DUAL MODULE
DIGITAL RODCELL SYSTEM

INSTRUCTION MANUAL
B-329

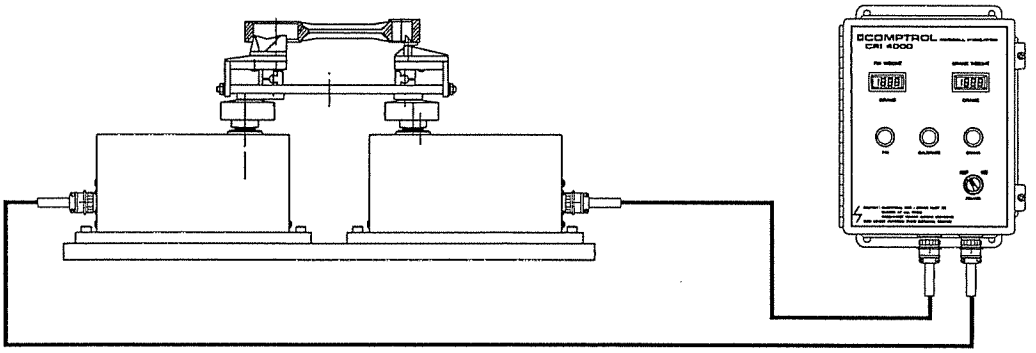

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TABLE OF CONTENTS

Printed in the U.S.A.

Form B-329-09-99

INTRODUCTION

This manual is intended for use by qualified personnel to assist them in the safe installation, setup, and operation of Comptrol Digital Rodcell Systems. Comptrol Incorporated has made every effort to insure the accuracy and completeness of the information and recommends that all procedures be read and understood before performing them. Please contact Comptrol Incorporated with any questions regarding any information contained in this manual.

SYSTEM OVERVIEW

Comptrol's Digital Rodcell System is designed to simultaneously weigh both the pin end and crank end of a connecting rod and indicate the precise off-balance weight for each end. The system includes the Rodcell Assembly, the Rodcell Indicator, the Cradle Assembly, and two cables for connecting the Rodcell Assembly to the indicator enclosure. A master weight rod and calibration weight are also provided for calibrating the system.

The Rodcell Assembly consists of two Rodcell Bodies - one for weighing the crank end of the connecting rod, the other for weighing the pin end. The bodies are mounted to a base or other custom structure to meet the user's mounting requirements and to provide the proper spacing between the two bodies.

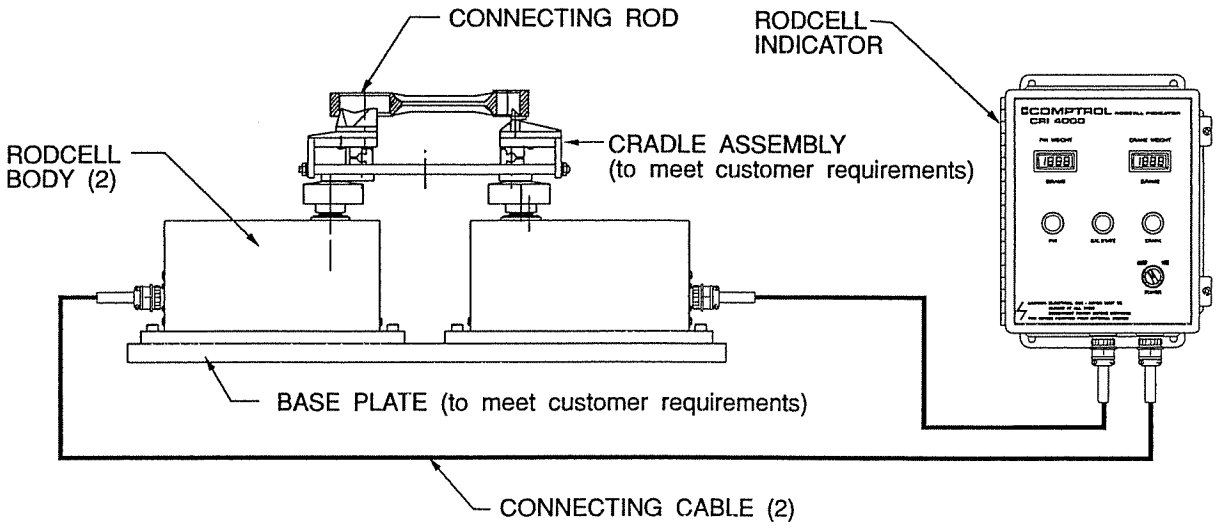
Comptrol Rodcells measure the difference between the actual weight of the connecting rod and the desired ideal weight set by the master rod during setup. When a connecting rod is placed on the cradle, the mechanical force of the applied weight at each end is converted into an electronic signal directly proportional to the amount of over or under weight. For a perfectly balanced connecting rod, the Rodcell produces zero electrical output indicating zero deviation.

The analog signal from the weighing device is converted into a digital signal by the microprocessor based electronics inside each Rodcell Body. The microprocessor digitally conditions and processes the input, and outputs a signal representative of the weight deviation to the Rodcell Indicator. The amount of the deviation is displayed in grams on the respective digital display.

The microprocessor in each body also calculates and compensates for weight transfer inherit in any balancing applications. During operation, the microprocessors communicate weight data back and forth, and factor in the compensation value stored in nonvolatile EEPROM during setup.

When the connecting rod is lifted off the cradle, the system automatically rezeroes itself, and the pin and crank end weight data can be transmitted in ASCII formatted text via the RS-422 or RS-232 serial interface. The autozeroing feature negates the effects of temperature, dirt, and chip buildup on the accuracy of the next weight reading.

Connections are also provided in the indicator enclosure for two ±3 volt DC outputs. These outputs can be fed to a PLC or system controller. In an automated connecting rod balancing process line application, these outputs may be used to control the motion of a machine to remove excess material or for rejection of undersized parts.



INSTALLATION

NOTE: Comptrol Digital Rodcell Systems are designed for ease of installation, calibration, and operation. Therefore, it is possible to functional check the system prior to installation. Refer to the Electrical Connection and Calibration sections in this manual for the proper procedures. If the Cradle is not assembled to the Rodcell Assembly refer to the Cradle installation and removal procedures.

HANDLING

Comptrol Rodcell Systems and related equipment are carefully packaged and secured in wooden crates for shipment.

NOTE: Insure that the proper handling equipment is available for lifting and moving equipment that cannot be handled manually.

If the system is to be stored for any extended period time, protect the equipment from exposure to weather, dirt, and moisture.

Upon receipt:

1. Inspect the entire shipment for external damage.
2. Check the contents against the packing list and inspect all electrical and mechanical components for physical damage.
3. Promptly report any shortages or damage to the carrier and Comptrol Incorporated.

MECHANICAL INSTALLATION

1. Check drawings and/or other documentation for the location of the Rodcell Assembly. Verify the proper mounting bolt pattern to attach the Comptrol equipment.
2. Position and align the Rodcell Assembly per the layout requirements.
3. Place a production connecting rod on the cradle assembly and check for proper clearance between the rod and surrounding machine frame and moving members.

   NOTE: If the cradle assembly is shipped separate from the Rodcell Assembly, refer to Cradle Installation and Removal on page 7.

4. Attach Rodcell Assembly base to mounting surface. Tighten all mounting and leveling screws.
5. Check for proper positioning of the production rod on cradle. Refer to Cradle Assembly section on page 7 for proper connecting rod position. Make sure the connecting rod is level when positioned on the cradle. If not make the necessary adjustments at the Rodcell Assembly base.

   NOTE: Each cradle assembly is custom designed to meet specific connecting rod locating and dimensional requirements, and should not be used for connecting rods other than those specified.

ELECTRICAL INSTALLATION

The CRI-4000 Rodcell Indicator is assembled in a self-contained, stainless steel enclosure. It can be wall or pedestal mounted, or housed in a cabinet or console.

When selecting a location for the enclosure consider:

- Operator accessibility to CALIBRATE pushbutton and power switch pushbutton during setup and operation
- Visibility and legibility of the digital readouts
- Proximity of the enclosure to the Rodcell Assembly for connecting the indicator to the Rodcell Bodies. Two cables are provided with the system.
- Clearance for opening the door of the enclosure and making electrical connections.

After selecting the location, securely mount the enclosure in position. Refer to dimension drawing on page 9 for the mounting hole locations.

ELECTRICAL CONNECTIONS

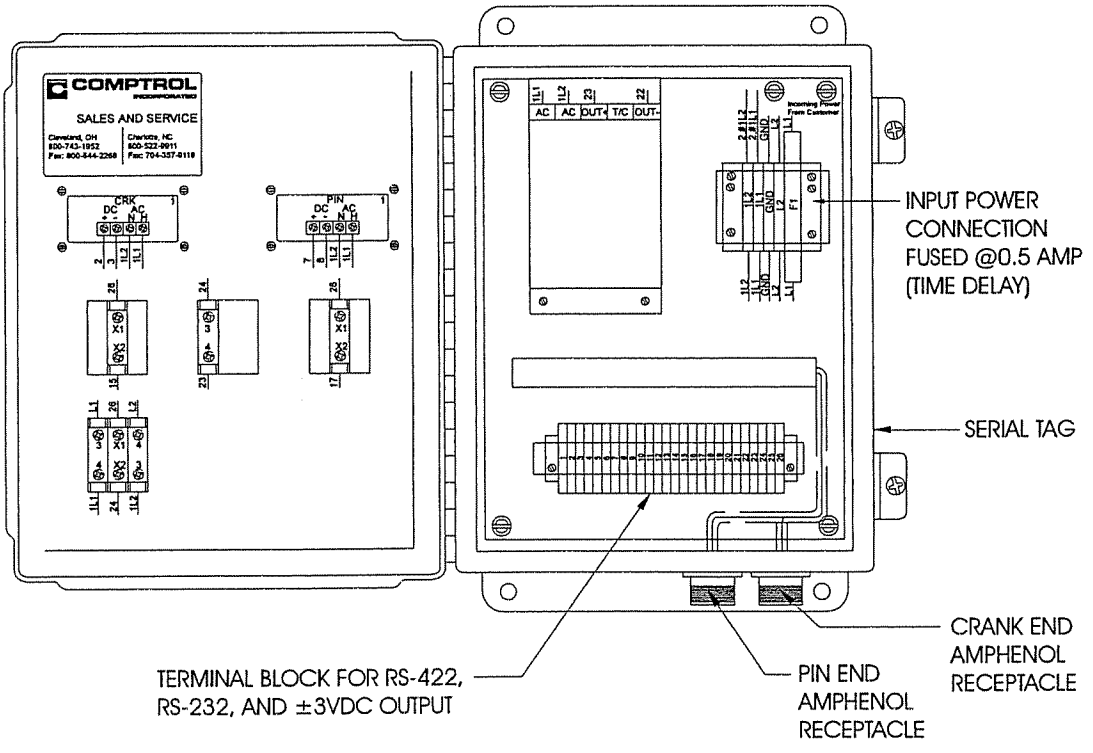
The CRI-4000 Rodcell Indicator is factory wired for either 120 VAC (CRI-4000-1) or 240 VAC (CRI-4000-2). Refer to the serial tag on the right side of the enclosure for proper voltage requirements.

Input Power

Power Requirements: CRI-4000-1 ..... 120 VAC, 1ph., 50-60Hz, @ 12 Watts
CRI-4000-2 ..... 240 VAC, 1ph., 50-60Hz, @ 12 Watts

Connect L1, L2, Gnd terminals located in upper right corner of enclosure as follows:

Terminal	CRI-4000-1	CRI-4000-2
L1	Hot	L1
L2	Neutral	L2
Gnd	Ground	Ground

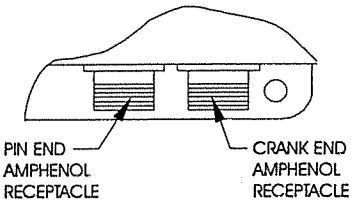


Indicator to Rodcell Assembly

The system includes two interchangeable cables with identical Amphenol connectors on both ends to connect the Crank and Pin End Rodcell Body to the CRI-4000 Indicator.

Pin End — Connect the end of one cable to the Amphenol connector on the pin end Rodcell Body, and the other end to the left Amphenol receptacle on the bottom of the indicator enclosure.

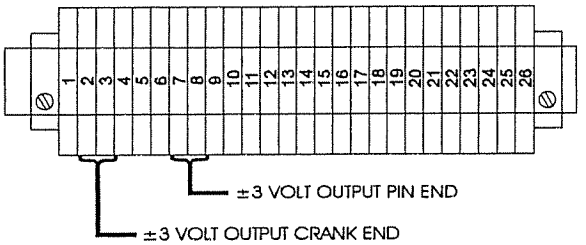
Crank End — Connect the end of the other cable to the Amphenol connector on the crank end Rodcell Body, and the other end to the right Amphenol receptacle on the bottom of the indicator enclosure.



±3 Volt Output Connections

The table below shows the terminal connections for the pin and crank end ±3 volt outputs.

TB#	Output Function
2	V out (CRANK)
3	COM
7	V out (PIN)
8	COM
1, 13	Shield to Ground



RS-422 or RS-232 Serial Connections

These terminals may be wired to send either pin end data first followed by crank end data, or crank end data first followed by the pin end data. The following table shows the terminal block connections required.

TB#	Function	TB#	Function	TB#	Function
3	RS-232 (COM)	8	RS-232 (COM)	10	RS-232 (Crank and Pin Input)
4	RS-232 (Crank First Output)	9	RS-232 (Pin First Output)	13	-RS-422 (Crank and Pin Input)
5	-RS-422 (Crank First Output)	11	-RS-422 (Pin First Output)	14	+RS-422 (Crank and Pin Input)
6	+RS-422 (Crank First Output)	12	+RS-422 (Pin First Output)	16,18	Shield to Ground

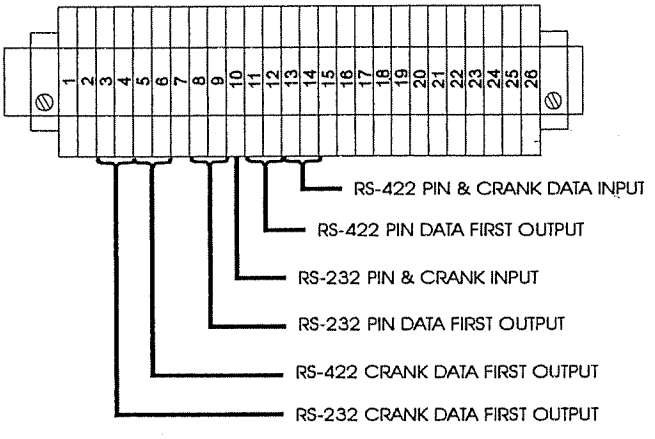
The following example shows the ASCII format of the output string depending on the terminal connections:

Example +0012 -0005

If connected to RS-422 TB# 10 and 11 (8 and 9 for RS-232), the string denotes the pin end weight deviation of +1.2 gram first followed by the crank end weight deviation -0.5 gram.

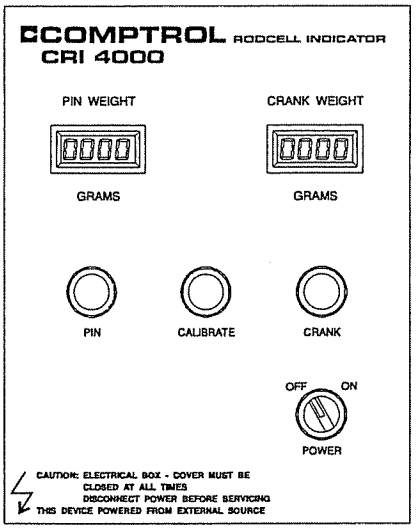
If connected to RS-422 TB# 5 and 6 (3 and 4 for RS-232), the string denotes the crank end weight deviation of +1.2 gram first followed by the pin end weight deviation of -0.5 gram .

NOTE: The pin and crank data are separated by a (SP - space) 020h. The output data is followed by (CR - carriage return) 0Dh and (LF - line feed) 0Ah. (h = hexadecimal).



CALIBRATION

The following steps define the procedure for calibrating the system using the master rod and calibration weights provided with the system.



The lights referred to in the following procedure are the Pin and Crank indicator lights on either side of the CALIBRATE pushbutton. With power to the system, the indicator lights should be illuminated except during the calibration process.

The lights turn off during calibration and blink once (on/off) after the CALIBRATE pushbutton is pressed, and twice (on/off, on/off) to acknowledge a step in the procedure is completed. At the end of the procedure, the lights will turn back on and stay illuminated.

Note: Both lights must blink, however, they may not blink simultaneously. *If only one light blinks or takes longer than 20 seconds to respond,* the system must be reinitialized by turning the power switch off and on and starting the calibration procedure from the beginning

To exit the Calibration procedure at any time, turn the power switch to the OFF position. The system will retain the settings from the last completed calibration procedure.

Note: The digital displays are not representative of the applied weight during calibration.

1. Turn the indicator power switch ON. If power is present, the switch and indicator lights will illuminate, and a numerical display will appear in each meter. If not refer to Troubleshooting on page 6.
2. Place the master rod on the cradle.
3. Press the CALIBRATE pushbutton. The indicator lights turn off for about 20 seconds, then turn back on.
4. Place the crank side of the 50 gram calibration weight in the center of the crank end bore.
5. Press the CALIBRATE pushbutton. The lights will turn off for about 10 seconds, then turn back on.
6. Remove the calibration weight and place the pin side of the weight in the center of the pin end bore.
7. Press the CALIBRATE pushbutton. The lights will turn off for about 10 seconds, then turn back on..
8. Remove the calibration weight and master rod and press the CALIBRATE pushbutton. The lights will turn off for about 20 seconds, then turn back on indicating the calibration is complete.
9. Place the master rod on the cradle, then remove it to clear the serial port buffer. The displays should both show -60.0 grams

To check for proper calibration:

Note: If the connecting rod is not properly positioned on the cradle, weight readings may vary.

1. Place master rod with the calibration weight in crank end bore on the cradle. The displays should show 50 grams (±0.2 gram) for the crank end and less than ±0.2 gram for the pin end.
2. Remove the master rod and weight. Both meters should display -60.0 grams.
3. Place the master rod with the calibration weight in the pin end bore on the cradle. The displays should show 50 grams (±0.2 gram) for the pin end, and less than ±0.2 gram for the crank end.
4. Remove the master rod and weight. Both meters should display -60.0 grams.

If the desired outputs are not achieved, repeat the calibration procedure.

NOTE: DUE TO THE NATURE OF THE AUTO-ZEROING ALGORITHM, ALLOW 1.5 SECONDS BEFORE WEIGHING ANOTHER CONNECTING ROD TO INSURE SPECIFIED REPEATABILITY.

OPERATING NOTES

The following notes provide general information about the operation of Comptrol Digital Rodcell Systems in inline or offline connecting rod weighing applications.

1. A weighing cycle starts when a connecting rod is placed on the cradle and ends when the rod is lifted off the cradle. Auto-zero and serial data transmission occur after liftoff.
2. Due to the nature of the auto-zeroing algorithm in the Rodcell firmware, allow 1.5 seconds between weighing cycles. During this time, the rodcells measure the input with zero weight applied to reference the autozero offset. The visual indication that the Rodcell is ready for another cycle is when both meters diplay -60.0 grams.
3. For inline applications, the best time for the PLC to read the Rodcell output voltage is just before or during the rod liftoff.
4. To reduce the influence of vibration and electromagnetic noise during the weighing cycle, the Rodcells continuously sample, capture, and display the "best weight" output values. The Rodcells clear the captured best weight values when the rod is lifted off the cradle. This is indicated by the meters displaying -60.0 grams.
5. For the best possible measurement data, Comptrol recommends using the RS-232 or RS-422 digital outputs for data acquisition. The Rodcell firmware automatically selects and combines the pin and crank end "best weight" values into one string and outputs the data once per cycle after the liftoff. This eliminates any possible errors added by PLC analog cards and PLC timing logic.
6. The RS-232 and RS-422 serial outputs can be used simultaneously - one for the control logic (PLC), and the other for data collection (PLC or PC). There are two RS-232 and two RS-422 serial ports available.
7. Improper positioning of the connecting rod on the cradle will result in inaccurate weight readings.

TROUBLESHOOTING

The following procedures are intended for initial start-up or subsequent power up situations of the system. If a condition persists or if any questionable condition(s) occur during operation, please contact Comptrol Incorporated for troubleshooting or technical support at 800-743-1952

Refer to the CRI-4000 Electrical Schematic (page 8) and Electrical Connections (page 3).

With input power connected to CRI-4000 and turned on and the indicator power switch ON, the power switch, numerical displays, an the Pin and Crank indicator lights should illuminate.

If the switch, displays, and indicator lights do not illuminate:

1. Check incoming power supply and connections.
2. Check fuse. Replace if necessary.

If the meters and indicator lights are on, but the power switch is not illuminated:

1. Check power to the bulb.
2. Check bulb. Replace if necessary.

If power switch is illuminated, but there is no display on the digital meter(s):

1. Check for power to the meter(s).
2. Check connection between meter(s) and terminal block.

If the power switch is illuminated, but the green indicator light(s) are not illuminated:

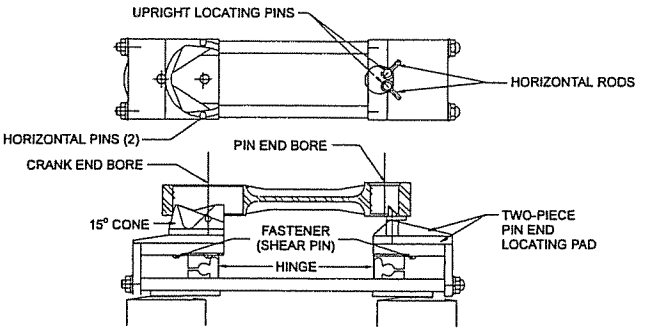
1. Check for power to indicator light(s).
2. Check connection between indicator light(s) and terminal block.
3. Check bulb(s).
4. Check cables and connections between Rodcell Bodies and Indicator. If the problem persists, try switching cables to determine if the problem is in the Rodcell Body or cable.

Note: The Rodcell Bodies contain no field serviceable parts and must be replaced as a complete unit. When ordering a new cable, reference Comptrol Part Number 59-1279-L.

CRADLE ASSEMBLY

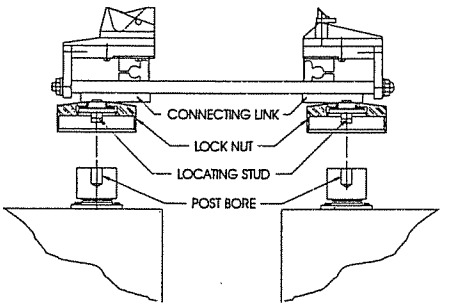
The cradle assembly is designed for positive location of the crank end bore with respect to its center on a 15° cone. Variation of bore sizes will change the contact point of the crank end bore on the slope of the cone. The horizontal pins of the cone prevent the rod from sliding off to one side. When a rod is properly located, the crank end should rest on the slope of the cone and not contact the horizontal pins. Clearance between the crank end and the pins depends on the size of the bore chamfer and can vary from .010 to .040 inch.

The pin end bore should encompass the upright locating pins and rest on the horizontal rods. Clearance between the pin end bore and the locating pins is factory set at .002 to .004 inch. If the clearance is less than or greater than this amount, adjust the clearance by loosening the two shear pins under the pin end locating pad. Place a shim equal to the amount of adjustment required around the upright pins and pull on the locating pad assembly until the shim is trapped between the locating pins and the wall of the pin end bore. Hold the pad assembly in this position and tighten both shear pins. Remove the shim stock before calibration.



Installation

1. Grip the cradle assembly by the large knurled lock nuts.
2. Holding the assembly upright, position the cradle over the Rodcell Assembly. Make sure the crank end of the cradle is over the crank end Rodcell Body.
3. Align the locating studs under each cradle end with the center bores in each Rodcell Body post.
4. Lower the cradle assembly to insert the studs in the post bores.
5. Engage the lock nut threads with the threads on the post.
6. Simultaneously tighten the lock nuts clockwise until both nuts contact the shoulder of the post.



7. Tighten each lock nut one quarter turn to secure the cradle to the Rodcell Assembly.

   Comptrol recommends holding a straight edge across the two connecting links to prevent the assembly from twisting or cocking when tightening the lock nuts.
8. Place a connecting rod on the cradle and check that the connecting rod is level on the cradle.

Removal

To remove the Cradle Assembly from the Rodcell Assembly or shipping bar:

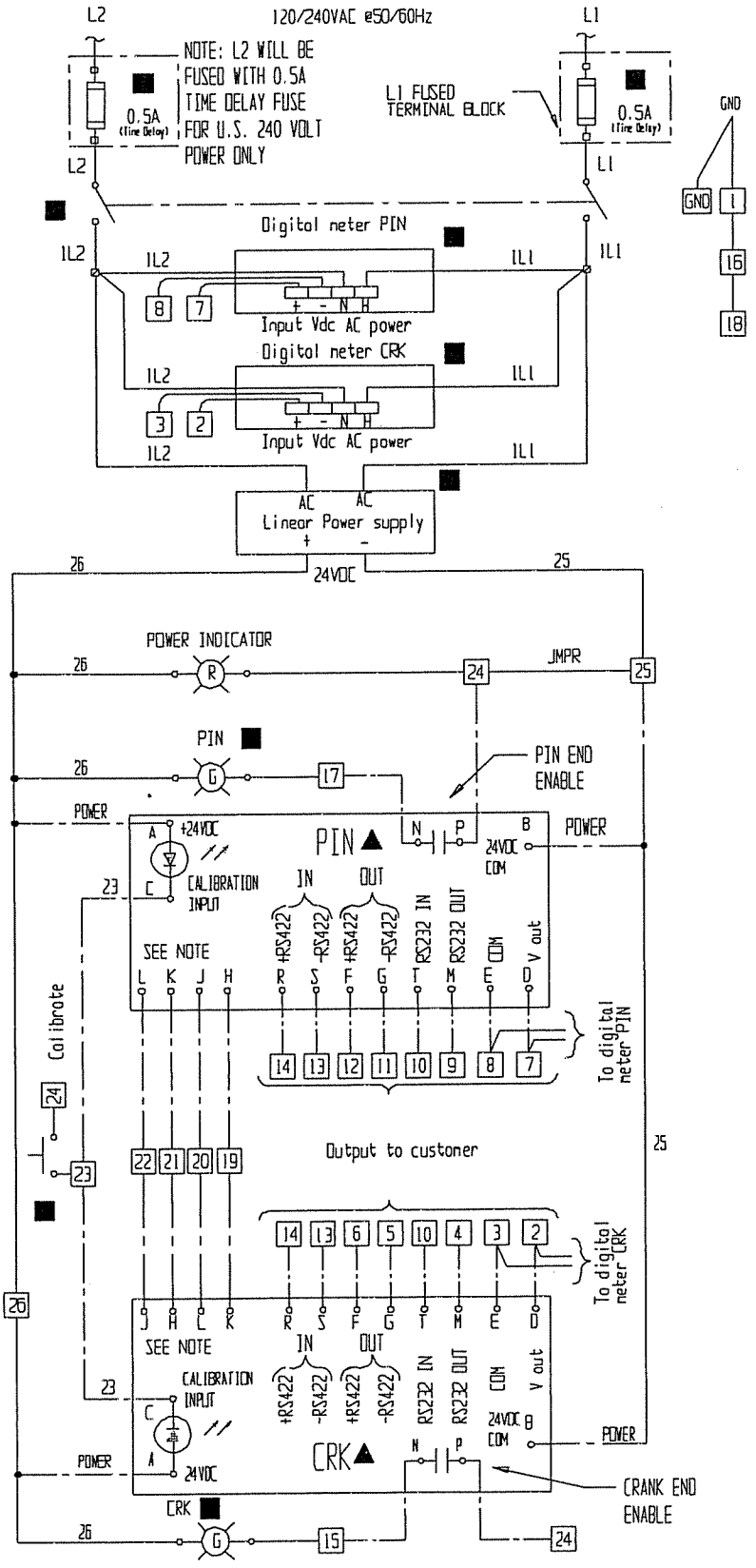
1. Remove connecting rod from the cradle if applicable.
2. Grip the large knurled lock nuts under each end of the cradle.
3. Simultaneously turn both lock nuts counterclockwise until the threads disengage (about two full turns).
4. Lift the Cradle Assembly straight up to dislodge the cradle locating studs from the Rodcell Body post.

If a "jam-up" or collision involves the cradle, inspect the cradle assembly. Misalignment of the locating pad indicates that the shear pins are broken. Remove the cradle assembly, and replace the shear pins and any damaged parts. Recalibrate the system after re-installing the cradle.

Installation of a new hinge requires the aid of a line-up fixture available from Comptrol Incorporated.

Do not substitute steel screws for the special Comptrol shear pins.

CRI-4000 WIRING SCHEMATIC



■ LOCATED IN CRI-4000 INDICATOR

▲ LOCATED IN RODCELL BODY

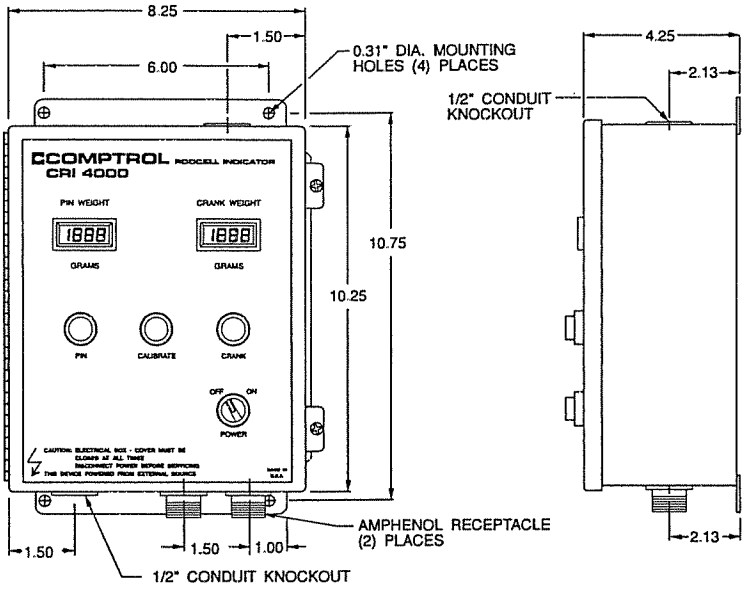
Note:
Cable connector pins (H, J,K,L) are used for RS422 serial communication between the pin and crank end modules as follows:

PIN	FUNCTION
H	+RS422 OUT
J	-RS422 OUT
K	+RS422 IN
L	-RS422 IN

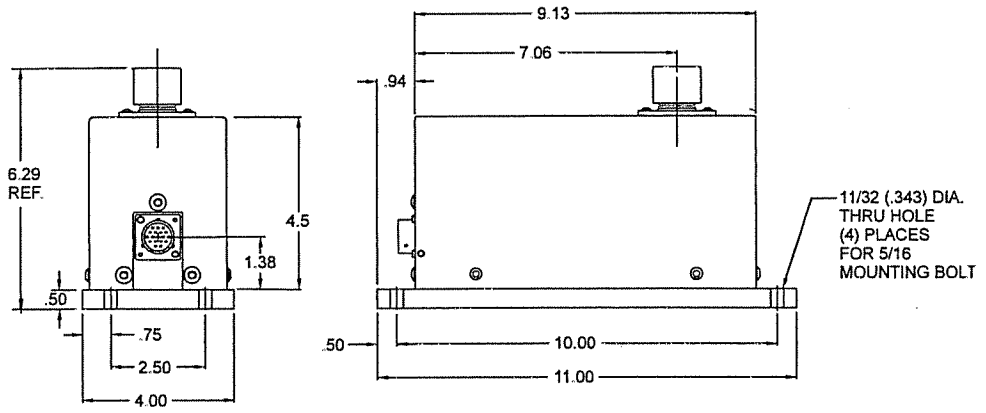
CRI-4000 PIN & CRANK END INTERNAL CONNECTIONS

CONNECTOR PIN	WIRE	TB# PIN	TB# CRK
A	WHT	26	26
B	ORG	25	25
C	BLU	23	23
D	WHT/BLK	7	2
E	RED/BLK	8	3
F	GRN/BLK	12	6
G	ORG/BLK	11	5
H	BLU/BLK	19	21
J	BLK/WHT	20	22
K	RED/WHT	21	19
L	GRN/WHT	22	20
M	BLU/WHT	9	4
N	BLK/RED	17	15
P	WHT/RED	24	24
R	ORG/RED	14	14
S	GRN	13	13
T	BLK	10	10
U	SHIELD	18	18

CRI-4000 RODCELL INDICATOR DIMENSIONS



RODCELL BODY DIMENSIONS



SPECIFICATIONS

System

Input Power to Indicator

CRI-4000-1 ..... 120 VAC, 1ph., 50-60Hz, @ 12 Watts

CRI-4000-2 ..... 240 VAC, 1ph., 50-60Hz, @ 12 Watts

Settling Time ..... 1.5 seconds

Minimum Cycle Time ..... 3 seconds

Meter Scale (standard format) ..... ±XX.X

Rodcell

Excitation Voltage ..... 24 VDC

Output (Analog) ..... ±3 VDC (0.05 VDC/g or 0.025 VDC/g)

Output (Digital) ..... 19.2kbps, NP, 8, 1 stop bit

Average Repeatability ..... ±0.1g **not accumulative** for Rod weighing no more than 1kg

Settling Time ..... 1 second

Temperature Drift ..... negligible due to Auto Zero

Linearity 0.015%

Hysteresis 0.01%

Ambient Temperature ..... 32-150°F (0-60°C)

Maximum Part Weight ..... per customer specification

Dimensions and specifications subject to change without notice.

COMPTROL INCORPORATED

ISO 9001 Registered

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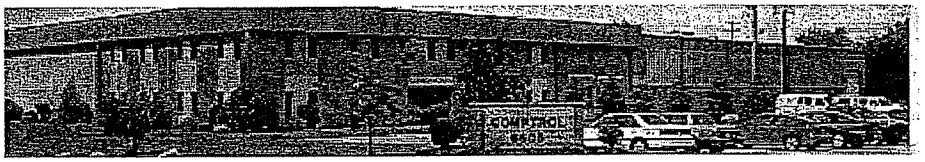

Comptrol Incorporated is a full-service manufacturer of tension measuring, linear motion, and quality verification products and systems. We are also a major distributor of industrial control products. Since 1952, Comptrol has earned an international reputation for providing customers with quality reliable products, experienced application assistance, and complete engineering and technical support not only for the products we manufacture, but also for the products of the leading manufacturers we represent