



# Instructions

## Derrick Controls Adjustment Procedure

### Introduction

This instruction explains the procedure to adjust and calibrate the controls on the DL/DM, DLB/DMB, D2000A, D3000A, D4000A, D2000B, D3000B, D4000B, and DT80 Series derricks. The procedure requires the following items in addition to normal mechanics tools:

### Tools

- Quick disconnect installed in the return line of the control valve (Altec kit p/n 970457959, if required)
- Electronic Low pressure gauge (0-600 psi or 0-1000 psi range)
- CADI
- Infrared (IR) thermometer

### Sections of Procedure

There are three sections to the procedure: Section 1: Differential Pilot Pressure Testing and Adjustment Procedure, Section 2: Threshold Calibration Procedure, and Section 3: Max Out and Low Speed Calibration Procedure. Read and understand all steps of the instructions before beginning the procedure. Perform all three sections of the procedure in the order shown.

### Section 1 Differential Pilot Pressure Testing

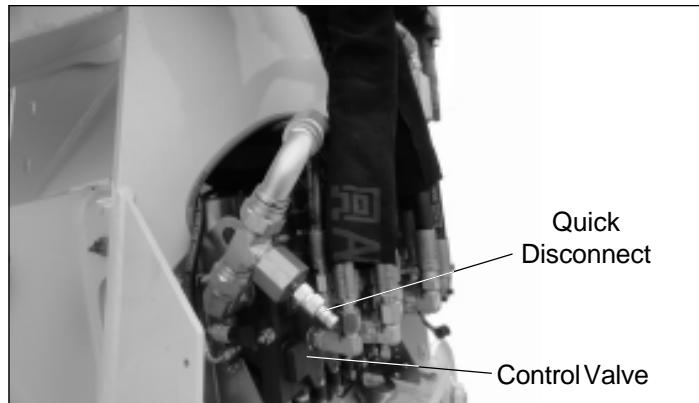
#### Section 1: Differential Pilot Pressure Testing and Adjustment Procedure

##### Testing

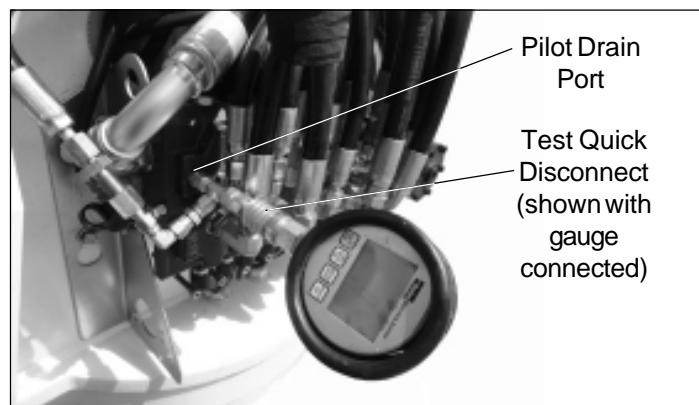
1. Position the unit on a level surface. Apply the parking brake and chock the wheels. Engage the unit's hydraulic system. Properly set the outriggers. Disengage the hydraulic system and shut off the engine. Move the outriggers and tools/derrick control to the Derrick position.
2. Remove the turntable cover from the right side of the turntable (as viewed from the boom tip looking toward the turntable).
3. Identify the type(s) of pulsars installed on the lower control valve. The color of the rubber boot where the control wiring enters the pulsar valve indicates the type of pulsar. A black boot is used on a standard pulsar. A light gray boot is used on a pressure feedback pulsar. If the lower control valve has one or more standard pulsars (pulsars with black boots), the proper differential pilot pressure is 160 psi nominal, with an acceptable range of 155 to 160 psi. If all of the pulsars in the lower control valve are pressure feedback pulsars (pulsars with light gray boots), the proper differential pilot pressure is 210 psi nominal, with an acceptable range of 205 to 215 psi.
4. Locate the tank pressure quick disconnect. Depending on the design of the valve, this quick disconnect will be located either on the large tee in the return line located to the left of the lower control valve (refer to Figure 1) or on the small tee in the external pilot drain port located in the upper left corner of the lower control valve (refer to Figure 2). If the unit is not equipped with a tank pressure quick disconnect, order and install Return Pressure Quick Disconnect Kit, part number 970457959, before continuing with Step 5.

## Section 1

### Differential Pilot Pressure Testing (Continued)



**Figure 1 — Quick Disconnect On Return Plumbing**



**Figure 2 — Gauge On Pilot Drain Quick Disconnect**

5. Attach the pressure gauge to the tank pressure quick disconnect (refer to Figure 1 or 2). Turn the gauge on, and zero it if it is not showing zero.
6. Start the engine and engage the unit's hydraulic system. With the engine running at idle, energize the pilot system as described in Step 6a or 6b.
  - a. If the unit is equipped with a two speed digger, move the digger shift switch to the High position.
  - b. If the unit is not equipped with a two speed digger, fully shift and hold the intermediate or upper boom hand control in the Retract position.
7. Record the tank pressure shown on the gauge attached to the tank pressure quick disconnect.
8. Disengage the unit's hydraulic system and turn off the engine. Leaving the pressure gauge turned on, remove it from the tank pressure quick disconnect and attach it to the pilot pressure quick disconnect, located on the lower right corner of the lower control valve (refer to Figure 3). **Do not rezero the pressure gauge when relocating it. The same pressure gauge must be used for both readings.**

## Section 1

### Differential Pilot Pressure Testing (Continued)



**Figure 3 — Gauge On Pilot Pressure Quick Disconnect**

9. Calculate the pilot pressure range as described in step a or b, depending on the type(s) of pulsars identified in Step 3.
  - a. If the valve has one or more standard pulsars, add 155 psi to the tank pressure recorded in step 7 to obtain the lower value of the pilot pressure range. Add 160 psi to the tank pressure value to obtain the upper value of the pilot pressure range. (Lower value = 155 + tank pressure; upper value = 160 + tank pressure.)
  - b. If all of the pulsars are pressure feedback pulsars, add 205 psi to the tank pressure recorded in step 7 to obtain the lower value of the pilot pressure range. Add 215 psi to the tank pressure value to obtain the upper value of the pilot pressure range. (Lower value = 205 + tank pressure; upper value = 215 + tank pressure.)
10. Start the engine and engage the unit's hydraulic system. With the engine running at idle, energize the pilot system using the same function as in Step 6a or 6b. The pressure gauge should indicate within the range calculated in Step 9. If the pilot pressure is above or below this range, adjust the pressure as described under Adjustment in this section.
11. If the pressure is correct, disengage the unit's hydraulic system and turn off the engine. Disconnect the pressure gauge. Proceed to Section 2: Threshold Calibration Procedure

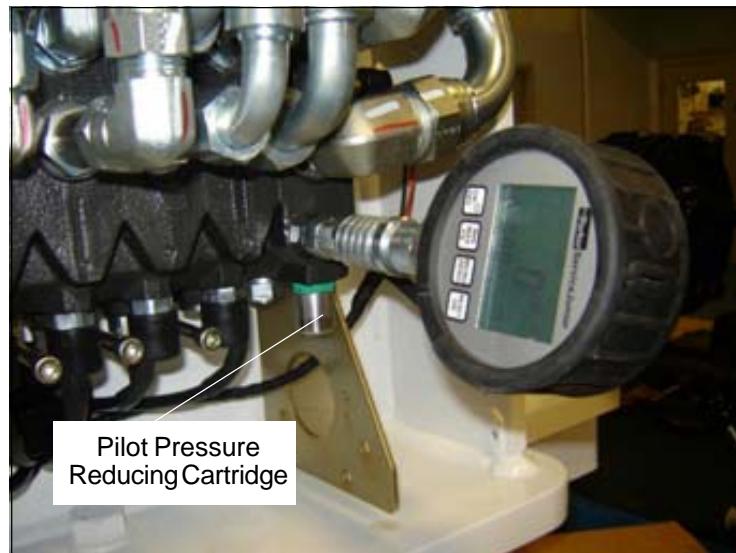
## Section 1

### Differential Pilot Pressure Adjustment

#### Adjustment

1. Remove the cap and loosen the jam nut on the pilot pressure reducing cartridge on the lower control valve (refer to Figure 4). Turn the adjusting screw clockwise to increase the pressure or counterclockwise to decrease the pressure. Hold the adjusting screw to keep it from turning, and tighten the jam nut

## Section 1 Differential Pilot Pressure Adjustment (Continued)



**Figure 5 - Pilot Pressure Reducing Valve Cartridge**

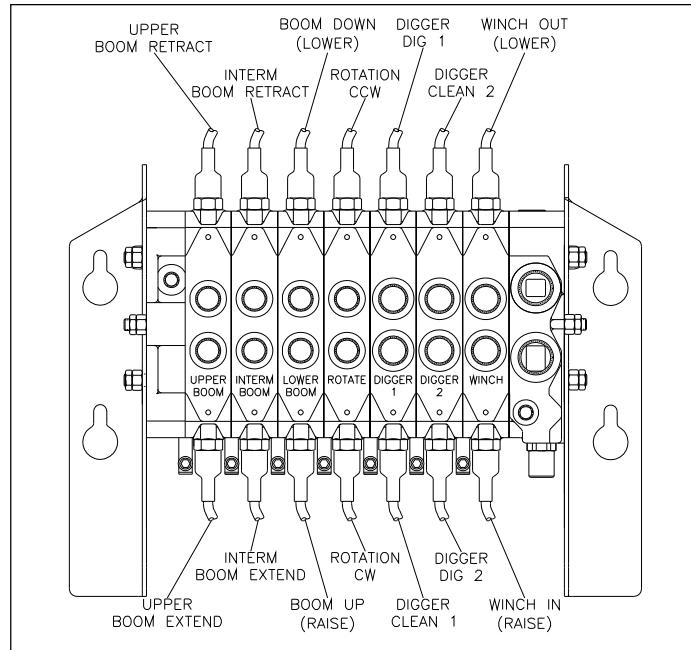
2. Test the pressure at the pilot pressure quick disconnect.
3. Repeat the adjustment until the gauge indicates the within the range calculated in Step 9 under Testing.
4. Replace the cap on the pilot pressure reducing cartridge. Disengage the PTO and turn off the engine. Disconnect the pressure gauge.
5. Proceed to Section 2: Threshold Calibration Procedure

## Section 2 Threshold Calibration

### Section 2: Threshold Calibration Procedure

The threshold (TH) calibration procedure described in this section is applicable for derricks utilizing a separate single-axis control handle for each function. If the unit has multiple-axis joystick(s), refer to the latest CADI Quick Reference Guide (p/n 749-30200) for the proper calibration procedure.

1. Review the type(s) of pulsars installed on the lower control valve as identified in Section 1, Step 3. 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 5).

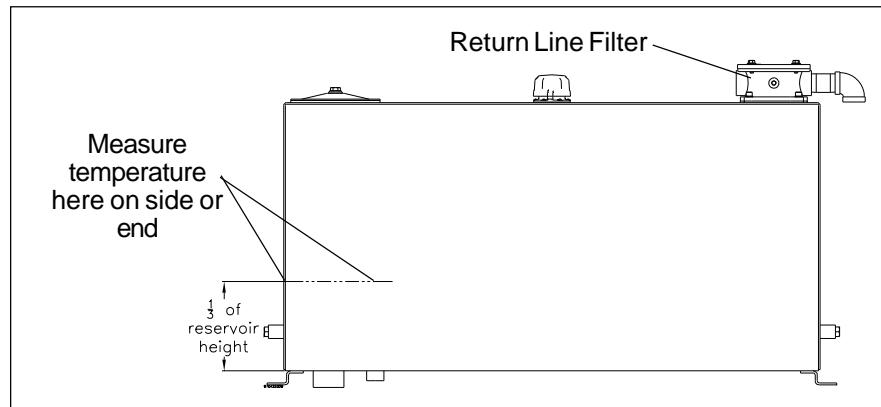


**Figure 5 — Pulsar Function Identification**

## Section 2

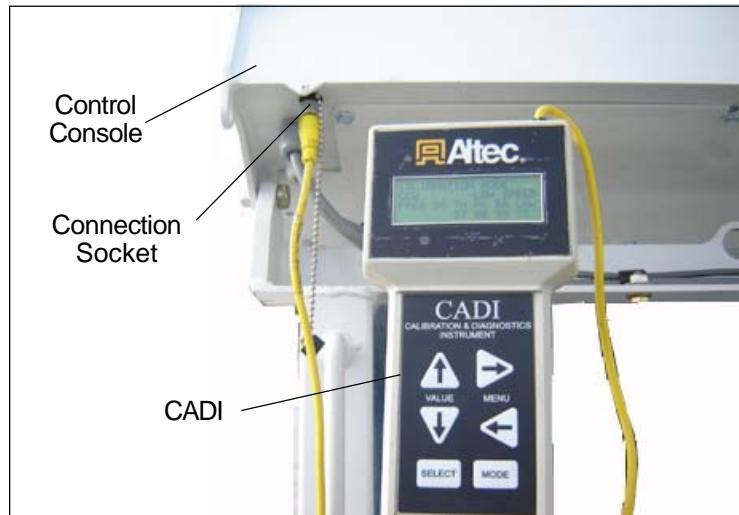
### Threshold Calibration (Continued)

2. Operate the unit to warm the hydraulic oil to 120 to 130 degrees Fahrenheit. This temperature range is important. **If the oil is not warmed to this temperature range, the CADI settings resulting from the calibration procedures will not be accurate, and poor meterability will result.** One way to verify the oil temperature is to 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 6). The oil can be warmed quickly as described in Step 2a or 2b.
  - 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 boom control fully shifted in the Retract position or holding the pole guide open/close switch in the Close position. When the oil has reached 120 to 130 degrees Fahrenheit, stow the digger and proceed to Step 3.
  - 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 boom control fully shifted in the Retract position or holding the pole guide open/close switch in the Close position. Do not allow the load hook to contact the boom tip when operating Winch Raise. When the oil has reached 120 to 130 degrees Fahrenheit, proceed to Step 3.



**Figure 6 - Reservoir Temperature Measurement Location Using IR Thermometer**

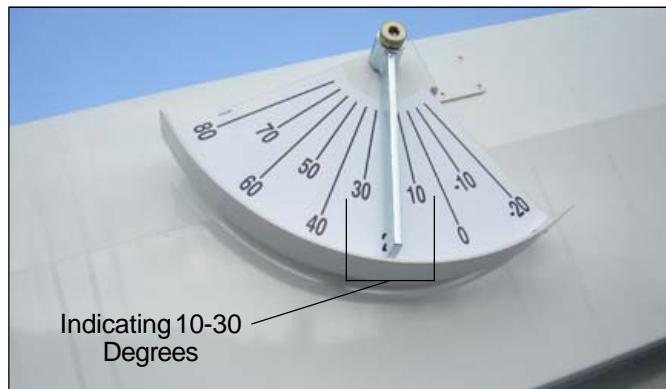
3. Connect the cable from the CADI to the CADI connection socket (refer to Figure 7).



**Figure 7 - CADI Attached to Connection Socket**

## Section 2 Threshold Calibration Procedure (Continued)

4. Position the boom at an angle from 10 to 30 degrees above horizontal (refer to Figure 8), and rotate it to a position where all the functions can be operated for calibration.



**Figure 8 - Boom Angle Indicator**

5. Set the low speed/standard switch to Standard on the control panel being used. Operate with the engine at full RPM.

6. Record the MX setting for the function to be calibrated (Boom Up/Down, Rotation CW/CCW, Second (Intermediate Boom) Extend/Retract, Third (Upper Boom) Extend/Retract, Winch In/Out, or Digger Dig/Clean). Then change the TH and MX settings for this function to 00. The value button on the CADI can be held down continuously until the setting reaches 00.

7. Operate the hand control and adjust the MX and TH values for the function being calibrated as described in Steps 7a through 7g.

- Fully shift and hold the hand control, and increase the MX value slowly until the function starts moving.
- Release the hand control, and decrease the MX value by 3 points.
- 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.
- Increase the MX value by 1 point every 5 seconds until the function begins to creep, meaning to operate 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.
- Release the hand control. Use the MX value from step d to obtain the required TH setting based on the type of pulsar installed for the function being tested. For a standard pulsar on any function other than digger, proceed to step f. For a pressure feedback pulsar on any function other than digger, proceed to step g. For digger dig or digger clean, two pulsars are used to operate the function. Proceed to step f if the one or both of the corresponding pulsars are the standard type, or proceed to step g if both pulsars are the pressure feedback type.
- For a standard pulsar or a digger function with at least one 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, subtract 15, and adjust the TH setting to 27. Proceed to step h.

**Section 2  
Threshold  
Calibration  
Procedure  
(Continued)**

- g. For a pressure feedback pulsar or a digger function with both pulsars that are the pressure feedback type, 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, subtract 5, and adjust the TH setting to 37.
- h. Record the final TH setting on the CADI Values Sheet or the Field CADI Settings Guide.
- i. Return the MX setting to the value it had before it was changed to 00.

8. Repeat Steps 6-7 for each direction of each boom, winch, and digger function.

9. Proceed to Section 3: Max Out and Low Speed Calibration.

**Section 3  
Max Out and Low  
Speed Calibration****Section 3: Max Out and Low Speed Calibration Procedure**

The Max Out (MX) and Low Speed (LMX) settings for the boom, winch, and digger functions must be properly adjusted to achieve the correct valve spool travel and cycle times at full control handle travel. Because the MX and LMX calibration procedures vary for different models, refer to the latest CADI Quick Reference Guide (p/n 749-30200) for the proper procedures.

**Testing and  
Completion**

1. After all testing and adjustments are completed, engage the unit's hydraulic system and operate the unit in all functions looking for leaks and proper operation. Make any corrections necessary.
2. Stow the unit. Replace the turntable cover. Retract the outriggers. Disengage the