GREER COMPANY

MICROGUARD® 434
CALIBRATION PROCEDURE
LINK BELT MODELS
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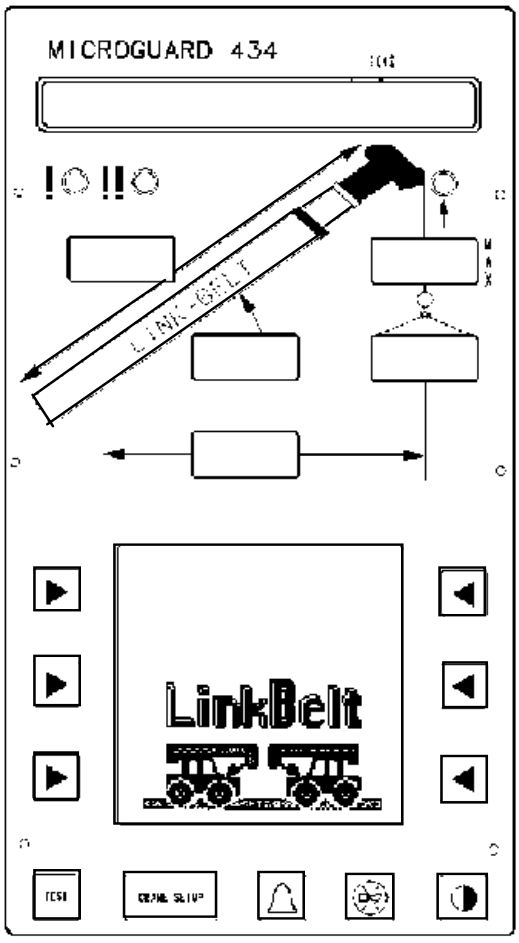
GENERAL INFORMATION

After satisfactory installation of the complete system, ensure that it is correctly wired in accordance with the appropriate Wiring Diagram found in the installation manual.

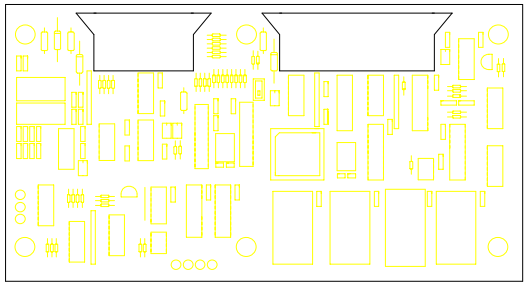
Before carrying out any crane operations ensure that the machine is on firm and level ground and that the outrigger beams are fully extended and jacks are correctly extended to level the carrier.

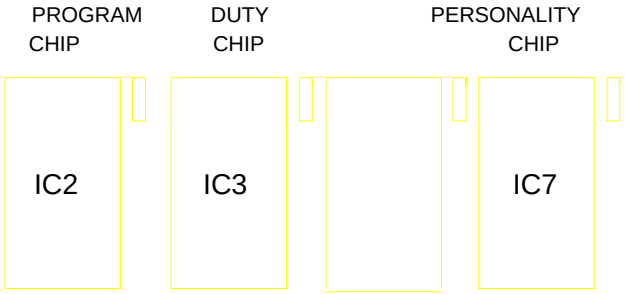


Throughout the procedure care must be taken not to exceed any structural or stability limits.

All attachments which can be optionally stowed or erected on the boom during normal operation e.g. aux. head, fly or jibs must be removed prior to calibration of the main boom.

The computer must be fitted with the appropriate program and duty chips as specified. They are specified as follows.





WARNING

POWER TO THE SYSTEM SHOULD BE SWITCHED OFF BEFORE INSERTING OR REMOVING ANY INTEGRATED CIRCUITS. FAILURE TO OBSERVE THIS PRECAUTION MAY CAUSE PERMANENT DAMAGE TO THE SYSTEM OR ITS COMPONENTS AND RESULT IN THE LOSS OF CALIBRATION DATA.

WARNING

WHEN THE SYSTEM IS IN THE CALIBRATION MODE THE AUDIBLE ALARM AND FUNCTION KICK-OUTS ARE INHIBITED AND THERE IS NO PROTECTION FROM OVERLOAD. ALL CRANE OPERATIONS ARE AT THE SOLE DISCRETION OF THE OPERATOR.

CALIBRATION PROCEDURES

The Display Unit provides the interface between the user and the calibration program. The user communicates with the program interactively using a keypad. The displays provide information and data to enable the calibration to be carried out using only on screen prompts.

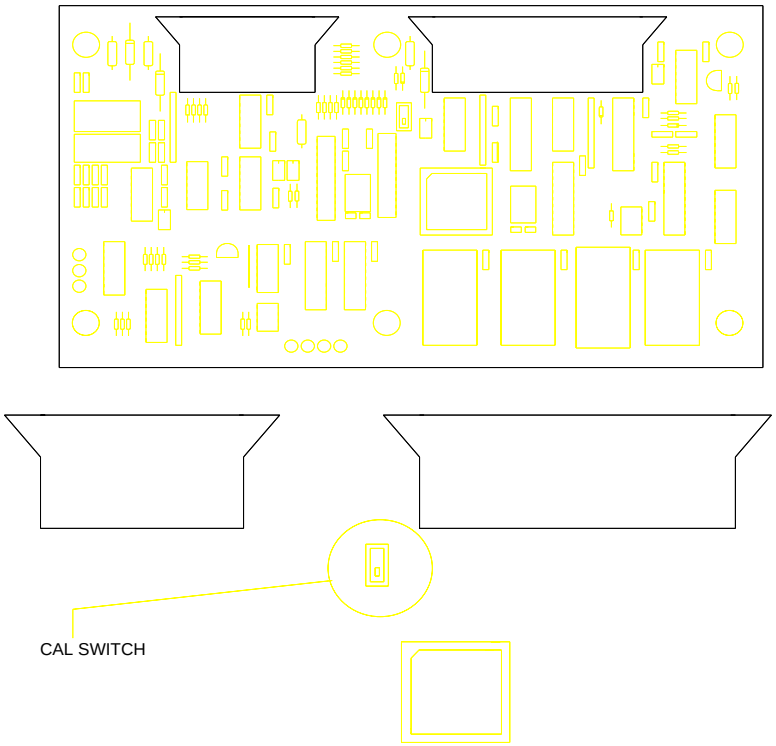
Data entry is achieved by the use of six selection keys located around the graphics panel.

Access to calibration routines is achieved by simultaneously pressing and holding the **CRANE SETUP** and **TEST** keys for approximately 2 seconds. At that point the display will request entry of the calibration entry security code.

The security code is entered by the consecutive pressing of the selection keys which **MUST** be in the following sequence; UPPER LEFT, LOWER RIGHT, LOWER LEFT, UPPER RIGHT.

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 restarted.

Calibration procedures will only work with the CAL switch in the computer set to the CAL position. To gain access to the CAL switch it is necessary to remove the cover from the computer assembly. The switch is located near to the center of the computer board just between and below the ribbon cable connectors.



COMMAND 00 RUN

Following correct entry of the calibration code then the system will be in the MONITOR mode and will be at Command 00 Run. Execution of this command will cause the system to carry out a system TEST and return to the working screen.

COMMAND 01 PERSONALITY

The Personality command is used to manipulate the crane calibration data.

The system has storage space for two sets of data in the EEPROM IC7. The active personality is the data actually used by the main program. The second set of data is a "back-up" personality which is used to keep a protected copy of the calibration data.

For convenience the sets of personality data are called:-

"A" the Active personality in IC7
"B" the Backup personality in IC7

The command provides the following functions;

- display the status of the personality sets.
- move data between the two sets
- delete data from the active personality.
- copy data to a back-up chip
- retrieve data from a back-up chip.

When the command is first selected and after copying data, both "A" and "B" sets are checked for correct check-sum. This is indicated by "good" or "bad" beside the respective reference in the display. Set "A" is also checked against set "B". If the data is identical this is indicated by "same" or if not the same by "diff". Moving of data is by means of sub-commands selected and a special [CAL] sequence. This requires the entry of a code which is the same as the one used to enter the calibration routines and provides adequate opportunity to abort the procedure. This is necessary because some of the sub-commands cause previously entered data to be irretrievably lost.

SUB-COMMAND 0	SAVE	Saves "A" into "B". (B data is lost)
SUB-COMMAND 1	XCHG	Exchanges "A" with "B" (data is not lost)
SUB-COMMAND 2	INIT	Initializes "A" prior to new calibration (A data is lost).
SUB-COMMAND 3	BACK	Copies the active calibration to a back-up chip (data is not lost).
SUB-COMMAND 4	RETR	Retrieves the calibration from a back-up chip.

WARNING

POWER TO THE SYSTEM SHOULD BE SWITCHED OFF BEFORE INSERTING OR REMOVING ANY INTEGRATED CIRCUITS. FAILURE TO OBSERVE THIS PRECAUTION MAY CAUSE PERMANENT DAMAGE TO THE SYSTEM OR ITS COMPONENTS AND RESULT IN THE LOSS OF CALIBRATION DATA.

WARNING

If the system has been previously calibrated and the intention is only to access data or change only a portion of the previous calibration then DO NOT perform the initialization process which follows otherwise the entire previous calibration data will be lost.

ENTRY TO CALIBRATION ROUTINES

START THE ROUTINE BY PRESSING AND HOLDING FOR APPROXIMATELY 2 SECONDS	**CRANE SETUP** AND **TEST**
FOLLOW THE **CAL** ENTRY SEQUENCE	**UPPER LEFT, LOWER RIGHT, LOWER LEFT, UPPER RIGHT**

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 restarted. Before the first calibration of a new system prepare the Personality Memory by the use of the following sequence.

CAUTION

THIS PROCEDURE TRANSFERS PRE-CALIBRATED DATA TO THE PERSONALITY CHIP. **IF** THIS HAS ALREADY BEEN CARRIED OUT AND THE INTENTION IS TO ONLY PARTIALLY CALIBRATE OR TO MODIFY CALIBRATION OR DATA IN AN ALREADY CALIBRATED SYSTEM, **DO NOT** CARRY OUT THE INITIALIZE ROUTINE. PROCEED DIRECTLY WITH THE CALIBRATION.

COMMAND 01/2 INITIALIZE

SCROLL TO **01 PERSONALITY** BY PRESSING	CORRESPONDING SELECTION KEY **MENU UP** OR **MENU DOWN**
START THE COMMAND BY PRESSING	CORRESPONDING SELECTION KEY
SCROLL TO **01/2 INITIALIZE** BY PRESSING	CORRESPONDING SELECTION KEY **MENU UP** OR **MENU DOWN**
START THE COMMAND BY PRESSING	CORRESPONDING SELECTION KEY
YES! CALIBRATE OR NO, EXIT/ABORT	CORRESPONDING SELECTION KEY
CALIBRATION SEQUENCE	**UPPER LEFT, LOWER RIGHT, LOWER LEFT, UPPER RIGHT**
AFTER THE MESSAGE CALIBRATING **EXIT** BY PRESSING	CORRESPONDING SELECTION KEY TO **EXIT**

The system will return to the MONITOR mode but will remain in the calibration routine.

NOTE

This procedure completely erases all previous data from the A personality. There is an opportunity to ABORT *the procedure at this point by use of NO, EXIT/ABORT selection key. Continuing will erase the memory from the A personality.*

COMMAND 01/0 SAVE

On completion of a calibration it is necessary to carry out Command 01/0 SAVE and this is referred to at the end of this manual. There is no reason, however, why this command should not be used at any time during the intermediate stages of a calibration, for example at the end of a period of work or if desired after each section of a calibration has been completed. The use of this command will ensure that a copy of the calibration, up to the point of carrying out "save", will be contained in the back-up memory.

SCROLL TO **01 PERSONALITY** BY PRESSING	CORRESPONDING SELECTION KEY **MENU UP** OR **MENU DOWN**
START THE COMMAND BY PRESSING	CORRESPONDING SELECTION KEY
SCROLL TO **01/0 SAVE** BY PRESSING	CORRESPONDING SELECTION KEY **MENU UP** OR **MENU DOWN**
START THE COMMAND BY PRESSING	CORRESPONDING SELECTION KEY
YES! CALIBRATE/ NO, EXIT/ABORT [NOTE]	CORRESPONDING SELECTION KEY
FOLLOW THE **CAL** ENTRY SEQUENCE	**UPPER LEFT, LOWER RIGHT, LOWER LEFT, UPPER RIGHT**
AFTER THE MESSAGE "CALIBRATING" THE DISPLAY WILL READ "A" GOOD "B" GOOD SAME	
EXIT BY PRESSING	CORRESPONDING SELECTION KEY **EXIT**

NOTE

This procedure completely erases all previous data from the B personality. There is an opportunity to ABORT *the procedure at this point by use of the NO,EXIT/ABORT Command, continuing will erase the memory.*

COMMAND 02 TEST/FAULT

THIS COMMAND IS USED TO CARRY OUT THE EXECUTION OF A SYSTEM SELF TEST AND DETECT AND DISPLAY ANY ERRORS PRESENT IN THE SYSTEM. THESE ERRORS ARE SHOWN BY MEANS OF AN ERROR CODE.

Carry out the command by use of the following sequence:-

SCROLL TO **02 TEST/FAULT** BY PRESSING	CORRESPONDING SELECTION KEY **MENU UP** OR **MENU DOWN**
START THE COMMAND BY PRESSING	CORRESPONDING SELECTION KEY
THE SYSTEM WILL EXECUTE A SELF-TEST AND DISPLAY FAULT CODES	
EXIT FROM THE ROUTINE BY PRESSING	CORRESPONDING SELECTION KEY TO **EXIT**

FAULT CODES

GROUP "A" ANALOG SENSORS

CODE

AAA		
000		NO FAULTS
001	SENSOR 0	PISTON PRESSURE TRANSDUCER
002	SENSOR 1	ROD SIDE 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
08	FAULT 8	2 HZ OSCILLATOR

NUMBER ENTRY

The MicroGuard 434 series computers do not have number entry keys. A special number entry procedure is used to allow the simple entry of numbers. When numerical entry of data is required the display will change to allow the entry of numbers. There are 4 categories in the display. and these are as follows;

•	SELECTS A DECIMAL POINT
0	SELECTS A DIGIT 0-9. THE CORRESPONDING ROW KEYS ARE USED TO CHANGE A NUMBER
▫	MINUS SIGN
C	CLEARS A CURRENTLY DISPLAYED NUMBER

If the number entry is to be **negative** the minus sign must be selected first.
When the number entry is started the display is flashing the number surrounded by < >.

<0> 1 2 3 4 5 6

Numbers are selected by use of the corresponding row selection keys. When the required number has been selected it is entered by use of the corresponding selection key. Successive numbers up to a total of five digits will be entered in this way. Five digits are required for the system to engage the calibration sequence (Example; 5.6 would be entered as 5.6000). If a number requires a decimal point this is entered by moving the < > to the decimal point by means of the corresponding row selection keys.The decimal point then becomes enclosed.

7 8 9 < **<•>** ▫ C

The decimal point is entered by use of the corresponding selection key. Enter the number and then move the cursor to flash the minus sign using the corresponding row selection key.

7 8 9 < • **<▫>** C

Press corresponding selection key to change to a negative value. If an error is made in the entry of data then move the cursor to flash the **C** using corresponding row selection key.

7 8 9 < • ▫ **<C>**

Press corresponding selection key to delete the erroneous number, move the cursor back to the entry of digits and enter the correct number.

NUMBER ENTRY (continued)

IN THE EXAMPLE WHICH FOLLOWS AN ARBITRARY NUMBER OF **MINUS 123.45** HAS BEEN CHOSEN TO ILLUSTRATE THE USE OF THE PROCEDURE.

MOVE THE CURSOR TO THE CHANGE SIGN **< □ >** BY PRESSING	CORESPONDING ROW SELECTION KEY
SELECT THE MINUS SIGN BY PRESSING	CORRESPONDING SELECTION KEY
SELECT THE FIRST DIGIT **< 1 >** BY PRESSING	CORESPONDING ROW SELECTION KEY
WHEN AT **< 1 >** PRESS	CORRESPONDING SELECTION KEY
SELECT THE SECOND DIGIT **< 2 >** BY PRESSING	CORESPONDING ROW SELECTION KEY
WHEN AT **< 2 >** PRESS	CORRESPONDING SELECTION KEY
SELECT THE THIRD DIGIT **< 3 >** BY PRESSING	CORESPONDING ROW SELECTION KEY
WHEN AT **< 3 >** PRESS	CORRESPONDING SELECTION KEY
MOVE THE CURSOR TO THE DECIMAL POINT **< ▪ >** BY PRESSING	CORESPONDING ROW SELECTION KEY
ENTER THE DECIMAL POINT BY PRESSING	CORRESPONDING SELECTION KEY
SELECT THE FIRST DECIMAL PLACE **< 4 >** BY PRESSING	CORESPONDING ROW SELECTION KEY
WHEN AT **< 4 >** PRESS	CORRESPONDING SELECTION KEY
CONFIRM CALIBRATION PRESS	CORRESPONDING SELECTION KEY **YES** OR **NO**

COMMAND 03 ZERO

The Zero Command permits the calibration of the zero of most analog sensors. There are four sensors which can be zeroed by the use of command 03. Each sensor is allocated a number which corresponds to the input to which it is connected in the system.

These are as follows:

- Piston side pressure transducer Input Tx.0
- Rod side pressure transducer Input Tx.1
- Boom extension sensor Analog input 2
- Boom angle sensor Analog input 3.

The swing sensor has its own routine and is calibrated using command 05.

ZERO PRESSURE TRANSDUCERS

- Lower the boom onto its lower end stops (boom hoist cylinder fully retracted).
- Stop the hydraulic pump and re-connect electrical power to the system.
- With the boom hoist cylinder fully retracted ensure that no pressure remains in the boom hoist cylinders by de-pressurizing the hydraulic tank and opening the hydraulic lines to the pressure transducers.
- With the pressure transducers open to atmosphere calibrate the zero of the piston and rod pressure transducers by use of the following sequence:

SCROLL TO **03 ZERO** BY PRESSING	CORRESPONDING SELECTION KEY **MENU UP** OR **MENU DOWN**
START THE COMMAND BY PRESSING	CORRESPONDING SELECTION KEY
SCROLL TO **Tx.0** BY PRESSING	CORRESPONDING SELECTION KEY **MENU UP** OR **MENU DOWN**
CONFIRM SELECTION OF THE SENSOR BY PRESSING	CORRESPONDING SELECTION KEY
THE DISPLAY WILL READ	**Tx.0 = XXX** (actual input)
START THE CALIBRATION OF **Tx.0** BY PRESSING	CORRESPONDING SELECTION KEY **YES** OR **NO**
THE DISPLAY WILL READ	**Tx.0 = 0** (zeroed input)

(continued)

ZERO (continued)

SCROLL TO **Tx.1** BY PRESSING	CORRESPONDING SELECTION KEY **MENU UP** OR **MENU DOWN**
CONFIRM SELECTION OF THE SENSOR BY PRESSING	CORRESPONDING SELECTION KEY
THE DISPLAY WILL READ	**Tx.1 = XXX** (actual input)
START THE CALIBRATION OF **Tx.1** BY PRESSING	CORRESPONDING SELECTION KEY **YES** OR **NO**
THE DISPLAY WILL READ	**Tx.1 = 0** (zeroed input)
EXIT FROM THE ROUTINE BY PRESSING	CORRESPONDING SELECTION KEY **EXIT**

Re-connect all hydraulic lines and re-install the tank pressure relief valve before resuming crane operation.

ZERO EXTENSION SENSOR

The Extension Sensor is fitted with 130 ft. of shielded 2-wire cable. The cable **cannot** be shortened to accommodate varying boom lengths and the following method of pre-tensioning is recommended.

- Fully retract all the boom sections.
- Pre-tension the reel by use of the following procedure:
- With the boom fully retracted, remove the clamp on the reel cable and allow it to slowly rewind onto the drum until there is no pre-tension. Continue to rewind the drum until the distance between the attachment point and the end of the cable is approximately 12 ft. At this point, because of the clutch on the reel shaft there will be no pre-tension. Now pull out the cable towards the attachment point and continue until the end of the cable is 3 ft. beyond the anchor point. Secure the cable to the anchor point with at least 4 wraps ensuring that there is sufficient cable at the boom head to connect to the A.T.B. switch.
- After installation remove the cover to the Extesion sensor and manually turn the large gear on the MicroGuard potentiometer fully counter-clockwise and then advance it clockwise three clicks.
- Calibrate the zero of the sensor by use of the following sequence:

SCROLL TO **03 ZERO** BY PRESSING	CORRESPONDING SELECTION KEY **MENU UP** OR **MENU DOWN**
START THE COMMAND BY PRESSING	CORRESPONDING SELECTION KEY
SCROLL TO SENSOR **No. 2** BY PRESSING	CORRESPONDING SELECTION KEY **MENU UP** OR **MENU DOWN**
CONFIRM SELECTION OF THE SENSOR BY PRESSING	CORRESPONDING SELECTION KEY
THE DISPLAY WILL READ	**No.2 = XXX** (actual input)
START THE CALIBRATION OF SENSOR **No.2** BY PRESSING	CORRESPONDING SELECTION KEY **YES** OR **NO**
THE DISPLAY WILL READ	**No.2 = 0** (zeroed input)
EXIT FROM THE ROUTINE BY PRESSING. .	CORRESPONDING SELECTION KEY **EXIT**
OR CHANGE SENSOR BY PRESSING	CORRESPONDING SELECTION KEY **MENU UP** OR **MENU DOWN**

ZERO BOOM ANGLE SENSOR

NOTE

THE INCLINOMETER OR MEASURING DEVICE USED TO CALIBRATE THE ANGLE OF THE MAIN BOOM MUST HAVE AN ACCURACY OF +/- 0.25°. USE OF A LESS ACCURATE DEVICE MAY RESULT IN CALIBRATION ERRORS.

USE GREAT CARE IN THE CALIBRATION OF THE BOOM ANGLE SENSOR. ALL SUBSEQUENT CALCULATIONS ARE DEPENDENT ON THE ACCURACY OF THE CALIBRATION OF THIS SENSOR.

- Using an inclinometer, set the boom horizontal.
- On all models the boom angle sensor is mounted inside the Extension sensor housing. Therefore, ensure that the Extension Sensor is mounted perpendicular to the boom.
- Calibrate the zero of the boom angle sensor by use of the following sequence:

SCROLL TO **03 ZERO** BY PRESSING	CORRESPONDING SELECTION KEY **MENU UP** OR **MENU DOWN**
START THE COMMAND BY PRESSING	CORRESPONDING SELECTION KEY
SCROLL TO SENSOR **No.3** BY PRESSING	CORRESPONDING SELECTION KEY **MENU UP** OR **MENU DOWN**
CONFIRM SELECTION OF THE SENSOR BY PRESSING	CORRESPONDING SELECTION KEY
THE DISPLAY WILL READ	**No.3 = XX.X** (actual input)
START THE CALIBRATION OF SENSOR **No.3** BY PRESSING	CORRESPONDING SELECTION KEY **YES** OR **NO**
THE DISPLAY WILL READ	**No.3 = 0** (zeroed input)
EXIT FROM THE ROUTINE BY PRESSING	CORRESPONDING SELECTION KEY **EXIT**
OR CHANGE SENSOR BY PRESSING	CORRESPONDING SELECTION KEY **MENU UP** OR **MENU DOWN**

COMMAND 04 SPAN

BOOM ANGLE SENSOR

NOTE

THE INCLINOMETER OR MEASURING DEVICE USED TO CALIBRATE THE ANGLE OF THE MAIN BOOM MUST HAVE AN ACCURACY OF +/- 0.25°. USE OF A LESS ACCURATE DEVICE MAY RESULT IN CALIBRATION ERRORS.

USE GREAT CARE IN THE CALIBRATION OF THE BOOM ANGLE SENSOR. ALL SUBSEQUENT CALCULATIONS ARE DEPENDENT ON THE ACCURACY OF THE CALIBRATION OF THIS SENSOR.

- Raise the retracted boom to an angle between 60° and 65° and measure the angle using an inclinometer. (E.G. 61.5°)
- Calibrate the span of the Boom Angle Sensor:

SCROLL TO **04 SPAN** BY PRESSING	CORRESPONDING SELECTION KEY **MENU UP** OR **MENU DOWN**
START THE COMMAND BY PRESSING	CORRESPONDING SELECTION KEY
SCROLL TO SENSOR **No.3** BY PRESSING	CORRESPONDING SELECTION KEY **MENU UP** OR **MENU DOWN**
THE DISPLAY WILL READ	**No.3 I/P = 0.00** (or actual input when re-calibrating)
START THE CALIBRATION OF SENSOR **No.3** BY PRESSING	CORRESPONDING SELECTION KEY
USE NUMBER ENTRY PROCEDURE TO ENTER MEASURED **BOOM ANGLE**	
CONFIRM CALIBRATION	CORRESPONDING SELECTION KEY **YES** OR **NO**
THE DISPLAY WILL READ	**No.3 I/P = XX.XX** (boom angle entered)
EXIT FROM THE ROUTINE BY PRESSING	CORRESPONDING SELECTION KEY **EXIT**

EXTENSION SENSOR

THROUGHOUT THIS PROCEDURE DO NOT FULLY EXTEND THE BOOM IF THIS WOULD CAUSE A TIPPING CONDITION. CARRY OUT CALIBRATION PROCEDURES ONLY WITHIN THE STABILITY LIMITS OF THE MACHINE.

(a) With the boom horizontal and fully retracted, measure the distance from the boom pivot to the hook center line. Note the distance.

(b) Extend the boom as far as possible without tipping the machine and measure the distance from the boom pivot to the hook center line. Note the distance.

(c) Calculate the boom extension from the formula **Extended** length minus **Retracted** length equals **Extension** value.

e.g. IF THE EXTENDED BOOM LENGTH IS 72 FEET AND THE RETRACTED BOOM LENGTH IS 30.5 THEN THE EXTENSION VALUE IS 72 – 30.5 = 41.5

(d) With the boom still fully extended, calibrate the **SPAN** of the **EXTENSION** by the use of the following sequence:

SCROLL TO **04 SPAN** BY PRESSING	CORRESPONDING SELECTION KEY **MENU UP** OR **MENU DOWN**
START THE COMMAND BY PRESSING	CORRESPONDING SELECTION KEY
SCROLL TO SENSOR **No.2** BY PRESSING	CORRESPONDING SELECTION KEY **MENU UP** OR **MENU DOWN**
THE DISPLAY WILL READ	**No.2 I/P = 0.00** (or actual input when re-calibrating)
START THE CALIBRATION OF SENSOR **No.2** BY PRESSING	CORRESPONDING SELECTION KEY
USE NUMBER ENTRY PROCEDURE TO ENTER **EXTENSION VALUE**	
CONFIRM CALIBRATION	CORRESPONDING SELECTION KEY **YES** OR **NO**
THE DISPLAY WILL READ	**No.2 I/P = XX.XX** (extension value you entered)
EXIT FROM THE ROUTINE BY PRESSING	CORRESPONDING SELECTION KEY **EXIT**

At this stage of the procedure the boom length display will indicate the extension value that you entered. After completion of Command 07, main boom radius/moment, it will display boom length.

Retract the boom and continue the procedure.

COMMAND 05 SWING

THIS ROUTINE WILL **ONLY** BE EXECUTED ON MODELS THAT HAVE SWING POTENTIOMETERS. IF EQUIPPED WITH SWING SWITCHES CONTINUE WITH COMMAND 06 PRESSURE.

SCALE

The swing command does not require the entry of measured data. All measurements of swing data are acquired automatically by the system during the calibration of the swing sensor. However, it is essential that when the crane upper is rotated during the **scale** procedure it is rotated **slowly**. This is especially important at the nodes which occur at 180° and 360°. These points can be observed on the display during the procedure.

ZERO

For all crane models whether lattice or hydraulic and whether truck or all terrain the datum for the zero of the potentiometer is **IN LINE OVER THE FRONT OF THE CARRIER**.

DIRECTION

Swing direction is likened to a compass. Swinging to the right will increase the readings and swinging to the left will decrease the reading. If the swing potentiometer is mounted in such a way that its output is in the wrong direction then this can be accounted for during this procedure by using the direction command to change the displayed direction.

The 3 routines are carried out consecutively. ZERO and DIRECTION can be done in isolation of SCALE but any time that SCALE is re-done it is followed by ZERO and DIRECTION.

Carry out the calibration of the swing potentiometer by use of the following sequence.

SCROLL TO **05 SWING** BY PRESSING	CORRESPONDING SELECTION KEY **MENU UP** OR **MENU DOWN**
START THE COMMAND BY PRESSING	CORRESPONDING SELECTION KEY
THE DISPLAY WILL READ	**0 = SCALE**
CONFIRM SELECTION OF **SCALE** BY PRESSING	CORRESPONDING SELECTION KEY
SLOWLY ROTATE THE UPPER STRUCTURE OF THE CRANE FOR AT LEAST 2 REVOLUTIONS	
STOP THE ROTATION AND START THE SLEW SCALE BY PRESSING	CORRESPONDING SELECTION KEY
CONFIRM THE CALIBRATION	CORRESPONDING SELECTION KEY **YES** or **NO**
THE DISPLAY WILL READ	**0 = SCALE**
SCROLL TO **1 SLEW ZERO** BY PRESSING **NOTE: OVER FRONT OF CARRIER**	CORRESPONDING SELECTION KEY **MENU UP** OR **MENU DOWN**
THE DISPLAY WILL READ	**1 = SET POT ZERO**
CONFIRM SELECTION OF **1 SLEW ZERO** BY PRESSING	CORRESPONDING SELECTION KEY

(continued)

COMMAND 05 SWING (continued)

POSITION THE CRANE UPPER DIRECTLY IN LINE OVER THE FRONT OF THE MACHINE	
START THE SLEW ZERO CALIBRATION BY PRESSING	CORRESPONDING SELECTION KEY
CONFIRM THE CALIBRATION	CORRESPONDING SELECTION KEY **YES** or **NO**
THE DISPLAY WILL READ	**1 = SET POT ZERO**
SCROLL TO **2 DIRECTION** BY PRESSING	CORRESPONDING SELECTION KEY **MENU UP** OR **MENU DOWN**
THE TOP DISPLAY WILL READ	**2 = DIRECTION**
CONFIRM SELECTION OF **2 DIRECTION** BY PRESSING	CORRESPONDING SELECTION KEY
THE CENTER DISPLAY WILL READ	**DIRECTION 0.0** (approx.)
ROTATE THE UPPER APPROX. 10° TO THE RIGHT	
IF THE NUMBERS INCREASE TO APPROX. **10° CONFIRM** THE DIRECTION BY PRESSING	**"+" DIRECTION**
IF THE NUMBERS DECREASE TO APPROX. **350° REVERSE** THE DIRECTION BY PRESSING	**"-" DIRECTION**
START THE DIRECTION CALIBRATION BY PRESSING	CORRESPONDING SELECTION KEY
CONFIRM THE CALIBRATION	CORRESPONDING SELECTION KEY **YES** or **NO**
EXIT FROM THE ROUTINE BY PRESSING	CORRESPONDING SELECTION KEY **EXIT**

CONFIGURATION SELECTION

In the normal operational mode the system is programmed to remember the configuration last selected. Each time the system is powered up it will automatically choose that configuration. Only when the crane is rigged differently must a new configuration be selected.

CRANE SET UP

The menu for the crane set up consists of 6 or 7 consecutive steps depending on the options available.

1. Select Outriggers, Tires, Rigging/Travel mode.
2. Select Counterweight. (If there are selections)
3. Select Boom. (This step is skipped on 3 section boom machines.)
4. Select Auxiliary Head fitted or not fitted.
5. Select Erected Fly, Jib or Fly/Jib combination if equipped.
6. Select Offset Angle of Fly, Jib or Fly/Jib combination.
7. Select Lifting Point for Front Winch.
8. Select Lifting Point for Rear Winch.
9. Select Stowed Attachments.

NOTE: ON SINGLE WINCH MACHINES SELECTIONS 7 AND 8 ARE NOT NECESSARY AND MAY NOT BE IN THE MENU.

PARTS-OF-LINE

Press and hold the PARTS-OF-LINE push-button to scroll through the available parts of line. The new value is automatically registered when the button is released. The number chosen applies only to the winch currently selected and a value must be programmed for both winches.

WINCH

The current selection is shown in the display by shading in the active winch. To change the selection press the selection key next to the winches. Successive pressing of the button will change the selection from one to the other. After the initial setup the system remembers the Parts-of-Line, Lifting Point and Deducts for each winch.

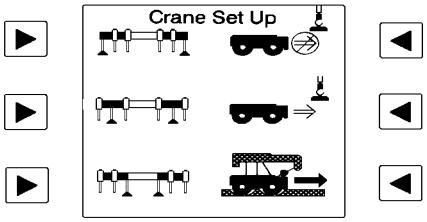
RIGGING TRAVEL MODE

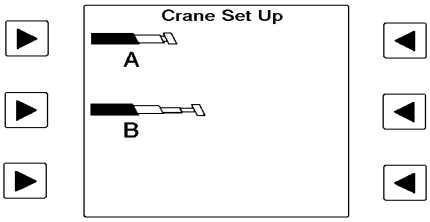
The Rigging /Travel mode is selected as part of the carrier options. This mode is used to facilitate the rigging and travel of the crane by inhibiting motion-cut and audible alarm while selected. The information screen is restricted to the display of radius, length, angle and precautionary messages during the time that the mode is selected.

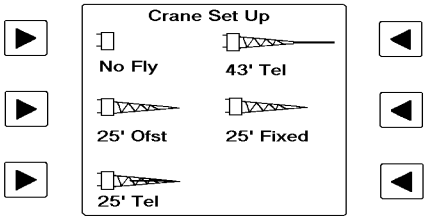
To return to normal operation use CRANE SET UP.

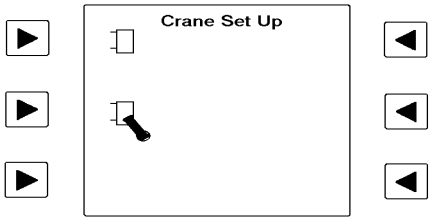
CONFIGURATION SELECTION

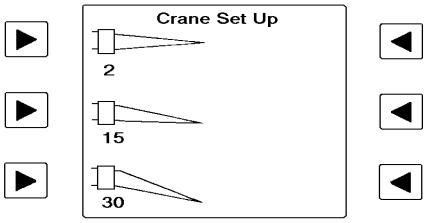
START THE SELECTION OF CRANE CONFIGURATION BY PRESSING **"CRANE SET UP"**

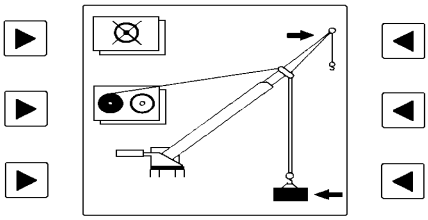


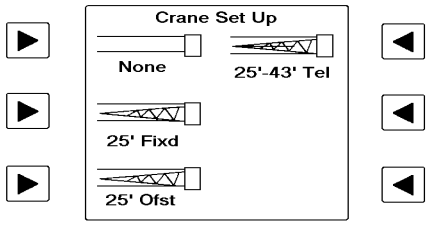


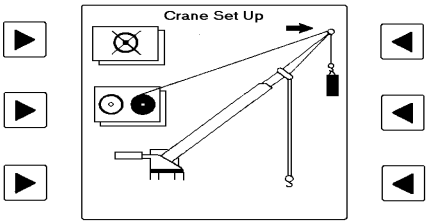


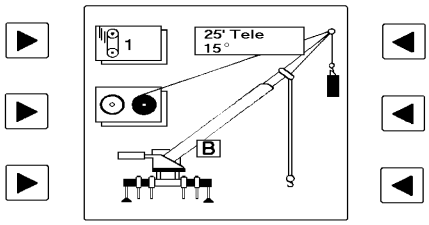


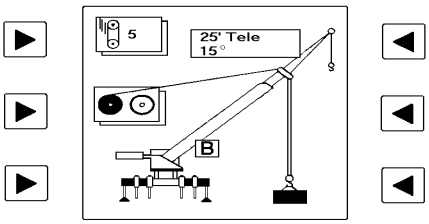












COMMAND 06 PRESSURE

- USE "CRANE SET UP" (MUST EXIT CALIBRATION ROUTINE) TO SELECT FULLY EXTENDED OUTRIGGERS, MAIN BOOM, AND ATTACHMENTS IF EQUIPPED.

- DETERMINE THE WEIGHT OF THE CALIBRATION LOAD. THE CALIBRATION LOAD INCLUDES THE WEIGHT OF THE PINS AND SLINGS BUT DOES NOT INCLUDE THE WEIGHT OF THE BLOCK OR BALL. FOR BEST ACCURACY USE A LOAD WHICH EXCEEDS 50% OF THE MACHINE CAPACITY. SMALLER LOADS MAY BE USED BUT THIS COULD RESULT IN REDUCED ACCURACY.

- WHEN THE LOAD IS GROUNDED THE SLINGS SHOULD ALSO BE GROUNDED AND NOT SUPPORTED BY THE HOOK.

- WHEN RAISING AND LOWERING THE LOAD, USE THE WINCH. DO NOT USE THE BOOM HOIST.

- BEFORE ACQUIRING DATA WAIT AT LEAST 10 SECONDS FOR THE PRESSURES TO BECOME STABLE.

- KEEP THE BOOM BETWEEN 42° AND 48° AND TELESCOPE THE LOAD TO A RADIUS OF APPROXIMATELY 95% OF CAPACITY. VERIFY THIS USING THE LOAD CHART PRIOR TO DOING THE LIFT. **DO NOT EXCEED THE LIMITATIONS OF THE LOAD CHART!**

Calibrate the pressure span by use of the following sequence:

SCROLL TO **06 PRESSURE** BY PRESSING	CORRESPONDING SELECTION KEY **MENU UP** OR **MENU DOWN**
START THE COMMAND BY PRESSING	CORRESPONDING SELECTION KEY
USE THE NUMBER ENTRY PROCEDURE TO ENTER THE WEIGHT OF THE **CALIBRATION LOAD**	
RAISE THE CALIBRATION LOAD USING THE WINCH AND PRESS	CORRESPONDING SELECTION KEY **LOAD ON**
USE THE NUMBER ENTRY PROCEDURE TO ENTER THE **EXACT RADIUS** OF THE CALIBRATION LOAD	
THE UPPER DISPLAY WILL READ **(U)** TO INDICATE THAT THE DATA IS ACQUIRED	
LOWER THE LOAD AND WITH THE LOAD ON THE GROUND PRESS	CORRESPONDING SELECTION KEY **LOAD OFF**
THE UPPER DISPLAY WILL READ **(D U)** TO INDICATE THAT THE DATA IS ACQUIRED	
START THE LOAD CALIBRATION BY PRESSING	CORRESPONDING SELECTION KEY
CONFIRM THE CALIBRATION	CORRESPONDING SELECTION KEY **YES** or **NO**
WITH THE LOAD STILL ON THE GROUND THE LOAD DISPLAY WILL READ ZERO. RAISE THE CALIBRATION LOAD. THE 3 X 3 DISPLAY WILL READ THE EXACT VALUE OF THE CALIBRATION LOAD.	
EXIT FROM THE ROUTINE BY PRESSING	CORRESPONDING SELECTION KEY **EXIT**

COMMAND 07 MAIN BOOM RADIUS/MOMENT

- This command is used to calibrate the **radius** AND **moment** of the main boom. It requires data at high and low angles retracted and high and low angles with the boom extended to the prescribed lengths.
- Calibration is carried out at each length and both high and low angle data must be stored for the calibration to operate. This acquisition of data is described by the word CALIBRATION in the procedure. If for any reason the data is not stored then the system will warn with the message "NO DATA" and the data CALIBRATION must be repeated.
- A high angle is one which is higher than 60°. A low angle is lower than 20 degrees. An attempt to acquire data outside these limits will result in a warning message "poor angle". When this message occurs as the result of an error it can be corrected and the procedure may then be continued using correct keyboard entries.
- When this message occurs as a result of requiring the acquisition of data outside the preferred angles then the data may be entered by the use of the high angle or low angle key to indicate at which unusual angle data is being acquired.

MAIN BOOM (OR MODE A)

- Use “Crane Set Up” (Must exit calibration routine) to select Fully Extended Outriggers, Main Boom, No Attacthments.
- Start the routine with the fully retracted boom at an angle of 5°.
- Determine the weight of the hook-block in use. Measure the radius from the center line of rotation to the center of the load.
- Calibrate the radius and moment of the main boom by use of the following sequence:
- Before entering data raise the hook block up close to the Two-Block weight prior to pressing the corresponding selction key in order to eliminate rope weight.

FIRST LENGTH

SCROLL TO 07 **RADIUS** BY PRESSING	CORRESPONDING SELECTION KEY **MENU UP** OR **MENU DOWN**
START THE COMMAND BY PRESSING	CORRESPONDING SELECTION KEY
USE THE NUMBER ENTRY ROUTINE TO ENTER WEIGHT OF THE HOOK (TARELOAD)	
STORE THE LOW ANGLE DATA BY PRESSING	CORRESPONDING SELECTION KEY
USE THE NUMBER ENTRY ROUTINE TO ENTER THE CURRENT RADIUS	
THE DISPLAY WILL READ **(D)**	

Raise the retracted boom to an angle between 60° and 65° and measure the **new radius**.

STORE THE HIGH ANGLE DATA BY PRESSING	CORRESPONDING SELECTION KEY
USE THE NUMBER ENTRY ROUTINE TO ENTER THE NEW RADIUS	
THE DISPLAY WILL READ **(D U)**	
START THE MOMENT CALIBRATION AT THE CURRENT LENGTH BY PRESSING	CORRESPONDING SELECTION KEY
CONFIRM THE CALIBRATION	CORRESPONDING SELECTION KEY **YES** or **NO**

SECOND LENGTH

Maintain the same high angle and extend the boom to 50% of extension or to the full extension if the boom mode extends less then 30 feet. Measure the **new radius**.

STORE THE HIGH ANGLE DATA BY PRESSING	CORRESPONDING SELECTION KEY
USE THE NUMBER ENTRY ROUTINE TO ENTER THE **NEW RADIUS**	
THE DISPLAY WILL READ **(U)**	

Maintain the same length and lower the boom to the lowest angle listed on the load chart for a fully extended boom. If the machine has 0° capabilities then lower the boom to 5°. Measure the **new radius.**

STORE THE LOW ANGLE DATA BY PRESSING	CORRESPONDING SELECTION KEY
USE THE NUMBER ENTRY ROUTINE TO ENTER THE **NEW RADIUS**	
THE DISPLAY WILL READ **(D U)**	
START THE MOMENT CALIBRATION AT THE CURRENT LENGTH BY PRESSING	CORRESPONDING SELECTION KEY
CONFIRM THE CALIBRATION	CORRESPONDING SELECTION KEY **YES** or **NO**

Some models with Mode A may have booms fully extended. If that is the case then continue with Command 8 BDC. Otherwise continue with this procedure on the next page.

THIRD LENGTH

Maintain the same low angle, fully extend the main boom and measure the **new radius**

STORE THE LOW ANGLE DATA BY PRESSING	CORRESPONDING SELECTION KEY
USE THE NUMBER ENTRY ROUTINE TO ENTER THE NEW RADIUS	
THE DISPLAY WILL READ **(D)**	

Raise the fully extended main boom to an angle between 60° and 65° and measure the **new radius**.

STORE THE HIGH ANGLE DATA BY PRESSING	CORRESPONDING SELECTION KEY
USE THE NUMBER ENTRY ROUTINE TO ENTER THE NEW RADIUS	
THE DISPLAY WILL READ **(D U)**	
START THE MOMENT CALIBRATION AT THE CURRENT LENGTH BY PRESSING	CORRESPONDING SELECTION KEY
CONFIRM THE CALIBRATION	CORRESPONDING SELECTION KEY **YES** or **NO**
EXIT FROM THE ROUTINE BY PRESSING	CORRESPONDING SELECTION KEY **EXIT**

Continue the calibration routine with Command 08, BDC. If there is a Manual section or Mode B on the machine return to Command 07 **after** completing the BDC for the Main Boom.

COMMAND 07 MAIN BOOM + MANUAL (MODE B) RADIUS/MOMENT

- This command is used to calibrate the **radius** AND **moment** of the main boom + manual or mode B. It requires data at high and low angles retracted and high and low angles with the boom extended to the prescribed lengths.
- Calibration is carried out at each length and both high and low angle data must be stored for the calibration to operate. This acquisition of data is described by the word CALIBRATION in the procedure. If for any reason the data is not stored then the system will warn with the message "NO DATA" and the data STORE must be repeated.
- A high angle is one which is higher than 60°. A low angle is lower than 20 degrees. An attempt to acquire data outside these limits will result in a warning message "poor angle". When this message occurs as the result of an error it can be corrected and the procedure may then be continued using correct keyboard entries.
- When this message occurs as a result of requiring the acquisition of data outside the preferred angles then the data may be entered by the use of the high angle or low angle key to indicate at which unusual angle data is being acquired.

MAIN BOOM + MANUAL (OR MODE B)

- Use “Crane Set Up” (Must exit calibration routine) to select Fully Extended Outriggers, Main Boom, No Attacthments.
- Start the routine with the fully retracted boom at an angle of 5°.
- Determine the weight of the hook-block in use. Measure the radius from the center line of rotation to the center of the load.
- Calibrate the radius and moment of the main boom by use of the following sequence:

FIRST LENGTH

SCROLL TO 07 **RADIUS** BY PRESSING	CORRESPONDING SELECTION KEY **MENU UP** OR **MENU DOWN**
START THE COMMAND BY PRESSING	CORRESPONDING SELECTION KEY
USE THE NUMBER ENTRY ROUTINE TO ENTER WEIGHT OF THE HOOK	
STORE THE LOW ANGLE DATA BY PRESSING	CORRESPONDING SELECTION KEY
USE THE NUMBER ENTRY ROUTINE TO ENTER THE CURRENT RADIUS	
THE DISPLAY WILL READ **(D)**	

Raise the retracted boom to an angle between 60° and 65° and measure the **new radius**.

STORE THE HIGH ANGLE DATA BY PRESSING	CORRESPONDING SELECTION KEY
USE THE NUMBER ENTRY ROUTINE TO ENTER THE NEW RADIUS	
THE DISPLAY WILL READ **(D U)**	
START THE MOMENT CALIBRATION AT THE CURRENT LENGTH BY PRESSING	CORRESPONDING SELECTION KEY
CONFIRM THE CALIBRATION	CORRESPONDING SELECTION KEY **YES** or **NO**

SECOND LENGTH

Maintain the same high angle and extend the boom to 50% of extension. Measure the **new radius**.

STORE THE HIGH ANGLE DATA BY PRESSING	CORRESPONDING SELECTION KEY
USE THE NUMBER ENTRY ROUTINE TO ENTER THE **NEW RADIUS**	
THE DISPLAY WILL READ **(U)**	

Maintain the same length and lower the boom to the lowest angle listed on the load chart for a fully extended boom. If the machine has 0° capabilities lower the boom to 5°. Measure the **new radius.**

STORE THE LOW ANGLE DATA BY PRESSING	CORRESPONDING SELECTION KEY
USE THE NUMBER ENTRY ROUTINE TO ENTER THE **NEW RADIUS**	
THE DISPLAY WILL READ **(D U)**	
START THE MOMENT CALIBRATION AT THE CURRENT LENGTH BY PRESSING	CORRESPONDING SELECTION KEY
CONFIRM THE CALIBRATION	CORRESPONDING SELECTION KEY **YES** or **NO**

THIRD LENGTH

Maintain the same low angle, fully extend the and measure the **new radius**

STORE THE LOW ANGLE DATA BY PRESSING	CORRESPONDING SELECTION KEY
USE THE NUMBER ENTRY ROUTINE TO ENTER THE NEW RADIUS	
THE DISPLAY WILL READ **(D)**	

Raise the fully extended main boom to an angle between 60° and 65° and measure the **new radius**.

STORE THE HIGH ANGLE DATA BY PRESSING	CORRESPONDING SELECTION KEY
USE THE NUMBER ENTRY ROUTINE TO ENTER THE NEW RADIUS	
THE DISPLAY WILL READ **(D U)**	
START THE MOMENT CALIBRATION AT THE CURRENT LENGTH BY PRESSING	CORRESPONDING SELECTION KEY
CONFIRM THE CALIBRATION	CORRESPONDING SELECTION KEY **YES** or **NO**
EXIT THE ROUTINE BY PRESSING	CORRESPONDING SELECTION KEY **EXIT**

Continue the calibration routine with Command 08, BDC.

♦ If machine is equipped with a Fly, Jib or Fly/Jib combination, erect the longest attachment and continue the calibration routine with Command 08, BDC.

NOTE: THAT IF THE RADIUS IS ALREADY CORRECT THEN THIS PROCEDURE MAY BE SKIPPED.

COMMAND 08 BOOM DEFLECTION CORRECTION

- With the boom fully extended at an angle of approximately 65°, pick up the maximum permitted load. (See Data Sheet)
- Measure the deflected radius and add 0.2' to the measured radius. The radius is measured from the center line of rotation to the center of the load.

NOTE: THAT IF THE RADIUS IS ALREADY CORRECT THEN THIS PROCEDURE MAY BE SKIPPED.

- With the load still suspended calibrate the B.D.C. by use of the following sequence:

SCROLL TO **08 B D C** BY PRESSING	CORRESPONDING SELECTION KEY **MENU UP** OR **MENU DOWN**
STORE THE DATA BY PRESSING	CORRESPONDING SELECTION KEY TO CALIBRATE
START THE BDC CALIBRATION BY PRESSING	CORRESPONDING SELECTION KEY
CONFIRM THE CALIBRATION	CORRESPONDING SELECTION KEY **YES** or **NO**
USE THE NUMBER ENTRY ROUTINE TO ENTER THE NEW RADIUS	
EXIT FROM THE ROUTINE BY PRESSING	CORRESPONDING SELECTION KEY **EXIT**

An attempt to acquire data below 60° will result in a warning message "poor angle". When this message occurs as the result of an error it can be corrected.
When this message occurs as a result of requiring the acquisition of data below 60° then the data may be entered by the use of the low angle key to indicate at which unusual angle data is being acquired.

COMMAND 09 ANNULAR GAIN

- There are two pressure transducers fitted in the system. One measures the piston side pressure and the other measures the rod side pressure. Because these are not identical cross-sectional areas, data must be entered which defines the ratio of the two areas. This is referred to as annular gain (A.G.). This is calculated from the rod (R) and bore (B) diameters as follows:

  A.G. = [(RxR)/(BxB)] - 1 e.g. R = 8 and B = 10 A.G. = - 0.360

- This value is automatically entered at the time of initialization. It may need to be modified because of differing pressure transducer sensitivities.

- If when booming down the load reading changes significantly the annular gain should be changed.

Change the setting of the annular gain by use of the following sequence:

SCROLL TO **09 ANNULAR GAIN** BY PRESSING	CORRESPONDING SELECTION KEY **MENU UP** OR **MENU DOWN**
START THE COMMAND BY PRESSING	CORRESPONDING SELECTION KEY
IF THE LOAD DECREASES WHEN BOOMING DOWN USE THE UP KEY TO CORRECT THE DYNAMIC DISPLAYED NUMBER	CORRESPONDING SELECTION KEY **UP**
IF THE LOAD INCREASES WHEN BOOMING DOWN USE THE DOWN KEY TO CORRECT THE DYNAMIC DISPLAYED NUMBER	CORRESPONDING SELECTION KEY **DOWN**
START THE ANNULAR GAIN CALIBRATION BY PRESSING	CORRESPONDING SELECTION KEY
CONFIRM THE CALIBRATION	CORRESPONDING SELECTION KEY **YES** or **NO**
EXIT FROM THE ROUTINE WITHOUT CALIBRATING BY PRESSING	CORRESPONDING SELECTION KEY **EXIT**

COMMAND 12 WINCHES

Permits the "hiding" of a winch when it is not sold with the machine thereby removing unnecessary steps from the Operator Menu.

This command operates by making a winch *selectable* or *hidden* by use of the following sequence:

SCROLL TO **12 WINCHES** BY PRESSING	CORRESPONDING SELECTION KEY **MENU UP** OR **MENU DOWN**
START THE COMMAND BY PRESSING	CORRESPONDING SELECTION KEY
SCROLL TO THE WINCH TO BE SELECTABLE OR HIDDEN BY USE OF THE CHANGE WINCH KEY	
CHANGE FROM SELECTABLE TO HIDDEN (AND VICE VERSA) BY PRESSING	CORRESPONDING SELECTION KEY
CONFIRM THE CHANGE	CORRESPONDING SELECTION KEY **YES** or **NO**
EXIT FROM THE ROUTINE BY PRESSING. (See Note below)	CORRESPONDING SELECTION KEY **EXIT**

COMMAND 13 ATTACHMENTS

Permits the "hiding" of an attachment when it is not sold with the machine thereby removing unnecessary steps from the Operator Menu.

Permits the change to *selectable* when an attachment is subsequently added to a machine.

This command operates by making an attachment *selectable* or *hidden* by use of the following sequence:

SCROLL TO **13 ATTACHMENT** BY PRESSING	CORRESPONDING SELECTION KEY **MENU UP** OR **MENU DOWN**
START THE COMMAND BY PRESSING	CORRESPONDING SELECTION KEY
SCROLL TO THE ATTACHMENT TO BE SELECTABLE OR HIDDEN BY USE OF THE NEXT ATTACHMENT UP/DOWN KEY	
CHANGE FROM SELECTABLE TO HIDDEN (AND VICE VERSA) BY PRESSING	CORRESPONDING SELECTION KEY
CONFIRM THE CHANGE	CORRESPONDING SELECTION KEY **YES** or **NO**
EXIT FROM THE ROUTINE BY PRESSING. (See Note below)	CORRESPONDING SELECTION KEY **EXIT**

NOTE: If any change was done to either one of these Commands, it is recommended that Command 01/0 "SAVE" be completed also.

COMMAND 15 ALARM LIMITS

In this routine the computer has provisions to put limits on various functions depending on which model of machine is being calibrated. The following explains each alarm/limit available:

Free Bm Mode - This allows the operator to select the Main Boom + Manual configuration after the Manual section is already extended (if equipped).
NOTE: If the machine being calibrated has Mode A and Mode B selections then this must be set to “NO”. Damage could result from the wrong selection made.

FKO Delay - This limit places a 5 second delay in the re-activation of the function kick-out solenoids.

Area Alarm - This limit activates the Area Alarm. Refer to the Crane’s Operator Manual for the explanation of the Area Alarms.

Low Angle Alarm - Some models have engine covers that stand tall and could be damaged by the boom or the boom hoist cylinders. Two alarms are used to warn the operator of his approach to this potential damage, they are swing arc and boom angle. These alarms have a preset value of:

Low Arc = 70 degrees
Low Ang = 4.5 degrees

%SWL0 - This is the overload alarm setting. This alarm is usually set at 100%. It can be lowered but must be no more then 100%.

%SWL1 - This is the pre-alarm setting. This alarm is usually set at 90%. It can be lowered but must be no more then 90%.

%SWL2 - This is the start of the audible alarm. Usually set for 90%.

NOTE: If any change is to be done to the alarms then it recommended that Command 01/0 "SAVE" be done also.

Enter details of the alarm settings by use of the following sequence:

SCROLL TO **15 ALARM** BY PRESSING	CORRESPONDING SELECTION KEY **MENU UP** OR **MENU DOWN**
START THE COMMAND BY PRESSING	CORRESPONDING SELECTION KEY
THE DISPLAY WILL READ	**Free Boom Mode? y/n NO**
START THE CALIBRATION OF THE **FREE BOOM MODE** BY PRESSING	CORRESPONDING SELECTION KEY
AFTER THE MESSAGE "**CALIBRATING**"	
THE DISPLAY WILL READ	**Free Boom Mode? y/n YES**
SCROLL TO NEXT ALARM BY PRESSING	CORRESPONDING SELECTION KEY **EXIT**
THE DISPLAY WILL READ	**FKO Delay? y/n NO**
START THE CALIBRATION OF THE **FKO DELAY** BY PRESSING	CORRESPONDING SELECTION KEY
AFTER THE MESSAGE "**CALIBRATING**"	

THE DISPLAY WILL READ	**FKO Delay? y/n** **YES**
SCROLL TO NEXT ALARM BY PRESSING	CORRESPONDING SELECTION KEY **EXIT**
THE DISPLAY WILL READ	**Area Alarm? y/n** **NO**
START THE CALIBRATION OF THE **AREA ALARM** BY PRESSING	CORRESPONDING SELECTION KEY
AFTER THE MESSAGE "**CALIBRATING**"	
THE DISPLAY WILL READ	**Area Alarm? y/n** **YES**
SCROLL TO NEXT ALARM BY PRESSING	CORRESPONDING SELECTION KEY **EXIT**
THE DISPLAY WILL READ	**Low Angle Alarm? y/n** **NO**
START THE CALIBRATION OF THE **LOW ANGLE ALARM** BY PRESSING	CORRESPONDING SELECTION KEY
AFTER THE MESSAGE "**CALIBRATING**"	
THE DISPLAY WILL READ	**Low Angle Alarm? y/n** **YES**
SCROLL TO NEXT ALARM BY PRESSING	CORRESPONDING SELECTION KEY **EXIT**
THE DISPLAY WILL READ	ENTER NEW % SWL0 CURRENTLY=100.00
START THE CALIBRATION OF **% SWL #0** BY PRESSING	CORRESPONDING SELECTION KEY
USE NUMBER ENTRY PROCEDURE TO ENTER THE **NEW SETTING**	
AFTER THE MESSAGE "**CALIBRATING**" THE DISPLAY WILL READ	ENTER NEW % SWL0 CURRENTLY=XXX.XX (VALUE ENTERED)
SCROLL TO **% SWL #1** BY PRESSING	CORRESPONDING SELECTION KEY**EXIT**
THE DISPLAY WILL READ	ENTER NEW % SWL1 CURRENTLY=90.00
START THE CALIBRATION OF **% SWL #1** BY PRESSING	CORRESPONDING SELECTION KEY
USE NUMBER ENTRY PROCEDURE TO ENTER THE **NEW SETTING**	
AFTER THE MESSAGE "**CALIBRATING**" THE DISPLAY WILL READ	ENTER NEW % SWL1 CURRENTLY=XXX.XX (VALUE ENTERED)
SCROLL TO **% SWL #2** BY PRESSING	CORRESPONDING SELECTION KEY **EXIT**
THE DISPLAY WILL READ	ENTER NEW % SWL2 CURRENTLY=90.00
START THE CALIBRATION OF **% SWL #2** BY PRESSING	CORRESPONDING SELECTION KEY
USE NUMBER ENTRY PROCEDURE TO ENTER THE **NEW SETTING**	

AFTER THE MESSAGE "**CALIBRATING**" THE DISPLAY WILL READ	ENTER NEW % SWL1 CURRENTLY=XXX.XX (VALUE ENTERED)
EXIT FROM THE ROUTINE BY PRESSING	CORRESPONDING SELECTION KEY **EXIT**

Details of Alarms may be examined by use of the following sequence:

SCROLL TO **15 ALARM** BY PRESSING	CORRESPONDING SELECTION KEY **MENU UP** OR **MENU DOWN**
START THE COMMAND BY PRESSING	CORRESPONDING SELECTION KEY
THE DISPLAY WILL READ	**Free Boom Mode? y/n**
SCROLL TO **FKO DELAY** BY PRESSING	CORRESPONDING SELECTION KEY **EXIT**
THE DISPLAY WILL READ	**FKO Delay? y/n**
SCROLL TO **AREA ALARM** BY PRESSING	CORRESPONDING SELECTION KEY **EXIT**
THE DISPLAY WILL READ	**Area Alarm? y/n**
SCROLL TO **LOW ANGLE ALARM** BY PRESSING	CORRESPONDING SELECTION KEY **EXIT**
THE DISPLAY WILL READ	**Low Angle Alarm? y/n**
SCROLL TO **% SWL #0** BY PRESSING	CORRESPONDING SELECTION KEY **EXIT**
THE DISPLAY WILL READ	ENTER NEW % SWL0 CURRENTLY=100.00
SCROLL TO **% SWL #1** BY PRESSING	CORRESPONDING SELECTION KEY **EXIT**
THE DISPLAY WILL READ	ENTER NEW % SWL1 CURRENTLY=90.00
SCROLL TO **% SWL #2** BY PRESSING	CORRESPONDING SELECTION KEY **EXIT**
THE DISPLAY WILL READ	ENTER NEW % SWL2 CURRENTLY=90.00
EXIT FROM THE ROUTINE BY PRESSING	CORRESPONDING SELECTION KEY **EXIT**

COMMAND 16 ROPE DATA

- Maximum hoist rope tension is specified by the crane manufacturer for the size and type of wire rope used on the machine. This value is set at the initialization of the system.

- The Rope Data command permits the modification of the values and they should be entered in units of 1000 #. Example 11,700 # is entered as 11.700

Change data by use of the following sequence:

SCROLL TO **16 ROPE** BY PRESSING	CORRESPONDING SELECTION KEY **MENU UP** OR **MENU DOWN**
START THE COMMAND BY PRESSING	CORRESPONDING SELECTION KEY
THE DISPLAY WILL READ	ENTER ROPELIMO CURRENTLY = 11.700
START THE CALIBRATION OF **ROPE LIMIT #0** BY PRESSING	CORRESPONDING SELECTION KEY
CONFIRM THE CALIBRATION	CORRESPONDING SELECTION KEY **YES** or **NO**
USE NUMBER ENTRY PROCEDURE TO ENTER THE **NEW LIMIT**	
THE DISPLAY WILL READ	ENTER ROPELIMO CURRENTLY = XX.XX (VALUE ENTERED)
SCROLL TO **ROPE LIMIT #1** BY PRESSING	CORRESPONDING SELECTION KEY **EXIT**
THE DISPLAY WILL READ	ENTER ROPELIM1 CURRENTLY = 11.700
START THE CALIBRATION OF **ROPE LIMIT #1** BY PRESSING	CORRESPONDING SELECTION KEY
CONFIRM THE CALIBRATION	CORRESPONDING SELECTION KEY **YES** or **NO**
USE NUMBER ENTRY PROCEDURE TO ENTER THE **NEW LIMIT**	
THE DISPLAY WILL READ	ENTER ROPELIM1 CURRENTLY = XX.XX (VALUE ENTERED)
EXIT FROM THE ROUTINE BY PRESSING	CORRESPONDING SELECTION KEY **EXIT**

Details of Rope Data may be examined by use of the following sequence:

SCROLL TO **16 ROPE** BY PRESSING	CORRESPONDING SELECTION KEY **MENU UP** OR **MENU DOWN**
START THE COMMAND BY PRESSING	CORRESPONDING SELECTION KEY
THE DISPLAY WILL READ	ENTER ROPELIM0 CURRENTLY = 11.700
SCROLL TO **ROPE LIMIT #1** BY PRESSING	CORRESPONDING SELECTION KEY **EXIT**
THE DISPLAY WILL READ	ENTER ROPELIM1 CURRENTLY = 11.700
EXIT FROM THE ROUTINE BY PRESSING	CORRESPONDING SELECTION KEY **EXIT**

NOTE: If there was any changes to the Rope Limits it is recommended that Command 01/0 "SAVE" be completed also.

COMMAND 17 AMPLIFIER GAIN

At the time of initialization the amplifier gain is set to the preferred value of 2. This value is suitable for the standard load cells and pressure transducers supplied with systems. For special application this gain setting may be modified as necessary.

Refer to the factory before making any changes.

SCROLL TO **17 AMPLIFIER** BY PRESSING	CORRESPONDING SELECTION KEY **MENU UP** OR **MENU DOWN**
START THE COMMAND BY PRESSING	CORRESPONDING SELECTION KEY
THE DISPLAY WILL READ	ENTER AMP GAIN CURRENTLY 2
START THE CALIBRATION OF **AMPLIFIER GAIN** BY PRESSING	CORRESPONDING SELECTION KEY
CONFIRM THE CALIBRATION	CORRESPONDING SELECTION KEY **YES** or **NO**
CHANGE THE SETTING BY PRESSING	INCREASE OR DECREASE VALUE KEYS
COMPLETE THE CALIBRATION BY PRESSING	CORRESPONDING SELECTION KEY
THE DISPLAY WILL READ	ENTER AMP GAIN CURRENTLY X (VALUE ENTERED)
EXIT FROM THE ROUTINE BY PRESSING	CORRESPONDING SELECTION KEY **EXIT**

COMMAND 01/0 SAVE

On completion of a calibration it is necessary to carry out Command 01/0 SAVE. The use of this command will ensure that a copy of the calibration, will be contained in the back-up memory.

SCROLL TO **01 PERSONALITY** BY PRESSING	CORRESPONDING SELECTION KEY **MENU UP** OR **MENU DOWN**
START THE COMMAND BY PRESSING	CORRESPONDING SELECTION KEY
SCROLL TO **01/0 SAVE** BY PRESSING	CORRESPONDING SELECTION KEY **MENU UP** OR **MENU DOWN**
START THE COMMAND BY PRESSING	CORRESPONDING SELECTION KEY
FOLLOW THE **CAL** ENTRY SEQUENCE	**UPPER LEFT, LOWER RIGHT, LOWER LEFT, UPPER RIGHT**
CONTINUE THE **SAVE** BY PRESSING	CORRESPONDING SELECTION KEY
CONFIRM THE CALIBRATION SEE NOTE	CORRESPONDING SELECTION KEY **YES** or **NO**
AFTER THE MESSAGE "CALIBRATING" THE DISPLAY WILL READ "A" GOOD "B" GOOD SAME	
EXIT BY PRESSING	CORRESPONDING SELECTION KEY **EXIT**

COMMAND 01/3 BACK-UP

On completion of a calibration and after the execution of Command 01/0 SAVE a permanent copy of the calibration may be obtained by use of the following procedures.

SCROLL TO **01 PERSONALITY** BY PRESSING	CORRESPONDING SELECTION KEY **MENU UP** OR **MENU DOWN**
START THE COMMAND BY PRESSING	CORRESPONDING SELECTION KEY
SCROLL TO **01/3 BACK** BY PRESSING	CORRESPONDING SELECTION KEY **MENU UP** OR **MENU DOWN**
START THE COMMAND BY PRESSING	CORRESPONDING SELECTION KEY
FOLLOW THE **CAL** ENTRY SEQUENCE	**UPPER LEFT, LOWER RIGHT, LOWER LEFT, UPPER RIGHT**
CONTINUE THE **BACK-UP** BY PRESSING	CORRESPONDING SELECTION KEY
CONFIRM THE CALIBRATION SEE NOTE	CORRESPONDING SELECTION KEY **YES** or **NO**
AFTER THE MESSAGE CALIBRATING **EXIT** BY PRESSING	CORRESPONDING SELECTION KEY **EXIT**

SWITCH OFF POWER TO THE SYSTEM BEFORE REMOVING OR INSERTING INTEGRATED CIRCUITS

A COPY OF THE CONTENTS OF THE "A" PORTION OF THE PERSONALITY IS NOW STORED TEMPORARILY IN MEMORY IN THE COMPUTER. THE CHIP IN SOCKET IC7 IS REMOVED AND WILL BE THE SERVICE BACK-UP CHIP. TO RE-INSTATE THE SYSTEM TO WORKING CONDITION FIT A NEW CHIP, TYPE 28C65, IN SOCKET IC7. RESTORE POWER TO THE SYSTEM AND CARRY OUT COMMAND 01/4-RESTORE BY USE OF THE FOLLOWING SEQUENCE.

RESTORE POWER AND ENTER THE CALIBRATION ROUTINE

START THE ROUTINE BY PRESSING AND HOLDING FOR APPROXIMATELY 10 SECONDS	**CRANE SETUP** AND **TEST**
FOLLOW THE **CAL** ENTRY SEQUENCE	**UPPER LEFT, LOWER RIGHT, LOWER LEFT, UPPER RIGHT**

COMMAND 01/4 RESTORE

SCROLL TO **01 PERSONALITY** BY PRESSING	CORRESPONDING SELECTION KEY **MENU UP** OR **MENU DOWN**
START THE COMMAND BY PRESSING	CORRESPONDING SELECTION KEY
SCROLL TO **01/4 RESTORE** BY PRESSING	CORRESPONDING SELECTION KEY **MENU UP** OR **MENU DOWN**
START THE COMMAND BY PRESSING	CORRESPONDING SELECTION KEY
FOLLOW THE **CAL** ENTRY SEQUENCE	**UPPER LEFT, LOWER RIGHT, LOWER LEFT, UPPER RIGHT**
CONTINUE THE **RESTORE** BY PRESSING	CORRESPONDING SELECTION KEY
CONFIRM THE CALIBRATION SEE NOTE	CORRESPONDING SELECTION KEY **YES** or **NO**
AFTER THE MESSAGE CALIBRATING **EXIT** BY PRESSING	CORRESPONDING SELECTION KEY **EXIT**

THE COPY OF THE CALIBRATION PERSONALITY IS NOW RESTORED TO THE "A" SECTION OF IC7. **IT SHOULD NOW BE SAVED TO THE "B" SECTION BY THE USE OF COMMAND 1/0 SAVE**

COMMAND 19 DIGITAL INPUTS

The logic status of digital inputs is displayed by use of this command.

The inputs can be high or low. Low is indicated by 0 and high is indicated by 1.

SCROLL TO **19 DIGITAL INPUTS** BY PRESSING	CORRESPONDING SELECTION KEY **MENU UP** OR **MENU DOWN**
START THE COMMAND BY PRESSING	CORRESPONDING SELECTION KEY
THE DISPLAY WILL READ THE STATUS OF ALL DIGITAL INPUTS	
EXIT FROM THE ROUTINE BY PRESSING	CORRESPONDING SELECTION KEY **EXIT**

DIGITAL INPUTS

1	NOT USED	
2	NOT USED	
3	NOT USED	
4	NOT USED	
5	NOT USED	
6	NOT USED	
7	NOT USED	
8	NOT USED	
9	NOT USED	
10	BY-PASS MESSAGE	HI = NO MESSAGE
11	SELECT OPTIONAL CHART	HI = SELECT CHART
12	NOT USED	
13	ATB IN	HI = NO ALARM
14	NOT USED	
15	NOT USED	

GLOSSARY OF TERMS

ABORT	The premature termination of a data entry procedure.
ALARM	A signal that warns or alerts such as a flashing light or loud noise.
AMPLIFIER	A device which takes an input and produces an output of greater magnitude (as in the case of a pressure transducer where a signal in the millivolt range is amplified to the level of up to ten volts).
AMPLIFIER GAIN	The factor used to express the level of amplification.
ANALOG	A mechanism in which data is represented by continuously variable physical quantities.
ANGLE SENSOR	A device which measures the inclination of a boom.
ANNULAR	Relating to, or forming a ring. e.g. the pressure around the rod of a boom hoist cylinder.
ANNULAR GAIN	The factor used to modify the pressure signal from the rod side of the boom hoist cylinder based on the difference in areas of the rod and bore.
BACK-UP	Move data from the working area of memory to a microchip which is stored elsewhere e.g. in a service department.
BOOM DEFLECTION	The change of radius due to the bending of a boom under load.
BOOM MOMENT	The turning moment around the boom pivot caused by the moment of the unladen boom.
BORE	The piston side of a boom hoist cylinder.
CALIBRATION	The adjustment of the graduation of sensors.
CAPACITY CHART	A table showing the rating of a crane.
CENTER OF GRAVITY	The point at which the entire weight of a body may be considered as concentrated so that if supported at this point the body would remain in equilibrium in any position.
COMMISSIONING	Preparing to be put into service.
CONFIGURATION	An arrangement of the lifting elements of a crane.
CURSOR	A pointer on a display which indicates the position where data is to be entered.
DATA	Factual information used as a basis for calculation.
DECREMENT	The action of decreasing a number or value.
DEDUCT	A reduction in rated capacity for an **unused** stowed or erected attachment.
DEFLECTION	The bending of a boom or the stretching of pendant lines within the elastic limits of the boom or pendants.
DIGITAL	Operating with numbers expressed directly as digits.
DIGITAL INPUTS	Computer inputs which usually are either on or off as determined by external switches.
DIRECTION	The direction of rotation of the superstructure.
DUTY	A working configuration on a crane usually contained in a single column of a capacity chart.
EEPROM	Electrically erasable and programmable "read only" memory. (ROM)

ELASTIC	Capable of recovering size or shape after deformation.
ERECTED ATTACHMENT	An attachment on the main boom fitted in its working position.
EXTENSION SENSOR	A device which measures the extension of the telescoping sections of a boom.
FLY/JIB	Something attached by one edge such as a lattice fly or jib on a crane boom.
FORCE	Energy exerted, in this case by the suspended weight of an object.
GEOMETRY	A branch of mathematics that deals with the measurement and relationships of points, lines, angles, surfaces and solids.
GRADUATED	Marked with degrees of measurement.
HEIGHT	The vertical distance from the ground to the tip of the boom or attachment.
HITE	An abbreviation of the word height. The height of the boom pivot above ground level.
HORIZONTAL	Parallel to the horizon.
HYDRAULIC CRANES	Operated using the pressure of oil.
INCREMENT	The action of increasing a number or value.
INITIALIZE	Erase all data from a memory prior to a new calibration.
INTEGRATED CIRCUITS	A tiny complex of electronic components and connections on a small slice of material (such as silicon).
MEASURE HEIGHT	The vertical distance below the boom pivot at which radius measurements are to be made when calibrating.
MICROPROCESSOR	A computer processor contained on an integrated chip.
MILLIVOLT	One thousandth of a volt.
MOMENT	The product of force and distance to a particular axis or point.
OUT OF DUTY	A point which is either longer than the longest permitted radius or lower than the lowest permitted angle on a capacity chart
OUTRIGGER	A projecting support run out from a main structure to provide additional stability or support.
PERSONALITY	Data stored in the calibration EEPROM.
PRESSURE	Hydraulic pressure in the boom hoist cylinder
RADIUS	The horizontal distance from the center line of rotation to the center of the hook.
RATED CAPACITY	The lifting capacity of a crane as determined by the published capacity chart.
RATED CAPACITY	The load which a crane can safely handle based on factors such as strength, stability and rating.
RATING	A factor determined by legislation which limits the proportion of a cranes capabilities which may be utilized in a lifting operation. Usually expressed as a percentage of strength or stability.
RESTORE	Move data from a back-up chip into the working personality.

ROM	"Read only" memory from which data can only be read, i.e. not changed after programming.
ROPE LIMIT	The maximum permitted single line pull determined by the construction and diameter of a wire rope.
SAVE	Move data from the working personality to a write protected area of memory.
SCALE	The use of a factor to set the scaling of analog sensors.
SCALE	Something graduated when used in measurement.
SENSITIVITY	A measure of the capacity of a sensor to respond to physical stimulus.
SENSOR	A device that responds to a physical stimulus and transmits a resulting impulse.
SHEAVE	A grooved wheel or pulley.
SLEW OFFSET	The horizontal distance from the boom pivot to the center of rotation
SPAN	An extent or spread between two limits.
SPAN	The calibration of an analog sensor between zero and maximum span.
STOWED ATTACHMENT	An attachment usually stowed on the main boom when not in use.
SUPERSTRUCTURE	The structural part of a crane above the carrier, usually rotating.
SWING	The rotation of a crane upper around its center line.
SWL (%SWL)	Percentage of safe working load. The proportion of the crane capacity which is being utilized at any one time expressed as a percentage of rated capacity
TRANSDUCER	A device which is actuated by energy from one system and converts this to another form for use by a different system (as a loudspeaker that is actuated by electrical signals and supplies acoustic power).
TX.0	The piston side pressure transducer.
TX.1	The rod side pressure transducer.
UNLADEN	A boom which has no additional stowed or erected attachments and which is not supporting a load.
VOLT	Unit of electrical potential difference and electromotive force.
WEIGHT	The amount that a body weighs
WRITE PROTECTED	An area of memory to which a microprocessor cannot write data.
ZERO	The point from which graduation of a scale begins.