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Operation of the SSD7120 verification system.



The verification of Knock and Detonation meters has been a topic for some time. How does one truly know if the detonation meter or the knock meter are working correctly? Is the spread linear as it relates to the range of the input voltages and settings on the knock meter dial. It is possible that the meter that is on the engine isn't linear and falls outside the 2point limits. We have developed a new technique to effectively test the Knock meter over the 0 to 100KI range and Detonation meter over the D1's range of output voltages 1.0V to 0.200V. This system allows one to test the meters and cables at various voltages and meter/spread settings to check for dead spots in the meter/spread rotors, cables and movements. Checking for the systems linearity which should be no more than 1% of full scale



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Run these tests with the engine stopped to prevent any electrical interference or EMI

Knock Meter Testing Procedure:

WARNING!!!! These meters are very fragile. Do not under any circumstances leave the meter contacts exposed to any voltage sources. A voltage above 0.0265 can damage the meter. Only preform the test with the voltage dropping adapter in place. We are not responsible for any meter damage resulting in the misuse of the calibrator and adapter.

Depending on the type of meter you have the voltages vs readouts may vary. This is due to each manufacturer Weshler, Meter Mod and Weston all have different meter resistances which will affect the voltage divider. This device allows the technician to successfully test all combinations of meters but you may not be able to achieve full scale deflection since you will change the dialed in voltage due to variation in cable and meter. SEE Note 1; Note 2

We would also strongly suggest that the meters resistance be checked at this time to determine if it is suitable to test at this time. It should be ohmed with a separate Multimeter they must fall in the 7.31 to 9.89 ohm range with the cable connected. If it falls in the specified range begin connecting the meter to the SSD7120 and proceed through the testing. If the resistance falls outside of the range remove the cable and test each part separately the meter and each leg of the cable. Replacing the defective part with new or rebuilt that satisfies the range. Don't be surprised if the needle moves on the meter but no damage will be done.

Before you proceed with any testing make sure you should mechanically zero the knock meter looking at it straight on rather that from an angle due to issues with parallax.

Start with the SSD7120 in the OFF position!

With supplied adapter connect it to the cable on the tester then connect the other end to the Knockmeter meter. Turn on the tester SSD7120. Looking at the readout turn the knob to obtain the values below. You should read full scale +/- 1%..

Tester Voltage Approx for 100KI	Meter and Cable Resistance
0.98500	7.31
0.84000	8.6
0.82800	9.08
0.73200	9.89

After establishing 100KI write down the value on the SSD7120. Multiply the value by 0.75 this is 75 KI. BY 0.50 is 50 KI and 0.25 is 25 KI. This should be within 1 KI



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Example: for a Meter-mod Meter

METER	
SSD7120 voltage displayed	Meter Dial reading
0.8289	100
0.6237	75
0.4102	50
0.205	25

After you have checked the meter and are satisfied with the results, turn off the SSD7120 meter and disconnect the cable. Then plug the meter cable back into the SSD7000 or the 501. Then proceed to checking system linearity.

Detonation Meter and Knock Meter Procedure: Linearity Test

Run this test with the engine stopped to prevent any electrical interference or EMI. We have established a test to check starting at 0.200 vdc to 1.00 vdc with 9 meter readings to be tested at each voltage value (5/0 set/10,20,30,40,50,60,70,80,90). Each output value has a specific corresponding set METER value at given SPREAD with the voltage remaining steady through each range.

- 1) Turn off the Detonation meter and write down current Meter/Spread values for reference.
- 2) Disconnect the pickup cable from the Detonation meter or the D1 pickup depending what tester accessories you have. Connect the SSD7120 source (0.200 to 1.00VDC) to the input of the SSD7000 or 501. Please note the meter setting will change if plugged directly into the Detonation meter vs if you have connected to the D1 pickup cable port with the adaptor.
- 3) Set the value on the source to 1.000VDC initially. We will later step the voltages down to 0.200 Vdc in 0.2 increments. This will simulate the range of voltage values that come from the D1 during operation.
- 4) Mechanically adjust the Knock meter to zero as seen as close to straight on to the meter to avoid a Parallax offset.
- 5) Turn the Detonation meter on via the Power switch. Wait 10 minutes for the circuit to “warm” up before proceeding.
- 6) Set the detonation meter to Zero/Calibrate and set zero on the Knock meter (avoid parallax).
- 7) Set the Detonation meter to operate. Setting the spread dial to 5/0 for the initial set.
- 8) Adjust the Meter course and fine dials to obtain a steady 50 on the Knockmeter. The meter will vary slightly until it warms up and the circuits establish equilibrium. Also allow about 20 seconds between adjustments. Don’t be surprised if you have to run through the entire initial sequence to get a good range if the meter hasn’t been run in a while.



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- 9) Establish a Knockmeter reading of 80 by turning the spread dial to 8. Meter and Voltage should remain the same value through this.
- 10) Establish a Knockmeter reading of 20 by moving spread to 2/0. Meter and voltage remain the same. (If the value is out you may need to open the 501 series meter and readjust R254 inside the meter case but recheck first.). Adjust the meter fine dial first at 50 then recheck 20 and 80.
- 11) Repeat the steps 8,9 and 10 adjusting the meter fine dial until the meter is consistently at 20, 50 and 80, when spread is stepped up. Record these values.
- 12) Once the meter output is consistent. Turn the spread dials to 2/0 and record the value on the Knockmeter. Continue on increasing the spread value by 1/0 recording each value returned until you reach 8/0 on spread. A perfectly linear Knockmeter will produce a readout exactly 10 time the Spread dial reading. So a 2/0 on spread would equal 20 on the meter, 5/0 on spread would equal 50 on the meter and etc.
- 13) If the Knockmeter deviates more than 2 deviations from linearity at any spread control setting from 2 to 8, the Knockmeter tracking accuracy is considered suspect and the Knockmeter must be repaired or replaced.
- 14) Return to step 4 adjusting the voltage by 0.200Vdc to the next lower value. And repeat the sequence of steps to test the Detonation meter and the Knockmeter through the simulated range recording the values obtained.

15)

Voltage	Meter value (approx.)	Spread Start Point
1.00	2/0	5.0
0.800	3/60	5.0
0.600	5/4	5.0
0.400	7/1	5.0
0.200	8/7	5.0

16) Sample cal sheet. To write down values on for later reference.



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Detonation Meter Linearity		
Voltage	Meter Approximate /Spread	K.I. +/- 2.0
1.00	1.82/5.0	50
1.00	1.82/8.0	80
1.00	1.82/2.0	20
1.00	1.82/2.0 THRU 8.0	20,30,40,50,60,70,80 PASS
0.800	3.56/5.0	50
0.800	3.56/8.0	80
0.800	3.56/2.0	20
0.800	3.56/2.0 THRU 8.0	20,30,40,50,60,70,80 PASS
0.600	5.38/5.0	50
0.600	5.38/8.0	80
0.600	5.38/2.0	20
0.600	5.38/2.0 THRU 8.0	20,30,40,50,60,70,80 PASS
0.400	7.08/5.0	50
0.400	7.08/8.0	80
0.400	7.08/2.0	20
.0400	7.08/2.0 THRU 8.0	20,30,40,50,60,70,80 PASS
0.200	8.64/5.0	50
0.200	8.64/8.0	80
0.200	8.64/2.0	20
0.200	8.64/2.0 THRU 8.0	20,30,40,50,60,70,80 PASS



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17) Restore the meter settings you wrote down in step 1 to dials and return the engine to operation.

Using the adapters and cables:

Pickup Cable adapter:

This supplied part connects to the silver connector on the output cable of the SSD7120. Once connected it now will plug into the end of the D1 pickup cable. Once connected all tests the linearity of the Knockmeter, pickup cable and the SSD7000 or 501 can be tested.

This adapter allows testing of the complete system at one time. This will also check if the pickup cable is resistive or bad if the results vary.

Front facing ports (red/black): Can be used as an external monitoring port for a second voltmeter or used with a cable to drive the D1 pickup end. If the port is used, the main output cable is left disconnected.

Accessory cable:

The SSD7120 can be configured to have a cable included with Red and Black plugs at one end and a red plug with an alligator clip at the other. The cable plugs into the front of the tester at the red and black ports. Once connected to the tester, disconnect the pickup cable off the D1 pick up and move to a non-conductive surface. Put the red probe end into the black connector at the tip of the pickup adapter. The black alligator clip can connect anywhere on the body. The screw heads on the cap are a good location.

Once connected Rerun the procedure if the voltage values change from 1.0 to 1.25 to obtain the same KI setting with a fixed meter/spread setting, you may have a resistive pickup cable that is bad or going bad.

Meter Adaptor:

A Male to female adaptor with a precision resistance. This adaptor must be used when testing the Knock meters. Never connect the SSD7120 directly to the Knockmeter under any circumstances

Note 1: According to the original specifications all meters shall be 8.6 OHMs +/- 15% (7.31 to 9.89 ohms), when connected to a voltage source of 26.5millivolts in series with a 6.5ohm resistor the meter should read 100%+/-1%. This equates to a voltage at the meter of 0.015039 volts for a deflection of 100KI. *Instrument Study Group Dec8, 1975 Specification, calibration, and checking of the weston model 271 Knockmeter*

Note 2: This was set up based on a Meter Mod meter with a freshly soldered cable. (0.45ohm/leg) and a resistance of 9.08ohms. The adapter will place 0.015693 volts to the meter for a deflection of 100KI.