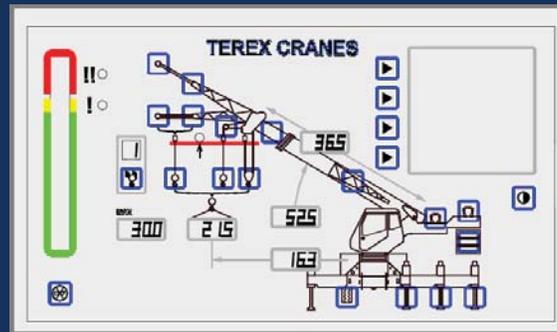


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EQUIPMENT SOLUTIONS

TEREX RCI 500



SERVICE MANUAL

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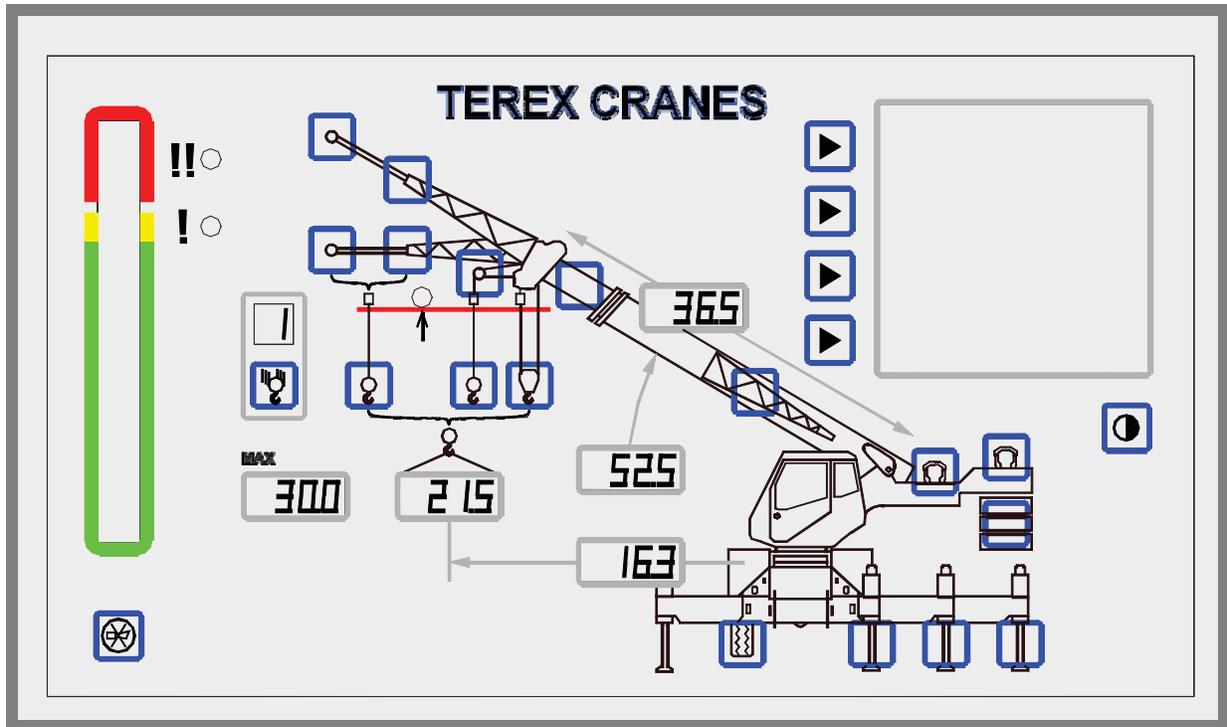
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MICROGUARD[®]

TEREX RCI 500



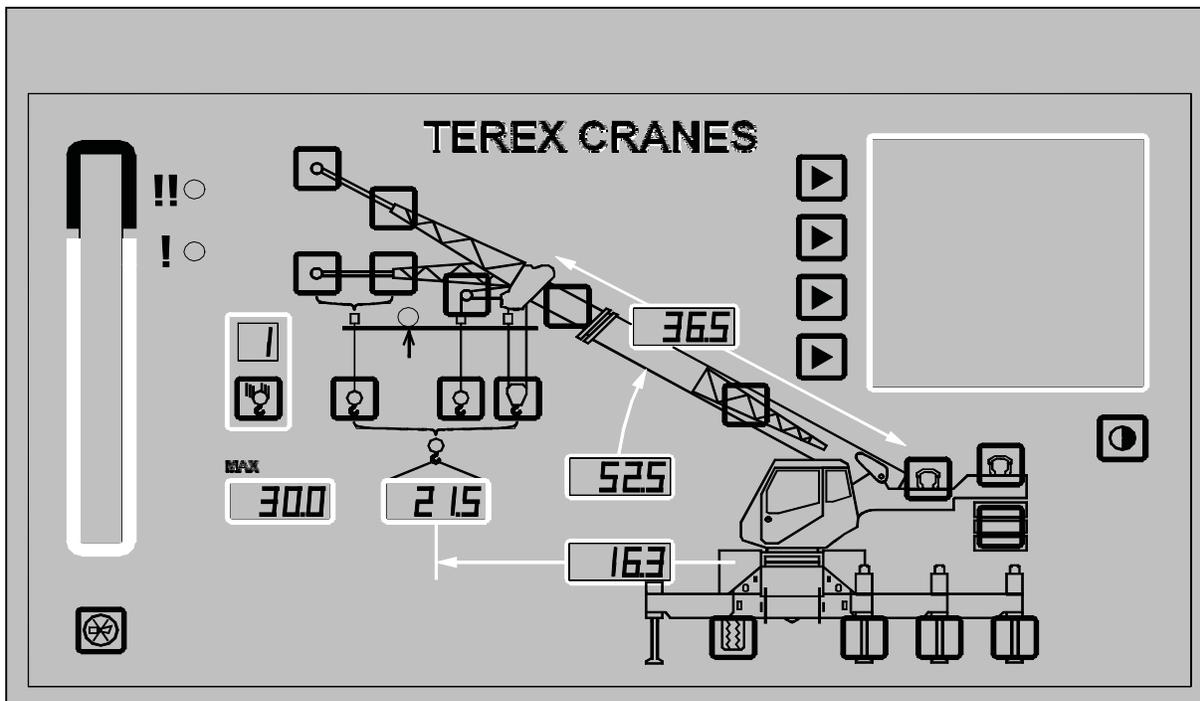
TROUBLESHOOTING MANUAL



TABLE OF CONTENTS

TEREX RCI 500 TROUBLESHOOTING MANUAL

System Description	3
Fault Diagnostic Procedures	4
Fault Codes.....	5-6
Voltage Checks – Power Supply Voltages.....	7
The Processor Board and the Termination Board	8-9
Checking the Analog Drive Voltage	9
Pressure Channel Fault Guide - Functional Tests	
Pressure Transducers	10-11
Analog Drive Voltage.....	12
Boom Extension Sensor AIN2.....	13-14
Boom Angle Sensor AIN3	15
Swing Potentiometer AIN5 and AIN6	16
No Duty Found	17
Other System Faults.....	17
Executive ROM	17
Personality ROM	17
Scratchpad RAM	17
Duty ROM.....	17
Current Duty Bad.....	17
Configuration – Not Calibrated	17
Digital and Analog I/O	17
Display Unit	17
Anti Two-Block System	18-19
Pressure Transducer Replacement	20
Extension Reel Replacement.....	20
Boom Angle Sensor Replacement.....	20-21
Chip Replacement	
Executive ROM Chip Replacement	21
Personality ROM Chip Replacement	21
Duty ROM Chip Replacement	21
Processor Board Replacement.....	21-22
Terminal Board and Box Replacement	22
Chip Removal and Installation	22
Processor Board Layout	23
Termination Board Layout.....	24
Extension Reel Layout	25
Glossary.....	26-31



SYSTEM DESCRIPTION

The Terex RCI-500 System is intended to aid the crane operator in the efficient operation of the crane by continuously monitoring the load and by warning of an approach to an overload or two-block condition.

The Terex RCI-500 System monitors crane functions by means of high accuracy sensors that continuously compare the load suspended below the boom head with data from the crane capacity chart stored in the memory of the computer. If an overload is approached, the system warns the operator by means of audible and visual alarms. The system can also be configured to cause function kick-out.

The MicroGuard® RCI 500 indicator provides the operator with a continuous display of:

- Rated Capacity
- Actual Load
- Percentage of Rated Capacity
- Radius of the Load
- Angle of the Main Boom
- Working Area
- Crane Configuration
- Length of the Main Boom

On-screen messages provide the operator with visual indications of the various alarms that may occur during normal operation of the RCI-500 System. These values appear on the left display. The right display gives information about the currently selected crane configuration.

FAULT DIAGNOSTIC PROCEDURES

Faults in the RCI-500 System are detected at start-up with an automatic self-test that lasts about 2-3 seconds. This self-test is activated each time the system is switched on. During normal operation, a self-test can be initiated at any time by pressing and holding the red TEST button on the right of the display.

Fault conditions in external sensors are detected without the need for a system self-test.

Faults detected in the system during a self-test, are identified on the display as follows:

- The word "FAULT" will appear in the information area.
- The RED LAMP will illuminate.
- The AUDIBLE ALARM will sound.

Faults occurring in the system can be diagnosed using the display.

1. PRESS and HOLD the TEST button to initiate the self-test and to identify any faults.

2. Continue to PRESS the TEST button.

NOTE: Following the self-test, faults found will be identified on the display screen and will remain visible as long as the operator continues to press the TEST button.

3. Fault information will appear on the screen in the following four groups.

- Group A Sensor Faults
- Group B I/O Faults
- Group C Memory Faults
- Group D General Faults

FAULT CODES

GROUP "A" – ANALOG SENSORS

CODE

AAA		
000		NO FAULTS
001	AIN0	PISTON PRESSURE TRANSDUCER
002	AIN1	ROD PRESSURE TRANSDUCER
004	AIN2	EXTENSION SENSOR
008	AIN3	BOOM ANGLE SENSOR
016	AIN4	NOT USED
032	AIN5	SWING POTENTIOMETER "A"
064	AIN6	SWING POTENTIOMETER "B"

GROUP "B" – INPUTS AND OUTPUTS

CODE

BB		
00		NO FAULTS
01	1	DIGITAL INPUT AND OUTPUT
02	2	ANALOG INPUT AND OUTPUT
04	4	DISPLAY UNIT

GROUP "C" – MEMORY

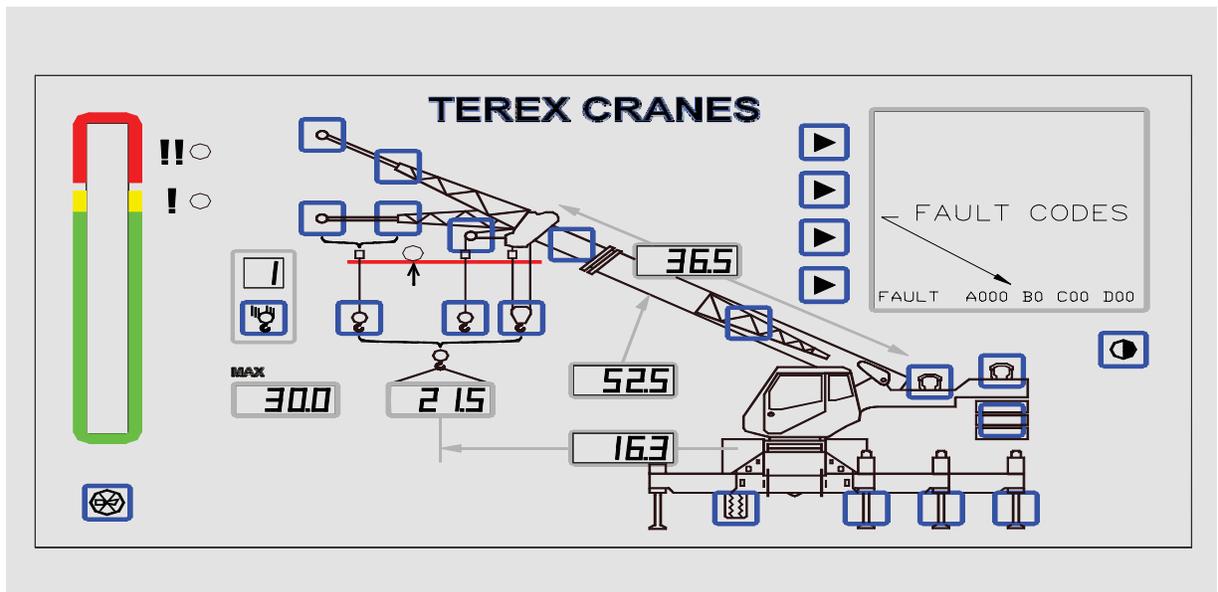
CODE

CC		
00		NO FAULTS
01	1	EXECUTIVE ROM
02	2	DUTY ROM
04	4	SCRATCHPAD RAM
08	8	PERSONALITY ROM

GROUP "D" – GENERAL

CODE

DD		
00		NO FAULTS
01	1	NO DUTY FOUND
02	2	CURRENT DUTY BAD
04	4	CONFIGURATION UNCALIBRATED



GROUP 'A' FAULT CODES

When a fault is detected by the system, a number will appear under one or more of the four group headings A through D, shown on the previous page. This number will correspond to one or more fault diagnostic numbers. The meaning of these numbers can be determined by looking at the appropriate code in the fault interpretation table.

Fault codes in Group A relate to analog sensors. Each sensor is allocated a number. This number is also the number of the channel to which it is connected in the system.

- Sensor 0 Piston Pressure
- Sensor 1 Rod Pressure
- Sensor 2 Extension Sensor
- Sensor 3 Boom Angle
- Sensor 4 Not Used
- Sensor 5 Swing Pot'r "A"
- Sensor 6 Swing Pot'r "B"

Each sensor is allocated a FAULT CODE. This code number appears under the group heading in the fault code display.

001	Sensor 0	Piston Pressure
002	Sensor 1	Rod Pressure
004	Sensor 2	Extension Sensor
008	Sensor 3	Boom Angle
032	Sensor 5	Swing Pot'r "A"
064	Sensor 6	Swing Pot'r "B"

When no faults are detected in the system, '000' will appear under all group headings.

When there are faults in only one sensor, one of the above codes will be listed.

When there are faults in more than one sensor, the codes indicated will be the sum of the fault codes.

EXAMPLES OF FAULT CODES:

Fault 0

AAA	B	CC	DD
000	0	00	00

No faults detected.

Fault 1

AAA	B	CC	DD
001	0	00	00

Piston pressure transducer.

Fault 2

AAA	B	CC	DD
002	0	00	00

Rod pressure transducer

Fault 3

AAA	B	CC	DD
003	0	00	00

Piston pressure transducer

Rod pressure transducer

Fault 4

AAA	B	CC	DD
004	0	00	00

Extension Sensor

Fault 5

AAA	B	CC	DD
005	0	00	00

Piston pressure transducer

Extension sensor

Fault 6

AAA	B	CC	DD
006	0	00	00

Rod pressure transducer

Extension sensor

Rod pressure transducer

Fault 7

AAA	B	CC	DD
007	0	00	00

Piston pressure transducer

Rod pressure transducer

Extension sensor

Fault 8

AAA	B	CC	DD
008	0	00	00

Boom angle sensor

Fault 9

AAA	B	CC	DD
009	0	00	00

Piston pressure transducer

Boom angle sensor

Fault 10

AAA	B	CC	DD
010	0	00	00

Boom angle sensor

Rod pressure transducer

Fault 11

AAA	B	CC	DD
011	0	00	00

Boom angle sensor

Piston pressure transducer

Rod pressure transducer

Fault 32

AAA	B	CC	DD
032	0	00	00

Swing potentiometer "A"

Fault 64

AAA	B	CC	DD
064	0	00	00

Swing potentiometer "B"

Fault 96

AAA	B	CC	DD
096	0	00	00

Swing potentiometer "A"

Swing potentiometer "B"

This sequence continues up to the maximum fault code of 127, which is the sum of all "GROUP A" fault codes.

Fault 127

AAA	B	CC	DD
127	0	00	00

All analog sensors.

This fault condition is seldom caused by the simultaneous failure of all sensors. It is usually the result of the failure of the analog drive voltage, which supplies the voltage for all sensors. This power supply fault may be due to the failure of the power supply or may be due to damage to the cable that connects the sensor to the computer.

When this fault occurs, carry out Power Supply Voltage checks before checking individual sensors.

VOLTAGE CHECKS

POWER SUPPLY VOLTAGES

The Computer Unit contains 2 major boards: the Processor Board and the Termination Board. Both of these assemblies are located in an aluminum box that is usually located on the rear wall of the cab and can be inside or outside the cab depending on crane model. All of the cables from the various sensors and the display are connected to the Termination Board. To access the Termination Board, refer to Page 8 of this manual.

INPUT POWER

The computer operates from an input voltage in a range from 9 to 36 volts DC. This input voltage is measured across the B+ and B- terminals on the Termination Board and corresponds to the battery voltage of the crane. At voltages below 9 and above 36 volts, the system will power down until correct voltage is restored.

If the INPUT POWER is not within these limits, check the battery and/or alternator before servicing the computer.

INTERNAL POWER SUPPLIES

The computer generates its own internal power from the incoming battery voltage.

This power can be monitored at the test points inside the computer adjacent to the fuses and Battery Input Terminals.

To monitor the internal power supplies, use a digital voltmeter set to the appropriate DC voltage range.

Connect the black (-ve) lead to GND

Connect the red (+ve) lead in turn to

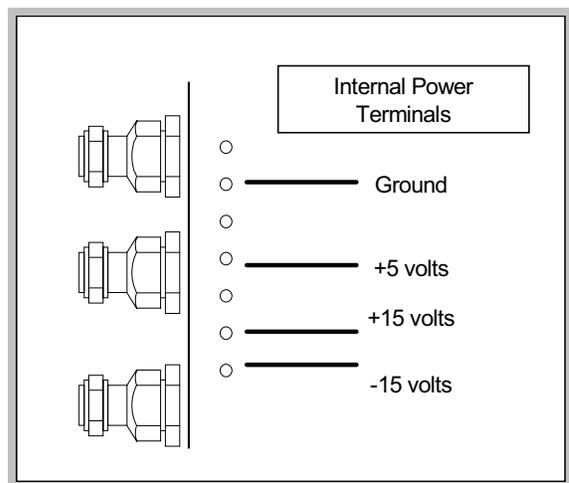
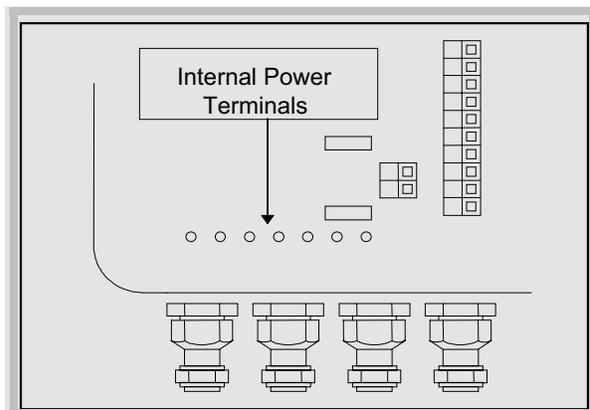
+15V +/- 0.1

-15V +/- 0.1

+5V +/- 0.1

If the voltages are out of range, it may be necessary to replace the computer.

Before replacing the computer, call the Product Support Department at the Greer Company, Telephone: 714-259-9702

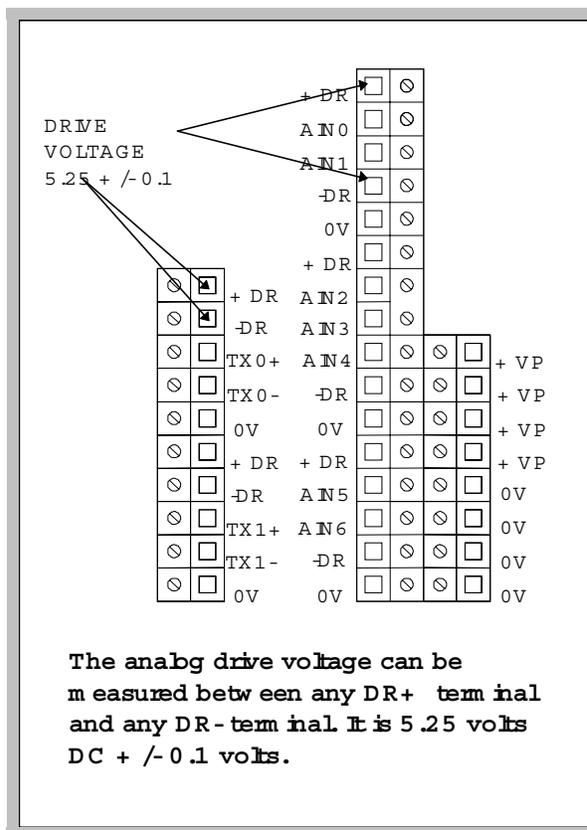


- To check voltages on the Termination Board, remove the two screws located at the left and right of the main computer backing plate and swing the assembly up. Take care not to damage the ribbon cables. These ribbon cables must remain connected to the Processor Board for voltage checks.

CHECKING ANALOG DRIVE VOLTAGE

To check the Analog Sensor Drive Voltage, use the following procedure:

- Access the Termination Board.
- With the system power on and a digital volt meter set to read DC voltage, place the negative lead on any -DR (- Drive) terminal (1) of the Analog Input Group.
- Place the positive lead of the meter on any +DR (+ Drive) terminal (2).
- The voltage should be 5.25 +/- 0.1 volts.
- If the Analog Drive Voltage is not within this range, disconnect all of the external sensor cables, including pressure transducers, cables 1 through 5.
- Recheck the Analog Drive Voltage. If the voltage is still out of range, the Processor Board will need to be replaced. If the voltage is within range, reconnect each cable, one at a time, checking the Analog Drive Voltage after each cable is connected.
- If the Analog Drive Voltage goes out of range after reconnecting any one of the sensors, it is probable that the wiring to the sensor is grounded or the sensor itself is faulty.
Check all wires and the sensor itself and repair or replace, as required.



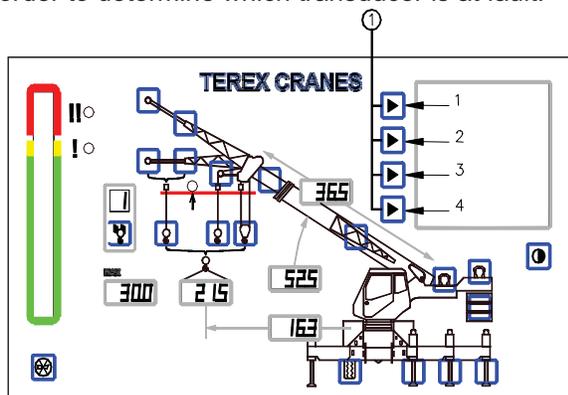
The analog drive voltage can be measured between any DR+ terminal and any DR- terminal. It is 5.25 volts DC +/- 0.1 volts.

Faults in any cable or sensor can cause the analog drive voltage to be faulty.

PRESSURE CHANNEL FAULT GUIDE - FUNCTIONAL TESTS

PRESSURE TRANSDUCERS

A fault in a pressure transducer is such that a fault on one channel can cause an apparent fault in the other channel. It is necessary to test both channels and both transducers together in order to determine which transducer is at fault.



1. Access the calibration routine by simultaneously pressing and holding **KEY (1)** and the **TEST** button (RED button on right side of display).
The display will request entry of the calibration Security Code.
2. Enter the Security Code using the Calibration Arrow Keys 1-4, as shown above. These keys **MUST** be pressed in the following sequence:
Key (1), Key (3), Key (2), Key (4)

Note: If the wrong sequence is used or if the entry is not completed within 5 seconds, the calibration entry will be aborted and must be re-entered. After accessing the calibration routine, the system alarm will sound indicating that the system is in the calibration routine.

3. Use the Up (2) or Down (3) arrow keys to scroll to command 03 Zero Sensor.
Press key (1)

4. Use the Up (2) or Down (3) arrow keys to select TX 0 (pressure transducer 0 piston side). Press key (1).
5. With the boom in the rest or the boom hoist cylinder fully retracted, relieve all pressure from both transducers. With no pressure, the upper display should indicate 0+/-20 bits.
6. Next, use the Up (2) or Down (3) arrow keys to select TX1 (pressure transducer rod side). With no pressure in the cylinder, the upper display should read 0+/-20 bits.
7. If the transducers were disconnected in step 5, tighten the fittings. With the boom fully retracted, boom up to a 60° angle.
8. Access the Zero of TX 0, as described in step 4; the upper display should read 200+/-100 bits.
9. Access the Zero of TX 1, as described in step 6; the upper display should read 5+/-25 bits.
10. Boom down. As the boom is moving down, the displayed bits of TX 1 should increase.
11. Place the retracted boom at a 60° angle. Access the Zero of TX 0, as described in step 4, and extend the boom. As the boom is extended, the displayed bits of TX 0 should increase. When the boom is fully extended, the display should read 400+/-100 bits for a three-section boom and 600+/-100 bits for a four-section boom.

The values listed are nominal values. The actual values will differ according to how the crane is equipped. A three-section boom will show a smaller value on TX 0 under the same conditions as a four-section boom. Additional equipment on the main boom, such as stowed fly, auxiliary head sheaves and hook blocks will give a higher value than the main boom alone.

If any value is out of range, contact your distributor or factory service department before replacing a pressure transducer.

Refer to page 20 of this manual for pressure transducer replacement.

12. Exit the calibration routine by pressing the EXIT (4) key.

If the foregoing functional tests indicate faults in the pressure channels, proceed with Power Supply Tests and the test for resistance of the bridge of the pressure transducers.

PRESSURE TRANSDUCER-RESISTANCE MEASUREMENT

The pressure transducer is a balanced bridge composed of strain gauges bonded to a flexible diaphragm. The following resistance tests can be carried out to establish the viability of the pressure transducer.

Piston Pressure Transducer

NOTE: Place the boom in rest (truck drive) or in its lowest position (RT's) and relieve all pressure to atmosphere on both transducers.

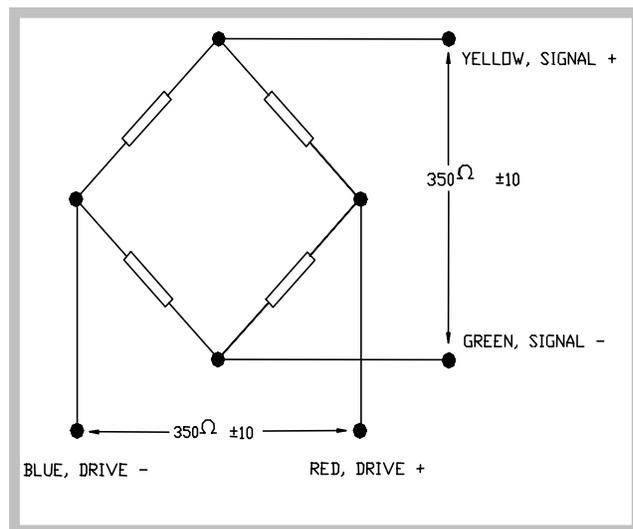
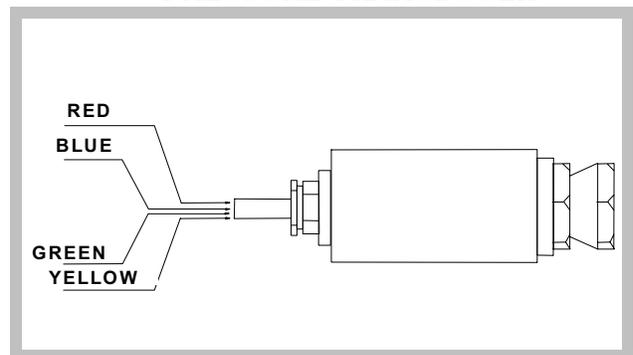
1. With the power to the computer off, disconnect the piston pressure transducer from the terminal blocks +DR, -DR, TX0+ and TX0- within the computer.
2. With the DVM set to the Ohms range, measure the resistance between red and blue wires.
The resistance should be $350\Omega \pm 10\Omega$
3. With the DVM set to the Ohms range, measure the resistance between yellow and green wires.
The resistance should be $350\Omega \pm 10\Omega$
4. With the DVM set to the Ohms range, measure the resistance between pins. Each of the open wires red, blue, green, yellow and the case of the transducer. *There should be no connection between the case and any of the pins.*

Rod Pressure Transducer

NOTE: Place the boom in rest (truck drive) or in its lowest position (RT's) and relieve all pressure on both transducers to atmosphere.

1. With the power to the computer off, disconnect the piston pressure transducer from the terminal block +DR, -DR, TX0+ and TX0- within the computer.
2. With the DVM set to the Ohms range, measure the resistance between the yellow and green wires.
The resistance should be $350\Omega \pm 10\Omega$
3. With the DVM set to the Ohms range, measure the resistance between pins, each of the open wires (red, blue, green, yellow) and the case of the transducer. *There should be no connection between the case and any of the pins.*

PRESSURE TRANSDUCER



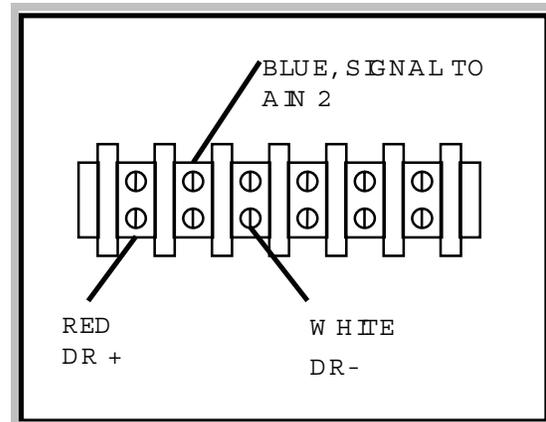
BOOM EXTENSION SENSOR AIN2

To check the Boom Extension Sensor Voltage, follow the procedure below.

1. Fully retract the boom.
2. Access the Computer and Termination Boards.
NOTE: Measure the analog sensor drive voltage. (Refer to page 9 of this manual).
3. With a digital voltmeter set to read DC voltage, place the negative lead on any 0 Volt terminal of the Analog Input Group.
4. Place the positive lead of the meter on the AIN2 terminal of the Analog Input Group. The voltage should be greater than 0.25 volts.
5. Extend the boom as far as is safe to do so. The boom need not be horizontal for this test.
6. The voltage should be less than 5 volts. (Usually around 2.5 volts depending on the boom length).
7. During **extension**, the voltage should **increase** linearly; during **retraction** the voltage should **decrease** linearly.
8. If the voltage is out of the range listed above, remove the four screws that secure the cover on the extension reel, which is located on the left side of the main boom section; remove the cover.
9. Under the cover on the right side of the extension reel is a terminal strip. This terminal strip has six wires connected to the bottom screws.
10. With a digital voltmeter set to read DC Voltage, place the negative lead on the terminal with the attached white wire (- Drive) and the positive lead on the terminal with the attached red wire (+Drive).
11. The voltage should be 5.25+/-0.1 volts. If this voltage is out of range, and if the Analog Drive Voltage measured in the computer was OK, it is possible that the cable is open or grounded between the computer and the

extension reel. Check all connections and plugs that may be between these two components. Repair or replace as required. Refer to the MicroGuard RCI 500 wiring details in the Installation Manual for the model of the crane being tested.

Continued on the next page.



BOOM EXTENSION SENSOR AIN2 cont.

12 With the negative lead of the voltmeter connected to the white drive (DR-) and the positive lead of the voltmeter connected to the blue AIN2 extension signal, the voltage should be the same as the voltage measured at AIN2 of the analog input group in the computer. If this voltage is not the same, it is possible that the cable between the reel and the computer is faulty.

NOTE: The blue and white wires at the reel are **REVERSE** at the connector of the reel. Therefore, the white -DR at the reel is blue (-DR) in the computer. The blue signal (Extension AIN2) at the reel is white (AIN2) in the computer.

