DOGAMI #508

Schlumberger

DUAL INDUCTION GAMMA RAY / SP 5" LOG

COUNTY COLUMBIA
FIELD MIST GAS STORAGE
LOCATION N 03-03-15 E 2286.41' & S 88-56-45
WELL IW 22DH-22-65
COMPANY NORTHWEST NATURAL GAS CO.

COMPANY NORTHWEST NATURAL GAS CO.

WELL IW 22DH-22-65

FIELD MIST GAS STORAGE

COUNTY: COLUMBIA **STATE:** OREGON

LOCATION
N 03-03-15 E 2286.41' & S 89 56-45
1915.16' FROM THE SW CORNER OF SEC. 22

API SERIAL NO.	SECT.	TWP.	RANGE
36-009-00328	22	6N	5W

Other Services:
INDUCTION
SONIC
FMS
DENSITY
NEUTRON
GAMMA RAY

Permanent Datum	GROUND LEVEL	**Elev.** 579.7 F		**Elev.:** K.B. 595.7 F
Log Measured From	KELLY BUSHING	16.0 F	**above Perm. Datum**	D.F.
Drilling Measured From	KELLY BUSHING			G.L. 579.7 F

Date	16-JAN-1998		23-JAN-1998			
Run No.	ONE		TWO			
Depth Driller	1995.0 F		2746.0 F			
Depth Logger (Schl.)	1990.0 F		2735.0 F			
Btm. Log Interval	1980.0 F		2725.0 F			
Top Log Interval	0.0 F		1990.0 F			
Casing-Driller	13 3/8" @ 426.0 F		8 5/8" @ 1992.0 F		@	
Casing-Logger	422.0 F		1992.0 F			
Bit Size	@		@		@	
Type Fluid in Hole	LSND		FLO-PRO			
Dens. / **Visc.**	9.80 LB/G	47.0 S	8.50 LB/G			
pH / **Fld. Loss**	8.5		10.0			
Source of Sample	FLOWLINE		FLOWLINE			
Rm @ Meas. Temp.	2.620 OHMM @ 64.0 DEGF		.245 OHMM @ 69.0 DEGF			
Rmf @ Meas. Temp.	1.560 OHMM @ 62.0 DEGF		.122 OHMM @ 67.0 DEGF			
Rmc @ Meas. Temp.	1.320 OHMM @ 62.0 DEGF		.134 OHMM @ 67.0 DEGF			
Source: Rmf / **Rmc**	CELL	CELL	CELL	CELL		
Rm @ BHT	1.806 OHMM @ 96.0 DEGF		.176 OHMM @ 99.0 DEGF			
TIME **Circulation Ended**	2:00 16-JAN-98		18:30 22-JAN-98			
TIME **Logger on Bottom**	SEE LOG					
Max. Rec. Temp.	96.0 DEGF		99.0 DEGF			
Equip. / **Location**	8303	BAKERSFIELD	8303	BAKERSFIELD		
Recorded By	GREG PERRY		GREG PERRY			
Witnessed By	MR. MEYER / MR. THOMAS		MR. ROTH			

The well name, location and borehole reference data were furnished by the customer

All interpretations are opinions based on inferences from electrical or other measurements and we cannot, and do not guarantee the accuracy or correctness of any interpretations, and we shall not, except in the case of gross or wilful negligence on our part, be liable or responsible for any loss, costs, damages or expenses incurred or sustained by anyone resulting from any interpretations made by any of our officers, agents or employees. These interpretations are also subject to Clause 4 of our General Terms and Conditions as set out in our current Price Schedule.

Run No.	ONE			TWO		
Service Order No.						
Drilling Fluid Level	0.0 F					
Salinity						
Rmf @ BHT	1.045 OHMM	@	96.0 DEGF	.085 OHMM	@	99.0 DEGF
Rmc @ BHT	.884 OHMM	@	96.0 DEGF	.094 OHMM	@	99.0 DEGF
Logging Speed	1800.0 F/HR					
EQUIPMENT DATA						
Tool Number 1	DIS 151					
Tool Number 2	DIC 159					
Tool Number 3	SLSWA					
Tool Number 4	SLC 432					
Tool Number 5	SGC 483					
Tool Number 6	TCCB 1289					
Tool Number 7	.					
Tool Number 8	AMS					
Tool Number 9	SHE					
Tool Number 10						
Tool Number 11						
Tool Number 12						

REMARKS:

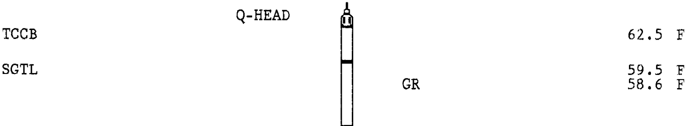
RAN FLEX JOINTS ON INDUCTION AND SONIC. .
RAN 6 ARM FINS ON SONIC.
RAN FLEX JOINTS ABOVE FMS AND ABOVE AMS.

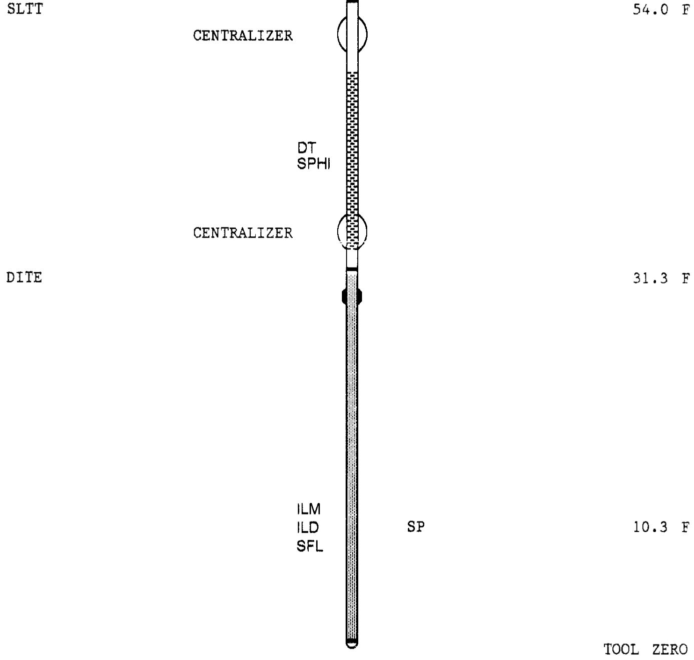
DID NOT TAG TD DUE TO PUSH DOWN TOOLS.

CREW: DAN LEE.

THANKS FOR CHOOSING SCHLUMBERGER!!!!

LOGGING TOOL STRING SKETCH





TOTAL TOOL STRING LENGTH IS 64.7 F.
TOTAL TOOL STRING WEIGHT IS 1032. LB IN AIR.

MAIN PASS

FILES SPLICED	SPLICE DEPTH
93 TO 76	1985.0 F

CHANGED PARAMETERS

NAME	VALUE	UNIT	DEPTH (F)	NAME	VALUE	UNIT	DEPTH (F)
DO	0.0	F	1986.0				

TENS(LBF)

10000. 0.0

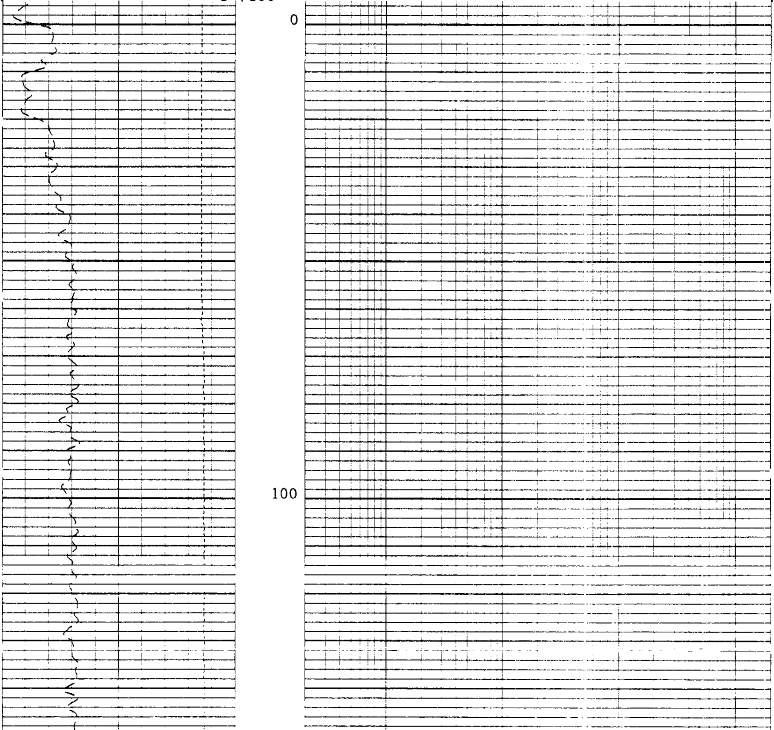
GR(GAPI)

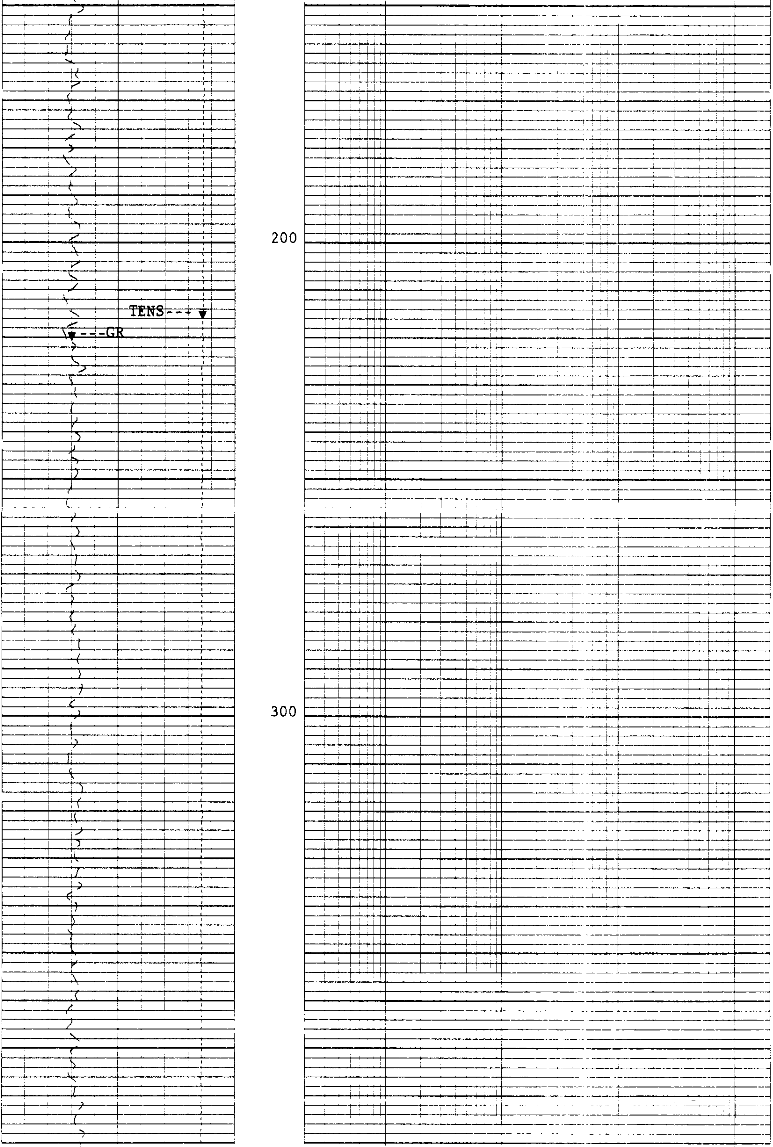
0.0 150.00

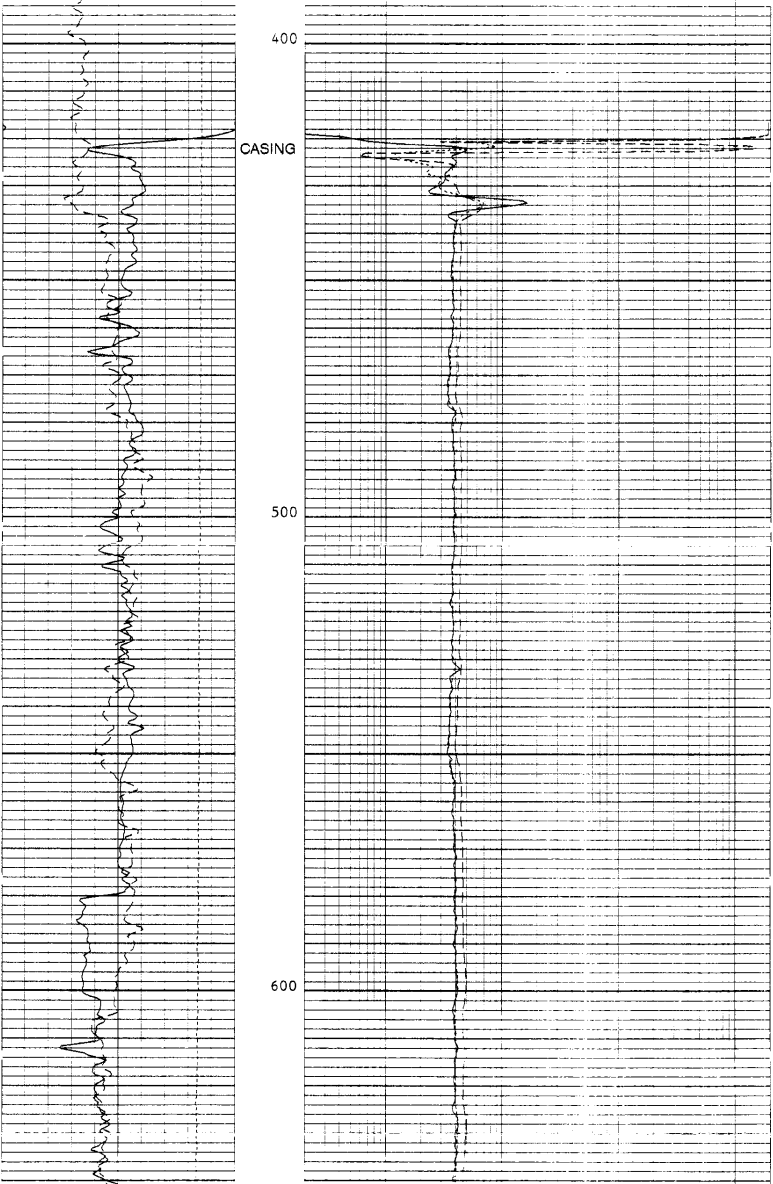
CP 44.2 FILE 95 23-JAN-1998 08:07

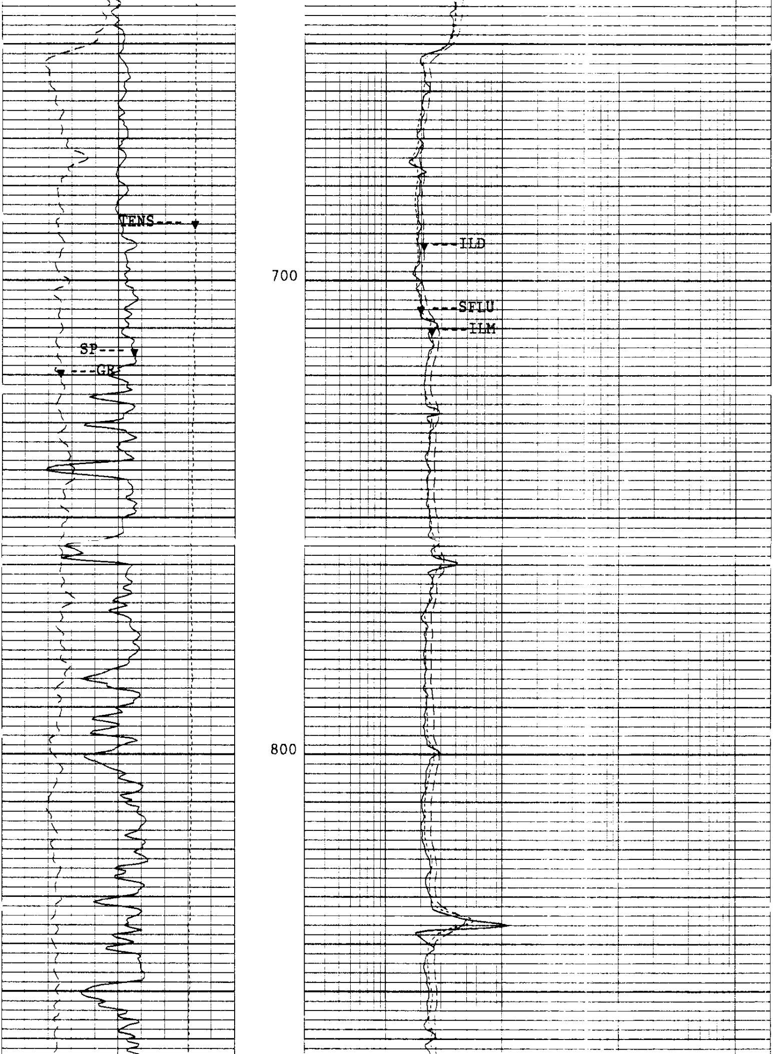
INPUT FILE(S) CREATION DATE
76 16-JAN-1998

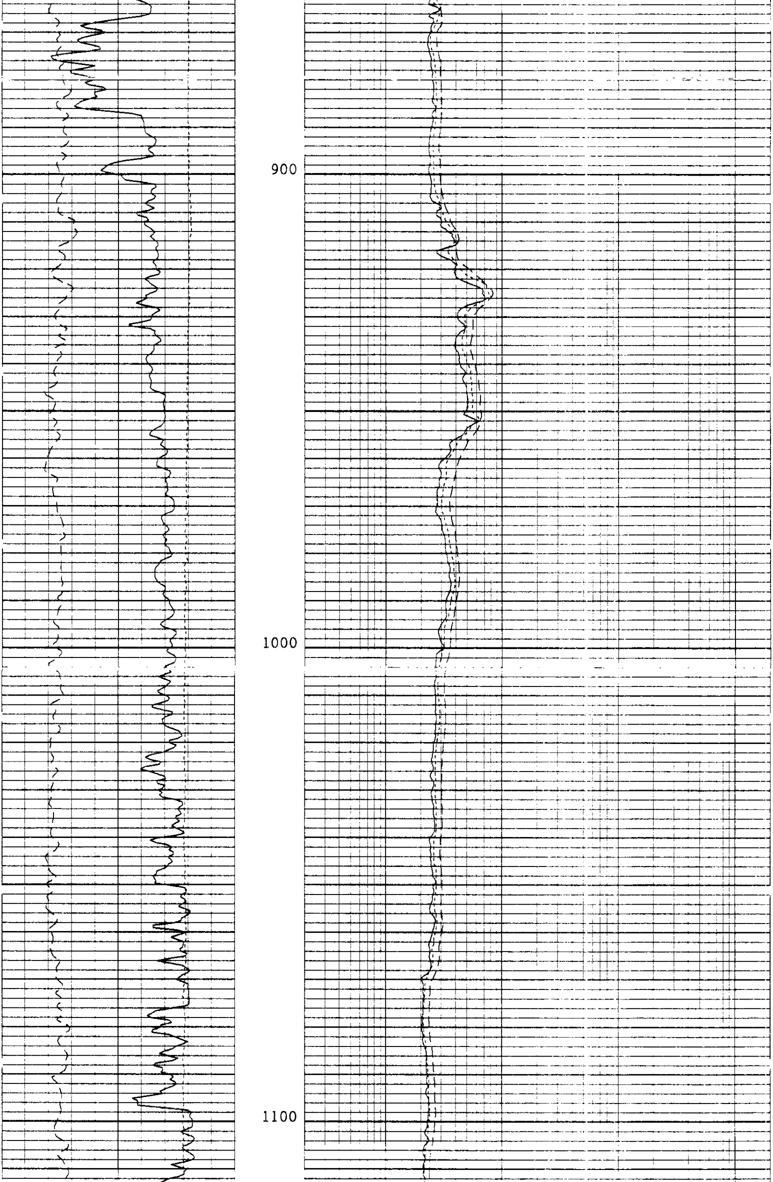
5"/100'

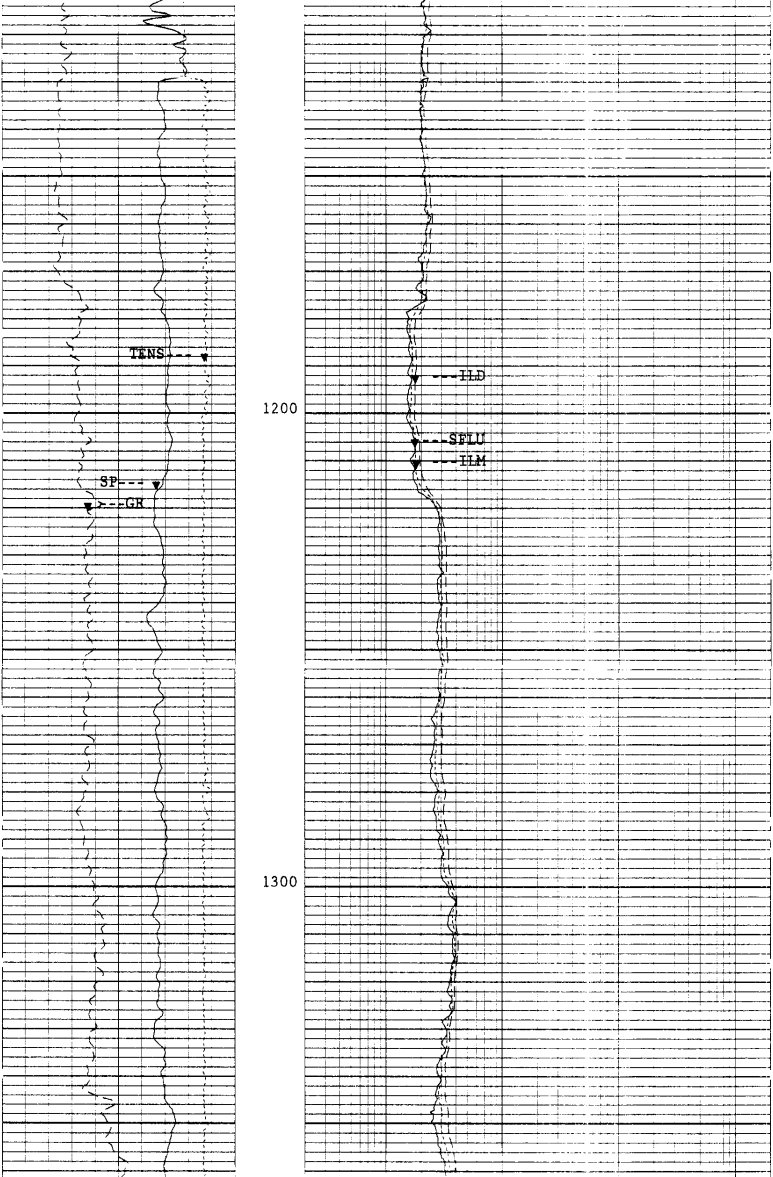


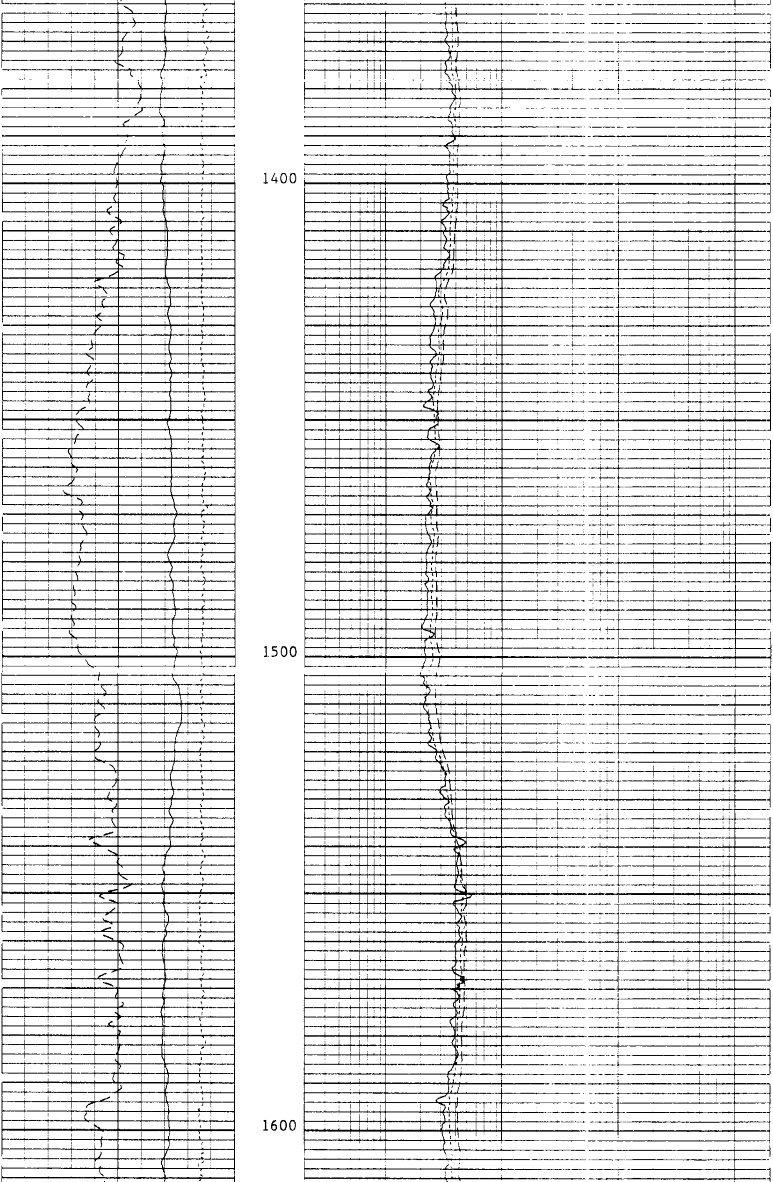


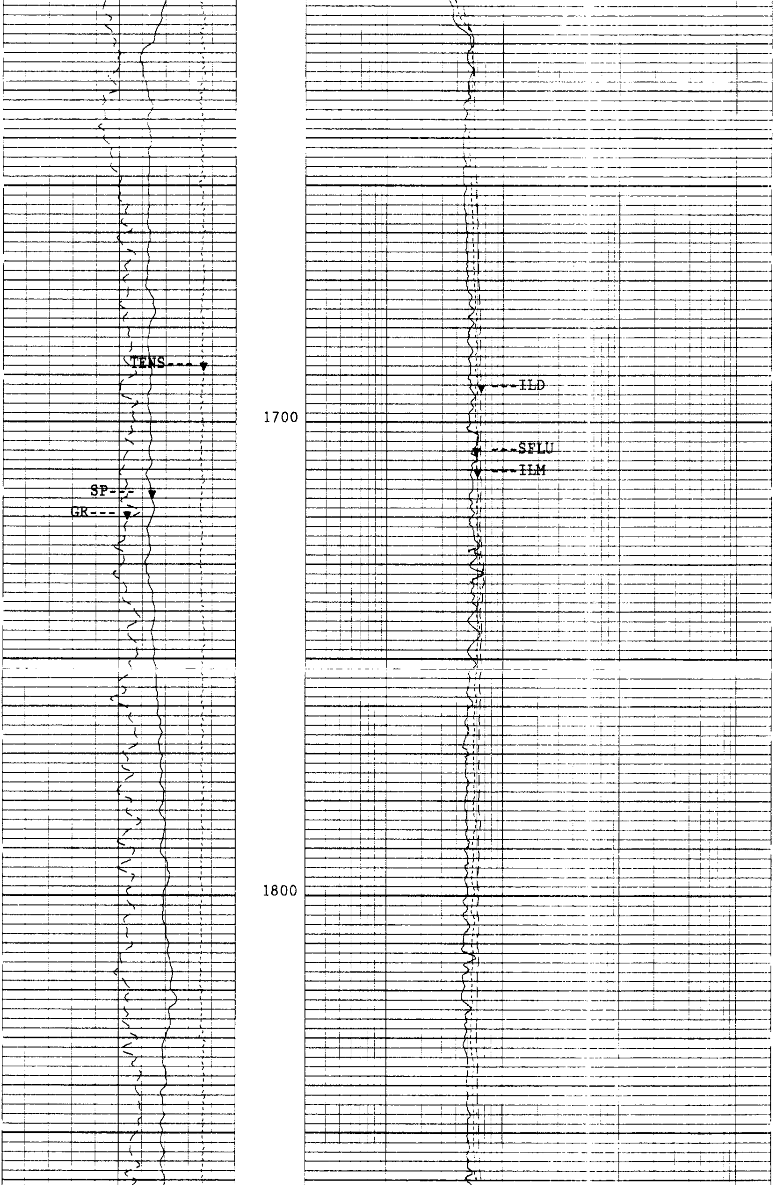


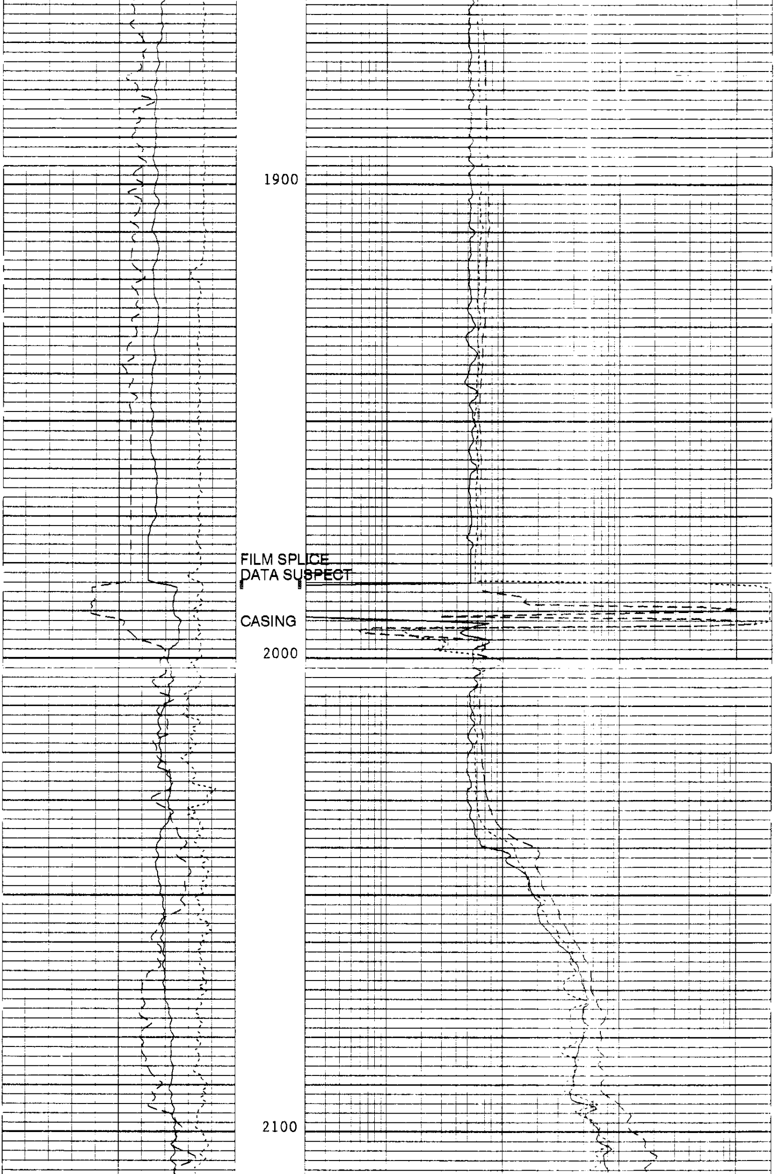


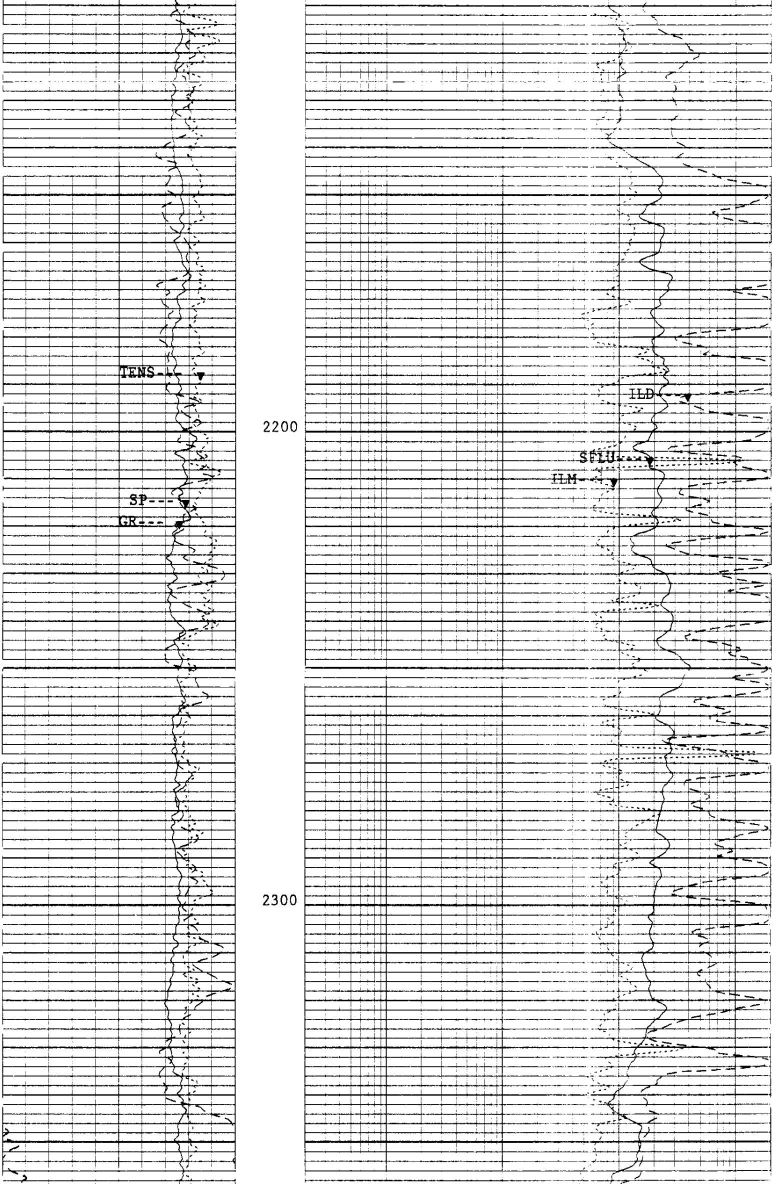


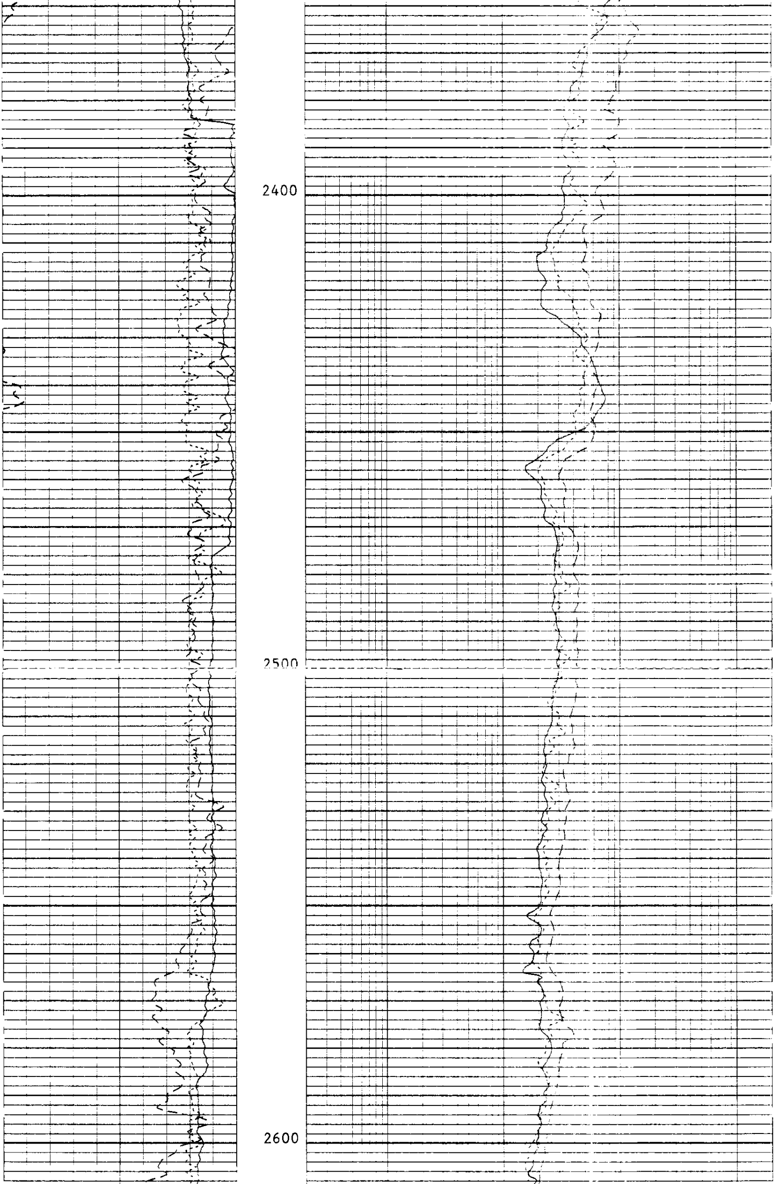


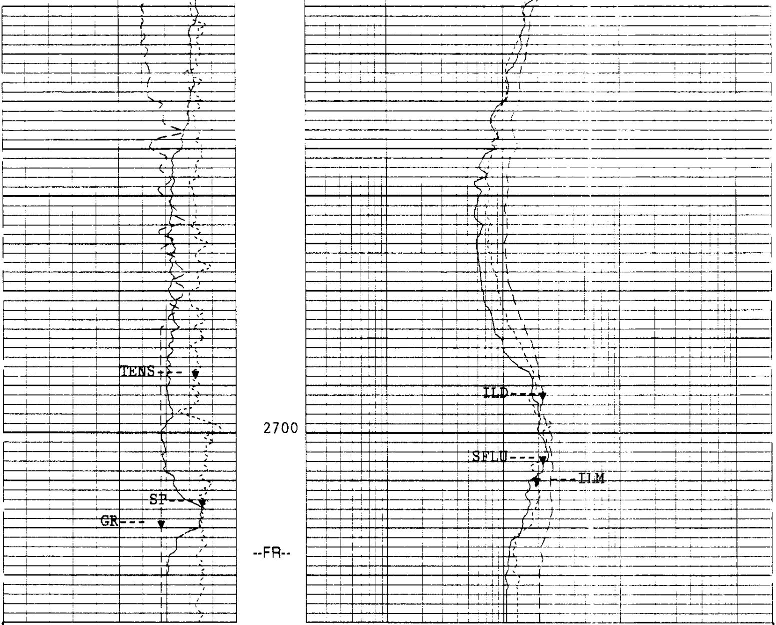












5"/100'

CP 44.2 FILE 95 23-JAN-1998 07:57

INPUT FILE(S) CREATION DATE
93 23-JAN-1998 06:47

TENS(LBF)		ILD(OHMM)	
10000.	0.0	.20000	2000.0
SP(MV)		SFLU(OHMM)	
-50.00	50.000	.20000	2000.0
GR(GAPI)		ILM(OHMM)	
0.0	150.00	.20000	2000.0

SENSOR MEASURE POINT TO TOOL ZERO

DITE	10.3	FEET	SGTL	62.6	FEET
AMS	71.8	FEET	DTT	0.0	FEET
SLTT	41.6	FEET			

PARAMETERS

NAME	VALUE	UNIT	NAME	VALUE	UNIT

```
SMB  DISA                         VDLR 2IN
TOCA DISA                         RATE 15          HZ
DG   AUTO                         DETE E2
NMSG 180        US                CBLG 35          US
AMPL 2                            CBL  2
WFM  1                            SS   FAST
TOD  DISA                         SLC  UA
DTF  189.000    US/F              DTM  56.0000     US/F
CDTS 100.000                      SPFS R-H
PP   NORM                         DO   4.00000     F
WMUD 8.50000    LB/G              TD   32768.0     F
IFRS 20         KHZ               SBR  1.00000     OHMM
MXE2 39.0062    MM/M              DXE2 124.493     MM/M
MRE2 17.0971    MM/M              DRE2 11.5626     MM/M
MPH2 -1.08185   DEG               DPH2 -.001757    DEG
MGF2 1.05831                      DGF2 1.00935
DESP DISA                         SFLE ALLO
DCAS -50000.0   F                 ITEN ALLO
DEVI 85.0000    DEG               DSES H48
IPRO STAN                         IPHA NORM
DWCO 512                          DSIN 5           US
DDEL 200        US                NCJT GSRY
GTSE TEMP                         SHT  45.0000     DEGF
BHT  85.0000    DEGF              DTCI 0.0         F
SPAE DISA                         BS   7.87500     IN
BHS  OPEN
```

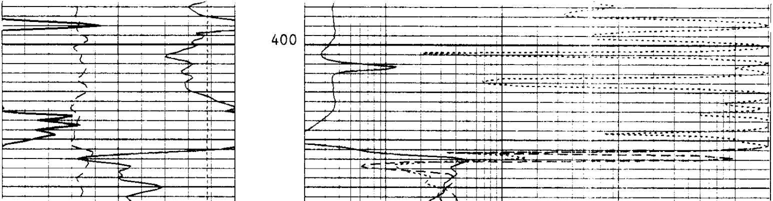
REPEAT SECTION

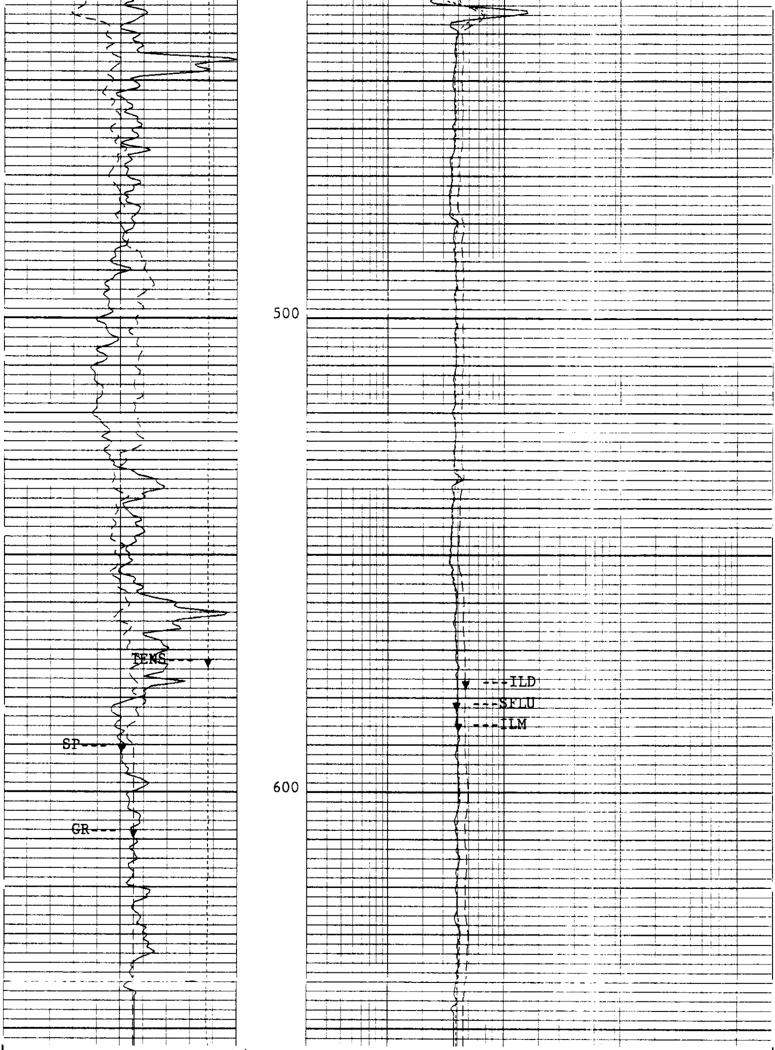
Curve	Left	Right		Curve	Left	Right
TENS(LBF)	10000.	0.0		ILD(OHMM)	.20000	2000.0
SP(MV)	-50.00	50.000		SFLU(OHMM)	.20000	2000.0
GR(GAPI)	0.0	150.00		ILM(OHMM)	.20000	2000.0

```
CP 44.2             FILE     1       16-JAN-1998 11:59

                    INPUT FILE(S)   CREATION DATE
                          1          16-JAN-1998 05:19
```

5"/100'





5"/100'

```
     CP 44.2            FILE    1       16-JAN-1998 11:58

                        INPUT FILE(S)   CREATION DATE
                              1         16-JAN-1998 05:19
```

TENS(LBF)			ILD(OHMM)	
10000.	0.0		.20000	2000.0
SP(MV)			SFLU(OHMM)	
-50.00	50.000		.20000	2000.0
GR(GAPI)			ILM(OHMM)	
0.0	150.00		.20000	2000.0

```
                   SENSOR MEASURE POINT TO TOOL ZERO

          DITE 10.3   FEET                        SGTL 37.9   FEET
          AMS  47.2   FEET                        DTT   0.0   FEET
```

```
                                PARAMETERS

        NAME  VALUE       UNIT                  NAME  VALUE       UNIT

        PP    NORM                              DO    2.00000     F
        WMUD  9.80000     LB/G                  TD    32768.0     F
        IFRS  20          KHZ                   SBR   1.00000     OHMM
        MXE2  39.0062     MM/M                  DXE2  124.493     MM/M
        MRE2  17.0971     MM/M                  DRE2  11.5626     MM/M
        MPH2  -1.08185    DEG                   DPH2  -.001757    DEG
        MGF2  1.05831                           DGF2  1.00935
        DESP  DISA                              SFLE  ALLO
        DCAS  -50000.0    F                     ITEN  ALLO
        DEVI  85.0000     DEG                   DSES  H48
        IPRO  STAN                              IPHA  NORM
        NCJT  GSRY                              GTSE  TEMP
        SHT   45.0000     DEGF                  BHT   85.0000     DEGF
        DTCI  0.0         F                     SPAE  DISA
        BS    12.2500     IN                    BHS   OPEN
```

CALIBRATIONS

```
               BEFORE SURVEY CALIBRATION Summary


    Performed:     16-JAN-1998 05:19
    Program File: TOH     (Version    44.2    95/07/25  95/07/25)


  SGTL             Detector Calibration Summary

                MEASURED
             BKGD     JIG           CALIBRATED          UNITS
     GR       35      192              165              GAPI

  Back: 29-AUG-1997 10:04   Jig: 29-AUG-1997 10:08   Comp: 29-AUG-1997 10:08


  DITE             Electronics Calibration Summary
```

```
Sonde SN#: 151
Cartridge SN#: 159
Induction Freq: 20  KHz

Induction Electronics:

      Offset   Valid Range    Gain  Valid Range    Phase   Valid Range
      (MM/M )    (MM/M )      (--)      (---)      (DEG.)    (DEG.)

  IRD    7.8 -117. => 133.    .992   .84 => 1.18
  IXD   21.2 -105. => 145.   1.001   .84 => 1.19    7.96  -5.89 => 24.11
  IRM   25.6 -199. => 251.   1.000   .85 => 1.20
  IXM    -.5 -224. => 226.    .960   .81 => 1.15    7.53  -6.49 => 23.51

SFL Electronics:

       Offset  Valid Range    Units      Gain   Valid Range

  SFV     .4  -14.5 => 15.5    MV        .98   .84 => 1.19
  SFC    -.0    -.6 =>   .6    MA        .98   .84 => 1.18

Plus Measurement performed at: 16-JAN-1998 05:18

Shop cals used were performed: 29-AUG-1997 11:39

   CP 44.2          FILE    0      16-JAN-1998 05:18
```

```
                SHOP Summary


  Performed:    20-OCT-1997 09:46
  Program File: CCSHOP (Version    44.2    95/07/25  95/07/25)


DITE            Calibration Summary

Sonde Serial Number: 151
Cartridge Serial Number: 159


                        SHOP CONSTANTS

Test Loop Calibration:  Calibration of internal reference
                        to test loop standard


        Cons.   Gain    Valid Range     Cons.   Phase   Valid Range
                (---)      (---)               ( DEG )   ( DEG )

10KHz:
  ILD: DGF1     .999  .900 => 1.100   DPH1      .15  -1.50 =>  1.50
  ILM: MGF1    1.054  .900 => 1.100   MPH1     -.32  -1.50 =>  1.50

20KHz:
  ILD: DGF2    1.009  .900 => 1.100   DPH2     -.00  -2.00 =>  2.00
  ILM: MGF2    1.058  .900 => 1.100   MPH2    -1.08  -3.00 =>  1.00

40KHz:
  ILD: DGF4    1.023  .900 => 1.100   DPH4    -1.09  -4.00 =>  2.00
  ILM: MGF4    1.083  .900 => 1.100   MPH4    -2.65  -5.00 =>  1.00

Sonde Error Corrections:  Correction for sonde response in Zero
                          Conductivity Environments
```

```
              Cons.  Sonde Error    Valid Range
                     Correction
                      (MM/M )        (MM/M )

10KHz:
  IRD SEC:  DRE1       31.60     -50.0 => 125.0
  IXD SEC:  DXE1      221.33    -250.0 => 350.0
  IRM SEC:  MRE1       63.89     -50.0 => 140.0
  IXM SEC:  MXE1       27.25   -1300.0 =>1300.0

20KHz:
  IRD SEC:  DRE2       11.56     -30.0 =>  30.0
  IXD SEC:  DXE2      124.49    -125.0 => 200.0
  IRM SEC:  MRE2       17.10     -50.0 =>  50.0
  IXM SEC:  MXE2       39.01    -650.0 => 650.0

40KHz:
  IRD SEC:  DRE4        1.24     -15.0 =>  15.0
  IXD SEC:  DXE4       79.27     -75.0 => 125.0
  IRM SEC:  MRE4        3.45     -30.0 =>  30.0
  IXM SEC:  MXE4       46.63    -350.0 => 350.0


NOTE: All Sonde Error Corrections have been normalized to 25 DegC.


               Shop Electronic Calibration Summary

Electronic Calibration:  Calibration of System Electronics
                         using the internal reference

Induction Electronics:

      Offset   Valid Range    Gain  Valid Range    Phase  Valid Range
      (MM/M )   (MM/M )       (--)    (---)        (DEG.)   (DEG.)

10 KHz:
  IRD    20.1 -375. => 375.    .936   .75 => 1.25
  IXD    47.4 -375. => 375.    .942   .75 => 1.25   10.99  -5.00 => 20.00
  IRM    64.2 -900. => 900.    .954   .75 => 1.25
  IXM     1.5 -900. => 900.    .917   .75 => 1.25    8.98  -5.00 => 20.00

20 KHz:
  IRD     8.0 -150. => 150.    .983   .75 => 1.25
  IXD    19.6 -150. => 150.    .989   .75 => 1.25    9.11  -5.00 => 20.00
  IRM    26.2 -350. => 350.    .997   .75 => 1.25
  IXM      .7 -350. => 350.    .958   .75 => 1.25    8.51  -5.00 => 20.00

40 KHz:
  IRD     5.2 -100. => 100.    .979   .75 => 1.25
  IXD    13.1 -100. => 100.    .984   .75 => 1.25   24.78 -10.00 => 35.00
  IRM    17.0 -200. => 200.   1.003   .75 => 1.25
  IXM      .5 -200. => 200.    .964   .75 => 1.25   25.13 -10.00 => 35.00

SFL Electronics:

       Offset  Valid Range    Units      Gain   Valid Range

  SFV     .5  -16.0 => 16.0    MV         .988   .75 => 1.25
  SFC    -.0     -.7 =>   .7   MA         .987   .75 => 1.25


DITE            Electronics Calibration Summary

Sonde SN#: 151
Cartridge SN#: 159
Induction Freq: 20  KHz
```

```
Induction Electronics:

      Offset   Valid Range     Gain  Valid Range     Phase   Valid Range
      (MM/M )    (MM/M )       (--)     (---)        (DEG.)    (DEG.)

  IRD    8.0 -117. => 133.     .982   .84 => 1.18
  IXD   19.6 -105. => 145.     .988   .84 => 1.19     9.13  -5.89 => 24.11
  IRM   26.2 -199. => 251.     .995   .85 => 1.20
  IXM     .7 -224. => 226.     .956   .81 => 1.15     8.57  -6.49 => 23.51

SFL Electronics:

       Offset  Valid Range     Units      Gain   Valid Range

  SFV     .5  -14.5 => 15.5    MV          .99   .84 => 1.19
  SFC    -.0     -.6 =>   .6   MA          .99   .84 => 1.18

   CP 44.2           FILE     0      20-OCT-1997 09:45



                SHOP Summary


  Performed:     12-AUG-1997 11:13
  Program File: CCSHOP (Version    44.2    95/07/25  95/07/25)


CNTH            Detector Calibration Summary

      CNC #                  : 4431
      Neutron Source #       : 2576
      Thermal Housing #      : 4431
      Alpha detectors        : Yes

          Input     Plus        Shop     Gain     Shop
                  Reference     Tank              Bkg
                    Counts     Counts            Counts

          CNTC    6031.00    5998.75    1.005    24.754
          CFTC    2793.00    2640.31    1.058    30.245

          RATIO     2.159      2.272

          Shop Counts temperature and housing size corrected

Shop Tank Calibration done: 12-AUG-1997 11:13

   CP 44.2           FILE     0      12-AUG-1997 11:13



                SHOP Summary


  Performed:     12-AUG-1997 14:06
  Program File: CCSHOP (Version    44.2    95/07/25  95/07/25)


LDTD            Detector Calibration Summary

        Density Resistivity Sonde Number      :  4768
        Nuclear Service Cartridge Number      :  2979
        Powered Detector Housing Number       :  1989
        Powered Gamma-Gamma Detector Number :  1989
        LDT Logging Source Number             :  1925
        LDT Calibration Mode                  :  WATE
```

```
                     Master Calibrated
                    Bkgd   Al+Fe     Al  Units
              LL    19.9    91.5   100.0   CPS
              LU    76.0   137.2   150.3   CPS
              LS    58.0   160.1   175.1   CPS
            LITH     5.6    42.3    66.5   CPS
             SS1    18.2   174.5   191.0   CPS
             SS2    12.4   250.6   271.1   CPS

          HV Settings          Detector Resolutions
        HV LS:  1230.1 V            LS:  8.7 %
        HV SS:  1201.1 V            SS:  8.7 %

                  Spectrum Quality Ratios
          Computed Value       Nominal Value   Tolerance
   QRLS         .666                0.65        +/- 0.05
   QRSS         .704                0.72        +/- 0.10
   QRLI         .380                0.39        +/- 0.06
   QLIR        1.436                1.39        +/- 0.06
   QR          1.000                1.00        +/- 0.02

Shop Block Calibration done: 12-AUG-1997 13:57

   CP 44.2           FILE    0      12-AUG-1997 14:06
```

COMPANY	NORTHWEST NATURAL GAS CO.		
WELL	IW 22DH-22-65		
FIELD	MIST GAS STORAGE		
COUNTY:	COLUMBIA	**STATE:**	OREGON

SCHL.	**FR**	2725.0 F
SCHL.	**TD**	2735.0 F
DRLR.	**TD**	2746.0 F
Elev:	**KB**	595.7 F
	DF	
	GL	579.7 F

Schlumberger

DUAL INDUCTION GAMMA RAY / SP

5" LOG