5530 LVDT Loadcell Amplifier

SSD DRIVES

Product Manual

HA351949

LVDT loadcell amplifier

Product Manual

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WARNING

Only qualified personnel who thoroughly understand the operation of this equipment and any associated machinery should install, start-up, or attempt maintenance of this equipment. Non-compliance with this warning may result in serious personal injury and/or equipment damage.

WARNING

Never work on any control equipment or motors without first removing all power supplies from the equipment.

Caution

This equipment contains **ESD** (Electrostatic Discharge) sensitive parts. Observe static control precautions when handling, installing, and servicing this device.

Caution

This equipment was tested before it left our factory. However, before installation and start up, inspect all equipment for transit damage, loose parts, packing materials, etc.

Caution

Ruptured semiconductor devices may release toxic materials. Contact SSD Drives or the semiconductor manufacturer for proper disposal procedures for semiconductors or other material.

NOTE

The installation of this equipment must comply with the National Electric Code and any applicable local codes.

CONTENTS

Chapter 1 INTRODUCTION

The 5530-1 LVDT Loadcell Amplifier scales the high level output signal from LVDT loadcells for use as tension indication or as a feedback signal for material tension control. Figure 1 shows a typical loadcell application using a pair of loadcells.

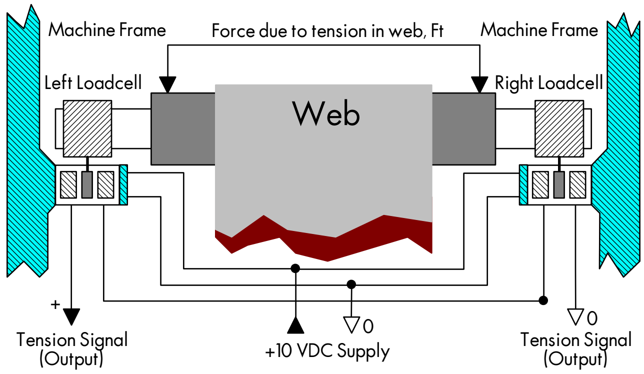

Figure 1 - Typical Loadcell Application

LVDT Loadcells use differential transformers to generate tension signals. The force, F_t, created by tension in the web bends the beams slightly causing the iron core position to change inside the loadcell. The position change is converted by internal electronics into a dc voltage that is proportional to web tension and the supply voltage.

The **5530-1 LVDT Loadcell Amplifier** takes the voltage signal from the loadcells and gives out +10 to -10 volt tension signal that is proportional to F_t.

Offset and **Span** potentiometers on the 5530-1 allow the loadcell amplifier to be calibrated.

The **Excite** potentiometer on the 5530-1 scales the loadcell supply voltage.

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Chapter 2 HARDWARE OVERVIEW

The 5530-1 contains a power supply circuit and LVDT Loadcell Amplifier circuit on one printed circuit board. The unit mounts on most standard DIN rail types. Figure 2 shows a simple block diagram of the unit connected to two loadcells.

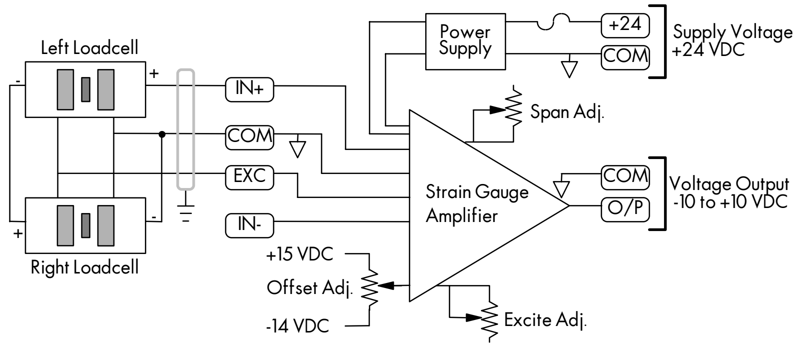

Figure 2 - Loadcell Amplifier Block Diagram

Power Supply

The 5530-1 converts the +24 VDC supply into ±15 VDC for the amplifier circuit and the excitation supply for the loadcells. The excitation supply provides +3.5 to 10.0 VDC. The voltage is set by the Excite potentiometer as required for the loadcell.

> Note: Loadcells can be powered from the main 24 VDC supply as long as the total loadcell output change for full tension does not exceed 9 volts. The 10 VDC supply is preferable because it will be more stable.

LVDT Loadcell Amplifier

The amplifier circuit uses the Offset Adj. potentiometer to compensate for offsets in the loadcells. The Span Adj. potentiometer can amplify the signal between 2 to 20X. The output provides a -10 to +10 VDC signal but is typically calibrated to provide +9 VDC when the web tension is maximum.

SPECIFICATIONS

Dimensions:	2.8" x 3.2" x 2.0" (H x W x D)
Input Signal:	450 mV to 5 V for full scale output
Input Impedance	> 1 G ohm
Excitation Supply:	Adjustable 3.5 to 10.0 VDC
	100 mA maximum
Output Span:	-10.0 to +10.0 VDC
Output Gain:	Adjustable: 2 - 20
Operating Temperature	0-50 Degrees C
Bandwidth:	Adjustable; 400 Hz standard
Functionality:	Adjustable Filter/Bandwidth
	Zero offset ± 100 percent of input
Supply Voltage Required	+18.0 to +27.6 VDC @ 130 mA, 24 VDC nominal

Chapter 3 INSTALLATION INSTRUCTIONS

The 24 VDC power supply to the 5530-1 is fused internally with a non-replaceable 2/10 amp fuse.

MOUNTING

Caution

This unit contains ESD (Electrostatic Discharge) sensitive parts. Observe static control precautions when handling, installing, and servicing this device.

The 5530-1 should be mounted inside a grounded metal enclosure on TS 32 or TS 35 DIN rail.

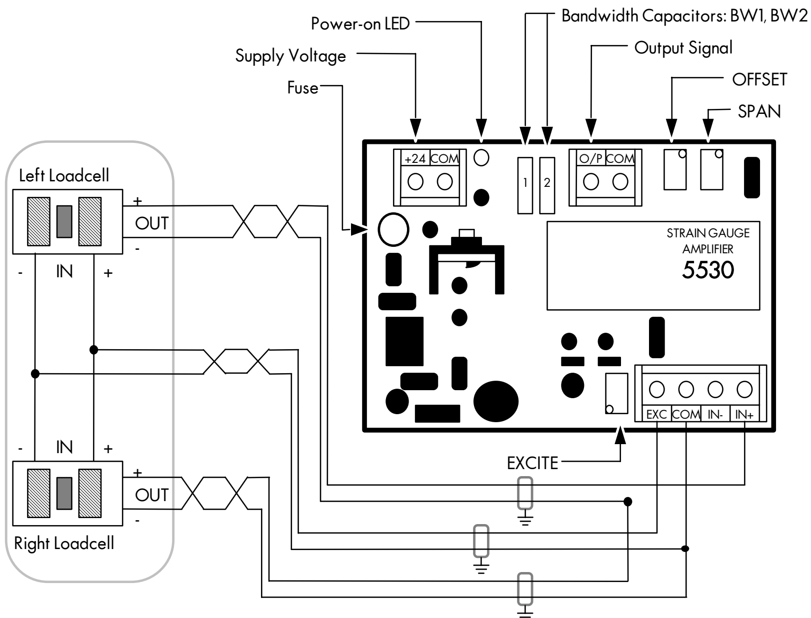

Figure 3 - Connection Diagram

BANDWIDTH CONFIGURATION

The default bandwidth, 400 Hz, should work with most applications. SSD Drives does not recommend changing its value. If a different bandwidth is required, change the bandwidth capacitors, BW1 and BW2. Use the formulas below to calculate the values of the capacitors required.

$$BW1 = 0.015\ \mu F\ [\ 1\ kHz / F_c\ (@\ 0\ dB) - 1]$$

$$BW2 = 0.0022\ \mu F\ [\ 1\ kHz / F_c\ (@\ 0\ dB) - 1]$$

$$F_c \equiv \text{Cutoff Frequency (10 Hz - 1 kHz)}$$

WIRING

The wiring configuration for a typical application of the 5530-1 is shown in Figure 3. Exercise special care wiring the loadcells due to the low level of the signals. Each shielded cable from the loadcell must be grounded at the enclosure housing the 5530-1 only. Using the following guidelines will help limit noise.

Signal Wiring Type

Signal wiring is to be shielded cable unless noted otherwise. The following types of shielded cable are recommended for signal wiring unless noted otherwise:

Two-pair: ALPHA 2466, BELDEN 8723, BICC H8085, UL 2493
Three pair: ALPHA 6010, BELDEN 8777, BICC H8086, UL 2493.

Wire Routing

Signal wiring (shielded cable) must be routed separately from power (high voltage), control (120 VAC) wiring, and any other non-signal wiring. Install separate conduit for signal wiring only. Within enclosures, harness and route signal wiring separately and as far from non-signal wiring as is possible. Where signal wiring must pass non-signal wiring, cross them at a 90 degree angle. When possible, route power wiring separately from all other wiring.

Terminating Shielded Cable

When using shielded cable, strip back the shield only as far as is necessary to terminate the conductors within. Connect one end of the shield to an enclosure earth ground terminal. Cut off and insulate the other end of the shield unless noted otherwise. If an intermediate junction of shielded cable is required, terminate or splice each shield individually to maintain each shield as a single, continuous conductor.

Grounding 0 VDC Signal Common

The 0 VDC signal common must be connected to earth ground at only one point. Connect a 0 VDC signal common terminal to an earth ground terminal within the enclosure if this connection does not exist elsewhere.

TERMINAL DESIGNATIONS

Function	Terminal
0 VDC Output Common	COM
-10 to +10 VDC Tension Output	O/P
0 VDC Power Common	COM
+24 VDC Power	+24
0 VDC Excitation Common	COM
Excitation Supply	EXC
0 VDC Input	IN-
Positive Input	IN+

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Chapter 4 LOADCELL CALIBRATION

Calibration of the loadcells requires a voltmeter, a rope and either a known weight or a spring scale to indicate loading. The tensioning source should be able to generate at least 40 percent of the maximum total material tension.

The following procedure calibrates the 5530-1 LVDT Loadcell Amplifier for +9 volts output at full tension. If an output other than +9 volts is required, reference voltage levels and polarities will be different.

Note: If the loadcells are ever rotated, replaced, or excessively loaded, they should also be re-calibrated per the following procedure.

A. Mount the loadcells and ensure that they are properly oriented to measure the force resulting from material tension. (Refer to instructions provided by the loadcell manufacturer.)

B. Set the excitation supply to the loadcells to the manufacturer's recommended value with the **Excite** potentiometer (usually 10 VDC). With no load on the roll, check that the loadcells give the appropriate output signal to terminal IN+ (usually 2.9 VDC when measured with respect to terminal COM). If the output signal measures about 0 VDC, reverse the leads for one of the loadcells. Also ensure that the signal is as free of electrical noise as possible.[1] If noise is present, verify that the wiring guidelines in the Installation Instruction were followed.

C. With no material over the tension roll, thread a rope along the center of the exact material path over the tension roll. Figure 4 shows a sample path. The path of the rope over the tension roll must be exactly the same as that of the material.

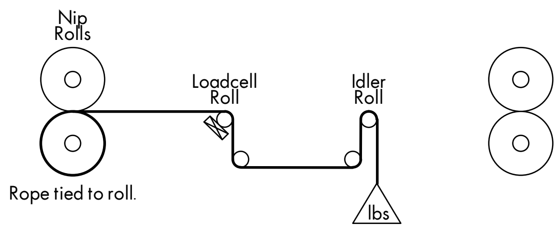


Figure 4 - Sample Rope Path

Note: The rope should pass across free spinning rolls only. Ensure uniform tension between the calibration weight and the tension roll.

[1] The AC ripple should be less than 15 mV at terminals IN+ and IN-. Once the roll is installed, the output will only be close to 2.9 VDC.

To simulate material tension, make a calibration weight or use another suitable method for applying a known amount of tension to the rope. The known amount of tension should be between 40 and 100 percent of full material tension. Calculate and record this percentage:

Calibration Weight	=________lbs
Full Material Tension = Max. lbs/linear inch * Max. material width	=________lbs
% Tension of Cal. Weight = (Calibration weight / Full tension) * 100	=________ %

D. With no load on the rope, record the No Load Value of the loadcell outputs. Attach the calibration weight from the rope and record the Cal Load Value. The voltage should move from its no load value (2.9V). The voltage to terminal IN+ should increase with load. Reverse the excitation supply wires in terminals IN+ and IN- if the output shift is incorrect.

	Terminal IN+
No Load Value:	___________ VDC
Cal Load Value:	___________ VDC
Change = No Load - Cal Load:	(-) ________ VDC

E. With no load on the roll, adjust the OFFSET potentiometer for 0 VDC ± 0.1V output from the amplifier (terminal O/P).

F. Hang the calibration weight from the rope. Adjust the SPAN potentiometer to achieve the correct percentage tension output from the amplifier on terminal O/P (e.g., if the calibration weight is 50 percent of full tension, the output should be 4.5 VDC; 80 percent should yield 7.2 VDC, etc.).
The polarity of the amplifier output signal (terminal O/P) should always be **positive**. If the voltage on terminal O/P goes negative with load, return to step D.

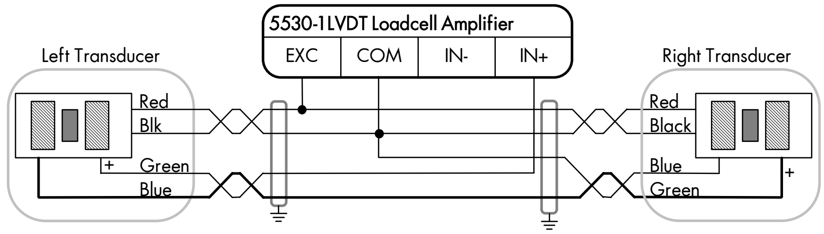
G. Repeat steps E and F until both the zero and loaded readings of tension output are within 0.1 volt of the correct reading. This tolerance gives 1 percent accuracy.

H. Move the rope to each side of the material path. When loaded, the amplifier should give close to the same output (terminal O/P) as when the load is in the center. This step checks for equal outputs from the loadcells. If the reading differs from one side to the other, check the orientation of the loadcells and verify that they have equivalent rating.

Appendix A APPLICATION NOTES

Comptrol Incorporated

Superloadcells and Monocells



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