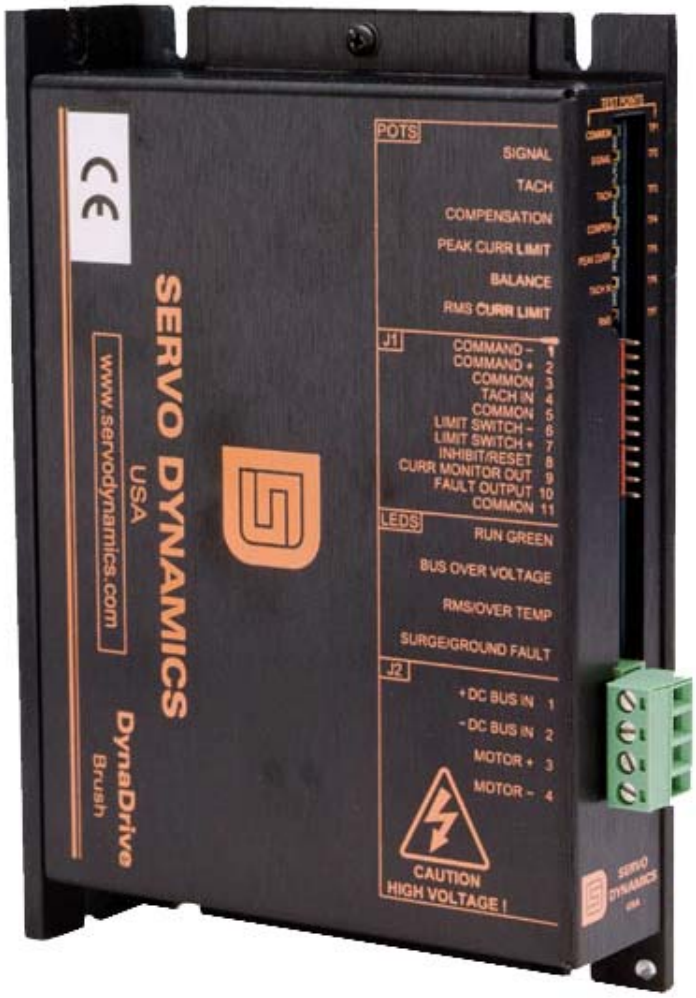
1525-BR

SERVO AMPLIFIER

FOR BRUSH SERVOMOTORS



USER GUIDE

September 2004

Important Notice

This document is subject to the following conditions and restrictions:

- This document contains proprietary information belonging to Servo Dynamics. This information is provided for the purpose of assisting users of the servo drive in its installation.
- The text and graphics in this document are for the purpose of illustration and reference only.
- The information in this document is subject to change without notice.

Revision History:
Version 1.01: September 27, 2004
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1. Introduction

This information manual provides the product specifications, wiring diagram, operational modes (torque and velocity) and troubleshooting procedures for the brush DynaDrive 1525-BR.

1.1 Description

The DynaDrive 1525-BR supplies 15 amps continuous current and 25 amps peak current at 164 VDC for a total of 2460 watts of continuous power. The DynaDrive is a current source type PWM amplifier.

The DynaDrive is a power duplicator of the command signal. A battery, a motion controller, or a signal generator can be the source of the command signal input.

Please read this manual thoroughly to the end as it contains important system information and warnings.

1.2 Technical Specifications

Performance Characteristics	
Peak Power	4.1 kW
Peak Output Voltage	± 164 vdc (shut off @ 205 vdc)
Peak Output Current	± 25 amps (1 sec.)
Max. Continuous Current	± 15 amps (50 °C), ± 19 amps (25 °C)
Electrical Characteristics	
Input Signal Voltage	± 10 vdc (typ.), ± 35 vdc (max.)
System Gain	0 to 10,000 amps/volt
Input Impedance	40 k Ohms
Typical Input Drift	10 µV/°C
Bandwidth	2 kHz with 1.2 mH Inductance
Dead Band	Zero
Input Power Requirements	
Input Voltage	60 - 170 vdc
Adjustments	
Peak Current Limit	0 to 25 amps
RMS Current Limit	0 to 19 amps
Signal Command Input	Scaling
Balance	Zero velocity offset
Compensation	System response
Tachometer	Scaling
Diagnostics	LED indication
Red	LED 1 – RUN GREEN - AMPLIFIER OPERATIONAL
Red	LED 2 – BUS OVER VOLTAGE
Red	LED 3 – EXCESSIVE RMS CURRENT/ OVER TEMP
Green	LED 4 – SURGE/GROUND FAULT
Physical Characteristics	
Module Dimensions (L x W x H)	6.5 in. x 1.4 in. x 4.5 in.
Weight	1.1 lbs
Ambient Temperature – Operating	0 °C to 50 °C
Shutdown Temperature	80 °C at heat sink
Relative Humidity	5 - 95% non-condensing

Table 1: Technical Specifications for DynaDrive 815 – BR-3

2. Safety Information

2.1 Electrical Cautions

Make sure that all voltages and tests are made with battery powered or electrically isolated instruments.

3. Installation

3.1 Matching the DynoDrive to the Motor

The factory preset potentiometer settings of the DynaDrive 1525-BR may need to be adjusted to match the continuous current rating of your motor. To accomplish this, find the continuous current rating of the motor to be used and adjust the RMS, PEAK CURR LIMIT and SIGNAL pot per Table 2 below. If the continuous current rating is between the values shown in the table, you may set to the lower value or use linear interpolation for each pot value. The signal pot settings are based on +/- 10 vdc input command signal. Remember that all resistance measurements must be made with power off and J1 disconnected.

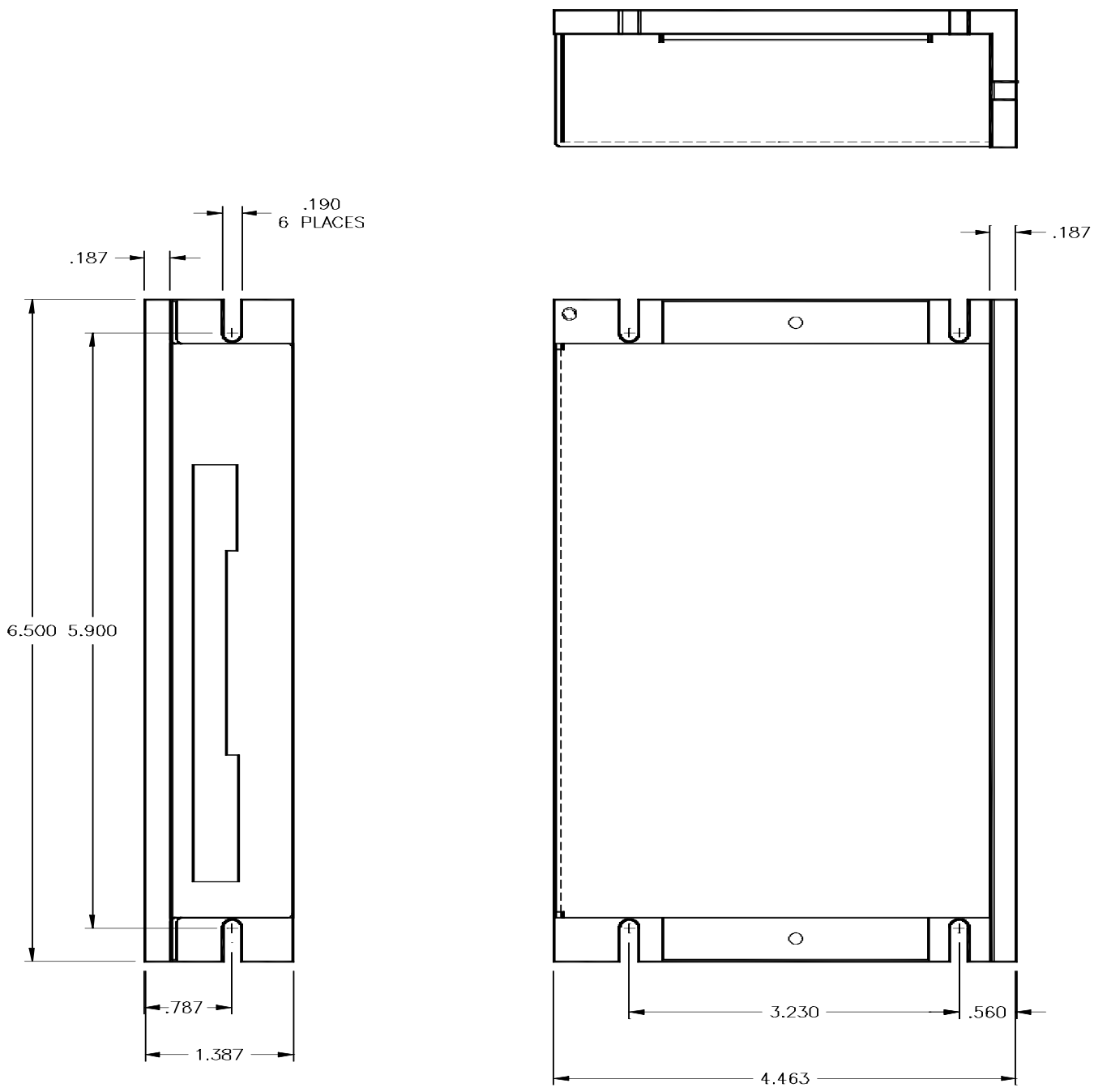
Continuous Current Rating of Motor (Amps)	RMS Pot Setting TP7 K Ohms (Amps)	PEAK CURRENT LIMIT Pot Setting TP5 K Ohms (Amps)	SIGNAL Pot Setting TP2 K Ohms
3	4.0 (3 Amps)	0.7 (9 Amps)	2.0
6	6.6 (6 Amps)	1.6 (18 Amps)	3.8
9	8.9 (9 Amps)	2.2 (25 Amps)	4.8
12	10.5 (12 Amps)	2.2 (25 Amps)	4.8
15	11.6 (15 Amps)	2.2 (25 Amps)	4.8

Table 2: Motor Specs

Note: All Measurements are with respect to TP1 (Common) with J1 removed.

3.2 Mounting Dimensions

Note: Units in inch



3.3 Connector Information

3.3.1 J1 – Control I/O Connection

J1	Label	Description
1	COMMAND -	Differential input
2	COMMAND +	Differential input. This pin can also be used as a single ended input. Use J1, pin 2 as common.
3	COMMON	Connected to other commons and connected to the metalwork of the amplifier mounting plate.
4	TACH IN	Single ended input that has additional tach filtering and conditioning.
5	COMMON	See pin 3 above.
6	LIMIT SWITCH -	Prevents motor over-travel in the CCW direction. Normally open, unless J4 is installed
7	LIMIT SWITCH +	Prevents motor over-travel in the CW direction. Normally open, unless J4 is installed.
8	INHIBIT/RESET	Internally pulled to + 12Vdc. Pull to common to inhibit and reset amplifier.
9	CURR MONITOR OUT	Current monitor output. +/- 4 VDC out equals approx. +/- 25 amps.
10	FAULT OUTPUT	Normally pulled up to +12 volts thru a 10 K resistor. Will sink 10 mA max to ground when a fault occurs.
11	COMMON	See pin 3 above.

3.3.2 J2 - Servomotor Connection

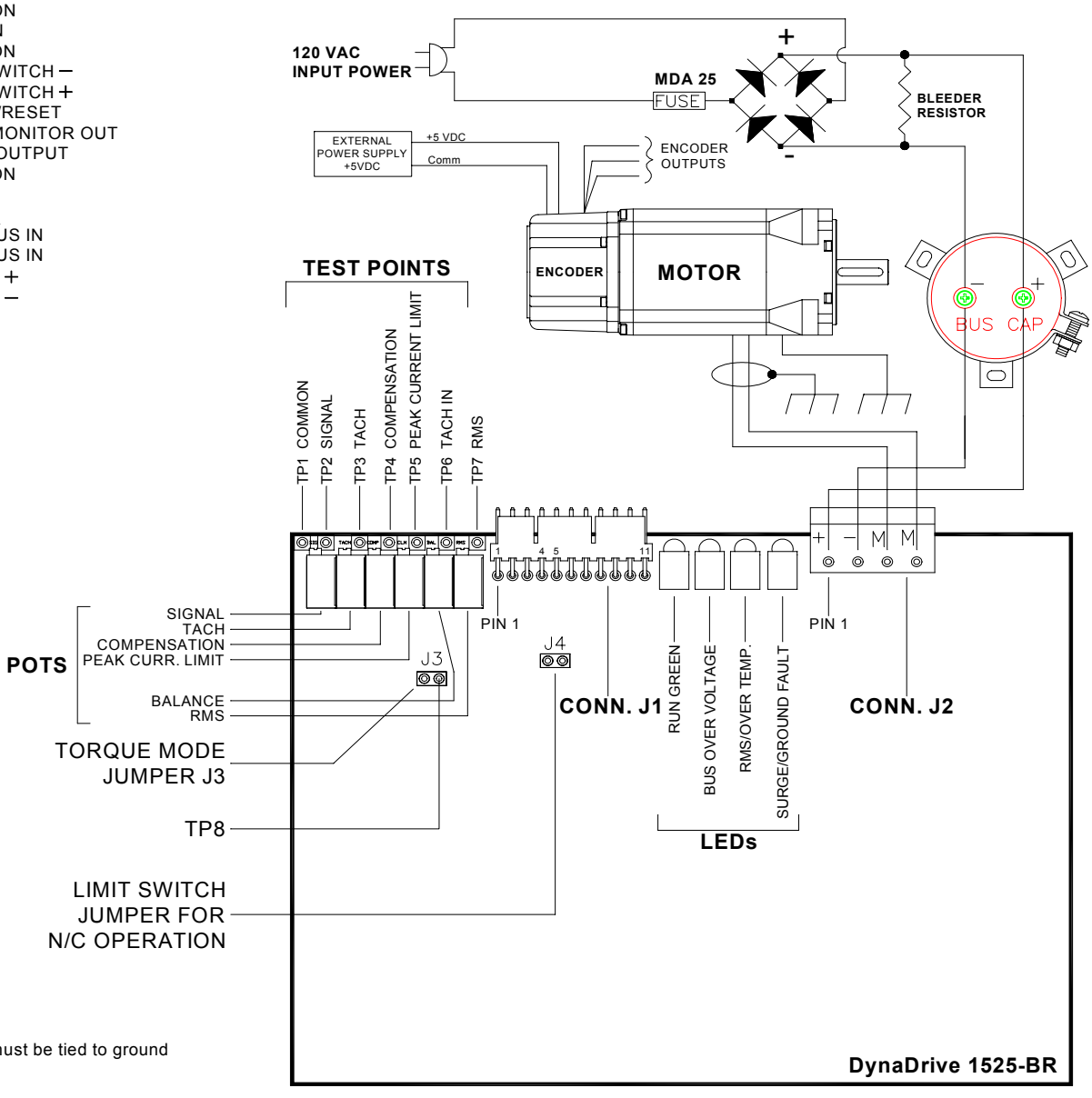
J2	Label	Description
1	+ DC BUS IN	+ Bus power input, 60 to 170 VDC
2	- DC BUS IN	- Bus power input, power return
3	MOTOR +	Output power to motor
4	MOTOR -	Output power to motor

3.4 Wiring Diagram

3.4.1 DynaDrive 1525-BR and Motor with Encoder

J1 CONNECTOR
PIN 1 COMMAND −
PIN 2 COMMAND +
PIN 3 COMMON
PIN 4 TACH IN
PIN 5 COMMON
PIN 6 LIMIT SWITCH −
PIN 7 LIMIT SWITCH +
PIN 8 INHIBIT/RESET
PIN 9 CURR MONITOR OUT
PIN 10 FAULT OUTPUT
PIN 11 COMMON

J2 CONNECTOR
PIN 1 + DC BUS IN
PIN 2 − DC BUS IN
PIN 3 MOTOR +
PIN 4 MOTOR −



Note: Heat sink must be tied to ground

3.5 Potentiometers -Adjustments

The following is a description of the function of each pot. The pot settings can be measured at test points TP1 thru TP7.

Potentiometer	Description
SIGNAL	The signal potentiometer is used for scaling the command signal. Turning the potentiometer CW increases the amount of command signal to the front end of the amplifier.
TACH	The tachometer potentiometer is used for scaling the various tachometer voltage gradients. This input has to be used because of special signal conditioning. Turning the pot CW increases the amount of tach-feedback into the amplifier.
COMPENSATION	The Compensation potentiometer is used to increase or decrease the response (bandwidth) of the amplifier. Turning the potentiometer CW increases the response of the amplifier.
PEAK CURR LIMIT	The peak current limit potentiometer is used to increase or decrease the peak output current of the amplifier. Turning the potentiometer CW increases the output current of the amplifier from zero amps to maximum peak amps.
BALANCE	The balance potentiometer is used to stop motor rotation when no input signal exists. The function of this pot is such that for zero input volts the output current should be at zero amps.
RMS	The RMS potentiometer is for changing the level of the RMS current. The amplifier is capable of providing maximum RMS current when fully CW. The minimum current is approximately 0 amps when fully CCW.

4. Operational Modes

The DynaDrive can operate in a Torque or Velocity mode.

In the Torque mode, the DynaDrive only closes the torque loop. The velocity loop is closed in the motion controller.

In the Velocity mode, the DynaDrive itself closes both the torque and velocity loop.

4.1 Torque Mode

4.1.1 Torque Mode – Factory Potentiometer Settings

Unless otherwise specified by the customer, the DynaDrive 1525-BR is shipped in the torque mode by installing the torque mode jumper at J3 and presetting the potentiometers for the torque mode. The factory potentiometer settings for the torque mode are as follows: (See ADJUSTMENTS section for a more complete description of the potentiometer functions). All resistance measurements must be made with power off and J1 disconnected.

Potentiometer Description	Potentiometer Setting	Potentiometer Test Point
N/A	N/A	TP1 – COMMON
SIGNAL	4.8 k Ohms	TP2 – SIGNAL
TACH	Full CCW	TP3 – TACH
COMPENSATION	Full CW	TP4 – COMPENSATION
PEAK CURR LIMIT	Full CW, 2.2 k Ohms (25 Amps)	TP5 – PEAK CURR LIMIT
BALANCE	No Preset	None
RMS	11.6 k Ohms (15 Amps)	TP7 – RMS

Table 3:Torque Mode POT settings

Note: All Measurements are with respect to TP1 (Common) with J1 removed.

4.1.2 Torque Mode - Setup

The factory preset potentiometer settings are adjusted for the torque mode operation.

To set up and run the DynaDrive 1525-BR in the torque mode, perform the following:

1. Turn power off.
2. Remove J1.
3. Check all wiring connections. Verify that J3 jumper is installed.
4. Set the RMS, PEAK CURRENT LIMIT and SIGNAL pots to match the motor as indicated in Table 2. For preliminary testing under no load, use the factory preset pot settings.
5. Check that the TACHOMETER pot is full counterclockwise (CCW).
6. Check that the COMPENSATION pot is full clockwise (CW).
7. Replace J1.
8. Inhibit the DynaDrive by pulling pin 8 of J1 to common.
9. Turn power on.
10. Insure that the voltage at COMMAND + and COMMAND – is zero.
11. Enable the DynaDrive by removing the inhibit of step 8.
12. The green LED should be the only LED on. No other LEDs should be on at this point. If any other situation exists, check the TROUBLESHOOTING section of this manual.
13. Adjust the BALANCE pot to give zero volts at CURRENT MONITOR OUT, J1 pin 9.
14. Apply a voltage (0 to +/- 10 VDC) at COMMAND + and COMMAND -. The motor shaft should turn CW when COMMAND + is positive and should turn CCW when COMMAND + is negative. At low COMMAND voltage, holding the shaft can stall the motor. At higher COMMAND voltage, the torque is much greater and it should be difficult to stall the motor.

4.2 Velocity Mode

4.2.1 Velocity Mode – Factory Potentiometer Setting

To set the DynaDrive in the Velocity Mode, remove the cover to expose the Torque Mode Jumper at J3. Remove the Torque Mode Jumper at J3 that is located right behind the Tach pot. The pot settings must be adjusted for Velocity mode per Table 4 below. The Velocity mode requires a tachometer feedback signal from the motor or motion control system.

To match the motor to the DynaDrive 1525-BR, set the RMS and SIGNAL pots per Table 2. Set the PEAK CURR LIMIT pot to full CCW. Set the remaining pots per Table 4 below. Now perform the Velocity Mode Setup procedure on the next page.

Potentiometer Description	Potentiometer Setting	Potentiometer Test Point
N/A	N/A	TP1 – Common
SIGNAL	See Table 2	TP2 – SIGNAL
TACH	7.0 k Ohms	TP3 – TACH
COMPENSATION	Full CCW	TP4 – COMPENSATION
PEAK CURR LIMIT	Full CCW	TP5 – PEAK CURR LIMIT
BALANCE	No Preset	None
RMS	See Table 2	TP7 – RMS

Table 4: Velocity Mode POT settings

Note: All Measurements are with respect to TP1 (Common) with J1 removed.

4.2.2 Velocity Mode- Setup

To set up and run the DynaDrive 1525-BR in the Velocity mode, perform the following:

1. Turn power off.
2. Remove J1.
3. Check all wiring connections. Verify that J3 jumper is removed.
4. Check that the pots are set per Table 4.
5. Inhibit the DynaDrive by pulling pin 8 of J1 to common.
6. Replace J1.
7. Turn power on.
8. Insure that the voltage at COMMAND + and COMMAND – is zero.
9. Enable the DynaDrive by removing the inhibit of step 5.
10. The green LED should be the only LED on. No other LEDs should be on at this point. If any other situation exists, check the TROUBLESHOOTING section of this manual.
11. Slowly turn the PEAK CURR LIMIT pot CW. If the motor runs away, turn the power off, reverse the velocity feedback leads and repeat above. If the motor does not run away, set the PEAK CURR LIMIT pot to the value given in Table 2.
12. Turn the COMPENSATION pot CW until the motor starts buzzing. Now turn the pot CCW until the motor stops buzzing and then turn another 1 ½ turns CCW.
13. The motor shaft should not be rotating at this point. If it is slowly rotating, adjust the BALANCE pot until rotation is stopped.
14. With zero voltage at COMMAND + and COMMAND –, the motor shaft should be stiff and difficult to turn. A low voltage at COMMAND + will cause the motor to turn at a slow speed with high torque and the motor should be difficult to stall. The motor speed should be proportional to the COMMAND voltage.

5. Troubleshooting

5.1 Diagnostic LEDs

There are four diagnostic LEDs:

1) RUN GREEN
2) BUS OVER VOLTAGE
3) RMS/ OVER TEMP
4) SURGE/ GROUND FAULT

5.1.1 Green LED

RUN GREEN - Indicates the amplifier is working properly. When the green LED goes OFF and there is no red LEDs ON, the following may have occurred:

1. Loss of power to the amplifier.
2. Bus Voltage less than 60 VDC.
3. Amplifier has been inhibited by J1, Pin 8.

5.1.2 Red LEDs:

Note: When a red LED is ON, the amplifier has been inhibited and remains inhibited until reset. To reset, toggle J1 pin 8 momentarily to Common.

5.1.2.1 BUS OVER VOLTAGE

Indicates that the bus voltage has exceeded 205 VDC. This condition may be caused by rapid deceleration or back driving of the motor. A shunt regulator is required to dissipate the motor energy. If a shunt regulator is present in the system check its fuses.

5.1.2.2 RMS/OVER TEMP

- **Excess RMS** - The amplifier delivered current beyond its continuous capability. This condition can exist if a machine is asked to perform a task greater than its design capabilities. This would include a motor that is mechanically stalled or binding or a motor with shorted stator (armature) wires.

- **Over temperature** - The heat sink has exceeded 80 °C. An over temperature condition may exist for the following reasons:
    1. Insufficient airflow across the heat sink.
    2. Ambient cabinet temperature too high.

5.1.2.3 SURGE/GROUND FAULT

- **Surge** - Indicates an excessive amount of current through the power transistors in the output power bridge. This condition may be due to a damaged output power device or shorted output leads to the motor.

- **Ground fault** - One of the output wires to the motor is shorted to ground. This condition may be due to faulty or pinched wiring or the motor is arcing to the case ground.

5.2 Other Conditions

Problem	Possible Solution
MOTOR OR MACHINE RUNS AWAY	1.Check the tachometer voltage to the amplifier by testing TP3 with respect to TP1. Then look at TP6 with respect to TP1 with a voltmeter. 2.Ensure the tachometer signal is phased correctly. 3.Check to see if the position loop phasing (CNC command) is correct relative to the position encoder feedback device.

5.3 Test Points

Test Point Pin	Observed Signal
TP1	COMMON
TP2	SIGNAL input POT wiper
TP3	TACH input wiper
TP4	COMPPENSATION POT wiper
TP5	PEAK CURR LIMIT POT wiper
TP6	TACH IN signal directly connected to J1, pin 3 thru a 10K resistor
TP7	RMS current setting pot wiper
TP8	Front-end opamp output (J3, pin 2)

5.4 Contact Information

If you are unable to resolve the problem, consult our web page located at:

http://www.servodynamics.com/

Contact the service department at Servo Dynamics:

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