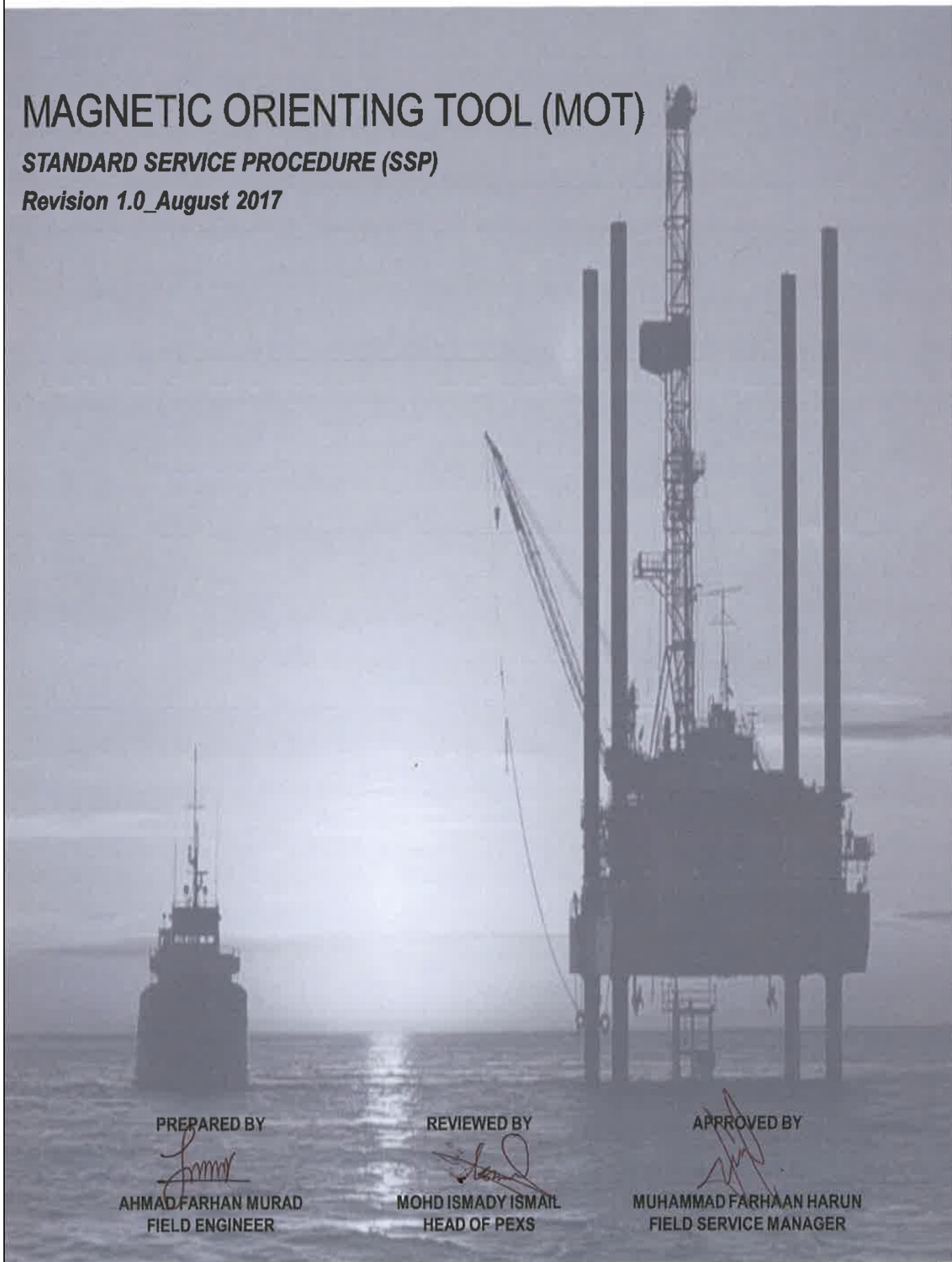




MAGNETIC ORIENTING TOOL (MOT)

STANDARD SERVICE PROCEDURE (SSP)

Revision 1.0_August 2017



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Revision List

Revision No	Date	Revised Details	Revised By	Approved By
1.0	August 2017	N/A	Ahmad Farhan	M.Farhaan

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Safety Precaution

Users of MOT must be aware of the following conditions:

- Strictly follow the explosive service procedure prior to use MOT as stated in Explosive Safety Placard (ESP) Revision 2.2R.
- MOT use an electrical energy storing device. The energy storage capability will increased when attached to the wireline cable.
- Two 800 volt diode and 500 volt FET are in series with the bottom of the tool to prevent positive current from firing the gun.
- Any electrical device are subject to failure. Tool power will not be applied until tool is at least 200 ft. (60 m) from the surface.
- MOT is designed to run on AC and DC Positive current. When negative current is applied, with respect to the cable armor, detonation of blasting cap will occur.

MOT Specification

Part Number	8037-16867EC075-12-06-A
Description	MOT (<i>PERF</i>) 1 11/16" O.D
Tool Rating	
Max Pressure	18,000 PSI (124 MPa)
Max Temperature	375° F (190.5° C)
Tool Dimension	
Tool Diameter	1 11/16" (4.28 cm)
Tool Length from top of CCL to bottom of Shock sub	119.23" (302.84 cm)
CCL Length	15.90" (39.62 cm)
Bow Spring Anchor Length	26.50" (67.31 cm)
M.O.T. Length	65.20" (165.61 cm)
Shock Sub Length	11.63" (29.54 cm)
Weight (MOT only)	26 lbs. (11.8 kg)
Recommended Logging Speed (CCL)	50 Ft. (15.2 M)/ Min
Curves Recorded	CCL / MOT / Markers
Operating Voltage & Current @ Cable Head	
M.O.T. Power	40 Vdc @ 35-50 mA
Motor	80 Vdc @ 90-110 mA
Exciter.	100 / 120 Vac @ 130-180 mA
Cable Type	Single Conductor
Measure Point	
Bottom of Shock Sub to CCL Coil Center	110.58" (280.87 cm)

GUN FIRE ON NEGATIVE VOLTAGE

Job Preparation





Other than job information that users required from client as stated before, temperature at perforation area plays a vital role to perform MOT run. The motor used to orient the gun that is attached to the MOT has internal thermal rise of 150 °F to 200 °F depending on the load placed on the motor.

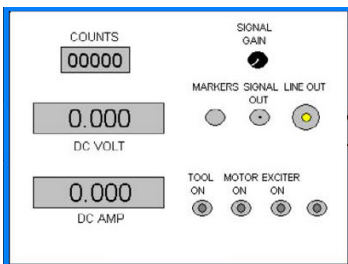
Dwell time is the recommended time that the motor is left unpowered between each rotation at that temperature.

Please refer to the below table:

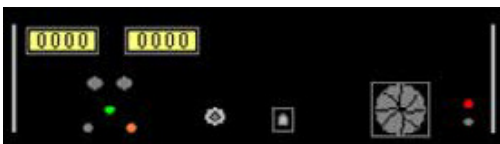
Temperature (°F)	Motor 'ON' time (minutes)	Dwell time (minutes)
375	8	30
360	10	25
325	12	20
300	14	15
275	16	10
250	continuous	continuous

Parts and Assembly

MOT-CCL	MOT-ANTI ROTATIONAL CENTRALIZER	MOT	MOT-SHOCK SUB
			

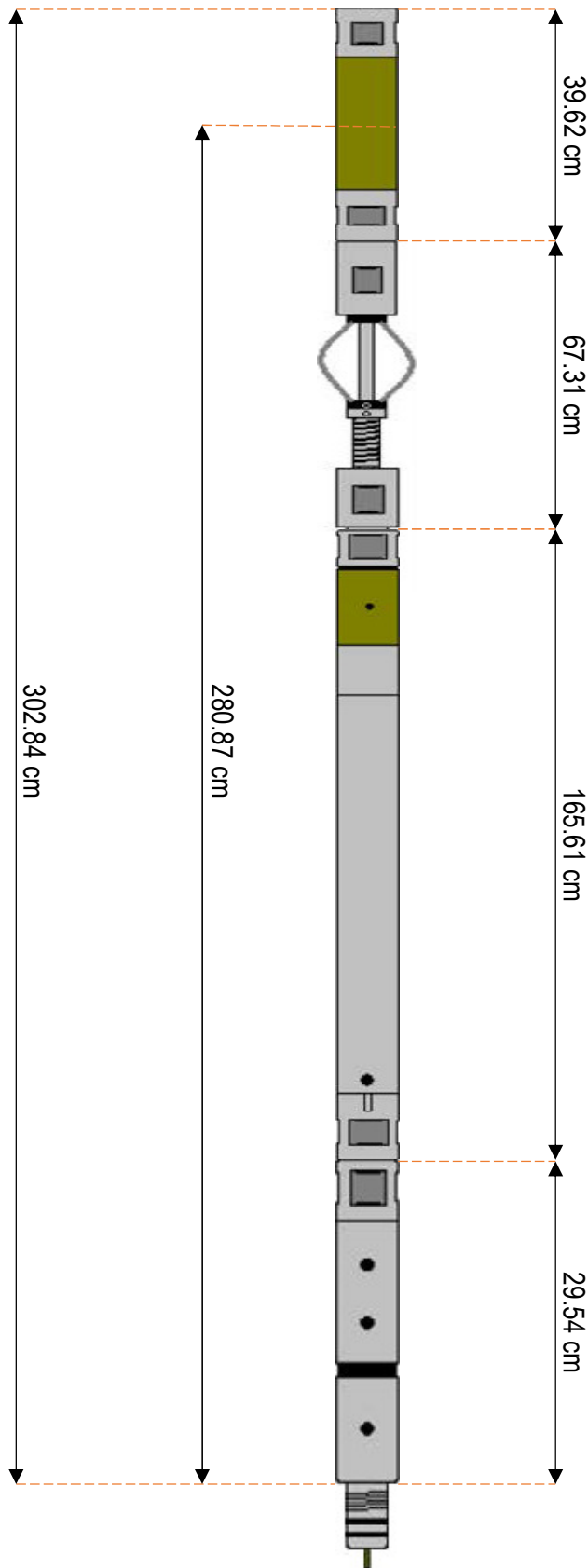


MOT Surface Panel

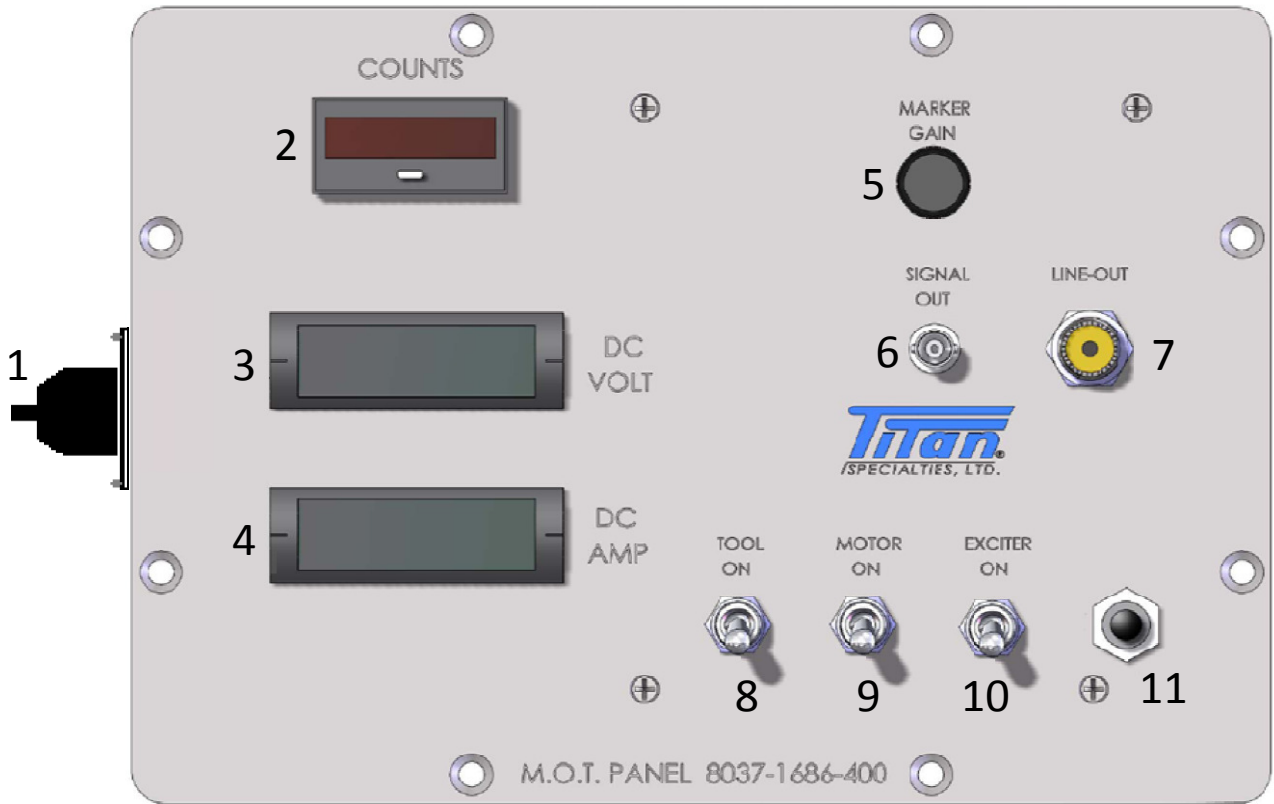


STIP - DRS014

Tool Measurement

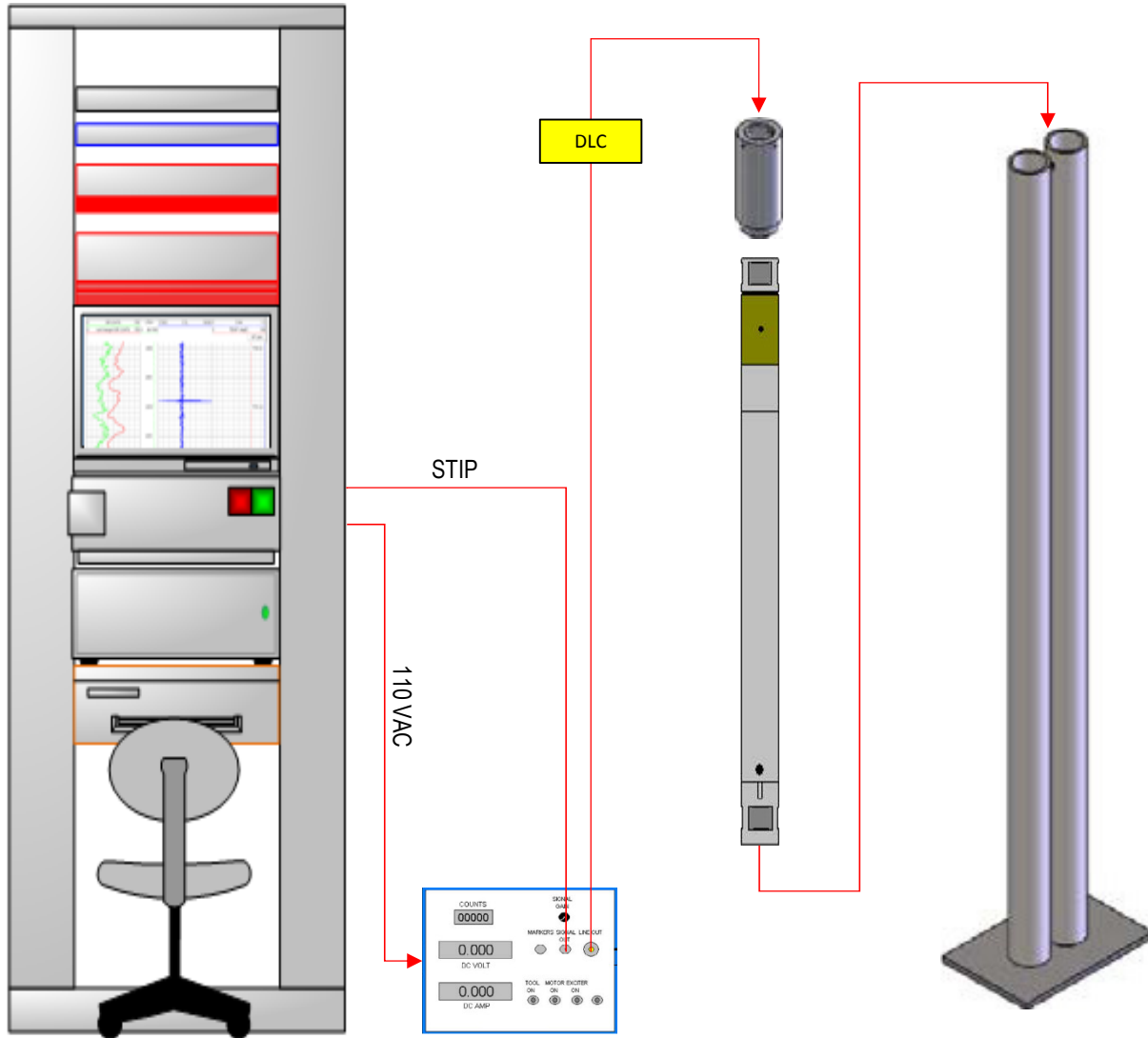


MOT Panel



No	Description	Remark
1	Power Supply	110V power supply
2	MOT Count Meter	Display count rate from MOT sensor
3	DC VOLT Meter	Display DC voltage applied to line
4	DC AMP Meter	Display DC amperage applied to line
5	Marker Gain Nob	Adjust the threshold for the marker
6	Signal Out Connector	Connection point to DRS014
7	Line Out Connector	Connection point to CIS box (tool)
8	Tool On Switch	Provide DC power to MOT electronic
9	Motor On Switch	Provide DC power to MOT motor
10	Exciter On Switch	Provide AC power to MOT exciter
11	Pop Up Circuit Breaker	Reset tool overload breaker


Surface Test Setup



Surface Test Guideline

No	Step	Check	Remark
1	Assemble the MOT with the proper subs for the MOT test stand.		Refer Surface Test Setup figure
2	Attach logging cable or load box (100Ω / 50W)		
3	Stand the test stand vertically and make sure the tool is centered		Clamp the head only at the flat surface on MOT Top Sub
4	<p>The POWER MONITOR function must be disabled.</p> <p>[Power Monitor] ;DANGER - HIGH VOLTAGE ON LINE ;CHECK STIP OPEN CIRCUIT CUT OFF IS WORKING BEFORE USE ;DO NOT DISABLE THE OPEN CIRCUIT CUT OFF WHEN USING A STIP External=yes</p>		
5	Start Warrior software, create new database for your test, and select TEKCO 1-11/16" MOT service		Make sure service file Tekco 169 MOT.wsv exist in Warrior config folder
6	Check tool string configuration and enable the line at Power Control window		Warning! Do not apply power from the Warrior Panel
7	Turn on the AC Power for MOT panel		DC VOLT and DC AMP should be 0±1V
8	Turn on the "Tool On" power		Voltage = 45 VDC (+/- 5V) Current = 36 mA (+/- 5 mA) Tool in static condition
9	Turn on the "Motor On" power		Voltage = 88 VDC (+/- 5V) Current = 135 mA (+/- 5 mA) Tool start to rotate
10	Turn on the "Exciter On" power		VOLT and AMP does not change. Panel measure DC. Exciter powered by AC
11	Check height of the pulses in the PMON window. Adjust the Sync gain slider bar until the pulses at 2.5V or the pulses touch the edge of the window. Positive and negative pulses should present.		
12	Adjust PMON discriminator to about half of the pulse height. To adjust PMON discriminator		If Positive pulses are present but no Negative pulses or the negative pulses are constant and do not come in a burst pattern the Marker gain may need to be adjusted.
13	Turn the adjustment knob full counter clockwise. Monitor PMON Window, begin turning the adjustment knob slowly clockwise. Stop turning the knob as soon as the negative pulses disappear.		Watch PMON Window and verify negative pulse appear in burst pattern. A pattern of 11 kicks evenly spaces followed by longer 'dead space'

Surface Test Guideline

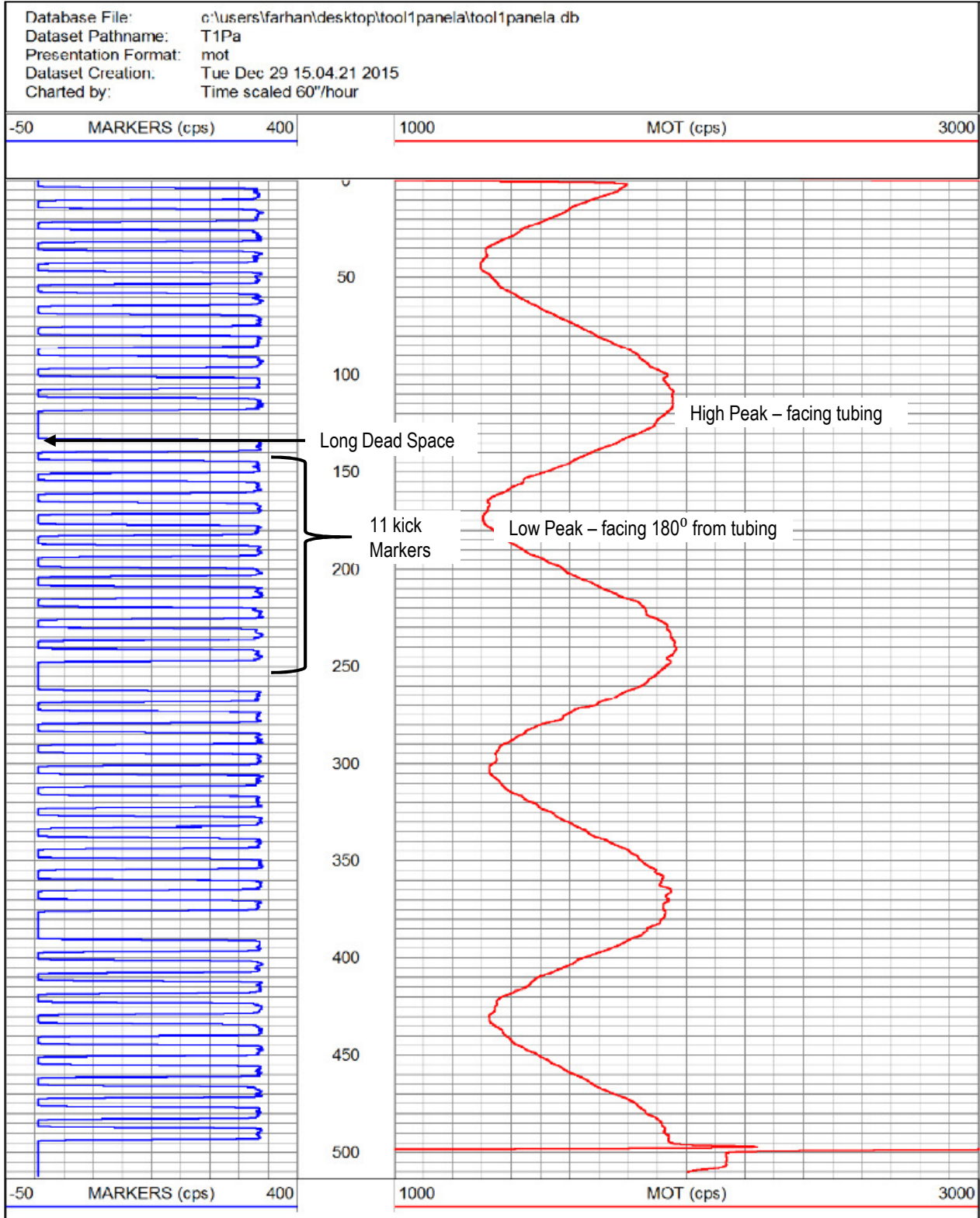
No	Step	Check	Remark
14	Check the monitor/outputs and verify Warrior is counting.		MOT counts will be steady output. Markers will come as a burst.
15	Start simulation log/time based log Action – Record on Time		Adjust the vertical log scale to 50 @ 60
16	Let the MOT rotate and record at least 3 high count peak		1 revolution = 2 min 15 sec
17	Once reach the apex of the 4 th peak, stop MOT. The best way to stop MOT is by turning off the Tool, Motor, and Exciter power simultaneously		
18	Lay down the test fixture carefully. Do not allow tool to rotate. Watch the alignment notch. It should be facing the adjacent tubing. 		If the alignment notch is 180° out of phase when stop at the high peak , DO NOT use that tool
19	Once it has been verified that the alignment notch is facing the adjacent tubing, next step is to check the FIRING CIRCUIT		
20	Put the MOT horizontally on a stand or vice, connect the wireline at the top. Place volt meter at the bottom of the tool		
21	Switch on the Tool, Motor, and Exciter. Measure the voltage below. No voltage should be present either AC or DC		If any voltage present, DO NOT use that tool
22	If no voltage present, power down tool completely and power down the MOT panel. Reconnect warrior line to MOT		

Surface Test Guideline

No	Step	Check	Remark
23	Connect volt meter to the bottom of MOT. Set the meter to measure DC		
24	Apply negative 100 VDC to MOT with Perforating Panel. Verify the output at the bottom of the MOT		Compare voltage at the bottom of the tool with the voltage applied from the perforating panel. Any voltage loss should be minimal
25	Reconnect the MOT panel. Connect the wireline at the top. Place volt meter at the bottom of the tool.		
26	Switch on the Tool, Motor, and Exciter. Measure the voltage below. No voltage should be present either AC or DC		If any voltage present, DO NOT use that tool
27	Power down tool and place the wireline in safe position. End of surface check		

MOT STANDARD SERVICE PROCEDURE (SSP)

Log Example (Surface Test)

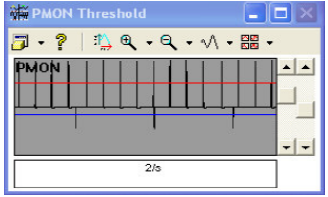


This test was performed in MOT test jig

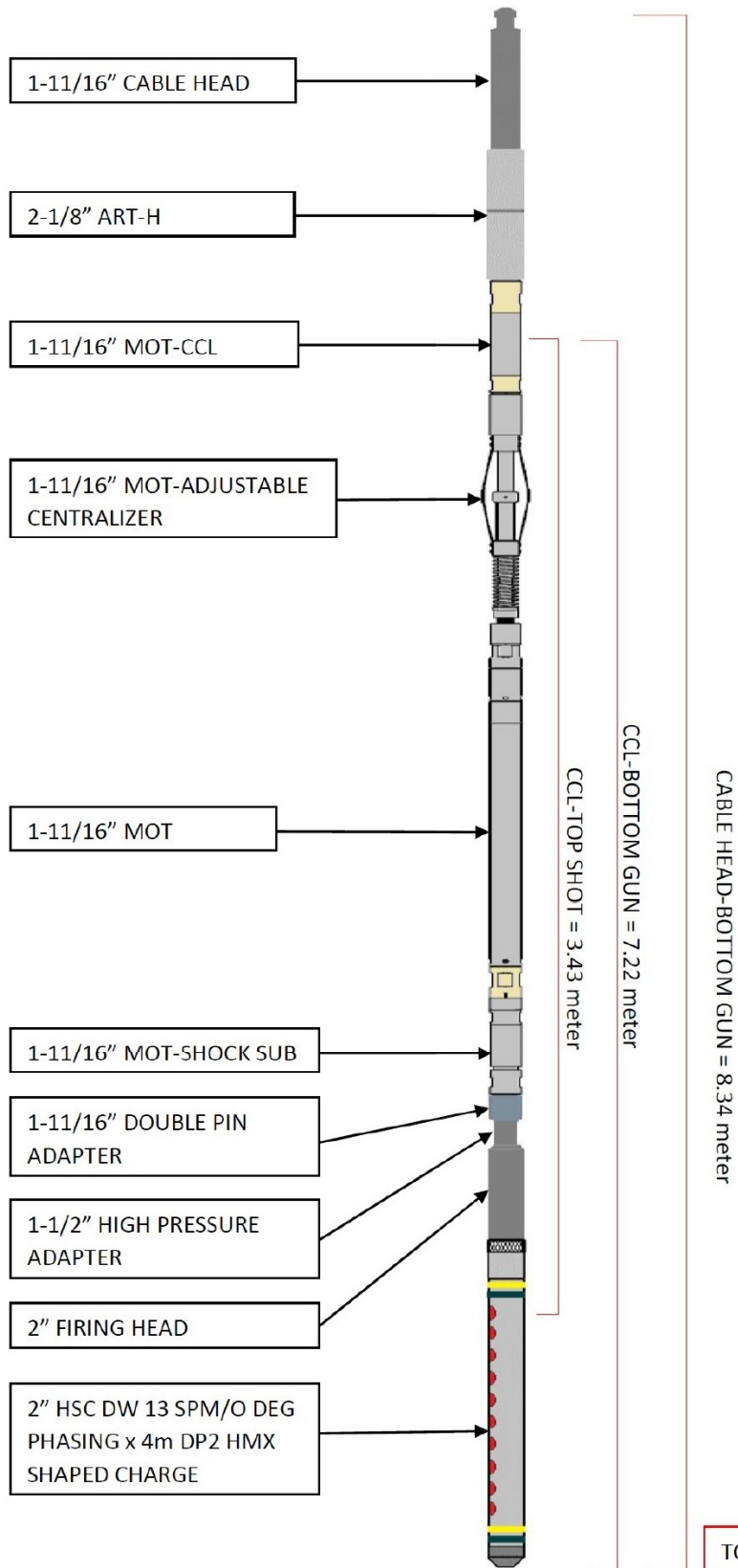
Operation Guideline

No	Step	Check	Remark
1	Perform MOT Surface Test Guideline		
2	Follow regular company's explosive safety procedure as stated in Explosive Safety Placard (ESP)		<ul style="list-style-type: none"> • Install grounding cable • Remove safety and perf key at the panel • Electrical arming before ballistic arming • Refer attach tool string for standard MOT gun string
3	Tighten the gun securely to the bottom of Shock Sub		<ul style="list-style-type: none"> • Take note the opening of the anchor centralizer • Too large can cause difficulty to RIH • Too small can cause the cable twisted
4	Using the adjustable collar at the pin end of the Shock Sub, align the shooting direction parallel with the MOT alignment notch		Once stop at the high peak, directional coil will always facing the denser metal. In actual, it will face the casing, 180 ⁰ away from adjacent tubing
5	Pull tool string into lubricator and proceed to run into well as standard perforation service practice		It is recommended to perform rotation test at certain depth before reach the shooting depth. Usually perform during dummy MOT run
6	Perform correlation pass using MOT-CCL. Once at the agreed depth to perforate, put the winch in break position. Standby to rotate the gun		
7	Connect the MOT panel to the line		
8	Start Warrior software, create new database for your test, and select TEKCO 1-11/16" MOT service		Make sure service file Tekco 169 MOT.wsv exist in Warrior config folder
9	Check tool string configuration and enable the line at Power Control window		Warning! Do not apply power from the Warrior Panel
10	Turn on the AC Power for MOT panel		DC VOLT and DC AMP should be 0±1V
11	Turn on the "Tool On" power		Voltage = 45 VDC (+/- 5V) Current = 36 mA (+/- 5 mA) Tool in static condition
12	Turn on the "Motor On" power		Voltage = 88 VDC (+/- 5V) Current = 135 mA (+/- 5 mA) Tool start to rotate
13	Turn on the "Exciter On" power		VOLT and AMP does not change. Panel measure DC.
MOT STANDARD SERVICE PROCEDURE (SSP)			Exciter powered by AC 16

Operation Guideline

No	Step	Check	Remark
14	Check height of the pulses in the PMON window. Adjust the Sync gain slider bar until the pulses at 2.5V or the pulses touch the edge of the window. Positive and negative pulses should present.		
15	Adjust PMON discriminator to about half of the pulse height. To adjust PMON discriminator		If Positive pulses are present but no Negative pulses or the negative pulses are constant and do not come in a burst pattern the Marker gain may need to be adjusted.
16	Turn the adjustment knob full counter clockwise. Monitor PMON Window, begin turning the adjustment knob slowly clockwise. Stop turning the knob as soon as the negative pulses disappear.		Watch PMON Window and verify negative pulse appear in burst pattern. A pattern of 11 kicks evenly spaces followed by longer 'dead space'
17	Check the monitor/outputs and verify Warrior is counting.		MOT counts will be steady output. Markers will come as a burst.
18	Start simulation log/time based log Action – Record on Time		Adjust the vertical log scale to 50 @ 60
19	Let the MOT rotate and record at least 3 high count peak		1 revolution = 2 min 15 sec
20	Once reach the apex of the 4 th peak, stop MOT. The best way to stop MOT is by turning off the Tool, Motor, and Exciter power simultaneously		Take note the temperature at the shooting depth. Rotating the motor longer than recommended limit will DAMAGE the MOT motor. Refer to Dwell Time table
21	Once the MOT is completely powered down, disconnect MOT panel from the line and re-connect warrior panel		
22	Shot the gun. Follow standard practice of perforating procedure		Watch the shooting indication <ul style="list-style-type: none"> • Cable vibration • THP both well (long/short) • Current deflection • Weight loss
23	Once got indication the gun is fired, continue POOH		

MOT Tool String (Example)



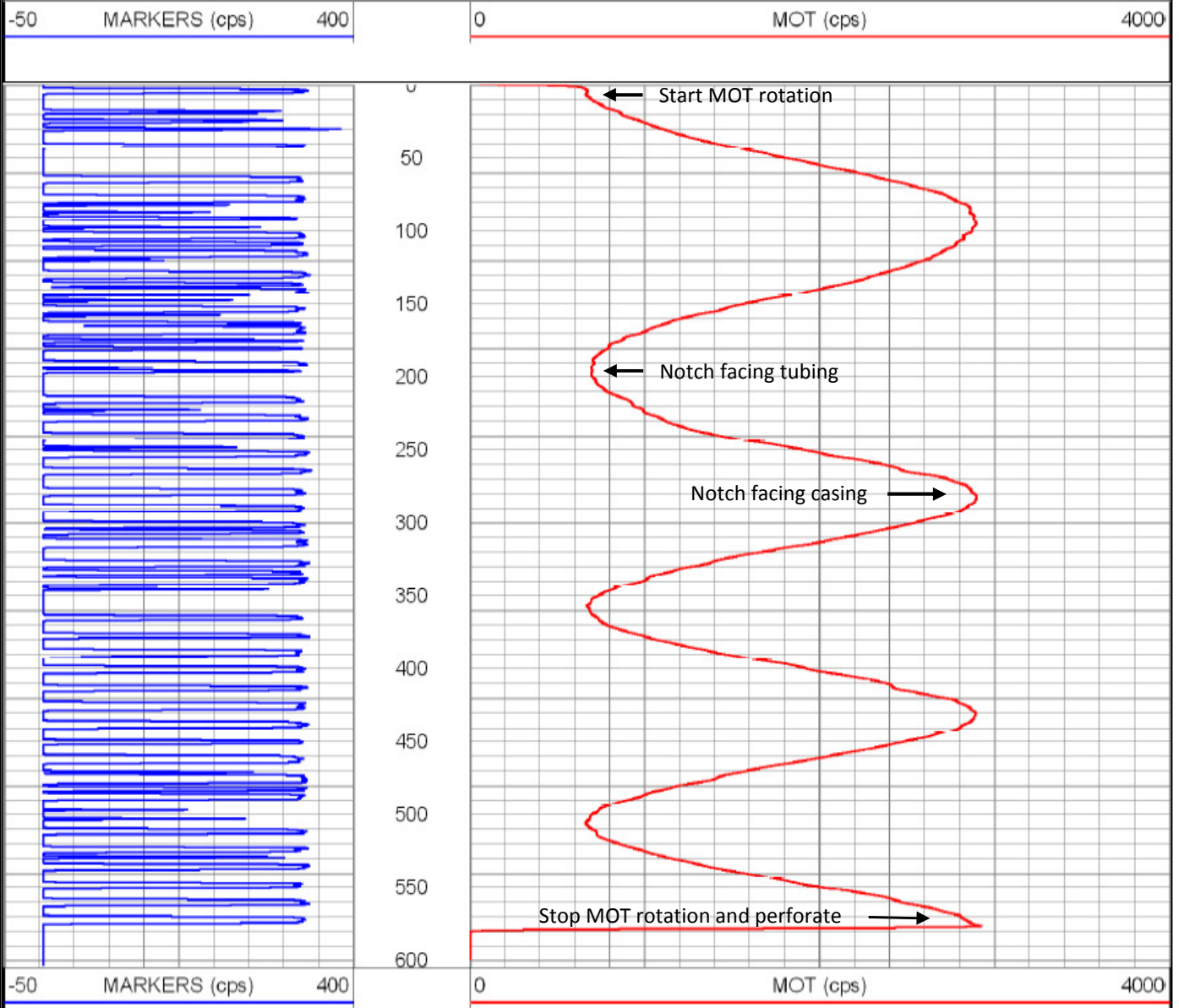
- VSS-Y are not compatible to be used with MOT since it will interrupt the MOT signal
- In case the tool was shorted and stuck after perforate, ART-H unable to be release
- VSS-F can be used as it does not interrupt the MOT signal

TOTAL WEIGHT = 168 lb

MOT STANDARD SERVICE PROCEDURE (SSP)

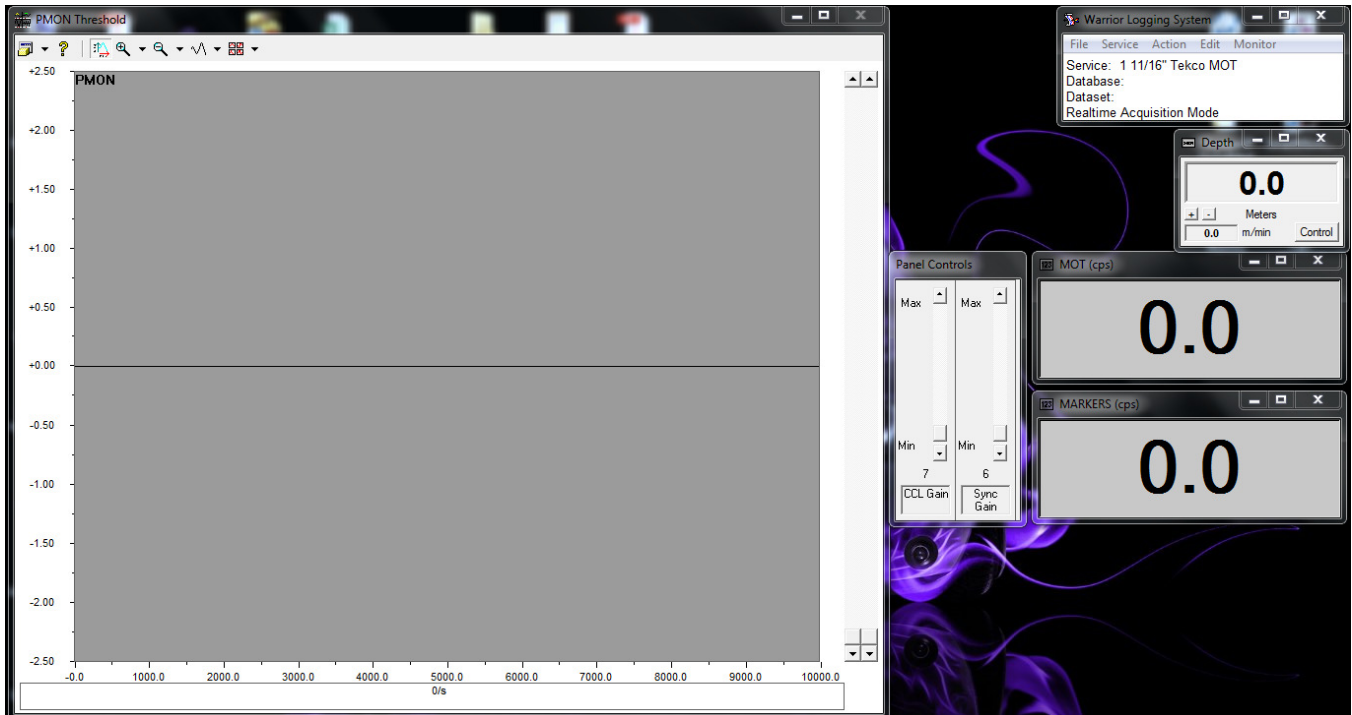
Log Example (Actual Run)

Database File:
 Dataset Pathname:
 Presentation Format: mot
 Dataset Creation: Fri Nov 18 17:58:29 2016 by Log Sondex V7.10
 Charted by: Time scaled 36"/hour




Attachment

1.0 MOT Warrior Control Display



2.0 Service Program Input Form



SERVICE PROGRAM INPUT

CLIENT INFORMATION			
NO	ITEM	TICK / or X	REMARKS
1	NAME OF CLIENT		
2	CONTRACT NAME		
3	CLIENT CONTRACT HOLDER		
TIMING AND DURATION			
NO	ITEM	TICK / or X	REMARKS
1	JOB DATE		
2	INSPECTION DATE		
3	JOB DURATION		
WELL INFORMATION			
NO	ITEM	TICK / or X	REMARKS
1	LOCATION AND FIELD NAME		
2	WELL NAME		
3	WELL HISTORY (if any)		
4	WELL COMPLETION DIAGRAM/TUBING TALLY		
5	WELL SURVEY FOR DEVIATION		
6	COMPLETION SIZE		
7	CURRENT WELL CONDITION, FLOWING, H ₂ S, CO ₂		
8	OHGR FILE IN.LAS FOR CORRELATION PURPOSE		
JOB OBJECTIVES			
NO	ITEM	TICK / or X	REMARKS
1	CLIENT PROPOSAL FROM SUBSURFACE OR INTERVENTION		
2	BACKUP REQUIREMENT		
3	ADDITIONAL SPECIFIC REQUIREMENT		
PERSONNEL AND HSE AND LOGISTICS			
NO	ITEM	TICK / or X	REMARKS
1	SAFETY REQUIREMENT		
2	PERSONNEL TRAINING REQUIREMENT		
3	EMBARKATION POINT		
4	PERSONNEL AND EQUIPMENT BOOKING CONTACT PERSON		
OTHERS (TO BE FILLED IF ANY)			
NO	ITEM	TICK / or X	REMARKS
1	WEM INPUT TEMPLATE		Applicable for Perforation job only
2	PVT INPUT TEMPLATE		Applicable for PLT Logging job only
3	JOB PROGRAM/PROPOSAL FROM 3 RD PARTY (if perform with 3 rd party)		
4			
5			

***ANY SUPPORTING DOCUMENTS ARE REQUIRED TO BE ATTACHED WITH THIS CHECKLIST**

Prepared by: _____

Name: _____

Position: _____

Date: _____

Verified by: _____

Name: _____

Position: _____

Date: _____

Doc. Ref No: **CHS-FORM-146** CONTROLLED COPY 1

Revision No.: **01**

Effective Date: **16/08/17**



Reference

1. 377M16T0-A Rev_C_MOT OPS MANUAL
2. MOT OP-CHECK PROCEDURE
3. MOT running procedure