HALLIBURTON
LOGGING SERVICES, INC.

FINAL PRINT

ACOUSTIC VELOCITY
GAMMA RAY
LOG

5″ = 100′

COMPANY ______
WELL ______
FIELD ______
COUNTY ______ ST __

COMPANY ARCO OIL AND GAS COMPANY

WELL C.E.R. 41-16-64

FIELD MIST

COUNTY COLUMBIA

STATE OR

API NO.
LOCATION :
217.27 FEET SOUTH AND
796.34 FEET WEST FROM THE
NORTHEAST CORNER OF:
SEC. 16 TWP 6N RGE 4W

OTHER SERVICES

DIG
SDL/DSN/GR

PERMANENT DATUM G.L. ELEV. 1616.5
LOG MEASURED FROM K.B. 11.5FT.ABOVE PERM.DATUM
DRILLING MEASURED FROM KELLY BUSHING

ELEV.:K.B. 1628.0
D.F. ------
G.L. 1616.5

DATE	09/10/89			
RUN NO.	ONE			
DEPTH-DRILLER	2107			
DEPTH- LOGGER	2104			
BTM. LOG INTER.	2101			
TOP LOG INTER.	1104			
CASING-DRILLER	7 IN.@1104	@	@	@
CASING- LOGGER	1104			
BIT SIZE	6 1/4			
TYPE FLUID IN HOLE	E-Z POLYMER			
DENS. : VISC	9.5 :43	:	:	:
PH : FLUID LOSS	10.0 :6.2	:	:	:
SOURCE OF SAMPLE	CIRCULATED			
RM @ MEAS. TEMP.	5.0 @72.	@	@	@
RMF @ MEAS. TEMP.	4.8 @78.	@	@	@
RMC @ MEAS. TEMP.	3.1 @78.	@	@	@
SOURCE RMF : RMC	MEAS.:MEAS.	:	:	:
RM @ BHT	3.59 @103.	@	@	@
TIME SINCE CIRC.	3.5 HOURS			
TIME ON BOTTOM	6:15 PM			
MAX. REC. TEMP.	103. @BHT	@	@	@
EQUIP. : LOCATION	2890 :WDLND	:	:	:
RECORDED BY	D.MCDANIEL			
WITNESSED BY	R.SPAETH	J.EASTES		

Fold Here

Service Ticket No.: 12268 API Serial No.: PGM Version: 1.31 PC

Change in Mud Type or Additional Samples		
Date/Sample No.	09/10/89:ONE	/ / :
Depth-Driller		
Type Fluid in Hole		
Dens. : Visc.	:	:
pH. : Fluid Loss	:	:
Source of Sample		
Rm @ Meas.Temp.	@	@
Rmf @ Meas.Temp.	@	@
Rmc @ Meas.Temp.	@	@
Source: Rmf:Rmc	:	:
Rm @ BHT	3.59 @103.	@
Rmf @ BHT	3.71 @103.	@
Rmc @ BHT	2.39 @103.	@

RESISTIVITY SCALE CHANGES

Type Log	Depth	Scale Up Hole	Scale Down Hole

RESISTIVITY EQUIPMENT DATA

Run No	Tool Type & No	Pad Type	Tool Pos.	Other
N/A	DUAL #W109432	N/A	1.5"S.O.	M412
N/A	SGRD #W108932	N/A	1.5"S.O.	M416

EQUIPMENT DATA

GAMMA		ACOUSTIC		DENSITY		NEUTRON	
Run No.	ONE	Run No.	ONE	Run No.	N/A	Run No.	N/A
Serial No.	W108594	Serial No.	W112458	Serial No.	W109742	Serial No.	W108750
Model No.	432	Model No.	305	Model No.	465	Model No.	434
Diameter	3 5/8	No.of Cent.	FOUR	Diameter	4 1/2	Diameter	3 5/8
Detector Model No.	N/A	Spacing	1 FOOT	Log Type	GAMMA	Log Type	NEUTRON
Type	SCINT.			Source Type	CS137	Source Type	AM241BE
Length	4 IN.	LSA	Y	Serial No.	118	Serial No.	66
Distance To Source	N/A	FWDA	N	Strength	1.5 CU.	Strength	19.5 CU

LOGGING DATA

GENERAL				GAMMA		ACOUSTIC			DENSITY			NEUTRON		
Run	Depth		Speed	Scale		Scale			Scale			Scale		
No.	From	To	Ft/Min	L	R	L	R	Matrix	L	R	Matrix	L	R	Matrix
ONE	2101	1104	30.	150.	0.	150.	50.	55.6						
					GAPI			US/FT						

Remarks: ANNULAR HOLE VOLUME CALCULATED FOR 3 1/2 INCH PRODUCTION CASING.
SONIC MATRIX=55.6 US/FT, A=.81, AND M=2.0 FOR RWA CALCULATIONS.
EXTRA REPEAT SECTION RUN TO SHOW SONIC RESPONSE FROM 1600 TO 1700 FEET.
CASING STRIP RUN ON TOP OF LOG TO SHOW DELTA-T IN FREE PIPE AND CALIPER.
SQUARING OF DEEP INDUCTION BETWEEN 1650 AND 1700 DUE TO MAXIMUM READINGS.

Halliburton Logging Services, Inc. does not guarantee the accuracy of any interpretation of log data, conversion of log data to physical rock parameters or recommendations which may be given by HLS personnel or which may appear on the log or in any other form. Any user of such data, interpretations, conversions or recommendations agrees that HLS is not responsible except where due to gross negligence or wilful misconduct, for any loss, damages, or expenses resulting from the use thereof.

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GAMMA RAY

0 API 150

CALIPER

4 INCHES 14

TENSION

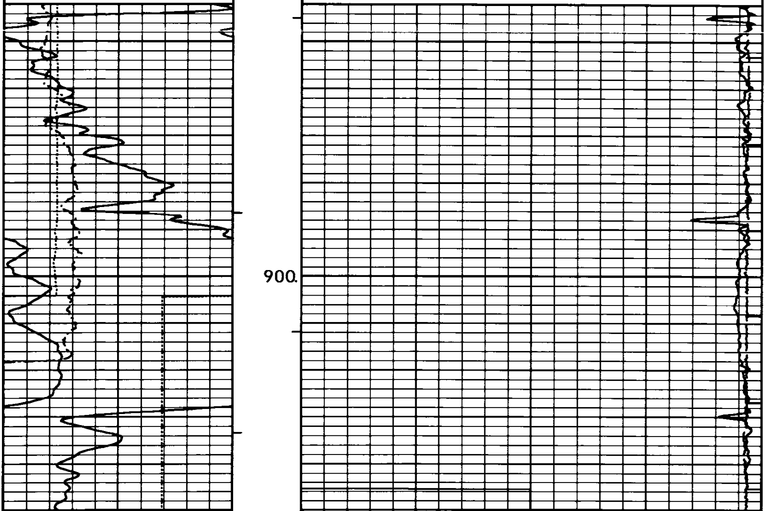
6000 POUNDS 1000

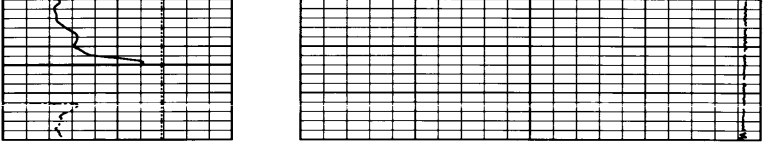
<TDI<

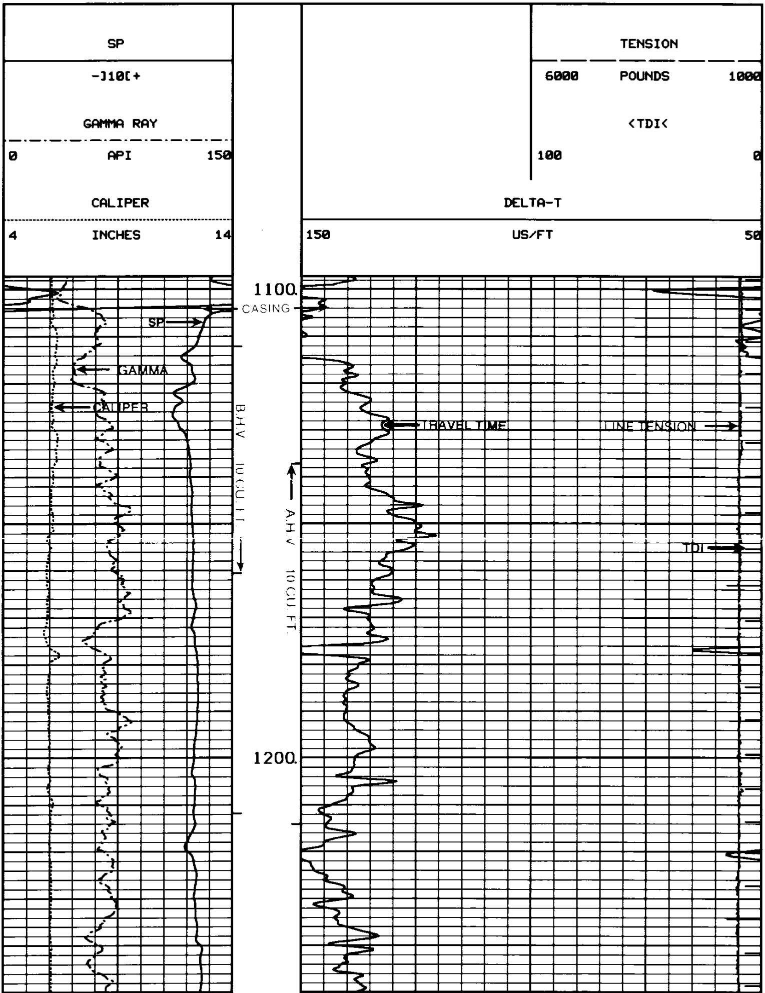
100 0

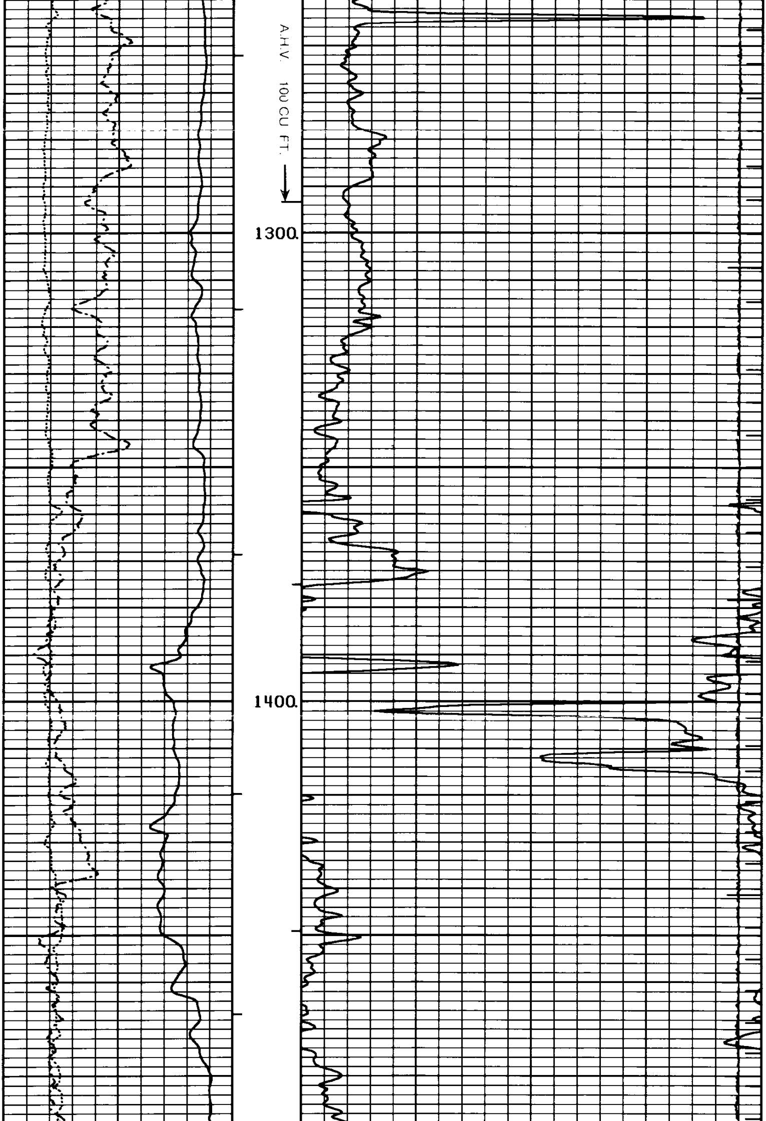
DELTA-T

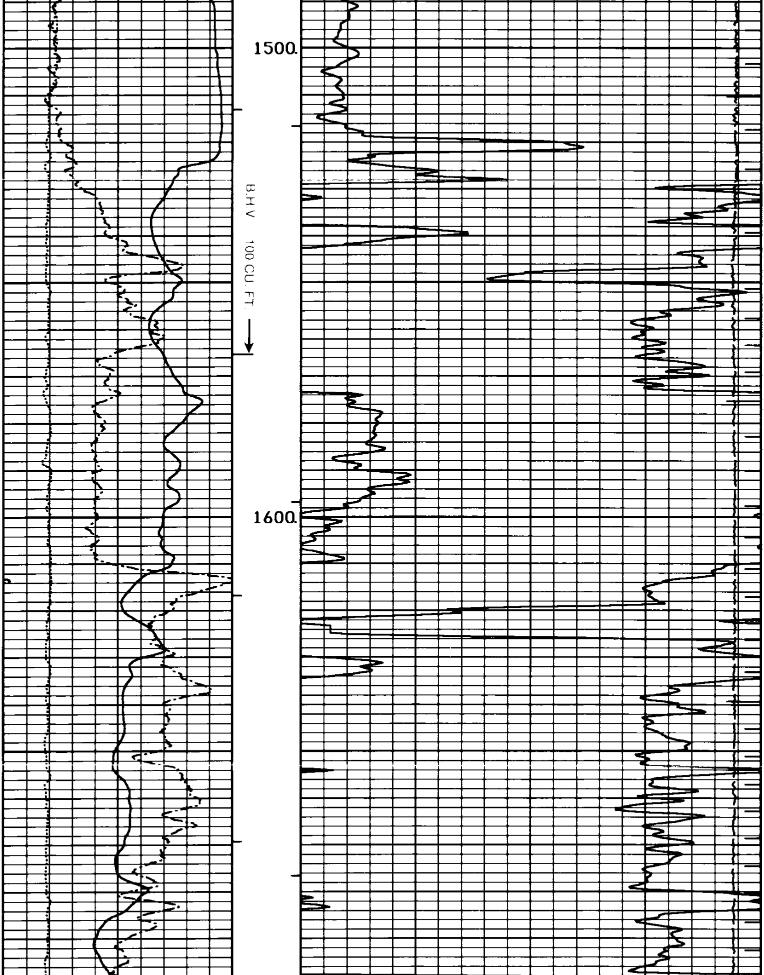
150 US/FT 50

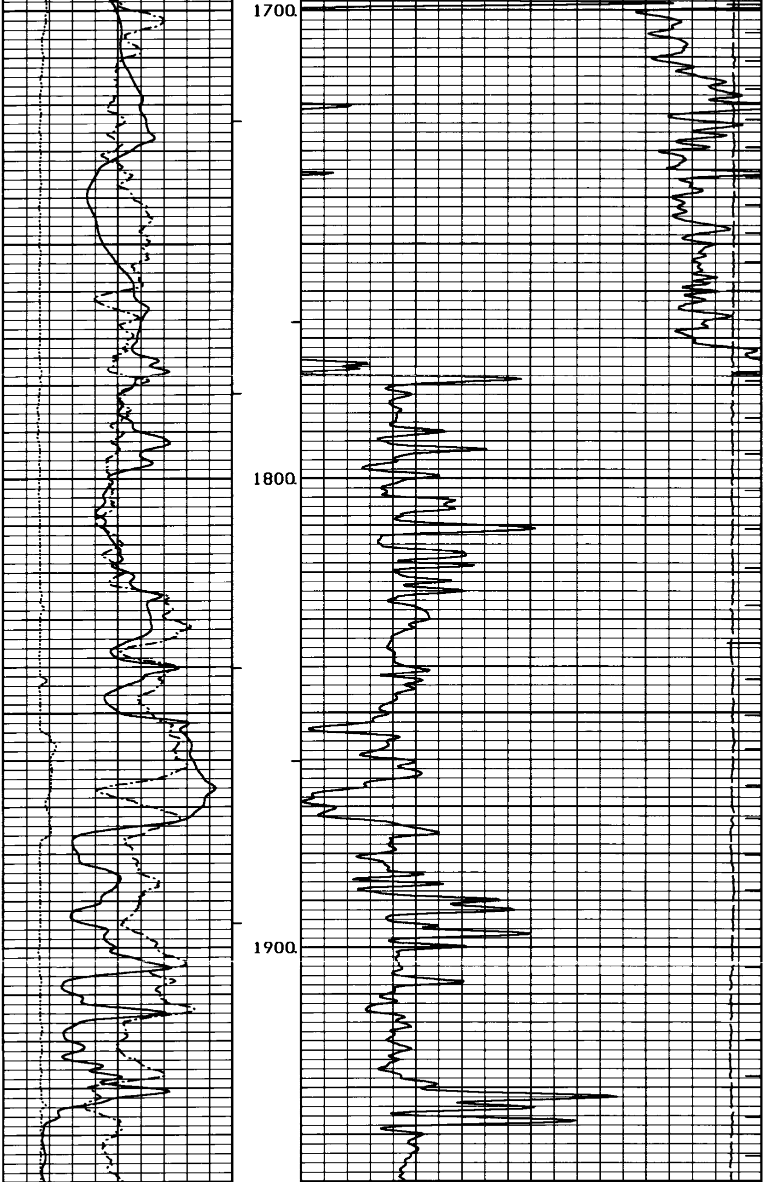


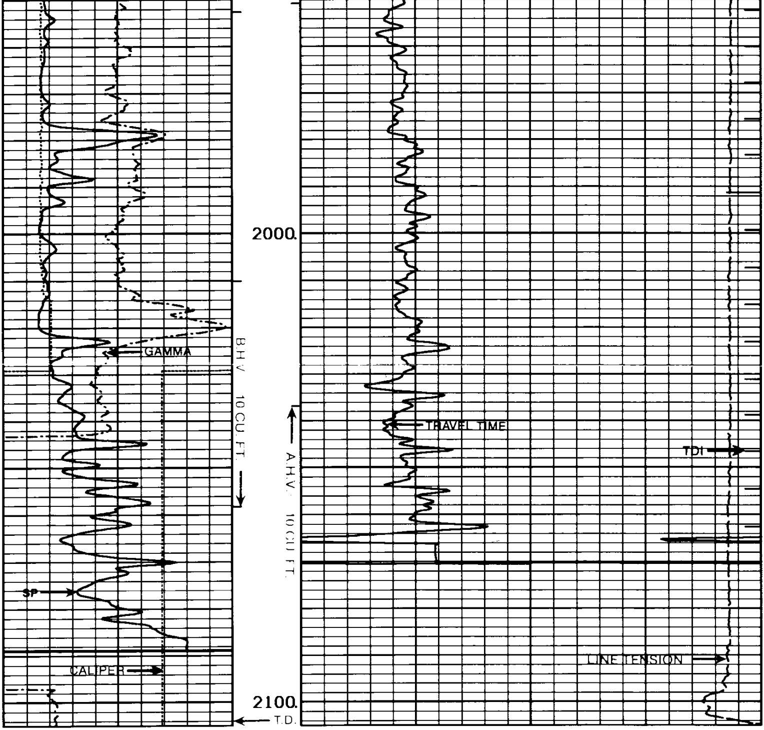












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GAMMA RAY

0 API 150

CALIPER

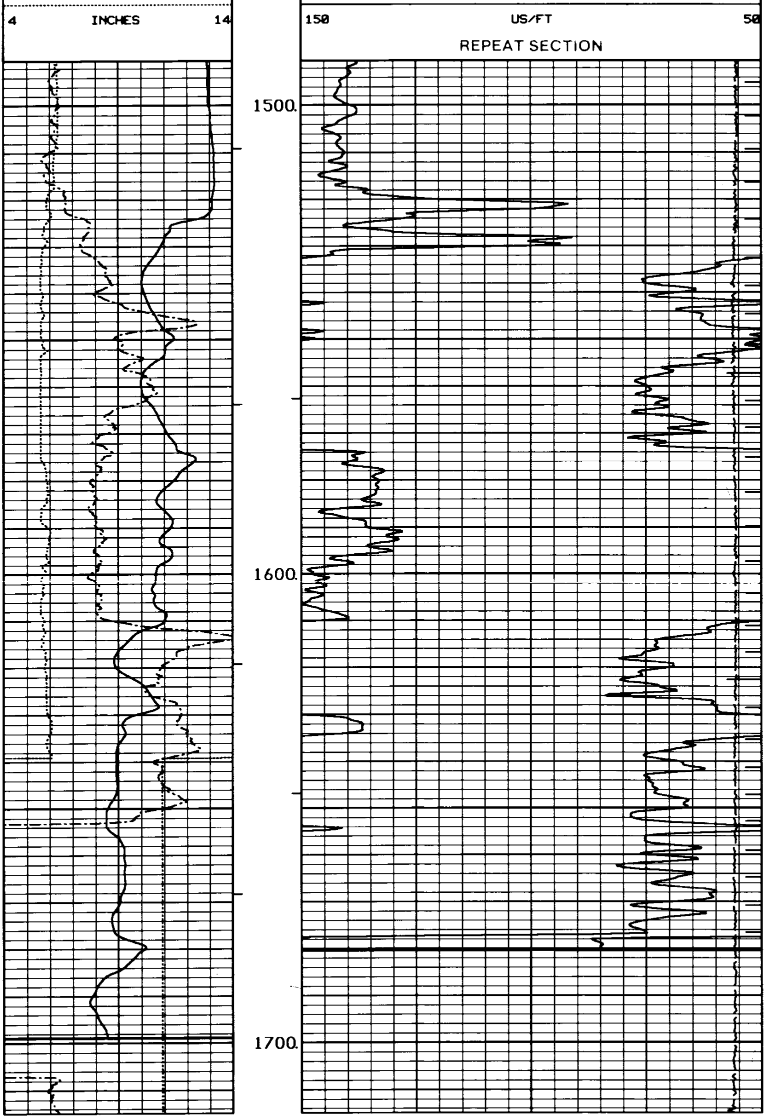
TENSION

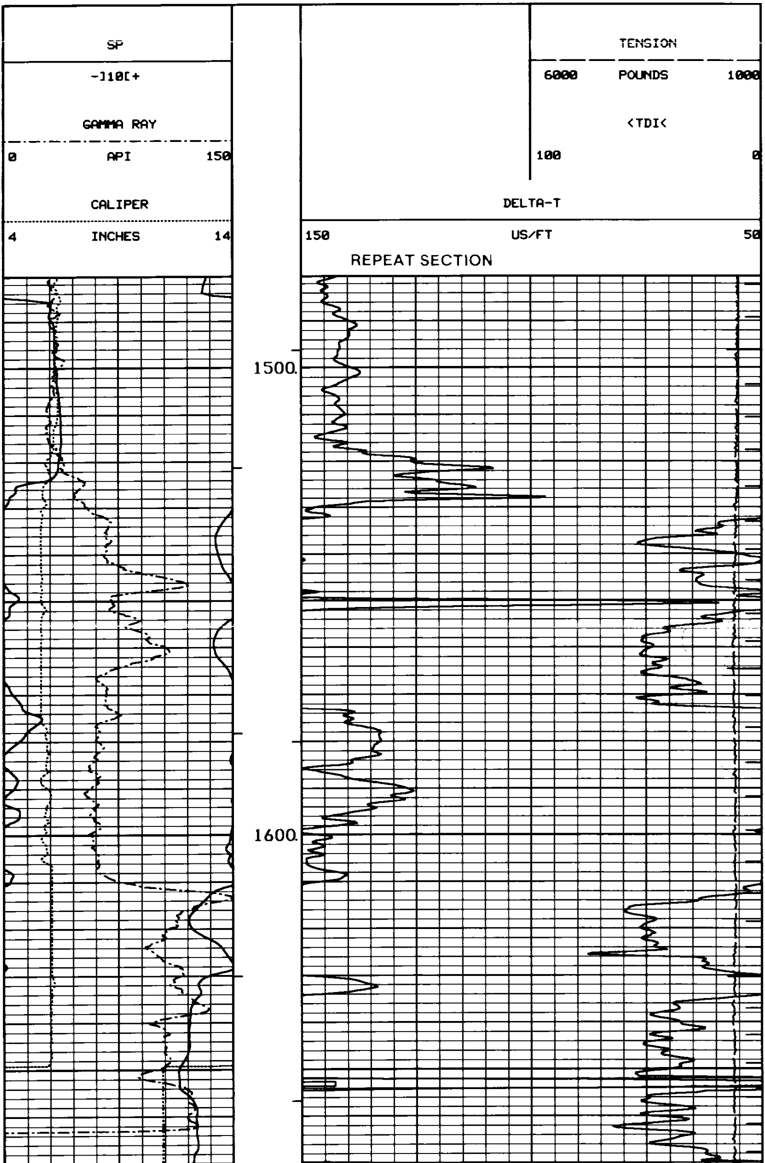
6000 POUNDS 1000

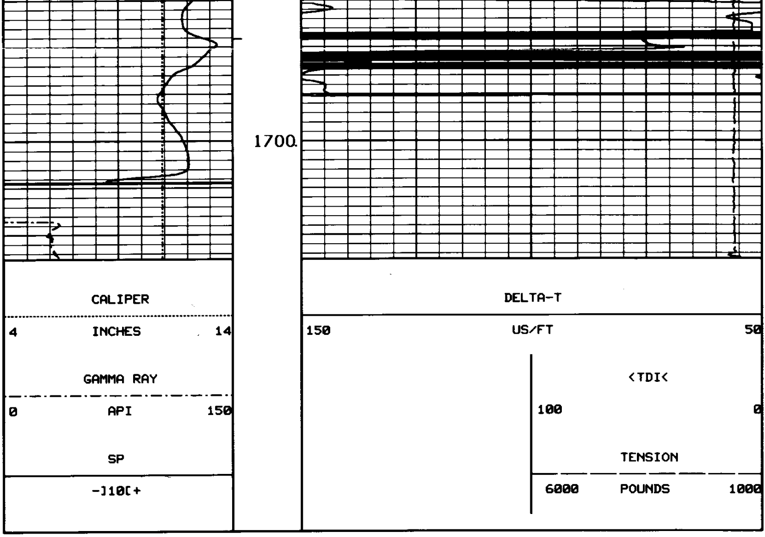
<TDI<

100 0

DELTA-T







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                  SHORT GUARD   SHOP CALIBRATION SUMMARY
PERFORMED:  10:57:24  08/31/89    LAST SHOP CALIBRATION:   14:26:45  08/10/89
SERIAL NUMBER: 108932             PROGRAM VERSION: 1.31 PC
MODEL: #405
PERFORMED BY: MCDANIEL
                         MEASURED         CALIBRATED          UNITS
                         --------         ----------          -----
EXT. CAL. POINT #1          1.996            2.000            OHM-M
EXT. CAL. POINT #2         20.018           20.000            OHM-M
EXT. CAL. POINT #3        192.589          200.000            OHM-M
INTERNAL REFERENCE         19.974           19.942            OHM-M

                  SHORT GUARD  BEFORE SURVEY FIELD CHECK SUMMARY
PERFORMED:  17:18:45  09/10/89    LAST SHOP CALIBRATION:   10:57:24  08/31/89

                           SHOP             FIELD             UNITS
                         --------         ----------         ------
INTERNAL REFERENCE         19.941           19.916            OHM-M


                  SHORT GUARD  AFTER SURVEY FIELD CHECK SUMMARY
PERFORMED:  18:53:03  09/10/89    LAST SHOP CALIBRATION:   10:57:24  08/31/89

                           BEFORE           AFTER             UNITS
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INTERNAL REFERENCE        19.916           19.919           OHM-M


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                 DUAL INDUCTION  SHOP CALIBRATION SUMMARY
PERFORMED:  11:05:42  08/31/89    LAST SHOP CALIBRATION:   14:34:51  08/10/89
SERIAL NUMBER: 109432             PROGRAM VERSION: 1.31 PC
MODEL: #412
PERFORMED BY: MCDANIEL

                           DEEP INDUCTION        MEDIUM INDUCTION
                        MEASURED   CALIBRATED   MEASURED   CALIBRATED     UNITS
                        ---------------------   ---------------------    -------
TOOL ZERO                  -.883        .000       -.007        .000     MMHOS/M
INTERNAL REFERENCE       494.528     496.539     499.505     502.422     MMHOS/M
WHEEL                    496.819     500.000     497.376     500.000     MMHOS/M
MANDREL BASE               4.517       3.727       5.650       5.896     MMHOS/M

                 DUAL INDUCTION BEFORE SURVEY FIELD CHECK SUMMARY
PERFORMED:  17:24:24  09/10/89    LAST SHOP CALIBRATION:   11:05:42  08/31/89

                           DEEP INDUCTION        MEDIUM INDUCTION
                           SHOP     FIELD          SHOP       FIELD       UNITS
                        ---------------------   ---------------------    -------
TOOL ZERO                   .000       2.467        .000       -.210     MMHOS/M
INTERNAL REFERENCE       496.539     505.795     502.420     509.633     MMHOS/M
MANDREL BASE               3.727       3.727       5.896       5.896     MMHOS/M

                 DUAL INDUCTION AFTER SURVEY FIELD CHECK SUMMARY
PERFORMED:  19:01:31  09/10/89    LAST SHOP CALIBRATION:   11:05:42  08/31/89

                           DEEP INDUCTION        MEDIUM INDUCTION
                          BEFORE     AFTER       BEFORE        AFTER      UNITS
                        ---------------------   ---------------------    -------
TOOL ZERO                  2.467       2.547       -.210       -.251     MMHOS/M
INTERNAL REFERENCE       505.794     507.094     509.632     510.220     MMHOS/M
MANDREL BASE               3.727       3.727       5.896       5.896     MMHOS/M


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                      GAMMA   SHOP CALIBRATION SUMMARY
PERFORMED:  10:05:26  09/01/89    LAST SHOP CALIBRATION:   14:24:17  08/08/89
SERIAL NUMBER: 108594             PROGRAM VERSION: 1.31 PC
MODEL: #432           FIELD CALIBRATOR: #2141
PERFORMED BY: MCDANIEL

                         MEASURED         CALIBRATED          UNITS
                         --------         ----------          -----
BACKGROUND                  13                13              API-CPS
BACKGROUND+CALIBRATOR      269               271              API-CPS
CALIBRATOR                 256               258              API-CPS

                      GAMMA  BEFORE SURVEY FIELD CHECK SUMMARY
PERFORMED:  17:16:47  09/10/89    LAST SHOP CALIBRATION:   10:05:26  09/01/89
FIELD CALIBRATOR: #2141

                           SHOP             FIELD             UNITS
                         --------         ----------          -----
BACKGROUND                  13                29              API-CPS
BACKGROUND+CALIBRATOR      271               289              API-CPS
CALIBRATOR                 258               260              API-CPS

                      GAMMA  AFTER SURVEY FIELD CHECK SUMMARY
PERFORMED:  19:14:03  09/10/89    LAST SHOP CALIBRATION:   10:05:26  09/01/89

                          BEFORE             AFTER            UNITS
                         --------         ----------          -----
BACKGROUND                  29                23              API-CPS
BACKGROUND+CALIBRATOR      289               286              API-CPS
CALIBRATOR                 260               263              API-CPS
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                    CALIPER   SHOP CALIBRATION SUMMARY
PERFORMED:  14:00:58  08/07/89    LAST SHOP CALIBRATION:    10:24:30  05/29/89
SERIAL NUMBER: TAN                PROGRAM VERSION: 1.31 PC
MODEL: #202
PERFORMED BY: JOHNSON

                        MEASURED        CALIBRATED          UNITS
                        --------        ----------          -----
VALUE 1                    8.038            8.000           INCHES
VALUE 2                   16.000           16.000           INCHES

                    CALIPER  BEFORE SURVEY FIELD CHECK SUMMARY
PERFORMED:  17:10:33  09/10/89    LAST SHOP CALIBRATION:    14:00:58  08/07/89

                          SHOP             FIELD            UNITS
                        --------         ---------          -----
VALUE 1                    8.000            8.334           INCHES

                    CALIPER  AFTER SURVEY FIELD CHECK SUMMARY
PERFORMED:  19:07:15  09/10/89    LAST SHOP CALIBRATION:    14:00:58  08/07/89

                         BEFORE            AFTER            UNITS
                        --------         ---------          -----
VALUE 1                    8.334            8.393           INCHES


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                    TENSION   SHOP CALIBRATION SUMMARY
PERFORMED:  17:08:21  09/10/89    LAST SHOP CALIBRATION:    23:16:08  09/06/89
SERIAL NUMBER: TOP                PROGRAM VERSION: 1.31 PC


                           H L S CALIBRATION SUMMARY TABLE
                           ------------------------------

   SERVICE or SIGNAL         SHOP      BEFORE     AFTER     CHANGE   TOLERANCE
-----------------------   ---------- --------- --------- --------  ---------
GUARD                        19.941    19.916    19.919    -.002    +/-.80
DEEP INDUCTION              496.539   505.794   507.094   -1.300    +/- 20
MEDIUM INDUCTION            502.420   509.632   510.220    -.587    +/- 20
GAMMA                       258       260       263       -3        +/- 9.0
CALIPER VALUE 1               8.000     8.334     8.393    -.059    +/- 0.50
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EVENTS

```
   1 16: 6:45 00000 >DATE OF LOG: MMDD                   910
   2 16:13: 8 00000 >PLS SOFTWARE REVISION              1.31
   3 16:13: 8 00000 >CURRENT REVISION UPDATE NUMBER PC
   4 16:43:26 00000 >CASING SIZE O.D. (INCHES)          5.500+0
   5 16:43:27 00000 >BIT SIZE? (INCHES)                 7.875+0
   6 16:43:29 00000 >DT-MATRIX(40=DOL<DT<70=SHALY)      5.700+1
   7 16:43:29 00000 >DT-SHALE (100=MIN<DT<160=MAX)      1.000+2
   8 16:43:29 00000 >FOR FORMATION FACTOR(.5<A<2.5)     1.000+0
   9 16:43:30 00000 >FOR FORMATION FACTOR(1.2<M<2.5)    2.000+0
  10 16:43:41 00000 >CASING SIZE O.D. (INCHES)          3.500+0
  11 16:43:52 00000 >BIT SIZE? (INCHES)                 6.250+0
  12 16:44: 8 00000 >FOR FORMATION FACTOR(.5<A<2.5)     8.100-1
  13 16:44:20 00000 >>LOG PARAMETERS UPDATED HERE
  14 17:39:35 01182 >DT-MATRIX(40=DOL<DT<70=SHALY)      5.560+1
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15 17:39:51 01174 >>LOG PARAMETERS UPDATED HERE
16 17:50:41 01725 >LOGGING SECTION NO.                 2
17 17:58:45 01479 >"HALTING" END OF SECTION
18 18: 1:21 01715 >LOGGING SECTION NO.                 3
19 18: 8:45 01489 >"HALTING" END OF SECTION
20 18: 8:46 01489 >"HALTING" END OF SECTION
21 18:16:18 02105 >LOGGING SECTION NO.                 4
22 18:49: 2 01096 >"HALTING" END OF SECTION
23 18:54:16 00980 >LOGGING SECTION NO.                 5
24 18:58:53 00841 >"HALTING" END OF SECTION
25 18:58:53 00840 >"HALTING" END OF SECTION
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