

MOOG

N123-134 Series Exciter/Demodulator

SPECIFICATIONS

Input

Differential input across terminals 10 and 11.

AC input signal level should be from .07 to 7.0 Vrms for ±10 VDC output.

Input impedance can be assumed to be 40KΩ (with standard values of R30, R31, R32, and R33).

Outputs

Excitation Output:

Frequency varies with C3, C4, and R3.

As shipped: Freq. varies 100 to 2,000 Hz

Remove C3—Freq. varies 500 to 10,000 Hz

Amplitude—2 to 11 V p-p
Stability—amplitude varies ≤ 250 ppm/°C

Demodulator Output:

to ±10 VDC nominal at Terminal 12

Ripple: < 40 mV p-p at ≥ carrier freq.

Linearity: ≤ ±0.2% at 1.2 kHz

Stability: ≤ 250 ppm gain/°C ±0.1 mV/°C

Polarity: Output at terminal 12 is negative when voltage at terminal 11 is in phase with terminal 3

Load Impedance: > 5KΩ

N123-134 Exciter/Demodulator: This Snap Trac module contains a power oscillator and a demodulator for use with LVDT's, synchros and other carrier excited, amplitude modulated, transducers. Carrier frequencies can be set from 100 to 10,000 Hz.

SPECIFICATIONS

Demodulator Gain: General expression for gain of the DC voltage at terminal 12 assuming R33=R32, R31=R30 and R34 fully CW (i.e. max span setting)

$$e_{12} = 1.41 \cdot \frac{R_{32}}{R_{30}} \cdot \frac{R_{37}}{R_{38}} \cdot \frac{R_{45}}{R_{39}} (e_{11} - e_{10}) \text{ VDC}$$

where e_{10} and e_{11} are Vrms

Differential Amplifier Gain:

$$V_{out} = \left(\frac{R_{32}}{R_{30}} \right) (e_{10} - e_{11})$$

Frequency Response: Phase lag of demodulator output signal increases linearly from 0° to 180° as frequency of modulation increases from zero to the carrier frequency.

Temperature Range:

-20°C to 50°C (-4°F to 122°F)

Power Required:

±E: ±15 VDC reg, 3-wire @ ±50 mA at pin-6, 7 & 8

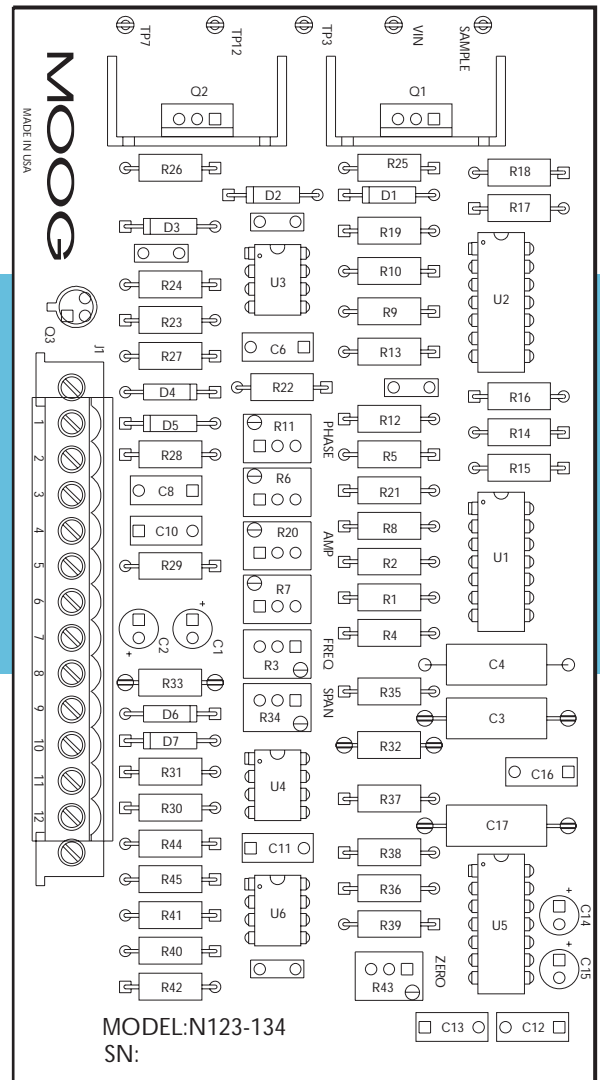
±V: ±15 VDC to ±22 VDC unreg @ ±40 mA, 3-wire at pin-1, 2 & 9 (or 7)

This power is available from the Model N121-132A Snap Trac Servocontroller.

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.



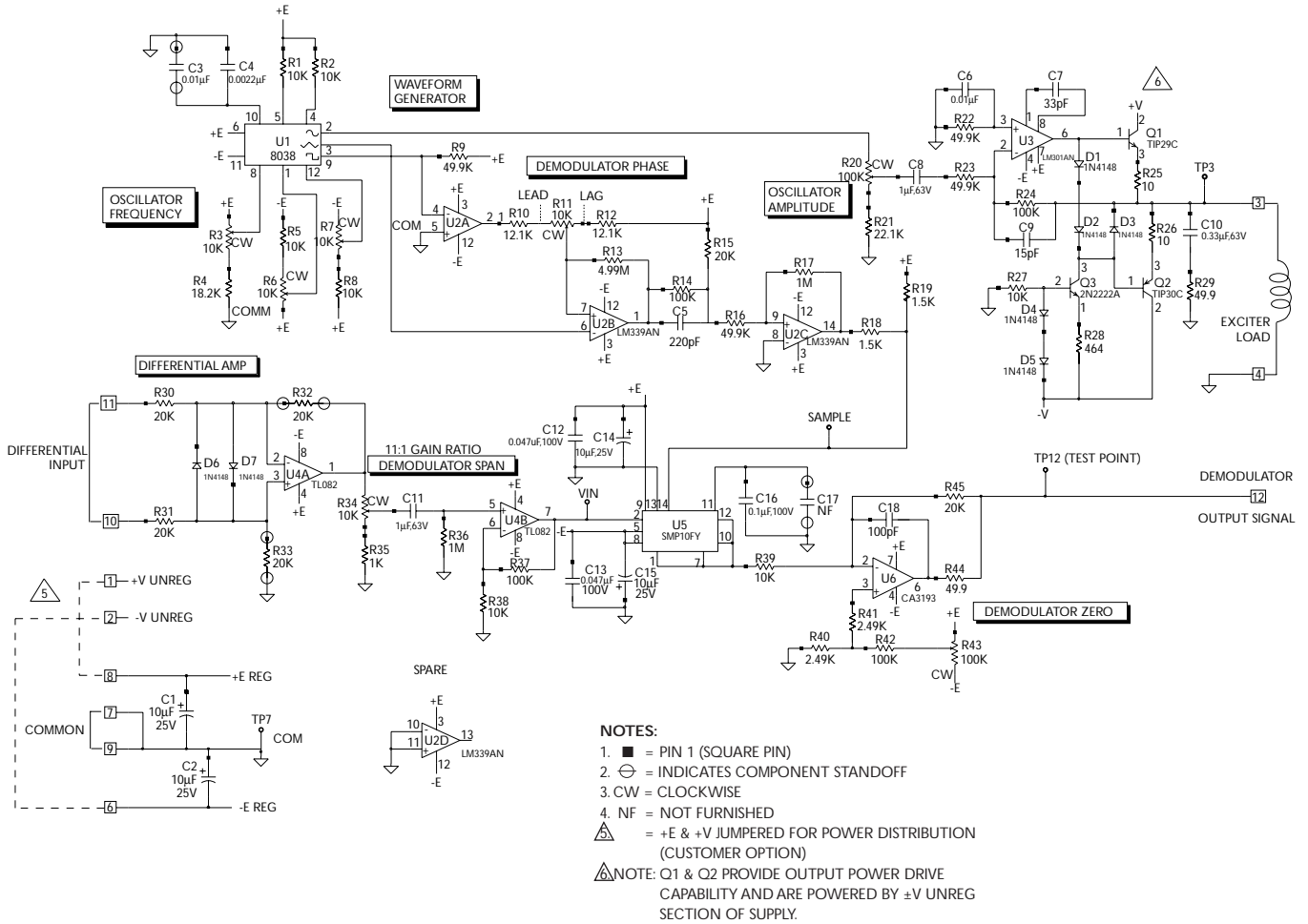
MOUNTING HARDWARE

- PVC Snap Trac, Part Number 65419-1

DIMENSIONS

Exciter/Demodulator: 3.25 in x 6.00 in long
Maximum Component Height: 2.42 in

N123-134 EXCITER/DEMODULATOR SCHEMATIC



CIRCUITRY

A precision waveform generator (U1) provides square, triangular and sinusoidal signals. The frequency of these signals is controlled by R3, R4, C3 and C4. U3 controls the amplitude of the sine wave between 2 and 11 volts peak to peak depending upon the setting of potentiometer R20. Transistors Q1 and Q2 provide output power drive capability. The load to be excited is connected between terminals 3 and 4.

The demodulator consists of a differential amplifier (U4A), an adjustable span potentiometer (R34), and a sample and hold integrated circuit (U5). The sampling pulse for

U5 is generated when the voltage of the triangular wave rises above an adjustable reference voltage (R11). Potentiometer R11 adjusts the phase of the sampling pulse over a 150° range of the signal to be demodulated. This allows triggering of the sample and hold circuit at the peak amplitude. Inverting amplifier U6 provides zero adjustment of the sampled signal. The demodulated signal is available at terminal 12.

Diodes D6 and D7 provide OP AMP protection against excessive voltage differential between the input terminals.

ADJUSTMENTS

FREQ (R3) – provides trimming capability for exciter frequency

AMPL (R20) – trims excitation amplitude

PHASE (R11) – adjusts timing of trigger pulse for peak sampling of signal to be demodulated

SPAN (R34) – provides approximately 11:1 gain adjustment of the signal to be demodulated

ZERO (R43) – provides a zero adjustment of the signal to be demodulated

TEST SET-UP PROCEDURES

1. Verify ± 15 VDC at Pins 6 & 8. All voltage measurements are with respect to Pin-7 or TP7 (PC Board Analog Common).
2. Verify Factory Setting: As shipped, frequency varies 100Hz to 2Khz. Frequency varies with C3, C4 & R3.
3. Remove C3 to vary frequency range from 500Hz to 10Khz.
4. Ensure proper exciter frequency is selected & configured on card.
5. Connect Ch1 of Scope to TP3 & monitor voltage waveform.
6. Adjust potentiometer R6 & R7 for Sinewave at TP3. Verify Waveform Symmetry as required. Note: Pots are factory set & should only be adjusted if waveform symmetry is not observed.
7. Adjust OSCILLATOR FREQUENCY pot (R3) for desired exciter frequency.
8. Adjust AMPLITUDE pot (R20) for approximately 3 to 4 Vp-p at TP3. Ensure saturation is not occurring as indicated by upper & lower flat waveform sections.
9. Connect Ch1 of Scope to Test Point "Vin" and Ch2 to Test Point "Sample"
10. Adjust DEMODULATOR PHASE pot (R11) until Sample Pulse occurs at Sinewave 'peak' (LVDT offset from Zero). Refer to attached waveform diagrams.
 - ii. The sample pulse will be a very 'narrow' pulse as indicated on waveform plotted from oscilloscope results.
12. The DEMODULATOR PHASE pot (R11) adjusts timing of trigger pulse for peak sampling of signal to be demodulated. By adjusting R11, the 'sample' pulse can be adjusted more than 150° of Ch1 waveform (ex. $\approx 40\%$ of the waveform).
13. Referring to attached diagrams, Figure A indicates sample pulse alignment required with LVDT ac waveform output for the 'positive' core position.
14. Figure B Indicates sample pulse alignment required with LVDT ac waveform output for the 'negative' core position. Figure C Indicates sample pulse alignment at the LVDT null or zero position.
15. Connect Scope to Output Test Point TP12.
16. Adjust DEMODULATOR SPAN pot (R34) and DEMODULATOR ZERO pot (R43) to obtain proper scaling at TP12 while moving LVDT over linear range. Ensure Demodulator Span output (U4B) does not enter saturation.
17. Span & Zero interaction is normal. Multiple iterations may be required. Continue to repeat steps until both are within specification without further adjustment.
18. **Note:** Operating points on ends of LVDT coils will become increasingly non-linear and should be avoided. An operating range over the \pm Span of the LVDT core adjustment must be made to achieve linear performance results.

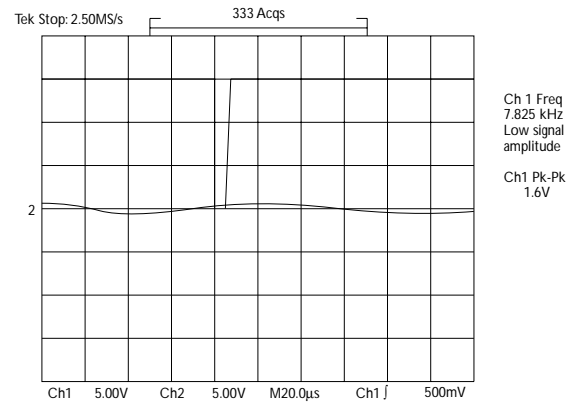


Figure C

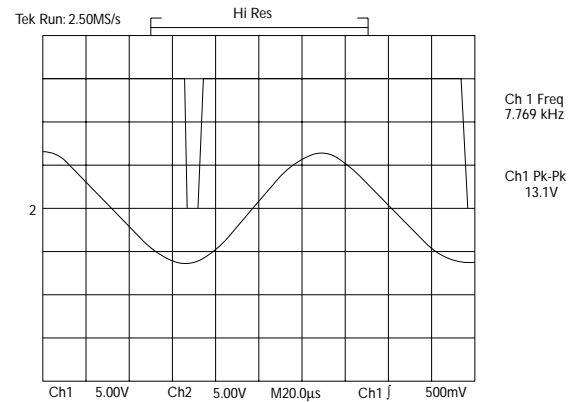


Figure B

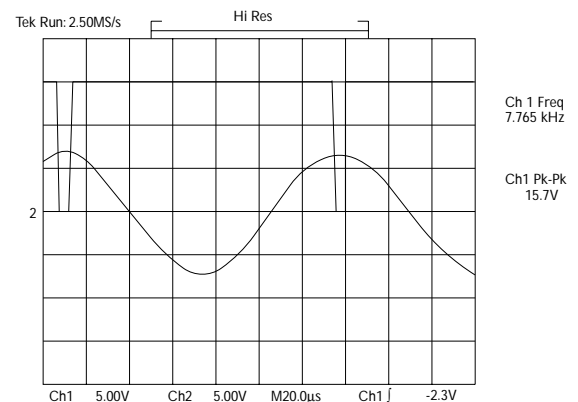


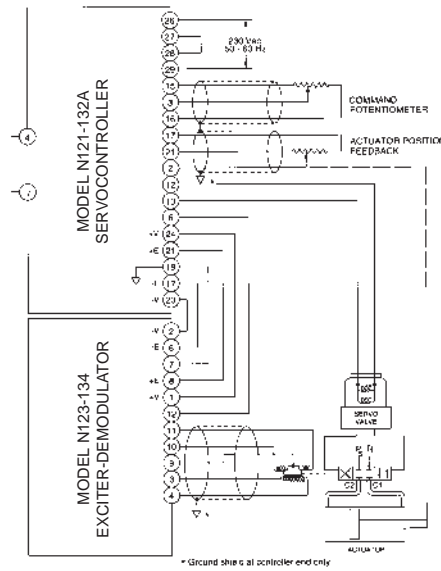
Figure A

SNAPTRAC EXAMPLE

Suggested Setup Procedure:

(Reference Moog Documents N121-132A and N123-134)

1. Turn off hydraulic power and relieve pressure.
2. Set the GAIN pots (R4 and R43) on the N121-132A card approximately five turns from full counter-clockwise.
3. Set the SCALE pot (R9) on the N121-132A card full clockwise.
4. Apply electrical power.
5. On the N121-132A card, temporarily remove the feedback connection from terminals [2] and [6]. Adjust the BIAS pot (R16) for zero coil current at midstroke of the command pot. Re-connect terminal [2].
6. Apply hydraulic pressure.
7. Adjust the N123-134 Exciter/Demodulator card for proper GAIN (R34) and PHASE (R11) by monitoring the voltage at terminal [12].
8. Re-connect terminal [6] of the N121-132A card. Turn the SCALE pot (R9) full counter-clockwise.
9. Increase the GAIN pots (R4, R43) clockwise until the system exhibits the desired sensitivity. Check the stability of the system throughout the full load range.
10. Adjust the BIAS pot (R16) for mid actuator position at zero command signal, or as desired.



Modifications to the N121-132A card:

(Reference Moog Document N121-132A)

- Set the jumpers for proportional control only.
- Insert R45=20K Ω .

MOOG
 Industrial Controls Division
 Moog Inc., East Aurora, NY 14052-0018
 Telephone: 716/655-3000
 Fax: 716/655-1803
 Toll Free: 1-800-272-MOOG