Calibration and Diagnostics Instrument (CADI) Quick Reference Guide
Table of Contents

Section 1 — Introduction
  About This Manual................................................................. 1
  General Use of the CADI...................................................... 1
  Initial Setup of the CADI...................................................... 2
  CADI Buttons........................................................................ 2
  Calibration Mode.................................................................... 3
  Date and Time Mode............................................................ 3
  Diagnostic Mode..................................................................... 3
  Extension Cable..................................................................... 4

Section 2 — DL/DM, D2/3/4000A, DT80 CADI Use
  Derrick Functions............................................................... 5
  Derrick Parameters............................................................. 6
  Multi-Functioning............................................................... 7
  Parameter Values............................................................... 7
  Calibration Procedure......................................................... 8

Section 3 — DLB/DMB, D2/3/4000B, DHB, DR42B CADI Use
  Derrick Functions............................................................... 17
  Derrick Parameters............................................................. 18
  Multi-Functioning............................................................... 19
  Parameter Values............................................................... 20
  Calibration Procedure......................................................... 20

Section 4 — AT235/AT235P/AT237/AT237S CADI Use
  Aerial Device Functions..................................................... 29
  Parameters......................................................................... 30
  Calibration Procedure......................................................... 31

Section 5 — A40P CADI Use
  Aerial Device Functions..................................................... 37
  A40P Parameters................................................................. 37
  Parameter Values............................................................... 39
  Calibration Procedure......................................................... 39

Section 6 — AT40-G CADI Use
  Aerial Device Functions..................................................... 41
  AT40-G Parameters............................................................ 41
  Parameter Values............................................................... 43
  Calibration Procedure......................................................... 43

Section 7 — L42E/L44E CADI Use
  Aerial Device Functions..................................................... 47
  L42E/L44E Parameters......................................................... 47
  Parameter Values............................................................... 48
  Calibration Procedure......................................................... 49

Section 8 — LS63 and LS87 CADI Use
  Aerial Device Functions..................................................... 53
  Aerial Device Parameters................................................... 53
  Parameter Values............................................................... 55
  Calibration Procedure......................................................... 55
  HOP Calibration — LS63....................................................... 55
  HOP Calibration — LS87....................................................... 55
Section 9 — DB37 CADI Use
Derrick Functions ................................................................. 59
Derrick Parameters .............................................................. 59
  Multi-Functioning ............................................................. 61
  Parameter Values .............................................................. 61
  Calibration Procedure ....................................................... 61

Section 10 — AT248F CADI Use
Aerial Device Functions ......................................................... 67
AT248F Parameters ............................................................... 67
  Parameter Values .............................................................. 69
  Calibration Procedure ....................................................... 69

Section 11 — T40P CADI Use
Aerial Device Functions ......................................................... 73
T40P Parameters ................................................................. 74
  Parameter Values .............................................................. 75
  Calibration Procedure ....................................................... 75

Section 12 — TDA58 CADI Use
Functions ........................................................................ 81
Parameters ....................................................................... 81
  Parameter Values .............................................................. 82

Appendix
DL/DM Series Field CADI Settings Sheet
DLB/DMB, DHB Series Field CADI Settings Sheet
D2/3/4000A and DT80 Field CADI Settings Sheet
D2/3/4000B Field CADI Settings Sheet
DB37 Series Field CADI Settings Sheet
Section 1 — Introduction

About This Manual...
This manual provides information about the Calibration and Diagnostics Instrument (CADI) device (refer to Figure 1.1). This information should be read and understood by maintenance personnel prior to performing their assigned duties. The CADI contains programming for several types of units. The information in this manual explains the general operation of the CADI and then explains the use with the various Altec equipment models listed in the table of contents. This supplement provides additional information to that which is in the maintenance manual concerning adjustment and troubleshooting using the CADI.

General Use of the CADI
All of the control system parameters for each individual unit are set at the factory for optimum performance. The settings can vary from one unit to another of the same model. The CADI is the device used to adjust these parameters. Each direction of the proportional control functions is adjusted independently of the opposite function direction. For example, changing the low speed or max out for boom up has no effect on boom down.

This manual contains several adjustment procedures that are necessary for the best operation of the unit. Follow the procedures completely and in the correct sequence to obtain the optimum performance of the unit.
The control system settings are stored in the above rotation valve driver. If this valve driver needs to be replaced, record the current settings before removing the original valve driver from the unit. Use the CADI to determine the current parameter settings, and write these down on a copy of the CADI values sheet provided in the unit specific section of this guide. After installing the new valve driver, use the CADI to adjust the settings to the values recorded from the original valve driver. If the original values could not be obtained, all the settings must be properly calibrated for optimum performance (refer to the unit specific section of this guide).

**Initial Setup of the CADI**

**Connecting the CADI**
The CADI connects to a socket (refer to Figure 1.2) and is powered by the unit.

**Figure 1.2 — CADI Connection Socket**

The CADI will power up and display the startup screen when it is connected to the connection socket (refer to Figure 1.3).

The unit type (for example, Derrick) will appear in the center of the startup screen. Two version numbers are displayed on the line below the unit type. The number beginning with V, located to the left, is the firmware version number for the above rotation valve driver installed on the unit. Some adjustment procedures may vary depending on this version number. The number located to the right is the CADI firmware version number. Altec technical support can use this version number to determine if the CADI contains the latest firmware update.

If the proper unit type is displayed, pressing any button on the keypad will bring up the first calibration mode screen.

If Unknown Machine appears on the startup screen, the CADI is not properly programmed for the unit to which it is connected. Contact Altec technical support at 1-877-GO-Altec option 4 to determine if the CADI firmware needs updating based on the CADI firmware version number shown on the startup screen. If updating is required, order and install a CADI chip revision kit, available by contacting Altec parts distribution at 1-877-GO-Altec option 1.

If No Machine appears on the startup screen, the unit to which it is connected has been shut off using the emergency stop. The emergency stop must be disengaged before the CADI will recognize the unit.

Note: Before making any adjustments using the CADI, the unit should be operated so that the oil is at proper operating temperature according to the specifications in the maintenance manual. It is strongly recommended that the original settings on the CADI be recorded on a copy of the CADI values sheet which is included at the end of each unit section.

**CADI Buttons**
The CADI keypad contains six buttons which are used to select the information displayed on the LCD screen, and to select and change various adjustable parameters (refer to Figure 1.1). The buttons must be pushed repeatedly to scroll through the items in the display or to change the parameter values.

**Mode Select Button (= MODE)**
Use the mode button to scroll through all the mode screens (calibration mode, date and time mode, and diagnostic mode). The display wraps around to the first mode screen after displaying the last screen.

**Parameter Select Button (= SELECT)**
In calibration mode, use the select button to scroll through all the control system parameters for the function that is currently displayed on the screen. The value for the parameter that is currently selected flashes on the display. The selection wraps around to the first parameter after reaching the last parameter.
In diagnostic mode, use the select button to scroll through all the available diagnostic screens. The display returns to the first diagnostic screen after displaying the last screen.

**Function Menu Select Buttons (= MENU)**
In calibration mode, use the left and right menu buttons to scroll through all the programmable function screens. The display wraps around to the first function screen after the last function screen is displayed when scrolling in either direction.

**Parameter Value Select Buttons (= VALUE)**
In calibration mode, use the up and down value buttons to incrementally increase or decrease the value of the selected (flashing) parameter. When adjusting a threshold (TH), max out (MX), or low speed (LMX) parameter while operating the function (hand control shifted), adjust the setting slowly, no faster than one point every five seconds. Adjusting the settings too fast will result in incorrect settings.

**Calibration Mode**
Pressing any button on the keypad while the startup screen is displayed (refer to Figure 1.3) will bring up calibration mode (refer to Figure 1.1), showing the screen for the first programmable function. Use the menu, select, and value buttons as described in the CADI buttons section to make all selections and adjustments. Follow the specific calibration procedure for the model being serviced contained in the applicable section of this guide.

In calibration mode, the LCD screen provides four rows of information (refer to Figure 1.1). The first row shows the mode. The second row shows the function selected. The third row lists all the parameters for the function. The fourth row lists all the current values for the parameters. The value for the parameter that is currently selected flashes on the display.

**Date and Time Mode**
Use the mode button to select date and time mode. The date and time settings are set at the factory and do not need adjustment.

**Diagnostic Mode**
Use the mode button to select diagnostic mode. The first time that diagnostic mode is accessed after plugging in the CADI, the I:/O: screen is displayed (refer to Figure 1.4). Use the select button to scroll through all the available diagnostic screens. If a diagnostic screen other than the I:/O: screen is displayed and the mode button is used to cycle through the mode screens again, this same diagnostic screen will be displayed again when the CADI returns to diagnostic mode. Once on this diagnostic screen, use the select button to scroll to the desired diagnostic screen. Note that some diagnostic screens are labeled diagnostic mode at the top, and some such as the I:/O: screen are not labeled like this.

**I:/O: Screen**
With the CADI in diagnostic mode, if the I:/O: screen is not already displayed, use the select button to scroll to the I:/O: screen (refer to Figure 1.4).

This screen displays the list of input and output boards that are not communicating with the systems in the above rotation valve driver board. I: designates the input boards that are not communicating and O: designates the output boards that are not communicating.

If a number is present after I: or O: it means that the indicated input or output board(s) is not reporting back to the above rotation valve driver board. Numbers listed do not necessarily indicate a problem, as they may not be options on the unit. The list of input and output boards and their corresponding board numbers for a derrick (except DB Series) is shown in Figure 1.5. For the I:/O: screen example shown in Figure 1.4, a derrick without a slave panel will have the numbers 2 and 3 listed after the I: since those are the input boards in a slave panel.
displayed on the screen in Figure 1.4 refers to the four-lever upper controls. This indicates that there is an error with this input or the unit is not equipped with this option.

For further information on using the I:/O: screen for troubleshooting for the various models included in this guide, contact Altec technical support at 1-877-GO-Altec option 4.

**Temp:/Volt: Screen**

With the CADI in diagnostic mode, use the select button to scroll to the temp:/volt: screen (provided on above rotation valve driver boards produced beginning in late 2012). This screen displays the temperature of the above rotation valve driver and the supply voltage from the chassis measured at the above rotation valve driver. The voltage reading can be used when diagnosing electrical issues which may be caused by low supply voltage.

**Other Diagnostic Screens**

With the CADI in diagnostic mode, use the select button to scroll through the additional diagnostic screens not described above. These screens display information which can be useful for more advanced troubleshooting. Call 1-877-GO-Altec and select option 4 for further information.

**Extension Cable**

An 8’ (2.44 m) long CADI extension cable is available to allow use of the CADI farther from the connection socket on the unit. Call 1-877-GO-Altec and select option 1 to order this cable, part number 970432863.
The CADI connection for the derrick is located in one of several locations depending on the type of control panel on the derrick.

- Traditional control panel with six lever-type hand controls or one joystick and two lever-type hand controls – under the control panel (refer to Figure 2.1).

- Opti-View riding seat – on the front of the right hand control pod (refer to Figure 2.2).

- Radio controls only with no lower control panel – on the back of the radio receiver mounting bracket on the turntable (refer to Figure 2.3).

Derrick Functions

With the CADI in calibration mode, use the left and right menu buttons to scroll through the programmable function screens and select the desired unit function to be adjusted (refer to Figure 2.4). The function is shown on the display. Derrick functions that can be adjusted are shown in Figure 2.5.
<table>
<thead>
<tr>
<th>Function</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boom up</td>
<td>Raises the boom</td>
</tr>
<tr>
<td>Boom down</td>
<td>Lowers the boom</td>
</tr>
<tr>
<td>CW</td>
<td>Clockwise rotation</td>
</tr>
<tr>
<td>CCW</td>
<td>Counterclockwise rotation</td>
</tr>
<tr>
<td>2nd extend</td>
<td>Extends the intermediate boom</td>
</tr>
<tr>
<td>2nd retract</td>
<td>Retracts the intermediate boom</td>
</tr>
<tr>
<td>3rd extend</td>
<td>Extends the upper boom</td>
</tr>
<tr>
<td>3rd retract</td>
<td>Retracts the upper boom</td>
</tr>
<tr>
<td>Winch in</td>
<td>Retracts the winch line</td>
</tr>
<tr>
<td>Winch out</td>
<td>Extends the winch line</td>
</tr>
<tr>
<td>Digger dig</td>
<td>Clockwise digger rotation</td>
</tr>
<tr>
<td>Digger clean</td>
<td>Counterclockwise digger rotation</td>
</tr>
<tr>
<td>HOP meter</td>
<td>Controls calibration of the HOP meter</td>
</tr>
<tr>
<td>HOP trip</td>
<td>Sets trip point of the HOP</td>
</tr>
<tr>
<td>ESLP CW</td>
<td>Controls set point of the electronic side load protection in clockwise direction</td>
</tr>
<tr>
<td>ESLP CCW</td>
<td>Controls set point of the electronic side load protection in counterclockwise direction</td>
</tr>
<tr>
<td>Throttle</td>
<td>Controls foot throttle parameter of unit</td>
</tr>
</tbody>
</table>

**Figure 2.5 — CADI Adjustable Functions**

**Derrick Parameters**

Use the select button to scroll through the control system parameters displayed on the screen and choose the parameter to be adjusted. The value for the parameter that is currently selected flashes on the display. For example, the boom up unit function is selected and the frequency parameter is selected (refer to Figure 2.6). The parameter values are shown under the parameter names. A description of each parameter is listed below.

- **FREQ – Frequency**
  FREQ refers to the frequency measured in hertz of the signal output by the above rotation valve driver for the function.

  Do not change the FREQ values from the factory settings. If this value is changed, the function will not operate at optimal performance.

- **SC – Speed curve (00)**
  The SC setting controls how the power level of the signal sent to the control valve changes in relation to the position of the hand control.

  The SC setting of 00 produces linear control operation, in which the power level of the signal increases or decreases in a linear fashion in proportion to how far the hand control is shifted.

  Do not change the SC values from the factory settings of 00. If this value is changed, the function will not operate at optimal performance.

- **TH – Threshold (from 00 to 99)**
  The TH setting controls the power level of the signal sent to the control valve when the hand control is shifted slightly out of neutral just to the position where it begins to send a minimum signal level to the control system.

  The TH value controls the metering of the unit function as function movement is started and stopped. If the TH value is set too low, the hand control will require excessive movement before the function starts to move. If the value is set too high, the function may not start and stop smoothly as the hand control is operated near the neutral position.

  The TH value for a boom, winch, or digger function must be less than both the LMX value and the MX value for that function.

- **MX – Max out (from 00 to 99, used in standard speed mode)**
  The MX setting controls the power level of the signal sent to the control valve when the hand control is operated with standard speed selected on the lower control panel or radio remote.

  The MX value determines the maximum speed (minimum cycle time) of a boom function when standard speed is selected and the hand control is fully shifted.

  The MX value determines the maximum speed of the winch and digger functions when standard speed is selected and the hand control is fully shifted, when
not operating any boom functions at the same time as the winch or digger.

Increase the MX value to increase a function’s standard speed (shorter cycle time), within the limits of the hydraulic flow available. Decrease the MX value to reduce a function’s standard speed (longer cycle time).

Do not set the MX value higher than required to achieve the proper cycle time. If the MX value is set too high, the valve spool may reach full travel before the hand control is fully shifted, causing a loss of meterability.

The MX value for a boom, winch, or digger function must be higher than both the LMX value and the TH value for that function.

The MX parameter is used to calibrate the load indicator gauge (HOP meter), as described in the maintenance manual. The LMX value must then be set to the same value as MX.

For units equipped with a variable foot throttle, the MX value determines the maximum engine rpm when the throttle is fully actuated. The LMX value must then be set to the same value as MX.

• RA – Ramp
The RA setting controls the rate of acceleration as function movement starts after the hand control is activated, and the rate of deceleration as function movement stops after the hand control is deactivated.

Do not change the RA values from the factory settings. If this value is changed, the function will not operate at optimal performance.

• LMX – Low speed (from 00 to 99, used in low speed mode and for priority flow)
The LMX setting (also referred to as low max) controls the reduced power level of the signal sent to the control valve when the hand control is operated with low speed selected on the lower control panel or radio remote or when the four-lever upper controls are operated.

The LMX value determines the reduced speed (increased cycle time) of a boom, winch, or digger function when low speed is selected and the hand control is fully shifted.

Increase the LMX value to increase a boom function’s low speed (shorter cycle time). Decrease the LMX value to reduce a boom function’s low speed (longer cycle time).

LMX values are used for winch and digger operation when either of these functions is operated at the same time as a boom function (priority flow).

Increase the LMX value for a winch or digger function to increase the winch or digger speed and decrease the boom function speed when operating winch or digger at the same time as a boom function.

The LMX value for a boom, winch, or digger function must be higher than the TH value and lower than the MX value for that function.

LMX is used to calibrate hydraulic overload protection (HOP) trip, and, if so equipped, electronic side load protection (ESLP) trip, as described in the maintenance manual.

The LMX value must be set equal to the MX value for HOP meter and throttle.

Multi-Functioning
When in standard speed mode and using a boom function with a winch or digger function (multi-functioning), the machine is programmed to use the priority flow functionality. Priority flow divides the oil between the winch and boom functions while operating both at the same time. Priority flow also divides the oil between the digger and boom functions while operating both at the same time. Priority flow is controlled by the LMX values of the winch and digger functions respectively.

During multi-functioning in standard speed mode, the boom function speeds are controlled by the MX values of the corresponding boom functions. However, the maximum boom function speeds may be reduced due to hydraulic flow limitations.

To synchronize (multi-function) boom extend/retract with winch out/in and boom down/up with digger dig/clean, adjust the winch or boom LMX values as described under Calibration Procedure.

Parameter Values
The parameter value flashes when selected using the select button. Use the up or down value button to change the value of the selected parameter.

When all parameters are properly set, unplug the CADI from the socket. The settings selected are saved in the above rotation valve driver as soon as they are changed.
Calibration Procedure

The following procedure covers the full calibration of all the boom, winch, and digger functions. If derrick performance indicates that the TH, MX, or LMX parameter of a single function needs calibrating, perform only the appropriate portion of the calibration procedure. If the pulsar has been replaced for a function, the TH, MX, and LMX settings must all be calibrated for that function.

For personnel who are familiar with the detailed calibration procedure contained in this section, a condensed calibration procedure for the boom, winch, and digger functions is provided in the Appendix of this guide (refer to the field CADI settings sheet for the applicable derrick model).

Make a copy of the applicable CADI values sheet (refer to Figures 2.15 and 2.16) or the field CADI settings sheet (refer to the Appendix) to use for recording the current and new parameter settings. Note that the TH, MX, and LMX values shown on the CADI values sheet are approximate preliminary values. These values must be adjusted for all the boom, winch, and digger functions according to the procedure in this section to obtain optimum performance. The HOP, ESLP, and throttle parameter values must be set in accordance with the model specific CADI values sheet (refer to Figure 2.15 or 2.16) or adjusted in accordance with the maintenance manual for proper operation. Do not adjust the parameter values for FREQ, RA, or SC.

If the calibration procedure is performed using the lower control panel on the unit, a second person will be needed to assist during the MX adjustment portion of the procedure. The calibration procedure can be performed by one person using the lower radio remote control, if so equipped, along with a CADI extension cable. The upper controls cannot be used for the calibration procedure except as indicated under Three-Axis Joystick CADI Parameters.

When the procedure refers to boom functions, this indicates boom up/down, rotation CW/CCW, second (intermediate) extend/retract, and third (upper) extend/retract.

The standard speed and low speed cycle time ranges used for calibrating the MX and LMX values for the boom functions are contained in the maintenance manual and in the unit specific field CADI settings sheet included in the Appendix of this guide.

Three-Axis Joystick CADI Parameters

If the lower control panel is equipped with a three-axis boom functions joystick, the calibration procedure for the second (intermediate) parameters will vary depending on the internal design of the control panel. The presence or absence of a placard by the CADI connection socket (refer to Figure 2.7) indicates the type of panel design furnished.

NOTICE

- Boom functions joystick utilizes "2ND" CADI settings for Intermediate Boom and "3RD" CADI settings for Upper Boom.

If the control panel does have the placard shown in Figure 2.7 installed by the CADI connection socket, the joystick uses second (intermediate) CADI parameters for the intermediate boom function and third (upper) parameters for the upper boom function. Calibrate the second (intermediate) parameters using the intermediate boom function on the joystick, and calibrate the third (upper) parameters using the upper boom function on the joystick.

If the control panel does not have the placard shown in Figure 2.7 located by the CADI connection socket, the lower control joystick uses third (upper) CADI parameters for both the intermediate boom and upper boom functions. If the unit is operated from upper controls or radio controls, second (intermediate) CADI parameters are used for the intermediate boom. Calibrate the second (intermediate) CADI parameters as described as follows.

- If the unit is not equipped with upper controls or radio controls, do not change the second (intermediate) parameter values from the factory settings. Because the intermediate boom cycle times cannot be adjusted independently, the intermediate boom may not be able to meet the published cycle times. A compromise may have to be made between intermediate and upper boom functionality when adjusting the third (upper) CADI parameters.

If the unit is equipped with radio controls, with or without four-lever upper controls, calibrate the second (intermediate) TH, MX, and LMX parameters using the radio controls.

- If the unit is equipped with four-lever upper controls but does not have radio controls, calibrate the second (intermediate) TH and LMX parameters using the four-lever upper controls. Do not adjust the second (intermediate) MX setting.
Setup

1. Position the unit on a level surface in an open area where the booms can be fully extended, raised, and rotated. Apply the parking brake and chock the wheels.

2. Remove the cover over the lower control valve on the right side of the turntable (as viewed from the boom tip looking toward the turntable). Identify the type(s) of pulsars installed on the lower control valve. The type of pulsar is identified by the color of the rubber boot where the control wiring enters the pulsar valve. A black boot indicates a standard pulsar. A light gray boot indicates a pressure feedback pulsar. If the pulsars are not all the same type, make note of which function(s) have standard pulsars and which function(s) have pressure feedback pulsars (refer to Figure 2.8).

3. Start the engine, engage the unit’s hydraulic system, and properly set the outriggers.

4. In accordance with the maintenance manual, check the system pressure and verify that the pump is delivering the correct oil flow. Make any necessary adjustments.

NOTICE

Proper differential pilot pressure, measured as the difference between pilot port pressure and return line (tank) pressure, is critical for optimum performance. If the procedure for setting differential pilot pressure is not described in the available unit maintenance manual, contact Altec technical support at 1-877-GO-Altec option 4 for further information.

5. Check the differential pilot pressure in accordance with the maintenance manual. If the control valve has one or more standard pulsars, the proper differential pilot pressure is 155 to 160 psi (10.69 to 11.03 bar). If all of the pulsars in the lower control valve are pressure feedback pulsars, the proper

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**Figure 2.8 — Pulsar/Function Identification**

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differential pilot pressure is 205 to 215 psi (14.13 to 14.82 bar). Make any necessary adjustment. Leave the turntable cover off after checking the differential pilot pressure.

NOTICE
If the oil is not warmed to the required temperature range, the CADI settings resulting from the calibration procedures will not be accurate, and poor meterability will result.

6. Operate the unit to warm the hydraulic oil to 120 to 130 degrees Fahrenheit (49 to 54 degrees Celsius). This temperature is important for proper TH calibration.

Use an infrared (IR) thermometer to read the temperature of the hydraulic reservoir on or near the end opposite from the return line filter, at a point about \( \frac{1}{3} \) of the way above the bottom of the reservoir (refer to Figure 2.9). The oil can be warmed quickly as described in step a or b.

a. If the unit is equipped with a digger, unstow the digger. Make sure the booms are fully retracted. With the engine at full rpm, operate digger dig at full speed while holding the intermediate or upper boom control fully shifted in the Retract position. When the oil has reached 120 to 130 degrees Fahrenheit (49 to 54 degrees Celsius), stow the digger and proceed to step 7.

b. If the unit is not equipped with a digger, make sure the booms are fully retracted. With the engine at full rpm, operate winch raise/winch lower repeatedly at full speed while holding the intermediate or upper boom control fully shifted in the Retract position. When the oil has reached 120 to 130 degrees Fahrenheit (49 to 54 degrees Celsius), proceed to step 7.

7. Position the boom at an angle between 10 and 30 degrees above horizontal, and rotate it to a position where all the functions can be operated for calibration.

8. Connect the CADI to the CADI connection socket. Use the CADI extension cable to make this connection if the calibration procedure will be performed by one person using the lower radio remote control.

9. Put the CADI into calibration mode. Write the current value of the TH, MX, and LMX parameter for each function to be calibrated on the CADI values sheet or the field CADI settings sheet before making any adjustments.

TH Calibration Procedure
10. Change the TH and MX settings to 00 for the function being calibrated. The value button on the CADI can be held down continuously until the setting reaches 00.

11. Set the low speed/standard switch to standard on the control panel being used. Operate with the engine at full rpm.

12. Operate the hand control and adjust the MX and TH values for the function being calibrated.

NOTICE
Do not allow the load hook to contact the boom tip when operating winch raise.
a. Fully shift and hold the hand control, and increase the MX value slowly until the function starts moving.

b. Release the hand control, and decrease the MX value by three points.

c. Fully shift and hold the hand control, and check for function movement. If the function is fully stopped, continue to step d. If the function is not fully stopped, go back to step b.

d. Increase the MX value by one point every five seconds until the function begins to creep, meaning to move at the slowest movement noticeable. For boom up/down, watch the lift cylinder rod for movement. For other functions, compare the moving component to a stationary object.

e. Release the hand control. Use the MX value from step d to obtain the required TH setting based on the flow chart shown in Figure 2.10.

f. Reduce the MX value determined in step d by 15 points to obtain the required TH setting. Adjust the TH value to this number. For example, if the function begins to creep at MX = 42 (refer to Figure 2.11), subtract 15, and adjust the TH setting to 27 (refer to Figure 2.12).

g. Reduce the MX value determined in step d by 5 points to obtain the required TH setting. Adjust the TH value to this number. For example, if the function begins to creep at MX = 42 (refer to Figure 2.13), subtract 5, and adjust the TH setting to 37 (refer to Figure 2.14).

h. Record the final TH setting on the CADI values sheet or the field CADI settings sheet.

i. Return the MX setting to the value recorded in step 9.

13. Repeat steps 10 through 12 for each direction of each function being calibrated.
MX Calibration Procedure

14. Set the low speed/standard switch to standard on the control panel being used. Operate with the engine at full rpm.

15. Fully shift the hand control for the function being calibrated and hold it in this position. Look at the manual override handle on the control valve to see if it is visibly vibrating or fluttering. If movement is not visible, touch the handle to feel for vibration. Adjust the MX value as described in step a, b, or c.

   a. If the manual override handle does visibly vibrate or flutter, increase the MX value by one point every five seconds until the flutter is no longer visible but the handle still vibrates to the touch. Then proceed to step 16.

   b. If the manual override handle does not visibly vibrate or flutter and does not vibrate to the touch, decrease the MX value by one point every five seconds until the vibration can be felt but is still not visible. Then proceed to step 16.

   c. If the manual override handle does not visibly vibrate or flutter but does vibrate to the touch, do not adjust the MX. Proceed to step 16.

16. Press on the manual override handle to try to move it farther in the direction that it is shifted. Adjust the MX value as described in step a or b.

   a. If the handle does not move any farther but stops vibrating to the touch, do not adjust the MX. Release the hand control, and proceed to step 17.

   b. If the handle does move farther, raise the MX value by 1 point and repeat step 16.

17. Time the function with the hand control on the control station fully shifted as specified, according to step a or b.

   a. For a boom function, operate the function for a full cycle while timing it, as described in the maintenance manual. If the cycle time is below the standard speed range, decrease the MX value and retest until the cycle time is within the published range. Record the final MX value and standard speed cycle time on the CADI values sheet or the field CADI settings sheet.

   b. For the winch or digger function, timing of the function is not required. Record the final MX value on the CADI values sheet or the field CADI settings sheet.

18. Repeat steps 15 through 17 for each direction of each function being calibrated.

LMX Calibration

19. Calibrate the LMX parameters using the appropriate procedure as indicated in step a or b.

   a. For boom functions, proceed to step 20.

   b. For winch and digger functions, proceed to step 25.

LMX Calibration Procedure for Boom Functions, Based on Cycle Time

20. Set the low speed/standard switch to low speed on the control panel being used. Operate with the engine at full rpm.

21. Fully shift the hand control for the boom function being calibrated and time it for a full cycle, as described in the maintenance manual. Adjust the LMX value and retest as required until the cycle time is within the low speed range.

22. Record the final LMX value and low speed cycle time on the CADI values sheet or the field CADI settings sheet.

23. Repeat steps 21 through 22 for each direction of each boom function being calibrated.

24. When the LMX parameters for all boom functions have been calibrated, proceed to step 25.

LMX Calibration Procedure for Winch and Digger Function, Based on Priority Flow

25. Set the low speed/standard switch to standard on the control panel being used. Operate with the engine at full rpm.

26. Adjust the LMX value for winch out so that the winch line speed matches the boom speed when operating intermediate or upper boom extend and winch lower at the same time at full hand control travel. Record the final LMX value on the CADI values sheet or the field CADI settings sheet.

27. Adjust the LMX value for winch in so that the winch line speed matches the boom speed when operating intermediate or upper boom retract and winch raise at the same time at full hand control travel. Record the final LMX value on the CADI values sheet or the field CADI settings sheet.

28. Adjust the LMX value for digger dig so the boom moves down slowly when operating boom lower and
digger dig at the same time at full hand control travel. Record the final LMX value on the CADI values sheet or the field CADI settings sheet.

29. Adjust the LMX value for digger clean so the boom moves up slowly when operating boom raise and digger clean at the same time at full hand control travel. Record the final LMX value on the CADI values sheet or the field CADI settings sheet.
<table>
<thead>
<tr>
<th>Function</th>
<th>Factory Setting</th>
<th>Factory Setting</th>
<th>Prelim Setting</th>
<th>Current/New Settings</th>
<th>Prelim Setting</th>
<th>Current/New Settings</th>
<th>Factory Setting</th>
<th>Prelim Setting</th>
<th>Current/New Settings</th>
<th>Standard Speed</th>
<th>Low Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boom up</td>
<td>00751</td>
<td>001</td>
<td>253</td>
<td>/</td>
<td>803</td>
<td>/</td>
<td>991</td>
<td>553</td>
<td>/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boom down</td>
<td>—</td>
<td>—</td>
<td>253</td>
<td>/</td>
<td>803</td>
<td>/</td>
<td>991</td>
<td>553</td>
<td>/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotation CW</td>
<td>00751</td>
<td>001</td>
<td>253</td>
<td>/</td>
<td>703</td>
<td>/</td>
<td>991</td>
<td>553</td>
<td>/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotation CCW</td>
<td>—</td>
<td>—</td>
<td>253</td>
<td>/</td>
<td>703</td>
<td>/</td>
<td>991</td>
<td>553</td>
<td>/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2nd (interm) extend</td>
<td>00751</td>
<td>001</td>
<td>403,4</td>
<td>/</td>
<td>803,4</td>
<td>/</td>
<td>991</td>
<td>653,4</td>
<td>/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2nd (interm) retract</td>
<td>—</td>
<td>—</td>
<td>403,4</td>
<td>/</td>
<td>803,4</td>
<td>/</td>
<td>991</td>
<td>653,4</td>
<td>/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd (upper) extend</td>
<td>00751</td>
<td>001</td>
<td>403</td>
<td>/</td>
<td>803</td>
<td>/</td>
<td>991</td>
<td>653</td>
<td>/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd (upper) retract</td>
<td>—</td>
<td>—</td>
<td>403</td>
<td>/</td>
<td>803</td>
<td>/</td>
<td>991</td>
<td>653</td>
<td>/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winch in</td>
<td>00751</td>
<td>001</td>
<td>303</td>
<td>/</td>
<td>803</td>
<td>/</td>
<td>991</td>
<td>603</td>
<td>/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winch out</td>
<td>—</td>
<td>—</td>
<td>303</td>
<td>/</td>
<td>803</td>
<td>/</td>
<td>991</td>
<td>603</td>
<td>/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digger dig</td>
<td>00751</td>
<td>001</td>
<td>403</td>
<td>/</td>
<td>903</td>
<td>/</td>
<td>991</td>
<td>703</td>
<td>/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digger clean</td>
<td>—</td>
<td>—</td>
<td>403</td>
<td>/</td>
<td>903</td>
<td>/</td>
<td>991</td>
<td>703</td>
<td>/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HOP meter</td>
<td>03921</td>
<td>001</td>
<td>001</td>
<td>—</td>
<td>643</td>
<td>/</td>
<td>052/992</td>
<td>645</td>
<td>/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HOP trip</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>863</td>
<td>/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ESLP CW</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>087</td>
<td>/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ESLP CCW</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>087</td>
<td>/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Throttle</td>
<td>03921</td>
<td>001</td>
<td>023</td>
<td>—</td>
<td>409</td>
<td>/</td>
<td>—</td>
<td>409</td>
<td>/</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 Factory setting. Do not change from value shown.
2 Factory setting is 99 for valve drivers built in 2012 and earlier, and 05 for valve drivers built in 2013 and later. Do not change from factory setting.
3 Preliminary setting only. Unit must be calibrated as described under Calibration Procedure in this guide for optimum performance.
4 If lower control panel is equipped with three-axis boom functions joystick, calibration procedure for second (intermediate) parameters varies. Refer to Three-Axis Joystick CADI Parameters under Calibration Procedure in this guide.
5 Preliminary setting only. Refer to Load Indicator Gauge in the maintenance manual for calibration procedure. Set LMX to same value as MX.
6 Preliminary setting only. Refer to Hydraulic Overload Protection (HOP) in the maintenance manual for calibration procedure.
7 If equipped with electronic side load protection, preliminary setting only. Refer to Electronic Side Load Protection in the maintenance manual for calibration procedure; if not equipped with electronic side load protection, set to 99.
8 If equipped with variable foot throttle, set to 02; if not equipped with variable foot throttle, set to 00.
9 If equipped with variable foot throttle, preliminary setting only. Adjust MX value to achieve engine rpm at maximum throttle producing maximum total pump flow of 38 gpm. Set LMX to same value as MX; if not equipped with variable foot throttle, set to 00.

Figure 2.15 — CADI Values Sheet for DL/DM
<table>
<thead>
<tr>
<th>Function</th>
<th>Factory Setting</th>
<th>Factory Setting</th>
<th>Prelim Setting</th>
<th>Current/New Settings</th>
<th>Prelim Setting</th>
<th>Current/New Settings</th>
<th>Factory Setting</th>
<th>Prelim Setting</th>
<th>Current/New Settings</th>
<th>Standard Speed</th>
<th>Low Speed</th>
<th>Cycle Times (Seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boom up</td>
<td>0075¹</td>
<td>00¹</td>
<td>25³</td>
<td>/</td>
<td>80²</td>
<td>/</td>
<td>99¹</td>
<td>55³</td>
<td>/</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boom down</td>
<td>—</td>
<td>—</td>
<td>25³</td>
<td>/</td>
<td>80²</td>
<td>/</td>
<td>99¹</td>
<td>55³</td>
<td>/</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotation CW</td>
<td>0075¹</td>
<td>00¹</td>
<td>25³</td>
<td>/</td>
<td>65³</td>
<td>/</td>
<td>99¹</td>
<td>50³</td>
<td>/</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotation CCW</td>
<td>—</td>
<td>—</td>
<td>25³</td>
<td>/</td>
<td>65³</td>
<td>/</td>
<td>99¹</td>
<td>50³</td>
<td>/</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2nd (interm) extend</td>
<td>0075¹</td>
<td>00¹</td>
<td>40³⁴</td>
<td>/</td>
<td>80³⁴</td>
<td>/</td>
<td>99¹</td>
<td>55³⁴</td>
<td>/</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2nd (interm) retract</td>
<td>—</td>
<td>—</td>
<td>40³⁴</td>
<td>/</td>
<td>80³⁴</td>
<td>/</td>
<td>99¹</td>
<td>55³⁴</td>
<td>/</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd (upper) extend</td>
<td>0075¹</td>
<td>00¹</td>
<td>40³</td>
<td>/</td>
<td>80³</td>
<td>/</td>
<td>99¹</td>
<td>55³</td>
<td>/</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd (upper) retract</td>
<td>—</td>
<td>—</td>
<td>40³</td>
<td>/</td>
<td>80³</td>
<td>/</td>
<td>99¹</td>
<td>55³</td>
<td>/</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winch in</td>
<td>0075¹</td>
<td>00¹</td>
<td>30³</td>
<td>/</td>
<td>80³</td>
<td>/</td>
<td>99¹</td>
<td>55³</td>
<td>/</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winch out</td>
<td>—</td>
<td>—</td>
<td>30³</td>
<td>/</td>
<td>80³</td>
<td>/</td>
<td>99¹</td>
<td>55³</td>
<td>/</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digger dig</td>
<td>0075¹</td>
<td>00¹</td>
<td>40³</td>
<td>/</td>
<td>90³</td>
<td>/</td>
<td>99¹</td>
<td>70³</td>
<td>/</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digger clean</td>
<td>—</td>
<td>—</td>
<td>40³</td>
<td>/</td>
<td>90³</td>
<td>/</td>
<td>99¹</td>
<td>70³</td>
<td>/</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HOP meter</td>
<td>0392¹</td>
<td>00¹</td>
<td>00¹</td>
<td>—</td>
<td>53³</td>
<td>/</td>
<td>05²/99²</td>
<td>53⁵</td>
<td>/</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HOP trip</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>82⁶</td>
<td>/</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ESLP CW</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>07³</td>
<td>/</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ESLP CCW</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>20⁷</td>
<td>/</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Throttle</td>
<td>0392¹</td>
<td>00¹</td>
<td>02⁸</td>
<td>—</td>
<td>42⁹</td>
<td>—</td>
<td>—</td>
<td>42⁹</td>
<td>/</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

¹ Factory setting. Do not change from value shown.
² Factory setting is 99 for valve drivers built in 2012 and earlier, and 05 for valve drivers built in 2013 and later. Do not change from factory setting.
³ Preliminary setting only. Unit must be calibrated as described under Calibration Procedure in this guide for optimum performance.
⁴ If lower control panel is equipped with three-axis boom functions joystick, calibration procedure for second (intermediate) parameters varies. Refer to Three-Axis Joystick CADI Parameters under Calibration Procedure in this guide.
⁵ D2/3000A Series, DT80 with radial outriggers, preliminary setting only. Refer to Load Indicator Gauge in the maintenance manual for calibration procedure. Set LMX to same value as MX; D4000A Series, DT80 with radial outriggers, preliminary setting only. Refer to Hydraulic Overload Protection (HOP) in the maintenance manual for calibration procedure.
⁶ D2/3000A Series, DT80 with out and down outriggers, leave at factory setting. Do not adjust. Refer to Load Indicator Gauge in the maintenance manual for calibration procedure.
⁷ D4000A Series, DT80 with out and down outriggers, leave at factory setting. Do not adjust. Refer to Hydraulic Overload Protection (HOP) in the maintenance manual for test procedure.
⁸ If equipped with electronic side load protection, set CW to 00. Preliminary setting only for CCW. Refer to Electronic Side Load Protection in the maintenance manual for calibration procedure; if not equipped with electronic side load protection, set CW and CCW to 99.
⁹ If equipped with variable foot throttle, set to 02; if not equipped with variable foot throttle, set to 00.

Figure 2.16 — CADI Values Sheet for D2/3/4000A and DT80
The CADI connection is located in one of several locations depending on the type of control panel.

- Traditional control panel with six lever-type hand controls or one joystick and two lever-type hand controls – under the control panel (refer to Figure 3.1).

- Opti-View riding seat – on the front of the right hand control pod (refer to Figure 3.2).

- Radio controls only with no lower control panel – on the back of the radio receiver mounting bracket on the turntable (refer to Figure 3.3).

- DR42B only – on the rear of the turntable (refer to Figure 3.4).

- On units which do not have a CADI connection socket accessible at the above locations, a socket is provided on the pedestal or turntable and connected by a cable to the closest valve driver board.

Derrick Functions

With the CADI in calibration mode, use the left and right menu buttons to scroll through the programmable function screens and select the desired unit function to be adjusted (refer to Figure 3.5). The function is shown on the display. Derrick functions that can be adjusted are shown in Figure 3.6.
**Figure 3.5 — Derrick Function**

<table>
<thead>
<tr>
<th>Function</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boom up</td>
<td>Raises the boom</td>
</tr>
<tr>
<td>Boom down</td>
<td>Lowers the boom</td>
</tr>
<tr>
<td>CW</td>
<td>Clockwise rotation</td>
</tr>
<tr>
<td>CCW</td>
<td>Counterclockwise rotation</td>
</tr>
<tr>
<td>2nd extend</td>
<td>Extends the intermediate boom</td>
</tr>
<tr>
<td>2nd retract</td>
<td>Retracts the intermediate boom</td>
</tr>
<tr>
<td>3rd extend</td>
<td>Extends the upper boom</td>
</tr>
<tr>
<td>3rd retract</td>
<td>Retracts the upper boom</td>
</tr>
<tr>
<td>Winch in</td>
<td>Retracts the winch line</td>
</tr>
<tr>
<td>Winch out</td>
<td>Extends the winch line</td>
</tr>
<tr>
<td>Digger dig</td>
<td>Clockwise digger rotation</td>
</tr>
<tr>
<td>Digger clean</td>
<td>Counterclockwise digger rotation</td>
</tr>
<tr>
<td>HOP meter</td>
<td>Controls calibration of the HOP meter</td>
</tr>
<tr>
<td>HOP trip</td>
<td>Sets trip point of the HOP</td>
</tr>
<tr>
<td>ESLP CW</td>
<td>Controls set point of the electronic side load protection in clockwise direction</td>
</tr>
<tr>
<td>ESLP CCW</td>
<td>Controls set point of the electronic side load protection in counterclockwise direction</td>
</tr>
<tr>
<td>Throttle</td>
<td>Controls foot throttle parameter of unit</td>
</tr>
<tr>
<td>LML</td>
<td>Sets trip point of the load moment limiter</td>
</tr>
</tbody>
</table>

**Figure 3.6 — CADI Adjustable Functions**

- **FREQ** – Frequency
  FREQ refers to the frequency measured in hertz of the signal output by the above rotation valve driver for the function.
  Do not change the FREQ values from the factory settings. If this value is changed, the function will not operate at optimal performance.

- **SC** – Speed curve (00)
  The SC setting controls how the power level of the signal sent to the control valve changes in relation to the position of the hand control.
  The SC setting of 00 produces linear control operation, in which the power level of the signal increases or decreases in a linear fashion in proportion to how far the hand control is shifted.
  Do not change the SC values from the factory settings of 00. If this value is changed, the function will not operate at optimal performance.

- **TH** – Threshold (from 00 to 99)
  The TH setting controls the power level of the signal sent to the control valve when the hand control is shifted slightly out of neutral just to the position where it begins to send a minimum signal level to the control system.
  The TH value controls the metering of the unit function as function movement is started and stopped. If the TH value is set too low, the hand control will require excessive movement before the function starts to
move. If the value is set too high, the function may not start and stop smoothly as the hand control is operated near the neutral position.

The TH value for a boom, winch, or digger function must be less than both the LMX value and the MX value for that function.

- **MX – Max out (from 00 to 99, used in standard speed mode)**
  The MX setting controls the power level of the signal sent to the control valve when the hand control is operated when standard speed is selected on the lower control panel or radio remote.

  The MX value determines the maximum speed (minimum cycle time) of a boom, winch, or digger function when standard speed is selected and the hand control is fully shifted.

  Increase the MX value to increase a function’s standard speed (shorter cycle time), within the limits of the hydraulic flow available. Decrease the MX value to reduce a function’s standard speed (longer cycle time).

  Do not set the MX value higher than required to achieve the proper cycle time. If the MX value is set too high, the valve spool may reach full travel before the hand control is fully shifted, causing a loss of meterability.

  The MX value for a boom, winch, or digger function must be higher than both the LMX value and the TH value for that function.

  The MX parameter is used to calibrate the load indicator gauge (HOP meter), as described in the maintenance manual. The LMX value must then be set to the same value as MX.

  For units equipped with a variable foot throttle, the MX value determines the maximum engine rpm when the throttle is fully actuated. The LMX value must then be set to the same value as MX.

- **RA – Ramp**
  The RA setting controls the rate of acceleration as function movement starts after the hand control is activated, and the rate of deceleration as function movement stops after the hand control is deactivated.

  Do not change the RA values from the factory settings. If this value is changed, the function will not operate at optimal performance.

- **LMX – Low speed (from 00 to 99, used in low speed mode)**
  The LMX setting (also referred to as low max) controls the reduced power level of the signal sent to the control valve when the hand control is operated with low speed selected on the lower control panel or radio remote or when the four-lever upper controls are operated.

  The LMX value determines the reduced speed (increased cycle time) of a boom, winch, or digger function when low speed is selected and the hand control is fully shifted.

  Increase the LMX value to increase a function’s low speed (shorter cycle time). Decrease the LMX value to reduce a function’s low speed (longer cycle time).

  The LMX value for a boom, winch, or digger function must be higher than the TH value and lower than the MX value for that function.

  LMX is used to calibrate hydraulic overload protection (HOP) trip, and, if so equipped, electronic side load protection (ESLP) trip and load moment limiter (LML) trip, as described in the maintenance manual.

  The LMX value must be set equal to the MX value for HOP meter and throttle.

**Multi-Functioning**

During multi-functioning in standard speed mode using two or more boom functions or when using a boom function with the winch or the digger, all the function speeds are controlled by the MX values of the corresponding functions. However, the maximum function speeds may be reduced due to hydraulic flow limitations.

When in standard speed mode and using a boom function with a winch or digger function (multi-functioning), the machine is not programmed to use the priority flow functionality.

To synchronize (multi-function) boom extend with winch out functions and boom retract with winch in functions while in standard speed, use the winch hand control function on the control panel to achieve the desired rate of speed. Do not adjust the MX or LMX values for boom extend or retract outside of the unit cycle times to synchronize winch speed with boom speed, as this will only slow the boom functions for both standard and low speeds. No adjustment is needed to synchronize (multi-function) boom down and digger dig while in standard speed.
Parameter Values
The parameter value flashes when selected using the select button. Use the up or down value button to change the value of the selected parameter.

When all the parameters are properly set, unplug the CADI from the socket. The settings selected are saved in the above rotation valve driver as soon as they are changed.

Calibration Procedure
The following procedure covers the full calibration of all the boom, winch, and digger functions. If derrick performance indicates that the TH, MX, or LMX parameter of a single function needs calibrating, perform only the appropriate portion of the calibration procedure. If the pulsar has been replaced for a function, the TH, MX, and LMX settings must all be calibrated for that function.

For personnel who are familiar with the detailed calibration procedure contained in this section, a condensed calibration procedure for the boom, winch, and digger functions is provided in the Appendix of this guide (refer to the field CADI settings sheet for the applicable derrick model).

Make a copy of the applicable CADI values sheet (refer to Figure 3.16, 3.17, 3.18, or 3.19) or the field CADI settings sheet (refer to the Appendix) to use for recording the current and new parameter settings. Note that the TH, MX, and LMX values shown on the CADI values sheet are approximate preliminary values. These values must be adjusted for all the boom, winch, and digger functions according to the procedure in this section to obtain optimum performance. The HOP, ESLP, and throttle parameter values must be set in accordance with the model specific CADI values sheet (refer to Figure 3.16, 3.17, 3.18, or 3.19) or adjusted in accordance with the maintenance manual for proper operation. Do not adjust the parameter values for FREQ, RA, or SC.

If the calibration procedure is performed using the lower control panel on the unit, a second person will be needed to assist during the MX adjustment portion of the procedure. The calibration procedure can be performed by one person using the lower radio remote control, if so equipped, along with a CADI extension cable. The upper controls cannot be used for the calibration procedure except as indicated under Three-Axis Joystick CADI Parameters.

When the procedure refers to boom functions, this indicates boom up/down, rotation CW/CCW, second (intermediate) extend/retract, and third (upper) extend/retract.

The standard speed and low speed cycle time ranges used for calibrating the MX and LMX values for the boom functions are contained in the maintenance manual and in the unit specific field CADI settings sheet included in the Appendix of this guide.

Three-Axis Joystick CADI Parameters
If the lower control panel is equipped with a three-axis boom functions joystick, the calibration procedure for the second (intermediate) parameters will vary depending on the internal design of the control panel. The presence or absence of a placard by the CADI connection socket (refer to Figure 3.8) indicates the type of panel design furnished.

Make a copy of the applicable CADI values sheet (refer to Figure 3.16, 3.17, 3.18, or 3.19) or the field CADI settings sheet (refer to the Appendix) to use for recording the current and new parameter settings. Note that the TH, MX, and LMX values shown on the CADI values sheet are approximate preliminary values. These values must be adjusted for all the boom, winch, and digger functions according to the procedure in this section to obtain optimum performance. The HOP, ESLP, and throttle parameter values must be set in accordance with the model specific CADI values sheet (refer to Figure 3.16, 3.17, 3.18, or 3.19) or adjusted in accordance with the maintenance manual for proper operation. Do not adjust the parameter values for FREQ, RA, or SC.

If the control panel does have the placard shown in Figure 3.8 installed by the CADI connection socket, the joystick uses second (intermediate) CADI parameters for the intermediate boom function and third (upper) parameters for the upper boom function. Calibrate the second (intermediate) parameters using the intermediate boom function on the joystick, and calibrate the third (upper) parameters using the upper boom function on the joystick.

If the control panel does not have the placard shown in Figure 3.8 located by the CADI connection socket, the lower control joystick uses third (upper) CADI parameters for both the intermediate boom and upper boom functions. If the unit is operated from upper controls or radio controls, second (intermediate) CADI parameters are used for the intermediate boom. Calibrate the second (intermediate) CADI parameters as described as follows.

- If the unit is not equipped with upper controls or radio controls, do not change the second (intermediate) parameter values from the factory settings. Because the intermediate boom cycle times cannot be adjusted independently, the intermediate boom may not be able to meet the published cycle times. A compromise may have to be made between intermediate and upper boom functionality when adjusting the third (upper) CADI parameters.
- If the unit is equipped with radio controls, with or without four-lever upper controls, calibrate the second
Setup
1. Position the unit on a level surface in an open area where the booms can be fully extended, raised, and rotated. Apply the parking brake and chock the wheels.

2. Remove the cover over the lower control valve on the right side of the turntable (as viewed from the boom tip looking toward the turntable). Identify the type(s) of pulsars installed on the lower control valve. The type of pulsar is identified by the color of the rubber boot where the control wiring enters the pulsar valve.

A black boot indicates a standard pulsar. A light gray boot indicates a pressure feedback pulsar. If the pulsars are not all the same type, make note of which function(s) have standard pulsars and which function(s) have pressure feedback pulsars (refer to Figure 3.9).

3. Start the engine, engage the unit’s hydraulic system, and properly set the outriggers.

4. In accordance with the maintenance manual, check the system pressure and standby pressure, and verify that the pump is delivering the correct oil flow. Make any necessary adjustments.

**NOTICE**
Proper differential pilot pressure, measured as the difference between pilot port pressure and return line (tank) pressure, is critical for optimum performance. If the procedure for setting differential pilot pressure

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*Figure 3.9 — Pulsar/Function Identification*
is not described in the available unit maintenance manual, contact Altec technical support at 1-877-GO-Altec option 4 for further information.

5. Check the differential pilot pressure in accordance with the maintenance manual. If the control valve has one or more standard pulsars, the proper differential pilot pressure is 155 to 160 psi (10.69 to 11.03 bar). If all of the pulsars in the lower control valve are pressure feedback pulsars, the proper differential pilot pressure is 205 to 215 psi (14.13 to 14.82 bar). Make any necessary adjustment. Leave the turntable cover off after checking the differential pilot pressure.

**NOTICE**

If the oil is not warmed to the required temperature range, the CADI settings resulting from the calibration procedures will not be accurate, and poor meterability will result.

6. Operate the unit to warm the hydraulic oil to 120 to 130 degrees Fahrenheit (49 to 54 degrees Celsius). This temperature is important for proper threshold calibration.

Use an infrared (IR) thermometer to read the temperature of the hydraulic reservoir on or near the end opposite from the return line filter, at a point about \( \frac{1}{3} \) of the way above the bottom of the reservoir (refer to Figure 3.10). The oil can be warmed quickly as described in step a or b.

a. If the unit is equipped with a digger, unstow the digger. Make sure the booms are fully retracted. With the engine at full rpm, operate digger dig at full speed while holding the intermediate or upper boom control fully shifted in the Retract position. When the oil has reached 120 to 130 degrees Fahrenheit (49 to 54 degrees Celsius), stow the digger and proceed to step 7.

**NOTICE**

Do not allow the load hook to contact the boom tip when operating winch raise.

b. If the unit is not equipped with a digger, make sure the booms are fully retracted. With the engine at full rpm, operate winch raise/winchar lower repeatedly at full speed while holding the intermediate or upper boom control fully shifted in the Retract position. When the oil has reached 120 to 130 degrees Fahrenheit (49 to 54 degrees Celsius), proceed to step 7.

7. Position the boom at an angle between 10 and 30 degrees above horizontal, and rotate it to a position where all the functions can be operated for calibration.

8. Connect the CADI to the CADI connection socket. Use the CADI extension cable to make this connection if the calibration procedure will be performed by one person using the lower radio remote control.

9. Put the CADI into calibration mode. Write the current value of the TH, MX, and LMX parameter for each function to be calibrated on the CADI values sheet or the field CADI settings sheet before making any adjustments.

**TH Calibration Procedure**

10. Change the TH and MX settings to 00 for the function being calibrated to 00. The value button on the CADI can be held down continuously until the setting reaches 00.

![Figure 3.10 — Reservoir Temperature Measurement Location](image-url)
11. Set the low speed/standard switch to standard on the control panel being used. Operate with the engine at full rpm.

12. Operate the hand control and adjust the MX and TH values for the function being calibrated.
   a. Fully shift and hold the hand control, and increase the MX value slowly until the function starts moving.
   b. Release the hand control, and decrease the MX value by three points.
   c. Fully shift and hold the hand control, and check for function movement. If the function is fully stopped, continue to step d. If the function is not fully stopped, go back to step b.
   d. Increase the MX value by one point every five seconds until the function begins to creep, meaning to move at the slowest movement noticeable. For boom up/down, watch the lift cylinder rod for movement. For other functions, compare the moving component to a stationary object.
   e. Release the hand control. Use the MX value from step d to obtain the required TH setting based on the flow chart shown in Figure 3.11.

f. Reduce the MX value determined in step d by 15 points to obtain the required TH setting. Adjust the TH value to this number. For example, if the function begins to creep at MX = 42 (refer to Figure 3.12), subtract 15, and adjust the TH setting to 27 (refer to Figure 3.13). Proceed to step h.

Figure 3.12 — MX Value at Function Creep

Figure 3.13 — 15 Point Offset TH Setting

g. Reduce the MX value determined in step d by 5 points to obtain the required TH setting. Adjust the TH value to this number. For example, if the function begins to creep at MX = 42 (refer to Figure 3.14), subtract 5, and adjust the TH setting to 37 (refer to Figure 3.15).

Figure 3.14 — MX Value at Function Creep

Figure 3.15 — 5 Point Offset TH Setting

h. Record the final TH setting on the CADI values sheet or the field CADI settings sheet.

i. Return the MX setting to the value recorded in step 9.

13. Repeat steps 10 through 12 for each direction of each function being calibrated.
MX Calibration Procedure
14. Set the low speed/standard switch to standard on the control panel being used. Operate with the engine at full rpm.

15. Fully shift the hand control for the function being calibrated and hold it in this position. Look at the manual override handle on the control valve to see if it is visibly vibrating or fluttering. If movement is not visible, touch the handle to feel for vibration. Adjust the MX value as described in step a, b, or c.

a. If the manual override handle does visibly vibrate or flutter, increase the MX value by one point every five seconds until the flutter is no longer visible but the handle still vibrates to the touch. Then proceed to step 16.

b. If the manual override handle does not visibly vibrate or flutter and does not vibrate to the touch, decrease the MX value by one point every five seconds until the vibration can be felt but is still not visible. Then proceed to step 16.

c. If the manual override handle does not visibly vibrate or flutter but does vibrate to the touch, do not adjust the MX. Proceed to step 16.

16. Press on the manual override handle to try to move it farther in the direction that it is shifted. Adjust the MX value as described in step a or b.

a. If the handle does not move any farther but stops vibrating to the touch, do not adjust the MX. Release the hand control, and proceed to step 17.

b. If the handle does move farther, raise the MX value by 1 point and repeat step 16.

17. Time the function with the hand control on the control station fully shifted, according to step a, b, or c.

a. For a boom function, operate the function for a full cycle while timing it, as described in the maintenance manual. If the cycle time is below the standard speed range, decrease the MX value and retest until the cycle time is within the published range. Record the final MX value and standard speed cycle time on the CADI values sheet or the field CADI settings sheet.

b. For the winch function, count the number of winch drum rotations in 15 seconds. Record the final MX value and number of standard speed rotations on the CADI values sheet or the field CADI settings sheet.

c. For the digger function, count the number of auger rotations in 15 seconds with the digger in high speed. Record the final MX value and number of standard speed rotations on the CADI values sheet or the field CADI settings sheet.

18. Repeat steps 15 through 17 for each direction of each function being calibrated.

LMX Calibration Procedure
19. Set the low speed/standard switch to low speed on the control panel being used. Operate with the engine at full rpm.

20. Time the function being calibrated with the hand control on the control station fully shifted, according to step a, b, or c.

a. For a boom function, operate the function for a full cycle while timing it, as described in the maintenance manual. Adjust the LMX value and retest as required until the cycle time is within the low speed range. Record the final LMX value and low speed cycle time on the CADI values sheet or the field CADI settings sheet.

b. For the winch function, count the number of winch drum rotations in 15 seconds. Adjust the LMX value and retest as required until the number of drum rotations is approximately half of the number at standard speed. Record the final LMX value and number of low speed rotations on the CADI values sheet or the field CADI settings sheet.

c. For the digger function, count the number of auger rotations in 15 seconds with the digger in high speed. Adjust the LMX value and retest as required until the number of auger rotations is approximately half of the number at standard speed. Record the final LMX value and number of low speed rotations on the CADI values sheet or the field CADI settings sheet.

21. Repeat step 37 for each direction of each function being calibrated.
<table>
<thead>
<tr>
<th>Function</th>
<th>Frequency (FREQ)</th>
<th>Speed Curve (SC)</th>
<th>Threshold (TH)</th>
<th>Max Out (MX)</th>
<th>Ramp (RA)</th>
<th>Low Speed (LMX)</th>
<th>Cycle Times (Sec or Turns in 15 Sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boom up</td>
<td>0075^1</td>
<td>00^1</td>
<td>30^3</td>
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<td>80^3</td>
<td>99^1</td>
<td>55^3</td>
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<tr>
<td>Boom down</td>
<td>—</td>
<td>—</td>
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<td>80^3</td>
<td>99^1</td>
<td>55^3</td>
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<td>Rotation CW</td>
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<td>/</td>
<td>70^3</td>
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<td>55^3</td>
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<td>99^1</td>
<td>65^3,4</td>
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<td>—</td>
<td>—</td>
<td>40^3,4</td>
<td>/</td>
<td>80^3,4</td>
<td>99^1</td>
<td>65^3,4</td>
</tr>
<tr>
<td>3rd (upper) extend</td>
<td>0075^1</td>
<td>00^1</td>
<td>40^3</td>
<td>/</td>
<td>80^3</td>
<td>99^1</td>
<td>65^3</td>
</tr>
<tr>
<td>3rd (upper) retract</td>
<td>—</td>
<td>—</td>
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<td>/</td>
<td>80^3</td>
<td>99^1</td>
<td>65^3</td>
</tr>
<tr>
<td>Winch in</td>
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<td>00^1</td>
<td>30^3</td>
<td>/</td>
<td>80^3</td>
<td>99^1</td>
<td>60^3</td>
</tr>
<tr>
<td>Winch out</td>
<td>—</td>
<td>—</td>
<td>30^3</td>
<td>/</td>
<td>80^3</td>
<td>99^1</td>
<td>60^3</td>
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<tr>
<td>Digger dig</td>
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<td>00^1</td>
<td>40^3</td>
<td>/</td>
<td>90^3</td>
<td>99^1</td>
<td>70^3</td>
</tr>
<tr>
<td>Digger clean</td>
<td>—</td>
<td>—</td>
<td>40^3</td>
<td>/</td>
<td>90^3</td>
<td>99^1</td>
<td>70^3</td>
</tr>
<tr>
<td>HOP meter</td>
<td>0392^1</td>
<td>00^1</td>
<td>00^1</td>
<td>—</td>
<td>64^5</td>
<td>05^/99^2</td>
<td>64^5</td>
</tr>
<tr>
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<td>—</td>
<td>—</td>
<td>—</td>
<td>86^6</td>
<td>—</td>
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<tr>
<td>ESLP CW</td>
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<td>—</td>
<td>—</td>
<td>—</td>
<td>08^7</td>
<td>—</td>
</tr>
<tr>
<td>ESLP CCW</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>08^7</td>
<td>—</td>
</tr>
<tr>
<td>Throttle</td>
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<td>00^1</td>
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<td>40^9</td>
<td>—</td>
<td>40^9</td>
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<tr>
<td>LML trip</td>
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<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>99^10</td>
<td>—</td>
</tr>
</tbody>
</table>

1 Factory setting. Do not change from value shown.
2 Factory setting is 99 for valve drivers built in 2012 and earlier, and 05 for valve drivers built in 2013 and later. Do not change from factory setting.
3 Preliminary setting only. Unit must be calibrated as described under Calibration Procedure in this guide for optimum performance.
4 If lower control panel is equipped with three-axis boom functions joystick, calibration procedure for second (intermediate) parameters varies. Refer to Three-Axis Joystick CADI Parameters under Calibration Procedure in this guide.
5 Preliminary setting only. Refer to Load Indicator Gauge in the maintenance manual for calibration procedure. Set LMX to same value as MX.
6 Preliminary setting only. Refer to Hydraulic Overload Protection (HOP) in the maintenance manual for calibration procedure.
7 If equipped with electronic side load protection, preliminary setting only. Refer to Electronic Side Load Protection in the maintenance manual for calibration procedure; if not equipped with electronic side load protection, set to 99.
8 If equipped with variable foot throttle, set to 02; if not equipped with variable foot throttle, set to 00.
9 If equipped with variable foot throttle, preliminary setting only. Adjust MX value to achieve engine rpm at maximum throttle producing maximum total pump flow of 43 gpm. Set LMX to same value as MX; if not equipped with variable foot throttle, set to 00.
10 If not equipped with load moment limiter, do not change from value shown; if equipped with load moment limiter, refer to Load Moment Limiter in the maintenance manual for calibration procedure.

*Figure 3.16 — CADI Values Sheet for DLB/DMB*
<table>
<thead>
<tr>
<th>Function</th>
<th>Factory Setting</th>
<th>Factory Setting</th>
<th>Prelim Setting</th>
<th>Prelim Setting</th>
<th>Max Out (MX)</th>
<th>Ramp (RA)</th>
<th>Low Speed (LMX)</th>
<th>Cycle Times (Sec or Turns in 15 Sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boom up</td>
<td>0075(^1)</td>
<td>00(^1)</td>
<td>30(^3)</td>
<td>/</td>
<td>80(^3)</td>
<td>/</td>
<td>99(^1)</td>
<td>/</td>
</tr>
<tr>
<td>Boom down</td>
<td>—</td>
<td>—</td>
<td>30(^3)</td>
<td>/</td>
<td>80(^3)</td>
<td>/</td>
<td>99(^1)</td>
<td>/</td>
</tr>
<tr>
<td>Rotation CW</td>
<td>0075(^1)</td>
<td>00(^1)</td>
<td>30(^3)</td>
<td>/</td>
<td>65(^3)</td>
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<tr>
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<td>65(^3)</td>
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<td>2nd (interm) extend</td>
<td>0075(^1)</td>
<td>00(^1)</td>
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<td>/</td>
<td>80(^3,4)</td>
<td>/</td>
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</tr>
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<td>—</td>
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<td>40(^3,4)</td>
<td>/</td>
<td>80(^3,4)</td>
<td>/</td>
<td>99(^1)</td>
<td>/</td>
</tr>
<tr>
<td>3rd (upper) extend</td>
<td>0075(^1)</td>
<td>00(^1)</td>
<td>40(^3)</td>
<td>/</td>
<td>80(^3)</td>
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<td>/</td>
<td>80(^3)</td>
<td>/</td>
<td>99(^1)</td>
<td>/</td>
</tr>
<tr>
<td>Winch in</td>
<td>0075(^1)</td>
<td>00(^1)</td>
<td>30(^3)</td>
<td>/</td>
<td>80(^3)</td>
<td>/</td>
<td>99(^1)</td>
<td>60(^3) / /</td>
</tr>
<tr>
<td>Winch out</td>
<td>—</td>
<td>—</td>
<td>30(^3)</td>
<td>/</td>
<td>80(^3)</td>
<td>/</td>
<td>99(^1)</td>
<td>60(^3) / /</td>
</tr>
<tr>
<td>Digger dig</td>
<td>0075(^1)</td>
<td>00(^1)</td>
<td>40(^3)</td>
<td>/</td>
<td>90(^3)</td>
<td>/</td>
<td>99(^1)</td>
<td>70(^3) / /</td>
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<tr>
<td>Digger clean</td>
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<td>/</td>
<td>90(^3)</td>
<td>/</td>
<td>99(^1)</td>
<td>70(^3) / /</td>
</tr>
<tr>
<td>HOP meter</td>
<td>0392(^2)</td>
<td>00(^1)</td>
<td>00(^1)</td>
<td>—</td>
<td>53(^5)</td>
<td>/</td>
<td>05(^2,99)^2</td>
<td>53(^5) / /</td>
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<tr>
<td>HOP trip</td>
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<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
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<td>/</td>
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<tr>
<td>ESLP CW</td>
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<td>—</td>
<td>—</td>
<td>—</td>
<td>00(^7)</td>
<td>/</td>
</tr>
<tr>
<td>ESLP CCW</td>
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<td>—</td>
<td>—</td>
<td>20(^7)</td>
<td>/</td>
</tr>
<tr>
<td>Throttle</td>
<td>0392(^2)</td>
<td>00(^1)</td>
<td>02(^8)</td>
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<td>42(^9)</td>
<td>/</td>
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<td>/</td>
</tr>
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<td>LML trip</td>
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<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>99(^10)</td>
<td>/</td>
</tr>
</tbody>
</table>

1 Factory setting. Do not change from value shown.
2 Factory setting is 99 for valve drivers built in 2012 and earlier, and 05 for valve drivers built in 2013 and later. Do not change from factory setting.
3 Preliminary setting only. Unit must be calibrated as described under Calibration Procedure in this guide for optimum performance.
4 If lower control panel is equipped with three-axis boom functions joystick, calibration procedure for second (intermediate) parameters varies. Refer to Three-Axis Joystick CADI Parameters under Calibration Procedure in this guide.
5 D2/3000B Series, preliminary setting only. Refer to Load Indicator Gauge in the maintenance manual for calibration procedure. Set LMX to same value as MX; D4000B Series, leave at factory setting. Do not adjust. Refer to Load Indicator Gauge in the maintenance manual for calibration procedure.
6 D2/3000B Series, preliminary setting only. Refer to Hydraulic Overload Protection (HOP) in the maintenance manual for calibration procedure; D4000B Series, leave at factory setting. Do not adjust. Refer to Hydraulic Overload Protection (HOP) in the maintenance manual for test procedure.
7 If equipped with electronic side load protection, set CW to 00. Preliminary setting only for CCW. Refer to Electronic Side Load Protection in the maintenance manual for calibration procedure. If not equipped with electronic side load protection, set CW and CCW to 99.
8 If equipped with variable foot throttle, set to 02; if not equipped with variable foot throttle, set to 00.
9 If equipped with variable foot throttle, preliminary setting only. Adjust MX value to achieve engine rpm at maximum throttle producing maximum total pump flow of 43 gpm. Set LMX to same value as MX; if not equipped with variable foot throttle, set to 00.
10 If not equipped with load moment limiter, do not change from value shown. If equipped with load moment limiter, refer to Load Moment Limiter in the maintenance manual for calibration procedure.

Figure 3.17 — CADI Values Sheet for D2/3/4000B
<table>
<thead>
<tr>
<th>Function</th>
<th>Factory Setting</th>
<th>Factory Setting</th>
<th>Prelim Setting</th>
<th>Current/New Settings</th>
<th>Prelim Setting</th>
<th>Current/New Settings</th>
<th>Factory Setting</th>
<th>Prelim Setting</th>
<th>Current/New Settings</th>
<th>Standard Speed</th>
<th>Low Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boom up</td>
<td>0075\footnote{1}</td>
<td>00\footnote{1}</td>
<td>30\footnote{3}</td>
<td>/</td>
<td>80\footnote{3}</td>
<td>/</td>
<td>99\footnote{1}</td>
<td>55\footnote{3}</td>
<td>/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boom down</td>
<td>—</td>
<td>—</td>
<td>30\footnote{3}</td>
<td>/</td>
<td>80\footnote{3}</td>
<td>/</td>
<td>99\footnote{1}</td>
<td>55\footnote{3}</td>
<td>/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotation CW</td>
<td>0075\footnote{1}</td>
<td>00\footnote{1}</td>
<td>30\footnote{3}</td>
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<td>65\footnote{3}</td>
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<td>99\footnote{1}</td>
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<td>/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotation CCW</td>
<td>—</td>
<td>—</td>
<td>30\footnote{3}</td>
<td>/</td>
<td>65\footnote{3}</td>
<td>/</td>
<td>99\footnote{1}</td>
<td>50\footnote{3}</td>
<td>/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2nd (intern) extend</td>
<td>0075\footnote{1}</td>
<td>00\footnote{1}</td>
<td>40\footnote{3,4}</td>
<td>/</td>
<td>80\footnote{3,4}</td>
<td>/</td>
<td>99\footnote{1}</td>
<td>55\footnote{3,4}</td>
<td>/</td>
<td></td>
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</tr>
<tr>
<td>2nd (intern) retract</td>
<td>—</td>
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<td>40\footnote{3,4}</td>
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<td>80\footnote{3,4}</td>
<td>/</td>
<td>99\footnote{1}</td>
<td>55\footnote{3,4}</td>
<td>/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd (upper) extend</td>
<td>0075\footnote{1}</td>
<td>00\footnote{1}</td>
<td>40\footnote{3}</td>
<td>/</td>
<td>80\footnote{3}</td>
<td>/</td>
<td>99\footnote{1}</td>
<td>55\footnote{3}</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>3rd (upper) retract</td>
<td>—</td>
<td>—</td>
<td>40\footnote{3}</td>
<td>/</td>
<td>80\footnote{3}</td>
<td>/</td>
<td>99\footnote{1}</td>
<td>55\footnote{3}</td>
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<td></td>
</tr>
<tr>
<td>Winch in</td>
<td>0075\footnote{1}</td>
<td>00\footnote{1}</td>
<td>30\footnote{3}</td>
<td>/</td>
<td>80\footnote{3}</td>
<td>/</td>
<td>99\footnote{1}</td>
<td>60\footnote{3}</td>
<td>/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winch out</td>
<td>—</td>
<td>—</td>
<td>30\footnote{3}</td>
<td>/</td>
<td>80\footnote{3}</td>
<td>/</td>
<td>99\footnote{1}</td>
<td>60\footnote{3}</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Digger dig</td>
<td>0075\footnote{1}</td>
<td>00\footnote{1}</td>
<td>40\footnote{3}</td>
<td>/</td>
<td>90\footnote{3}</td>
<td>/</td>
<td>99\footnote{1}</td>
<td>70\footnote{3}</td>
<td>/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digger clean</td>
<td>—</td>
<td>—</td>
<td>40\footnote{3}</td>
<td>/</td>
<td>90\footnote{3}</td>
<td>/</td>
<td>99\footnote{1}</td>
<td>70\footnote{3}</td>
<td>/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HOP meter</td>
<td>0392\footnote{1}</td>
<td>00\footnote{1}</td>
<td>00\footnote{1}</td>
<td>/</td>
<td>64\footnote{5}</td>
<td>/</td>
<td>05/99\footnote{2}</td>
<td>64\footnote{5}</td>
<td>/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HOP trip</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>/</td>
<td>—</td>
<td>/</td>
<td>—</td>
<td>86\footnote{6}</td>
<td>/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ESPL CW</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>/</td>
<td>—</td>
<td>/</td>
<td>—</td>
<td>00\footnote{7}</td>
<td>/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ESPL CCW</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>/</td>
<td>—</td>
<td>/</td>
<td>—</td>
<td>20\footnote{7}</td>
<td>/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Throttle</td>
<td>0392\footnote{1}</td>
<td>00\footnote{1}</td>
<td>02\footnote{8}</td>
<td>/</td>
<td>42\footnote{9}</td>
<td>/</td>
<td>—</td>
<td>42\footnote{9}</td>
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<td></td>
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<tr>
<td>LML trip</td>
<td>—</td>
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<td>—</td>
<td>/</td>
<td>—</td>
<td>/</td>
<td>—</td>
<td>99\footnote{10}</td>
<td>/</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\footnote{1} Factory setting. Do not change from value shown.
\footnote{2} Factory setting is 99 for valve drivers built in 2012 and earlier, and 05 for valve drivers built in 2013 and later. Do not change from factory setting.
\footnote{3} Preliminary setting only. Unit must be calibrated as described under Calibration Procedure in this guide for optimum performance.
\footnote{4} If lower control panel is equipped with three-axis boom functions joystick, calibration procedure for second (intermediate) parameters varies. Refer to Three-Axis Joystick CADI Parameters under Calibration Procedure in this guide.
\footnote{5} Preliminary setting only. Refer to Load Indicator Gauge in the maintenance manual for calibration procedure. Set LMX to same value as MX.
\footnote{6} Preliminary setting only. Refer to Hydraulic Overload Protection (HOP) in the maintenance manual for calibration procedure.
\footnote{7} If equipped with variable foot throttle, preliminary setting only. Adjust MX value to achieve engine rpm at maximum throttle producing maximum total pump flow of 46 gpm. Set LMX to same value as MX; if not equipped with variable foot throttle, set to 00.
\footnote{8} If not equipped with load moment limiter, do not change from value shown; if equipped with load moment limiter, refer to Load Moment Limiter in the maintenance manual for calibration procedure.

Figure 3.18 — CADI Values Sheet for DHB
<table>
<thead>
<tr>
<th>Function</th>
<th>Factory Setting</th>
<th>Factory Setting</th>
<th>Prelim Setting</th>
<th>Current/New Settings</th>
<th>Prelim Setting</th>
<th>Current/New Settings</th>
<th>Factory Setting</th>
<th>Prelim Setting</th>
<th>Current/New Settings</th>
<th>Standard Speed</th>
<th>Low Speed</th>
<th>Cycle Times (Sec or Turns in 15 Sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boom up</td>
<td>0075¹</td>
<td>00¹</td>
<td>30³</td>
<td>/</td>
<td>71³</td>
<td>/</td>
<td>99¹</td>
<td>61³</td>
<td>/</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boom down</td>
<td>—</td>
<td>—</td>
<td>30³</td>
<td>/</td>
<td>75³</td>
<td>/</td>
<td>99¹</td>
<td>63³</td>
<td>/</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotation CW</td>
<td>0075¹</td>
<td>00¹</td>
<td>30³</td>
<td>/</td>
<td>70³</td>
<td>/</td>
<td>99¹</td>
<td>58³</td>
<td>/</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotation CCW</td>
<td>—</td>
<td>—</td>
<td>30³</td>
<td>/</td>
<td>70³</td>
<td>/</td>
<td>99¹</td>
<td>59³</td>
<td>/</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2nd (interm) extend</td>
<td>0075¹</td>
<td>00¹</td>
<td>30³</td>
<td>/</td>
<td>90³</td>
<td>/</td>
<td>99¹</td>
<td>90³</td>
<td>/</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2nd (interm) retract</td>
<td>—</td>
<td>—</td>
<td>30³</td>
<td>/</td>
<td>90³</td>
<td>/</td>
<td>99¹</td>
<td>90³</td>
<td>/</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd (upper) extend</td>
<td>0075¹</td>
<td>00¹</td>
<td>30³</td>
<td>/</td>
<td>75³</td>
<td>/</td>
<td>99¹</td>
<td>55³</td>
<td>/</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd (upper) retract</td>
<td>—</td>
<td>—</td>
<td>30³</td>
<td>/</td>
<td>90³</td>
<td>/</td>
<td>99¹</td>
<td>55³</td>
<td>/</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winch in</td>
<td>0075¹</td>
<td>00¹</td>
<td>30³</td>
<td>/</td>
<td>80³</td>
<td>/</td>
<td>99¹</td>
<td>60³</td>
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<tr>
<td>Winch out</td>
<td>—</td>
<td>—</td>
<td>30³</td>
<td>/</td>
<td>80³</td>
<td>/</td>
<td>99¹</td>
<td>60³</td>
<td>/</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digger dig</td>
<td>0075¹</td>
<td>00¹</td>
<td>30³</td>
<td>/</td>
<td>90³</td>
<td>/</td>
<td>99¹</td>
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<tr>
<td>Digger clean</td>
<td>—</td>
<td>—</td>
<td>30³</td>
<td>/</td>
<td>90³</td>
<td>/</td>
<td>99¹</td>
<td>70³</td>
<td>/</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HOP meter</td>
<td>0392¹</td>
<td>00¹</td>
<td>00¹</td>
<td>—</td>
<td>64⁴</td>
<td>/</td>
<td>05²/99²</td>
<td>64⁵</td>
<td>/</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HOP trip</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>86⁶</td>
<td>/</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>ESLP CW</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>/</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ESLP CCW</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>/</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Throttle</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>/</td>
<td>—</td>
<td>—</td>
<td>/</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>LML trip</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>/</td>
<td>99¹</td>
<td>—</td>
<td>/</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

¹ Factory setting. Do not change from value shown.
² Factory setting is 99 for valve drivers built in 2012 and earlier, and 05 for valve drivers built in 2013 and later. Do not change from factory setting.
³ Preliminary setting only. Unit must be calibrated as described under Calibration Procedure in this guide for optimum performance.
⁴ If lower control panel is equipped with three-axis boom functions joystick, calibration procedure for second (intermediate) parameters varies. Refer to Three-Axis Joystick CADI Parameters under Calibration Procedure in this guide.
⁵ Preliminary setting only. Refer to Load Indicator Gauge in the maintenance manual for calibration procedure. Set LMX to same value as MX.
⁶ Preliminary setting only. Refer to Hydraulic Overload Protection (HOP) in the maintenance manual for calibration procedure.
⁷ If equipped with electronic side load protection, preliminary setting only. Refer to Electronic Side Load Protection in the maintenance manual for calibration procedure; if not equipped with electronic side load protection, set to 99.
⁸ If equipped with variable foot throttle, set to 02; if not equipped with variable foot throttle, set to 00.
⁹ If equipped with variable foot throttle, preliminary setting only. Adjust MX value to achieve engine rpm at maximum throttle producing maximum total pump flow of 43 gpm. Set LMX to same value as MX; if not equipped with variable foot throttle, set to 00.
10If not equipped with load moment limiter, do not change from value shown; if equipped with load moment limiter, refer to Load Moment Limiter in the maintenance manual for calibration procedure.

Figure 3.19 — CADI Values Sheet for DR42B
There are two CADI connection locations on the AT235/AT235P/AT237/AT237S.

- On the top of the upper control panel of the AT235 and AT237 (refer to Figure 4.1) and on the bottom of the AT235P (refer to Figure 4.2)

- On the top of the upper control panel of the AT237S (refer to Figure 4.3)

- On the top of the lower control panel (refer to Figure 4.4)

Aerial Device Functions

With the CADI in calibration mode, use the left and right menu buttons to scroll through the programmable function screens and select the desired unit function to be adjusted (refer to Figure 4.5). The function is shown on the display. Aerial device functions that can be adjusted are shown in Figure 4.6.
Figure 4.5 — Function

<table>
<thead>
<tr>
<th>Function</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boom up</td>
<td>Raises the boom</td>
</tr>
<tr>
<td>Boom down</td>
<td>Lowers the boom</td>
</tr>
<tr>
<td>CW</td>
<td>Clockwise rotation</td>
</tr>
<tr>
<td>CCW</td>
<td>Counterclockwise rotation</td>
</tr>
<tr>
<td>Extend</td>
<td>Extends the boom out</td>
</tr>
<tr>
<td>Retract</td>
<td>Retracts the boom in</td>
</tr>
<tr>
<td>Elevator up</td>
<td>Brings the arm up</td>
</tr>
<tr>
<td>Elevator down</td>
<td>Brings the arm down</td>
</tr>
</tbody>
</table>

Figure 4.6 — CADI Adjustable Functions

Parameters

Use the select button to scroll through the control system parameters displayed on the screen and choose the parameter to be adjusted. The value for the parameter that is currently selected flashes on the display. For example, the boom up unit function is selected and the frequency parameter is selected (refer to Figure 4.7). The parameter values are shown under the parameter names. A description of each parameter is listed below.

When all parameters are properly set, unplug the CADI from the socket. The settings are saved in the valve driver as soon as they are changed.

- **FREQ** — Frequency
  
  FREQ refers to the frequency measured in hertz of the signal output by the valve driver for the function.

  Do not change the FREQ values from the factory settings. If this value is changed, the function will not operate at optimal performance.

- **SC** — Speed curve
  
  The SC setting controls how the power level of the signal sent to the control valve changes in relation to the position of the hand control.

  The SC setting of 00 produces linear control operation, in which the power level of the signal increases or decreases in a linear fashion in proportion to how far the hand control is shifted.

  Do not change the SC values from the factory settings of 00 except as directed to temporarily do so in the calibration procedure. If this value is not set as specified, the function will not operate at optimal performance.

  For use during the calibration procedure, the SC setting of 03 selects a two-speed calibration curve that is used to calibrate the TH and MX parameters. This calibration curve sends a constant power signal to the control valve that is equivalent to the corresponding TH value for the function when the hand control is positioned between 10 and 80 percent of total travel, and equivalent to the corresponding MX value for the function when the hand control is shifted beyond 80 percent of total travel. The SC setting can be controlled individually within the display for each function or collectively by the first function within a pair of functions. The SC setting must be returned to 00 after completing the calibration procedure.

- **TH** — Threshold (from 00 to 99)
  
  The TH setting controls the power level of the signal sent to the control valve when the hand control is shifted slightly out of neutral just to the position where it begins to send a minimum signal level to the control system.
The TH value controls the metering of the unit function as function movement is started and stopped. If the TH value is set too low, the hand control will require excessive movement before the function starts to move. If the value is set too high, the function may not start and stop smoothly as the hand control is operated near the neutral position.

The TH value for a function must be less than the MX value for that function.

- MX – Max out (from 00 to 99, used for upper controls)
  The MX setting controls the power level of the signal sent to the control valve when the hand control is operated with upper controls selected on the lower control panel.

  The MX value determines the maximum speed (minimum cycle time) of a function operated from upper controls when the hand control is fully shifted.

  Increase the MX value to increase a function’s upper control speed (shorter cycle time), within the limits of the hydraulic flow available. Decrease the MX value to reduce a function’s standard speed (longer cycle time).

  Do not set the MX value higher than the value required to achieve the correct cycle time. If the MX value is set too high, the valve spool will reach full travel before the hand control is fully shifted, causing a loss of meterability.

  The MX value for a function must be higher than the TH value for that function.

- RA – Ramp
  The RA setting controls either the rate of acceleration into a function or the rate of deceleration out of a function. For units equipped with valve drivers with ramp in functionality, the RA setting controls the rate of change from threshold to the requested value (as function movement starts after a control is activated). It also controls the rate of change from any current movement to a request with greater movement speed. For units equipped with valve drivers with ramp out functionality, the RA setting controls the rate of deceleration from any current movement speed to a request with lower speed. The interlock input must remain engaged for a function to ramp out (decelerate). For units equipped with valve drivers with ramp out functionality, the rate of acceleration is controlled by a nonadjustable setting within the valve driver.

Do not change the RA values from the factory settings except as directed to temporarily do so in the calibration procedure. If this value is not set as specified, the function will not operate at optimal performance.

- LMX – Low speed (from 00 to 99, used for lower controls)
  The LMX setting (also referred to as low max) is used to determine the reduced speed (low speed) setting. LMX is used when lower controls is selected on the lower control panel.

  Do not change the LMX values from the factory setting.

- LMX – Low speed maximum (from 00 to 99)
  The low speed LMX values for upper control functions should be set to the same value as the MX for each function (AT237S only).

### Calibration Procedure

1. Look at the initial screen on the CADI. Record the four digit code displayed in the location shown in Figure 4.8. Use the code to determine the correct CADI values sheet to use.

   - AT235 or AT235P - A2.78 (refer to Figure 4.9)
   - AT235 or AT235P - A5.40 (refer to Figure 4.10)
   - AT237 - A2.78 (refer to Figure 4.11)
   - AT237 - A5.40 (refer to Figure 4.12)
   - AT237S - A1.D1 (refer to Figure 4.13)
   - AT237S - A4.D4 (refer to Figure 4.14)
   - All other codes - Use either model specific value sheet, but use 99 for the RA values

2. Make a copy of the CADI values sheet to use for recording the current and new parameter settings. Note that the TH and MX values shown on the CADI values sheet are approximate preliminary values. These values must be adjusted for all of the functions according to the procedure in this section to obtain optimum performance.
<table>
<thead>
<tr>
<th>Function</th>
<th>Frequency (FREQ)</th>
<th>Speed Curve (SC)</th>
<th>Threshold (TH)</th>
<th>Max Out (MX)</th>
<th>Ramp (RA)</th>
<th>Low Speed (LMX)</th>
<th>Cycle Times (Seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boom up</td>
<td>0075</td>
<td>00</td>
<td>30</td>
<td>75</td>
<td>02</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>Boom down</td>
<td></td>
<td>30</td>
<td>70</td>
<td>03</td>
<td>80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotate CW</td>
<td>0075</td>
<td>00</td>
<td>30</td>
<td>80</td>
<td>02</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>Rotate CCW</td>
<td></td>
<td>30</td>
<td>80</td>
<td>02</td>
<td>80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extend</td>
<td>0075</td>
<td>00</td>
<td>30</td>
<td>80</td>
<td>03</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>Retract</td>
<td></td>
<td>30</td>
<td>75</td>
<td>03</td>
<td>80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elevator up</td>
<td>0075</td>
<td>00</td>
<td>30</td>
<td>70</td>
<td>04</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>Elevator down</td>
<td></td>
<td>30</td>
<td>70</td>
<td>02</td>
<td>80</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. The values shown for TH and MX are approximate preliminary values only. Adjust these values as required for proper performance during the calibration procedure.
2. Refer to Figure 4.15 to set the approximate cycle times using the MX settings.

*Figure 4.9 — CADI Values Sheet for AT235/AT235P With Ramp In (A2.78)*

<table>
<thead>
<tr>
<th>Function</th>
<th>Frequency (FREQ)</th>
<th>Speed Curve (SC)</th>
<th>Threshold (TH)</th>
<th>Max Out (MX)</th>
<th>Ramp (RA)</th>
<th>Low Speed (LMX)</th>
<th>Cycle Times (Seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boom up</td>
<td>0075</td>
<td>00</td>
<td>30</td>
<td>75</td>
<td>12</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>Boom down</td>
<td></td>
<td>30</td>
<td>70</td>
<td>10</td>
<td>60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotate CW</td>
<td>0075</td>
<td>00</td>
<td>30</td>
<td>80</td>
<td>10</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>Rotate CCW</td>
<td></td>
<td>30</td>
<td>80</td>
<td>10</td>
<td>60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extend</td>
<td>0075</td>
<td>00</td>
<td>30</td>
<td>80</td>
<td>16</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>Retract</td>
<td></td>
<td>30</td>
<td>75</td>
<td>16</td>
<td>60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elevator up</td>
<td>0075</td>
<td>00</td>
<td>30</td>
<td>70</td>
<td>16</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>Elevator down</td>
<td></td>
<td>30</td>
<td>70</td>
<td>16</td>
<td>60</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. The values shown for TH and MX are approximate preliminary values only. Adjust these values as required for proper performance during the calibration procedure.
2. Refer to Figure 4.15 to set the approximate cycle times using the MX settings.

*Figure 4.10 — CADI Values Sheet for AT237 With Ramp Out (A5.40)*
<table>
<thead>
<tr>
<th>Function</th>
<th>Frequency (FREQ)</th>
<th>Speed Curve (SC)</th>
<th>Threshold (TH)</th>
<th>Max Out (MX)</th>
<th>Ramp (RA)</th>
<th>Low Speed (LMX)</th>
<th>Cycle Times (Seconds)</th>
<th>Specification²</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boom up</td>
<td>0075</td>
<td>00</td>
<td>30</td>
<td>75</td>
<td>02</td>
<td>60</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boom down</td>
<td></td>
<td></td>
<td>30</td>
<td>70</td>
<td>03</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotate CW</td>
<td>0075</td>
<td>00</td>
<td>30</td>
<td>80</td>
<td>02</td>
<td>60</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotate CCW</td>
<td></td>
<td></td>
<td>30</td>
<td>80</td>
<td>02</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extend</td>
<td>0075</td>
<td>00</td>
<td>30</td>
<td>80</td>
<td>03</td>
<td>60</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retract</td>
<td></td>
<td></td>
<td>30</td>
<td>75</td>
<td>03</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elevator up</td>
<td>0075</td>
<td>00</td>
<td>30</td>
<td>70</td>
<td>04</td>
<td>60</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elevator down</td>
<td></td>
<td></td>
<td>30</td>
<td>70</td>
<td>02</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

¹ The values shown for TH and MX are approximate preliminary values only. Adjust these values as required for proper performance during the calibration procedure.
² Refer to Figure 4.15 to set the approximate cycle times using the MX settings.

*Figure 4.11 — CADI Values Sheet for AT237 With Ramp In (A2.78)*

<table>
<thead>
<tr>
<th>Function</th>
<th>Frequency (FREQ)</th>
<th>Speed Curve (SC)</th>
<th>Threshold (TH)</th>
<th>Max Out (MX)</th>
<th>Ramp (RA)</th>
<th>Low Speed (LMX)</th>
<th>Cycle Times ( Seconds)</th>
<th>Specification²</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boom up</td>
<td>0075</td>
<td>00</td>
<td>30</td>
<td>75</td>
<td>12</td>
<td>60</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boom down</td>
<td></td>
<td></td>
<td>30</td>
<td>70</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotate CW</td>
<td>0075</td>
<td>00</td>
<td>30</td>
<td>80</td>
<td>10</td>
<td>60</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotate CCW</td>
<td></td>
<td></td>
<td>30</td>
<td>80</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extend</td>
<td>0075</td>
<td>00</td>
<td>30</td>
<td>80</td>
<td>16</td>
<td>60</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retract</td>
<td></td>
<td></td>
<td>30</td>
<td>75</td>
<td>16</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elevator up</td>
<td>0075</td>
<td>00</td>
<td>30</td>
<td>70</td>
<td>16</td>
<td>60</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elevator down</td>
<td></td>
<td></td>
<td>30</td>
<td>70</td>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

¹ The values shown for TH and MX are approximate preliminary values only. Adjust these values as required for proper performance during the calibration procedure.
² Refer to Figure 4.15 to set the approximate cycle times using the MX settings.

*Figure 4.12 — CADI Values Sheet for AT237 With Ramp Out (A5.40)*
3. Position the unit on a level surface that will allow for boom raise, extension, rotation, and arm raise. Apply the parking brake and chock the wheels.

4. Remove the plastic cover over the main control valve and identify the type of pulsar used on the main control valve. The type of pulsar is identified by the color of the rubber boot where the control wiring enters the pulsar valve. The color of boot will either be light gray or black. A black boot indicates a standard pulsar. A light gray boot indicates a pressure feedback pulsar. Once the type of pulsar has been identified, install the plastic cover over the main control valve.

5. Start the vehicle engine and move the PTO on/off switch to the On position. Switch the station selector switch on the lower control to the Upper position.

6. Enter the platform and properly secure the personal fall protection system to the lanyard anchor. Raise and rotate the lower boom until it is clear of any objects that might obstruct boom movement.

7. Completely cycle all main boom functions until the hydraulic oil temperature is at the proper operating temperature (between 100 and 120 degrees Fahrenheit) before making any CADI adjustments.
8. Connect the CADI to the CADI connection socket at the upper controls.

9. Record the current TH and MX settings on the CADI values sheet (refer to Figures 4.9 through 4.14).

10. Set the RA values for each upper control function (refer to step 1).

11. Change the SC value to 03 for the function being adjusted. The SC setting can be controlled individually within the display for each function or collectively by the first function within a pair of functions. The SC setting of 03 provides a constant power signal equivalent to the corresponding TH (threshold) value to the actuator when the hand control is engaged between approximately 10 and 80 percent of the total hand control movement.

12. Squeeze the interlock trigger and move the hand control into position for the desired function being calibrated throughout this step. Be careful not to exceed 80 percent of the hand control’s total travel. Exceeding 80 percent of the total hand control travel will provide a constant power signal equivalent to the corresponding MX (max out) value. If the function begins to move as soon as the handle is engaged into the function, lower the TH value until all motion is stopped. Raise the value for the TH setting 1 point every 5 seconds until the function begins to creep [less than 1” (2.54 cm) of platform movement per second]. Reduce this TH value according to the pulsars on the unit. For units with standard pulsars, proceed to step 13. For units with pressure feedback pulsars, proceed to step 14.

13. For a standard pulsar, reduce this TH value by 20 points to finalize the TH setting (refer to Figures 4.9 through 4.13). Proceed to step 15.

14. For the pressure feedback pulsar, reduce this TH value by 5 points to finalize the TH setting (refer to Figures 4.9 through 4.13).

15. Switch the calibration unit function selection to the opposite function within the pair being adjusted. Repeat steps 11 and 12 for the opposite function.

16. Repeat steps 11 through 15 for the remaining upper control functions.

17. Reset the SC value to 00 for all upper control functions.

18. Once the TH values are properly set, check the cycle times of the aerial device. Allow room for full boom movement. Engage the interlock trigger and quickly move the hand control to the full travel position in the direction required for the function selected. Time the function for full stroke travel.

19. If the cycle times do not fall within the boundaries of the specified cycle times (refer to Figure 4.15), make the following adjustments. If the cycle time achieved is faster than the minimum cycle time for any specific function, select the MX parameter on the CADI for the appropriate function. Reduce the MX setting until the function’s movement starts to slow down. Incrementally decrease the MX setting until the proper cycle time is achieved. If the cycle time achieved is slower than the maximum cycle time for the function, increase the MX setting until the proper cycle time is achieved. If the MX setting cannot be utilized to achieve the proper cycle time, the spool stop may need to be adjusted to achieve faster cycle times. Refer to Main Control Valve in the maintenance manual for information regarding how to adjust the spool stops and then repeat this procedure.

---

**Table 4.15** — Cycle Times (in Seconds) Based on MX Value

<table>
<thead>
<tr>
<th>MX Value</th>
<th>99</th>
<th>95</th>
<th>90</th>
<th>85</th>
<th>80</th>
<th>75</th>
<th>70</th>
<th>65</th>
<th>60</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boom up</td>
<td>16.6</td>
<td>16.7</td>
<td>17.3</td>
<td>17.5</td>
<td>18.6</td>
<td>21.0</td>
<td>25.1</td>
<td>31.8</td>
<td>45.6</td>
</tr>
<tr>
<td>Boom down</td>
<td>11.4</td>
<td>11.5</td>
<td>12.3</td>
<td>13.3</td>
<td>14.9</td>
<td>16.7</td>
<td>20.0</td>
<td>24.2</td>
<td>33.5</td>
</tr>
<tr>
<td>Rotate CW</td>
<td>53.0</td>
<td>54.2</td>
<td>56.9</td>
<td>61.0</td>
<td>68.2</td>
<td>77.2</td>
<td>95.0</td>
<td>124.5</td>
<td>189.6</td>
</tr>
<tr>
<td>Rotate CCW</td>
<td>54.9</td>
<td>56.9</td>
<td>60.4</td>
<td>66.8</td>
<td>74.4</td>
<td>90.3</td>
<td>113.2</td>
<td>162.8</td>
<td>276.8</td>
</tr>
<tr>
<td>Extend</td>
<td>12.0</td>
<td>12.1</td>
<td>12.1</td>
<td>12.9</td>
<td>14.1</td>
<td>15.5</td>
<td>18.3</td>
<td>22.8</td>
<td>29.9</td>
</tr>
<tr>
<td>Retract</td>
<td>13.5</td>
<td>13.6</td>
<td>13.9</td>
<td>14.7</td>
<td>15.7</td>
<td>17.1</td>
<td>20.3</td>
<td>24.4</td>
<td>33.3</td>
</tr>
<tr>
<td>Elevator up</td>
<td>10.9</td>
<td>10.9</td>
<td>11.1</td>
<td>11.2</td>
<td>12.1</td>
<td>13.5</td>
<td>15.5</td>
<td>19.3</td>
<td>26.6</td>
</tr>
<tr>
<td>Elevator down</td>
<td>7.3</td>
<td>7.3</td>
<td>7.5</td>
<td>7.8</td>
<td>8.5</td>
<td>9.9</td>
<td>11.6</td>
<td>15.1</td>
<td>20.4</td>
</tr>
</tbody>
</table>

---

Section 4 — AT235/AT235P/AT237/AT237S CADI Use • 35
20. Record the final MX value for each upper control function (refer to Figures 4.9 through 4.13).

21. Verify that the LMX value is 60 for each lower control function for the AT237 and AT237S and 80 for each lower control function for the AT235 and AT235P, and adjust it if necessary.
Section 5 — A40P CADI Use

There are two CADI connection locations on the A40P.

- On the bottom of the upper control panel (refer to Figure 5.1).

Aerial Device Functions

With the CADI in calibration mode, use the left and right menu buttons to scroll through the programmable function screens and select the desired unit function to be adjusted (refer to Figure 5.3). The function is shown on the display. Aerial device functions that can be adjusted are shown in Figure 5.4.

---

<table>
<thead>
<tr>
<th>Function</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boom up</td>
<td>Raises the boom</td>
</tr>
<tr>
<td>Boom down</td>
<td>Lowers the boom</td>
</tr>
<tr>
<td>CW</td>
<td>Clockwise rotation</td>
</tr>
<tr>
<td>CCW</td>
<td>Counterclockwise rotation</td>
</tr>
<tr>
<td>Extend</td>
<td>Extends the boom out</td>
</tr>
<tr>
<td>Retract</td>
<td>Retracts the boom in</td>
</tr>
</tbody>
</table>

---

A40P Parameters

Use the select button to scroll through the control system parameters displayed on the screen, and choose the parameter to be adjusted. The value for the parameter that is currently selected flashes on the display. For example, the boom up unit function is selected and the frequency parameter is selected (refer to Figure 5.5). The parameter values are shown under the parameter names. A description of each parameter is listed below.
• **FREQ – Frequency**

FREQ refers to the frequency measured in hertz of the signal output by the above rotation valve driver for the function.

Do not change the FREQ values from the factory settings. If this value is changed, the function will not operate at optimal performance.

• **SC – Speed curve (from 00 to 03)**

The SC setting controls how the power level of the signal sent to the control valve changes in relation to the position of the hand control.

The SC setting of 00 produces linear control operation in which the power level of the signal increases or decreases in a linear fashion in proportion to how far the hand control is shifted.

Do not change the SC values from the factory settings of 00 except as directed to temporarily do so in the calibration procedure. If this value is not set as specified, the function will not operate at optimal performance.

For use during the calibration procedure, the SC setting of 03 selects a two-speed calibration curve that is used to calibrate the TH and MX parameters. This calibration curve sends a constant power signal to the control valve that is equivalent to the corresponding TH value for the function when the hand control is positioned between 10 and 80 percent of total travel, and equivalent to the corresponding MX value for the function when the hand control is shifted beyond 80 percent of total travel. The SC value is adjusted on the calibration screen for the first direction of a function pair and applies to both function directions. For example, the SC setting for boom up also applies to boom down. The SC setting must be returned to 00 after completing the calibration procedure for both directions of a function.

• **TH – Threshold (from 00 to 99)**

The TH setting controls the power level of the signal sent to the control valve when the hand control is shifted slightly out of neutral just to the position where it begins to send a minimum signal level to the control system.

The TH value controls the metering of the unit function as function movement is started and stopped. If the TH value is set too low, the hand control will require excessive movement before the function starts to move. If the value is set too high, the function may not start and stop smoothly as the hand control is operated near the neutral position.

The TH value for a function must be less than the MX value for that function.

• **MX – Max out (from 00 to 99, used for upper controls)**

The MX setting controls the power level of the signal sent to the control valve when the hand control is operated at upper controls.

The MX value determines the maximum speed (minimum cycle time) of a function operated from upper controls when the hand control is fully shifted.

Increase the MX value to increase a function’s upper control speed (shorter cycle time) within the limits of the hydraulic flow available. Decrease the MX value to reduce a function’s upper control speed (longer cycle time).

Do not set the MX value higher than the value required to achieve the correct cycle time. If the MX value is set too high, the valve spool will reach full travel before the hand control is fully shifted, causing a loss of meterability.

The MX value for a function must be higher than the TH value for that function.

• **RA – Ramp**

The RA setting controls the rate of acceleration as function movement starts after the hand control is activated. The rate of deceleration as function movement stops after the hand control is deactivated is controlled by a nonadjustable setting within the valve driver.
Do not change the RA values from the factory settings except as directed to temporarily do so in the calibration procedure. If this value is not set as specified, the function will not operate at optimal performance.

- LMX – Low speed
  This parameter is not used in this application.

Do not change the LMX values from the factory settings of 99.

Parameter Values
The parameter value flashes when selected using the select button. Use the up or down value button to change the value of the selected parameter.

When all the parameters are properly set, unplug the CADI from the socket. The settings selected are saved in the above rotation valve driver as soon as they are changed.

Calibration Procedure

1. Make a copy of the CADI values sheet (refer to Figure 5.6) to use for recording the current and new parameter settings. Note that the TH and MX values shown on the CADI values sheet are approximate preliminary values. These values must be adjusted for all the functions according to the procedure in this section to obtain optimum performance.

2. Position the unit on a level surface that will allow for boom raise, extension, and rotation. Apply the parking brake and chock the wheels.

3. Remove the plastic cover over the main control valve and identify the type of pulsar used on the main control valve. The type of pulsar is identified by the color of the rubber boot where the control wiring enters the pulsar valve. The color of boot will either be light gray or black. A black boot indicates a standard pulsar. A light gray boot indicates a pressure feedback pulsar. Once the type of pulsar has been identified, install the plastic cover over the main control valve.

4. Start the vehicle engine and move the PTO on/off switch to the On position. Move the platform to an accessible position and switch the station selector switch on the lower control to the Upper position.

5. Enter the platform and properly secure the personal fall protection system to the lanyard anchor. Raise and rotate the lower boom until it is clear of any objects that might obstruct boom movement.

6. Completely cycle all main boom functions until the hydraulic oil temperature is at the proper operating temperature (above 100 degrees Fahrenheit) before making any CADI adjustments.

7. Connect the CADI to the CADI connection socket at the upper controls.

8. Record the current TH and MX settings on the CADI values sheet (refer to Figure 5.6).

9. Set the RA value to the value listed in Figure 5.6 for each upper control function.

10. Select the pair of upper control functions to be adjusted (boom up/down, CW/CCW, or extend/retract). A pair of functions needs to be calibrated together since the first function within each pair contains the SC (speed curve) for both functions within the pair. For example, the SC can be adjusted only on the boom up screen as there is no SC selection for boom down.

<table>
<thead>
<tr>
<th>Function</th>
<th>Frequency (FREQ)</th>
<th>Speed Curve (SC)</th>
<th>Threshold (TH)</th>
<th>Max Out (MX)</th>
<th>Ramp (RA)</th>
<th>Low Speed (LMX)</th>
<th>Cycle Times (Seconds) Specification Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boom up</td>
<td>0075</td>
<td>00</td>
<td>30</td>
<td>90</td>
<td>02</td>
<td>99</td>
<td></td>
</tr>
<tr>
<td>Boom down</td>
<td>0075</td>
<td>00</td>
<td>30</td>
<td>90</td>
<td>03</td>
<td>99</td>
<td></td>
</tr>
<tr>
<td>Rotate CW</td>
<td>0075</td>
<td>00</td>
<td>35</td>
<td>75</td>
<td>02</td>
<td>99</td>
<td></td>
</tr>
<tr>
<td>Rotate CCW</td>
<td>0075</td>
<td>00</td>
<td>35</td>
<td>75</td>
<td>02</td>
<td>99</td>
<td></td>
</tr>
<tr>
<td>Extend</td>
<td>0075</td>
<td>00</td>
<td>30</td>
<td>70</td>
<td>03</td>
<td>99</td>
<td></td>
</tr>
<tr>
<td>Retract</td>
<td>0075</td>
<td>00</td>
<td>30</td>
<td>70</td>
<td>03</td>
<td>99</td>
<td></td>
</tr>
</tbody>
</table>

1 The values shown for TH and MX are approximate preliminary values only. Adjust these values as required for proper performance during the calibration procedure.

2 Refer to Figure 5.7 to set the approximate cycle times using the MX settings.

Figure 5.6 — CADI Values Sheet for A40P
11. Change the SC value to 03 for the first function within the pair being adjusted. The SC setting of 03 provides a constant power signal equivalent to the corresponding TH (threshold) value to the actuator when the hand control is engaged between approximately 10 and 80 percent of the total hand control movement. The SC adjustment will apply to both sides of the pair of functions selected.

12. Squeeze the interlock trigger and move the hand control into position for the desired function being calibrated throughout this step. Be careful not to exceed 80 percent of the hand control’s total travel. Exceeding 80 percent of the total hand control travel will provide a constant power signal equivalent to the corresponding MX (max out) value. If the function begins to move as soon as the handle is engaged into the function, lower the TH value until all motion is stopped. Raise the value for the TH setting 1 point every 5 seconds until the function begins to creep [less than 1” (2.54 cm) of platform movement per second]. Reduce this TH value according to the pulsars on the unit. For units with standard pulsars, proceed to step 13. For units with pressure feedback pulsars, proceed to step 14.

13. For a standard pulsar, reduce this TH value by 20 points to finalize the TH setting (refer to Figure 5.6). Proceed to step 15.

14. For the pressure feedback pulsar, reduce this TH value by 5 points to finalize the TH setting (refer to Figure 5.6).

15. Switch the calibration unit function selection to the opposite function within the pair being adjusted. Repeat step 12 for the opposite function.

16. Repeat steps 9 through 15 for the remaining upper control functions.

17. Reset the SC value to 00 for all upper control functions. If SC is not reset to 00, neither function within the pair will operate correctly.

18. Once the TH values are properly set, check the cycle times of the aerial device. Allow room for full boom movement. Engage the interlock trigger and quickly move the hand control to the full travel position in the direction required for the function selected. Time the function for full stroke travel.

19. If the cycle times do not fall within the boundaries of the specified cycle times (refer to Figure 5.7), make the following adjustments. If the cycle time achieved is faster than the minimum cycle time for any specific function, select the MX parameter on the CADI for the appropriate function. Reduce the MX setting until the function’s movement starts to slow down. Incrementally decrease the MX setting until the proper cycle time is achieved. If the cycle time achieved is slower than the maximum cycle time for the function, increase the MX setting until the proper cycle time is achieved. If the MX setting cannot be utilized to achieve the proper cycle time, the spool stop may need to be adjusted to achieve faster cycle times. Refer to Aerial Control Valve in the maintenance manual for information regarding how to adjust the spool stops and then repeat this procedure.

20. Record the final MX value for each upper control function (refer to Figure 5.6).

21. Verify that the LMX value is 99 for each lower control function, and adjust it if necessary.

### Table: A40P Cycle Times (in Seconds) Based on MX Value

<table>
<thead>
<tr>
<th>MX Value</th>
<th>99</th>
<th>95</th>
<th>90</th>
<th>85</th>
<th>80</th>
<th>75</th>
<th>70</th>
<th>65</th>
<th>60</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boom up</td>
<td>19.9</td>
<td>20.2</td>
<td>21.1</td>
<td>22.7</td>
<td>24.5</td>
<td>28.0</td>
<td>35.7</td>
<td>46.7</td>
<td>69.1</td>
</tr>
<tr>
<td>Boom down</td>
<td>21.5</td>
<td>23.4</td>
<td>26.2</td>
<td>28.3</td>
<td>32.0</td>
<td>38.4</td>
<td>49.6</td>
<td>71.9</td>
<td>129.9</td>
</tr>
<tr>
<td>Rotate CW</td>
<td>53.0</td>
<td>54.2</td>
<td>56.9</td>
<td>61.0</td>
<td>68.2</td>
<td>77.2</td>
<td>95.0</td>
<td>124.5</td>
<td>189.6</td>
</tr>
<tr>
<td>Rotate CCW</td>
<td>54.9</td>
<td>56.9</td>
<td>60.4</td>
<td>66.8</td>
<td>74.4</td>
<td>90.3</td>
<td>113.2</td>
<td>162.8</td>
<td>276.8</td>
</tr>
<tr>
<td>Extend</td>
<td>13.2</td>
<td>13.2</td>
<td>13.3</td>
<td>13.4</td>
<td>13.5</td>
<td>14.0</td>
<td>16.4</td>
<td>20.8</td>
<td>31.9</td>
</tr>
<tr>
<td>Retract</td>
<td>15.7</td>
<td>15.8</td>
<td>16.0</td>
<td>16.0</td>
<td>16.3</td>
<td>17.5</td>
<td>21.9</td>
<td>31.7</td>
<td>50.7</td>
</tr>
</tbody>
</table>

*Figure 5.7 — A40P Cycle Times (in Seconds) Based on MX Value*
Section 6 — AT40-G CADI Use

There is one location to connect the CADI on the AT40-G, located on the lower control station (refer to Figure 6.1).

Aerial Device Functions

With the CADI in calibration mode, use the left and right menu buttons to scroll through the programmable function screens and select the desired unit function to be adjusted (refer to Figure 6.2). The function is shown on the display. Functions that can be adjusted are shown in Figure 6.3.

<table>
<thead>
<tr>
<th>Function</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boom up</td>
<td>Raises the boom</td>
</tr>
<tr>
<td>Boom down</td>
<td>Lowers the boom</td>
</tr>
<tr>
<td>CW</td>
<td>Clockwise rotation</td>
</tr>
<tr>
<td>CCW</td>
<td>Counterclockwise rotation</td>
</tr>
<tr>
<td>Extend</td>
<td>Extends the boom out</td>
</tr>
<tr>
<td>Retract</td>
<td>Retracts the boom in</td>
</tr>
<tr>
<td>Elevator up</td>
<td>Brings the arm up</td>
</tr>
<tr>
<td>Elevator down</td>
<td>Brings the arm down</td>
</tr>
</tbody>
</table>

Figure 6.3 — CADI Adjustable Functions

AT40-G Parameters

Use the select button to scroll through the control system parameters displayed on the screen and choose the parameter to be adjusted. The value for the parameter that is currently selected flashes on the display. For example, the boom up unit function is selected and the frequency parameter is selected (refer to Figure 6.4). The parameter values are shown under the parameter names. A description of each parameter is listed below.

- **FREQ** — Frequency
  
  FREQ refers to the frequency measured in hertz of the signal output by the above rotation valve driver for the function.
Do not change the FREQ values from the factory settings. If this value is changed, the function will not operate at optimal performance. Refer to the Maintenance Manual for the correct frequency setting.

- SC – Speed curve (from 00 to 03)
  The SC setting controls how the power level of the signal sent to the control valve changes in relation to the position of the hand control.

  The SC setting of 00 produces linear control operation, in which the power level of the signal increases or decreases in a linear fashion in proportion to how far the hand control is shifted.

  Do not change the SC values from the factory settings of 00 except as directed to temporarily in the calibration procedure. If this value is not set as specified, the function will not operate at optimal performance.

  For use during the calibration procedure, the SC setting of 03 selects a two-speed calibration curve that is used to calibrate the TH and MX parameters. This calibration curve sends a constant power signal to the control valve that is equivalent to the corresponding TH value for the function when the hand control is positioned between 10 and 80 percent of total travel, and equivalent to the corresponding MX value for the function when the hand control is shifted beyond 80 percent of total travel. The SC value is adjusted on the calibration screen for the first direction of a function pair, and applies to both function directions. For example, the SC setting for boom up also applies to boom down. The SC setting must be returned to 00 after completing the calibration procedure for both directions of a function.

- TH – Threshold (from 00 to 99)
  The TH setting controls the power level of the signal sent to the control valve when the hand control is shifted slightly out of neutral just to the position where it begins to send a minimum signal level to the control system.

  The TH value controls the metering of the unit function as function movement is started and stopped. If the TH value is set too low, the hand control will require excessive movement before the function starts to move. If the value is set too high, the function may not start and stop smoothly as the hand control is operated near the neutral position.

  The TH value for a function must be less than the MX value for that function.

- MX – Max out (from 00 to 99, used for upper controls)
  The MX setting controls the power level of the signal sent to the control valve when the hand control is operated at upper controls.

  The MX value determines the maximum speed (minimum cycle time) of a function operated from upper controls when the hand control is fully shifted.

  Increase the MX value to increase a function’s upper control speed (shorter cycle time), within the limits of the hydraulic flow available. Decrease the MX value to reduce a function’s upper control speed (longer cycle time).

  Do not set the MX value higher than the value required to achieve the correct cycle time. If the MX value is set too high, the valve spool will reach full travel before the hand control is fully shifted, causing a loss of meterability.

  The MX value for a function must be higher than the TH value for that function.

- RA – Ramp (from 00 to 99)
  The RA setting controls either the rate of acceleration into a function or the rate of deceleration out of a function. For units equipped with valve drivers with ramp in functionality, the RA setting controls the rate of change from threshold to the requested value (as function movement starts after a control is activated). It also controls the rate of change from any current movement to a request with greater movement speed. For units equipped with valve drivers with ramp out functionality, the rate of deceleration is controlled by a nonadjustable setting within the valve driver. For units equipped with valve drivers with ramp out functionality, the RA setting controls the rate of change from any current movement speed to a request with lower speed. The interlock input must remain engaged for a function to ramp out (decelerate). For units equipped with valve drivers with ramp out functionality, the rate of acceleration is controlled by a nonadjustable setting within the valve driver.

  Do not change the RA values from the factory settings except as directed to temporarily do so in the calibration procedure. If this value is not set as specified, the function will not operate at optimal performance.

  Do not change the RA values from the factory settings except as directed to temporarily in the calibration procedure. If this value is not set as specified, the function will not operate at optimal performance.

- LMX – Low speed
  This parameter is not used in this application.
Do not change the LMX values from the factory settings of 99.

**Parameter Values**
The parameter value flashes when selected using the select button. Use the up or down value button to change the value of the selected parameter.

When all the parameters are properly set, unplug the CADI from the socket. The settings are saved in the above rotation valve driver as soon as they are changed.

**Calibration Procedure**

1. Remove the plastic cover over the main control valve and identify the type of pilot valve used on the main control valve. There are three types of pilot valves that could be used on the unit: Thomas Magnetes, standard pulsars, and pressure feedback pulsars (refer to Figure 6.5). The standard pulsar and pressure feedback pulsar can be identified by the color of the rubber boot where the control wires enter the pulsar valves. The color of the boot will either be light gray or black. A black boot indicates a standard pulsar. A light gray boot indicates a pressure feedback pulsar (refer to Figure 6.8). Thomas Magnetes do not have a rubber boot and are encased in a painted metal housing with an integrated Deutsch connector that the main valve harness plugs into.

2. Make a copy of the CADI values sheet (refer to Figure 6.8 or 6.9) to use for recording the current and new parameter settings. Note that the TH and MX values shown on the CADI values sheet are approximate preliminary values. These values must be adjusted for all the functions according to the procedure in this section to obtain optimum performance.

3. Position the unit on a level surface that will allow for boom raise, extension, rotation, and arm raise. Apply the parking brake and chock the wheels.

4. Start the vehicle engine and move the PTO on/off switch to the On position. Switch the station selector switch at the lower control station to the Upper position.

5. Get in the platform and properly secure the personal fall protection system to the lanyard anchor. Raise and rotate the lower boom until it is clear of any objects that might obstruct boom movement.

6. Operate all main boom functions 10 complete cycles or more. Then verify that the hydraulic oil temperature is at the proper operating temperature (between 100 and 120 degrees Fahrenheit) before making any CADI adjustments. If the valve uses standard pulsars or pressure feedback pulsars proceed to step 7. If the valve uses Thomas Magnetes proceed to step 8 (refer to Figure 6.9).

---

**WARNING**

Death or serious injury can result from hydraulic oil being injected into the flesh.

Seek immediate medical attention if injured by escaping hydraulic oil. Serious infection or reaction can result if medical treatment is not given immediately.

Spilled hydraulic oil creates slick surfaces and can cause personnel to slip and/or fall. Keep the unit and work areas clean.

---

**CAUTION**

Injury can result from airborne particles entering the eyes. Wear appropriate safety equipment.
7. Bleed the air out of the top bonnets on all seven spools on the main control valve. Back each plug out with an Allen wrench while engaging the dump valve. The dump valve can be engaged by holding the station selector switch in the Lower position. While engaging the dump valve, back each of the seven plugs out (one at a time) until a small amount of hydraulic oil escapes by the plug (refer to Figure 6.7). A shop towel or rag can be placed around the plug to capture the majority of the spilled hydraulic oil. Be careful not to back the plugs out too far so that an open path is created for the pilot pressure to escape.

8. Connect the CADI to the CADI connection socket at the lower controls. A CADI extension cable can be utilized to allow for calibration from the upper controls at the platform. If an extension cable is not available, an assistant will be required to make adjustments to the CADI while an operator cycles the unit from the upper controls at the platform.

9. Record the current TH and MX settings on the CADI values sheet (refer to Figure 6.8 or 6.9).

10. Set the RA value to the value listed in Figure 6.8 or 6.9 for each function (refer to step 1).

11. Select the pair of functions to be adjusted (boom up/down, CW/CCW, extend/retract, or elevator up/down). A pair of functions need to be calibrated together, since the first function within each pair contains the SC for both functions within the pair. For example, the SC can be adjusted only on the boom up screen, as there is no SC selection for boom down.

12. Change the SC value to 03 for the first function within the pair being adjusted. The SC setting of 03 provides a constant power signal equivalent to the corresponding TH value to the actuator when the hand control is engaged between approximately 10 to 80 percent of the total hand control movement. The SC adjustment will apply to both sides of the pair of functions selected.

13. Engage the interlock trigger and move the hand control into position for the desired function being calibrated throughout this step. Be careful not to exceed 80 percent of the hand control’s total travel. Exceeding 80 percent of the total hand control travel will provide a constant power signal equivalent to the corresponding MX value. If the function begins to move as soon as the handle is engaged into the function, lower the TH value until all motion is stopped. Raise the value for the TH setting 1 point every 5 seconds until the function begins to creep [less than 1” (2.54 cm) of platform movement per second]. Reduce this TH value according to the type of pilot valve used on the unit. For units with standard pulsars, proceed to step 14. For units with pressure feedback pulsars, proceed to step 15. For units with Thomas Magnetes, proceed to step 16.

14. For a standard pulsar, reduce this TH value by 20 points to finalize the TH setting (refer to Figure 6.8). Proceed to step 17.

15. For a pressure feedback pulsar, reduce this TH value by five points to finalize the TH setting (refer to Figure 6.8).

16. For Thomas Magnetes, reduce this TH value by two points to finalize the TH setting (refer to Figure 6.9).

17. Switch the calibration unit function selection to the opposite function within the pair being adjusted. Repeat step 13 for the opposite function.

18. Repeat steps 10 through 17 for the remaining functions.
19. Reset the SC value to 00 for all functions. If SC is not reset to 00, neither function within the pair will operate correctly.

20. Once the TH values are properly set, check the cycle times of the aerial device. Allow room for full boom movement. Engage the interlock trigger and quickly move the hand control to the full travel position in the direction required for the function selected. Time the function for full stroke travel.

21. If the cycle times do not fall within the boundaries of the specified cycle times (refer to Cycle Times in the Maintenance Manual), make the following adjustments. If the cycle time achieved is faster than the minimum cycle time for any specific function, select the MX parameter on the CADI for the appropriate function. Reduce the MX setting until the function’s movement starts to slow down. Incrementally decrease the MX setting until the proper cycle time is achieved. If the cycle time achieved is slower than the maximum cycle time for the function, increase the MX setting until the proper cycle time is achieved. If the MX setting cannot be utilized to achieve the proper cycle time, the spool stop may need to be adjusted to achieve faster cycle times. Refer to Main Control Valve in the maintenance manual for information regarding how to adjust the spool stops and then repeat this procedure.

22. Record the final MX value for each function (refer to Figure 6.8 or 6.9).
There is one location to connect the CADI on the L42E/44E (refer to Figure 7.1).

**Figure 7.1 — CADI Connection Socket**

**Aerial Device Functions**

With the CADI in calibration mode, use the left and right menu buttons to scroll through the programmable function screens and select the desired unit function to be adjusted (refer to Figure 7.2). The function is shown on the display. Aerial device functions that can be adjusted are shown in Figure 7.3.

**Figure 7.2 — L42E/L44E Function**

<table>
<thead>
<tr>
<th>Function</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper boom fold</td>
<td>Folds the upper boom</td>
</tr>
<tr>
<td>Upper boom unfold</td>
<td>Unfolds the upper boom</td>
</tr>
<tr>
<td>CW</td>
<td>Clockwise rotation</td>
</tr>
<tr>
<td>CCW</td>
<td>Counterclockwise rotation</td>
</tr>
<tr>
<td>Lower boom fold</td>
<td>Folds the lower boom</td>
</tr>
<tr>
<td>Lower boom unfold</td>
<td>Unfolds the lower boom</td>
</tr>
</tbody>
</table>

**Figure 7.3 — CADI Adjustable Functions**

**L42E/L44E Parameters**

Use the select button to scroll through the control system parameters displayed on the screen and choose the parameter to be adjusted. The value for the parameter that is currently selected flashes on the display. For example, the lower boom fold function is selected and the ramp parameter is selected (refer to Figure 7.4). The parameter values are shown under the parameter names. A description of each parameter is listed below.

**Figure 7.4 — L42E/L44E Parameter Display**

- **FREQ** – Frequency
  FREQ refers to the frequency measured in hertz of the signal output by the above rotation valve driver for the function.

  Do not change the FREQ values from the factory settings. If this value is changed, the function will not operate at optimal performance.

- **SC** – Speed curve (from 00 to 03)
  The SC setting controls how the power level of the signal sent to the control valve changes in relation to the position of the hand control.
The SC setting of 00 produces linear control operation, in which the power level of the signal increases or decreases in a linear fashion in proportion to how far the hand control is shifted.

Do not change the SC values from the factory settings of 00 except as directed to temporarily in the calibration procedure. If this value is not set as specified, the function will not operate at optimal performance.

For use during the calibration procedure, the SC setting of 03 selects a two-speed calibration curve that is used to calibrate the TH and MX parameters. This calibration curve sends a constant power signal to the control valve that is equivalent to the corresponding TH value for the function when the hand control is positioned between 10 and 80 percent of total travel, and equivalent to the corresponding MX value for the function when the hand control is shifted beyond 80 percent of total travel. The SC value is adjusted on the calibration screen for the first direction of a function pair, and applies to both function directions. For example, the SC setting for boom up also applies to boom down. The SC setting must be returned to 00 after completing the calibration procedure for both directions of a function.

- TH – Threshold (from 00 to 99)
  The TH setting controls the power level of the signal sent to the control valve when the hand control is shifted slightly out of neutral just to the position where it begins to send a minimum signal level to the control system.

  The TH value controls the metering of the unit function as function movement is started and stopped. If the TH value is set too low, the hand control will require excessive movement before the function starts to move. If the value is set too high, the function may not start and stop smoothly as the hand control is operated near the neutral position.

  The TH value for a function must be less than both the LMX value and the MX value for that function.

- MX – Max out (from 00 to 99, used in standard speed mode)
  The MX setting controls the power level of the signal sent to the control valve when the hand control is operated with standard speed (rabbit mode) selected at the upper controls.

  The MX value determines the maximum speed (minimum cycle time) of a function operated from upper controls when standard speed is selected and the hand control is fully shifted.

  Increase the MX value to increase a function’s standard speed (shorter cycle time), within the limits of the hydraulic flow available. Decrease the MX value to reduce a function’s standard speed (longer cycle time).

  Do not set the MX value higher than the value required to achieve the correct cycle time. If the MX value is set too high, the valve spool will reach full travel before the hand control is fully shifted, causing a loss of meterability.

  The MX value for a function must be higher than both the LMX value and the TH value for that function.

- RA – Ramp
  Locate the serial number tag on the valve to determine the manufacturer. On Parker valves, the RA setting controls the rate of acceleration as function movement starts after the hand control is activated. On Walvoil valves, the RA setting controls ramp out when the hand control is centered with the control remaining active. The RA setting does not control the rate of deceleration as function movement stops after the hand control is deactivated, as this is controlled using a nonadjustable default setting within the valve driver.

- LMX – Low speed (from 00 to 99, used in low speed mode)
  The LMX setting (also referred to as low max) controls the reduced power level of the signal sent to the control valve when the hand control is operated with low speed (turtle mode) selected at the upper controls.

  The LMX value determines the reduced speed (increased cycle time) of a function operated from upper controls when low speed is selected and the hand control is fully shifted.

  Increase the LMX value to increase a function’s low speed (shorter cycle time). Decrease the LMX value to reduce a function’s low speed (longer cycle time).

  The LMX value for a function must be higher than the TH value and lower than the MX value for that function.

Parameter Values
The parameter value flashes when selected using the select button. Use the up or down value button to change the value of the selected parameter.
When all the parameters are properly set, unplug the CADI from the socket. The settings selected are saved in the above rotation valve driver as soon as they are changed.

### Calibration Procedure

Put CADI into calibration mode. Write the value of each parameter in the gray space to the right of the printed value. Values can be different than the values that are shown. Do not adjust values for frequency (FREQ), speed curve (SC), or ramp (RA).

Refer to Figure 7.5 and to the maintenance manual before making adjustments.

### Calibration

The unit’s control system parameters for the programmable functions are preset at the factory. The control system parameters are adjusted with the CADI to the individual unit for optimum performance. The CADI allows each function direction to be adjusted independent of the opposite function direction. For example, changing the low speed or max out for upper boom unfold has no effect on upper boom fold. The only exceptions are the frequency and speed curve parameters. Both of these parameters can only be adjusted on one function direction, and this adjustment will apply to both function directions.

The CADI connects to the lower control panel near the emergency stop push button and is powered by the unit. There is only one location to connect the CADI. The CADI will power up when the it is connected to the unit. When initially connected, the CADI will read out, “Altec Industries Inc. L42/44E. Press any key.” This will display until any key on the CADI is selected, the CADI will then go into calibration mode. If “unknown machine” appears in the display, this indicates that your CADI is not properly set for your machine. If this occurs, please send the CADI to the CADI update program. Contact your Altec representative for more information.

<table>
<thead>
<tr>
<th>Function</th>
<th>Frequency (FREQ)</th>
<th>Speed Curve (SC)</th>
<th>Threshold (TH)</th>
<th>Max Out (MX)</th>
<th>Ramp (RA)</th>
<th>Low Speed (LMX)</th>
<th>Cycle Times (Seconds)</th>
<th>Specification</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up boom unfold</td>
<td>75</td>
<td>00</td>
<td>35</td>
<td>79</td>
<td>04</td>
<td>62</td>
<td>62</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Up boom fold</td>
<td></td>
<td></td>
<td>35</td>
<td>79</td>
<td>04</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotate CW</td>
<td>75</td>
<td>00</td>
<td>35</td>
<td>85</td>
<td>03</td>
<td>68</td>
<td>68</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotate CCW</td>
<td></td>
<td></td>
<td>35</td>
<td>85</td>
<td>03</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low boom unfold</td>
<td>75</td>
<td>00</td>
<td>35</td>
<td>85</td>
<td>04</td>
<td>80</td>
<td>80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low boom fold</td>
<td></td>
<td></td>
<td>35</td>
<td>85</td>
<td>04</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 The values shown for TH, MX, and LMX are approximate preliminary values only. Adjust these values as required for proper performance during the calibration procedure.

2 Lower boom unfold is set from 0 to 90 degrees and fold from 90 to 0 degrees. Upper boom is set at a 180 degree arc and rotate on complete 360 degree revolution.

### Parker

<table>
<thead>
<tr>
<th>Function</th>
<th>Frequency (FREQ)</th>
<th>Speed Curve (SC)</th>
<th>Threshold (TH)</th>
<th>Max Out (MX)</th>
<th>Ramp (RA)</th>
<th>Low Speed (LMX)</th>
<th>Cycle Times (Seconds)</th>
<th>Specification</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up boom unfold</td>
<td>150</td>
<td>00</td>
<td>35</td>
<td>79</td>
<td>07</td>
<td>62</td>
<td>62</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Up boom fold</td>
<td></td>
<td></td>
<td>35</td>
<td>79</td>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotate CW</td>
<td>150</td>
<td>00</td>
<td>35</td>
<td>85</td>
<td>10</td>
<td>68</td>
<td>68</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotate CCW</td>
<td></td>
<td></td>
<td>35</td>
<td>85</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low boom unfold</td>
<td>150</td>
<td>00</td>
<td>35</td>
<td>85</td>
<td>07</td>
<td>80</td>
<td>80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low boom fold</td>
<td></td>
<td></td>
<td>35</td>
<td>85</td>
<td>07</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 The values shown for TH, MX, and LMX are approximate preliminary values only. Adjust these values as required for proper performance during the calibration procedure.

2 Lower boom unfold is set from 0 to 90 degrees and fold from 90 to 0 degrees. Upper boom is set at a 180 degree arc and rotate on complete 360 degree revolution.

### Walvoil

*Figure 7.5 — CADI Values Sheet for L42E/L44E*
Before making any adjustments on a CADI, record all of the original settings. Additionally, make sure the hydraulic oil temperature is at the proper operating temperature (between 100 and 120 degrees Fahrenheit (38 and 49 degrees Celsius)) before making any CADI adjustments. Oil viscosity is significantly affected by temperature.

1. Position the unit on a level surface that will allow for operation of the upper boom, lower boom, and rotation functions. Apply the parking brake and chock the wheels.

2. Start the vehicle engine and move the PTO on/off switch to the On position. Switch the station selector switch at the lower control station to the Lower Controls position.

3. Engage the tools with no tool couplers connected to heat the oil to between 100 and 120 degrees Fahrenheit (38 and 49 degrees Celsius). Cycle each boom function two to three times to mix the cold oil in the cylinders. Verify that the hydraulic oil temperature is at the proper operating temperature (between 100 and 120 degrees Fahrenheit (38 and 49 degrees Celsius)) before making any CADI adjustments. Turn off the tools when proper temperature range is achieved.

4. Connect the CADI to the CADI connection at the lower controls. Using the lower controls, position the unit so that the lower boom is fully or nearly fully articulated and the upper boom is vertical with the platform at the ground. Rotate the unit around to the passenger side of the vehicle. The CADI can be placed on the body package accessible to the operator in the platform.

5. Switch the unit into upper controls using the switch at the lower controls station.

6. Get in the platform and properly secure the personal fall protection system to lanyard anchor.

7. Make sure the RA (ramp) value is set to 99 for each function. A value of 99 is needed to properly calibrate the unit. The ramp value will be set to the proper value for operation during step 16.

8. Select the pair of functions to be adjusted (upper boom fold/unfold, clockwise/counterclockwise or lower boom fold/unfold). A pair of functions needs to be calibrated together, since the first function within each pair contains the speed curve for both functions within the pair. For example, the speed curve can be adjusted only on the boom up screen, as there is no speed curve selection for boom down.

9. Change the speed curve to ‘03’ for the first function within the pair being adjusted. Speed Curve ‘03’ provides a constant power signal equivalent to the corresponding TH (threshold) value to the actuator when the hand control is engaged between 10 to 80 percent of the total hand control movement. The speed curve adjustment will apply to both sides of the pair of functions selected.

10. Engage the interlock trigger and move the hand control 10 to 80 percent into position for the desired function being calibrated throughout this step. Be careful not to exceed 80 percent of the hand control’s total travel. Exceeding 80 percent of the total hand control travel will provide a constant power signal equivalent to the corresponding MX (max out) value. If the function begins to move as soon as the handle is engaged into the function, lower the TH (threshold) value until all motion is stopped. Raise the value for the TH (threshold) setting one point every five seconds until the function begins to creep (less than one inch of platform movement per second). Finalize the TH setting by reducing the TH value by 10 points for a Parker valve or 2 points for a Walvoil valve (refer to Figure 7.6). Record the final TH value.

11. Switch the calibration unit function selection to the opposite function within the pair being adjusted. Repeat step 10 for the opposite function.

12. Repeat steps 7 to 11 for the remaining functions.

13. Once the thresholds are properly set, check the cycle times of the aerial device with full platform capacity. Allow room for full boom movement. The upper boom is 180 degrees of travel, lower boom is 0 to 90 degrees, and rotate is 360 degrees. Engage the interlock trigger and quickly move the hand control to the full travel position in the direction required for the function selected. Time the function for full stroke travel. If the unit is equipped with low speed positioning, be sure that it is set to the faster speed indicated by the rabbit icon.

14. If the cycle times do not fall within the boundaries of the specified cycle times, make the following adjustments.

   a. If the cycle time achieved is faster than the minimum cycle time for any specific function, select the MX (max out) parameter on the CADI for the appropriate function. Reduce the max out setting until the function’s movement starts to slow down. Incrementally decrease the max out setting until the proper cycle time is achieved.
b. If the cycle time achieved is slower than the maximum cycle time for the function, increase the max out setting until the proper cycle time is achieved.

c. If the max out setting cannot be utilized to achieve the proper cycle time, the spool stop may need to be adjusted to achieve faster cycle times. Refer to Main Control Valve for information regarding how to adjust the spool stops and then repeat this procedure.

15. Reset the speed curve to ‘00’ for all functions. If the speed curve is not reset to ‘00’, neither function within the pair will operate correctly.

16. Set the ramp value to the value listed for each function listed in Figure 7.5. Select the RA parameter for each function and set it to the proper value. The parameter can be changed to the operator’s preference. On the Parker valve, RA parameters change ramp in. On the Walvoil valve, RA parameters change ramp out. Higher RA values lead to more abrupt starts/stops. Lower RA settings lead to smoother starts/stops. Lower RA settings for ramp out can lead to undesirable delays when stopping.

17. Set the LMX (low speed) value for each function using Figure 7.7.
<table>
<thead>
<tr>
<th>Threshold</th>
<th>MAX Out</th>
</tr>
</thead>
<tbody>
<tr>
<td>28</td>
<td>56 57 57 58 59 59 60 60 61 62 62 63 63 64 64 65 65 66 66 66 67 67 68 68 68 68</td>
</tr>
<tr>
<td>29</td>
<td>57 57 58 58 59 59 60 60 61 61 62 63 63 64 64 65 65 66 66 66 67 67 68 68 68 68</td>
</tr>
<tr>
<td>30</td>
<td>57 58 58 59 59 60 60 61 61 62 62 63 63 64 64 65 65 66 66 66 67 67 68 68 68 68</td>
</tr>
<tr>
<td>31</td>
<td>57 58 59 59 60 60 61 61 62 62 63 63 64 64 65 65 66 66 66 67 67 68 68 68 68 68</td>
</tr>
<tr>
<td>32</td>
<td>58 58 59 60 60 61 61 62 62 63 63 64 64 65 65 66 66 66 67 67 68 68 69 69 69 70</td>
</tr>
<tr>
<td>33</td>
<td>58 59 59 60 60 61 61 62 62 63 63 64 64 65 65 66 66 66 67 67 68 68 69 69 70 70</td>
</tr>
<tr>
<td>34</td>
<td>59 59 60 60 61 61 62 62 63 63 64 64 65 65 66 66 66 67 67 68 68 69 69 70 70 71</td>
</tr>
<tr>
<td>35</td>
<td>59 60 60 61 61 62 62 63 63 64 64 65 65 66 66 66 67 67 68 68 69 69 70 70 71 71</td>
</tr>
<tr>
<td>36</td>
<td>59 60 61 61 62 62 63 63 64 64 65 65 66 66 66 67 67 68 68 69 69 70 70 71 71 71</td>
</tr>
<tr>
<td>37</td>
<td>60 60 61 61 62 62 63 63 64 64 65 65 66 66 66 67 67 68 68 69 69 70 70 71 71 72</td>
</tr>
<tr>
<td>38</td>
<td>60 61 61 61 62 62 63 63 64 64 65 65 66 66 66 67 67 68 68 69 69 70 70 71 72 72</td>
</tr>
<tr>
<td>39</td>
<td>61 61 61 62 62 63 63 64 64 65 65 66 66 66 67 67 68 68 69 70 70 71 71 72 72 73</td>
</tr>
<tr>
<td>40</td>
<td>61 62 62 62 63 63 64 64 65 65 66 66 66 67 67 68 68 69 69 70 71 71 72 72 73 73</td>
</tr>
<tr>
<td>41</td>
<td>61 62 63 63 63 64 64 65 65 66 66 66 67 67 68 68 69 69 70 70 71 71 72 72 73 73</td>
</tr>
<tr>
<td>42</td>
<td>62 62 62 63 64 64 65 65 66 66 67 67 67 68 68 69 70 70 71 71 72 72 73 73 74 74</td>
</tr>
<tr>
<td>43</td>
<td>62 63 63 63 64 65 65 66 66 66 67 67 68 68 69 69 70 70 71 71 72 72 73 73 74 74</td>
</tr>
<tr>
<td>44</td>
<td>63 63 64 64 65 66 66 66 67 67 68 68 69 69 70 70 71 71 72 72 73 73 74 74 74 75</td>
</tr>
<tr>
<td>45</td>
<td>63 64 64 65 65 66 66 66 67 67 68 68 69 69 70 70 71 71 72 72 73 73 74 74 74 75</td>
</tr>
<tr>
<td>46</td>
<td>64 64 65 65 65 66 66 66 67 67 68 68 69 69 70 70 71 71 72 72 73 73 74 74 75 75</td>
</tr>
<tr>
<td>47</td>
<td>64 65 65 65 66 66 66 67 67 68 68 69 69 70 70 71 71 72 72 73 73 74 74 75 75 75</td>
</tr>
<tr>
<td>48</td>
<td>65 65 65 65 66 66 67 67 68 68 69 69 70 70 71 71 72 72 73 73 74 74 75 75 76 76</td>
</tr>
<tr>
<td>49</td>
<td>65 65 66 66 66 67 67 68 68 69 69 70 70 71 71 72 72 73 73 74 74 75 75 76 77 77</td>
</tr>
<tr>
<td>50</td>
<td>65 66 66 66 67 67 68 68 69 69 70 70 71 71 72 72 73 73 74 74 75 75 76 76 77 77</td>
</tr>
</tbody>
</table>

Figure 7.7 — Low Speed
Section 8 — LS63 and LS87 CADI Use

There are two CADI connection locations.

- Lower control panel – bottom side (refer to Figure 8.1).
- Platform controls – bottom side (refer to Figure 8.2).

**Aerial Device Functions**

With the CADI in calibration mode, use the left and right menu buttons to scroll through the programmable function screens and select the desired unit function to be adjusted (refer to Figure 8.3). The function is shown on the display. Aerial device functions that can be adjusted are shown in Figure 8.4.

<table>
<thead>
<tr>
<th>Function</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boom up</td>
<td>Raises the boom</td>
</tr>
<tr>
<td>Boom down</td>
<td>Lowers the boom</td>
</tr>
<tr>
<td>CW</td>
<td>Clockwise rotation</td>
</tr>
<tr>
<td>CCW</td>
<td>Counterclockwise rotation</td>
</tr>
<tr>
<td>Boom extend</td>
<td>Extends the boom</td>
</tr>
<tr>
<td>Boom retract</td>
<td>Retracts the boom</td>
</tr>
<tr>
<td>Winch in</td>
<td>Retracts the winch line</td>
</tr>
<tr>
<td>Winch out</td>
<td>Extends the winch line</td>
</tr>
<tr>
<td>HOP meter</td>
<td>Controls calibration of the HOP meter</td>
</tr>
<tr>
<td>HOP trip</td>
<td>Sets trip point of the HOP</td>
</tr>
</tbody>
</table>

**Aerial Device Parameters**

Use the select button to scroll through the control system parameters displayed on the screen and choose the parameter to be adjusted. The value for the parameter that is currently selected flashes on the display. For example, the boom up unit function is selected and the frequency parameter is selected (refer to Figure 8.5). The parameter values are shown under the parameter names. A description of each parameter is listed below.
The TH value for a function must be less than both the LMX value and the MX value for that function.

Use the following procedure to set TH.

1. Set TH and LMX to 0.
2. Set MX to 35.
3. Fully shift and hold the hand control for the function being calibrated, and increase MX by 1 each second.
4. When movement is detected, release the control, and decrease MX by 3.
5. Actuate the control again, and count to 5, increasing the MX by 1 for each 5 seconds counted.
6. When movement is detected, release the control. Set the TH to the MX minus 15, and set MX and LMX based on suggested cycle times.

- **MX** – Max out (from 00 to 99, used in standard speed mode)
  The MX setting controls the power level of the signal sent to the control valve when the hand control is operated with standard speed selected at the upper controls.
  The MX value determines the maximum speed (minimum cycle time) of a function operated from upper controls when standard speed is selected and the hand control is fully shifted.
  Increase the MX value to increase a function’s standard speed (shorter cycle time), within the limits of the hydraulic flow available. Decrease the MX value to reduce a function’s standard speed (longer cycle time).
  Do not set the MX value higher than the value required to achieve the correct cycle time. If the MX value is set too high, the valve spool will reach full travel before the hand control is fully shifted, causing a loss of meterability.
  The MX value for a function must be higher than both the LMX value and the TH value for that function.
  The MX parameter is used to calibrate the load indicator gauge (HOP meter). The LMX value must then be set to the same value as MX.
• RA – Ramp
   The RA setting controls the rate of acceleration as function movement starts after the hand control is activated, and the rate of deceleration as function movement stops after the hand control is deactivated.

   Contact your Altec representative before changing RA values.

• LMX – Low speed (from 00 to 99, used in low speed mode)
   The LMX setting (also referred to as low max) controls the reduced power level of the signal sent to the control valve when the hand control is operated with low speed selected at the upper controls.

   The LMX value determines the reduced speed (increased cycle time) of a function operated from upper controls when low speed is selected and the hand control is fully shifted.

   Increase the LMX value to increase a function’s low speed (shorter cycle time). Decrease the LMX value to reduce a function’s low speed (longer cycle time).

   The LMX value for a function must be higher than the TH value and lower than the MX value for that function.

   LMX is used to calibrate hydraulic overload protection (HOP) trip.

   The LMX value must be set equal to the MX value for HOP meter.

Parameter Values
   The parameter value flashes when selected using the select button. Use the up or down value button to change the value of the selected parameter.

   When all the parameters are properly set, unplug the CADI from the socket. The settings selected are saved in the above rotation valve driver as soon as they are changed.

Calibration Procedure
   Follow the procedures completely and in the correct sequence to obtain the optimum performance of the unit.

1. Position the unit in an open area where the booms can be fully extended, raised, and rotated.

2. Position the unit on a level surface, apply the parking brake, and chock the wheels.

3. Engage the unit’s hydraulic system, and properly set the outriggers.

4. Warm the oil to proper operating temperature.

5. Check system pressure and pilot pressure according to the maintenance manual, and verify that the pump is delivering the correct oil flow before testing function speeds.

6. Hold each function control at full stroke when measuring cycle time. Check all function cycle times before making any adjustments. Refer to the maintenance manual for cycle times. All functions must be in the average cycle times for optimal performance.

7. Record all function settings before making any adjustments with the CADI.

Put CADI into calibration mode. Write the value of each parameter in the gray space to the right of the printed value. Values can be different than the values that are shown. Do not adjust values for FREQ, SC, or RA.

Refer to Figure 8.6 before making adjustments.

HOP Calibration — LS63
   If the testing procedure from the Maintenance Manual reveals the HOP system needs to be adjusted, use the following procedure. Make sure the test weight is still suspended from the boom.

1. At the lower controls, connect the CADI to the connection socket. Navigate to the HOP meter screen. Adjust the TH (threshold) value to zero. Adjust the MX setting until the needle on the HOP gauge is at 105 percent. Adjust the LMX value to match the MX value. The HOP indicator gauge is now correctly adjusted.

2. Navigate to the HOP trip screen. With the test weight still attached to the boom tip, lower the HOP trip value until HOP engages. Verify that HOP engages by attempting to boom down. When the unit no longer allows boom down function, HOP has engaged. Set HOP trip at the highest value at which HOP will engage, which is typically around 45.

HOP Calibration — LS87
   If the testing procedure from the Maintenance Manual reveals the HOP system needs to be adjusted, use the following procedure. Make sure the test weight is still suspended from the boom.

1. At the lower controls, connect the CADI to the connection socket.
<table>
<thead>
<tr>
<th>Function</th>
<th>Frequency (FREQ)</th>
<th>Speed Curve (SC)</th>
<th>Threshold (TH)</th>
<th>Max Out (MX)</th>
<th>Ramp (RA)</th>
<th>Low Speed (LMX)</th>
<th>Cycle Times (Sec or Turns in 15 Sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boom up</td>
<td>0075¹</td>
<td>00¹</td>
<td></td>
<td></td>
<td>10¹</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boom down</td>
<td>—</td>
<td>—</td>
<td></td>
<td></td>
<td>10¹</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotation CW</td>
<td>0075¹</td>
<td>00¹</td>
<td></td>
<td></td>
<td>10¹</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotation CCW</td>
<td>—</td>
<td>—</td>
<td></td>
<td></td>
<td>10¹</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boom extend</td>
<td>0075¹</td>
<td>00¹</td>
<td></td>
<td></td>
<td>10¹</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boom retract</td>
<td>—</td>
<td>—</td>
<td></td>
<td></td>
<td>10¹</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winch in</td>
<td>0075¹</td>
<td>00¹</td>
<td></td>
<td></td>
<td>99¹</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winch out</td>
<td>—</td>
<td>—</td>
<td></td>
<td></td>
<td>99¹</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HOP meter</td>
<td>0392¹</td>
<td>00¹</td>
<td>00¹</td>
<td>—</td>
<td>05/99¹</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HOP trip</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

¹ Factory setting. Do not change from value shown.

*Figure 8.6 — CADI Values Sheet for LS63 and LS87*
2. If HOP engages before the preoperation HOP check decal is visible, HOP is set too low and needs to be adjusted.
   
a. Increase the HOP trip LMX value
   
b. With each adjustment, retract the boom for several seconds to reduce pressure on the lift cylinder and reset HOP.
   
c. Extend the boom again to see where HOP engages.

3. If HOP does not engage until the leading edge of the lower boom passes the second set of arrows on the preoperation HOP check decal, HOP is set too high, and needs to be adjusted.
   
a. Reduce the HOP trip LMX value
   
b. With each adjustment, retract the boom for several seconds to reduce pressure on the lift cylinder and reset HOP.
   
c. Extend the boom again to see where HOP engages.

4. Repeat step 2 and/or 3 until HOP engages when the leading edge of the lower boom is between the arrows on the preoperation HOP check decal.

5. The following functions should be disabled when HOP is engaged.
   
   • Winch raise
   • Boom extend
   • Boom lower
   • Jib winch raise

   If any of these functions operate while HOP is engaged, stop operation and contact your Altec representative. Operate the following functions to ensure the unit can effectively return to safe operation from HOP mode.
   
   • Winch lower
   • Boom retract
   • Boom raise
   • Jib winch lower

6. Once the HOP trip setting is correct, verify the HOP meter setting is correct by reading the load gauge on the control panel. With the boom still in the HOP engaged position, the needle on the gauge should read 100 percent. While still using the lower controls, adjust the MX value until the needle rests at the 100 percent line on the gauge. Then adjust the LMX value to match the MX value.
Section 9 — DB37 CADI Use

The CADI connection for the DB37 is located under the lower control panel (refer to Figure 9.1).

**Derrick Functions**

With the CADI in calibration mode, use the left and right menu buttons to scroll through the programmable function screens and select the desired unit function to be adjusted (refer to Figure 9.2). The function is shown on the display. Derrick functions that can be adjusted are shown in Figure 9.3.

<table>
<thead>
<tr>
<th>Function</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>L track fwd</td>
<td>Left track forward</td>
</tr>
<tr>
<td>L track rev</td>
<td>Left track reverse</td>
</tr>
<tr>
<td>R track fwd</td>
<td>Right track forward</td>
</tr>
<tr>
<td>R track rev</td>
<td>Right track reverse</td>
</tr>
<tr>
<td>Boom up</td>
<td>Raises the boom</td>
</tr>
<tr>
<td>Boom down</td>
<td>Lowers the boom</td>
</tr>
<tr>
<td>CW</td>
<td>Clockwise rotation</td>
</tr>
<tr>
<td>CCW</td>
<td>Counterclockwise rotation</td>
</tr>
<tr>
<td>2nd extend</td>
<td>Extends the intermediate boom</td>
</tr>
<tr>
<td>2nd retract</td>
<td>Retracts the intermediate boom</td>
</tr>
<tr>
<td>3rd extend</td>
<td>Extends the upper boom</td>
</tr>
<tr>
<td>3rd retract</td>
<td>Retracts the upper boom</td>
</tr>
<tr>
<td>Winch in</td>
<td>Retracts the winch line</td>
</tr>
<tr>
<td>Winch out</td>
<td>Extends the winch line</td>
</tr>
<tr>
<td>Digger dig</td>
<td>Clockwise digger rotation</td>
</tr>
<tr>
<td>Digger clean</td>
<td>Counterclockwise digger rotation</td>
</tr>
<tr>
<td>HOP meter</td>
<td>Controls calibration of the HOP meter</td>
</tr>
<tr>
<td>HOP trip</td>
<td>Sets trip point of the HOP</td>
</tr>
<tr>
<td>ESLP CW</td>
<td>Controls set point of the electronic side load protection in clockwise direction</td>
</tr>
<tr>
<td>ESLP CCW</td>
<td>Controls set point of the electronic side load protection in counterclockwise direction</td>
</tr>
</tbody>
</table>

**Derrick Parameters**

Use the select button to scroll through the control system parameters displayed on the screen and choose the parameter to be adjusted. The value for the parameter that is currently selected flashes on the display. For example, the boom up unit function is selected and the frequency parameter is selected (refer to Figure 9.4). The parameter values are shown under the parameter names. A description of each parameter is listed below.
The TH value for a boom, winch, or digger function must be less than both the LMX value and the MX value for that function.

- **MX** – Max out (from 00 to 99, used in standard speed mode)
The MX setting controls the power level of the signal sent to the control valve when the hand control is operated with standard speed selected. Standard speed is selected by default when using the lower control panel, and is selectable by a switch on the radio remote.

  The MX value determines the maximum speed (minimum cycle time) of a boom function when standard speed is selected and the hand control is fully shifted. The MX value determines the maximum speed of the winch and digger functions when standard speed is selected and the hand control is fully shifted, when not operating any boom functions at the same time as the winch or digger.

  Increase the MX value to increase a function’s standard speed (shorter cycle time), within the limits of the hydraulic flow available. Decrease the MX value to reduce a function’s standard speed (longer cycle time).

  If the MX value is set too high, the valve spool will reach full travel before the hand control is fully shifted, causing a loss of meterability.

  The MX value for a boom, winch, or digger function must be higher than both the LMX value and the TH value for that function.

  The MX parameter is used to calibrate the load indicator gauge (HOP meter), as described in the maintenance manual. The LMX value must then be set to the same value as MX.

- **RA** – Ramp
The RA setting controls the rate of acceleration as function movement starts after the hand control is activated, and the rate of deceleration as function movement stops after the hand control is deactivated.

  Do not change the RA values from the factory settings. If this value is changed, the function will not operate at optimal performance.

- **LMX** – Low speed (from 00 to 99, used in low speed mode and for priority flow)
The LMX setting (also referred to as low max) controls the reduced power level of the signal sent to function movement is started and stopped. If the TH value is set too low, the hand control will require excessive movement before the function starts to move. If the value is set too high, the function may not start and stop smoothly as the hand control is operated near the neutral position.

  The TH value for a boom, winch, or digger function must be less than both the LMX value and the MX value for that function.

- **SC** – Speed curve
The SC setting controls how the power level of the signal sent to the control valve changes in relation to the position of the hand control.

  The SC setting of 00 produces linear control operation, in which the power level of the signal increases or decreases in a linear fashion in proportion to how far the hand control is shifted.

  Do not change the SC values from the factory settings of 00. If this value is not set as specified, the function will not operate at optimal performance.

- **FREQ** – Frequency
FREQ refers to the frequency measured in hertz of the signal output by the above rotation valve driver for the function.

  Do not change the FREQ values from the factory settings. If this value is changed, the function will not operate at optimal performance.

  FREQ refers to the frequency measured in hertz of the signal output by the above rotation valve driver for the function.

**Figure 9.4 — Derrick Parameter Display**

- **FREQ** – Frequency
FREQ refers to the frequency measured in hertz of the signal output by the above rotation valve driver for the function.

  Do not change the FREQ values from the factory settings. If this value is changed, the function will not operate at optimal performance.

  **Figure 9.4 — Derrick Parameter Display**

- **SC** – Speed curve
The SC setting controls how the power level of the signal sent to the control valve changes in relation to the position of the hand control.

  The SC setting of 00 produces linear control operation, in which the power level of the signal increases or decreases in a linear fashion in proportion to how far the hand control is shifted.

  Do not change the SC values from the factory settings of 00. If this value is not set as specified, the function will not operate at optimal performance.

- **TH** – Threshold (from 00 to 99)
The TH setting controls the power level of the signal sent to the control valve when the hand control is shifted slightly out of neutral just to the position where it begins to send a minimum signal level to the control system.

  The TH value controls the metering of the unit function as function movement is started and stopped. If the TH value is set too low, the hand control will require excessive movement before the function starts to move. If the value is set too high, the function may not start and stop smoothly as the hand control is operated near the neutral position.

  The TH value for a boom, winch, or digger function must be less than both the LMX value and the MX value for that function.

- **RA** – Ramp
The RA setting controls the rate of acceleration as function movement starts after the hand control is activated, and the rate of deceleration as function movement stops after the hand control is deactivated.

  Do not change the RA values from the factory settings. If this value is changed, the function will not operate at optimal performance.

- **LMX** – Low speed (from 00 to 99, used in low speed mode and for priority flow)
The LMX setting (also referred to as low max) controls the reduced power level of the signal sent to function movement is started and stopped. If the TH value is set too low, the hand control will require excessive movement before the function starts to move. If the value is set too high, the function may not start and stop smoothly as the hand control is operated near the neutral position.

  The TH value for a boom, winch, or digger function must be less than both the LMX value and the MX value for that function.

  The MX value for a boom, winch, or digger function must be higher than both the LMX value and the TH value for that function.

  The MX parameter is used to calibrate the load indicator gauge (HOP meter), as described in the maintenance manual. The LMX value must then be set to the same value as MX.

  Do not change the SC values from the factory settings of 00. If this value is not set as specified, the function will not operate at optimal performance.

  Increase the MX value to increase a function’s standard speed (shorter cycle time), within the limits of the hydraulic flow available. Decrease the MX value to reduce a function’s standard speed (longer cycle time).

  If the MX value is set too high, the valve spool will reach full travel before the hand control is fully shifted, causing a loss of meterability.

  The MX value for a boom, winch, or digger function must be higher than both the LMX value and the TH value for that function.

  The MX value determines the maximum speed of the winch and digger functions when standard speed is selected and the hand control is fully shifted, when not operating any boom functions at the same time as the winch or digger.

  Increase the MX value to increase a function’s standard speed (shorter cycle time), within the limits of the hydraulic flow available. Decrease the MX value to reduce a function’s standard speed (longer cycle time).

  If the MX value is set too high, the valve spool will reach full travel before the hand control is fully shifted, causing a loss of meterability.

  The MX value for a boom, winch, or digger function must be higher than both the LMX value and the TH value for that function.

  The MX parameter is used to calibrate the load indicator gauge (HOP meter), as described in the maintenance manual. The LMX value must then be set to the same value as MX.

  Increase the MX value to increase a function’s standard speed (shorter cycle time), within the limits of the hydraulic flow available. Decrease the MX value to reduce a function’s standard speed (longer cycle time).

  If the MX value is set too high, the valve spool will reach full travel before the hand control is fully shifted, causing a loss of meterability.

  The MX value for a boom, winch, or digger function must be higher than both the LMX value and the TH value for that function.

  The MX parameter is used to calibrate the load indicator gauge (HOP meter), as described in the maintenance manual. The LMX value must then be set to the same value as MX.
the control valve when the hand control is operated with low speed selected on the radio remote.

The LMX value determines the reduced speed (increased cycle time) of a boom, winch, or digger function when low speed is selected and the hand control is fully shifted.

Increase the LMX value to increase a boom function’s low speed (shorter cycle time). Decrease the LMX value to reduce a boom function’s low speed (longer cycle time).

LMX values are used for winch and digger operation when either of these functions is operated at the same time as a boom function (priority flow).

Increase the LMX value for a winch or digger function to increase the winch or digger speed and decrease the boom function speed when operating winch or digger at the same time as a boom function.

The LMX value for a boom, winch, or digger function must be higher than the TH value and lower than the MX value for that function.

LMX is used to calibrate hydraulic overload protection (HOP) trip and electronic side load protection (ESLP) trip, as described in the maintenance manual.

The LMX value must be set equal to the MX value for HOP meter.

Parameter Values
The parameter value flashes when selected using the select button. Use the up or down value button to change the value of the selected parameter.

When all the parameters are properly set, unplug the CADI from the socket. The settings selected are saved in the above rotation valve driver as soon as they are changed.

Calibration Procedure
The following procedure covers the full calibration of all the boom, winch, and digger functions. If derrick performance indicates that the TH, MX, or LMX parameter of a single function needs calibrating, perform only the appropriate portion of the calibration procedure. If the pulsar has been replaced for a function, the TH, MX, and LMX settings must all be calibrated for that function.

For personnel who are familiar with the detailed calibration procedure contained in this section, a condensed calibration procedure for the boom, winch, and digger functions is provided in the Appendix of this guide (refer to the field CADI settings sheet for the applicable derrick model).

Make a copy of the CADI values sheet (refer to Figure 9.10) or the field CADI settings sheet (refer to the Appendix) to use for recording the current and new parameter settings. Note that the TH, MX, and LMX values shown on the CADI values sheet are approximate preliminary values. These values must be adjusted for all the boom, winch, and digger functions according to the procedure in this section to obtain optimum performance. The HOP, ESLP, and throttle parameter values must be set in accordance with the CADI values sheet (refer to Figure 9.10) or adjusted in accordance with the maintenance manual for proper operation. Do not adjust the parameter values for FREQ, RA, or SC.

If the calibration procedure is performed using the lower control panel on the unit, a second person will be needed to assist during the MX adjustment portion of the procedure. The calibration procedure can be performed by one person using the lower radio remote control, if so equipped.

When the procedure refers to boom functions, this indicates boom up/down, rotation CW/CCW, second (intermediate) extend/retract, and third (upper) extend/retract.

The standard speed and low speed cycle time ranges used for calibrating the MX and LMX values for the boom functions are contained in the maintenance manual and in the unit specific field CADI settings sheet included in the Appendix of this guide.
Setup

1. Position the unit on a level surface in an open area where the booms can be fully extended, raised, and rotated.

2. Remove the cover over the lower control valve on the right side of the turntable (as viewed from the boom tip looking toward the turntable). Identify the type(s) of pulsars installed on the lower control valve. The type of pulsar is identified by the color of the rubber boot where the control wiring enters the pulsar valve. A black boot indicates a standard pulsar. A light gray boot indicates a pressure feedback pulsar. If the pulsars are not all the same type, make note of which function(s) have standard pulsars and which function(s) have pressure feedback pulsars (refer to Figure 9.5).

3. Start the engine, engage the unit’s hydraulic system, and properly set the outriggers.

4. Check the system pressure, and verify that the pump is delivering the correct oil flow, in accordance with the maintenance manual. Make any necessary adjustments.

5. Check the differential pilot pressure in accordance with the maintenance manual. If the control valve has one or more standard pulsars, the proper differential pilot pressure is 155 to 160 psi (10.69 to 11.03 bar). If all of the pulsars in the lower control valve are pressure feedback pulsars, the proper differential pilot pressure is 205 to 215 psi (14.13 to 14.82 bar). Make any necessary adjustment. Leave the turntable cover off after checking the differential pilot pressure.

   **NOTICE**

   Proper differential pilot pressure, measured as the difference between pilot port pressure and return line (tank) pressure, is critical for optimum performance. If the procedure for setting differential pilot pressure is not described in the available unit maintenance manual, contact Altec technical support at 1-877-GO-Altec option 4 for further information.

6. Operate the unit to warm the hydraulic oil to 120 to 130 degrees Fahrenheit (49 to 54 degrees Celsius). This temperature is important for proper threshold calibration.

   **NOTICE**

   If the oil is not warmed to the required temperature range, the CADI settings resulting from the calibration procedures will not be accurate, and poor meterability will result.

   Use an infrared (IR) thermometer to read the temperature of the hydraulic reservoir on or near the end opposite from the return line filter, at a point about $\frac{1}{3}$ of the way above the bottom of the reservoir (refer to Figure 9.6). The oil can be warmed quickly. Unstow the digger. Make sure the booms are fully retracted. With the engine at full rpm, operate digger dig at full

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![Figure 9.5 — Boom Functions Valve](image-url)
speed with tools circuit on. When the oil has reached 120 to 130 degrees Fahrenheit (49 to 54 degrees Celsius), stow the digger and proceed to step 7.

7. Position the boom at an angle between 10 and 30 degrees above horizontal, and rotate it to a position where all the functions can be operated for calibration.

8. Connect the CADI to the CADI connection socket.

9. Put the CADI into calibration mode. Write the current value of the TH, MX, and LMX parameter for each function on the CADI values sheet before making any adjustments.

TH Calibration Procedure

10. Change the TH and MX settings to 00 for the function being calibrated. The value button on the CADI can be held down continuously until the setting reaches 00.

11. Set the low speed/standard switch to standard on the control panel being used. Operate with the engine at full rpm.

12. Operate the hand control and adjust the MX and TH values for the function being calibrated.

   a. Fully shift and hold the hand control, and increase the MX value slowly until the function starts moving.

   b. Release the hand control, and decrease the MX value by three points.

   c. Fully shift and hold the hand control, and check for function movement. If the function is fully stopped, continue to step d. If the function is not fully stopped, go back to step b.

   d. Increase the MX value by one point every five seconds until the function begins to creep, meaning to move at the slowest movement noticeable. For boom up/down, watch the lift cylinder rod for movement. For other functions, compare the moving component to a stationary object.

   e. Release the hand control. Use the MX value determined in the previous step to obtain the required TH setting based on the type of pulsar installed on the function being tested. For a standard pulsar, proceed to step f. For a pressure feedback pulsar, proceed to step g.

   f. For a standard pulsar, reduce the MX value determined in step d by 15 points to obtain the required TH setting. Adjust the TH value to this number. For example, if the function begins to creep at MX = 42 (refer to Figure 9.7), subtract 15, and adjust the TH setting to 27 (refer to Figure 9.8). Proceed to step h.

   g. For a pressure feedback pulsar, reduce the MX value determined in step d by 5 points to obtain the required TH setting. Adjust the TH value to this number. For example, if the function begins to creep at MX = 42 (refer to Figure 9.8), subtract 5, and adjust the TH setting to 37 (refer to Figure 9.9).

   h. Record the final TH setting on the CADI values sheet or the field CADI settings sheet.

   i. Return the MX setting to the value recorded in step 9.
13. Repeat steps 10 through 12 for each direction of each boom, winch, and digger function being calibrated.

**MX Calibration Procedure**

14. If using the radio remote, set the low speed/standard switch to standard. Operate with the engine at full rpm.

15. Fully shift the hand control for the function being calibrated and hold it in this position. Look at the manual override handle on the control valve to see if it is visibly vibrating or fluttering. If movement is not visible, touch the handle to feel for vibration. Adjust the MX value as described in step a, b, or c.

   a. If the manual override handle does visibly vibrate or flutter, increase the MX value by one point every five seconds until the flutter is no longer visible but the handle still vibrates to the touch. Then proceed to step 16.

   b. If the manual override handle does not visibly vibrate or flutter and does not vibrate to the touch, decrease the MX value by one point every five seconds until the vibration can be felt but is still not visible. Then proceed to step 16.

   c. If the manual override handle does not visibly vibrate or flutter but does vibrate to the touch, do not adjust the MX. Proceed to step 16.

16. Press on the manual override handle to try to move it farther in the direction that it is shifted. Adjust the MX value as described in step a or b.

   a. If the handle does not move any farther but stops vibrating to the touch, do not adjust the MX. Release the hand control, and proceed to step 17.

   b. If the handle does move farther, raise the MX value by 1 point and repeat step 16.

17. Time the function with the hand control on the control station fully shifted as specified, according to step a or b.

   a. For a boom function, operate the function for a full cycle while timing it, as described in the maintenance manual. If the cycle time is below the standard speed range, decrease the MX value and retest until the cycle time is within the published range. Record the final MX value and standard speed cycle time on the CADI values sheet or the field CADI settings sheet.

   b. For the winch or digger function, timing of the function is not required. Record the final MX value on the CADI values sheet or the field CADI settings sheet.

18. Repeat steps 15 through 17 for each direction of each function being calibrated.

**LMX Calibration**

19. Calibrate the LMX parameters using the appropriate procedure as indicated in step a or b.

   a. For boom functions, proceed to step 20.

   b. For winch and digger functions, proceed to step 25.

**LMX Calibration Procedure for Boom Functions, Based on Cycle Time**

20. Set the low speed/standard switch to low speed on the radio remote and operate the unit from the radio remote. Operate with the engine at full rpm.

21. Fully shift the hand control for the boom function being calibrated and time it for a full cycle, as described in the maintenance manual. Adjust the LMX value and retest as required until the cycle time is within the low speed range.

22. Record the final LMX value and low speed cycle time on the CADI values sheet or the field CADI settings sheet.

23. Repeat steps 21 and 22 for each direction of each boom function being calibrated.

24. When the LMX parameters for all boom functions have been calibrated, proceed to step 25.
**LMX Calibration Procedure for Winch and Digger Function, Based on Priority Flow**

25. Set the low speed/standard switch to standard on the radio remote and operate the unit from the radio remote. Operate with the engine at full rpm.

26. Adjust the LMX value for winch out so that the winch line speed matches the boom speed when operating intermediate or upper boom extend and winch lower at the same time at full hand control travel. Record the final LMX value on the CADI values sheet or the field CADI settings sheet.

27. Adjust the LMX value for winch in so that the winch line speed matches the boom speed when operating intermediate or upper boom retract and winch raise at the same time at full hand control travel. Record the final LMX value on the CADI values sheet or the field CADI settings sheet.

28. Adjust the LMX value for digger dig so that the boom moves down slowly when operating boom lower and digger dig at the same time at full hand control travel. Record the final LMX value on the CADI values sheet or the field CADI settings sheet.

29. Adjust the LMX value for digger clean so that the boom moves up slowly when operating boom raise and digger clean at the same time at full hand control travel. Record the final LMX value on the CADI values sheet or the field CADI settings sheet.
<table>
<thead>
<tr>
<th>Function</th>
<th>Frequency (FREQ)</th>
<th>Speed Curve (SC)</th>
<th>Threshold (TH)</th>
<th>Max Out (MX)</th>
<th>Ramp (RA)</th>
<th>Low Speed (LMX)</th>
<th>Cycle Times (Seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>R track fwd</td>
<td>0075^1</td>
<td>00^1</td>
<td>50^1</td>
<td>—</td>
<td>99^1</td>
<td>99^1</td>
<td>—</td>
</tr>
<tr>
<td>R track rev</td>
<td>0075^1</td>
<td>00^1</td>
<td>50^1</td>
<td>—</td>
<td>99^1</td>
<td>99^1</td>
<td>—</td>
</tr>
<tr>
<td>L track fwd</td>
<td>0075^1</td>
<td>00^1</td>
<td>50^1</td>
<td>—</td>
<td>99^1</td>
<td>99^1</td>
<td>—</td>
</tr>
<tr>
<td>L track rev</td>
<td>0075^1</td>
<td>00^1</td>
<td>50^1</td>
<td>—</td>
<td>99^1</td>
<td>99^1</td>
<td>—</td>
</tr>
<tr>
<td>Boom up</td>
<td>0075^1</td>
<td>00^1</td>
<td>25^3</td>
<td>/</td>
<td>89^3</td>
<td>99^1</td>
<td>60^3</td>
</tr>
<tr>
<td>Boom down</td>
<td>—</td>
<td>—</td>
<td>25^3</td>
<td>/</td>
<td>89^3</td>
<td>99^1</td>
<td>60^3</td>
</tr>
<tr>
<td>Rotation CW</td>
<td>0075^1</td>
<td>00^1</td>
<td>25^3</td>
<td>/</td>
<td>89^3</td>
<td>99^1</td>
<td>60^3</td>
</tr>
<tr>
<td>Rotation CCW</td>
<td>—</td>
<td>—</td>
<td>25^3</td>
<td>/</td>
<td>89^3</td>
<td>99^1</td>
<td>60^3</td>
</tr>
<tr>
<td>2nd (intern) extend</td>
<td>0075^1</td>
<td>00^1</td>
<td>30^3</td>
<td>/</td>
<td>99^3</td>
<td>99^1</td>
<td>60^3</td>
</tr>
<tr>
<td>2nd (intern) retract</td>
<td>—</td>
<td>—</td>
<td>30^3</td>
<td>/</td>
<td>99^3</td>
<td>99^1</td>
<td>60^3</td>
</tr>
<tr>
<td>3rd (upper) extend</td>
<td>0075^1</td>
<td>00^1</td>
<td>30^3</td>
<td>/</td>
<td>99^3</td>
<td>99^1</td>
<td>60^3</td>
</tr>
<tr>
<td>3rd (upper) retract</td>
<td>—</td>
<td>—</td>
<td>30^3</td>
<td>/</td>
<td>99^3</td>
<td>99^1</td>
<td>60^3</td>
</tr>
<tr>
<td>Winch in</td>
<td>0075^1</td>
<td>00^1</td>
<td>30^3</td>
<td>/</td>
<td>89^3</td>
<td>99^1</td>
<td>60^3</td>
</tr>
<tr>
<td>Winch out</td>
<td>—</td>
<td>—</td>
<td>30^3</td>
<td>/</td>
<td>89^3</td>
<td>99^1</td>
<td>60^3</td>
</tr>
<tr>
<td>Digger dig</td>
<td>0075^1</td>
<td>00^1</td>
<td>30^3</td>
<td>/</td>
<td>89^3</td>
<td>99^1</td>
<td>75^3</td>
</tr>
<tr>
<td>Digger clean</td>
<td>—</td>
<td>—</td>
<td>30^3</td>
<td>/</td>
<td>89^3</td>
<td>99^1</td>
<td>75^3</td>
</tr>
<tr>
<td>HOP meter</td>
<td>0392^1</td>
<td>00^1</td>
<td>00^1</td>
<td>—</td>
<td>86^4</td>
<td>05^2/99^2</td>
<td>86^4</td>
</tr>
<tr>
<td>HOP trip</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>70^6</td>
<td>—</td>
</tr>
<tr>
<td>ESLP CW</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>05^6</td>
<td>—</td>
</tr>
<tr>
<td>ESLP CCW</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>05^6</td>
<td>—</td>
</tr>
</tbody>
</table>

1 Factory setting. Do not change from value shown.
2 Factory setting is 99 for valve drivers built in 2012 and earlier, and 05 for valve drivers built in 2013 and later. Do not change from factory setting.
3 Preliminary setting only. Unit must be calibrated as described under Calibration Procedure in this guide for optimum performance.
4 Preliminary setting only. Refer to Load Indicator Gauge in the maintenance manual for calibration procedure. Set LMX to same value as MX.
5 Preliminary setting only. Refer to Hydraulic Overload Protection (HOP) in the maintenance manual for calibration procedure.
6 Preliminary setting only. Refer to Electronic Side Load Protection in the maintenance manual for calibration procedure.

Figure 9.10 — CADI Values Sheet for DB37
There are two CADI connections on the AT248F.

- On the top of the upper control panel (refer to Figure 10.1).
- On the bottom of the lower control panel (refer to Figure 10.2).

Aerial Device Functions

With the CADI in calibration mode, use the left and right menu buttons to scroll through the programmable function screens and select the desired unit function to be adjusted (refer to Figure 10.3). The function is shown on the display. Functions that can be adjusted are shown in Figure 10.4.

<table>
<thead>
<tr>
<th>Function</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boom up</td>
<td>Raises the boom</td>
</tr>
<tr>
<td>Boom down</td>
<td>Lowers the boom</td>
</tr>
<tr>
<td>CW</td>
<td>Clockwise rotation</td>
</tr>
<tr>
<td>CCW</td>
<td>Counterclockwise rotation</td>
</tr>
<tr>
<td>Extend</td>
<td>Extends the boom out</td>
</tr>
<tr>
<td>Retract</td>
<td>Retracts the boom in</td>
</tr>
<tr>
<td>Elevator up</td>
<td>Brings the arm up</td>
</tr>
<tr>
<td>Elevator down</td>
<td>Brings the arm down</td>
</tr>
</tbody>
</table>

AT248F Parameters

Use the select button to scroll through the control system parameters displayed on the screen and choose the parameter to be adjusted. The value for the parameter that is currently selected flashes on the display. For example, the boom up unit function is selected and the Frequency parameter is selected (refer to Figure 10.5). The parameter values are shown under the parameter names. A description of each parameter is listed below.
• **FREQ** – Frequency
  FREQ refers to the frequency measured in hertz of the signal output by the above rotation valve driver for the function.

  Do not change the FREQ values from the factory settings. If this value is changed, the function will not operate at optimal performance. Refer to the Maintenance Manual for the correct frequency setting.

• **SC** – Speed curve (from 00 to 03)
  The SC setting controls how the power level of the signal sent to the control valve changes in relation to the position of the hand control.

  The SC setting of 00 produces linear control operation, in which the power level of the signal increases or decreases in a linear fashion in proportion to how far the hand control is shifted.

  Do not change the SC values from the factory settings of 00 except as directed to temporarily in the calibration procedure. If this value is not set as specified, the function will not operate at optimal performance.

  For use during the calibration procedure, the SC setting of 03 selects a two-speed calibration curve that is used to calibrate the TH and MX parameters. This calibration curve sends a constant power signal to the control valve that is equivalent to the corresponding TH value for the function when the hand control is positioned between 10 and 80 percent of total travel, and equivalent to the corresponding MX value for the function when the hand control is shifted beyond 80 percent of total travel. The SC value is adjusted on the calibration screen for the first direction of a function pair, and applies to both function directions. For example, the SC setting for boom up also applies to boom down. The SC setting must be returned to 00 after completing the calibration procedure for both directions of a function.

• **TH** – Threshold (from 0 to 99)
  The TH setting controls the power level of the signal sent to the control valve when the hand control is shifted slightly out of neutral just to the position where it begins to send a minimum signal level to the control system.

  The TH value controls the metering of the unit function as function movement is started and stopped. If the TH value is set too low, the hand control will require excessive movement before the function starts to move. If the value is set too high, the function may not start and stop smoothly as the hand control is operated near the neutral position.

  The TH value for a function must be less than both the LMX value and the MX value for that function.

• **MX** – Max out (from 00 to 99, used in high speed mode)
  The MX setting controls the power level of the signal sent to the control valve when the hand control is operated with high speed (rabbit mode) selected at the upper controls.

  The MX value determines the maximum speed (minimum cycle time) of a function operated from upper controls when high speed is selected and the hand control is fully shifted.

  Increase the MX value to increase a function’s high speed (shorter cycle time), within the limits of the hydraulic flow available. Decrease the MX value to reduce a function’s high speed (longer cycle time).

  Do not set the MX value higher than the value required to achieve the correct cycle time. If the MX value is set too high, the valve spool will reach full travel before the hand.

  The MX value for a function must be higher than both the LMX value and the TH value for that function.
• RA – Ramp (from 00 to 99)
  The RA setting controls either the rate of acceleration into a function or the rate of deceleration out of a function. For units equipped with valve drivers with ramp in functionality, the RA setting controls the rate of change from threshold to the requested value (as function movement starts after a control is activated). It also controls the rate of change from any current movement to a request with greater movement speed. For units equipped with valve drivers with ramp in functionality, the rate of deceleration is controlled by a nonadjustable setting within the valve driver. For units equipped with valve drivers with ramp out functionality, the RA setting controls the rate of change from any current movement speed to a request with lower speed. The interlock input must remain engaged for a function to ramp out (decelerate). For units equipped with valve drivers with ramp out functionality, the rate of acceleration is controlled by a nonadjustable setting within the valve driver.

Do not change the RA values from the factory settings except as directed to temporarily do so in the calibration procedure. If this value is not set as specified, the function will not operate at optimal performance.

• LMX – Low speed (from 00 to 99, used in low speed mode and for lower controls)
  The LMX setting (also referred to as low max) controls the reduced power level of the signal sent to the control valve when the hand control is operated with low speed (turtle mode) selected at the upper controls.

  The LMX value determines the reduced speed (increased cycle time) of a function operated from upper controls when low speed is selected and the hand control is fully shifted.

Do not change the LMX values for upper control functions from the factory settings of 65.

  A separate LMX parameter is used to determine the reduced speed of a function when operated from lower controls.

Do not change the LMX values for lower control functions from the factory settings of 70.

Parameter Values
  The parameter value flashes when selected using the select button. Use the up or down value button to change the value of the selected parameter.

When all the parameters are properly set, unplug the CADI from the socket. The settings are saved in the above rotation valve driver as soon as they are changed.

Calibration Procedure

1. Remove the plastic cover over the main control valve and identify the type of pilot valve used on the main control valve. There are three types of pilot valves that could be used on the unit: Thomas Magnetes, standard pulsars, and pressure feedback pulsars (refer to Figure 10.6). The standard pulsar and pressure feedback pulsar can be identified by the color of the rubber boot where the control wires enter the pulsar valves. The color of the boot will either be light gray or black. A black boot indicates a standard pulsar. A light gray boot indicates a pressure feedback pulsar (refer to Figure 10.9). Thomas Magnetes do not have a rubber boot and are encased in a painted metal housing with an integrated Deutsch connector that the main valve harness plugs into (refer to Figure 10.10).

2. Make a copy of the CADI values sheet (refer to Figure 10.9 or 10.10) to use for recording the current and new parameter settings. Note that the TH and MX values shown on the CADI values sheet are approximate preliminary values. These values must be adjusted for the all the functions according to the procedure in this section to obtain optimum performance.
3. Position the unit on a level surface that will allow for boom raise, extension, rotation, and arm raise. Apply the parking brake and chock the wheels.

4. Start the vehicle engine and move the PTO on/off switch to the On position. Switch the station selector switch at the lower control station to the Upper position. Set the high speed/low speed switch to high speed (rabbit mode) at the upper controls.

5. Get in the platform and properly secure the personal fall protection system to the lanyard anchor. Raise and rotate the lower boom until it is clear of any objects that might obstruct boom movement.

6. Operate all main boom functions 10 complete cycles or more. Then verify that the hydraulic oil temperature is at the proper operating temperature (between 100 and 120 degrees Fahrenheit) before making any CADI adjustments. If the valve uses standard pulsars or pressure feedback pulsars proceed to step 7. If the valve uses Thomas Magnetes proceed to step 8.

7. Bleed the air out of the top bonnets on all seven spools on the main control valve. Back each plug out with an Allen wrench while engaging the dump valve. The dump valve can be engaged by holding a function over relief. While engaging the dump valve, back each of the seven plugs out (one at a time) until a small amount of hydraulic oil escapes by the plug (refer to Figure 10.8). A shop towel or rag can be placed around the plug to capture the majority of the spilled hydraulic oil. Be careful not to back the plugs out too far so that an open path is created for the pilot pressure to escape.

8. Connect the CADI to the CADI connection socket at the upper controls.

9. Record the current TH and MX settings on the CADI values sheet (refer to Figure 10.9 or 10.10).

10. Set the RA value to the value listed in Figure 10.9 or 10.10 for each upper control function (refer to step 1).

11. Select the pair of upper control functions to be adjusted (boom up/down, CW/CCW, extend/retract, or elevator up/down). A pair of functions need to be calibrated together, since the first function within each pair contains the SC for both functions within the pair. For example, the SC can be adjusted only on the boom up screen, as there is no SC selection for boom down.

12. Change the SC value to 03 for the first function within the pair being adjusted. The SC setting of 03 provides a constant power signal equivalent to the corresponding TH value to the actuator when the hand control is engaged between approximately 10 to 80 percent of the total hand control movement. The SC adjustment will apply to both sides of the pair of functions selected.

**Figure 10.7 — Turntable**

**WARNING**

Death or serious injury can result from hydraulic oil being injected into the flesh.

Seek immediate medical attention if injured by escaping hydraulic oil. Serious infection or reaction can result if medical treatment is not given immediately.

Spilled hydraulic oil creates slick surfaces and can cause personnel to slip and/or fall. Keep the unit and work areas clean.

**CAUTION**

Injury can result from airborne particles entering the eyes. Wear appropriate safety equipment.
13. Engage the interlock trigger and move the hand control into position for the desired function being calibrated throughout this step. Be careful not to exceed 80 percent of the hand control’s total travel. Exceeding 80 percent of the total hand control travel will provide a constant power signal equivalent to the corresponding MX value. If the function begins to move as soon as the handle is engaged into the function, lower the TH value until all motion is stopped. Raise the value for the TH setting 1 point every 5 seconds until the function begins to creep [less than 1” (2.54 cm) of platform movement per second]. Reduce this TH value according to the type of pilot valve used on the unit. For units with standard pulsars, proceed to step 14. For units with pressure feedback pulsars, proceed to step 15. For units with Thomas Magnetes, proceed to step 16.

14. For a standard pulsar, reduce this TH value by 20 points to finalize the TH setting (refer to Figure 10.9). Proceed to step 17.

15. For a pressure feedback pulsar, reduce this TH value by five points to finalize the TH setting (refer to Figure 10.9).

16. For Thomas Magnetes, reduce this TH value by two points to finalize the TH setting (refer to Figure 10.10).

17. Switch the calibration unit function selection to the opposite function within the pair being adjusted. Repeat step 13 for the opposite function.

18. Repeat steps 10 through 17 for the remaining upper control functions.
19. Reset the SC value to 00 for all upper control functions. If SC is not reset to 00, neither function within the pair will operate correctly.

20. Once the TH values are properly set, check the cycle times of the aerial device. Allow room for full boom movement. Engage the interlock trigger and quickly move the hand control to the full travel position in the direction required for the function selected. Time the function for full stroke travel.

21. If the cycle times do not fall within the boundaries of the specified cycle times (refer to Figure 10.9), make the following adjustments. If the cycle time achieved is faster than the minimum cycle time for any specific function, select the MX parameter on the CADI for the appropriate function. Reduce the MX setting until the function’s movement starts to slow down. Incrementally decrease the MX setting until the proper cycle time is achieved. If the cycle time achieved is slower than the maximum cycle time for the function, increase the MX setting until the proper cycle time is achieved. If the MX setting cannot be utilized to achieve the proper cycle time, the spool stop may need to be adjusted to achieve faster cycle times. Refer to Main Control Valve in the maintenance manual for information regarding how to adjust the spool stops and then repeat this procedure.

22. Record the final MX value for each upper control function (refer to Figure 10.9 or 10.10).

23. Verify that the LMX value is 65 for each upper control function, and adjust it if necessary.

24. Verify that the LMX value is 70 for each lower control function, and adjust it if necessary.
There are two CADI connection locations on the T40P.

- On the bottom of the upper control panel (refer to Figure 11.1)

- On the top of the lower control panel (refer to Figure 11.2)

Aerial Device Functions

With the CADI in calibration mode, use the left and right menu buttons to scroll through the programmable function screens and select the desired unit function to be adjusted (refer to Figure 11.3). The function is shown on the display. Aerial device functions that can be adjusted are shown in Figure 11.4.
<table>
<thead>
<tr>
<th>Function</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boom up</td>
<td>Raises the boom</td>
</tr>
<tr>
<td>Boom down</td>
<td>Lowers the boom</td>
</tr>
<tr>
<td>CW</td>
<td>Clockwise rotation</td>
</tr>
<tr>
<td>CCW</td>
<td>Counterclockwise rotation</td>
</tr>
<tr>
<td>Extend</td>
<td>Extends the boom out</td>
</tr>
<tr>
<td>Retract</td>
<td>Retracts the boom in</td>
</tr>
<tr>
<td>Reel in/out</td>
<td>Pays reel driver motor in and out</td>
</tr>
<tr>
<td>Front brake</td>
<td>Brake power for strand carrier brakes</td>
</tr>
<tr>
<td>Rear brake</td>
<td>Brake power for reel lifter brakes</td>
</tr>
<tr>
<td>Capstan</td>
<td>Pays capstan motor in and out</td>
</tr>
<tr>
<td>Reel raise</td>
<td>Raises the reel lifter</td>
</tr>
<tr>
<td>Reel lower</td>
<td>Lowers the reel lifter</td>
</tr>
</tbody>
</table>

**Figure 11.4 — CADI Adjustable Functions**

**T40P Parameters**

Use the select button to scroll through the control system parameters displayed on the screen, and choose the parameter to be adjusted. The value for the parameter that is currently selected flashes on the display. For example, the boom up unit function is selected and the frequency parameter is selected (refer to Figure 11.5). The parameter values are shown under the parameter names. A description of each parameter is listed below.

- **FREQ** – Frequency
  
  FREQ refers to the frequency measured in hertz of the signal output by the applicable valve driver for the function.

  Do not change the FREQ values from the factory settings. If this value is changed, the function will not operate at optimal performance.

- **SC** – Speed curve (from 00 to 03)
  
  The SC setting controls how the power level of the signal sent to the control valve changes in relation to the position of the control.

  The SC setting of 00 produces linear control operation in which the power level of the signal increases or decreases in a linear fashion in proportion to how far the control is shifted.

  Do not change the SC values from the factory settings of 00 except as directed to temporarily do so in the calibration procedure. If this value is not set as specified, the function will not operate at optimal performance.

  For use during the calibration procedure, the SC setting of 03 selects a two-speed calibration curve that is used to calibrate the TH and MX parameters. This calibration curve sends a constant power signal to the control valve that is equivalent to the corresponding TH value for the function when the control is positioned between 10 and 80 percent of total travel, and equivalent to the corresponding MX value for the function when the control is shifted beyond 80 percent of total travel. The SC value is adjusted on the calibration screen for the first direction of a function pair and applies to both function directions. For example, the SC setting for boom up also applies to boom down. The SC setting must be returned to 00 after completing the calibration procedure for both directions of a function.

- **TH** – Threshold (from 00 to 99)
  
  The TH setting controls the power level of the signal sent to the control valve when the applicable control is shifted slightly out of neutral just to the position where it begins to send a minimum signal level to the control system.

  The TH value controls the metering of the unit function as function movement is started and stopped. If the TH value is set too low, the control will require excessive movement before the function starts to move. If the value is set too high, the function may not start and stop smoothly as the control is operated near the neutral position.

  The TH value for a function must be less than both the LMX value and the MX value for that function.

- **MX** – Max out (from 00 to 99, used for upper controls)
  
  The MX setting controls the maximum power level of the signal sent to the control valve when the control is fully shifted.
The MX value determines the maximum speed (minimum cycle time) of a function operated from the applicable control station when the control is fully shifted.

Increase the MX value to increase a function's control speed (shorter cycle time) within the limits of the hydraulic flow available. Decrease the MX value to reduce a function's control speed (longer cycle time).

Do not set the MX value higher than the value required to achieve the correct cycle time. If the MX value is set too high, the valve spool will reach full travel before the hand control is fully shifted, causing a loss of meterability.

The MX value for a function must be higher than the TH value for that function. Increasing the MX above 90 will not typically affect the speed of the function. The spools will normally be fully engaged (full flow) with an MX setting of 90 or below.

- RA – Ramp
  The RA setting controls the rate of acceleration as function movement starts after the control is activated. The RA setting does not control the rate of deceleration as function movement stops after the control is deactivated. This is controlled by a nonadjustable setting within the valve driver.

Do not change the RA values from the factory settings. If this value is not set as specified, the function will not operate at optimal performance.

- LMX – Low speed (from 00 to 99, used in low speed mode at lower controls)
  The LMX setting (also referred to as low max) controls the reduced power level of the signal sent to the control valve when the lower control is operated with low speed selected at the lower control station. The LMX setting only applies to boom raise, boom lower, extend, retract, rotate CW, and rotate CCW.

  Increase the LMX value to increase a function’s low speed (shorter cycle time). Decrease the LMX value to reduce a function’s low speed (longer cycle time).

  The LMX value for the boom functions (boom raise, boom lower, extend, retract, CW, and CCW) must be higher than the TH value and lower than the MX value for that function.

**Parameter Values**

The parameter value flashes when selected using the select button. Use the up or down value button to change the value of the selected parameter.

When all the parameters are properly set, unplug the CADI from the socket. The settings selected are saved in the above rotation valve driver as soon as they are changed.

**Calibration Procedure**

1. Make a copy of the CADI values sheet (refer to Figure 11.6) to use for recording the current and new parameter settings. The TH, MX, and LMX values shown on the CADI values sheet are approximate preliminary values. These values must be adjusted for all the functions according to the procedure in this section to obtain optimum performance.

2. Record the current TH, MX, and LMX settings on the CADI values sheet (refer to Figure 11.6).

3. Position the unit on a level surface that will allow for boom raise, extension, rotation, and reel lifter lower. Apply the parking brake, and chock the wheels.

4. Start the vehicle engine, and move the cab controls’ unit on/off switch to the On position.

5. Cycle the following below rotation functions from the lower control station: reel lifter raise, reel lifter lower, reel driver pay in, reel driver pay out, capstan pay in, and capstan pay out. Cycle the reel lifter functions for 10 complete cycles or more. Cycle the reel driver and capstan for three minutes or more in each direction. Turn both the front and rear brakes on for three minutes or more.

6. From the lower controls, move the platform to an accessible position, and move the station selector switch at the lower controls to the Upper Controls position.

7. Enter the platform, and properly secure the personal fall protection system to the lanyard anchor. Raise and rotate the lower boom until it is clear of any objects that might obstruct boom movement.

8. Completely cycle all main boom functions until the hydraulic oil temperature is at the proper operating temperature [above 100 degrees Fahrenheit (38 degrees Celsius)] before making any CADI adjustments.

**Upper Control Functions**

9. Connect the CADI to the CADI connection socket at the upper controls.

10. Set the RA value to the value listed in Figure 11.6 for each boom function.
11. Select the pair of upper control functions to be adjusted (boom up/down, CW/CCW, or extend/retract). A pair of functions needs to be calibrated together since the first function within each pair contains the SC (speed curve) for both functions within the pair. For example, the SC can be adjusted only on the boom up screen as there is no SC selection for boom down.

12. Change the SC value to 03 for the first function within the pair being adjusted. The SC setting of 03 provides a constant power signal equivalent to the corresponding MX (max out) value. If the function begins to move as soon as the control is engaged into the function, lower the TH value until all motion is stopped. Raise the value for the TH setting 1 point every 5 seconds until the function begins to creep [less than 1” (2.54 cm) of platform movement per second]. Reduce this TH value by five points to finalize the TH setting.

13. Squeeze the interlock trigger, and move the control into position for the desired function being calibrated throughout this step. Do not exceed 80 percent of the control’s total travel. Exceeding 80 percent of the total travel will provide a constant power signal equivalent to the corresponding MX (max out) value. If the function begins to move as soon as the control is engaged into the function, lower the TH value until all motion is stopped. Raise the value for the TH setting 1 point every 5 seconds until the function begins to creep [less than 1” (2.54 cm) of platform movement per second]. Reduce this TH value by five points to finalize the TH setting.

14. Switch the calibration unit function selection to the opposite function within the pair being adjusted. Repeat step 13 for the opposite function.

15. Repeat steps 10 through 14 for the remaining boom functions. Record the final TH value for each upper control function (refer to Figure 11.6).

16. Reset the SC value to 00 for all the boom functions. If SC is not reset to 00, neither function within the pair will operate correctly.

17. Once the TH values are properly set for the boom functions, check the cycle times of the aerial device.

---

**Figure 11.6 — CADI Values Sheet for T40P**

<table>
<thead>
<tr>
<th>Function</th>
<th>Frequency (FREQ)</th>
<th>Speed Curve (SC)</th>
<th>Threshold (TH)</th>
<th>Max Out (MX)</th>
<th>Ramp (RA)</th>
<th>Low Speed (LMX)</th>
<th>Cycle Times (Seconds)</th>
<th>Specification</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boom up</td>
<td>0075</td>
<td>00²</td>
<td>40</td>
<td>80</td>
<td>02</td>
<td>60²</td>
<td>60²</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boom down</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotate CW</td>
<td>0075</td>
<td>00²</td>
<td>40</td>
<td>80</td>
<td>02</td>
<td>60²</td>
<td>60²</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotate CCW</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extend</td>
<td>0075</td>
<td>00²</td>
<td>40</td>
<td>80</td>
<td>04</td>
<td>60²</td>
<td>60²</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retract</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Front brake</td>
<td>0392</td>
<td>00²</td>
<td>20</td>
<td>50</td>
<td>99</td>
<td>0⁶</td>
<td>0⁶</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rear brake</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reel raise</td>
<td>0075</td>
<td>00²</td>
<td>40</td>
<td>80</td>
<td>03</td>
<td>0⁶</td>
<td>0⁶</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reel lower</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>0⁶</td>
<td>0⁶</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reel in/out</td>
<td>0075</td>
<td>00²</td>
<td>20</td>
<td>70</td>
<td>02</td>
<td>0⁶</td>
<td>0⁶</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capstan</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Factory setting. Do not change from value shown.
2. Factory setting. Do not change from value shown except for temporary adjustment as specified under Calibration Procedure in this guide.
3. The values shown for TH and MX are approximate preliminary values only. Adjust these values as required for proper performance during the calibration procedure.
4. Factory setting. It is recommended to not change the ramp value from the factory setting. However, the ramp values can be changed to optimize performance on an as needed basis.
5. The values for LMX are approximate preliminary values only. Set the LMX as described under Calibration Procedure in this guide for optimum performance. The LMX values should be individually set as LMX = (MX + TH)/2. For example, if boom up TH = 42 and MX = 74, the following formula would calculate the LMX for boom up: LMX = (42 + 74)/2 = 58.
6. The LMX values are not used for these functions. Do not change the LMX values from the factory settings of 0.
7. Refer to the maintenance manual to set the cycle times using the MX settings.
Allow room for full boom movement. Engage the interlock trigger, and quickly move the control to the full travel position in the direction required for the function selected. Time the function for full stroke travel.

18. If the cycle times do not fall within the boundaries of the specified cycle times (refer to the maintenance manual), make the following adjustments.

a. If the cycle time achieved is faster than the minimum cycle time for any specific function, select the MX parameter on the CADI for the appropriate function. Reduce the MX setting until the function’s movement starts to slow down. Incrementally decrease the MX setting until the proper cycle time is achieved.

b. If the cycle time achieved is slower than the maximum cycle time for the function, increase the MX setting until the proper cycle time is achieved. Increasing the MX above 90 will not typically affect the speed of the function. The spools will normally be fully engaged with a MX setting of 90 or below.

c. If the MX setting cannot be used to achieve the proper cycle time, the spool stop may need to be adjusted to achieve faster cycle times. Refer to Aerial Control Valve in the maintenance manual for information regarding how to adjust the spool stops and then repeat this procedure.

19. Record the final MX value for each upper control function (refer to Figure 11.6).

20. Set the LMX value for each of the boom functions half way between the corresponding TH and MX settings. For example, if the boom up TH setting is 48 and the boom up MX setting is 80, the LMX would need to be set at 64 [(48 + 80)/2 = 64]. Set the LMX for each boom function: boom up, boom down, CW, CCW, extend, and retract. Record the final LMX value for each upper control function (refer to Figure 11.6).

Below Rotation Functions (Not Including Brakes)

21. Move to the lower control station. Connect the CADI to the CADI connection socket at the lower controls.

22. Set the RA value to the value listed in Figure 11.6 for each below rotation function: reel in/out, capstan, and reel raise/lower.

23. Select the pair of below rotation functions to be adjusted: reel driver pay in/out, capstan pay in/out, or reel lifter raise/lower. A pair of functions should be calibrated together. The screen for the reel raise function will have the SC and FREQ setting for the reel raise and reel lower pair of functions. Both the reel driver pay in/out and capstan pay in/out pairs of functions only have one calibration page for each corresponding pair of functions. The calibration procedure will be repeated for each function within the pair for the capstan and reel driver, and the procedure will direct how to finalize the corresponding values.

24. Change the SC value to 03 for the reel raise, capstan, and reel driver screens. The SC setting of 03 provides a constant power signal equivalent to the corresponding TH value to the actuator when the controller is engaged between approximately 10 and 80 percent of the total control movement. The SC adjustment will apply to both sides of the pair of functions selected.

25. Move the control into position for the desired function being calibrated throughout this step. The green master control switch must be engaged and held for the reel lifter and reel driver functions. Do not exceed 80 percent of the control total travel. Exceeding 80 percent of the total control travel will provide a constant power signal equivalent to the corresponding MX value. If the function begins to move as soon as the control is engaged into the function, lower the TH value until all motion is stopped. Raise the value for the TH setting 1 point every 5 seconds until the function begins to creep [less than 1” (2.54 cm) of reel lifter or 2 degrees of rotational movement per second]. If programming reel raise or reel lower, reduce this TH value by 5 points to finalize the TH and proceed to step 26. If programming the capstan or reel driver, note the TH value that produced movement in this step and proceed to step 27.

26. If programming reel raise or reel lower, switch the calibration function selection to the opposite function being adjusted. Repeat step 25 for the opposite function.

27. Repeat step 25 for the opposite function. Reduce the TH value by five points from the lower of the two TH values.

28. Repeat steps 22 through 27 for the remaining below rotation functions. Record the final TH value for each below rotation control function (refer to Figure 11.6).

29. Reset the SC value to 00 for all the below rotation functions. If SC is not reset to 00, neither function within the pair will operate correctly.
30. Once the TH values are properly set for the below rotation functions, set the MX for the reel driver and capstan functions to 70.

31. Check the cycle times of the below rotation functions. Allow room for full reel lifter movement. Quickly move the control to the full travel position in the direction required for the function selected. Time the function for full stroke travel for the reel lifter functions or for one minute to determine the rpm for the rotary functions.

32. If the cycle times do not fall within the boundaries of the specified cycle times (refer to maintenance manual), make the following adjustments.
   a. If the cycle time achieved is faster than the minimum cycle time for any specific function, select the MX parameter on the CADI for the appropriate function. Reduce the MX setting until the function’s movement starts to slow down. Incrementally decrease the MX setting until the proper cycle time is achieved.
   b. If the cycle time achieved is slower than the maximum cycle time for the function, increase the MX setting until the proper cycle time is achieved. Increasing the MX above 90 will not typically affect function speed. The spools will normally be fully engaged with a MX setting of 90 or below.
   c. If the MX setting cannot be used to achieve the proper cycle time, the spool stop may need to be adjusted to achieve faster cycle times. Refer to Below Rotation Control Valve in the maintenance manual for information regarding how to adjust the spool stops, and then repeat this procedure.

33. Record the final MX value for each below rotation function (refer to Figure 11.6).

Brakes
34. Leave the CADI connected to the lower control station. Move to the cab control station.

35. Turn on the brakes at the cab controls.

36. Bleed any air in the brake caliper (refer to the maintenance manual).

37. Remove the cover from the rear of the pedestal.

38. Turn off the brakes at the cab controls. Connect a 3,000 psi (206.84 bar) pressure gauge to the applicable quick disconnect located at the brake manifold valve in the pedestal (refer to Figure 11.7). Connect to RDG if calibrating the reel brakes. Connect to SDG if calibrating the strand brakes.

Figure 11.7 — Strand and Reel Brake View

39. Read the pressure on the pressure gauge. This is the nominal tank pressure reading. Remember the value of this pressure reading as it will be used as a baseline for setting the correct brake pressures later in this procedure.

40. Turn on the brakes at the cab controls. Set both brake adjustment knobs to 0 on the cab control. Select the brake system on the CADI that will be calibrated.

41. Test the threshold setting of the applicable brake.
   a. While observing the pressure gauge, slowly turn the applicable brake adjustment knob clockwise to increase the pressure applied to the brake caliper. At approximately the 5 to 10 position as indicated at the cab controls, the applicable brake control system should turn on, and the pressure gauge should read between 10 to 50 psi (0.69 to 3.45 bar) higher than the brake pressure noted in step 39. If the appropriate change in pressure is observed on the pressure gauge, no further testing of the threshold is required. If there is an abrupt change in pressure [more than 50 psi (3.45 bar) increase], the TH value needs to be lowered. If the brake adjustment is turned past the 10 setting before an increase in brake pressure is noted, the TH value needs to be raised.
   b. While observing the pressure gauge, turn the applicable brake control back and forth from the 0 to 10 setting as indicated at the cab controls. Use the value keys on the CADI to adjust the threshold value up or down to obtain a smooth increase in pressure [10 to 50 psi (0.69 to 3.45 bar)] in relation
to the pressure noted in step 39 from the 0 to 10 position. Leave the TH value at this setting.

42. Test the MX setting of the applicable brake.

   a. Set the applicable brake adjustment knob to the 100 position.

   b. While observing the pressure gauge, change the MX setting on the applicable brake MX value until the appropriate pressure is read on the gauge. For the reel brake, the desired pressure is 500 to 600 psi (34.47 to 41.37 bar). For the strand brakes, the desired pressure is 550 to 650 psi (37.92 to 44.82 bar). Raising the MX value should raise the pressure on the pressure gauge, and lowering the MX value should lower the pressure. Leave the MX setting at the applicable value once the correct pressure has been achieved.

43. Repeat steps 38 through 42 for the other brake function. Record the final TH and MX values for each brake function (refer to Figure 11.6).

44. If applicable, set the pressure limiters for the tow line winch, hydraulic tool circuit, and reel drive motor by following the procedure in the maintenance manual.
The CADI connection for the TDA58 is located under the lower control panel (refer to Figure 12.1).

**Figure 12.1 — CADI Connection Socket**

**Functions**

With the CADI in calibration mode, use the left and right menu buttons to scroll through the programmable function screens and select the desired unit function to be adjusted (refer to Figure 12.2). The function is shown on the display. Functions that can be adjusted are shown in Figure 12.3.

**Figure 12.2 — Function**

<table>
<thead>
<tr>
<th>Function</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>L track fwd</td>
<td>Left track forward</td>
</tr>
<tr>
<td>L track rev</td>
<td>Left track reverse</td>
</tr>
<tr>
<td>R track fwd</td>
<td>Right track forward</td>
</tr>
<tr>
<td>R track rev</td>
<td>Right track reverse</td>
</tr>
<tr>
<td>Boom up</td>
<td>Lowers the boom</td>
</tr>
<tr>
<td>Boom down</td>
<td>Raises the boom</td>
</tr>
<tr>
<td>CW</td>
<td>Clockwise rotation</td>
</tr>
<tr>
<td>CCW</td>
<td>Counterclockwise rotation</td>
</tr>
<tr>
<td>2nd extend</td>
<td>Retracts the lower arm</td>
</tr>
<tr>
<td>2nd retract</td>
<td>Extends the lower arm</td>
</tr>
<tr>
<td>3rd extend</td>
<td>Retracts the upper arm</td>
</tr>
<tr>
<td>3rd retract</td>
<td>Extends the upper arm</td>
</tr>
<tr>
<td>Winch in</td>
<td>Extends the upper boom</td>
</tr>
<tr>
<td>Winch out</td>
<td>Retracts the upper boom</td>
</tr>
</tbody>
</table>

**Figure 12.3 — CADI Adjustable Functions**

**Parameters**

Use the select button to scroll through the control system parameters displayed on the screen and choose the parameter to be adjusted. The value for the parameter that is currently selected flashes on the display. For example, the boom up unit function is selected and the frequency parameter is selected (refer to Figure 12.4). The parameter values are shown under the parameter names. A description of each parameter is listed below.

**Figure 12.4 — Parameter Display**

- **FREQ** – Frequency
  
  FREQ refers to the frequency measured in hertz of the signal output by the above rotation valve driver for the function.
Do not change the FREQ values from the factory settings. If this value is changed, the function will not operate at optimal performance.

- **SC** – Speed curve
  The SC setting controls how the power level of the signal sent to the control valve changes in relation to the position of the hand control.

  The SC setting of 00 produces linear control operation, in which the power level of the signal increases or decreases in a linear fashion in proportion to how far the hand control is shifted.

  Do not change the SC values from the factory settings of 00. If this value is not set as specified, the function will not operate at optimal performance.

- **TH** – Threshold (from 00 to 99)
  The TH setting controls the power level of the signal sent to the control valve when the hand control is shifted slightly out of neutral just to the position where it begins to send a minimum signal level to the control system.

  The TH value controls the metering of the unit function as function movement is started and stopped. If the TH value is set too low, the hand control will require excessive movement before the function starts to move. If the value is set too high, the function may not start and stop smoothly as the hand control is operated near the neutral position.

  The TH value for a boom or track function must be less than both the LMX value and the MX value for that function.

- **MX** – Max out (from 00 to 99, used in standard speed mode)
  The MX setting controls the power level of the signal sent to the control valve when the hand control is operated.

  *Boom Functions* – The MX value determines the maximum speed (minimum cycle time) of a boom function when standard speed is selected and the hand control is fully shifted.

  *Track Functions* – The MX value determines the maximum speed of the tracks when the track controller is fully shifted, the stability sensors indicate the tracks are fully extended, and the unit is not approaching ground slope limits.

  Increase the MX value to increase a function’s standard speed (shorter cycle time), within the limits of the hydraulic flow available. Decrease the MX value to reduce a function’s standard speed (longer cycle time).

  If the MX value is set too high, the valve spool will reach full travel before the hand control is fully shifted, causing a loss of meterability.

  The MX value for a boom or track function must be higher than both the LMX value and the TH value for that function.

- **RA** – Ramp
  The RA setting controls the rate of acceleration as function movement starts after the hand control is activated, and the rate of deceleration as function movement stops after the hand control is deactivated.

  Do not change the RA values from the factory settings. If this value is changed, the function will not operate at optimal performance.

- **LMX** – Low speed (from 00 to 99, used in low speed mode)
  The LMX setting (also referred to as low max) controls the reduced power level of the signal sent to the control valve when the hand control is operated and unit stability is reduced (determined by track width, position, and ground slope), resulting in reduced speed of the the track functions.

  Increase the LMX value to increase a track function’s low speed (shorter cycle time). Decrease the LMX value to reduce a track function’s low speed (longer cycle time).

  LMX values are only used for track functions.

  The LMX value for a track function must be higher than the TH value and lower than the MX value for that function.

**Parameter Values**

The parameter value flashes when selected using the select button. Use the up or down value button to change the value of the selected parameter.

When all the parameters are properly set, unplug the CADI from the socket. The settings selected are saved in the above rotation valve driver as soon as they are changed.
<table>
<thead>
<tr>
<th>Function</th>
<th>Frequency (FREQ)</th>
<th>Speed Curve (SC)</th>
<th>Threshold (TH)</th>
<th>Max Out (MX)</th>
<th>Ramp (RA)</th>
<th>Low Speed (LMX)</th>
</tr>
</thead>
<tbody>
<tr>
<td>R track fwd</td>
<td>0075</td>
<td>00</td>
<td>35</td>
<td>99</td>
<td>99</td>
<td>85</td>
</tr>
<tr>
<td>R track rev</td>
<td>0075</td>
<td>00</td>
<td>35</td>
<td>99</td>
<td>99</td>
<td>85</td>
</tr>
<tr>
<td>L track fwd</td>
<td>0075</td>
<td>00</td>
<td>35</td>
<td>99</td>
<td>99</td>
<td>85</td>
</tr>
<tr>
<td>L track rev</td>
<td>0075</td>
<td>00</td>
<td>35</td>
<td>99</td>
<td>99</td>
<td>85</td>
</tr>
<tr>
<td>Boom up</td>
<td>0075</td>
<td>00</td>
<td>35</td>
<td>89</td>
<td>99</td>
<td>—</td>
</tr>
<tr>
<td>Boom down</td>
<td>—</td>
<td>—</td>
<td>35</td>
<td>89</td>
<td>99</td>
<td>—</td>
</tr>
<tr>
<td>Rotation CW</td>
<td>0075</td>
<td>00</td>
<td>35</td>
<td>89</td>
<td>99</td>
<td>—</td>
</tr>
<tr>
<td>Rotation CCW</td>
<td>—</td>
<td>—</td>
<td>35</td>
<td>89</td>
<td>99</td>
<td>—</td>
</tr>
<tr>
<td>2nd (interm) extend</td>
<td>0075</td>
<td>00</td>
<td>40</td>
<td>99</td>
<td>99</td>
<td>—</td>
</tr>
<tr>
<td>2nd (interm) retract</td>
<td>—</td>
<td>—</td>
<td>40</td>
<td>99</td>
<td>99</td>
<td>—</td>
</tr>
<tr>
<td>3rd (upper) extend</td>
<td>0075</td>
<td>00</td>
<td>40</td>
<td>99</td>
<td>99</td>
<td>—</td>
</tr>
<tr>
<td>3rd (upper) retract</td>
<td>—</td>
<td>—</td>
<td>40</td>
<td>99</td>
<td>99</td>
<td>—</td>
</tr>
<tr>
<td>Winch in</td>
<td>0075</td>
<td>00</td>
<td>30</td>
<td>89</td>
<td>99</td>
<td>—</td>
</tr>
<tr>
<td>Winch out</td>
<td>—</td>
<td>—</td>
<td>30</td>
<td>89</td>
<td>99</td>
<td>—</td>
</tr>
<tr>
<td>Digger dig</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Digger clean</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>HOP meter</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>HOP trip</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>ESLP CW</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>ESLP CCW</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

Factory setting. Do not change from value shown.

*Figure 12.5 — CADI Values Sheet for TDA58*
Appendix
Read and understand the CADI Quick Reference Guide (749-30200) before using this sheet.

1. Setup
   - Identify pulsar type(s) installed on lower control valve.
     - Black boot = standard pulsar.
     - Light gray boot = pressure feedback (PF) pulsar.
   - If pulsars are not all the same type, note which type is on which function(s) (refer to Figure 1).
   - Record current TH, MX, and LMX values before making any adjustments (refer to Figure 2).
   - Warm oil to 120 to 130 degrees Fahrenheit (49 to 54 degrees Celsius).
   - Verify system pressure [3,000 psi (206.84 bar)], and adjust if necessary.
   - Verify differential pilot pressure (see below), and adjust if necessary.
     - If valve has one or more standard pulsars, use 155 to 160 psi (10.69 to 11.03 bar) + tank pressure.
     - If valve has all PF pulsars, use 205 to 215 psi (14.13 to 14.82 bar) + tank pressure.

Oil temp ______________________________
System pressure _______________________
Tank pressure _________________________
Differential pilot pressure ______________

2. Diagnostics
   Symptoms vs. corresponding CADI adjustments (refer to Figure 3).

3. TH Calibration (refer to Figure 4)
   - Set controls to standard speed.
   - Operate with engine at full rpm.
   - Record new TH values after completing calibration (refer to Figure 2).

4. MX Calibration (refer to Figure 5)
   - Set controls to standard speed.
   - Operate with engine at full rpm.
   - Record new MX values and boom functions standard speed cycle times after completing calibration (refer to Figure 2).

5. LMX Calibration
   - Operate with engine at full rpm.
   - For boom functions, set controls to standard speed and adjust LMX values for multi-functioning operation.
     - For winch plus boom extend/retract, if winch outruns boom, decrease winch LMX.
     - For winch plus boom extend/retract, if boom outruns winch, increase winch LMX.
     - For digger plus boom up/down, if boom stops, decrease digger LMX.
     - For digger plus boom up/down, if digger stops, increase digger LMX.
   - Record new LMX values and boom functions low speed cycle times after completing calibration (refer to Figure 2).
<table>
<thead>
<tr>
<th>Function</th>
<th>Threshold (TH)</th>
<th>Max Out (MX)</th>
<th>Low Speed (LMX)</th>
<th>Cycle Times (Seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Current New</td>
<td>Current New</td>
<td>Current New</td>
<td>Standard Speed Low</td>
</tr>
<tr>
<td>Boom up</td>
<td></td>
<td></td>
<td></td>
<td>Speed</td>
</tr>
<tr>
<td>Boom down</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotation CW</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotation CCW</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2nd (interm) extend</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2nd (interm) retract</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd (upper) extend</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd (upper) retract</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winch in</td>
<td></td>
<td></td>
<td></td>
<td>—</td>
</tr>
<tr>
<td>Winch out</td>
<td></td>
<td></td>
<td></td>
<td>—</td>
</tr>
<tr>
<td>Digger dig</td>
<td></td>
<td></td>
<td></td>
<td>—</td>
</tr>
<tr>
<td>Digger clean</td>
<td></td>
<td></td>
<td></td>
<td>—</td>
</tr>
</tbody>
</table>

*Figure 1 — Pulsar/Function Identification*

*Figure 2 — CADI Values*
### Appendix — DL/DM Series Field CADI Settings Sheet

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excessive hand control travel before function movement starts</td>
<td>TH</td>
</tr>
<tr>
<td>Poor meterability at function start</td>
<td>TH</td>
</tr>
<tr>
<td>Excessive hand control travel after function reaches full speed</td>
<td>MX</td>
</tr>
<tr>
<td>Function does not meet rated cycle time at full hand control travel</td>
<td>MX</td>
</tr>
<tr>
<td>Boom extend/retract outruns winch, or winch outruns boom extend/retract</td>
<td>LMX</td>
</tr>
<tr>
<td>Boom up/down and digger will not operate together</td>
<td>LMX</td>
</tr>
<tr>
<td>Not enough difference between standard speed and low speed</td>
<td>LMX</td>
</tr>
<tr>
<td>Four-lever upper control speeds are too fast or too slow</td>
<td>LMX</td>
</tr>
</tbody>
</table>

**Figure 3 — Adjustments**

- Change MX and TH to 00
- Fully shift function hand control
- Increase MX slowly until function moves
- Release hand control, decrease MX by 3 points
- Fully shift function hand control. Does function move?
- Increase MX slowly until function begins to creep
- Release hand control, observe MX value

**Figure 4 — TH Calibration**

- Fully shift function hand control
- Does manual override handle vibrate visibly?
  - Yes: Increase MX by 1 point
  - No: Decrease MX by 1 point
- Does manual override handle vibrate to touch?
  - Yes: Increase MX by 1 point
  - No: Decrease MX by 1 point
- Does manual override handle move farther when pressed by hand?
  - Yes: Increase MX by 1 point
  - No: Decrease MX by 1 point
- Is a boom function being tested?
  - Yes: Increase MX to meet cycle time
  - No: Decrease MX to meet cycle time
- Is boom function within cycle time at full speed?
  - Yes: Decrease MX to meet cycle time
  - No: Increase MX by 1 point

**Figure 5 — MX Calibration**

- Does manual override handle vibrate to touch?
  - Yes: Increase MX by 1 point
  - No: Decrease MX by 1 point
- Are Dig 1 and Dig 2 both PF pulsars?
  - Yes: Set TH to 15 points less than MX value
  - No: Decrease MX by 1 point
- Are Clean 1 and Clean 2 both PF pulsars?
  - Yes: Set TH to 15 points less than MX value
  - No: Decrease MX by 1 point
- Is a boom function being tested?
  - Yes: Increase MX by 1 point
  - No: Decrease MX by 1 point
- Is boom function within cycle time at full speed?
  - Yes: Decrease MX to meet cycle time
  - No: Increase MX by 1 point

Appendix — DL/DM Series Field CADI Settings Sheet
### Standard Speed

<table>
<thead>
<tr>
<th>Function</th>
<th>DL42</th>
<th>DL45</th>
<th>DM45/47</th>
<th>DM50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boom raise</td>
<td>35 to 40</td>
<td>35 to 40</td>
<td>43 to 48</td>
<td>43 to 48</td>
</tr>
<tr>
<td>Boom lower</td>
<td>24 to 28</td>
<td>24 to 28</td>
<td>31 to 36</td>
<td>31 to 36</td>
</tr>
<tr>
<td>Rotation CW or CCW (360°)</td>
<td>100 to 107</td>
<td>100 to 107</td>
<td>114 to 122</td>
<td>114 to 122</td>
</tr>
<tr>
<td>Intermediate boom extend</td>
<td>26 to 30</td>
<td>32 to 36</td>
<td>32 to 36</td>
<td>48 to 52</td>
</tr>
<tr>
<td>Intermediate boom retract</td>
<td>20 to 24</td>
<td>24 to 28</td>
<td>24 to 28</td>
<td>42 to 46</td>
</tr>
<tr>
<td>Upper boom extend</td>
<td>28 to 32</td>
<td>28 to 32</td>
<td>28 to 32</td>
<td>44 to 48</td>
</tr>
<tr>
<td>Upper boom retract</td>
<td>22 to 26</td>
<td>22 to 26</td>
<td>22 to 26</td>
<td>40 to 44</td>
</tr>
</tbody>
</table>

### Low Speed

*Figure 6 — Cycle Times (Seconds)*
DLB/DMB, DHB Series Field CADI Settings Sheet

Read and understand the CADI Quick Reference Guide (749-30200) before using this sheet.

1. Setup
   • Identify pulsar type(s) installed on lower control valve.
     — Black boot = standard pulsar.
     — Light gray boot = pressure feedback (PF) pulsar.
   • If pulsars are not all the same type, note which type is on which function(s) (refer to Figure 1).
   • Record current TH, MX, and LMX values before making any adjustments (refer to Figure 2).
   • Warm oil to 120 to 130 degrees Fahrenheit (49 to 54 degrees Celsius).
   • Verify system pressure [3,000 psi (206.84 bar)], and standby pressure [400 psi (27.58 bar)]. Adjust if necessary.
   • Verify differential pilot pressure (see below), and adjust if necessary.
     — If valve has one or more standard pulsars, use 155 to 160 psi (10.69 to 11.03 bar) + tank pressure.
     — If valve has all PF pulsars, use 205 to 215 psi (14.13 to 14.82 bar) + tank pressure.

Oil temp ____________________________
System pressure _______________________
Standby pressure _______________________
Tank pressure _________________________
Differential pilot pressure ______________

2. Diagnostics
   Symptoms vs. corresponding CADI adjustments (refer to Figure 3).

3. TH Calibration (refer to Figure 4)
   • Set controls to standard speed.
   • Operate with engine at full rpm.
   • Record new TH values after completing calibration (refer to Figure 2).

4. MX Calibration (refer to Figure 5)
   • Set controls to standard speed.
   • Operate with engine at full rpm.
   • Record new MX values and standard speed cycle times/turns after completing calibration (refer to Figure 2).

5. LMX Calibration
   • Set controls to low speed.
   • Operate with engine at full rpm.
   • For boom functions, adjust LMX values to achieve low speed cycle times (refer to Figure 6).
   • For winch and digger, adjust LMX values to achieve 1/2 the number of rotations in 15 seconds as in standard speed.
   • Record new LMX values and low speed cycle times/turns after completing calibration (refer to Figure 2).
<table>
<thead>
<tr>
<th>Function</th>
<th>Threshold (TH)</th>
<th>Max Out (MX)</th>
<th>Low Speed (LMX)</th>
<th>Cycle Times (Sec or Turns in 15 Sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Current</td>
<td>New</td>
<td>Current</td>
<td>New</td>
</tr>
<tr>
<td>Boom up</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boom down</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotation CW</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotation CCW</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2nd (interm) extend</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2nd (interm) retract</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd (upper) extend</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd (upper) retract</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winch in</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winch out</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digger dig</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digger clean</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Figure 1 — Pulsar/Function Identification**

**Figure 2 — CADI Values**

*Appendix — DLB/DMB, DHB Series Field CADI Settings Sheet*
Symptom | Adjustment
---|---
Excessive hand control travel before function movement starts | TH
Poor meterability at function start | TH
Excessive hand control travel after function reaches full speed | MX
Function does not meet rated cycle time at full hand control travel | MX
Not enough difference between standard speed and low speed | LMX
Four-lever upper control speeds are too fast or too slow | LMX

**Figure 3 — Adjustments**

- Change MX and TH to 00
- Fully shift function hand control
- Increase MX slowly until function moves
- Release hand control, decrease MX by 3 points
- Fully shift function hand control. Does function move?
- Increase MX slowly until function begins to creep
- Release hand control, observe MX value

**Figure 4 — TH Calibration**

- What type of function is being tested?
- Boom function or winch
- Digger dig
- Digger clean
- Are Dig 1 and Dig 2 both PF pulsars?
- Set TH to 15 points less than MX value
- Are Clean 1 and Clean 2 both PF pulsars?
- Set TH to 15 points less than MX value
- Does function have PF pulsar?
- Set TH to 15 points less than MX value

**Figure 5 — MX Calibration**

- Fully shift function hand control
- Does manual override handle vibrate visibly?
- Increase MX by 1 point
- Decrease MX by 1 point
- Does manual override handle vibrate to touch?
- Yes
- No
- Decrease MX by 1 point
- Yes
- No
- Increase MX by 1 point
- Does manual override handle move farther when pressed by hand?
- Yes
- No
- Increase MX by 1 point
- What type of function is being tested?
- Winch
- Count no. of drum rotations in 15 sec
- Boom
- Count no. of auger rotations in 15 sec in high
- Digger
- Decrease MX to meet cycle time
- Yes
- Is boom function within cycle time at full speed?
- Yes
- Done
- No
<table>
<thead>
<tr>
<th>Function</th>
<th>DL42B</th>
<th>DL45B</th>
<th>DM45B/47B</th>
<th>DM50B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boom raise</td>
<td>16 to 21</td>
<td>16 to 21</td>
<td>20 to 25</td>
<td>20 to 25</td>
</tr>
<tr>
<td>Boom lower</td>
<td>11 to 15</td>
<td>11 to 15</td>
<td>14 to 19</td>
<td>14 to 19</td>
</tr>
<tr>
<td>Rotation CW or CCW (360°)</td>
<td>48 to 55</td>
<td>48 to 55</td>
<td>55 to 63</td>
<td>55 to 63</td>
</tr>
<tr>
<td>Intermediate boom extend</td>
<td>12 to 16</td>
<td>15 to 19</td>
<td>15 to 19</td>
<td>23 to 27</td>
</tr>
<tr>
<td>Intermediate boom retract</td>
<td>9 to 13</td>
<td>11 to 15</td>
<td>11 to 15</td>
<td>20 to 24</td>
</tr>
<tr>
<td>Upper boom extend</td>
<td>13 to 17</td>
<td>13 to 17</td>
<td>13 to 17</td>
<td>21 to 25</td>
</tr>
<tr>
<td>Upper boom retract</td>
<td>10 to 14</td>
<td>10 to 14</td>
<td>10 to 14</td>
<td>19 to 23</td>
</tr>
</tbody>
</table>

**Standard Speed**

<table>
<thead>
<tr>
<th>Function</th>
<th>DL42B</th>
<th>DL45B</th>
<th>DM45B/47B</th>
<th>DM50B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boom raise</td>
<td>35 to 40</td>
<td>35 to 40</td>
<td>43 to 48</td>
<td>43 to 48</td>
</tr>
<tr>
<td>Boom lower</td>
<td>24 to 28</td>
<td>24 to 28</td>
<td>31 to 36</td>
<td>31 to 36</td>
</tr>
<tr>
<td>Rotate clockwise or counterclockwise (360°)</td>
<td>100 to 107</td>
<td>100 to 107</td>
<td>114 to 122</td>
<td>114 to 122</td>
</tr>
<tr>
<td>Intermediate boom extend</td>
<td>26 to 30</td>
<td>32 to 36</td>
<td>32 to 36</td>
<td>48 to 52</td>
</tr>
<tr>
<td>Intermediate boom retract</td>
<td>20 to 24</td>
<td>24 to 28</td>
<td>24 to 28</td>
<td>42 to 46</td>
</tr>
<tr>
<td>Upper boom extend</td>
<td>28 to 32</td>
<td>28 to 32</td>
<td>28 to 32</td>
<td>44 to 48</td>
</tr>
<tr>
<td>Upper boom retract</td>
<td>22 to 26</td>
<td>22 to 26</td>
<td>22 to 26</td>
<td>40 to 44</td>
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</table>

**Low Speed**

<table>
<thead>
<tr>
<th>Function</th>
<th>DH45B</th>
<th>DH48B</th>
<th>DH50B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boom raise</td>
<td>25 to 31</td>
<td>25 to 31</td>
<td>25 to 31</td>
</tr>
<tr>
<td>Boom lower</td>
<td>25 to 31</td>
<td>25 to 31</td>
<td>25 to 31</td>
</tr>
<tr>
<td>Intermediate boom extend</td>
<td>15 to 18</td>
<td>17 to 20</td>
<td>18 to 22</td>
</tr>
<tr>
<td>Intermediate boom retract</td>
<td>15 to 18</td>
<td>17 to 20</td>
<td>18 to 22</td>
</tr>
<tr>
<td>Upper boom extend</td>
<td>13 to 16</td>
<td>15 to 18</td>
<td>16 to 20</td>
</tr>
<tr>
<td>Upper boom retract</td>
<td>13 to 16</td>
<td>15 to 18</td>
<td>16 to 20</td>
</tr>
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**Standard Speed**

<table>
<thead>
<tr>
<th>Function</th>
<th>DH45B</th>
<th>DH48B</th>
<th>DH50B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boom raise</td>
<td>53 to 59</td>
<td>53 to 59</td>
<td>53 to 59</td>
</tr>
<tr>
<td>Boom lower</td>
<td>53 to 59</td>
<td>53 to 59</td>
<td>53 to 59</td>
</tr>
<tr>
<td>Intermediate boom extend</td>
<td>32 to 35</td>
<td>36 to 39</td>
<td>38 to 42</td>
</tr>
<tr>
<td>Intermediate boom retract</td>
<td>32 to 35</td>
<td>36 to 39</td>
<td>38 to 42</td>
</tr>
<tr>
<td>Upper boom extend</td>
<td>28 to 31</td>
<td>32 to 35</td>
<td>34 to 38</td>
</tr>
<tr>
<td>Upper boom retract</td>
<td>28 to 31</td>
<td>32 to 35</td>
<td>34 to 38</td>
</tr>
</tbody>
</table>

**Low Speed**

*Figure 6 — Cycle Times (Seconds)*
D2/3/4000A and DT80 Field CADI Settings Sheet

Read and understand the CADI Quick Reference Guide (749-30200) before using this sheet.

1. Setup
   • Identify pulsar type(s) installed on lower control valve.
     — Black boot = standard pulsar.
     — Light gray boot = pressure feedback (PF) pulsar.
   • If pulsars are not all the same type, note which type is on which function(s) (refer to Figure 1).
   • Record current TH, MX, and LMX values before making any adjustments (refer to Figure 2).
   • Warm oil to 120 to 130 degrees Fahrenheit (49 to 54 degrees Celsius).
   • Verify system pressure [3,000 psi (206.84 bar)], and adjust if necessary.
   • Verify differential pilot pressure (see below), and adjust if necessary.
     — If valve has one or more standard pulsars, use 155 to 160 psi (10.69 to 11.03 bar) + tank pressure.
     — If valve has all PF pulsars, use 205 to 215 psi (14.13 to 14.82 bar) + tank pressure.

Oil temp _______________________________
System pressure _______________________
Tank pressure _________________________
Differential pilot pressure _______________

2. Diagnostics
   Symptoms vs. corresponding CADI adjustments (refer to Figure 3).

3. TH Calibration (refer to Figure 4)
   • Set controls to standard speed.
   • Operate with engine at full rpm.
   • Record new TH values after completing calibration (refer to Figure 2).

4. MX Calibration (refer to Figure 5)
   • Set controls to standard speed.
   • Operate with engine at full rpm.
   • Record new MX values and boom functions standard speed cycle times after completing calibration (refer to Figure 2).

5. LMX Calibration
   • Operate with engine at full rpm.
   • For winch and digger, set controls to standard speed and adjust LMX values for multi-functioning operation.
     — For winch plus boom extend/retract, if winch outruns boom, decrease winch LMX.
     — For winch plus boom extend/retract, if boom outruns winch, increase winch LMX.
     — For digger plus boom up/down, if boom stops, decrease digger LMX.
     — For digger plus boom up/down, if digger stops, increase digger LMX.
   • Record new LMX values and boom functions low speed cycle times after completing calibration (refer to Figure 2).
<table>
<thead>
<tr>
<th>Function</th>
<th>Threshold (TH)</th>
<th>Max Out (MX)</th>
<th>Low Speed (LMX)</th>
<th>Cycle Times (Seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Current</td>
<td>New</td>
<td>Current</td>
<td>New</td>
</tr>
<tr>
<td>Boom up</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boom down</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotation CW</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotation CCW</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2nd (interm) extend</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2nd (interm) retract</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd (upper) extend</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd (upper) retract</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winch in</td>
<td></td>
<td></td>
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<tr>
<td>Winch out</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Digger dig</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Digger clean</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Figure 1 — Pulsar/Function Identification**

**Figure 2 — CADI Values**
<table>
<thead>
<tr>
<th>Symptom</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excessive hand control travel before function movement starts</td>
<td>TH</td>
</tr>
<tr>
<td>Poor meterability at function start</td>
<td>TH</td>
</tr>
<tr>
<td>Excessive hand control travel after function reaches full speed</td>
<td>MX</td>
</tr>
<tr>
<td>Function does not meet rated cycle time at full hand control travel</td>
<td>MX</td>
</tr>
<tr>
<td>Boom extend/retract outruns winch, or winch outruns boom extend/retract</td>
<td>LMX</td>
</tr>
<tr>
<td>Boom up/down and digger will not operate together</td>
<td>LMX</td>
</tr>
<tr>
<td>Not enough difference between standard speed and low speed</td>
<td>LMX</td>
</tr>
<tr>
<td>Four-lever upper control speeds are too fast or too slow</td>
<td>LMX</td>
</tr>
</tbody>
</table>

**Figure 3 — Adjustments**

- Change MX and TH to 00
- Fully shift function hand control
- Increase MX slowly until function moves
- Release hand control, decrease MX by 3 points
- Fully shift function hand control. Does function move?
  - Yes
  - No, increase MX slowly until function begins to creep
  - Release hand control, observe MX value

**Figure 4 — TH Calibration**

- Does function have PF pulsar?
  - Yes
  - No
- Are Dig 1 and Dig 2 both PF pulsars?
  - Yes
  - No
- Are Clean 1 and Clean 2 both PF pulsars?
  - Yes
  - No

**Figure 5 — MX Calibration**

- Fully shift function hand control
- Does manual override handle vibrate visibly?
  - Yes
  - No
  - Increase MX by 1 point
  - Decrease MX by 1 point
- Does manual override handle vibrate to touch?
  - Yes
  - No
- Does manual override handle move farther when pressed by hand?
  - Yes
  - No
  - Increase MX by 1 point
  - Decrease MX by 1 point
- Is a boom function being tested?
  - Yes
  - No
- Is boom function within cycle time at full speed?
  - Yes
  - No
  - Decrease MX to meet cycle time
  - Done
<table>
<thead>
<tr>
<th>Function</th>
<th>D2045A</th>
<th>D2050A</th>
<th>D2055A</th>
<th>D3050A</th>
<th>D3055A</th>
<th>D3060A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boom raise</td>
<td>28 to 32</td>
<td>28 to 32</td>
<td>28 to 32</td>
<td>33 to 39</td>
<td>33 to 39</td>
<td>33 to 39</td>
</tr>
<tr>
<td>Boom lower</td>
<td>28 to 32</td>
<td>28 to 32</td>
<td>28 to 32</td>
<td>33 to 39</td>
<td>33 to 39</td>
<td>33 to 39</td>
</tr>
<tr>
<td>Rotate CW or CCW (360°)</td>
<td>58 to 64</td>
<td>58 to 64</td>
<td>58 to 64</td>
<td>58 to 64</td>
<td>58 to 64</td>
<td>58 to 64</td>
</tr>
<tr>
<td>Intermediate boom extend</td>
<td>20 to 23</td>
<td>23 to 27</td>
<td>28 to 32</td>
<td>23 to 27</td>
<td>28 to 32</td>
<td>30 to 34</td>
</tr>
<tr>
<td>Intermediate boom retract</td>
<td>17 to 21</td>
<td>20 to 24</td>
<td>24 to 28</td>
<td>20 to 24</td>
<td>24 to 28</td>
<td>26 to 30</td>
</tr>
<tr>
<td>Upper boom extend</td>
<td>18 to 22</td>
<td>21 to 25</td>
<td>21 to 25</td>
<td>21 to 25</td>
<td>21 to 25</td>
<td>28 to 34</td>
</tr>
<tr>
<td>Upper boom retract</td>
<td>16 to 20</td>
<td>19 to 23</td>
<td>19 to 23</td>
<td>19 to 23</td>
<td>19 to 23</td>
<td>26 to 31</td>
</tr>
</tbody>
</table>

**Standard Speed**

<table>
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<th>D2050A</th>
<th>D2055A</th>
<th>D3050A</th>
<th>D3055A</th>
<th>D3060A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boom raise</td>
<td>58 to 62</td>
<td>58 to 62</td>
<td>58 to 62</td>
<td>69 to 75</td>
<td>69 to 75</td>
<td>69 to 75</td>
</tr>
<tr>
<td>Boom lower</td>
<td>58 to 62</td>
<td>58 to 62</td>
<td>58 to 62</td>
<td>69 to 75</td>
<td>69 to 75</td>
<td>69 to 75</td>
</tr>
<tr>
<td>Rotate CW or CCW (360°)</td>
<td>119 to 125</td>
<td>119 to 125</td>
<td>119 to 125</td>
<td>119 to 125</td>
<td>119 to 125</td>
<td>119 to 125</td>
</tr>
<tr>
<td>Intermediate boom extend</td>
<td>42 to 45</td>
<td>48 to 52</td>
<td>58 to 62</td>
<td>48 to 52</td>
<td>58 to 62</td>
<td>62 to 66</td>
</tr>
<tr>
<td>Intermediate boom retract</td>
<td>36 to 40</td>
<td>42 to 46</td>
<td>50 to 54</td>
<td>42 to 46</td>
<td>50 to 54</td>
<td>54 to 58</td>
</tr>
<tr>
<td>Upper boom extend</td>
<td>38 to 42</td>
<td>44 to 48</td>
<td>44 to 48</td>
<td>44 to 48</td>
<td>44 to 48</td>
<td>59 to 65</td>
</tr>
<tr>
<td>Upper boom retract</td>
<td>34 to 38</td>
<td>40 to 44</td>
<td>40 to 44</td>
<td>40 to 44</td>
<td>40 to 44</td>
<td>55 to 60</td>
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**Low Speed**

<table>
<thead>
<tr>
<th>Function</th>
<th>D4050A</th>
<th>D4055A</th>
<th>D4060A</th>
<th>D4065A</th>
<th>DT80</th>
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<tbody>
<tr>
<td>Boom raise</td>
<td>44 to 52</td>
<td>44 to 52</td>
<td>44 to 52</td>
<td>44 to 52</td>
<td>33 to 37</td>
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<tr>
<td>Boom lower</td>
<td>44 to 52</td>
<td>44 to 52</td>
<td>44 to 52</td>
<td>44 to 52</td>
<td>29 to 33</td>
</tr>
<tr>
<td>Rotate CW or CCW (360°)</td>
<td>58 to 64</td>
<td>58 to 64</td>
<td>58 to 64</td>
<td>58 to 64</td>
<td>71 to 79</td>
</tr>
<tr>
<td>Intermediate boom extend</td>
<td>23 to 27</td>
<td>28 to 32</td>
<td>30 to 34</td>
<td>39 to 45</td>
<td>31 to 35</td>
</tr>
<tr>
<td>Intermediate boom retract</td>
<td>20 to 24</td>
<td>24 to 28</td>
<td>26 to 30</td>
<td>32 to 47</td>
<td>33 to 37</td>
</tr>
<tr>
<td>Upper boom extend</td>
<td>21 to 25</td>
<td>21 to 25</td>
<td>28 to 34</td>
<td>37 to 45</td>
<td>38 to 44</td>
</tr>
<tr>
<td>Upper boom retract</td>
<td>19 to 23</td>
<td>19 to 23</td>
<td>26 to 31</td>
<td>32 to 48</td>
<td>37 to 41</td>
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**Standard Speed**

<table>
<thead>
<tr>
<th>Function</th>
<th>D4050A</th>
<th>D4055A</th>
<th>D4060A</th>
<th>D4065A</th>
<th>DT80</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boom raise</td>
<td>92 to 100</td>
<td>92 to 100</td>
<td>92 to 100</td>
<td>92 to 100</td>
<td>68 to 72</td>
</tr>
<tr>
<td>Boom lower</td>
<td>92 to 100</td>
<td>92 to 100</td>
<td>92 to 100</td>
<td>92 to 100</td>
<td>60 to 64</td>
</tr>
<tr>
<td>Rotate CW or CCW (360°)</td>
<td>119 to 125</td>
<td>119 to 125</td>
<td>119 to 125</td>
<td>119 to 125</td>
<td>146 to 154</td>
</tr>
<tr>
<td>Intermediate boom extend</td>
<td>48 to 52</td>
<td>58 to 62</td>
<td>62 to 66</td>
<td>81 to 87</td>
<td>64 to 68</td>
</tr>
<tr>
<td>Intermediate boom retract</td>
<td>42 to 46</td>
<td>50 to 54</td>
<td>54 to 58</td>
<td>72 to 87</td>
<td>68 to 72</td>
</tr>
<tr>
<td>Upper boom extend</td>
<td>44 to 48</td>
<td>44 to 48</td>
<td>59 to 65</td>
<td>78 to 86</td>
<td>79 to 85</td>
</tr>
<tr>
<td>Upper boom retract</td>
<td>40 to 44</td>
<td>40 to 44</td>
<td>55 to 60</td>
<td>72 to 88</td>
<td>76 to 80</td>
</tr>
</tbody>
</table>

**Low Speed**

*Figure 6 — Cycle Times (Seconds)*
D2/3/4000B Field CADI Settings Sheet

Read and understand the CADI Quick Reference Guide (749-30200) before using this sheet.

1. Setup
   • Identify pulsar type(s) installed on lower control valve.
     — Black boot = standard pulsar.
     — Light gray boot = pressure feedback (PF) pulsar.
   • If pulsars are not all the same type, note which type is on which function(s) (refer to Figure 1).
   • Record current TH, MX, and LMX values before making any adjustments (refer to Figure 2).
   • Warm oil to 120 to 130 degrees Fahrenheit (49 to 54 degrees Celsius).
   • Verify system pressure [3,000 psi (206.84 bar)] and standby pressure [400 psi (27.58 bar)]. Adjust if necessary.
   • Verify differential pilot pressure (see below), and adjust if necessary.
     — If valve has one or more standard pulsars, use 155 to 160 psi (10.69 to 11.03 bar) + tank pressure.
     — If valve has all PF pulsars, use 205 to 215 psi (14.13 to 14.82 bar) + tank pressure.

Oil temp ______________________________
System pressure ________________________
Standby pressure ________________________
Tank pressure ___________________________
Differential pilot pressure ________________

2. Diagnostics
   Symptoms vs. corresponding CADI adjustments (refer to Figure 3).

3. TH Calibration (refer to Figure 4)
   • Set controls to standard speed.
     • Operate with engine at full rpm.
     • Record new TH values after completing calibration (refer to Figure 2).

4. MX Calibration (refer to Figure 5)
   • Set controls to standard speed.
     • Operate with engine at full rpm.
     • Record new MX values and standard speed cycle times/turns after completing calibration (refer to Figure 2).

5. LMX Calibration
   • Set controls to low speed.
     • Operate with engine at full rpm.
     • For boom functions, adjust LMX values to achieve low speed cycle times (refer to Figure 6).
     • For winch and digger, adjust LMX values to achieve 1/2 the number of rotations in 15 seconds as in standard speed.
     • Record new LMX values and low speed cycle times/turns after completing calibration (refer to Figure 2).
### Figure 1 — Pulsar/Function Identification

<table>
<thead>
<tr>
<th>Function</th>
<th>Threshold (TH) Current</th>
<th>Threshold (TH) New</th>
<th>Max Out (MX) Current</th>
<th>Max Out (MX) New</th>
<th>Low Speed (LMX) Current</th>
<th>Low Speed (LMX) New</th>
<th>Cycle Times (Sec or Turns in 15 Sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boom up</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boom down</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotation CW</td>
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<tr>
<td>Rotation CCW</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2nd (interm) extend</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>2nd (interm) retract</td>
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<tr>
<td>3rd (upper) extend</td>
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<td></td>
</tr>
<tr>
<td>3rd (upper) retract</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winch in</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winch out</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digger dig</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digger clean</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Figure 2 — CADI Values

Appendix — D2/3/4000B Field CADI Settings Sheet
<table>
<thead>
<tr>
<th>Symptom</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excessive hand control travel before function movement starts</td>
<td>TH</td>
</tr>
<tr>
<td>Poor meterability at function start</td>
<td>TH</td>
</tr>
<tr>
<td>Excessive hand control travel after function reaches full speed</td>
<td>MX</td>
</tr>
<tr>
<td>Function does not meet rated cycle time at full hand control travel</td>
<td>MX</td>
</tr>
<tr>
<td>Not enough difference between standard speed and low speed</td>
<td>LMX</td>
</tr>
<tr>
<td>Four-lever upper control speeds are too fast or too slow</td>
<td>LMX</td>
</tr>
</tbody>
</table>

**Figure 3 — Adjustments**

1. Change MX and TH to 00
2. Fully shift function hand control
3. Increase MX slowly until function moves
4. Release hand control, decrease MX by 3 points
5. Fully shift function hand control. Does function move?
   - Yes
   - No
     - Increase MX slowly until function begins to creep
     - Release hand control, observe MX value

**Figure 4 — TH Calibration**

1. What type of function is being tested?
   - Boom function or winch
   - Digger dig
   - Digger clean

2. Are Dig 1 and Dig 2 both PF pulsars?
   - Yes
   - No
     - Set TH to 15 points less than MX value
     - Set TH to 5 points less than MX value

3. Does function have PF pulsar?
   - Yes
   - No
     - Set TH to 15 points less than MX value
     - Set TH to 5 points less than MX value

4. Are Clean 1 and Clean 2 both PF pulsars?
   - Yes
   - No
     - Set TH to 15 points less than MX value
     - Set TH to 5 points less than MX value

**Figure 5 — MX Calibration**

1. Fully shift function hand control
2. Does manual override handle vibrate visibly?
   - Yes
   - No
     - Increase MX by 1 point
     - Decrease MX by 1 point

3. Does manual override handle vibrate to touch?
   - Yes
   - No
     - Increase MX by 1 point
     - Decrease MX by 1 point

4. Does manual override handle move farther when pressed by hand?
   - Yes
   - No
     - Increase MX by 1 point
     - Decrease MX by 1 point

5. What type of function is being tested?
   - Boom
   - Winch

6. Is boom function within cycle time at full speed?
   - Yes
   - No
     - Count no. of drum rotations in 15 sec
     - Decrease MX to meet cycle time

7. Done
<table>
<thead>
<tr>
<th>Function</th>
<th>D2045B</th>
<th>D2050B</th>
<th>D2055B</th>
<th>D3050B</th>
<th>D3055B</th>
<th>D3060B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boom raise</td>
<td>28 to 32</td>
<td>28 to 32</td>
<td>28 to 32</td>
<td>33 to 39</td>
<td>33 to 39</td>
<td>33 to 39</td>
</tr>
<tr>
<td>Boom lower</td>
<td>28 to 32</td>
<td>28 to 32</td>
<td>28 to 32</td>
<td>33 to 39</td>
<td>33 to 39</td>
<td>33 to 39</td>
</tr>
<tr>
<td>Rotate CW or CCW (360°)</td>
<td>58 to 64</td>
<td>58 to 64</td>
<td>58 to 64</td>
<td>58 to 64</td>
<td>58 to 64</td>
<td>58 to 64</td>
</tr>
<tr>
<td>Intermediate boom extend</td>
<td>20 to 23</td>
<td>23 to 27</td>
<td>28 to 32</td>
<td>23 to 27</td>
<td>28 to 32</td>
<td>30 to 34</td>
</tr>
<tr>
<td>Intermediate boom retract</td>
<td>17 to 21</td>
<td>20 to 24</td>
<td>24 to 28</td>
<td>20 to 24</td>
<td>24 to 28</td>
<td>26 to 30</td>
</tr>
<tr>
<td>Upper boom extend</td>
<td>18 to 22</td>
<td>21 to 25</td>
<td>21 to 25</td>
<td>21 to 25</td>
<td>21 to 25</td>
<td>28 to 34</td>
</tr>
<tr>
<td>Upper boom retract</td>
<td>16 to 20</td>
<td>19 to 23</td>
<td>19 to 23</td>
<td>19 to 23</td>
<td>19 to 23</td>
<td>26 to 31</td>
</tr>
</tbody>
</table>

**Standard Speed**

<table>
<thead>
<tr>
<th>Function</th>
<th>D2045B</th>
<th>D2050B</th>
<th>D2055B</th>
<th>D3050B</th>
<th>D3055B</th>
<th>D3060B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boom raise</td>
<td>58 to 62</td>
<td>58 to 62</td>
<td>58 to 62</td>
<td>69 to 75</td>
<td>69 to 75</td>
<td>69 to 75</td>
</tr>
<tr>
<td>Boom lower</td>
<td>58 to 62</td>
<td>58 to 62</td>
<td>58 to 62</td>
<td>69 to 75</td>
<td>69 to 75</td>
<td>69 to 75</td>
</tr>
<tr>
<td>Rotate CW or CCW (360°)</td>
<td>119 to 125</td>
<td>119 to 125</td>
<td>119 to 125</td>
<td>119 to 125</td>
<td>119 to 125</td>
<td>119 to 125</td>
</tr>
<tr>
<td>Intermediate boom extend</td>
<td>42 to 45</td>
<td>48 to 52</td>
<td>58 to 62</td>
<td>48 to 52</td>
<td>58 to 62</td>
<td>62 to 66</td>
</tr>
<tr>
<td>Intermediate boom retract</td>
<td>36 to 40</td>
<td>42 to 46</td>
<td>50 to 54</td>
<td>42 to 46</td>
<td>50 to 54</td>
<td>54 to 58</td>
</tr>
<tr>
<td>Upper boom extend</td>
<td>38 to 42</td>
<td>44 to 48</td>
<td>44 to 48</td>
<td>44 to 48</td>
<td>44 to 48</td>
<td>59 to 65</td>
</tr>
<tr>
<td>Upper boom retract</td>
<td>34 to 38</td>
<td>40 to 44</td>
<td>40 to 44</td>
<td>40 to 44</td>
<td>40 to 44</td>
<td>55 to 60</td>
</tr>
</tbody>
</table>

**Low Speed**

<table>
<thead>
<tr>
<th>Function</th>
<th>D4050B</th>
<th>D4055B</th>
<th>D4060B</th>
<th>D4065B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boom raise</td>
<td>44 to 52</td>
<td>44 to 52</td>
<td>44 to 52</td>
<td>44 to 52</td>
</tr>
<tr>
<td>Boom lower</td>
<td>44 to 52</td>
<td>44 to 52</td>
<td>44 to 52</td>
<td>44 to 52</td>
</tr>
<tr>
<td>Rotate CW or CCW (360°)</td>
<td>58 to 64</td>
<td>58 to 64</td>
<td>58 to 64</td>
<td>58 to 64</td>
</tr>
<tr>
<td>Intermediate boom extend</td>
<td>23 to 27</td>
<td>28 to 32</td>
<td>30 to 34</td>
<td>39 to 45</td>
</tr>
<tr>
<td>Intermediate boom retract</td>
<td>20 to 24</td>
<td>24 to 28</td>
<td>26 to 30</td>
<td>32 to 47</td>
</tr>
<tr>
<td>Upper boom extend</td>
<td>21 to 25</td>
<td>21 to 25</td>
<td>28 to 34</td>
<td>37 to 45</td>
</tr>
<tr>
<td>Upper boom retract</td>
<td>19 to 23</td>
<td>19 to 23</td>
<td>26 to 31</td>
<td>32 to 48</td>
</tr>
</tbody>
</table>

**Standard Speed**

<table>
<thead>
<tr>
<th>Function</th>
<th>D4050B</th>
<th>D4055B</th>
<th>D4060B</th>
<th>D4065B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boom raise</td>
<td>92 to 100</td>
<td>92 to 100</td>
<td>92 to 100</td>
<td>92 to 100</td>
</tr>
<tr>
<td>Boom lower</td>
<td>92 to 100</td>
<td>92 to 100</td>
<td>92 to 100</td>
<td>92 to 100</td>
</tr>
<tr>
<td>Rotate CW or CCW (360°)</td>
<td>119 to 125</td>
<td>119 to 125</td>
<td>119 to 125</td>
<td>119 to 125</td>
</tr>
<tr>
<td>Intermediate boom extend</td>
<td>48 to 52</td>
<td>58 to 62</td>
<td>62 to 66</td>
<td>81 to 87</td>
</tr>
<tr>
<td>Intermediate boom retract</td>
<td>42 to 46</td>
<td>50 to 54</td>
<td>54 to 58</td>
<td>72 to 87</td>
</tr>
<tr>
<td>Upper boom extend</td>
<td>44 to 48</td>
<td>44 to 48</td>
<td>59 to 65</td>
<td>78 to 86</td>
</tr>
<tr>
<td>Upper boom retract</td>
<td>40 to 44</td>
<td>40 to 44</td>
<td>55 to 60</td>
<td>72 to 88</td>
</tr>
</tbody>
</table>

**Low Speed**

*Figure 6 — Cycle Times (Seconds)*
Read and understand the CADI Quick Reference Guide (749-30200) before using this sheet.

1. Setup
   • Identify pulsar type(s) installed on lower control valve.
     — Black boot = standard pulsar.
     — Light gray boot = pressure feedback (PF) pulsar.
   • If pulsars are not all the same type, note which type is on which function(s) (refer to Figure 1).
   • Record current TH, MX, and LMX values before making any adjustments (refer to Figure 2).
   • Warm oil to 120 to 130 degrees Fahrenheit (49 to 54 degrees Celsius).
   • Verify system pressure [3,000 psi (206.84 bar)], and adjust if necessary.
   • Verify differential pilot pressure (see below), and adjust if necessary.
     — If valve has one or more standard pulsars, use 155 to 160 psi (10.69 to 11.03 bar) + tank pressure.
     — If valve has all PF pulsars, use 205 to 215 psi (14.13 to 14.82 bar) + tank pressure.

Oil temp ______________________________
System pressure ________________________
Tank pressure __________________________
Differential pilot pressure __________________

2. Diagnostics
   Symptoms vs. corresponding CADI adjustments (refer to Figure 3).

3. TH Calibration (refer to Figure 4)
   • Set controls to standard speed.
   • Operate with engine at full rpm.
   • Record new TH values after completing calibration (refer to Figure 2).

4. MX Calibration (refer to Figure 5)
   • Set controls to standard speed.
   • Operate with engine at full rpm.
   • Refer to Figure 5 for all functions.

5. LMX Calibration
   • Operate with engine at full rpm.
   • For boom functions, set controls to low speed and adjust LMX values to achieve low speed cycle times (refer to Figure 6).
   • For winch and digger, set controls to standard speed and adjust LMX values for multi-functioning operation.
     — For winch plus boom extend/retract, if winch outruns boom, decrease winch LMX.
     — For winch plus boom extend/retract, if boom outruns winch, increase winch LMX.
     — For digger plus boom up/down, if boom stops, decrease digger LMX.
     — For digger plus boom up/down, if digger stops, increase digger LMX.
   • Record new LMX values and boom functions low speed cycle times after completing calibration (refer to Figure 2).
### Appendix — DB37 Series Field CADI Settings Sheet

#### Threshold (TH)

- Excessive hand control travel before function movement starts
- Poor meterability at function start
- Excessive hand control travel after function reaches full speed
- Function does not meet rated cycle time at full hand control travel
- Boom extend/retract outruns winch, or winch outruns boom extend/retract
- Boom up/down and digger will not operate together
- Not enough difference between standard speed and low speed

#### Max Out (MX)

#### Low Speed (LMX)

#### Cycle Times (Seconds)

<table>
<thead>
<tr>
<th>Function</th>
<th>Current</th>
<th>New</th>
<th>Current</th>
<th>New</th>
<th>Current</th>
<th>New</th>
<th>Standard Speed</th>
<th>Low Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boom raise</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boom lower</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotation CW</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotation CCW</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2nd (interm) extend</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2nd (interm) retract</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd (upper) extend</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd (upper) retract</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winch raise</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winch lower</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digger dig</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digger clean</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Symptom

- Excessive hand control travel before function movement starts
- Poor meterability at function start
- Excessive hand control travel after function reaches full speed
- Function does not meet rated cycle time at full hand control travel
- Boom extend/retract outruns winch, or winch outruns boom extend/retract
- Boom up/down and digger will not operate together
- Not enough difference between standard speed and low speed

#### Adjustment

- TH
- MX
- LMX

#### Figure 1 — Boom Functions Valve

#### Figure 2 — CADI Values

#### Figure 3 — Adjustments
Figure 4 — TH Calibration

Change MX and TH to 00

Fully shift function hand control

Increase MX slowly until function moves

Release hand control, decrease MX by 3 points

Fully shift function hand control. Does function move?

Increase MX slowly until function begins to creep

Release hand control, set TH to 15 points less than this MX value for standard pulsar or 5 points less than this MX value for PF pulsar

Reset MX to original value

Figure 5 — MX Calibration

Fully shift function hand control

Does manual override handle vibrate to touch?

Yes

Increase MX by 1 point

No

Decrease MX by 1 point

Does manual override handle vibrate visibly?

Yes

Increase MX by 1 point

No

Decrease MX by 1 point

Does manual override handle move farther when pressed by hand?

Yes

Increase MX by 1 point

No

Decrease MX by 1 point

Is a boom function being tested?

Yes

Decrease MX to meet cycle time

No

Is boom function within cycle time at full speed?

Yes

Done

Function | Standard Speed | Low Speed |
--- | --- | --- |
Boom raise | 12 to 17 | 20 to 28 |
Boom lower | 9 to 13 | 15 to 19 |
Rotation CW or CCW (360°) | 44 to 51 | 72 to 80 |
Intermediate boom extend | 9 to 14 | 15 to 20 |
Intermediate boom retract | 13 to 18 | 15 to 20 |
Upper boom extend | 9 to 14 | 15 to 20 |
Upper boom retract | 15 to 19 | 18 to 22 |

Figure 6 — Cycle Times (Seconds)