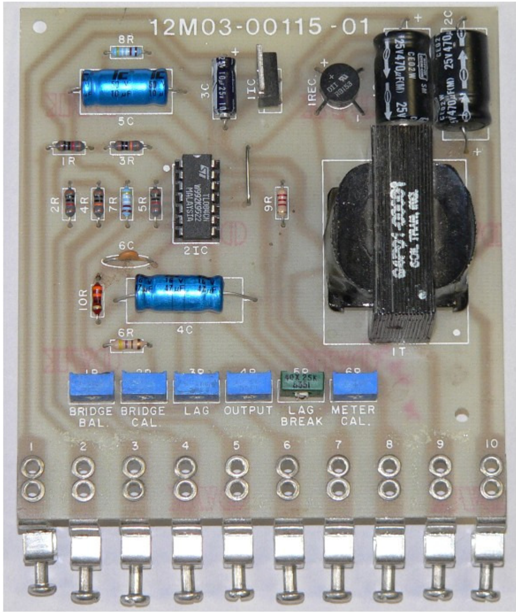
MODEL 222 LOAD CELL AMPLIFIER

PART NUMBER 12M03-00115



GENERAL DESCRIPTION

The MODEL 222 LOAD CELL AMPLIFIER is designed for use with semi-conductor type strain gages to measure and/or control process variables such as pressure, torque, acceleration or tension. It takes its input signal from a four-leg strain gage bridge and amplifies it to a nominal ten volt DC full-scale level.

An internal strain gage bridge power supply eliminates large common mode voltages. In addition, it uses dual-band selective compensation circuitry to permit high gain and fast response at operating speeds but reduces gain at critical higher frequencies. A separate meter-driver amplifier is included to provide damped output to a 1mA DC meter.

Advanced circuit design insures a high level of accuracy, noise immunity and reliability in industrial environments. A field-proven mounting arrangement provides reliable connection, but allows easy removal without disturbing permanent wiring. Front access and detailed technical manual makes installation and service easy.

The MODEL 222 LOAD CELL AMPLIFIER can be used with other REFLEX® SERIES 200 CONTROL MODULES and POWER CONVERTERS for precise control in many applications. It is compatible with equipment of other manufacturers.

FEATURES

- COMPACT, SELF-CONTAINED
- MODERATELY PRICED
- HIGH PERFORMANCE
- COMPATIBLE WITH EQUIPMENT OF OTHER MANUFACTURERS
- POSITIVE, FRONT ACCESS CONNECTION
- EASILY REMOVED, REPAIRED OR REPLACED
- CONSERVATIVELY RATED FOR RELIABILITY
- DETAILED TECHNICAL MANUAL

TYPICAL APPLICATIONS

- TENSION INDICATION AND/OR CONTROL IN CONTINUOUS PROCESSES
- CONSTANT TENSION WINDERS

SPECIFICATIONS

SUPPLY: 120V AC ±10%
50/60 Hz, Single Phase

AMBIENT TEMPERATURE: 0° to 40°C
(32°-104°F) 50°C in Cabinet

INPUT: From strain-gage bridge with 120 ohms nominal per leg. 100mV minimum input for full output with the bridge excited with 6 volts DC.

OUTPUTS: Adjustable up to ±10V DC @ 5mA at terminal 6. ±1mA to a 1mA meter at terminal 7.

ADJUSTMENTS: Bridge Balance, Bridge Calibrate, Meter Calibrate, Output Adjust, Lag, Lag Break

OPTIONS

- SIGNAL ISOLATOR
- COMPATIBLE WITH OTHER SERIES 200 CONTROLS (See Bulletin SB200)
- SYSTEM APPLICATION DIAGRAMS AVAILABLE

GEMINI CONTROLS LLC
W61 N14280 TAUNTON AVE.
PO BOX 380
CEDARBURG, WI 53012
www.geminicontrols.com

PHONE: (262)-377-8585
FAX: (262-377-4920
email:sales@geminicontrols.com

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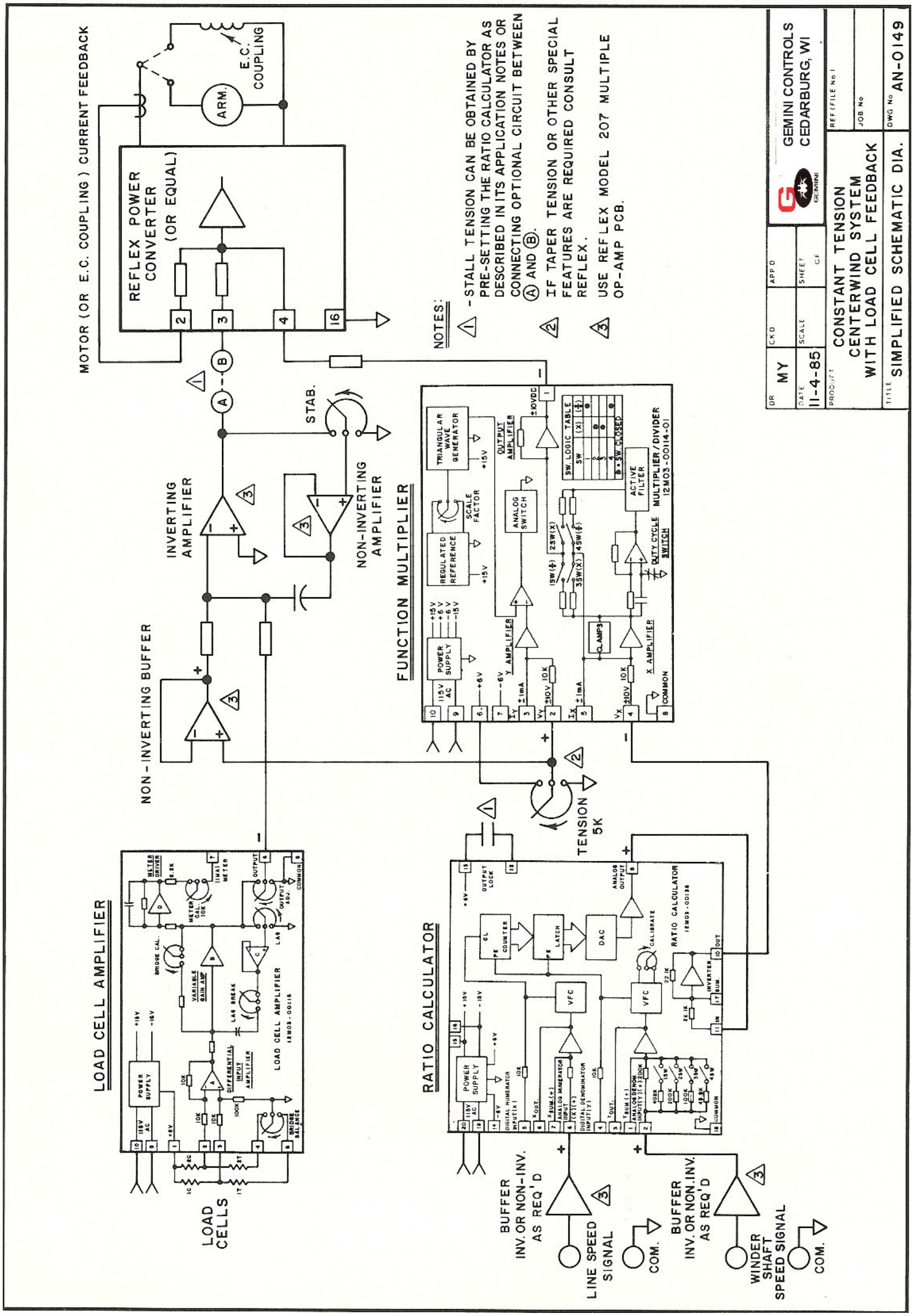

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Part Number 12M03-00115-01
APPLICATION NOTES

1. Install the Load Cells according to the manufacturer´s recommendations, and make the electrical connections as shown on the schematic diagram.

   If a single load cell is used (a common practice when measuring tension in wire or a narrow web) use a second "dummy" load cell or two 120 ohm resistors in place of one load cell.

2. Determining Transducers Required for webs, sheets, wire, or other continuous material. To determine the size of transducer required for a particular application, the Maximum Working Force (MWF) must be calculated. Refer to Figures 1a & 1b and select the appropriate transducer configuration dependent upon physical location of the transducers and web path.

   The following factors will be required to determine MWF, and are most easily obtained from machine layout or assembly drawings and process operating specifications:

   1. Angle A (degrees) - Wrap Angle
   2. Angle B (degrees) - Angular difference between vector sum of tensions and weight vector of sensing or guide roll.
   3. Weight W - Weight of sensing or guide roll (includes pillow blocks and associated hardware).

      NOTE: W must be less than 1/2 calculated MWF to insure measured tension is within range of transducers.

   4. Tension T - Maximum process tension force to be measured and/or controlled.

   Using the following formula, calculate the Maximum Working Force:

   $$MWF = T \sin \frac{A}{2} (\cos B + \sin B) \pm \frac{W}{2}$$

   The appropriate algebraic sign preceeding the W/2 term in the above equation is determined by the vector relationship of the Weight and the vector sum of the Tensions in the material being measured.

   If the angle betweeen the Weight vector (vertical) and the sum of the Tension vectors is less than 90°, the sign is positive. For angle greater than 90° but less than 270°, the sign is negative.

   After determining the Maximum Working Force, select transducers rated for a MWF equal to or greater than the calculated MWF.

3. Transducer Loading - The following equipment is required to "load" the sensing roll to facilitate amplifier calibration:

    1. Length of rope, belt or similar material. (Maximum working strength at least 2 times maximum tension.)

       NOTE: The length required depends upon the dimensions of the machine utilizing the transducers.

    2. Spring scale or similar device with a maximum rating equal to or greater than the maximum tension to be measured.

    3. Ratchet winch or similar device with a capacity greater than maximum tension to be measured.

   Refer to Figure 2 for a typical measurement configuration.`

   The rope or belt is run in the same path as the material in which the tension is to be monitored. Termination points for the rope and Ratchet Puller must be selected carefully to avoid damage during loading of the sensing roll. The sensing roll and any other rolls that are utilized (idler or pull rolls) must be free to rotate to ensure accurate tension measurements. Wide web configurations may require additional considerations to avoid overstressing rolls and causing damage. The configuration shown in Figure 2 can be duplicated to distribute load across the sensing roll. Total tension equals the sum of individual tensions. Avoid situations where the weight of the spring scale and ratchet puller will add or subtract from tensions being measured.

4. Amplifier Calibration - To facilitate calibration, place a multimeter, set to 10 VDC scale across terminals 6(+) and 8(-).

    a. Set adjustments initially as follows:

Bridge Balance	50%
Bridge Calibrate	50%
Lag	50%
Lag Break	50%
Output	100%
Meter Calibrate	50%

    b. Adjust "Bridge Balance" (1P) for zero output at terminal 6 and 8. This adjustment compensates for differences between load cells and weight of the sensing roll.

    c. "Load" the transducer sensing roll to a known tension value as close to rated as possible. (See Transducer Loading).

d. Adjust "Bridge Calibrate" (2P) for required output at terminals 6 and 8 (typically ±10 VDC).

   NOTE: Polarity of the amplifier output is determined by the application (If the Load Cell controlled drive is downstream, an increase in Load Cell output should decrease speed or torque. If the Load Cell controlled Drive is upstream, an increase in Load Cell output should increase speed or torque.). To reverse polarity, reverse leads to terminals 2 & 3.

e. "Unload" the transducer sense roll. Output should return to zero. If not, repeat steps b thru e.

f. If the optional Tension Meter is used, repeat Step c and adjust "Meter Calibrate" (6P) for desired Tension Meter reading.

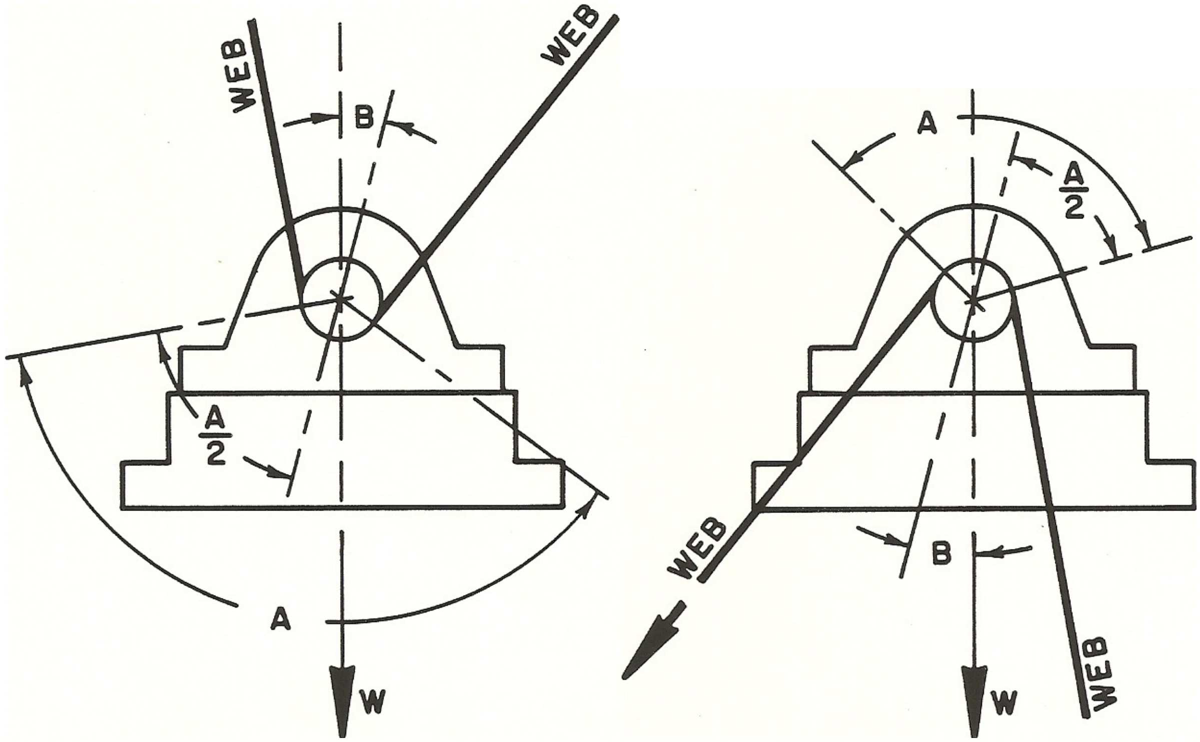
g. Load Cell Amplifier calibration is complete.

5. Stability Adjustments - Increasing the "LAG" potentiometer clockwise will make the control more sluggish. This may be desirable in applications where the process causes unnecessary movement of the Load Cell (as when winding an eccentric roll).

   The "LAG BREAK" potentiometer should be adjusted in conjunction with the "LAG" potentiometer for optimum response.

   Decreasing the "OUTPUT" potentiometer counterclockwise, will reduce the amount of control the Load Cell has on the system. The output potentiometer may be turned to zero (CCW) during startup to isolate the drive from Load Cell control.

6. The circuit is applicable to other strain gage measurements such as weight and also for use for "Wheatstone" type bridges in other forms of transducers measuring pressure, torque, acceleration and other variables.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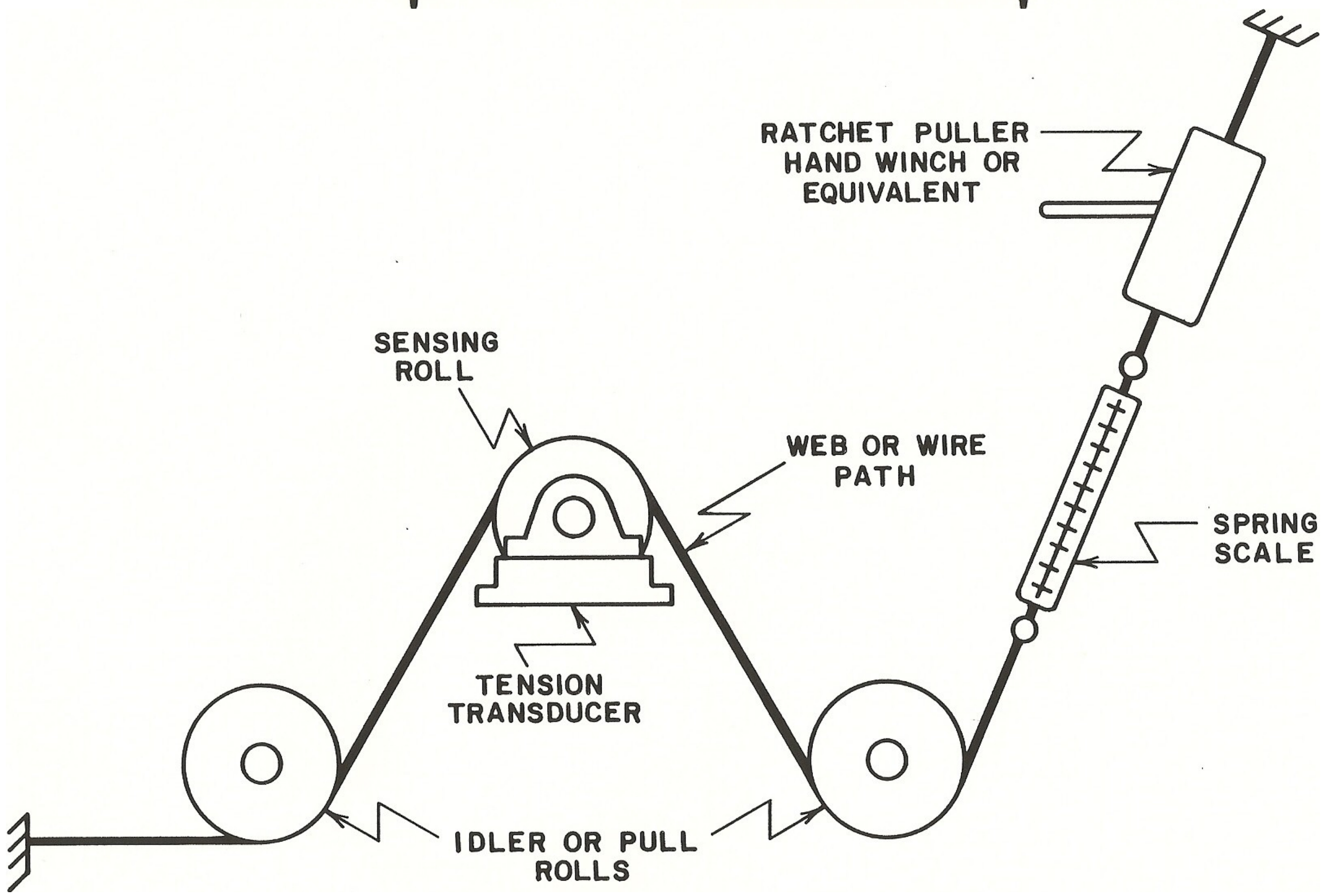
RATCHET PULLER HAND WINCH OR EQUIVALENT
SENSING ROLL
WEB OR WIRE PATH
SPRING SCALE
TENSION TRANSDUCER
IDLER OR PULL ROLLS