

Echometer How To

TWM Basic Steps to Acquire 50K Lbs Horseshoe Load Cell Dynamometer Data.

by

Echometer Company

50K HORSESHOE TRANSDUCER

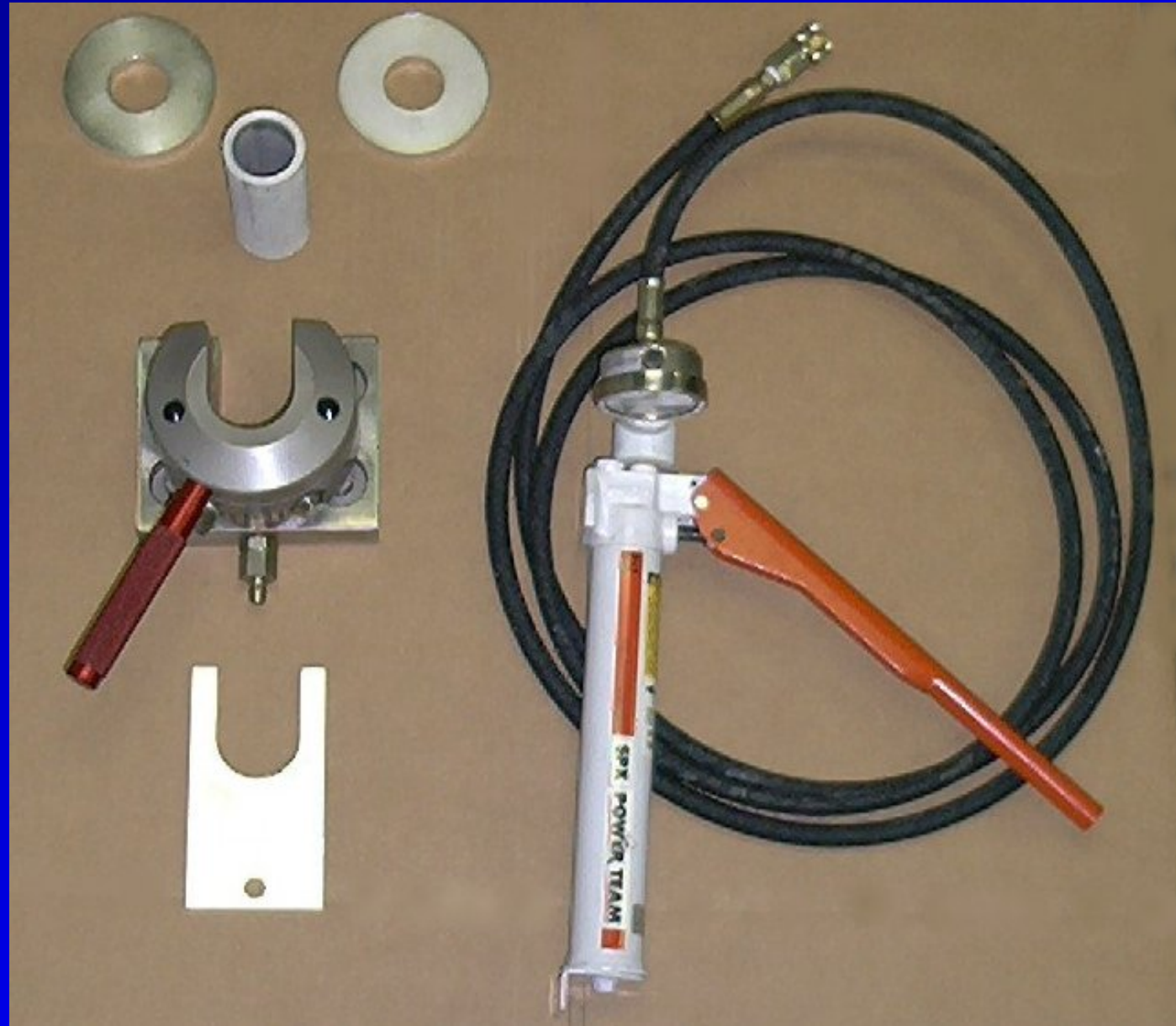
INCLUDES ACCELEROMETER

SAFE, FAST, CONVENIENT, ACCURATE LOAD & POSITION



50K Horseshoe Load Cell Package

1. The 50K HT is wider than 2" and will work on 2.0 and smaller Polished Rods.
2. Consists of 5 parts: the spool (3 silver pieces), the 5" horseshoe transducer, the hydraulic jack, the pump with hose and the $\frac{1}{4}$ " thick spacer



Stop the Pumping Unit carefully, near the bottom of the stroke.



For safety purposes, when stopping the pumping unit to attach the HT transducer, the operator should disconnect the power and set the break.

Spool & Washers Mounted on Well

1. Permanently Install Spool Assembly on the Well.
2. Spool fits over the polished rod between the carrier bar and the permanent polished clamp.
3. Spool assembly consists of an upper washer, a lower washer and a 5" long (2" OD) steel tube, that separates the two washers.



Connect the cables to Well Analyzer.



Far end of the coiled cable is attached to the 25-foot Y-cable or Straight cable which is connected into the MAIN INPUT on the Well Analyzer.

Turn on the computer.

Wait for Windows to complete loading.

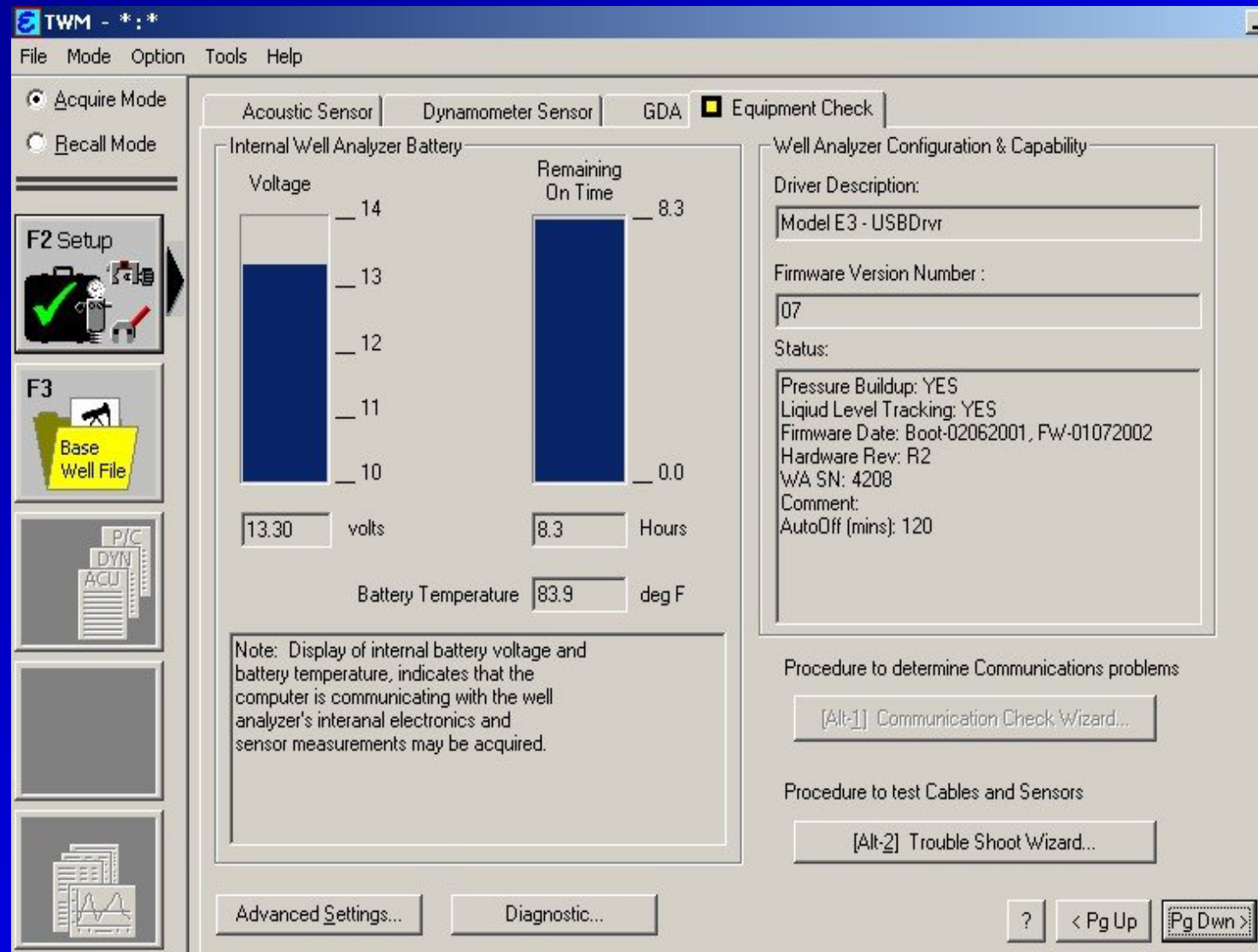


Turn on Well Analyzer and wait for
GREEN LED.



Start TWM in Acquire Mode.

1. Select the **Equipment Check** tab
2. The display of internal battery voltage and battery temperature indicates that the computer is communicating with the well analyzer's internal electronics, and sensor measurements may be acquired.



Select the Dynamometer Sensor tab.



Acoustic Sensor ☒ Dynamometer Sensor GDA Equipment Check

[Alt-1] Select Load Transducer

Serial No. HT5018 Create New... Delete...

[Alt-2] Transducer Coefficients

C1	1.87	C2	24.23	C3	0
C4	0	C5	0	C6	1.84

Transducer Zero Offset

Last Zero Offset: 0.28 Klb Set On: 08/13/02 16:27:35

[Alt-3] Update Zero Offset with Present Reading

Present Zero Offset:

0.17 Klb

NOTE: Zero Offset should be obtained with transducer under no load and attached to cable.

Accelerometer Output:

0.133324 mV/V

NOTE: Accelerometer output should be between +8 and -8 mV/V and output will vary when rotated.

1. Select the serial number of the 50k HT, Horse Shoe Transducer. Use **Create New...** if your serial number is not found in the list. Make sure all coefficients are entered as typed on transducer label.
2. Prior to placing the HT on the Polished Rod verify the transducer output.

Install 5" Horseshoe Transducer and Hydraulic Jack

1. The horseshoe transducer, HT, and hydraulic jack are placed between the upper and lower washers.
2. The hydraulic jack and 5" HT are attached together by two bolts, so both are installed together.
3. Height of the jack and HT is approximately 4.9". The inner steel tube, which separates the upper washer and lower washer, is 5" in length.



Hydraulic Pump and Jack Lift Rods

1. Hydraulic pump is actuated to raise the horseshoe transducer and place the polished rod load onto the horseshoe transducer.
2. A $\frac{1}{4}$ " spacer plate is inserted between the hydraulic jack and the horseshoe transducer.
3. The load remains on the horseshoe transducer when the pressure in the hydraulic jack is released.



Horseshoe Transducer Hydraulic Jack Assembly Installed on Well

1. After the spacer is inserted, hydraulic pressure on the jack is released as the hydraulic liquid is bled back into the pump
2. The polished rod load is lowered onto the horseshoe transducer, spacer plate, and the hydraulic jack.
3. The entire polished rod load is on the 5" horseshoe transducer and jack.



Use Coiled Cable with Locking Nut

1. Use a coiled cable with a locking nut to prevent the coiled cable from vibrating loose from the HT transducer connector as the polished rod travels up and down.
2. A cable is attached from the Well analyzer to the horseshoe transducer to record accurate polished rod load and also acceleration data.
3. Do NOT allow the horse head to hit the 50K HT at the top of the stroke.



Accelerometer Determines Position

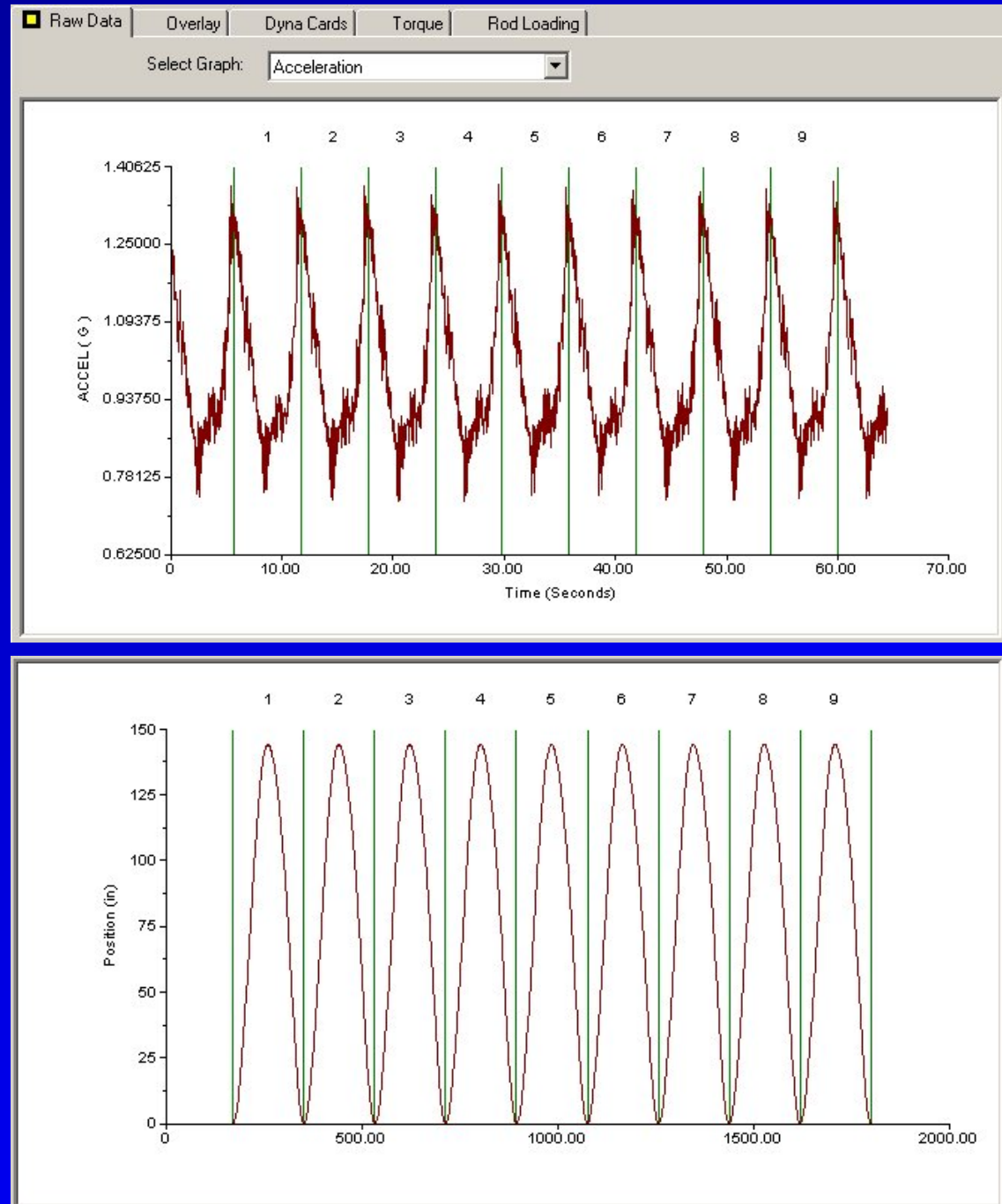
1. An accelerometer is contained within the 5" horseshoe transducer.
2. The acceleration data is processed to obtain position data, so a string position transducer is not required.
3. The accelerometer does not require as much maintenance as a string type position transducer requires and is easier to use.



Acquired Acceleration of Polished Rod

Position of the polished rod is determined by twice integration of measured acceleration data.

Accelerometer is compact, convenient to use, less expensive, and more accurate than conventional string position indicators.



Coiled dynamometer cable can become tangled in wellhead.

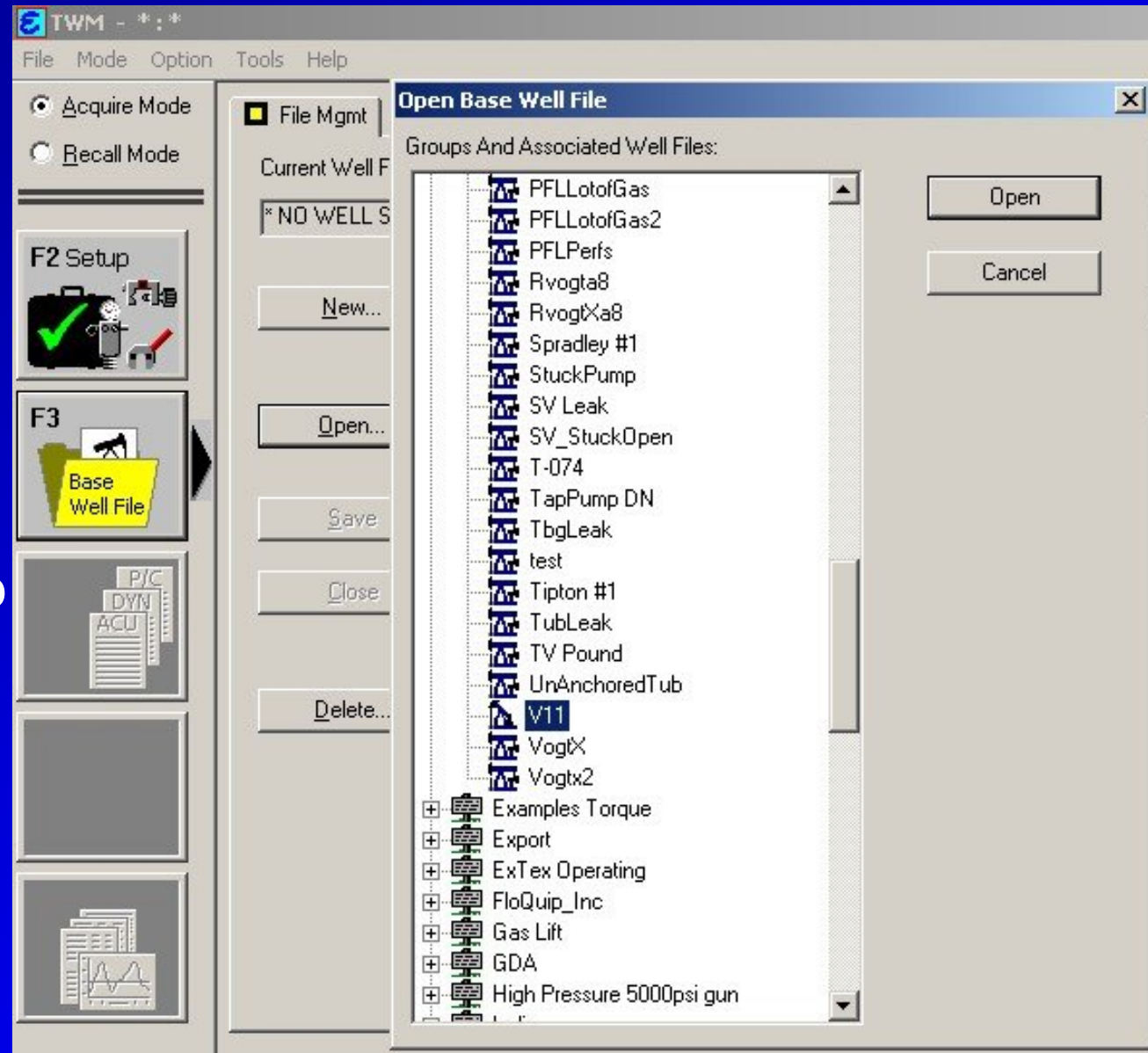
1. Support the cable to prevent entanglement with the wellhead connections during polished rod movement.
2. One end of coiled cable is connected to the polished rod transducer and the other end of the coiled cable is suspended on the ladder or fixed object.



This setup is a safe way to protect the dynamometer cable, the cable connectors and the connector on the load cell.

TWM Software – F3 to Select Well

1. Open Base Well File for the well where data is to be acquired. Use New... to create a Base Well File if one does not exist.
2. For acoustic surveys be sure to enter at least **avg. joint length, pump and formation depths.**



Select Wellbore Tab to Verify Data

1. From the **Base Well File** select the Wellbore Tab and verify the data is representative for the well.
2. For PRT surveys be sure to enter Rod Type, Rod Length, Rod Diameter, Pump Plunger Dia., Pump Intake, Polished Rod Diameter, fluid gravities, and production rates.

TWM - Examples : V11

File Mode Option Tools Help

☒ Acquire Mode
☐ Recall Mode

F2 Setup
F3 Base Well File
F4 P/C DYN ACU Select Test

File Mgmt General Surface Equip. **Wellbore** Conditions Press. Transient Data

[Alt-1] Tubulars

Tubing OD 2.375 in Table..
Casing OD 5.5 in Table..
Ave. Joint Length 31.7 ft
Anchor Depth 5100 ft
KB Correction 0 ft

[Alt-3] Pump

Plunger Dia. 1.5 in
Pump Intake 5226 ft

[Alt-4] Polished Rod

Diameter 1.5 in

[Alt-2] Rod String

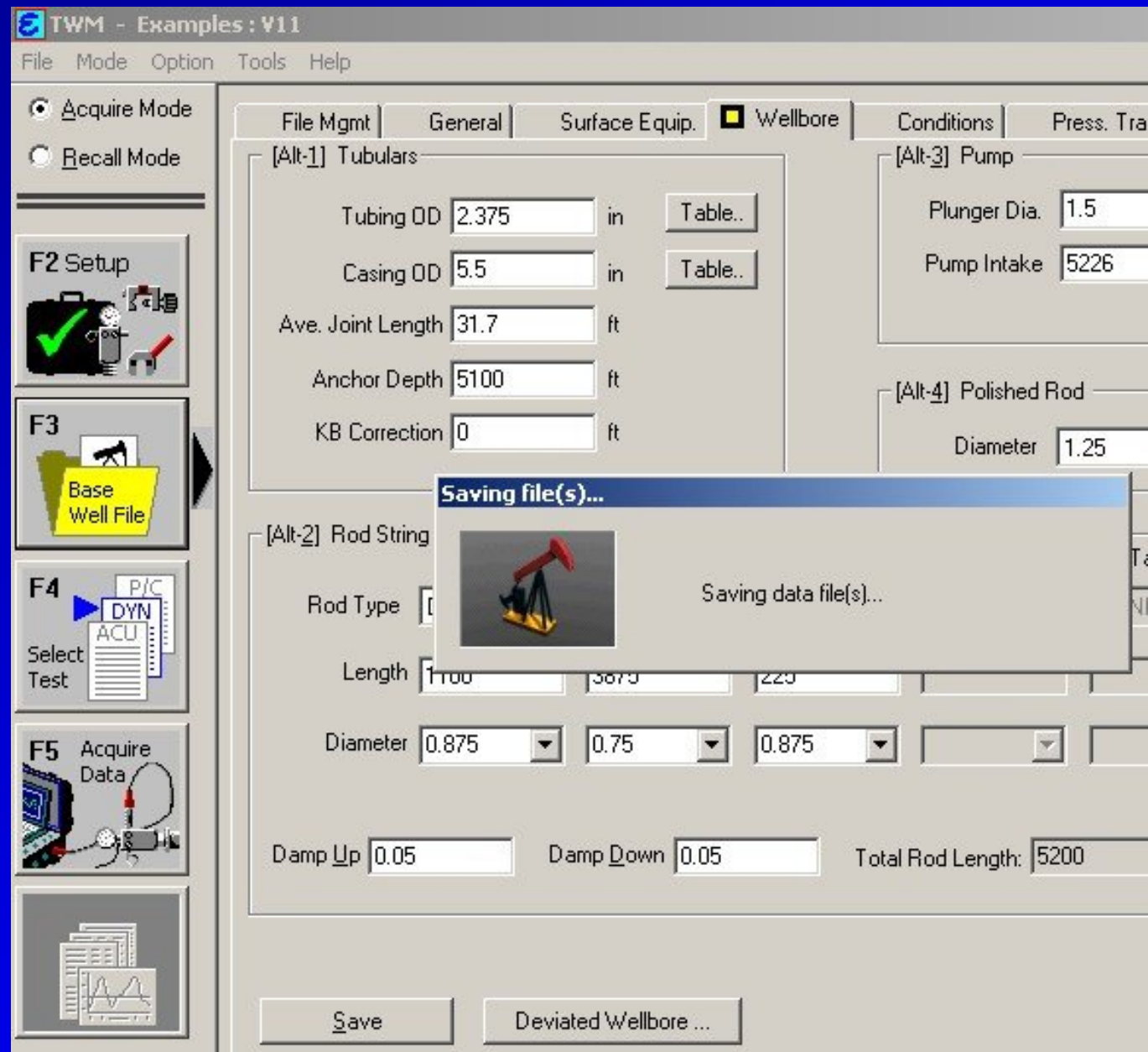
	Top Taper	Taper 2	Taper 3	Taper 4	Taper 5	Taper 6
Rod Type	D	D	D	NONE	NONE	NONE
Length	1100	3875	225			
Diameter	0.875	0.75	0.875			

Damp Up 0.05 Damp Down 0.05 Total Rod Length: 5200

Save Deviated Wellbore ... ? < Pg Up

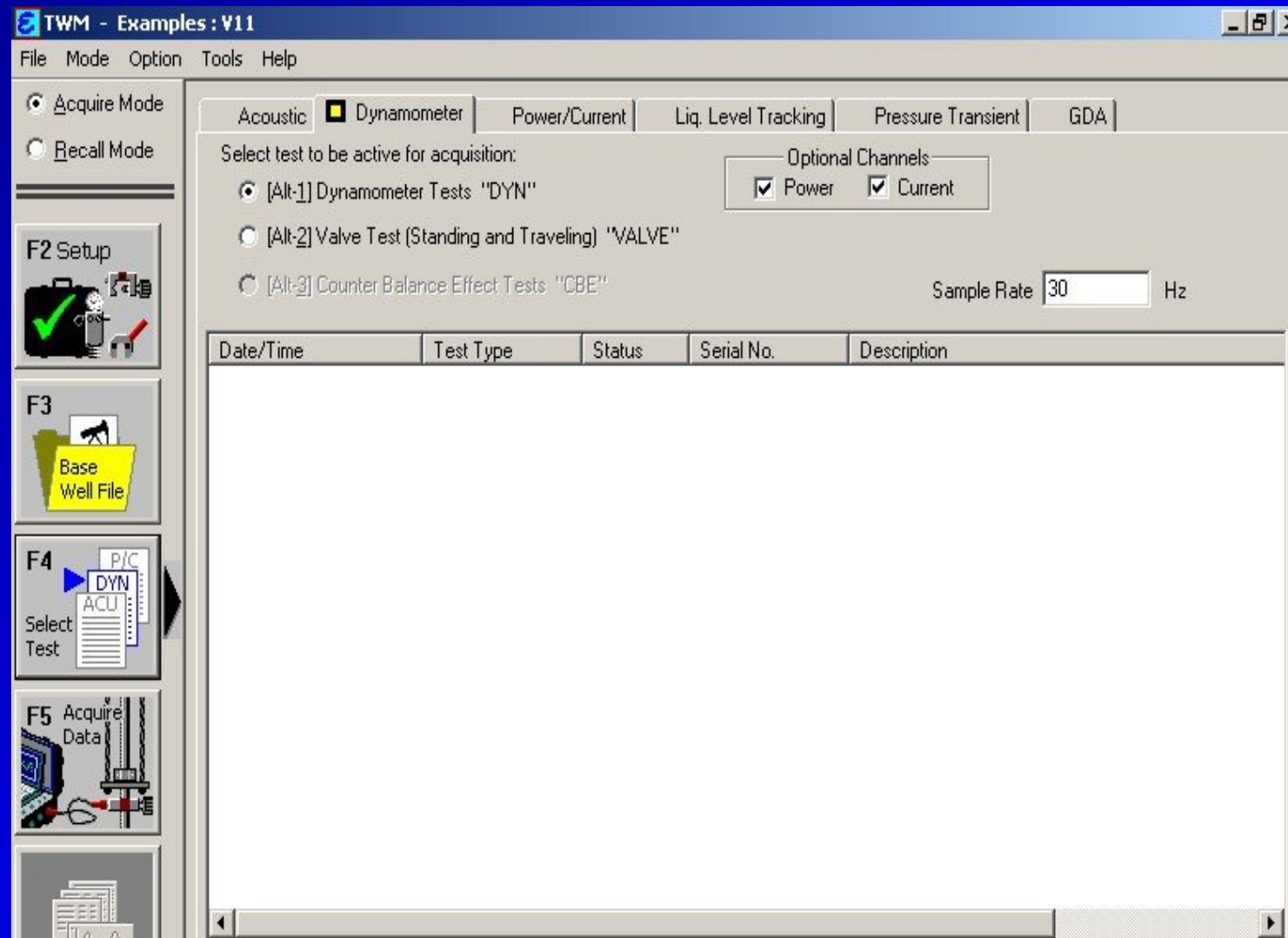
Save Changes to Base Well File

Click the **Save** button to be sure to save changes to the base well file.



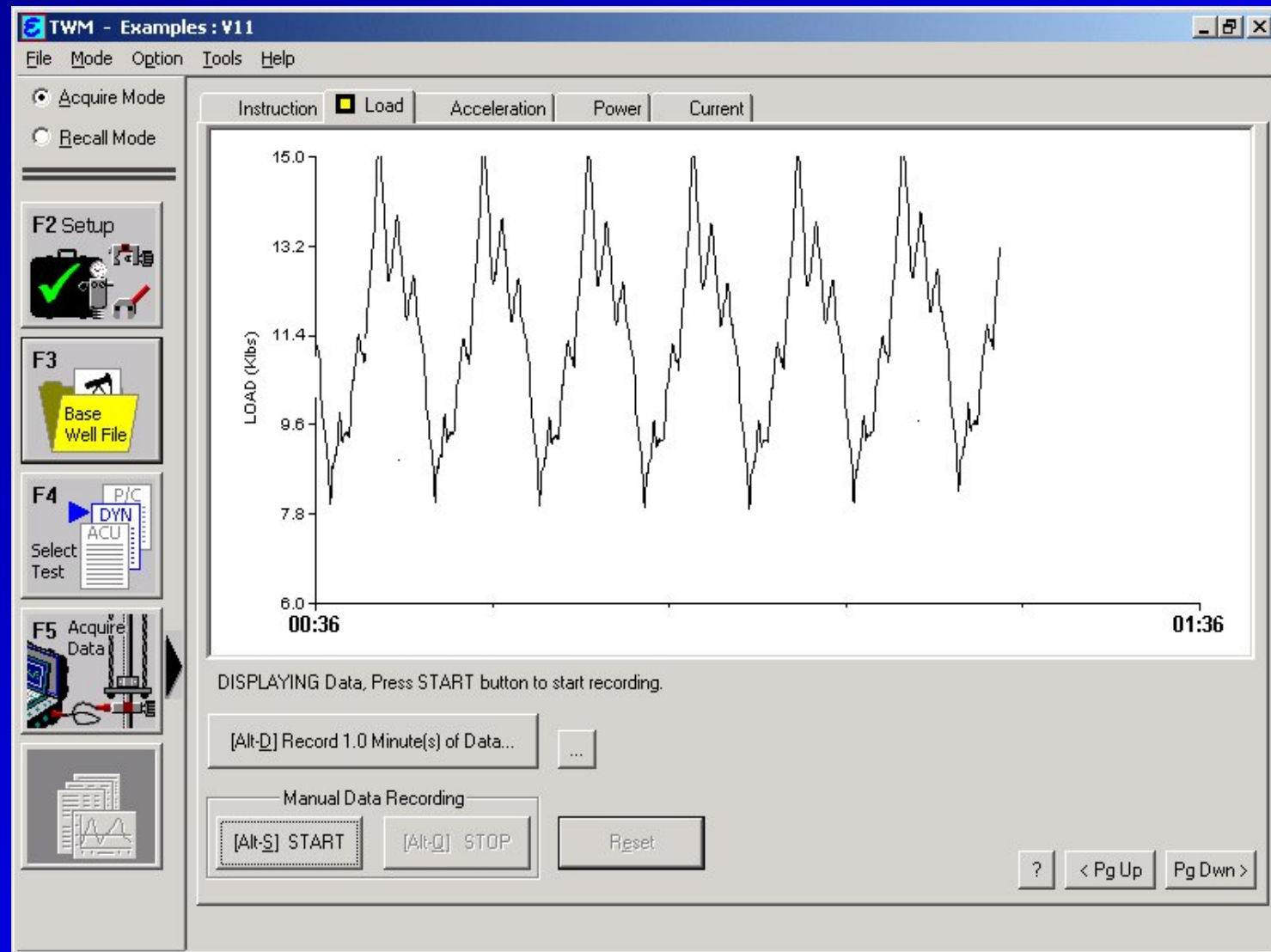
Select Type of Data Acquisition Test

1. Select **F4** to Select Test type to be acquired.
2. Click the **Dynamometer** Tab to indicate that DYNO data will be acquired.
3. Select **F5** to Acquire Data



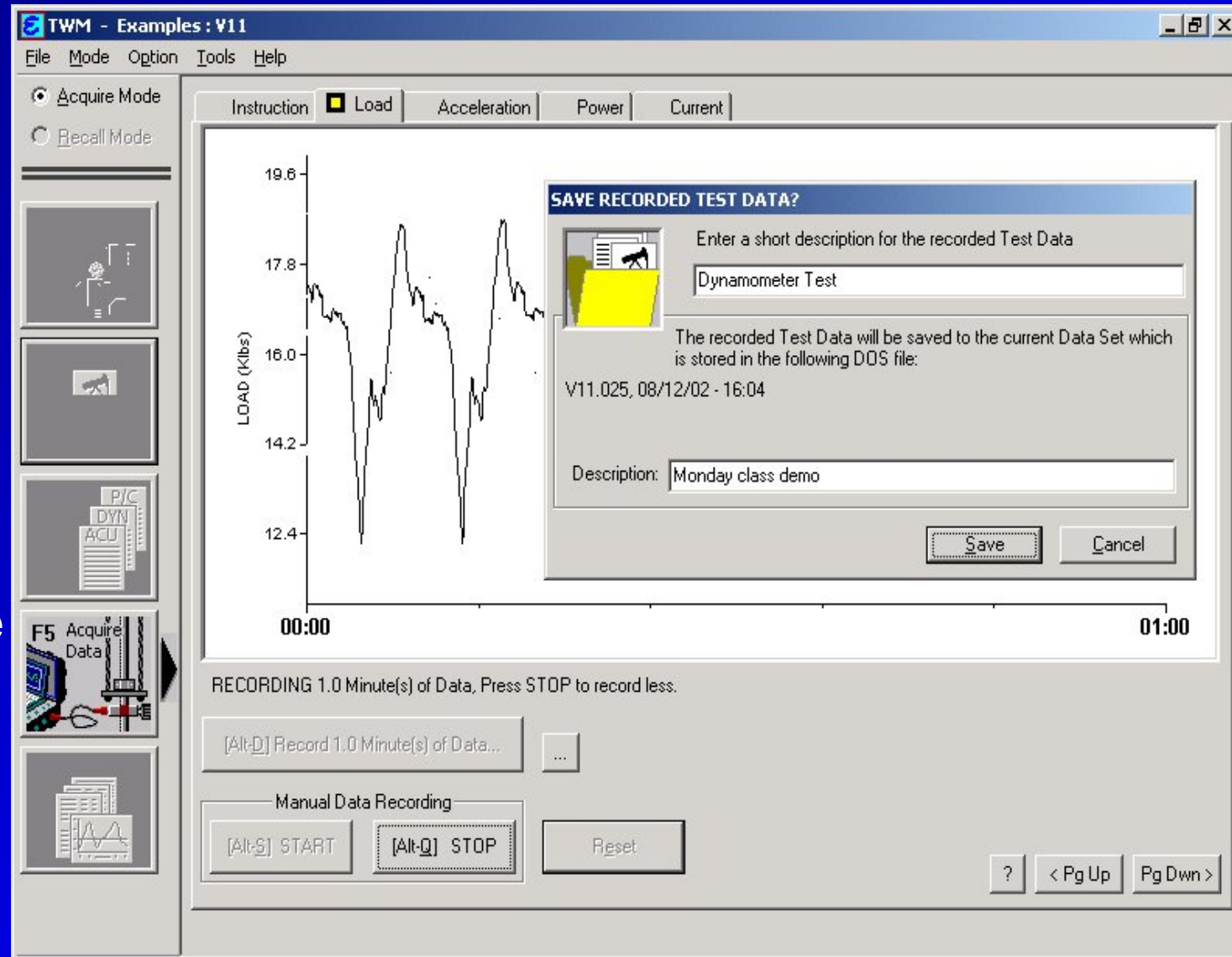
Click START for TWM Automatic Display of Relative Rod Loading

1. Click **Alt-D** to Record 1.0 Minute of DYNO Data.
2. Click **Alt-S** to START acquiring data for a specific length of time.
3. Click **Alt-Q** to STOP acquiring DYNO data.



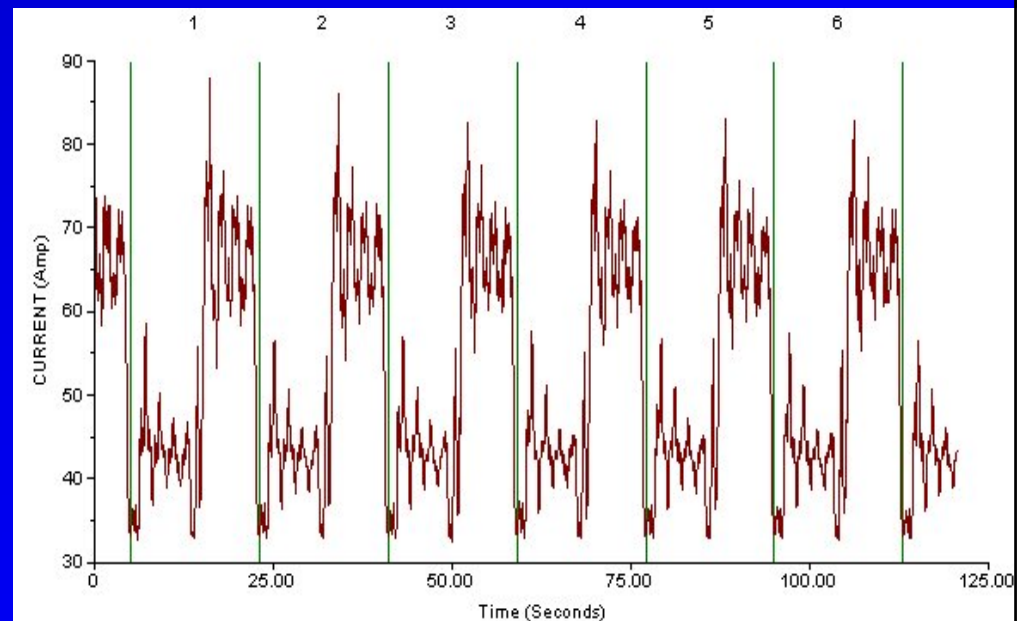
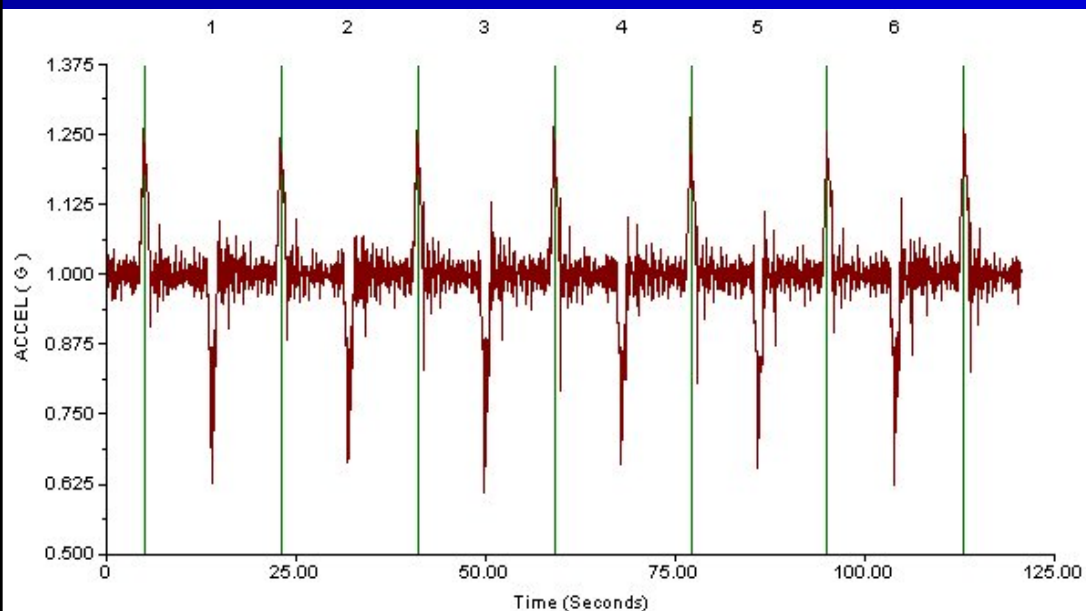
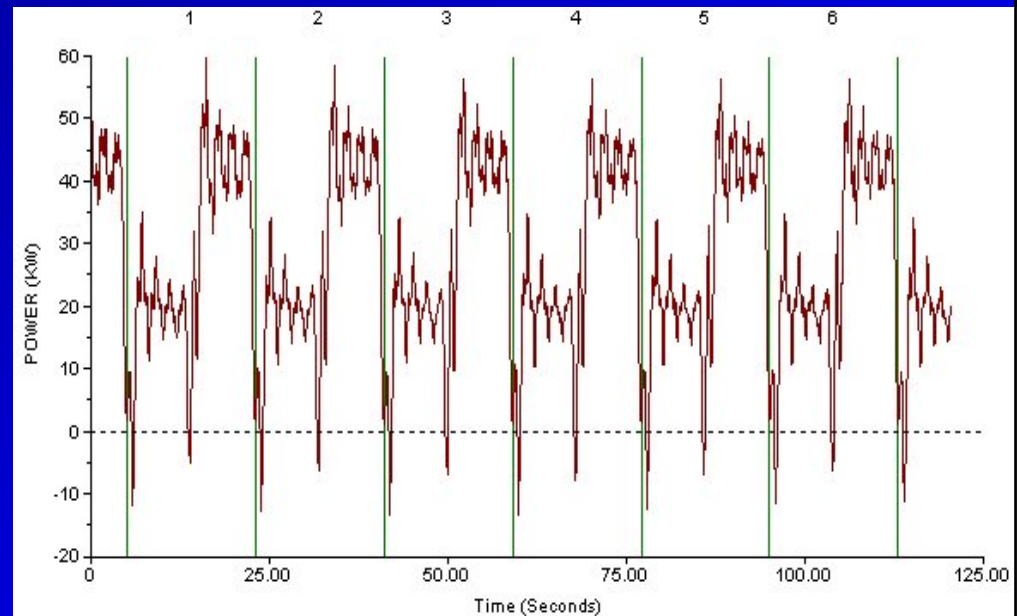
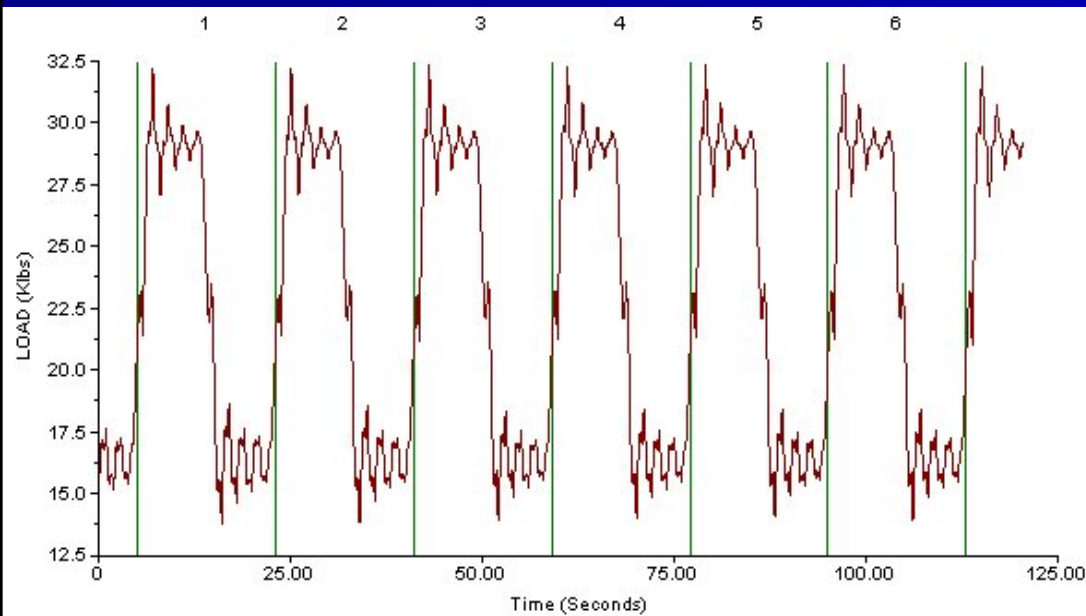
Click Save Button to Store Data in File

1. After 1 Minute or Alt-Q button is clicked, TWM prompts user to save recorded test data.
2. Two fields are available for the user to enter description for the session.
3. Click **Save** button to store acquired data.



Acquired Dynamometer Data

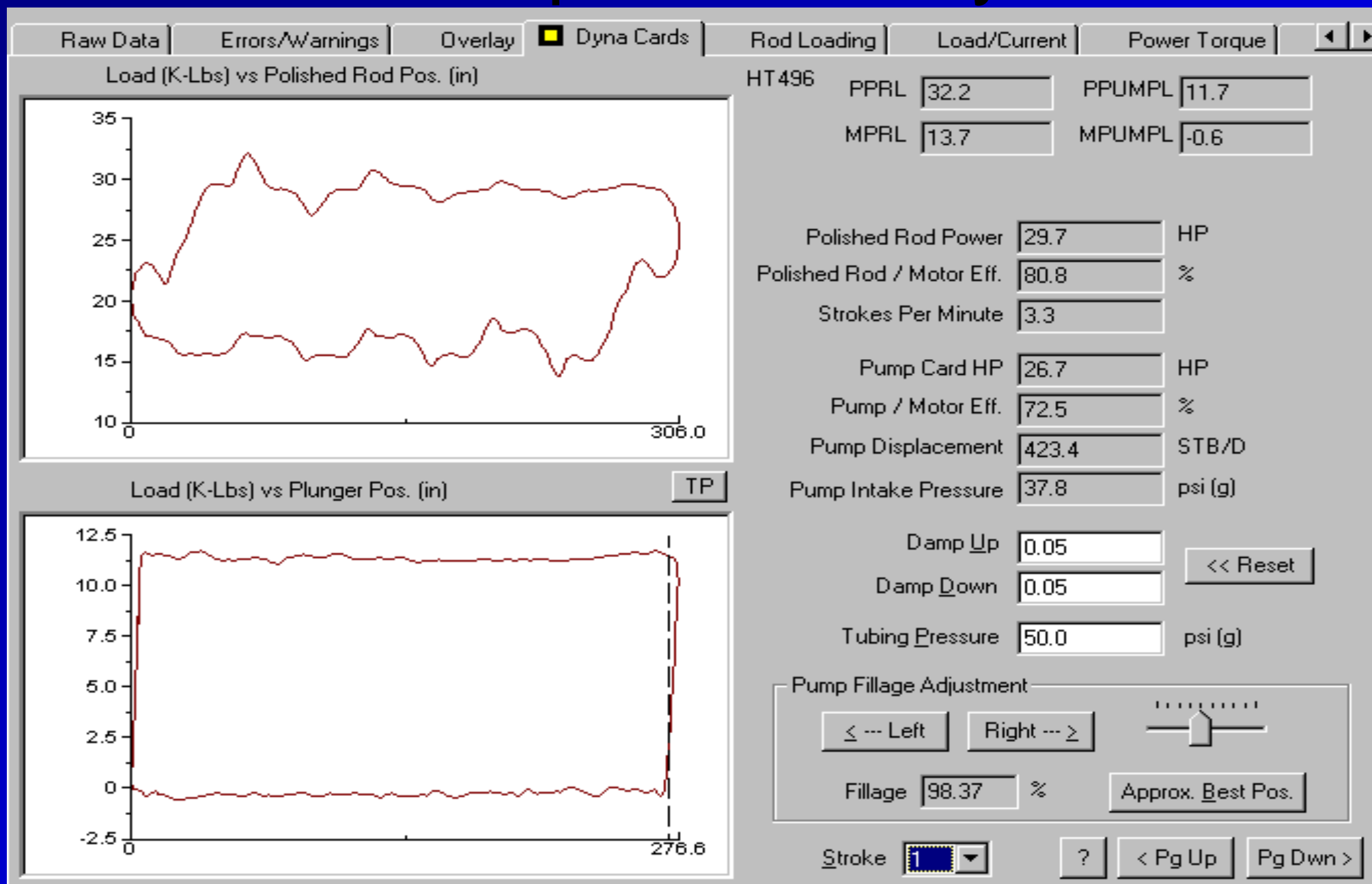
Load, Acceleration, Power, Current



DYNAMOMETER SURVEY ANALYSIS ANSWERS THE FOLLOWING QUESTIONS:

1. Is the well pumped off?
2. What is the pump intake pressure?
3. What is the pump fillage? And pump displacement?
4. What is the current pumping speed?
5. Are the traveling and/or standing valves leaking?
6. Are the maximum and minimum rod loads within limits?
7. What is the polished rod and pump horsepower?
8. Is the gearbox overloaded? Is the unit properly balanced?
9. What movement of the counterweights will balance the unit?
10. Is the downhole gas separator operating effectively?

Dynamometer Surface Card And Pump Card Analysis:



Is Rod Loading Within Limits?

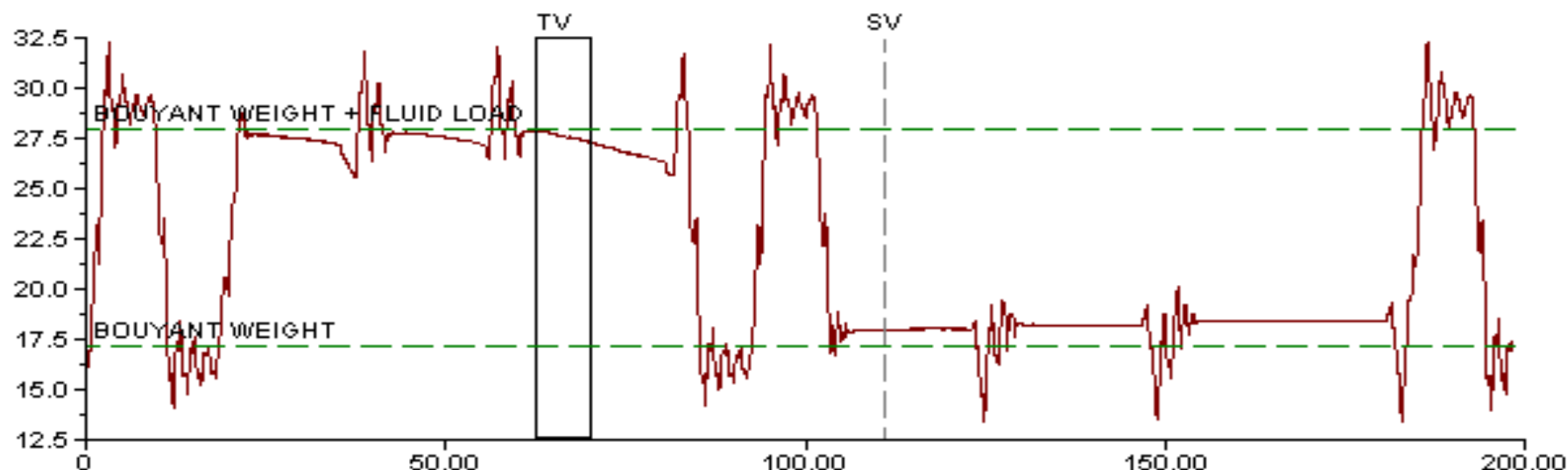
Raw Data		Errors/Warnings		Overlay		Dyna Cards		<input checked="" type="checkbox"/> Rod Loading	Load/Current		Power Torque	
Top Rod Loading As % of Goodman for Given Grades												
		C	D	K	H							
	1.0	114.6	95.6	119.3	72.2							
Service Factor	0.85	128.3	107.9	133.3	84.9							
	0.60	160.4	137.5	165.9	120.3							
						Beam Loading	64.0 %					
Rod Loading At Top of Tapers As % of Goodman												
		Top Taper	Taper 2	Taper 3	Taper 4	Taper 5	Taper 6					
Rod Type		Corod SE	Corod SE	Corod SE								
Diameter	in	1.0625	1	0.9375								
<hr/>												
	1.0	72.2	79.4	80.1								
Service Factor	0.85	84.9	93.4	94.2								
	0.60	120.3	132.3	133.5								
Rod Stress	Max	36093	39689	40050								
psi	Min	16011	18993	17890								

Are Traveling And Standing Valve Loads OK?

Valve Analysis

Traveling Valve Load (K-Lbs) vs Time (sec)

HT 496



Traveling Valve Analysis

Calc. Bouyant Rod Wgt. + Fluid Load lbf

Measured Load lbf

Leakage Interval

sec

Leakage STB/D

--> | <--

<-- <-- >> >>

≤ --- Left

Right --- ≥



Calculated Fluid Load lbf

Standing Valve Analysis

Calc. Bouyant Rod Wgt. lbf

Measured Load lbf

Intake Pressure psi (g)

≤ --- Left

Right --- ≥



?

< Pg Up

Pg Dwn >

After the Dynamometer test, the Horseshoe Transducer, Hydraulic Jack and Spacer are removed in reverse manner leaving the spool on the well for another test when desired.