MMP 30A 25-60V

4Q PWM Microprocessor-based Chassis Adjustable Speed or Torque Drive for Low Voltage PMDC Brush Motors

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Specifications

Model	Source Voltage (VDC)	Armature Voltage Range (VDC)	Continuous Armature Current (Amps)	Motor Continuous HP Range
MMP 30A 25-60V	36 48	Up to 95% of Source Voltage	40	1/12 - 1 1/2 1/6 - 2

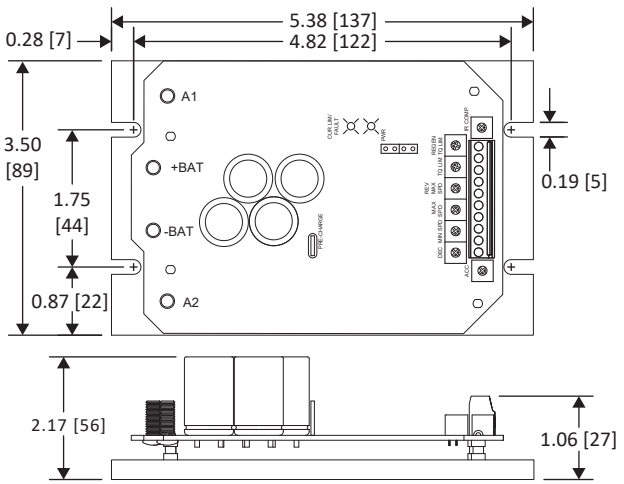
Source Voltage MMP 30A 25-60V ..... 20 - 51.5 VDC
Brake Output ..... 100% source VDC, 3 amps maxiumum
Acceleration Time Range ..... 0.5 - 15 seconds
Deceleration Time Range ..... 0.5 - 15 seconds
Analog Input Voltage Range ..... 0 - 5 VDC
Input Impedance (S1 to S2) ..... >100K ohms
Form Factor 1.01
Load Regulation ..... 1% base speed
Speed Range 80:1
Vibration *(0 - 50 Hz)* ..... 0.5G maximum
(>50 Hz) ..... 0.1G maximum
Surrounding Air Temperature Range ..... 32°F - 122°F / 0°C - 50°C
Pollution Degree 2
Altitude ..... 6561 ft / 2000 m
Weight ..... 0.74 lbs / 0.34 kg
Tightening Torque on Logic Terminals ..... 2.2 in-lbs / 0.25 Nm
on Power Terminals ..... 24 in-lbs / 2.7 Nm
Safety Certifications ..... UL Recognized, US/cUL 61800-5-1, File # E132235

Safety Warnings

READ ALL SAFETY WARNINGS BEFORE INSTALLING THIS EQUIPMENT

- **DO NOT INSTALL, REMOVE, OR REWIRE THIS EQUIPMENT WITH POWER APPLIED.** Have a qualified electrical technician install, adjust and service this equipment. Follow the National Electrical Code and all other applicable electrical and safety codes, including the provisions of the Occupational Safety and Health Act (OSHA), when installing equipment.
- Avoid direct contact with the printed circuit board and circuit elements to prevent the risk of serious injury or fatality. Use a non-metallic screwdriver for adjusting the calibration trim pots and personal protection equipment and insulated tools if working on this drive with power applied.
- The drive is not diode-protected from reverse battery voltage. You must ensure that the positive terminal is wired to +BAT and the negative terminal is wired to -BAT.
- Reduce the chance of an electrical fire, shock, or explosion by using proper grounding techniques, over-current protection, thermal protection, and enclosure. Follow sound maintenance procedures.
- **Removing DC power is the only acceptable method for emergency stopping.** Do not use regenerative braking, decelerating to minimum speed, or coasting to a stop for emergency stopping. They may not stop a drive that is malfunctioning. Removing DC power is the only acceptable method for emergency stopping.
- Applying and removing DC source voltage is recommended for infrequent starting and stopping of a drive only. Regenerative braking, decelerating to minimum speed, or coasting to a stop is recommended for frequent starts and stops. Frequent starting and stopping can produce high torque. This may cause damage to motors.
- **Do not disconnect any of the motor leads from the drive** unless power is removed or the drive is disabled. Opening any one lead while the drive is running may destroy the drive.
- Under no circumstances should power and logic level wires be bundled together.
- Be sure potentiometer tabs do not make contact with the potentiometer's body. Grounding the input may cause damage to the drive.
- SCCR: Drives are limited to a power source with a maximum of 100A short circuit current available.
- Motor over-temperature protection is not provided.
- Integral solid-state short circuit protection does not provide branch circuit protection. Branch circuit protection must be provided in accordance with the NEC and any additional local codes.
- These drives do not have solid state motor overload protection.
- These drives do not have current limiting protection.

Dimensions



ALL DIMENSIONS IN INCHES [MILLIMETERS]

Connections

Input Power
Connect the DC input power leads to terminals +BAT (positive) and -BAT (negative).
Connecting the DC input power backwards will cause damage to the drive.

Pre-Charge
Connect a contactor between the positive battery terminal and +BAT on the drive. Connect the pre-charge switch between the positive battery terminal and the PRE-CHARGE tab. To pre-charge the drive the contactor is opened and the pre-charge switch is closed. Closing this switch allows the power circuitry to charge without the entre drive turning on (i.e. logic is off). This prevents large in-rushes of current and sparking on the main power contacts. To run the drive open the pre-charge switch and then close the contactor.

Motor
Connect the DC armature leads to terminals A1 and A2. If the motor does not spin in the desired direction, power down the drive and reverse these connections.

Do not exceed 30 in-lbs (2.7 Nm) of tightening torque on power terminals A1, A2, +BAT, -BAT.
Do not exceed 2.2 in-lbs (0.25 Nm) of tightening torque on logic terminals.

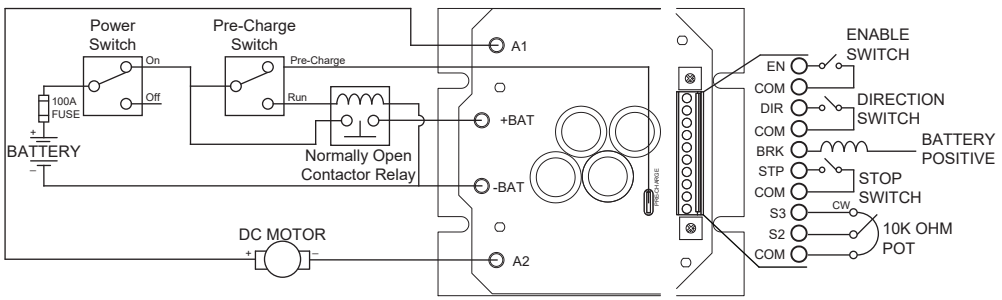
Speed Potentiometer / Analog Signal
Use a 10K ohm, 1/4 W potentiometer for speed control. Connect the counter-clockwise end of the potentiometer to COM, the wiper to S2, and the clockwise end to S3. If the potentiometer works inversely of desired functionality, (i.e. to increase motor speed, you must turn the potentiometer counterclockwise), power off the drive and swap the COM and S3 connections. To use an analog signal, connect the common (-) end of the signal to terminal COM and the reference (+) end of the signal to terminal S2.

Enable Switch
Connect an enable switch to the COM and EN terminals. Close the switch to run and open the switch to coast the motor to a stop. The enable comes into effect regardless of direction. If no switch is desired, jumper the COM and EN terminals. **Do not use the Enable function for emergency stopping.**

Regenerative Brake / Stop Switch
Short the COM and STP terminals to regeneratively brake the motor to zero speed. The stop circuit bypasses the DEC trim pot. Open the COM and STP terminals to accelerate the motor to set speed.
Do not use the Stop function for emergency stopping.

Direction Switch
Connect a direction switch to the COM and DIR terminals. Close the switch to change direction.

Electro-mechanical Brake
The BRK terminal acts as a power switch for an electro-mechanical brake (rated for 3 amps max). Upon power up, the BRK output is off meaning the electro-mechanical brake is engaged. Whenever the drive is given a run command (EN is closed, STP is open, and there is a voltage on S2), the drive will connect terminal BRK to battery negative. This powers/releases the electro-mechanical brake allowing the motor to spin. There is a 0.1 second delay between when a run command is given and when the drive motor output reacts to allow for the brake to release. The brake will stay released / BRK terminal connected to battery negative as long as there is a run command or as long as the drive detects motor movement by measuring the motor voltage and current during a regenerative deceleration or coasting from a disable.



Installation

Mounting

- Drive components are sensitive to electrostatic discharge. Avoid direct contact with the circuit board. Hold the drive by the chassis only.
- Protect the drive from dirt, moisture, and accidental contact.
- Provide sufficient room for access to the terminal block and calibration trim pots.
- Mount the drive away from heat sources. Operate the drive within the specified ambient operating temperature range.
- Prevent loose connections by avoiding excessive vibration of the drive.
- Mount the drive with its board in either a horizontal or vertical plane. Four 0.19" (5 mm) wide slots in the chassis accept #8 pan head screws.
- The chassis should be earth grounded.

Wiring

Use 18 - 24 AWG wire for logic wiring. Use 8 AWG wire for DC source (+BAT, -BAT) and motor (A1, A2) wiring.

Shielding Guidelines

As a general rule, it is recommended to shield all conductors. If it is not practical to shield power conductors, it is recommended to shield all logic-level leads. If shielding of logic-level leads is not practical, the user should twist all logic leads with themselves to minimize induced noise. It may be necessary to earth ground the shielded cable. If noise is produced by devices other than the drive, ground the shield at the drive end. If noise is generated by the drive, ground the shield at the end away from the drive. Do not ground both ends of the shield.

Fusing

The drives require an external fuse for protection. Use fast acting CLASS T fuse rated for 100A or less with a minimum voltage rating of 125 VDC. Connect the fuse to the positive terminal.

Startup

- Verify that no foreign conductive material is present on the printed circuit board.
- Ensure that all jumpers are properly set.

1. Turn the speed adjust potentiometer full counterclockwise (CCW) or apply the minimum analog signal (0 VDC).
2. Apply the source voltage.
3. Close the Enable switch.
4. Slowly advance the speed adjust potentiometer clockwise (CW) or increase the analog signal. The motor should slowly accelerate as the potentiometer is turned CW / signal increased. Continue until the desired speed is reached.
5. Remove the source voltage from the drive to coast the motor to a stop.

Calibration

Minimum Speed (MIN SPD): The MIN SPD setting determines the minimum motor speed when the speed adjust potentiometer is set for minimum speed. It is factory set for zero speed. To calibrate the MIN SPD:

1. Set the MIN SPD trim pot full CCW.
2. Set the speed adjust potentiometer for minimum speed.
3. Adjust MIN SPD until the desired minimum speed is reached or is just at the threshold of rotation.

If in a bidirectional mode (see Modes section), then the MIN SPD setting determines the position on the external potentiometer that will command zero speed or torque. To calibrate the MIN SPD:

1. Set the MIN SPD trim pot at 12 o'clock.
2. Set the external adjust potentiometer at the desired zero speed/torque position.
3. Adjust MIN SPD until the motor speed / torque is at zero.

Forward Maximum Speed (MAX SPD): The MAX SPD setting determines the maximum motor speed in the forward direction (when A1 is positive with respect to A2). To calibrate the MAX SPD:

1. Set the MAX SPD trim pot full CCW.
2. Set the speed adjust potentiometer for maximum speed.
3. Adjust MAX SPD until the desired maximum speed is reached.

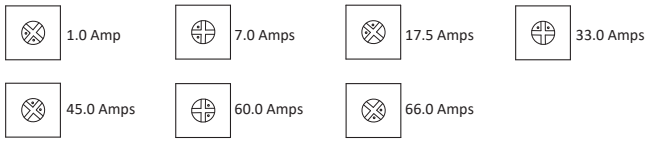
Reverse Maximum Speed (REV MAX SPD): The REV MAX SPD setting determines the maximum motor speed in the reverse direction (when A2 is positive with respect to A1). To calibrate the REV MAX SPD:

1. Set the REV MAX SPD trim pot full CCW.
2. Set the speed adjust potentiometer for maximum speed.
3. Adjust REV MAX SPD until the desired maximum speed is reached.

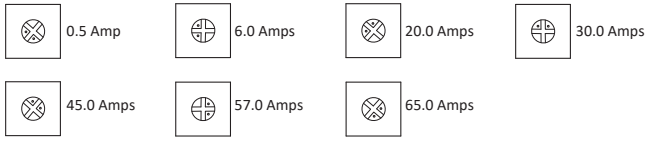
Motoring Torque (TQ LIM): The TQ LIM setting determines the maximum torque for accelerating and driving the motor in the forward or reverse directions. To calibrate the TQ LIM:

1. With the power disconnected from the drive, connect a DC ammeter in series with the armature.
2. Set the TQ LIM trim pot to minimum (full CCW).
3. Set the speed adjust potentiometer to maximum forward speed (full CW).
4. Carefully lock the motor armature. Be sure that the motor is firmly mounted.
5. Apply power source. The motor should be stopped.
6. Slowly adjust the TQ LIM trim pot CW until the armature current is 150% of motor rated armature current.
7. Turn the speed adjust potentiometer to minimum speed (full CCW).
8. Remove power source.
9. Remove the stall from the motor.
10. Remove the ammeter in series with the motor armature if it is no longer needed.

Alternatively, see the approximate settings below.



Regenning Torque (REGEN TQ LIM): The REGEN TQ LIM setting determines the maximum torque for decelerating the motor and resisting an overhauling load in the forward or reverse directions. Turn the REGEN TQ LIM trim pot CW to increase the regen current limit and CCW to decrease the regen current limit. See the approximate settings below.



IR Compensation (IR COMP): The IR COMP setting determines the degree to which motor speed is held constant as the motor load changes. To calibrate the IR COMP:

1. Set the IR COMP trim pot full CCW.
2. Increase the speed adjust potentiometer until the motor runs at midspeed without load. A handheld tachometer may be used to measure motor speed.
3. Load the motor armature to its full load armature current rating. The motor should slow down.
4. While keeping the load on the motor, rotate the IR COMP trim pot until the motor runs at the speed measured in step 2. If the motor oscillates (overcompensation), the IR COMP trim pot may be set too high (CW). Turn the IR COMP trim pot CCW to stabilize the motor.
5. Unload the motor.

Acceleration (ACC): The ACC setting determines the time the motor takes to ramp to a higher speed. To Calibrate the ACC, turn the ACC trim pot CW for a longer acceleration time and CCW for a shorter acceleration time.

Deceleration (DEC): The DEC setting determines the time the motor takes to ramp to a lower speed. To calibrate the DEC, turn the DEC trim pot CW for a longer deceleration time and CCW for a shorter deceleration time.

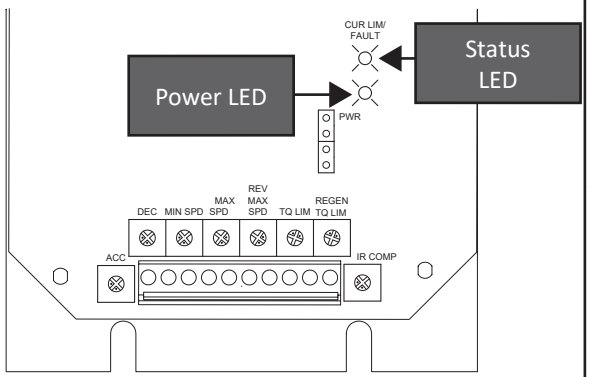
LEDs

Power (PWR): Green LED

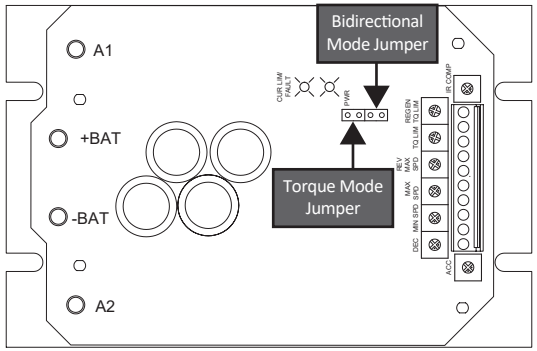
Off: The drive does not have power.
Blinking : The source voltage is either below 24 VDC or above 63 VDC.
Solid: The source voltage is within range and the drive is operating correctly.

Status (CUR LIM/FAULT): Red LED. Under some fault conditions, the drive may trip / disable. To reset the drive, open and re-close the Enable connection or remove and re-apply the DC power source.

Solid: The drive is either in Torque Limit or Regenerative Torque Limit.
Continuous Blinking: The drive is overheating. Provide more ventilation to the drive or decrease the load.
2 Blinks: The drive is approaching or has entered an under-voltage trip.
3 Blinks: The drive has entered an over-voltage trip.
4 Blinks: The drive has detected a short circuit on the output.



Modes



Speed Mode: In Speed Mode, the drive will output whatever current (torque) is necessary to achieve the commanded voltage (speed). The external potentiometer on S1, S2, and S3 will vary the motor speed as it is turned up and down. Full counterclockwise is minimum speed and full clockwise is maximum speed. To change the motor's direction, use the Direction Switch. To run in Speed Mode, do not place any jumpers on the Torque Mode or Bidirectional Mode pins.

Speed Mode w/ Bidirectional Control: Just like Speed Mode above, except now the external potentiometer on S1, S2, and S3 will vary the motor speed and direction as it is turned up and down. Full counterclockwise is reverse maximum speed and full clockwise is forward maximum speed. The MIN SPD trim pot is used to determine the point on the external potentiometer that commands zero speed. The Direction Switch will still come into effect (ie inverts the potentiometer). To run in Speed Mode with bidirectional control, only place a jumper on the Bidirectional Mode pins.

Torque Mode: In Torque Mode, the drive will output whatever voltage (speed) is necessary to achieve the commanded current (torque). The external potentiometer on S1, S2, and S3 will vary the motor torque as it is turned up and down. Full counterclockwise is minimum torque and full clockwise is maximum torque. To change the motor's torque direction, use the Direction Switch. To run in Torque Mode, only place a jumper on the Torque Mode pins.

Torque Mode w/ Bidirectional Control: Just like Torque Mode above, except now the external potentiometer on S1, S2, and S3 will vary the motor torque and direction as it is turned up and down. Full counterclockwise is reverse maximum torque and full clockwise is forward maximum torque. The MIN SPD trim pot is used to determine the point on the external potentiometer that commands zero torque. The Direction Switch will still come into effect (ie inverts the potentiometer). To run in Torque Mode with bidirectional control, place jumpers on both the Torque Mode and Bidirectional Mode pins.