# GREER COMPANY

# MICROGUARD® 414

## CALIBRATION PROCEDURE
## LINKBELT  HTC 8665/D6P0031

# PSR Professional Service & Repair Inc.

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# CONTENTS

# GENERAL INFORMATION

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

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.
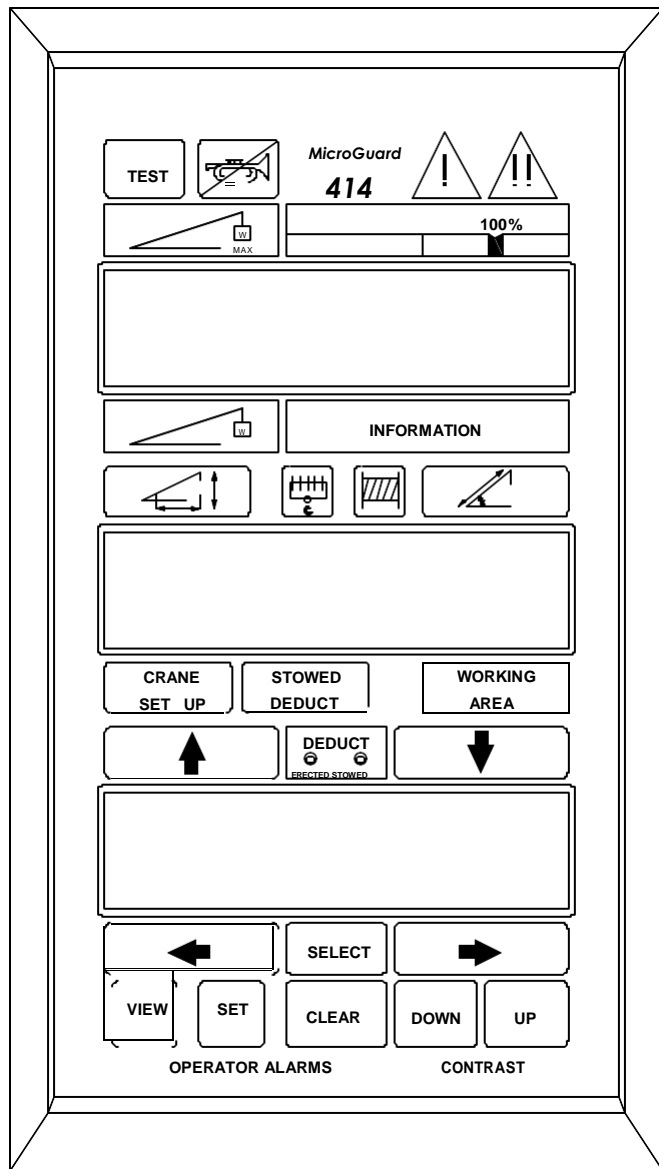
The 12,000# ctwt should be fitted during the calibration.

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 in the installation manual.

| PROGRAM | DUTY | PERSONALITY |
| CHIP | CHIP | CHIP |
| IC2 | IC3 | IC7 |
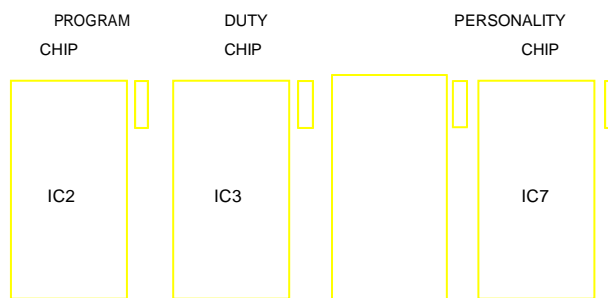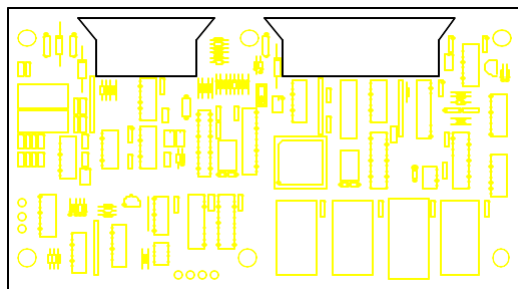
## WARNING

WHEN THE SYSTEM IS IN THE CALIBRATION MODE THE AUDIBLE ALARM AND FUNCTION KICK-OUTS ARE INHIBITED AND THERE IS NO PROTECTION FROM TWO-BLOCK OR 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 of the keypads on the standard display. These are shown as follows with a description of their basic function.

| | | |
|---|---|---|
| ⇧ | UP ARROW | INCREMENT A NUMBER |
| ⇩ | DOWN ARROW | DECREMENT A NUMBER |
| ⇦ | LEFT ARROW | CHANGE A CATEGORY OR SENSOR |
| ⇨ | RIGHT ARROW | CHANGE A CATEGORY AND EXIT |
| **SELECT** | SELECT KEY | SELECT AND CALIBRATE |
| **TEST** | TEST KEY | START THE CALIBRATION |

Access to calibration routines is achieved by simultaneously pressing and holding the **SELECT** 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 calibration keys which **MUST** be in the following sequence;

<p align="center">⇧   ⇩   ⇦   ⇨   <b>SELECT</b></p>

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.*

CAL SWITCH
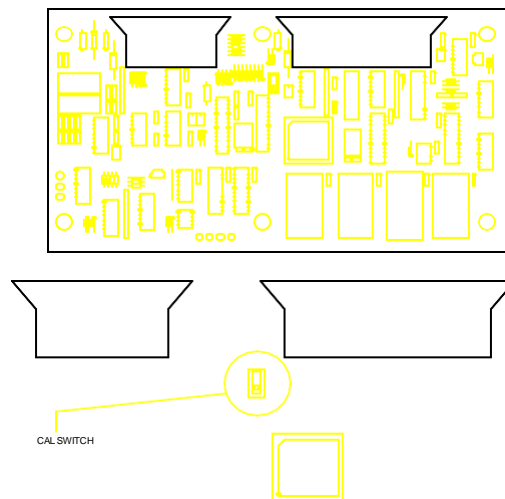
# COMMAND 00   RUN

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 lower 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.

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 10 SECONDS | **SELECT** AND **TEST** |
|---|---|
| FOLLOW THE **CAL** ENTRY SEQUENCE | ⇧ ⇩ ⇦ ⇨ |
| CONFIRM THE CALIBRATION (or abort with ⇨) | **SELECT** |

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 | ⇧ OR ⇩ |
|---|---|
| START THE COMMAND BY PRESSING | **SELECT** |
| SCROLL TO **01/2 INITIALIZE** BY PRESSING | ⇧ OR ⇩ |
| START THE COMMAND BY PRESSING | **SELECT** |
| FOLLOW THE **CAL** ENTRY SEQUENCE | ⇧ ⇩ ⇦ ⇨ |
| CONTINUE THE INITIALIZATION BY PRESSING | **SELECT** |
| CONFIRM THE CALIBRATION (or abort with ⇨) SEE NOTE | **SELECT** |
| AFTER THE MESSAGE CALIBRATING **EXIT** BY PRESSING | ⇨ |

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* ⇨ *Continuing with* **SELECT** *will erase the memory*

# 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 | ⇧ **OR** ⇩ |
| START THE COMMAND BY PRESSING | **SELECT** |
| SCROLL TO **01/0 SAVE** BY PRESSING | ⇧ **OR** ⇩ |
| START THE COMMAND BY PRESSING | **SELECT** |
| FOLLOW THE **CAL** ENTRY SEQUENCE | ⇧    ⇩    ⇦    ⇨ |
| CONTINUE THE **SAVE** BY PRESSING | **SELECT** |
| CONFIRM THE CALIBRATION (or abort with ⇨) SEE NOTE | **SELECT** |
| AFTER THE MESSAGE "CALIBRATING" THE DISPLAY WILL READ "A" GOOD "B" GOOD SAME | |
| **EXIT** BY PRESSING | ⇨ |

**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 the right arrow* ⇨ *Continuing with* **SELECT** *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 | ⇧ **OR** ⇩ |
| START THE COMMAND BY PRESSING | **SELECT** |
| THE SYSTEM WILL EXECUTE A SELF-TEST AND DISPLAY FAULT CODES | |
| **EXIT** FROM THE ROUTINE BY PRESSING | ⇨ |

# 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 404 does 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 center display will change to allow the entry of numbers. There are 5 categories in the display. and these are as follows;

| | |
|---|---|
| • | SELECTS A DECIMAL POINT |
| 0 | SELECTS A DIGIT 0-9. THE ⇧ AND ⇩ KEYS ARE USED TO CHANGE A NUMBER |
| ▫ | CHANGE SIGN +/- |
| C | CLEARS A CURRENTLY DISPLAYED NUMBER |
| E | TERMINATES THE NUMBER AND COMPLETES THE ENTRY PROCESS |

When the number entry is started the display is flashing on the number entry category and it is highlighted by arrows pointing to the category.

| • | ⇨**0**⇦ | ▫ | C | E |
|---|---|---|---|---|
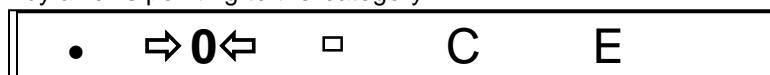
Numbers are changed by use of the ⇧ and ⇩ keys. When the required number has been selected it is entered by use of the **SELECT** key. Successive numbers up to a total of five digits may be entered in this way. If a number requires a decimal point this is entered by moving the highlighted selection to the decimal point by means of ⇦ .The decimal point then becomes highlighted.

| ⇨•⇦ | 0 | ▫ | C | E |
|---|---|---|---|---|

The decimal point is entered by use of the **SELECT** key. After the selection of a decimal point the highlighted flashing cursor returns to the digits for the completion of the number entry. If a number requires to be entered as a negative value the digits must be entered first followed by the change sign command.

Enter the number and then move the cursor to highlight the minus sign using ⇨

| • | 0 | ⇨▫⇦ | C | E |
|---|---|---|---|---|

Press **SELECT** to change to a negative value. If an error is made in the entry of data then move the cursor to highlight the **C** using ⇨

| • | 0 | ▫ | ⇨**C**⇦ | E |
|---|---|---|---|---|
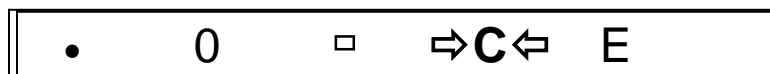
Press **SELECT** to delete the erroneous number, move the cursor back to the entry of digits and enter the correct number. After entry of all digits, decimal point and sign changes, move the cursor to **E** using ⇨ and press **SELECT** to terminate the sequence

| • | 0 | ▫ | C | ⇨**E**⇦ |
|---|---|---|---|---|
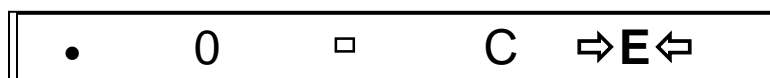
**NUMBER ENTRY** (continued)

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

| | |
|---|---|
| SELECT THE FIRST DIGIT ⇨**1**⇦ BY PRESSING | ⇧ **OR** ⇩ |
| WHEN AT ⇨**1**⇦ PRESS | **SELECT** |
| SELECT THE SECOND DIGIT ⇨**2**⇦ BY PRESSING | ⇧ **OR** ⇩ |
| WHEN AT ⇨**2**⇦ PRESS | **SELECT** |
| SELECT THE THIRD DIGIT ⇨**3**⇦ BY PRESSING | ⇧ **OR** ⇩ |
| WHEN AT ⇨**3**⇦ PRESS | **SELECT** |
| MOVE THE CURSOR TO THE DECIMAL POINT ⇨▪⇦ BY PRESSING | ⇦ |
| ENTER THE DECIMAL POINT BY PRESSING | **SELECT** |
| SELECT THE FIRST DECIMAL PLACE ⇨**4**⇦ BY PRESSING | ⇧ **OR** ⇩ |
| WHEN AT ⇨**4**⇦ PRESS | **SELECT** |
| SELECT THE NEXT DECIMAL PLACE ⇨**5**⇦ BY PRESSING | ⇧ **OR** ⇩ |
| WHEN AT ⇨**5**⇦ PRESS | **SELECT** |
| MOVE THE CURSOR TO THE CHANGE SIGN ⇨ ▫ ⇦ BY PRESSING | ⇨ |
| SELECT THE MINUS SIGN BY PRESSING | **SELECT** |
| MOVE THE CURSOR TO ⇨ **E**⇦ BY PRESSING..................................*SEE NOTE* | ⇨ |
| TERMINATE THE ENTRY BY PRESSING | **SELECT** |

**NOTE**

*AFTER THE ENTRY OF FIVE DIGITS THE CURSOR WILL MOVE AUTOMATICALLY TO* **E.**

*IF LESS THAN FIVE DIGITS HAVE BEEN ENTERED THEN USE* ⇨ *TO MOVE THE CURSOR TO* **E**.

# COMMAND 03  ZERO

The Zero Command permits the calibration of the zero of most analog sensors.  There are five sensors which can be zeroed by the use of command 03. Each of these sensors 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 TX0

♦    Rod side pressure transducer                 Input TX1

♦    Inner-mid extension sensor                    Analog input 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 | ⇧ **OR** ⇩ |
| START THE COMMAND BY PRESSING | **SELECT** |
| SCROLL TO **TX 0** BY PRESSING | ⇧ **OR** ⇩ |
| CONFIRM SELECTION OF THE SENSOR BY PRESSING | **SELECT** |
| THE DISPLAY WILL READ | **TX.0 = XXX** (actual input) |
| START THE CALIBRATION OF **TX 0** BY PRESSING | **SELECT** |
| CONFIRM THE CALIBRATION (or abort with ⇨) | **SELECT** |
| THE DISPLAY WILL READ | **TX.0 = 0** (zeroed input) |
| CHANGE SENSOR BY PRESSING | ⇦ |
| SCROLL TO **TX 1** BY PRESSING | ⇧ |
| CONFIRM SELECTION OF THE SENSOR BY PRESSING | **SELECT** |
| THE DISPLAY WILL READ | **TX.1 = XXX** (actual input) |
| START THE CALIBRATION OF **TX 1** BY PRESSING | **SELECT** |
| CONFIRM THE CALIBRATION (or abort with ⇨) | **SELECT** |
| THE DISPLAY WILL READ | **TX.1 = 0** (zeroed input) |
| **EXIT** FROM THE ROUTINE BY PRESSING | ⇨ |

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

# ZERO EXTENSION SENSORS

The reels are fitted with 130 ft. of shielded 2-wire cable which is terminated in a 3-pin socket on the extension sensor D6L0001. 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 reels 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 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 which is terminated in a 3-pin plug.

♦ *There are two potentiometers in each reel. The MicroGuard uses the potentiometers nearest to the terminal strip. The other potentiometers are used by the E.T.C.S. system. Refer to the procedure for the E.T.C.S. system for information about setting these potentiometers.*

♦ Manually turn the large gear on the MicroGuard potentiometer fully counter-clockwise and then advance it clockwise three clicks. Repeat the procedure on the other reel.

♦ Calibrate the zero of the sensors by use of the following sequence:

| | |
|---|---|
| SCROLL TO **03 ZERO** BY PRESSING | ⇧ **OR** ⇩ |
| START THE COMMAND BY PRESSING | **SELECT** |
| SCROLL TO SENSOR **NO. 1** BY PRESSING | ⇧ **OR** ⇩ |
| CONFIRM SELECTION OF THE SENSOR BY PRESSING | **SELECT** |
| THE DISPLAY WILL READ | **NO 1 = XXX** (actual input) |
| START THE CALIBRATION OF SENSOR **NO. 1** BY PRESSING | **SELECT** |
| CONFIRM THE CALIBRATION (or abort with ⇨) | **SELECT** |
| THE DISPLAY WILL READ | **NO 1 = 0** (zeroed input) |
| CHANGE SENSOR BY PRESSING | ⇦ |
| SCROLL TO SENSOR **NO. 2** BY PRESSING | ⇧ **OR** ⇩ |
| CONFIRM SELECTION OF THE SENSOR BY PRESSING | **SELECT** |
| THE DISPLAY WILL READ | **NO.2 = XXX** (actual input) |
| START THE CALIBRATION OF SENSOR **NO. 2** BY PRESSING | **SELECT** |
| CONFIRM THE CALIBRATION (or abort with ⇨) | **SELECT** |
| THE DISPLAY WILL READ | **NO.2 = 0** (zeroed input) |
| **EXIT** FROM THE ROUTINE BY PRESSING | ⇨ |
| OR CHANGE SENSOR BY PRESSING | ⇦ |

# 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.

♦  Ensure that with the boom horizontal, the boom angle 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 | ⇧ **OR** ⇩ |
| START THE COMMAND BY PRESSING | **SELECT** |
| SCROLL TO SENSOR **NO. 3** BY PRESSING | ⇧ **OR** ⇩ |
| CONFIRM SELECTION OF THE SENSOR BY PRESSING | **SELECT** |
| THE DISPLAY WILL READ | **NO.3 = XX.X** (actual input) |
| START THE CALIBRATION OF SENSOR **NO. 3** BY PRESSING | **SELECT** |
| CONFIRM THE CALIBRATION (or abort with ⇨) | **SELECT** |
| THE DISPLAY WILL READ | **NO.3 = 0**   (zeroed input) |
| **EXIT** FROM THE ROUTINE BY PRESSING | ⇨ |
| OR CHANGE SENSOR BY PRESSING | ⇦ |

# 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 | ⇧ **OR** ⇩ |
| START THE COMMAND BY PRESSING | **SELECT** |
| SCROLL TO SENSOR **NO. 3** BY PRESSING | ⇧ **OR** ⇩ |
| CONFIRM SELECTION OF THE SENSOR BY PRESSING | **SELECT** |
| 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 | **SELECT** |
| USE NUMBER ENTRY PROCEDURE TO ENTER MEASURED **BOOM ANGLE** | |
| CONFIRM THE CALIBRATION (or abort with ⇨) | **SELECT** |
| THE DISPLAY WILL READ | **NO.3 I/P = BOOM ANGLE** |
| **EXIT** FROM THE ROUTINE BY PRESSING | ⇨ |

## EXTENSION SENSORS

THE FULLY EXTENDED BOOM WILL NOT CAUSE A TIPPING CONDITION. CARRY OUT CALIBRATION PROCEDURES WITH ALL THE SECTIONS FULLY EXTENDED.

THE EXTENSION VALUE FOR THE INNER MID SECTION IS 24.92 FEET.

THE FULL EXTENSION VALUE FOR THE BOOM IS 74.50 FEET.

| | |
|---|---|
| SCROLL TO **04 SPAN** BY PRESSING | ⇧ **OR** ⇩ |
| START THE COMMAND BY PRESSING | **SELECT** |
| SCROLL TO SENSOR **NO. 1** BY PRESSING | ⇧ **OR** ⇩ |
| CONFIRM SELECTION OF THE SENSOR BY PRESSING | **SELECT** |
| THE DISPLAY WILL READ | **NO. 1 I/P = 0.00** (or actual input when re-calibrating) |
| START THE CALIBRATION OF SENSOR **NO. 1** BY PRESSING | **SELECT** |
| USE NUMBER ENTRY PROCEDURE TO ENTER **EXTENSION VALUE 24.92** | |
| CONFIRM THE CALIBRATION (or abort with ⇨) | **SELECT** |
| THE DISPLAY WILL READ | **NO.2 I/P =24.92** (extension value) |
| CHANGE SENSOR BY PRESSING | ⇦ |
| SCROLL TO SENSOR **NO. 2** BY PRESSING | ⇧ **OR** ⇩ |
| CONFIRM SELECTION OF THE SENSOR BY PRESSING | **SELECT** |
| 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 | **SELECT** |
| USE NUMBER ENTRY PROCEDURE TO ENTER **EXTENSION VALUE = 74.5** | |
| CONFIRM THE CALIBRATION (or abort with ⇨) | **SELECT** |
| THE DISPLAY WILL READ | **NO.2 I/P =74.50** (extension value) |
| **EXIT** FROM THE ROUTINE BY PRESSING | ⇨ |

At this stage of the procedure the boom length display will indicate extension 74.5 feet. After completion of Command 07, main boom radius/moment, it will display boom length.
Retract the boom and continue the procedure.

# COMMAND 05   SWING

**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 | ⇧ **OR** ⇩ |
| START THE COMMAND BY PRESSING | **SELECT** |
| THE DISPLAY WILL READ | **0 = SCALE** |
| CONFIRM SELECTION OF **SCALE** BY PRESSING | **SELECT** |
| SLOWLY ROTATE THE UPPER STRUCTURE OF THE CRANE FOR AT LEAST 2 REVOLUTIONS | |
| STOP THE ROTATION AND START THE SLEW SCALE BY PRESSING | **SELECT** |
| CONFIRM THE CALIBRATION (or abort with ⇨) | **SELECT** |
| THE DISPLAY WILL READ | **0 = SCALE** |
| SCROLL TO **1 SLEW ZERO** BY PRESSING | ⇧ |
| THE DISPLAY WILL READ | **1 = ZERO** |
| CONFIRM SELECTION OF **1 SLEW ZERO** BY PRESSING | **SELECT** |

**(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 | **SELECT** |
| CONFIRM THE CALIBRATION (or abort with ⇨) | **SELECT** |
| THE DISPLAY WILL READ | **1 = ZERO** |
| SCROLL TO **2 DIRECTION** BY PRESSING | ⇧ |
| THE TOP DISPLAY WILL READ | **2 = DIRECTION** |
| CONFIRM SELECTION OF **2 DIRECTION** BY PRESSING | **SELECT** |
| 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 | ⇧ |
| IF THE NUMBERS DECREASE TO APPROX. **350°** **REVERSE** THE DIRECTION BY PRESSING | ⇩ |
| START THE DIRECTION CALIBRATION BY PRESSING | **SELECT** |
| CONFIRM THE CALIBRATION (or abort with ⇨) | **SELECT** |
| **EXIT** FROM THE ROUTINE BY PRESSING | ⇨ |

# 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 7 consecutive steps.

1.  Select Outriggers, Tires, Rigging/Travel mode.

2.  Select Counterweight.

3.  Select Boom Telescope Mode.

4.  Select Auxiliary Head fitted or not fitted.

5.  Select Erected Attachments.

6.  Select Lifting Point for Front Winch.

7.  Select Lifting Point for Rear Winch.

**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 use of the letter F for front winch and the letter R for rear winch. To change the selection press the WINCH select push-button. 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, height 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"**

| **CRANE SET UP** | | | | | | |
|---|---|---|---|---|---|---|

| SCROLL TO CARRIER | | | | | | |
|---|---|---|---|---|---|---|
| ⇧ OR ⇩ | OUTRIGGERS FULLY EXT. | OUTRIGGERS HALF EXT. | OUTRIGGERS RETRACTED | ON TIRES STATIONARY | PICK AND CARRY | RIGGING TRAVEL |
| SELECT | | | | | | |

| SCROLL TO CTWT | | | | | |
|---|---|---|---|---|---|
| ⇧ OR ⇩ | NO CTWT | 3,000# CTWT | 6,000# CTWT | 9,000# CTWT | 12,000# CTWT |
| SELECT | | | | | |

| SCROLL TO BOOM MODE | | |
|---|---|---|
| ⇧ OR ⇩ | MAIN BOOM MODE A | MAIN BOOM MODE B |
| SELECT | | |

| SCROLL TO AUX. HEAD | | |
|---|---|---|
| ⇧ OR ⇩ | AUX. HEAD FITTED | AUX. HEAD NOT FITTED |
| SELECT | | |

| SCROLL TO ATTACHMENT | | | | | | |
|---|---|---|---|---|---|---|
| ⇧ OR ⇩ | NO ATTACHMENT | +34' FLY 0° OFFSET | +34' FLY 15° OFFSET | +34' FLY 30° OFFSET | +56' FLY 0° OFFSET | +56' FLY 15° OFFSET | +56' FLY 30° OFFSET |
| SELECT | | | | | | |

| SCROLL TO FRONT WINCH LIFTING POINT | | | | | | | |
|---|---|---|---|---|---|---|---|
| ⇧ OR ⇩ | MAIN BOOM HEAD | AUX. LIFTING SHEAVE | +34' FLY 0° OFFSET | +34' FLY 15° OFFSET | +34' FLY 30° OFFSET | +56' FLY 0° OFFSET | +56' FLY 15° OFFSET | +56' FLY 30° OFFSET |
| **SELECT** | | | | | | | |

| SCROLL TO REAR WINCH LIFTING POINT | | | | | | | |
|---|---|---|---|---|---|---|---|
| ⇧ OR ⇩ | MAIN BOOM HEAD | AUX. LIFTING SHEAVE | +34' FLY 0° OFFSET | +34' FLY 15° OFFSET | +34' FLY 30° OFFSET | +56' FLY 0° OFFSET | +56' FLY 15° OFFSET | +56' FLY 30° OFFSET |
| **SELECT** | | | | | | | |

FOLLOWING THE SELECTION OF CRANE SET UP USE THE WINCH PUSH-BUTTON TO SELECT THE LIFTING POINT. SET THE PARTS OF LINE IN USE FOR EACH WINCH.

# COMMAND 06   PRESSURE

♦ USE "CRANE SET UP" TO SELECT FULLY EXTENDED OUTRIGGERS, 12,000# CTWT, BOOM MODE "A", NO ATTACHMENTS.

♦ FULLY EXTEND THE INNER AND OUTER MID SECTIONS. DO NOT EXTEND THE TIP SECTION.

♦ PREPARE TO LIFT A CALIBRATION LOAD OF APPROXIMATELY 15,000# AT THE MAXIMUM SAFE RADIUS FOR THE LOAD.

♦ THE CALIBRATION LOAD INCUDES THE WEIGHT OF THE PINS AND SLINGS BUT DOES NOT INCLUDE THE WEIGHT OF THE BLOCK OR BALL.

♦ 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.

Calibrate the pressure span by use of the following sequence:

| | |
|---|---|
| SCROLL TO **06 PRESSURE** BY PRESSING | ⇧ **OR** ⇩ |
| START THE COMMAND BY PRESSING | **SELECT** |
| USE THE NUMBER ENTRY PROCEDURE TO ENTER THE WEIGHT OF THE **CALIBRATION LOAD** | |
| RAISE THE CALIBRATION LOAD USING THE WINCH AND PRESS | ⇧ |
| USE THE NUMBER ENTRY PROCEDURE TO ENTER THE **EXACT RADIUS** OF THE CALIBRATION LOAD | |
| THE UPPER DISPLAY WILL READ (⇧ ) TO INDICATE THAT THE DATA IS ACQUIRED | |
| LOWER THE LOAD AND WITH THE LOAD ON THE GROUND PRESS | ⇩ |
| THE UPPER DISPLAY WILL READ (⇩ ⇧ ) TO INDICATE THAT THE DATA IS ACQUIRED | |
| START THE LOAD CALIBRATION BY PRESSING | **SELECT** |
| CONFIRM THE CALIBRATION (or abort with ⇨) | **SELECT** |
| WITH THE LOAD STILL ON THE GROUND THE LOAD DISPLAY WILL READ ZERO. RAISE THE CALIBRATION LOAD. THE DISPLAY WILL READ THE EXACT VALUE OF THE CALIBRATION LOAD. | |
| **EXIT** FROM THE ROUTINE BY PRESSING | ⇨ |

# 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 STORE 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 between 60° and 65°. 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 ABORTED by use of the ⇨⇨ key 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 ⇧ or ⇩ key to indicate at which unusual angle data is being acquired.

*THIS CALIBRATION ROUTINE IS USED FOR BOTH BOOM TELESCOPE MODES "A" AND "B". IT IS NECESSARY TO HAVE THE **CORRECT** SELECTION PRIOR TO STARTING THE CALIBRATION ROUTINE. TO FACILITATE THIS THE "CRANE SETUP" MENU CAN BE ACCESSED FROM WITHIN THE RADIUS CALIBRATION ROUTINE.*

## BOOM MODE "A".

- ♦ Start the routine with the horizontal boom fully retracted.

- ♦ Determine the weight of the hook-block in use.

- ♦ Calibrate the radius and moment of the main boom, mode A, by use of the following sequence:

| | |
|---|---|
| SCROLL TO 07 **RADIUS** BY PRESSING | ⇧ **OR** ⇩ |
| START THE COMMAND BY PRESSING | **SELECT** |
| USE THE NUMBER ENTRY ROUTINE TO ENTER WEIGHT OF THE HOOK | |
| USE THE CRANE SET UP MENU TO SELECT THE CURRENT CONFIGURATION, MODE "A" | |
| STORE THE LOW ANGLE DATA BY PRESSING | **SELECT** |
| USE THE NUMBER ENTRY ROUTINE TO ENTER THE CURRENT RADIUS | |
| THE DISPLAY WILL READ (⇩    ) | |

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

| | |
|---|---|
| STORE THE HIGH ANGLE DATA BY PRESSING | **SELECT** |
| USE THE NUMBER ENTRY ROUTINE TO ENTER THE NEW RADIUS | |
| THE DISPLAY WILL READ (⇩ ⇧ ) | |
| START THE MOMENT CALIBRATION AT THE CURRENT LENGTH BY PRESSING | **SELECT** |
| CONFIRM THE CALIBRATION (or abort with ⇨ ) | **SELECT** |

Maintain the same high angle and extend the boom to 84.5 feet. Measure the **new radius**.

| | |
|---|---|
| STORE THE HIGH ANGLE DATA BY PRESSING | **SELECT** |
| USE THE NUMBER ENTRY ROUTINE TO ENTER THE **NEW RADIUS** | |
| THE DISPLAY WILL READ ( ⇧ ) | |

Maintain the same length and lower the boom to horizontal. Measure the **new radius**

| | |
|---|---|
| STORE THE LOW ANGLE DATA BY PRESSING | **SELECT** |
| USE THE NUMBER ENTRY ROUTINE TO ENTER THE **NEW RADIUS** | |
| THE DISPLAY WILL READ (⇩ ⇧ ) | |
| START THE MOMENT CALIBRATION AT THE CURRENT LENGTH BY PRESSING | **SELECT** |
| CONFIRM THE CALIBRATION (or abort with ⇨ ) | **SELECT** |

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

| | |
|---|---|
| STORE THE LOW ANGLE DATA BY PRESSING | **SELECT** |
| USE THE NUMBER ENTRY ROUTINE TO ENTER THE NEW RADIUS | |
| THE DISPLAY WILL READ ( ⇩ ) | |

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

| | |
|---|---|
| STORE THE HIGH ANGLE DATA BY PRESSING | **SELECT** |
| USE THE NUMBER ENTRY ROUTINE TO ENTER THE NEW RADIUS | |
| THE DISPLAY WILL READ (⇩ ⇧ ) | |
| START THE MOMENT CALIBRATION AT THE CURRENT LENGTH BY PRESSING | **SELECT** |
| CONFIRM THE CALIBRATION (or abort with ⇨) | **SELECT** |
| EXIT FROM THE ROUTINE BY PRESSING | ⇨ |

# COMMAND 07    MAIN BOOM  RADIUS/MOMENT

**BOOM MODE "B"**

♦        Start the routine with the horizontal boom fully retracted.

♦        Determine the weight of the hook-block in use.

♦        Calibrate the radius and moment of the main boom, mode B, by use of the following sequence:

| | |
|---|---|
| SCROLL TO 07 **RADIUS** BY PRESSING | ⇧ **OR** ⇩ |
| START THE COMMAND BY PRESSING | **SELECT** |
| USE THE NUMBER ENTRY ROUTINE TO ENTER WEIGHT OF THE HOOK | |
| USE THE CRANE SET UP MENU TO SELECT THE CURRENT CONFIGURATION, MODE "B" | |
| STORE THE LOW ANGLE DATA BY PRESSING | **SELECT** |
| USE THE NUMBER ENTRY ROUTINE TO ENTER THE CURRENT RADIUS | |
| THE DISPLAY WILL READ (⇩    ) | |

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

| | |
|---|---|
| STORE THE HIGH ANGLE DATA BY PRESSING | **SELECT** |
| USE THE NUMBER ENTRY ROUTINE TO ENTER THE NEW RADIUS | |
| THE DISPLAY WILL READ (⇩ ⇧ ) | |
| START THE MOMENT CALIBRATION AT THE CURRENT LENGTH BY PRESSING | **SELECT** |
| CONFIRM THE CALIBRATION (or abort with ⇨) | **SELECT** |

Maintain the same high angle and extend the OUTER MID SECTION. Measure the new radius.

| | |
|---|---|
| STORE THE HIGH ANGLE DATA BY PRESSING | **SELECT** |
| USE THE NUMBER ENTRY ROUTINE TO ENTER THE NEW RADIUS FROM | |
| THE DISPLAY WILL READ ( ⇧ ) | |

Maintain the same length, lower the boom to horizontal and measure the **new radius**

| | |
|---|---|
| STORE THE LOW ANGLE DATA BY PRESSING | **SELECT** |
| USE THE NUMBER ENTRY ROUTINE TO ENTER THE NEW RADIUS | |
| THE DISPLAY WILL READ (⇩ ⇧ ) | |
| START THE MOMENT CALIBRATION AT THE CURRENT LENGTH BY PRESSING | **SELECT** |
| CONFIRM THE CALIBRATION (or abort with ⇨ ) | **SELECT** |

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

| | |
|---|---|
| STORE THE LOW ANGLE DATA BY PRESSING | **SELECT** |
| USE THE NUMBER ENTRY ROUTINE TO ENTER THE NEW RADIUS | |
| THE DISPLAY WILL READ (⇩ ) | |

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

| | |
|---|---|
| STORE THE HIGH ANGLE DATA BY PRESSING | **SELECT** |
| USE THE NUMBER ENTRY ROUTINE TO ENTER THE NEW RADIUS | |
| THE DISPLAY WILL READ (⇩ ⇧ ) | |
| START THE MOMENT CALIBRATION AT THE CURRENT LENGTH BY PRESSING | **SELECT** |
| CONFIRM THE CALIBRATION (or abort with ⇨ ) | **SELECT** |

Maintain the same high angle, extend the INNER MID SECTION and measure the **new radius**

| | |
|---|---|
| STORE THE HIGH ANGLE DATA BY PRESSING | **SELECT** |
| USE THE NUMBER ENTRY ROUTINE TO ENTER THE NEW RADIUS FROM | |
| THE DISPLAY WILL READ **(⇧ )** | |

Maintain the same length, lower the boom to horizontal and measure the **new radius**

| | |
|---|---|
| STORE THE LOW ANGLE DATA BY PRESSING | **SELECT** |
| USE THE NUMBER ENTRY ROUTINE TO ENTER THE NEW RADIUS | |
| THE DISPLAY WILL READ **(⇩ ⇧ )** | |
| START THE MOMENT CALIBRATION AT THE CURRENT LENGTH BY PRESSING | **SELECT** |
| CONFIRM THE CALIBRATION (or abort with ⇨) | **SELECT** |
| EXIT FROM THE ROUTINE BY PRESSING | ⇨ |

# COMMAND 08   BOOM DEFLECTION CORRECTION

♦   With the boom fully extended at an angle of approximately 65 degrees, pick up the maximum permitted load.

♦   Measure the deflected radius. The radius is measured from the center line of rotation to the center of the load.

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

| | |
|---|---|
| SCROLL TO **08 B D C** BY PRESSING | ⇧ **OR** ⇩ |
| STORE THE DATA BY PRESSING | **SELECT** |
| START THE BDC CALIBRATION BY PRESSING | **SELECT** |
| CONFIRM THE CALIBRATION (or abort with ⇨) | **SELECT** |
| USE THE NUMBER ENTRY ROUTINE TO ENTER THE NEW RADIUS | |
| **EXIT** FROM THE ROUTINE BY PRESSING | ⇨ |

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 ABORTED by use of the ⇨⇨ key 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 ⇧ or ⇩ 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 | ⇧ **OR** ⇩ |
| START THE COMMAND BY PRESSING | **SELECT** |
| IF THE LOAD DECREASES WHEN BOOMING DOWN USE THE UP ARROW TO CORRECT THE DISPLAYED NUMBER | ⇧ |
| IF THE LOAD INCREASES WHEN BOOMING DOWN USE THE DOWN ARROW TO CORRECT THE DISPLAYED NUMBER | ⇩ |
| START THE ANNULAR GAIN CALIBRATION BY PRESSING | **SELECT** |
| CONFIRM THE CALIBRATION (or abort with ⇨) | **SELECT** |
| **EXIT** FROM THE ROUTINE WITHOUT CALIBRATING BY PRESSING | ⇨ |

# COMMAND 15   ALARM LIMITS

At the initialization of the system the following values are set.

- Alarm 0            100% SWL        Red Lamp and Motion-Cut Relay

- Alarm 1             90% SWL         Amber Lamp and Pre-Alarm Relay

- Alarm 2             90% SWL         Internal Audible Alarm

The alarm command permits their modification and they should be entered as percentages.
Enter details of the alarm settings by use of the following sequence:

| | |
|---|---|
| SCROLL TO **15 ALARM** BY PRESSING | ⇧ **OR** ⇩ |
| START THE COMMAND BY PRESSING | **SELECT** |
| THE DISPLAY WILL READ | **% SWL 0 = 100.000** |
| START THE CALIBRATION OF **% SWL #0** BY PRESSING | **SELECT** |
| CONFIRM THE CALIBRATION (or abort with ⇨) | **SELECT** |
| USE NUMBER ENTRY PROCEDURE TO ENTER THE **NEW SETTING** | |
| AFTER THE MESSAGE "**CALIBRATING**" THE DISPLAY WILL READ | **NEW SETTING** |
| SCROLL TO **% SWL #1** BY PRESSING | ⇨ |
| THE DISPLAY WILL READ | **% SWL 1 = 90.000** |
| START THE CALIBRATION OF **% SWL #1** BY PRESSING | **SELECT** |
| CONFIRM THE CALIBRATION (or abort with ⇨) | **SELECT** |
| USE NUMBER ENTRY PROCEDURE TO ENTER THE **NEW SETTING** | |
| AFTER THE MESSAGE "**CALIBRATING**" THE DISPLAY WILL READ | **NEW SETTING** |
| SCROLL TO **% SWL #2** BY PRESSING | ⇨ |
| THE DISPLAY WILL READ | **% SWL 2 = 90.000** |
| START THE CALIBRATION OF **% SWL #2** BY PRESSING | **SELECT** |
| CONFIRM THE CALIBRATION (or abort with ⇨) | **SELECT** |
| USE NUMBER ENTRY PROCEDURE TO ENTER THE **NEW SETTING** | |
| AFTER THE MESSAGE "**CALIBRATING**" THE DISPLAY WILL READ | **NEW SETTING** |
| **EXIT** FROM THE ROUTINE BY PRESSING | ⇨ |

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

| | |
|---|---|
| SCROLL TO **15 ALARM** BY PRESSING | ⇧ **OR** ⇩ |
| START THE COMMAND BY PRESSING | **SELECT** |
| THE DISPLAY WILL READ | **% SWL 0 = 100.000** |
| SCROLL TO **% SWL #1** BY PRESSING | ⇨ |
| THE DISPLAY WILL READ | **% SWL 1 = 90.000** |
| SCROLL TO **% SWL #2** BY PRESSING | ⇨ |
| THE DISPLAY WILL READ | **% SWL 2 = 90.000** |
| **EXIT** FROM THE ROUTINE BY PRESSING | ⇨ |

# 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 13,000 # is entered as 13.00

Change data by use of the following sequence:

| | |
|---|---|
| SCROLL TO **16 ROPE** BY PRESSING | ⇧ **OR** ⇩ |
| START THE COMMAND BY PRESSING | **SELECT** |
| THE DISPLAY WILL READ | **ROPE LIMIT 0 = 13.000** |
| START THE CALIBRATION OF **ROPE LIMIT #0** BY PRESSING | **SELECT** |
| CONFIRM THE CALIBRATION (or abort with ⇨) | **SELECT** |
| USE NUMBER ENTRY PROCEDURE TO ENTER THE **NEW LIMIT** | |
| AFTER THE MESSAGE "**CALIBRATING**" THE DISPLAY WILL READ | **NEW LIMIT** |
| SCROLL TO **ROPE LIMIT #1** BY PRESSING | ⇨ |
| THE DISPLAY WILL READ | **ROPE LIMIT 1 = 13.000** |
| START THE CALIBRATION OF **ROPE LIMIT #1** BY PRESSING | **SELECT** |
| CONFIRM THE CALIBRATION (or abort with ⇨) | **SELECT** |
| USE NUMBER ENTRY PROCEDURE TO ENTER THE **NEW LIMIT** | |
| AFTER THE MESSAGE "**CALIBRATING**" THE DISPLAY WILL READ | **NEW LIMIT** |
| **EXIT** FROM THE ROUTINE BY PRESSING | ⇨ |

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

| | |
|---|---|
| SCROLL TO **16 ROPE** BY PRESSING | ⇧ **OR** ⇩ |
| START THE COMMAND BY PRESSING | **SELECT** |
| THE DISPLAY WILL READ | **ROPE LIMIT 0 = 13.000** |
| SCROLL TO **ROPE LIMIT #1** BY PRESSING | ⇨ |
| THE DISPLAY WILL READ | **ROPE LIMIT 1 = 13.000** |
| **EXIT** FROM THE ROUTINE BY PRESSING | ⇨ |

# 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 | ⇧ **OR** ⇩ |
| START THE COMMAND BY PRESSING | **SELECT** |
| THE DISPLAY WILL READ | **AMP GAIN = 2** |
| START THE CALIBRATION OF **AMPLIFIER GAIN** BY PRESSING | **SELECT** |
| CONFIRM THE CALIBRATION (or abort with ⇨) | **SELECT** |
| CHANGE THE SETTING BY PRESSING | ⇧ **OR** ⇩ |
| COMPLETE THE CALIBRATION BY PRESSING | **SELECT** |
| **EXIT** FROM THE ROUTINE BY PRESSING | ⇨ |

# 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 | ⇧ **OR** ⇩ |
| START THE COMMAND BY PRESSING | **SELECT** |
| SCROLL TO **01/0 SAVE** BY PRESSING | ⇧ **OR** ⇩ |
| START THE COMMAND BY PRESSING | **SELECT** |
| FOLLOW THE **CAL** ENTRY SEQUENCE | ⇧   ⇩   ⇦   ⇨ |
| CONTINUE THE **SAVE** BY PRESSING | **SELECT** |
| CONFIRM THE CALIBRATION (or abort with ⇨) SEE NOTE | **SELECT** |
| AFTER THE MESSAGE "CALIBRATING" THE DISPLAY WILL READ "A" GOOD "B" GOOD SAME | |
| **EXIT** BY PRESSING | ⇨ |

# 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 | ⇧ **OR** ⇩ |
| START THE COMMAND BY PRESSING | **SELECT** |
| SCROLL TO **01/3 BACK** BY PRESSING | ⇧ **OR** ⇩ |
| START THE COMMAND BY PRESSING | **SELECT** |
| FOLLOW THE **CAL** ENTRY SEQUENCE | ⇧   ⇩   ⇦   ⇨ |
| CONTINUE THE **BACK-UP** BY PRESSING | **SELECT** |
| CONFIRM THE CALIBRATION (or abort with ⇨) SEE NOTE | **SELECT** |
| AFTER THE MESSAGE CALIBRATING **EXIT** BY PRESSING | ⇨ |

## SWITCH OFF POWER TO THE SYSTEM

**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**

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| START THE ROUTINE BY PRESSING AND HOLDING FOR APPROXIMATELY 10 SECONDS | **SELECT** AND **TEST** |
| FOLLOW THE **CAL** ENTRY SEQUENCE | ⇧　　⇩　　⇦　　⇨ |
| CONFIRM THE CALIBRATION (or abort with ⇨) | **SELECT** |

## COMMAND 01/4 RESTORE

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| SCROLL TO **01 PERSONALITY** BY PRESSING | ⇧ **OR** ⇩ |
| START THE COMMAND BY PRESSING | **SELECT** |
| SCROLL TO **01/4 RESTORE** BY PRESSING | ⇧ **OR** ⇩ |
| START THE COMMAND BY PRESSING | **SELECT** |
| FOLLOW THE **CAL** ENTRY SEQUENCE | ⇧　　⇩　　⇦　　⇨ |
| CONTINUE THE **RESTORE** BY PRESSING | **SELECT** |
| CONFIRM THE CALIBRATION (or abort with ⇨) SEE NOTE | **SELECT** |
| AFTER THE MESSAGE CALIBRATING **EXIT** BY PRESSING | ⇨ |

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 | ⇧ **OR** ⇩ |
|---|---|
| START THE COMMAND BY PRESSING | **SELECT** |
| THE DISPLAY WILL READ THE STATUS OF ALL DIGITAL INPUTS | |
| **EXIT** FROM THE ROUTINE BY PRESSING | ⇨ |

## 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

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| 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) |

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| 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. |

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| 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 or the poundage to be carried by a horse in a handicap race. |
| WRITE PROTECTED | An area of memory to which a microprocessor cannot write data. |
| ZERO | The point from which graduation of a scale begins. |