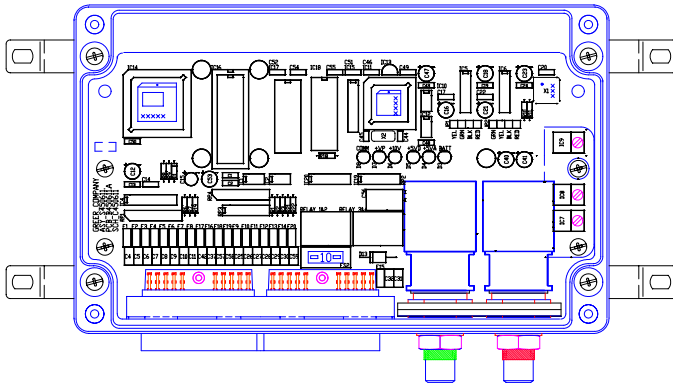


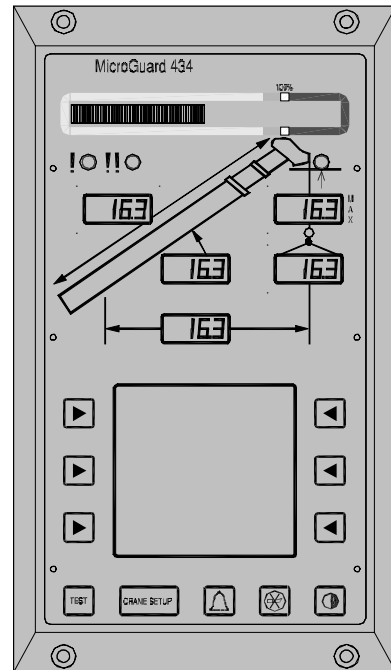
# MicroGuard® 500 Service Training Manual



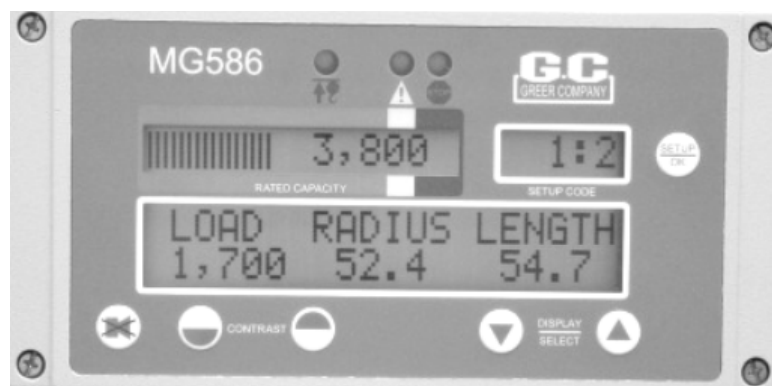
**MG® 500 Computer**



**RCI 510 Display**



**RCI 434 Display**



**RCI 586 Display**

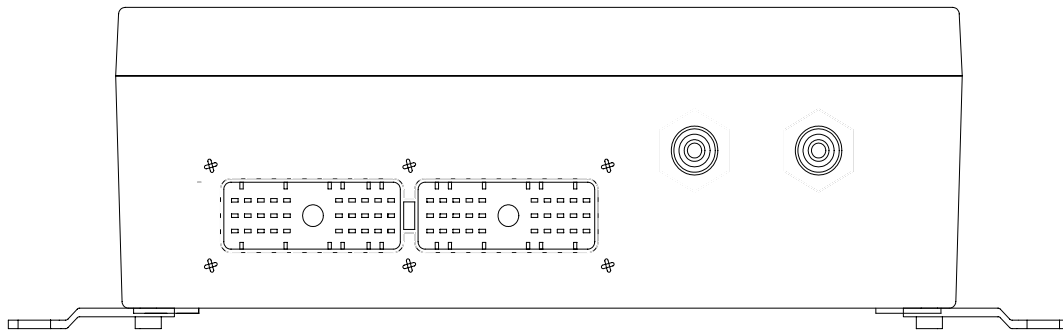
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## The Computer Unit

The MicroGuard<sup>®</sup> 500 (MG500) Computer, which is the center of the MicroGuard<sup>®</sup> 500 System, provides all of the necessary functions to read the sensors, control computations, disconnect functions, and communicate with the display console and internal bar graph.

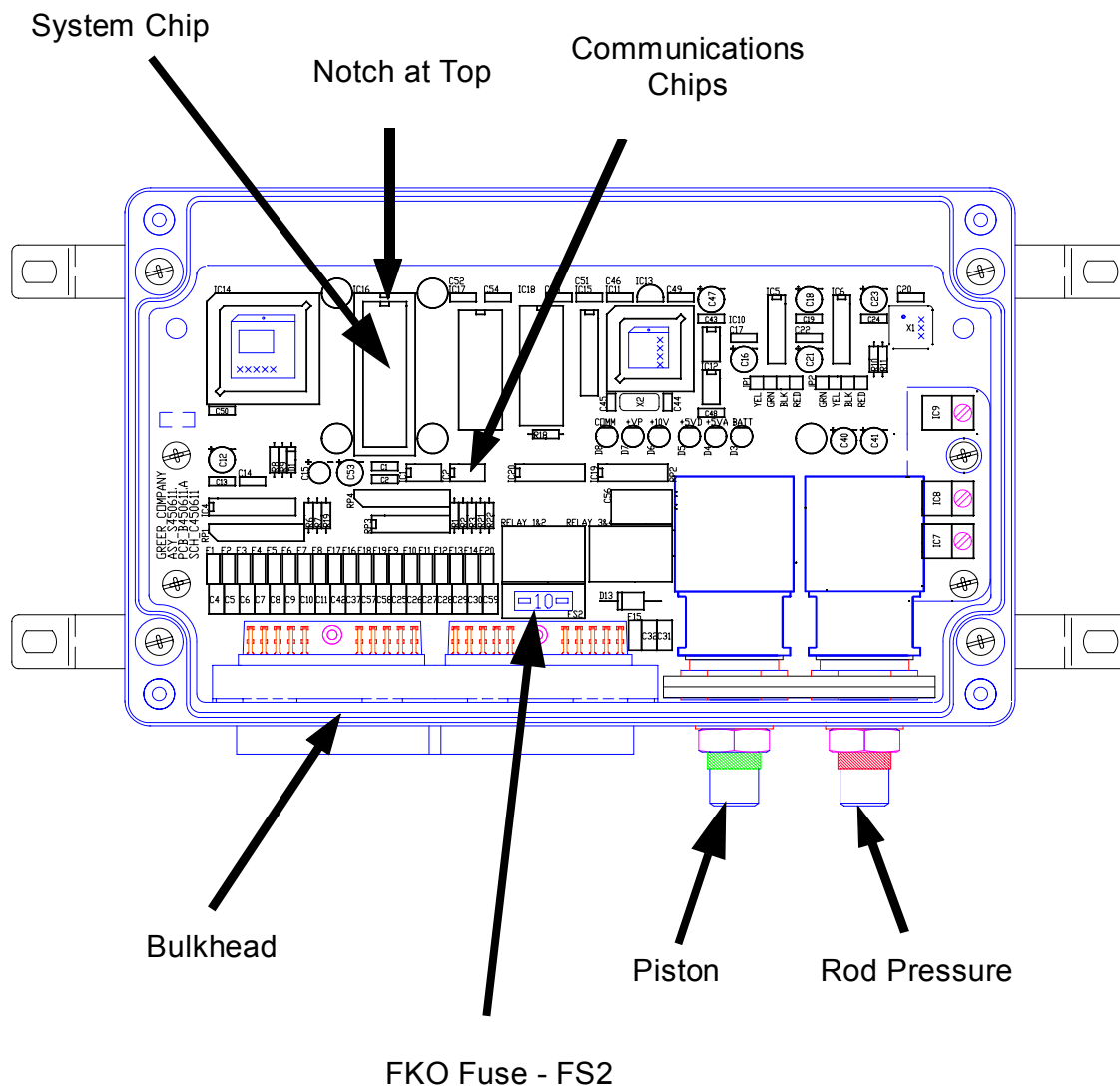
The MG<sup>®</sup> 500 computer unit connects directly to the crane wiring harness via a 60-way bulkhead connector. There are no wiring connections or screw terminals within the unit. The shapes and amounts of connections may differ depending on the “OEM” or the manufacturer furnishing the product. For example, Link Belt has “A Max” and “B Mode” operations. To understand these and other possible options, refer to the complete manual supplied by the crane manufacturer.



**Bottom View of the MicroGuard<sup>®</sup> 500 Computer**

Two hydraulic pressure transducers designed to sense pressure within the boom hoist cylinder are contained within the computer unit. These transducers, which must remain as one assembly, are pre-matched and calibrated at the Greer Company laboratory for each individual computer. Resulting information is stored on the computer board.

Should replacement of a transducer become necessary, the entire computer unit must be returned to the Greer Company factory for installation and calibration.



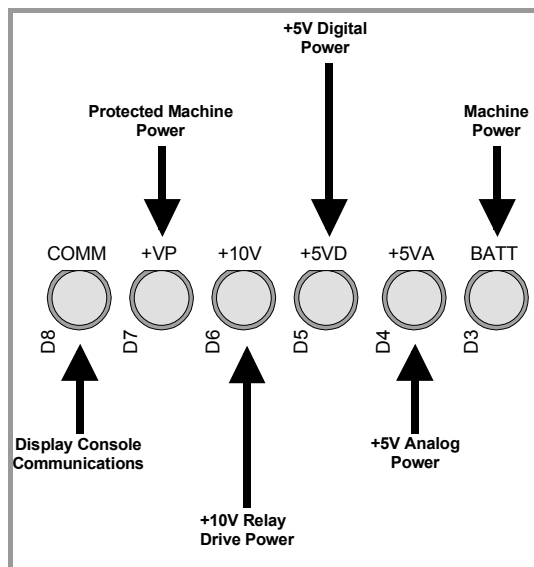
**MicroGuard® 500 Computer Components**

## The Computer Unit Continued

































The computer unit contains a row of indicators to aid in checking the power supply and communications operation within the system. Remove the lid of the computer and check these indicators, which are bright green light emitting diodes.

There are five power indicators and one communication indicator (comm). With the exception of the comm indicator, all indicators should be illuminated at the same brightness level when the system power is on.

A missing or dimly lit indicator points to a power supply problem. Check the indicator chart below for repair actions.



Remember that a short occurring in the machine wiring can be the cause of a dim or missing light as well as a burned out LED or a bad computer board. Always check the system thoroughly and watch carefully for loose or corroded connectors, water in connectors, or shorted or pinched wiring.

<b>Indicator states</b>  = Light OFF  = Light ON	<b>Actions</b>
COMM  +VP  +10V  +5VD  +5VA  BATT 	Check Crane power and circuit breaker.
COMM  +VP  +10V  +5VD  +5VA  BATT 	+VP power to display console shorted to crane ground. Check display console/bargraph cabling.
COMM  +VP  +10V  +5VD  +5VA  BATT 	+10V relay power internal short or regulator failure. Replace Computer.
COMM  +VP  +10V  +5VD  +5VA  BATT 	+5VD digital power internal short or regulator failure. Replace Computer
COMM  +VP  +10V  +5VD  +5VA  BATT 	+5VA analog power/drive to sensors. Check extension reel connection inside reel & wiring to extension reel.

## **Computer Unit Replaceable Parts**

The **Computer Unit** contains the following three parts that may be replaced in the field. Refer to the illustration on page 4.

- A **Function Kickout Fuse (FS2)** that protects the power feed to the function kickout circuit and relay contacts in case a short circuit occurs across the crane kickout solenoids. This is a standard 10 Amp Automotive Fuse that is located on the circuit board within the unit. This fuse may be replaced if error codes indicate that the function kickout power feed is missing, and/or it has been established that the crane circuit breaker is closed and power from the crane is present.

Before replacing the fuse, ensure that any electrical shorts that may have caused the failure of the original fuse have been removed.

- The **System Chip (IC16)** (also called the system program/capacity chip).
- The **Communications Chips (IC1, IC2)** communicate with the display console and are pluggable.

### **WARNING**

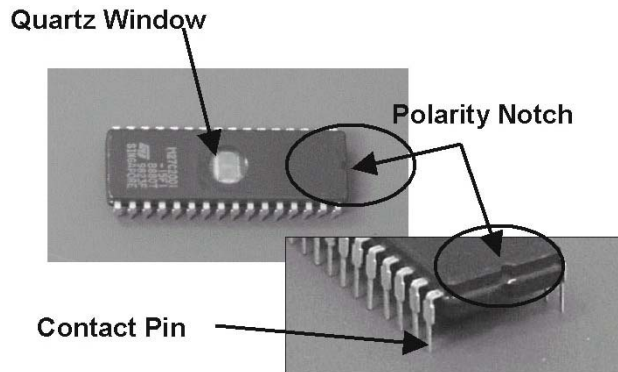
**When removing and installing the fuse, ensure that the crane power is turned off.**

## The MicroGuard® 500 System EPROM

The letters, **EPROM** stand for Erasable, Programmable, Read Only Memory. This device is generally used as a “Program” EPROM, in which case it is programmed once and entered into the system where it remains.

Programming is done through a programming console called a “Chip Burner.” The EPROM is put into the Chip Burner. With the use of a computer, the computer program is installed in the memory of the chip by address codes to provide easy recall when needed by the processor.

Looking into the quartz window of the chip, a small IC containing all of the collected information is visible. This IC is a small grid, with thousands of intersecting grid junctures where information can be burned in by a high voltage signal and memorized. This memory action operates with high voltage electrical currents passing through the programmable pin and burning a path for the storage of memory.



Removing memory after storage requires the use of an EPROM eraser, which is basically a high intensity ultra-violet light source that can discharge the currents from each of the information storage points. A highly static electrical discharge from a person touching the programming pins could result in a similar response, which has the potential for damaging one or several information storage points and/or causing computer malfunction.

### What Can Affect the Storage Capabilities of an EPROM?

- **Ultraviolet light** – exposure as a result of the tape being left off of the quartz window and the chip exposed to direct sunlight.
- **Ultraviolet oven** – exposure, in which case storage is intentionally erased.
- **A high voltage static discharge** – (usually from a human source) through the pins on the EPROM due to improper handling.
- **Improper grounding** – not grounding oneself properly before handling.
- **Transfer of an EPROM** – between two people without proper discharge. If one person's body has a higher discharge than the other person, the EPROM could be damaged.
- **Improper installation** – installed with the notch at the wrong end, which subjects the unit to power at the wrong pins.
- **Mishandling** – can cause contacts to be bent over or broken. Sometimes contact is made for a while before quitting.

## Changing EPROM Chips

### Required Tools

- Large Phillips or slotted screwdriver (for cover screws)
- Model EX-2 Chip Puller or equivalent (OK Industries)  
Do **not** use screwdrivers, pocketknives, etc.; to do so will void the warranty.

OK Industries Chip puller

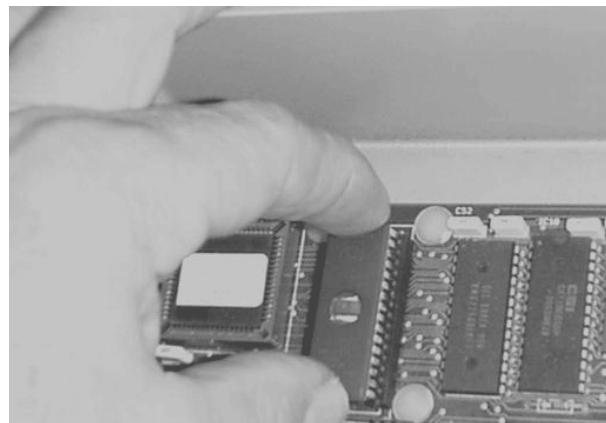


### Preparation

- Assure that power to the unit has been disconnected.
- Before handling the chips, be sure to touch the enclosure to discharge any static electricity that may be in your body.
- Locate the System chip (see illustration below). Using the Chip Puller (or equivalent), grasp and remove the existing EPROM chip.

## Installing the Program EPROM

1. Ensure that all of the legs on the EPROM are neither damaged nor bent and aligned properly within the socket.
2. Ensure that the EPROM polarity is correct with the notch positioned at the top.
3. Apply gentle pressure with two fingers (as shown) assuring that all of the legs on the EPROM are started into the correct holes in the IC socket.



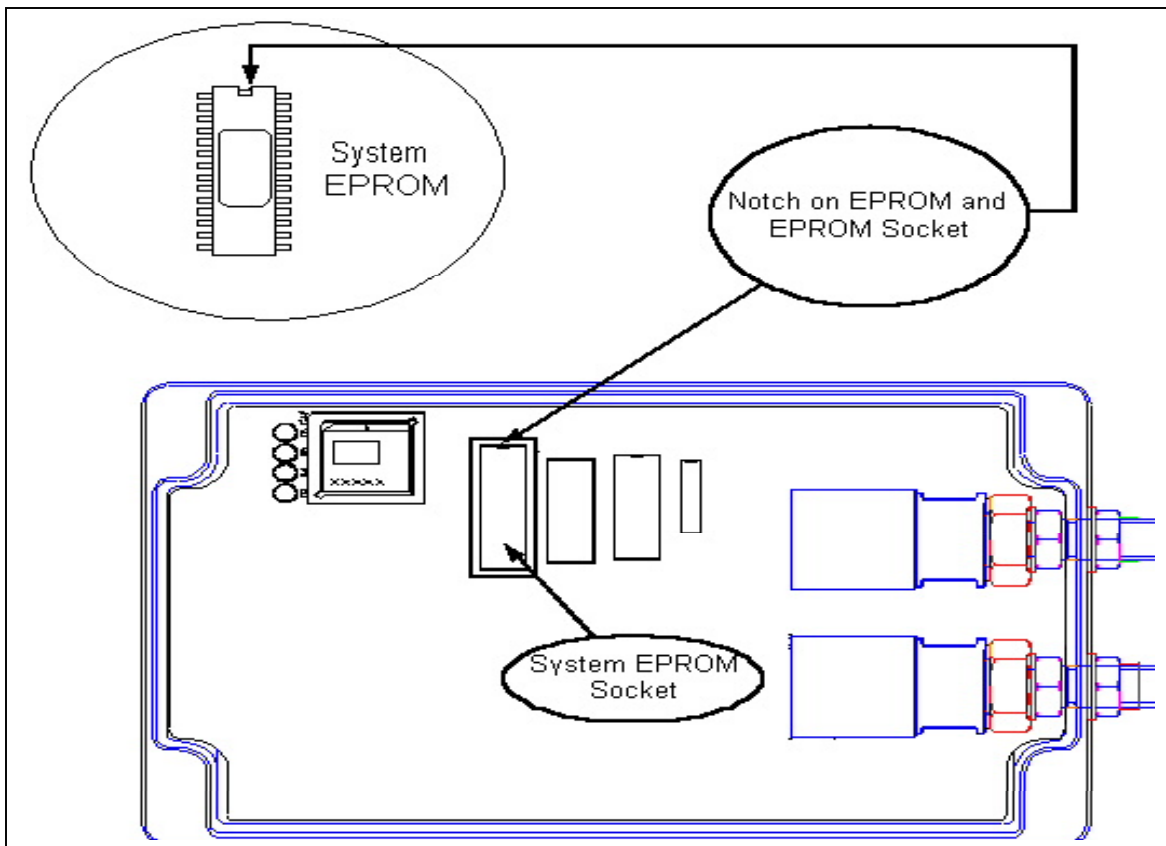
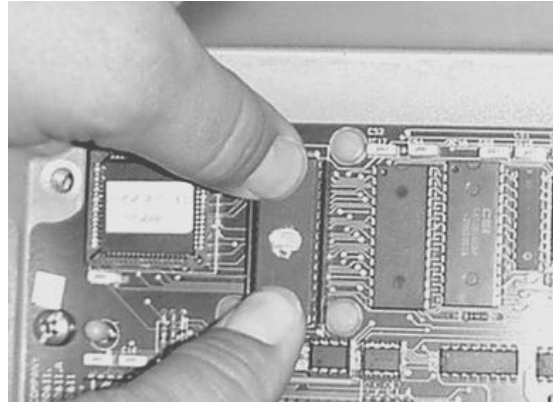
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## Installing the Program EPROM

Continued

4. Using a finger from each hand, apply equal pressure to both ends of the EPROM while fully seating it in the IC Socket.
5. Install the enclosure cover and tighten each cover screw evenly and tightly to prevent entry of moisture.
6. Reestablish any electrical connections that were disconnected in this procedure.



## **System Self-Test**

When the power is turned on or when the “TEST” button is pressed during operation, the computer and operator’s display console perform a “SELF-TEST,” which activates display functions. At this time, the operator can check the indicators for proper operation of the computer, display console, cables, and all remote sensors. The operator must be able to recognize and fully understand these indications when solving possible computer and display communication problems.

For six seconds following “power on” or activation of the TEST button (T), the display will show the following indications:

- All display segments of the bar graph display will be black (ON).
- All display segments of the load, angle, radius, length, and rated capacity windows will be black (ON), showing **188.8** or **888,800** for load and capacity.
- All green configuration lamps will be illuminated.
- The red LED indicators for overload and Anti Two-Block will be illuminated.
- The yellow LED indicator for pre-warning will be illuminated.
- The audible alarm will sound in the crane cab.
- The display will now show the crane model/chart number and the units of measurement along with the message: “SELF-TEST IN PROGRESS.”

## **Fault Reporting And Fault Codes**

**SYSTEM FAULT CODES** provide one of the most important ways to quickly locate and assess problems in the MicroGuard® System. Please review this section carefully.

Each time the system is turned on, it goes through a self-testing process lasting six seconds that automatically detects most faults in the system. During normal operation, a self-test can be initiated at any time by pressing the TEST button on the display console.

Many fault conditions are detected without a system self-test.

Faults detected in the system during the self-test, are indicated on the display console in the following ways:

- **The RED OVERLOAD LAMP** will illuminate.
- **The AUDIBLE ALARM** will sound.
- **“WARNING SYSTEM FAULT!”** will be displayed at the bottom of the text window.

Fault codes can be displayed on the display console. To view the codes, press and hold the **“TEST”** button and wait for the system to complete the self-test. Do not release the **TEST** button. Fault codes will now be displayed at the bottom of the text window for as long as the **TEST** button is held down.

<b>FAULTS- A000 B000 C000 D000</b>
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<b>ALWAYS INVESTIGATE FAULTS IN THE “B” AND “C” GROUPS FIRST, THEN CONTINUE WITH “A” AND FINALLY “D” GROUP FAULTS.</b>
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## Sample Fault Code Table

Below is an error code table taken from the maintenance manual. The fault codes, consisting of 3 digits, appear in the far left column. The next 5 columns, define the error. The Action column on the right gives the section and paragraph of the maintenance manual that will lead through a series of checks to define and/or resolve the problem.

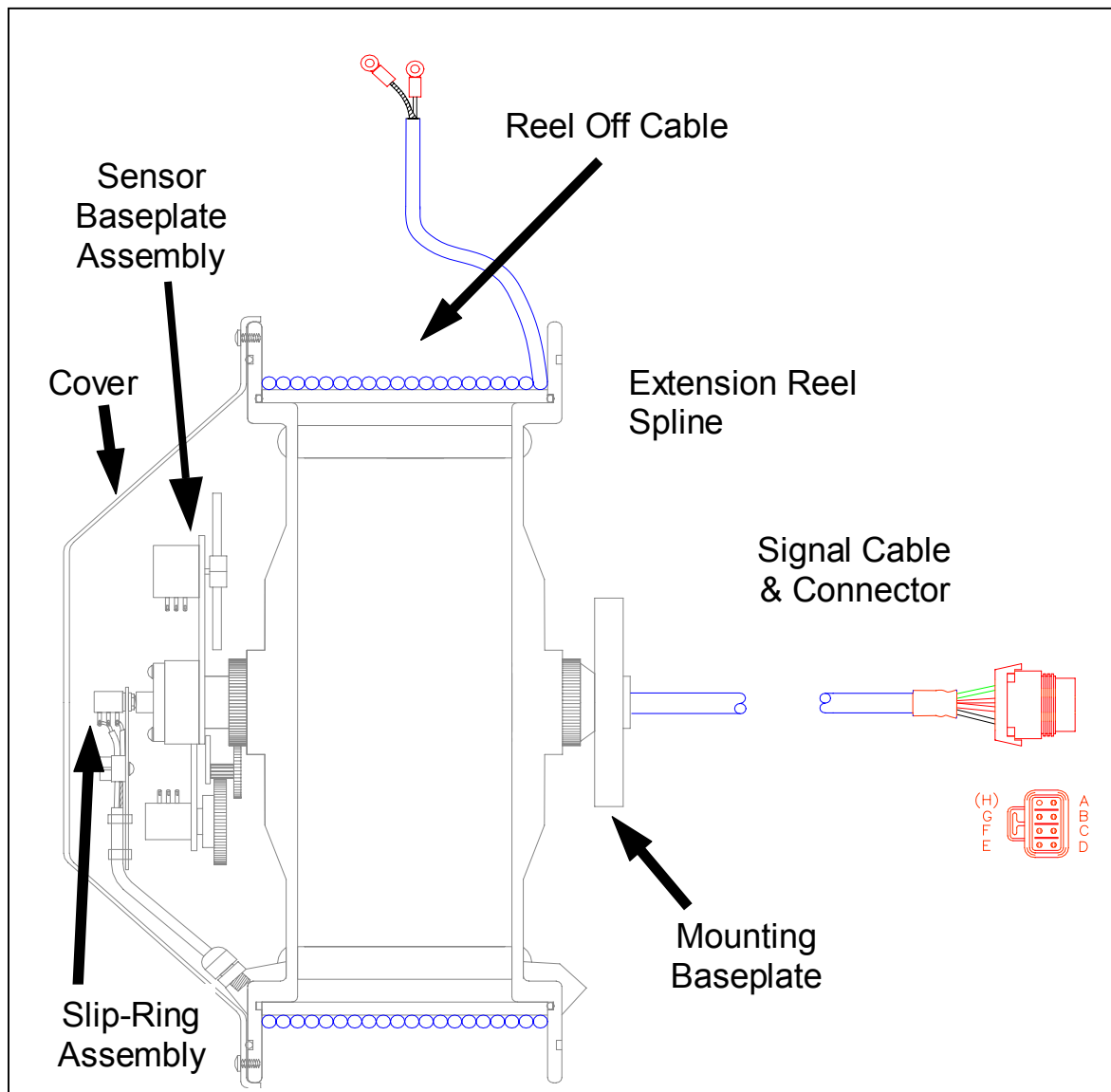
It is always best to resolve sensor faults first. All sensors are defined and have procedures in the maintenance manual.

FAULT CODE "A"	Swing Sensor	Boom Angle Sensor	Extension Sensor	TX 1 Rod Pressure	TX 0 Piston Pressure	ACTION
016	X					Follow SECTION 9
017	X				X	Replace computer
018	X			X		
019	X			X	X	
020	X		X			Follow SECTIONS 6.3, 6.4 & 9
021	X		X		X	Replace computer
022	X		X	X		
023	X		X	X	X	
024	X	X				Follow SECTIONS 6.7, 6.8 & 9
025	X	X			X	Replace computer
026	X	X		X		
027	X	X		X	X	
028	X	X	X			Follow SECTIONS 6.3, 6.4, 6.7, 6.8 & 9
029	X	X	X		X	Replace computer
030	X	X	X	X		
031	X	X	X	X	X	Follow SECTIONS 6.3, 6.4, 6.7, 6.8 & 9
<b>032 &amp; Higher</b>	Internal Temperature Sensor Fault Replace Computer					

## Extension Reel Overview

The primary operation of the **Extension Reel** is to measure the extension of the telescoping sections of the main boom. The extension reel also includes an angle sensor to measure the main boom angle, and an electrical slip-ring, which transfers the Two-Block signal from the reel-off cable to the system computer.

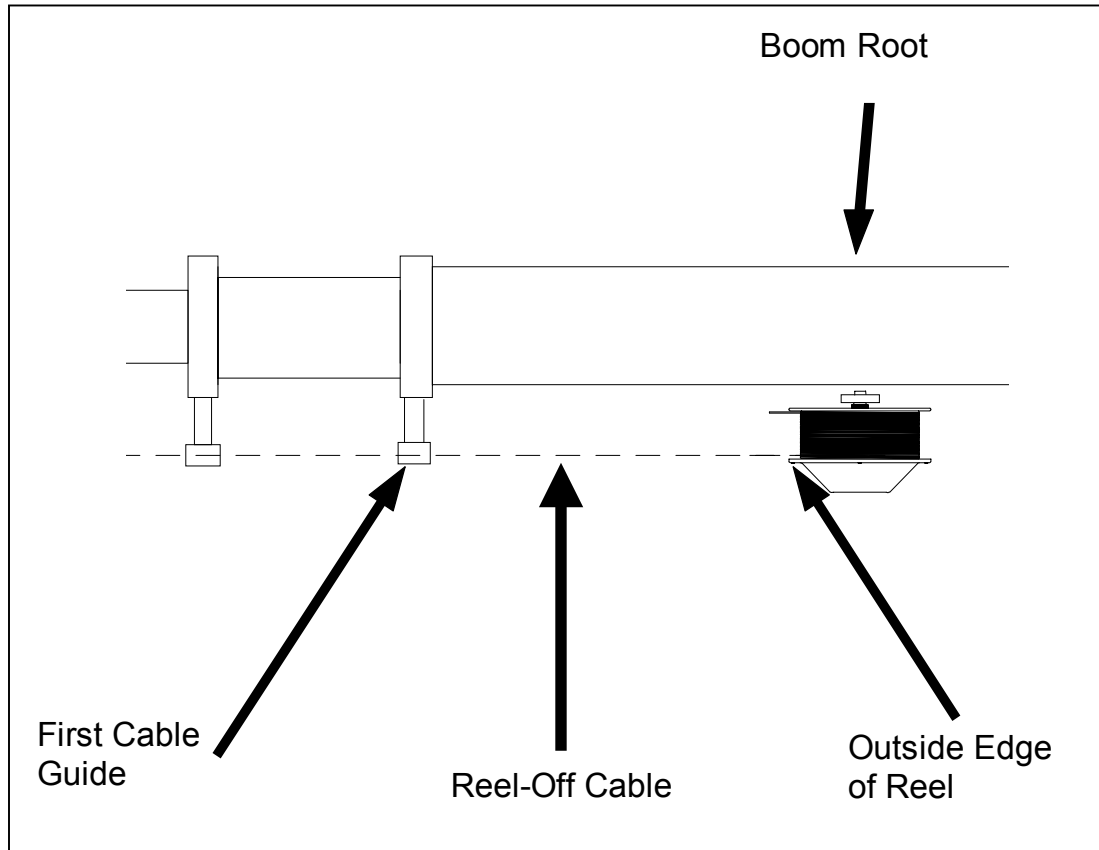
The extension reel is designed to provide an accurate measurement of extension and angle. It is important that the setup and maintenance of these devices be properly carried out following the procedures contained within this manual. Incorrect maintenance will result in system calculation errors.



### Checking the Reel-Off Cable Layering

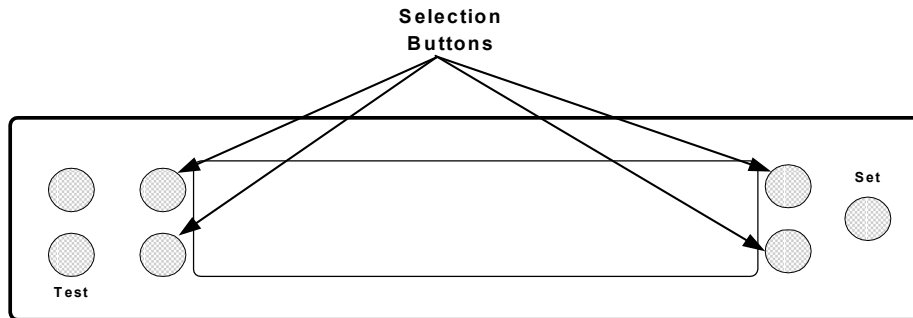
The extension reel is designed to provide an accurate measurement of boom extension when the **Reel-Off Cable** forms a single flat layer across the surface of the extension reel as the boom is telescoped out and then retracted. Any stacking of the cable will cause extension errors as the boom retracts. Telescope the boom fully out and then fully retract the boom.

- Check that the reel-off cable forms a flat single layer across the surface of the extension reel with each successive turn of cable laying next to the last.
- If any stacking or build-up of the cable occurs, make sure that the first cable guide at the top of the boom root section is correctly aligned with the outside edge of the extension reel, as shown below. Clean the reel-off cable and then lubricate it with silicone oil.



## RCI 510 System Setup

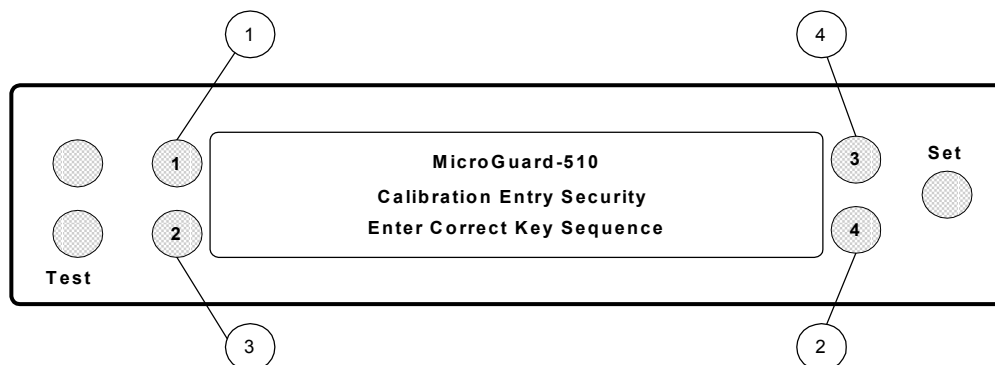
The RCI 510 operator console is the tool used to communicate with the MG<sup>®</sup>500 System computer. Anytime a computer is replaced, a setup procedure must be performed. The display console has a series of buttons that are used for this purpose. They are as shown below.



To set up the computer properly, data relating to boom length and boom angle must be input into the computer memory to calculate items such as boom length and boom angle.

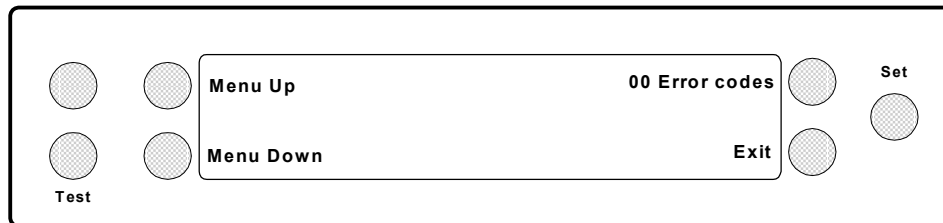
The computer must be programmed to start at the "0" zero point and to stop at the outside limits of the span routine. To enter this information into the computer, access the Calibration Mode and the calibration routines as follows.

1. Push and hold the **"Test"** and **"Set"** buttons simultaneously to enter the Calibration Mode. Continue to hold both buttons down until the system asks for a calibration "password" or "code." Within 5 seconds, press the buttons called out below in this sequence: **1234**.

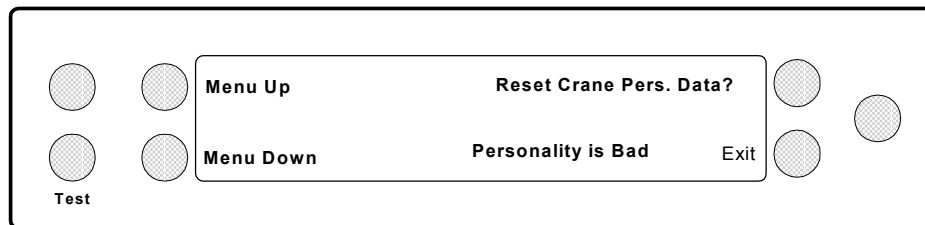


## RCI 510 System Setup continued

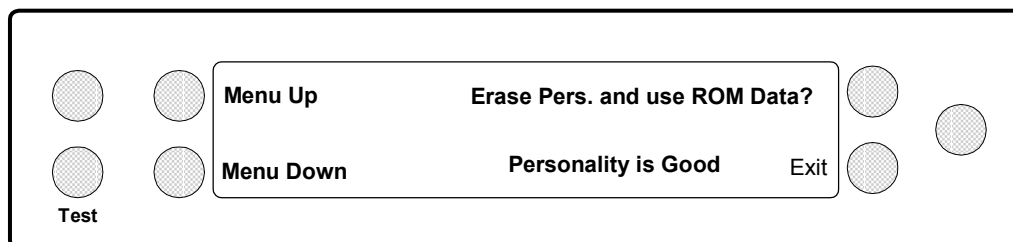
- Once the calibration Security Code is entered, the screen will read: "Entering Calibration Mode..." and will then revert to the screen below.



- Press Menu Up to 01 Crane data. The screen should read: **"Personality is Bad,"** as shown below. If so, continue to the next page. If not, continue below.



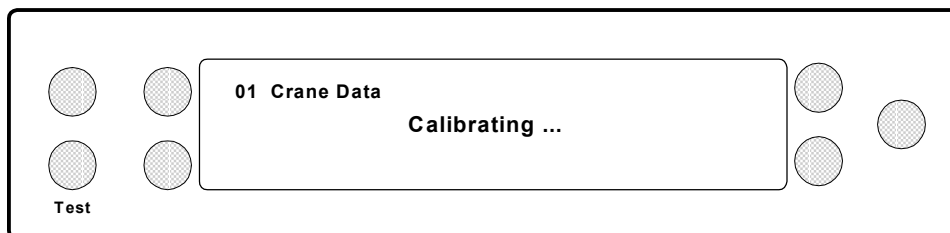
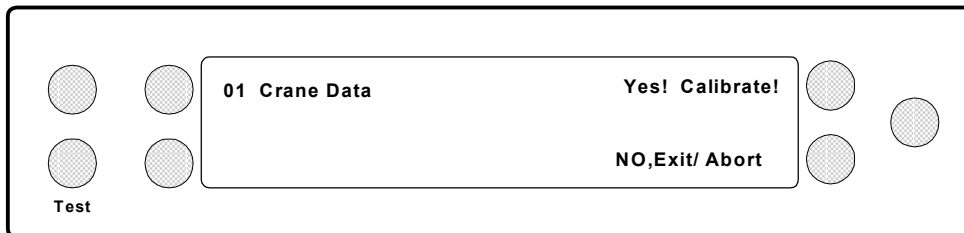
- If information has been copied to the **"Personality"** chip, the unit will read: **"Personality is Good."** In this case, press the Menu Up button.
- The screen should then ask, "Erase Pers. and use ROM data?" as shown below. Press the button next to "Erase Pers. and use ROM data?" The system will verify that you want to erase data and will ask for the **calibration entry code:1234** (see page 15). Continue to the next page.



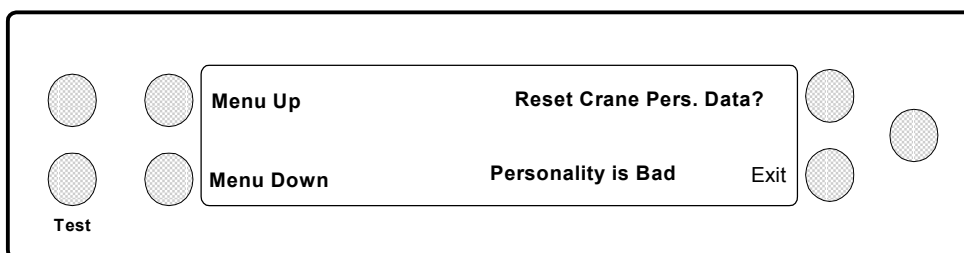


**RCI 510 System Setup** continued

6. Push the button next to **“Yes! Calibrate!”** The system will ask for the security code (1234) for a second time. The screen action will appear as shown below.



After completion of the crane data erase steps above, the screen should read:  
**“Personality is bad”** as shown below.

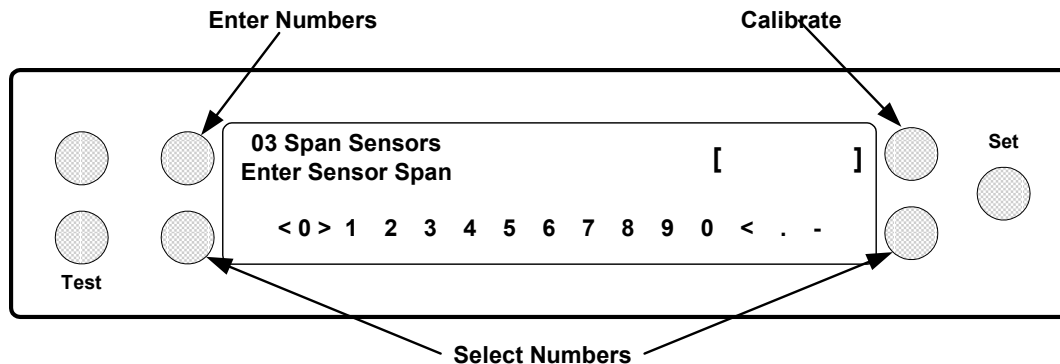


7. Press the button next to **“Exit”** to exit the routine.

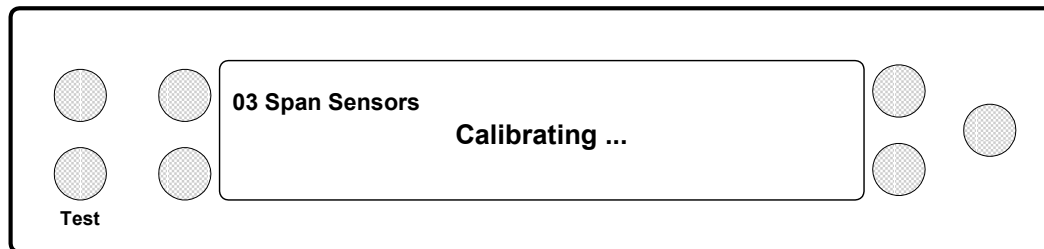
## Zero and Span Setup Routines

It is now possible to complete all of the calibration setup routines required for calibration of a new computer system. Pressing the Menu Up and Menu Down selection buttons provide easy access to the calibration routines. The routines most frequently accessed for this purpose are the **02 “Zero Sensors,”** the **03 “Span Sensors,”** and the **04 “Swing Potentiometer.”**

The **“Zero”** sensor routine is used to identify the start of the function, i.e. a place to start the measurement. **Example:** The fully retracted boom, or boom at 0 °(zero degrees).



1. Enter the length or angle calibration numbers and touch the calibration button. The screen will read: **“Calibrating”** as below.



2. The boom angle or length window on the display will read the actual angle or length. This completes this portion of the calibration process.

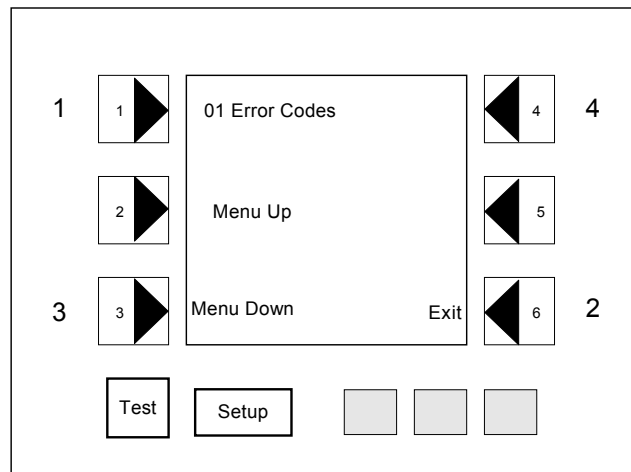
## RCI 434 System Set Up

The calibration screen can be employed as a great troubleshooting tool, as well as being the platform used in the calibration of the RCI 434 System. As such, **this tool should be used cautiously and carefully.** Making adjustment to Radius Moment or any other adjustments is prohibited, unless authorized by the Greer factory.

**Should the computer need to be replaced,** specific calibration procedures are required, which provide parameters for the “0” (zero) and Span values for extension, boom, and swing. These values can be easily set. This setup procedure usually takes 30 to 45 minutes to perform. Also, the Personality chip in the new computer will be blank making it is necessary to copy the program to the blank personality chip. This action, called “Data Reset,” is accessed from the “01” Command called “Crane Data.”

### The Calibration Mode and the Calibration Security Code

To use the calibration screen, the operator must first enter the Calibration Mode and the Calibration Security Code into the system.



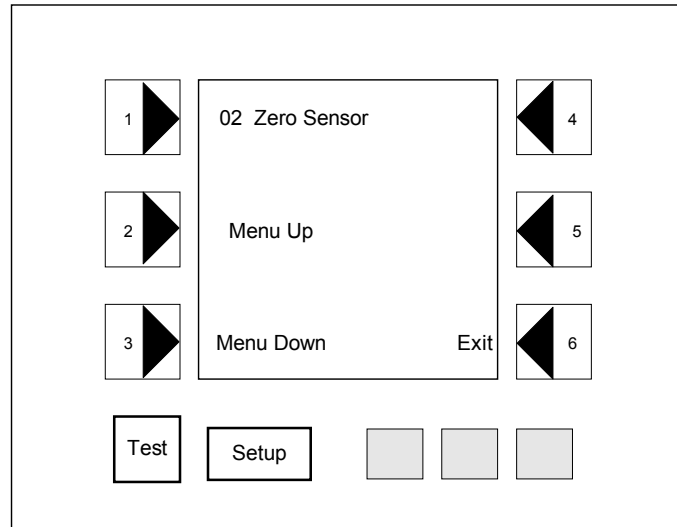
Simultaneously press and hold the **“Test”** and **“Setup”** buttons on the display until the screen requests the **“Cal Seq” (calibration security code)**. Using the display shown here, press the **corner** buttons identified here as 1,2,3,4 in that order within 5 seconds of the request. If this entry is delayed or the sequence is wrong, the computer will return to a working screen and the Calibration Mode will need to be reentered and the process repeated.

After accessing the Calibration Mode, the first menu that will be shown is “00” Error Codes. Press button number 1 to scroll to other error codes. These codes will remain on the screen until number 6 Exit is selected; the screen will then return to the main menu.

Press buttons 2 or 3 to scroll from one menu to the next. The screens and procedures used in the setup of a new computer are shown on the following pages.

**RCI 434 System Set Up** continued

The MG® 500 Computer Unit works in conjunction with the operator's display console to relay information from the operator to the computer and to assist the computer in supplying complex calculations used in the calibration process. Whenever a computer is replaced, setup information and crane data reset information must be processed before the crane can be used. The operator enters the new data via press-buttons on the display console.

**Setting Zero's in the new**

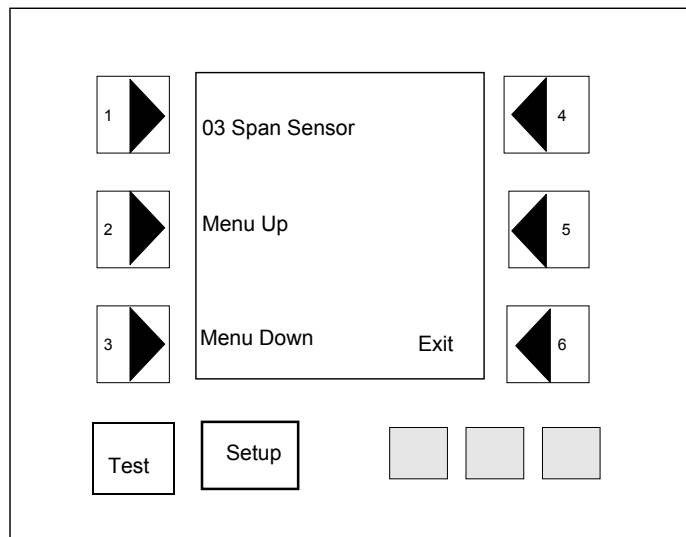
**system** When a problem is encountered and the computer replaced, setting zero's for computer calculation is essential. If the computer does not know where to start, it cannot do an accurate calibration of where the boom is and how long it is.

To set "Zero" settings, press the Menu Up, or Menu Down button to access the "Zero Sensor" routines. This is a multi-level menu that allows the operator to set zero points for boom and extension functions. Upon accessing the Zero Sensor menu, press button 1 and the sensor identification menu will appear. The Sensors will be labeled by sensor number (Sensor 2 = Extension and Sensor 3 = Boom Angle).

**Setting Spans in the New System**

Setting the spans for the computer to use in calculations is equally important. Spanning assures that the system potentiometers read movements of the boom up and down function, or telescoping out or retracting and are scaled appropriately.

Once the zero point is set, exit out of the zero command and scroll to menu # 3 "Span Sensor." Again, this is a multi-



layered menu and will allow insertion of span values into the system for proper calibration. If the proper values for the extension span are unknown, either measure them, or contact the factory for help, as the proper value is critical to proper machine operation.

## Setting Zero and Direction on Rotation

Before the computer can correctly determine which load chart to use, it must know the relationship of the upper structure to the base crane structure. This is done using a "Swing Pot" mounted on the center swivel in the turret. This pot sends a continuous signal to the computer at all times so that the proper load chart is in effect for the area in which the lifting is to take place. Remember, if the computer does not have this information, it will send an error code, reading:

**"I can't find a Load Chart!!"** and the system will immediately shut down. Setting the "0" (zero) on the swing pot is simple. Put the unit in the stowed position and utilize the "house lock." Then scroll to menu #4 Swing Pot. Press button #1. The system will scroll to the swing zero menu shown to the right. When the unit is in the "zero" or "locked down" position, the display should read "0" under swing and "0" on the console. If it does not, press the number 1 button beside Zero = and the computer will adjust to make the swing pot read zero. The computer will automatically span the pot. There will be no need for spanning. Lift the lock and rotate to the right. Make sure that displays count up.

