GREER COMPANY

MicroGuard® 404
COMMISSIONING
PROCEDURE

HYDRAULIC CRANES

PSR Professional Service & Repair Inc.

Professional Service & Repair Inc. is a full-service mobile crane repair, inspection, and certification company. At Professional Service & Repair we understand the critical aspect of your crane being operational to your project schedule and budget. We will deliver world class service to have your crane operational in the minimum amount of time.

PSR is the global provider for sales, repair and installation of Load Moment Indicating (LMI) systems, Anti-Two Block Systems (A2B), and Rated Capacity Indicating systems. Please contact us with your crane repair and certification needs today.

PSR is the name businesses trust for crane repair, inspection, and certification.

Main Line: 706-718-0856
Fax: 706-569-7004
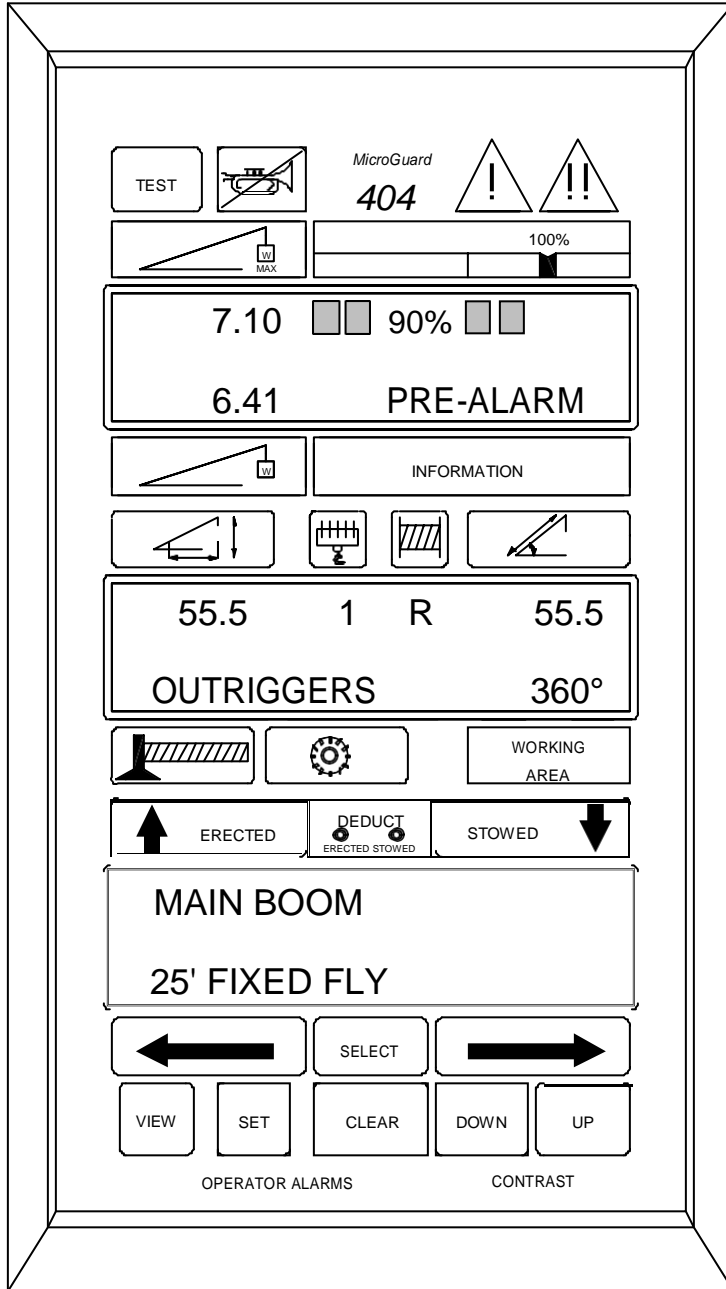**E-Mail: jeff@psrinc.biz**

P.O. Box 6506
Columbus, GA
31917-6506

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 and jacks are correctly extended.

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

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

Main boom calibration **MUST** be completed before calibration of fly and jib configurations.

Fly and jib configurations may be calibrated in any sequence after main boom calibration.

Boom deflection correction is optional but is recommended on all configurations in order to achieve the greatest accuracy.

CALIBRATION PROCEDURES

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

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
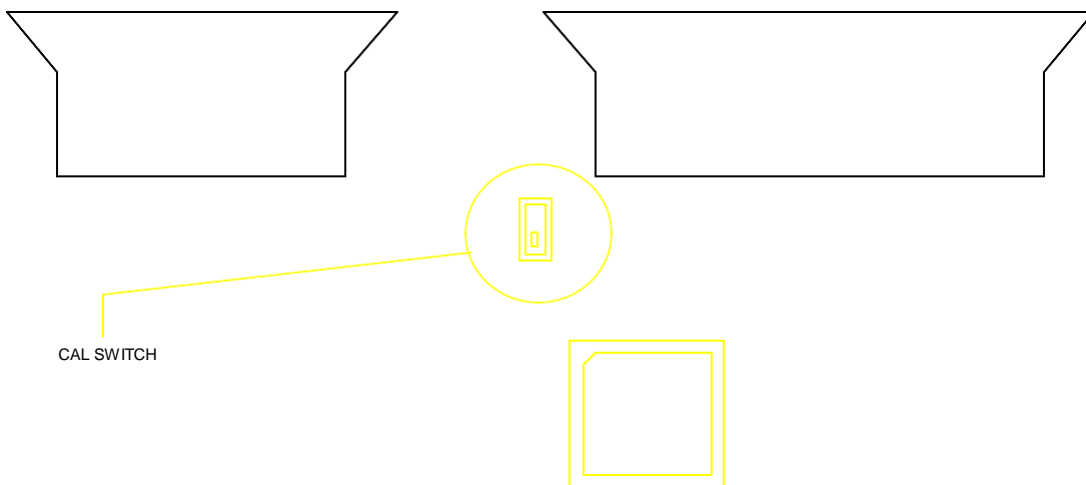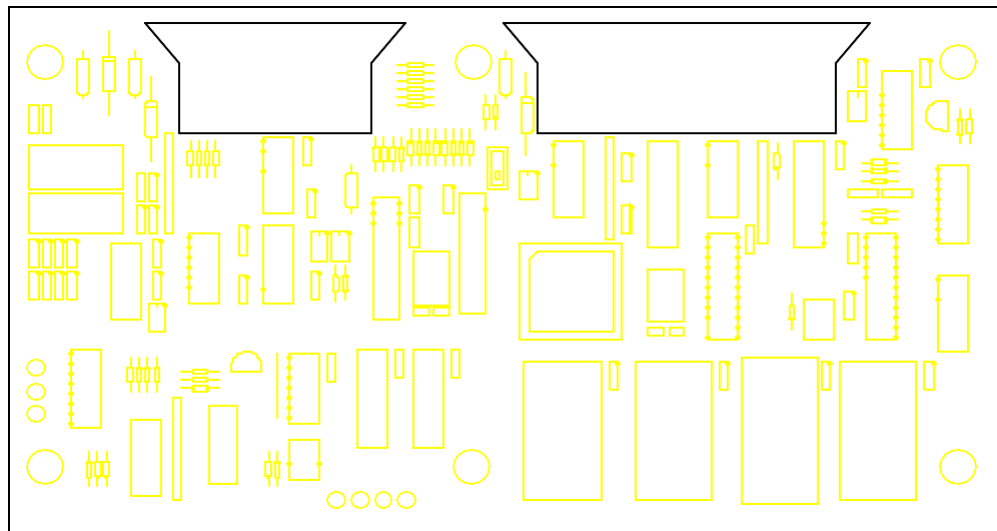
Data entry is achieved by the use of six of the keypads on the standard display. These are shown as follows with a description of their basic function.

⇧	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 ten 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;

<div align="center">

⇧   ⇩   ⇦   ⇨   **SELECT**
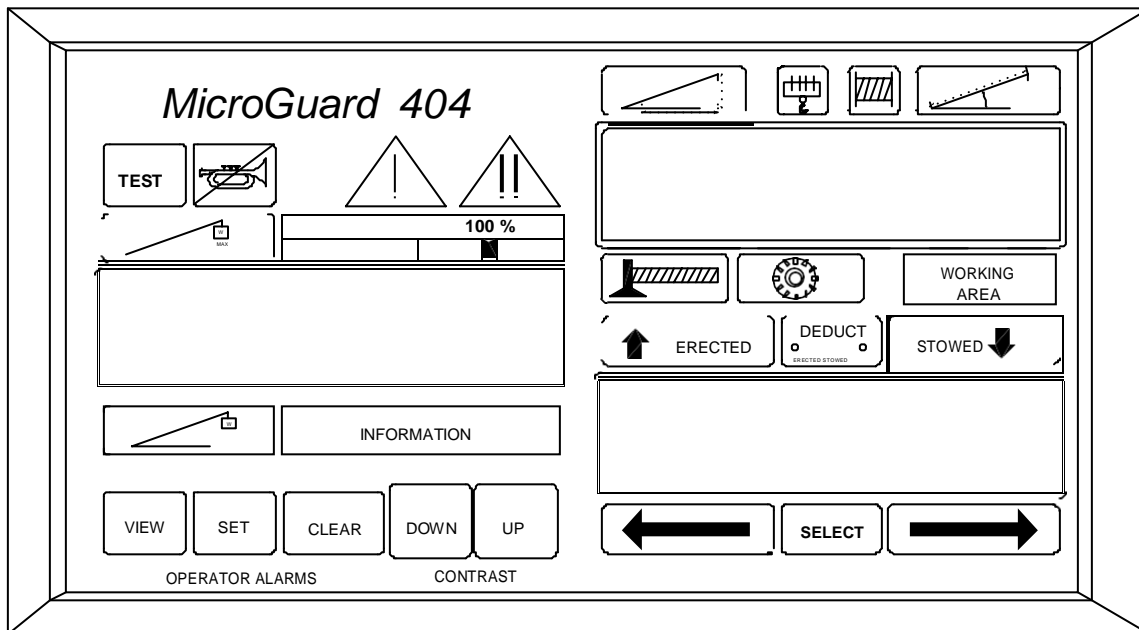
</div>

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.

Following correct entry of the calibration code then the system will be in the MONITOR mode and will be at the Command 00 Run.

The entire calibration menu is as follows.

00	RUN	RETURNS TO NORMAL SCREEN AFTER SELF TEST
01	TEST	PERFORMS TEST AND REMAINS IN CAL MODE
02	ERRORS	DISPLAYS ERROR CODES
03	SCALE	ENTERS SCALING FACTORS FOR SENSORS
04	ALARMS	ENTERS ALARM SETTINGS
05	ROPE	ENTERS ROPE AND WINCH DATA
06	SET ZERO	ZERO OF ANALOG SENSORS (EXCEPT SWING)
07	SPAN	SPAN ANALOG SENSORS (EXCEPT SWING AND PRESSURE)
08	SWING	SCALE, ZERO AND DIRECTION OF SWING POTENTIOMETER
09	RADIUS	CALIBRATES RADIUS OF MAIN BOOM
10	PRESSURE	SPAN OF PRESSURE TRANSDUCERS
11	BOOM MOMENT	CALIBRATE MAIN BOOM MOMENT
12	B.D.C.	CALIBRATE BOOM DEFLECTION CORRECTION
13	HEIGHT	CALIBRATE BOOM HEAD HEIGHT
14	FLY	CALIBRATE RADIUS AND MOMENT OF FLY AND JIB
15	DEDUCT	ENTER WEIGHT, CG AND DEDUCTS FOR ATTACHMENTS
16	SENSITIVITY	RESET GAIN FOR REPLACEMENT SENSORS
17	PERSONALITY	MANIPULATES SETS OF STORED DATA
19	DIGITAL INPUTS	DISPLAYS STATUS OF DIGITAL INPUTS
20	DUTY	SELECT NEW DUTY WITHOUT EXIT FROM CAL MODE

Calibration of sensors and the entry of data **SHOULD** be carried out in the following sequence:-

17/2	INITIALIZE	INITIALIZE THE WORKING PERSONALITY
03	SCALE	ENTERS SCALING FACTORS FOR SENSORS
04	ALARMS	ENTERS ALARM SETTINGS
05	ROPE	ENTERS ROPE AND WINCH DATA
15	DEDUCT	ENTER WEIGHT, CG AND DEDUCTS FOR ATTACHMENTS
06	SET ZERO	ZERO OF ANALOG SENSORS (EXCEPT SWING)
07	SPAN	SPAN ANALOG SENSORS (NOT SWING AND PRESSURE)
08	SWING	SCALE, ZERO AND DIRECTION OF SWING POT'R
09	RADIUS	CALIBRATE RADIUS OF MAIN BOOM
10	PRESSURE	SET SPAN OF PRESSURE TRANSDUCERS
11	BOOM MOMENT	CALIBRATE MAIN BOOM MOMENT
12	B.D.C.	CALIBRATE BOOM DEFLECTION CORRECTION
13	HEIGHT	CALIBRATE BOOM HEAD HEIGHT
20	DUTY	SELECT NEW DUTY WITHOUT EXIT FROM CAL MODE
14	FLY	CALIBRATE RADIUS AND MOMENT OF FLY AND JIB
12	BDC	CALIBRATE BDC OF EACH FLY/JIB
17/0	SAVE	SAVE THE CALIBRATION
17/3	BACK	COPY THE CALIBRATION TO A BACK-UP CHIP

COMMAND 17 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.
SUB-COMMAND 3 BACK   Copies the active calibration to a back-up chip.
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 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 PERMITS PRE-CALIBRATION OF DATA. **IF** THIS HAS BEEN CARRIED OUT, **DO NOT** CARRY OUT THE INITIALIZE ROUTINE. PROCEED DIRECTLY WITH THE CALIBRATION.

COMMAND 17/2 INITIALIZE

SCROLL TO **17 PERSONALITY** BY PRESSING	⇧ **OR** ⇩
START THE COMMAND BY PRESSING	**SELECT**
SCROLL TO **17/2 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 17/0 SAVE

On completion of a calibration it is necessary to carry out Command 17/0 SAVE and this is referred to at the end of this publication. 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 **17 PERSONALITY** BY PRESSING	⇧ OR ⇩
START THE COMMAND BY PRESSING	**SELECT**
SCROLL TO **17/0 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 **EXIT** BY PRESSING	⇨

NOTE This procedure completely copies over and erases all previous data in the B personality. There is an opportunity to ABORT *the procedure at this point by use of* ⇨ *Continuing with* **SELECT** *will overwrite the B memory.*

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 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
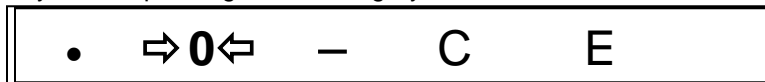
Numbers are changed by use of the ⇧ and ⇩ keys. When the required number has been selected it is entered by use of the **SELECT** key. Successive numbers up to a total of five digits may be entered in this way. If a number requires a decimal point this is entered by moving the highlighted selection to 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
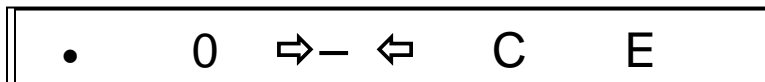
Press **SELECT** to change to a negative value. If an error is made in the entry of data then move the cursor to highlight the **C** using ⇨

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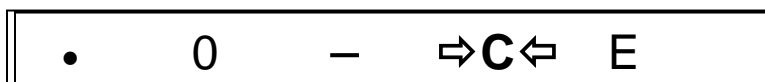
Press **SELECT** to delete the erroneous number. After entry of all digits, decimal point and sign changes, move the cursor to **E** using ⇨ and press **SELECT** to enter the number and terminate the sequence.

•	0	–	C	⇨**E**⇦
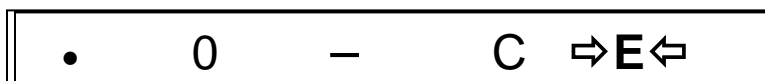
NUMBER ENTRY (continued)

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

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

THIS COMMAND IS USED TO EXIT FROM THE CAL MODE AND RETURN TO THE NORMAL OPERATING SCREEN AFTER THE COMPLETION OF A CALIBRATION. INCLUDED IN THE OPERATION OF THE COMMAND IS THE EXECUTION OF A SYSTEM SELF TEST WHICH IS CARRIED OUT AUTOMATICALLY FROM WITHIN THE COMMAND.

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

SCROLL TO **00 RUN** BY PRESSING	⇧ **OR** ⇩
START THE COMMAND BY PRESSING	**SELECT**
THE SYSTEM WILL EXECUTE A SELF-TEST AND RETURN TO THE NORMAL OPERATING MODE	

COMMAND 01 TEST

THIS COMMAND IS USED TO CARRY OUT THE EXECUTION OF A SYSTEM SELF TEST AND REMAIN IN THE CAL MODE.

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

SCROLL TO **01 TEST** BY PRESSING	⇧ **OR** ⇩
START THE COMMAND BY PRESSING	**SELECT**
THE SYSTEM WILL EXECUTE A SELF-TEST AND REMAIN IN THE CAL MODE	

COMMAND 02 ERRORS

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 ERRORS** BY PRESSING	⇧ **OR** ⇩
START THE COMMAND BY PRESSING	**SELECT**
THE SYSTEM WILL EXECUTE A SELF-TEST AND DISPLAY ERROR CODES	
EXIT FROM THE ROUTINE BY PRESSING	⇨

ERROR 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

COMMAND 03 SCALE

REFER TO THE CRANE INSTALLATION MANUAL FOR THE SCALING FACTORS TO BE USED. **EXAMPLES** ONLY ARE SHOWN IN THIS MANUAL. THE UNITS WILL MEET A PARTICULAR CUSTOMER REQUIREMENT E.G. FEET/METERS/POUNDS/KILOS/TONNES ETC. THEREFORE USE ONLY THE UNITS OF MEASUREMENT SHOWN ON THE CABLE SCHEDULE FOR THE UNIT TO BE CALIBRATED.
Enter the data by use of the following sequence:-

SCROLL TO **03 SCALE** BY PRESSING	⇧ **OR** ⇩
START THE COMMAND BY PRESSING	**SELECT**
THE DISPLAY WILL READ	**LENGTH =0.0000**
START THE CALIBRATION OF **SL** BY PRESSING	**SELECT**
CONFIRM THE CALIBRATION (or abort with ⇨)	**SELECT**
USE NUMBER ENTRY PROCEDURE TO ENTER **SL** EXAMPLE 128	
AFTER THE MESSAGE "**CALIBRATING**" THE DISPLAY WILL READ	**LENGTH =128.00**
SCROLL TO **SF** BY PRESSING	⇨
THE DISPLAY WILL READ	**FORCE = 0.0000**
START THE CALIBRATION OF **SF** BY PRESSING	**SELECT**
CONFIRM THE CALIBRATION (or abort with ⇨)	**SELECT**
USE NUMBER ENTRY PROCEDURE TO ENTER **SF** EXAMPLE 256	
AFTER THE MESSAGE "**CALIBRATING**" THE DISPLAY WILL READ	**FORCE = 256.00**
SCROLL TO **SM** BY PRESSING	⇨
THE DISPLAY WILL READ	**MOMENT = 0.0000**
START THE CALIBRATION OF **SM** BY PRESSING	**SELECT**
CONFIRM THE CALIBRATION (or abort with ⇨)	**SELECT**
USE NUMBER ENTRY PROCEDURE TO ENTER **SM** EXAMPLE 16	
AFTER THE MESSAGE "**CALIBRATING**" THE DISPLAY WILL READ	**MOMENT 16.000**
SCROLL TO **SA** BY PRESSING**.**	⇨
THE DISPLAY WILL READ *THIS FACTOR CANNOT BE CHANGED*	**ANGLE = 45.511**
EXIT FROM THE ROUTINE BY PRESSING	⇨

Details of entered scaling factors may be checked by use of the following sequence:-

SCROLL TO **03 SCALE** BY PRESSING	⇧ **OR** ⇩
START THE COMMAND BY PRESSING	**SELECT**
THE DISPLAY WILL READ	**LENGTH = 128.00**
SCROLL TO **SF** BY PRESSING	⇨
THE DISPLAY WILL READ	**FORCE = 256.00**
SCROLL TO **SM** BY PRESSING	⇨
THE DISPLAY WILL READ	**MOMENT = 16.000**
SCROLL TO **SA** BY PRESSING**.**	⇨
THE DISPLAY WILL READ	**ANGLE = 45.511**
EXIT FROM THE ROUTINE BY PRESSING	⇨

COMMAND 04 ALARM

The alarm command permits the setting or modification of the following alarms:-

♦ Alarm 0   %SWL for Red Lamp and Motion-Cut Relay
♦ Alarm 1   %SWL for Amber Lamp and Pre-Alarm Relay
♦ Alarm 2   %SWL for Internal Audible Alarm
♦ Out of Duty Radius   Outside Capacity Chart/Limit of Radius
♦ Out of Duty Angle   Outside Capacity Chart/Limit of Angle

They should be entered as percentages, units of length or degrees as appropriate.
Enter details of the alarm settings by use of the following sequence:

NOTE THAT ALARMS 0, 1 AND 2 ARE PRE-PROGRAMMED AT 100%, 90% AND 90%. THESE ARE THE PREFERRED VALUES WHICH ONLY NEED BE CHANGED IF OTHER VALUES ARE REQUIRED. WHEN USING THESE PREFERRED VALUES SCROLL DIRECTLY TO O-D RADIUS BY MEANS OF THE RIGHT ARROW.

SCROLL TO **04 ALARM** BY PRESSING	⇧ **OR** ⇩
START THE COMMAND BY PRESSING	**SELECT**
THE DISPLAY WILL READ	**% SWL # 0 = 0.0000**
START THE CALIBRATION OF **% SWL #0** BY PRESSING	**SELECT**
CONFIRM THE CALIBRATION (or abort with ⇨)	**SELECT**
USE NUMBER ENTRY PROCEDURE TO ENTER **% SWL #0 = 100**	
AFTER THE MESSAGE "**CALIBRATING**" THE DISPLAY WILL READ	**% SWL # 0 = 99.996**
SCROLL TO **% SWL #1** BY PRESSING	⇨
THE DISPLAY WILL READ	**% SWL #1 = 0.0000**
START THE CALIBRATION OF **% SWL #1** BY PRESSING	**SELECT**
CONFIRM THE CALIBRATION (or abort with ⇨)	**SELECT**
USE NUMBER ENTRY PROCEDURE TO ENTER **% SWL #1 = 90**	
AFTER THE MESSAGE "**CALIBRATING**" THE DISPLAY WILL READ	**% SWL #1 = 90.000**
SCROLL TO **% SWL #2** BY PRESSING	⇨

THE DISPLAY WILL READ	**% SWL #2 = 0.0000**
START THE CALIBRATION OF **% SWL #2** BY PRESSING	**SELECT**
CONFIRM THE CALIBRATION (or abort with ⇨)	**SELECT**
USE NUMBER ENTRY PROCEDURE TO ENTER **% SWL #2 = 90**	
AFTER THE MESSAGE "**CALIBRATING**" THE DISPLAY WILL READ	**% SWL # 2 = 90.000**
SCROLL TO **O-D RADIUS** BY PRESSING	⇨
THE DISPLAY WILL READ	**O-D RAD. = 0.0000**
START THE CALIBRATION OF **O-D RADIUS** BY PRESSING	**SELECT**
CONFIRM THE CALIBRATION (or abort with ⇨)	**SELECT**
USE NUMBER ENTRY PROCEDURE TO ENTER **O-D RADIUS = 2 FT**	
AFTER THE MESSAGE "**CALIBRATING**" THE DISPLAY WILL READ	**O-D RAD. = 2.0000**
SCROLL TO **O-D ANGLE** BY PRESSING	⇨
THE DISPLAY WILL READ	**O-D ANG. = 0.0000**
START THE CALIBRATION OF **O-D ANGLE** BY PRESSING	**SELECT**
CONFIRM THE CALIBRATION (or abort with ⇨)	**SELECT**
USE NUMBER ENTRY PROCEDURE TO ENTER **O-D ANGLE = 1.5°**	
EXIT FROM THE ROUTINE BY PRESSING	⇨

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

SCROLL TO **04 ALARM** BY PRESSING	⇧ **OR** ⇩
START THE COMMAND BY PRESSING	**SELECT**
THE DISPLAY WILL READ	**% SWL # 0 = 99.996**
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**
SCROLL TO **O-D RADIUS** PRESSING	⇨
THE DISPLAY WILL READ	**O-D RAD. = 2.0000**
SCROLL TO **O-D ANGLE** BY PRESSING	⇨
THE DISPLAY WILL READ	**O-D ANG. = 1.5000**
EXIT FROM THE ROUTINE BY PRESSING	⇨

COMMAND 05 ROPE

- Maximum hoist rope tension is specified by the crane manufacturer for the size and type of wire rope used on the machine. This value plus a 10% margin is entered in this procedure for each hoist.

- Some regulations require that the maximum line pull is derated by a fixed amount per part of line and this value may be entered in this procedure. Where no regulation exists then a value is not entered.

- During the entry of rope data the maximum number of parts of line which could be used on the crane is entered. *This is not the actual parts in use at the time of entering data but is the maximum possible.*

- The position of the winch relative to the boom pivot is accounted for in the computations carried out by the computer. This dimension is the horizontal distance from the boom pivot to the center of the hoist drum. Where the winches are mounted on the boom or close to the boom pivot the distance will be small but should still be entered.

In the following example of the use of this procedure the values used are:

- Limit 0 (front winch line pull) 10,520 units

- Limit 1 (rear winch line pull) 8,850 units

- Max Parts   8

- W0 (front winch position)   8.34 units

- W1 (rear winch position)   9.68 units

Enter data by use of the following sequence:

SCROLL TO **05 ROPE** BY PRESSING	⇧ OR ⇩
START THE COMMAND BY PRESSING	**SELECT**
THE DISPLAY WILL READ	**LIMIT # 0 = 0.0000**
START THE CALIBRATION OF **LIMIT #0** BY PRESSING	**SELECT**
CONFIRM THE CALIBRATION (or abort with ⇨)	**SELECT**
USE NUMBER ENTRY PROCEDURE TO ENTER **LIMIT #0 = 10.520**	
AFTER THE MESSAGE "**CALIBRATING**" THE DISPLAY WILL READ	**LIMIT #0 = 10.520**
SCROLL TO **LIMIT #1** BY PRESSING	⇨
THE DISPLAY WILL READ	**LIMIT # 1 = 0.0000**

START THE CALIBRATION OF **LIMIT #1** BY PRESSING	**SELECT**

CONFIRM THE CALIBRATION (or abort with ⇨)	**SELECT**
USE NUMBER ENTRY PROCEDURE TO ENTER **LIMIT #1 = 8.850**	
AFTER THE MESSAGE "**CALIBRATING**" THE DISPLAY WILL READ	**LIMIT #1 = 8.8500**
SCROLL TO **% perPart** BY PRESSING	⇨
THE DISPLAY WILL READ *THIS FEATURE IS NOT USED*	**% perPart = 0.0000**
SCROLL TO **MAX PARTS** BY PRESSING	⇨
THE DISPLAY WILL READ	**Max Parts = 0**
START THE SELECTION OF **MAX PARTS** BY PRESSING	**SELECT**
SCROLL TO **MAX NUMBER OF PARTS** BY PRESSING	⇧ **OR** ⇩
START THE CALIBRATION OF **MAX PARTS** BY PRESSING	**SELECT**
CONFIRM THE CALIBRATION (or abort with ⇨)	**SELECT**
SCROLL TO **Dimn. W0** BY PRESSING	⇨
THE DISPLAY WILL READ	**Dimn. W0 = 0.0000**
START THE CALIBRATION OF **Dimn. W0** BY PRESSING	**SELECT**
CONFIRM THE CALIBRATION (or abort with ⇨)	**SELECT**
USE NUMBER ENTRY PROCEDURE TO ENTER **DIMN. W0 = 8.34**	
AFTER THE MESSAGE "**CALIBRATING**" THE DISPLAY WILL READ	**Dimn. W0 = 8.3400**
SCROLL TO **DIMN W1** BY PRESSING	⇨
THE DISPLAY WILL READ	**Dimn. W1 = 0.0000**
START THE CALIBRATION OF **DIMN. W1** BY PRESSING	**SELECT**
CONFIRM THE CALIBRATION (or abort with ⇨)	**SELECT**
USE NUMBER ENTRY PROCEDURE TO ENTER **DIMN. W1 = 9.68**	
AFTER THE MESSAGE "**CALIBRATING**" THE DISPLAY WILL READ	**Dimn. W1 = 9.6800**
EXIT FROM THE ROUTINE BY PRESSING	⇨

Details of Limits previously entered may be examined by use of the following sequence:

SCROLL TO **05 ROPE** BY PRESSING	⇧ **OR** ⇩
START THE COMMAND BY PRESSING	**SELECT**
THE DISPLAY WILL READ	**LIMIT # 0 = 10.250**
SCROLL TO **LIMIT #1** BY PRESSING	⇨
THE DISPLAY WILL READ	**LIMIT # 1 = 8.8500**
SCROLL TO **% perPart** BY PRESSING	⇨
THE DISPLAY WILL READ *THIS FEATURE IS NOT USED*	**% perPart = 0.0000**
SCROLL TO **MAX PARTS** BY PRESSING	⇨
THE DISPLAY WILL READ	**Max Parts = 8**
SCROLL TO **Dimn. W0** BY PRESSING	⇨
THE DISPLAY WILL READ	**Dimn. W0 = 8.340**
SCROLL TO **DIMN W1** BY PRESSING	⇨
THE DISPLAY WILL READ	**Dimn. W1 = 9.6800**
EXIT FROM THE ROUTINE BY PRESSING	⇨

COMMAND 15 DEDUCT

The Deduct Command permits the entry of "deduct" data for stowed or erected but **unused** lifting attachments.

The program modifies both the boom moment and the rated capacity according to the data which is entered.

- ♦ Weight = Weight of the attachment.
- ♦ C of G = Position of the center of gravity of the attachment.
- ♦ Deduct = Reduction in rated capacity for the attachment erected but unused.

These data should be entered in units of force or length as appropriate.

For stowed attachments the C of G is measured in line with the boom from the boom pivot.

For erected attachments the C of G is measured in line with the boom from the axle of the main boom head sheaves.

The rated capacity is reduced by the value of the deduct. If its value would thereby become negative it is reduced to zero.

Data may be entered for up to three stowed and fifteen unused erected attachments. Stowed and erected attachments are individually selectable and if both are selected simultaneously their moment and deducts are additive. If two or more attachments can be stowed or erected simultaneously then the values entered must be for the composite arrangement.

Deduct information is recalled and used in computation according to the selection of deducts made via the display. It is therefore essential that data is stored in the corresponding area of memory and reference should be made to the Installation Manual in order to determine the memory areas to be used.

During this procedure ⬇ will select **STOWED** and ⬆ will select **ERECTED**.

Enter "deduct" data by use of the following sequence:

SCROLL TO **15 DEDUCTS** BY PRESSING	⬆ **OR** ⬇
START THE COMMAND BY PRESSING	**SELECT**
THE DISPLAY WILL READ	**15 DEDUCTS St. 1** **SELECT CONFIGURATION**
SCROLL TO **ERECTED** OR **STOWED** BY PRESSING	⬆ **OR** ⬇
SELECT **ERECTED** OR **STOWED** BY PRESSING	**SELECT**
SCROLL TO DEDUCT NUMBER BY PRESSING	⬆ **OR** ⬇
SELECT DEDUCT NUMBER BY PRESSING	**SELECT**
THE DISPLAY WILL READ	**WEIGHT =0.0000**
START THE CALIBRATION OF **WEIGHT** BY PRESSING	**SELECT**
CONFIRM THE CALIBRATION (or abort with ⇨)	**SELECT**
USE NUMBER ENTRY PROCEDURE TO ENTER **WEIGHT** EXAMPLE 750#	
AFTER THE MESSAGE "**CALIBRATING**" THE DISPLAY WILL READ	**WEIGHT = 0.7500**
SCROLL TO **C OF G** BY PRESSING	⇨
START THE CALIBRATION OF **C OF G** BY PRESSING	**SELECT**
CONFIRM THE CALIBRATION (or abort with ⇨)	**SELECT**
USE NUMBER ENTRY PROCEDURE TO ENTER **C OF G** EXAMPLE 12.98 FT	
AFTER THE MESSAGE "**CALIBRATING**" THE DISPLAY WILL READ	**C OF G = 12.980**
SCROLL TO **DEDUCT** BY PRESSING	⇨
START THE CALIBRATION OF **DEDUCT** BY PRESSING	**SELECT**
CONFIRM THE CALIBRATION (or abort with ⇨)	**SELECT**
USE NUMBER ENTRY PROCEDURE TO ENTER **DEDUCT** EXAMPLE 1230#	
AFTER THE MESSAGE "**CALIBRATING**" THE DISPLAY WILL READ	**DEDUCT = 1230.0**

SCROLL TO NEW **ERECTED** OR **STOWED** BY PRESSING	⇧ **OR** ⇩
SELECT **ERECTED** OR **STOWED** BY PRESSING	**SELECT**
SCROLL TO NEW **DEDUCT** NUMBER BY PRESSING	⇧ **OR** ⇩
SELECT **DEDUCT** NUMBER BY PRESSING	**SELECT**
WHEN ERECTED OR STOWED AND DEDUCT NUMBER SELECTION IS COMPLETED PRESS	**SELECT**
CONTINUE WITH THE ENTRY OF ERECTED AND STOWED DATA AND WHEN FINISHED..........	
EXIT FROM THE ROUTINE BY PRESSING	⇨

THIS SECTION CONCLUDES THE PORTION OF THE CALIBRATION WHICH WAS CONCERNED WITH THE ENTRY OF DATA. THE FOLLOWING PORTION OF THE MANUAL DEALS WITH THE ACTUAL CALIBRATION OF THE SYSTEM DURING WHICH THE CRANE WILL BE OPERATED IN VARIOUS CONFIGURATIONS WHERE THE LIMITS OF STABILITY OR STRENGTH ARE APPROACHED. YOU ARE REMINDED TO BE SURE THAT THE MACHINE MUST BE ON FIRM AND LEVEL GROUND AND THAT THE OUTRIGGERS MUST BE USED.

COMMAND 06 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 06. 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.   Analog input 0.

♦   Rod side pressure transducer.   Analog input 1.

♦   Boom extension sensor.   Analog input 2.

♦   Boom angle sensor.   Analog input 3.

♦   Superstructure angle sensor.   Analog input 4.

ZERO PRESSURE TRANSDUCERS

(a)   Lower the boom into its cradle or on to its lower end stops.

(b)   Stop the hydraulic pump motor.

(c)   With the boom resting on its lower end stops or resting in the boom cradle, ensure that no pressure remains in the boom hoist cylinders. (If necessary open the hydraulic lines to the pressure transducers).

(d)   Calibrate the zero of the piston side pressure transducer by use of the following sequence:

SCROLL TO **06 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 = XX.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 = 0.0000** (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 = XX.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 = 0.0000** (zeroed input)
EXIT FROM THE ROUTINE BY PRESSING	⇨

If the pressure in the boom hoist cylinders was relieved by uncoupling the pressure sensors, then re-connect all hydraulic lines before resuming crane operation.

ZERO EXTENSION SENSOR.

The reel is fitted with 130 ft. of shielded 2-wire cable which is terminated in a 3-pin socket. The cable **cannot** be shortened to accommodate varying boom lengths and the following method of pre-tensioning is recommended.

(a)   Fully retract the main boom.

(b)   Pre-tension the BLR800C two-wire 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 boom head and the connector 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 boom head and continue until the end of the cable is 3 ft. beyond the boom head anchor point. Secure the cable to the anchor point with at least 4 wraps ensuring that there is sufficient cable to connect to the A.T.B. switch which is terminated in a 3-pin plug.

(d)   Remove the cover from the reeling drum and manually turn the large gear fully counter-clockwise and then advance it clockwise three clicks.

(e)   Calibrate the zero of the extension sensor by use of the following sequence:

SCROLL TO **06 ZERO** BY PRESSING	⇧ **OR** ⇩
START THE COMMAND BY PRESSING	**SELECT**
SCROLL TO SENSOR **NO. 2** BY PRESSING	⇧ **OR** ⇩
CONFIRM SELECTION OF THE SENSOR BY PRESSING	**SELECT**
THE DISPLAY WILL READ	**NO.2 = XX.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 = 0.0000** (zeroed input)
EXIT FROM THE ROUTINE BY PRESSING	⇨
OR CHANGE SENSOR BY PRESSING	⇦

ZERO BOOM ANGLE SENSOR

(a)   Using an inclinometer, set the boom horizontal.

(b)   Ensure that with the boom horizontal, the boom angle sensor is mounted perpendicular to the boom.

(c)   Calibrate the zero of the boom angle sensor by use of the following sequence:

SCROLL TO **06 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.XXX** (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 = 0.0000** (zeroed input)
EXIT FROM THE ROUTINE BY PRESSING	⇨
OR CHANGE SENSOR BY PRESSING	⇦

ZERO SUPERSTRUCTURE ANGLE SENSOR (S.A.S.)

(a)   Ensure that the superstructure is level and that the S.A.S. is perpendicular to the superstructure.

(b)   Calibrate the zero of the S.A.S. by use of the following sequence:

SCROLL TO **06 ZERO** BY PRESSING	⇧ **OR** ⇩
START THE COMMAND BY PRESSING	**SELECT**
SCROLL TO SENSOR **NO. 4** BY PRESSING	⇧ **OR** ⇩
CONFIRM SELECTION OF THE SENSOR BY PRESSING	**SELECT**
THE DISPLAY WILL READ	**NO.4 = XX.XXX** (actual input)
START THE CALIBRATION OF SENSOR **NO. 4** BY PRESSING	**SELECT**
CONFIRM THE CALIBRATION (or abort with ⇨)	**SELECT**
THE DISPLAY WILL READ	**NO.4 = 0.0000** (zeroed input)
EXIT FROM THE ROUTINE BY PRESSING	⇨
OR CHANGE SENSOR BY PRESSING	⇦

COMMAND 07 SPAN

Command **07** permits the scaling of most analog sensors with the exception of Swing Sensors and Pressure Sensors which have their own routines.

SPAN BOOM 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 horizontal 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 EXTENDED BOOM LENGTH IS 115 FT AND RETRACTED BOOM LENGTH IS 37 FT THEN EXTENSION VALUE IS 115 - 37 = 78

(d)   With the boom still extended, calibrate the span of the B.E.S. by use of the following sequence:

SCROLL TO **07 SPAN** BY PRESSING	⇧ **OR** ⇩
START THE COMMAND BY PRESSING	**SELECT**
SCROLL TO SENSOR **NO. 2** BY PRESSING	⇧ **OR** ⇩
CONFIRM SELECTION OF THE SENSOR BY PRESSING	**SELECT**
THE DISPLAY WILL READ	**NO.2 I/P = 0.0000** (or actual input when re-calibrating)
START THE CALIBRATION OF SENSOR **NO. 2** BY PRESSING	**SELECT**
CONFIRM THE CALIBRATION (or abort with ⇨)	**SELECT**
USE NUMBER ENTRY PROCEDURE TO ENTER **EXTENSION VALUE** EXAMPLE 78	
THE DISPLAY WILL READ	**NO.2 I/P = 78.000** (extension value)
EXIT FROM THE ROUTINE BY PRESSING	⇨
OR CHANGE SENSOR BY PRESSING	⇦

At this stage of the procedure the boom length display will indicate extension e.g. 78 units. After completion of Command 09, main boom radius, it will display length.
Retract the boom and continue the procedure.

SPAN BOOM ANGLE SENSOR

(a)   Raise the retracted boom to an angle higher than 60 degrees and measure the angle using an inclinometer. (E.G. 71.5°)

(b)   Calibrate the span of the B.A.S. by use of the following sequence:

SCROLL TO **07 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 = 0.0000** (or actual input when re-calibrating)
START THE CALIBRATION OF SENSOR **NO. 3** BY PRESSING	**SELECT**
CONFIRM THE CALIBRATION (or abort with ⇨)	**SELECT**
USE NUMBER ENTRY PROCEDURE TO ENTER **BOOM ANGLE** EXAMPLE 71.5	
THE DISPLAY WILL READ	**NO.3 I/P = 71.500** (measured angle)
EXIT FROM THE ROUTINE BY PRESSING	⇨
OR CHANGE SENSOR BY PRESSING	⇦

SPAN SUPERSTRUCTURE ANGLE SENSOR

The calibration of the S.A.S. is similar to the calibration of the B.A.S. However, whereas it was possible to raise the boom to a high angle, it will not be possible to tilt the superstructure in such a way. The calibration of the S.A.S. will be carried out with the unit removed from its mount. The direction in which the unit is to be tilted will be as though the machine was being tipped backwards.

(a)   Remove the fixing bolts from the unit and rotate it backwards so that it is tilted to an angle of 90 degrees using the bottom edge of the casting as a reference. Use one fixing bolt to temporarily secure the unit in the calibration position. Accurately measure the angle of tilt. (example 90°)

(b)   Calibrate the span of the S.A.S. by use of the following sequence:

SCROLL TO **07 SPAN** BY PRESSING	⇧ **OR** ⇩
START THE COMMAND BY PRESSING	**SELECT**
SCROLL TO SENSOR **NO. 4** BY PRESSING	⇧ **OR** ⇩
CONFIRM SELECTION OF THE SENSOR BY PRESSING	**SELECT**
THE DISPLAY WILL READ	**NO.4 I/P = 0.0000** (or actual input when re-calibrating)
START THE CALIBRATION OF SENSOR **NO. 4** BY PRESSING	**SELECT**
CONFIRM THE CALIBRATION (or abort with ⇨)	**SELECT**
USE NUMBER ENTRY PROCEDURE TO ENTER **EXTENSION VALUE** EXAMPLE 90	
THE DISPLAY WILL READ	**NO.4 I/P = 90.000** (measured angle)
EXIT FROM THE ROUTINE BY PRESSING	⇨
OR CHANGE SENSOR BY PRESSING	⇦

Restore the S.A.S. to its original position and tighten the fixing bolts.

COMMAND 08 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 as 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 is accounted for during this procedure.

It is intended that the 3 routines are carried out consecutively. If necessary ZERO and DIRECTION can be done in isolation of SCALE but any time that SCALE is re-done it is recommended that it is followed by ZERO and DIRECTION.

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

SCROLL TO **08 SWING** BY PRESSING	⇧ **OR** ⇩
START THE COMMAND BY PRESSING	**SELECT**
THE DISPLAY WILL READ	**0 = SLEW 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 = SLEW SCALE**
SCROLL TO **1 SLEW ZERO** BY PRESSING	⇧
THE DISPLAY WILL READ	**1 = SLEW ZERO**
CONFIRM SELECTION OF **1 SLEW ZERO** BY PRESSING	**SELECT**

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 = SLEW 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	**SLEW ANGLE 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	⇨

COMMAND 09 RADIUS

ALL RADIUS MEASUREMENTS ARE TAKEN FROM THE CENTER LINE OF ROTATION TO THE CENTER OF THE HOOK. FOR BEST ACCURACY, CARRY OUT RADIUS CALIBRATION ON EVEN PARTS OF LINE AND BE SURE TO SET THE PARTS OF LINE FOR THE PARTS OF LINE IN USE.

(a)   With the boom horizontal and retracted, measure the radius.

(b)   Measure the horizontal distance from the center of rotation to the boom pivot. This offset will be entered as a negative value.

(c)   Measure the height at which radius measurements are to be made relative to the boom pivot. The value in line with the boom pivot will be zero. Data will be positive for measurements below the boom pivot.

(d)   Measure the radius of the head sheave.

(e)   Calibrate the radius by use of the following sequence:

SCROLL TO **09 RADIUS** BY PRESSING	⇧ **OR** ⇩
START THE COMMAND BY PRESSING	**SELECT**
THE DISPLAY WILL READ	**SLEW OFFSET = 0.0000**
START THE CALIBRATION OF **SLEW OFFSET** BY PRESSING	**SELECT**
CONFIRM THE CALIBRATION (or abort with ⇨)	**SELECT**
USE NUMBER ENTRY PROCEDURE TO ENTER **SLEW OFFSET** (b)	
CONTINUE TO THE NEXT PART OF THE SEQUENCE BY PRESSING	⇨
START THE CALIBRATION OF **MEASURE HEIGHT** BY PRESSING	**SELECT**
CONFIRM THE CALIBRATION (or abort with ⇨)	**SELECT**
USE NUMBER ENTRY PROCEDURE TO ENTER **MEASURE HEIGHT** (c)	
CONTINUE TO THE NEXT PART OF THE SEQUENCE BY PRESSING	⇨
START THE CALIBRATION OF **RADIUS HEAD SHEAVE** BY PRESSING	**SELECT**
CONFIRM THE CALIBRATION (or abort with ⇨)	**SELECT**
USE NUMBER ENTRY PROCEDURE TO ENTER **RADIUS HEAD SHEAVE** (d)	
CONTINUE TO THE NEXT PART OF THE SEQUENCE BY PRESSING	⇨

WITH THE BOOM STILL HORIZONTAL AND RETRACTED CONTINUE THE SEQUENCE

START THE CALIBRATION OF RADIUS BY PRESSING	**SELECT**
CONFIRM THE CALIBRATION (or abort with ⇨)	**SELECT**
USE NUMBER ENTRY PROCEDURE TO ENTER **RADIUS** (a)	
THE UPPER DISPLAY WILL READ (⇩) TO INDICATE THAT THE DATA IS ACQUIRED	

(g)   **RAISE THE BOOM TO APPROXIMATELY 65° AND MEASURE THE *NEW RADIUS***

CONTINUE THE CALIBRATION OF RADIUS BY PRESSING	**SELECT**
USE NUMBER ENTRY PROCEDURE TO ENTER ***NEW RADIUS*** (g)	
THE UPPER DISPLAY WILL READ (⇩ ⇧) TO INDICATE THAT THE DATA IS ACQUIRED	
START THE RADIUS CALIBRATION AT THE CURRENT LENGTH BY PRESSING	**SELECT**
CONFIRM THE CALIBRATION (or abort with ⇨)	**SELECT**
THE CENTER DISPLAY WILL READ THE CURRENT RADIUS	
IF THE BOOM CANNOT BE EXTENDED OR IF AT THE FINAL LENGTH **EXIT** BY PRESSING	⇨

(h)   **FULLY EXTEND THE BOOM AT THE SAME HIGH ANGLE, MEASURE THE *NEW RADIUS***

CONTINUE THE CALIBRATION OF RADIUS BY PRESSING	**SELECT**
USE NUMBER ENTRY PROCEDURE TO ENTER **NEW RADIUS**(h) *HIGH ANGLE DATA ONLY*	
START THE RADIUS CALIBRATION AT THE CURRENT LENGTH BY PRESSING	**SELECT**
CONFIRM THE CALIBRATION (or abort with ⇨)	**SELECT**
THE CENTER DISPLAY WILL READ THE CURRENT RADIUS	
WHEN AT THE FINAL LENGTH **EXIT** BY PRESSING	⇨

COMMAND 10 PRESSURE

GENERAL

Command 10 is used to enter values relating to the geometry of the boom hoist cylinder(s) and to set the span of the pressure transducers.

Details of the geometry will often be given on the cable schedule but may also be measured on the machine as necessary.

Four positional dimensions are required:

"L"   Boom pivot to upper boom hoist cylinder pivot - horizontal

"J"   Boom pivot to upper boom hoist cylinder pivot - vertical

"G"   Boom pivot to lower boom hoist cylinder pivot - horizontal

"H"   Boom pivot to lower boom hoist cylinder pivot - vertical

Dimension "J" may be positive, negative or zero.

With the boom horizontal it is:

♦   positive for cylinder pivot above boom pivot
♦   negative for cylinder pivot below boom pivot
♦   zero for cylinder pivot and boom pivot in line

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.).
A.G. is calculated from the rod and bore diameters as follows:

A.G.   = $[(R \times R)/(B \times B)] - 1$

e.g.   R = 5.5 and B = 9.0

A.G.   = $[(5.5 \times 5.5)/(9.0 \times 9.0)] - 1$
          = $[30.25/81] - 1$
          =   0.3735 - 1
          =   - 0.6265

NOTE A.G. is always negative and is always less than 1. However, the system has been programmed to account for this and therefore the entry of this value ignores the decimal point and the polarity of the number which is entered as a whole number. In this example it will be entered as 6265

Enter the geometry data by use of the following sequence:

SCROLL TO **10 PRESSURE** BY PRESSING	⇧ **OR** ⇩
START THE COMMAND BY PRESSING	**SELECT**
START THE CALIBRATION OF **DIMN. L** BY PRESSING	**SELECT**
CONFIRM THE CALIBRATION (or abort with ⇨)	**SELECT**
USE NUMBER ENTRY PROCEDURE TO ENTER **DIMN. L**	
CONTINUE TO THE NEXT PART OF THE SEQUENCE BY PRESSING	⇨
START THE CALIBRATION OF **DIMN. J** BY PRESSING	**SELECT**
CONFIRM THE CALIBRATION (or abort with ⇨)	**SELECT**
USE NUMBER ENTRY PROCEDURE TO ENTER **DIMN. J**	
CONTINUE TO THE NEXT PART OF THE SEQUENCE BY PRESSING	⇨
START THE CALIBRATION OF **DIMN.G** BY PRESSING	**SELECT**
CONFIRM THE CALIBRATION (or abort with ⇨)	**SELECT**
USE NUMBER ENTRY PROCEDURE TO ENTER **DIMN. G**	
CONTINUE TO THE NEXT PART OF THE SEQUENCE BY PRESSING	⇨
START THE CALIBRATION OF **DIMN.H** BY PRESSING	**SELECT**
CONFIRM THE CALIBRATION (or abort with ⇨)	**SELECT**
USE NUMBER ENTRY PROCEDURE TO ENTER **DIMN. H**	
CONTINUE TO THE NEXT PART OF THE SEQUENCE BY PRESSING	⇨
TO CHANGE THE AMPLIFIER GAIN PRESS.......	⇧ **OR** ⇩
START THE CALIBRATION OF **AMPLIFIER GAIN** BY PRESSING	**SELECT**
CONFIRM THE CALIBRATION (or abort with ⇨)	**SELECT**
CONTINUE TO THE NEXT PART OF THE SEQUENCE BY PRESSING	⇨
START THE CALIBRATION OF **ANNULAR GAIN** BY PRESSING	**SELECT**
CONFIRM THE CALIBRATION (or abort with ⇨)	**SELECT**

USE NUMBER ENTRY PROCEDURE TO ENTER **ANN. GAIN**	
CONTINUE TO THE NEXT PART OF THE SEQUENCE BY PRESSING	⇨
START THE CALIBRATION OF **HOOK BLOCK** BY PRESSING	**SELECT**
CONFIRM THE CALIBRATION (or abort with ⇨)	**SELECT**
USE NUMBER ENTRY PROCEDURE TO ENTER THE WEIGHT OF THE **HOOK BLOCK** IN USE	
CONTINUE TO THE NEXT PART OF THE SEQUENCE BY PRESSING	⇨

REMAIN IN THE CALIBRATION ROUTINE IF CONTINUING WITH PRESSURE SPAN

OR EXIT BY ENTERING A VALUE OF ZERO AND PRESSING ⇨

NOTE THAT THE UNITS OF SCALING ARE TYPICALLY 1 = 1,000 LBS.
e.g. 75,520 LBS WILL BE ENTERED AS 75.52

With the boom fully retracted prepare to lift a calibration load at a safe radius for the load. For best accuracy use a load which exceeds 50% of the machines capacity. Smaller loads may be used but this could result in reduced accuracy.

♦   *WHEN RAISING AND LOWERING THE LOAD, USE THE WINCH. NOT THE BOOM HOIST.*

Continue the pressure span by use of the following sequence:

USE NUMBER ENTRY PROCEDURE TO ENTER THE WEIGHT OF THE **CALIBRATION LOAD**	
WITH THE LOAD ON THE GROUND PRESS	⇩
THE UPPER DISPLAY WILL READ (⇩) TO INDICATE THAT THE DATA IS ACQUIRED	
RAISE THE CALIBRATION LOAD USING THE WINCH AND 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**
EXIT FROM THE ROUTINE BY PRESSING	⇨

NOTE

At this stage of the procedure the load meter will read higher than the calibration load. This is because the weight of the boom has not yet been deducted. This will take place during the next stage of the procedure.

ANNULAR GAIN

In some circumstances it may be necessary to change the setting of the annular gain after the main calibration has been completed. For example if when booming down, spurious function kick-out occurs then the setting must be changed to meet the new dynamic conditions. Change the setting of the annular gain by use of the following sequence:

SCROLL TO **10 PRESSURE** BY PRESSING	⇧ **OR** ⇩
START THE COMMAND BY PRESSING	**SELECT**
DISPLAY READS **DIMN. L**	
CONTINUE TO THE NEXT PART OF THE SEQUENCE BY PRESSING	⇨
DISPLAY READS **DIMN. J**	
CONTINUE TO THE NEXT PART OF THE SEQUENCE BY PRESSING	⇨
DISPLAY READS **DIMN. G**	
CONTINUE TO THE NEXT PART OF THE SEQUENCE BY PRESSING	⇨
DISPLAY READS **DIMN. H**	
CONTINUE TO THE NEXT PART OF THE SEQUENCE BY PRESSING	⇨
DISPLAY READS **AMP. GAIN**	
CONTINUE TO THE NEXT PART OF THE SEQUENCE BY PRESSING	⇨
USE NUMBER ENTRY PROCEDURE TO CHANGE **ANN. GAIN**	

REMAIN IN THIS STAGE OF THE PROCEDURE LONG ENOUGH TO OBSERVE THE EFFECTS OF THE CHANGES. CHANGE THE ANNULAR GAIN TO THE OPTIMUM SETTING BY REPEATING THE **ANN. GAIN** CHANGE. WHEN ALL IS SATISFACTORY, ENTER A LOAD OF ZERO AND **EXIT** FROM THE COMMAND WITHOUT DOING THE **CAL** ROUTINE AS IN THE FOLLOWING ROUTINE.

CONTINUE TO THE NEXT PART OF THE SEQUENCE BY PRESSING	⇨
DISPLAY READS **HOOK BLOCK**	
CONTINUE TO THE NEXT PART OF THE SEQUENCE BY PRESSING	⇨
USE THE NUMBER ENTRY ROUTINE TO ENTER A **LOAD OF ZERO**	
EXIT FROM THE ROUTINE WITHOUT CALIBRATING BY PRESSING	⇨

When using this short procedure to re calibrate annular gain, make a copy of the changes just made by carrying out the save routine as detailed in section 17/0 of this procedure.

COMMAND 11 BOOM MOMENT

MAIN BOOM ONLY

♦ All fly or jib attachments which were removed at the commencement of calibration will remain off the boom until later in the procedure.

♦ Tare data is the weight of the hook-block fitted during the procedure. If a different hook-block is fitted subsequently its weight will be automatically calculated.

♦ Data will normally be acquired at high and low angle with the boom fully retracted and at high and low angle with the boom fully extended. High or low data can be acquired in any order but the calibration must always commence at the shorter boom length.

♦ Crane booms which extend and retract proportionally need only be calibrated at retracted and extended lengths.

♦ Crane booms which extend sequentially must be calibrated as each section is extended.

♦ This procedure is for a proportional boom but may be adapted for a sequential boom.

WARNING

DURING THIS PROCEDURE, THE MACHINE MAY BE REQUIRED TO BE OPERATED NEAR THE LIMITS OF STABILITY. EXERCISE DUE CAUTION IN THE OPERATION OF THE MACHINE AND AT NO TIME EXCEED THE MANUFACTURERS OPERATIONAL LIMITATIONS.

A low angle is one which is below 20 degrees and a high angle is considered to be above 60 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.

(a)   Fully retract the horizontal boom.

(b)   Determine the weight of the hook-block currently fitted.

(c)   Calibrate the moment of the main boom by use of the following sequence:

SCROLL TO **11 BOOM MOMENT** BY PRESSING	⇑ **OR** ⇓
START THE COMMAND BY PRESSING	**SELECT**
USE THE NUMBER ENTRY ROUTINE TO ENTER WEIGHT OF THE HOOK BLOCK	
ACQUIRE THE LOW ANGLE DATA BY PRESSING	**SELECT**
THE DISPLAY WILL READ **(⇓)**	

RAISE THE RETRACTED BOOM TO AN ANGLE GREATER THAN 60°

ACQUIRE THE HIGH ANGLE DATA BY PRESSING	**SELECT**
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 ANGLE AND EXTEND THE BOOM

ACQUIRE THE HIGH ANGLE DATA BY PRESSING	**SELECT**
THE DISPLAY WILL READ **(⇑)**	

LOWER THE EXTENDED BOOM AS FAR AS STABILITY WILL ALLOW

ACQUIRE THE LOW ANGLE DATA BY PRESSING	**SELECT**
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 12 BOOM DEFLECTION CORRECTION

BOOM DEFLECTION CORRECTION (BDC)

THIS COMMAND CAN BE USED FOR ALL CONFIGURATIONS. IT IS ALWAYS NECESSARY FOR THE MAIN BOOM BUT IT IS CONSIDERED TO BE OPTIONAL FOR FLY OR JIB CONFIGURATIONS. HOWEVER, THE USE OF THE COMMAND WILL ALWAYS RESULT IN GREATER ACCURACY AND IT IS RECOMMENDED FOR ALL CONFIGURATIONS..

PRIOR TO THE USE OF THIS COMMAND ALWAYS ENSURE THAT THE CONFIGURATION TO BE CALIBRATED IS SELECTED. CONFIGURATIONS MAY BE SELECTED PRIOR TO ENTRY INTO THE CALIBRATION MODE OR MAY BE SELECTED FROM WITHIN THE CALIBRATION MODE BY THE USE OF COMMAND 20.

♦ Select the configuration to be calibrated. (Main boom must be carried out before jibs).

♦ With the boom fully extended at an angle of approximately 65 degrees, pick up the maximum permitted load and **measure the deflected radius from the center line of rotation to the center of the hook.**

♦ With the load still suspended calibrate the BDC by use of the following sequence:

SCROLL TO **12 B D C** BY PRESSING	⇧ **OR** ⇩
START THE COMMAND 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 SELECT key.

COMMAND 13 HITE

The "HITE" command permits the calibration of the boom head height. Most of the data required for the computation is already available. This procedure will establish a fixed offset which is the height of the boom pivot above ground level.

(a)   With the crane on outriggers and the boom horizontal and retracted, **measure the height of the boom pivot above ground level.**

(b)   Calibrate the boom head height by use of the following sequence:

SCROLL TO **13 HITE** BY PRESSING	⇧ **OR** ⇩
START THE COMMAND BY PRESSING	**SELECT**
START THE **HITE** CALIBRATION BY PRESSING	**SELECT**
CONFIRM THE CALIBRATION (or abort with ⇨)	**SELECT**
USE THE NUMBER ENTRY ROUTINE TO ENTER THE HITE FROM (a)	
EXIT FROM THE ROUTINE BY PRESSING	⇨

COMMAND 14 FLY/JIB

*THE CALIBRATION ROUTINE FOR FLYS/JIBS WILL NOT OPERATE UNTIL A FLY OR JIB CONFIGURATION IS SELECTED. IT IS ABSOLUTELY NECESSARY TO HAVE THE **CORRECT** SELECTION PRIOR TO ACCESSING THE ROUTINE.*

THE PROGRAM WILL NOT PERMIT THE SELECTION OF A FLY CONFIGURATION FROM THE OPERATORS MENU UNLESS IT HAS BEEN CALIBRATED. THIS IS DONE TO ELIMINATE UNNECESSARY SELECTION CHOICES IN THE OPERATORS MENU. WHEN CALIBRATING A FLY FOR THE FIRST TIME IT IS ONLY POSSIBLE TO SELECT IT FROM WITHIN THE CALIBRATION MENU USING COMMAND 20. AFTER IT IS CALIBRATED IT WILL APPEAR IN THE OPERATORS MENU.

This command is used to calibrate the **radius** AND **moment** of all configurations other than main boom. It operates in a similar way to command 11 in as much as it requires data at high and low angles retracted and high and low angles extended.

A high angle is one which is higher than 60 degrees and 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 SELECT key.

Erect the fly/jib configuration to be calibrated.

Select the configuration to be calibrated.

With the boom retracted as far as possible and at a low angle, measure the radius.

Determine the weight of the hook-block.

Calibrate the radius and moment of the fly/jib by use of the following sequence:

SCROLL TO **14 FLY'S** BY PRESSING	⇧ **OR** ⇩
START THE COMMAND BY PRESSING	**SELECT**
USE THE NUMBER ENTRY ROUTINE TO ENTER WEIGHT OF THE HOOK	
START THE DATA ACQUISITION BY PRESSING	**SELECT**
ACQUIRE THE LOW ANGLE DATA BY PRESSING	⇩
USE THE NUMBER ENTRY ROUTINE TO ENTER THE CURRENT RADIUS	
THE DISPLAY WILL READ (⇩)	

Raise the retracted boom to an angle greater than 60° and measure the **new radius**.

START THE DATA ACQUISITION BY PRESSING	**SELECT**
ACQUIRE THE HIGH ANGLE DATA BY PRESSING	⇧
USE THE NUMBER ENTRY ROUTINE TO ENTER THE NEW RADIUS (f)	
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 as far as safe to do. Measure the new radius.

START THE DATA ACQUISITION BY PRESSING	**SELECT**
ACQUIRE THE HIGH ANGLE DATA BY PRESSING	⇧
USE THE NUMBER ENTRY ROUTINE TO ENTER THE NEW RADIUS	
THE DISPLAY WILL READ **(⇧)**	

Maintain the same length and lower the extended boom as far as stability will allow and measure the **new radius**

DO NOT LOWER THE UNLADEN BOOM BELOW THE MINIMUM ANGLE SPECIFIED ON THE CAPACITY CHART.

START THE DATA ACQUISITION BY PRESSING	**SELECT**
ACQUIRE THE LOW ANGLE DATA BY PRESSING	⇩
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 16 SENSITIVITY

The **SENSITIVITY** Command permits the user to change the scaling of analog sensors according to their sensitivity.

Typically the routine would be used when a service replacement transducer is fitted but full re- calibration facilities are not available. It should be noted that the accuracy of the new scaling will be limited by the accuracy of the known transducer sensitivities. Checks should be made following re-scaling to preserve system accuracy.

For pressure transducers, the rated pressure should be accounted in the sensitivity ratio calculation. It should be ensured that the gain setting of the pre-amplifier is still suitable, especially if the sensitivity ratio exceeds unity.

IF THE GAIN SETTING HAS TO BE MODIFIED, THE PRESSURE SCALING MUST BE FULLY RE- CALIBRATED USING THE PRESSURE COMMAND.

Calibrate the SENSITIVITY by use of the following sequence:

SCROLL TO **16 SENSITIVITY** BY PRESSING	⇧ **OR** ⇩
START THE COMMAND BY PRESSING	**SELECT**
SCROLL TO THE SENSOR TO BE MODIFIED BY PRESSING	⇧ **OR** ⇩
CONFIRM THE SELECTION OF THE SENSOR BY PRESSING	**SELECT**
THE DISPLAY WILL READ THE CURRENT VALUE	
START THE CALIBRATION BY PRESSING	**SELECT**
CONFIRM THE CALIBRATION (or abort with ⇨)	**SELECT**
USE NUMBER ENTRY PROCEDURE TO ENTER THE **NEW RATIO**	
AFTER THE MESSAGE "**CALIBRATING**" THE DISPLAY WILL READ THE NEW VALUE	
EXIT BY PRESSING	⇨

The sensitivity ratio referred to above is the ratio of the old transducer to the sensitivity of the new transducer.

For pressure sensors with differing pressure ratings use the following example;

       Old sensitivity   2.71 mV/V for 5000 psi
       New sensitivity   1.30 mV/V for 3500 psi

Sensitivity ratio [2.71/5000] x [3500/1.30] = 1.459

COMMAND 17/0 SAVE

On completion of a calibration it is necessary to carry out Command 17/0 SAVE. The use of this command will ensure that a copy of the calibration, will be contained in the back-up memory.

SCROLL TO **17 PERSONALITY** BY PRESSING	⇧ **OR** ⇩
START THE COMMAND BY PRESSING	**SELECT**
SCROLL TO **17/0 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 **EXIT** BY PRESSING	⇨

COMMAND 17/3 BACK-UP

On completion of a calibration and after the execution of Command 17/0 SAVE a permanent copy of the calibration may be obtained by use of the following procedures.

SCROLL TO **17 PERSONALITY** BY PRESSING	⇧ **OR** ⇩
START THE COMMAND BY PRESSING	**SELECT**
SCROLL TO **17/3 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 17/4-RESTORE BY USE OF THE FOLLOWING SEQUENCE.

ENTER THE CALIBRATION ROUTINE

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 17/4 RESTORE

SCROLL TO **17 PERSONALITY** BY PRESSING	⇧ OR ⇩
START THE COMMAND BY PRESSING	**SELECT**
SCROLL TO **17/4 RESTORE** 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	⇨

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 17/0 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	⇨

COMMAND 20 DUTY

This command is used to change duty from within the calibration command without leaving the calibration routines. After starting the command the upper/left display will show the currently selected duty.

♦ Page # is the part of the duty chip where the current selection is stored

♦ Duty # is the number of the currently selected duty

♦ Fly # is the reference for the calibration of the moment of the configuration

Most of the calibration is carried out on outriggers. The following procedure describes the selection of a duty on outriggers.

There are four stages to select an outrigger configuration.

♦ Select Outriggers

♦ Select Counterweight (where applicable)

♦ Select Main Boom (main boom includes manual extension and aux. head combinations)

♦ Select Fly/Jib

Change duty by use of the following sequence.

SCROLL TO **20 DUTY** BY PRESSING	⇧ **OR** ⇩
START THE COMMAND BY PRESSING	**SELECT**
THE DISPLAY WILL READ THE CURRENTLY SELECTED CONFIGURATION	
START THE NEW SELECTION BY PRESSING	**OUTRIGGER PUSHBUTTON**
SCROLL TO THE OUTRIGGER SELECTION BY PRESSING	⇧ **OR** ⇩
CONFIRM THE SELECTION AND SCROLL TO COUNTERWEIGHT BY PRESSING	**SELECT**
SCROLL TO COUNTERWEIGHT SELECTION BY PRESSING	⇧ **OR** ⇩
CONFIRM THE SELECTION AND SCROLL TO MAIN BOOM	**SELECT**
SCROLL TO MAIN BOOM SELECTION BY PRESSING	⇧ **OR** ⇩
CONFIRM THE SELECTION AND SCROLL TO FLY/JIB	**SELECT**
SCROLL TO FLY/JIB SELECTION BY PRESSING	⇧ **OR** ⇩
CONFIRM THE SELECTION	**SELECT**
EXIT AND RETURN TO THE CALIBRATION MENU BY PRESSING	⇨

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 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.