

64811 U.S. PTO



01/14/10

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re Application of: Bobby J. Bowden	§	
	§	
Patent Owner: Wildcat Services L.P.	§	Group Art Unit: 3993
	§	
Control No.: 90/010,615	§	Examiner: Peter C. English
	§	
Reexamination of Patent No. 5,474,142	§	Atty Docket: NOV-2RE:142
	§	
For: Automatic Drilling System	§	Customer No.: 21897

**RESPONSE TO OFFICE ACTION MAILED DECEMBER 14, 2009**

Mail Stop *Ex Parte* Reexam  
 Attn: Central Reexamination Unit  
 Commissioner for Patents  
 United States Patent & Trademark Office  
 P.O. Box 1450  
 Alexandria, VA 22313-1450

Dear Commissioner:

This paper is presented in response to the Office Action dated December 14, 2009.

Patentee respectfully submits the following grounds in support of this Response.

The **Listing of Claims** is attached as Appendix A to this Response.

A **History** of the Examination of the claims of the '142 Patent; the litigation with Requestor and other litigation and events related to the '142 Patent is attached as Appendix B to this Response.

The **Remarks** begin on page 2 of this response.

### **REMARKS**

Patentee and the undersigned appreciate the careful review of Examiner English in this reexamination proceeding. Consideration of the present application in view of the following remarks is respectfully requested.

Claims 1-8 and 11-15 are subject to reexamination.

Claims 9-10 are not subject to reexamination.

Claims 2-4 and 6-8 were deemed patentable and/or confirmed.

Claims 1, 5 and 11-15 are rejected.

#### **I. The Invention of the '142 Patent**

The invention of the '142 Patent was a monumental breakthrough in the automatic driller arts. The prior art automatic drilling systems were designed to drill vertical wells where only weight on bit (WOB) was an important variable in drilling. In vertical drilling, it was safely assumed that whatever weight was indicated or derived by the tension in the rig's hoisting system cables was also indicative of the weight sensed by the drill bit at the bottom of the well. The *Description of the Related Art* section of the '142 Patent describes the prior art *Weight-on-Bit* type automatic driller as follows:

"Typical automatic drillers presently control the drill string using only bit weight. Such drillers throttle the brake handle of the cable drum brake in response to decreases in bit weight to release the drill string support cable and, thus, lower the drill string. The lowering of the drill string places additional weight of the drill string on top of the drill bit in order to increase bit weight back to its desired value. A driller operator enters a desired bit weight value into the automatic driller which then compares the desired value to the actual bit weight measured by a weight indicator. As long as the actual bit weight remains within the tolerance of the desired bit weight, the cable drum brake remains engaged, and the drill string support cable supports the drill string at its present level. However, once the weight indicator measures a bit weight that falls outside the desired bit weight entered into the automatic driller by the drilling rig operator, the automatic driller

manipulates the brake handle to release the cable drum brake which lowers the drill string cable, thereby placing more weight of the drill string upon the drill bit. The cable drum brake remains released until the weight indicator provides a signal to the automatic driller which substantially equals the desired bit weight."

(See '142 Patent, Col. 1, ll. 14-35)

Such prior art WOB automatic drillers were sufficient for vertical drilling. However, when directional and horizontal drilling became commonplace, the prior art WOB automatic drilling systems were no longer adequate. This was because once the wellbore was deviated from the vertical at least a portion of the drill string would often rest on the slope of the directional well. Thus, surface indicia of weight as proxies of the tension of the hoisting system were no longer accurate.

## **II. The Le Compte *et al.* Patent (U.S. Patent No. 1,891,329 (1932))**

Claims 1 and 11 of the Bowden '142 Patent have been rejected as anticipated (35 U.S.C. § 102) by Le Compte *et al.* (U.S. Patent No. 1,891,329) (hereinafter "Le Compte"). Patentee respectfully traverses.

### **A. Le Compte Only Releases The Upper Drill String, It Does Not Release The Entire Drill String As Claimed By The '142 Patent**

As recognized by the Examiner, Le Compte discloses a telescoping joint type drill string for drilling a vertical well, i.e., not a directional or horizontal well, "wherein telescopic means is employed that will permit of a predetermined pressure being applied to the drilling bit, or cones, throughout the drilling operation." See Le Compte, Page 6, ll. 54-58. Le Compte will only work with a sectioned drill string comprising an upper drill string suspended within the drilling rig derrick and a lower drill string having a drilling bit connected at its lower end. The upper and lower drill strings are separated by a telescoping joint or sliding sleeve that is operated to be neither fully

extended nor fully collapsed. With Le Compte's telescopic joint, the "bit is intended to be entirely safe from the weight of the upper drill stem at all times so that a predetermined weight can always be applied to the bit as recommended by the manufacturers of the bit for the various earth formations." See Le Compte, Page 6, ll. 43-48. The drawworks of Le Compte can only control the release of the upper drill string from the rig's mast. See Page 6, ll. 29-30 ("sliding valve 84 will be further closed to allow normal lowering of the upper drill stem section H"); Page 5, ll. 23-36 ("permit the cable drum to revolve at such speed as to lower upper drill stem into the hole"); Page 5, ll. 110-112 ("further set the brake and slow up feeding of upper drill stem into the hole").

Le Compte never describes controlling the release of "the drill string" as claimed, but only the release of the "upper drill stem." Because the lower drill string or stem is connected to a telescoping joint, the drawworks does not regulate the release of the lower drill stem. The rate of release of the lower drill stem is controlled by the rate of penetration of the bit as it cuts through the earth, not the braking mechanism on the rig floor. Instead, the braking mechanism on the rig floor is used to control the rate of release of only the upper drill stem in a way that attempts to keep pace with the rate of release of the lower drill stem. This is not controlling the rate of release of the entire drill string in response to changes in drilling fluid pressure as claimed in the '142 Patent.

Claims 1 and 11 of the '142 Patent each refers to both an increase and decrease in the rate of release of "the drill string." The drill string of the '142 Patent, identified by numeral "21," is described as containing a mud motor 85 and drill bit 23, and is not

comprised of an upper drill stem with a lower drill stem telescopically suspended therebelow. *See* '142 Patent, Col. 3, Line 52 – Col. 4, ll. 15.

As described in the '142 Patent, the purpose of the invention is to adjust the drawworks 22 “in order to retain drill bit 23 ‘on bottom’ (i.e., on the bottom of the borehole 86) and maintain the progression of borehole 86 through formation 87.” *See* '142 Patent, Col. 4, ll. 15-18. As further explained by the '142 Patent, “[t]o maintain drill bit 23 ‘on bottom’ and, thus, the optimal rate of penetration, automatic driller 33 connects to brake handle 208 via cable 207 to regulate the release of cable 28 from drum 26. Automatic driller 33 senses when drill bit 23 is ‘off bottom’ and manipulates brake 32 to release cable 28 and lower drill string 21 until drill bit 33 is again ‘on bottom’. Automatic driller 33 determines when drill bit 23 is ‘off bottom’ by measuring drilling fluid pressure, bit weight, drill string torque, and drill string revolutions per minute (RPM).” *See* '142 Patent, Col. 4, ll. 33-42.

While the Office Action states that “Le Compte measures the weight using a telescopic device that reflects the bit weight in the pressure of the drilling fluid” (Office Action Page 6), Patentee would point out that Le Compte only generates a control signal indicating the relative position of the telescopic joint via a choke manifold. As explained by Le Compte the “primary aim, at all times, [is] to maintain a predetermined pressure, by weight of a lower section of drill stem on the bit, and no more.” *See* Page 2, ll. 92-94. Additionally, Le Compte explicitly specifies “at no time can upper drill stem section come into contact and rest upon the lower drill stem section to add all of its weight to the drilling bit.” *See* Page 6, ll. 31-33. That is, so long as the telescopic joint is not fully collapsed (compressed) or fully extended (tensioned), the weight on

the drill bit will remain constant in a vertical well because the preloaded weight of the lower drill stem will always rest on the drill bit. Thus, a change in drilling fluid pressure caused by the relative position of the choke manifold in the telescopic joint only represents the position of the telescopic joint. It does not, in fact, indicate weight or the interaction of the drill bit with the formation and is not used to control the rate of release of the drill string in the manner of the '142 Patent.

For these reasons, Le Compte cannot anticipate claims 1 and 11 of the '142 Patent. Patentee respectfully requests withdrawal of the rejection based upon 35 U.S.C. §102(b) and allowance of Claims 1 and 11.

**B. Le Compte Fails To Teach A System For Increasing AND Decreasing The Rate of Release As Required By Claims 1 & 11 of the '142 Patent**

The December 14, 2009 Office Action recites that Le Compte “teaches the concept of increasing or decreasing the rate of release (setting or releasing of the brake) of the drill string.” See Page 5. Le Compte itself purports to describe a mechanism for *decreasing the rate of release* (Page 5, ll. 110-112 (“...to further set the brake and slow up feeding of upper drill stem into the hole”) and, allegedly, *increasing the rate of release* (Page 6, ll. 14-15 (“admitting less steam to cylinder and causing a slight let up on the braking action”) & ll. 28-30 (“the sliding valve 84 will be further closed to allow normal lowering of the upper drill stem section H”).

The Le Compte Patent discloses a “brake actuating mechanism” for activating a drawworks brake reproduced below. The drawworks brake is similar to band brake systems still utilized today. As described by Le Compte with reference to Figure 15, reproduced below,

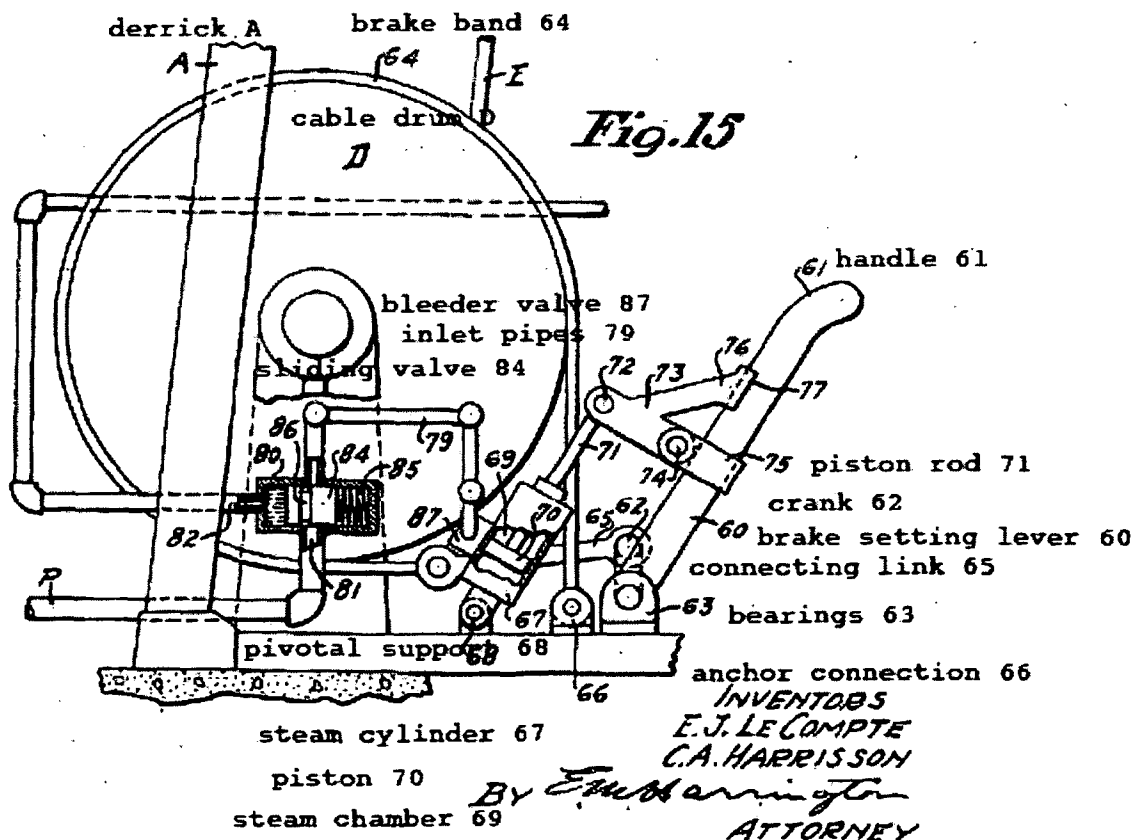
“the cable drum brake actuating mechanism embodies a brake setting lever 60, which can be manually actuated through the handle 61 ... [t]he brake lever 60 is fixed at its lower end to a rock shaft having a crank 62, which rock shaft is journaled in suitable bearings 63 fixed to the floor of the derrick A. The crank 60 [sic] is connected with the free end of a brake band 64 riding over the cable drum D by means of a connecting link 65. The brake band 64 is fixed at its opposite or forward end to the floor of the derrick A, by means of a suitable anchor connection 66. By this arrangement, the brake band can be brought into braking contact with the cable drum D when so desired with any degree of frictional contact when manually operating the brake lever by manipulating the handle thereof for leading off cable from the cable drum, at any desired speed for lowering upper drill stem section into the well hole bored by the drilling bit.” See Le Compte, Page 4, Line 128 – Page 5, Line 23.

By this arrangement, when brake handle 61 is lowered vertically towards the rig floor, the crank 62 tightens brake band 64 against drum D (increasing the friction and braking force), which slows down and ultimately stops the rotation of the drum D, decreasing the rate of the letting off of cable E from drum D and, therefore, decreasing the rate of release of the upper drill string or stem.

Conversely, when brake handle 61 is raised vertically away from the rig floor, the crank 62 loosens (slacks off) the brake band 64 around drum D (decreasing the friction and braking force), which starts or speeds up the rotation of the drum D, increasing the rate of the letting off of cable E from drum D and, therefore, increasing the rate of release of the upper drill string or stem.

As described by Le Compte, “if for any reason the mud laden fluid pressure increases from normal, due to the collapsible telescopic action of the drill stem length compensator U, the valve [84] will be opened sufficiently to admit more steam into the steam cylinder [67] for quickly raising the piston [70] therein to move the brake lever 60 to quickly set the brake against the cable drum [D].” See Page 5, ll. 64-72. While the written description of Le Compte describes the steam entering the “steam chamber

69" of the "steam cylinder 67," indicated in Figure 15 as the annular space between "piston rod 71" and "steam cylinder 67" above the "piston 70," such a description is illogical and inconsistent with the description of the operation. According to this description of the structure, more steam (i.e., pressure) would enter the "steam chamber 69" through "inlet pipes 79" and "bleeder valve 87" to force "piston 70" and "piston rod 71" to move down towards "pivotal support 68" relative to the "steam cylinder 67" which would, in turn, tend to cause the "brake lever 60" to lift and rotate counter-clockwise and hence slack off on the "brake band 64" with respect to the "drum D." This, however, would actually decrease the frictional force and hence the braking force applied, and increase the rate of release of the upper drill string or stem, which is the opposite of the intended result described by Le Compte. See Figure 15 below.





Even if it were assumed that the control system of Figure 15 of Le Compte, can properly be re-drawn to reflect what is described within the written description, the system would still be inoperable. In that event, steam from "inlet pipes 79" and "bleeder valve 87" would not enter "steam chamber 69" above the "piston 70," but instead would enter the "steam cylinder 67" below the "piston 70." Under this assumption, the more steam that entered the cylinder would drive "piston 70" and "piston rod 71" upwardly and to the right to move the "brake lever 60" down and clockwise toward the rig floor to tighten the "brake band 64" around the "drum D" and slow down and stop the release of the upper drill string or stem. The more steam that enters "steam cylinder 67" under "piston 70," the more braking force that is applied, i.e., the "brake lever 60" is moved clockwise to tighten "brake band 64" against drum D. However, while this arrangement might allow for a possible reduction in the rate of release of the upper drill stem, no mechanism is provided for increasing the rate of release.

Nowhere within the Le Compte disclosure is there a structure for admitting steam to either or both sides of the "piston 70" for moving the "piston 70" in opposite directions. Instead, Le Compte's only means of allegedly varying braking action is to allow more or less steam to enter the "steam cylinder 67." *See, e.g.,* Le Compte, p.6 ll. 24-30 ("sliding valve 84 will be further closed to *allow* normal lowering of the upper drill stem section"). Allowing more or less steam to enter "steam cylinder 67," however, cannot actually allow for varying braking action as Le Compte does not disclose, describe or provide any means for removing pressure from the steam cylinder. In other words, once "steam cylinder 67" is filled, Le Compte provides no structure for

further varying the braking action in the direction intended to correspond with admitting more steam to the cylinder, or in the opposite direction intended to correspond with admitting less steam to the same cylinder. Additionally, no structure is disclosed for urging the brake lever 60 in an opposite direction upon the elimination by undisclosed means of steam from either one or both of the two sides of piston 70.

Use of prior art in rejections where operability is a question is typically not appropriate. See, MPEP, §2121.01. The MPEP states, "The disclosure in an assertedly anticipating reference must provide an enabling disclosure of the desired subject matter..." The Le Compte patent is not operable for the purpose it was cited and therefore should not be used.

Moreover, Requester's expert conformed under oath that the Le Compte Patent is different from the '142 Patent. During the jury trial between Patentee NOV and Requester Pason over the '142 Patent, Requester Pason's technical expert was designated as a person having skill in the art of the '142 Patent testified under oath on direct examination (by Pason's counsel) that the Le Compte patent discloses a binary "on/off" type release system substantially similar to the previously considered Varney patent of the 1<sup>st</sup> Reexamination as follows:

"Q: You know, we've -- we've heard some reference to another patent we're going to talk about called Varney having sort of an on/off switch.

A: Right.

Q: Is that -- once you move outside the dead band is that --

A: Yeah, what will happen in Le Compte and many of these other older patents is they have kind of an on/off switch nature to them. And so what will happen with Le Compte is when it says, Oh, pressure is too high -- it says, okay, release the drill string, not

release it a little bit, release it a lot, you know, be real careful how you release it, anything like -- it just says release the drill string. And it says, oh, pressure is too high, release the drill string. Oh, pressure is -- pressure is too high hold back on the string; pressure is too low release the string and so it's just an on/off kind of switch.

(See Trial Transcript of J. Ford Brett at **Appendix D**, Day 6 p. 1292, ll. 7-22, November 3, 2008).

Moreover, on cross-examination, Requester's designated expert further testified:

Q: You mentioned the Varney patent and you said it was an on/off switch, and you said Le Compte and some of these other ones were on/off switches, correct?

A: Right.

Q: They don't release a little; they either stop the release or start the release.

A: That's right.

Q: It's your understanding that the 142 patent is different from that. It's not a stop or start.

A: I agree, this is different.

(See Trial Transcript of J. Ford Brett at **Appendix D**, Day 7, p. 1391, ll. 4-13, November 4, 2008);

Q: Mr. Brett, you lump Le Compte, Dillon, Miller, Garrett, and Varney all together.

A: They all -- I lump them together because they have that similar on/off type nature to them.

Q: They all have the on/off nature, which you just testified is different that the Bowden 142.

A: I agree.

(See Trial Transcript of J. Ford Brett at **Appendix D**, Day 7, p. 1392, ll. 8-14, November 4, 2008).

Thus, Le Compte cannot anticipate any claim of the '142 Patent where Pason's representative and designated expert witness admitted under oath that the Le Compte

Patent fails to regulate the release of the drill string, i.e., increase and decrease the rate of release.

For the reasons given above, Patentee respectfully requests withdrawal of the rejection based upon 35 U.S.C. §102(b) and allowance of Claims 1 and 11.

### **III. The Obviousness Rejection (35 U.S.C. § 103(a))**

Claims 1, 5 and 11-15 of the Bowden '142 Patent were rejected as obvious (35 U.S.C. § 103) over Bowden '359 (U.S. Patent No. 3,265,359) in view of Dillon *et al.* (U.S. Patent No. 2,005,889) and Hobhouse (U.S. Patent No. 3,550,697). Patentee NOV respectfully traverses.

#### **A. BOWDEN '359**

The Bowden '359 patent was filed in 1957, before directional or horizontal drilling had been commercially developed. The Bowden '359 patent was designed to drill substantially vertical wells based upon changes in WOB alone and nothing more.

The Bowden '359 Patent was issued to J.E. Bowden, the late father of the inventor of Patentee's '142 Patent, Mr. Bobbie Joe Bowden. The Bowden '359 patent teaches a weight-on-bit (WOB) automatic drilling system that controlled the rate-of-release (ROR) in response to changes in changes in WOB. The WOB was measured from the tension in the drilling line or cable via a "diaphragm tension sensor 16 [and 116]" illustrated in Figures 1, 2, 3, 4, 7 and 11. The only other parameter being measured by Bowden '359 is the rate of rotation of the drawworks cable drum which indicates the rate of release of the drill string for feedback of the control system. This feedback is measured by "friction wheel 44" or "pulley 133" and is sometimes referred

to in the art as a drum crawler that is substantially similar to the feedback provided by the "wheel drum rotation sensor 90" of the preferred embodiment of the '142 Patent.

The Patentee's '142 Patent described the Bowden '359 patent in the *Description of the Related Art* section. Additionally, the Ball patent similarly describes the *Weight-on-Bit* type automatic drilling system of the Bowden '359 patent.

## **B. DILLON**

The Patentee's '142 Patent's European Counterpart Application was challenged in view of the Dillon patent (D1) alone and in combination with other previously cited references in the *References Cited* section of the '142 Patent, including Ball, Rogers and Jasinski, in a EPO Opposition proceeding that was filed on July 1, 2003 by Bentec GmbH Drilling Oilfield Systems. See EPO Opposition history Attached as **Appendix C**. Like the USPTO concluded with respect to the Varney patent in the 1<sup>st</sup> Reexamination, the EPO concluded that the Dillon patent similarly failed to disclose an automatic drilling system that can increase or decrease the rate of release. The EPO made the following findings with respect to Dillon in allowing the substantially similar claims in the '142 Patent's European counterpart application:

"D1 [Dillon] discloses an automatic drilling system responsive to parameters as drilling fluid pressure, weight on bit, drill string torque and drill string rpms. Considering in particular drilling fluid pressure, in the system according to D1 [Dillon] drilling is started with weight on bit, a rate of release of zero (page 3, right column, lines 30-37) and drilling fluid circulated at a given target pressure. A drop in fluid pressure exceeding a given amount causes the drill string to be lowered at a constant rate until the target fluid pressure is reestablished, at which moment the rate of release is set again to zero. [emphasis supplied]

The controller of D1 [Dillon] reacts therefore to a drop in fluid pressure by:

- maintaining the drill string vertically stationary if the drop is lower than a given amount, or
- lowering the drill string at a **given, predetermined** rate if the drop is lower than that amount." (emphasis by EPO Examiner)

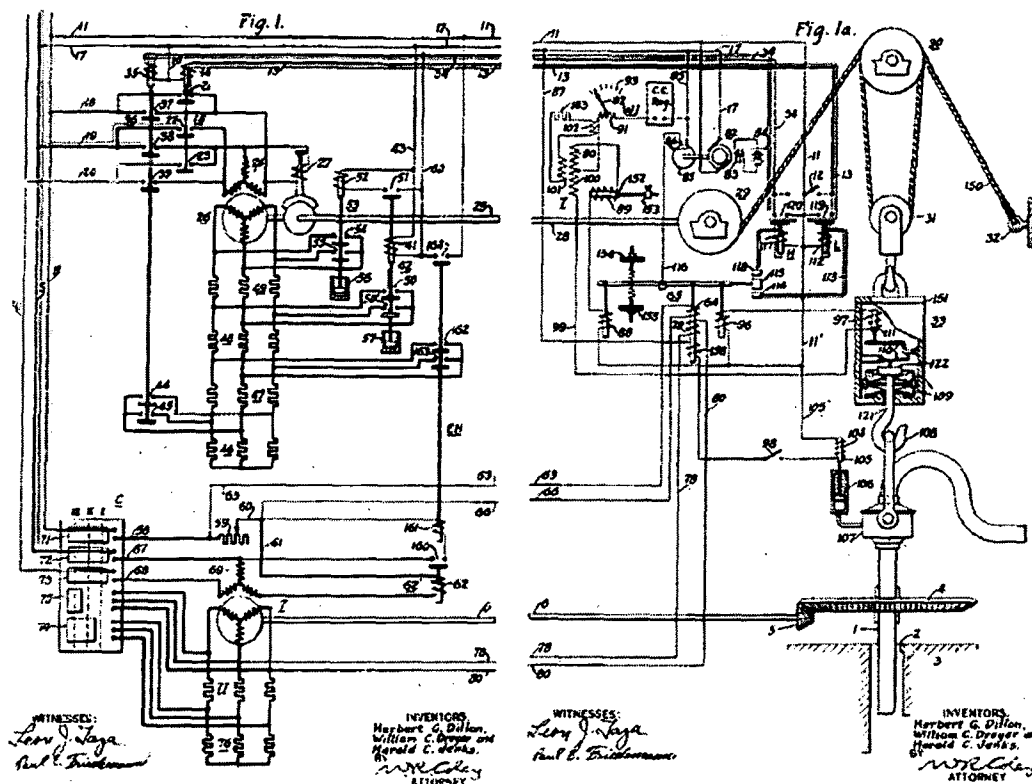
(See **Appendix C**, p. "NOV 758." See also "NOV387.").

The Dillon patent cannot provide for the increase or decrease of the rate of release of the drill string as explained therein:

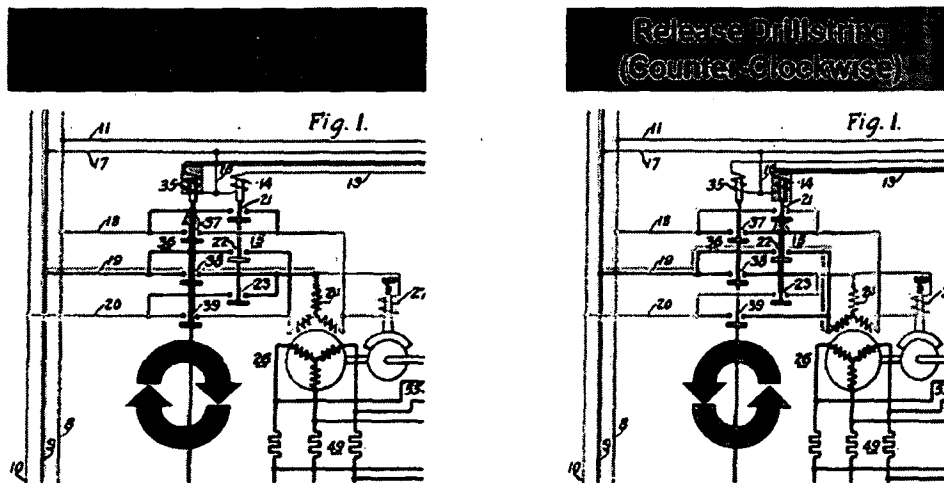
"To release the hoisting drum 29 for the lowering operation, the brake coil 27 is connected directly across the leads of the primary winding 24 and is thus energized whenever either one of the directional contactors 15 or 36 have operated. With the motor energized, the hoist drum, by virtue of the operation of the brake 27 is released, the operation being effected through the shaft 28. The drill stem 1 is thus lowered as the cable is paid out by the drum 29 and traverses the crown block 30 and the traveling block 31."

(See Dillon patent at Requestor's Ex. D, p. 2, Right Column, ll. 49-59)

The manner in which the "directional contactor 15" changes the poles of the "primary winding 24" and hence the direction of "motor 26" is illustrated below:



As shown, the "balancing mechanism 65" is either (1) balanced as shown in Fig. 1a and thus no current is provided to the "winding 24" or "brake 27" thereby holding the drill string static; or (2) unbalanced whereby "directional contactor 15" either completes the circuit with "contact members 114 or 118." If the circuit is completed with "contact member 114" actuating coil 112 of the "lowering relay L" is actuates "coil 14" and hence "contact members 21, 22 and 23" cause "directional contactor 15" to energize "winding 24" to rotate counter-clockwise to release the drill string. Conversely, if the circuit is completed with "contact member 118" actuating coil 117" of the "hoisting relay H" is actuates "coil 35" and hence "contact members 37, 38 and 39" cause "directional contactor 36" to energize "winding 24" to rotate clockwise to release the drill string. The manner in which "directional contactors 15 and 36" changes the poles of the "primary winding 24" and hence the direction of "motor 26" is illustrated below:



Thus, as confirmed by the EPO, the Dillon patent does not regulate the rate of release of the drill string and therefore cannot raise a substantial new question of patentability.

Dillon teaches away from the present invention. Dillon does not consider the pressure to be an "appreciable factor." Particularly, Dillon states:

Since the pressure of the fluid in the pumping system is usually not a very appreciable factor, the operation of this system would more often proceed with the switch 98 in the position shown. In some instances it may even be desirable not to utilize coils 64 and 79, in which case these coils may be disconnected by switching mechanism not herein shown.

Dillon patent, p.4, Col. 1, ll. 33-40, emphasis added. In 1932, when the Dillon patent was filed, the only technology that existed was vertical drilling technology without mud motors. Thus, any change in pressure was a result of a wash out, a clogged jet nozzle or a ruptured pipe. Therefore, Dillon supports that the presently claimed invention is not obvious and Dillon teaches away from the present claimed invention.

Moreover, during the jury trial between the Patentee and the Requester over the '142 Patent, Requester's designated a person having skill in the art of the '142 Patent as Requester's expert on patent invalidity. This expert was J. Ford Brett, who is also the



co-author of the Brett et al. publication described above, who testified under oath on direct examination (by Requester's counsel) that Dillon discloses a binary "on/off" type release system substantially similar to Varney. Requester's expert testified as follows:

Q: Mr. Brett, you lump Le Compte, Dillon, Miller, Garrett, and Varney all together.

A: They all -- I lump them together because they have that similar on/off type nature to them.

Q: They all have the on/off nature, which you just testified is different that the Bowden 142.

A: I agree.

(See Trial Transcript of J. Ford Brett at Appendix D, p. 1392, ll. 8-14, November 4, 2008)(emphasis supplied).

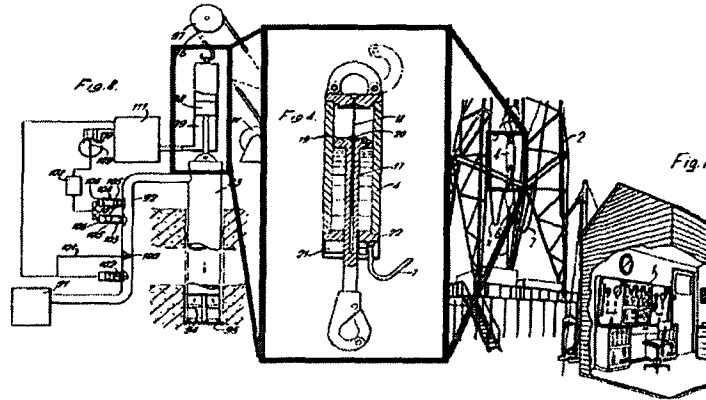
Thus, Dillon cannot raise a substantial new question of patentability. Requester's own expert admitted under oath that the Dillon patent is no more relevant than the Varney patent which the PTO has already confirmed fails to teach the regulation of the release of the drillstring. Further, Dillon is merely cumulative to the prior art previously considered.

### **C. Hobhouse**

The Hobhouse patent was previously considered by the EPO during the examination of the '142 Patent's European counterpart application. See EPO File History of Patentee's '142 Patent's counterpart, 2005 Search Report identifying G.B. Patent No. 1,189,644 to Hobhouse whereby the U.S. Patent No. 3,550,697 to Hobhouse claims priority. See **Appendix F**.

The Hobhouse patent discloses a hydraulic hoisting system, similar to a conventional snubbing unit that is substantially similar to the previously considered

Rogers patent (U.S. Patent No. 4,165,789), which controls the hoisting and releasing of the drill string as shown in its Figures below:



Further, the specification of Hobhouse specifies the following method or steps be performed by the system when an increase in drilling fluid pressure is detected:

"The following sequence of control is advantageous upon torque rise in the bit causing an increase in mud-flush pressure in pipe 92 detected by the control device 104, for example due to the drill bit striking a harder strata than previously being drilled:

1. increase mud-flush flow by opening valve 102;
2. **stop sinkage** by pressurizing underside of piston 98;
3. lift weight off bit 95;
4. stop drilling."

See Hobhouse at Requestor's Exhibit E, Col. 8, ll. 37-45 (emphasis supplied).

Conversely, Hobhouse specifies that when the system disclosed detects a decrease in drilling fluid pressure, the following method or steps be performed:

"The following sequence upon torque fall at the drill bit 95 sensed by a pressure drop detected at control device 103 for example due to the drill breaking through into a softer strata:

1. **increase sinkage** by releasing pressure beneath piston 98;

2. increase volume of mud-flush flow by opening valve 102;
3. stop drilling."

*See* Hobhouse at Requestor's Exhibit E, Col. 8, ll. 46-51 (emphasis supplied).

Hobhouse discloses only a single control structure for hoisting and lowering the drill string, which is depicted in Figure 6, reproduced below, and described as follows:

"As shown in FIG. 6, the hydraulic control circuit is duplicated by a circuit indicated at 67 and two position changeover valves 68 and 69 select whichever is to be used.

"The drive motors for the pumps 13 are also controlled by the changeover valves 68 and 69. The pump 13 of the selected circuit is continually running, at its nominal speed and its outlet 90 connected to a two-way solenoid valve 71, which, in turn, connects it to the hydraulic cylinder 4, when solenoid 71A is energized.

The outlet 90 is also connected to a bypass circuit 72 consisting of a manually adjustable valve 73 to set maximum system pressure, and a normally open solenoid valve 74C which is energized closed at the same time as solenoid valve 71A is energized open.

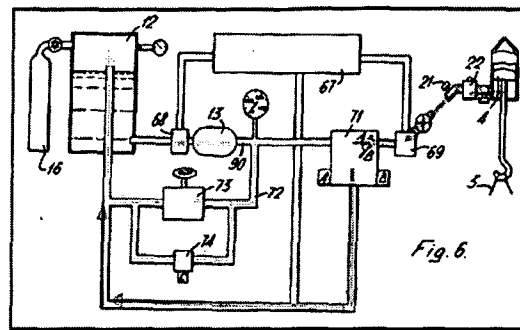
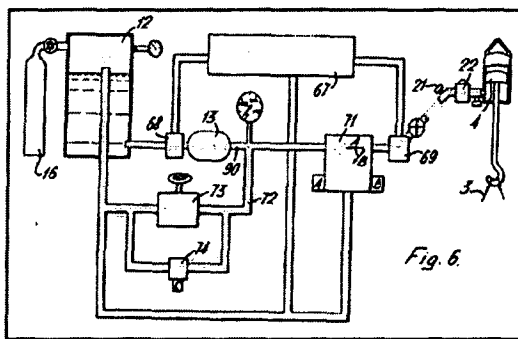
Therefore, when it is required to raise the piston in the cylinder 4, solenoid 71A and 74C are energized, opening the two-way valve 71 and closing the bypass 72 allowing oil to be pumped into the cylinder 4.

To lower the piston in the cylinder 4, solenoid 71B is operated, and the load on the piston pumps oil through the return ports of the two-way valve 71 and back to the tank 12."

(*See* Hobhouse at Requestor's Exhibit E, Col. 6, l. 66- Col. 7, l. 19).

Thus, in the Hobhouse invention, fluid is pumped under piston of "cylinder 4", via a "continually running" "pump 13" which pumps fluid at a constant system pressure that is set by "valve 73." To lift the cylinder and thus reverse the release of the drill string, "solenoid valve 71" is open to the "A" position to permit the pumping of fluid into "cylinder 4" at a constant pressure and a constant rate.

Hobhouse's description is coded below to show how "two-way valve 71" is controlled by "solenoid 71A" to open "valve 71" between the "pump 13" and "cylinder 4" to hoist the drill string as shown left. Conversely, the "two-way valve 71" is controlled by "solenoid 71B" to open "valve 71" between the "cylinder 4" and "tank 12" to lower the drill string as shown right.



Thus, as shown and described, the system taught by Hobhouse, like that of Varney and Dillon, cannot increase or decrease the rate of release of the drill string. Additionally, while Hobhouse discloses an alternative system for multi-parameter control based upon WOB and/or torque, there is nothing within Hobhouse that suggests the combination of drilling fluid pressure with any other parameter.

More particularly, Hobhouse describes using a WOB technique, or a torque technique, or a combination of WOB and torque technique. However, Hobhouse does not teach combining pressure. Hobhouse does not make the link to use pressure in such a combination. Hobhouse discussing the various techniques without the critical combination is significant evidence of non-obviousness.

#### **D. Secondary Indications of Non-Obviousness**

The Federal Circuit has established a number of factors to be considered as a necessary part of a determination of obviousness under 35 U.S.C. § 103. These factors, also known as secondary indications of non-obviousness, include (1) commercial success of products covered by the patent claims; (2) a long-felt, but unresolved need for the solution provided by the claimed invention; (3) unsuccessful attempts by others to find the solution provided by the claimed invention; (4) copying of the claimed invention by others; (5) unexpected and superior results from the claimed invention; (6) acceptance by others of the claimed invention as shown by praise from others in the field of the invention or from the licensing of the claimed invention; (7) disclosures in the prior art that criticize, discredit, or otherwise discourage the claimed invention and would therefore tend to show that the invention was not obvious; and (8) other evidence tending to show non-obviousness. *Graham v. John Deere Co.*, 383 U.S. 1(1966); *KSR Int'l Co. v. Teleflex Inc.*, 127 S.Ct. 1727 (2007); *Ruiz v. A B. Chance Co.*, 234 F.3d 654 (Fed. Cir. 2000); *Arkie Lures Inc. v. Gene Larew Tackle Inc.*, 119 F.3d 953, 957 (Fed. Cir. 1997); *Specialty Composites v. Cabot Corp.*, 845 F.2d 981, 991 (Fed. Cir. 1988); *Windsurfing Int'l Inc. v. AMF Inc.*, 782 F.2d 995, 1000 (Fed. Cir. 1986); *Pentec. Inc. v. Graphic Controls Corp.*, 776 F.2d 309, 313 (Fed. Cir. 1985).

##### **1. Products Covered by the Claims**

The automatic drilling system developed by inventor, Bobbie J. Bowden, is known as the Wildcat drilling system. The Wildcat drilling system is covered by the claims of United States Patent 5,474,142 ('142 Patent). The patent covers an automatic

drilling system that regulates the rate of release of a drill string in response to changes in drilling fluid pressure alone or in combination with changes in weight on bit, drill string torque and/or drill string revolutions per minute. Appendix E-1, 389:9 – 389:13. The invention of Claim 1 contains a pressure sensor, a regulator measuring changes in drilling fluid pressure and outputting a signal, a relay responsive to the output signal of the drilling fluid pressure regulator, and a controller that increases or decreases the rate of release of the drill string in response to the aforementioned signal. All of these features are contained in the Wildcat drilling system. Appendix E-1, 384:8 – 384:23; Appendix E-12, Wildcat services brochure (“Proper use of pump pressure controls (Delta P) has proven to be the superior method of drilling with mud motors.”); Appendix E-13, Wildcat services Technical Manual (“Proper use of pump pressure controls (Delta P) has proven to be the superior method of drilling with mud motors.”).

The Wildcat drilling system also represents a system that is used to perform all the steps of method claim 11 of the ‘142 Patent, including measuring drilling fluid pressure, producing a signal in response to changes in drilling fluid pressure, relaying the signal to a drilling string controller and controls the drill string controller to increase or decrease the rate of release of the drill string when the pressure signal represents a decrease or increase in drilling fluid pressure. Appendix E-1, 384:25 – 385:12. Additionally, the Wildcat drilling system may also be used to perform the method of Claim 14, including producing a second signal representing changes in bit weight. Appendix E-1 385:16 – 385:13; also Appendix E-12 and Appendix E-13.

The automatic drilling system produced by Pason Corporation, the Pason AutoDriller, is also covered by the claims of the ‘142 Patent. Indeed, after a nine-day

jury trial in the United States District Court for the District of Colorado, the Pason AutoDriller was found to infringe claim 1 and to have been used to infringe method claims 11 and 14.

2. Commercial Success of Products Covered by the Patent Claims

Both the Wildcat drilling system and the Pason AutoDriller have been enormously successful and revolutionized the horizontal drilling industry. As described by NOV's expert, who performed a multifaceted analysis of the industry, the increase in the use of the equipment can be characterized as nothing short of "dramatic," since the advent of the Wildcat drilling system and Pason AutoDriller. Appendix E-2, 629:6 – 629:9.

The evidence presented in NOV v. Pason of these products' commercial success was overwhelming. It was determined that the Wildcat drilling system could save anywhere from \$20,000 - \$100,000 in the cost of drilling a well. Appendix E-3, 204:23 – 205:16. The first distributor of the Wildcat, Drillex, system had a simple sales pitch, "try it... if you like it you keep it." Once the automatic drilling system was used, it was almost never taken down, boasting a 99% success rate. Appendix E-4, 212:21 – 213:17. The growth of the Wildcat drilling system went from a total of 110 units built over a five-year span from 1994 - 1999 to building over a hundred units a year starting in 2000. Appendix E-5, 221:4 – 222:1.

As for the Pason Auto-Driller, it grew from being installed on 35% of Canadian and 6% U.S. land rigs operating with a Pason EDR system in 2004 to being installed on 55% of Canadian and 50% U.S. land rigs operating with a Pason EDR system in 2005.

Additionally, Pason's 2007 annual report boasted "A significant increase in automatic driller revenue of 47%." Appendix E-6, 259:19 – 262:20.

3. Long Felt, but Unresolved Need

The most popular drilling technique in the industry is directional drilling. This is primarily because this technique can be used to drill in the producing zone where the oil and gas is contained, which can result in increased production per well and reduce the number of wells drilled. The ability to drill multiple wells from a single location also reduces the environmental impact caused by the drilling of multiple wells. The downside to horizontal drilling is that it is relatively more complicated and expensive than other drilling techniques. Appendix E-7, 191:2 – 192:10.

Before the invention of the Bowden '142 Patent, there were no effective automatic drilling systems for controlling the rate of release of the drill string during the drilling of a directional or deviated well. In particular, before the '142 invention, there were no automatic drilling systems in the marketplace that controlled the rate of release of a drill string based upon changes in drilling fluid pressure. Appendix E-8, 351:15 – 353:1. The long-felt and increasing need for an effective automatic drilling system in directional wells was evident by the many problems caused by an operator having to attempt to control the rate of release through manual manipulation of a brake handle. As opposed to simply monitoring a machine, a driller would have to stand at a huge lever approximately three to five feet long and physically lift it with his hand and compress it with his body weight to control the brake. If the operator did not perform his job properly, and for example, allowed too much weight on the bit, the well bore



would deviate from its intended path. Additionally, if the brake was not handled correctly the bit could be damaged. If the bit was damaged then the operators would have to make a “trip” to remove all of the pipe down-hole, stick by stick, and then replace the bit and put the pipe all the way back down into the hole. The process of making a trip could take anywhere from a half a day to two days and was very expensive. Appendix E-9, 197:15 – 204:5.

The long-felt need for an automatic drilling system useful for directional drilling was not resolved by the use of weight on bit automatic drillers that at the time were being used successfully in vertical wells. Unlike vertical wells, if weight on bit automatic drillers were used in horizontal wells then at the point the well turned (dog-legged) pipes would start dragging throughout the wall of the hole creating side forces or drag. After this dog-leg, the operator is no longer directly transferring weight on bit. The indirect transfer and drag created by the pipe contacting the walls of the hole made it harder and harder to measure the weight on bit. *Id.*

The Wildcat drilling system provided the solution that the industry had been looking for. It could drill with pump pressure and pump pressure/weight on bit in combination. The problems associated with standard weight on bit operations caused by manual operation and pipe drag were eliminated. Additionally, the Wildcat drilling system allowed operators for the first time in horizontal drilling to be able to drill automatically, ultimately saving the operators a lot of money and time by getting down-hole faster and more efficiently. *Id.*

4. Unsuccessful Attempts by Others to Find the Solution Provided by the Claimed Invention.

Before the invention of the Bowden '142 Patent, there were no effective automatic drilling systems for controlling the rate of release of the drill string during the drilling of a directional or deviated well. In particular, before the '142 Patent, there were no automatic drilling systems in the marketplace that controlled drilling based upon changes in drilling fluid pressure. Appendix E-8, 351:15 – 353:1. The Wildcat Driller was the first to find the solution to the problems associated with traditional weight on bit measuring automatic drillers that could not be used in horizontal wells. The Wildcat eliminated the need for manual operation, as well as the associated problems that came with it, allowing operators to rely on automatic drillers in horizontal wells. Appendix E-9, 203:8 – 203:22.

5. Copying of the Claimed Invention by Others

The Wildcat drilling system was copied by several different companies in the oilfield industry. First, there was a division of what was then known as Varco Company, MD Totco, which developed an automatic driller that was integrated into the rig at the time the rig was built. MD Totco subsequently honored the '142 Patent, without litigation, by paying damages associated with the sale or use of its infringing products. Appendix E-10, 250:16 – 252:18. The invention of the '142 Patent was also copied by a company called Tech Power Controls Company. Tech Power Controls Company entered into an agreed judgment dated September 12, 2001, which stated that Tech Power would pay damages for past products produced and would no longer

manufacture or sell their version of an automatic driller. Appendix E-10, 252:25 – 255:8.

A third company that copied the '142 Patent was IDM Equipment. IDM Equipment entered into a confidential settlement agreement in 2005 admitting that IDM's automatic drilling systems with automatic differential pump pressure control systems infringed one or more claims of the '142 Patent. IDM also agreed to pay a royalty for all infringing products that had been previously produced. Appendix E-10, 255:17 – 258:21. A fourth company was Dick's Oilfield, which also consented to a judgment that it had infringed the claims of the '142 Patent by offering for sale in commerce an automatic drilling system. Appendix E-11, 323:12 – 323:18. Lastly, the fifth company to copy the claimed invention was Pason, through its production of the Pason AutoDriller as found by a jury in NOV v. Pason.

6. Unexpected and Superior Results from the Claimed Invention

The use of the Wildcat drilling system resulted in unexpected and superior results as evidenced by the costs saved from the use of the automatic drilling system and further confirmed by its widespread demand in the industry. Cost savings studies were conducted to determine the extent of the Wildcat drilling system's benefit in actual drilling operations. As noted above, from the monitoring of the performance of the drill and customer input, it was determined that the Wildcat drilling system could save anywhere from \$20,000 - \$100,000 in cost of drilling a well. Appendix E-3, 204:23 – 205:16.

7. Acceptance by Others of the Claimed Invention as Shown by Praise from Others in the Field of the Invention or From Licensing of the Claimed Invention

Acceptance by others of the claimed invention is shown by the growth in production of the Wildcat drilling system or Pason AutoDriller, or by the licensed use of the product by prominent companies in the industry. The huge growth in production, as well as the fact that after people would rent and use the Wildcat drilling system they were “clambering” to use it again, affirms its widespread acceptance by others. Appendix E-3, 204:17 – 204:22. In fact, once the drill was used it was almost never taken down, boasting a 99% success rate. Appendix E-4, 212:21 – 213:17.

Secondly, the licensing of the invention to several different operators can show acceptance by others. The first of these was a company named Drillex, which was licensed to distribute the product. In exchange, Mr. Bowden the owner of the ‘142 Patent received a 50% royalty. Appendix E-11, 205:20 – 205:22. In 1998, Baker Hughes, Incorporated bought Drillex and continued to honor the agreement paying Mr. Bowden a 50% royalty per unit sold. Id, 206:17 – 207:7. The invention was later licensed to MD Totco, a Varco company, on September 1, 1999 agreeing to pay a fee of \$6,000 per licensed product. After Varco acquired the rights to the ‘142 Patent in December 2005, Varco entered into a licensing agreement with IDM Equipment stipulating that IDM would pay Varco a royalty of \$10,000 per unit. Appendix E-10, 255:17 – 258:12.

8. Conclusion

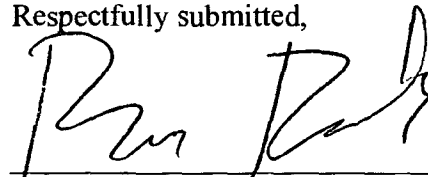
In sum, the '142 Patent is not anticipated and not obvious. The undisputed evidence overwhelmingly establishes the commercial success of the product, the long-felt but unsolved need for a solution provided by the claimed invention, a persistent track record of copying of the invention by others, the unexpected and superior results generated by the invention, and the acceptance by others of the claimed invention by both praise from others in the field and the licensing of the invention. Because these objective factors weigh heavily in favor of non-obviousness, the '142 Patent is patentable and valid in accordance with 35 U.S.C. § 103.

For the reasons given above, Applicant respectfully requests withdrawal of the rejection based upon 35 U.S.C. §103 and allowance of the claims.

IV. SUMMARY

In view of the foregoing, it is respectfully submitted that the claims in the present reexamination are allowable, particularly claims 1, 5 and 11-15. It is believed that this case is now in condition for allowance and such action is respectfully requested.

Respectfully submitted,



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IN THE UNITED STATES DISTRICT COURT  
FOR THE DISTRICT OF COLORADO

NATIONAL OILWELL VARCO, L.P.	)	
	)	
Plaintiffs,	)	
	)	
vs.	)	1:03-cv-02579-RPM
	)	
PASON SYSTEMS USA, CORP.,	)	
	)	
Defendants.	)	

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TRIAL TO JURY - DAY 6  
TRANSCRIPT OF PROCEEDINGS

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Proceedings held before the HONORABLE RICHARD P.  
MATSCH, U. S. District Judge for the District of Colorado,  
beginning at 9:01 a.m. on the 3rd day of November, 2008, in  
Courtroom A, United States Courthouse, Denver, Colorado.

APPEARANCES

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Houston, Texas 77057

Proceedings recorded by electronic sound recording;  
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Brett - Direct

1 Q And is--

2 A Which is close enough to being okay so don't do  
3 anything.

4 Q --and is the Le Compte Patent an example of a device  
5 that practices this dead band?

6 A That's right.

7 Q You know, we've--we've heard some reference to another  
8 patent we're going to talk about called Varney having sort of  
9 an on/off switch.

10 A Right.

11 Q Is that--once you move outside the dead band is that--

12 A Yeah, what will happen in Le Compte and many of these  
13 other older patents is they have kind of an on/off switch  
14 nature to them. And so what will happen with Le Compte is  
15 when it says, Oh, pressure is too high--it says, okay,  
16 release the string, not release it a little bit, release it a  
17 lot, you know, be real careful how you release it, anything  
18 like--it just says release the string.

19 And it says, oh, pressure is too high, release the  
20 string. Oh, pressure is--pressure is too high hold back on  
21 the string; pressure is too low release the string and so  
22 it's just an on/off kind of switch.

23 Q Okay. If we can go back to Exhibit A-1, the bottom of  
24 that second page, the next patent listed is Patent Number  
25 2,005,889 to Dillon.

Brett - Direct

- 1 A Yeah.
- 2 Q And within that there's a quoted section, Mr. Brett--
- 3 first of all, are you familiar with the Dillon Patent?
- 4 A Yes, I am.
- 5 Q Okay. There's a quoted section that says, "controlling
- 6 the movement of the drill stem as a form of tension in the
- 7 drill stem supporting hook." Does that equate to something
- 8 that we've talked about in this case in terms of one of the
- 9 drilling parameters?
- 10 A Yes.
- 11 Q And what drilling parameter does the equate to?
- 12 A That's hook load or weight on bit.
- 13 Q Okay. And then it goes on to say, "And the pressure of
- 14 the fluid pumped by the mud pump." Does that equate to one
- 15 of the parameters that was talked about?
- 16 A Yeah, the people call it standpipe pressure, drilling
- 17 fluid pressure, that's--we're talking about the pressure of
- 18 the fluid being pumped down the hole.
- 19 Q Now, Mr. Brett, while we're--while we're on the subject
- 20 of different words for different things, I've heard a lot of
- 21 discussion about the rate of release of the drill string.
- 22 A Okay.
- 23 Q Okay. Is that a particular term of art that you're
- 24 familiar with?
- 25 A Some terms of art have special meanings and error is one



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7 November, 2008.

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IN THE UNITED STATES DISTRICT COURT  
FOR THE DISTRICT OF COLORADO

NATIONAL OILWELL VARCO, L.P.	)	
	)	
Plaintiffs,	)	
	)	
vs.	)	1:03-cv-02579-RPM
	)	
PASON SYSTEMS USA, CORP.,	)	
	)	
Defendants.	)	

---

TRIAL TO JURY - DAY 7  
TRANSCRIPT OF PROCEEDINGS

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Proceedings held before the HONORABLE RICHARD P.  
MATSCH, U. S. District Judge for the District of Colorado,  
beginning at 9:02 a.m. on the 4th day of November, 2008, in  
Courtroom A, United States Courthouse, Denver, Colorado.

APPEARANCES

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1391

Brett - Cross

1 A That's right.

2 Q Thank you, sir.

3 A Right.

4 Q You mentioned the Varney patent and you said it was an  
5 on/off switch, and you said Le Compte and some of these other  
6 ones were on/off switches, correct?

7 A Right.

8 Q They don't release a little; they either stop the  
9 release or start the release.

10 A That's right.

11 Q It's your understanding that the 142 patent is different  
12 from that. It's not a stop or start.

13 A I agree, this is different--

14 Q Thank you, sir.

15 A --it's not.

16 Q You mentioned the Dillon patent. That's a 1935 patent,  
17 correct?

18 A Right.

19 Q Again, 50--over 50 years before the advent of the very  
20 popular use of mud motors with directional and horizontal  
21 drilling.

22 A That's right.

23 Q Varney is a 1965 patent, correct?

24 A I think so.

25 Q You said that that was also a telescopic joint.

Brett - Cross

1 A Yeah.

2 Q And it was an on/off.

3 A Right.

4 MR. RALEY: In fact if I could just approach the chart,  
5 Your Honor?

6 THE COURT: Sure.

7 MR. RALEY: Thank you, Your Honor.

8 Q (by Mr. Raley) Mr. Brett, you lump Le Compte, Dillon,  
9 Miller, Garrett, and Varney all together.

10 A They all--I lump them together because they have that  
11 similar on/off type nature to them.

12 Q They all have the on/off nature, which you just  
13 testified is different than the Bowden 142.

14 A I agree.

15 Q Thank you. I think that you've said for these four that  
16 are the on/off, if the error is big enough it will either  
17 hold back or let go, put the pressure back on target.

18 A Right.

19 Q It's not a continuous--the automatic drillers at issue  
20 in this case, the Bowden 142 and the Pason, the evidence has  
21 been move the brake handle continuously up or down.

22 A That's right.

23 Q Would it be kind of like when you're driving the car,  
24 the steering wheel, you're just always kind of adjusting to  
25 keep it straight?

1529

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7 November, 2008.

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s/Theresa Ornelas

13

Theresa Ornelas

14

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IN THE UNITED STATES DISTRICT COURT  
FOR THE DISTRICT OF COLORADO

NATIONAL OILWELL VARCO, L.P.	)	
	)	
Plaintiffs,	)	
	)	
vs.	)	1:03-cv-02579-RPM
	)	
PASON SYSTEMS USA, CORP.,	)	
	)	
Defendants.	)	

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TRIAL TO JURY - DAY 2  
TRANSCRIPT OF PROCEEDINGS

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Proceedings held before the HONORABLE RICHARD P.  
MATSCH, U. S. District Judge for the District of Colorado,  
beginning at 9:00 a.m. on the 28th day of October, 2008, in  
Courtroom A, United States Courthouse, Denver, Colorado.

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Houston, Texas 77057

Proceedings recorded by electronic sound recording;  
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Bowden - Direct

1 she wanted to go into an antique store. So she started an  
2 antique store and there was space in the back of it and I  
3 moved back there, but after about six months my banging  
4 around with the customers, she decided to move me.

5 Q She kicked you out, huh?

6 A Yes.

7 Q No more banging. Maybe that's not conducive to people  
8 buying antiques if they hear a lot of banging in the  
9 background. All right. So you had to move away someplace  
10 else then?

11 A I bought a little used gas station, old gas station.

12 Q The first ones did you have to kind of wait for the  
13 money to come in in rental before you could buy new parts, or  
14 how does that work?

15 A Yes, it--that's another thing. I had to, you know--I  
16 could only build them so fast.

17 Q Sure. The--and could we pull up the Claim 1  
18 demonstrative from the opening? We don't have it? I've got  
19 it. We don't have it on the (inaudible). Do you have it on  
20 the board?

21 UNIDENTIFIED SPEAKER: (Inaudible).

22 Q (by Mr. Raley) That's okay. I'll do it with this  
23 chart. I'll do it the old-fashion way.

24 Mr. Bowden, Claim 1 of your patent is at issue in  
25 this case and it refers to--

Bowden - Direct

1 THE COURT: We're going to lose you off the record here.  
2 where you're away from a microphone.

3 MR. RALEY: I apologize, Your Honor. I'll--I'll get the  
4 hand held. I can hold it. Oh, we got it; that's what I  
5 wanted to do. We're back. We can be ready with 11 and 14  
6 and we won't need the posters.

7 Thank you, Your Honor.

8 Q (by Mr. Raley) Mr. Bowden, Claim 1 of your patent, the  
9 Bowden '142 Patent, speaks of a pressure sensor. Did your  
10 invention have a pressure sensor?

11 A Yes.

12 Q And a regulator measuring changes in drilling fluid  
13 pressure and outputting the signal, did yours do that?

14 A Yes, sir.

15 Q And a relay responsive to the output signal of the  
16 drilling fluid pressure regulator; did yours do that?

17 A Yes, sir.

18 Q And a controller that increases or decreases the rate of  
19 release of the drill string--

20 A Yes.

21 Q --in response to that signal? Do you understand that  
22 the issue for the jury in this case is whether the Pason  
23 AutoDriller does these things?

24 A Yes.

25 Q Same with Claim 11, if you could pull that up. Did your



Bowden - Direct

- 1 invention measure drilling fluid pressure?
- 2 A Yes, sir.
- 3 Q Did it produce a signal in response to changes in
- 4 drilling fluid pressure?
- 5 A Yes, sir.
- 6 Q And did it relay the signal to a drilling string
- 7 controller?
- 8 A Yes, sir.
- 9 Q And did it control the drilling string controller to
- 10 increase or decrease the rate of release of the drill string
- 11 depending on what the drilling fluid pressure is doing?
- 12 A Yes, sir.
- 13 Q Do you understand the issue for the jury in this case is
- 14 whether the Pason AutoDriller performs these steps?
- 15 A Yes, sir, I do.
- 16 Q Same with Claim 14, please. Now, Claim 14 of the '142
- 17 Patent contains a reference to bit weight; is that correct?
- 18 A Yes, sir.
- 19 Q 1 and 11 spoke of pressure, but this speaks of measuring
- 20 drilling fluid pressure and bit weight; is that correct?
- 21 A Yes, sir.
- 22 Q And then producing a signal, a first signal in response
- 23 to changes in pressure; is that correct?
- 24 A Yes, sir.
- 25 Q Producing a second signal in response to changes in bit

Bowden - Direct

1 weight; is that correct?

2 A Yes, sir.

3 Q And selecting between the first and second signal; you  
4 see that, sir?

5 A Yes, sir.

6 Q And finally, relaying the selected signal to a  
7 controller which regulates the release of the drill string;  
8 do you see that, sir?

9 A Yes, sir.

10 Q Now, is that the combination rule of bit weight and  
11 pressure that you thought of out there during the testing  
12 period?

13 A Yes, sir.

14 Q And is it your understanding that the issue before the  
15 jury in this case is whether or not the Pason AutoDriller  
16 performs these steps?

17 A Yes, sir, I understand.

18 Q And is it your understanding that each of these claims  
19 is a separate deed to property?

20 A Yes, sir.

21 Q And that infringing one of these claims is infringement  
22 of your patent?

23 A Yes, sir.

24 Q All right, sir. Could we put up Exhibit 430--470, which  
25 is in evidence? Very briefly, sir, I want to look at the

Bowden - Direct

- 1 middle of that page, the mode selector.
- 2 A Yes, sir.
- 3 Q 1, 2 and 3 in the middle. There we go. What does the 1
- 4 represent?
- 5 A It's if you want to drill by bit--weight on the bit
- 6 only.
- 7 Q All right. And then you had the settings on the side
- 8 for that?
- 9 A Yes, sir.
- 10 Q And what does number two represent?
- 11 A If you want to drill strictly by pump pressure, drilling
- 12 fluid pressure.
- 13 Q And the setting is on the side for that?
- 14 A Yes, sir.
- 15 Q And what does number three represent?
- 16 A If you want to be the combination of both of them at the
- 17 same time.
- 18 Q That's the one you invented during the testing phase?
- 19 A Yes, sir.
- 20 Q So in this case, Claims 1 and 11 have to do with number
- 21 two there, the pressure setting; is that right?
- 22 A Yes, 11.
- 23 Q And Claim 14 has to do with the combination setting
- 24 number three there?
- 25 A Yes, sir.

Bowden - Direct

1 Q All right. Thank you. Thank you. Mr. Bowden, have you  
2 at times in your life had to fight for what's right?

3 A Yes, sir.

4 Q Could you pull up Exhibit 446, please, just for the  
5 witness's eyes only? Can you recognize Exhibit 446?

6 A Yes, sir.

7 Q What is--what is Exhibit 446?

8 A It's a notice that I actually typed up warning people  
9 not to infringe on my U.S. Patent.

10 MR. RALEY: I'll offer Exhibit 446 into evidence at this  
11 time, Your Honor.

12 MR. ATKINSON: Your Honor, we have no objection to the  
13 fact that it was a notice. We object to it as hearsay for  
14 the truth of the matter asserted within it.

15 MR. RALEY: I'm offering it for the state of mind of  
16 this witness that he's willing to defend his patent, Your  
17 Honor.

18 THE COURT: Yes. Well, this is what he has put out,  
19 correct? Yes.

20 MR. ATKINSON: And we have no objection to it on that  
21 basis, Your Honor.

22 THE COURT: It's received for what Mr. Bowden has  
23 published.

24 MR. RALEY: Thank you, Your Honor.

25 (Plaintiff's Exhibit 446 was received in evidence.)

Bowden - Direct

- 1 Q (by Mr. Raley) We can pull it on the screen there. Mr.  
2 Bowden, is this a notice that you sent out, sir?
- 3 A Yes, sir, I did.
- 4 Q And let's look at it together. The first--first  
5 paragraph, please, if we could blow that up. There we go.  
6 "Attention oil contractors and drilling contractors, notice  
7 of patent infringement Bobbie Bowden, a.k.a. Wildcat  
8 Specialty, is the inventor and owner of the U.S. Patent No.  
9 5474142, the '142 Patent. The patent covers an automatic  
10 drilling system. This system combines--I'm sorry, regulates  
11 the drill string in response to drilling fluid pressure alone  
12 or in combination with bit weight, drill string torque and or  
13 drill string RPM"; did you write those words?
- 14 A Yes, sir, I did.
- 15 Q And what did you say in the next line that's--that's all  
16 capitalized in bold?
- 17 A "This is notice of my intent to fully enforce this  
18 patent."
- 19 Q And was that your intent at the time?
- 20 A Yes, sir.
- 21 Q And what have you warned them in the next paragraph,  
22 sir?
- 23 A I was warning them not to be co-conspirators on anyone  
24 infringing or trying to steal my intellectual properties."
- 25 Q All right, sir. If we could scroll further, please.

Bowden - Direct

1                   Were you offering a reward?

2   A     Yes, sir, I was.

3   Q     Why were you offering a reward?

4   A     Well, it's--it's--of course I'm busy and there could be  
5 someone make one and put it on a rig in, you know, in Utah or  
6 Mississippi and I wanted to know about it anytime it  
7 happened.

8   Q     You wanted to defend your patent?

9   A     As soon as I knew that they infringed, yes.

10   Q    Is that why you're here today, sir?

11   A     Yes, sir. The U.S. Patent Office gave me a patent.

12 They don't enforce it for me. I have to be the policeman. I  
13 have to enforce it, and that was my intent to notify people.

14       MR. RALEY: Pass the witness, Your Honor.

15       THE COURT: All right. Mr. Atkinson.

16       MR. ATKINSON: Thank you, Your Honor.

17                   CROSS-EXAMINATION

18 BY MR. ATKINSON:

19   Q     Good afternoon, Mr. Bowden.

20   A     Good afternoon.

21       MR. ATKINSON: Bob, if we could go back to the exhibit  
22 that was just up on the page, please. No, the Plaintiff's  
23 Exhibit 461.

24   Q     (by Mr. Atkinson) Mr. Bowden, we were just taking a  
25 look at Plaintiff's Exhibit 461.

1                                    TRANSCRIBER'S CERTIFICATE

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3 transcribed by me to the best of my ability, and constitutes  
4 a true and accurate transcript of the mechanically recorded  
5 proceedings in the above matter.

6                    Dated at Aurora, Colorado, this 29th day of  
7 October, 2008.

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s/Theresa Ornelas

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Theresa Ornelas

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IN THE UNITED STATES DISTRICT COURT  
FOR THE DISTRICT OF COLORADO

NATIONAL OILWELL VARCO, L.P.	)	
	)	
Plaintiffs,	)	
	)	
vs.	)	1:03-cv-02579-RPM
	)	
PASON SYSTEMS USA, CORP.,	)	
	)	
Defendants.	)	

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TRIAL TO JURY - DAY 3  
TRANSCRIPT OF PROCEEDINGS

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Proceedings held before the HONORABLE RICHARD P.  
MATSCH, U. S. District Judge for the District of Colorado,  
beginning at 9:05 a.m. on the 29th day of October, 2008, in  
Courtroom A, United States Courthouse, Denver, Colorado.

APPEARANCES

For the Plaintiffs:

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2000 Bering Drive, #700  
Houston, Texas 77057

Proceedings recorded by electronic sound recording;  
transcript produced by transcription service.



Hall - Direct

1 total rental days for both Varco and Pason from 2003. It's  
2 on the same scale, the left-hand scale, as the previous  
3 graph, 0 percent to 300 percent, and also measures the change  
4 from the base year of 2003, which as you can see in the  
5 yellow box the total rental days for both Varco and Pason  
6 were 69,916. And we can see from the brown bars moving left  
7 to right from 2004 to 2008 that the number of rental days or  
8 the demand from the operators and contractors using this  
9 product increased dramatically.

10 Q Now, did you compare the percentage increase in the  
11 number of rigs to the percentage increase or growth in the  
12 Wildcat and Pason AutoDrillers?

13 A Yes, I did. I compared those two elements by combining  
14 the graphs that we've just seen, the green bar graph and the  
15 blue--and the brown bar graph, excuse me.

16 Q Please pull up chart 708. What does that chart show?

17 A This is a chart I created to compare the percentage  
18 change in rig count grown from 2003 to the percentage change  
19 from Varco and Pason's rental days for the same period. And  
20 as you can see, the demand from the market, the operators and  
21 contractors who wanted to most effectively drill  
22 directionally and horizontally increased dramatically and far  
23 out paced the grown of the rig counts, indicating to me that  
24 the demand for the patented features was substantial that  
25 allowed these contractors and operators to drill as cost

1                                    TRANSCRIBER'S CERTIFICATE

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5 proceedings in the above matter.

6                    Dated at Aurora, Colorado, this 30th day of  
7 October, 2008.

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s/Theresa Ornelas

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Theresa Ornelas

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IN THE UNITED STATES DISTRICT COURT  
FOR THE DISTRICT OF COLORADO

NATIONAL OILWELL VARCO, L.P.	)	
	)	
Plaintiffs,	)	
	)	
vs.	)	1:03-cv-02579-RPM
	)	
PASON SYSTEMS USA, CORP.,	)	
	)	
Defendants.	)	

---

TRIAL TO JURY - DAY 1  
TRANSCRIPT OF PROCEEDINGS

---

Proceedings held before the HONORABLE RICHARD P.  
MATSCH, U. S. District Judge for the District of Colorado,  
beginning at 8:30 a.m. on the 27th day of October, 2008, in  
Courtroom A, United States Courthouse, Denver, Colorado.

APPEARANCES

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2000 Bering Drive, #700  
Houston, Texas 77057

Proceedings recorded by electronic sound recording;  
transcript produced by transcription service.

Prejean - Direct

1 Wildcat Automatic Driller?

2 A Well, I was pretty enthusiastic, excited, you know. We  
3 could now operate this thing on lots of wells that we were on  
4 and save our customers a lot of money and enable the  
5 performance of our equipment.

6 Q Were you aware that the Wildcat Driller actually was a  
7 patented invention? Did you know that there was a patent on  
8 the Wildcat Driller?

9 A Shortly after I went to work at Drillex I became aware  
10 of the specific--of specifics of the arrangement, and, yes, I  
11 was made aware there was a patent.

12 Q Now, did Drillex rent these Wildcat Drillers to crews or  
13 drilling contractors using mud motors and horizontal wells?

14 A Yes.

15 Q And what did you observe about the demand for these  
16 features of the Wildcat Driller?

17 A Well, as soon as we would demonstrate it our customer  
18 would use this system for this well and the next well and as  
19 long as he had a drilling program. And then it would catch  
20 on at other customers that learned that we were using it,  
21 when we demonstrated it they would continue to rent it and  
22 use it. They were clambering for it.

23 Q Did you do any studies about the cost-savings that the  
24 Wildcat Automatic Driller could benefit the--the actual  
25 drilling operation?

Prejean - Direct

- 1 A Yes. We--we would periodically monitor the performance.  
2 We would have our field technicians get input from our  
3 customers and we would try to determine some sort of cost-  
4 savings, hours, days, you know, motor--you know, the number  
5 of runs that it would take to drill the particular interval  
6 that we were drilling, so--
- 7 Q When you talk about saving hours or days how does that  
8 translate into dollars?
- 9 A Well, drilling operation--an oil and gas company might  
10 pay anywhere from 15 to \$30,000 a day for the overall  
11 operation. So, you know, just using simple math if he was--  
12 if the rig cost was 24,000 a day that's \$1,000 an hour; if we  
13 could save them 1,000 bucks and do that 30 days a month,  
14 that's \$30,000 on the well; that's a very simple analysis.
- 15 But it varied, but we saved anywhere from 20,000 to  
16 \$100,000 in rig cost and cost of drilling the well.
- 17 Q Now, was there any financial arrangement between Drillex  
18 when you were vice president of operations there and the  
19 inventor of the Wildcat, Mr. Bobbie Bowden?
- 20 A Yes. The--Drillex was the distributor, Mr. Bowden was  
21 the Wildcat specialist--he was the manufacturer. And Mr.  
22 Bowden received a 50 percent royalty.
- 23 Q Now, in your role as vice president of operations there  
24 did you get a chance to meet the inventor Mr. Bowden?
- 25 A Yes, I did.

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TRANSCRIBER'S CERTIFICATE

I hereby certify that the foregoing has been transcribed by me to the best of my ability, and constitutes a true and accurate transcript of the mechanically recorded proceedings in the above matter.

Dated at Aurora, Colorado, this 28th day of October, 2008.

s/Theresa Ornelas  
Theresa Ornelas  
Federal Reporting Service, Inc.  
17454 East Asbury Place  
Aurora, Colorado 80013  
(303) 751-2777

IN THE UNITED STATES DISTRICT COURT  
FOR THE DISTRICT OF COLORADO

NATIONAL OILWELL VARCO, L.P.	)	
	)	
Plaintiffs,	)	
	)	
vs.	)	1:03-cv-02579-RPM
	)	
PASON SYSTEMS USA, CORP.,	)	
	)	
Defendants.	)	

---

TRIAL TO JURY - DAY 1  
TRANSCRIPT OF PROCEEDINGS

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Proceedings held before the HONORABLE RICHARD P.  
MATSCH, U. S. District Judge for the District of Colorado,  
beginning at 8:30 a.m. on the 27th day of October, 2008, in  
Courtroom A, United States Courthouse, Denver, Colorado.

APPEARANCES

For the Plaintiffs:

Jane Michaels, Esq.  
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2000 Bering Drive, #700  
Houston, Texas 77057

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Prejean - Direct

1 Q Is this a fair and accurate representation of the  
2 Wildcat Driller?

3 A It's the--it's the control panel so it's the  
4 functionality part of it, yes.

5 MS. MICHAELS: Your Honor, at this time we'd offer  
6 Exhibit 470 into evidence. I understand it's--

7 MR. HAYNES: No objection, Your Honor.

8 THE COURT: 470 received.

9 (Plaintiff's Exhibit 470 was received in evidence.)

10 Q (by Ms. Michaels) Would you point out please what the  
11 various features are of Exhibit 470.

12 A Okay. Well, these are indicators, gauges, indicators.  
13 This is a selector switch and you can select weight on bit,  
14 pump pressure, or a combination of both. And these are your  
15 setting knobs where you can adjust your weight or your pump  
16 pressure, differential.

17 And so once you set up a system on the rig and  
18 you're ready to start drilling and you hook it up, you  
19 basically select which mode you want it to operate in and you  
20 start drilling, make your adjustments and start drilling.

21 Q And once you became the distributor of the Wildcat  
22 Driller did you have to go out and educate the potential  
23 customers on what this device did?

24 A Yes. And it was--it was quite a challenge. Although  
25 the popularity of the system--or the invention was--was high



Prejean - Direct

1 demand, we still had skeptical customers everywhere. The  
2 guys on drilling rigs don't take lightly to anything that  
3 controls the brake handle. You have to convince them. It's  
4 probably the most crucial step on the rig to lift and set the  
5 brake handle because any error or mistake can either damage a  
6 drill assembly or cause a great--you know, catastrophic event  
7 if you drop the blocks it can be a safety hazard, so, yeah,  
8 it was difficult. I had to go out and convince the  
9 customers.

10 But once they demonstrated--once we demonstrated it  
11 it was like--it was easy.

12 Q What was your success rate once you demonstrated it?

13 A Well, we had a simple philosophy of putting these on  
14 rigs as we had our field guys go out and tell the customer  
15 try it and we'll demonstrate it for you; if you like it you  
16 keep it. And they never would rig it down. We had a 99  
17 percent success rate.

18 Q What was your--

19 A So once--

20 Q Excuse me.

21 A Pardon?

22 Q I didn't mean to cut you off. What were you--what was  
23 your observation about what--what was driving that demand?

24 A Well, the features of this invention, the ability to use  
25 pump pressure was critical and, you know, my background in

Prejean - Direct

1 horizontal drilling and directional drilling, you know, I  
2 knew how to do this and knew how to talk to the customers  
3 about it and train my employees.

4 But all that's important, but once these customers  
5 started using this they didn't want to stop, so--

6 Q Now, just to clarify did most of these drilling  
7 contractors already own weight on bit automatic drillers?

8 A Yes. Every--most every rig has a standard--as part of  
9 the rig inventory an automatic driller on the rig that uses  
10 weight on bit. But what they don't have is one with these  
11 features.

12 Q I'd like to turn your attention to another time, a  
13 couple of years after you started being the distributor for  
14 the Wildcat Driller did Mr. Bowden come to you to ask for  
15 your help?

16 A Yes. In 2001 Mr. Bowden's responsibility was to  
17 manufacture the units and provide them at--at my request. I  
18 noticed that he was having trouble keeping focus on the  
19 business and--or phone calls and meetings were becoming more  
20 and more sporadic.

21 And so a few trips down to visit with him I noticed  
22 that his wife was becoming ill and he finally completely--he  
23 finally told me that she was terminally ill so he--he asked  
24 me to buy out his half of the business or his part of the  
25 business.

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Dated at Aurora, Colorado, this 28th day of October, 2008.

s/Theresa Ornelas  
Theresa Ornelas  
Federal Reporting Service, Inc.  
17454 East Asbury Place  
Aurora, Colorado 80013  
(303) 751-2777

IN THE UNITED STATES DISTRICT COURT  
FOR THE DISTRICT OF COLORADO

NATIONAL OILWELL VARCO, L.P.	)	
	)	
Plaintiffs,	)	
	)	
vs.	)	1:03-cv-02579-RPM
	)	
PASON SYSTEMS USA, CORP.,	)	
	)	
Defendants.	)	

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TRIAL TO JURY - DAY 1  
TRANSCRIPT OF PROCEEDINGS

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Proceedings held before the HONORABLE RICHARD P. MATSCH, U. S. District Judge for the District of Colorado, beginning at 8:30 a.m. on the 27th day of October, 2008, in Courtroom A, United States Courthouse, Denver, Colorado.

APPEARANCES

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Al-Azem, PLLC  
2000 Bering Drive, #700  
Houston, Texas 77057

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Prejean - Direct

1 Q Could you help us understand the growth in the number of  
2 Wildcat units that you were able to put on rigs from  
3 inception to mid--to mid-2004?

4 A Well, of course, Bobbie started with one in '93, one or  
5 two. And in '94 to '95 he marketed the thing on his own and  
6 he got up to about 50 units. He built 50 I guess by the time  
7 he handed off distribution to Drillex in '95.

8 And then I think from '95 to '98 they built another  
9 50 or 60 units. So they had about 100, 110 in '98 and that's  
10 when the--that's when the industry declined, the rig count  
11 declined significantly so they didn't build any more units  
12 because the units they had were starting to become idle.  
13 Rigs started stacking--we call it stacking when the rig stops  
14 working so that--they release all the equipment on that rig  
15 and you don't have a place to rent your item. So--so in '99  
16 I guess they had about 110 when I took over.

17 Q And then what happened?

18 A And then for about a year we didn't have to build any  
19 units. It was everything we could do to get all the rigs  
20 working again.

21 In 2000 we started, you know, manufacturing at a  
22 rapid pace. Bobbie started building them pretty fast; rig  
23 count was coming up and I guess we--from 2000 to 2004 we  
24 built 400 units.

25 Q So you had 400 units by mid-2004?

Prejean - Direct

1 A Yeah, over 100 a year I think, yeah.

2 Q I'd like to turn to a completely different topic and ask  
3 you about the defendant company Pason.

4 A Uh-huh.

5 Q What in general did you know about Pason's business?

6 A Pason was--what I knew about them they were a Canadian  
7 based company; they provided electronic instrumentation and  
8 monitoring equipment to the oil and gas business.

9 Q You talked about monitoring equipment, is that well  
10 monitoring equipment?

11 A Yes. They didn't provide control systems, they provided  
12 things that recorded the events of the rig activity and I  
13 believe they also provided things that monitored the mud  
14 systems and the tanks and things like that, so well control.

15 MS. MICHAELS: Mr. Yost, would you please pull up  
16 Exhibit 62.

17 Q (by Ms. Michaels) This is a letter dated January 14th,  
18 2003 from your patent lawyer to Pason Systems Corporation in  
19 Canada, did you receive a carbon copy of that letter, Mr.  
20 Prejean?

21 A Yes, I did.

22 MS. MICHAELS: At this time Plaintiff offers Exhibit 62  
23 in evidence.

24 MR. RALEY: No objection, Your Honor.

25 THE COURT: Received, 62.

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IN THE UNITED STATES DISTRICT COURT  
FOR THE DISTRICT OF COLORADO

NATIONAL OILWELL VARCO, L.P.	)	
	)	
Plaintiffs,	)	
	)	
vs.	)	1:03-cv-02579-RPM
	)	
PASON SYSTEMS USA, CORP.,	)	
	)	
Defendants.	)	

---

TRIAL TO JURY - DAY 2  
TRANSCRIPT OF PROCEEDINGS

---

Proceedings held before the HONORABLE RICHARD P.  
MATSCH, U. S. District Judge for the District of Colorado,  
beginning at 9:00 a.m. on the 28th day of October, 2008, in  
Courtroom A, United States Courthouse, Denver, Colorado.

APPEARANCES

For the Plaintiffs:

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2000 Bering Drive, #700  
Houston, Texas 77057

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Prejean - Direct

1 A Well, they publicly and in the industry went out and  
2 built a device that we believe infringes on our patent, and  
3 marketed it to the entire market and our customers.

4 Q Did their marketing and rentals of the auto driller  
5 increase from year to year?

6 A Yes, significantly.

7 Q Please pull up Exhibit 441. What is this document, Mr.  
8 Prejean?

9 A This is Pason's annual report, 2004.

10 Q Is this a public document?

11 A I believe it is.

12 Q Have you ever reviewed this before?

13 A Yes, I have.

14 MS. MICHAELS: Your Honor, at this time, we offer  
15 Exhibit 441 in evidence.

16 MR. HAYNES: No objection.

17 THE COURT: Received.

18 (Plaintiff's Exhibit 441 was received in evidence.)

19 MS. MICHAELS: Mr. Bouck, please turn to Page 10 of  
20 Pason's annual report for 2004. And, enlarge the paragraph  
21 that says, "Auto drillers," if you would, please, sir?

22 Q (by Ms. Michaels) The next to the last sentence under  
23 "Auto drillers," states "By the end of 2004, Pason's auto  
24 driller had been installed on 35 percent of Canadian and 6  
25 percent of U.S. land rigs operating with a Pason EDR system."

Prejean - Direct

1 Do you see that?

2 A Yes.

3 Q What is the EDR system?

4 A It's called an electronic drilling recorder.

5 Q And, is this statement consistent with what you observed  
6 back in that time frame in 2004?

7 A Yes.

8 MS. MICHAELS: Please turn to Exhibit 442, Mr. Bouck.

9 Q (by Ms. Michaels) I'd like you to identify this  
10 document, Mr. Prejean, what is this?

11 A This is Pason's 2005 annual report.

12 Q And, you've read this before?

13 A Yes, I have.

14 MS. MICHAELS: We offer Exhibit 442 in evidence, Your  
15 Honor.

16 MR. HAYNES: No objection.

17 THE COURT: Received.

18 (Plaintiff's Exhibit 442 was received in evidence.)

19 MS. BOUCK: Please pull up Page 17, Mr. Bouck, and  
20 enlarge the paragraph called "Electronic auto driller."

21 Q (by Ms. Michaels) Please read the last sentence of that  
22 paragraph aloud.

23 A Starting with "By the end"?

24 Q Yes.

25 A "By the end of 2005, Pason's electronic auto driller had

Prejean - Direct

1 been installed on 55 percent of Canadian, and 50 percent of  
2 U.S. land rigs operating with a Pason EDR system."

3 Q What was your reaction to this increase in sales by  
4 Pason?

5 A I was concerned, very concerned.

6 MS. MICHAELS: Please pull up Exhibit 443, Mr. Bouck.

7 Q (by Ms. Michaels) Mr. Prejean, what is this document?

8 A This is Pason's 2006 annual report.

9 Q Have you ever reviewed this before?

10 A Yes.

11 MS. MICHAELS: Your Honor, we offer Exhibit 443 into  
12 evidence.

13 MR. HAYNES: No objection.

14 THE COURT: Received.

15 (Plaintiff's Exhibit 443 was received in evidence.)

16 MS. MICHAELS: Please turn to Page 28, Mr. Bouck, and  
17 pull up the paragraph that states, "Auto drillers."

18 Q (by Ms. Michaels) Mr. Prejean, would you read the last  
19 sentence of this paragraph for us?

20 A "By the end of 2006, Pason's auto driller had been  
21 installed on 59 percent of Canadian and 20 percent of U.S.  
22 land rigs operating with a Pason EDR system."

23 Q Did you observe that happening around you in the oil  
24 fields?

25 A Yes, we did.

Prejean - Direct

1 MS. MICHAELS: Please pull up Exhibit 444, Mr. Bouck.

2 Q (by Ms. Michaels) What is this document, Mr. Prejean?

3 A This is Pason's 2007 annual report.

4 Q And, you have reviewed this document?

5 A I have reviewed the document.

6 MS. MICHAELS: At this time, Your Honor, we offer  
7 Exhibit 444 into evidence.

8 MR. HAYNES: No objection.

9 THE COURT: Received.

10 (Plaintiff's Exhibit 444 was received in evidence.)

11 MS. MICHAELS: Mr. Bouck, please turn to Page 5 of  
12 Exhibit 444. And, enlarge for us, if you would, please, the  
13 last few lines of the first paragraph.

14 Q (by Ms. Michaels) Would you read the last sentence for  
15 us of that paragraph, Mr. Prejean?

16 A "We continue to grow revenue in the U.S. by expanding  
17 the regions in which we offer our services, which meant  
18 expansion in Mississippi and the Appalachian states during  
19 the year. We also had a significant increase in automatic  
20 driller revenue of 47 percent in 2007."

21 MS. MICHAELS: Please turn to Page 9 of Exhibit 444,  
22 and, if you would, please, Mr. Bouck, enlarge the graph on  
23 the bottom left.

24 Q (by Ms. Michaels) What is this, as far as you can tell,  
25 Mr. Prejean?

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6                    Dated at Aurora, Colorado, this 29th day of  
7 October, 2008.

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s/Theresa Ornelas

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IN THE UNITED STATES DISTRICT COURT  
FOR THE DISTRICT OF COLORADO

NATIONAL OILWELL VARCO, L.P. )  
 )  
 Plaintiffs, )  
 )  
 vs. ) 1:03-cv-02579-RPM  
 )  
 PASON SYSTEMS USA, CORP., )  
 )  
 Defendants. )

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TRIAL TO JURY - DAY 1  
TRANSCRIPT OF PROCEEDINGS

---

Proceedings held before the HONORABLE RICHARD P.  
MATSCH, U. S. District Judge for the District of Colorado,  
beginning at 8:30 a.m. on the 27th day of October, 2008, in  
Courtroom A, United States Courthouse, Denver, Colorado.

APPEARANCES

For the Plaintiffs:

Jane Michaels, Esq.  
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Houston, Texas 77057

Proceedings recorded by electronic sound recording;  
transcript produced by transcription service.

Prejean - Direct

1 of rigs and lots of vertical holes. And directional drilling  
2 enables you to drill multiple wells from a single location.  
3 So for a lot of purposes when offshore environments were on  
4 land you could reduce the environmental impact or improve the  
5 environment by not drilling multiple wells. You could use  
6 one location and drill multiple wells.

7 Q All right.

8 MS. MICHAELS: Would you pull up, Mr. Yost, graphic 636  
9 --you don't need to be so close to the mic. 636 please.

10 Thank you.

11 Q (by Ms. Michaels) You have a graphic in front of you--  
12 and I think it can be shown to the jury, it's a  
13 demonstrative.

14 THE COURT: Yes, only for demonstrative purposes, sure.

15 Q (by Ms. Michaels) Would you please describe for us the  
16 three different types of wells that we see there on the  
17 demonstrative?

18 A Yes. This is an example of a vertical well, which is  
19 still being drilled today, but it was--you know, the focus of  
20 drilling back in the '50s, '60s, and '70s, and in the '80s  
21 and on up until today directional drilling started to become  
22 more popular. This is an example of a directional well here.

23 And then horizontal drilling is probably the most  
24 popular technique used today.

25 Q Why is it more popular today?

Prejean - Direct

1 A Well, primarily because this technique is used to drill  
2 in the producing zone where the oil and gas is contained.  
3 And by drilling horizontally you can reduce the number of  
4 wells you drill and produce more out of one well.

5 Q Which type of well is the most complicated to drill?

6 A Depending on the depth and target it could be either one  
7 of these but mostly the horizontal wells are the most  
8 complicated.

9 Q And which is the most expensive to drill?

10 A Usually the horizontal is the most expensive.

11 Q Now, how many drilling rigs have you been on over the  
12 course of your career, sir?

13 A 100s I guess.

14 MS. MICHAELS: Would you pull graphic 614, Mr. Yost,  
15 it's a demonstrative and can be published to the jury.

16 THE COURT: All right.

17 Q (by Ms. Michaels) Is this a typical drilling rig?

18 A Yes, it is.

19 Q Would you walk us through the parts of a typical  
20 drilling rig starting with the crown block, what is that, Mr.  
21 Prejean?

22 A Well, the top--on the top here is the crown block--the  
23 crown block that's kind of like a rack or a structure for a  
24 big pulley. It houses the cable that's used to hoist the  
25 traveling block and the drill string up and down.



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IN THE UNITED STATES DISTRICT COURT  
FOR THE DISTRICT OF COLORADO

NATIONAL OILWELL VARCO, L.P.	)	
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Plaintiffs,	)	
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vs.	)	1:03-cv-02579-RPM
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PASON SYSTEMS USA, CORP.,	)	
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TRIAL TO JURY - DAY 2  
TRANSCRIPT OF PROCEEDINGS

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Proceedings held before the HONORABLE RICHARD P.  
MATSCH, U. S. District Judge for the District of Colorado,  
beginning at 9:00 a.m. on the 28th day of October, 2008, in  
Courtroom A, United States Courthouse, Denver, Colorado.

APPEARANCES

For the Plaintiffs:

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2000 Bering Drive, #700  
Houston, Texas 77057

Proceedings recorded by electronic sound recording;  
transcript produced by transcription service.

Bowden - Direct

1 they lay the pipes--

2 Q Where it's dragging when it turns. All right. So if  
3 the weren't able to use the weight on bit automatic drillers  
4 in the late 1980's, so what did they do with the brake  
5 handle?

6 A Well, they--they just had to go back like they did in  
7 the '30's and '20's and '40's and just manually do it. They  
8 also with the mud motor there is generally--they hire two  
9 directional driller engineers to stay out there on location  
10 and they're doing 12-hour shifts, and that's their job.

11 Q So by manually do it, what are you referring to manually  
12 doing?

13 A Manually releasing the break handle so that the drill  
14 pipe can continue to penetrate.

15 Q So there was no automatic driller that would do it; they  
16 had to do it manually?

17 A Yes, sir.

18 Q All right. I want to ask you what you were thinking  
19 about around the time that you came up with the idea for what  
20 became the '142 Patent. What did you see in the oil field  
21 and what were you thinking about?

22 A I was out on a drilling rig working on I think a weight  
23 indicator and I--you know, it just dawned on me they're  
24 sitting there manually having to drill, just like I did, you  
25 know, 40 years ago. The technology of mud motor drilling,

Bowden - Direct

- 1 you know, automatic drillers has not kept up.
- 2 Q So what did you think?
- 3 A Well, all the automatic drillers that was on the market
- 4 was--most of them was developed in the '50's.
- 5 Q Yes, sir, like your father's was?
- 6 A Yes, sir, and that was great for conventional drilling.
- 7 Q For vertical holes?
- 8 A Yes. But when mud motor, the whole thing changed.
- 9 Q Okay. So what did you think when you thought, well, you
- 10 know, maybe I could do something? What was on your mind?
- 11 A Well, I felt like that--well, of course I felt like that
- 12 I could--I could make a piece of equipment just like my dad
- 13 did but one that could drill by drilling fluid pressure.
- 14 Q And do it automatically?
- 15 A Yes, sir.
- 16 Q Had anybody done that before to your knowledge?
- 17 A No, sir.
- 18 Q Had anybody to your knowledge increased or decreased the
- 19 rate of release of drill string using pressure as the
- 20 parameter?
- 21 A No, sir. I had been--since I was 14--I was 49 when I
- 22 made my first prototype for drilling fluid pressure, so I've
- 23 been in this 35 years. Nobody in the world had been in that
- 24 field 35 years. But I--I knew what I--I was the best there
- 25 was in what I did in the world, and I believe that if it

Bowden - Direct

1 could be done I could do it.

2 Q Now, would you be taking away the driller's job by doing  
3 this? Were there other things the driller could be working  
4 on than holding the handle for eight hours at a time?

5 A Well, the driller has four or five men under him.

6 Q Right.

7 A And he supervises them and they do maintenance and  
8 different things around the rig, so--and then of course he  
9 has reports and records and all kinds of things to keep up.  
10 He still had other things to do. But, no, I didn't replace  
11 his job. It didn't replace the driller back when my dad  
12 developed the weight. And besides that, like I said, when  
13 there's a mud motor out there, there's two additional new  
14 guys out there, drilling engineers, directional drillers that  
15 actually do the hand drilling.

16 Q Okay. Let me--let me ask you, what did you first do as  
17 far as getting started with this idea of yours mechanically.  
18 Did you buy a part or what did you do?

19 A September of '91 I bought an electrical stainless steel  
20 box.

21 Q You bought a box, all right.

22 A Yes.

23 Q Did you have anything in the box yet?

24 A No.

25 Q Okay. Go ahead.

Bowden - Direct

1 A I just--no, I--that's the first thing I ever bought.

2 Q All right. When did you actually start the work on your  
3 invention, trying to design it?

4 A Actually I didn't start until after Christmas, and it  
5 was actually January of '92, then I picked it up and then I  
6 gave a lot of thought to different possibilities of the way I  
7 wanted to do it.

8 Q All right. Where did you do your work?

9 A In my garage some, and then I had a little shop too.

10 Q All right. So did you--did you do drawings, did you do  
11 test--experiment? What did you do when you were trying to  
12 make this thing? Tell the jury about what you did during  
13 January of 1992.

14 A Well, one of my first thoughts is to use two Bourdon  
15 (phonetic) tubes in combination to each other, attached to  
16 each other, and so that they would, you know, offset each  
17 other. And then I realized that at some times they would  
18 want to drill just with weight and then sometimes they would  
19 want to just drill with pump pressure. But--so I scrapped  
20 the idea.

21 But eventually I came down to--I ordered a new type  
22 of pressure regulator which is actually kind of a pressure  
23 switch, just a pressure regulator, and I experimented with  
24 that. And I decided--on the pump side. The weight side I  
25 kind of used the standard Bourdon tube. Bourdon tubes are so

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PASON SYSTEMS USA, CORP.,	)	
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Defendants.	)	

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TRIAL TO JURY - DAY 1  
TRANSCRIPT OF PROCEEDINGS

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APPEARANCES

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Prejean - Direct

1 line off the draw works and lowers the load in the hole. If  
2 he--and he can take the brake and stop the brake or lift the  
3 brake and control how fast that happens.

4 Q In your industry what is that called when you're making  
5 the drill pipe go fast or slower down into the hole?

6 A Well, you can call it drilling or you can call it rate  
7 control and the rate of release.

8 Q Controlling the rate of release?

9 A Yes. The rate--the descent at which the pipe or the  
10 drilling assembly can go into the hole. Now, remember you're  
11 drilling--you don't just lower in the hole and it just falls,  
12 you lower it at a rate that the drill bit will allow you to  
13 lower it. As the drill bit removes rock and formation then  
14 you can lower it in the hole at that rate.

15 Q How does the driller actually handle the brake manually,  
16 what does he actually do to control the rate of release?

17 A Well, when he's operating it manually he's physically  
18 standing at a huge lever that's approximately three to five  
19 feet long; it's connected to linkage through the braking  
20 system. And he physically lifts it with his hand and  
21 physically compresses it with his body weight.

22 Q What happens if the driller doesn't do his job properly?

23 A Well, a number of things, if he puts too much weight on  
24 the bit the well can--the well bore can deviate from its  
25 intended path, meaning it just kind of swivels off or he can

Prejean - Direct

1 damage the bit.

2 Q What happens if the bit is damaged?

3 A If you damage the bit they have to do what's called make  
4 a trip, it's like a journey, you actually have to remove all  
5 of this out of the whole stick by stick or they usually use--  
6 pull three joints at a time, so they pull 90 feet at a time.  
7 and stack it up in the derrick and just keep doing this until  
8 this travels all the way up to the top and then they replace  
9 the bit and have to go all the way back in.

10 Q In a deep hole how long does that take to do a trip with  
11 getting all the pipe out of the hole?

12 A It could take anywhere from a half a day to two days  
13 depending on the depth and the complexity of the well.

14 Q And is that expensive?

15 A Very expensive.

16 Q Now, can the brake also be controlled automatically?

17 A Yes.

18 Q And in general terms how is the brake controlled  
19 automatically in a vertical well?

20 A In a vertical well he can do it manually or he could use  
21 a weight on bit automatic driller which most rigs have an  
22 existing automatic driller that protects the weight on bit  
23 and automatically regulates the rate of release.

24 Q How does this weight on bit automatic driller work in  
25 general terms?

Prejean - Direct

1 A It sensors the weight, sends it to a control system and  
2 that system sends an output to a control device that's  
3 attached to the brake handle. The brake handle is actually  
4 levered down to the floor and you pull against a spring. And  
5 this device pulls against the brake handle just like the man  
6 would, but he just stands there and kind of watches it just  
7 like you would if you were driving your car down the highway  
8 and you set your cruise control you hold the steering wheel  
9 and look at the road, but you wouldn't have to control the  
10 accelerator so to speak, kind of the same principle.

11 Q What kind of drilling technique is typically used when  
12 you're drilling in a vertical well?

13 A Most wells that are vertically drilled are drilled with  
14 a rotary table, meaning your rotary drill--you drive the--you  
15 drive the pipe from surface; you rotate from surface and it  
16 continues to transfer energy or rotational force all the way  
17 down to the bit.

18 And in some cases that's many--many wells are  
19 drilled vertically with a rotary system. In many cases  
20 nowadays they're using what's called downhole drilling motor,  
21 which is attached here. And all of the power is centered  
22 down there, you don't have to actually rotate the pipe to get  
23 the power to the bit.

24 Q In rotary drilling does the actual pipe spine?

25 A Yes.

Prejean - Direct

1 Q Now, is--is the downhole motor used typically in  
2 directional wells?

3 A It's more--it was originally used in directionals, yes,  
4 and it's--it must be used in directional wells.

5 Q And what about in horizontal wells?

6 A It has--it has to be used in horizontal wells.

7 Q What has to be used in horizontal wells?

8 A Downhole drilling motors.

9 Q Are those sometimes referred to as mud motors?

10 A Mud--yeah, they're also--because mud--or the fluid is  
11 what drives the--the torque component of the motor.

12 Q Based on--on your oilfield experience or extensive years  
13 of experience can weight on bit automatic drillers be used  
14 reliability and effectively with mud motors in horizontal  
15 wells?

16 A Not really.

17 Q And why is that?

18 A Because as--as described in the graphic earlier--

19 MS. MICHAELS: Let's--let's pull up graphic 636 please.

20 And then I'll show you an animation if that would--

21 Q (by Ms. Michaels) Would an animation be more helpful to  
22 you?

23 A That's okay.

24 MS. MICHAELS: Let's pull up animation 649 and it can be  
25 published to the jury.

Prejean - Direct

1       THE WITNESS: As you can see from the red spots on here  
2 this is kind of depicting where the bit is seeing the weight  
3 transfer or singe from surface. And if you're in a vertical  
4 well it's what we consider static. That means you can  
5 transfer energy or force on the bit continuously down this  
6 vertical plain.

7               When you get into a directional drilling  
8 application as the well becomes more crooked as we call it--  
9 they actually use a term called dog legs--like a dog leg,  
10 that's really how the hole articulates. And as the well  
11 becomes more crooked it creates side forces or drag, the  
12 pipes start dragging throughout the wall of the hole.

13 Q       Could you pause the video when it comes to the bottom.

14 A       And it gets more difficult to effectively measure your  
15 weight on bit transfer as you get more deviated and that's  
16 especially more difficult in horizontal wells. Because after  
17 you make this curve you are not directly transferring weight  
18 on bit, it's--it's intermittent as you rotate or shove the  
19 pipe in the hole it gets harder and harder to get weight on  
20 the bit and measure it in the same manner that you would  
21 here.

22 Q       All right. So what does the red signify on the vertical  
23 well?

24 A       The red would be what I consider the contact point,  
25 okay, where you would measure weight on bit.

Prejean - Direct

1 Q And is the contact point in a directional well over on  
2 the side rather than bottom of the well?

3 A What we're trying to illustrate here is that you become  
4 more crooked or more deviated you're contact points will  
5 change. You'll see these contact points before you see the  
6 weight on the bit, okay, here and here.

7 Q And it's even more pronounced, is it not, in the  
8 horizontal well?

9 A That's correct.

10 Q Is that sometimes called pipe drag?

11 A Yeah, we call it pipe drag, stacking, there's a lot of  
12 terms for it, all the same thing.

13 Q Now, I'd like to turn your attention to a different  
14 subject, when did you first see a Wildcat Automatic Driller?

15 A 1997.

16 Q Where were you working at that time, Mr. Prejean?

17 A I went to work for a company called Drillex, which is a  
18 provider of directional drilling services throughout--a  
19 worldwide company.

20 Q What was your position with Drillex?

21 A I was a manager of the western hemisphere operations.

22 Q Now, how was the Wildcat Automatic Driller that you  
23 first saw in 1997 different from the weight on bit  
24 conventional automatic drillers that you had seen before?

25 A Well, I had worked in the field in management for 18

Prejean - Direct

1 years in the directional and horizontal and drilling business  
2 and have been on 100s of rigs and that was the first time I  
3 saw a device that would do that particular operation.

4 Q What was the particular operation that the Wildcat  
5 Driller could do that you had never seen before?

6 A This invention could drill with pump pressure and pump  
7 pressure and weight on bit combination.

8 Q And could you describe what you mean by drilling with  
9 pump pressure?

10 A When you run--when you drill a directional or horizontal  
11 well you're going to be running this mud motor almost  
12 continuously while you're in the hole. And you have to  
13 effectively measure pump pressure to determine the operating  
14 characteristics of this downhole device that's mounted down  
15 the drilling assembly. And you can't really use weight on  
16 bit to do this, you have to--so we would do it manually, that  
17 means we would start actually manually operating the brake,  
18 either the driller or the horizontal drilling expert that was  
19 out there. And we would take turns most of the time.

20 But now we had a device that we could put on there  
21 automatically just like they had done in the '50s and '60s  
22 for the vertical drilling operations.

23 And this--this invention, this Wildcat was--I had  
24 never seen one in 18 years, 100s of rigs.

25 Q What--what was your reaction to the features of the

Prejean - Direct

1 Wildcat Automatic Driller?

2 A Well, I was pretty enthusiastic, excited, you know. We  
3 could now operate this thing on lots of wells that we were on  
4 and save our customers a lot of money and enable the  
5 performance of our equipment.

6 Q Were you aware that the Wildcat Driller actually was a  
7 patented invention? Did you know that there was a patent on  
8 the Wildcat Driller?

9 A Shortly after I went to work at Drillex I became aware  
10 of the specific--of specifics of the arrangement, and, yes, I  
11 was made aware there was a patent.

12 Q Now, did Drillex rent these Wildcat Drillers to crews or  
13 drilling contractors using mud motors and horizontal wells?

14 A Yes.

15 Q And what did you observe about the demand for these  
16 features of the Wildcat Driller?

17 A Well, as soon as we would demonstrate it our customer  
18 would use this system for this well and the next well and as  
19 long as he had a drilling program. And then it would catch  
20 on at other customers that learned that we were using it,  
21 when we demonstrated it they would continue to rent it and  
22 use it. They were clamoring for it.

23 Q Did you do any studies about the cost-savings that the  
24 Wildcat Automatic Driller could benefit the--the actual  
25 drilling operation?



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vs.	)	1:03-cv-02579-RPM
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PASON SYSTEMS USA, CORP.,	)	
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TRIAL TO JURY - DAY 1  
TRANSCRIPT OF PROCEEDINGS

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Prejean - Direct

1 we produced a signal from this pressure change, and then that  
2 was put into a controller, and it delivered a response to a  
3 relay, and that delivered a response to a system that  
4 operated a brake handle automatically.

5 Q All right, I'd like to turn back to another subject. We  
6 were talking about this a little bit yesterday before we  
7 broke for recess.

8 MS. MICHAELS: Please pull up Exhibit 376, Mr. Bouck.

9 Q (by Ms. Michaels) This is a patent license agreement  
10 dated September 1, 1999 between Bobbie Bowden and MD Totco.  
11 Have you ever seen this document before?

12 A Yes.

13 Q Was that in your files?

14 A Yes.

15 MS. MICHAELS: Your Honor, at this time, we offer  
16 Exhibit 376 into evidence.

17 MR. HAYNES: No objection, Your Honor.

18 THE COURT: Received, 376.

19 (Plaintiff's Exhibit 376 was received in evidence.)

20 MS. MICHAELS: Mr. Bouck, please enlarge the first  
21 "Whereas" clause.

22 Q (by Ms. Michaels) It states, "Whereas, Bowden owns  
23 patent rights relating to an automatic drilling system, and  
24 MD Totco desires a patent license to manufacture and sell an  
25 automatic drilling system according to Bowden's patent

Prejean - Direct

1 rights." Did I read that correctly?

2 A Yes, you did.

3 Q And, does this patent license agreement then set forth  
4 in detail the terms of the license agreement between MD Totco  
5 and the inventor of the 142 patent?

6 A Yes.

7 Q Now, as of September of 1999, was MD Totco a division of  
8 a company called Varco?

9 A Yes.

10 Q In 1999, did you as the head of Wildcat Services have  
11 any relationship whatsoever with Varco?

12 A No, not any formal relationship, no.

13 Q And, in 1999, did Mr. Bowden have a relationship with  
14 Varco?

15 A No.

16 Q Please tell us about the infringing product that MD  
17 Totco had on the market at that point?

18 A The Varco/MD Totco group had developed a auto driller.  
19 It was electronic, and used computers, and what it did was it  
20 was engineered and integrated into the rig through a  
21 different braking system. So, when someone would build a  
22 brand new rig, they wanted to--they took the approach where  
23 they wanted to put a control system on the rig that  
24 controlled a block up and down and all sites above, detectors  
25 and sensors, but they also put an auto driller package onto

Prejean - Direct

1 this control system. And, included in that auto driller  
2 package was a very important feature that the customer  
3 specified had to have on this new rig, and that was we had to  
4 be able to control with pump pressure, and pump pressure and  
5 weight on bit, because we're going to be drilling directional  
6 and horizontal wells. So, Varco and MD Totco incorporated  
7 that feature.

8 MS. MICHAELS: All right. Would you please turn to Page  
9 4, Mr. Bouck? And, pull up the first half of the license  
10 payment paragraph.

11 Q (by Ms. Michaels) Would you please read that aloud?

12 A "In consideration for entering into this license  
13 agreement, MD Totco agrees to pay Bowden a one time only  
14 license fee of \$50,000 within 30 days after the execution of  
15 this agreement. MD Totco represents and warrants that prior  
16 to the effective date of this patent license agreement, it  
17 has sold no more than seven units, which Bowden alleges to be  
18 infringing units. The parties agree that these no more than  
19 seven units will be considered licensed products under this  
20 agreement. MD Totco further agrees to pay Bowden a royalty  
21 fee of \$6,000 per licensed product for each unit transferred  
22 subsequent to the effective date of this patent." Continue?

23 "License agreement--"

24 Q That's fine.

25 A Okay.

Prejean - Direct

1 Q So, at that point in time, MD Totco was paying damages  
2 for past infringement; is that right?

3 A Pardon?

4 Q They were paying \$50,000; is that right?

5 A Yes.

6 Q And, did MD Totco pay that?

7 A Yes. Yes, they did.

8 Q At the time that Mr. Bowden entered into this license  
9 agreement with MD Totco, what was the relative size of  
10 Wildcat Services and MD Totco?

11 A Well, MD Totco was part of Varco. They were quite a  
12 large company. I guess they were 30 times larger.

13 Q What was your reaction to MD Totco's decision to pay  
14 damages for past infringement, and to pay royalties for  
15 future use of the patented invention?

16 A Well, I was impressed with their decision to honor our  
17 patent and intellectual property and do the right thing.

18 MS. MICHAELS: Would you pull up graphic 625, please,  
19 Mr. Bouck?

20 Q (by Ms. Michaels) Is this an accurate summary of the  
21 license agreement between Mr. Bowden and MD Totco?

22 A Yes. MD Totco obtained the license and paid damages.  
23 They paid royalty, and they paid damages.

24 MS. MICHAELS: Please pull up Exhibit 377, Mr. Bouck. Q

25 (by Ms. Michaels) This is an agreed judgment dated

Prejean - Direct

1 September 12, 2001 between Bowden, the inventor of the 142  
2 patent, and a company called Tech Power Controls Company.

3 Have you ever seen this document before?

4 A Yes.

5 Q Was this document in your files?

6 A Yes, it is.

7 MS. MICHAELS: At this time, Your Honor, we offer  
8 Exhibit 377 into evidence.

9 MR. HAYNES: No objection, Your Honor.

10 THE COURT: Received.

11 (Plaintiff's Exhibit 377 was received in evidence.)

12 Q (by Ms. Michaels) What lead up to this agreed judgment  
13 at the time in 2001, what was going on with Bobbie Bowden and  
14 your company in 2001?

15 A Oh, this was about the time we started our--my purchase  
16 of Mr. Bowden's company, but we had not completed the  
17 transaction as of this time. So, we was still responsible  
18 for the prosecution of any patent issues that might come up  
19 because he was still the owner of the patent. I had not yet  
20 been--we were in the process of working out the final  
21 details.

22 Q And, in 2001 at the time this agreement was signed, was  
23 Tech Power Controls in the process of selling its company?

24 A Yes. From the time we started suit on Tech Power, to  
25 the time we did this judgment, Tech Power had sold its assets

Prejean - Direct

1 to National Oilwell, which was an independent company from  
2 Varco. They were not merged at the time.

3 Q That was what I was going to ask you. Was National  
4 Oilwell related to Varco at that point in time?

5 A No.

6 Q And, at that point in time, did Bobbie Bowden have any  
7 relationship to National Oilwell?

8 A No.

9 Q Did Wildcat Services have any relationship to National  
10 Oilwell?

11 A No.

12 MS. MICHAELS: Please turn to the second page, Mr.  
13 Bouck. Would you enlarge Paragraph 7, please?

14 Q (by Ms. Michaels) Would you read that aloud for us,  
15 please, Mr. Prejean?

16 A "Defendant has sold all of its assets relating to the  
17 auto driller to National Oilwell, LP and is no longer in the  
18 business of manufacturing or selling the auto driller."

19 Q Would you please pull up the "Ordered, adjudged and  
20 decreed" paragraph, AA and B?

21 Please read that aloud.

22 A "Ordered, adjudged and decreed that A, with respect to  
23 all claims of infringement of the U.S. Patent Number 142,  
24 defendant is no longer manufacturing or selling the auto  
25 driller as of April 30, 2001. Defendant shall pay plaintiff,



Prejean - Direct

1 Bobbie Bowden \$24,000 upon entry of this agreed judgment by  
2 the court."

3 Q All right. Did Tech Power honor this agreement?

4 A Yes, they did.

5 Q And, did National Oilwell, which acquired Tech Powers,  
6 honor this agreement?

7 A Yes, they never manufactured another unit, and ceased  
8 any infringing activity.

9 MS. MICHAELS: Please pull up graphic 625, Mr. Bouck.

10 Q (by Ms. Michaels) Mr. Prejean, is this an accurate  
11 summary of the agreed judgment between Bobbie Bowden, the  
12 owner of the 142 patent, and Tech Power Controls?

13 A Yes. Our objective was to get them to stop infringing  
14 and pay damages, and not infringe anymore, and they did all  
15 three of those things.

16 MS. MICHAELS: Please pull up Exhibit 378, Mr. Bouck.

17 Q (by Ms. Michaels) This is a confidential settlement  
18 agreement dated December 2005 between Varco and IDM  
19 Equipment. Are you familiar with this agreement?

20 A Yes, I am.

21 Q Was it part of your files?

22 A Yes, it is.

23 MS. MICHAELS: Your Honor, at this time, we introduce  
24 Exhibit 378 into evidence.

25 MR. HAYNES: No objection.

Prejean - Direct

1 THE COURT: Received.

2 (Plaintiff's Exhibit 378 was received in evidence.)

3 MS. MICHAELS: Please pull up and enlarge the first  
4 "Whereas" clause.

5 Q (by Ms. Michaels) It states, "Whereas, Varco, LP is the  
6 owner of United States Patent Number 5-474-142 hereinafter  
7 the 142 patent entitled automatic drilling system, which was  
8 filed on April 19, 1993 and issued on December 12, 1995, and  
9 is in full force and effect." Did I read that correctly?

10 A Yes.

11 Q As of December 2005 when this confidential settlement  
12 agreement was entered into, did Varco then own the 142  
13 patent?

14 A Yes, that's correct.

15 MS. MICHAELS: Please pull up the last two "Whereas"  
16 clauses, Mr. Bouck.

17 Q (by Ms. Michaels) Would you read those aloud, please?

18 A "Whereas, IDM hereby expressly agrees that its automatic  
19 drilling systems with automatic differential pump pressure  
20 control systems infringe one or more claims of the 142  
21 patent. Whereas, IDM and those in privity with its any  
22 successors or predecessors in interest hereby stipulate with  
23 respect to the 142 patent that they stipulate that the 142  
24 patent is valid and enforceable, and they shall not assert  
25 that the 142 patent is invalid and/or unenforceable."

Prejean - Direct

1 Q All right. As of this confidential settlement  
2 agreement, or prior to its execution, IDM had sold some  
3 equipment that was infringing some device; is that right?

4 A Yes.

5 Q Would you describe whether the device was computerized  
6 or not?

7 A It was an electronic or computerized automatic control  
8 system for a new rig.

9 Q Had the infringing device that Tech Power sold been  
10 computerized or electronic in nature?

11 A Yes.

12 MS. MICHAELS) Please turn to the second page, Mr.  
13 Bouck, and pull up the second and third "Whereas" clauses.

14 Q (by Ms. Michaels) Would you read those aloud, please?

15 A "Whereas, IDM further warrants and admits as of the date  
16 of this agreement, that it has manufactured two automatic  
17 drilling systems with automatic differential pump pressure  
18 control systems. Whereas, IDM represents that it has  
19 discontinued the manufacture and sale of automatic drilling  
20 systems with automatic differential pump pressure control  
21 systems, and except as otherwise provided below, agrees not  
22 to manufacture, sell or offer for sale such automatic  
23 drilling systems until the expiration of the 142 patent."

24 Q Did you verify that IDM had only sold two infringing  
25 units?

Prejean - Direct

1 A Yes, we did.

2 Q Did IDM honor the agreement not to sell any further  
3 infringing units?

4 A Yes, they did.

5 MS. MICHAELS: Mr. Bouck, please turn to the third page  
6 of this document, and Paragraph 1 regarding payment  
7 obligations, license, please pull up the first few lines.

8 Q (by Ms. Michaels) It indicates that IDM would pay to  
9 Varco a royalty of \$10,000. Do you see that?

10 A Yes.

11 Q And, did IDM pay that royalty?

12 A Yes, they did.

13 Q And, was that for the two infringing units that they had  
14 sold?

15 A That's correct.

16 Q Or rented. Please pull up graphic 625. On the last  
17 line of this graphic, there's a summary of the license  
18 agreement--excuse me--the confidential settlement agreement  
19 between IDM and Varco. Is that an accurate summary?

20 A Yes, they agreed never to infringe the patent, and they  
21 paid damages, and they ceased infringing activities.

22 Q Now, let's talk about Pason. In contrast to all these  
23 companies that either entered into a license agreement, or  
24 consent judgment agreeing not to continue infringing, what  
25 did Pason do?

Prejean - Direct

1 A Well, they publicly and in the industry went out and  
2 built a device that we believe infringes on our patent, and  
3 marketed it to the entire market and our customers.

4 Q Did their marketing and rentals of the auto driller  
5 increase from year to year?

6 A Yes, significantly.

7 Q Please pull up Exhibit 441. What is this document, Mr.  
8 Prejean?

9 A This is Pason's annual report, 2004.

10 Q Is this a public document?

11 A I believe it is.

12 Q Have you ever reviewed this before?

13 A Yes, I have.

14 MS. MICHAELS: Your Honor, at this time, we offer  
15 Exhibit 441 in evidence.

16 MR. HAYNES: No objection.

17 THE COURT: Received.

18 (Plaintiff's Exhibit 441 was received in evidence.)

19 MS. MICHAELS: Mr. Bouck, please turn to Page 10 of  
20 Pason's annual report for 2004. And, enlarge the paragraph  
21 that says, "Auto drillers," if you would, please, sir?

22 Q (by Ms. Michaels) The next to the last sentence under  
23 "Auto drillers," states "By the end of 2004, Pason's auto  
24 driller had been installed on 35 percent of Canadian and 6  
25 percent of U.S. land rigs operating with a Pason EDR system."

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I hereby certify that the foregoing has been transcribed by me to the best of my ability, and constitutes a true and accurate transcript of the mechanically recorded proceedings in the above matter.

Dated at Aurora, Colorado, this 28th day of October, 2008.

s/Theresa Ornelas  
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Federal Reporting Service, Inc.  
17454 East Asbury Place  
Aurora, Colorado 80013  
(303) 751-2777

IN THE UNITED STATES DISTRICT COURT  
FOR THE DISTRICT OF COLORADO

NATIONAL OILWELL VARCO, L.P.	)	
	)	
Plaintiffs,	)	
	)	
vs.	)	1:03-cv-02579-RPM
	)	
PASON SYSTEMS USA, CORP.,	)	
	)	
Defendants.	)	

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TRIAL TO JURY - DAY 1  
TRANSCRIPT OF PROCEEDINGS

---

Proceedings held before the HONORABLE RICHARD P. MATSCH, U. S. District Judge for the District of Colorado, beginning at 8:30 a.m. on the 27th day of October, 2008, in Courtroom A, United States Courthouse, Denver, Colorado.

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Proceedings recorded by electronic sound recording;  
transcript produced by transcription service.

Prejean - Direct

1 A Yes. We--we would periodically monitor the performance.  
2 We would have our field technicians get input from our  
3 customers and we would try to determine some sort of cost-  
4 savings, hours, days, you know, motor--you know, the number  
5 of runs that it would take to drill the particular interval  
6 that we were drilling, so--

7 Q When you talk about saving hours or days how does that  
8 translate into dollars?

9 A Well, drilling operation--an oil and gas company might  
10 pay anywhere from 15 to \$30,000 a day for the overall  
11 operation. So, you know, just using simple math if he was--  
12 if the rig cost was 24,000 a day that's \$1,000 an hour; if we  
13 could save them 1,000 bucks and do that 30 days a month,  
14 that's \$30,000 on the well; that's a very simple analysis.

15 But it varied, but we saved anywhere from 20,000 to  
16 \$100,000 in rig cost and cost of drilling the well.

17 Q Now, was there any financial arrangement between Drillex  
18 when you were vice president of operations there and the  
19 inventor of the Wildcat, Mr. Bobbie Bowden?

20 A Yes. The--Drillex was the distributor, Mr. Bowden was  
21 the Wildcat specialist--he was the manufacturer. And Mr.  
22 Bowden received a 50 percent royalty.

23 Q Now, in your role as vice president of operations there  
24 did you get a chance to meet the inventor Mr. Bowden?

25 A Yes, I did.



Prejean - Direct

1 Q Would you tell us about that please.

2 A Well, shortly after I went to work there Mr. Bowden came  
3 to Houston at Monte Crest to have a meeting so we could kind  
4 of meet and greet, get to know each other because we had been  
5 working together. And so we sat and talked for about an  
6 hour, discussed the business issues and went to lunch.

7 And over lunch I got to kind of know him more  
8 personally and--

9 Q And what--what was your reaction to meeting this  
10 inventor?

11 A Well, I mean he's this guy that invented this very  
12 unique invention and--at first I--you know, he kind of talked  
13 real slow and he was real hard to get to know. But after I  
14 got to visit with him and realized how smart he was and how  
15 brilliant, he was the world foremost authority on automatic  
16 drillers. And I was quite impressed with him, so--

17 Q Let's talk a little bit about Drillex, now you've told  
18 us about the royalty arrangement between Drillex and Bobbie  
19 Bowden, the inventor, did Drillex get acquired by another  
20 company while you were working there?

21 A Yes. I went there many--late '96 or early--I think it  
22 was early '97 and in '98 Baker Hughes, Incorporated, which is  
23 another large oilfield service company bought Drillex, the  
24 company I was working for.

25 Q When Baker Hughes purchased or acquired Drillex, did

Prejean - Direct

1 Baker Hughes continue the agreement with Mr. Bowden?

2 A Yes, they continued it with the obligations of that  
3 distribution agreement through the end of the term.

4 Q What--and what was the royalty payment that they made to  
5 Mr. Bowden?

6 A Well, they continued with the same terms, 50 percent  
7 royalty to Mr. Bowden off of the rental revenue.

8 Q While you were at Drillex and Baker Hughes what was the  
9 level of drilling activity in the United States?

10 A In--in 1997 there was something we referred to as a rig  
11 count, it's a--it's actually the number of companies keep  
12 track of how many rigs are working--active rigs are working.  
13 The rig count was--U.S. rig count was at about eight, 900.

14 Q That was in 1997?

15 A '97, '98, maybe up to 900 to 1,000. And in 1999 it  
16 dropped to a historic all-time low of about 470 rigs I think  
17 in April of '99 or in '80, which was unprecedented. And I  
18 think oil--the price of oil was done--can you believe it, \$9  
19 a barrel.

20 Q How did that impact Baker Hughes at that time?

21 A It impacted Baker Hughes adversely. In fact, a lot of  
22 service companies and drilling companies and oil companies--  
23 it was probably the worst time in our industry.

24 Q Were there layoffs at Baker Hughes?

25 A Yes, we were laying people off and cutting cost.

Prejean - Direct

1 Q And were there any decisions being made at Baker Hughes  
2 regarding core products versus other products?

3 A Well, one of the things--one of my responsibilities  
4 there was to evaluate different product lines and we were  
5 trying to determine which ones were strategic to the  
6 corporation and which ones were nonstrategic. And that's--  
7 that's what I was doing, so--

8 Q Now, when did the distribution agreement with Mr. Bowden  
9 expire?

10 A It was set to expire May 30th of 1999.

11 Q And did Baker Hughes renew that distribution agreement?

12 A No, it did not.

13 Q Why not?

14 A Well, as I said earlier we were evaluating how the  
15 company was going to go forward. And Baker Hughes is a big  
16 corporation and they had, you know, acquired the Wildcat  
17 distribution rights through the acquisition of Drillex.

18 And the Wildcat being a piece of surface equipment  
19 was not--didn't fit into the core product strategy of the  
20 corporation. Baker Hughes is a downhole company, they do  
21 motors and guidance systems, and all sorts of completion  
22 tools, all focused on the bottom part of the hole, not the  
23 surface equipment.

24 Q After Baker Hughes made a decision not to renew the  
25 distribution agreement with Mr. Bowden did you have any

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Dated at Aurora, Colorado, this 28th day of October, 2008.

s/Theresa Ornelas  
Theresa Ornelas  
Federal Reporting Service, Inc.  
17454 East Asbury Place  
Aurora, Colorado 80013  
(303) 751-2777

# Wildcat Services



*"The Ultimate Drilling Machine"*

**The Wildcat Automated Drilling System (ADS).  
Innovative Technology That Delivers Extra Value.**

The patented, state of the art technology found in the Wildcat ADS makes it the right choice for updating the surface control system of virtually any drilling rig. Tested in numerous applications and in a variety of geographic locales and economic operating areas, Wildcat ADS consistently outperformed all weight-only devices and manually operated braking systems.

Wildcat ADS provides smooth, precise operation of the rig brake handle with unprecedented accuracy while monitoring multiple drilling parameters. Properly configured, it can sustain potential instantaneous drilling rates of up to 500 feet per hour. This is over five times better than the older technology. (Rig braking system, air supply, and other factors may determine the actual limits based on the setup of the system.)

## The New Method

Wildcat ADS is designed with today's drilling requirements and technology in mind. New downhole technology requires precision weight transfer to maximize and fully exploit the potential of the operator's investment. Proper use of pump pressure controls (Delta P) has proven to be the superior method of drilling with mud motors, significantly enhancing performance and delivering important cost savings. By enabling constant and consistent surface controls of the downhole assembly, many operators have reduced days on the well by MATCHING PRECISION SURFACE CONTROL WITH SOPHISTICATED DOWN HOLE TECHNOLOGY. *Our system performs these functions with an efficiency older weight-only and manual operated systems cannot possibly match.*

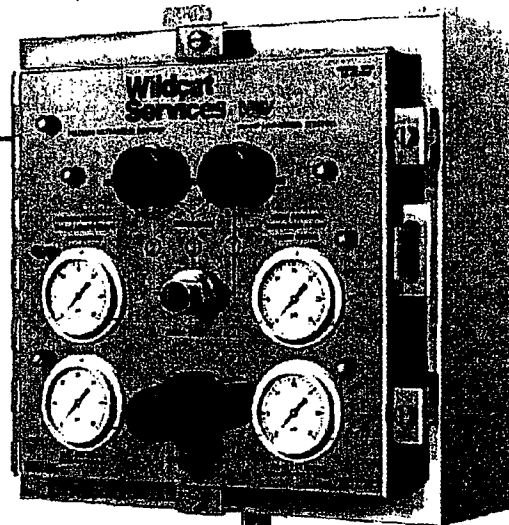
## Service, Training and Maintenance to Assure Reliable, High Quality Performance

Even the most innovative equipment requires proper installation, training and maintenance to assure successful operation and customer satisfaction. With Wildcat ADS, you receive a complete support package. Our trained professionals will install it for you, instruct your drillers in its proper operation and make service calls as needed to make sure the system is performing to your expectations.

## Safety Is a Wildcat Priority

The design of the differential drawworks gear unit makes it the safest brake actuator available. In addition, an internal low pressure shutdown system is set by our technician prior to the beginning of operations, allowing pressure to be adjusted to fit the application.

Also important, the simultaneous multiparameter design allows redundancy with a primary and secondary setting to insure reliable shutdown should a radical change in drilling dynamics occur.



**Pump/Weight  
Controller –  
The Key to  
Simple, Reliable  
Drilling Control  
and Performance  
Enhancement**

## A History of Success

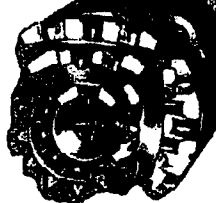
Because of its superior multiparameter Delta P capability, Wildcat ADS was originally tested and deployed as a downhole motor controller primarily for use with mud motors. Since then, our equipment has been proven on thousands of wells in all types of applications, from shallow straight hole drilling to some of the deepest and most complex directional/horizontal wells in the world.

## Service Locations include:

Alaska/Canada	Louisiana
Edmonton, Alberta	Gulf Coast and Offshore
Rocky Mountains	Lafayette, LA
Rock Springs, WY	South America/Venezuela
West Coast/California	Anaco, VZ
Bakersfield, CA	Europe/Caspian Region
Mid-Continent Region	Baku, Azerbaijan
Elk City, OK	Middle East
West Texas/Permian Basin	Abu Dhabi, UAE
Midland, TX	Southeast Asia
Texas	Bangkok, Thailand
Houston, TX	
(+4 locations)	

**Wildcat ADS - The right choice for updating the surface control system of virtually any rig. For more information on how this innovative technology can improve your drilling operation and bottom line, call us today at:**

**281.463.6322 or email us at [wildcatservices@nov.com](mailto:wildcatservices@nov.com)  
Also visit us at our website: [www.wildcatservices.com](http://www.wildcatservices.com)**

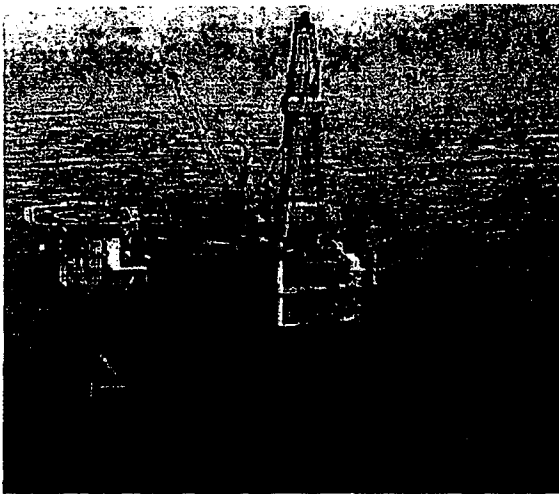


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**PLAINTIFF'S  
EXHIBIT**

**466**

**03-M-2579**

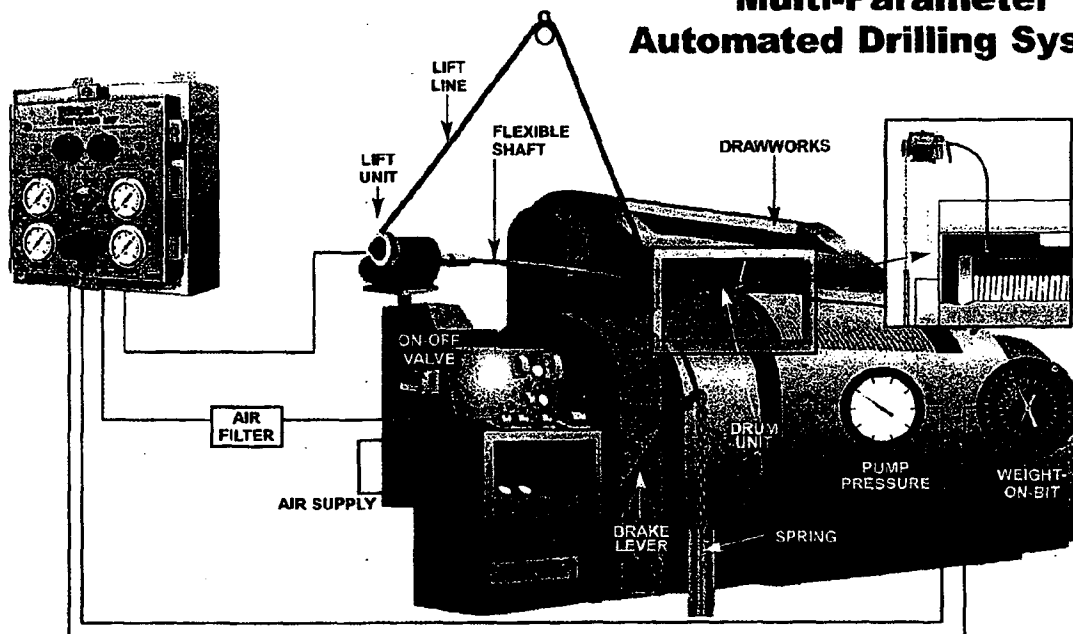


# Wildcat Services

## System Specifications and Features:

- **Patented pump pressure control**
- Precise control of weight on bit
- Can be operated in single, dual, or a combination of modes
- Upon reactivation of the system, settings return to previous parameters
- A broad range of ROP capabilities.
- **ROP Limiter** – operator can preset pace of feed-off as required for the application. Utilized when controlled drilling, reaming or milling is required. Also an enhanced safety feature. See operating instructions.

## Multi-Parameter Automated Drilling System



## Wildcat ADS Precision Benefits:

- |   |  |
|---|--|
| <ul style="list-style-type: none"> <li>• Reduced drillstring vibration</li> <li>• Reduced hole deviation problems</li> <li>• Constant and consistent control (ROP Limiter)</li> <li>• Increased percentage of time on bottom</li> </ul> | <ul style="list-style-type: none"> <li>• Improves bit life</li> <li>• Improves downhole motor life</li> <li>• Improved ROP</li> <li>• Consistent work rate tour-to-tour</li> <li>• Improved safety conditions</li> </ul> |
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**It All Adds up to Fewer Drilling Days and Lower Operating Costs for You.**

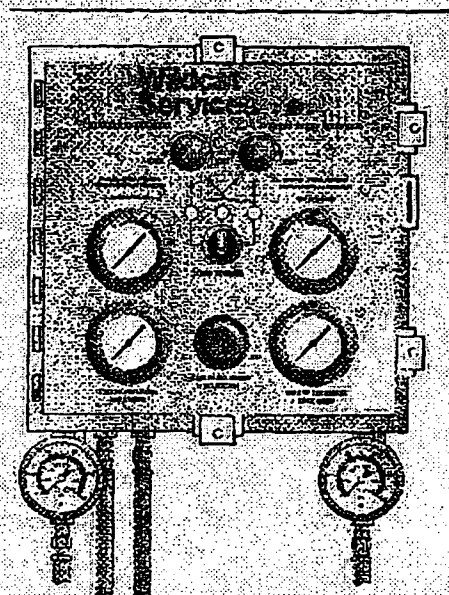
281.463.6322 or email us at [wildcatservices@nov.com](mailto:wildcatservices@nov.com)

Also visit us at our website: [www.wildcatservices.com](http://www.wildcatservices.com)

NOV - 3803



# Wildcat Services



## Technical Manual

Wildcat Services

Automatic Drilling Control

PLAINTIFF'S  
EXHIBIT  
461  
03-M-2579

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DOCUMENT NUMBER <b>42TM81-02</b>	REV <b>A</b>



**NATIONAL OILWELL VARCO**

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Document number: 42TM81-02  
Revision: A  
Page: 3 of 68

### **Revision History**

A	11.10.2005	Issued for Implementation			
Rev	Date	Reason for Issue	Prepared	Checked	Approved

### **Change Description**

Revision	Change Description
A	First Issue



Document number 42TM81-02  
Revision A  
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## 1: General Information

This manual is intended for use by field engineering, installation, operation, and repair personnel. Every effort has been made to ensure the accuracy of the information contained herein. M/D Totco will not be held liable for errors in this material, or for consequences arising from misuse of this material.

### Conventions

#### Notes, Cautions, and Warnings

Notes, cautions, and warnings provide readers with additional information and advise the reader to take specific action to protect personnel from potential injury or lethal conditions. They may also inform the reader of actions necessary to prevent equipment damage. Please pay close attention to these advisories.

**Note:**



The note symbol indicates that additional information is provided about the current topics.

**Caution:**



The caution symbol indicates that potential damage to equipment or injury to personnel exists. Follow instructions explicitly. Extreme care should be taken when performing operations or procedures preceded by this caution symbol.

**Warning:**



The warning symbol indicates a definite risk of equipment damage or danger to personnel. Failure to observe and follow proper procedures could result in serious or fatal injury to personnel, significant property loss, or significant equipment damage.

**ESD**

**Warning:**



The ESD (Electrostatic Discharge) warning symbol indicates that static control precautions are needed.

### Illustrations

Illustrations (figures) provide a graphical representation of equipment components or screen snapshots for use in identifying parts or establishing nomenclature, and may or may not be drawn to scale.

For component information specific to your application, see the technical drawings included with your M/D Totco documentation.

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General Information

## Safety Requirements

M/D Totco equipment is installed and operated in a controlled drilling rig environment involving hazardous situations. Proper maintenance is important for safe and reliable operation. Procedures outlined in M/D Totco manuals are the recommended methods of performing operations and maintenance.



*To avoid injury to personnel or equipment damage, carefully observe requirements outlined in this section.*

## Personnel Training

All personnel performing installation, operations, repair, or maintenance procedures on the equipment, or those in the vicinity of the equipment, should be trained on rig safety, tool operation, and maintenance to ensure their safety.



*Personnel should wear protective gear during installation, maintenance, and certain operations.*

## Recommended Tools

Service operations may require the use of tools designed specifically for the purpose described. M/D Totco recommends that only those tools specified be used when stated. Ensure that personnel and equipment safety are not jeopardized when following service procedures or using tools not specifically recommended by M/D Totco.

## General System Safety Practices

The equipment discussed in this manual may require or contain one or more utilities, such as electrical, hydraulic, pneumatic, or cooling water.



*Read and follow the guidelines below before installing equipment or performing maintenance to avoid endangering exposed persons or damaging equipment.*

- ☐ Isolate energy sources before beginning work.
- ☐ Avoid performing maintenance or repairs while the equipment is in operation.
- ☐ Wear proper protective equipment during equipment installation, maintenance, or repair.

## Replacing Components

- ☐ Verify that all components (such as cables, hoses, etc.) are tagged and labeled during assembly and disassembly of equipment to ensure correct installment.
- ☐ Replace failed or damaged components with genuine M/D Totco parts. Failure to do so could result in equipment damage or injury to personnel.



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## **Routine Maintenance**

Equipment must be maintained on a routine basis. See the service manual for maintenance recommendations.



*Failure to conduct routine maintenance could result in equipment damage or injury to personnel.*

## **Proper Use of Equipment**

M/D Totco equipment is designed for specific functions and applications, and should be used only for its intended purpose.

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General Information

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## 2: Description

### System Overview

The Wildcat Automatic Drilling Controller is a system for controlling weight and/or differential pressure at the drill bit during the drilling operation by mechanical manipulation of the drawwork's brake handle. Operation is based on the relationship of deadline tension and weight on the drill bit as well as differential pressure across the mud motor.

The system utilizes hydraulic pressure generated by the deadline anchor weight sensor. As deadline tension increases above the preselected level on the system controller, the Wildcat pays out drill line by raising the drawworks brake lever. This allows the drum to turn. By lowering the brake handle, the drum stops when a preselected weight value is reached.

Proper use of pump pressure controls (Delta P) has proven to be the superior method of drilling with mud motors, significantly enhancing performance and delivering important cost savings. By enabling constant and consistent surface controls of the downhole assembly, many operators have reduced days on the well by matching precision surface control with sophisticated down-hole technology. The ROP limiter allows the operator to preset the pace of feed-off as required for the application. This is utilized when controlled drilling, reaming or milling is required. The ROP limiter also acts as an enhanced safety feature.

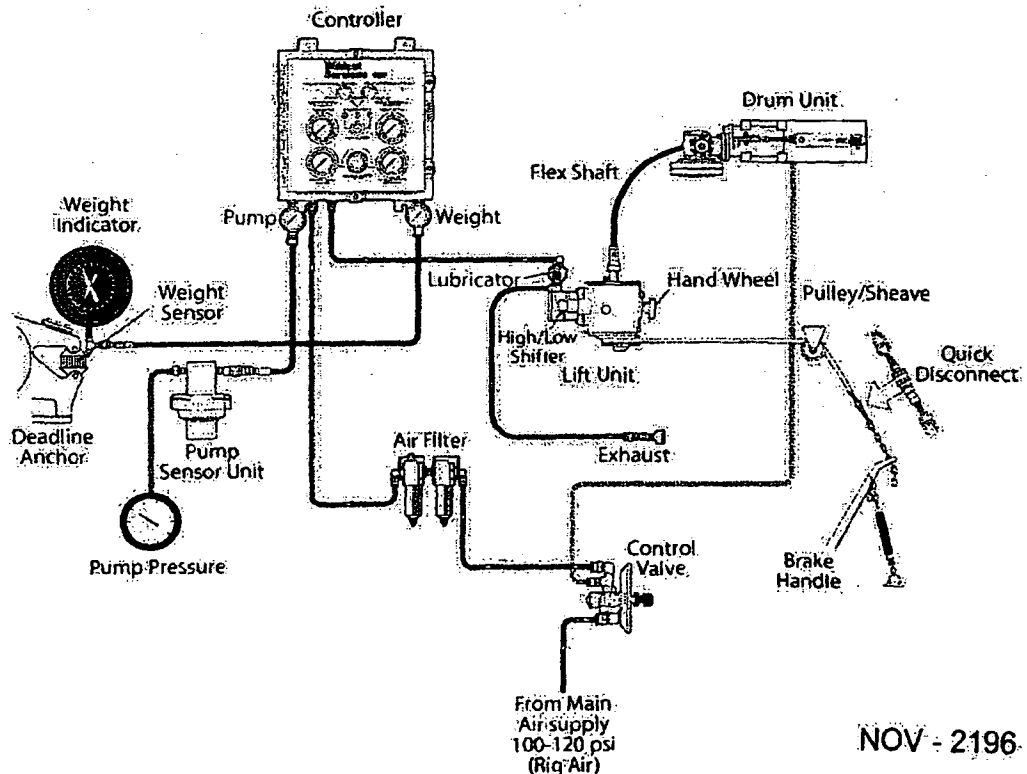


Figure 2.1: Wildcat Automatic Drilling Control System

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Description

## Component Description

### Control Unit

The controller assembly (Figure 2.2) operates the lift unit (Figure 2.3). A bourdon tube in the unit reacts to changes in deadline tension and operates a flapper valve that controls air flow through an orifice. The air flow opens the 3-to-1 valve providing air to operate the air motor. The weight differential knob is used to adjust the weight on the bit.

The Wildcat ADS (Automated Drilling System) is the most comprehensive automatic driller in the world. The Wildcat addresses various drilling needs in the industry:

- Matches precision surface technology with current downhole technology.
- Matches precise weight-on-bit (WOB) transfer with the unique feature of pump pressure differential control when using downhole motors and WOB control that uses high performance bits and rotary systems.
- Patented as the only multi-parameter method of actuating a rig braking system.

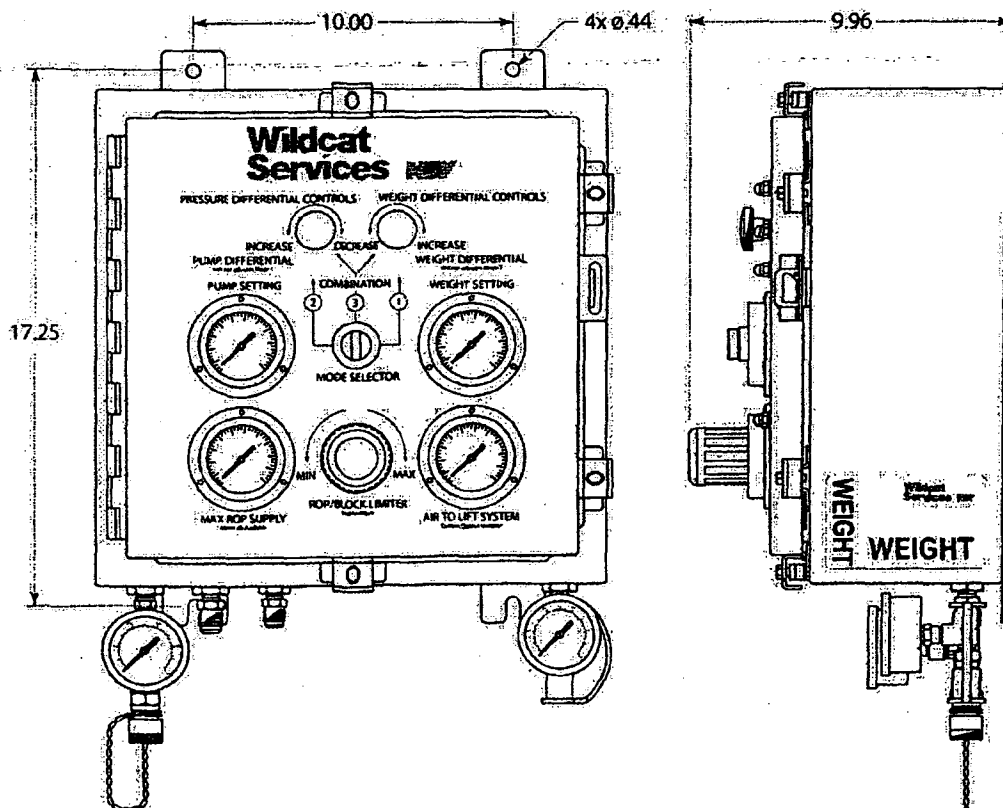


Figure 2.2: Controller Unit Dimensions

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**Standpipe Pressure and Deadline Anchor**

The standpipe pressure input is typically from a diaphragm protector (part number: E17) and is an optional accessory used for directional drilling ( $\Delta P$ ). The signal is sent to the pump differential bourdon tube in the controller assembly.

The weight input is typically from a deadline sensor (part number: E80, 40223761 or equivalent).

**Options**

Controllers are shipped to match load sensing equipment used on the rig. Rigs with deadline anchors will require controllers with 1000 PSI or 1500 PSI bourdon tubes, depending upon the type of anchor.

**Lift Unit**

The lift unit (Figure 2.3) has two inputs and operates as a differential gear unit, winding up the cable. The unit begins winding up the lift line when air pressure is applied to the air motor. The rotation of the drawworks drum causes rotation of the friction wheel on the drum unit. A counter-rotational force is transferred to the lift unit via the flex shaft assembly. The lift unit responds differentially to the two forces and stops winding up the lift line. A High/Low shifter provides the gear assembly with two-speed capability for fast or slow drilling. A hand wheel is used to synchronize gearing when shifting from low to high speed and back. The lift unit, with air motor, is mounted on the drum guard or a pole.

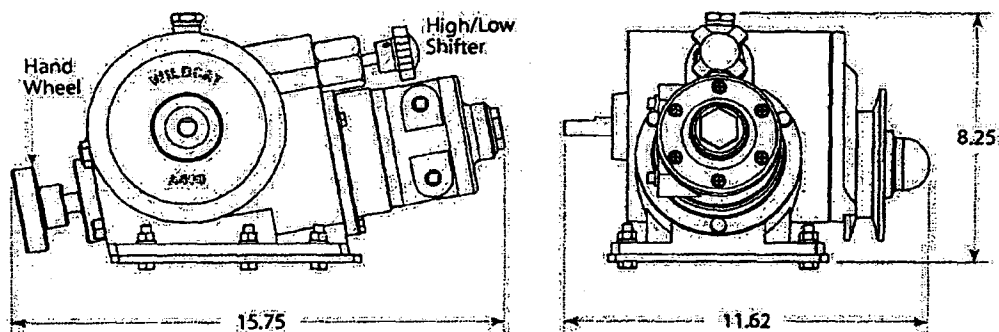


Figure 2.3: Lift Unit Dimensions

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Description

## Drum Unit

The drum unit (Figure 2.4) consists of an air cylinder, a right angle drive and a rubber friction wheel. The air cylinder forces the friction wheel against the inside of the drum flange to sense rotation of the drum. The friction wheel drives a right angle gear assembly, which rotates a flexible shaft connected to the lift unit.



**Note:** The lift unit will not lift the brake handle unless the drum sensor is firmly engaged against the drum flange. This is a safety feature.

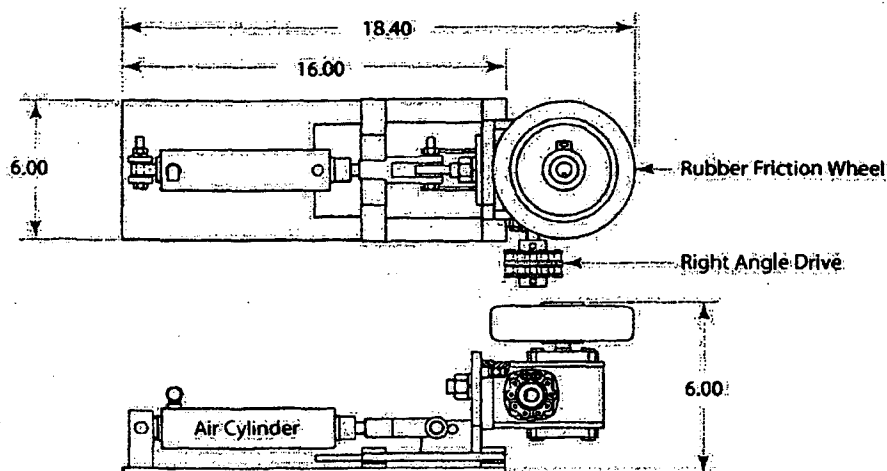


Figure 2.4: Drum Unit Dimensions

## Control Valve

The control valve (Figure 2.5) is a push-pull, on-off valve used to start and stop the Wildcat system usually mounted on the driller's console (see Figure 3.2). The control valve knob is used to start and stop the operation of the system. When the knob is in the on (pulled out) position, air pressure holds the drum unit tire firmly against the inside of the flange of the drum spool. Air to drive the air-motor-driven gear box is also provided. The ROP/Block Limiter is used to control the rate of penetration by regulating air pressure to the lift unit.

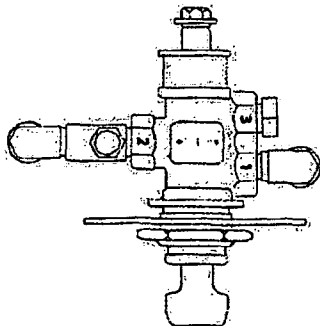


Figure 2.5: Control Valve (Part Number: 40223850-001)

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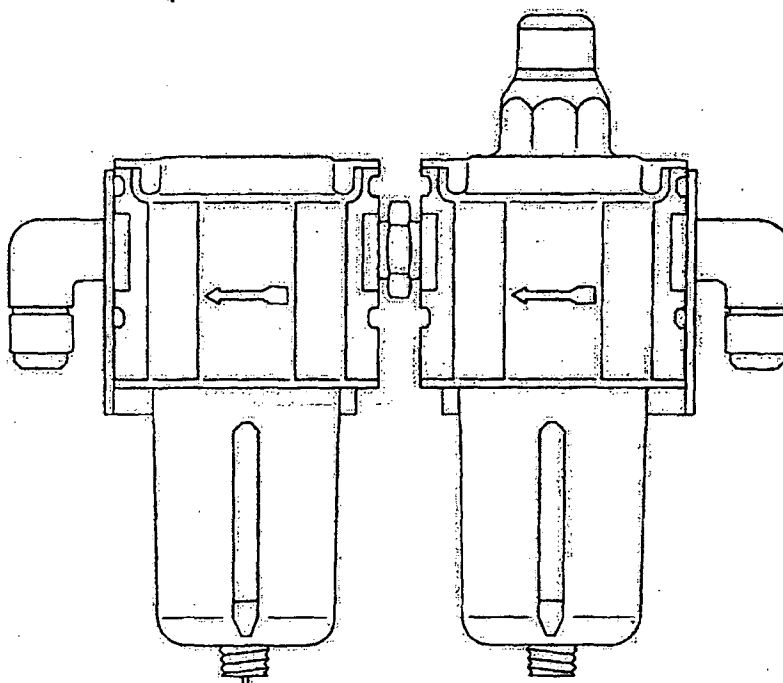
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**Air Filter**

The air filter (Figure 2:6), with fittings, is rated at 150 PSI maximum and is installed between the rig air tap and the control valve so all components in the system receive filtered air. The air filter for the 40223852-001 System is mounted in the driller's console. For details refer to Chapter 3, titled "Installation".



**Figure 2:6: Air Filter**

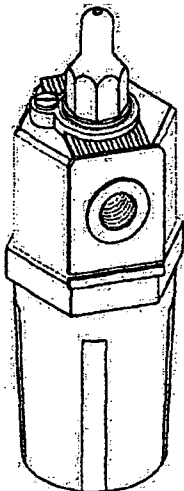
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**2****Description**

## Lubricator

The lubricator supplies oil to the air motor during operation and is mounted directly to the air motor.

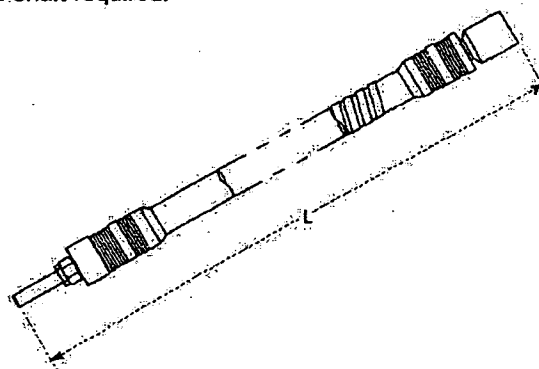


## Flexible Shaft

The Flex-Shaft connects the drum unit box to the gear box assembly. Flexible shafts can be ordered in one of five available lengths ranging from 40 inches to 67.62 inches. See the table below for a list of shaft lengths and part numbers. The distance of the gear box from the drawworks determines the length of flexible shaft required.

### Lengths

Part Number	Length (L)
40982606-010	40 inches
40982606-020	50 inches
40982606-025	56 inches
40982606-030	60 inches
40982606-035	67.62 inches



## Brake Handle Spring Assembly

The spring assembly is connected by chain to the drawworks brake handle and is welded to the rig floor. The spring will maintain pull on the brake lever, keeping the brake set, unless a counter force from the gear box cable overrides it.

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## Cable

A coil of cable and two clamps are provided to load the gear box reel. The cable connects the gear box to the drawworks brake handle.

## Air Hose

Air hoses (No. 6 and No. 8) and a hydraulic hose (No. 4) are provided to interconnect components of the system.

## Specifications

Device	Specification	Note
Rig Air Supply Pressure	30 to 150 PSI	Cleanest air supply available, usually at some high point to prevent moisture.
Controller Operating Pressure	30 PSI	From the regulator inside the unit.
Air Motor Operating Pressure	100 PSI (maximum)	From the speed control valve
Air Filter Pressure	150 PSI (maximum)	Rig air pressure
Speed Regulator Pressure	100 PSI (maximum)	From the regulator inside the unit.
Air Motor Power	1.5 H.P. @ 2300 RPM	Power generated by the Air Motor.
Control Valve Type	3-position	On/Off control switch.

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### 3: Installation

#### Facilities Preparation

Before installation, place the various components in their approximate locations to ensure that the flexible shaft has a single, smooth curve and that the lift line reel will give a straight pull on the brake lever.

For installation of the six basic components shown in Figure 3.1 and Figure 3.2, ensure there is adequate space for mounting them.

For proper operation of the components, follow the steps below:

1. Mount the differential gear box so the cable will have a straight pull to the brake handle.



Note: Pulleys can be used to ensure the cable pulls in a straight line.

2. Mount the drum unit in the drawworks, Figure 3-1, without interfering with drum or cable movement. The drum flange should be smooth with a dry surface to ensure the rubber wheel on the sensor turns properly.



Note: The recommended clearance between the rubber wheel and drum flange should be 3/4 to 1 inch.

3. Install the flex-shaft between the gear box and the drum sensor.
4. Weld or bolt the spring set to the rig floor and adjust it for sufficient pull on the brake handle. Verify the brake handle has a hook so the spring set can be attached.



Note: Drawwork brake characteristics differ between rigs. Experience determines how much tension is required. (Too much tension will cause erratic operation; too little will allow the drum to creep.)

5. Ensure there is adequate room in the console for the air filter, control valve and the connecting hoses.

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Installation

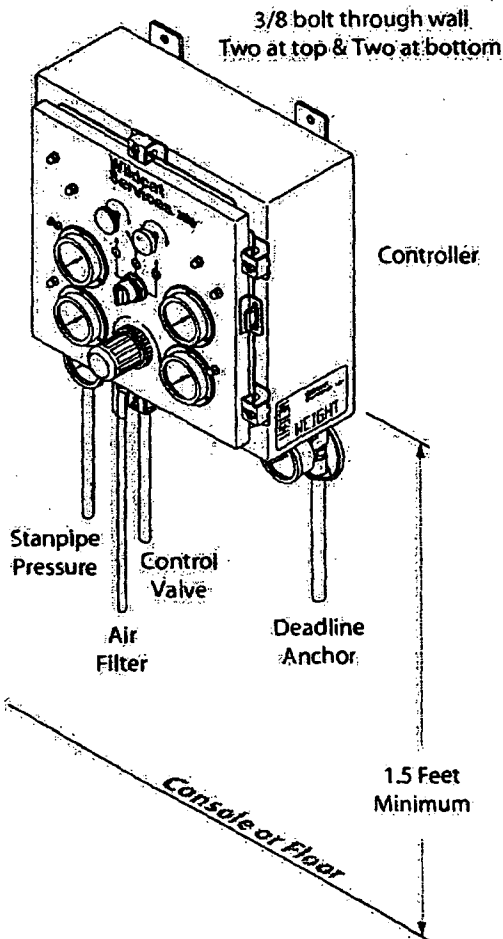
## Mounting the Components

Mount the components as shown detailed in the following sections and depicted in Figure 3-1. If possible, route air lines below the rig floor.

**1** *Caution: Do not use gear box for grounding the welding electrode. Clamp the welding electrode to a structure attached to the rig floor.*

## Controller Assembly Installation

The bourdon tubes will be vacuum pumped and filled at the same time as the weight indicator. The Wildcat controller assembly will require installation as well as hookup. Mount the controller assembly near the drillers position protected from the weather, preferably in the doghouse close to the door. Fill bourdon tube and all hydraulic plumbing leading to it with hydraulic fluid (W15).



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Figure 3.1: Mounting Controller to DogHouse Wall

## Drum Unit Installation

Install the drum unit inside the drum guard in a position to allow the flexible shaft a smooth curve to the lift unit. In locating the drum unit consideration must be given to two requirements:

- The flexible shaft must form a smooth curve to the lift unit
- The rubber tired friction wheel must be .75 inch (19mm) from the drum spool flange and as close as possible to the rim.

Refer to Figure 2.4 on page 16 for the overall mounting dimensions.

Follow the steps below to properly mount the drum unit:

1. Hold the drum unit inside the drum guard to determine the best location.

**1** Note: The friction wheel mounting bolt is offset to allow a one inch variation while mounting. This will allow the friction wheel to be mounted closer to the rim of the drum spool flange.

2. When the drum unit is located, draw a line around the base plate. Remove the sensor.
3. Remove the air cylinder and slide it from the base plate.
4. Weld the base plate to the drum guard at location determined in steps 1 and 2.
5. Apply a liberal amount of grease to the slide area of the base plate.
6. Slip friction wheel slide into place and attach air cylinder to the base plate.
7. Align friction wheel so it will roll true on drum spool flange. Tighten wheel mount locknut.
8. Connect air hose drum control valve to air cylinder.
9. Cut hole thru top cover of drum guard to provide passage of the flexible shaft from the drum unit to the lift unit.
10. Install one end of the flexible shaft to the right angle drive shaft.

## Air Motor and Lift Unit Installation

Locate the air motor and lift unit on the top cover of the drum guard so the flexible shaft has a smooth curve and the lift line reel has a straight pull on the brake lever. The gear box assembly should be mounted level. Fabricate a bracket as necessary to attain level mounting.

**1** Note: On some drawworks it may be necessary to use 1 or 2 intermediate sheaves to route the lift line around obstacles.

Follow the steps below to correctly mount the lift unit:

1. Install the free end of the flex shaft to the lift unit.
2. Mount the lift unit on the top of the drawworks with the lift line reel in line with the brake lever, or intermediate sheave. Fabricate a bracket as necessary to maintain level mounting and weld in place.
3. Bolt lift unit in place.
4. Unreel full length of lift line from reel.
5. Hook end of line to brake lever.

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6. Take up slack at reel by pulling line thru hole in reel. Brake lever must remain all the way down.
7. Loosen clamp and slide to within 3 feet of the reel (approximately 3 or 4 wraps). Tighten clamp.
8. Cut off excess line.
9. Reel lift line clockwise around reel, facing side of reel.
10. Connect air line from air motor to air motor valve on back of controller assembly.
11. Connect rig air, thru the filter, to the control valve inlet fitting.

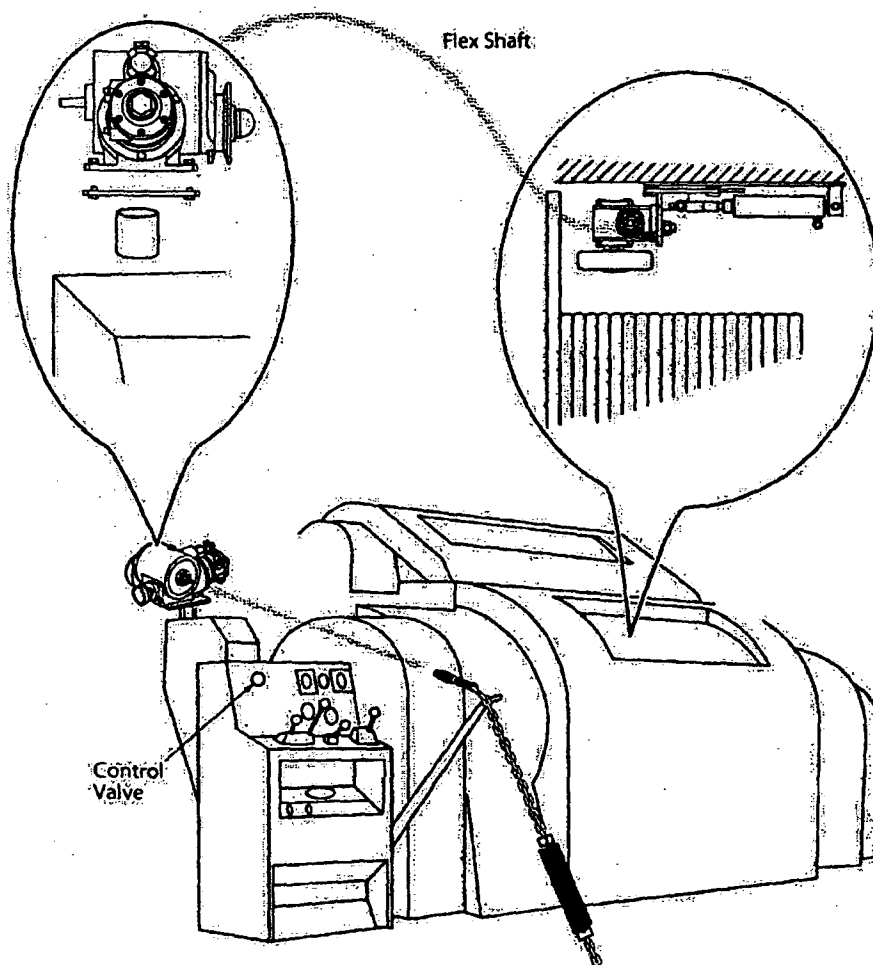


Figure 3.2: Mounting Components on the Drawworks

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## Purging and Pressurization Of The System

The system's hydraulic line and controller are pre-charged with hydraulic fluid (P/N W15) and tested in the field with the W15 provided. After connecting the hydraulic line to the deadline anchor as shown, the system should be purged of air and re-charged as necessary. Typically, this is done as a standard routine of the installation procedure.



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Installation

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## 4: Operation

The wildcat controller uses the following methods (or modes) of operation.

Mode	Description
<b>Mode 1</b>	<b>Weight Only Mode</b> – Mode 1 disables the pump side and is the preferred method if your drilling situation does not have pump pressure implications.
<b>Mode 2</b>	<b>Pump Only Mode</b> – Mode 2 disables the weight side and is only used in special drilling situations. Drilling with pump pressure as the only measured parameter means the system continues to lift the brake and “chase” the desired pump pressure limit or “on bottom pressure” set at the beginning of the interval. Horizontal wells usually use Pump Only Mode when string sticking is required to advance the string when attempting to side drill. Many directional drillers use this method when excessive string weight compression is preferred to drill ahead for a course correction. <b>IMPORTANT:</b> Wildcat Services does not recommend use of Mode 2 unless the driller stays near the brake handle and closely monitors the drilling activity and the weight indicator.
<b>Mode 3 – Balanced</b>	<b>Multi-Parameter Mode</b> – Both parameters are set equally (balanced). Mode 3 is the safest and most efficient method in most applications. Mode 3 has two additional operating options: <ul style="list-style-type: none"> <li>• Mode 3 Bit Weight Primary</li> <li>• Mode 3 Pump Differential Primary</li> </ul>

The control panel lists modes 1, 2, and 3 on the selector switch. Before you select a mode of operation, decide what you want to accomplish with the system before drilling.



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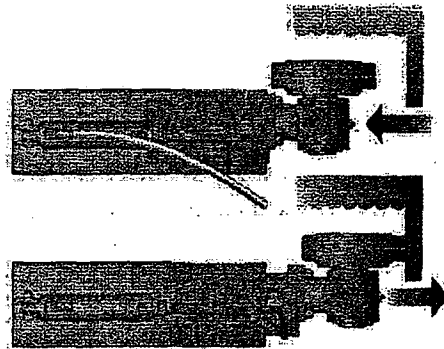
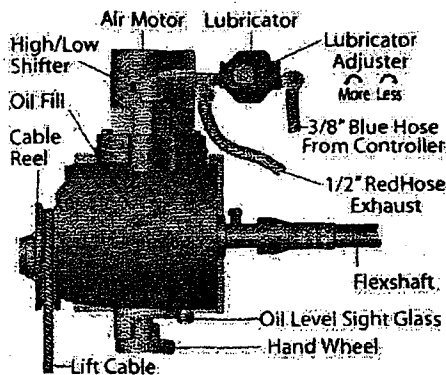
Before you begin to drill, ensure that the following components are working properly:

#### Lift Unit

- Ensure that the lubricator fluid level is full
- Determine the gear required to operate the Wildcat:
  - High: Used for faster drilling.
  - Low: Used for slower drilling.

#### Drum Unit

- Ensure that the female end of the flex shaft securely connects the lift unit.
- Ensure that the male end of the flex shaft securely connects the chain coupler.
- Test the engagement to the drum unit by pulling the ON/OFF valve to the ON position and observe the drum unit tire action against the drum. It should slide back and forth smoothly when turning to ON/OFF.



The Wildcat is ready to operate upon the proper configuration of the drum unit and lift unit components.

## Starting the Wildcat

Assuming the drill string is off the slips and the driller is ready to drill, pumps and kelly bushing are set, and brake spring is attached, you are ready to start the system for the first time.

1. Set the mode selector to the preferred mode. For the purpose of startup, use Mode 1:
  - Mode 1: Drill with weight-on-bit (WOB) only.
  - Mode 2: Drill with pump pressure only.
  - Mode 3: Can set to Balanced, Weight Primary, or Differential Primary.
    - a. To set Mode 3 set bit-weight in Mode 1.
    - b. Set the pump differential in Mode 2.
    - c. Turn the mode selector switch straight up to switch to Mode 3 to drill and control bit-weight and pump differential pressure in combination.
2. Turn WOB and PP adjustment knobs in the Decrease direction for 2-3 turns.
3. Engage the ON/OFF valve by pulling it forward to the ON position.
4. Observe the lift unit. If the lift unit is reeling cable, continue to turn the adjustment knobs in the Decrease direction until it stops.



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5. Observe the drum unit to ensure the wheel is firmly engaged against the drum and tracks the drum pace.
6. Observe the amount of air supply on the ROP supply gauge. A good starting point is 30 psi. Pull and turn the ROP Limiter to the left or right to adjust and then release. The gauge should read at least 30 psi (30%) of capacity.
7. Connect the lift line to the brake handle.
8. Turn the WOB adjustment knob to increase until the lift unit responds and begins to lift the brake.
9. Continue to slowly increase the WOB adjustment knob until you reach the preferred WOB. If you are drilling very fast and the system does not keep pace with expected ROP, pull and turn the ROP limiter knob to the right until the pressure increases to a sufficient amount to keep pace with drilling.



Note: You can use this technique as a safety measure to ensure the pace of drilling is optimum, but not out of control.

10. Observe the air to lift system indicator, which is the output to the lift unit. In fast paced drilling, the indicator may register 40-60 psi. In medium to slower drilling, the pressure needed to smoothly operate the system may be lower.



Note: The driller should use some trial and error, depending on your situation.

The expected result of using the Wildcat is a smooth and steady feed of the brake system with an unprecedented response to changes in the formation interface with the bit.

If the system is not working smoothly, check or change the High/Low shifter position on the lift unit, or contact your Wildcat Services Service Technician.



Note: Make sure the rig brakes are adjusted properly and in good working order.

## Mode Three Combination Options

The operator may prefer to operate with either a bit-weight or pump differential as the primary control and the other as secondary control.

- ☐ Balanced
- ☐ Bit Weight Primary
- ☐ Pump Pressure Differential Primary

## Mode Three Balanced Control

You may choose to set each equally balanced with the output gauges reading the same control, which is sometimes preferred if you want to optimize the pump pressure differential.



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but also prefer to limit the amount of weight transfer to achieve the differential. Simply adjust each control knob by increasing or decreasing until the setting gauges are in balance.

**i** Note: The example below is only for reference. The actual pressures may be higher or lower depending on the drilling application.

This is also a unique safety feature of the Wildcat.

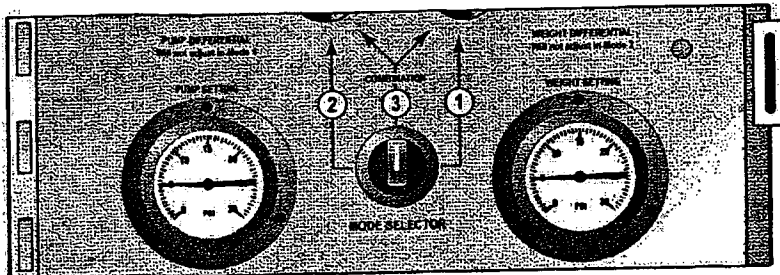


Figure 4.1: Example of Mode Three - Balanced

## Bit Weight Primary

To operate the bit weight primary, complete the following steps:

1. Set the mode selector to Mode 1 and adjust the preferred bit weight to begin drilling.
2. Move the selector switch straight up and adjust the secondary output pressure gauge (pump pressure) to indicate a higher pressure than the primary output gauge (WOB indicator).

**i** Note: The pump differential is set as secondary and is used as a stall-out prevention or cap. If the pump pressure differential is sporadic and unreliable, WOB is the preferred primary parameter.

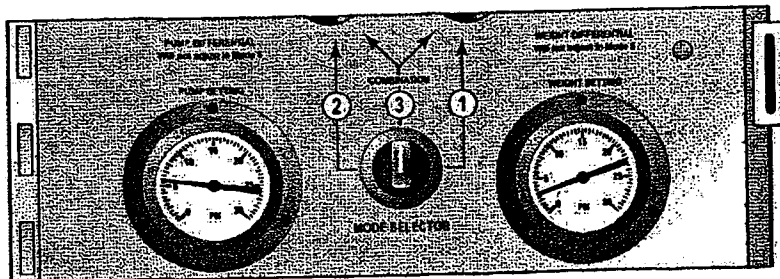


Figure 4.2: Example of Bit Weight Primary

## Pump Pressure Differential Primary

The pump pressure differential primary is preferred and very valuable in downhole motor applications as well as most all drilling applications. The operator may prefer to operate with the pump differential as primary and the bit-weight as a secondary control.

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The pump pressure differential primary selection is generally used when surface-indicated weight is inaccurate, and pump pressure differential is a more positive method to determine where the drill bit position is related to the formation.

The bit weight as secondary is used as a stacking limiter or safety factor and stops advancing the drill string if the WOB parameter exceeds its preset limit to achieve the preset/primary pump pressure control.

The bit weight as secondary is valuable when:

- ❑ **Slide-drilling:** Prevents the slip-stick effect of transferring string weight in excess of preferred limits.
- ❑ **Straight hole performance drilling:** Due to the redundant nature of the pump and weight combination, this mode is preferred.

**1** Note: The Wildcat multi-parameter drilling control is designed so that one parameter is capable of overriding the other parameter when it exceeds the preferred, preset (adjusted) weight or pressure. The controller automatically controls the rate of penetration in relation to bit weight and pump pressure differential.

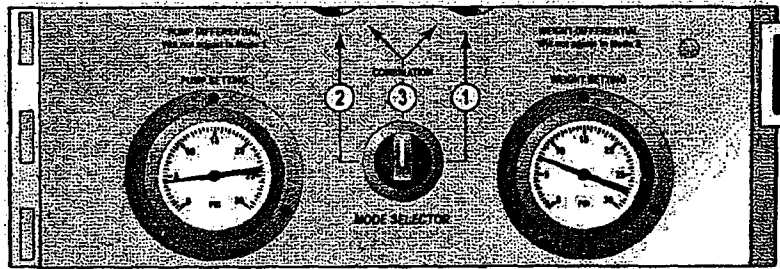


Figure 4.3: Example Mode Three Combination – Pump Primary

The pump differential is in primary control with the weight setting higher than the initial weight required for the initial differential target setting.

**1** **Warning:** When operating the multi-parameter control, the operator should observe the weight and pump output gauges to determine the parameter in control (overriding) at a particular time. Before adjusting either parameter, knowing the parameter in control is important.

**1** Note: When in Mode 3, the lowest output gauge pressure is in control (primary), and the highest output gauge pressure indicated is always secondary. The operator cannot adjust an increase in the secondary (highest pressure) and get a response because the lower output pressure on the other side is in control and holding a cap on the penetration feed-off.

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## Operating the High/Low Shifter

To shift gears using the High/Low shifter, complete the following steps:



*Caution: Before attempting to adjust the High/Low shifter, be certain the main control valve of the system is in the OFF position. Failure to turn the system OFF results in serious damage to the lift unit.*

1. Turn off the air supply to the system.
2. Simultaneously rotate the hand wheel at the front of the gear unit while pulling or pushing the shifter knob.
  - For slower drilling, push the shifter knob in.
  - For faster rates of penetration, pull the shifter knob out.

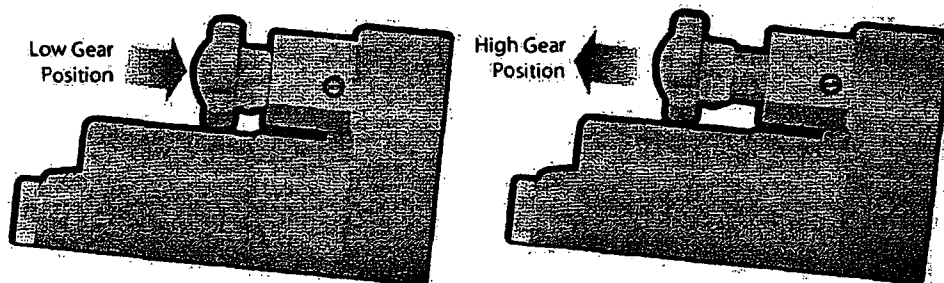


Figure 4.4: High/Low Shifter



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## R.O.P. Limiter

You must adjust the available air supply to the system to increase, decrease, or limit penetration rate (also described as a throttle control).

**To increase\*** Pull the ROP limiter knob from the locked position and turn clockwise.

- \* Release the knob after turning to the new position.

**To decrease\*** Pull the ROP limiter knob from the locked position and turn counter clockwise.

- \* Release the knob after adjusting to set the new position.

**i** Note: The ROP limiter functionality is preferred in erratic formation or when drilling in faults. The bottom right pressure gauge indicates the air pressure supply used and is necessary for the brake actuator for that particular rate of penetration. As long as the bottom left gauge (MAX. ROP SUPPLY) indicates a higher pressure than the bottom right pressure gauge (AIR TO LIFT SYSTEM), a sufficient air supply is available for the current rate of penetration.



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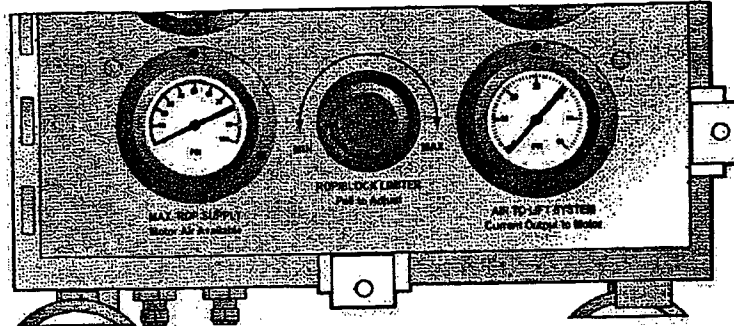


Figure 4.5: ROP Limiter

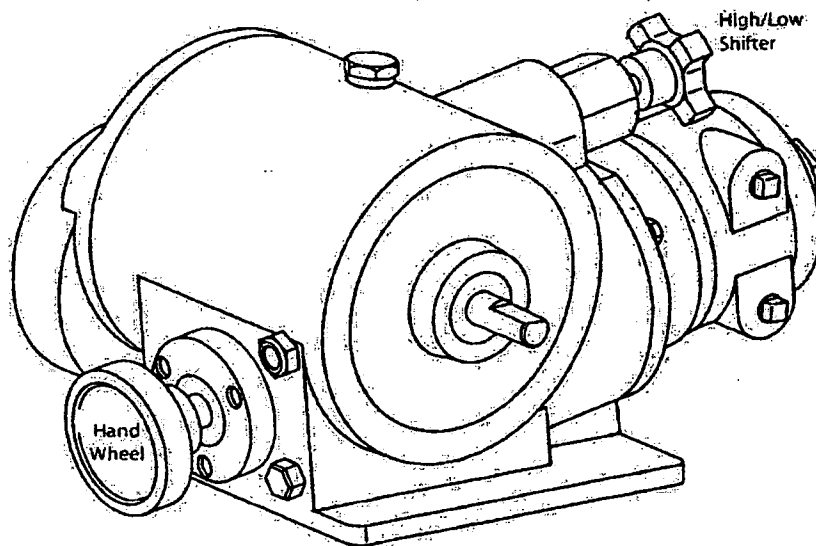


Figure 4.6: Lift Unit

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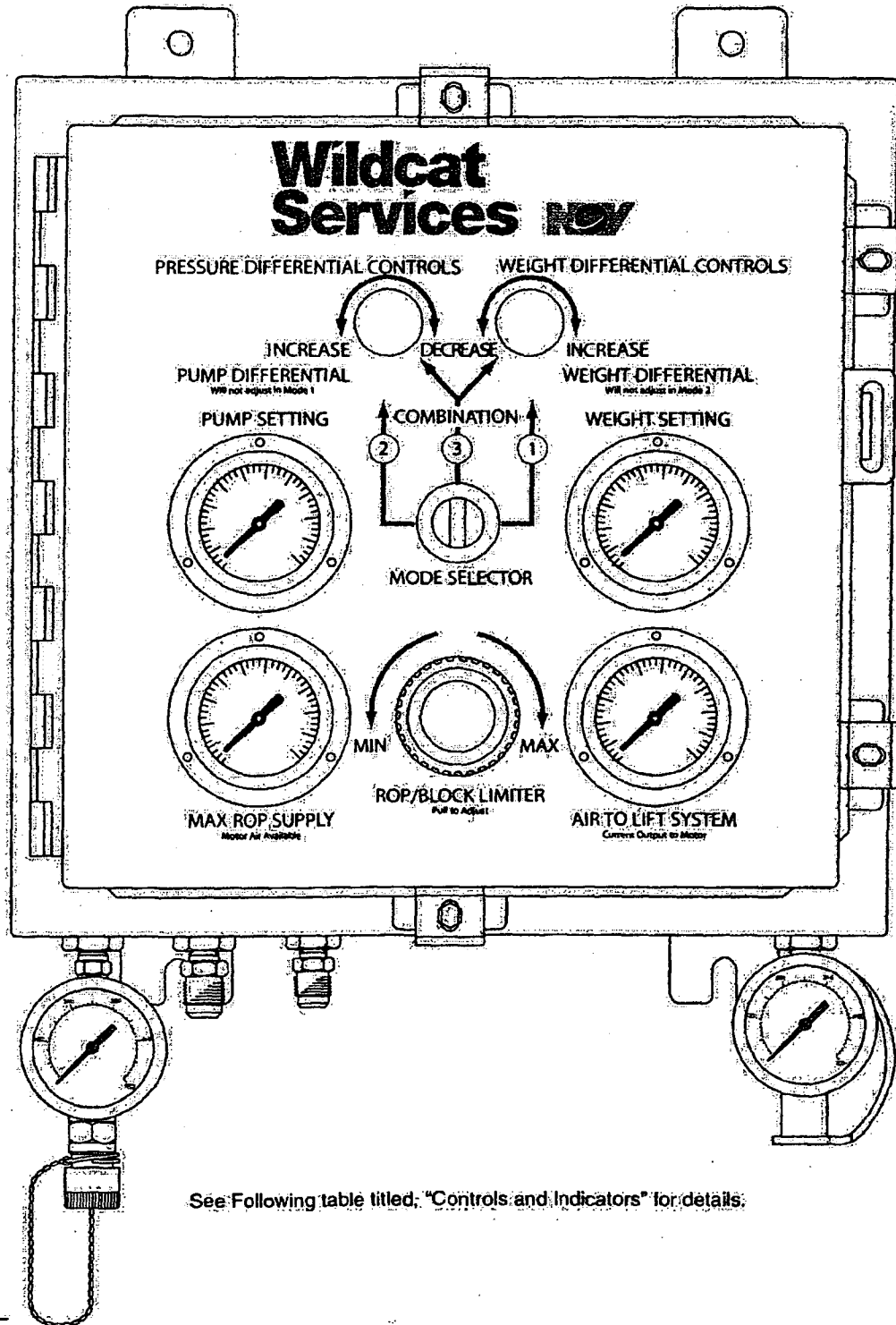
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Figure 4.7: Controller Operating Controls and Indicators

**Controls and Indicators**

Control/Indicator	Type	Function
Pressure Differential Control Knob	Adjusting screw with knob	Sets pressure to be maintained by Wildcat
Pump Setting	0-30 psi gauge	Indicates pump pressure setting
Max ROP Supply	0-100 psi gauge	Shows input air pressure available to operate air motor. Normally set at 30-40 psi. Adjusted by ROP/Block limiter knob
Mode Selector	Pneumatic switch	Changes flow of air to appropriate drilling mode
ROP/Block Limiter	knob	Controls operating pressure to air motor, and therefore, controls speed during feed off
Weight Differential Knob	Adjusting screw knob	Sets weight on bit, to be maintained by Wildcat
Weight Setting	0-30 psi gauge	Indicates weight on bit setting
Air to Lift System	0-60 psi gauge (best operation is in the 3 to 5 psi range)	Indicates control pressure from orifice to operate air motor valve, which sends operating pressure to air motor. Will show a proportion of weight setting pressure
Pump Pressure	0-5000 psi gauge (typical)	Indicates pressure signal from pump or standpipe
Weight Pressure	0-1000 psi gauge (typical)	Indicates weight on bit from deadline sensor
Control Valve Knob	Push/Pull valve	Engages Wildcat to control drilling

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## 5: Maintenance and Troubleshooting

### Cleaning, Lubrication, and Inspection Daily

The following tasks are required daily to maintain the Wildcat:

- Fill the air motor lubricator with a 10 wt. oil or equivalent, and monitor the usage of oil to ensure the air motor is lubricated while in use (Marvel Mystery Oil, Rig Instrument Fluid).
- Check the functionality of the drum unit system and tighten all set screws on the flex shaft, chain coupler, and lift unit.
- Check the integrity of the lift line for smoothness. The lift line should not be frayed or broken. If damaged, replace with a spare lift line or contact Wildcat Services.
- Check the rig brakes for condition and proper adjustment. They should be cooled and free of contamination (oil, water, etc.). This will have a major impact on system operation.



Note: A light dusting of the brakes with Fuller's Earth or Barite may be helpful.



Caution: Do not disconnect the sensor inputs for weight and pump. The pump and weight hose are tagged and have different connections to prevent this problem.



Note: Before making a call for service, please check your rig components. Wildcat Services reserves the right to charge additional fees to maintain the rig components not provided by Wildcat.

### Weekly

- Check the lift unit for oil leaks (Figure 5.1). Check the oil level in the sight glass if lift unit is level; or if not, visually through the fill plug.
- Inspect the air lines for abrasions or cuts and loose fittings.
- Check the drum unit for ease of operation. Add light grease (chassis lube) to slide bearing points as required. Check operation of air cylinder and rubber wheel for wear.

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- Check flex-shaft for loose set screws at both ends. Tighten as necessary.

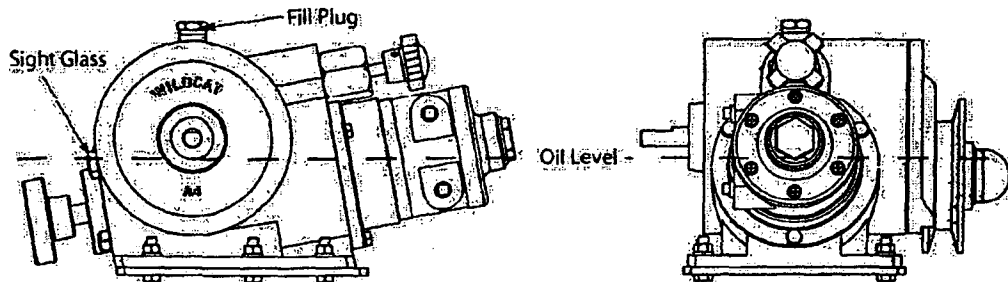


Figure 5.1: Oil Level Check in Gear Box

## Troubleshooting

### Quick Tips

Before you begin troubleshooting, use the following guidelines to ensure that components are in good working order:

Component	Guidelines
<b>Air Pressure</b>	<ul style="list-style-type: none"> <li>• Ensure that all air lines are engaged and the system has sufficient air pressure to operate.</li> <li>• Look at the rig console to determine the amount of air going into the Wildcat input.</li> <li>• Ensure that all air hoses are free of kinks and cuts that can inhibit air power.</li> <li>• Observe the air pressure at the controller after engaging the ON/OFF valve.</li> </ul>
<b>Sensor Signals</b>	Ensure that the weight and pump hoses are in good working order and are connected to the correct source. Also, check for tightness of fittings (no leaks). Observe gauges for pressure reading.
<b>Lift Unit</b>	Ensure that the lift unit LUBRICATOR has oil and is lubricating when the unit is aired up.
<b>High/Low Shifter</b>	Determine the preferred High/Low shifter position on the lift unit.
<b>Drum Sensor Unit</b>	Observe the drum sensor unit to ensure that it is engaged. The tire should be firm and in line with the drum.
<b>Mode Selection</b>	Determine the mode selection at the controller.
<b>Brake</b>	Adjust and set the proper brake spring tension.

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Component	Guidelines
<b>Adjustment Knobs</b>	<p>Set the adjustment knobs towards DECREASE to indicate zero pressure on pump and weight indicator gauges before starting.</p> <ul style="list-style-type: none"> <li>• Mode 1 = Zero weight; opens the pump control; pump indicator should read full pressure, meaning it is disabled (20-25 psi).</li> <li>• Mode 2 = Zero pump; opens the weight control; weight indicator should read full pressure, meaning it is disabled (20-25 psi).</li> <li>• Mode 3 = Both weight and pump can be adjusted to zero indicator pressure. Adjust accordingly before starting.</li> </ul>
<b>ROP Supply</b>	<p>Ensure that the ROP supply is sufficient to achieve the drilling objective (30-40 psi suggested for starting).</p>

Contact Wildcat Services for assistance, service, and training.

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Maintenance and Troubleshooting

## Malfunction Identification Chart

Problem	Solution
<b>The unit is not working.</b>	Follow the Quick Tip Guidelines.
<b>The unit is not keeping up with the expected ROP.</b>	<ul style="list-style-type: none"> <li>• Increase ROP supply pressure.</li> <li>• Determine the appropriate mode selection (1, 2, and 3) for the preferred result.</li> <li>• Check for kinks that can restrict air lines.</li> <li>• Determine the High/Low shifter position.</li> <li>• Adjust the rig dynamic/electric brakes.</li> </ul>
<b>The unit is 'dumping weight.'</b>	<ul style="list-style-type: none"> <li>• Check the weight signal and pump signal inputs. Ensure the system has a signal and is quality for purpose.</li> <li>• Check the High/Low shifter for the proper selection.</li> <li>• Adjust the ROP Limiter. – Reduce to lower erratic function or increase to prevent Start/Stop.</li> <li>• Adjust the brake spring.</li> <li>• Ensure lubricator is full of oil and functioning properly.</li> <li>• Check the air hoses for kinks or cuts that can restrict airflow.</li> <li>• Check the travel of brake release point and evaluate efficiency of rig brake system.</li> </ul>
<b>It will not raise the brake!</b>	<ul style="list-style-type: none"> <li>• Check the air pressure coming from rig input. Ensure that the system has air supply (80 psi minimum).</li> <li>• Ensure that the drum unit is engaged and the tire is firmly against the drum. Low rig air pressure may prevent proper force to load drum unit.</li> <li>• Check the ROP supply. If you are limiting the ROP supply, the Controller does not have enough air to begin drilling. In either mode 1, 2, or 3, the air supply should be at least 40 psi when maximum ROP is preferred.</li> <li>• Check and tighten the set screws on the flex shaft connected to the lift unit and drum unit chain coupler.</li> <li>• Ensure pump and weight setting gauges indicate pressure when adjusted past the start point of the original pump and weight setting.</li> <li>• Ensure that the High/Low shifter is not in between gears (neutral).</li> </ul>
<b>Tire is slipping.</b>	Make sure the tire is firm against the drum. Make certain the contact area is free from oil and drill line tar. Excessive dirt and grime can cause the tire to slip.

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Problem	Solution
<b>The system is drilling erratically</b>	<ul style="list-style-type: none"> <li>• Check the ho air pressure to see if it is low</li> <li>• Determine if there is faulty weight or pump input from the source. The Wildcat may be responding to changes in the weight and pump</li> <li>• Determine if there is bit vibration or pump surge from pump pressure</li> <li>• Ensure that the lubricator is full of oil</li> <li>• Change to high or low gear</li> <li>• Adjust the brake spring if it is too tight or too loose and evaluate the brake efficiency</li> </ul>
<b>Lift unit is not responding</b>	<ul style="list-style-type: none"> <li>• Ensure that the lubricator is full of oil</li> <li>• Check for kinks or cuts in the air hose that can restrict air lines</li> <li>• Damage to the unit may have occurred. Contact your Wildcat Representative</li> </ul>

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## 6: Parts List

Included in this Chapter are drawings of all components and assemblies along with the respective parts listing. The list, compiled in reference designator order, and contains the part description and part number of each component.

Spare parts and repair parts are available. When specifying parts, please include the following information (as applicable).

1. Instrument model number.
2. Instrument serial number.
3. Part description.
4. Reference designator (if applicable).

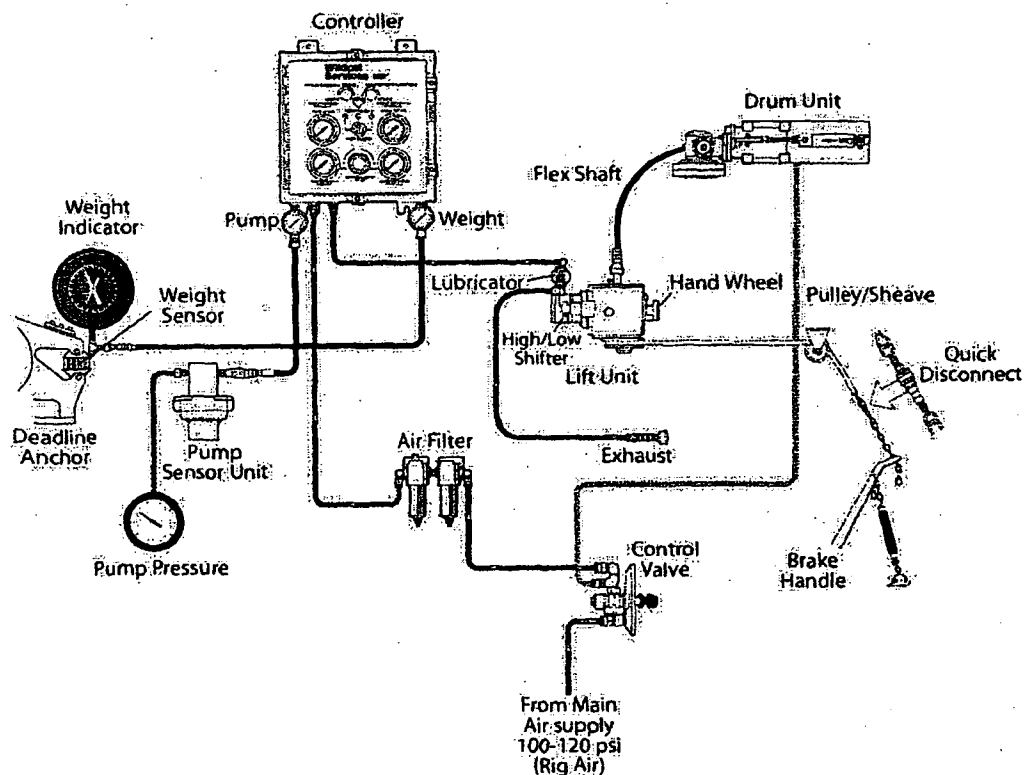


Figure 6.1: Wildcat Automatic Drilling System

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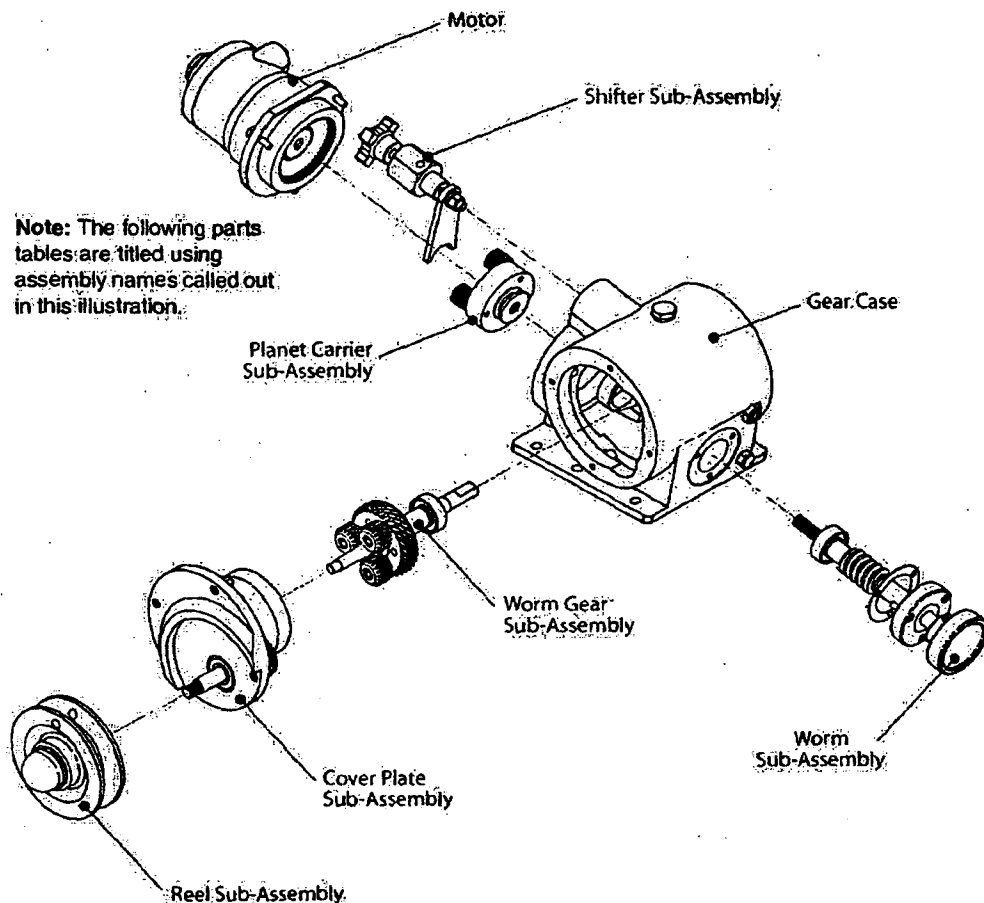
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## Lift Unit

Refer to the illustration and tables that follow for a detailed listing of part numbers for the Lift Unit.



### Cover Plate Sub-Assembly Parts

Part Number	Description	Qty
985827-032	Two Seals Ball Bearing, 17MM Bore	1
J811-6KQ	Socket Head Screw, 1/4-20 x .75, GR5, Steel	4
40223793-001	Cover Plate Gasket	2
40223794-001	Machined Cover Plate	1
40223798-001	Gear and Shaft Weldment, Reel Assembly	1

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Part Number	Description	Qty
985822-024	Precision Ball Bearing, .750 inch Bore	1
985835-015	Two Seals Ball Bearing, 10MM x 26MM	1
40223791-001	Combination Gear	1

**Gear Case Parts**

Part Number	Description	Qty
40223789-001	Main Gear Case	1
979453-077	Shaft Oil Seal, 0.625 inch diameter	1
935756-002	Oil Level Sight Glass, 3/8 NPT	1
J826-2HB	Hex Head Plug, 1/4 inch NPT, Brass	1
J823-4HB	Hex Head Plug, 1/2 inch NPT, Brass	1

**Motor Parts**

Part Number	Description	Qty
40223783-001	Flange Gear Gasket	1
40223781-001	Flange Gear	1
G177-4MQ	Spring Lock Washer, 1/4, .255 x .493	6
999393-226	Hex Head Screw, 1/4-20 x 1.00, Stainless Steel	3
40223784-001	Air Motor Gasket	1
953705-02	Face mount Pneumatic Motor	1
999324-241	Socket Head Cup Set Screw 5/16-18 x .25	1
40223780-001	Air Motor Gear, 27T	1
J811-6HA	Hex Head Screw 1/4-20 x .75, Steel	3

**Planet Carrier Sub-Assembly Parts**

Part Number	Description	Qty
40223806-001	Planet Carrier Gear	1

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Part Number	Description	Qty
40223807-001	Gear Retention Pin	3
40223808-001	Planet Gear, 12T	3
985842-002	Needle Bearing, .250 x .437 x .31	6

### Reel Sub-Assembly Parts

Part Number	Description	Qty
40223795-001	Machined Reel	1
40984100-001	Overrunning Clutch, 39 ft-lb.	1
979453-079	Shaft Oil Seal, .656 inch Inside Diameter	1
G180A-07213	Flat Washer, 1/2, .531 x 1.25 x .1	1
J806-8FP	Elastic Stop Hex Nut, 1/2-20	1
40989530-001	Grease Cap, 1.786 Outside Diameter	1

### Shifter Sub-Assembly Parts

Part Number	Description	Qty
999324-200	Socket Head Hex Set Screw, 1/4-20 x .375	1
40223801-001	Shifter Body	1
40223803-001	Shifter Shaft	1
40223802-001	Shifter Knob	1
979453-076	Shaft Oil Seal, 0.313 inch Inside Diameter	1
40999578-001	Ball Plunger, 3/8-16 UNC, Stainless Steel	1
40223778-001	Fork Shifter	1
999321-640	Helical Lock Washer, 3/8, .388 x .679	1
J827-6CA	Hex Nut, 3/8-16, Steel	1

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**Worm Gear Sub-Assembly Parts**

Part Number	Description	Qty
985827-032	Two Seals Ball Bearing, 17MM Bore	1
40223729-001	Cross Pinion Shaft	1
985835-014	Two Seals Ball Bearing, 17MM x 35MM	2
40223800-001	Worm Gear	1
K640B3210	Dowel Pin, .3125 x 2.00 Long, Oversize	3
40223868-001	Planet Gear, 18T	3
985842-003	Needle Bearing, .312 x .500 x .438	6
40223799-001	Round Spacer	1

**Worm Sub-Assembly Parts**

Part Number	Description	Qty
40223785-001	Worm Shaft	1
985827-032	Two Seals Ball Bearing, 17MM Bore	1
985835-013	Two Seals Ball Bearing, .6693 inch	1
40223787-001	Bearing Retainer Gasket	1
40223786-001	Retainer Bearing Plate	1
979453-077	Shaft Oil Seal, 0.625 inch Inside Diameter	1
J811-6KQ	Socket Head Screw, 1/4-20 x .75, Grade 5 Steel	3
40223788-001	Hand Wheel	1
999324-241	Socket Head Cup Set Screw, 5/16-18 x .25	1

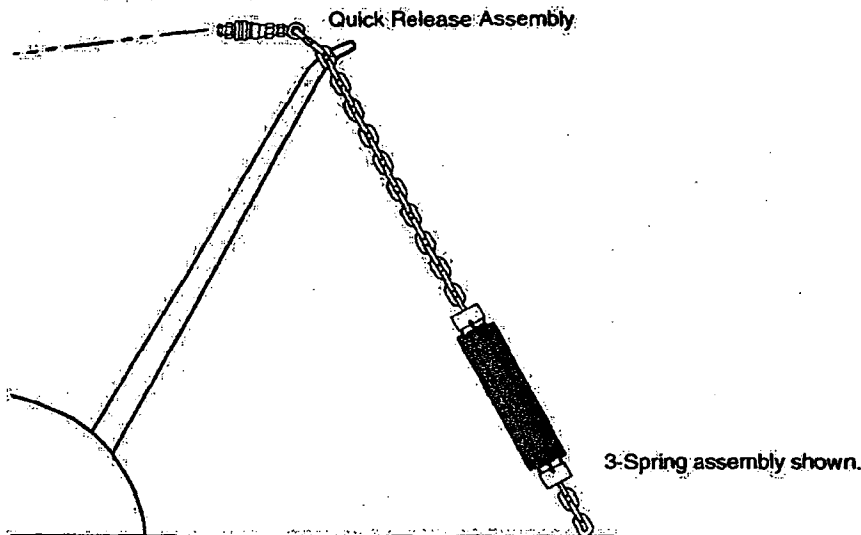
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## Brake Handle Spring Assembly

Refer to the illustration and tables that follow for a detailed listing of part numbers for the brake handle spring assembly.



### Spring Assembly Parts

Part Number	Description	Qty
40223843-001	3-Spring Brake Assembly Bracket	2
983101-122	Spring, 1 inch Diameter, 35#, Cad Plated	3

### Quick Release Assembly Parts

Part Number	Description	Qty
970621-004	Quick Disconnect Socket Coupling, 1/4 x 1/4 inch, Brass	1
970621-005	Quick Disconnect Plug Coupling, 1/4 x 1/4 inch, Brass	1
40223915-001	Quick Release Plug module Assembly	1
40223923-001	Hex Head Eyebolt Plug	1
983857-008	Galvanized Wire Rope, .125 inch, 7 x 19, 600 #	20 ft
999413-003	Connector Chain Link, 1/4 inch, Stainless Steel	2
970129-011	Stop Sleeve, .125 inch Wire Rope	1
999235-015	Eyebolt, 1/4-20 x 1-0, .50 inch ID, FGD	1

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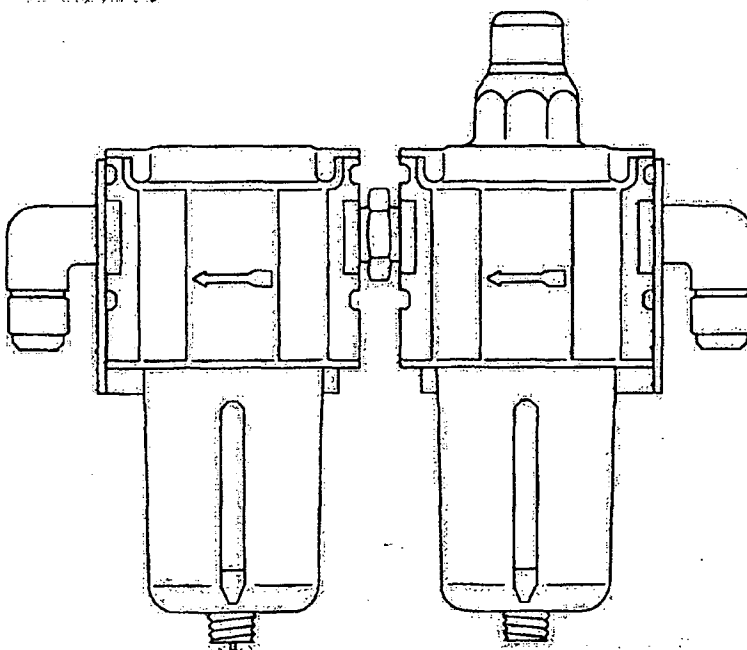
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Part Number	Description	Qty
999316-750	Hex Jam Nut, 1/4-20 x .164, 316 Stainless Steel	1
983853-001	Galvanized Welded Chain, 3/16 inch, 1150 #	4 ft

**Rig Air Filter**

Refer to the illustration and table that follows for a detailed listing of part numbers for the rig air filter assembly.

**Rig Air Filter Parts**

Part Number	Description	Qty
972342-007	Oil Removal Air filter, 3/8 inch - PTF	1
972342-008	Gen Purp Air Filter, 3/8 inch - PTF	1
968643-026	Male elbow, 1/2 T x 3/8 NPT, SAE 45° FLR	2
968137-008	Hex Nipple, 3/8 inch NPT, Brass	1
40223949-001	Mounting Bracket	2
999279-005	Self Locking Hex Nut, 1/4-20, Stainless Steel	4
999010-001	Hexhead Screw, 1/4 - 20 x 1.50, Stainless Steel	4

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Part Number	Description	Qty
X10351A	Cloth Bag, 5 x 7 inches	1



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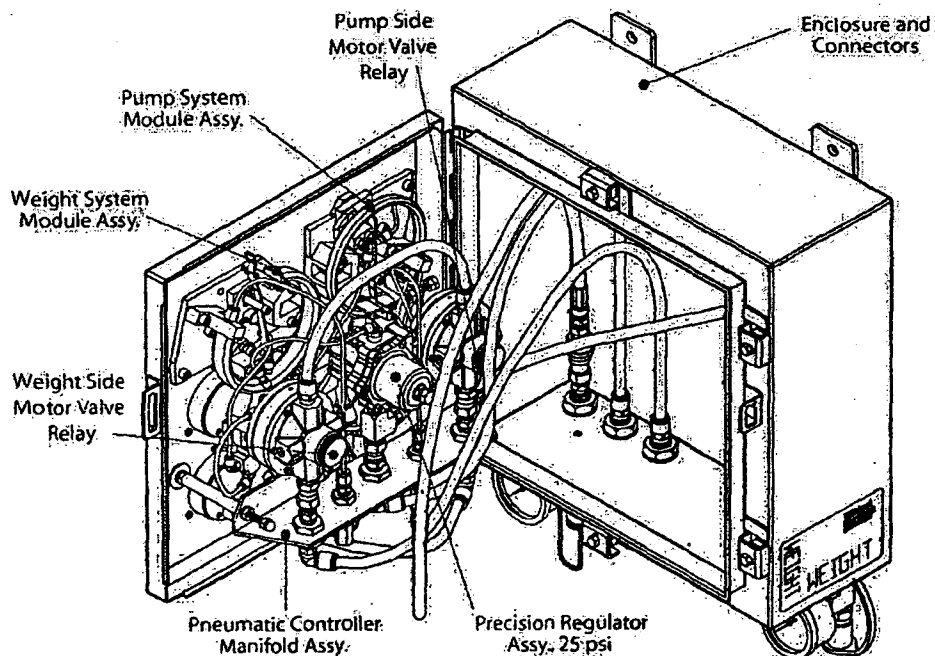
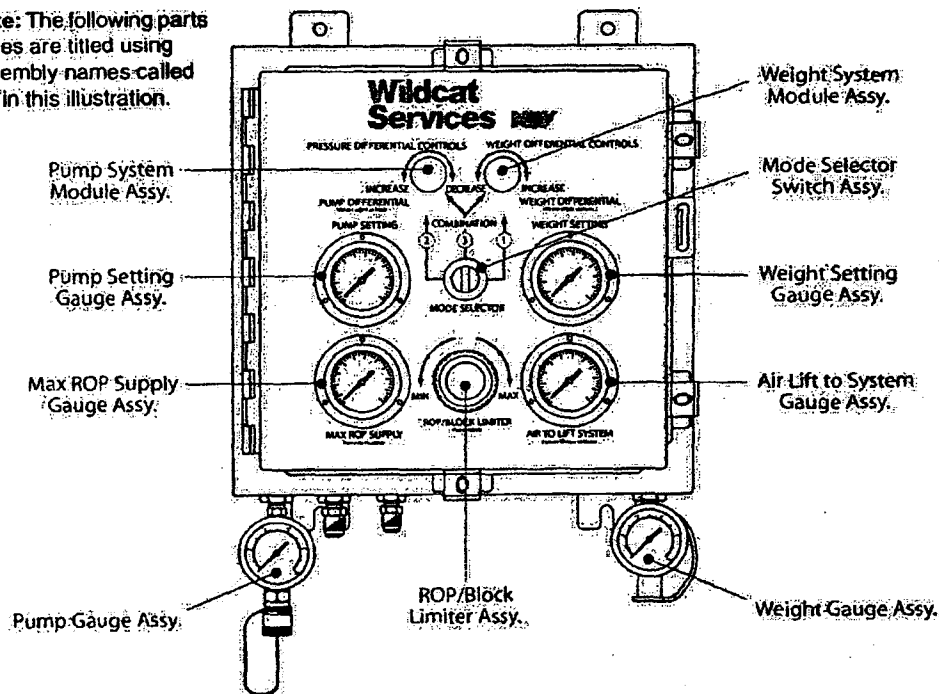
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**Control Unit**

Refer to page 54 through page 61 for a detailed listing of parts for the Control Unit.

Note: The following parts tables are titled using assembly names called out in this illustration.



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Parts List

### Air Lift to System Gauge Assembly Parts

Part Number	Description	Qty
935730-009	0-60 psi Gauge, 2.5", 1/4" NPT	1
999279-002	Self-locking Hex Nut, #6-32, Stainless Steel	3
971185-038	Female Stud Elbow Connector, P-L	1
999469-070	Ovalhead X-Rec Screw, #6-32 x .50, Stainless Steel	3
978903-001	Panel Seal Gasket, 55 Shore A	1

### Enclosure and Connectors

Part Number	Description	Qty
40223704-001	Wildcat Pneumatic Controller Enclosure	1
971152-010	Male Connector, 3/8" T x 1/4" NPT, 45° FL, Brass	1
978919-004	Foam Tape, 1/2 inch Wide, 1/4 inch Thick	58"
971152024	Male Connector, 1/2" T x 1/4" NPT, 45° FL	1
971185-034	Male Stud Hex Coupling Connector	2

### Max ROP Supply Gauge Assembly Parts

Part Number	Description	Qty
999279-002	Self-locking Hex Nut, #6-32, Stainless Steel	3
971185-038	Female Stud Elbow Connector, P-L	1
999469-070	Ovalhead X-Rec Screw, #6-32 x .50, Stainless Steel	3
935730-010	0-100 psi Gauge, 2.5", 1/4" NPT	1
978903-001	Panel Seal Gasket, 55 Shore A	1

### Mode Selector Switch Assembly Parts

Part Number	Description	Qty
969142-002	Hex Socket Plug, 1/8" NPT, Stainless Steel	2
999279-024	Self locking Hex Nut, #10-32, Stainless Steel	2


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Part Number	Description	Qty
J812-12KS	Sockethead Screw, #10-32 x 1.50, Stainless Steel	2
976736-017	3-Way Air Valve, Normally Closed	2
933204-002	Cutler Adapter Switch	1
932504-213	3 Position Operation Selector, 30 MM	1
971185-028	Male Stud Run Tee Connector, P-L	1

**Precision Regulator 25 psi Assembly Parts**

Part Number	Description	Qty
968214-002	Hex Nipple, 1/4 inch NPT, Brass	1
968705-003	Street Tee 1/4 inch NPT, Brass	1
999393-259	Hexhead Screw, 5/16-24 x 1.25, Stainless Steel	1
974509-016	Instrument Regulator, 35 psi	1
971185-037	Male Stud Elbow Connector, P-L	1
971185-030	Male Stud elbow Connector, P-L, 5/32 T - 1/4 NPT	1
971185-039	Male Stud Elbow Connector, P-L, Swivel, 1/8 T - 1/4 NPT	1

**Pneumatic Controller Manifold Assembly Parts**

Part Number	Description	Qty
40223738-001	Manifold Spacer Stud	2
968214-002	Hex Nipple, 1/4 inch NPT, Brass	2
RG822-2	1/4-20 Acorn Hex Nut, Stainless Steel	2
G10017A-000011	Flat Washer, 1/4, .253 x .5 x .062	4
999268-011	Helical Lock Washer, 1/4 (.25), Stainless Steel	6
970627-003	Female Swivel Connector, 1/4 inch NPT, Steel	1
40223719-001	Pneumatic Manifold Spacer	2
40223712-001	Pneumatic Controller Manifold	1

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Part Number	Description	Qty
999397-048	Hex Nut, 1/4-20, Stainless Steel	4
971103-042	Male Adapter, 1/8 inch Tee x 5/16-24 UNF	2
971100-002	Adapter, 1/4 inch NPT x .93 inch, Brass	3
971135-005	Connector, 1/8 inch NPT Brass	1
971135-004	Connector, 1/8 inch NPT Brass	1
999520-011	Fender/Plaster Washer 1/4 inch	2
970627-004	90 Degree Swivel Connector, 1/8-27 Female	2
971185-037	Male Stud Elbow Connector, P-L	3
970117-017	Tube Fitting Nut, 1/8 inch NPT	2
971101-003	Pipe Adapter, 1/4 inch FX 1/4 inch Male, Brass	1
970128-001	Comp Sleeve, .125 inch, Brass	2

### Pump Gauge Assembly Parts

Part Number	Description	Qty
970621-019	Quick Disconnect Socket Coupling, 1/8 inch Male, Brass	1
968138-003	Hex Nipple, 1/4 inch x 1/8 inch NPT, Brass	1
968137-013	Hex Nipple, 1/4 inch NPT, Stainless Steel	1
J10900A-20	Male Coupler, 17K psi, 1/4 inch Female NPT	1
968218-033	Quick Disconnect Plug Coupling, 1/8 inch Male, Stainless Steel	1
935730-007	Gauge 0-5000 psi, 2.5 inch, 1/4 inch NPT	1
968680-022	Male Run Tee, 1/4-18 Female NPT	1
40970693-004	Hose Assembly, 34 inch Hydr/Pneu	1

### Pump Setting Gauge Assembly Parts

Part Number	Description	Qty
999279-002	Hex Self locking Nut, #6-32, Stainless Steel	3
999469-070	Ovalhead X-Rec Screw, #6-32 x .50, Stainless Steel	3


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Part Number	Description	Qty
968600-002	Street Elbow, 1/4 inch x 1/8 inch NPT, Brass	1
969622-017	Female Cross, 1/8 inch NPT, Brass	1
935730-008	0-30 psi Gauge, 2.5 inch - 1/4 inch NPT	1
971185-032	Male Stud Elbow Connector, P-L	1
971185-033	Male Stud Hex Coupling Connector, P-L	1
971185-029	Male Stud Elbow Connector, 5/32 T - 1/8 inch NPT	1
978903-001	Panel Seal Gasket, 55 Shore A	1

## Pump Side Motor Valve Relay Parts

Part Number	Description	Qty
G10017A-000011	Flat Washer 1/4, .253 x .5 x .062	2
970627-003	Female Swivel Connector, 1/4 inch NPT, steel	1
40223716-001	Pneumatic MVR Spacer	1
40223715-001	Pneumatic MVR Spacer Seat	1
969142-002	Hex Socket Plug, 1/8 inch NPT, Stainless Steel	2
J828-6HS	Hex Head Screw, 1/4-28 x .75, Stainless Steel	1
999383-900	Fillet Head Screw, #12-24 x 1.25	6
971185-034	Male Stud Hex Coupling Connector, P-L	1
971185-030	Male Stud Elbow Connector, P-L, 5/32 T - 1/4 NPT	1
971185-029	Male Stud Elbow Connector, P-L, 5/32 T - 1/8 NPT	1
976775-003	Lower Diaphragm valve, MVR	1
40223736-001	Large Spacer, MVR Regulator	1
40223737-001	Small Spacer, MVR Regulator	1
976775-004	Upper Diaphragm Valve, MVR	1
976701-002	Bonnet valve MVR Regulator	1

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## Pump System Module Assembly Parts

Part Number	Description	Qty
RG822-2	Acorn Hex Nut, 1/4-20, Stainless Steel	2
G10017A-000011	Flat Washer, 1/4, .253 x .5 x .062	2
999268-011	Helical Lock Washer, 1/4 (.25), Stainless Steel	1
40223721-001	Spring Bourdon Tube Spacer	1
40223720-001	Stop Spacer, .25 Diameter x .94 Long	1
40223718-001	Low Pump Pressure Bracket	1
40223717-001	Pneumatic Pivot Plug	1
40223714-001	Pneumatic Module Orifice Block	1
40223713-001	Adjustment Pressure Block	1
40223711-001	Pneumatic Green Pivot Plate	1
40223710-001	Pneumatic Blue Mounting Plate	1
40223709-001	Pneumatic Left Hand Shaft	1
40223708-001	Right Hand Threaded Shaft	1
999397-047	Mach Hex nut, 1/4 - 28 x .193, stainless Steel	2
J806-4FS	Elastic Stop Hex Nut, 1/4-28	1
999397-030	Machine Hex Nut, #10-32 x .13, Stainless Steel	1
999338-007	Internal T Lock Washer, #10	1
G10017A-000009	Flat Washer, #10, .196 x .375 x .062	2
999368-754	Socket Head Screw, #10-32 x .75, Stainless Steel	1
999368-705	Socket Head Screw, #10-32 x .50, Stainless Steel	1
J812-10KS	Socket Head Screw, #10-32 x 1.25, Stainless Steel	3
999368-760	Socket Head Screw, 1/4-20 x .75, Stainless Steel	4
999279-003	Self Locking Hex Nut, #8-32, Stainless Steel	2
999368-739	Socket Head Screw, #8-32 x .37, Stainless Steel	2
999397-048	Hex Nut, 1/4-20, Stainless Steel	2



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Part Number	Description	Qty
40223727-001	Pivot Plate Delrin Washer	1
999301-002	Spring CRV Washer, .265 x .49 x .011	1
SA1229	Flapper	1
970117-018	Tube Fitting Nut, 1/8 inch	1
40999577-001	Nylon Flat Washer	2
999301-022	Spring Wave Washer, Stainless Steel	2
999255-160	Retaining E-Ring, Ext-E Crescent	1
999312-011	Shoulder Socket Head Screw, #10-24 x .37	1
40981617-001	45 Degree Pitch Angle Beveled Gear	2
971185-031	Male Stud Elbow Connector, P-L	2
40223746-001	Low Pump Pressure Stud	1
970128-001	Comp. Sleeve, .125 inch, Brass	1
962717-007	Round Knob, #10-32 x 1.38 inch Diameter	1
983101-121	Ext. Flapper Spring	1
965903-003	Orifice Restriction	1
935605-026	5000 psi Bourdon Tube	1
999383-700	Slotted Fillet Head Pivot Screw, Stainless Steel	2
999399-009	Self-locking Hex Nut, Brass	2
999291-013	Flat Washer, #10, .190 x .354 x .032	1

## Weight Gauge Assembly Parts

Part Number	Description	Qty
968214-002	Hex Nipple, 1/4 inch NPT, Brass	1
968218-034	Quick Disconnect Plug Coupling, 1/4 inch Male, Stainless Steel	1
970621-019	Quick Disconnect Socket Coupling, 1/8 inch Male, Brass	1
968138-003	Hex Nipple, 1/4 inch x 1/8 NPT, Brass	1
968705-003	Street Tee 1/4 inch NPT, Brass	1

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Parts List

Part Number	Description	Qty
971100-002	BHD Adapter, 1/4 inch NPT x .93 inch, Brass	4
968218-033	Quick Disconnect Plug Coupling, 1/8 inch Male, Stainless Steel	1
935730-008	0-1000 psi Gauge, 2.5 inch, 1/4 inch NPT	1
40970693-004	Hydraulic/Pneumatic Hose Assembly, 34 inches	1

### Weight Setting Gauge Assembly Parts

Part Number	Description	Qty
999279-002	Hex Self locking Nut, #6-32, Stainless Steel	3
999469-070	Ovalhead X-Rec Screw, #6-32 x .50, Stainless Steel	3
968600-002	Street Elbow, 1/4 inch x 1/8 inch NPT, Brass	1
969622-017	Female Cross, 1/8 inch NPT, Brass	1
935730-008	0-30 psi Gauge, 2.5 inch - 1/4 inch NPT	1
971185-032	Male Stud Elbow Connector, P-L	1
971185-033	Male Stud Hex Coupling Connector, P-L	1
971185-029	Male Stud Elbow Connector, 5/32 T - 1/8 inch NPT	1
978903-001	Panel Seal Gasket, 55 Shore A	1

### Weight Side Motor Valve Relay Parts

Part Number	Description	Qty
G10017A-000011	Flat Washer 1/4, .253 x .5 x .062	2
970627-003	Female Swivel Connector, 1/4 inch NPT, steel	1
40223716-001	Pneumatic MVR Spacer	1
40223715-001	Pneumatic MVR Spacer Seat	1
969142-002	Hex Socket Plug, 1/8 inch NPT, Stainless Steel	1
974509-006	5-125 psi Pressure Regulator, 1/4 inch NPTF	1
J828-6HS	Hex Head Screw, 1/4-28 x .75, Stainless Steel	1



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Part Number	Description	Qty
999383-900	Fillet Head Screw, #12-24 x 1.25	6
971185-034	Male Stud Hex Coupling Connector, P-L	1
971185-030	Male Stud Elbow Connector, P-L, 5/32" T - 1/4 NPT	1
971185-029	Male Stud Elbow Connector, P-L, 5/32" T - 1/8 NPT	1
976775-003	Lower Diaphragm valve, MVR	1
40223736-001	Large Spacer, MVR Regulator	1
40223737-001	Small Spacer, MVR Regulator	1
976775-004	Upper Diaphragm Valve, MVR	1
976701-002	Bonnet valve MVR Regulator	1

## Weight System Module Assembly Parts

Part Number	Description	Qty
RG822-2	Acorn Hex Nut, 1/4-20, Stainless Steel	2
G10017A-000011	Flat Washer, 1/4, .253 x 5 x .062	2
40223714-001	Pneumatic Module Orifice Block	1
40223713-001	Adjustment Pressure Block	1
40223711-001	Pneumatic Green Pivot Plate	1
40223710-001	Pneumatic Blue Mounting Plate	1
40223709-001	Pneumatic Left Hand Shaft	1
40223708-001	Right Hand Threaded Shaft	1
999397-030	Machine Hex Nut, #10-32 x .13, Stainless Steel	1
999338-007	Internal T Lock Washer, #10	1
G10017A-000009	Flat Washer, #10, .196 x .375 x .062	2
999368-705	Socket Head Screw, #10-32 x .50, Stainless Steel	1
J812-10KS	Socket Head Screw, #10-32 x 1.25, Stainless Steel	2

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Part Number	Description	Qty
999368-760	Socket Head Screw, 1/4-20 x .75, Stainless Steel	4
999397-048	Hex Nut, 1/4-20, Stainless Steel	2
40223727-001	Pivot Plate Delrin Washer	1
999301-002	Spring CRV Washer, .265 x .49 x .011	1
SA1229	Flapper	1
999301-022	Spring Wave Washer, Stainless Steel	2
999255-160	Retaining E-Ring, Ext-E Crescent	1
999312-011	Shoulder Socket Head Screw, #10-24 x .37	1
40981617-001	45 Degree Pitch Angle Beveled Gear	2
971185-031	Male Stud Elbow Connector, P-L	1
962717-007	Round Knob, #10-32 x 1.38 inch Diameter	1
983101-121	Ext. Flapper Spring	1
935605-023	500 psi Bourdon Tube (Blue)	1
999383-700	Slotted Fillet Head Pivot Screw, Stainless Steel	2
999399-009	Self-locking Hex Nut, Brass	2
999291-013	Flat Washer, #10, .190 x .354 x .032	1
971185-035	Run Tee Stud Connector, Male	1
970117-017	Nut Tube Fitting, 1/8 inch NPT	1
970128-001	Comp. Sleeve, .125 inch, Brass	1

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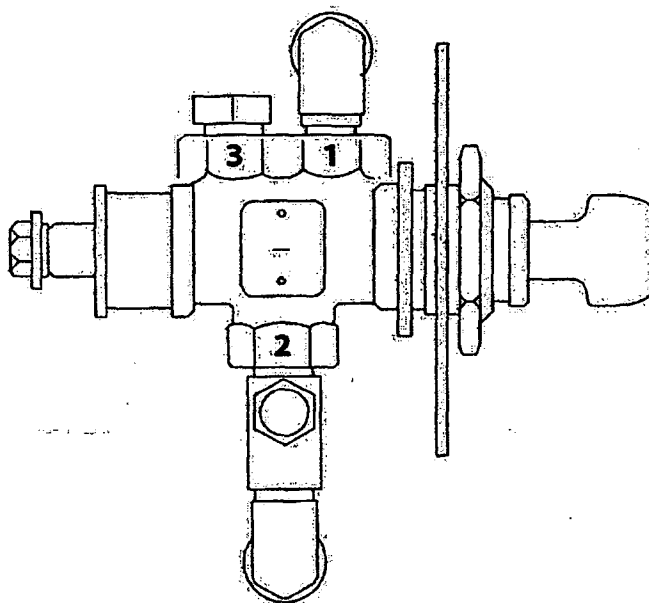
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## Control Valve

Refer to the illustration and table that follows for a detailed listing of part numbers for the brake handle spring assembly.



## Control Valve Parts

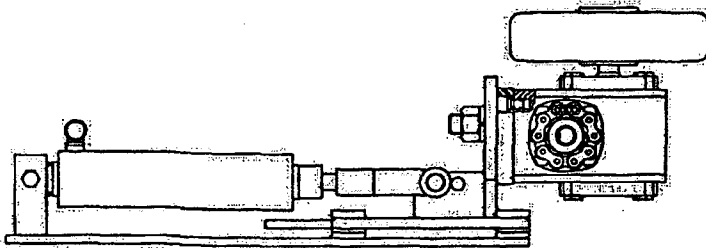
Part Number	Description	Qty
976761-007	3-Way Pneumatic Valve, 1/4 inch NPT	1
968643-025	Male Elbow, 1/2 T x 1/4 NPT, SAE 45° FLR	2
971152-004	Male Connector, 1/4 T x 1/4 NPT, 45° FL, Brass	1
968705-003	Street Tee, 1/4 inch NPT, Brass	1
40223849-101	Mounting Bracket Set	1
J811-6YS	Button Head Screw, 1/4-20 x .75, Stainless Steel	2
999279-005	Self-locking Hex Nut, 1/4-20, Stainless Steel	2
972312-003	Breather Vent, 1/4 inch NPT, 6/16 inch Hex	1

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## Drum Unit Assembly



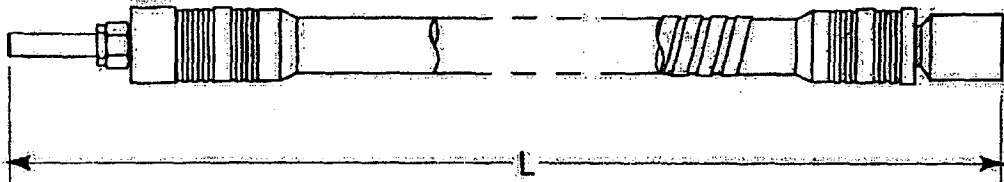
### Drum Unit Assembly Parts

Part Number	Description	Qty
40223832-001	Mounting Base Weldment, Sensor Assembly	1
40223834-001	Slide Weldment, Drum Sensor Assembly	1
40984901-001	Right Angle 5:1 Gear Unit	1
40223924-001	6 inch Wheel, Drum Sensor Assembly	1
40223913-001	Sprocket Modification	2
40983855-010	Roller chain Connector Link, #40-2	1
40983855-001	Roller Chain, #40-2, 5/32 inch P, 1.25 inch Wide	.04
979014-006	Single Air Cylinder, 1.5 inch Bore, 4 inch Stroke	1
983106-243	CPRSN Spring, 1.09 inch x .135 inch x 5.0 inch	1
X10092A-003	Loctite #271 (50 Mil)	.002
968643-004	Male Elbow, 1/4 T x 1/4 NPT, SAE 45° FLR	1
40223833-001	Mounting Plate Drum Sensor Assembly	1
40999462-001	Wheel Bolt, 5/8-18 F x 1-3/4 inch	1
999321-270	Helical Lock Washer, 5/8, .653 x 1.08	1
J806-10EP	Elastic Stop Hex Nut, 5/8-18	1
J816-6KA	Socket Head Screw, 5/16-18 x .75, GR8 Steel	4
999385-161	Hex Head Screw, 5/16-18 x 2.0, Steel - Zinc Plated	2
G180A-04813	Flat Washer, 5/16, .344 x .875	4
G177-5MA	Spring Lock Washer, 5/16, .319 x .591	2
J827-5CP	Hex Nut, 5/16-18, Steel - Cad Plated	2

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Part Number	Description	Qty
J837-514CS	Socket Head Set Screw Cup, 5/16-18 x .5	6
989515-012	Tapered Cap Plug, .471 x .409, Red	1

**Flexible shaft****Flexible Shaft Lengths**

Part Number	Description	Qty
40982606-010	40 inch Flexible Shaft	1
40982606-020	50 inch Flexible Shaft	1
40982606-025	56 inch Flexible Shaft	1
40982606-030	60 inch Flexible Shaft	1
40982606-035	67.62 inch Flexible Shaft	1

**Spare Parts List**

The following items are recommended spare parts for a usage period of one month. Keeping these items in stock will reduce down time caused by normal use and wear.

**Three Way Pneumatic Valve (P.N.: 976761-007)**

Part Number	Description
976761-9001	SERVICE KIT, MANUAL OPERATED
976761-9002	KNOB & ADAPTER KIT, REPLACEMENT
976761-9003	LOCKWASHER
976761-9004	STEM STOP
976761-9005	STEM STOP SCREW

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Part Number	Description
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976761-9006	END BEARING, PLAIN
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**General Purpose Air Filter (P.N.: 972342-008)**

Part Number	Description
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972342-9001	ELEMENT, FILTER 40 MICRON
972342-9002	KIT, SERVICE, SEAL & GASKET
972342-9003	INDICATOR, SERVICE LIFE, VISUAL
972342-9004	KIT, LENS, LIQUID LEVEL
972310-9101	DRAIN, MANUAL, QUARTER TURN

**Oil Removal Air Filter (P.N.: 972342-008)**

Part Number	Description
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972342-9005	KIT, SERVICE, SEAL & GASKET
972342-9006	ELEMENT, FILTER COALESCING
972342-9003	INDICATOR, SERVICE LIFE, VISUAL
972342-9004	KIT, LENS, LIQUID LEVEL

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