

# MOOG

## N123-139 Series

### Snap Trac

## Current to Voltage Converter

### SPECIFICATIONS

#### I-V Converter

##### Input:

Polarity of input current must be observed; that is,  $e_3 > e_4$ .

Range of input current is 4 to 20 mA DC.

Other input ranges can be used by plugging in another resistor at R1.

For 1 to 5 mA DC,

R1=1 K $\Omega$ , 1/2 watt

For 10 to 50 mA DC,

R1=100  $\Omega$ , 1/2 watt

For 20 to 100 mA DC,

R1=49.9  $\Omega$ , 1 watt

Input impedance = R1.

##### Output:

Output voltage depends on Jumper settings (see Configuration Chart on next page).

Typically output at terminal 1.

Proportional to input current  $\pm 0.25\%$ .

Minimum load resistance  $\geq 5$  K $\Omega$ .

##### Drift:

Maximum drift =  $\pm 200$  ppm/ $^{\circ}$ C

plus  $\pm 0.65$

mV/ $^{\circ}$ C over a temperature range of  $0^{\circ}$ C to  $50^{\circ}$ C.

##### Frequency Response:

$< -3$  dB down at 2000 Hz.

##### Temperature Range:

$-20^{\circ}$ C to  $50^{\circ}$ C ( $-4^{\circ}$ F to  $122^{\circ}$ F).

##### Power Required:

$\pm 15.0$  VDC at  $\pm 10$  mA DC,

regulated, 3-wire

( $\pm E$ ) at terminals 5, 6, and 7.

This power is available from Model

N121-132A Snap Trac Servocontroller.

The N123-139 Snap Trac Current to Voltage Converter contains a DC current to voltage converter with adjustable zero and span. Typically, this module is used to interface a current output device (such as a process controller) to a servoamplifier. The auxiliary differential amplifier may be used for low level amplification of a signal, or may be custom modified if desired.

### SPECIFICATIONS

#### Aux Amplifier

##### Input:

Two individual inputs at terminals 8 and 9 or

differential input between terminal 8 and 9.

Input signal may range from  $\pm 0.1$  to 100 VDC.

##### Output:

Output signal at terminal 10.

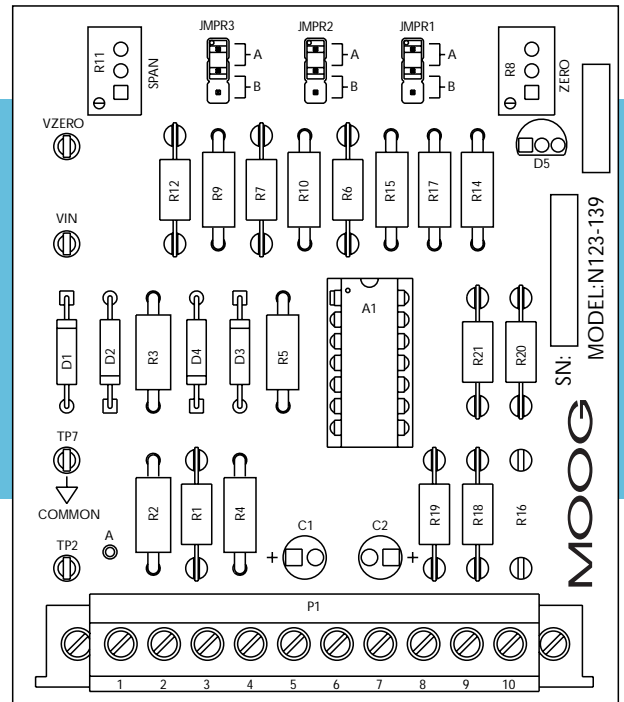
Load impedance  $\geq 5$  K $\Omega$ .

$\pm 10$  VDC max output.

### DIMENSIONS

Converter: 3.25 in x 2.80 in long

Maximum Component Height: 0.69 in

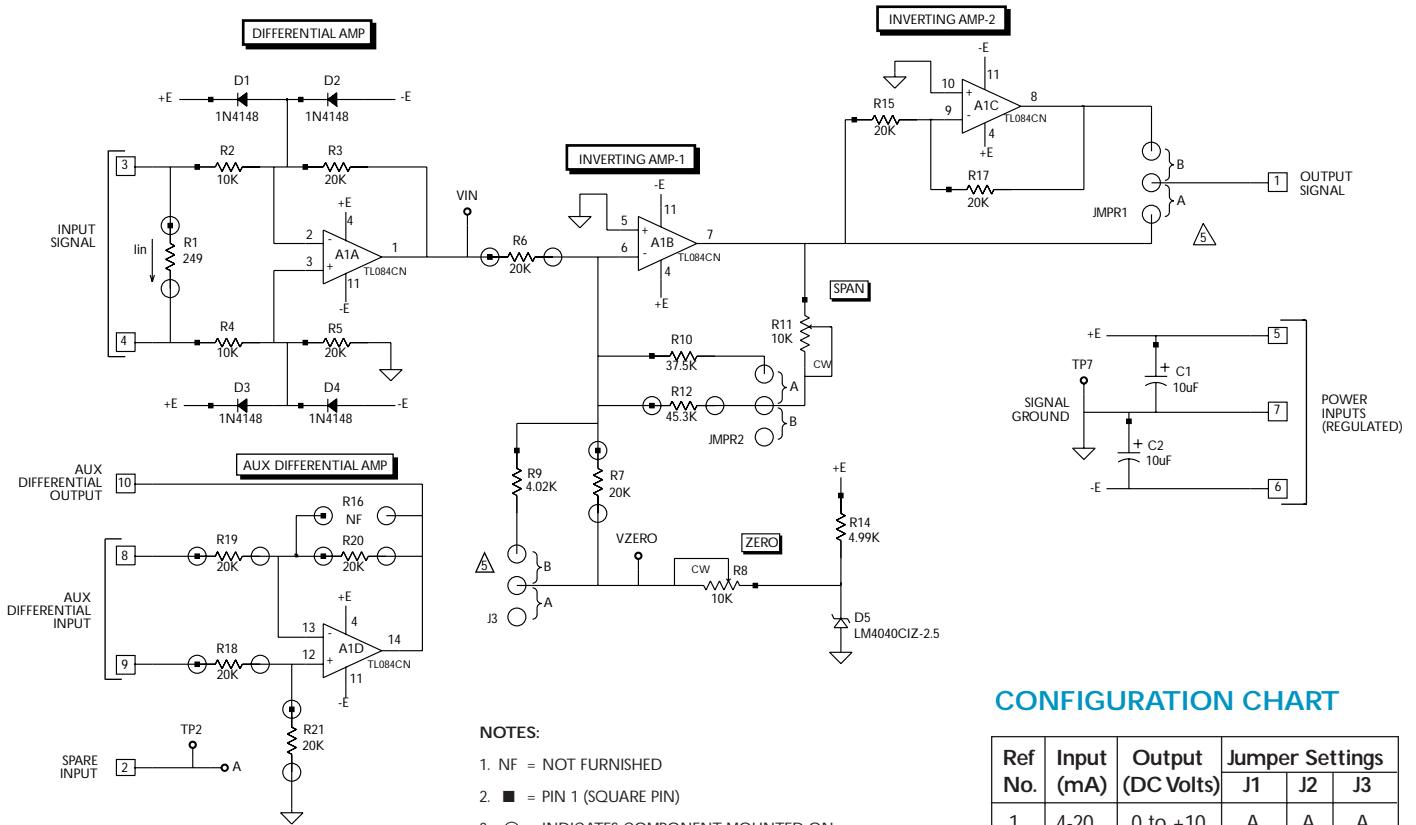


### FEATURES

#### Construction

- Plug-in connectors for quick installation of board.
- Test points on all critical signals for easy system setup.
- Component standoffs on all user-configurable components.
- Twenty-turn potentiometers for all adjustable controls.
- Rugged construction with solder mask for reliability.

# N123-139 CURRENT TO VOLTAGE CONVERTER SCHEMATIC



- NOTES:**
1. NF = NOT FURNISHED
  2. ■ = PIN 1 (SQUARE PIN)
  3. ⊖ = INDICATES COMPONENT MOUNTED ON STANDOFF
  4. CW = CLOCKWISE
- △ SEE STANDARD CONFIGURATION CHART

## CONFIGURATION CHART

Ref No.	Input (mA)	Output (DC Volts)	Jumper Settings		
			J1	J2	J3
1	4-20	0 to +10	A	A	A
2	4-20	0 to -10	B	A	A
3	4-20	-10 to +10	A	B	B
4	4-20	+10 to -10	B	B	B
5	4-20	-5 to +5	A	A	B
6	4-20	+5 to -5	B	A	B

## CIRCUITRY

The input current is applied from terminal 3 to terminal 4. Since R1 is much less than either R2 or R4, the voltage drop across R1 is approximately R1 times the input current. This voltage drop is differentially amplified by A1A to obtain a voltage that is approximately proportional to the input current. A1B is an inverting amplifier with zero and span adjustments to produce an output voltage that depends on Jumper settings (see Standard Configuration Chart).

The output voltage range at terminal 1 is 0.0 to +10.0 VDC.

The polarity of input current must be observed; that is, potential at terminal 3 is greater than terminal 4, or the zero adjustment will not be capable of zeroing the output at terminal 1.

➤ A1C is an inverting amp for output DC voltages which require special neg (-) output ranges at terminal 1, including 0 to -10V, +10V to -10V and +5 to -5V. For these ranges, J1 is in position 'B'.

➤ A1D is an aux differential amp for general low level signal amplification. Input signals are applied to terminals 8 and 9, with the output signal at terminal 10. Output voltage range at terminal 10 is ±10 VDC.

## ADJUSTMENTS

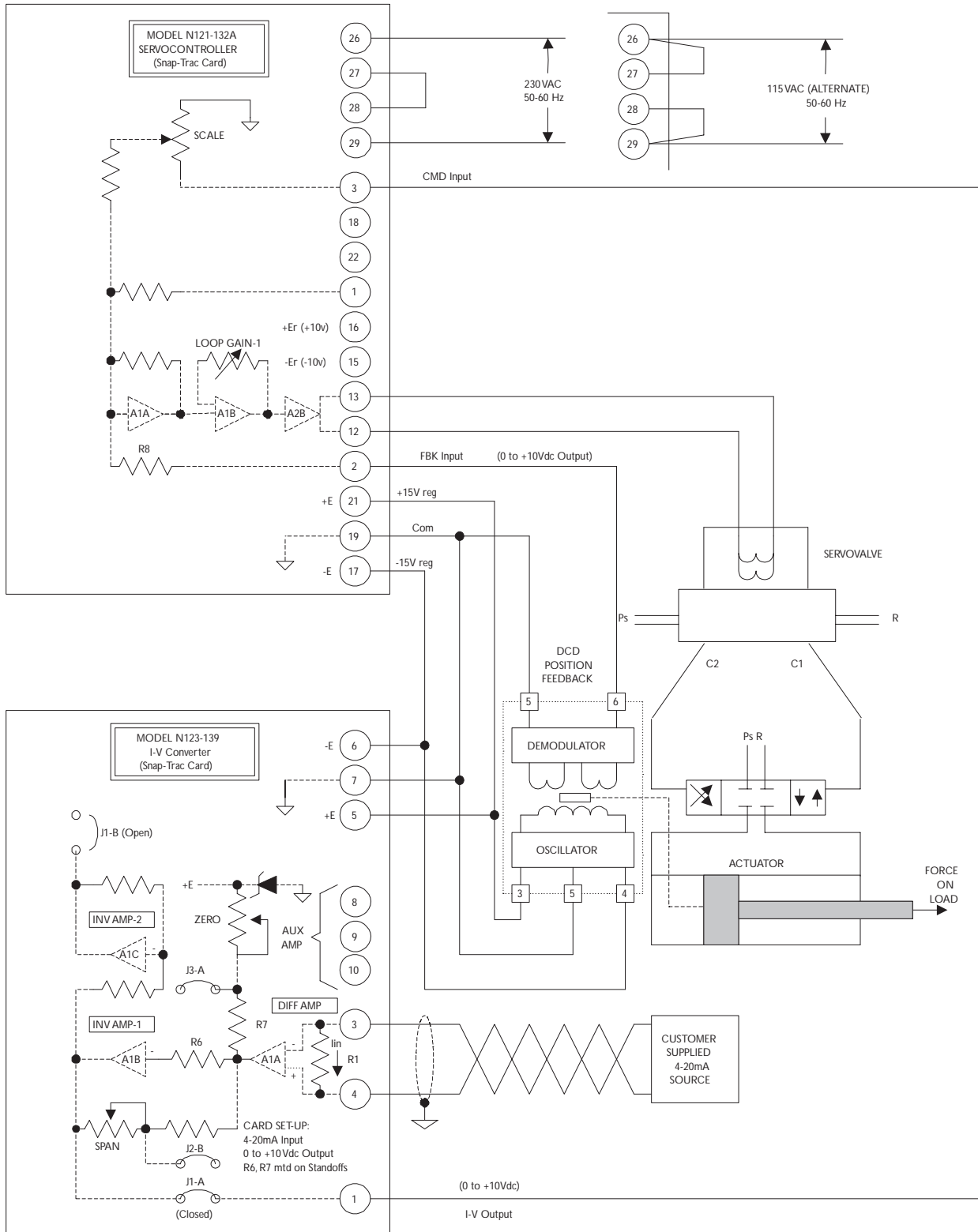
**Zero (R8)** – sets zero output with minimum input current.

**Span (R11)** – sets signal sensitivities. (e.g. +10VDC output for +20mA DC input)

### MOUNTING:

Mount using Curtiss type TR-3 plastic track (Moog P/N 65419-1)

# CLOSED-LOOP POSITION CONTROL (3-STAGE VALVE)

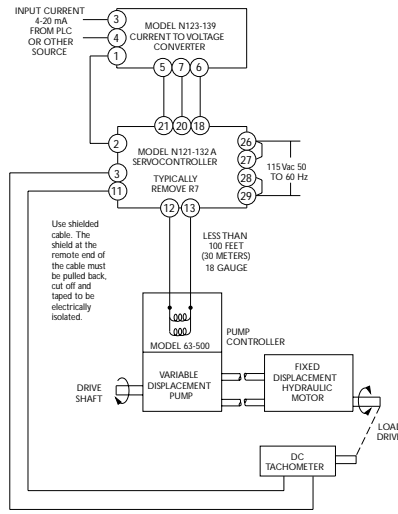


## CLOSED-LOOP VELOCITY CONTROL WITH ACCELERATION LIMIT

Closed-loop velocity control with acceleration limit can be achieved through the use of a servo-amplifier. Typically, a packaged rotary servomotor is used, and the velocity is measured by a DC tachometer driven directly, or through gearing, from the back of the motor shaft. The velocity command signal is obtained from a potentiometer or a command source such as a Programmable Logic Controller (PLC). Integral control is used for improved speed tracking performance.

Moog Technical Bulletin TB122 contains a detailed summary of sizing criteria and performance characteristics of velocity servos using servomotors.

In these examples, the Current to Voltage Converter is used to interface with the 4mA to 20mA current command source from a PLC to the voltage input of the servoamplifier.



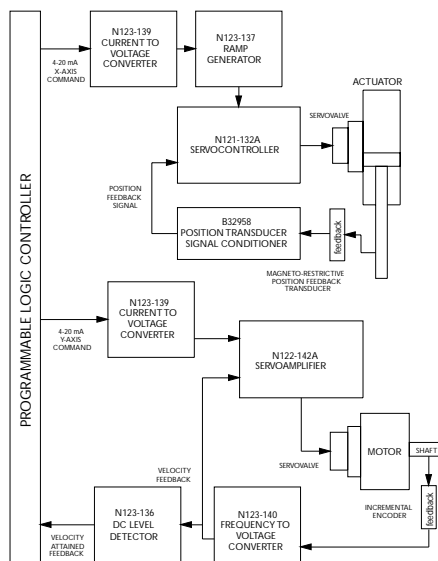
Snap Trac Example

### Suggested Setup Procedure:

1. Turn off hydraulic power and relieve pressure.
2. Set the GAIN pot (R4) and the INTEGRATOR pot (R58) on the N121-132A card approximately five turns from full counter-clockwise.
3. Set the SCALE pot (R9) on the N121-132A card fully clockwise.
4. Remove the tachometer connection from terminal [3] on the N121-132A card.
5. Apply electrical power.
6. Adjust ZERO (R8) and SPAN (R11) on the N123-139 card so that 4-20 mA input corresponds to  $\pm 10$  V output to the N121-132A card. Refer to the N123-139 line card.
7. Re-connect the tachometer lead to terminal [3] on the N121-132A card.
8. Adjust the GAIN pot (R4) and (R58) on the N121-132A card for maximum (clockwise) with stable controller coil current (no oscillation).
9. Set the SCALE pot (R9) on the N121-132A card for desired speed range vs command signal range. Check the stability of the system throughout full speed and load range.
10. Adjust the BIAS pot (R16) on the N121-132A card for zero load speed at zero command input.

## TWO AXIS PROGRAMMABLE LOGIC CONTROLLER (PLC) SERVOSYSTEM

The rotary X-axis uses a Current to Voltage Converter as an interface between the PLC and the servoamplifier, which consequently provides closed-loop control of the valve/motor drive. The Frequency to Voltage Converter card decodes the pulsed output of the incremental encoder and provides a DC output feedback voltage proportional to the rotational speed of the motor. The DC Level Detector is configured to trip at a preset feedback voltage level to provide feedback to the PLC when the desired motor speed has been obtained.



Snap Trac Example

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