

#OILWELL 1

OPERATING INSTRUCTIONS 1

START UP OPERATIONS. (CARD READER IN USE).

(See Manual for additional information)

1. With the HP 41 'OFF' plug the *OILWELL 1 module into the first available port after any Memory Modules that may be in use.
2. Plug in any additional accessories and turn them 'ON'.
3. Turn 'ON' the HP 41. If 'USER' is displayed in the display window then PRESS the 'USER' key to turn 'OFF' the 'USER' mode.
4. Make the 'MSTA' Key Assignment as follows:
 - a. Press the YELLOW 'SHIFT' key. The word 'SHIFT' will appear in the display.
 - b. Press the key marked 'XEQ'. The display will now show 'ASN -'.
 - c. Press the key marked 'ALPHA'. The word 'ALPHA' will be added to the display.
 - d. Press in turn each of the following keys marked with the BLUE Alpha Characters: - 'M' 'S' 'T' 'A'.
 - e. Press the key marked 'ALPHA'. The display will now show: - 'ASN MSTA -'
 - f. Select the key to which you want the *OILWELL1 'MSTA' programme assignment to be made. This may be a 'shifted' or 'un-shifted' key.
For example: - you might choose the 'XEQ' key.
 - g. Press your selected key. (Press the 'SHIFT' key first if it is a 'shifted' key). For example: - press the 'XEQ' key.
YOUR 'MSTA' KEY ASSIGNMENT IS NOW COMPLETE.
5. Load the 'Master Data' from the two '*MDATA' Cards as follows:-
 - a. Press the key marked 'XEQ' the display will now show: - 'XEQ -'
 - b. Press the key marked 'ALPHA' the word 'ALPHA' will be added to the display and the display will now show: - 'XEQ -'
 - c. Press in turn each of the following keys marked with the BLUE Alpha Characters: - 'C' 'L' 'R' 'G'.
 - d. Press the key marked 'ALPHA'. This procedure will have CLEARED all the HP 41 Data Registers.
 - e. Press the YELLOW 'SHIFT' key. The word 'SHIFT' will appear in the display.
 - f. Press the key marked with the Left pointing ARROW ('CLX/A') The contents of the 'X' - Register will now be ZERO.
 - g. Press the key marked 'USER', this selects the 'USER' mode in which the 'MSTA' key assignment becomes active.
 - h. Press the key to which you have made the 'MSTA' key ASSIGNMENT. The programme will start to run and after a second or two will display: - '*MDATA CARD', and the letters 'PRGM' will also be in the display.
 - i. Insert both sides of '*MDATA' CARDS 1 and 2 into the Card Reader. Following loading of the Data the module will cause output of the following: -

KEY	This *KEY* output gives the current units in
LENGTH:-FEET.	use for each of the basic parameters used by
DIA:-INS.	the module. The output obtained at this stage
VOL:-BBL.	gives the module's internal operating units
MUD WT:-P.P.G.	and the default units selection active with
PRES:-P.S.I.	all UNITS CONTROL FLAGS CLEAR
WT:-LBS.	

The final display is: 'OK' and sounds a TONE.

- NOTES: -
1. If the printer is not in use then these outputs will need to have been obtained by stepping through them using the 'R/S' key (see Manual).
 2. The current UNITS SELECTION will remain active for all future module operations until changed using a 0.4, 0.5, or 0.6 CODE operation. The current selection can be checked at any time using a 0.7 CODE operation.

THE MASTER DATA - '*MDATA' - is now loaded and will be retained by the HP 41's continuous memory.
To retain the data set INTACT the CONTENTS of data Registers 46 -99 (incl) MUST NOT now be altered by the USER.

THE *OILWELL MODULE IS NOW READY FOR USE.

#OILWELL 1

OPERATING INSTRUCTIONS 2

USING THE MODULE.

The operation of the module is based on the use of CODE NUMBERS that correspond to various FUNCTIONS as set out in the "OILWELL1 USER CODES" table.

To use these CODES proceed as follows:-

1. Select the required FUNCTION to be executed.
2. Enter the corresponding CODE NUMBER of that FUNCTION into the HP 41's 'X' - REGISTER.
3. Press the key marked 'USER'. The word 'USER' will be added to the display and the HP 41 will now be in 'USER' mode.
4. Execute the 'MSTA' key assignment.
e.g. Press the 'XEQ' key if you made the 'MSTA' key assignment to this key.

Operation of the module will now commence according to the input CODE NUMBER, the USER will be PROMPTED for INPUTS as required.

NOTE: - If the printer is NOT attached programme operation will halt after each OUTPUT, including headings, has been displayed. After noting the display the user must RESTART the programme by pressing the 'R/S' key.

When an input is required programme execution will stop and a PROMPT will be displayed. Proceed as follows:-

1. If a NUMERIC input is required then the prompt will be followed in the display by "?=" . Key in the required input value, the keyboard may be used to calculate the value, then press the 'R/S' key.
2. If an ALPHA input is required then the prompt will be followed in the display by "?". The word 'ALPHA' will also be in the display. Key in the required input, usually 'Y' or 'N' for 'YES' or 'NO', then press the 'R/S' key.

Following input of all the required DATA the programme will RUN and then output data according to the FUNCTION CODE selected. Finally a display of 'OK' will appear.

NOTE: - For certain CODE operations 'OK' will NOT be displayed, instead the FINAL output value will be REPEATED each time the 'R/S' key is pressed.

USING WELL GEOMETRY DATA.

Certain CODE NUMBERS marked on the 'USER CODES' table with a DOT, require the existence of WELL GEOMETRY DATA before they will operate. If the data does not exist they will prompt for it to be loaded from a DATA CARD, if the Card Reader is present, or display 'NONEXISTENT'. WELL GEOMETRY DATA may alternatively be entered manually using a 9.2 CODE operation or from a storage medium (data card or 'X-memory') using a 0.2 or 0.3 CODE operation.

HINTS

1. If the module does not operate as expected try turning the HP 41 'OFF' then 'ON' again. Should this fail repeat step 5. of the start up procedure and then reload the WELL GOEMETRY DATA, "WDATA".
2. To make use of the 0.6 Code operation set the required UNITS CONTROL flags PRIOR to initiating the CODE 0.6 operation.
3. Units handling is LOGICAL. Parameters of mixed units take their units from the logical combination of the current units of the appropriate basic parameters. e.g. CAPACITY is VOLUME per UNIT LENGTH this means that if the LENGTH parameter is in METERS and the VOLUME parameter is in BARRELS then the CAPACITY will be in BARRELS per METER.
4. DON'T store any data in registers 46 and above without being fully aware of the possible consequences as described in the manual.
5. In general it is not essential to have completed each Code operation prior to activating a new Code, however certain criteria should be met. They are:-
 - a. ALWAYS COMPLETE all Code 9 operations, failure to do this may result in invalid WELL GOEMETRY DATA.
 - b. Don't STOP a RUNNING Programme (PRGM shown in the display.). this will most likely result in some undesirable Flag settings.



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*OILWELL 1 USER CODES

CODE NO.	FUNCTION	CODE NO.	FUNCTION
0.0	LOAD MASTER DATA CARD	7.0	GAS CUT MUD <small>STRONG-WHITE EQUATION</small>
0.1	LOAD MASTER DATA	7.1	LEAK OFF TEST
0.2	LOAD WELL GEO. DATA CARD	7.2	Effect of ADD SOLID <small>→Volume & Wt Solid</small>
0.3	LOAD WELL GEO. DATA	7.3	mud additive ADD SOLID <small>→Resulting Mud Wt.</small>
0.4	SELECT ENGLISH UNITS	7.4	additions or ADD LIQUID <small>→Volume & Wt. Liquid</small>
0.5	SELECT ALTERNATIVE UNITS	7.5	mud wt. ADD LIQUID <small>→Resulting Mud Wt.</small>
0.6	USER SELECT UNITS	8.0	WORK DONE - ROUND TRIP
0.7	OUTPUT CURRENT UNITS	8.1	WORK DONE - WIPER TRIP
0.8	X-MEMORY DATA STORAGE	8.2	WORK DONE - CASING
1.0	ALL HOLE, PIPE & ANNULUS DATA	8.3	WORK DONE - DRILL-CORE-REAM
1.1	ALL HOLE DATA	8.4	WORK DONE - STACK
1.2	ALL PIPE DATA	9.0	CHANGE WELL GEOMETRY DATA
1.3	ALL ANNULUS DATA	9.1	INPUT NEW SET OF PIPE DATA
1.4	HOLE PIPE & ANNULUS Σ DATA	9.2	*INPUT WELL GEOMETRY DATA
1.5	HOLE Σ DATA	10.0	CRITICAL ROTARY SPEEDS
1.6	PIPE Σ DATA	10.1	PIPE STRETCH
1.7	ANNULUS Σ DATA	10.2	STUCK PIPE - FREE POINT
1.8	ALL ANN. DATA FROM CALC-D	10.3	TENSILE & TORSIONAL DATA
1.9	ANN. Σ DATA FROM CALC-D	10.4	TORSION UNDER TENSION
3.0	ALL PIPE & ANN. DATA + PRES	10.5	CALC. O.D. FROM I.D. & WT.
3.1	ALL PIPE DATA + PRES	10.5	CALC. WT. FROM I.D. & O.D.
3.2	ALL ANN. DATA + PRES	10.5	CALC. I.D. FROM O.D. & WT.
3.3	PIPE & ANN. Σ DATA + Σ PRES	10.6	CALC. X-SECTIONAL AREA
3.4	PIPE Σ DATA + Σ PRES	11.0	BIT HYDRAULICS OPTIMISATION
3.5	ANN. Σ DATA + Σ PRES	11.1	*CHG. MAX. PRES. & NO. NEW NOZ.
3.6	As 1.8 + PRES	11.2	*ACTUAL HYDRAULICS
3.7	As 1.9 + Σ PRES	11.3	*INPUT SPECIFIC FLOW RATE
3.8	USER CALCULATIONS	11.4	*INPUT NEW Q-RATE/PRES DATA
3.9	SURGE-SWAB CALCULATIONS	12	GENERAL CALCULATIONS
OPERATION 1. Enter CODE NUMBER. 2. Select USER MODE 3. Execute MSTA KEY ASSIGNMENT.		13.0	RHEOLOGY FROM FANN DATA
•	UTILISES WELL GEOMETRY DATA	13.1	INPUT RHEOLOGY & MUD WT.
♦	DEPENDENT ON OPERATION 11.0	13.2	OUTPUT RHEOLOGY & MUD WT.
		13.3	INPUT P.V., Y.P. & MUD WT.
		13.4	LIFTING CAPACITY OF MUD

12 GENERAL CALCULATIONS 12

a PIPE DISPLACEMENT	b FLOW RATE	c PIPE FLUID VELOCITY	d BUOYANCY FACTOR	e ANN. MUD WT. - (DRILLING)
A HOLE CAPACITY	B ANNULUS CAPACITY	C ANN. FLUID VELOCITY	D NOZZLE SIZES/AREA	E MIN. H. PWR. (FULLERTON)
F NOZ.A	G Q RATE	H PRES.	I MUD WT.	PRESS R/S KEY WITHOUT INPUT TO CALCULATE RESULTS
INTERACTIVE BIT HYDRAULICS				

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UNITS CONTROL.

LENGTH : FLAG 00 MUD WT. : FLAG 03
 DIA. : FLAG 01 PRES. : FLAG 04
 VOL. : FLAG 02 WT. : FLAG 04

★ OILWELL 1 REGISTER USAGE

R. No	CONTENT	R. No	CONTENT	R. No	CONTENT	R. No	CONTENT	R. No	CONTENT
0/1	USER	31		61	9714263 -4	91	LBS	21	H-L.DIA. 6
2	CODE OPS	32		62	OD	92	DA.N	22	H-L.DIA. 7
3	SEC.No/KEYOP	33		63	I.D.<P>	93	SURF_	23	H-L.DIA. 8
4	UNITS Control	34		64	I.D.<C>	94	DATA#	24	P-L.O.D. 1
5	DATA Labeling	35		65	CAP	95	HOLE_	25	P-L.O.D. 2
6	CALCS Control	36		66	VOL	96	PIPE_	26	P-L.O.D. 3
7	CALCS Control	37		67	VEL	97	ANN_	27	P-L.O.D. 4
8	LENGTH HPA	38		68	DISP	98	DEPTH	28	P-L.O.D. 5
9	DIA HPA	39		69	VOLD	99	_SETS	29	P-L.O.D. 6
10	OD H	40		70	Vn/Sec	100	DEPTH/ CALCD	30	P-ID P-C 1
11	I.D.<P><C> ϵ x	41		71	WT/U.L	101	X<>F CONTROL	31	P-ID P-C 2
12	CAP HPA ϵ x	42		72	Q.RATE	102	STOFLAG CONTROL	32	P-ID P-C 3
13	VOL HPA ϵ y	43	ϵ PIPE PRES.	73	VARIABLE ALPHA DATA	103	ACTIVE HOLE CONTROL	33	P-ID P-C 4
14	DISP P ϵ y	44	ϵ ANN PRES.	74	P/GRD=	104	ACTIVE PIPE CONTROL	34	P-ID P-C 5
15	VDISP P ϵ y	45	ϵ HPA-SURE PR.	75	LENGTH	105	Q-RATE	35	P-ID P-C 6
16	WTA. P n	46	CURRENT DEPTH	76	FEET.	106	P.P.G.	36	OPS CONTROL
17	ϵ WTA P	47	No. of nozzles	77	MTRS.	107	BUOYANCY FACTOR	37	ACTIVE H. 1
18	ϵ VOLD P	48	NOZ.	78	DIA.	108	hi n	38	ACTIVE H. 2
19	ϵ VOL HPA	49	RIGHT	79	INS.	109	HI K	39	ACTIVE H. 3
20	VEL. PA	50	766990394 -4	80	MMTR.	110	n	40	ACTIVE H. 4
21	(mud wt)	51	74569987 -1	81	VOL	111	K	41	ACTIVE H. 5
22	(buoyancy)	52	2450408401 -2	82	BBL.	112		42	ACTIVE H. 6
23	CALCS	53	6544438248 +1	83	C.MTR.	113	CALCS.	43	ACTIVE H. 7
24	ϵ PRES	54	16128 -1	84	MUD WT.	114	CH/K DATA	44	ACTIVE H. 8
25	CALCS. Vmet	55	3048 -1	85	PPG.	115	SURF DATA	45	ACTIVE P. 1
26	Pcal. VmL	56	254 -1	86	S.G.	116	H-L:DIA. 1	46	ACTIVE P. 2
27	Pcal. VmL	57	1589872949 -1	87	PRES	117	H-L:DIA. 2	47	ACTIVE P. 3
28	Pcal. V	58	1198264274 -1	88	P.S.I.	118	H-L:DIA. 3	48	ACTIVE P. 4
29		59	6094757293 -2	89	BARS.	119	H-L:DIA. 4	49	ACTIVE P. 5
30		60	4448221615 -1	90	WT	120	H-L:DIA. 5	50	ACTIVE P. 6



★ MDATA CARD 1.



★ MDATA CARD 2.



★ WDATA CARD.

