strive to improve it's products performance and reliability. The contents of this manual outlines the latest features and specifications of the DYN2 AC Servo Drive and may be changed at any time to reflect corrections, improvements or changes to the product or information in this manual.

Manual Revision History

Version	Manual Number	Details	Date
A1	DYN2MS-01E-0814A1	Release Version	August 2014

DYN2 Servo Drive Revision History

♦ Hardware Version

Version	Details	Date
AH10	Release Version	June 2014

♦ Software Version

Version	Details	Date
AH10	Release Version	June 2014

DYN2 Series

AC Servo Drive

Type - A General-Purpose Pulse/Analog
Specification Manual

Manual Number : DYN2MS-01E-0814A1 Electronic Version
Revision : A1

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