

R1021 Load Indicator

Operators Manual

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1. GENERAL DESCRIPTION

The R-1000 is a universal system. It is designed for custom applications. It is not a micro-processor based system; therefore it does not require any programming. Although this reduces the versatility of the system, it simplifies its applications. Without programming or special modifications, the system can be used as a thermostat, an overload, a scale, a length indicator, an angle indicator, a voltmeter, a load indicator, a level indicator, etc,... The system also has other features allowing it to perform more sophisticated tasks.

The R-1000 is an electronic instrument capable of monitoring and displaying an electrical linear change. This linear change can come from a sensor converting a physical change into an electrical one. When limits of that change are the only concern, linearity is irrelevant.

The R-1000 can supply to the sensor either original supply or a clean and precise 5.0 V. In return, it will accept electrical analog inputs like 4-20 mA, 0-5 V and 0-10 mV up to 0-50mV. The system will automatically compare the input with internally preset limits to insure acceptable readings and, if installed, displays a value.

The R-1000 can be equipped with an alarm card which displays: a supply power condition light turning red or green according to the state of the input voltage; a green light showing good condition status of the input; a red light showing that the input has reached either a low or a high limit; a red light showing the status of a digital input and a buzzer working in parallel with the alarm light.

If a limit is reached, the R-1000 will trigger a relay with both a normally closed and a normally opened connection. It can be used to stop or start a certain action in the event of an alarm.

The R-1000 can also read two black and white inputs. The first one, if open triggers the alarm instantly by bypassing the analog input. It can be used with a limit switch when a certain state overrides the analog status or to receive the relay output from another R-1000 if mounted in series. The second digital input, available on a special alarm card, bypasses the system and neutralizes the relay output. It can be used as an emergency bypass of the relay output or with a limit switch if the state of the sensor is irrelevant at a certain point.

The R-1000 also has a keyboard card allowing manual setting of limits and display of limits if the display card is present. The keyboard card can also be used to control the tare when the system is used as a scale. A fine tare control is available with the addition of a potentiometer.

The display card can display numbers from -199.9 to 199.9. It can be calibrated by the main control. It is equipped with a back light for night viewing.

The R-1000 can be mounted either vertically or horizontally. The display card can rotate 90°.

2. INTRINSIC SAFETY

The system is intrinsically safe because it compares continuously the analog input with a low and a high limit. If a wire was cut or shorted; the analog input would automatically reach one limit. Furthermore, the limits are adjustable; therefore, they can be set as close as possible to the boundaries of the normal signal variations.

The relay is also considered intrinsically safe because it is turned on as long as the signal is within limits and turned off when a limit is reached. The normally opened side of the relay is therefore closed when the signal is within limits. The normally closed side of the relay is open during normal operations and closed when the signal reaches a limit. This terminal cannot be considered intrinsically safe and is intended for external warning lights and siren.

Because the relay is turned on during normal operations, it would turn off in the event of a power failure. Furthermore, the system is equipped with a power supply comparator that declares an alarm if the supply power is not high enough to work acceptably.

The normally closed digital input is also intrinsically safe because it must be closed to allow the system to work. If opened, it triggers the alarms. The normally opened digital input is used for bypassing the relay and, it cannot be rated intrinsically safe, if connected to an outside switch; since its safety depends on the switch's rating and installation. When used through the display panel, it is a push only button and therefore could not be left on. This switch can easily be disabled.

When operating normally and within limits, the system can display a green light both for power supply and sensor signal. This way a operator can be certain that the system is working properly at all times.

The R-1000 is not affected by extreme temperatures or pressures or input voltages. It either works well and precisely and shows the operator the green lights or it shuts down. The R-1000 can therefore be considered fail safe.

NOTE: The R-1000 does not include the sensors, only the input signals. To insure total intrinsic safety, the sensors must also be constructed and positioned in a fail safe manner.

3. ENVIRONMENT RATING

The R-1000 was designed in Canada to withstand the Canadian climate without additional protection. This includes water, snow, ice, rain, salt, temperatures, shocks on moving vehicles on normal Canadian roads, radio frequencies, magnetic fields, etc,...

The R-1000 system is offered in its standard versions in an aluminum cast enclosure sealed by a rubber joint. It complies with the IP-65 and NEMA 4X norms. This means that it can withstand water splashings from any angle. It will easily withstand rain, ice, dust, wind, sun, grease and some corrosive materials. The system cannot be submerged under water for a long time nor repeatedly.

Because of its metal enclosure, the system is unaffected by radio frequencies and magnetic fields.

For optimal performance outside, the system should be sheltered against rain and sun. Alterations between the two creates temperature changes and internal pressure changes that may affect the seal and allow some water penetration. If this situation is likely to happen; a vent should be installed at the lowest point of the system.

The system will withstand normal vibrations and shocks on road vehicles without suspension.

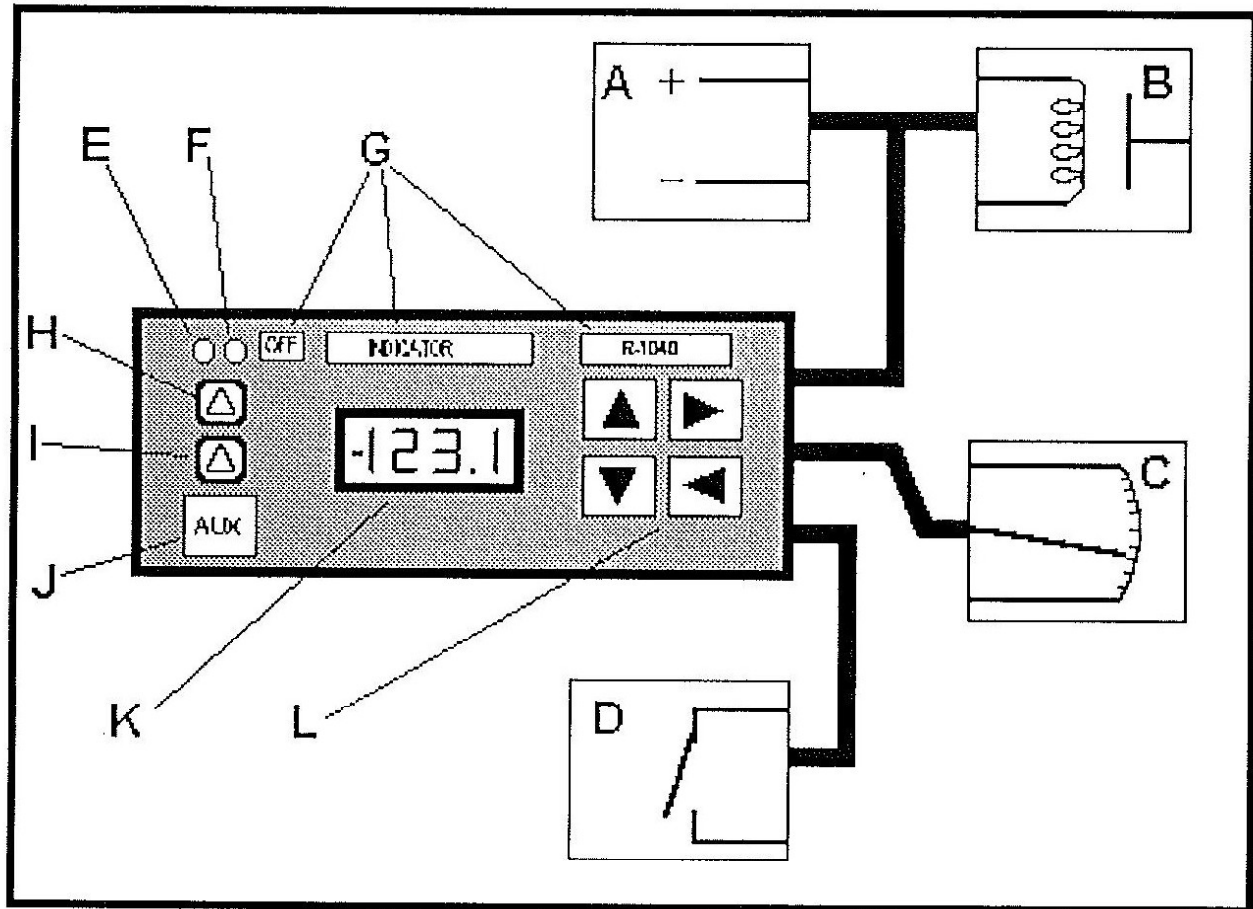
The circuits are coated to insure maximum humidity resistance.

The circuits can operate between -40°C and +50°C. The system can work with even lower temperatures if left to warm up for a few minutes.

The display card can only work with temperatures as low as -30°C. Again, if the system is left to warm up, the display can work with temperatures as low as -45°C. A heating element can be added to allow lower temperatures.

The R-1000 base circuit is internally fused to prevent power surges and automatically shuts down if the supply power is insufficient.

4. GENERAL LAYOUT



A: Supply wires compatible from 10 Vdc to 28 Vdc.

B: Relay output 5 A NC and NO can activate a valve, a light or a relay.

C: Analog sensor input 0-5 V, 4-20 mA or 0-5 to 0-50 mV. Available supply for sensor is 5.00 V or original supply.

D: Digital or black and white inputs.

E: Power supply status: off: less than 9V; red 9 to 11 V, green 11 to 28 V.

F: Status of digital input #1: off: closed; red: open.

G: Customized label.

H: Red visual alarm.

I: Green good status visual indicator.

J: Digital input #2 button bypass. Can be deactivated.

K: Numerical display of analog sensor value; from -199.9 to 199.9.

L: Keypad control for manual setting of limits and tare.

5. OPERATING PROCEDURES (1021)

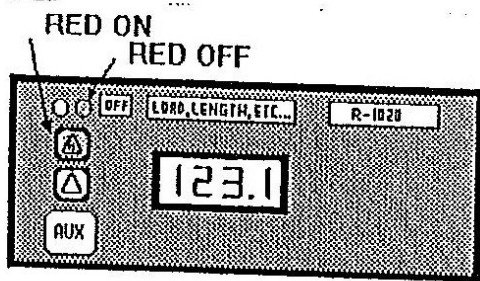
The R-1021 has for its goal to display the hook load. The operator only has to set the number of parts of lines and if installed, manually set the tare.

In the top left corner of the display, there is a "batt" light. This light is green when the system is on and supplied properly. It turns red when supply voltage drops below 9 volts and turns off when the system is turned off.

The R-1021 also has the digital input which can be used to monitor an end of travel warning like slew front limit or anti two block. If it is used; the system will display two red warning alarms and an audible alarm. The first one is the large triangular warning light which indicates that the relay output is activated; this means that if a lock out device is installed, certain motions would be cut until the situation is reverted. The second warning light is the small top right hand light; it indicates that the source of the alarm comes from the digital input. The operator must maneuver to return to the normal operating mode.

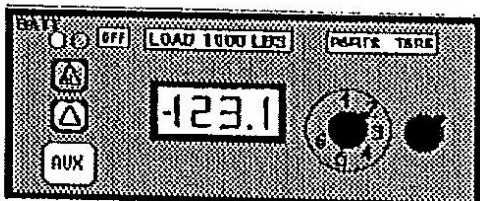
If the lock out relay output blocks all maneuvers; the operator can press the "AUX" button to temporarily bypass the lock out and return to the normal operating mode.

If the large red triangular warning light and the buzzer go on and the small digital input light is off; the system indicates either that the



machine is in an abnormal situation like overload or that it has failed. The operator cannot rely on the system until the green light reappears. The limits can be preset internally.

On the right side of the display, is the parts of line selector. By turning it, the operator selects the number of parts of lines. A wrong selection will yield improper readings of the load.



Another button can be added as an option. It is the tare button. This button positioned right to the parts of line button, allows the operator to adjust the zero offset. Changing the zero offset will also offset the load reading amount. An operator can then tare the hook block or other lifting equipment. NOTE: This button is not necessary to operate the system; it only makes it more precise.

6. DESCRIPTION OF SYSTEM: (AA102130)

R-1021 Load indicator on boom trucks

MACHINES: Will fit boom trucks with the winch attached to the boom. A different sensor is needed for other boom trucks and cranes.

GOALS: Display the load on the hook and settings for parts of lines. May display the ATB situation if hooked-up. Can also hook up a lock out set on the maximum pull per line or the ATB signal. On this model, the setting is permanently set. A key board must be added for temporary setting.

PARTS:Control unit 1021
Dynamometer (boom truck version)
Wire 18/4 (35 ft)
Wire 16/2 (15 ft)
Tie wraps (40 pc)

OPTIONS:
Weather box
Tare button on display unit

Terminal connector:

- | | | |
|--|---------------------------|---------------|
| 1. Power supply input +..... | 1)white strand | 2 strand wire |
| 2. Power supply input 0V..... | 2)black strand | |
| 3. Digital input #1 (requires 0V)..... | short with #4 | |
| 4. Digital output 0V | | |
| 5. Sensor supply +5V..... | 1)red strand | 4 strand wire |
| 6. Analog input +..... | 2)green strand* | |
| 7. Analog input - (0-50mV or less bridge)..... | 3)white or yellow strand* | |
| 8. Sensor supply 0V..... | 4)black or blue strand | |
| 9. Normally opened relay output | | |
| 10. Normally closed relay output | | |

Calibration potentiometer:

- P1: Gain setting.....set to load with load on hook**
P2: Zero setting.....set to zero with no load on hook
P3: Low limit manual setting
P4: High limit manual setting

AMP: Amplifier card bolted on base board.

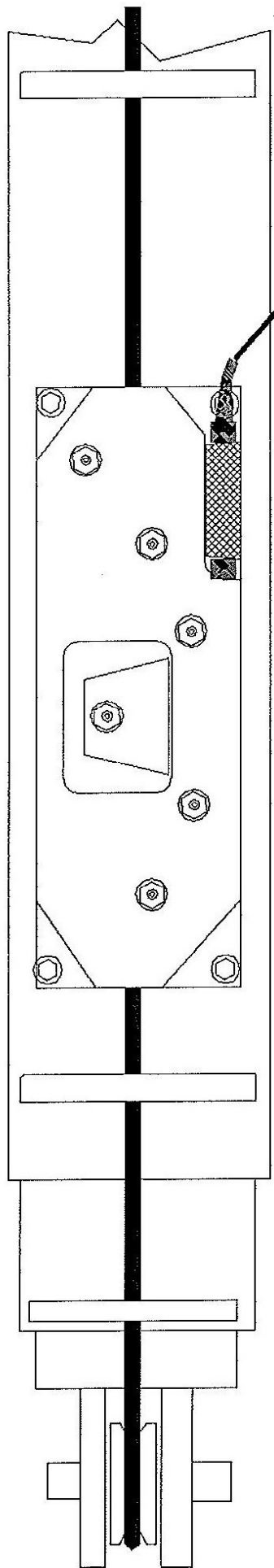
- J100: Amplifies signal by 100 times
J200: Amplifies signal by 200 times.....factory set
J500: Amplifies signal by 500 times
No jumper: Amplifies by 1000 times

* If the load on the display decrease, inverse the strand white and green.

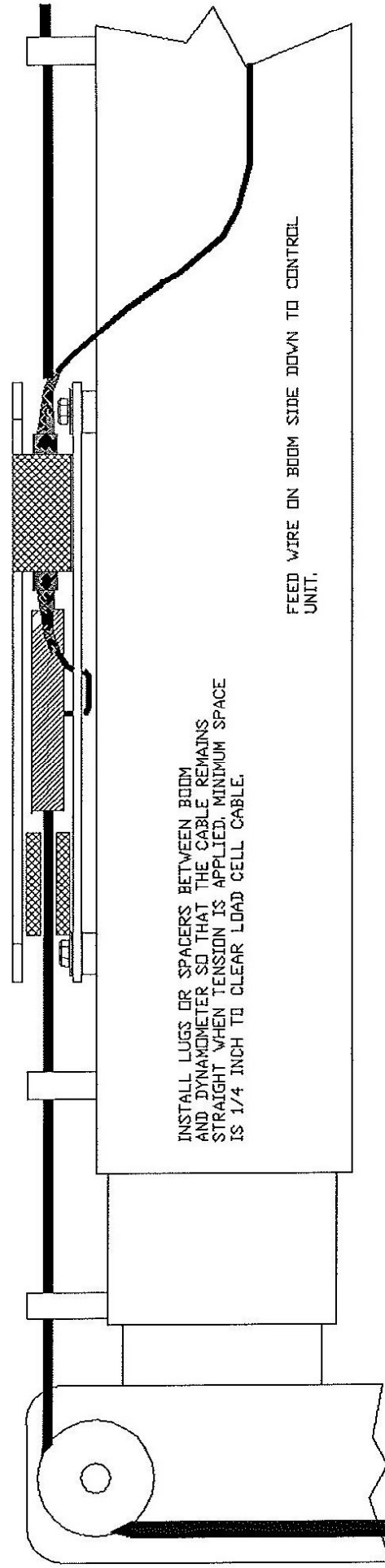
** Use 2/3 or more of cable operating load capacity.

INSTALL DYNAMOMETER FLAT ON BOOM, NEAR END OF FIRST SECTION, IF AND ONLY IF WINCH IS MOUNTED ON THE SAME SECTION.

LOCATE DYNAMOMETER WIDTHWISE SO THAT CABLE IS STRAIGHT WHEN HALFWAY BETWEEN THE FLANGES ON THE WINCH.



CONNECTION IN JUNCTION BOX IS DONE BY MATENING COLORS.
EX: WHITE ON WHITE, RED ON RED, ETC..



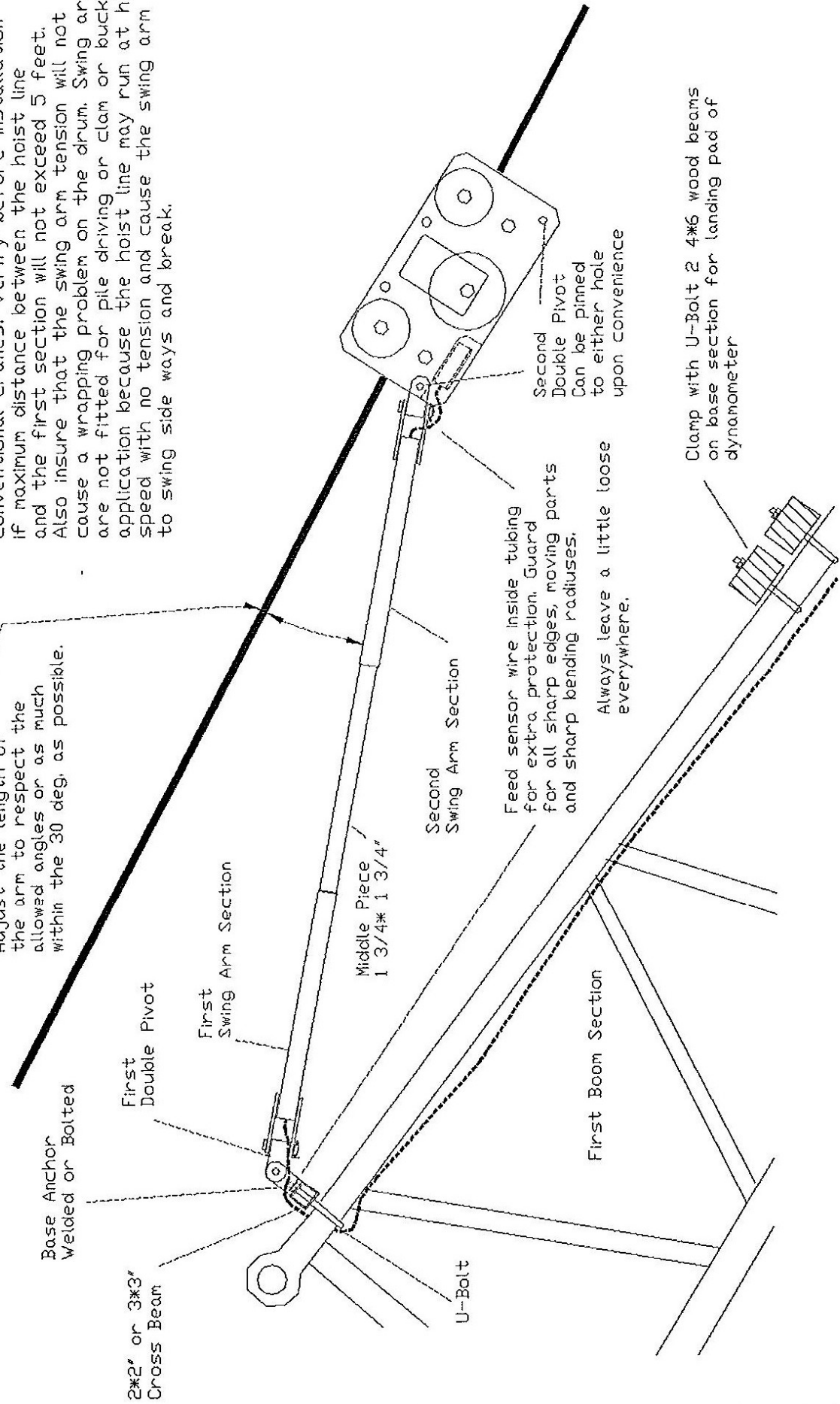
INSTALL LUGS OR SPADERS BETWEEN BOOM AND DYNAMOMETER SO THAT THE CABLE REMAINS STRAIGHT WHEN TENSION IS APPLIED. MINIMUM SPACE IS 1/4 INCH TO CLEAR LOAD CELL CABLE.

FEED WIRE ON BOOM SIDE DOWN TO CONTROL UNIT.

Min. angle is 0 and max.
angle is 30.

Adjust the length of
the arm to respect the
allowed angles or as much
within the 30 deg. as possible.

NOTE: This arrangement will work on most
conventional cranes. Verify before installation
if maximum distance between the hoist line
and the first section will not exceed 5 feet.
Also insure that the swing arm tension will not
cause a wrapping problem on the drum. Swing arm
are not fitted for pile driving or clam or bucket
application because the hoist line may run at high
speed with no tension and cause the swing arm
to swing side ways and break.

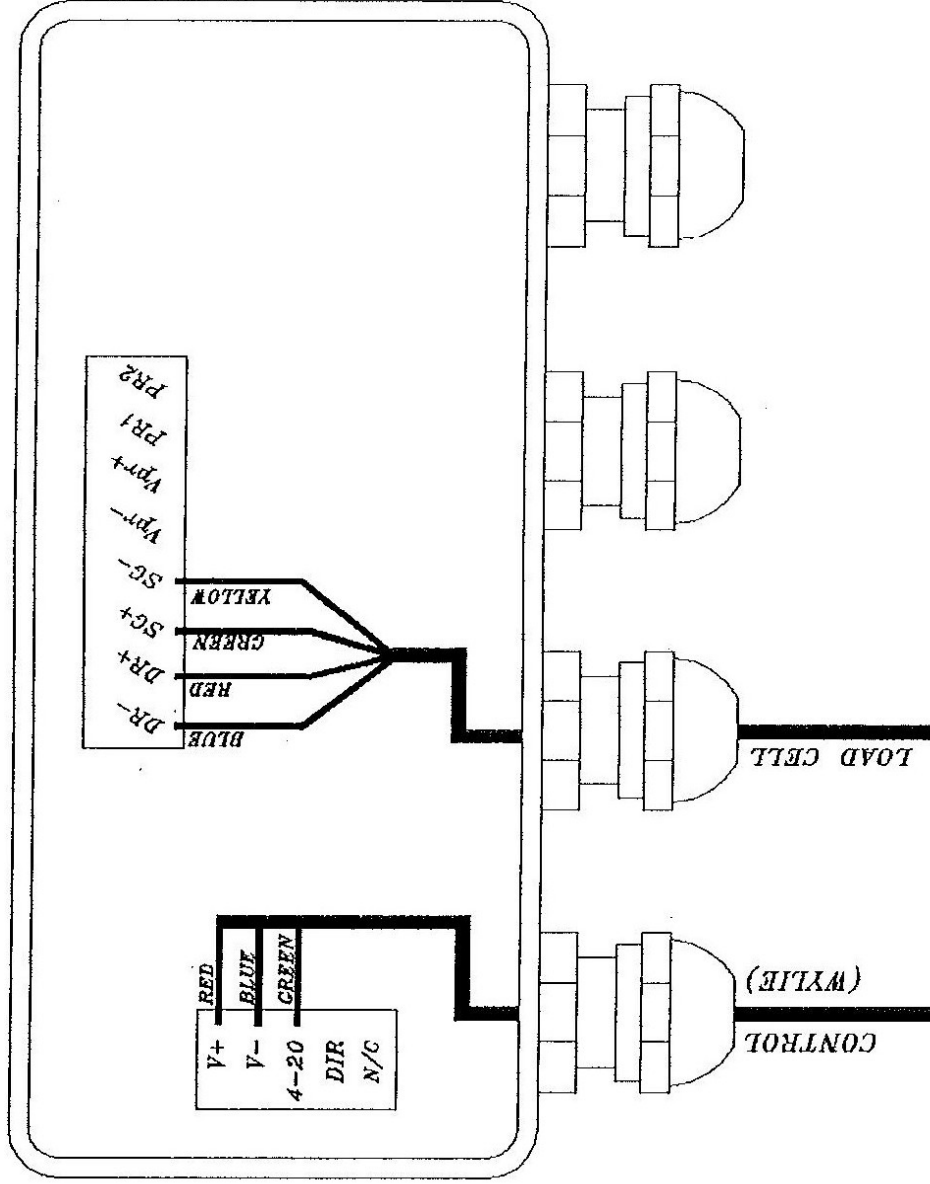


STANDARD SWING ARM ASSEMBLY
HOIST LINE, CONVENTIONAL CRANE

WYLIE SYSTEMS
RAYCO SYSTEM

S. CHAYER

10/07/94



DATE: 5/03/95

SCALE:

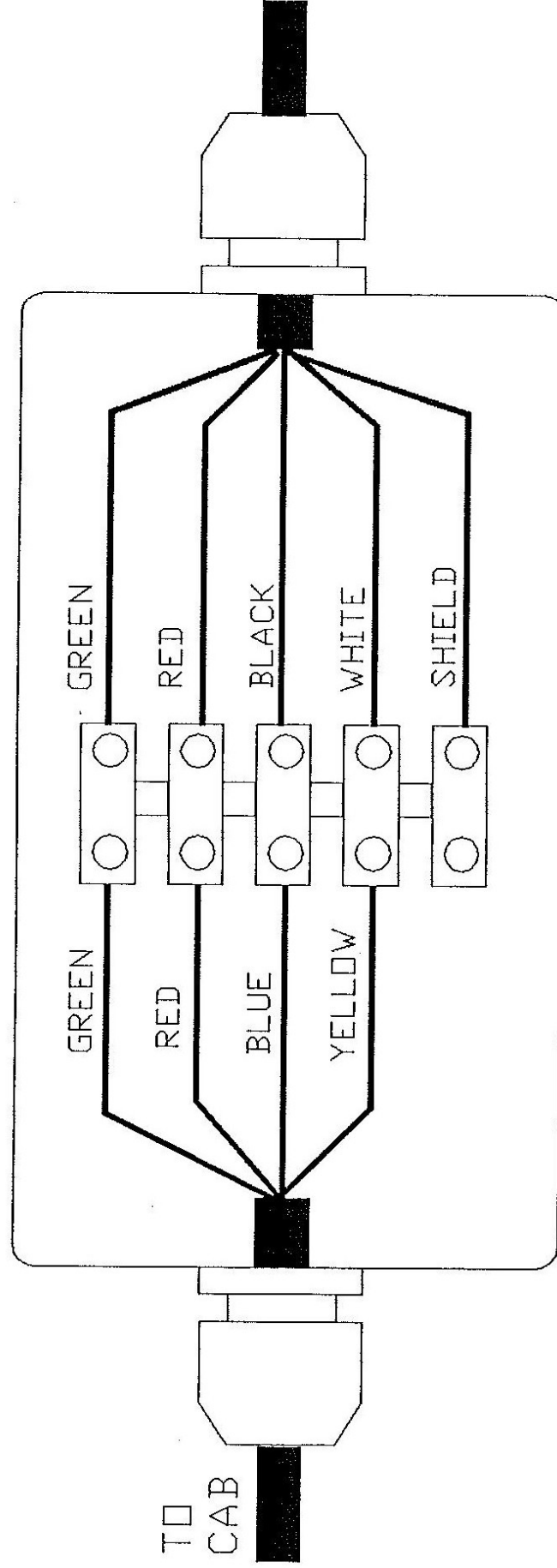
JUNCTION BOX CONNECTIONS

VERSION 1.1

jbox1

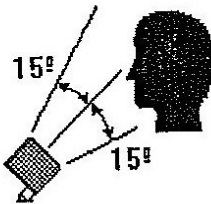
DOMINIC C. LAPOINTE

RAYCO--WYLIE SYSTEMS



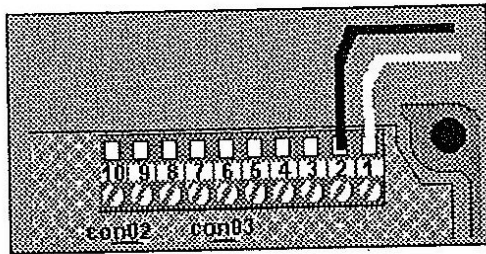
R-1021 LOAD INDICATOR (AA102103)

INSTALLATION:

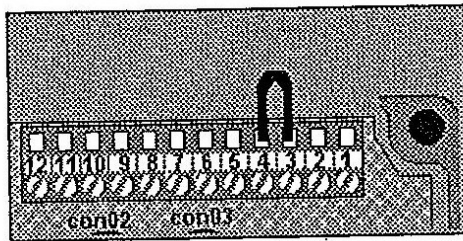


Place the control near the operator and bolt it to the machine. Make sure the control points directly towards the operator so that he can see the visual display. Remain within $\pm 15^\circ$ on both axes.

The control unit may be placed in a weather proof box for improved durability.



Feed the power supply cable (16-2) through a collar and connect white wire to terminal 1 and black to terminal 2.



Install a wire between terminal 3 and 4 if not using the Anti-two-block status display.

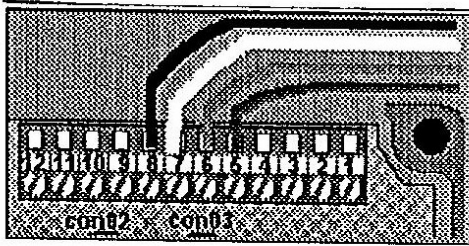
Feed the wire to the fuse panel.

Find an accessory terminal on the fuse panel that is used for a minor application, like wipers or cigarette lighter. Do not use terminals for flood lights, starter, engine, radio or head lights. Check voltage to insure it is between 10 and 28 Vdc at all times while the engine is running and while using the accessories on that terminal. Double check the origin of the positive source: terminal or body.

Fix white wire on positive source. An error could result in severe damage to the control unit.

Fix black wire on 0 V source. Usually this is the body, but on positive body it is the fuse terminal.

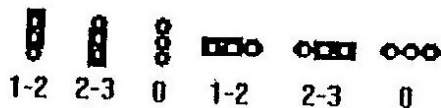




Install load sensor and wires. See load sensor section.

Bring load sensor wire to the control unit and feed through the second collar. Connect the wires as follows: red on terminal #5, green on terminal #6, white or yellow on terminal #7 and black or blue on terminal #8. Refer to troubleshooting for description of wires.

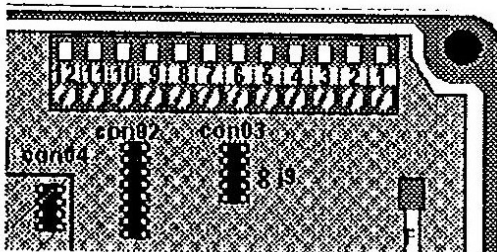
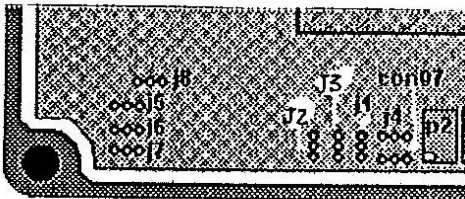
CALIBRATION:



Place jumpers on the board as follows:

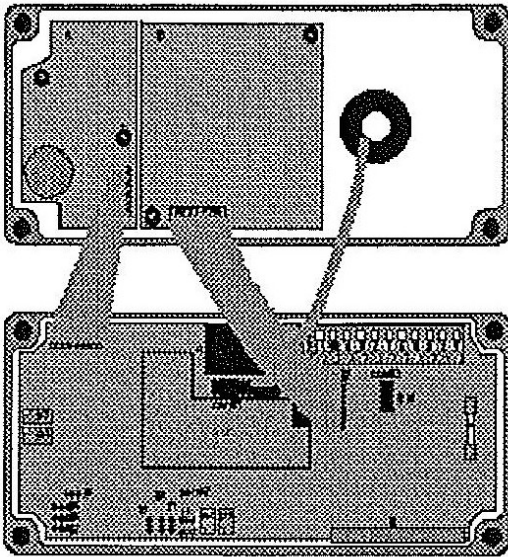
****All set in advance from our manufacturing plant****

Position 1-2 means the left or top pin and the center pin are connected by the jumper.
Position 2-3 means the center pin and the right or lowest pin are connected together by the jumper.
Position 0 means no jumper at all.



- J1: Amplifier.....on 2-3
- J2: Tare.....on 1-2
- J3: Tare.....on 2-3
- J4: Tare.....on 0
- J5: Min. limit.....on 1-2
- J6: Max. limit.....on 1-2
- J7: Amplifier.....on 2-3
- J8: Tare.....on 1-2
- J9: 4-20 mA.....on 0

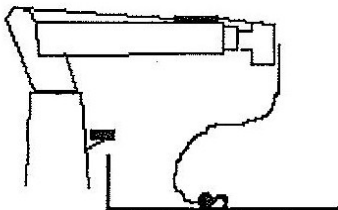
Set jumper 200 on AMP middle board



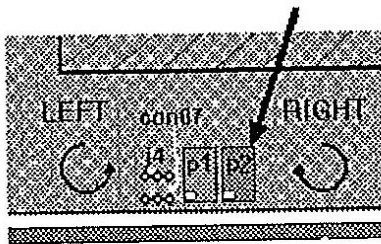
Connect the top boards on cover, note a white mark on the connectors, it must match with the same mark on the board. Connect the 16 pin display connector on CON 02. Connect light and buzzer 8 pin connector to CON 06 on base board.

Do not turn potentiometer 03 and 04 since they are precalibrated for this version.

Start the machine and the system.

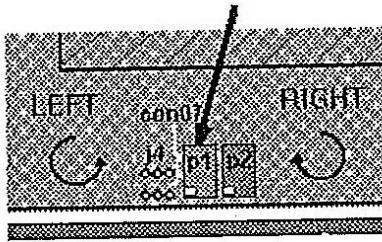


Drop load and hook block.



Turn potentiometer # 2 until the display shows zero.

Turn right knob to one part of line and rig one part of line. Pick up a known weight of at least 2/3 of cable capacity. If the load on the display decrease, inverse the strand YELLOW and green.



Turn potentiometer # 1 until this value is exactly reached.

Drop the load and verify the zero. Re-zero if necessary. Depending on the load cell capacity, the cable, the amount of cable on each side of the top sheave and the friction in the top sheave, the zero may shift at any time within a thousand pounds.

Calibration completed.

Close the controller box.

Tighten all collars to ensure water resistance. Do not overtighten.