RCI-1550 LM Telescopic Boom System
Instruction Manual

MAN-1078 Rev B

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CONTENTS

1. Important Safety Notice

 Note	The electronic load-charts in this system have been provided to assist the operator to drive the crane safely and productively. These load-charts have been provided to Robway by either the crane manufacturer or crane owner (or their representatives). Robway dutifully re-represent these load-charts into memory.

 Warning	Motion Limiters may have been fitted to stop those functions that will increase radius and hoist-up if the load-chart is exceeded. This feature is provided as an aid to safer crane operation. In certain situations, such as crane setup, the crane operator may need to 'over-ride' the motion limiters. At these times, the system can no-longer warn of overload and the crane must only be used in strict accordance to the crane manufacturer's setup and operation procedures. Proper system operation requires the operator to correctly program the Robway system to match crane setup and working configuration.

 Warning	This Rated Capacity Indicator is fitted to assist the crane operator. This Rated Capacity Indicator is not a substitute for operator judgement, experience or safe crane operation. At all times the driver is ultimately responsible for safe crane operation.

2. SPECIAL NOTES

2.1. Brandnames, Tradenames and Trade Marks.

All product, brand or trade names used in this publication are the trademarks of their respective owners and they are only mentioned to provide more accurate information for the reader.

2.2. Important Safety Notice

Notes, cautions and warnings are presented to aid in understanding and operating the equipment or to protect personnel and equipment. At all times, relevant codes applicable to location of service must be adhered to.

Safe, reliable operation of Robway systems require the systems to be maintained in a proper manner and serviced by technically trained personnel using trade (or profession) recognised service procedures and correct tools for the purpose.

Provided warnings are not exclusive, as Robway could not possibly know, evaluate and advise service people of all conceivable ways in which service might be performed or all possible associated hazardous consequences.

Accordingly, anyone who uses service procedures or tools which are not recommended by Robway must first satisfy themselves to their suitability and that neither personnel safety or equipment safety will be jeopardised by the selected method.

2.3. Limited Product Warranty

Robway Safety Systems P/L (RSS) warrants to the Buyer (Purchaser) of new products manufactured or supplied by RSS that such products were, at the time of delivery to the purchaser, compliant to RSS Quality Assurance documentation ISO 9001.

Any RSS product that has been repaired or altered in such a way, in RSS's judgement, as to affect the product adversely, including installation methods and procedures, negligence, accident or improper storage or use will be judged solely by RSS in regard to any partial or full warranty claim.

RSS's obligation under this warranty is limited to repairing or, at RSS's option, replacement of faulty parts. Any associated transportation or labour costs (other than those directly acceptable by RSS and consumed at RSS premises) shall not be part of the warranty claim and shall be at the originator's expense.

Associated re-installation costs shall be at the originator's expense.

Replaced (or repaired items) by RSS are warranted for the remainder of the warranty period of the originally supplied goods as if they were supplied with the original goods.

This above warranty period extends for 12 months from the original supply date to original purchaser from RSS.

2.4. Glossary of some used terms

Used in Manual	Alternative	Description
RSS	Robway	Robway Safety Systems P/L.
Length Sensor	Boom Length	Measures telescoping boom sections
Pressure Transducer		Measures hydraulic pressure
Boom Angle sensor	BAS	Measures angle to horizon
ATB	Over-hoist	Over-hoisting the hook into the boom tip.
RCI	LMI	same, being Rated Capacity Indicator or Load Moment Indicator.

3. INTRODUCTION

3.1. Manual Contents

This manual contains installation, operation, calibration, maintenance and parts information for the RCI-1550 Crane Rated Capacity Indicator system manufactured by Robway Safety Systems suitable for installation to fixed or mobile telescopic cranes.

3.2. Scope of Manual

Refer to Contents section. This section is an itemised list of sections with their corresponding section number and page number.

3.3. Intended Audience

This manual is intended for use by field engineering, maintenance, operation and repair personnel trained by RSS or familiar with RSS methods and application knowledge.

3.4. Personnel Qualifications

The procedures described in this manual should be performed only by persons who have read the safety notices in this manual, have read, and understood the relevant section and who are suitably qualified and trained to perform the procedures within.

4. SYSTEM DESCRIPTION

4.1. Multi-purpose Application


Note

The RCI-1550 is designed to suit Telescopic Boom Cranes of either mobile or fixed installation.

This manual covers the use of Load Moment based sensors and calibration refer to cranes where the tension cell/s are fitted to monitor the forward moment forces of the boom and then calculate the hook load.

4.2. Purpose

The RCI-1550 automatic Rated Capacity Indicator (RCI) is designed to assist the operator in the course of normal crane operation and consists of boom angle, length, slew and ATB sensors. Additionally, the system has tension cell/s to monitor the boom pendant forces to more effectively warn the crane operator of;

- impending overload.
- actual overload
- and is designed to activate function motion-cut (if fitted/connected)

4.3. Capabilities

The RCI-1550 display provides the following capabilities:

- Suitable for mobile, crawler and fixed type telescopic-boom cranes, load-moment sensor based,
- Multi-hoisting winch operation,
- Provides monitoring and display of;
  - Boom Length,
  - Boom Angle & Luffing fly jib Angle (as applicable)
  - Boom Tip Radius,
  - Boom Tip Height,
  - Lifted Load,
  - Selected Hook Falls,
  - Selected Crane configuration,
  - Crane configured S.W.L,
  - S.W.L. as a percentage of Crane configured SWL, and
  - Restricted Slew zones,
  - Hoist/Luff direction (if required for friction compensation).

- Provides visual and audible warnings, motion-cut and Anti-Two blocking detection,
- Self-diagnosis and error codes,
- Unique simulated analogue display for visual feedback of S.W.L. percentage,
- Multi-line text character window to display messages,
- Built-in calibration and fault-finding tools.

4.4. Available Options

- Options for
  - slew-zone continuous monitoring encoder sensor
  - hook height
  - multiple switch/analogue input/output expansion
  - engine management
  - special alarms
  - on-site configurable user data,
  - data-logging (customer formats optional),
  - printing,

 Note	ROBWAY also cater for custom applications and special user requirements. Please contact your nearest ROBWAY distributor or ROBWAY directly.

5. INSTALLATION - GENERAL

5.1. Setting Up the Crane

Lower the crane boom to a safe and convenient position for installation of system components.

 Warning	**High tensile booms require proper welding procedure specifi cations. Obtain special ist assistance in these cases.**
 Information	**Please r efer to the General Arrangement drawings at the rear of the manual for an overview of the configuration.**

5.2. Angle Sensors

The telescopic crane Boom Angle Sensor is mounted on the electrical sub-plate within the recoil drum. Factory supply (unless ordered specifically) is for RH mounting. If mounting to LHS the BAS must be realigned. Refer next paragraph.

5.2.1. Changing from RHS to LHS mounting

The Boom Angle Sensor (BAS) is physically mounted within the recoil set for RHS boom mounting as standard. Should the recoil drum be mounted to the LHS of the boom, the BAS will need to be rotated to the LHS mount position.

Undo the 2 mount screws and rotate the BAS clockwise to the alternative mount position.

Refix the 2 mount screws.

5.3. Length Sensors

5.3.1. General

Fix the recoil drum and pay-out cable to the RHS side of the main boom (LH installations require the electronic angle sensor to be re-positioned on its mount, (refer to the above BAS section) by welding the mounting bracket provided.

Route the cable carefully from the recoil drum back around the boom pivot to the cab. Fix the cable to the boom and turret using adequate fixings ensuring that the cable is not pinched or stretched as the boom moves through its full luffing arc. Only connect the cable to the Control Unit when finished welding.

5.3.2. 110’ Length Sensor – (DRURW33LAA)

INSTALLATION- (Please read through before starting)

- Ensure that the face onto which the unit is to be mounted is flat, vertical and parallel to the line of cable pay-out. The mounting position should allow free uninterrupted pay-out of cable.
- The unit should be mounted with fixing brackets in the horizontal plane and be parallel with the crane boom. An anti-condensation filter unit is fitted to the unit close to cable entry glands, this should be at the lowest point when the reel is mounted.
- Weldable pads are usually supplied with the units to provide stud fixings. These pads also act as stand offs, so that if they are not used for mounting, care should be taken to ensure that there is sufficient clearance between the reel barrel and the mounting face, to allow free rotation.
- A cable anchor pulley must be mounted at the boom tip, in order to tie off the free end of cable securely.
- Assuming now that the cable reeling drum is correctly mounted, setting up can proceed.
- Remove cover from unit and, first ensure that, if fitted, drive gears for the potentiometer are disengaged.
- With all cable wound on the reel, turn the reel in the direction of payout, say two full turns, when tension will be found to build up. These turns are called pre-load turns and provide for initial cable tension.
- Have an assistant hold the reel from turning and unwind sufficient cable to reach the cable anchor while boom or travel is at minimum “Tie off cable to cable anchor securely.”
- Extend boom or travel machine slowly to the full extent of travel. Before reaching the limit of travel, haul off cable from the reel by hand, to ensure that the reel will not bind up before full travel is reached.
- Check that at full extension there is at least one turn available at the reel before binding up. Whilst doing this, keep on turning the reel to bind up and note the number of turns still available.
- Retract boom or travel to minimum extension while observing that the reel is working correctly. If more tension appears to be required, bearing in mind the turns available, more pre-load turns may be applied
- The reel should now be set up mechanically.
- Electrical connections for over-hoist system, & luffing fly angle sensors (where fitted), should now be made off and secured.
- Potentiometer gear for length sensing may now be re-engaged into mesh with the driver gear. Ensure that all gear-locking screws are secure. Normally it is necessary to ensure that the boom is fully retracted or, that the machine is fully home. The pot gear should be turned by hand, in the direction driven when winding in cable, until the end stop is felt. Turn gears forward one quarter (¼) turn, and allow to engage into mesh. Further adjustments will then relate to the length indication system.
- Route the cable carefully from the recoil drum back around the boom pivot to the cab. Fix the cable to the boom and turret using adequate fixings ensuring that the cable is not pinched or stretched as the boom moves through its full luffing arc. Only connect the cable to the Control Unit when finished welding.

5.3.3. 140’ Length Sensor– (DRURW43LAA)

INSTALLATION- (Please read through before starting)

- Ensure that the face onto which the unit is to be mounted is flat, vertical and parallel to the line of cable payout. The mounting position should allow free uninterrupted payout of the cable.
- The unit should be mounted with fixing brackets in the horizontal plane. An anti-condensation filter is fitted to the unit close to cable entry glands, this should be at the lowest point when the reel is mounted.
- Weldable pads are usually supplied with the units to provide stud fixings. These pads also act as stand offs, so that if they are not used for mounting, care should be taken to ensure that there is sufficient clearance between the reel barrel and the mounting face, to allow free rotation.
- A cable anchor pulley now requires to be mounted at the boom tip, in order to tie off the free end of cable securely.
- Assuming now that the cable reeling drum is correctly mounted, setting up can proceed.
- Remove cover from unit and, first ensure that, if fitted, drive gears for potentiometer are disengaged.
- With all cable wound on the reel, turn the reel in the direction of payout about two full turns or until tension starts to build up. These turns which provide the initial cable tension are called pre-load turns.
- Have an assistant hold the reel from turning and unwind sufficient cable to reach the cable anchor while boom or travel is at minimum “Tie off cable to cable anchor securely.”
- Extend boom or travel machine slowly to the full extent of travel. Before reaching the limit of travel, haul off cable from the reel by hand, to ensure that the reel will not bind up before full travel is reached.
- Check that at full extension there is at least one turn available at the reel before binding up. Whilst doing this, keep on turning the reel to bind up and note the number of turns still available. Also check that at full extension, at least one full turn of cable is on the reel.
- Retract boom or travel to minimum extension while observing that the reel is working correctly. If more tension appears to be required, bearing in mind the turns available, more pre-load turns may be applied
- The reel should now be set up mechanically.
- Electrical connections for over-hoist system, (if fitted), should now be made off and secured.
- The potentiometer gear for length sensing may now be re-engaged into mesh with the driver gear. Ensure that all gear locking screws are secure. Normally it is necessary to ensure that the boom is fully retracted or, that machine is fully home. The pot gear should be turned by hand, in the direction driven when winding in cable, until the end stop is felt. Turn gears forward one quarter (¼) turn and allow to engage into mesh. Further adjustments will then relate to the length indication system.

5.3.4. Pay-out Cable

With the pay-out cable attached to the boom tip stand-off bracket, select positions for the intermediate cable guides provided, one for each telescoping section and one or more for the main boom allowing 9'-12' between the drum and the nearest cable guide. Measure the distance from the cable to the sides of the booms, record lengths and mark the positions for the guides. Cut and weld the guides to the boom after removing the cable. Refit the cable through the eyes and anchor to the post using the clamp provided. Adjust the position of each eye so that the cable passes through just touching the top of the ring. When booms deflect and pads wear the cable will take up a lower position in the eye.

5.4. Anti-Two-Block (if installed)

5.4.1. Rectangular type Anti-two Block switches

The switches require fitting at an offset angle to ensure correct operation throughout the full working angle range of the boom. Fix the switch to the bolt and lock the nuts. Consult installation drawings at the rear of this manual.

5.4.2. Tubular type Anti-two Block switches

Fix the anti-two-block switch mounting bolt by welding it to the boom head preferably so that the bob weight (when suspended from the switch) can be fitted to the static hoist rope below the rope anchor. Check that the switch works correctly as the boom luffs throughout its working range. Consult installation drawings at the rear of this manual.

5.4.3. Multiple Anti-two Block switches

Additional switches (for fly-jibs) can be added. Connection is via plug and socket at the Junction box adjacent to the main boom head. Consult installation drawings at the rear of this manual.

5.4.4. Bob-weight (both types of switches)

Hang the bob weight assembly from the switch eye after cutting the chain to length if desired to suit winch line speed. Repeat the procedure if required for rooster or fly jib. Consult installation drawings at the rear of this manual.

5.5. Load Moment based systems

5.5.1. Overview

Pressure transducers are fitted into the luffing cylinder of hydraulic luffing cranes.

5.5.2. Pressure Transducers (Luffing Cylinder)

5.5.2.1. Luff Cylinder - Annular (rod) Side
Install the appropriately marked pressure transducer into the hydraulic line feeding the top of the boom luffing cylinder. Ensure it is fitted to DIRECTLY read the internal pressure WITHOUT being influenced by outside check valves or similar.

5.5.2.2. Luff Cylinder - Force (piston) Side
Install the appropriately marked pressure transducer into the hydraulic line feeding the bottom of the boom luffing cylinder. Ensure it is fitted to DIRECTLY read the internal pressure WITHOUT being influenced by outside check valves or similar.

5.5.2.3. Cabling
Pressure Transducer cables should be fixed firmly to the crane structure and routed to the controller ensuring freedom of movement around moving parts, such as the boom pivot pin. Clip cables at 2-foot intervals.

5.6. Cabling and Glands

Load cell cables should be fixed firmly to the crane structure and routed to ensuring freedom of movement around the boom pivot pin and other moving parts etc. Clip cables at 2’ intervals. Manual reeling drums are suggested cable storage devices for long lattice booms or on cranes that require regular boom length changes.

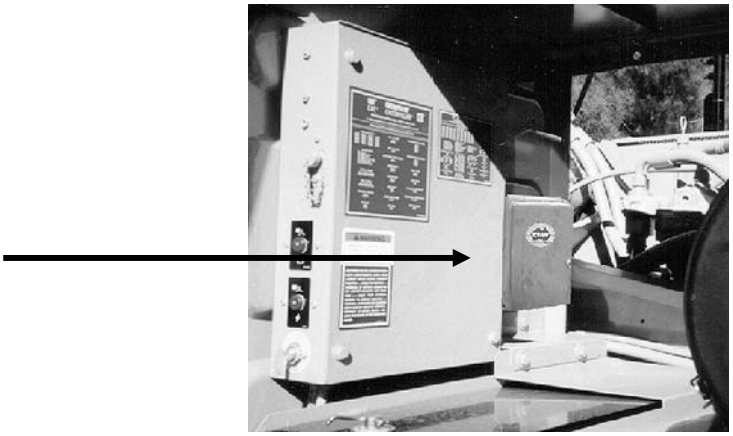
The gland types used are designed to trap the braid or screen (or armour in certain applications) within the braid for maximum EMI protection. Failure to terminate the screens in the glands will void the Electro Magnetic Compatibility (EMC) compliance which the system carries and will put the unit at risk of malfunction due to EMI. When armoured cable is used, then the armour must be trapped in the gland body, and the internal cable braid or screen must be terminated in the chassis terminals on the appropriate on board connectors. The gland termination of either armour or braid is also essential for protection of the inner conductors in the event of lightning or other transient effects. Failure to correctly terminate within the gland may also lead to destruction of the internal circuitry in such circumstances.

5.7. Display Unit

Fit the RCI-1550 Display Unit in a convenient position in the cab such that the operator can view the display and reach the push buttons comfortably

Important	**Check bonding between enclosure and chassis. If a good bond cannot be ensured through the mounting bracket, then install earth strap. It is a condition of installation that equipotential bonding must be ensured between the display enclosure and the Control Unit enclosure.**

5.8. Control Unit



The Control Unit (CU) contains the termination points for all modules within the RCI-1550 system. It also contains all the user interfaces, signal conditioning and processing circuitry required to satisfy the RCI/LMI functionality. The CU enclosure is a powder coated steel and carries an environmental protection rating of IP 65 which is suitable for internal or external mounting. All cable entries are via a gland plate mounted on the bottom of the enclosure.

Important	**Check bonding between enclosure and chassis. If a good bond cannot be ensured through the mounting bracket, then install earth strap. It is a condition of installation that equipotential bonding must be ensured between the display enclosure and the Control Unit enclosure.**

5.8.1. Power Supply (PS)

Also refer to drawings at the rear of this manual for this item.

The power supply is a 16W, triple output isolated power supply. The input connector has three terminals for each of the supply positive (V+); and supply negative (V-), allowing for looping if required.

The V+ is switched to the output connector via a single pole 5A relay only when the PS is running. The output connector contains two sets of power/RS-485 connections, one being for the display connection and the other for expansion modules. The front panel fuse protects power for this output connector.

The RS-485 signals are electrically isolated from the power and care must be take to ensure that no short circuit is introduced between them, otherwise the unit's transient protection will be compromised.

Transient protection has been included on all inputs. All internal power rails are current limited and short circuit protected using re-settable fuses. These fuses will reset only when the fault has been corrected and the power to the unit has been removed for at least 30 seconds before re-application. There are no operator adjustments or settings on this board.

For complete wiring details refer to the installation drawings.

5.8.1.1. Specifications

Input supply:	10V - 40V dc @ 8W (max)
Input fuse:	5A slow blow
User output:	Switched V+ when PSU is running (5A max)
Internal outputs:	5V @ 500mA (max) 12V @ 500mA (max) 12V (2) @ 500mA (max) All supplies operate with 1mV p-p ripple.

5.8.1.2. Transient protection

Common mode to chassis:	> 7kV on RS-485 signal, power input and outputs.
Differential (line-to-line):	> 7kV on RS-485 signal lines > 2kV on power input and outputs.

5.8.2. CPU Section

The processor is an 8051 derivative which contains a number of enhancements over the standard 8051, including an on-board 10 bit ADC. For most applications this degree of resolution is more than adequate.

The data memory is in the form of a single package which contains the memory device with real time clock (RTC) and integral lithium battery. This package has guaranteed memory retention of 10 years, and when flat the whole package must be replaced.

The program memory may reside in either a 64kB EPROM or the Expansion EPROM package labelled as U5 (refer to the PCB overlay). When the program has been put into U5, it will be labelled with the application WA number, otherwise it will be labelled with an ID number. When it is labelled with a WA number, there must be no EPROM loaded in location U8 otherwise damage to the processor circuitry will result. The Expansion EPROM package must only be removed using the correct extraction tool otherwise either the package or the socket may be damaged.

The high capacity Flash memory has been added to the 1550 to contain three main blocks of information, being Load-charts, Load Moment (LM) calibration tables and Data-logging. The memory is contained in two plug-in SIMM cards and depending on the application, any number of these may be installed. Refer to the relevant software configuration sheets for more details.

The SIMM cards can only be inserted one way, however care must be take during installation and removal. It is essential that the SIMM cards are installed in the correct sockets and that the correct sequence is followed.

To install a SIMM card, simply push the card into the socket at an angle of approximately 45 degrees (with the components facing toward the centre of the main circuit board). Once the gold pads on the leading edge of the card have entered the socket, gently push the card into the socket while rotating it to a vertical position. Installation is complete when the retaining clips on each end of the socket have captured the edges of the board and have fully returned to their original position.

To remove a SIMM card simply push the retaining clips at each end of the socket outwards until the SIMM card springs away from its vertical position. The card can then be gently withdrawn from the socket.

5.8.2.1. Specifications

Processor:	8051 derivative, operating at 18.4320MHz
Data Memory:	32kB of battery backed non-volatile SRAM
Program Memory:	64kB EPROM for program memory, expandable to 256kB
High Capacity Memory:	up to 4MB Flash.
RS-232:	9600 baud (8N1)
RS-485:	19,200 baud. (8N1)
On-board ADC:	10 bit
PWM output:	8 bit.

5.8.3. Analog Input Section

The analog section is takes advantage of the CPU's on board 10bit ADC. This board can support up to four load cells, three angle sensors and three length sensors.

5.8.3.1. Sensor Excitation Supply

The excitation supply provides power for all the sensors connected to the Analog section. The nominal output is 4v (or 12V for 4-20mA transducers). Do not connect either the +VEX or the –VEX outputs to any external supplies or chassis.

5.8.3.2. Load Cell Inputs

The analog input section is capable of accepting load cells with sensitivities of 1, 2 or 3mV/V. Load cells of different sensitivities can be used on the one RCI-1550 at the one time. The gain setting is controlled via software.

5.8.3.3. Angle Inputs

Either oil damped or electronic inclinometers can be connected to the RCI-1550's angle inputs. Note that all angle sensors must be the same type and may not be mixed. The analog section must be configured, via a single jumper link to accept the appropriate type of sensor. See connection diagram in rear of manual.

5.8.3.4. Length Inputs

The length inputs are designed to accept a 500Ω length sensor. No adjustments or configurations are required on these inputs.

5.8.4. Digital IO Section

Refer to drawings at the rear of this manual for this item.
The DIO section provides general-purpose inputs and output capable of sensing the state of 8 switch inputs and controlling 8 relay outputs. Connection is via plug-in Mini Combicon (R) screw terminals. The DIO section is very versatile and reference should be made to the installation drawings for details.
The digital section features LED indicators for input and output status. If the digital section detects an input signal (voltage) the corresponding LED will be illuminated. If an output LED is on then the given output relay is closed.

5.8.4.1. I/O Connections

Refer to drawings at the rear of this manual for this item.

5.8.4.2. Inputs

Refer to RCI-1550 User Wiring Detail – DIO2.

The DIO section contains 8 isolated inputs that require an external voltage source to activate. This means that each input has two connections, a positive and a negative. This allows the digital section to sense either switched high or switch low signals. To sense a switched low signal, as would come from a switch with one side grounded, the output of the switch is connected to the negative of the desired input and the positive side of the input is tied to the supply. For a switched high signal as would come from a switch connected to the supply, take the switch output to the positive of the desired input channel and ground the negative side.

The DIO also contains a dedicated ATB input. This only requires a simple switch closure between the two associated pin. No voltage is require to be applied to this input

Finally the DIO section has a disable input which forces the outputs to a predefined state. This input has the same properties as the eight data inputs.

The function of the switch inputs is defined in software and reference should be made to the software configuration sheets for details.

5.8.4.3. Outputs

All eight outputs consist of normally open voltage free contacts that close when the output is on. Each output is isolated from all others. Hence to have an output switch high one side must be tied to the supply and the other is used to drive the load. The opposite applies for switch low output. Since all outputs a fully isolated from each other this allows some outputs to switch high and others to switch low.

 Warning	Note: These outputs are not fuse protected through the RCI-1550, hence the protection must be provided by external means.

5.8.4.4. Snubber diode protection to crane fitted solenoids or relays

The use of snubbed inductive loads (ie solenoids and relays) is strongly recommended, however care must be taken to ensure correct polarity connection to these devices.

5.8.4.5. Defining the status of Outputs (normally closed OR open)

Provision has been added to the circuit to define the state of each output if there is an on-going fault in the CPU section. The reasoning for this provision is that the user may want one output to fault to an off position (ie Motion Cut) and another to fault to an on position (ie External audible alarm). The status is defined using DIP switch SW1 with the switch position number referring to the respective output. When the switch is “ON”, the corresponding output will be energised if the CPU fails, or alternatively when the switch is “OFF” the corresponding output will be de-energised if the CPU fails. This ‘fault state’ can be selected manually by the user by activating the disable input.

5.8.4.6. Specifications

Relay Outputs:	5 ampere @ 30 VDC
Switched Inputs:	Input current approx. 6mA @ 24V DC

5.8.4.7. Anti-Two Block input

Refer to DIO connection drawing in the rear of the manual.

Provision has been made on the board for the direct activation of Output 1 via an external switch.

This produces an instantaneous output signal, avoiding the possibility of delays caused by software.

To use this facility, ensure that link P4 is in the “ON” position that allows the CPU to read the status of the switch. The user then has the choice of allowing the CPU to over-ride the condition (ie in Rigging mode) or to leave total control to the external switch. If CPU control is desired, then link P3 must be in the “ON” position, otherwise leave it “OFF”.

If control has been given to the CPU, then the user must ensure that the fault status switch for Output 1 is in the “OFF” position, otherwise in a fault condition the output will be over-ridden. Once this has been set up, the status of the output is defined by the status of the external switch connected as per the wiring detail, with the output relay being energised (ie closed contacts) when the external switch is closed.

5.8.4.8. Slewing Zone Switch/es input/s

Fit slewing zone indicator micro-switch (or proximity switch) provided at a convenient place near the centre of rotation providing run on and off ramps as required for the particular application. This switch will convey a signal to the Control Unit when the crane moves into a zone of restricted capacity rating. For correct wiring instruction refer to drawings at the back of this manual.

 Important	**The switch wiring requires a "voltage free" connection. Never connect the switch wiring into any other system/wiring loom unless the exact nature of the connection is known.**

5.8.4.9. Motion Cut

If motion cut is required the client shall provide appropriate solenoid valves/devices to activate the function and wire them as shown in this manual.

5.8.4.10. Connections

 Warning	**1. Permanent display damage may occur if incorrect motion-cut connections are made.** **2. POWER MUST BE DISCONNECTED before attempting connections.** **3. NEVER insert larger capacity fuses than those originally supplied.** **4. Obtain specialist assistance if you are unfamiliar with crane electrics.** **5. The Robway relay contact ampere rating must not be exceeded when directly operating hydraulic or mechanical solenoid devices or high capacity relays. For such devices a "slave" relay must be used.**

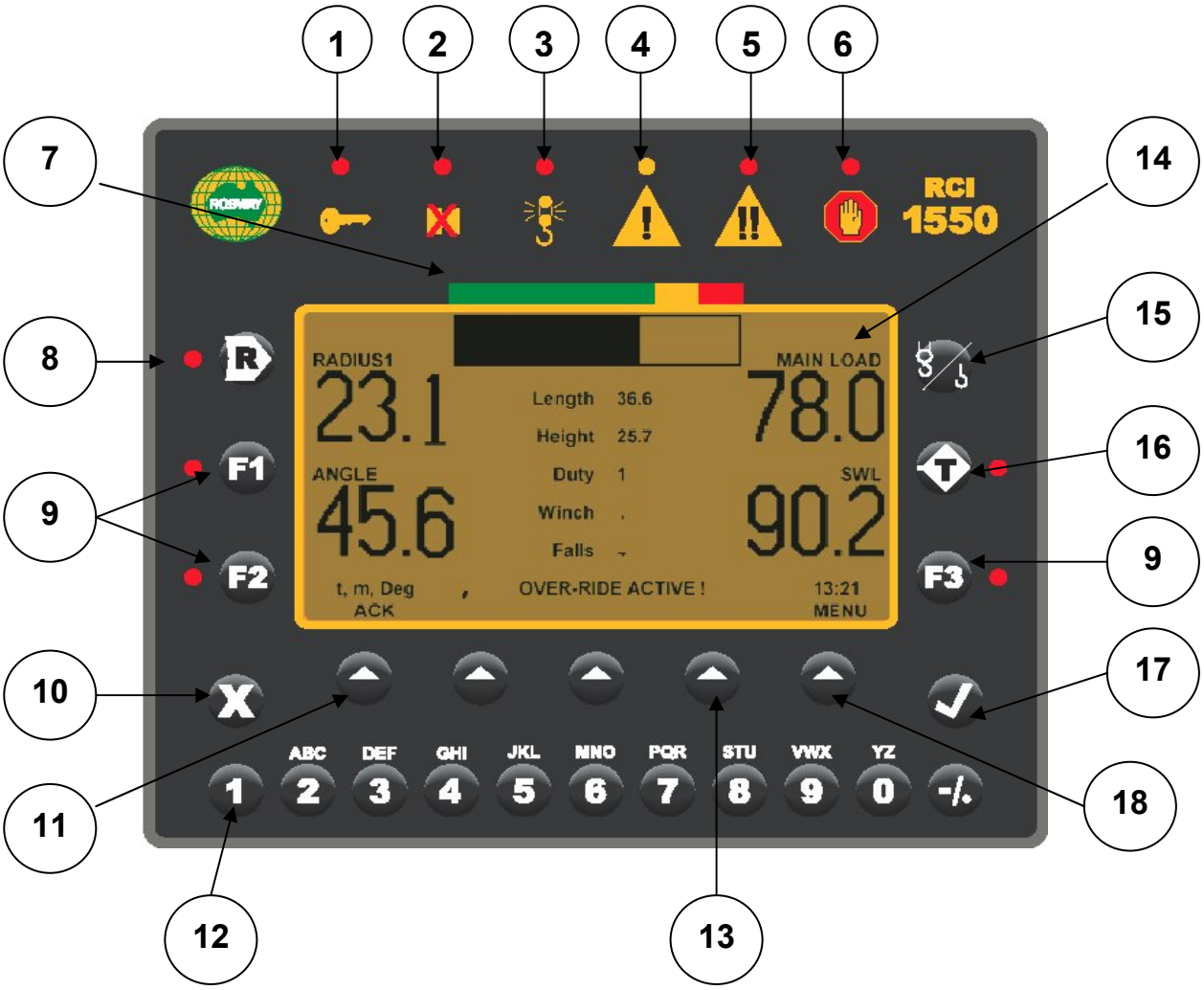
 Important	**The switch wiring requires a "voltage free" connection. Never connect the switch wiring into any other system/wiring loom unless the exact nature of the connection is known.**

5.9. Upgrading to RCI-1550 from earlier Robway model displays.

The RCI-1550 display/controller utilises the same sensors as used on other RCI series systems. However, it is recommended that all earlier version systems used negatively switched motion-cut output signals. The RCI-1550 can be configured for either negative or positive type outputs. Please ensure the preferred arrangement is connected via the digital section connector strips.

6. OPERATING INSTRUCTIONS

6.1. The LCD Display



1. Over-ride active indicator
2. Audible alarm disabled LED
3. Two Block Indicator
4. Approach to rated capacity LED
5. 100% capacity exceeded LED
6. Motion Cut activated LED
7. Bar Graph: - % of rated capacity
8. Rigging mode button
9. Function Buttons: - refer manual
10. Cancel button
11. Soft menu buttons: - refer manual
12. Alpha-numeric buttons: refer manual
13. “Up” button when Menu selected: - see also 18
14. LCD Display: - refer manual
15. Winch Select Button
16. Tare on/off button
17. OK or accept button
18. MENU button (also “Down” button when MENU selected - see 13

6.1.1. The Bar Graph

This is the rectangular bar that is in the top centre of the LCD. This gives an “analogue” indication of the percentage the current load is of the Safe Working Load. The bar will start to grow when the load is 50% of the SWL and reach the amber section at 85%. The start of the red section corresponds to 100% rated capacity.

6.1.2. SWL

The displayed S.W.L. is extracted from memorised look-up load-charts and will depend on the current crane configuration, duty, winch selected, the maximum line-pull and the falls selected.

6.1.3. Length

This is the current TOTAL boom length as selected from the Crane Duty Listing provided for each System. TOTAL boom length includes any attachment/s as specified by the current crane configuration duty.

- eg. For a SINGLE WINCH CRANE with #1 winch selected for a MAIN BOOM configuration, the boom length will be the MAIN boom, however, for a fly-jib selected configuration the boom length will be the MAIN + FLY-JIB length.
- eg. For a TWIN WINCH CRANE,
- #1 winch selected will display MAIN BOOM length and,
- #2 (or #3) winch selected will show TOTAL BOOM length inclusive of the Upper Boom Point (rooster sheave) OR inclusive of the FLY-JIB.

6.1.4. Angle

This is the current boom angle. This angle will be either the MAIN BOOM, OR the LUFFING FLY (when selected and in use)

6.1.5. Radius

Shows the operating radius for the CURRENT CONFIGURATION and DUTY and WINCH selection. The radius is calculated from the Boom Angle and Length sensors with compensation applied to include, slew offset distance, head sheave radius and boom deflection.

6.1.6. Load

This shows the current total lifted load for the selected winch. For endless/tandem reeving it will show the total load of both winches. Please note that this load value may contain some TARE value. The TARE lamp being on indicates this *(see TARE function later in this section).*

Use the WINCH button to switch between #1, # 2 or #3 selection.
INVALID WINCH SELECTIONS WILL BE DISABLED IN SOFTWARE.

Although the RCI-1550 will always check safe operation for all winches, you should make sure that the correct winch is selected as the winch selection affects the values shown on the displays. When the ACTUAL LOAD exceeds the SWL for the current crane configuration the RCI-1550 will activate audible and visual alarms.

6.1.6.1. Hook Load selection

MAIN WINCH SELECTED #1	AUX. WINCH SELECTED #2
Main load displayed Main SWL displayed Main falls displayed	Aux. Load displayed Aux. SWL displayed Aux. falls displayed
Note: #3 winch selection is reserved for cranes with 3 hook winches.	**PROGRAMME REVIEWS AT ALL TIMES**
	Main load - Main SWL Main line pull Aux. load - Aux. SWL Aux. line pull

6.1.7. Error Codes

Additionally, the lower area display LCD is used to display ERROR codes when any errors are detected.

Should the operator press the ACK button with an error code number displayed, the text window will revert to normal until a different error condition arises, or the acknowledge timeout expires.

The original error code can be reviewed by simply pressing the ACK key a second time.

Please refer to the 'Trouble Shooting' section of this manual for the meaning of the displayed error codes.

6.2. The Display Keypad

This section describes the operation of the keypad and the associated LED indicators. Operationally, this window displays the selected crane configuration and provides warning lamps to visually indicate the reason for activation of the audible alarm.

6.2.1. Function Key (F1, F2, F3)

These are general-purpose keys that may be assigned a job specific use. Any special functions use will be listed in the appendix.

6.2.2. Soft Menu Keys

These are similar to the Function keys in that each one does not have a specific use. Their use can change depending on what state the display is in. The function of each key, if it is actually used at that time, will be listed above it on the bottom line of the LCD. Not all will have assigned uses at any one time. Take careful note of the LCD as their use can change as you navigate through menus. For example the right hand soft menu key is typically used to invoke the menus during normal operating mode. Once the menu is used the two right-hand buttons are used to scroll up and down the menu list.

Refer to the section titled "Menu Navigation" (section 6.7) for more information on the functions of each menu

6.2.3. Alpha-Numerical Keys

Used for data entry in Calibration mode. When the display is expecting a numerical input the number assigned to each key will be used. If text data is required the first key-press will generate the first letter above the pressed key. If the key is pressed again in quick succession a second time the letter will change to the second above the key and so on. If no key is pressed for approximately 1 second the character on the screen will be accepted as being correct and the display will move to the next character.

6.2.4. Ok (√) key

Used to 'accept' the currently displayed message or option on the LCD.

6.2.5. Cancel (x) Key

Used in Calibration mode to cancel incorrectly entered data or to escape out of various menus

6.2.6. Tare Key

The RCI-1550 allows the operator to TARE out the weight of the hook, rope and accessories of the selected winch if required. This is a toggle function that turns on or off depending on its current state and is a function of the currently winch selected.

If the TARE indicator is illuminated then the displayed load is the total weight minus the accessory weight. When TARE is next pressed, the displayed load reverts to the total. If the TARE indicator is off then the actual load shown in the load window at the time of pressing the TARE button will be stored in the system as the tare load.

Please note that when the TARE function is active, the %SWL is still determined by the total load, irrespective of what is currently displayed.
All tared weights are removed on system start-up.

6.2.7. Rigging Key

Rigging mode is operator selectable via the MENU button and scrolling to Rigging Mode, alternatively the rigging key on the front panel can be used to initiate rigging.

There are two forms of Rigging mode.

- General Rigging mode, where motion-cut is over-ridden (if fitted) to luff down and hook up and tele-out. This mode is ONLY intended for use during crane lay-down or setup.

  If after this function is initiated, the boom is raised more than 10 degrees, this function will reset to normal crane operation. This is necessary to ensure overall safe crane operation.

- Temporary/ATB Rigging mode, which is essentially the same as normal rigging mode with the exception that it over-rides motion cuts for only a limited period or time. This mode is intended to allow the operator to over-ride the display in special circumstances (eg. need to raise through ATB switch to gain some height etc.).

This operator selectable mode is provided to enable crane hoist rope reeving which would otherwise cause alarms and motion-cut (if fitted). When selected, the display automatically chooses whether full rigging mode or temporary rigging mode is enabled. Full rigging mode will only be enabled when the crane is NOT positioned in a legal lifting position.

Rigging mode will be cancelled when the operator presses the cancel button. If errors become active in rigging mode they will not be displayed but the audible will sound. The ACK button can be used to silence them for approximately 5 minutes (according to the setting for the Acknowledge Timeout).

If normal crane operation is overridden the LCD will display a message indicating "Temporary Over-Ride" is occurring. The override will end if the operator presses cancel or 10 seconds have expired.

If an attempt is made to enter rigging mode but there is a load on the hook which exceeds the rigging threshold, or the boom length exceeds the rigging length threshold, then a message stating this will be displayed. The main menu will subsequently be displayed after approx. 3 seconds.

 Important	ROBWAY recommends that the over-ride key-switch be switched off (ie, normal position) at all times and the over-ride key held by the site-supervisor.

6.3. LED Indicators

This section describes that operation of the 5 LED indicators that run along the tope edge of the RCI-1550 display.

6.3.1. Override LED

The Override Led is illuminated when the Override key switch is activated. Refer to the section on the Override key switch for more information. It is also activated during rigging modes.

6.3.2. Audible Alarm Disabled LED

Illuminated when the in cabin alarm has been cancelled. This occurs when the operator presses the ACK soft menu button to acknowledge an error. Acknowledging an error effectively cancels the alarm for that error for a period of time. The amount of time the error will remain acknowledged is determined by the setting for this option. If the Acknowledge Timeout value is set to zero the error will not re-sound unless a new error occurs or the same error re-occurs.

6.3.3. A.T.B. Indicator (anti-two-block or over-hoist)

The RCI-1550 can be supplied with an Anti-Two-Block sensor to prevent two-blocking of the main and aux winches. When the A.T.B. indicator on the front panel is lit, a two-blocking condition has occurred and further hoisting may be stopped by activation of the ATB motion cut relay if installed. An audible alarm also sounds a warning. If the Anti-Two-Block system is not required for the given application the two wires normally connected to the two-block sensor/s, should be connected together to avoid erroneous activation of motion cut *(refer to the drawing section of this manual).*

If in Over-ride OR Rigging mode.
During some operations (such as Over-Ride and rigging modes) the ATB LED will flash. This indicates that the ATB circuit has been over-ridden and the RCI unit can not actually sense the state of the ATB condition.

6.3.4. Approach to Rated Capacity LED

This is illuminated when 85% of rated capacity is exceeded. This corresponds to the bar graph being in the amber region.

6.3.5. 100% Capacity Exceeded LED

This is illuminated when 100% rated capacity has been exceeded. This corresponds to the bar graph being in the red region.

6.3.6. Motion Cut LED

This illuminated when the RCI-1550 has activated the motion cut outputs and is preventing the crane from moving into a more hazardous state.

6.4. Over-ride Key-Switch (If fitted)

Should crane overload be reached (or other limitations exceeded, such as maximum radius, minimum angle, winch line-pull etc), the system will activate the motion cut relay, if installed. This will then stop further over-loading of the crane. To bypass or temporarily override motion cut, the operator can use the over-ride key which should be held by the site-supervisor. When the key is inserted and turned on, the O/RIDE indicator is illuminated as a reminder.

 Note	**The Mast er Over-ride key-sw itch is located on the Control Box Unit.** **Turn on to deactivate motion lock-outs.**

6.5. Disable Key Switch (If Fitted)

The purpose of the disable switch input is to bypass the RCI-1550 should a hardware fault develop. The override input simply signals to the software that if an overload is present to ignore it, hence is software controlled. The disable input is a hardware bypass, and in fact no software need to be running at all. Hence should the main processor fail, the disable input can be used to allow operation of the crane until the unit can be serviced.

Like the override key, this key should be held by the site supervisor.

6.6. Turning on the RCI-1550

Generally by the ignition key-switch OR as installed.
Power to the RCI-1550 can be derived from the automotive alternator DC supply, nominally 12V or 24V DC namely;

- The crane electrical ignition circuit.
- The crane electrical accessory circuit.

 Important	**For either DC suppl y, absolut e voltage range is 10 - 40V DC.**

As soon as power is applied to the RCI-1550, its display and other indicators should light up and the RCI-1550 should go through its self-test operation.

6.6.1. On Power Up

Upon power being supplied, a test pattern is written to the LCD that completely blackens it and all LEDs will be active. After approx. 5 seconds the test pattern will be replaced by Robway information for approx. 3 seconds on the graphical LCD. The message “Please Wait” will then be displayed until communication has been established with the control unit.

The LCD will then display the build information. The operator is required to press the OK button for the display to proceed to the normal operating mode.

The active “Crane Configuration” is then displayed, the operator is required to press the OK button if the crane configuration is correct or the Cancel button if incorrect.

Pressing cancel will allow the operator to change the duty and/or falls (a ‘PIN’ number may be required to be entered by the operator in order to effect changes). After the crane configuration has been be confirmed the display will proceed to the normal operating mode.

6.7. Menu Navigation

During normal operation the soft menu key with the label “Menu” can be pressed. This will cause the lower section of the LCD to display the main menu screen.

By pressing the Up/Down soft menu keys the desired menu item can be selected.

The currently selected menu item is highlighted by a solid bar, pressing the OK key will activate the selected item. The main menu consists of 4 four main sections which are discussed below.

6.7.1. Config Change Menu

This selection is used when the operator wishes to change some aspect of the crane configuration. Upon selection of this item the “Config Menu” is displayed. The Config Menu typically allows the operator to change the following parameters:

- the currently selected duty,
- the falls (parts of line) for each winch,
- any special items for a particular job,

It is not possible to change the crane configuration when a lift is being performed. If the current load (on any winch) is greater than or equal to the Lift Threshold value (for the given winch), the Lift in progress screen will be displayed. This inhibits the altering of configuration once a lift has begun. If it is imperative to change the configuration even though a lift is being monitored, it is possible to change the duty and or falls in calibration mode provided you have the correct access code.

When no lift is in progress it is possible to change any of the items that describe the crane configuration.

Selecting to change the duty will cause a series of screens to be displayed prompting the operator to select each aspect of the current crane configuration.

Once editing is complete, pressing the OK button changes the duty according to the selections made, if possible, else a message is displayed informing the operator that there is no duty provided that matches the selections made.

Selecting to change the falls will bring up the falls change screen, provided that no lift is currently in progress. This screen allows the operator to set the currently reeved falls *for the currently selected winch*.

The falls can be changed by either using the Up/Down keys or by using the numeric buttons. Once editing has been complete, pressing the OK button effects the change to the new edited value. If the cancel button is pressed the edit is discarded and the display returns to the main menu.

6.7.2. Function Codes

Refer to the Function listing at the rear of the manual for detailed information on the available function codes.

6.7.3. Display Options Menu

This menu contains the settings that are specific to the look and “feel” of the display unit itself. Such items include the units displayed, the volume of the buzzer and contrast of the display as well as the setting for the Acknowledge Timeout.

6.7.3.1. Acknowledge Time-Out
Sets the time for which the acknowledge soft menu button will silence the in cabin alarm and hide any errors.

6.7.3.2. Display Units
This option allows the operator to view information in either metric or imperial units according to personal preference. Selection of the “Change Units” item can be performed at any time (ie. even during a lift).

6.7.3.3. LCD Contrast
This allows the operator to adjust the LCD for optimum contrast. The contrast or ratio of black to “white” on the LCD depends on viewing angle and temperature. Temperature compensation is provided in hardware but variations in the individual LCD circuits mean this may not compensate perfectly. Hence the contrast may need to be adjust occasionally. The setting is retained when the unit is turned off. The LCD contrast can also be changed during display start-up by pressing using the rigging button BEFORE the first OK after the unit powers up.

6.7.3.4. Buzzer Volume
Allows the operator to set the in cabin audible alarm to an appropriate level. This setting is retained when the RCI-1550 is turned off.

6.8. Data Logging and Data Down-loading

Please refer to the Data Logging Manual supplied separately for details.

7. CALIBRATION

7.1. Calibration Purpose

The monitoring sensors (Load-cells, Boom angle, Boom length etc) require calibration (scaling) so that their output directly relates to the crane.

7.1.1. Entering Calibration Mode and Selecting calibration functions.

Make sure that the correct duty number, winch and falls are selected before entering Calibration mode. Verify the correct boom length is displayed.

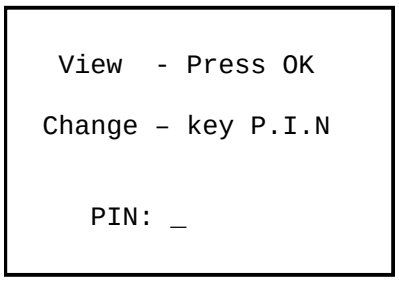
To enter Calibration mode, press MENU then ARROW to “Function Codes”, press OK. You will be asked to enter a PIN NUMBER to confirm your Robway Training. Enter the correct pin number to gain access to Calibration Function Codes, an incorrect Pin Number will cause only VIEW mode to be accessed.

Once calibration mode is entered use the UP/DOWN keys to ramp through the calibration functions.

Pressing the Cancel button twice will return the system to Operator mode.

7.1.2. Function codes menu item

When the Function code item is selected from the main menu, the password entry screen will be displayed. A PIN is required to enter calibration mode.

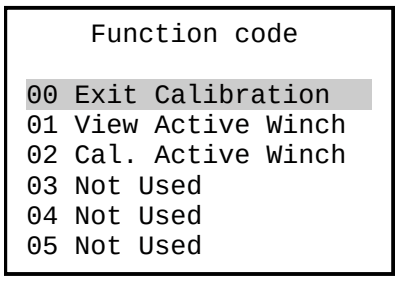


Pressing the Cancel button returns the operator to the main menu.

If view mode is requested the message “View access granted” will be displayed.

If calibration mode is required the operator must enter a PIN and then press the OK button. If the PIN is correct and the controller enters calibration mode then the message “Cal access granted” will be displayed. An incorrect PIN will result in the message “Incorrect Password View access granted” being displayed.

When in calibration or view mode, the function code screen (below) is used to select the desired function. The Up/Down data entry buttons or the numeric buttons can be used to scroll through the function codes. Pressing the Cancel button returns the operator to the main menu. By pressing the OK button the display enters the selected function.



7.1.3. General information regarding text editing

Function codes that require editing will have a blinking cursor indicating where the edit will take place. The numeric buttons are used to enter the new value (unless stated otherwise). The OK button should be pressed when the edit is complete to accept the new value. Pressing the cancel button aborts the edit and any changes made are discarded.

The ". / -" button can be used to enter a decimal point or a negative value. If a negative number needs to be entered the ". / -" button should be pressed before any numeric buttons. Pressing the ". / -" button again before any other numeric button are pressed, results in the " - " being removed. If a number contains only a fractional part (ie. 0.123) the operator needs to press the button "0" before the ". / -" button otherwise a "-" will be displayed.

7.2. Calibration Functions Breakdown

7.2.1. Exit Calibration Item

Returns the operator to the main menu.

7.2.2. View Main Load and View Aux Load items

Displays the active winch load on LM systems

```
VIEW MAIN LOAD
     F01:

Load = 100.12



               hh:mm
```

7.2.2.1. CAL ACTIVE WINCH item

By using the numeric buttons, calibration of the active winch (the one selected and in use) can be achieved. The display will initially request the Load + Hook weight to be entered (see following diagram).

```
  CAL ACTIVE WINCH
       F02:

Enter Load + hook
 Edit : 234.89


               hh:mm
```

Once the load + hook weight has been entered and OK is presseda section number is requested (see following diagram).

```



Enter the section no.
  Edit : "xx"


               hh:mm
```

When the section number has been entered or if its not a telescopic crane, the operator will be asked to "Luff to a safe high Angle and Press OK" or "Luff to a safe low Angle and Press OK".

7.2.3. View Boom Angle item

Displays the calibrated and un-calibrated values.

```
   VIEW BOOM ANGLE
        F07:

Uncal. = 555

  Cal. =   23.22

                 hh:mm
```

7.2.3.1. CAL LOW BOOM ANGLE item

Allows the low end of the selected item to be calibrated using the numeric buttons. The current raw value and calibrated value are displayed and below it the edited value. Once the edit is complete, pressing OK will result in the Display request the controller to do a calibration change. Pressing Cancel at any time will abort the edit and return the operator to the Function codes menu screen.

```
    CAL LOW B.ANGLE
        F08:

Uncal. =  555
  Cal. =   24.34
 Edit  =  133.6

                 hh:mm
```

7.2.3.2. CAL HIGH BOOM ANGLE item

The graphical LCD will appear similar to CAL LOW BOOM ANGLE.

7.2.4. View Jib Angle item

This function code item is only available for Luffing fly systems.
The graphical LCD will appear similar to VIEW BOOM ANGLE.

7.2.4.1. CAL LOW J.ANGLE item

This function code item is only available for Luffing fly systems.
The graphical LCD will appear similar to CAL LOW B.ANGLE.

7.2.4.2. CAL HIGH JIB ANGLE item

This function code item is only available for Luffing fly systems.
The graphical LCD will appear similar to CAL LOW B.ANGLE.

7.2.5. View Length item

The graphical LCD will appear similar to VIEW BOOM ANGLE.

7.2.5.1. CAL SHORT LENGTH item

The graphical LCD will appear similar to CAL LOW B.ANGLE.

7.2.5.2. CAL LONG LENGTH item

The graphical LCD will appear similar to CAL LOW B.ANGLE.

7.2.6. Set Gain Trans 1 item

This function code allows the transducer gain to be input by software. The numeric buttons “1”, “2” “3” and “4” or the Up/Down buttons can be used to alter the gain for the selected transducer. The graphical will appear as shown:

```
   SET GAIN TRANS 1
        F13:

  Uncal.:  555
   Gain :  2 mV/V


                  hh:mm
```

7.2.6.1. VIEW TRANS 1item

Allows viewing of the raw, calibrated, and health signal for transducer 1. The graphical LCD will appear as shown:

```
      VIEW TRANS 1
         F14:

Uncal. =  555
Health =   500 approx
  Cal. =  22.11

                  hh:mm
```

7.2.6.2. CAL TRANS 1 LOW item

The graphical LCD will appear similar to CAL LOW B.ANGLE.

7.2.6.3. CAL TRANS 1 HIGH item

The graphical LCD will appear similar to CAL LOW B.ANGLE.

7.2.7. Set Gain Trans 2 item

This function code is exactly the same as the “Set Gain Trans 1” item except it of course operates on the transducer 2 gain.

7.2.7.1. VIEW TRANS 2 item

The graphical LCD will appear similar to VIEW TRANS 1 item.

7.2.7.2. CAL TRANS 2 LOW item

The graphical LCD will appear similar to CAL LOW B.ANGLE.

7.2.7.3. CAL TRANS 2 HIGH item

The graphical LCD will appear similar to CAL LOW B.ANGLE.

7.2.8. Set MUX. Delay item

Editing this value alters the multiplexer delay. The multiplexer delay is the settling time (in ms) for the analogue hardware. To edit the numeric buttons can be used or the Up/Down buttons.

```
    SET MUX. DELAY
        F22:

Mux delay :  4



                  hh:mm
```

7.2.9. No. of Samples item

This menu item is used to stabilise the display in the event that the numbers are changing erratically.

The graphical LCD will show the number of samples currently being used to average the sensor inputs.

This value can be edited by either using the numeric or the Up/Down buttons. If the numeric buttons are used and the value entered is larger than then maximum allowed the message “Max Sample = ” will be displayed.

```
    NO. OF SAMPLES
        F22:

 Samples =  8



                  hh:mm
```

7.2.10. Set Lift Value (Threshold) item

A lift of a load is said to have commenced when the load is greater than or equal to the lift value. During a load lift it is not possible to change the crane configuration (duty, falls etc.). There is one lift value setting for each winch being monitored. When setting the lift value the load entered should be slightly greater than the weight of the hook block for the winch.

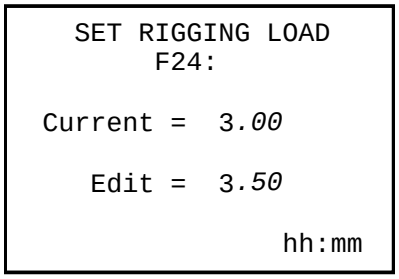
The lift threshold value can be edited by using the numeric buttons. On the graphical LCD both the current lift threshold value and the edited value are shown.

```
    SET LIFT VALUE
        F23:

Current =  8.23

   Edit =  23.12

                  hh:mm
```

7.2.11. Set Rigging Load Threshold item

Rigging the crane often requires that the boom be positioned outside of the normal operating regions of the load chart. It is not generally safe practice for the crane to be placed in such positions however, at times such actions are necessary. The “Rigging Load” value is set by the system installer to allow the crane to be manoeuvred off of the load chart. This value represents the highest load that can be seen by the system during a rigging operation. If the load on either hook (or indeed, the combination of loads) exceeds the setting for this function code then rigging mode is automatically disabled and the display will return to a normal operating mode thus generally causing motion cut to the crane.

Setting this value to 0 will effectively disable the rigging mode operation. Any positive setting for this value will allow rigging mode to be activated as long as the combination of loads does not exceed the setting.



The installer must satisfy themselves that any value entered here is in accordance with the crane manufacturer or their agents.

7.2.12. Correct Radius (Unladen boom) item

This function code item is only available for telescopic cranes.

This function code allows the installer to calibrate the system to account for unladen boom deflection. As such it should only be used when the displayed load radius is less than the true operating radius of the crane. In such a case the installer should measure the physical load radius at a position where boom deflection is seen to have the maximum effect on the load radius.

Maximum boom deflection occurs when the boom is fully telescoped and is positioned at about 45-60 degrees. On duties where the winches are both assumed to be reeved over the main boom head it is necessary to calibrate only for the main winch (winch 1). However, when a jib is installed it is possible to calibrate boom deflection both for the main boom head and for the head of the jib.

To calibrate, select the desired winch, fully extend the boom and position it for worst case deflection. Measure the physical radius, confirm it is greater than the displayed radius, and then enter it against the Unladen radius correction function code. Repeat this procedure for any winch that is reeved over a job.

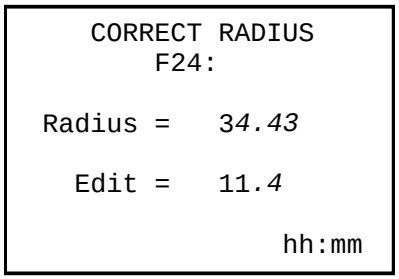
7.2.13. Correct Radius (laden boom) item

This function code item is only available for telescopic cranes.

This function code allows the installer to calibrate the system to account for laden boom deflection. As such it should only be used when the displayed load radius is less than the true operating radius of the crane AND unladen correction has already been employed. In such a case the installer should measure the physical load radius at a position where boom deflection is seen to have the maximum effect on the load radius.

Maximum boom deflection occurs when the boom is fully telescoped and a load, which approaches the SWL, is suspended on the hook. On duties where the winches are both assumed to be reeved over the main boom head it is necessary to calibrate only for the main winch (winch 1). However, when a jib is installed it is possible to calibrate boom deflection both for the main boom head and for the head of the jib.

When editing the radius correction the LCD display should appear as in below. If the load is less than the "Lift Threshold" setting, the message "No Lift in progress" is displayed.



7.2.14. Set Rigging Length Threshold item

This item is, once again, used for rigging. The rigging length is the maximum length allowed during rigging operations. If the boom length is less than the "Rigging Length" then the display can be placed in the rigging mode. If rigging mode can't be entered because of the rigging length threshold a message is shown on the graphical LCD informing the operator. Generally this is only used on telescopic cranes however, in some cases it may also apply to lattice boom scenarios.

7.2.15. View Directions item

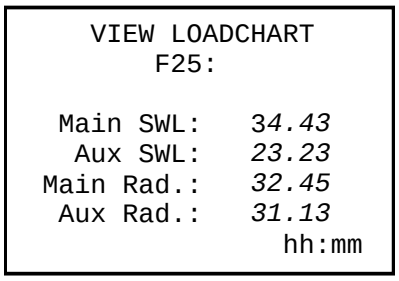
The Hoist directions for winch 1, 2 and 3 can be viewed (if installed) and the Luff direction of the boom is displayed in this function code.

Note 1: N/A represents **Not Applicable**

Note 2: Stat represents **Stationary**

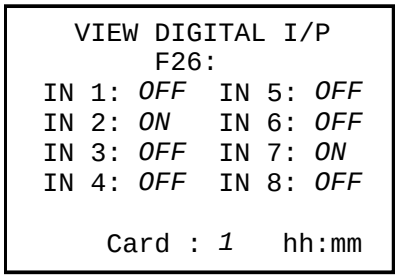
7.2.16. View Load-Chart item

This function code is intended to allow easy viewing of the SWL over the operating range of the crane. This mode should NOT be used to actually monitor a lift, however, it is useful for determining whether a specific load will be tolerated at the desired operating position.
The main and auxiliary (if there is more than one hook) safe working loads can be viewed. The main and auxiliary radii are also displayed.



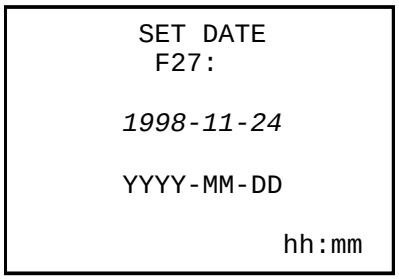
7.2.17. View Digital I/P item

The state of the digital inputs can be viewed on the graphical LCD by using this function code. To determine what a particular digital input signal is being used for in the software, please refer to the "System Configuration Sheets."



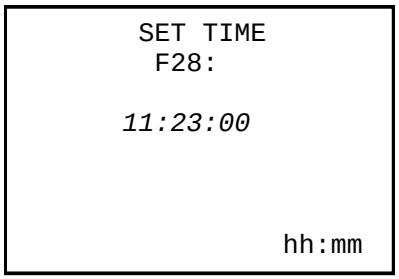
7.2.18. Set Date item

When changing the date, the graphical LCD will appear as shown in the following diagram. The date displayed is in the ISO format (YYYY-MM-DD). An invalid date will cause an error message to appear.



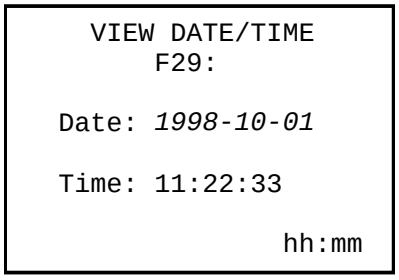
7.2.19. Set Time item

When changing the time, the graphical LCD will appear as shown in the following diagram. The time displayed is in the format HH:MM:SS. An invalid time will cause an error message to appear. Note: The seconds can't be edited and will always be "00". The seconds will begin incrementing once the OK button is pressed



7.2.19.1. VIEW DATE / TIME item

When viewing the date and time, the graphical LCD will appear as shown:



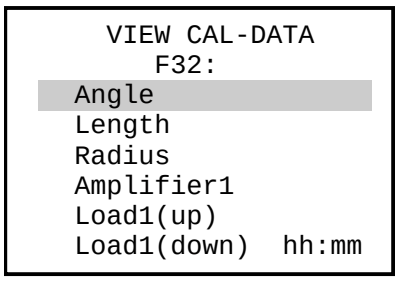
7.2.20. Download Logger item

Please refer to the Data Logging Manual supplied separately for details.

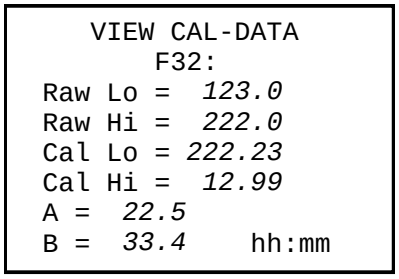
7.2.21. View Cal-Data item

This function code is for the manual recording of calibration data just in case the calibration is lost or a display needs to be replaced. This is to be used in conjunction with the alter calibration data function code when inputting pre-recorded cal data.

The Cal data item of interest needs to be selected before viewing can occur. This is achieved in a similar method to selecting main menu items (see diagram below).

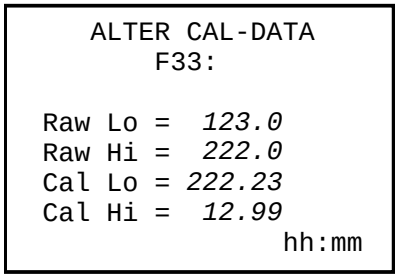


Once the Cal data item of interest has been selected and OK is pressed the graphical display should be showing the following information.



7.2.21.1. ALTER CAL-DATA item

The Cal data item of interest needs to be selected before editing can occur. This is achieved in a similar method to selecting main menu items. When the OK button is pressed the following screen should be displayed.



To edit an item, use the Up/Down buttons to move the cursor to the item you wish to edit. Then use the numeric buttons as in previous edits to enter the new values. The Ok button should be pressed to set the new values or use cancel to abort the edit.

Warning, incorrect settings may cause the display to operator incorrectly.

7.2.22. Change Duty item

This function code is the same as if change duty was selected from the Config Change menu with the exception that the duty can be changed even if a lift has commenced. This feature is only provided in Calibration mode.

7.2.23. Change Falls item

This function code is the same as if change falls was selected from the Config change menu with the exception that the falls can be changed even if a lift has commenced. This feature is only provided in Calibration mode.

7.2.24. Transmit Load Moment Data item

This function code item is only available for Load Moment systems.

Since Load Moment calibration can be time consuming it is desirable to have a means of recording this information for quick upload to a replacement display or sister crane. This objective is achieved through use of this function code. As for downloading data logger information any standard PC can be used along with associated terminal emulation software. The communications settings for the PC are as follows:

7.2.25. RS-232 Communication Settings

Protocol	XMODEM (16 bit CRC)
Data Rate	9600 Baud
Data Bits	8
Parity	None
Stop Bits	1

The Display will prompt the operator to press OK if a LM data download is required. The message “Downloading LM data” will be displayed while the download is in progress. Once downloading has commenced it can’t be aborted by the operator. When starting a transmission, set up the PC with the appropriate settings but only start the PC once the download function code has been activated on the RCI-1550.

7.2.26. Receive Lm Data item

This function code item is only available for Load Moment systems.

This function is of course the opposite of the above. It allows load moment calibration that was previously saved to be restored to the RCI-1550. The communications settings are as shown above and once again the RCI-1550 should be started before the transmission is started from the PC.

When a record is first sent to the RCI-1550, some checks are run on the data being sent to ensure it is correct for the system it is being stored on. In the event a mismatch is found a message will be displayed to the operator. Please consult Robway in the case of difficulty.

The Display will prompt the operator to press OK if uploading of LM data is required. The message “Uploading LM data” will be displayed while uploading is in progress. Once uploading has commenced it can’t be aborted by the operator.

7.2.27. Back Up Cal-Table item

A backup of the entire calibration data can be made through the use of this function code. The backup is stored on the display and can be used to quickly restore the previous calibration if an incorrect modification to calibration has been made or if calibration is lost/corrupted. Calibration backup should be performed after commissioning, when the system is operating well. On load moment systems a calibration backup will also back up load calibration data. Upon completion, the message screen will indicate the success / failure of this process, as well as that of the calibration data.

7.2.28. Restore Cal-Table item

The backup calibration data can be restored by using “Restore Cal-Table” function code.

Pressing the OK button will start the restore processes and the LCD will display “Executing …”. The calibration data is copied from backup memory to the calibration data that is used at run time. The success of the calibration backup and the optional backup of load calibration data (LM systems only) will be reported.

If the Cancel button is pressed the restore process will not start and the current calibration data will be retained.

7.2.29. Erase Cal-Table! item

The Display will prompt the operator to press OK if he wishes to erase the Cal Table.

Pressing OK here w ill clean out the memor y sys tem and default back to hard coded sof tware. Any on-site changes made will be lost.

Proceed with extreme caution…

```
ERASE CAL-TABLE!
     F39:

To Erase the Cal
 Table Press OK


                hh:mm
```

7.2.30. User Variables

ROBWAY stores the load-charts and crane geometry in the memory of the RCI-1550 at the time of manufacture. As this information may very from crane to crane, even if they are of the same model, the RCI-1550 allows the installer to change crane information on site. These user variables include dimensions such as slew-offset, maximum falls for main/aux winches, maximum line-pulls, sheave diameters etc. *(refer to function code listing at the end of this manual)*

The actual value of these variables are printed on a configuration sheet which is supplied with the system and a copy of it is also attached to this manual.

To verify or change the current value of any of these user variables follow the procedure below:

- Enter calibration mode,
- Select the correct function code from the listing then using the UP/DOWN keys ramp to that function code and press ENTER,
- If you want to change the value use the UP/DOWN key to select the new value then press the ENTER key,
- If you only want to verify the current value press the CANCEL key when finished viewing,
- Now you should be back at the F-xx prompt and can continue on with the next operation.

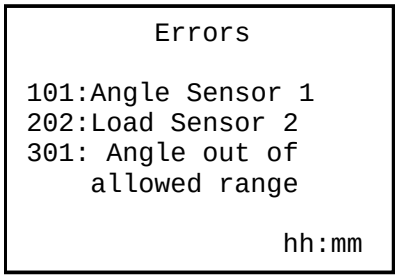
Please note that the value of these variables is very important as they affect the safe operation of the RCI-1 550 indicator. Therefo re the values of the user variables must be c hecked and correcte d if necessary before proceeding with further calibration or operation.

7.2.31. Viewing Errors

If errors exist they will automatically be displayed when the display is in normal operating mode (ie. provided no other menu displays are active). The graphical LCD will display an error code followed by a short description.

Pressing the ACK button will temporarily silence the cabin buzzer and hide the error report from the screen. The fact that there are “acknowledged” errors in the system will be indicated by the ACK LED illuminating. Any acknowledged errors will be re-reported after a certain amount of time that can be altered in the Display Option menu. Errors are also re-reported if any new error conditions arise.

Once errors have been acknowledged, they can be re-viewed by simply pressing the acknowledge button once more to “un-acknowledge” the errors.



7.2.32. Verifying Operation of Sensors

Before you start calibrating the RCI-1550, make sure that the sensors are working correctly and their signals reach the RCI-1550.

The RCI-1550 'sees' the crane and its surroundings through sensors. The signals from these sensors are represented as numbers inside the RCI-1550. The range of possible numbers is 0 to 1023 when an 8 bit analogue to digital converter is used (which is the most common type).

The RCI-1550 allows the user to view both the UNCALIBRATED or the CALIBRATED signal from a given sensor *(refer to function code listing at the back of this manual)*.

When viewing the UNCALIBRATED signal from a sensor, make sure the number displayed is less than 999 and is more than 32 as you work the sensor through its working range. This is the correct operating range. Also make sure that the numbers displayed in the window are changing in a nice, smooth manner. If you find that the number is too unstable, that is changes by more than 10, then you should check the connections to the RCI-1550 *(refer to troubleshooting at the end of this manual)*.

If the signal is less than 32, suspect a short circuit somewhere on that input channel. Eg. the cable to the RCI-1550 has been crushed and has an internal short circuit in it. Moisture inside the plugs can look like short circuit too.

If the count displayed in the window is more than 1,000, look for an open circuit on that input channel. E.g. disconnected lead. If the sensors check out then you can continue on and start with the calibration procedure. If you find any problems, check the troubleshooting guide at the end of this manual or seek help from your nearest ROBWAY distributor.

 Note	Please note that while in view mode, that is using either "VIEW UNCALIBRATED ..." or "VIEW CALIBRATED ..." functions, the **ENTER** key works as a toggle switch to turn that channel ON or OFF. This function allows the user to temporarily turn a sensor off if it is not needed. E.g. if you want to use the main winch only on a twin winch system; normally, if you have not connected the auxiliary sensor up, the RCI-3100 will report an error and activate motion cut. To prevent this you can press the ENTER key, while in "VIEW UNCALIBRATE TRANSDUCER 2 function", to turn the auxiliary channel off. To turn a channel back on, you have to re-enter the same VIEW UNCALIBRATED... function and press the ENTER key again.
 Important	**Remember that you must always end a view function by pressing the CANCEL key.**

7.3. Tools Required for Calibration

To ensure correct calibration, you will require the following;

- an accurate 100’ measuring tape
- an accurate boom angle finder tool
- a Robway RCI simulator tool is recommended
- a notepad to record results
- the correct Robway system manual for the crane

7.4. Map of Calibration (suggested order)

- Set date and Time
- Verify the raw counts stay within 33-999 for full working range of all sensors.
- Ensure all digital inputs (switched) are wired correctly, incl. ATB.
- Ensure all digital outputs (switched) are wired correctly.
- Review all geometry Function code settings for correctness
- Check / Set the following function codes
  - No. of Samples (amount of averaging applied to sensor inputs)
  - Set Lift Value (enter a weight slightly larger than the selected winch hook block)
  - Set Rigging Load (enter the maximum allowable load allowed during rigging)
  - Set Rigging Length (enter the maximum boom length allowed during rigging)
  - Set % SWL trip points (nominally set to 85, 100 and 110%)
  - Set Data-logger recording points (if supplied)
- Calibrate lo/hi boom angle sensor.
- Calibrate short/long boom length sensor (telescopic cranes only)
- Calibrate lo/hi luffing fly angle sensor (if fitted)
- Set Amplifier gain for Transducer 1 to suit load-cell m/volt output.
- Set Amplifier gain for Transducer 2 to suit load-cell m/volt output.
- Test & Calibrate Transducer 1.
- Test & Calibrate Transducer 2.
- Calibrate lo/hi luffing fly angle sensor (if fitted)
- Calibrate Active winch – main.
- Calibrate Active winch – aux.
- Calibrate Unladen boom radius correction
- Calibrate Laden boom radius correction
- Boom Stop Friction (compression) correction.
- Once happy the system is operating correctly, perform a “Cal-Table Backup” to ensure the calibration data can be restored if necessary.
- Use the “Transmit LM Data” function code to save a copy of the load calibration to a PC file.
- Use the “View Cal-Data” function code to manually record (pen and paper) the sensor calibration data as an extra safeguard.

7.5. Calibrating Boom Angle

7.5.1. Calibrating a low boom angle

- Safely luff the boom down to a low angle, eg. 30°,
- Enter calibration mode and select the correct function code for calibrating low boom angle,
- Accurately measure the actual boom angle using an angle finder,
- Use the UP/DOWN keys to ramp the display to the required value then press ENTER to accept this value.

7.5.2. Calibrating a high boom angle

- Safely luff the boom up to a high angle, eg. 65°,
- Enter calibration mode and select the correct function code for calibrating high boom angle,
- Accurately measure the actual boom angle using an angle finder,
- Use the UP/DOWN keys to ramp the display to the required value then press ENTER to accept this value.

Verify that the boom angle is accurately measured, using the VIEW BOOM ANGLE function.

7.6. Calibrating Jib Angle (Luffing fly jibs only)

7.6.1. Calibrating low Jib angle

- Ensure that the angle sensor is mounted on the luffing fly and the cable is connected,
- Safely luff the jib down to a low angle (eg. 30° to the horizon),
- Enter calibration mode and select the correct function code for calibrating low jib angle,
- Accurately measure the actual jib angle using an angle finder,
- Use the UP/DOWN keys to ramp the display to the required value then press ENTER to accept this value.

7.6.2. Calibrating high Jib angle

- Safely luff the jib up to a high angle (eg 65° to the horizon),
- Enter calibration mode and select the correct function code for calibrating high jib angle,
- Accurately measure the actual jib angle using an angle finder,
- Use the UP/DOWN keys to ramp the display to the required value then press ENTER to accept this value.

Verify that the jib angle is accurately measured, using the VIEW JIB ANGLE function.

7.7. Calibrating Boom Length

- Fully retract the boom,
- Enter calibration mode and select the correct function code for calibrating SHORT (LO) boom length,
- Use the UP/DOWN keys to ramp the display to the required value then press ENTER to accept this value.
- Safely fully extend the boom,
- Enter calibration mode and select the correct function code for calibrating LONG (HI) boom length,
- Use the UP/DOWN keys to ramp the display to the required value then press ENTER to accept this value.

Verify that the boom length is accurately measured, using the VIEW BOOM LENGTH function.

7.8. Calibrating Load Moment Based Systems

7.8.1. Calibrating Load

- Testing and calibrating force transducers
- Preparations before calibrating load
- Calibrating MAIN BOOM FORCE
- Calibration FLY-JIB FORCE

7.8.2. Calibrating Load Overview - (Without Test-weights)

ROBWAY has introduced a new, simple method for calibrating load on Load Moment systems. This method does not require test loads for calibrating the load, instead it uses the un-laden boom which is calibrated at two different boom angles.

The weight of the hook block and any wire rope between the hook block and boom/jib sheaves must be known precisely.

7.8.3. Testing & calibrating Transducers Overview

Load is measured using force transducers. There may be one or two of these devices used depending on the application. Before going on to calibrating the load, the transducers must be checked and calibrated to force. The following paragraphs describe how this is done.

Testing the force transducers is done through the functions

- "VIEW UNCALIBRATED TRANSDUCER 1 INPUT"
- "VIEW UNCALIBRATED TRANSDUCER 2 INPUT", *(only needed if using two transducers)*
-

Make sure that the transducers are correctly connected to the ROBWAY system.

Connect the auxiliary cable to the Robway system as for the Main winch above.

For two pendant load-cells connect the right hand side transducer (as you look on to the boom from the driver's seat) to input #1, and the left hand side transducer to input #2.

Activate the viewing function for the transducer you want to check (if using two transducers they must be checked in turn). Slowly luff the boom up and down through the entire working angle range and observe the numbers shown in the display window.

The numbers displayed will be between 0 and 1023. *For correct operation the numbers must be between 33 and 999.*

If the transducers are working correctly you should see the numbers increase as the boom is being luffed down and decrease luffing up. The value for an unladen boom will probably vary between 100 and 600, depending on the weight of the boom and attachments.

If the numbers go below 33 you should check for short circuits in the wiring from the transducer to the ROBWAY indicator.

If the numbers are higher than 999 you should check for open circuit from the transducer to the ROBWAY indicator.

If the numbers displayed stay within the 100 - 900 range then press the CANCEL button to exit view mode and calibrate the transducers as described below. If the numbers do not change or fall outside the valid range then check the wiring from the transducers to the ROBWAY display.

If the transducer signals check out then you need to calibrate them to force. This is done using a ROBWAY transducer simulator and functions. Alternatively, you can just activate function code, “ALTER CAL DATA”, and edit the “Cal Lo” and “Cal Hi” values of the Amplifiers.

- "CALIBRATE LOW END OF TRANSDUCER 1"
- "CALIBRATE HIGH END OF TRANSDUCER 1"
- "CALIBRATE LOW END OF TRANSDUCER 2", *(only if using two transducers)*
- "CALIBRATE HIGH END OF TRANSDUCER 2", *(only if using two transducers)*

Please note that the ROBWAY simu lator has been designed t o produce 2mv/V sign al w hen the switch is set to position 10 which is suitable for the majority of force sensing devices.

Some force transd ucers, ho wever, have a 3m v/V full scale output.

The simulators can still be used for calibrating these devices, however, w hen calibrating the full scale (high) end of th e transducers you mu st enter 2/3 of the full scale force into the ROBWAY system when the simulator is in position 10.

7.8.4. Calibrating the Low end of Transducer 1

This procedure will be required if using a load-cell not supplied by Robway with the initial system supply, or, a load-cell is/has been changed from original.

- Plug the simulator cable into the Load 1 transducer input on the Controller Unit analog section.
- Enter calibration mode, if not already activated and select function "CALIBRATE LOW END OF TRANSDUCER 1",
- Dial up position 0 on the simulator switch,
- Using the UP/DOWN keys, dial up a display value corresponding to the 0 mV/V value marked on the load cell/pressure transducer.
- Press the ENTER key.
- Alternatively (without using the Simulator), simply activate function code, “ALTER CAL DATA” and select Amplifier 1, and then enter the value of the “Low End of Transducer 1” on “Cal Lo”.

7.8.5. Calibrating the High end of Transducer 1

This procedure will be required if using a load-cell not supplied by Robway with the initial system supply, or, a load-cell is/has been changed from original.

- Make sure the simulator cable is plugged into Load 1 on the Controller Unit analog section.
- Enter calibration mode, if not already activated and select function "CALIBRATE HIGH END OF TRANSDUCER 1",
- Dial up position 10 on the simulator switch,
- Using the UP/DOWN keys, dial up a display value corresponding to the 2 mV/V value marked on the load cell/pressure transducer.
- Press the ENTER key.
- Alternatively (without using the Simulator), simply activate function code, “ALTER CAL DATA” and select Amplifier 1, and then enter the value of the “High End of Transducer 1” on “Cal Hi”.

If simulator is used, after calibrating transducer 1 use function "VIEW CALIBRATED TRANSDUCER 1 INPUT" to check calibration. Set the simulator to different positions and verify that the display shows the expected values, eg. when the simulator switch is at position 5 the display should show half the value entered at fourth dot point above.

7.8.6. Calibrating the Low end of Transducer 2

This procedure will be required if using a load-cell not supplied by Robway with the initial system supply, or, a load-cell is/has been changed from original.

- Plug the simulator cable into the Load 2 transducer input on the Controller Unit analog section.
- Enter calibration mode, if not already activated and select function "CALIBRATE LOW END OF TRANSDUCER 2",
- Dial up position 0 on the simulator switch,
- Using the UP/DOWN keys, dial up a display value corresponding to the 0 mV/V value marked on the load cell/pressure transducer.
- Press the ENTER key.
- Alternatively (without using the Simulator), simply activate function code, “ALTER CAL DATA” and select Amplifier 2, and then enter the value of the “Low End of Transducer 2” on “Cal Lo”.

7.8.7. Calibrating the High end of Transducer 2

This procedure will be required if using a load-cell not supplied by Robway with the initial system supply, or, a load-cell is/has been changed from original.

- Make sure the simulator cable is plugged into the Load 2 transducer input on the Controller Unit analog section.
- Enter calibration mode, if not already activated and select function "CALIBRATE HIGH END OF TRANSDUCER 2",
- Dial up position 10 on the simulator switch,
- Using the UP/DOWN keys, dial up a display value corresponding to the 2 mV/V value marked on the load cell/pressure transducer.
- Press the ENTER key.
- Alternatively (without using the Simulator), simply activate function code, “ALTER CAL DATA” and select Amplifier 2, and then enter the value of the “High End of Transducer 2” on “Cal Hi”.

If simulator is used, after calibrating transducer 2 use function "VIEW CALIBRATED TRANSDUCER 2 INPUT" to check calibration. Set the simulator to different positions and verify that the display shows the expected values, eg. when the simulator switch is at position 5 the display should show half the value entered at the fourth dot point above.

7.9. Preparation Before Calibrating Load

Load calibration is a simple procedure, however, before the load can be calibrated the installer must make sure that the following procedures have already been done:

- Correct duty, falls and winch have been selected,
- The user configurable options have been checked and correctly set up, ***of special importance is the crane geometry information,*** *(please refer to function code listing and the configuration sheet),*
- The boom angle has been calibrated and checked for accuracy.
- You should also check that the angle readout is stable. If you find that the angle display is unstable use the function "NUMBER OF SAMPLES TO AVERAGE" to activate averaging thus making the display more stable. You should set the number of samples to 3 initially and check the display. You may have to experiment a little to find a compromise which gives you stable yet fast enough angle display. If you require a number larger than 8 you should first check that there is no problem with the actual installation, ie. check that there is no moisture in the cable plugs, the cable is not pulled as the boom is being luffed and that the cable/angle sensor are not damaged. *Only on very dynamic cranes would a number larger than 8 may be required.*
- Transducers have been calibrated and checked. The transducers must be calibrated using a ROBWAY load-cell simulator with a 10 position switch, to set the zero and full scale points. This is done through functions "CALIBRATE LOW END OF TRANSDUCER" and "CALIBRATE HIGH END OF TRANSDUCER". If using two transducers then both have to calibrated, if only using one then only TRANSDUCER 1 needs calibration *(refer to previous sections of this manual)*. Alternatively, if no simulator is available, you can also calibrate the low and high of the transducers by simply activating function code, “Alter Cal Data” and enter the low and high cal values of the amplifiers.

Please no te that the follow ing procedu res must be done for every duty selectable

7.10. Calibrating Active (selected) WINCH

Make sure that the correct duty and falls are selected for the crane setup and that the correct WINCH is selected before proceeding. For duties where a jib is installed make sure that its hook block is hoisted up as far as possible, without being able to contact the jib tip sheave.
Luff the boom down, safely, to the lowest boom angle allowed by the load-chart. The lower the boom angle the more accurate the calibration will be. If the hook block is swinging or the boom is not stable, wait until they stop moving.

- Ensure the correct duty is selected
- Activate function "CALIBRATE ACTIVE WINCH",
- Enter the precise weight of the ACTIVE WINCH hook block plus the weight of the wire rope between the hook block and the boom sheave and then press ENTER,
- When prompted, enter the section number that is being calibrated. Section number “1” for fully retracted boom and Section number “17” for fully extended boom.
- Follow the text screen instructions which will request a Low and High position of the boom.
- Check the accuracy of the load display with a known weight, about 50% of the maximum SWL if possible.
- Repeat steps 2 to 6 for as many sections as are required. Proportional booms should only require section number 1 calibrated on fully retracted boom and section number 17 calibrated on a fully extended boom. With some sequential booms it may be necessary to repeat this step at more intermediate lengths (e.g. section 8, then 4 and 12) in order to improve the accuracy in those regions.
- Repeat steps 2 to 6 for each load hoisting winch installed on the crane.
- Repeat steps 2 to 8 for each duty that requires calibration.

7.11. Boom Stop Friction (compression) correction

7.11.1. Introduction

Some cranes attempt to limit the high angle of the boom by employing a physical boom Back-Stop. When this Back-Stop takes the form of a spring, acting so as to oppose the raising of the boom, it can affect the load reading on LOAD MOMENT systems.

This is because Load Moment systems measure the force being applied on the boom by the load. If there is some pre-loading of the boom by the boom Back-Stop then it is measured as force being applied by the load and the system will thus see a bigger load on the hook than there actually is.

To avoid the boom Back-Stop force altering the load reading, three Function Codes are employed. These Function Codes are described below.

7.11.2. Boom Backstop Function Codes

7.11.2.1. Backstop Low Angle
This is *the physical boom angle at which the boom backstop first begins applying force* to inhibit the boom luffing any higher. It should be close to the angle at which the boom first makes contact with the backstops as it is luffed up.

7.11.2.2. Backstop High Angle
This is *the physical boom angle at which the boom is restricted from moving any higher (by the boom back-stop).* For most cranes this value should be known, however, it can be measured simply by luffing the boom to the highest possible angle and measuring the angle.

7.11.2.3. Backstop Load Error
This value represents *the error in the load reading when the load is luffed from the "Low Angle" to the "High Angle."* If a known 5t test weight was luffed up to the "High Angle, " and the display then showed 8t, then the "Backstop Load Error" would be (8t - 5t) = 3t.

7.11.3. How to Calibrate

To measure the *Backstop Load Error* it is first necessary to ensure that the current value for this parameter is 0. This requires selecting the appropriate Function Code, and entering 0 into the display. The display must be fully calibrated in regard to all other facets aside from the *Backstop Load Error*. A known test weight is lifted (with the boom angle below the *Backstop Low Angle*) and the weight should be verified against the calibrated display reading. The boom is then luffed up to the *Backstop High Angle* and the erroneous load reading recorded. The value for the *Backstop Load Error* is equal to the load reading at the max. angle minus the actual weight of the load. This value should be entered against the appropriate Function Code for setting the *Backstop Load Error.*

8. MAINTENANCE

When maintenance is to be performed on the RCI-1550 system, care must be taken to ensure that the level of safety is not reduced. Such a reduction in the level of safety can easily be done by the careless use of tools or test equipment, either directly or by damage to safety components, wiring or clearances. Therefore it is essential that maintenance be performed by competent personnel only. The following are recommendations from the standard on maintenance procedures.

8.1. Check List

It is recommended that a checklist similar to the one below be prepared prior to maintenance.

Maintenance Checklist

Pre-maintenance	Necessary documents are available
	All records have been examined.
	Test gear is available and is satisfactory for use in hazardous areas if applicable.
	Permission to commence work has been granted.
	The area is safe to work.
	Any necessary precautions have been taken.
Maintenance	All re-connections have been made.
	Equipment is functional.
	Malfunctions have been reported.
	Installation conforms to drawings and documentation.
	Any modifications have been approved.
	Earthing requirements are still valid.
	General check in accordance with an Inspection and Test Schedule completed.
Post-maintenance	Documentation is completed and filed.
	Inspection report is complete.
	Company and operator requirements have been satisfied.

8.2. In-cabin items

Ensure the display unit mounting is solid and vibration free and that the display cable connection is firmly connected.
Ensure the display cable is not pinched or caught or may become suspect to damage on route from the Display Unit to the Controller Unit outside the cabin.

A water dampened cloth is preferred for cleaning general dirt items from the display. Wipe off any build-up of grease and oils. A light mixture of detergent may be used to remove stubborn stains. DO NOT USE SOLVENTS.

8.2.1. Additional detail

The RCI-1550 Display case is made of Stainless Steel - Grade 316 and powder coated with high quality DULUX powder coat. High adhesion between metal surface and powder layer ensures excellent resistance to scratches and similar mechanical damages.

Powder coat has increased resistance to chemical agents and UV light. The Stainless steel case ensures resistance to even most aggressive environments such as offshore installations or chemical plants, even when the paint layer is damaged The unit as whole, is designed to comply with the latest EMI and ESD standards.

The front membrane switch panel is made from tough high quality textured polyester film. It offers enhanced chemical resistance and dramatically improved flex life (>5 million switch cycles).

The Acrylic layer is made of CHEMCAST. Acrylic sheet can be used up to 90 °C. It should be cleaned only with household grade detergents or methyl alcohol (30%).

The unit as whole could be used in very hostile environment in temperature range –20 °C to +70 °C

8.3. ELECTRICAL EQUIPMENT

When any electrical equipment is removed for maintenance, any exposed conductors that remain must be mechanically and electrically secured in a manner to prevent the occurrence of an unsafe condition.

8.4. RECOIL DRUM (Telescopic cranes)

GENERAL

In normal use little attention to maintenance is required.

8.4.1. 110' Recoil Drum – (DRURW33LAAX)

Periodically, simply observe that reel behaves correctly when extending and, retracting cable without hesitation. Check wound cable for damage at anchor pulley and generally.

At major machine service intervals, remove reel cover and check that interior is clean and dry. Check slip rings are clean with no signs of arcing. Check collector brushes are correctly located on rings and, that brush spring pressure is being maintained. Replace cover making sure that seal is located correctly all round.

8.4.1.1. Rewind Spring Mechanism

In the unlikely event of rewind spring failure, the reel will require to be removed from the machine on which it is fixed.

With the reel on the bench, remove cover and disconnect potentiometer from engagement, tie back spring loaded arm, disconnect wiring which passes through the reel shaft.

Turn unit over to stand on its 4 cover studs and withdraw cable from shaft.
Release socket screws, 2 at 90°, holding cable compartment onto shaft and withdraw compartment, complete with cable.

The spring compartment is now exposed and, the 4 nyloc nuts and the cover may be removed.

The rewind spring will now be visible and seen to be held in a captive band. A broken spring normally occurs close to the arbor, as this is at the point of maximum flexing. If this is seen to be the case, the spring may be lifted out, *"BEING VERY CAREFUL TO ENSURE THAT THE COILS REMAIN WITHIN THE CAPTIVE BAND."*

Tie the spring with soft iron wire or stout cord, as seen on the replacement spring. Alternatively box up securely and label danger, for disposal.
Remove broken portion of spring from arbor, check for any foreign bodies, apply grease to the arbor and fit replacement spring.

Replace spring cover making sure that seal is correctly located.

Re-assemble reel in reverse order, paying particular attention to correctly locating cable compartment boss onto shaft and that socket screws are correctly located in shaft dimples. Use Loctite "Screwlock."

Unit may now be fully re-assembled and full setting up procedure, (installation may be completed.

8.4.1.2. Replacing the Payout cable

Reading through the instructions for changing a spring will help with fitting a replacement cable.

You can save time and effort if, when removing a damaged cable, having disconnected at the slip-ring, the old cable is used to pull a drawstring through the shaft. The drawstring can be fixed to the end of the new cable to draw through the shaft.

Ensure that cable glands or seals are all correctly fitted and that reel rotates freely.

8.4.1.3. Safety

At all times, when handling spring operated cable reeling drums, keep full control of rotation.

Be very careful, when handling loose rewind springs, to ensure that all of the coils remain within the captive band.

8.4.2. 140' Recoil Drum – (DRURW43LAAX)

In normal use little attention is required.

Periodically, simply observe that reel behaves correctly when extending and, retracting cable without hesitation. Check wound cable for damage at anchor pulley and generally.

At major machine service intervals, remove reel cover and check that interior is clean and dry. Check sliprings are clean with no signs of arcing. Check collector brushes are correctly located on rings and, that brush spring pressure is being maintained. Replace cover making sure that seal is located correctly all round.

8.4.2.1. Rewind Spring Mechanism

In the unlikely event of rewind spring failure, the reel will require to be removed from the machine on which it is fixed.

With the reel on the bench, remove cover and disconnect potentiometer from engagement, tie back spring loaded arm, disconnect wiring which passes through the reel shaft.

Turn unit over to stand on its 4 cover studs and withdraw cable from shaft.

Release socket screws, 2 at 90°, holding cable compartment onto shaft and withdraw compartment, complete with cable.

The spring compartment is now exposed and, the 4 nyloc nuts and the cover may be removed.

The rewind spring will now be visible and seen to be held in a captive band. A broken spring normally occurs close to the arbor, as this is at the point of maximum flexing. If this is seen to be the case, the spring may be lifted out, "BEING VERY CAREFUL TO ENSURE THAT THE COILS REMAIN WITHIN THE CAPTIVE BAND."

Tie the spring with soft iron wire or stout cord, as seen on the replacement spring. Alternatively box up securely and label danger, for disposal.

Remove broken portion of spring from arbor, check for any foreign bodies, apply grease to the arbor and fit replacement spring.

Replace spring cover making sure that seal is correctly located.
Re-assemble reel in reverse order, paying particular attention to correctly locating cable compartment boss onto shaft and that socket screws are correctly located in shaft dimples. Use Loctite "Screwlock."

Unit may now be fully re-assembled and full setting up procedure, (installation may be completed.

8.4.2.2. Replacing the Payout Cable

Reading through the instructions for changing a spring will help with fitting a replacement cable.

It can save time and effort if, when removing a damaged cable, having disconnected at the slipring, the old cable is used to pull a drawstring through the shaft. The drawstring can be fixed to the end of the new cable to draw through the shaft.

Ensure that cable glands or seals are all correctly fitted and that reel rotates freely.

8.4.2.3. Safety
At all times, when handling spring operated cable reeling drums, keep full control of rotation.

Be very careful, when handling loose rewind springs, to ensure that all of the coils remain within the captive band.

8.5. INSPECTION AFTER MAINTENANCE

Robway consider it essential by that a detailed Inspection is performed following any maintenance to ensure that the equipment and installation continue to comply with the documentation. Any deviations to supplied documentation should be updated to inform any future service attendance.

8.6. RECORDS

Any details of defects found should be recorded in the crane log book.

9. TROUBLESHOOTING

A trouble-shooting or fault-finding section is always a difficult document to write because things that are obvious to one person can be anything but obvious to another. One the other hand, most times when you read such a guide the fault you are trying to solve happens to be the very fault that has been left out! The main purpose of this section is to help both us at Robway and you the reader to find the problem and solve it quickly. Some times this takes patience, which isn't always easy when are you on the site, your customer is angry because you haven't fixed it yet, and the Robway guy at the other end of the phone wants you to tell him all over again what you just did!! What we have found many times is that when a situation is described by the service person a couple of times extra details come out in the conversation that are vital to solving the problem. It seems that the more trouble we have finding the faults, the more simple the cause was!

The RCI-1550 system incorporates a number of software features that are designed to help the service person quick identify a fault, **however** it must be stressed that these features cannot identify everything. They can only be used as a guide to identify additional checks that can be made. Some notes are provided below, followed by some example faults and possible causes.

Identify the symptoms. Take time to find out exactly what is happening to indicate a problem. If possible have the problem demonstrated so you can "describe it in your own words". Sometimes what someone else has told you is only part of the story.

Leave the calibration alone! Too many times a re-calibration has been attempted in order to rectify a problem before that problem has been correctly identified. This leads to added confusion as the perspective is generally moved from the real fault to "calibration problems'. We have often received a message indicating that our display has "not accepted the calibration data". Most times this is due to a fault in a cable or sensor which was not identified prior to re-calibration. Re-calibration must only be performed when all physical inputs have been verified for correct operation, and in actual fact is rarely ever needed.

Do you have your simulator with you? A simulator is a very quick way to verify if the fault is external to the display and will save you a lot of heartache. A simulator is purely resistive and hence considered simple apparatus and can be used freely in a hazardous area.

Have you read the manual! When all else fails, read the manual! Your answer may actually be in there.

Know what information you need to gather. If you collect the correct information from the display the job is half done. Before you begin to suspect faults with the system, you must satisfy yourself that the display is correctly configured for the crane environment. In other words, check that the correct duty, falls, slew zone etc. have been selected. Are all of the sensors connected? In general if sensors have been supplied with the system, they must always be connected. The display will check them continuously and issue an error if that sensor cannot be detected. Check your length, angle and radius against the chart to verify that the equipment is permitted to be in that situation. If there is still a problem once these have been checked, then you will need to check the hardware.

The main pieces of useful information obtainable from the displays are the **raw counts**. The raw counts shows what the actual inputs are doing (ie. like a signal strength indication). These raw counts are manipulated in software according to the calibration data stored in the display to produce the readouts on the Display Unit. If the calibration has been done incorrectly, or the configuration is incorrect, or something else is wrong, then the Display Unit readouts (eg. The LOAD or ANGLE values) may provide you with misleading information.

 Note	**YOU MUST USE THE "VIEW" FUNCTION C ODES TO DETERMINE THE CORRECT OPERATI ON OF TH E EXTERNAL SENSORS.** **For correct operation the "raw signal" values must be in the range 33 to 999. Anything outside of this range will produce an error. Refer to the manual f or how to access these raw counts.**

Check the obvious. Once you have found a problem with a sensor for example, check all of the obvious things to do with that sensor such as making sure all of the connectors are tight. Be systematic – make notes about what you have done and what you found. You will find that under pressure you can easily forget what you have checked and it becomes very easy to miss things.

9.1. Error Code List

9.1.1. Example Errors & Possible Causes

Code	Description on LCD	Fault Description
101	Angle Sensor 1	Sensor is open or short circuit
102	Angle Sensor 2	Sensor is open or short circuit
104	Angle Sensor 3	Sensor is open or short circuit
108	Angle Sensor 4	Sensor is open or short circuit
201	Load Sensor 1	Sensor is open or short circuit
202	Load Sensor 2	Sensor is open or short circuit
204	Load Sensor 3	Sensor is open or short circuit
208	Load Sensor 4	Sensor is open or short circuit
210	Digital Input	Digital input error detected
220	ATB	Crane is two-blocking
240	Overload	Current load exceeds safe working load
280	Linepull	Current load exceeds line pull
301	Angle out of allowed range	Angle is off the load chart or limit is exceeded
304	Radius out of allowed range	Radius is off the load chart or limit is exceeded
308	Height out of allowed range	Height is off the load chart or limit is exceeded
310	Slew out of allowed range	Crane has been positioned in a non-lifting area

9.1.2. Problems That Do Not Produce Error Codes

The load does not vary when I lift a weight.

Determine which winch you are looking at. If you are looking at the main winch, then view the UNCALIBRATED TRANSDUCER 1 INPUT and noting that the value shown in the LOAD display while lifting a weight and see if it is varying. If not, then view the UNCALIBRATED TRANSDUCER 2 INPUT. If this is varying, then the load cables have been swapped. If neither are moving then the most probable cause is;

The load sensor is faulty. Check the resistance values. This does not give the complete story. Even if the resistances are correct, there is still a chance that a fault exists.

If the UNCALIBRATED values did vary when a load is lifted, then check the calibration data. If you entered the same value of load for both the light load and the heavy load, then the display will assume that any input represents the same load. If this is the case, then re-calibrate.

The display works OK, but when I lift above a certain load I get an Error code.

View the UNCALIBRATED TRANSDUCER 1 and 2 INPUT's while lifting a load and check that the value is increasing with increasing load. If the value is decreasing with load then the load cell signal wires are swapped or the load cell has been installed upside-down.

The load display is very erratic and displays massive changes in value.

Check the view UNCALIBRATED TRANSDUCER INPUT for that channel. If the values are flickering by 2-3 counts while the display is changing by say a number of tonnes, then the cause is most probably calibration. One common cause of this is if different load values were entered for the high and low calibration without the actual load being altered (or of course there was an error in a load channel while you were calibrating). In other words you forgot to lift the heavy load! (It happens often) In this situation the display is confused because the calibration data is telling it that the signal it is seeing represent both the low load value and the high load value simultaneously. Correct the calibration.

This can also occur if only part of the calibration procedure has been completed. You should expect strange results if you have not completed the calibration of that sensor.

When the system starts in the morning the displays are erratic, but settle during the day.

This is a common sign of moisture ingress into either the display, the connectors, the sensors or the cable. These should be checked, dried and sealed.

The display does not start.

You should check the power supply. Refer to the manual for allowable voltage ranges. If these are correct you may need to open the Control Unit and check the fuses.

10. ELECTRICAL SPECIFICATIONS

Controller	Automotive alternator DC supply, nominally 12V or 24V DC.
Power Consumption	Approximately 20VA (Watts).
Operating Temperature Range	-20°C to +60°C tested to (-30°C to + 70°C)

Expected Resistance Values

Load Cells	Should have the following nominal resistance values, for a standard 350 ohm cell (*note that these values may vary slightly from cell to cell*). RED-BLACK 400 ohms RED-GREEN 290 ohms RED - WHITE 290 ohms BLACK-GREEN 290 ohms BLACK-WHITE 290 ohms WHITE-GREEN 350 ohms SHIELD to any other wire must be open circuit
Oil Dampened Angle Sensor (When Used)	Across the excitation wires: 1k or 5k ohms Between the signal and each of the excitation wires varying between 0 and 1k or 5k ohms between any of the wires and chassis or shield high ohms, or open circuit
Electronic Angle Sensor	Between any of the wires and chassis or shield high ohms, or open circuit
Length Sensor	Across the excitation wires: 500 ohms Between the signal and each of the excitation wires varying between 0 and 500 ohms Between any of the wires and chassis or shield high ohms, or open circuit
Voltage Levels	Load cell excitation 4.0V Angle excitation 4.0V Length excitation 4.0V Between the chassis and shield 0V

11. Electronic Angle Sensor Specifications:

Total range:	120 deg
Linear range:	90 deg
Threshold and resolution:	0.001 deg
Linearity:	+/- 1% of angle
Null repeatability:	0.05 deg
Operating Temperature range:	-40C – 65C
Temperature coefficient – null:	0.008 deg/C
scale:	0.1%/C

12. APPENDICES

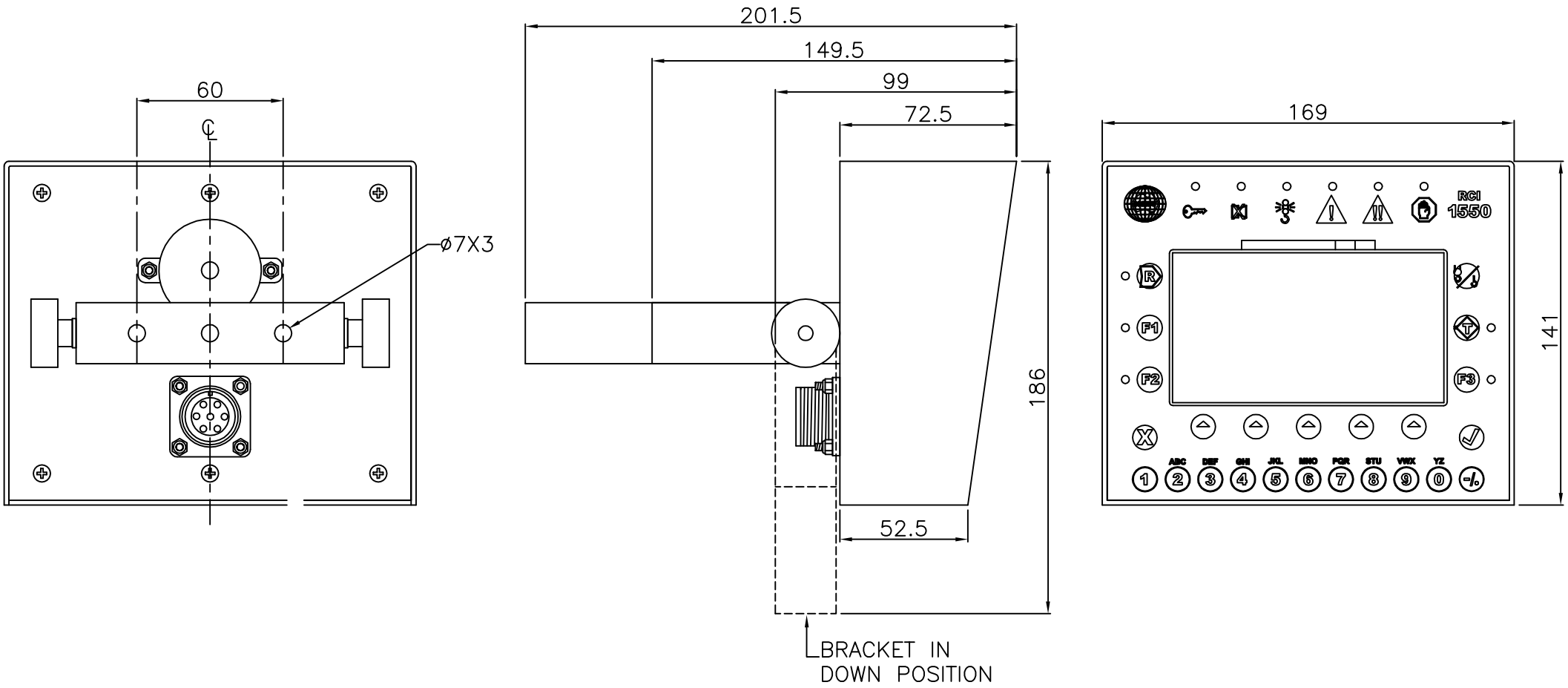
12.1. Drawings Part A - System Components

12.2. Drawings Part B - General Arrangements and Wiring

12.3. Software Documents

Drawings Part A
System Components

3RD ANGLE



NOTE:
TWO BRACKET LENGTHS ARE AVAILABLE

REV	DATE	DESCRIPTION OF CHANGE	APPR'D

TOL: X. +/- 1
X.X +/- 0.2
X.XX AS STATED

DO NOT SCALE DRAWING
ALL DIMENSIONS ARE IN MILLIMETERS
UNLESS OTHERWISE STATED

DRAWN	APPROVED	PART OF ASSY
C. HOBBY	D. PLANTHABER	–
28/07/99	15/11/00	

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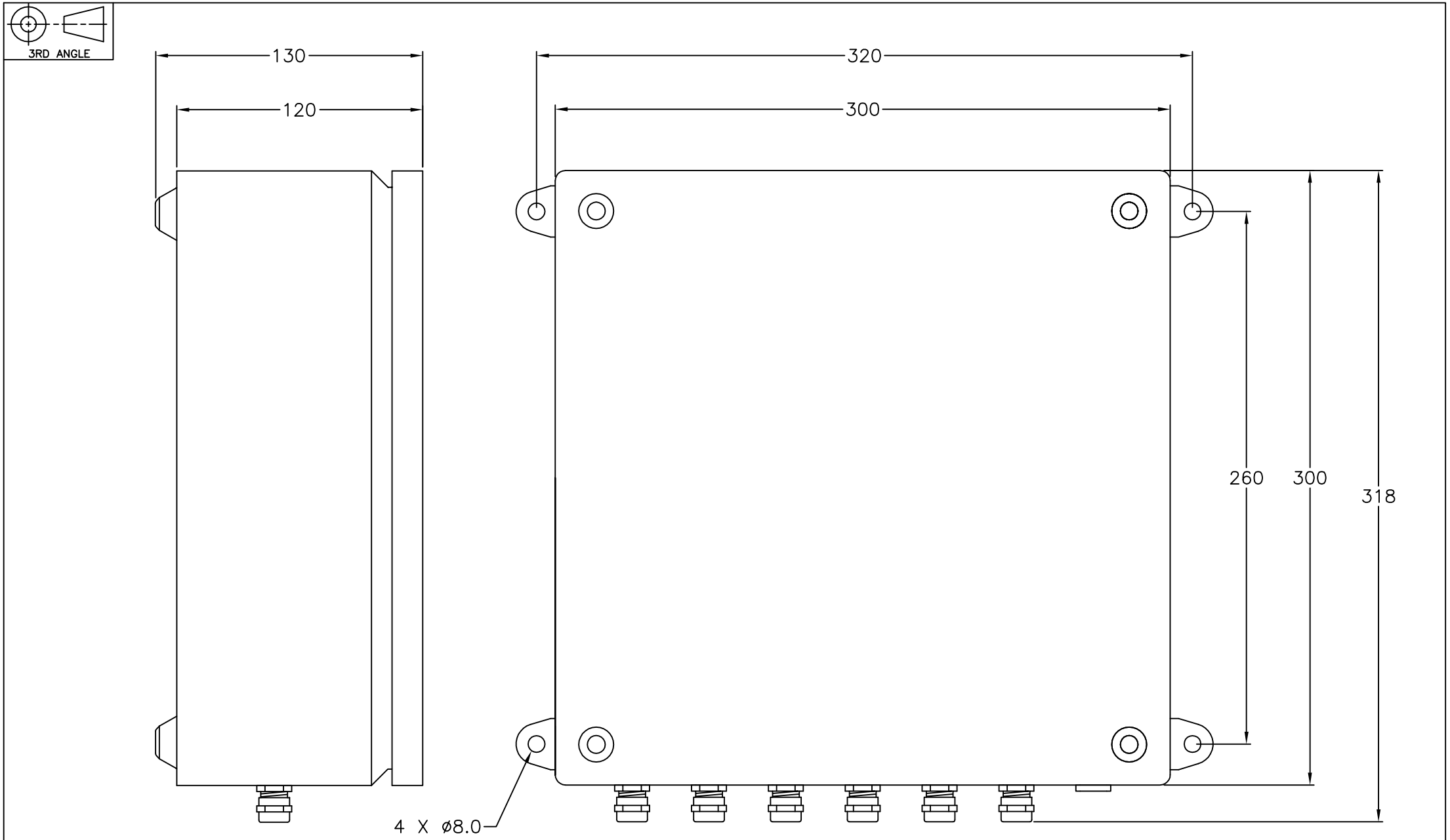
PART No:	PROJECT:
–	RCI–1550 DISPLAY

TITLE: DIMENSIONAL DETAILS

SCALE N/A

SHEET 1 OF 1

DRAWING No:	FILE No:	REV
DWG 2046	204601AA.DWG	1.0



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TOL: X. +/- 1
X.X +/- 0.2
X.XX AS STATED

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DRAWN	APPROVED	PART OF ASSY
S. CHAMBERS		–
21/11/00		

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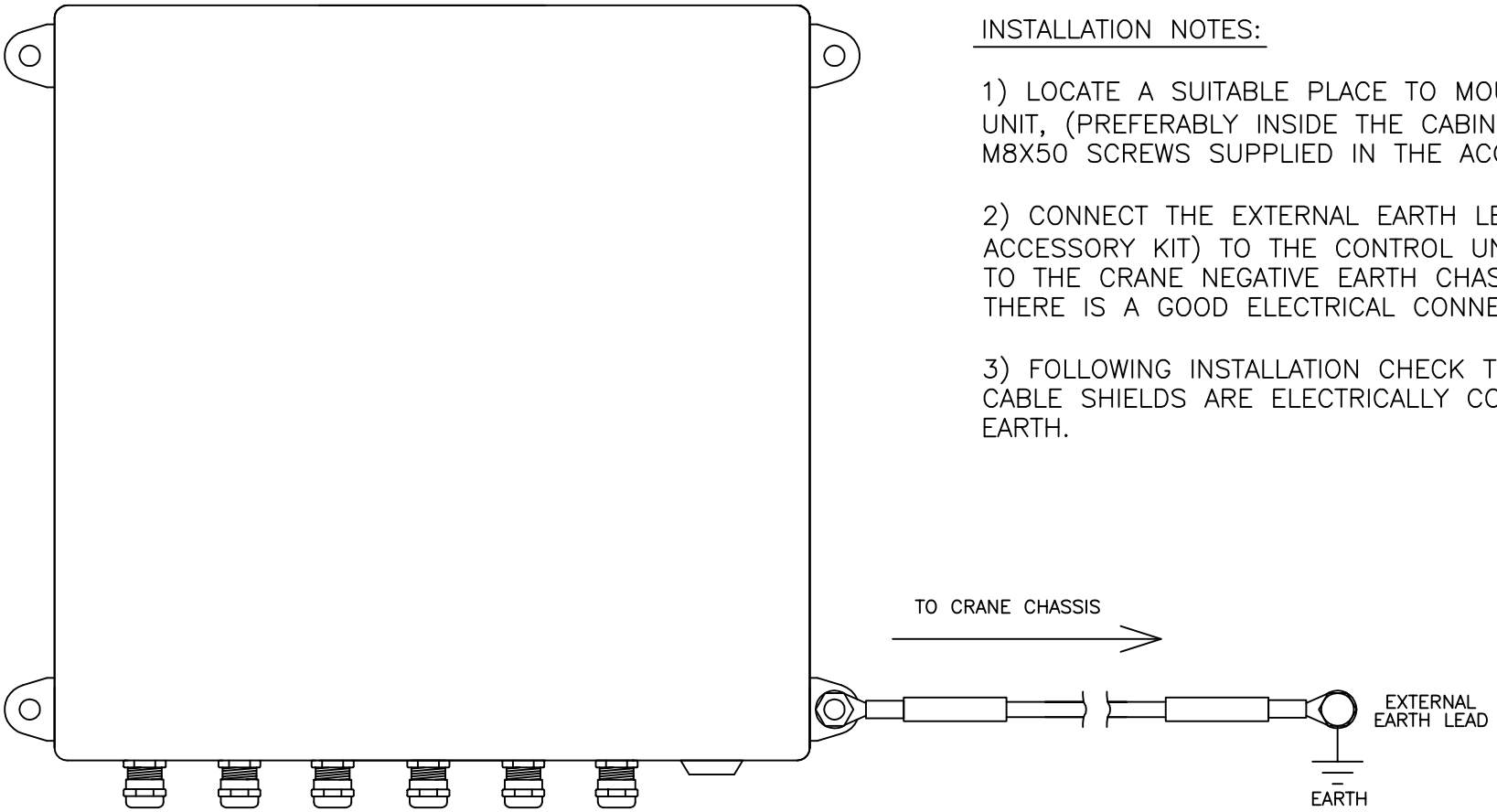
PART No: –	PROJECT: RCI–1550 CONTROL UNIT
TITLE: DIMENSIONAL DETAILS	SCALE N/A
	SHEET 1 OF 1
DRAWING No: DWG 2057	FILE No: 205701A.DWG
	REV A

RCI–1550 CONTROL UNIT



INSTALLATION NOTES:

1) LOCATE A SUITABLE PLACE TO MOUNT THE CONTROL UNIT, (PREFERABLY INSIDE THE CABIN) USING THE M8X50 SCREWS SUPPLIED IN THE ACCESSORY KIT.

2) CONNECT THE EXTERNAL EARTH LEAD (REFER ACCESSORY KIT) TO THE CONTROL UNIT AND TERMINATE TO THE CRANE NEGATIVE EARTH CHASSIS, ENSURING THERE IS A GOOD ELECTRICAL CONNECTION.

3) FOLLOWING INSTALLATION CHECK THAT THE LOAD CABLE SHIELDS ARE ELECTRICALLY CONNECTED TO EARTH.

REV	DATE	DESCRIPTION OF CHANGE	APPR'D

TOL: X. +/– 1
X.X +/– 0.2
X.XX AS STATED

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DRAWN	APPROVED	PART OF ASSY
S. CHAMBERS	A. CANLAS	–
21/11/01	21/11/01	

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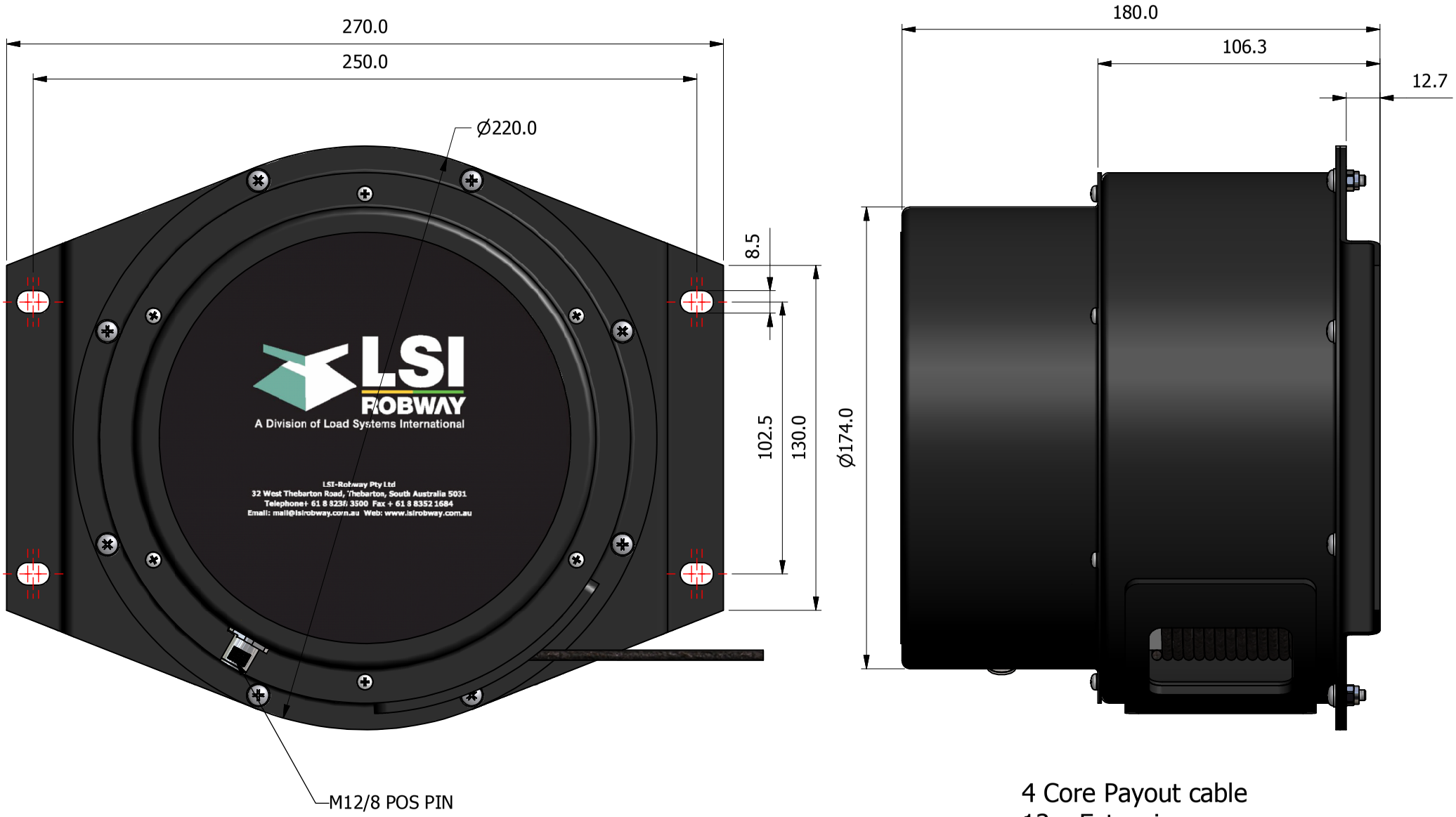
PART No: CUSRCI1550		PROJECT: RCI–1550 CONTROL UNIT	
TITLE: INSTALLATION DETAIL			SCALE N/A
			SHEET 1 OF 1
DRAWING No: DWG 2566		FILE No: 256601AA.DWG	REV 1.0



4 Core Payout cable
13m Extension

REV	DATE	DESCRIPTION OF CHANGE	APPRV'D

TOL: X. +/-1
X.X +/-0.2
X.XX +/-0.02

DRAFTING STANDARD: AS1100

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DRAWN BY	APPROVED BY	PART OF ASSY
J.Hart		
18/01/2012		

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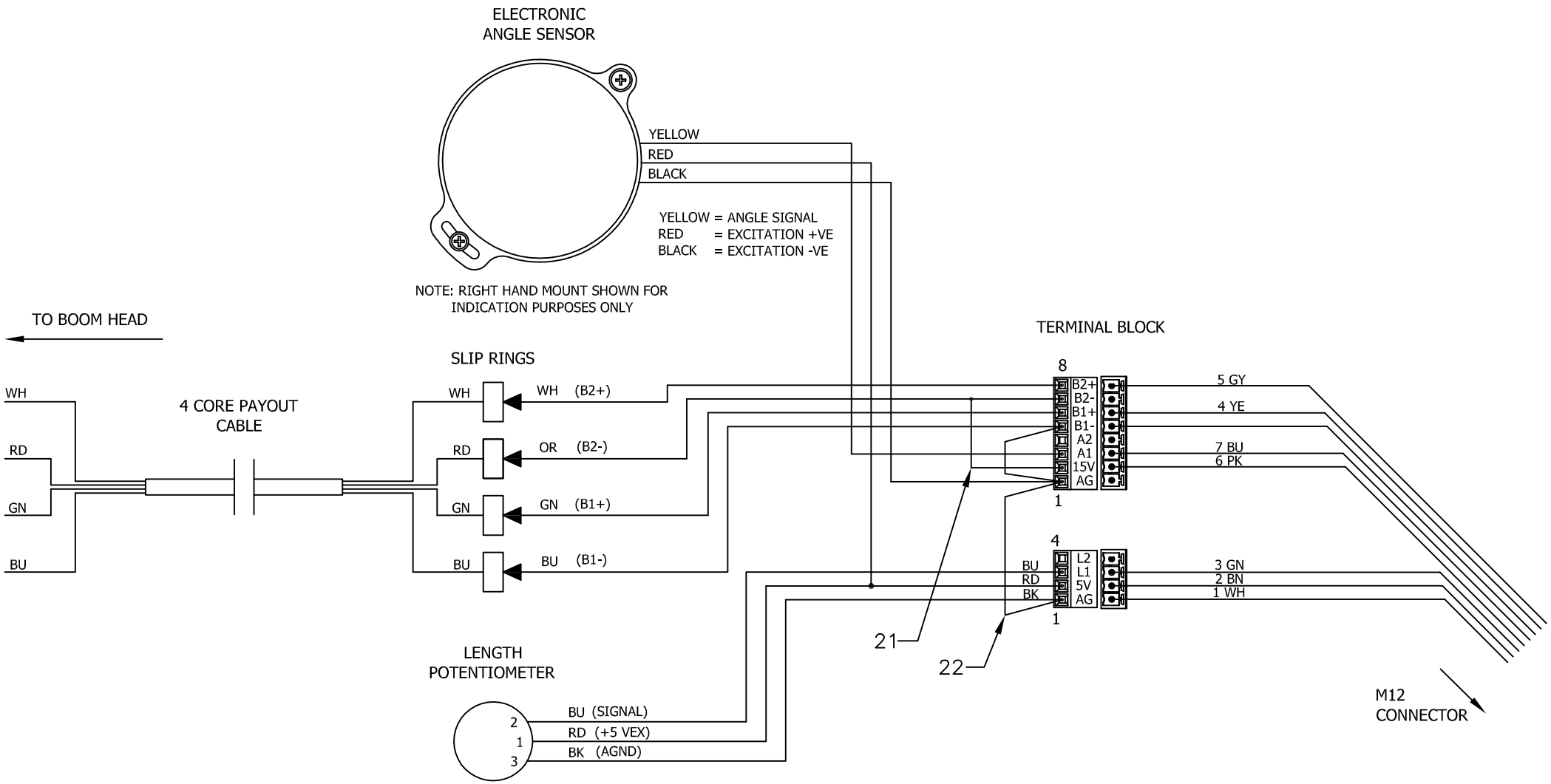
PART No: DRUKOR0413LAB
PROJECT:
TITLE: Overall Dimensions and Mounting Centers
A4
SHEET 1 OF 1
DRAWING No: 4576
FILE No: 457601AA.idw
REV 1.0



DRUKOR0413LAB-1
DRUKOR0426LAB-1
DRUKOR0430LAB-1

REV	DATE	DESCRIPTION OF CHANGE	APPR'D

TOL: X. +/- 1
X.X +/- 0.2
X.XX AS STATED

DRAFTING STANDARD: AS1100

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DRAWN	APPROVED	PART OF ASSY
j.hart	-	-
-	-	

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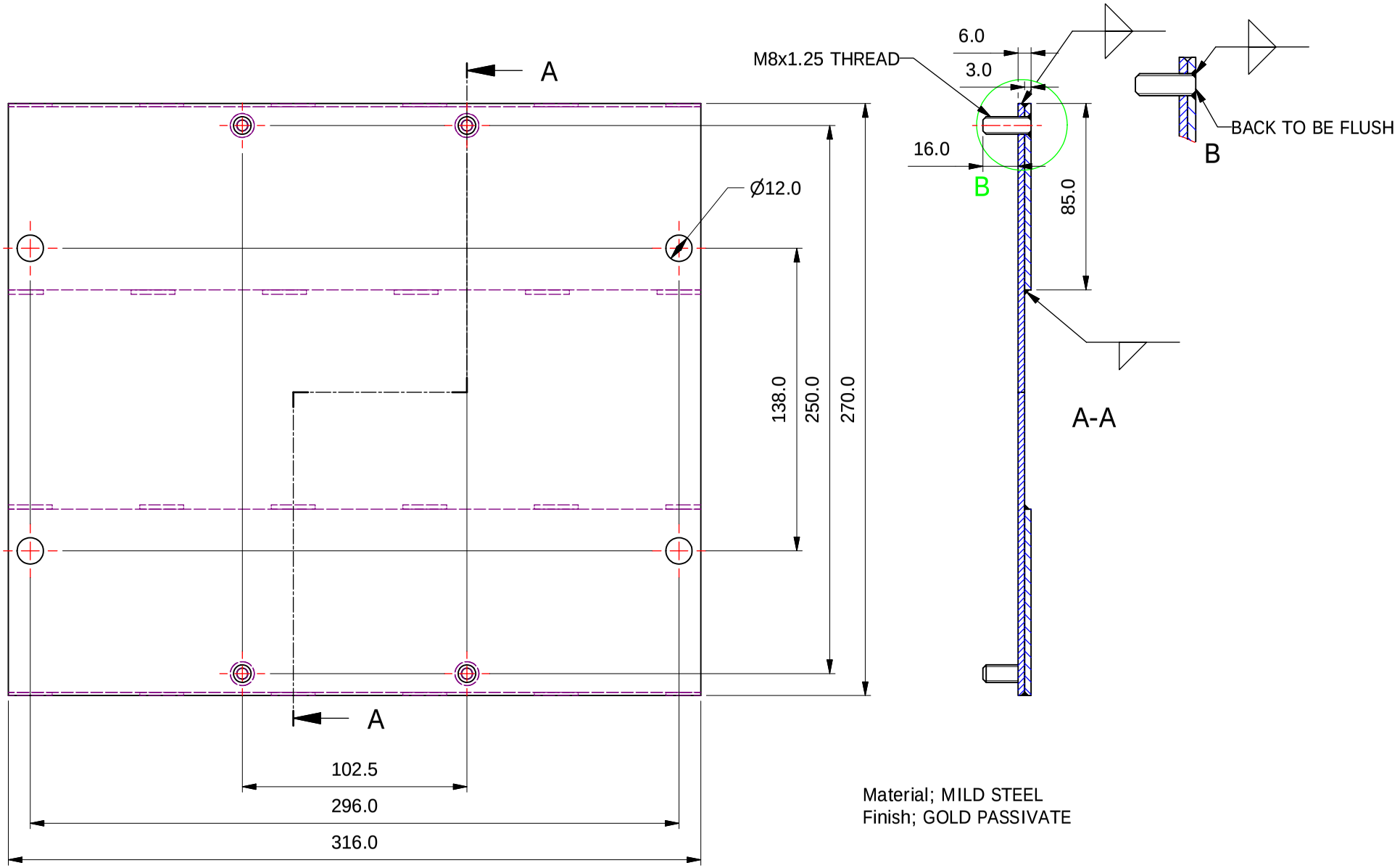
PART NO:	PROJECT:
	-

TITLE: WIRING DETAILS

SCALE N/A

SHEET 1 OF 1

DRAWING No:	FILE No:	REV
4579	4579-B.DWG	B



Material; MILD STEEL
Finish; GOLD PASSIVATE

REV	DATE	DESCRIPTION OF CHANGE	APPRV'D

TOL: X. +/-1
X.X +/-0.2
X.XX +/-0.02

DRAFTING STANDARD: AS1100

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DRAWN BY	APPROVED BY	PART OF ASSY
johnh		
19/04/2013		

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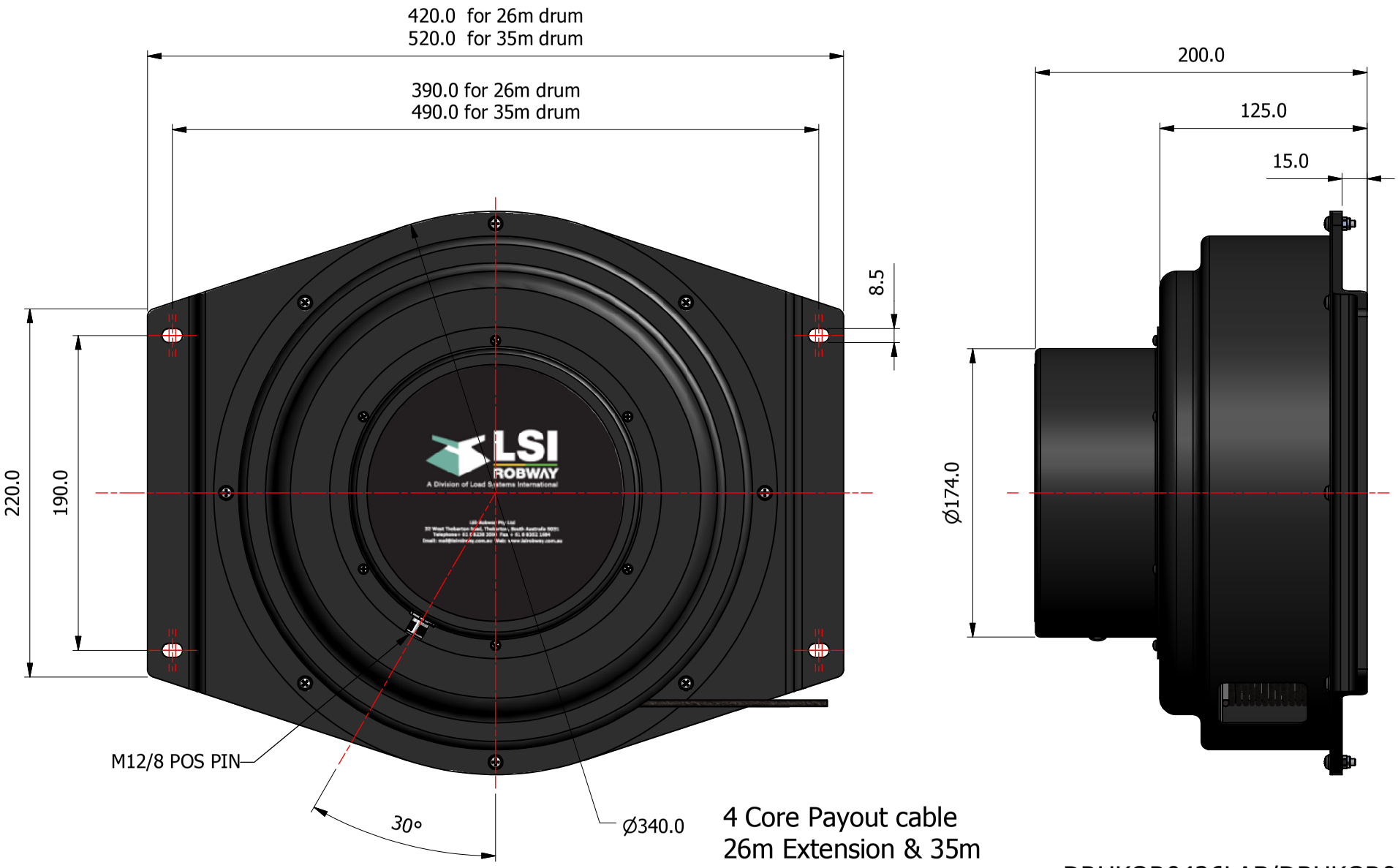
PART No: PLAM4807
PROJECT:
TITLE: MOUNTING PLATE TO SUIT RW10 TO DRUKOR0413
A4
SHEET 1 OF 1
DRAWING No: 4807
FILE No: 4807-A.idw
REV A



4 Core Payout cable
26m Extension & 35m Extension

DRUKOR0426LAB/DRUKOR0435LAB

REV	DATE	DESCRIPTION OF CHANGE	APPRV'D

TOL: X. +/-1
X.X +/-0.2
X.XX +/-0.02

DRAFTING STANDARD: AS1100

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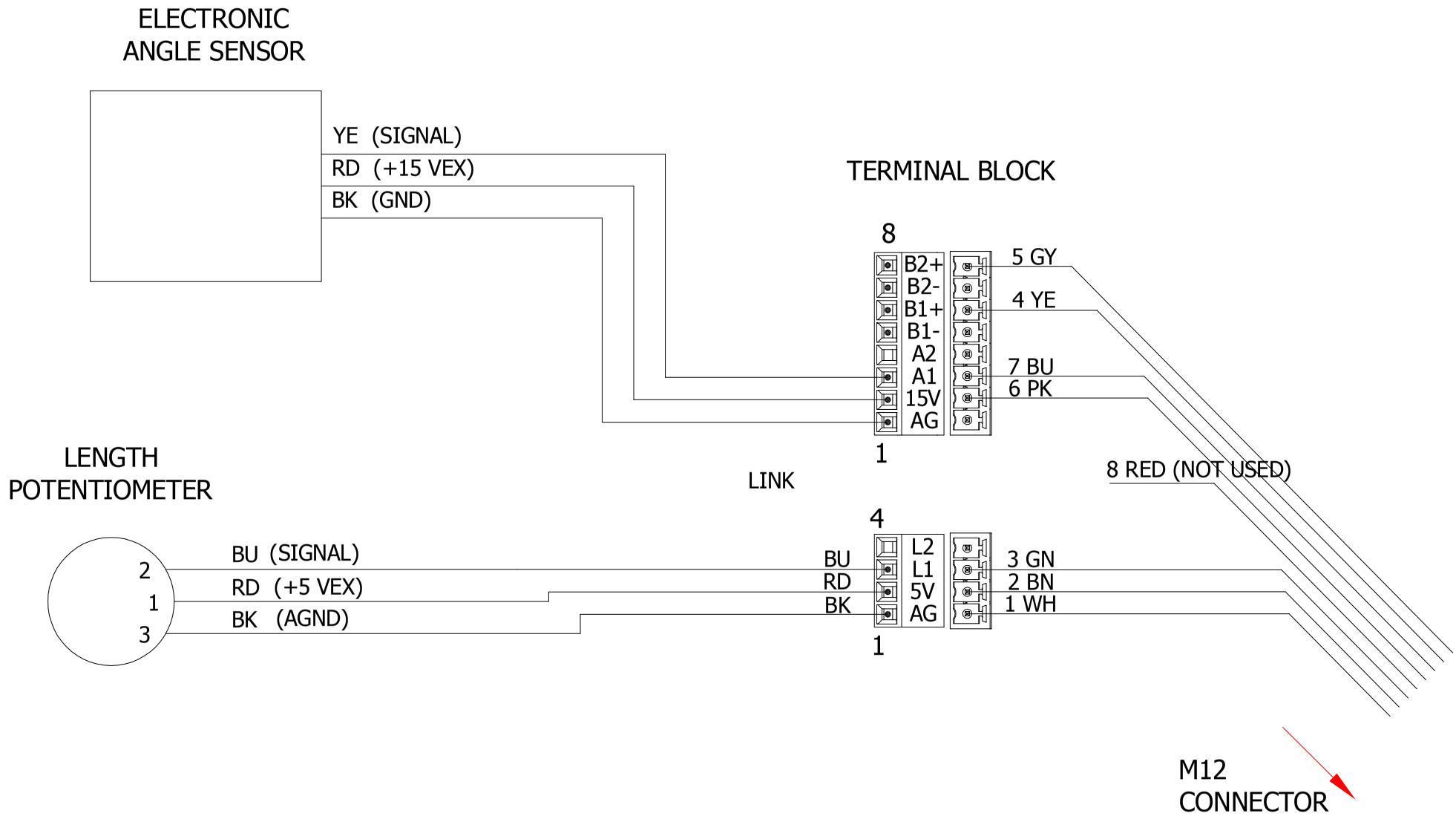
PART No:	PROJECT:	
-		
TITLE: OVERAL SIZE & MOUNTING DETAILS		A4
		SHEET 1 OF 1
DRAWING No: 4577	FILE No: 457701AA.idw	REV 1.0



REV	DATE	DESCRIPTION OF CHANGE	APPRV'D

TOL: X. +/-1
X.X +/-0.2
X.XX +/-0.02

DRAFTING STANDARD: AS1100

DO NOT SCALE DRAWING
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UNLESS OTHERWISE STATED

DRAWN BY	APPROVED BY	PART OF ASSY
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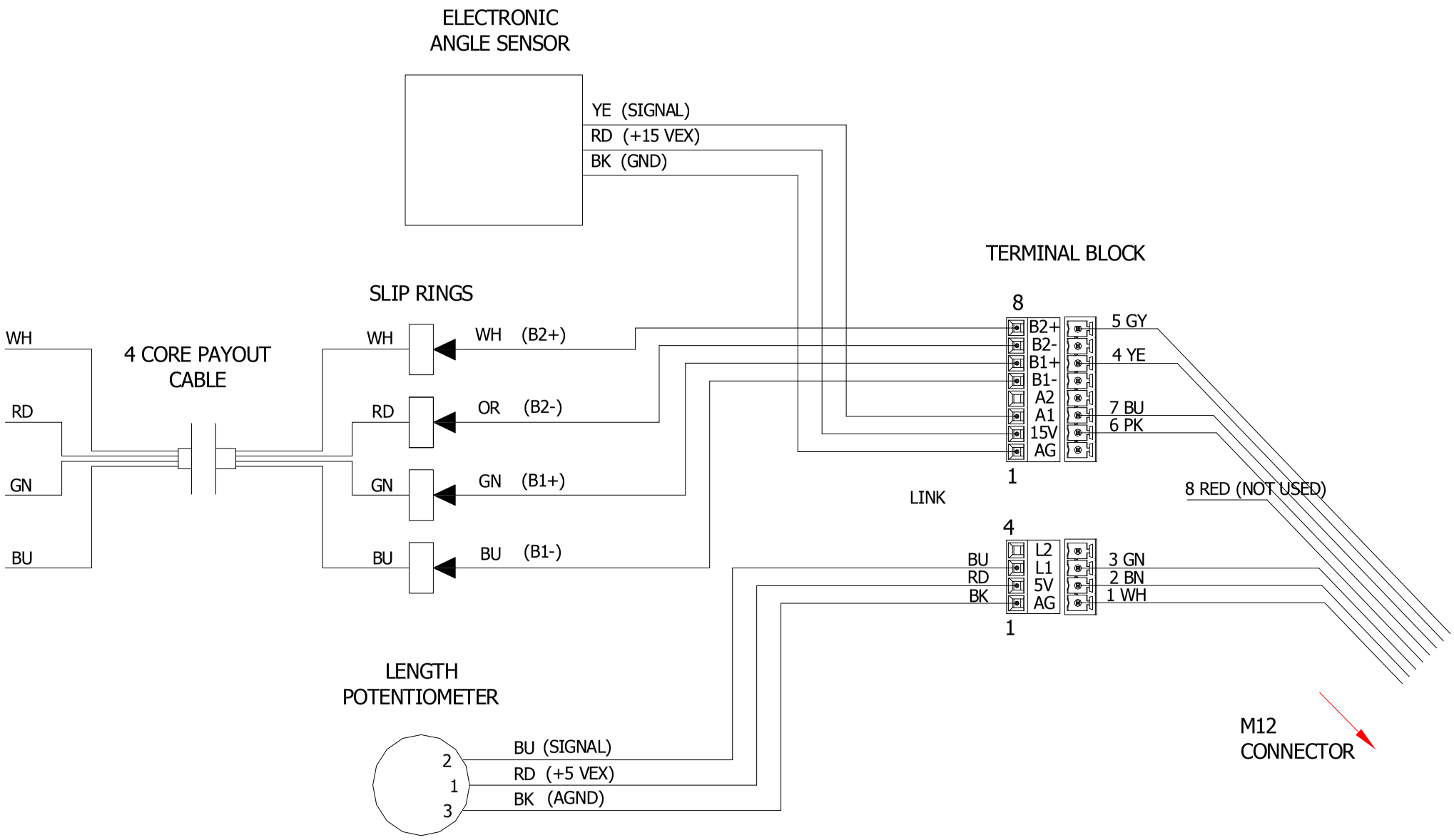
PART No: DRUKOR0113LA-1R
PROJECT:
TITLE: TOP ASSY, 13m RECOIL DRUM, LENGTH, ANGLE & SINGLE WIRE PAYOUT
A4
SHEET 6 OF 6
DRAWING No: 4772
FILE No: 4772-A.idw
REV A



REV	DATE	DESCRIPTION OF CHANGE	APPRV'D

TOL: X. +/-1
X.X +/-0.2
X.XX +/-0.02

DRAFTING STANDARD: AS1100

DO NOT SCALE DRAWING
ALL DIMENSIONS ARE IN MILLIMETERS
UNLESS OTHERWISE STATED

DRAWN BY	APPROVED BY	PART OF ASSY
J.CHOI	J.HART	
20/01/2012	31/01/2012	

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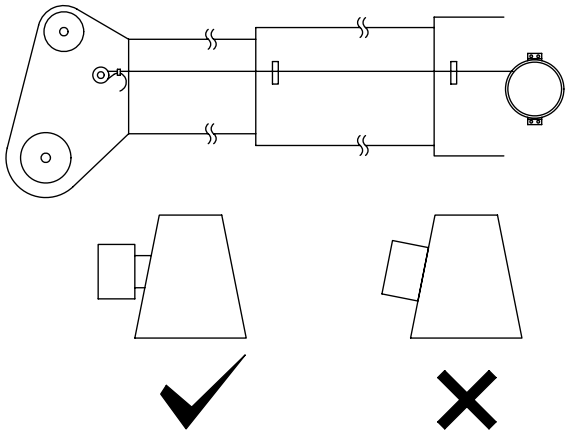
FAX: +61 8 8352 1684

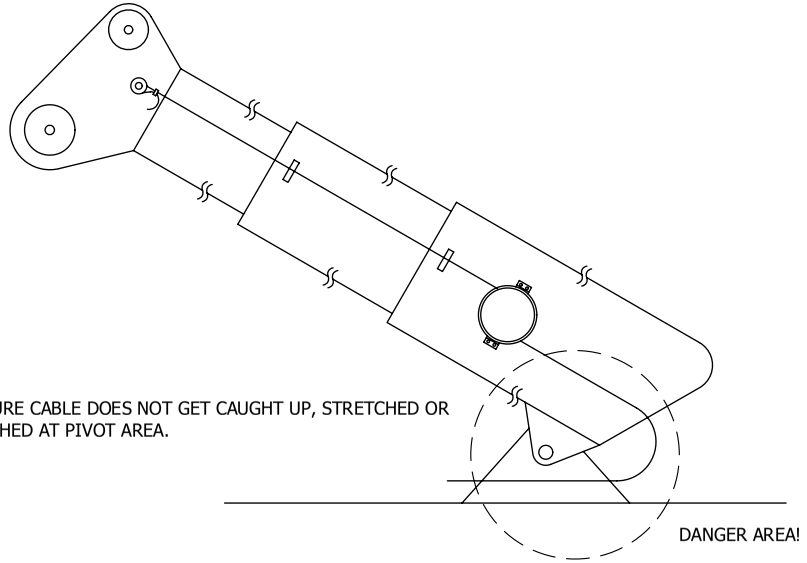
PART No: DRUKOR0426LAB
PROJECT: RECOUL DRUM
TITLE: TOP ASSY,26m RECOIL DRUM, LENGTH, ANGLE & 4 CORE PAYOUT CABLE
A4
SHEET 6 OF 6
DRAWING No: 4581
FILE No: 458101AA.idw
REV 1.0

STEP 1

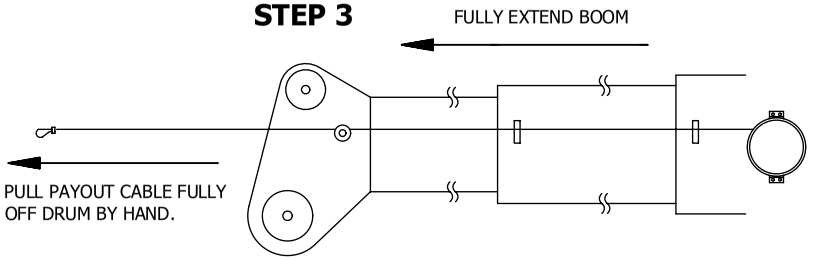


ENSURE THAT THE RECOIL DRUM IS MOUNTED VERTICALLY AND THAT THE DIRECTION THE CABLE IS PULLED OFF THE DRUM IS IN LINE WITH THE BOOM. IF IT COMES OFF AT AN ANGLE THERE IS RISK THAT IT WILL SLIP OFF THE SIDE OF THE DRUM.

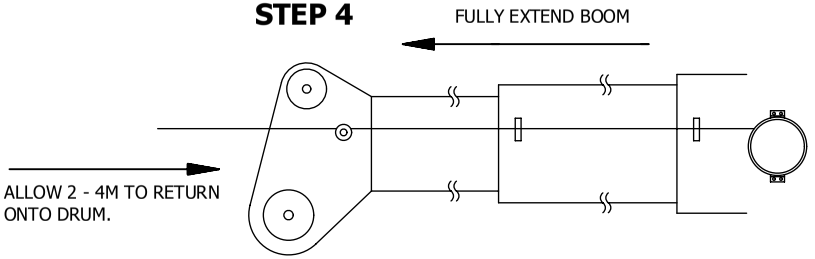
STEP 2



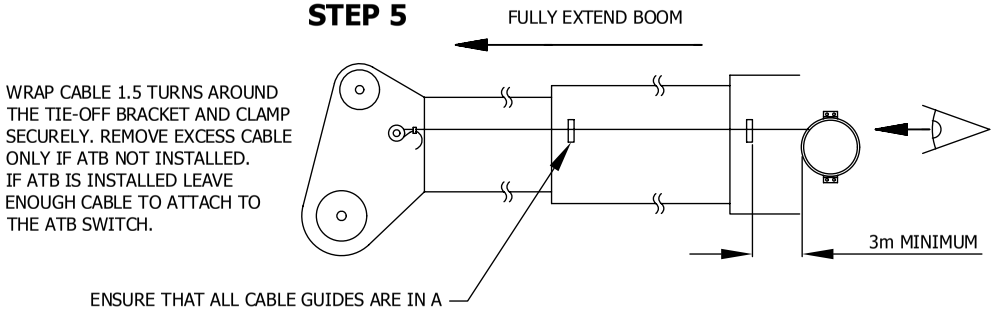
STEP 3



STEP 4



STEP 5



REV	DATE	DESCRIPTION OF CHANGE	APPR'D

TOL: X. +/- 1
X.X +/- 0.2
X.XX AS STATED

DRAFTING STANDARD: AS1100

DO NOT SCALE DRAWING
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE STATED

DRAWN	APPROVED
S. CHAMBERS	J. KOVAL
31/10/2007	1/11/07

PART OF ASSY
—

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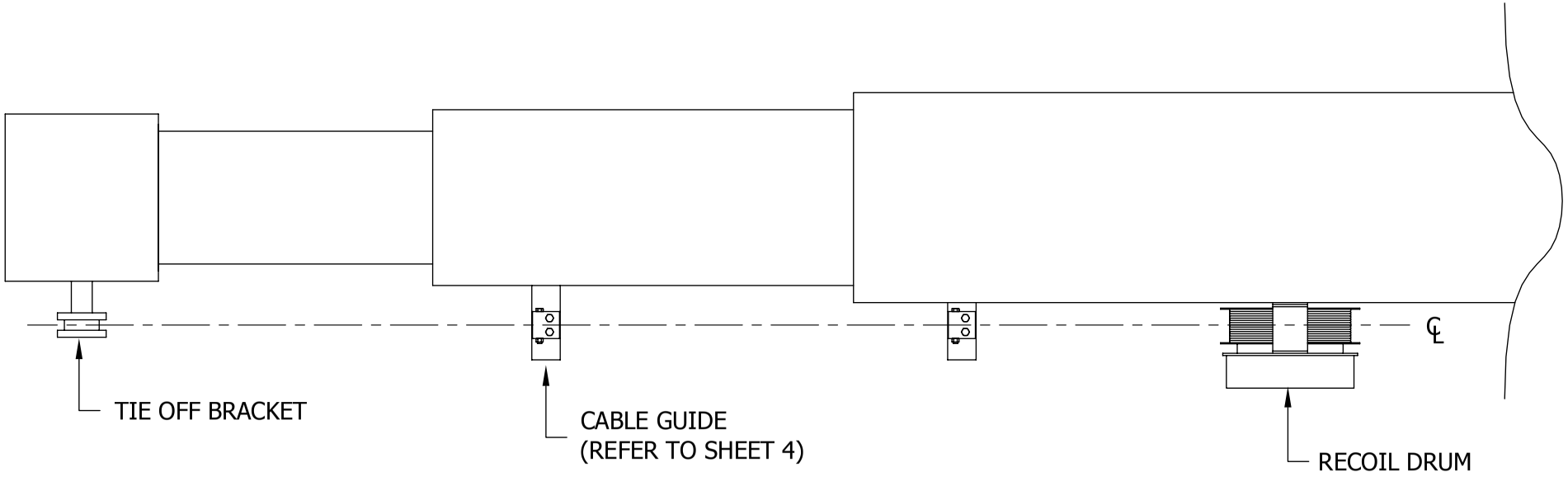
PART NO.:	PROJECT:
-	RECOIL DRUM

TITLE: INSTALLATION DETAILS

SCALE N/A

SHEET 1 OF 4

DRAWING No:	FILE No:	REV
DWG 3718	371801AA.DWG	1.0



NOTE:
TO ENSURE CABLE FLEETS EVENLY OVER DRUM WIDTH. THE CENTRE OF THE CABLE GUIDES MUST BE FITTED ON THE CENTRE LINE OF THE CABLE DRUM AS SHOWN.

WARNING:
IF THE ABOVE NOTE IS NOT SATISFIED, THE CABLE MAY OVER SPILL SIDES OF THE DRUM FLANGE.

REV	DATE	DESCRIPTION OF CHANGE	APPR'D

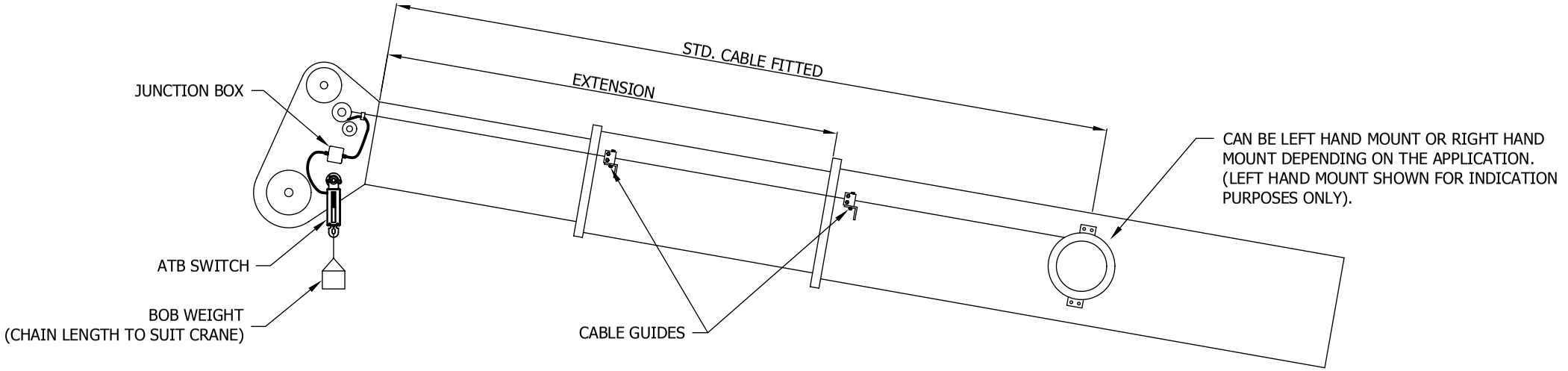
TOL: X. +/- 1
X.X +/- 0.2
X.XX AS STATED

DRAFTING STANDARD: AS1100

DO NOT SCALE DRAWING
ALL DIMENSIONS ARE IN MILLIMETERS
UNLESS OTHERWISE STATED

DRAWN	APPROVED	PART OF ASSY
S. CHAMBERS	J. KOVAL	—
31/10/2007	1/11/07	

PART NO.: -	PROJECT: RECOIL DRUM	
TITLE: INSTALLATION DETAILS		SCALE N/A
		SHEET 2 OF 4
DRAWING No: DWG 3718	FILE No: 371801AA.DWG	REV 1.0



REV	DATE	DESCRIPTION OF CHANGE	APPR'D

TOL: X. +/- 1
X.X +/- 0.2
X.XX AS STATED

DRAFTING STANDARD: AS1100

DO NOT SCALE DRAWING
ALL DIMENSIONS ARE IN MILLIMETERS
UNLESS OTHERWISE STATED

DRAWN	APPROVED	PART OF ASSY
S. CHAMBERS	J. KOVAL	—
31/10/2007	1/11/07	

PART NO.: -

PROJECT: RECOIL DRUM

TITLE: INSTALLATION DETAILS

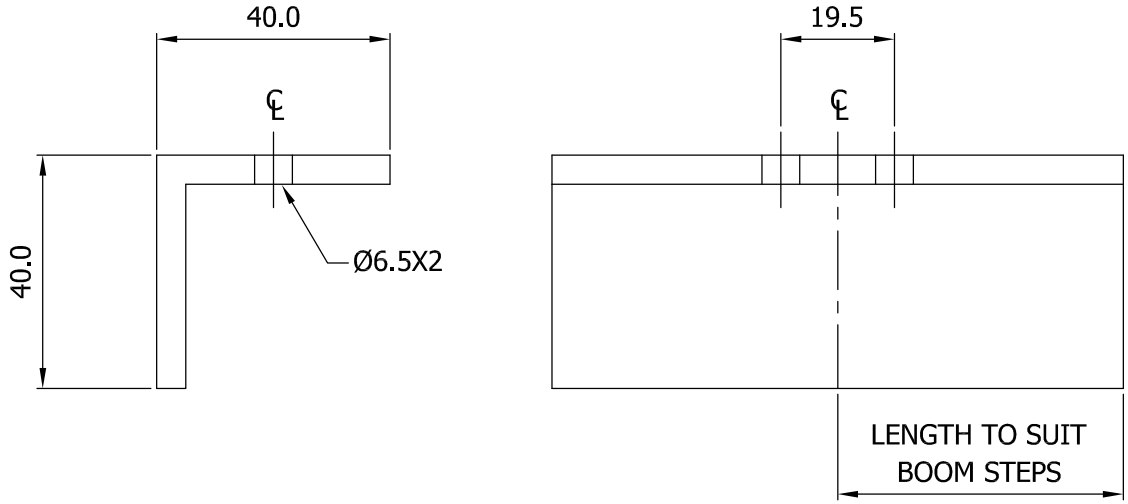
SCALE N/A

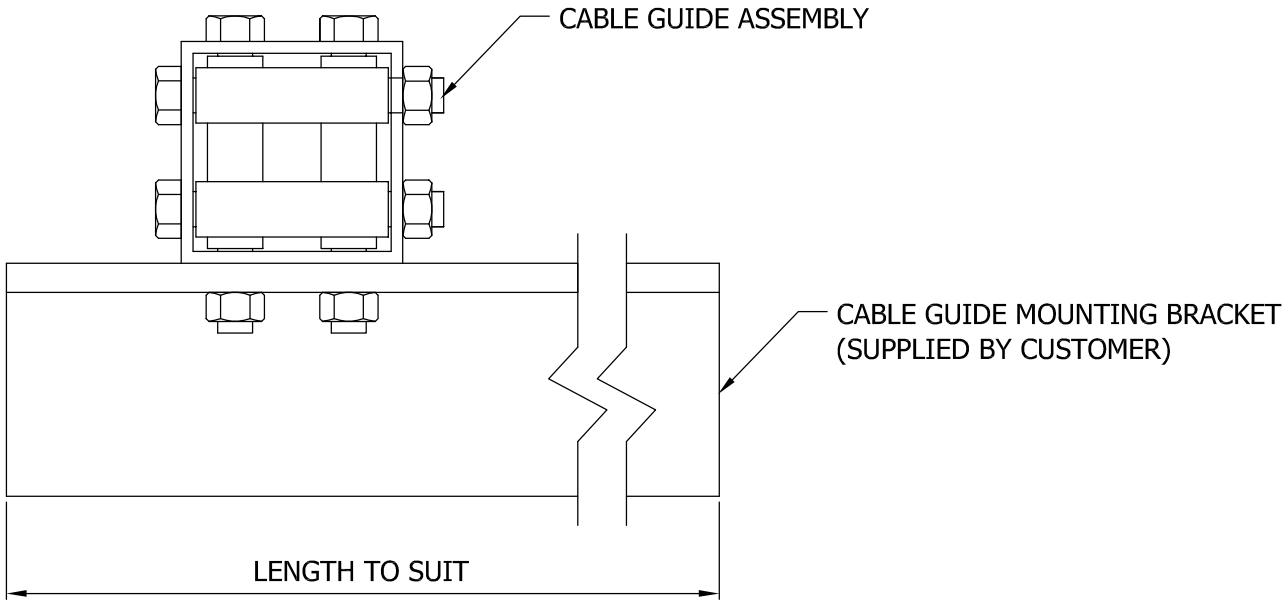
SHEET 3 OF 4

DRAWING No: DWG 3718

FILE No: 371801AA.DWG

REV 1.0





NOTES:

1. RECOMMENDED MATERIAL 40X40X5mm RIGHT ANGLED STEEL PLATE.
2. WELD THE MOUNTING BRACKET TO THE CRANE BOOM. ENSURING THAT THE LOCATION MEETS THE CRITERIA OUTLINED ON SHEET 2.
3. BOLT THE CABLE GUIDE ASSEMBLY TO THE MOUNTING BRACKET.

REV	DATE	DESCRIPTION OF CHANGE	APPR'D

TOL: X. +/- 1
X.X +/- 0.2
X.XX AS STATED

DRAFTING STANDARD: AS1100

DO NOT SCALE DRAWING
ALL DIMENSIONS ARE IN MILLIMETERS
UNLESS OTHERWISE STATED

DRAWN	APPROVED
S. CHAMBERS	J. KOVAL
31/10/2007	1/11/07

PART OF ASSY
—

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PH: +61 8 8238 3500
FX: +61 8 8352 1684

PART NO.: -

PROJECT: RECOIL DRUM

TITLE: INSTALLATION DETAILS

SCALE N/A

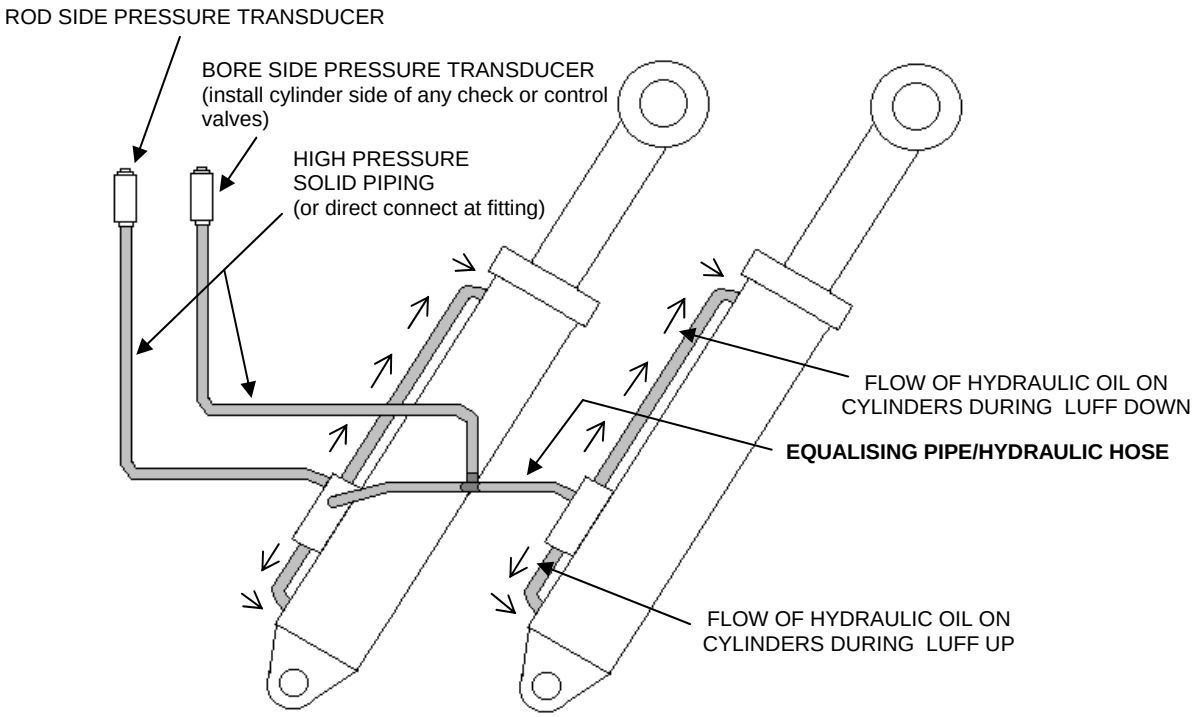
SHEET 4 OF 4

DRAWING No: DWG 3718

FILE No: 371801AA.DWG

REV 1.0

Typical Pressure Transducer Installation on Telescopic Cranes



Above sample diagram (Figure 5) is a typical installation of the BORE (FORCE) and ROD Pressure Transducers on telescopic cranes with two hydraulic cylinders. Lift ram hydraulic flows are also shown to illustrate the sample tapping points for the pressure transducers.

Different machines have different geometries and the installer must determine correct tapping points of the transducers.

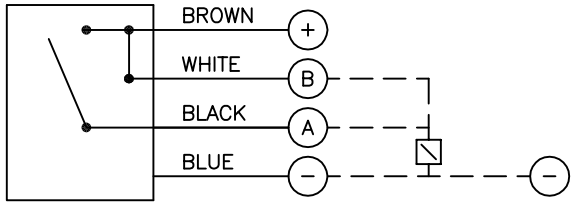
The BORE (FORCE) side pressure transducer must be connected to the full bore (head) side of the ram. If Lock Valve is fitted to the bore side, the transducer must be fitted to the “live” side of the valve. If machine has two lift cylinders, they should be equalised.

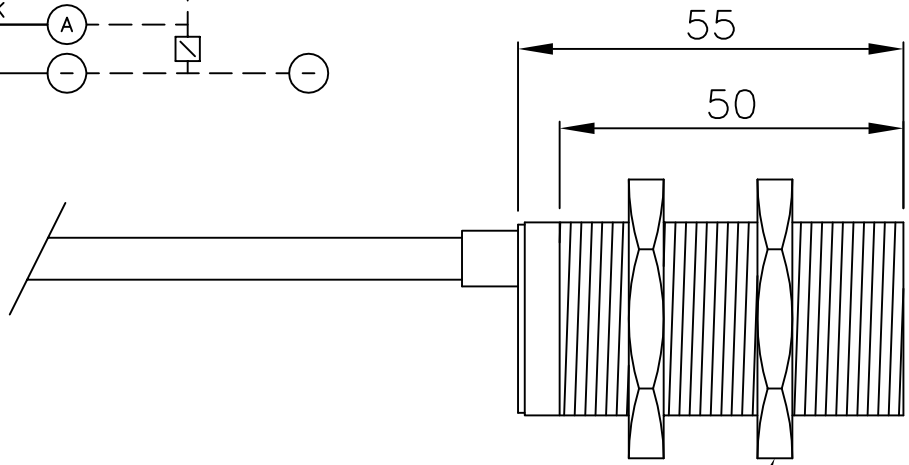
The ROD transducer is connected to the rod (annulus) side of the ram. Pressure on the rod side is normally very low and fairly constant when boom is “luffing up”. When “luffing down” this pressure can go up to a very high value, then drops back to its original value (value before luffing down) as soon as the boom stops moving or luffing.

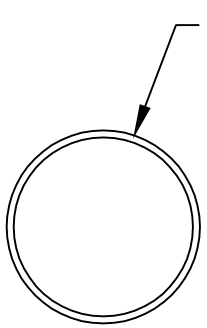
3RD ANGLE

WIRING DETAIL

(PNP – NORMALLY OPEN / NORMALLY CLOSED)







2 X LOCKNUTS SUPPLIED WITH PROX. SWITCH.

REV	DATE	DESCRIPTION OF CHANGE	APPR'D

TOL: X. +/– 1
X.X +/– 0.2
X.XX AS STATED

DO NOT SCALE DRAWING
ALL DIMENSIONS ARE IN MILLIMETERS
UNLESS OTHERWISE STATED

DRAWN	APPROVED	PART OF ASSY
S. CHAMBERS		–
10/07/01		

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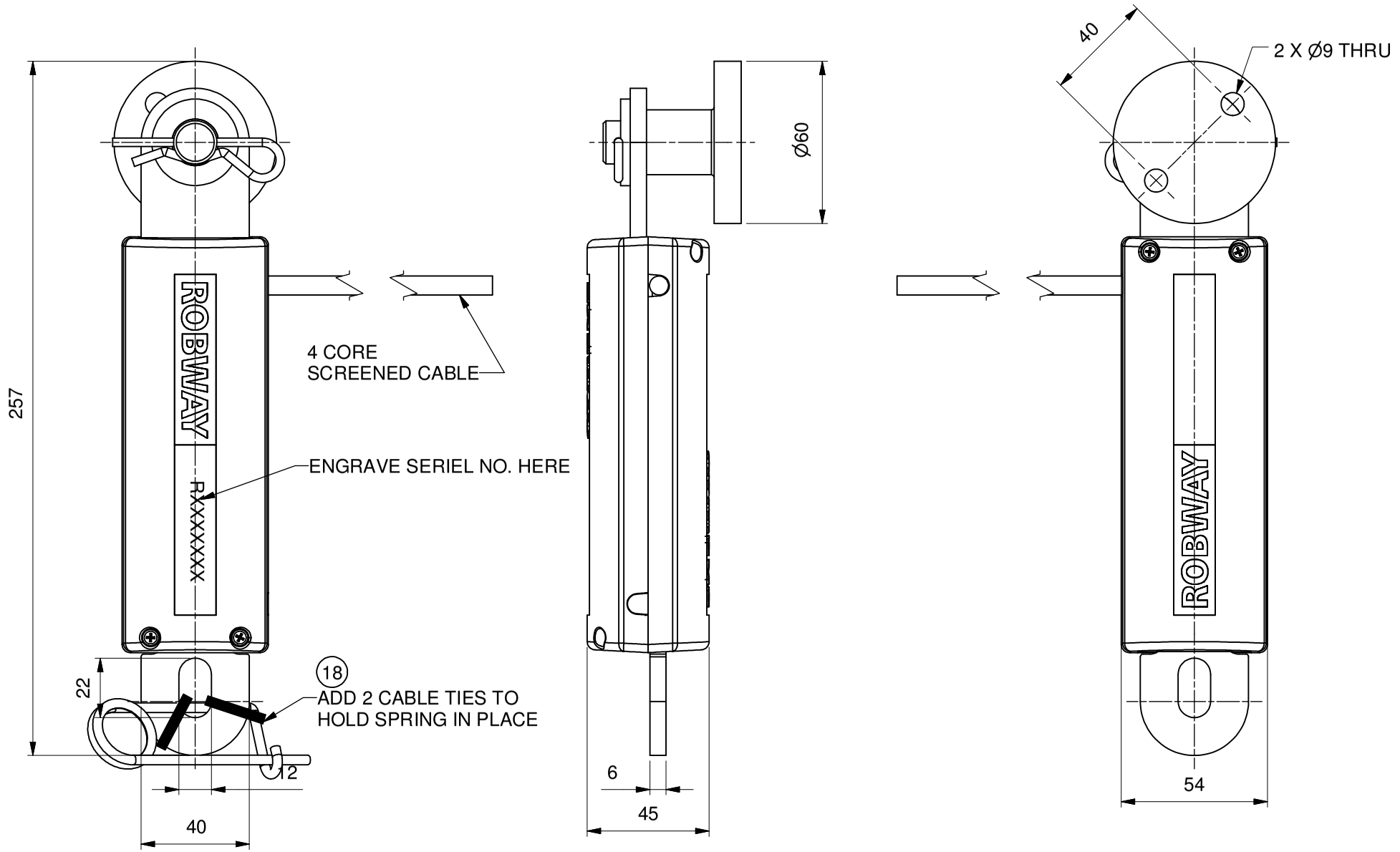
PART No:	PROJECT:	
SWIPROX03	PROXIMITY SWITCH	
TITLE: DIMENSIONAL DETAILS		SCALE N/A
		SHEET 1 OF 1
DRAWING No: DWG 2462	FILE No: 246201AA.DWG	REV 1.0

3RD ANGLE

Parts List				
ITEM	QTY	DESCRIPTION	DWG No.	PART NUMBER
18	2	CABLE TIES		TIE200BK



REV	DATE	DESCRIPTION OF CHANGE	APPRV'D
1.1	16/07/10	EXPLORED VIEW ADDED REFER PCR#322	A.A.
1.2	14/01/2011	REFER TO PCR#366	A.A.
1.3	24-1-14	REFER TO ECN 543	J.H

TOL: X. +/-1
X.X +/-0.2
X.XX +/-0.02

DO NOT SCALE DRAWING
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UNLESS OTHERWISE STATED

DRAWN BY	APPROVED BY	PART OF ASSY
S. CHAMBERS	A. CANLAS	-
19/04/2005	19/04/2005	

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PART No:	PROJECT:
SWIBB5	BB5 ATB SWITCH

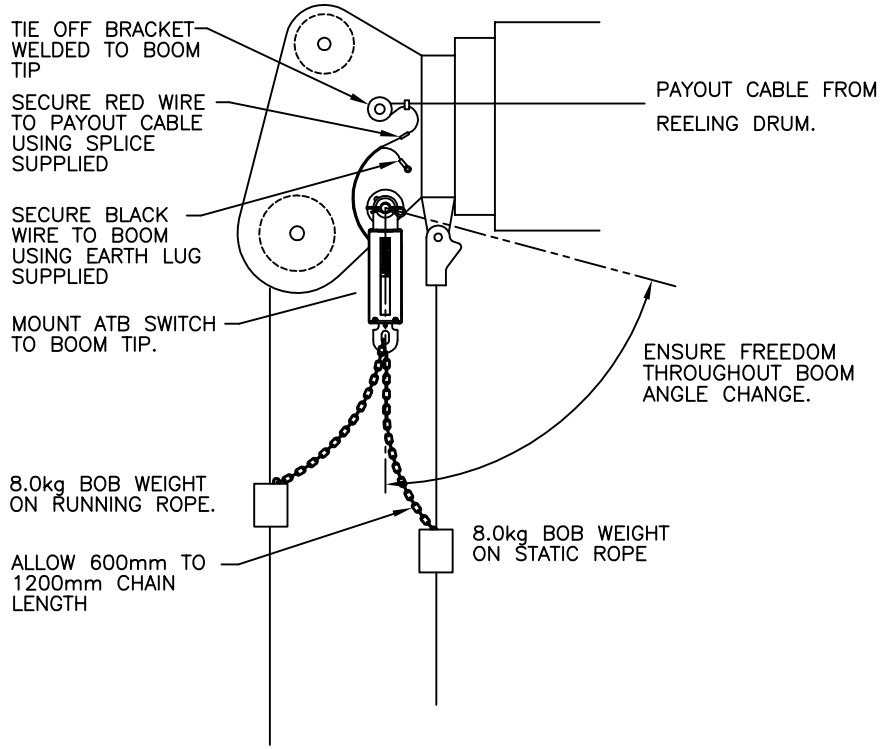
TITLE: ASSY, BB5 DIMENSIONAL DETAIL

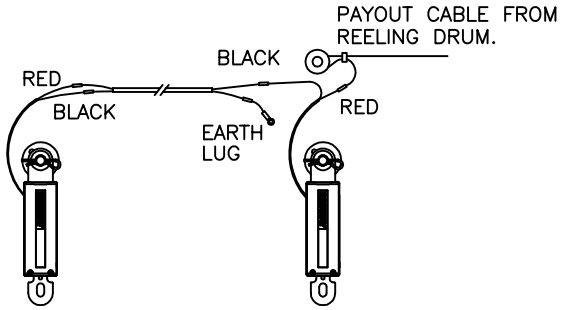
SCALE: N/A

SHEET: 1 OF 2

DRAWING No:	FILE No:	REV
2934	293401AD.idw	1.3

TELESCOPIC BOOM SINGLE CORE PAYOUT CABLE APPLICATION





ATB SWITCH CONNECTION FOR MAIN AND FLY

REV	DATE	DESCRIPTION OF CHANGE	APPR'D
1.1	03/08/05	REFER TO DR#421	A.C.

TOL: X. +/- 1
X.X +/- 0.2
X.XX AS STATED

DO NOT SCALE DRAWING
ALL DIMENSIONS ARE IN MILLIMETERS
UNLESS OTHERWISE STATED

DRAWN	APPROVED	PART OF ASSY
S. CHAMBERS	A. CANLAS	—
10/07/01	10/07/01	

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PART No:	PROJECT:
—	—

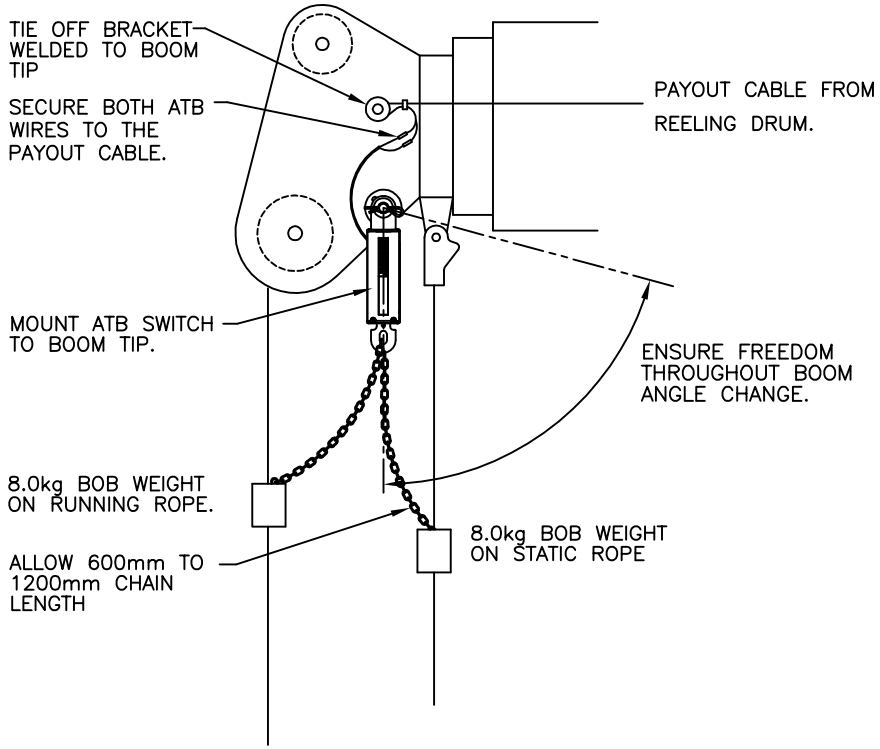
TITLE: ATB SWITCH INSTALLATION DETAILS

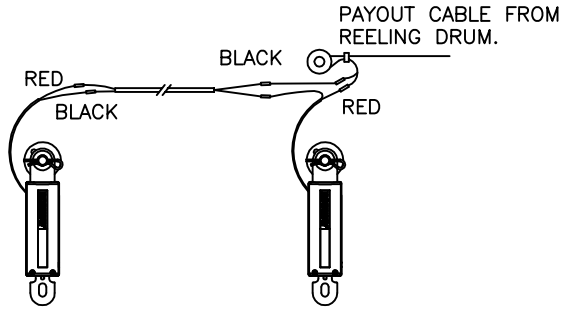
SCALE N/A

SHEET 1 OF 3

DRAWING No:	FILE No:	REV
DWG 0667	066701AB.DWG	1.1

TELESCOPIC BOOM TWO CORE PAYOUT CABLE APPLICATION





ATB SWITCH CONNECTION FOR MAIN AND FLY

REV	DATE	DESCRIPTION OF CHANGE	APPR'D
1.1	03/08/05	REFER TO DR#421	A.C.

TOL: X. +/- 1
X.X +/- 0.2
X.XX AS STATED

DO NOT SCALE DRAWING
ALL DIMENSIONS ARE IN MILLIMETERS
UNLESS OTHERWISE STATED

DRAWN	APPROVED	PART OF ASSY
S. CHAMBERS	A. CANLAS	—
10/07/01	10/07/01	

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PART No:	PROJECT:
—	—

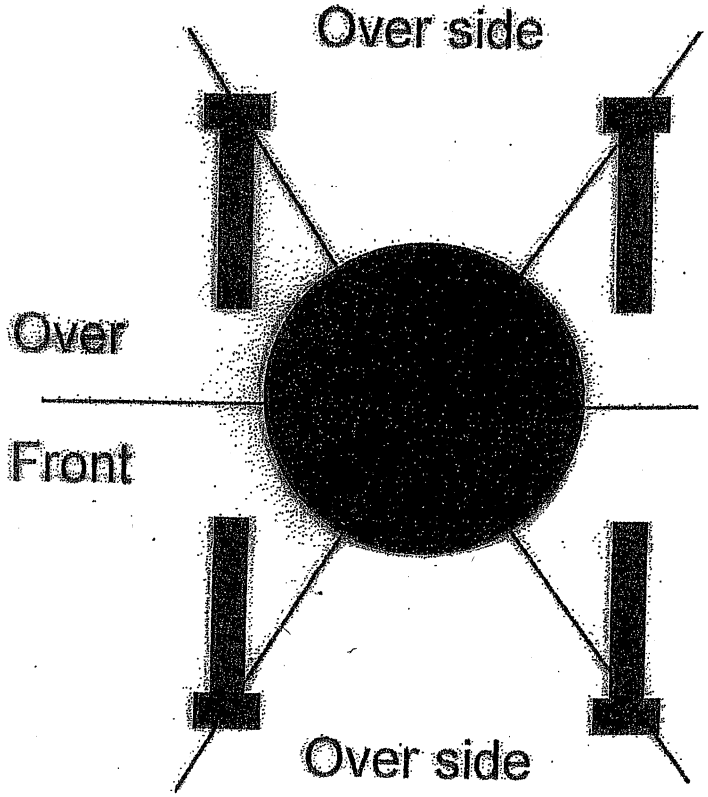
TITLE: ATB SWITCH INSTALLATION DETAILS

SCALE N/A

SHEET 2 OF 3

DRAWING No:	FILE No:	REV
DWG 0667	066701AB.DWG	1.1

Typical Slew/Proximity Switch Application



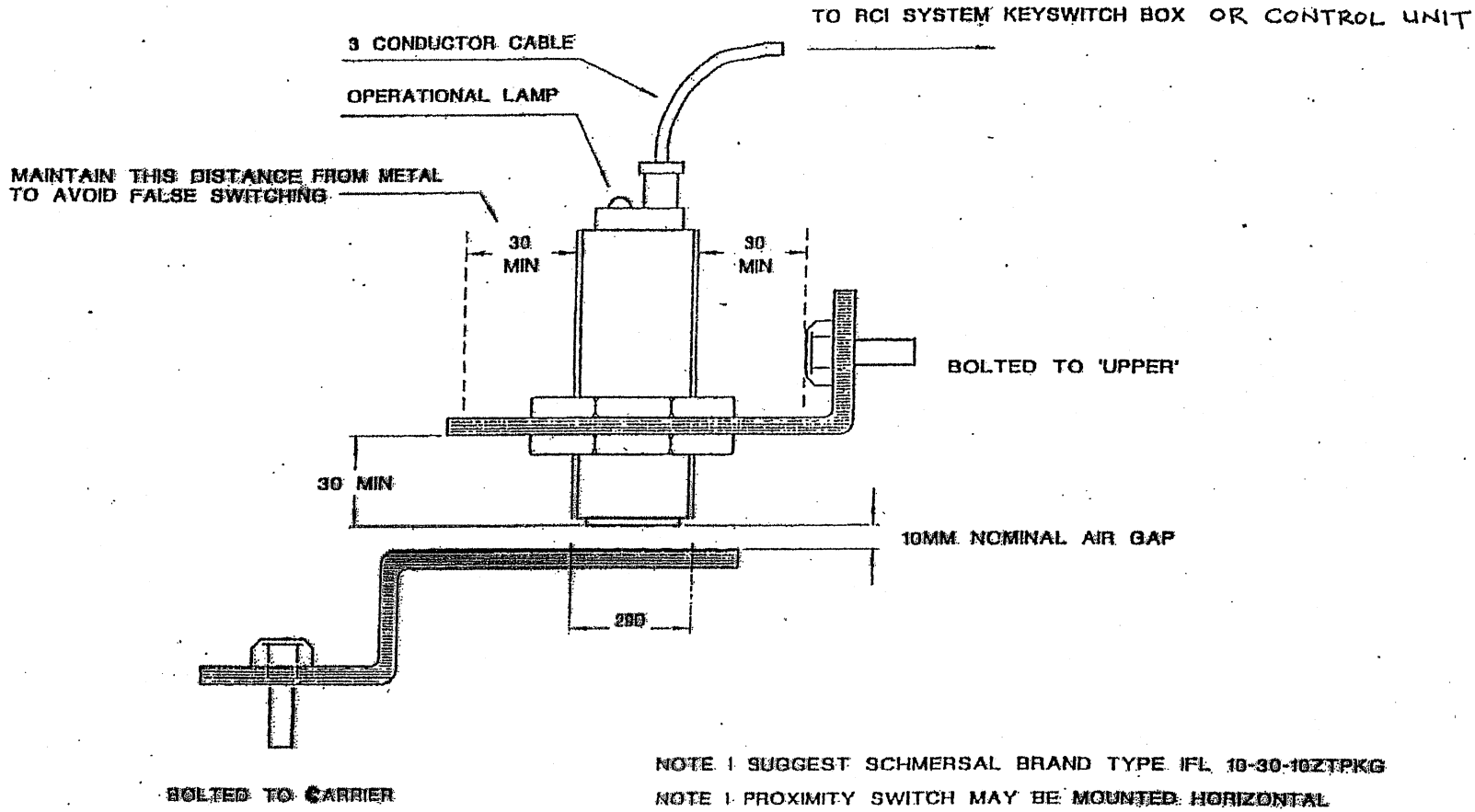
Switch 1 — opens when over-front

Switch 2 — opens when over-side

Therefore a truth table is;

sw1	sw2	condition
c	c	over-rear
c	o	over-side
o	o	over-front
broken cables		over-front, least capacity.

RCI SLEW SWITCH MOUNTING (WHERE REQUIRED)



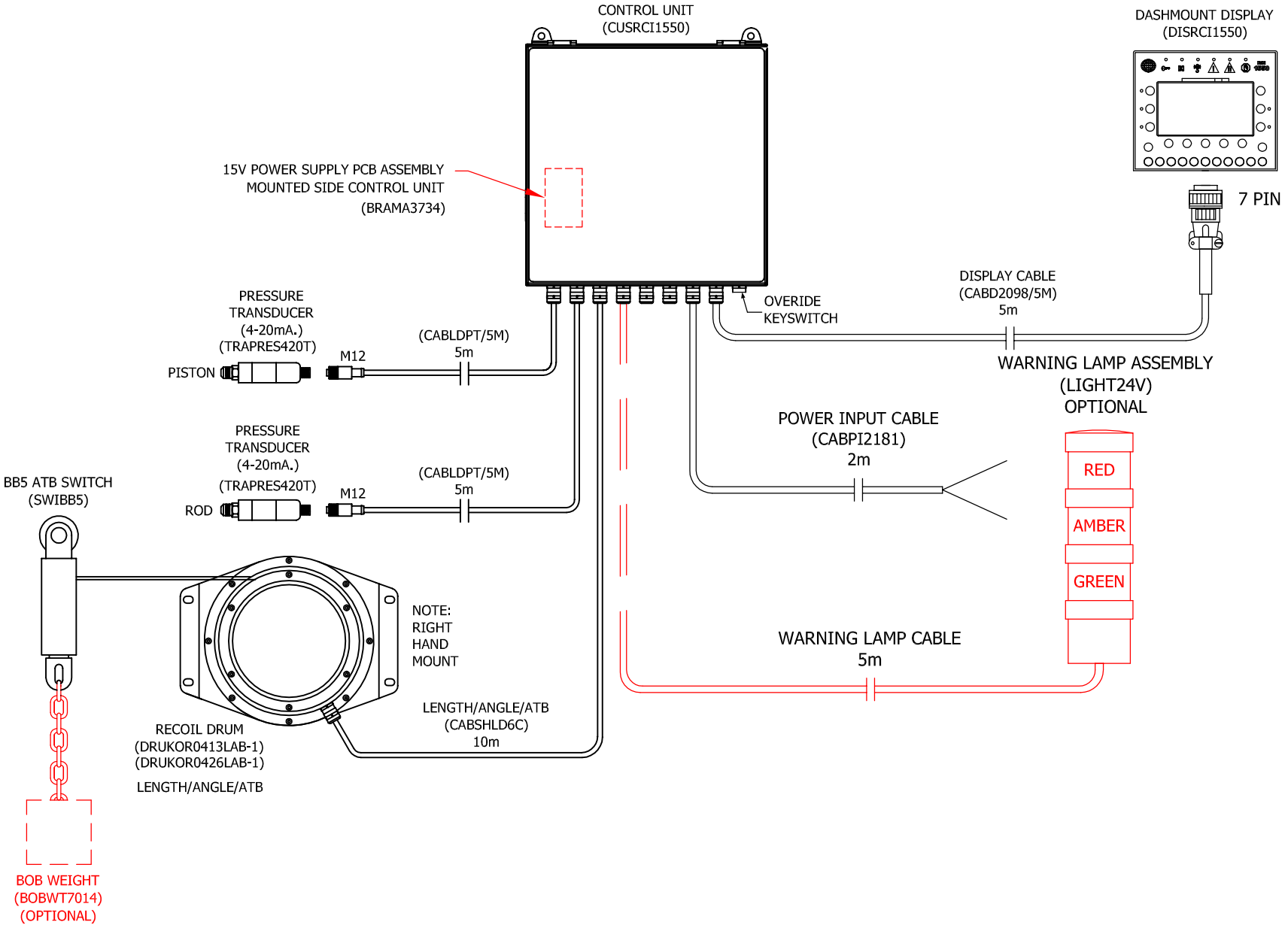
NOTE 1 SUGGEST SCHMERSAL BRAND TYPE IFL 18-30-18ZTPKG

NOTE 1 PROXIMITY SWITCH MAY BE MOUNTED HORIZONTAL

DRAWN: IAW	CHECKED:	DATE 9.11.98
CUSTOMER: RCI MANUALS		FAB/ASSY/NEG
RCI SLEW SWITCH MOUNTING		
		DWG 930050
FILE No:930050		REV No:

ROBWAY SAFETY SYSTEMS P/L 08 352 6055

Drawings Part B
General Arrangement and Wiring



REV	DATE	DESCRIPTION OF CHANGE	APPR'D

TOL: X. +/- 1
X.X +/- 0.2
X.XX AS STATED

DRAFTING STANDARD: AS1100

DO NOT SCALE DRAWING
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UNLESS OTHERWISE STATED

DRAWN	APPROVED	PART OF ASSY
J.HART	-	—
31-10-12	-	

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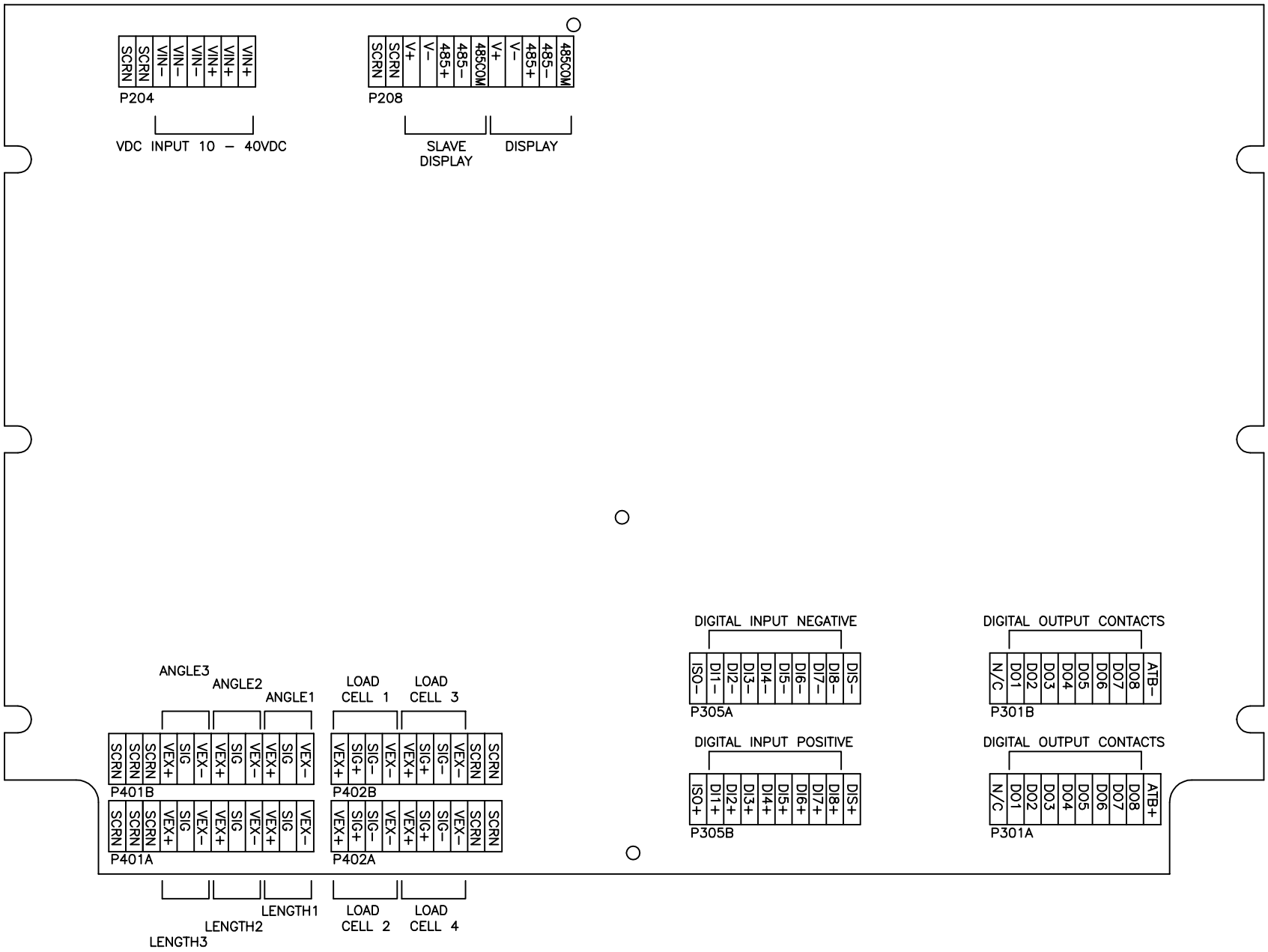
CUSTOMER:	PROJECT:
-	SYS1550-27

TITLE: GA,RCI-1550 GA, GENERIC LOAD MOMENT,TELE SYSTEM

SCALE N/A

SHEET 1 OF 4

DRAWING No:	FILE No:	REV
4749	4749-A.DWG	A



REV	DATE	DESCRIPTION OF CHANGE	APPR'D
1.1	31/05/01	REFER TO DR#800	A.C.
1.2	24/01/03	REFER TO PR#132	A.C.
1.3	12/07/04	REFER TO DR#264	G.C.
1.4	17/01/06	REFER TO DR#443	A.C.

TOL: X. +/- 1
X.X +/- 0.2
X.XX AS STATED

DO NOT SCALE DRAWING
ALL DIMENSIONS ARE IN MILLIMETERS
UNLESS OTHERWISE STATED

DRAWN	APPROVED	PART OF ASSY
D. PLANTHABER	D. PLANTHABER	–
02/09/99	22/06/00	

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FAX +61 8 8352 1684

PART No: –

PROJECT: RCI-1550

TITLE: RCI 1550 ELECTRICAL CONNECTIONS

SCALE N/A

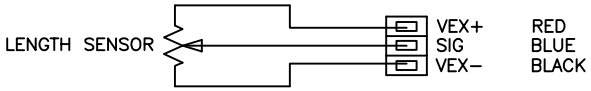
SHEET 1 OF 3

DRAWING No: DWG 2078

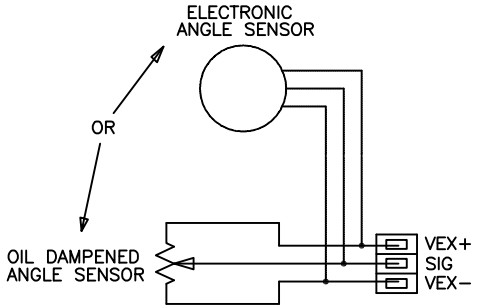
FILE No: 207801AE.DWG

REV 1.4

LENGTH



ANGLE



FOR ELECTRONIC TYPE ANGLE SENSORS
PLACE JUMPER AS SHOWN –

FOR OIL DAMPENED TYPE ANGLE SENSORS
PLACE JUMPER AS SHOWN –

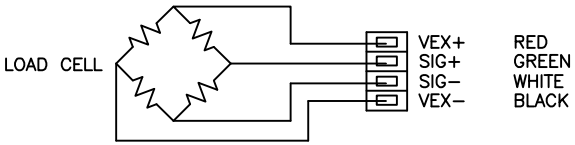
NOTE: ONLY ONE TYPE OF ANGLE SENSOR
CAN BE USED PER CONTROLLER.

GAIN ADJUSTMENT

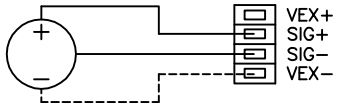
VR401 = 4–20mA GAIN ADJUST
VR402 = 3mV/V GAIN ADJUST
VR403 = 2mV/V GAIN ADJUST
VR404 = 1mV/V GAIN ADJUST

THESE ADJUSTMENTS ARE
TO BE MADE BY ROBWAY
AUTHORIZED PERSONNEL ONLY

LOAD

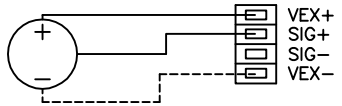


"ACTIVE" 4–20mA TRANSDUCER



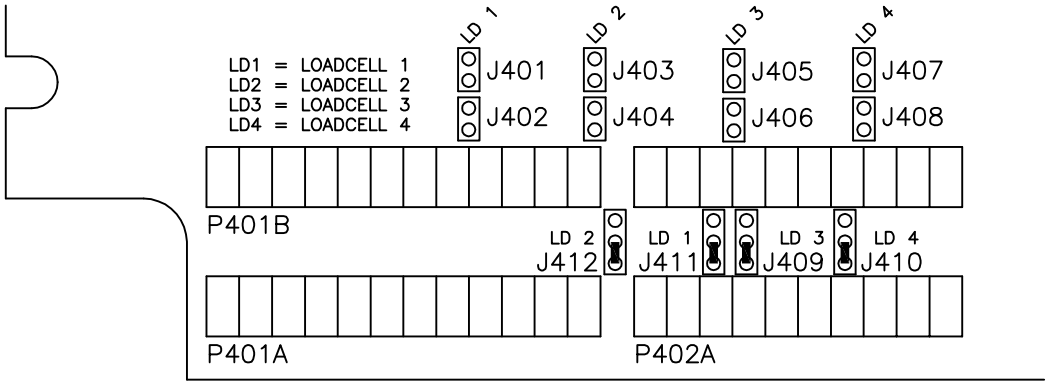
(IF 3 WIRE, VEX– IS NOMINAL GROUND)

"PASSIVE" 4–20mA TRANSDUCER

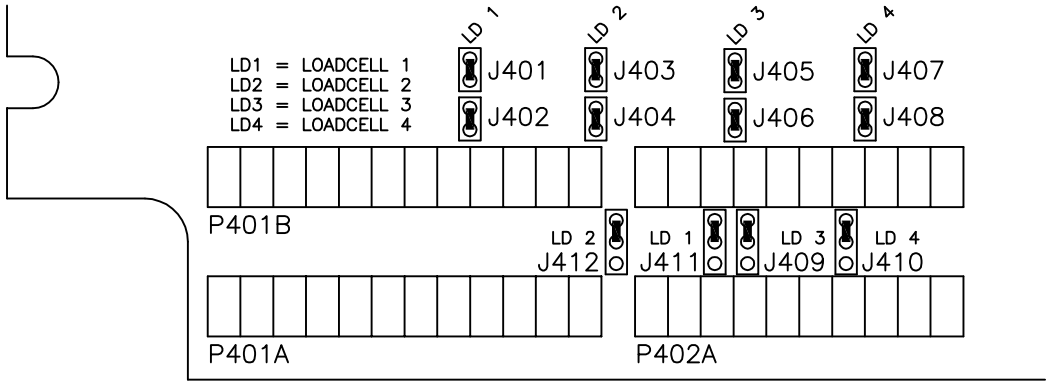


(IF 3 WIRE, VEX– IS NOMINAL GROUND)

FOR VOLTAGE TYPE SENSORS (mV/V)
PLACE JUMPERS AS FOLLOWS –



FOR CURRENT TYPE SENSORS (4–20mA)
PLACE JUMPERS AS FOLLOWS –



REV	DATE	DESCRIPTION OF CHANGE	APPR'D
1.1	31/05/01	REFER TO DR#800	A.C.
1.2	24/01/03	REFER TO PR#132	A.C.
1.3	12/07/04	REFER TO DR#264	G.C.
1.4	17/01/06	REFER TO DR#443	A.C.

TOL: X. +/- 1
X.X +/- 0.2
X.XX AS STATED

DO NOT SCALE DRAWING
ALL DIMENSIONS ARE IN MILLIMETERS
UNLESS OTHERWISE STATED

DRAWN	APPROVED	PART OF ASSY
D. PLANTHABER	D. PLANTHABER	–
02/09/99	22/06/00	

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PART No: –

PROJECT: RCI-1550

TITLE: RCI 1550 ELECTRICAL CONNECTIONS

SCALE N/A

SHEET 2 OF 3

DRAWING No: DWG 2078

FILE No: 207801AE.DWG

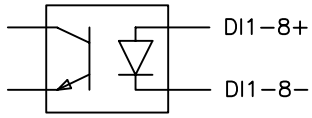
REV 1.4

DISABLE INPUT	DIS−	P305A	DIS+	P305B
INPUT 8	DI8−		DI8+	
INPUT 7	DI7−		DI7+	
INPUT 6	DI6−		DI6+	
INPUT 5	DI5−		DI5+	
INPUT 4	DI4−		DI4+	
INPUT 3	DI3−		DI3+	
INPUT 2	DI2−		DI2+	
INPUT 1	DI1−		DI1+	
ISOLATED 12V SUPPLY	ISO−		ISO+	

INPUTS ARE ARRANGED AS PAIRS OF FLOATING TERMINALS WHICH REQUIRE AN EXTERNAL VOLTAGE SOURCE FOR OPERATION

THE POWER SUPPLY FOR EXTERNAL PROXIMITY SWITCHES TO BE TAKEN FROM THE INCOMING POWER SUPPLY LINE.

WHEN ACTIVATED, THE DISABLE INPUT FORCES ALL THE OUTPUTS TO ASSUME THE STATE DEFINED BY THE CARD'S RESET DIP SWITCH SETTINGS.

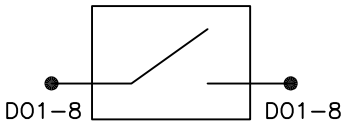


ATB INPUT (INPUT 1)	ATB−	P301B	ATB+	P301A
OUTPUT 8	DO8		DO8	
OUTPUT 7	DO7		DO7	
OUTPUT 6	DO6		DO6	
OUTPUT 5	DO5		DO5	
OUTPUT 4	DO4		DO4	
OUTPUT 3	DO3		DO3	
OUTPUT 2	DO2		DO2	
ATB RELAY OUTPUT (OUTPUT 1)	DO1		DO1	
NOT CONNECTED	N/C		N/C	

OUTPUTS ARE ARRANGED AS VOLTAGE FREE RELAY CONTACTS WITH SEMICONDUCTOR SNUBBER. ENSURE LOAD SUPPLY DOES NOT EXCEED 50V DC.

NOTE: OUTPUTS ARE NOT FUSE PROTECTED. USER MUST UTILIZE SUITABLE EXTERNAL PROTECTION SUCH AS IN−LINE FUSES.

ATB SWITCH INPUT REQUIRES SIMPLE SWITCH CLOSURE BETWEEN ATB+ AND ATB−.



REV	DATE	DESCRIPTION OF CHANGE	APPR'D
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1.4	17/01/06	REFER TO DR#443	A.C.

TOL: X. +/− 1
X.X +/− 0.2
X.XX AS STATED

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DRAWN	APPROVED	PART OF ASSY
D. PLANTHABER	D. PLANTHABER	−
02/09/99	22/06/00	

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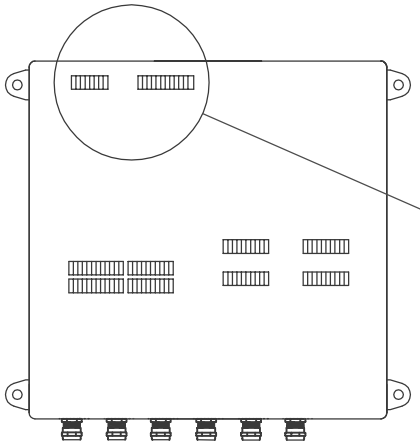
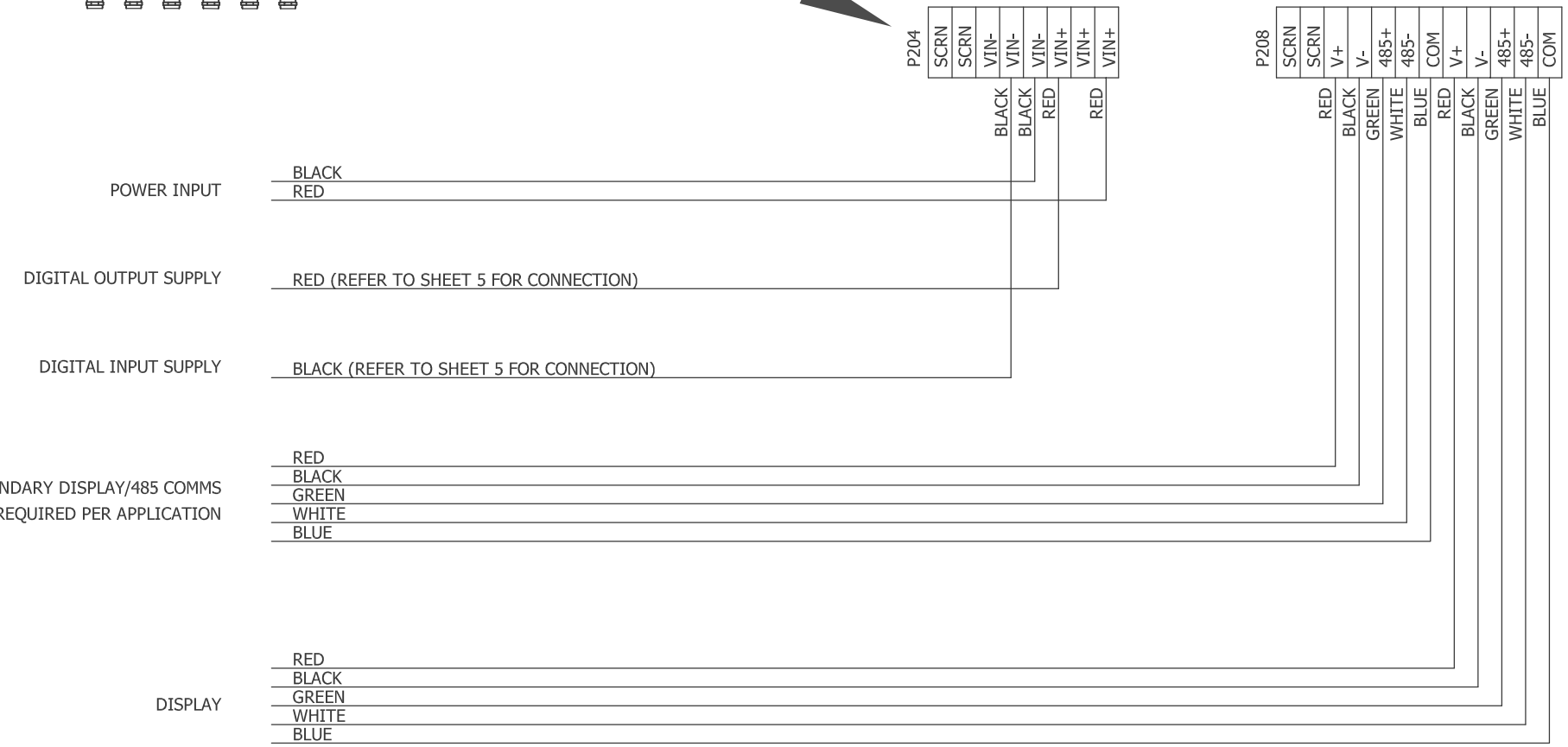
PART No: −	PROJECT: RCI−1550
TITLE: RCI 1550 ELECTRICAL CONNECTIONS	SCALE N/A
	SHEET 3 OF 3
DRAWING No: DWG 2078	FILE No: 207801AE.DWG
	REV 1.4

POWER INPUT/DISPLAY WIRING





REV	DATE	DESCRIPTION OF CHANGE	APPR'D
1.2	30/05/01	REFER TO DR#799	A.C
1.3	19/06/01	REFER TO DR#805	A.C
1.4	03/03/03	REFER TO DR#137	G.H
1.5	10/02/06	ADD 4-20mA WIRING DETAIL	S.C
1.6	23/08/07	REFER TO PCR#31	J.K
1.7	3/12/2010	REFER TO PCR#359	-

TOL: X. +/- 1
X.X +/- 0.2
X.XX AS STATED

DRAFTING STANDARD: AS1100

DO NOT SCALE DRAWING
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UNLESS OTHERWISE STATED

DRAWN	APPROVED
S.CHAMBERS	D.PLANTHABER
08/02/01	12/02/01

PART OF ASSY
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PART NO.: -

PROJECT: RCI-1550 CONTROLLER

TITLE: STANDAND WIRING DIAGRAM FOR TELESCOPIC BOOM CRANES

SCALE N/A

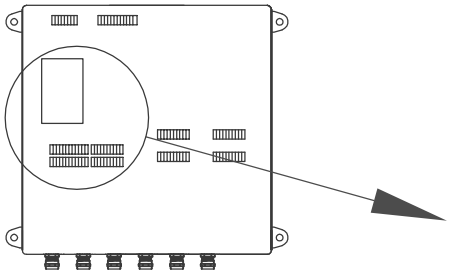
SHEET 1 OF 5

DRAWING No: 2354

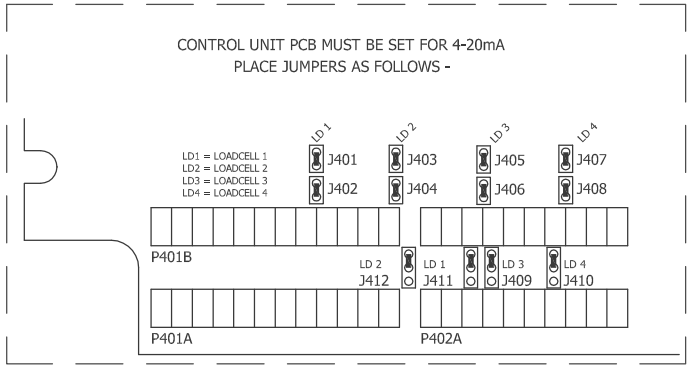
FILE No: 235401AH.DWG

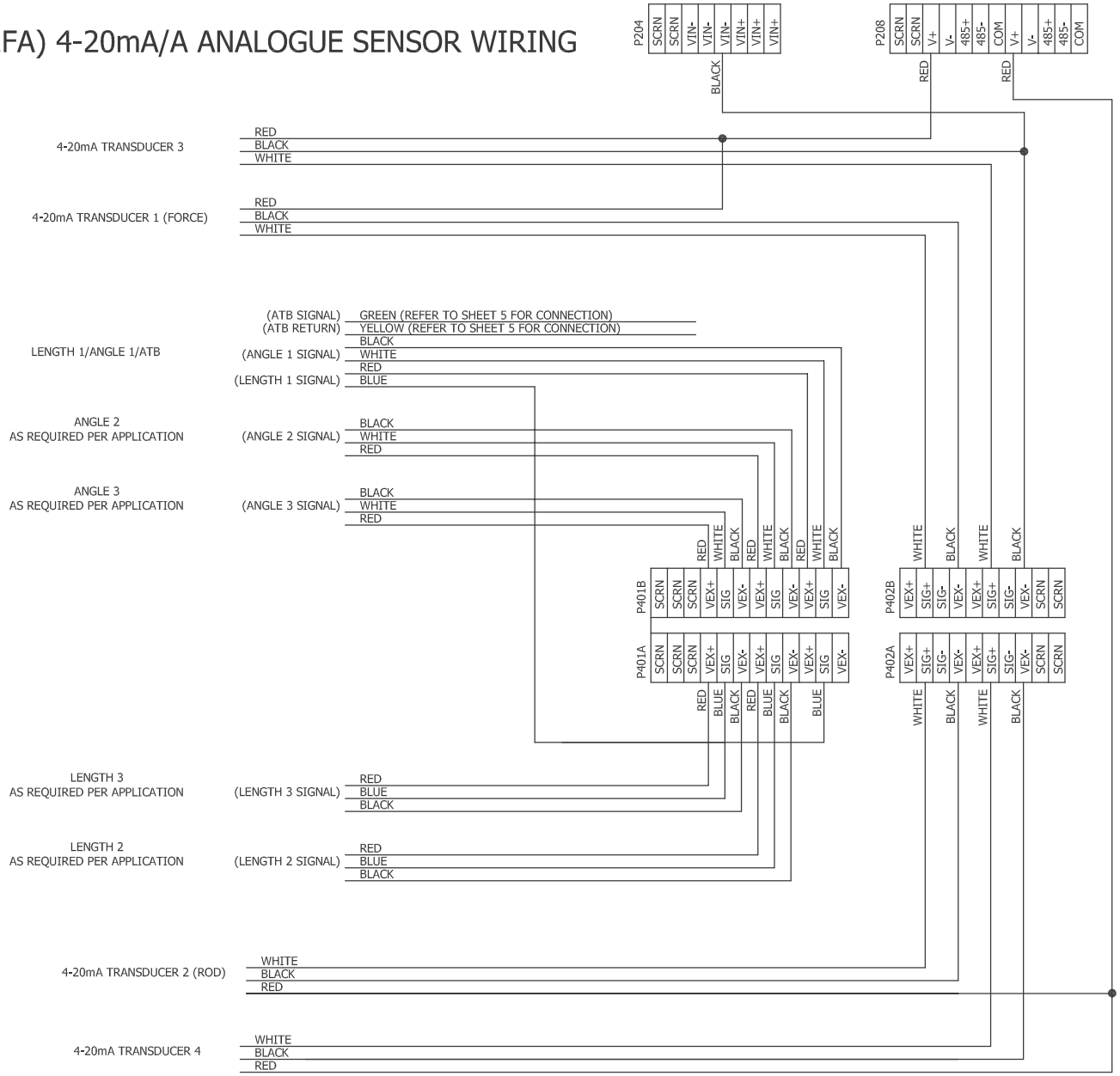
REV 1.7

(TRAPP642FA) 4-20mA/A ANALOGUE SENSOR WIRING



CONTROL UNIT PCB MUST BE SET FOR 4-20mA
PLACE JUMPERS AS FOLLOWS -





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1.7	3/12/2010	REFER TO PCR#359	-

TOL: X. +/- 1
X.X +/- 0.2
X.XX AS STATED

DRAFTING STANDARD: AS1100

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DRAWN	APPROVED
S.CHAMBERS	D.PLANTHABER
08/02/01	12/02/01

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PART NO.: -

PROJECT: RCI-1550 CONTROLLER

TITLE: STANDAND WIRING DIAGRAM FOR TELESCOPIC BOOM CRANES

SCALE N/A

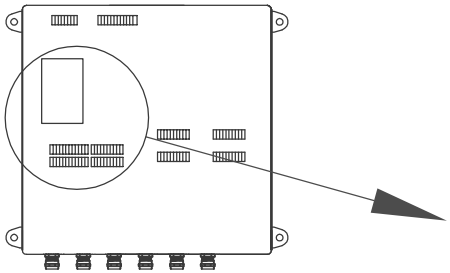
SHEET 4 OF 5

DRAWING No: 2354

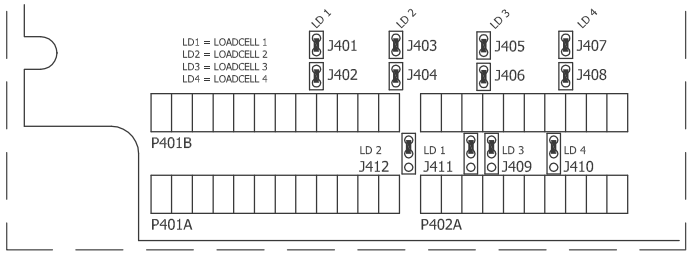
FILE No: 235401AH.DWG

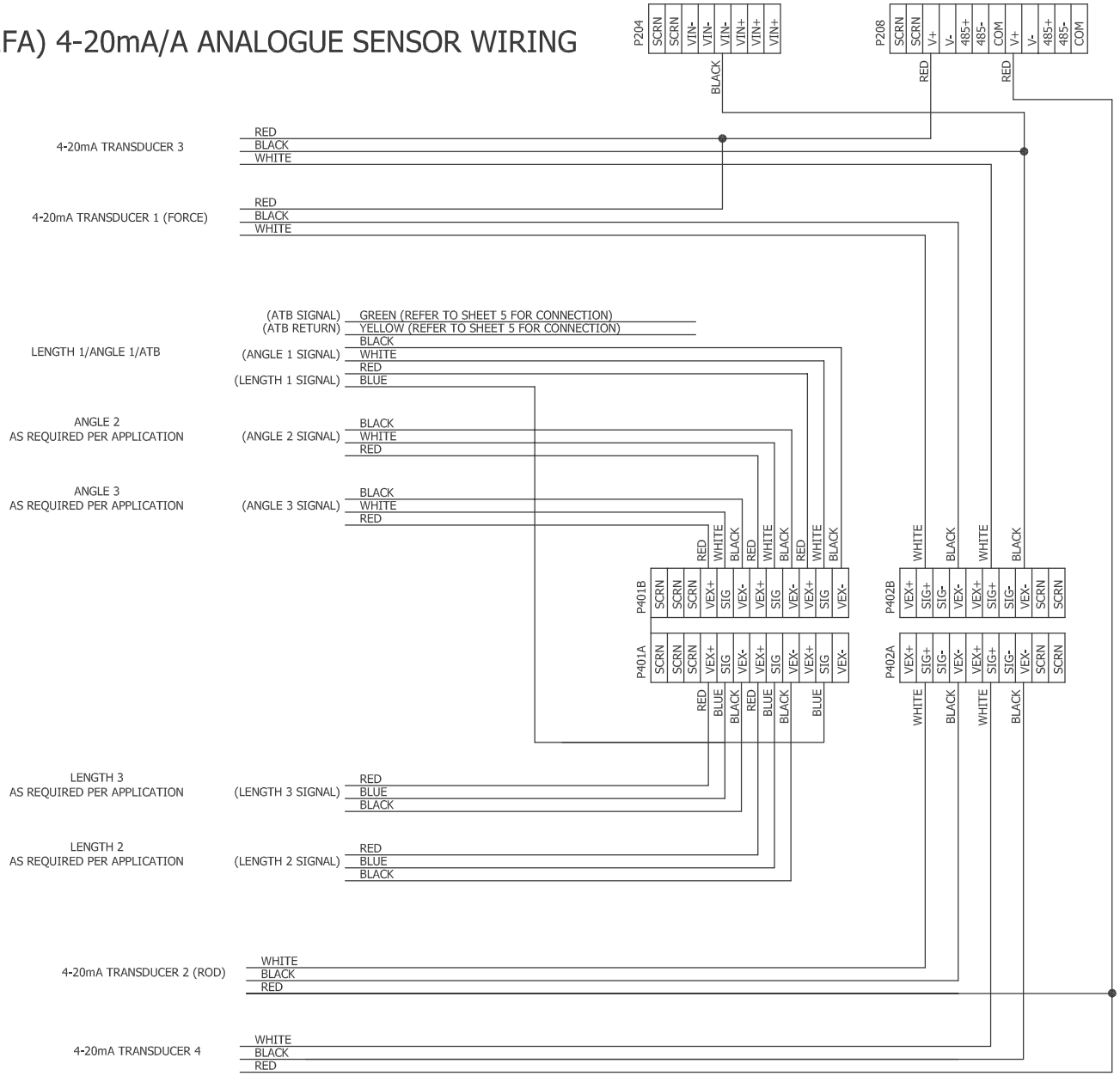
REV 1.7

(TRAPP642FA) 4-20mA/A ANALOGUE SENSOR WIRING



CONTROL UNIT PCB MUST BE SET FOR 4-20mA
PLACE JUMPERS AS FOLLOWS -





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1.7	3/12/2010	REFER TO PCR#359	-

TOL: X. +/- 1
X.X +/- 0.2
X.XX AS STATED

DRAFTING STANDARD: AS1100

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DRAWN	APPROVED
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PART NO.: -

PROJECT: RCI-1550 CONTROLLER

TITLE: STANDAND WIRING DIAGRAM FOR TELESCOPIC BOOM CRANES

SCALE N/A

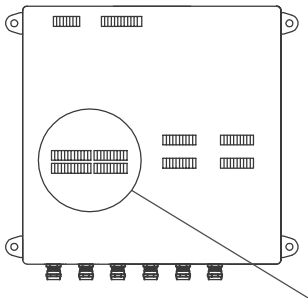
SHEET 3 OF 5

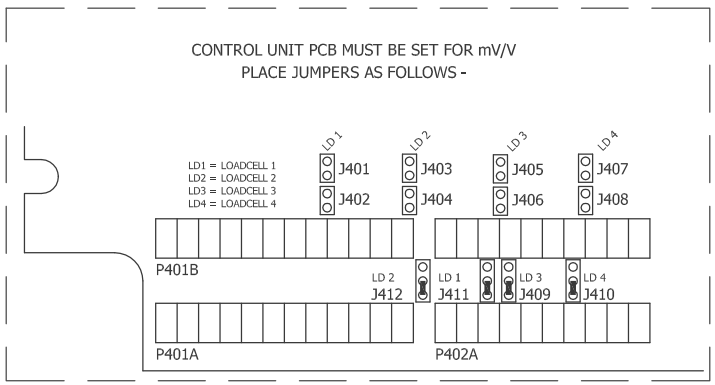
DRAWING No: 2354

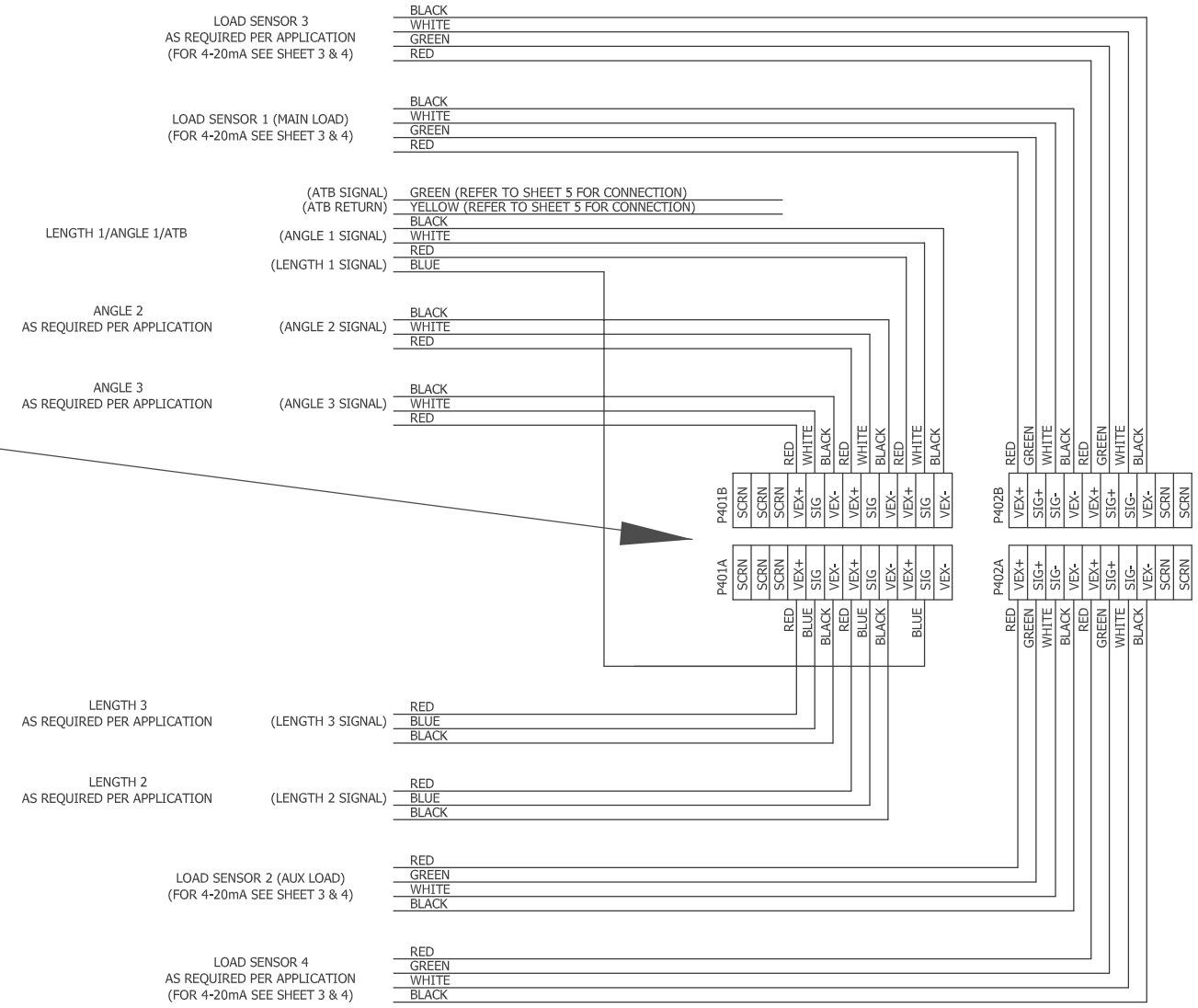
FILE No: 235401AH.DWG

REV 1.7

mV/V ANALOGUE SENSOR WIRING







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1.7	3/12/2010	REFER TO PCR#359	-

TOL: X. +/- 1
X.X +/- 0.2
X.XX AS STATED

DRAFTING STANDARD: AS1100

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DRAWN	APPROVED
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08/02/01	12/02/01

PART OF ASSY
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PART NO.: -

PROJECT: RCI-1550 CONTROLLER

TITLE: STANDAND WIRING DIAGRAM FOR TELESCOPIC BOOM CRANES

SCALE N/A

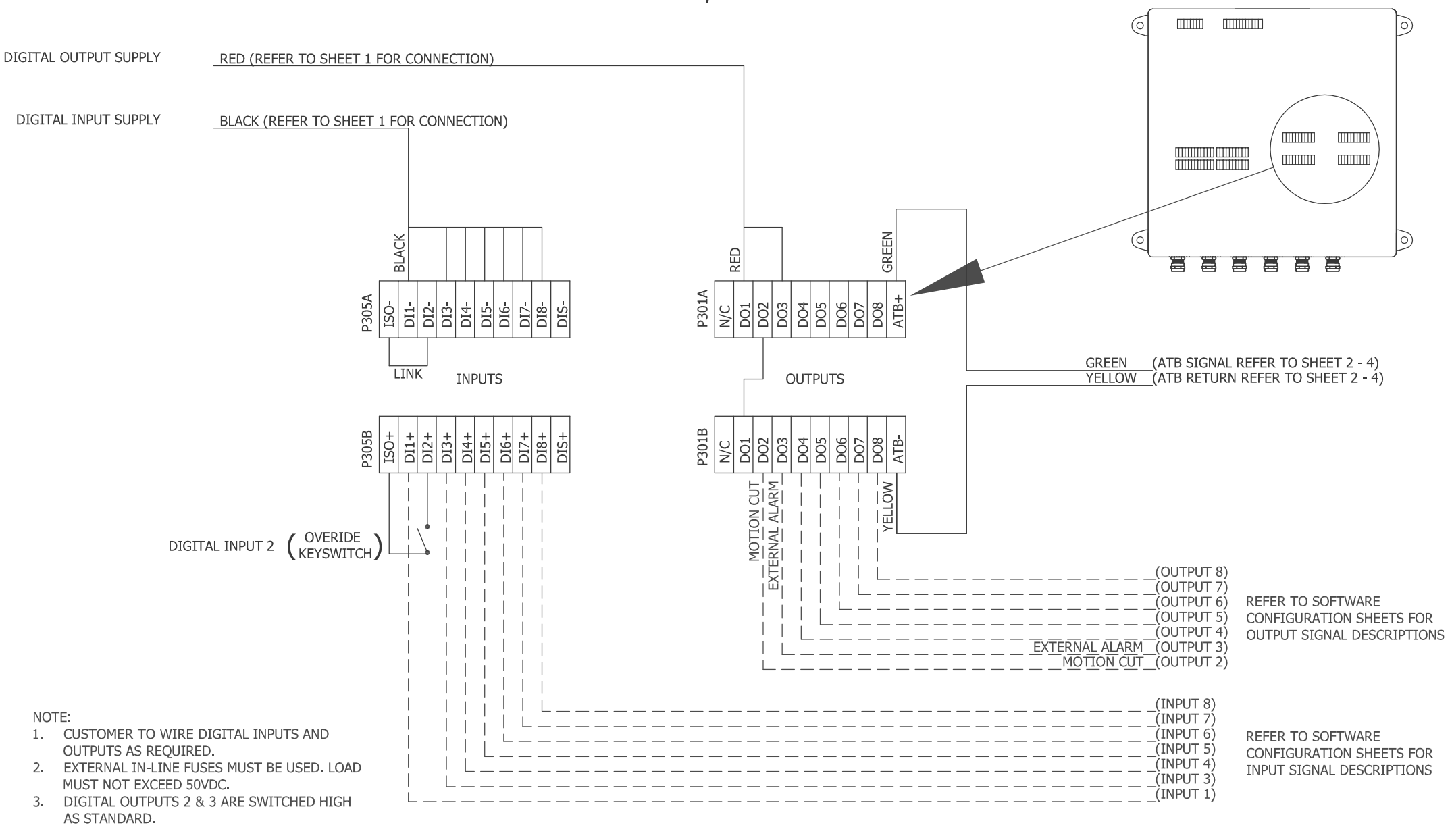
SHEET 2 OF 5

DRAWING No: 2354

FILE No: 235401AH.DWG

REV 1.7

DIGITAL INPUT/OUTPUT WIRING



NOTE:
1. CUSTOMER TO WIRE DIGITAL INPUTS AND OUTPUTS AS REQUIRED.
2. EXTERNAL IN-LINE FUSES MUST BE USED. LOAD MUST NOT EXCEED 50VDC.
3. DIGITAL OUTPUTS 2 & 3 ARE SWITCHED HIGH AS STANDARD.

REV	DATE	DESCRIPTION OF CHANGE	APPR'D
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1.4	03/03/03	REFER TO DR#137	G.H
1.5	10/02/06	ADD 4-20mA WIRING DETAIL	S.C
1.6	23/08/07	REFER TO PCR#31	J.K
1.7	3/12/2010	REFER TO PCR#359	-

TOL: X. +/- 1
X.X +/- 0.2
X.XX AS STATED

DRAFTING STANDARD: AS1100

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DRAWN	APPROVED
S.CHAMBERS	D.PLANTHABER
08/02/01	12/02/01

PART OF ASSY: —

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PART NO.: -

PROJECT: RCI-1550 CONTROLLER

TITLE: STANDAND WIRING DIAGRAM FOR TELESCOPIC BOOM CRANES

SCALE N/A

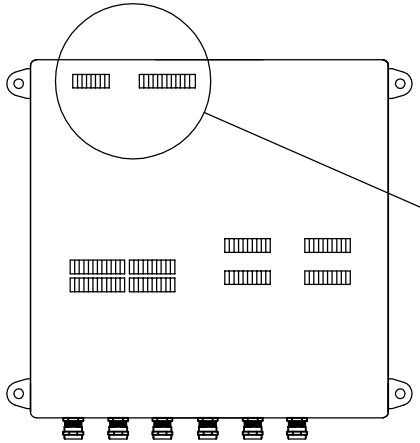
SHEET 5 OF 5

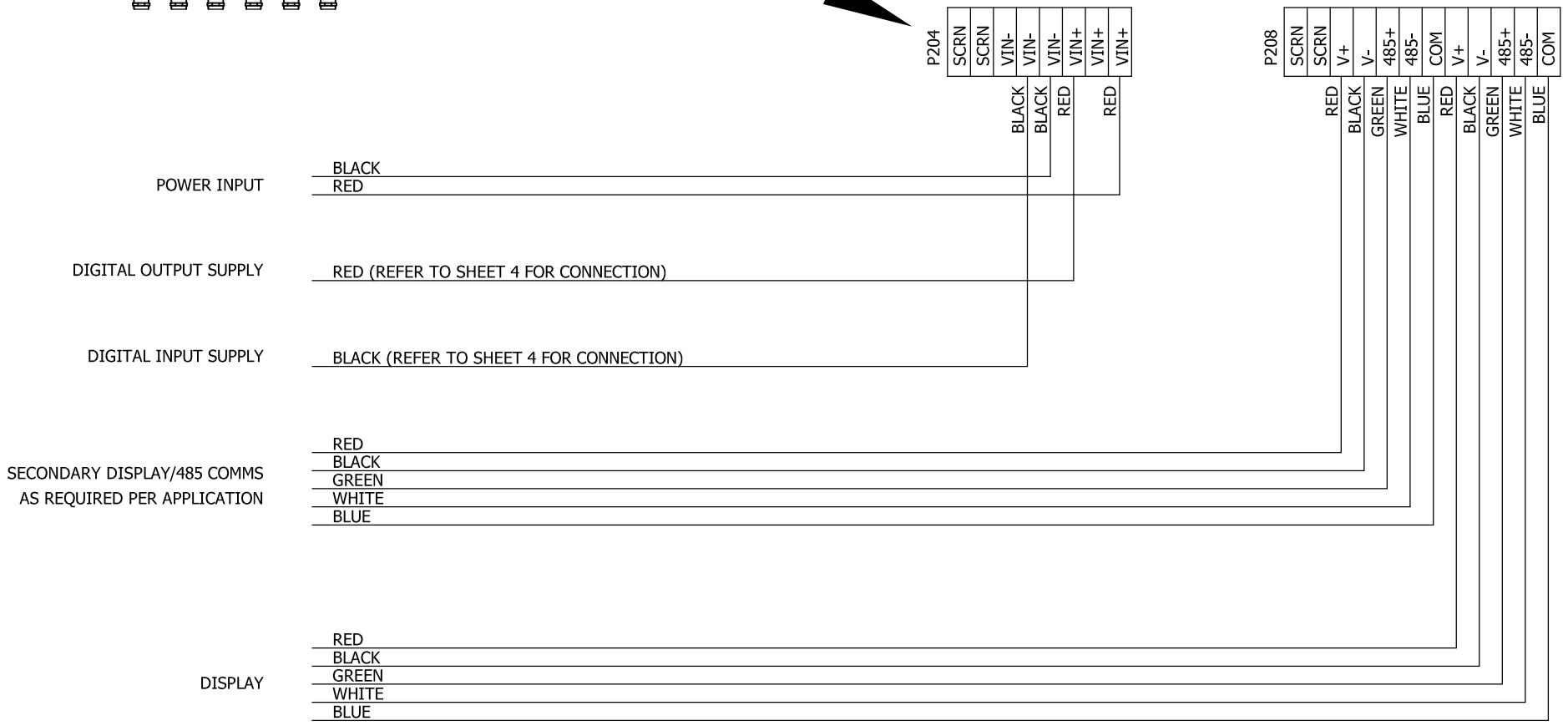
DRAWING No: 2354

FILE No: 235401AH.DWG

REV 1.7

POWER INPUT/DISPLAY WIRING





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1.5	29/08/07	REFER TO PCR#31	J.K

TOL: X. +/- 1
X.X +/- 0.2
X.XX AS STATED

DRAFTING STANDARD: AS1100

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DRAWN	APPROVED
S.CHAMBERS	D.PLANTHABER
08/02/01	12/02/01

PART OF ASSY
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PART NO.: DWG 2389

PROJECT: RCI-1550 CONTROL UNIT

TITLE: STANDARD WIRING DIAGRAM FOR STRUT BOOM CRANES

SCALE N/A

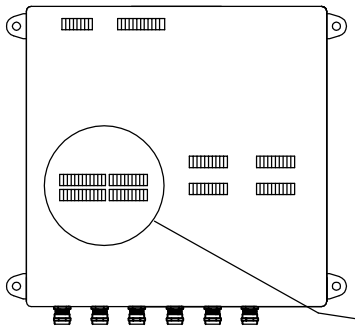
SHEET 1 OF 4

DRAWING No: DWG 2389

FILE No: 238901AF.DWG

REV 1.5

mV/V ANALOGUE SENSOR WIRING



LOAD SENSOR 3
AS REQUIRED PER APPLICATION
(FOR 4-20mA SEE SHEET 3)
BLACK
WHITE
GREEN
RED

LOAD SENSOR 1 (MAIN LOAD)
(FOR 4-20mA SEE SHEET 3)
BLACK
WHITE
GREEN
RED

ANGLE 1 (ANGLE 1 SIGNAL)
BLACK
WHITE
RED

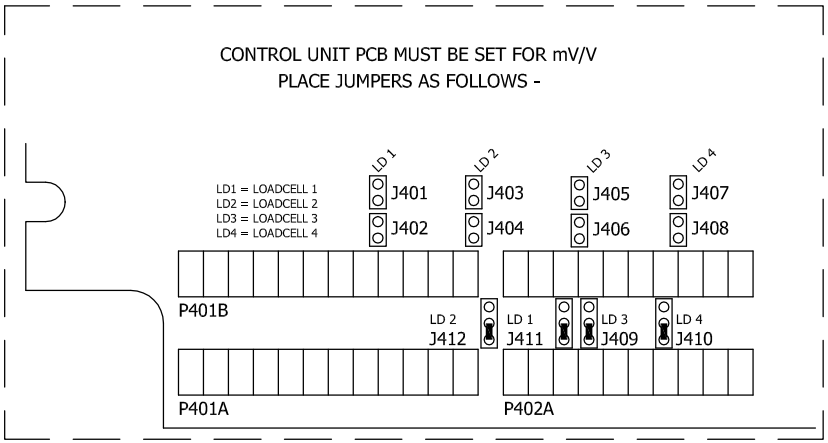
ANGLE 2
AS REQUIRED PER APPLICATION
(ANGLE 2 SIGNAL)
BLACK
WHITE
RED

ANGLE 3
AS REQUIRED PER APPLICATION
(ANGLE 3 SIGNAL)
BLACK
WHITE
RED

P401B	P402B
SCRN	VEX+
SCRN	SIG+
SCRN	SIG-
VEX+	VEX-
SIG	VEX+
VEX-	SIG+
VEX+	SIG-
SIG	VEX-
VEX-	SCRN
VEX+	SCRN
SIG	
VEX-	

P401A	P402A
SCRN	VEX+
SCRN	SIG+
SCRN	SIG-
VEX+	VEX-
SIG	VEX+
VEX-	SIG+
VEX+	SIG-
SIG	VEX-
VEX-	SCRN
VEX+	SCRN
SIG	
VEX-	

CONTROL UNIT PCB MUST BE SET FOR mV/V
PLACE JUMPERS AS FOLLOWS -



LOAD SENSOR 2 (AUX LOAD)
(FOR 4-20mA SEE SHEET 3)
RED
GREEN
WHITE
BLACK

LOAD SENSOR 4
AS REQUIRED PER APPLICATION
(FOR 4-20mA SEE SHEET 3)
RED
GREEN
WHITE
BLACK

REV	DATE	DESCRIPTION OF CHANGE	APPR'D
1.1	30/05/01	REFER TO DR#799	A.C
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1.3	03/03/03	REFER TO PR#137	A.C
1.4	10/02/06	ADD 4-20mA WIRING DETAIL	S.C
1.5	29/08/07	REFER TO PCR#31	J.K

TOL: X. +/- 1
X.X +/- 0.2
X.XX AS STATED

DRAFTING STANDARD: AS1100

DO NOT SCALE DRAWING
ALL DIMENSIONS ARE IN MILLIMETERS
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DRAWN	APPROVED
S.CHAMBERS	D.PLANTHABER
08/02/01	12/02/01

PART OF ASSY
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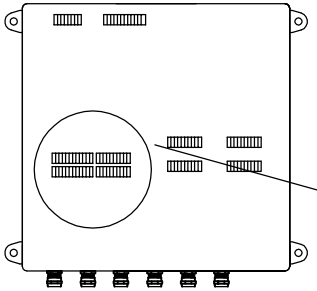
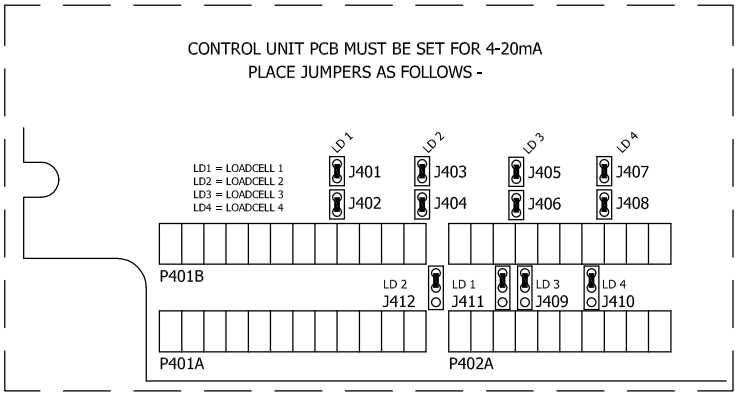
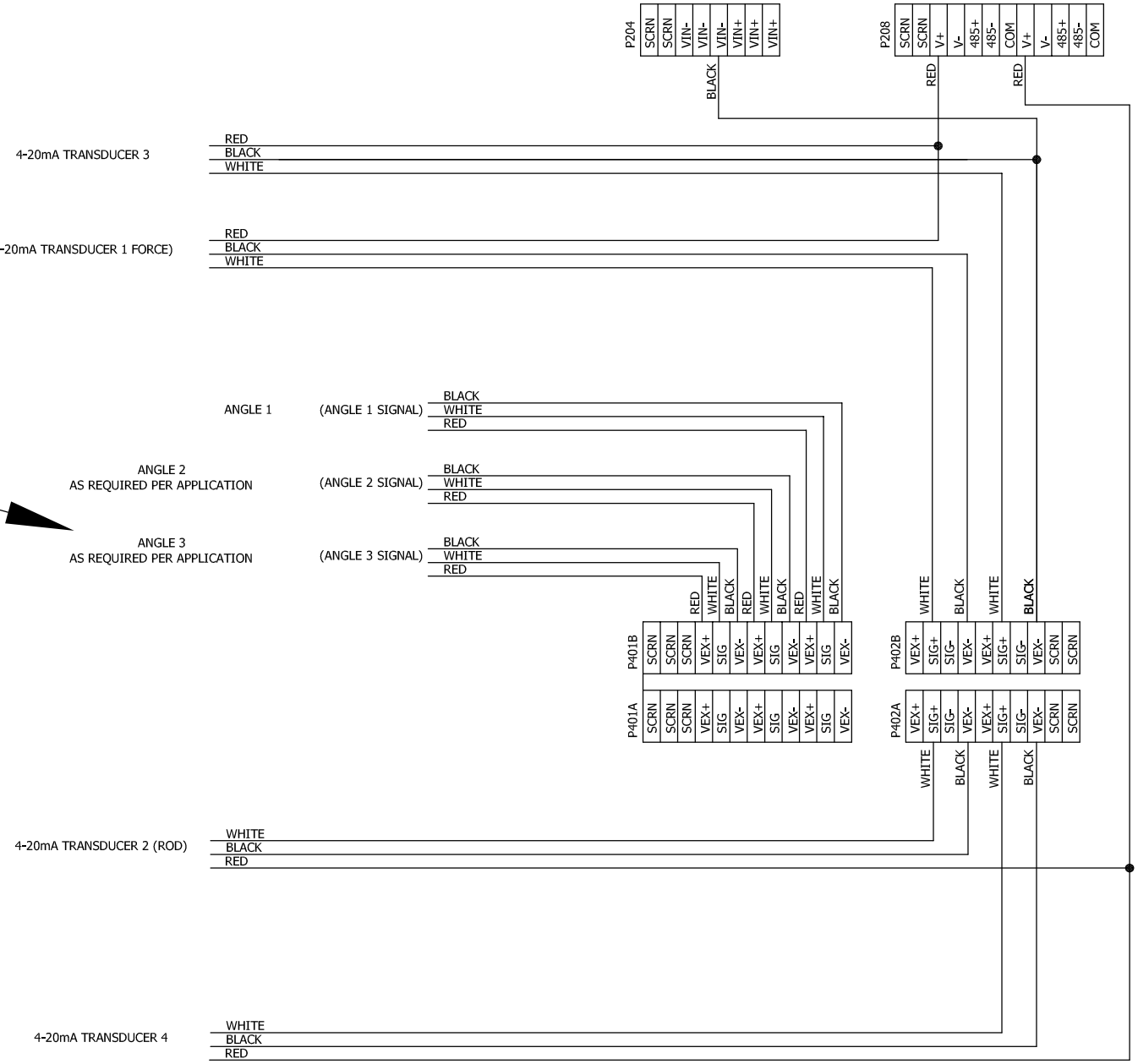
PART NO.: DWG 2389
PROJECT: RCI-1550 CONTROL UNIT
TITLE: STANDARD WIRING DIAGRAM FOR STRUT BOOM CRANES
SCALE N/A
SHEET 2 OF 4
DRAWING No: DWG 2389
FILE No: 238901AF.DWG
REV 1.5

4-20mA ANALOGUE SENSOR WIRING







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1.5	29/08/07	REFER TO PCR#31	J.K

TOL: X. +/- 1
X.X +/- 0.2
X.XX AS STATED

DRAFTING STANDARD: AS1100

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UNLESS OTHERWISE STATED

DRAWN	APPROVED
S.CHAMBERS	D.PLANTHABER
08/02/01	12/02/01

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FX: +61 8 8352 1684

PART NO.: DWG 2389

PROJECT: RCI-1550 CONTROL UNIT

TITLE: STANDARD WIRING DIAGRAM FOR STRUT BOOM CRANES

SCALE N/A

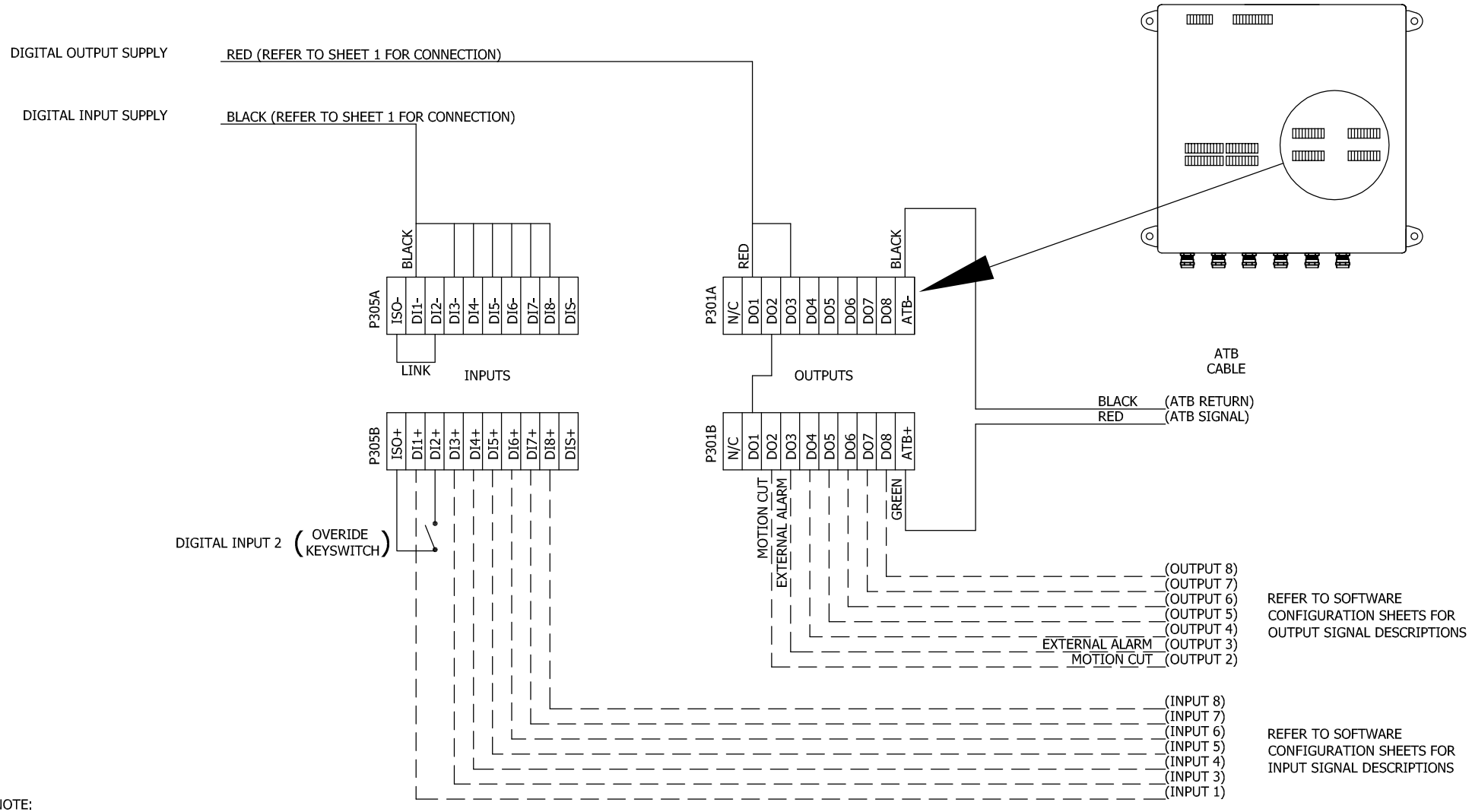
SHEET 3 OF 4

DRAWING No: DWG 2389

FILE No: 238901AF.DWG

REV 1.5

DIGITAL INPUT/OUTPUT WIRING



NOTE:
1. CUSTOMER TO WIRE DIGITAL INPUTS AND OUTPUTS AS REQUIRED.
2. EXTERNAL IN-LINE FUSES MUST BE USED. LOAD MUST NOT EXCEED 50VDC.
3. DIGITAL OUTPUTS 2 & 3 ARE SWITCHED HIGH AS STANDARD.

REV	DATE	DESCRIPTION OF CHANGE	APPR'D
1.1	30/05/01	REFER TO DR#799	A.C
1.2	19/06/01	REFER TO DR#805	A.C
1.3	03/03/03	REFER TO PR#137	A.C
1.4	10/02/06	ADD 4-20mA WIRING DETAIL	S.C
1.5	29/08/07	REFER TO PCR#31	J.K

TOL: X. +/- 1
X.X +/- 0.2
X.XX AS STATED

DRAFTING STANDARD: AS1100

DO NOT SCALE DRAWING
ALL DIMENSIONS ARE IN MILLIMETERS
UNLESS OTHERWISE STATED

DRAWN	APPROVED
S.CHAMBERS	D.PLANTHABER
08/02/01	12/02/01

PART OF ASSY
—

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Appendix 11.2/3/4

RCI System Crane Configuration Sheet / Duty Listing / Function Codes