Technical Manual

CHAPTER - II
CONTROL DESCRIPTION - OPERATORS AREA

2.1 LISTINGS AND EXPLANATIONS

1. HIGH TEMPERATURE LIGHT - Indicates compressor oil temperature is high - 240° or above light comes on.

2. PRESSURE DIFFERENTIAL LIGHT - Indicates the pressure differential between the high stage screw and low stage screw of the compressor.

3. LOW OIL PRESSURE LIGHT - Indicates high oil pressure in compressor low stage screw (114 PSI maximum).

4. COMPRESSOR TEMPERATURE GAUGE - Indicates air compressor oil temperature - normal operating range 200° – 230° F.

5. DRILLING PRESSURE GAUGE - Indicates air pressure to the drill stem, or air pressure to drive mud pump, if equipped with air-driven pump.

6. LOW STAGE OIL PRESSURE - Indicates oil pressure in compressor's low stage screw - normal reading 110 PSI.

7. ENGINE TEMPERATURE GAUGE - Indicates temperature of the engine coolant.

8. HYDRAULIC OIL PRESSURE GAUGE - Indicates pressure to the hydraulic system for controls 38 through 48.

9. ENGINE OIL PRESSURE GAUGE - Indicates engine oil pressure.

10. ENGINE AMMETER - Indicates electric current charge to batteries.

11. ENGINE SPEED RPM GAUGE - Indicates engine revolutions per minute (RPM).

12. PULLDOWN PRESSURE GAUGE - Indicates pressure in the hydraulic system on the side of the hydraulic cylinder that is applying force downward on the drill pipe.

13. ROTARY HYDRAULIC PRESSURE GAUGE - Indicates hydraulic pressure being applied to rotate the top drive.

14. HOLDBACK PRESSURE GAUGE - Indicates pressure in the hydraulic system on the side of the hydraulic cylinder that limits or counteracts the downward force of the drill pipe.

15. PULLDOWN PRESSURE CONTROL - Controls pulldown pressure and force applied to bit.

16. ROTARY TORQUE CONTROL - Controls hydraulic pressure to top drive motor and the amount of torque the top drive will produce.

17. HOLDBACK PRESSURE CONTROL - Controls holdback pressure and force applied to bit.

c. Press STOP BUTTON (20).

d. Turn IGNITION SWITCH (21) to OFF position.

3.4 TO LEVEL RIG

1. CONDITIONS: Engine running.

CAUTION

ALWAYS KEEP RIG AT ITS LOWEST POSSIBLE POSITION. SELECT LEVEL SPOTS FOR JACK PADS AND BE SURE THE PADS ARE WELL SEATED AND STABLE.

NOTE: Note that the following sequence is for leveling the rig on flat ground only. On unlevel ground, always begin leveling the rig at its lowest corner first.

a. Move LEFT REAR JACK CONTROL (44) and RIGHT REAR JACK CONTROL (45) to EXTEND position until the jacks reach the ground and begin to raise the rear of the rig.

b. Move both LEFT REAR JACK CONTROL (44) and RIGHT REAR JACK CONTROL (45) to CENTER (NEUTRAL) position.

c. Move FRONT JACK CONTROL(S) (43) to EXTEND position until the jack(s) reach(es) the ground and begins to raise the front of the rig. NOTE: Rigs may be equipped with 3, 4, or 5 leveling jacks, use same procedure for all jacks.

d. While operating JACK CONTROLS (44), (43), and (45), observe LEVEL GAUGE (37) until machine is level in both planes.

e. When machine is level in both planes, move JACK CONTROLS (44), (43), and (45) to CENTER (NEUTRAL) position.

f. If necessary, repeat leveling operation on individual jacks until the rig is level. After the rig is level, make sure that the JACK CONTROLS (44), (43), and (45) are in CENTER (NEUTRAL) position.

3.5 TO RAISE MAST

1. CONDITIONS: Engine running. Machine Leveled.

DANGER

BE SURE MACHINE IS STABLE.

DO NOT RAISE MAST UNDER OR CLOSE TO OVERHEAD POWER OR UTILITY LINES.

CHECK FOR POSSIBLE AIR IN HYDRAULIC SYSTEM BEFORE RAISING MAST.

VISUALLY CHECK TO SEE THAT THERE ARE NO LOOSE OBJECTS IN OR ON THE MAST THAT COULD FALL AND POSSIBLY CAUSE INJURY TO PERSONNEL.

⚠ DANGER

WEAR PROTECTIVE LENSES TO SHIELD EYES FROM FLYING OBJECTS CAUSED BY AIR DISCHARGES THROUGH DRILL BIT.

3.9 TO DRILL WITH AIR

1. CONDITIONS: Operation "PREPARE TO DRILL" completed.
   a. Adjust PULLDOWN PRESSURE CONTROL (15) for desired pulldown force. As PULLDOWN PRESSURE CONTROL (15) is turned clockwise, top drive will start to move down dependent upon resistance encountered. Observe PULLDOWN PRESSURE GAUGE (12) for correct pressure. (100 PSI = 1590 LBS - Falcon 30; 100 PSI = 1590 LBS - Falcon 40 ; 100 PSI = 2825 LBS - Falcon 70.) (A graduated dial name-plate is mounted under the gauge.)

NOTE: Desired pulldown pressure depends upon the formation being drilled and type of bit. The pulldown system is equipped with a relief valve to prevent excessive pulldown force.

   b. While drilling, observe DRILLING PRESSURE GAUGE (5) . Adjust pulldown force and pentration rate to prevent bit from clogging.

⚠ CAUTION

NEVER LEAVE RIG UNATTENDED WHILE OPERATING. THE PULLDOWN RELIEF VALVE IS SET SUCH THAT THE FORCE PRODUCED IS LESS THAN THE RIG WEIGHT. UNDER CERTAIN CONDITIONS, A MALFUNCTION COULD CAUSE THE DRILL TO CLIMB THE DRILL PIPE.

⚠ CAUTION

DO NOT CONTINUE DRILLING WITH A PLUGGED BIT BECAUSE RAPID WEAR OR STUCK DRILL STEM MAY RESULT.

NOTE: Good judgment and experience will enable the operator to obtain the best results from the drilling machine. Constant monitoring of both rotation speed and pulldown force is necessary while drilling from the top of the hole to the bottom of the hole.

   c. Continue drilling until pipe flats are below the guide bushings (Figure 3.9.1a (next page)).

   d. Push PULLDOWN/HOLDBACK OFF-ON CONTROL (19) in to the OFF position.

   e. Move ROTARY SPEED CONTROL (30) to OFF (CENTER) position.

   f. Move DRILLING FLUID CONTROL VALVE (28) to CLOSED position.

   g. Move MANUAL BLOWDOWN (DUMP) VALVE (29) to OPEN position.

   h. Proceed to operation "TO BREAK A JOINT" in this manual on page 31.

NOTE: The following hints will aid in effective drilling.

1. Control the rate of rotation with ROTARY SPEED CONTROL (30) so excessive pulldown pressure will not result.
2. Control rate of drilling with the PULLDOWN PRESSURE CONTROL (15) and HOLDBACK PRESSURE CONTROL (17). In soft formations, reduce drilling rate to allow cleaning and to avoid bit plugging and sticking.
3. The water injection pump may be used when desired during air drilling or hammer drilling for dust control or if using additives such as foam.

e. Manually swing POWER BREAKOUT TONG into position.

f. Extend TONG CYLINDER with its control (41) and engage top sub (Figure 3.12.1c).

Figure 3.12.1c

g. Retract TONG CYLINDER rotating sub to unthread it from drill pipe (Figure 3.12.1d).

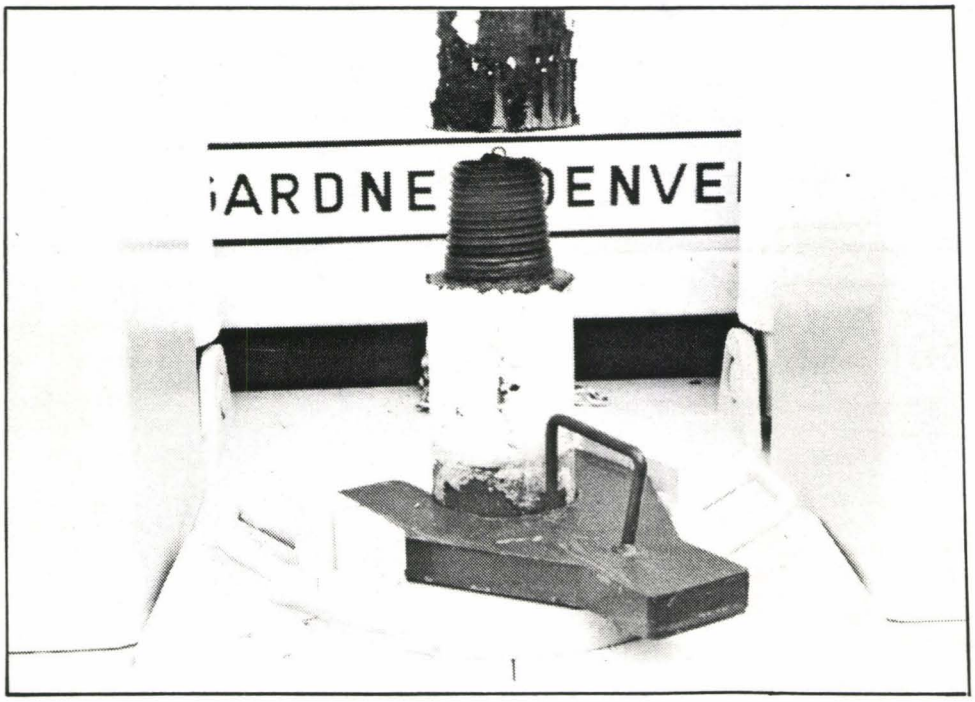

Figure 3.12.1d

t. Install thread protector on top end of pipe after the pipe is down.

u. After pipe is positioned remove pipe sling from pipe.

v. Move FEED CONTROL (31) slowly toward LOWER position until pin end on bottom of saver sub goes into box end of drill string held in the breakout shoe.

w. As soon as threads begin to screw together, move FEED CONTROL (31) to CENTER (NEUTRAL) position.

NOTE: Slip sub usually provided should be partly collapsed. This will allow for thread take-up and prevent drill string from being lifted from breakout shoe as threads make up. This also helps to prevent excessive wear to threads. (Figure 3.13.1j).

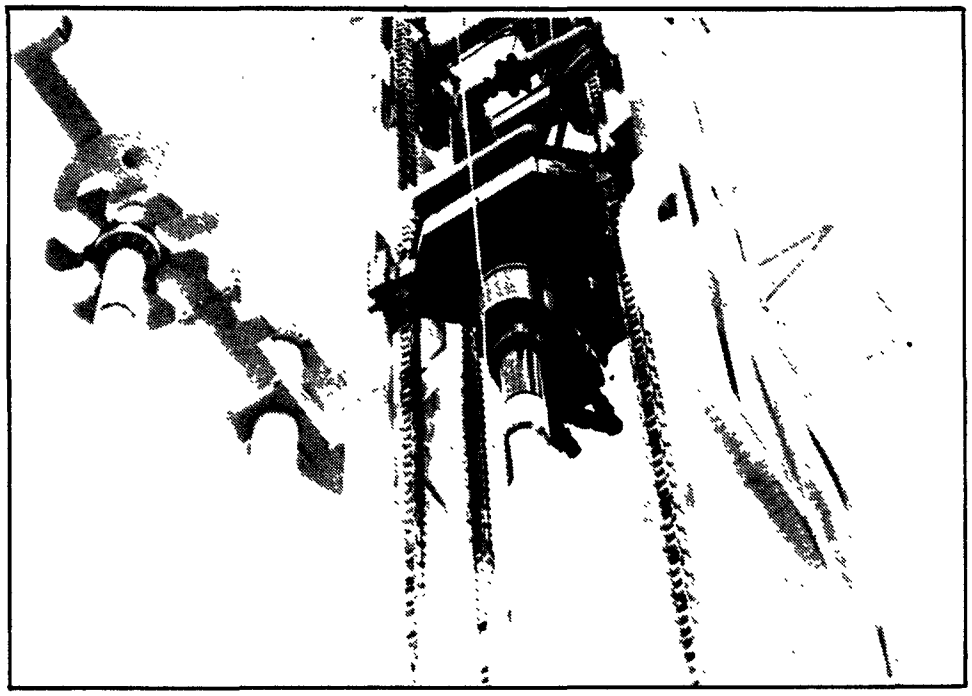

Figure 3.13.1j

x. Continue slow rotation as joint screws together. When joint is screwed together, move ROTARY SPEED CONTROL (30) to CENTER (NEUTRAL) position.

y. Momentarily move ROTARY SPEED CONTROL (30) to REVERSE position to relieve torque on breakout shoe.

z. Move FEED CONTROL (31) toward HOIST position until breakout shoe can be removed; then move FEED CONTROL (31) to CENTER (NEUTRAL) position.

aa. Remove breakout shoe.

CAUTION
DO NOT REMOVE BREAKOUT SHOE UNTIL SECTION OF PIPE AND DRILL STRING ARE SECURELY CONNECTED.

NOTE: Continue to remove drill string by repeating steps a thru aa.

i. Repeat procedure for next pipe.

CAUTION

NEVER HAVE DRILL PIPE INDEXED IN CAROUSEL TO OPEN SLOT IN TOP RETAINER PLATE WHILE MAST IS DOWN AND READY FOR TRANSIT. PIPE MAY SLIDE FORWARD AND FALL OUT OF CAROUSEL. ONLY FOUR JOINTS OF PIPE CAN BE IN CAROUSEL DURING TRANSIT.

3.15 TO UNLOAD PIPE FROM CAROUSEL INTO HOLE.

1. CONDITIONS: Top drive has been separated from drill string. Drill string suspended by breakout shoe. Drill pipe in carousel (Figure 3.15.1a).

Figure 3.15.1a

a. Move FEED CONTROL (31) slowly toward HOIST position and observe bottom end of top drive as it raises up in the mast.

r. Manually index carousel, using pin located on bottom of pipe rack (Figure 3.15.1f).

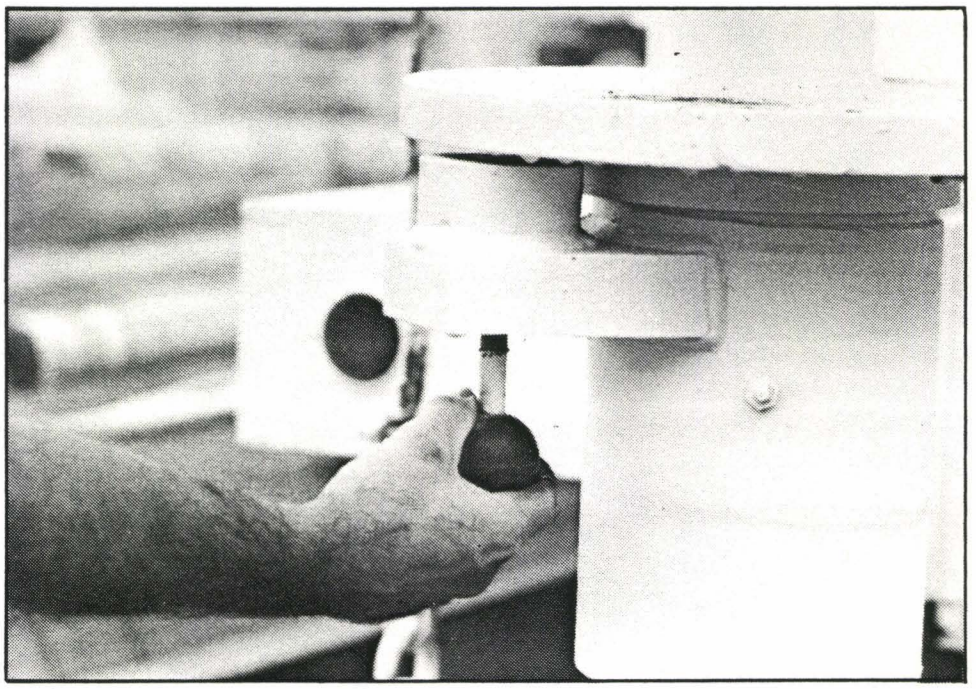

Figure 3.15.1f

s. Proceed to operation "TO DRILL" in this manual on page 25.

h. Move PIPE RACK CONTROL (42) to OUT position. Hold control in this position until carousel swings out against its stop; then move PIPE RACK CONTROL (42) to CENTER (NEUTRAL) position (Figure 3.16.1f).

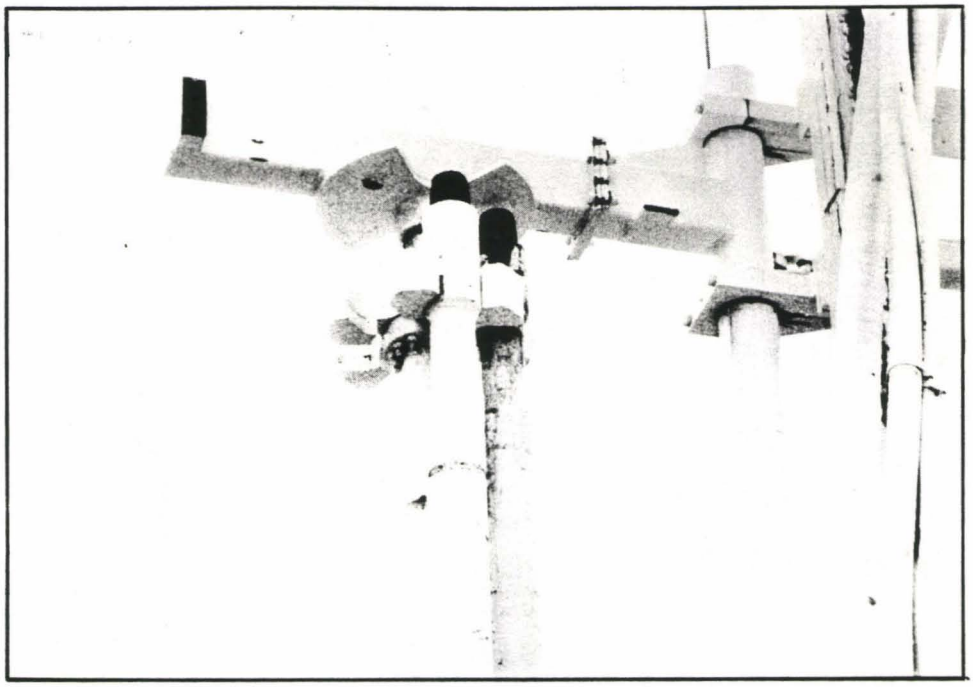

Figure 3.16.1f

3.17 TO UNLOAD SECTION OF PIPE FROM CAROUSEL

1. CONDITIONS: Drilling completed. Pipe in carousel and carousel in OUT position. (Figure 3.16.1f).

   a. Adjust JIB BOOM EXTENSION CONTROL (39) and JIB BOOM SWING CONTROL (40) until hoist line is directly over the top of the section of pipe to be unloaded. (Pipe must be in position with open slot in uppermost retainer plate. If not, index carousel as necessary (Figure 3.17.1a).

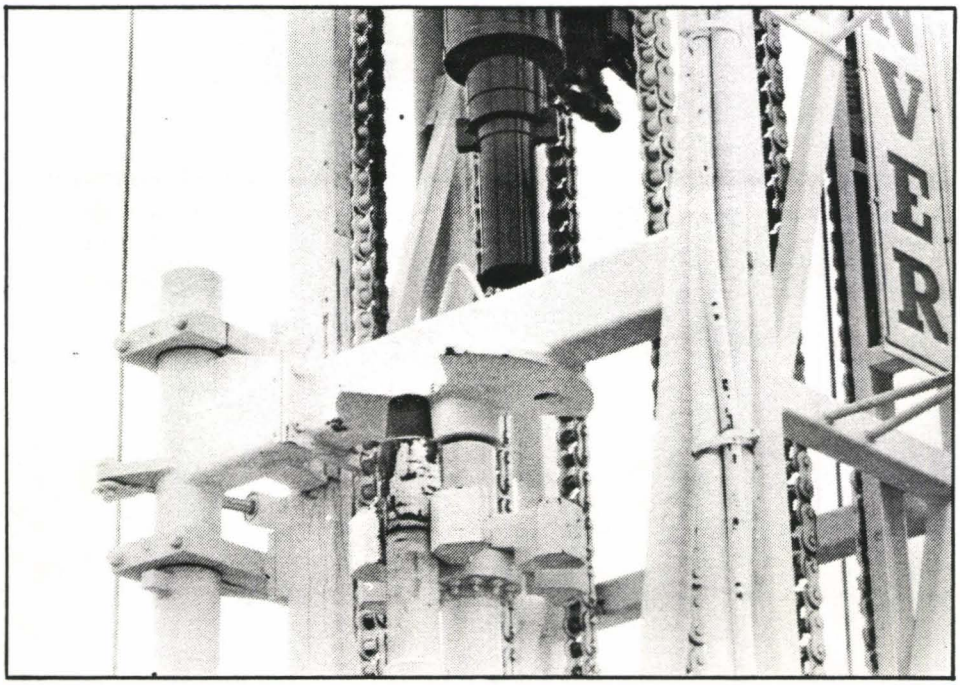

Figure 3.17.1a

3.20 TO RETRACT LEVELING JACKS

1. CONDITIONS: Machine leveled. Mast lowered. Top drive in top of mast.

   a. Be sure that JACK CONTROL (44), (43), (45), and MAST UP/DOWN CONTROL (37) are in CENTER (NEUTRAL) position.

   b. Move LEFT REAR JACK CONTROL (44), FRONT JACK CONTROL (33), and RIGHT REAR JACK CONTROL (45) slowly to RETRACT position and keep machine about level while going down.

   c. When machine is lowered, move LEFT REAR JACK CONTROL (44), FRONT JACK CONTROL (43), and RIGHT REAR JACK CONTROL (45) to CENTER (NEUTRAL) position.

   d. Visually check to insure that all jacks are fully retracted.

   e. The machine is now ready to be moved.

   NOTE: Some rigs may be equipped with 4 or 5 jacks. Use same procedure for rigs equipped with 4 jacks. Procedure for rigs with 5 jacks should be to retract the front center jack first, then retract the remaining 4 jacks together. This eliminates the possibility of supporting the rig weight at its most extreme supports in the event of operator error or machine malfunction.

4.1 LUBRICATION GUIDE

COMPONENTS, RESERVOIR & POINTS OF LUBRICATION	LUBRICANT				QTY	SERVICE FREQUENCY
	-20°F	-20° to +20°F	+20° to 110°F	OVER 110°F		
O. HYDRAULIC OIL	ATF TYPE F				135 GAL	CHECK LEVEL DAILY; QTY IS WITH CYLINDERS FULL. CHANGE SEMI-ANNUALLY. CHECK FILTER INDICATOR DAILY; CHANGE WHEN INDICATED DIRTY OR AT 1000 HRS.
P. MUD PUMP	SAE 40W	SAE 40W to 80°F	SAE 140W OVER 60°F	SAE 140W		CHECK DAILY; CHANGE EVERY 5000 HOURS
Q. AIR COMPRESSOR	ATF TYPE F				55 GAL	CHECK FILTER INDICATOR DAILY. REFER TO LUBRICATION/FILTER SERVICE SCHEDULE ON PAGE 87
R. THREADS (DRILL PIPE STABILIZER, BIT, ETC.)	†GREYS, KOPR-KOTE, BEST OF LIFE OR EQUIVALENT				AS REQ'D	REFER TO OPERATOR MANUAL
S. LINE OILER	REFER TO HAMMER DRILL MFG'S RECOMMENDED LUBRICATION INSTR.					CHECK OIL LEVEL IN OILER PUMP TANK FREQUENTLY
T. CAROUSEL (5 SWING POINTS)	NLGI 1					LUBE MONTHLY
U. SHOCK SUB	†UNIREX MALY H					5 STROKES PER WEEK; DO NOT OVER GREASE
V. TOP CAROUSEL BEARING	NLGI 1					LUBE MONTHLY
W. BOTTOM CAROUSEL BEARING	NLGI 1					LUBE MONTHLY
X. WATER INJECTION PUMP . DUPLEX . TRIPLEX	SAE 30				15 PTS** 4 QTS**	CHECK WEEKLY; CHANGE SEMI-ANNUALLY
Y. CHAIN COUPLING AT WATER INJECTION	30W				AS REQ'D	REMOVE COVER & OIL CHAIN
Z. PULLDOWN CHAIN	SAE 30-90					REMOVE CHAIN & BATHE IN KEROSENE EVERY THREE MONTHS

*ALL REFERENCES TO SAE EP 80W-90 ARE FOR STRAIGHT MINERAL GEAR OIL.
**OVERFILL FOR SLOW OPERATION.
†THESE COMMERCIAL LUBRICANTS ARE LISTED AS EXAMPLES, GARDNER-DENVER/COOPER INDUSTRIES DOES NOT ENDORSE ANY ONE PRODUCT. OTHER PRODUCTS, IF EQUIVALENT TO THOSE LISTED, SHOULD GIVE EQUALLY SATISFACTORY RESULTS.