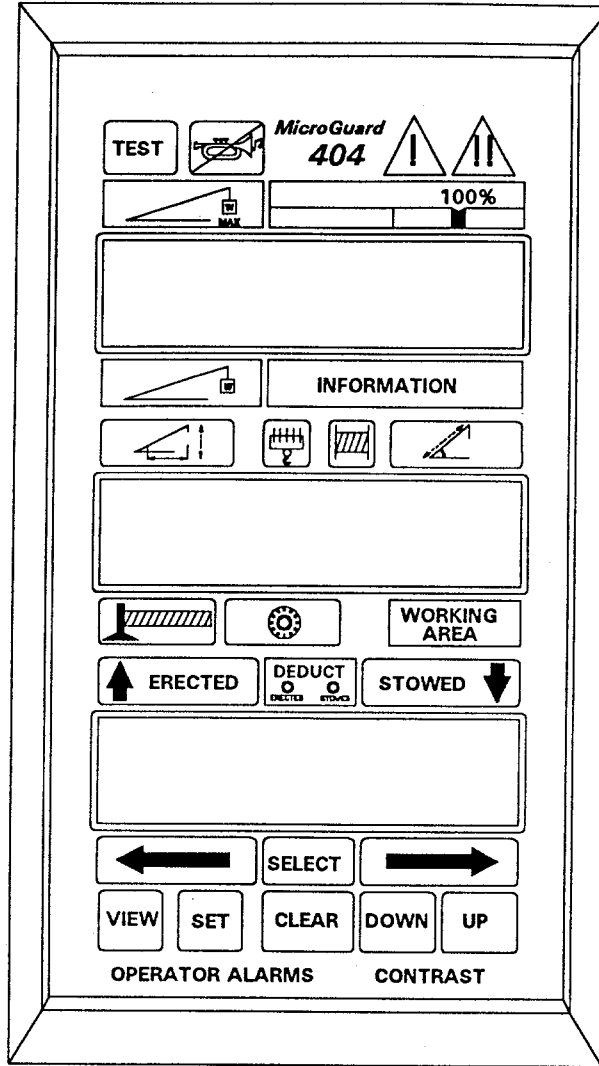


# MicroGuard 404



## TROUBLE SHOOTING MANUAL



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System Description .....	1
Fault Diagnosis Procedures .....	1
System Faults:	
Pressure Transducers AIN 0 and AIN 1 .....	4
Boom Extension AIN 2 .....	6
Boom Angle AIN 3 .....	8
Super Structure Angle AIN 4 .....	10
No Duty Found .....	12
Executive ROM .....	14
Personality ROM .....	14
Scratchpad RAM .....	14
Duty ROM .....	14
Current Duty Bad .....	14
Configuration Uncalibrated .....	14
Digital I/O and Analog I/O .....	14
Display Unit .....	14
Anti Two-Block System .....	16
Accessing Main Computer Board .....	18
Accessing Terminal Connection Board .....	18
Checking Analog Drive Voltage .....	19
Sensor Replacement:	
Pressure Transducers .....	20
Extension Reel .....	22
Boom Angle .....	25
Super Structure Angle .....	27
Executive ROM Replacement .....	28
Personality ROM Replacement .....	28
Duty ROM Replacement .....	29
Main Computer Board Replacement .....	30
Relay and Termination Board Replacement .....	32
General Chip Replacement Information .....	34
Fault Interpretation Table .....	Appendix A
MicroGuard 404 Wiring Diagram .....	Appendix B

## SYSTEM DESCRIPTION

The system monitors crane functions by means of high accuracy sensors and continuously compares the actual load with the rated load which is derived from a copy of the machines capacity chart which is stored in the computer memory. If an overload is approached, the system warns by means of audible and visual alarms and is configured to cause function kick-out.

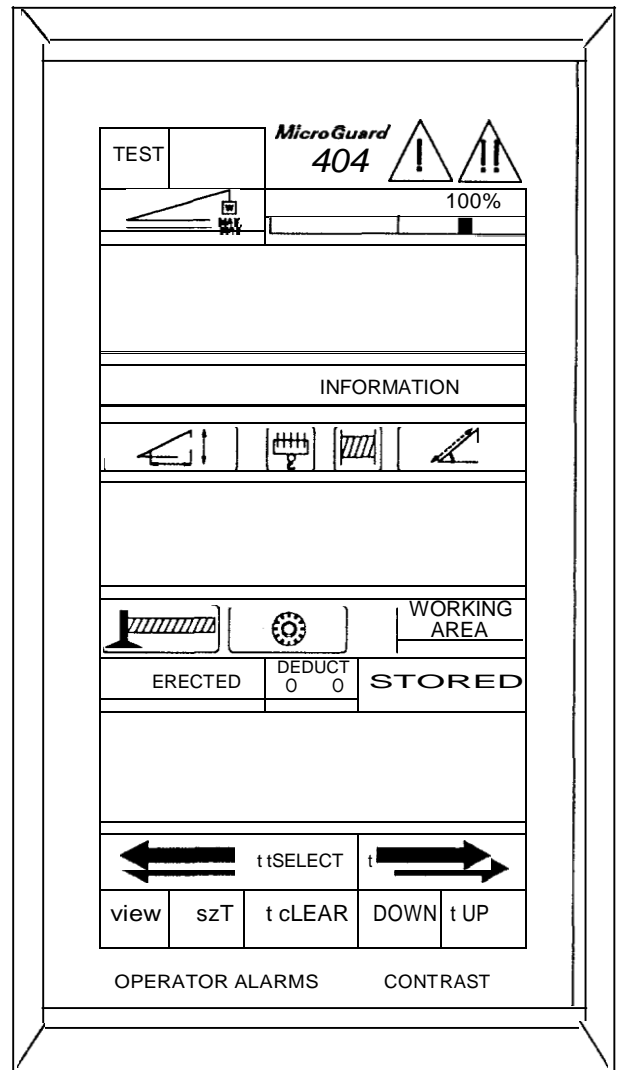
The Microguard 404 is a Rated Capacity Limiter (RCL) System incorporating:

- a. Sensors:
  1. Boom Angle Sensor
  2. Superstructure Angle Sensor
  3. Boom Length Sensor
  4. Pressure Transducers
  5. Anti two-block Switches
- b. Computer Unit
- c. Display Unit

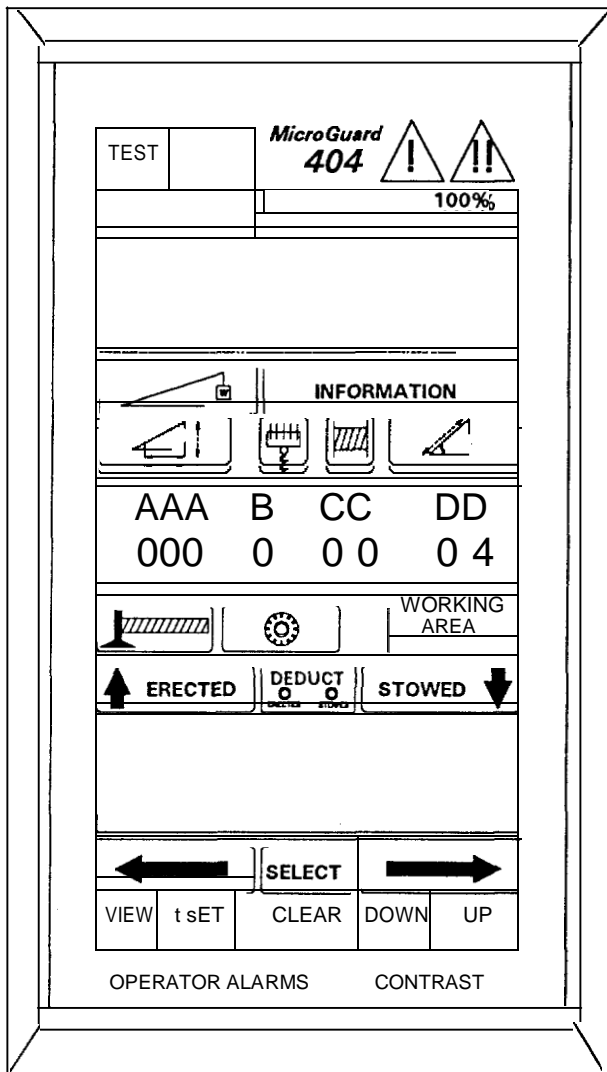
## FAULT DIAGNOSIS PROCEDURES

Faults in the system are detected automatically. Each time the system is switched on, it goes through a start-up self test which lasts about 2-3 seconds. During operation a test can be initiated by pressing the test button on the main display. Faults in external sensors are detected by the system without the need for self-test. If faults are detected in the system during tests, they will be indicated in the following way:

- (a) The word **FAULT** will appear in the **INFORMATION** area of the main display.
- (b) The red lamp and the audible alarm will operate.  
When faults occur in the system they can be diagnosed by use of the Main Display.



Details of faults may be obtained by pressing and holding the test button. This will replace the working screen with the fault screen. Information will be displayed on the fault screen in four sections:



A External sensor faults.

B V0 faults

C Computer Memory faults

D General faults

AAA	B	CC	DD
Sensors	I/O	Memory	General

If a fault is detected by the system a number will appear under one or more of the above headings. This number will correspond to one or more Faults which can be determined by looking up the appropriate code on the fault interpretation table. This table can be found in appendix A of this manual. If no faults are detected by the system "0" will appear under all of the headings.

AAA	B	CC	DD
000	0	00	04

The above would indicate a fault under the general heading of D 4. Looking at the fault interpretation table found in appendix A, we can see that a fault code of D 4 would indicate "configuration uncalibrated". This means that this configuration

was not calibrated and cannot be used until calibrated. Fault codes which indicate a problem in more than one area will be a number corresponding to the sum of the sensed fault codes.

For example if the fault code A 3 appears it would be a composite fault made up of faults 1 + 2 and would indicate a fault in both the piston and the rod side pressure transducers and the fault code A 12 it would be a composite fault made up of faults 8 + 4 and would indicate a fault in both the extension sensor and the boom angle sensor.

If the fault code indicates a problem in all of the external sensors the most likely problem would be the analog supply voltage. This voltage supplies all of the external sensors. The fault code for all external sensors would be A 127 which is the sum of all of the external sensor fault codes.

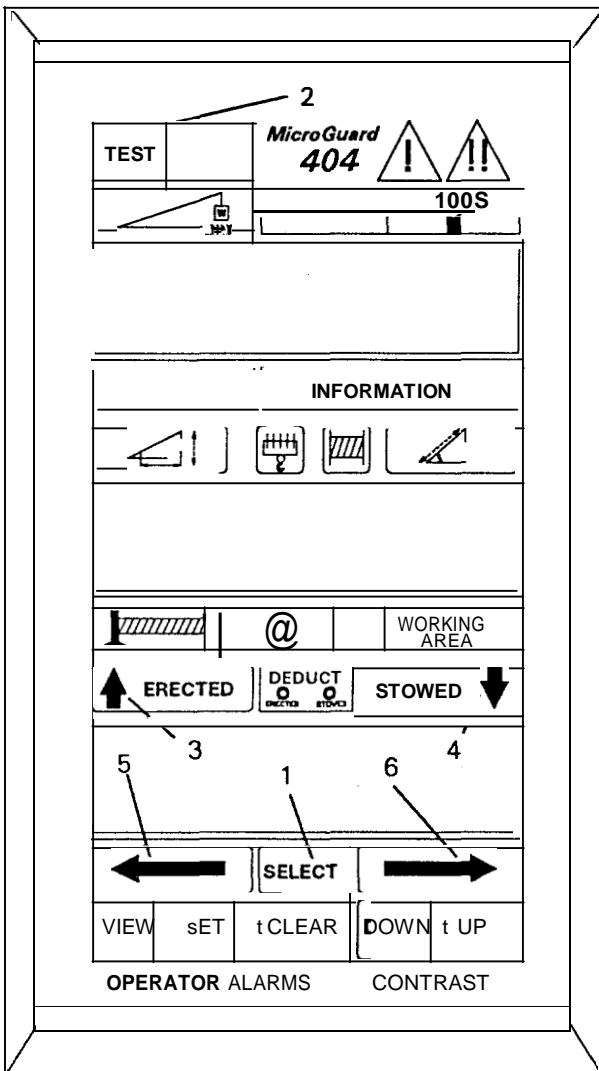
When a fault is indicated in any sensor channel, carry out signal voltage checks using a digital voltmeter. Voltage checks are carried out at the Relay and Termination Board. The Relay and Termination Board is the termination of the incoming cables from the analog sensors.

The computer Unit is where all voltage, signals and computer data is junctioned. This unit contains its own power supply which takes an input voltage of + 12 volts and converts that voltage into the other voltages needed by the external sensors and internal components in the system.

The computer unit consists of two main parts. The Main Computer board and the Relay and Termination Board. Both of these assemblies are located in an enclosure which is called the computer box. The computer box can be located on the inside or the outside of the operators cab usually behind the seat or on the outside back wall of the cab.

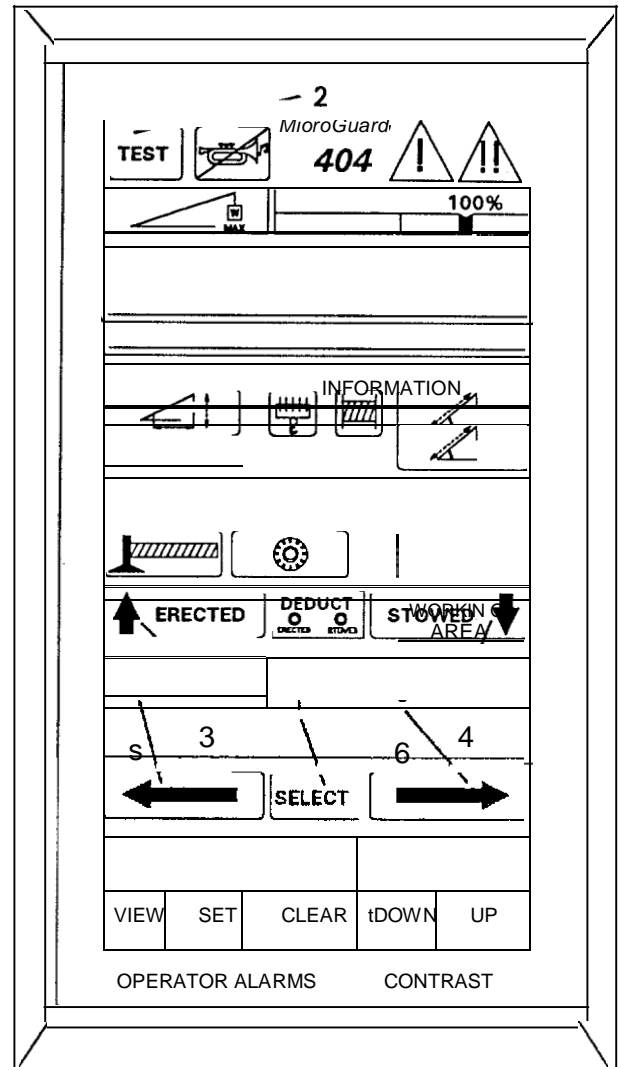
### PRESSURE A IN 0 AND A IN 1

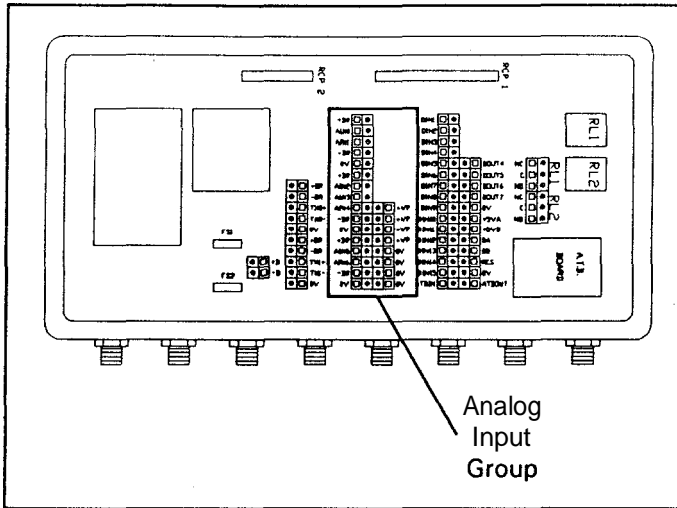
A fault in a pressure transducer is such that a fault on one channel can cause a fault in the other channel. To determine which transducer is at fault use the following procedure:



1. Access the Termination Board.  
(refer to page 18 of this manual)  
Check the Analog Drive Voltage.  
(refer to page 19 of this manual)
2. Access the calibration routine by pressing and holding the SELECT (1) and the TEST (2) keys for approximately ten seconds. At this point the display will request entry of the calibration security code.
3. The security code is entered by the consecutive pressing of the calibration arrow keys which must be in the following sequence:  
  
Up, (3), Down (4), Left (5), Right (6), SELECT (1)  
  
*If the wrong sequence is used or if the entry is not completed within 5 seconds then the calibration entry will be aborted and must be re-entered. After accessing the calibration routine, the system alarm will sound as a reminder that you are in the calibration routine.*
4. Use the Up (3) or Down (4) Arrow keys to scroll to command 06 Zero. Press Select (1)
5. Press the Left Arrow (5) and then use the Up (3) or Down (4) Arrow keys to select TX 0 (pressure transducer 0 piston side). Press Select (1).
6. 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.

7. Press the Left Arrow (5) and then use the Up (3) or Down (4) arrow keys to select TX1 (pressure transducer rod side). With no pressure in the cylinder the upper display should read 0 +/- 20bits.
8. If the transducers were disconnected in step 5 tighten the fittings. With the boom fully retracted, boom up to a 60 degree angle.
9. Access the Zero of TX 0 as described in step 5, the upper display should read 200 +/- 100 bits.
10. Access the Zero of TX 1 as described in step 7, the upper display should read 5 +/- 25 bits.
11. Boom down. As the boom is moving down, the displayed bits of TX 1 should increase.
12. Place the retracted boom at a 60 degree angle. Access the Zero of TX 0 as described in step 4, and extend the boom fully. 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 machine 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 flies, auxiliary head sheaves and hook blocks will give a higher values 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.
13. Exit the calibration routine by pressing the TEST (2) key.

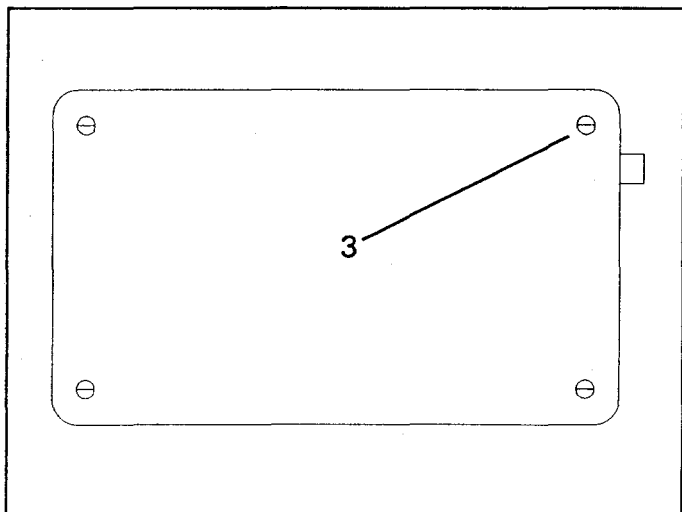
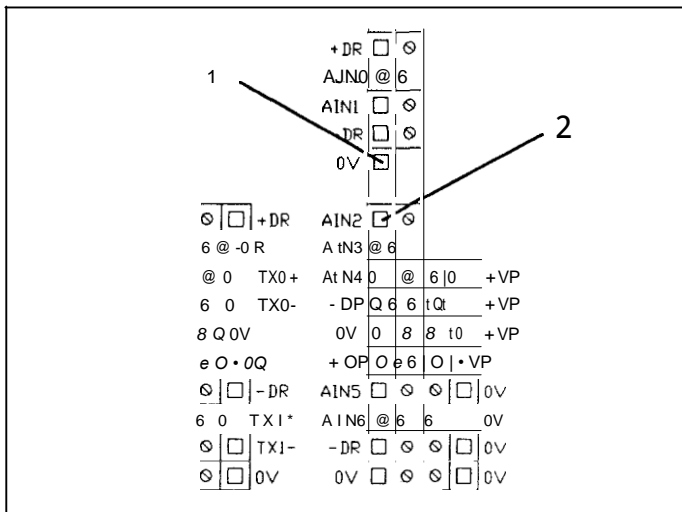




**BOOM EXTENSION SENSOR AIN 2**

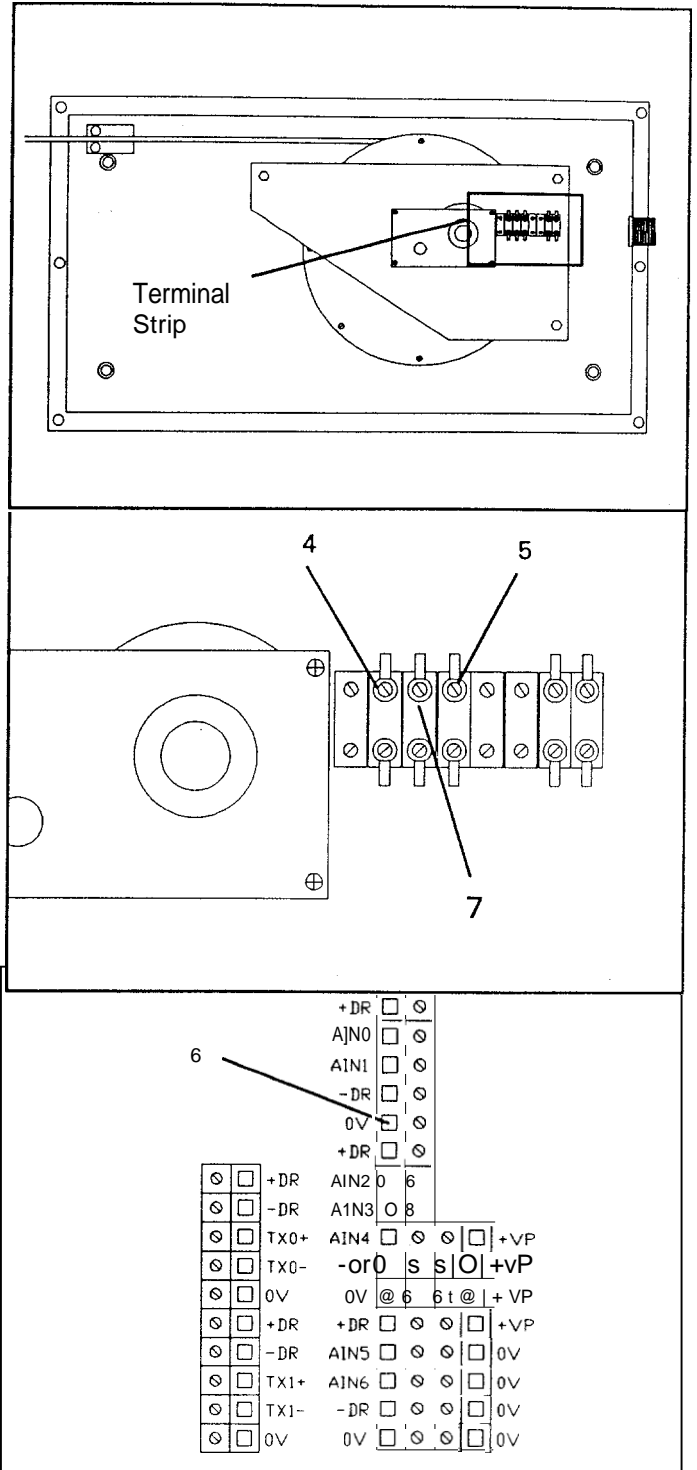
To check the Boom Extension Sensor Voltage use the following procedure.

1. Fully retract the boom.
2. Access the Relay and Termination Board. (refer to page 18 of this manual).  
Check the Analog Sensor Drive Voltage.(refer to page 19 of this manual).
3. With a Digital Volt Meter set to read DC voltage place the negative lead on any 0 Volt terminal (1) of the Analog Input Group.
4. Place the positive lead of the meter on the AIN 2 terminal (12) of the Analog Input Group, the voltage should be greater than .25 volts.
5. Fully extend the boom.
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 and during retraction the voltage should decrease linearly.
8. If the voltage is out of the range listed above remove the four screws(3) securing the cover on the extension reel located on the left side of the main boom section and remove the cover.



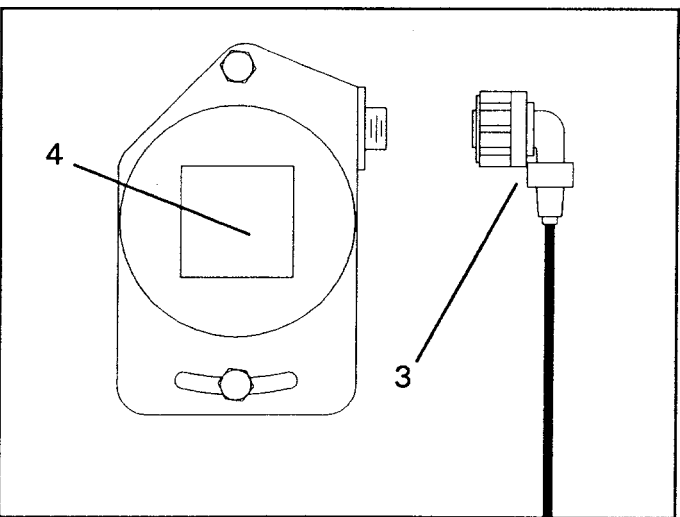
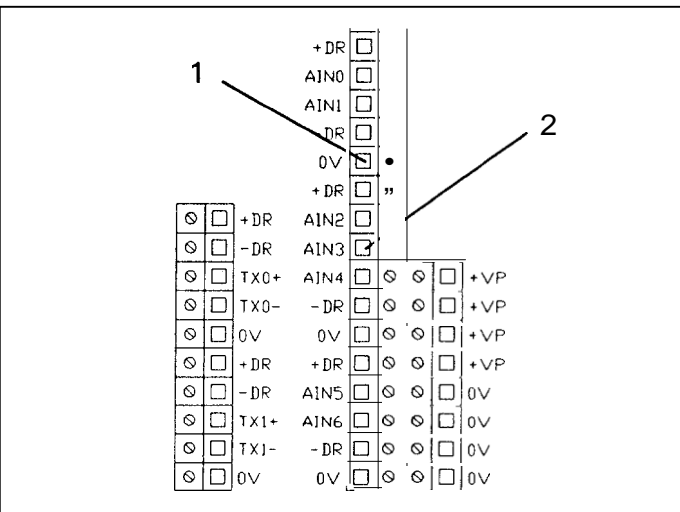
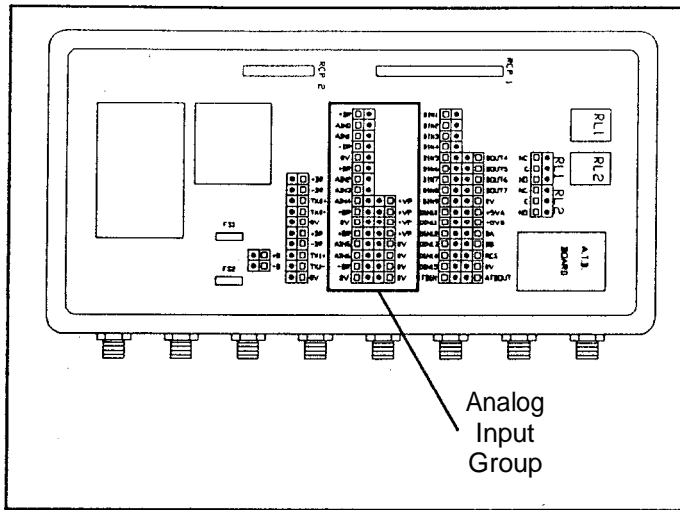


9. Under the cover on the right side of the extension reel you will see a terminal strip. This terminal strip has five wires connected to the top and bottom screws.
10. With a Digital Volt Meter set to read DC Voltage, place the negative lead on the terminal with the white wire attached to it (- Drive)(4) and the positive lead on the terminal with the red wire attached to it (+ Drive)(5).
11. The voltage should be 5.25 +/- 0.1 volts. If this voltage is out of range and the Analog Drive Voltage checked in step two was OK then it is probable that the red or the white wire is open or grounded between the Terminal Connection Board and the Extension Reel. Check all connections and plugs which may be between these two components. Repair or replace as required. Refer to the MicroGuard 404 wiring diagram in Appendix B of this manual.
12. With the negative lead of the Volt meter connected to any 0 Volt terminal of the Analog Input Group (6) on the Terminal Connection Board and the positive lead on the terminal at the Extension Reel with the Green wire attached to it (Signal AIN 2T(7), the voltage should be the same as measured previously at AIN 2 of the Analog Input Group. If this voltage is not within range it is possible that the Green wire is open between the Terminal Connection Board and the Extension Reel. Check all connections and plugs between these two components. Repair or replace as required. Refer to the MicroGuard 404 wiring diagram in Appendix B of this manual.
13. If the Drive voltage at the Extension Reel is OK and no opens or grounds are found in the wiring replace the Extension Reel as described on page 22 of this manual.



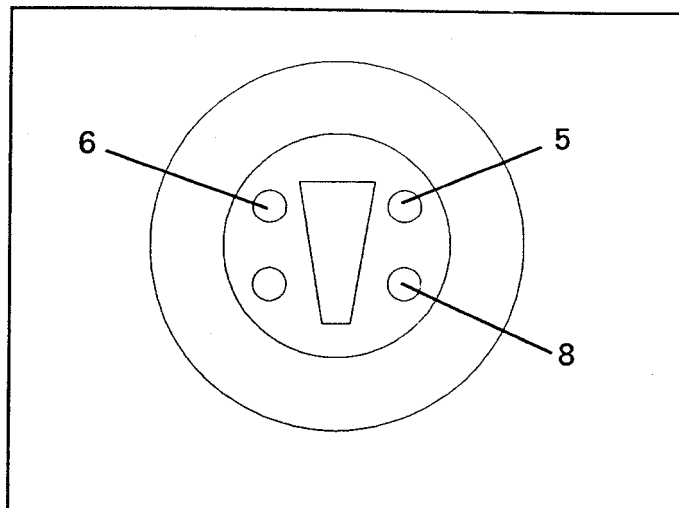
BOOM ANGLE SENSOR AIN 3

1. Place the main boom at a 0 degree angle. Verify that it is at a 0 degree angle with an inclinometer.
2. Access the Terminal Connection Board. (refer to page 18 of this manual) Check the Analog Drive Voltage. (refer to page 19 of this manual)

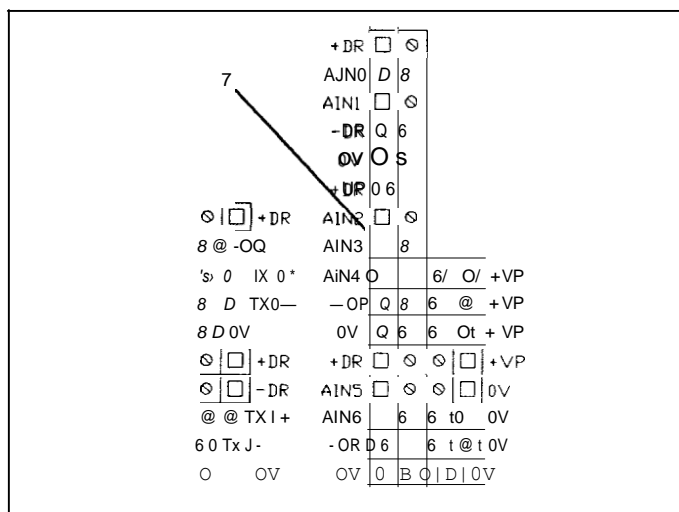


3. With a digital voltmeter set for DC Volts, connect the negative lead of the meter to any 0 Volt terminal (1) of the Analog Input Group.
4. Connect the positive lead to the AIN 3 terminal (2) of the Analog Input Group.
5. With the boom horizontal the voltage should be 2.6 + /- 0.25 volts.
6. Raise the main boom to a 60 degree angle. Verify that it is at a 60 degree angle with an inclinometer.
7. With the boom at a 60 degree angle the voltage should be 3.5 + /- 0.25 volts.
8. If this voltage is out of range, remove the cable (3) from the Boom Angle Sensor (4) located on the left side of the main boom near to the boom pivot pin.

9. With a digital voltmeter set for DC volts, connect the negative lead to pin B (5) (- Drive) of the connector.
10. Connect the positive lead to pin D (6) (+ Drive) of the connector.
11. The voltage should be 5.25 +/- 0.1 volts. If this voltage is out of range and the Analog Drive Voltage checked in step 2 was OK then it is possible that the red or blue wire is either open or grounded between the Terminal Connection Board and the Boom Angle Sensor. Check all connections and plugs which may be between these two components. Repair or replace as required. Refer to the MicroGuard 404 Wiring Diagram in Appendix B of this manual.



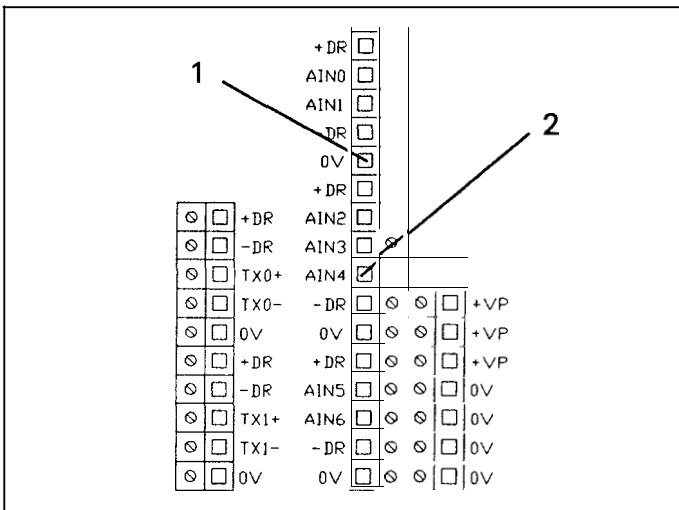
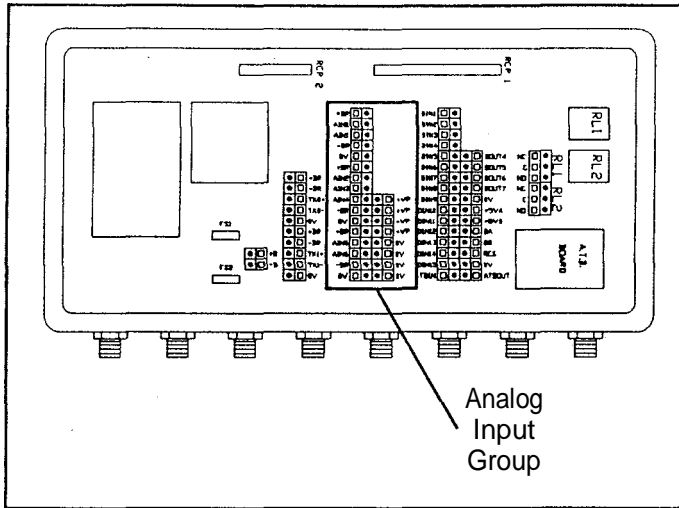
12. Switch the power off and remove the green Signal Wire from AIN 3 (7). With a Digital Voltmeter set for continuity connect one lead to pin A (8) of the connector and the other lead to the green signal wire. There should be continuity between these points. If there is not continuity replace the Boom Angle Sensor Cable.
13. If the above voltage checks are within range and no grounds or opens are found in the wires, replace the Boom Angle Sensor as described on page 25 of this manual.



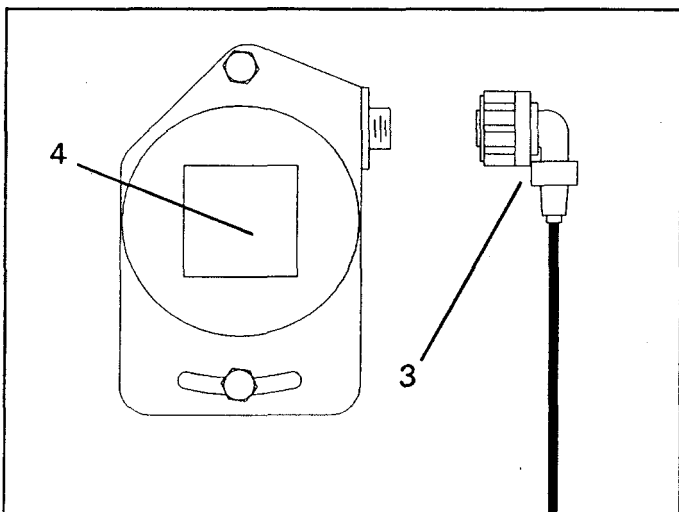
SUPERSTRUCTURE ANGLE SENSOR AIN 4

1. Place the crane level on outriggers, verify that it is level.
2. Access the Relay and Termination Board. (refer to page 18 of this manual)

Check the Analog Drive Voltage. (refer to page 19 of this manual).

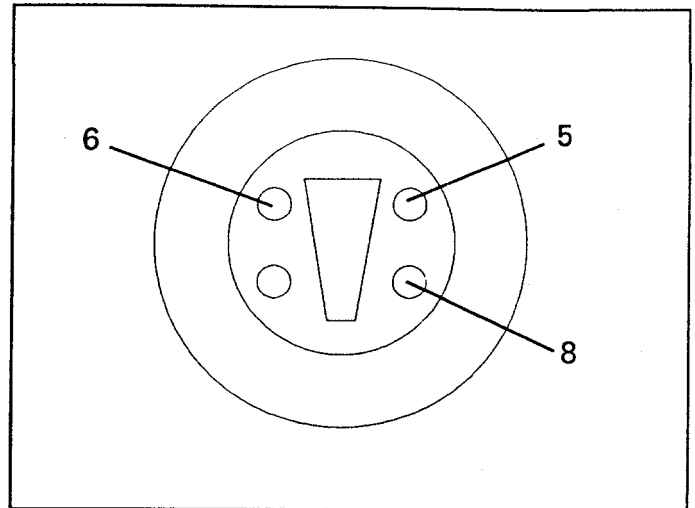


3. With a digital voltmeter set for DC Volts, connect the negative lead of the meter to any 0 Volt terminal ( 1 ) of the Analog Input Group.
4. Connect the positive lead to the AIN 4 terminal (2) of the Analog Input Group.
5. With the crane level the voltage should be 2.6 +/- 0.25 volts.

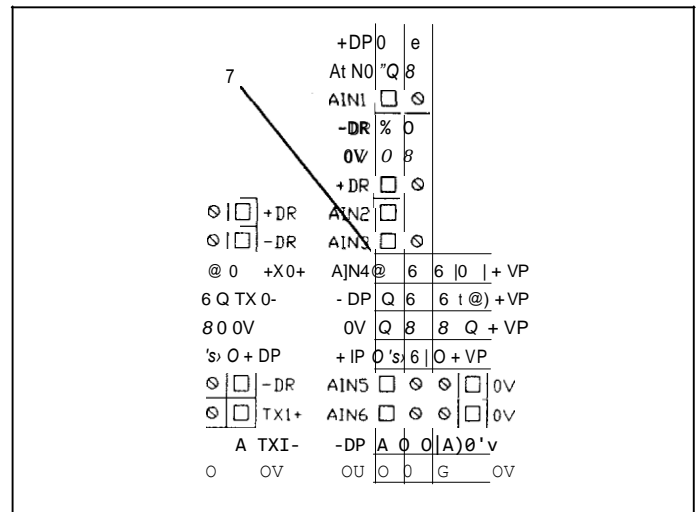


6. If this voltage is out of range, remove the cable (31 from the Superstructure Angle Sensor (4) located on the left side of the superstructure.

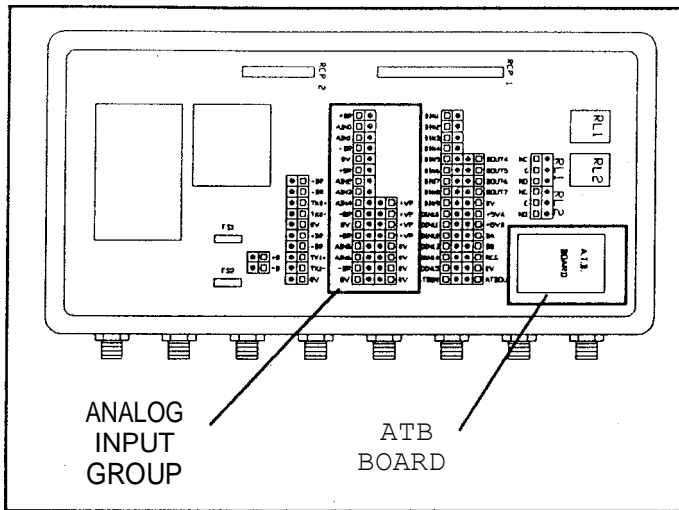
7. With a digital voltmeter set for DC volts, connect the negative lead to pin B (5) (- Drive) of the connector.
8. Connect the positive lead to pin D (6) (+ Drive) of the connector.
9. The voltage should be 5.25 +/- 0.1 volts. If this voltage is out of range and the Analog Drive Voltage checked in step 2 was OK then it is possible that the red or blue wire is open or grounded between the Terminal Connection Board and the Super Structure Angle Sensor. Check all connections and plugs which may be between these two components. Repair or replace as required. Refer to the MicroGuard 404 Wiring Diagram in Appendix B of this manual.



10. Switch the power off and remove the green Signal Wire from AIN 4 (7). With a Digital Voltmeter set for continuity connect one lead to pin A (8) of the connector and the other lead to the green signal wire. There should be continuity between these points. If not replace the Superstructure Angle Sensor Cable.



13. If the above voltage checks are within range and no grounds or opens are found in the wires, replace the Superstructure Angle Sensor as described on page 27 of this manual.



**NO DUTY FOUND**

The system needs to know the same information that you would need to know in order to read a load chart. If for any reason this information is not available the fault "No Duty Found" will result. Normally this fault would occur if either the Boom Angle Sensor or the Extension Sensor inputs are faulty. The system uses these inputs to determine the radius. Upon correction of the Sensor fault the system will again be able to find a duty.

The position of the upper structure in relation to the carrier must also be determined. This is accomplished by means of swing potentiometer mounted in the collector ring. If the system does not have an input from the swing potentiometer it will not be able to find a duty.

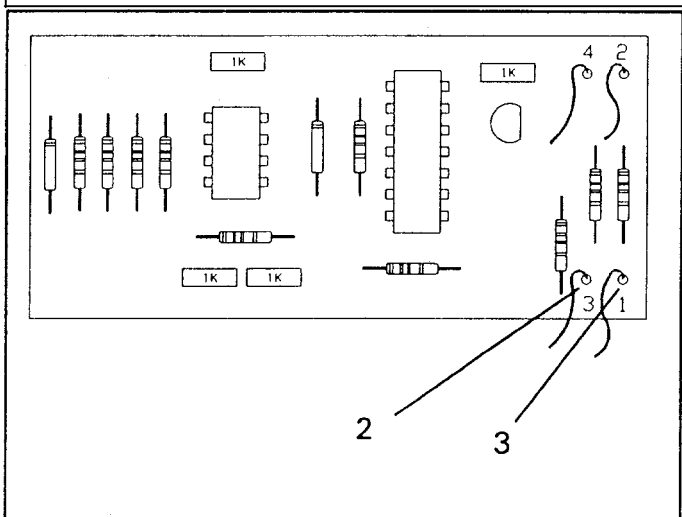
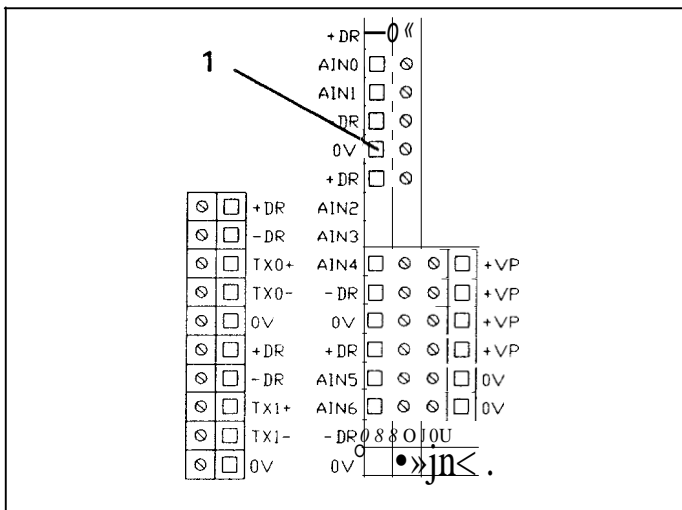
To check the Swing Potentiometer use the following procedure:

1. Access the Relay and Termination Board. refer to page 18 of this manual).

Check the Analog Drive Voltage. (refer to page 19 of this manual).

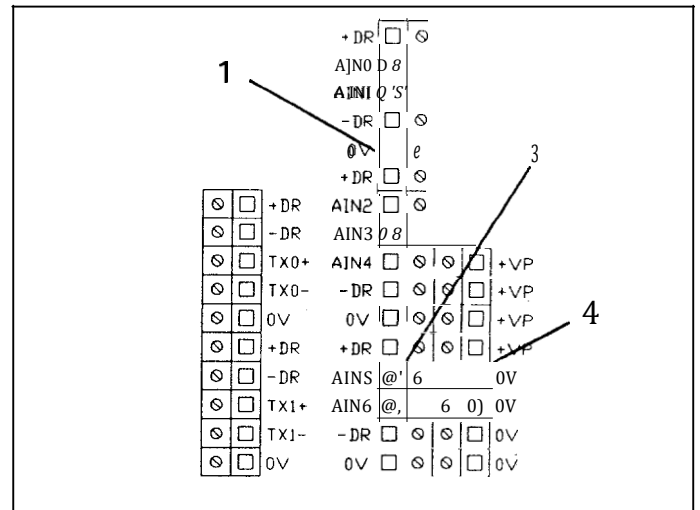
2. With a digital voltmeter set for DC volts check the voltage at the connections to the potentiometer located on the Anti Two-Block Board. The connections are marked by a 1 and a 3 at the lower right corner of the Anti Two-Block board. Connection 1 has a red wire attached to it and connection 3 has a black wire attached to it.

4. Connect the black lead of the DVM to connection 3 (black wire)(2) and the red lead of the DVM to connection 1(red wired)(3). The voltage should be 4.1 25 + /-0.1 volts. If this voltage is out of range the Termination Board will need to be replaced. Refer to page 32 of this manual.



- With the black lead on any 0 Volt terminal (1) check the voltage at AIN 5 terminal (3) and AIN 6 terminal (4). The voltage should be 4.50 +/- 0.1 maximum and 0.365 +/- 0.1 minimum. Both of these voltages should rise and fall linearly within this range as the upper is rotated left or right. If the Drive Voltage and the Voltage at the connection to the potentiometer were correct and the voltages on AIN 5 and AIN 6 are out of range the swing potentiometer will need to be replaced.

Contact your distributor or your Factory Service Department for procedures on replacing the swing potentiometer.



## OTHER SYSTEM FAULTS

### EXECUTIVE ROM

The Executive Rom fault code indicates failure of IC 2 on the main computer board. This chip can be replaced without the need for re-calibration. The chip is labeled M444005.E. Refer to page 28 of this manual for Executive Rom replacement.

### PERSONALITY ROM

The Personality Rom fault code will be present until the system is fully calibrated. At the completion of calibration a code is automatically inserted into the memory which enables the system to carry out the self test. If the fault code occurs in normal service it could indicate either a failure of IC 7 or the loss of data in the device. It will be necessary to obtain a copy of the Personality Rom which was made at the completion of the initial calibration or carry out a complete re-calibration of the system. Contact your Distributor or Factory Service Department for details. Refer to page 28 of this manual for Personality Rom replacement.

### SCRATCHPAD RAM

The Scratchpad Ram fault code indicates the failure of IC 6 on the Main Computer Board. This item is not user serviceable and requires the replacement of the Main Computer. Refer to page 30 of this manual for Main Computer Board replacement.

### DUTY ROM

This fault is associated with the failure of the Duty Chip IC 3 on the Main Computer Board. It can be replaced without the need for re-calibration. It contains the load chart data for the crane on which it is fitted and must be the exact type

for the load chart on the machine. Refer to page 29 of this manual for Duty Rom replacement.

### CURRENT DUTY BAD

This fault indicates failure of the Duty Chip IC 3 on the Main Computer Board. It can be replaced without the need for re-calibration. It contains the load chart data for the crane on which it is fitted and must be the exact type for the load chart on the machine. Refer to page 29 of this manual for Duty Rom replacement.

### CONFIGURATION UNCALIBRATED

When a machine is initially calibrated its duty chip may contain more configurations than are to be sold with that particular machine. Fly or jib options which are not supplied with the machine will not be calibrated. If such a configuration is selected by the end user the fault code will indicate "Configuration Uncalibrated". If the crane is to be retro-fitted with a configuration which was not calibrated, it will be necessary to calibrate that particular configuration.

### DIGITAL I/O & ANALOG I/O

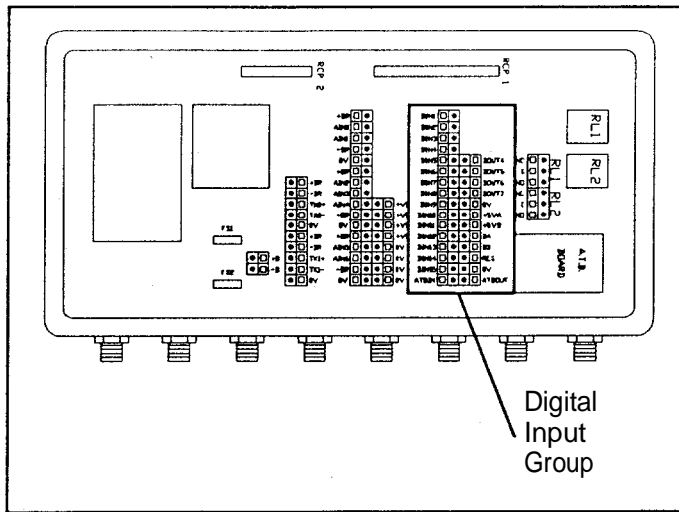
Digital and Analog I/O faults are not user serviceable. When this fault code is detected it will be necessary to replace the Main Computer Board. Refer to page 30 of this manual for Main Computer Board replacement.

### DISPLAY UNIT

This item is not user serviceable. When this fault code is detected it will be necessary to replace the Display Unit. This can be done by removing the four screws securing the display into the dash and unscrewing the cable from the back of the display. Connect the display cable to the new display, install it into the dash and secure with the four mounting screws.



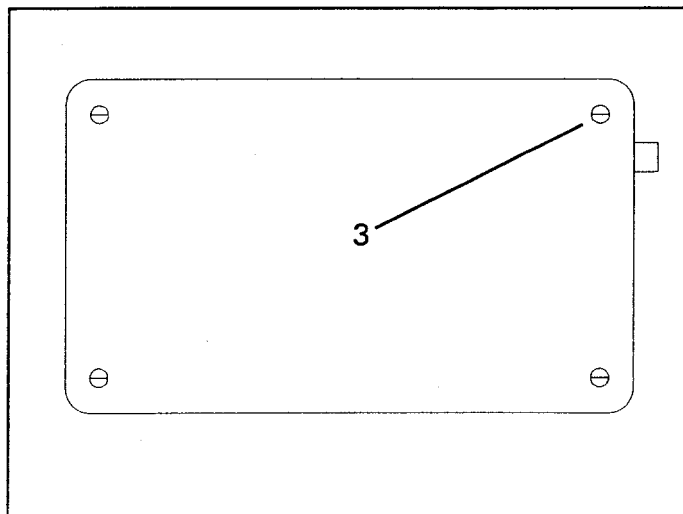
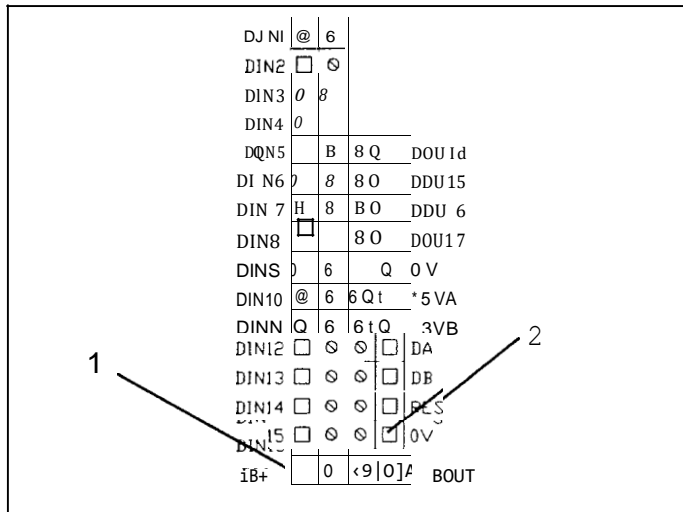
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ANTI TWO BLOCK SYSTEM

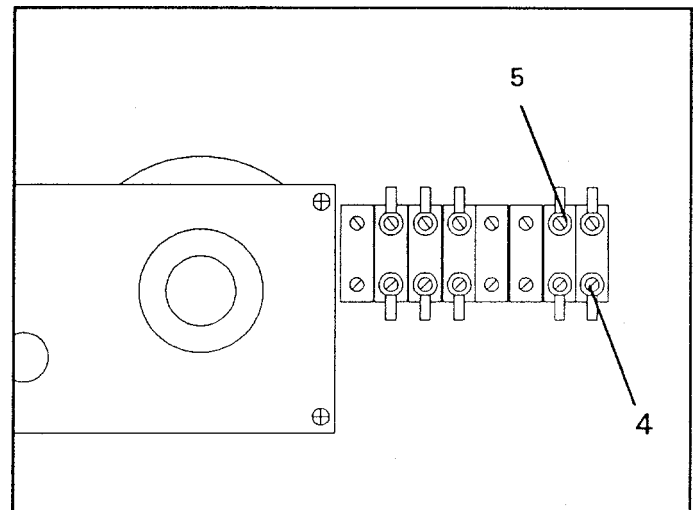
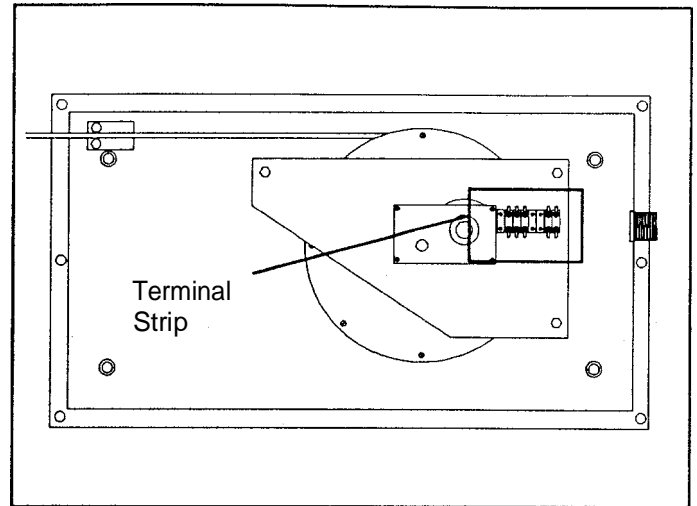
System will not show Two-Block when machine is Two-Blocked:

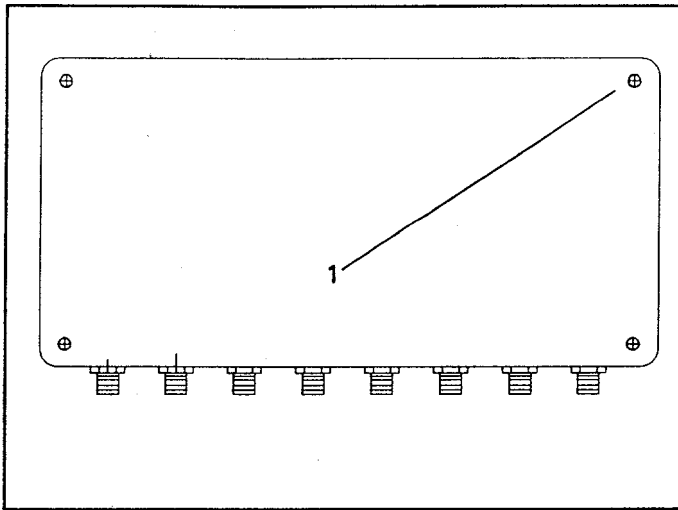
1. Access the Termination Board. (refer to page 18 of this manual).
2. Make certain that the Anti Two-Block weight is attached to the boom head switch and that the selector switch is properly positioned.
3. Remove the brown wire connected to the ATB IN terminal (1) of the digital input group. The system should show a Two-Block warning.
4. Connect a jumper wire from the 0 volt terminal (2) to the ATBIN terminal t1). The Two-Block warning should no longer be displayed. If the two-Block warning remains the problem is in the Termination Board. Refer to page 32 of this manual for Termination Board replacement.
5. Remove the jumper wire and reconnect the brown wire to ATB in terminal (1). Remove the four cover screws (3) from the extension reel located on the left side of the main boom and remove the cover.
6. Remove the brown wire (5) from the terminal strip. (see terminal strip drawing Page 17) The system should show a Two-Block warning. If it does not, the brown wire or its connections between the Termination Board and the extension reel are grounded. If the system does show a Two-Block warning there is a ground in the wiring or connections between the extension reel and the Switch at the boom head. Check all wires and connections between these two components and repair or replace as required.



System shows Two-Block when machine is not Two-Blocked

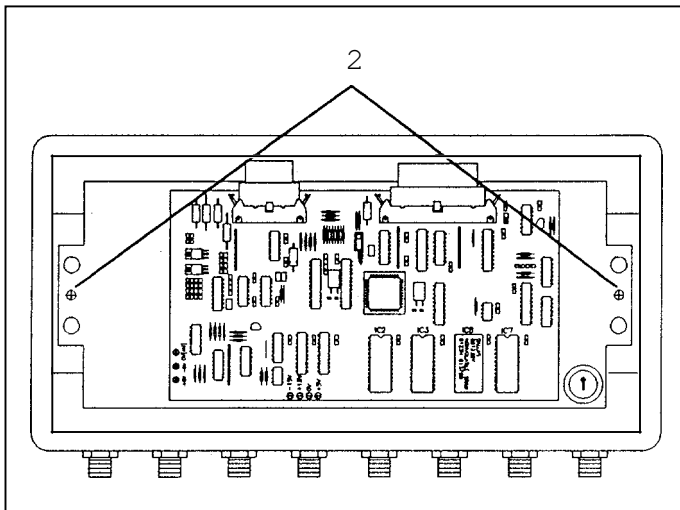
1. Check that the selection switch of the Two-Block switch located at the main boom head is correctly set.
2. Make certain that the Anti Two-Block weight is attached to the boom head switch.
3. Access the Termination Board.  
(refer to page 18 of this manual).
4. Remove the brown wire connected to ATB in terminal (1) of the digital input group.  
(refer to terminal strip Page 16)  
The system should show a Two-Block warning.
5. Connect a jumper wire from the 0 volt terminal (2) to the ATB in terminal (1). The Two-Block warning should no longer be displayed. If the two-Block warning remains the problem is in the Termination Board assembly, refer to page 32 of this manual for Termination Board replacement. If not the problem is in the external wiring or switches.
6. Remove the jumper wire and reconnect the brown wire to ATB in terminal (1). Remove the four screws (3) from the extension reel located on the left side of the main boom.
7. Connect a jumper wire between the black wire (4) and the brown wire (5) on the terminal strip, the Two-block warning should no longer be displayed. If it remains the brown wire is open between the Termination Board and the Extension Reel. If the warning is no longer displayed the problem is somewhere between the extension reel and the boom head switch. Check all wires and connections between these two components and repair or replace as required .



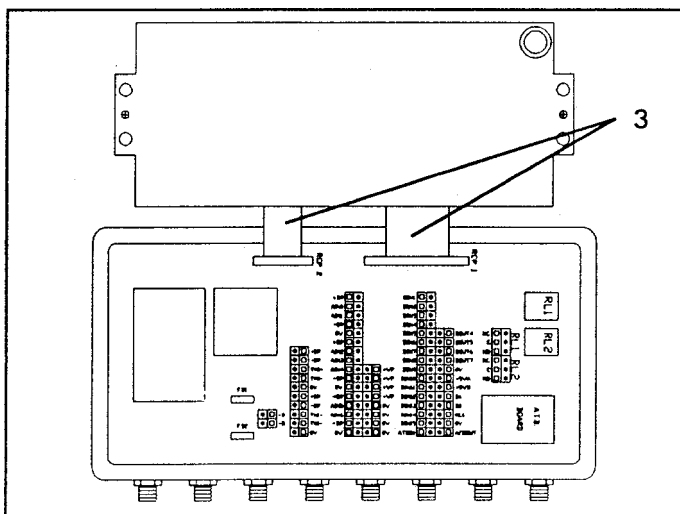


## ACCESSING MAIN COMPUTER BOARD AND TERMINATION BOARD

1. Remove the four screws (1) securing the computer lid to the computer box. This lid is NOT hinged so care should be taken not to allow the lid to fall from the box. Set the lid aside.



2. Under the lid you will see the Main Computer Board. This board contains the Micro Processor and its related components. This unit is held in place by two screws (2) located at the left and right of the Main Computer Board backing plate and is connected to the Terminal Connection Board via 2 ribbon cables (3). These cables carry the signals to and from the Termination Board. These will be to the top of the Main Computer Board.

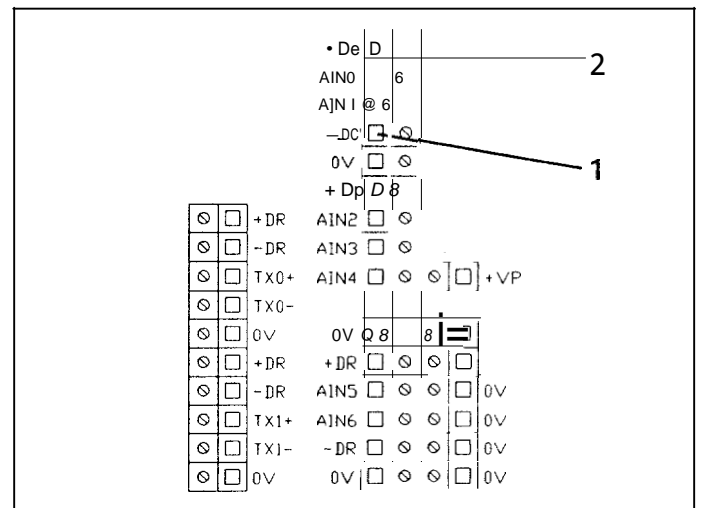
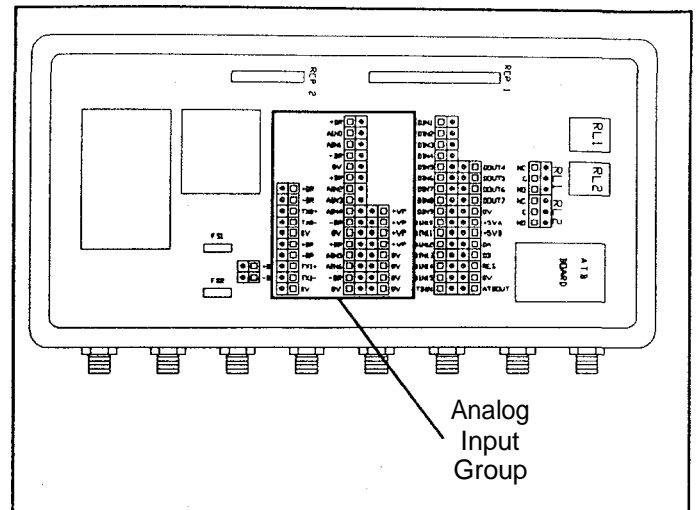


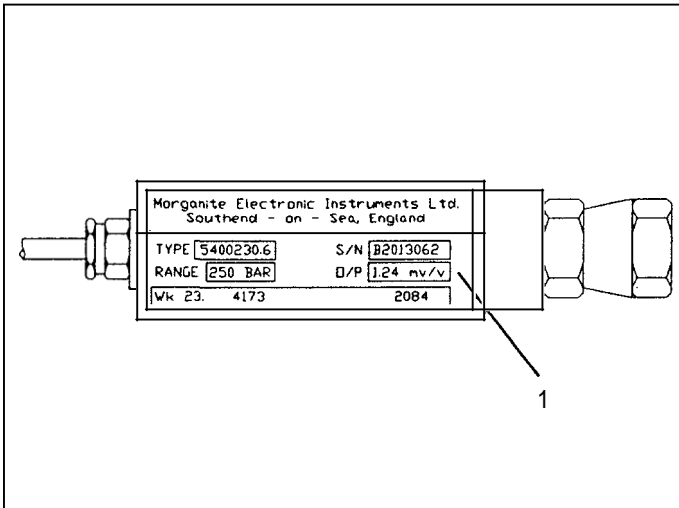
3. If you are going to check voltages on the Termination Board remove the two (2) screws located at the left and right of the Main Computer Backing Plate and swing the assembly up. Take care not to damage the ribbon cables (3). These ribbon cables must remain connected to the Main Computer Board for voltage checks.

CHECKING ANALOG DRIVE VOLTAGE

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

1. Access the Termination Board. (refer to page 18 of this manual).
2. 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.
3. Place the positive lead of the meter on any + DR (+ Drive) terminal (2T).
4. The voltage should be 5.25 +/- 0.1 volts.
5. If the Analog Drive Voltage is not within this range disconnect all of the external sensor cables, including pressure transducers, cables 1 through 5.
6. Recheck the Analog Drive Voltage, if the voltage is still out of range the Computer Board will need to be replaced. (refer to page 30 of this manual). If the voltage is within range reconnect each cable one at a time checking the Analog Drive Voltage after each cable is connected.
7. If after reconnecting any one of the sensors the Analog Drive Voltage goes out of range, it is probable that the wiring to the sensor or the sensor itself is grounded. Check all wires and the sensor itself and repair or replace as required. Refer to the MicroGuard 404 Wiring Diagram in Appendix B of this manual.

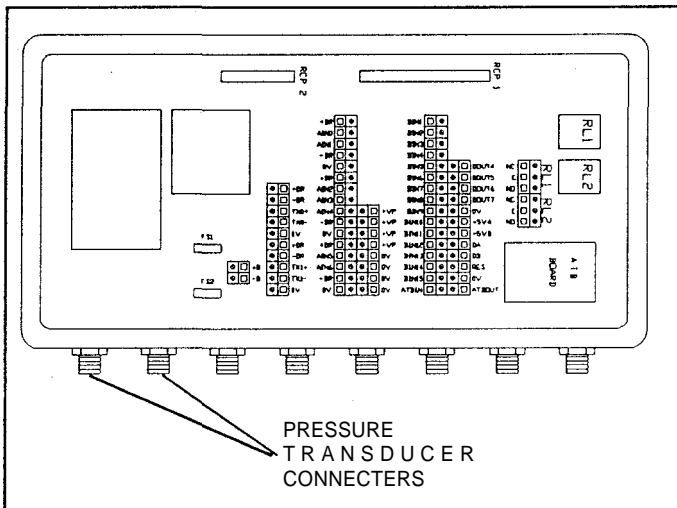




### PRESSURE TRANSDUCER REPLACEMENT

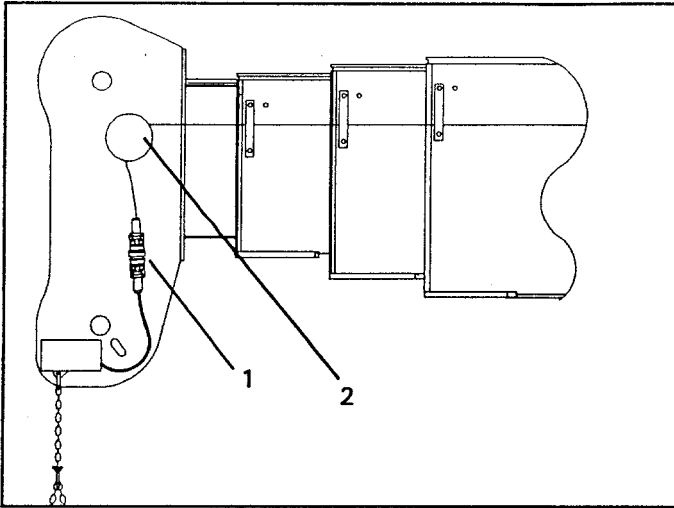
1. It is recommended that the replacement transducer is closely matched to the sensitivity of the old transducer. The sensitivity value (1) is recorded on the serial number plate.
3. Remove the connector connecting the transducer to be replaced from the computer box.
4. With the boom cylinder completely retracted, in the rest, or with the boom safely supported, remove the transducer to be replaced.

Install the new transducer on the boom hoist cylinder.



6. Run the cable to the computer box and connect it to the appropriate computer box connector. Refer to the MicroGuard 404 Wiring Diagram in Appendix B of this manual.
7. Pick a known weight to verify the accuracy of the system. If the load reading is not within tolerance after the replacement of a pressure transducer contacts the Factory Service Department.

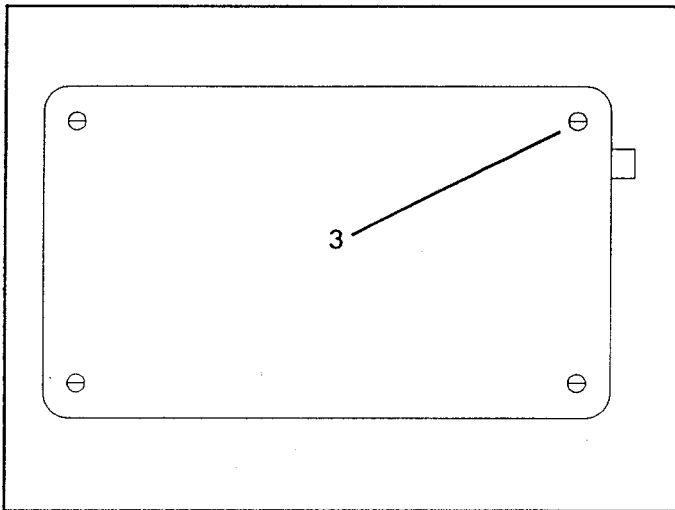
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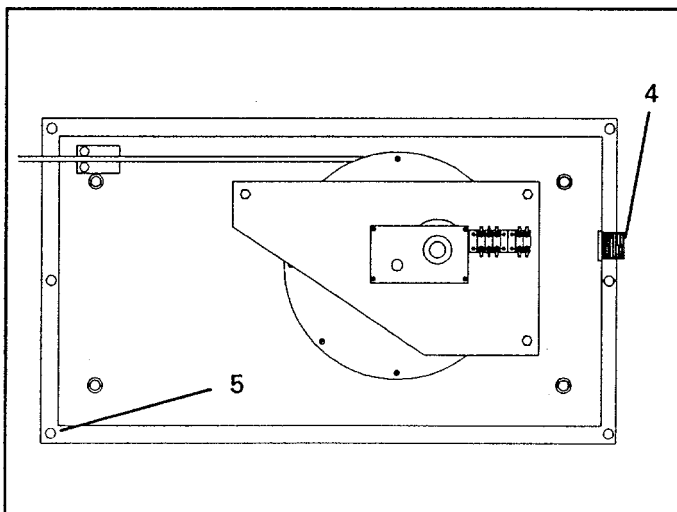
## EXTENSION REEL REPLACEMENT

To replace the extension Reel assembly use the following procedure:

1. Fully retract the main boom.
2. Disconnect the connector to the Two-Block switch (1) and remove the cable from the main boom head anchor (2). Allow the cable to retract onto the reel, be careful not to let the cable retract too rapidly.



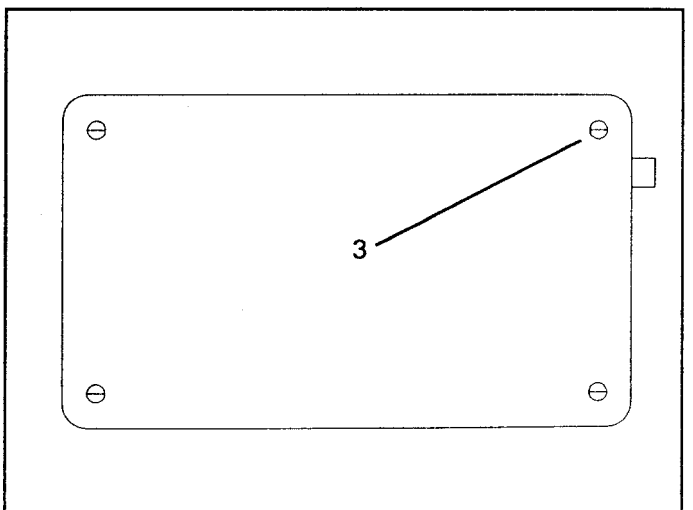
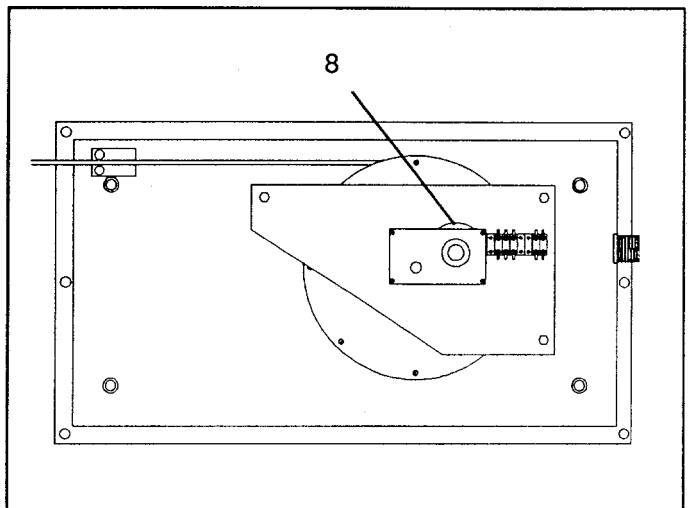
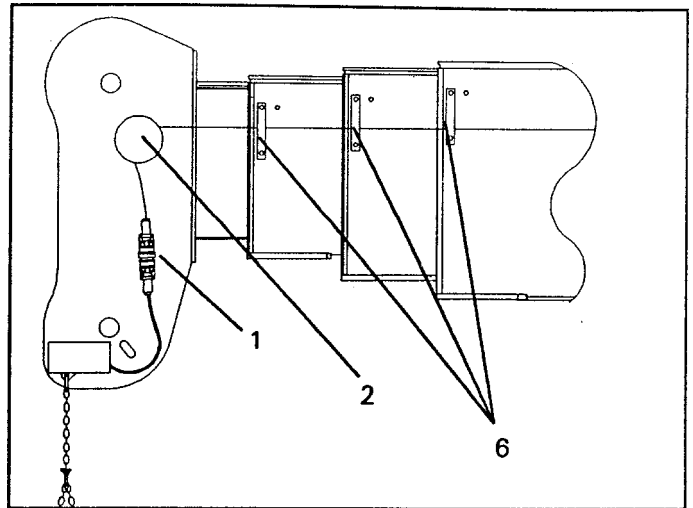
3. Remove the four screws securing the cover on the reel (3).



4. Remove the Extension Reel Cable connector (4).
5. Remove the four mounting bolts (5) securing the Extension Reel to the boom and remove the reel.
6. Mount the new reel to the boom, secure with the mounting bolts and connect the Extension Reel Cable Connector (4).



7. Remove the shipping cable clamp from the new cable and allow it to slowly rewind onto the drum until there is no pre-tension. Continue to re-wind the drum in the same direction until the distance between the boom head and the connector is approximately 12 ft. At this point there will be no pre-tension.
8. Pull the cable out passing it through the cable guides (6) until the end of the cable is 3 ft. beyond the boom head.
9. Wrap the cable around the boom head anchor (2) a minimum of five times and secure with a wire tie or the shipping cable clamp.
10. Connect the cable to the connector (1) coming from the Two-Block switch.
11. Manually turn the large gear (8) connected to the potentiometer fully counter-clockwise.
12. Observe the length display and turn the large gear (8) at least 3 clicks clockwise until the length display reads the retracted boom length.
13. Replace the Extension Reel Cover, securing it with the four screws(3).
14. Extend and retract the main boom and see that the boom length reading on the display is correct.

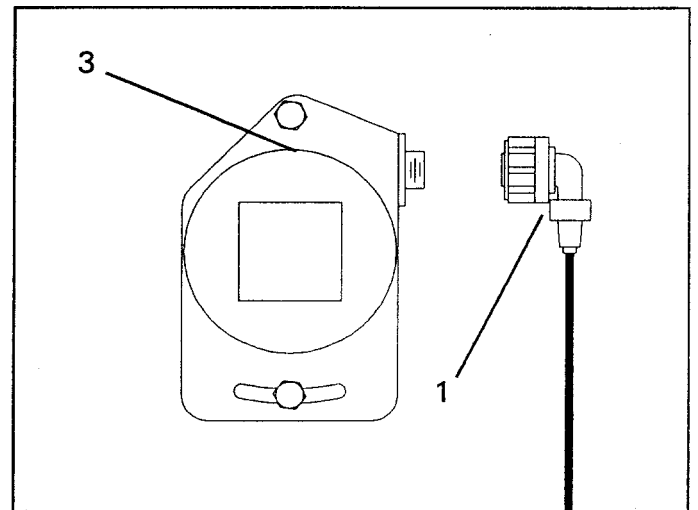
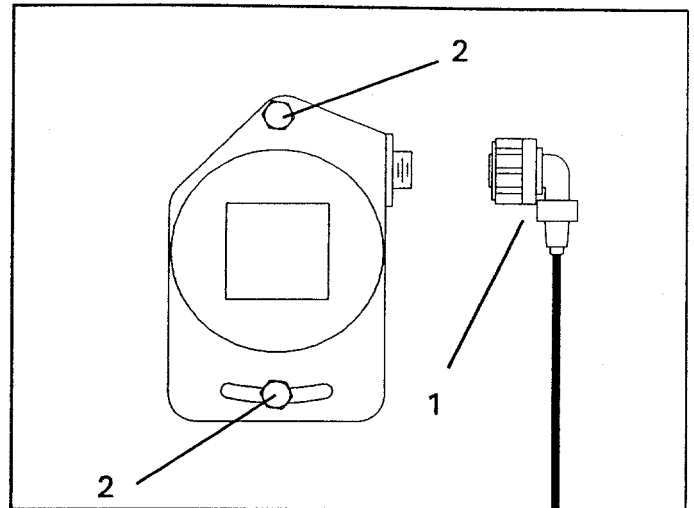


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## BOOM ANGLE SENSOR REPLACEMENT

To replace the Boom Angle Sensor use the following procedure:

1. With the power off, disconnect the Boom Angle Sensor cable (1) from the sensor located on the left side of the boom near the boom extension reel.
2. Remove the two bolts (2) securing the sensor to the boom.
3. Keeping the new sensor upright, remove the transit screw (3) located at the top of the sensor and replace it with the short screw supplied with the unit. Seal the screw with silicone sealant.
4. Install the new sensor on the boom, secure it loosely with the mounting bolts and connect the cable (1).
5. Raise the boom to a 60 degree angle and verify the angle with an inclinometer. While viewing the display adjust the sensor until the display reads 60 degrees and tighten the mounting bolts.
6. Place the boom horizontal, verify that it is at 0 degrees with an inclinometer.
7. Verify that the displayed boom angle is correct.

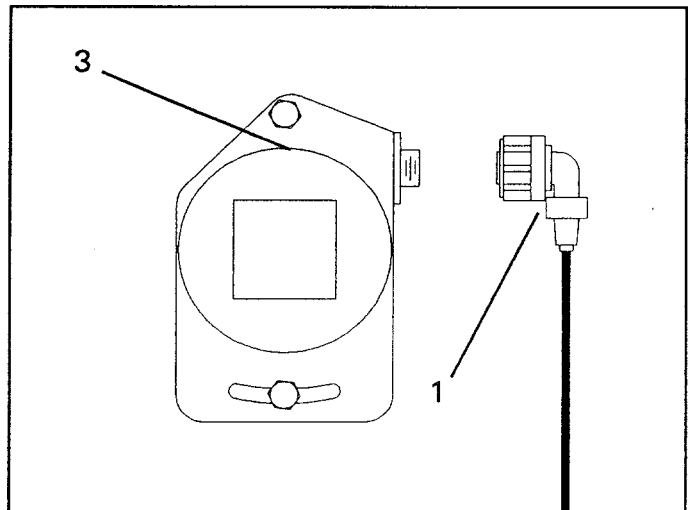
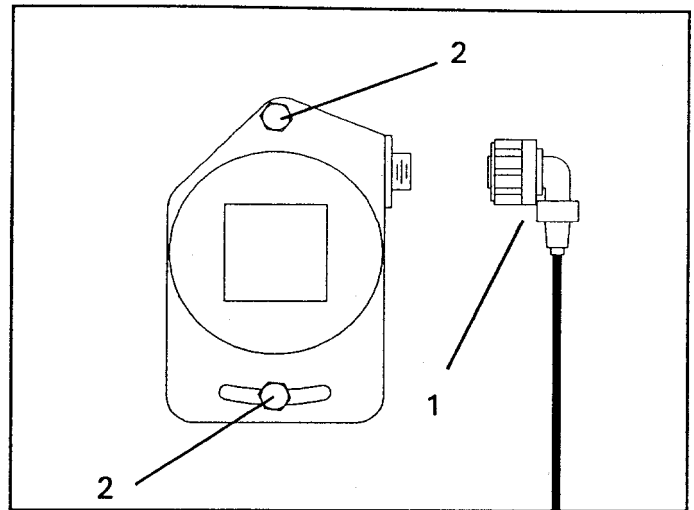


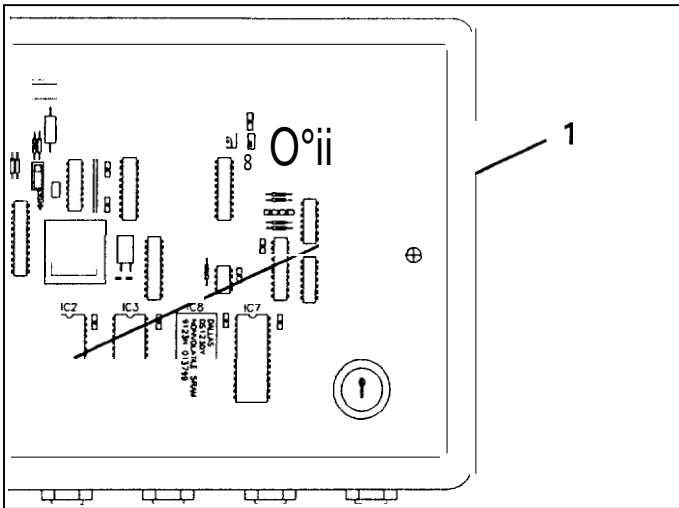
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## SUPERSTRUCTURE ANGLE SENSOR REPLACEMENT

To replace the Superstructure Angle Sensor use the following procedure:

1. With the power off, disconnect the Superstructure Angle Sensor cable (1) from the sensor located on the left side of the superstructure.
2. Mark the sensor location and remove the two bolts (2) securing the sensor to the boom.
3. Keeping the new sensor upright, remove the transit screw (3) located at the top of the sensor and replace it with the short screw supplied with the unit. Seal the screw with silicone sealant.
4. Install the new sensor on the superstructure in the original location, secure it with the mounting bolts and connect the cable (1).
5. The superstructure angle sensor affects the load reading. Check the actual load reading using a known load and verify that it is correct. Small adjustments of the position of the superstructure angle sensor are permissible in order to "fine tune" the load reading. If the load reading is incorrect after replacement of the sensor refer to the service department.





### EXECUTIVE ROM CHIP REPLACEMENT

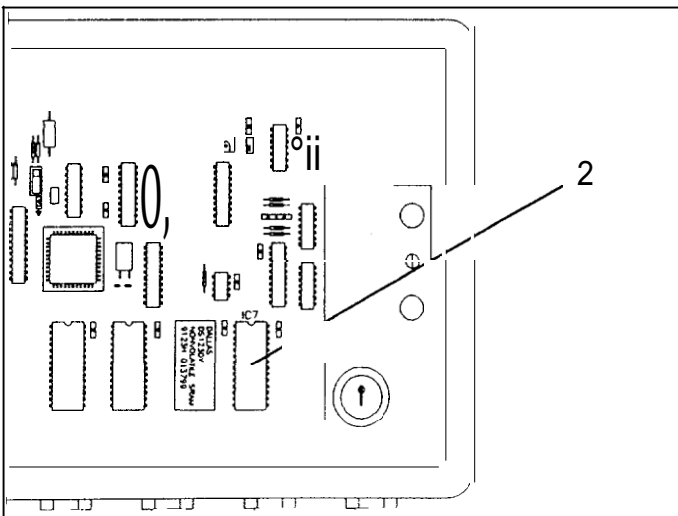
The Executive ROM Chip contains the main program data which the computer uses to function and must be specific to the system.

1. Access the Main Computer Board.  
(refer to page 18 of this manual).
2. With the power off remove IC 2, the Executive ROM Chip (1) from its socket. Refer to General Chip Removal and Installation on page 34 of this manual.
3. Install the new Executive ROM Chip into the socket. Make certain the notch in the chip is lined up with the notch in the socket and all pins are properly inserted.

### PERSONALITY ROM CHIP REPLACEMENT

The Personality ROM Chip must be the proper chip for the particular machine serial number. This chip contains calibration data which is unique to each machine.

1. Access the Main Computer Board.  
(refer to page 18 of this manual) .
2. With the power off remove IC 7, the Personality ROM Chip (2) from its socket. Refer to General Chip Removal and Installation on page 34 of this manual.
3. Install the new Personality ROM Chip into the socket. Make certain the notch in the chip is lined up with the notch in the socket and all pins are properly inserted.



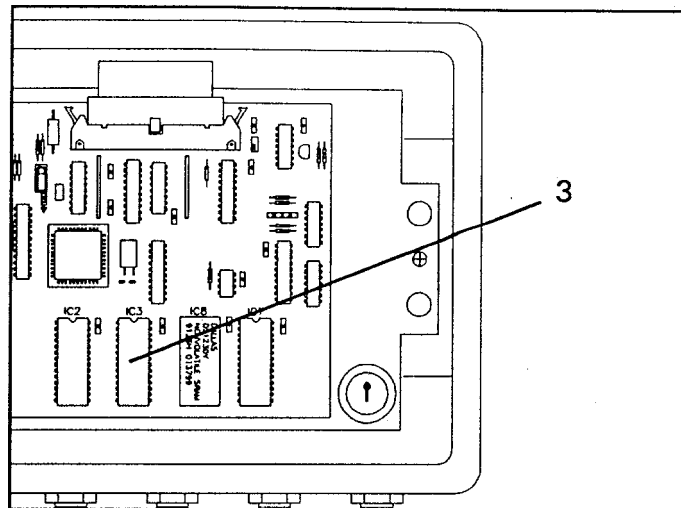
## DUTY ROM CHIP REPLACEMENT

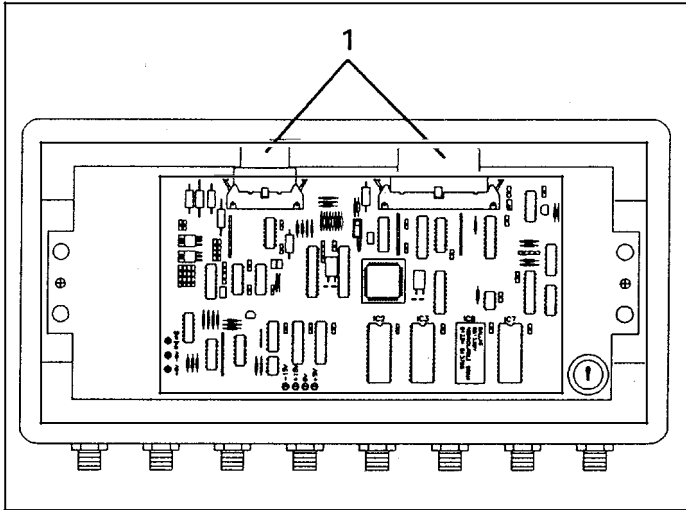
The Duty ROM Chip must be specific to the load chart used in the machine. This chip contains a copy of the load chart and must match the load chart in the machine.

1. Access the Main Computer Board.  
(refer to page 18 of this manual).
2. With the power off remove IC 3, the Duty ROM Chip (3) from its socket. Refer to General Chip Removal and Installation on page 34 of this manual.
3. Install the new Duty ROM Chip into the socket. Make certain the notch in the chip is lined up with the notch in the socket and all pins are properly inserted.

*NOTE: Replacement of the Executive or Duty ROM Chip does NOT necessitate the recalibration of the system.*

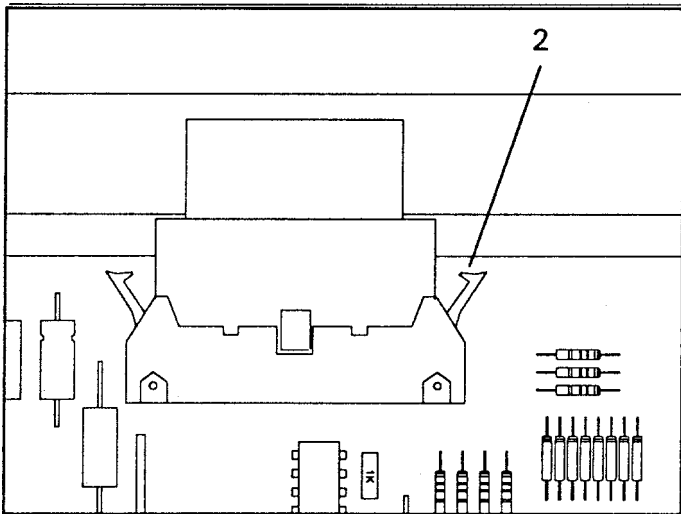
*NOTE. Replacement of the Personality ROM Chip does NOT require recalibration of the system if the new Personality ROM Chip is an exact duplicate of the original. If a copy of the Personality Chip is not available the system will need to be completely recalibrated.*



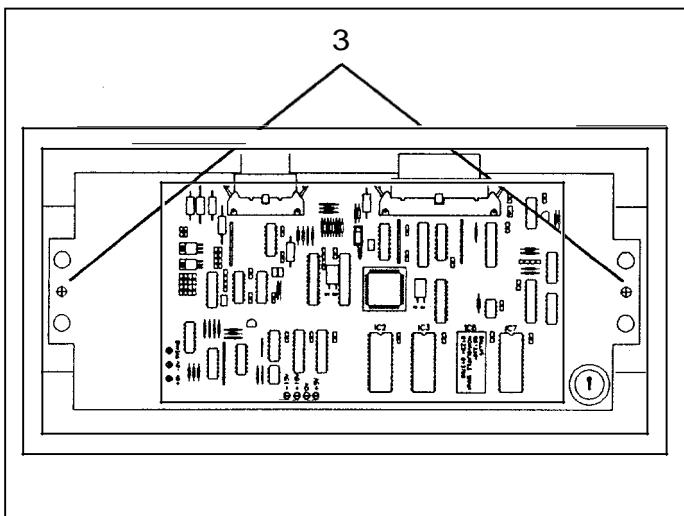


## COMPUTER BOARD REPLACEMENT

1. With the power off, access the Main Computer Board.  
(refer to page 18 of this manual).
2. Locate the two ribbon cables (1) connecting the Main Computer Board to the Termination Board.



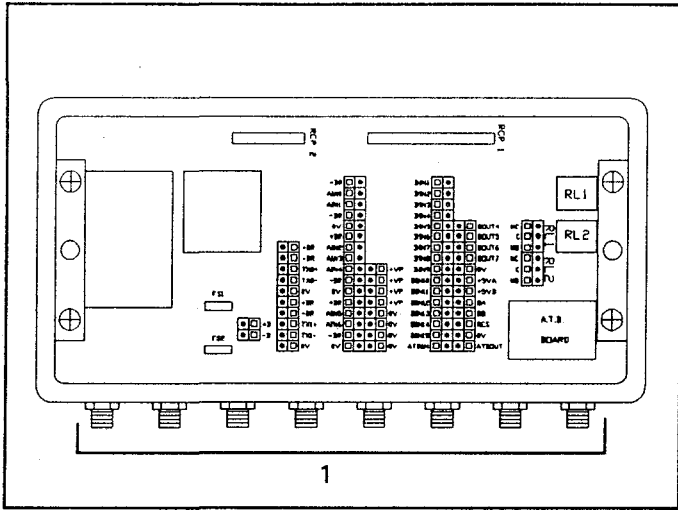
3. The ribbon cables are held in place by two locking tabs (2) on each cable end. These locking tabs must be pushed away from the cable to disconnect the cable. As the locking tabs are pushed the connector will come loose from the Main Computer Board.



4. Loosen the two screws (3) holding the Main Computer backing plate to the computer box.
5. Disconnect the three wires connecting the Over-Ride Key Switch to the Termination Board noting the colors and connection points.
6. Remove the Main Computer Board Assembly.





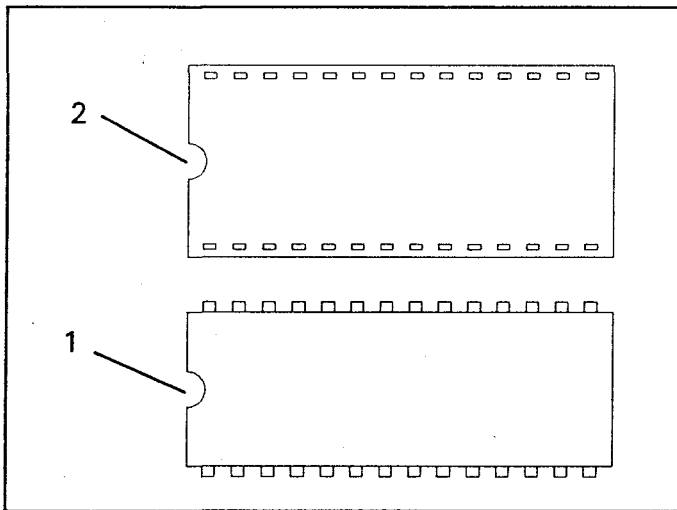


## COMPUTER BOX REPLACEMENT

(INCLUDING TERMINATION BOARD, THE COMPUTER BOARD IS REPLACED SEPARATELY, SEE PAGES 30 AND 31 )

1. Access the Termination Board and remove the Main Computer Board assembly. (Refer to page 30 of this manual).
2. Disconnect all cables (1) from the Computer Box.
3. Remove the four screws securing the computer box.
4. Remove the Computer box.
5. Install the new computer and secure with the four mounting screws.
6. Reconnect all eight cables.  
NOTE THAT CONNECTORS 1 AND 2 ARE SIMILAR AND CONNECTORS 3 AND 4 ARE SIMILAR. THEY ARE COLOR CODED AND MUST BE CONNECTED WITH THE COLOR ON THE CABLE MATCHING THE COLOR ON THE SOCKET.
7. Install the Main Computer Board assembly. (refer to page 30 of this manual).

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## GENERAL CHIP REMOVAL AND INSTALLATION

When removing and installing chips be certain the power is switched off. Do not touch the chip pins unless you are properly grounded. Static electricity can damage chips.

1. Make certain the power is off.
2. Remove the chip to be replaced with a chip removal tool.

*NOTE: Chip removal and installation tools are available from any electronics store.*

3. Insert the new chip into the installation tool per the instructions on the package.
4. Insert the new chip into the socket, making certain that the notch in the chip (1) lines up with the notch in the socket (2).
5. Double check that all pins are properly inserted into the chip socket. These pins are very easily bent. Failure to have all pins inserted can cause damage to the system and the chip.

## FAULT CODES

### GROUP "A" ANALOG SENSORS

#### CODE

#### AAA

000		NO FAULTS
001	SENSOR 0	PISTON SIDE PRESSURE TRANSDUCER
002	SENSOR 1	RODSIDE PRESSURE TRANSDUCER
004	SENSOR 2	EXTENSION SENSOR
008	SENSOR 3	BOOM ANGLE SENSOR
016	SENSOR 4	UPPERSTRUCTURE ANGLE SENSOR
032	SENSOR 5	SWING POTENTIOMETER "A"
064	SENSOR 6	SWING POTENTIOMETER "B"

### GROUP "B" INPUTS AND OUTPUTS

#### CODE

#### BB

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

### GROUP "C" MEMORY

#### CODE

#### cC

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

### GROUP "D" GENERAL

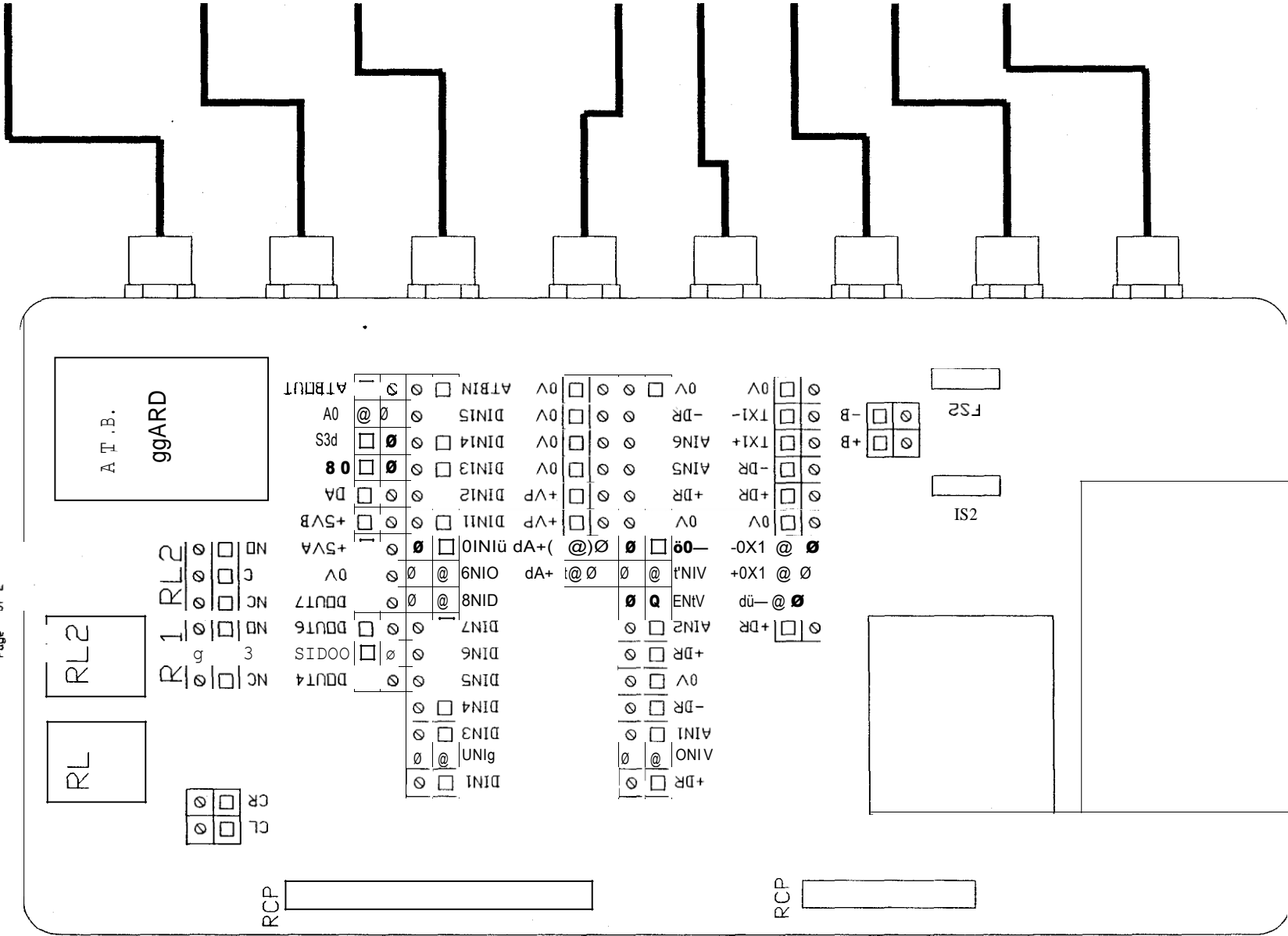
#### CODE

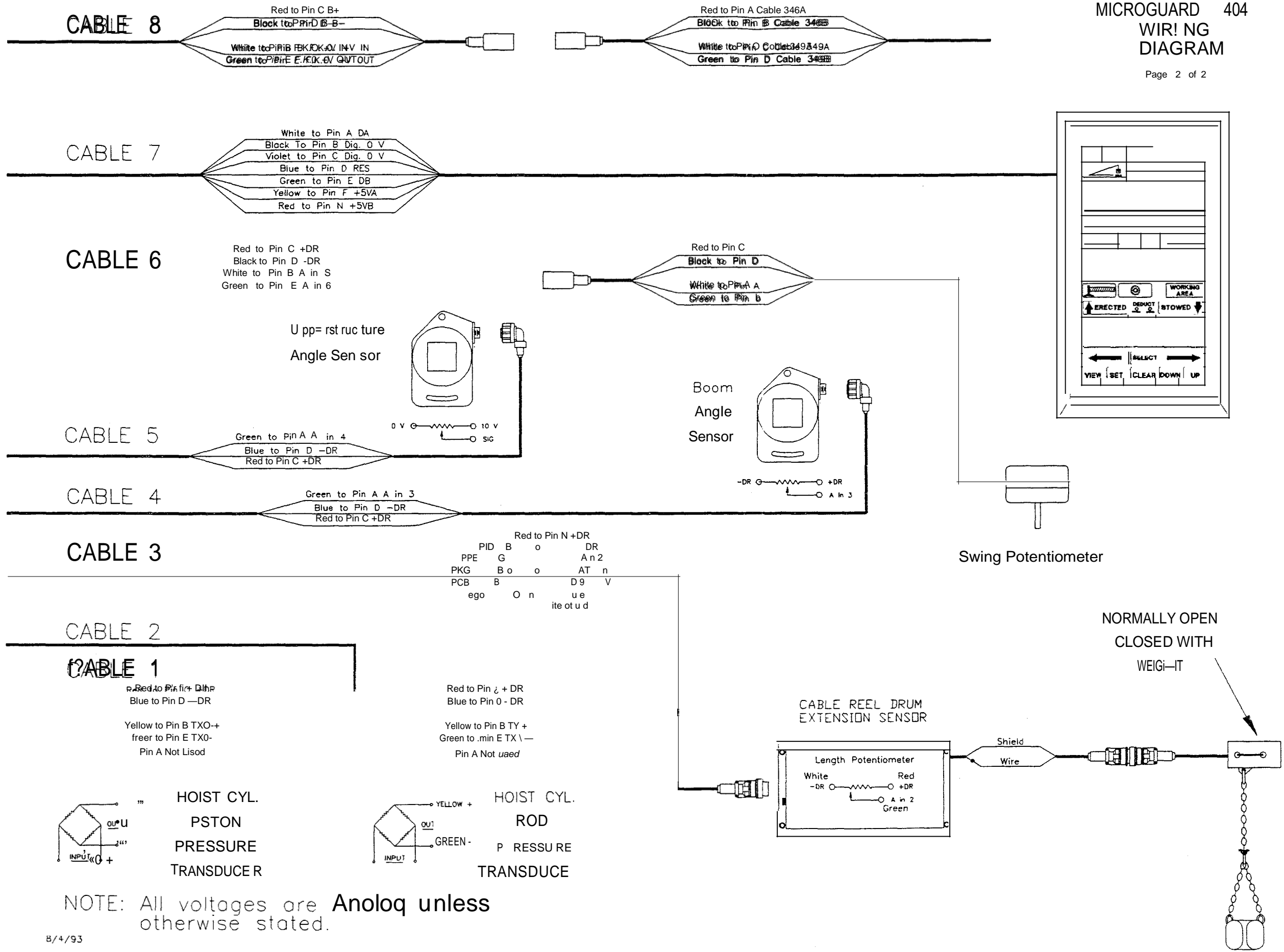
#### DD

00		NO FAULTS
01	FAULT 1	NO DUTY FOUND
02	FAULT 2	CURRENT DUTY BAD
04	FAULT 4	CONFIGURATION NOT CALIBRATED

APPENDIX B  
 MICROGUARD 404  
 WIRING  
 DIAGRAM

Page of 2





NOTE: All voltages are Analog unless otherwise stated.