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AUTOMATION, INC.

APPLICATIONS

TA115 MANUAL

(3/01)

The following documentation provides descriptions and definitions of the operating parameters for the TA115 amplifier.

Setup

The TA115 is designed to drive a small-size brush-type motor, and can be configured for either torque (current) mode or velocity (voltage) mode. See the corresponding diagram depicting several methods of operation.

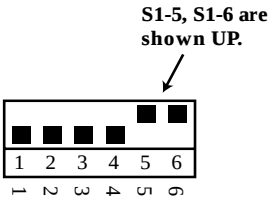
Switch Settings

S1 – System Configuration

SW#	DOWN	UP
1	TA115-supplied +5V (20mA max)	User-supplied +5V (for optical isolation)
2	Aux Gnd tied to GND	Aux Gnd isolated from GND
3	/FAULT	FAULT
4	Current mode	Voltage mode (A_V=20)
5	DTS bit 0	
6	DTS bit 1	

Gain - Transconductance & DTS

Setting	S1-5		S1-6	
10V in = 2A out	Down	(0)	Down	(0)
10V in = 4A out	Up	(1)	Down	(0)
10V in = 6A out	Down	(0)	Up	(1)
10V in = 8A out	Up	(1)	Up	(1)



NOTE: S1-5 and S1-6 must be "UP" for DTS use.

Amplification Mode

Torque

Torque mode is the most common mode of operation. In torque mode, the amplifier produces a current proportional to the command input voltage; the current produced is directly proportional to torque. The transconductance (Amps *per* Volt) is calculated by the following equation:

$$g_m = \frac{I_o}{V_c}$$

g_m = current gain (transconductance)
I_o = output current (use worst case)
V_c = command voltage

Example:

If: I_o desired = 4A, and V_c (max) = 10V

Then: $g_m = \frac{4}{10}$ or 0.4A *per* Volt

NOTE: Current output is limited by Ohm's law.

I_{max} is limited by the following equation:

$$I_{max} = \frac{\text{Bus voltage - 5V}}{\text{Motor Impedance in Ohms}}$$

For a command-input voltage of ±10V, the current output settings are 2A, 4A, 6A, and 8A. These are also the current limits, in this mode. Custom current limits can be preset at the factory.

Velocity

In velocity mode, the amplifier produces a voltage proportional to the command input voltage; the voltage produced is directly proportional to velocity. The equation for determining the output voltage for a given input is as follows:

V_{out} = command voltage * A_v

A_v = voltage gain (factory preset = 20)
V_c = command voltage

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Example:

If: V_{out} desired = 40V, with A_V = 20

Then: $V_C = \frac{40}{20}$ or 2.0V

Command Signal Input

The TA115 is outfitted with differential command signal inputs, eliminating potential noise susceptibility on the command signal lines. Signal connections to the TA115 are made via J1.

Most systems operate satisfactorily with a single-ended command signal configuration. Many controllers only offer a single-ended output, with a common signal ground. In this configuration, connect the controller's signal ground to the -SIGA connection (J1-2) on the TA115.

Current Limit

The TA115 current limit is set via S1-5 and S1-6 (see datasheet or diagrams), and can be varied from 2A-8A in both torque and velocity modes.

NOTE: Current limit and transconductance settings are the same.

Thermal Limits

The TA115's powerblock is thermally protected, inherently. The thermal limit of operation is 75°C. If the powerblock's thermal limit is exceeded, a FAULT output is generated. The TA115 will continue to operate, however, limited output may result. The amplifier does *not* auto-disable in this condition.

Dynamic Transconductance Selection

A feature pioneered by Trust Automation, Dynamic Transconductance Selection (DTS) enables on-the-fly changes to the transconductance settings. This is accomplished by logically controlling the DTS bits D0

and D1 on connector J1. This feature is advantageous in frictionless systems (i.e. in an airbearing x-y system) where there is high inertia. This situation necessitates high currents upon start-of-motion or change-of-direction, but requires high precision, high-resolution control when at-speed.

Enable

The /Enable inputs must be pulled to AUX Ground, or logic *low**, for the TA115 to operate. The /Enable input is pulled-up internally (to AUX +5); therefore, if connection is lost to the /Enable input, the amplifier *will* disable. Opto-isolation is available when +5V is user-supplied at connector J1-10, and S1-1 & S1-2 are in the UP position. /Enable is located at J1-7, and is referenced to AUX ground.

*A minimum sinking capability (I_{OL}) of 5mA is required.

NOTE: Logic *low* input minimum voltage (V_{IL}) is 0.8V; logic *high* input minimum voltage (V_{IH}) is 2.0V. See circuit in Figure 1.

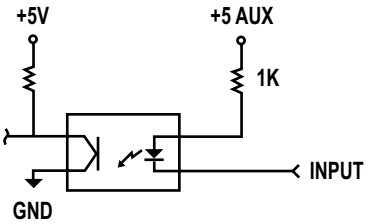

Figure 1 - Logic Input Circuit (Enable, DTS)

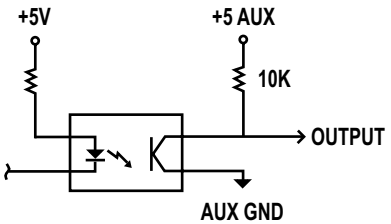

Figure 2 - Fault Output Circuit

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Fault

The TA115 fault circuit will output a logic *low* or logic *high* upon over-current or thermal overload. Opto-isolation is available when +5V is user-supplied at connector J1-10. The FAULT output is on J1-8, referenced to AUX ground, and is pulled-up to AUX +5V.

FAULT is activated under several conditions, relating to both over-current and over-temperature. FAULT from over-temperature can result from several differrent conditions; continuous current over the rated value (4 Amps), operation outside the power dissipation limitations specified (see page 6), or can simply result from a loss of cooling. FAULT from over-current is only applicable in Velocity mode, since the current output is controlled in torque mode (see page 1).

The TA115 will continue to operate during a FAULT condition; however, limited output may result. It is the responsibility of the controller to react to the FAULT signal, if desired, and take corrective action.

NOTE: Logic *high* output minimum voltage (V_{OH}) is 2.5V; logic *low* output maximum voltage (V_{OL}) is 0.8V. See circuit in Figure 2.

Ground Connections

The AUX ground (common to both command input and digital) should be isolated from power ground. This is recommended to prevent any power supply line perturbations from being conducted onto the command signal or logic control input and output circuitry.

Avoid connecting power ground (J2-4) to earth ground, as this will increase vulnerability to noise.

Command Signal & Logic

Verify the TA115's AUX ground is common to the logic ground (i.e., Enable, Fault), and signal ground on the controller.

Power Supply

The TA115 can accept power in the range of 15-48VDC. A regulated switcher-type supply is suitable for most applications, due to their small

size and availability. However, if there is the utmost concern for noise interference, a linear power supply, regulated or unregulated is recommended. If an unregulated supply is chosen, verify that the voltage supplied, at V+ (J2-5), does not exceed the absolute maximum supply voltage of +52V, otherwise damage to the TA115 may occur.

If the power supply is located greater than 4ft. (cable length) from the amplifiers, local filtering is recommended (330µF min./63V capacitor) for best performance.

Power Dissipation Calculations

Since the TA115 operates in linear mode, thus voltage *not* applied to the motor, is dropped across the amplifier. The heat generated, by the amplifier, is directly proportional to this voltage drop multiplied by the motor current. Heat dissipation is an especially critical factor when the motor is in a stalled condition (low motor voltage, high current). The TA115 is limited to a maximum of 100W continuous dissipation, and 200W peak dissipation (0.5 sec). To determine an application's potential heat dissipation at the amplifier, use the following equation:

$$P_D = I_{motor} * (V_{supply} - V_{motor})$$

P_D = power dissipated by the amplifier
I_{motor} = motor current (use worst case)
V_{supply} = total supply voltage
V_{motor} = voltage across motor (during worst-case condition)

Chassis

Mounting

The TA115 can be mounted vertically or horizontally. However, it is recommended that the amplifier be mounted such that any existing airflow will be directed through the TA115 in the direction marked atop the amplifier's cover. If there is no existing airflow, and the amplifier will be mounted vertically, verify that the amplifier's airflow is UP.

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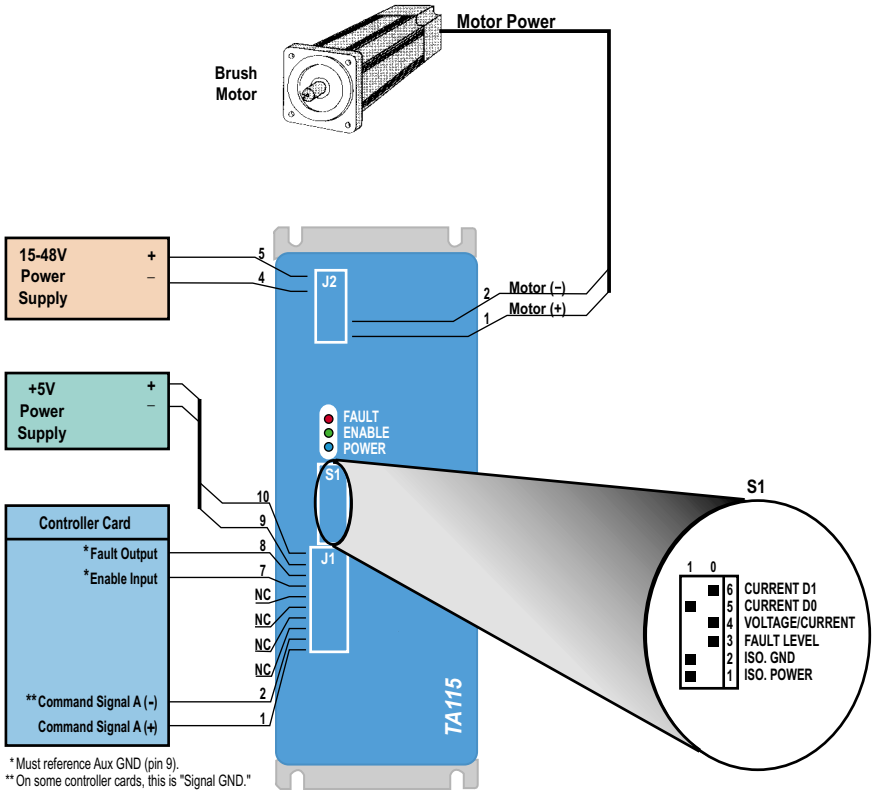
Grounding

Mount the TA115 securely to an earth-grounded enclosure or panel. If the amplifier is mounted on an electrically insulated material (isolated from earth), then connect the TA115's chassis to earth ground, via a braided ground strap.



* Must reference Aux GND (pin 9).
** On some controller cards, this is "Signal GND."

NOTE: Drawing does not depict connections of a positional or velocity feedback mechanism.

Diagram 115-01	Parameter	Setting
The above connections depict the TA115 operating in torque (current) mode; it is set for a fixed current limit of 4A, and logic lines are optically isolated (requires user-supplied 5V supply).	Amplification Mode Logic Optoisolation Fault Output Active Current Limit Transconductance	Torque Yes Low 4A .4A/V

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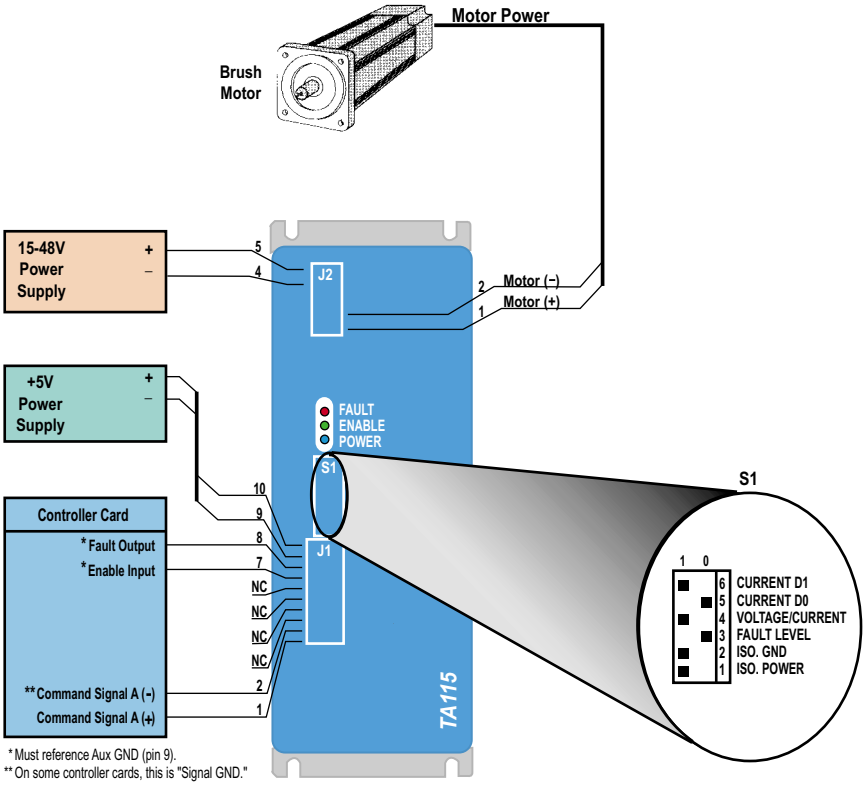
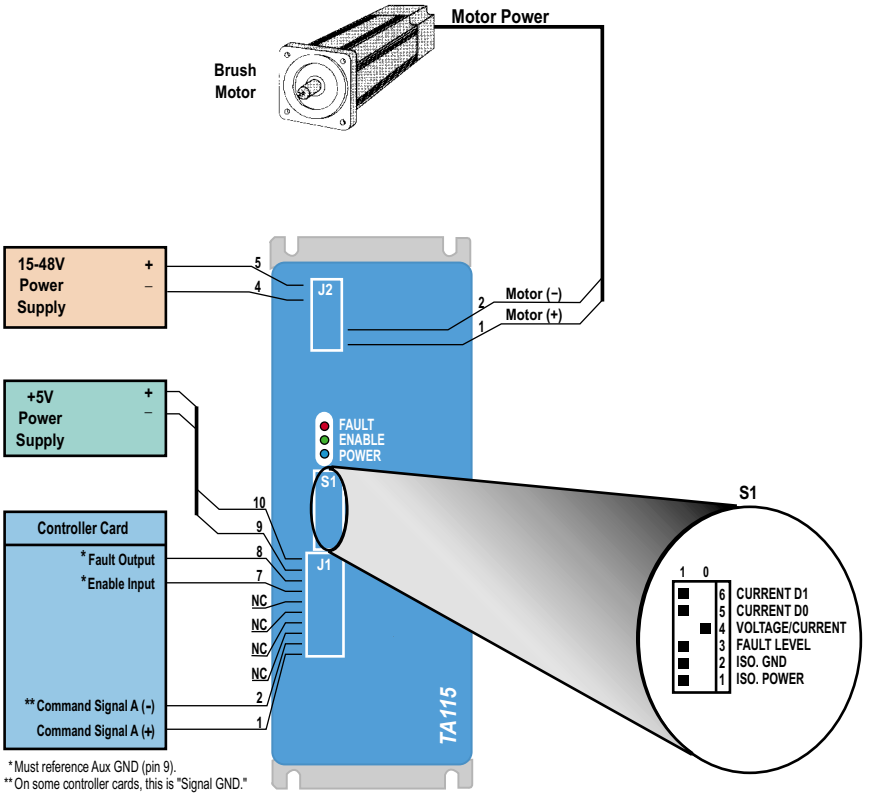


* Must reference Aux GND (pin 9).
** On some controller cards, this is "Signal GND."

NOTE: Drawing does not depict connections of a positional or velocity feedback mechanism.

Diagram 115-02	Parameter	Setting
The above connections depict the TA115 operating in velocity (voltage) mode; it is set for a fixed current limit of 6A, and logic lines are optically isolated (requires user-supplied 5V supply).	Amplification Mode Logic Optoisolation Fault Output Active Current Limit Transconductance	Velocity Yes Low 6A .6A/V



*Must reference Aux GND (pin 9).
**On some controller cards, this is "Signal GND."

NOTE: Drawing does not depict connections of a positional or velocity feedback mechanism.

Diagram 115-03	Parameter	Setting
The above connections depict the TA115 operating in torque (current) mode; it is set for a fixed current limit of 8A, and logic lines are optically isolated (requires user-supplied 5V supply).	Amplification Mode Logic Optoisolation Fault Output Active Current Limit Transconductance	Torque Yes High 8A .8A/V

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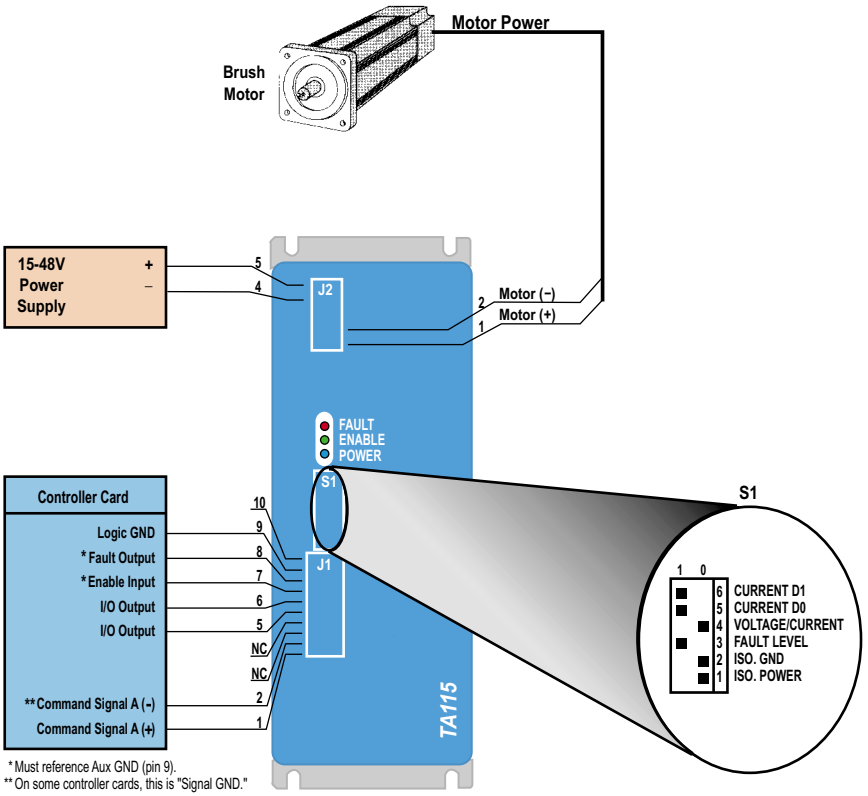

* Must reference Aux GND (pin 9).
** On some controller cards, this is "Signal GND."

NOTE: Drawing does not depict connections of a positional or velocity feedback mechanism.

Diagram 115-04	Parameter	Setting
The above connections depict the TA115 operating in torque (current) mode; it is set for variable current limit and variable transconductance. Logic lines are not isolated.	Amplification Mode Logic Optoisolation Fault Output Active Current Limit Transconductance	Torque No High Variable Variable