
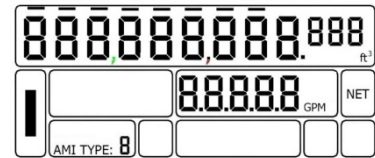




MASTER METER OCTAVE TESTING GUIDE

Pre-Test Information

- The Octave does not offer field calibration. All tests are done as a measure of confirming meter accuracy. If you did not achieve acceptable test results, please consult the TROUBLESHOOTING section of this document.
- The Octave is constantly measuring flow as low as 1/1,000th or 0.001 of a measuring unit (gallon, cubic foot, cubic meter, or acre foot).
-  The Alert/Alarm icon of the Octave register indicates either an empty pipe or other fault. This icon will go away when the sensors are wetted meter.



Sample Octave Register (SW 4.00 and greater)

Procedures

Field Test

Master Meter recommends following safe confined space entry procedures before entering a vault, pit or any other confined space. If a confined space program is not established, consult OSHA document 1910.146.


- 1) Connect hose to the test port. For best results, it is recommended that the test port is at least 2 pipe diameters downstream of the meter.
- 2) Flush meter and open the service bypass line (if available) then close the downstream valve. Continue flushing until water clears up. Once flush is complete, connect fire hose to the portable test meter.
- 3) Slowly pressurize the fire hose, ensuring the hose has no sharp bends or kinks. Once the Octave begins measuring flow, you are ready to start the first test.
 - If the outlet service valve is not completely turned off some water may leak by during the test and cause test uncertainties and errors. Do not begin until the Rate of Flow is at 0.000.
- 4) Record the start read of the Octave down to the lowest displayed resolution.
- 5) Reset read on portable test meter. If the tester does not have a resettable register, record the start read down to the lowest resolution.
- 6) Run first test at the desired rate of flow. Document all results. (See Table 1 for recommendations)
- 7) Record the end reads from both the Octave and the test meter. Subtract the start read from the end read from each meter to determine consumption.
- 8) *Mean accuracy** is determined by dividing the Octave consumption with the portable test meter's consumption. Next multiply the mean accuracy with the portable test meter's accuracy at that given flow rate to get *true accuracy*†.
 - Example:
 - a) The Octave recorded 100.2 gallons. Your portable tester recorded 99.9 gallons. The *mean accuracy* of the Octave is 100.3%. ($100.2 \div 99.9 = 1.003$ or 100.3%)
 - b) Your portable tester is 99.7% accurate at the flow you just ran. The *true accuracy* of the Octave is 99.3%. ($100.3 \times 99.7 = .999$ or 99.9%)

**Mean accuracy should not be determined by using the rate of flow from the portable test meter and comparing it to the indicated rate of flow on the Octave.*

†True accuracy is best determined with a calibrated portable test meter and is at best $\pm 1 \frac{1}{2}\%$ of the meter's true accuracy due to consistent flow control and the repeatability of both the portable test meter and the Octave.




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- 9) If the meter is operating within acceptable standards of accuracy proceed with next test.
- 10)  If the meter is not operating within acceptable standards, repeat the test to check for repeatability.
 - If the second test provides acceptable results, run the test one more time to establish repeatability for that flow rate.
 - If the second test provides unacceptable results, consult the Troubleshooting section at the end of this procedure.
- 11) When all tests are completed, flush the line and open the downstream valve before closing the bypass valve.

Shop Test

- 1) Place meter(s) on the test bench. When testing multiple meters, have at least two pipe diameters between each meter.
- 2) Flush air from the test bench. Continue flush until all air is out of the bench. The Octave is ready for test when the alert / alarm icon is no longer illuminated and the Octave begins measuring flow.
- 3) Close the drain valve on the tank after it is fully drained.
- 4) Record the start read of the Octave down to the lowest displayed resolution.
- 5) Run first test at the desired rate of flow. Document all results. (See Table 1 for recommendations)
- 6) Record the consumption of the meter(s). Accuracy is determined by dividing the Octave's consumption with total tank volume.
 - Example:

The Octave recorded 99.7 gallons. Your tank total was 100.2 gallons. The accuracy of the Octave is 99.7%. ($99.7 \div 100.2 = 0.995$ or 99.5%)
- 7) If the meter is operating within acceptable standards of accuracy proceed with the next test.
- 8)  If the meter is not operating within acceptable standards, repeat the test to check for repeatability.
 - If the second test provides acceptable results, run the test one more time to establish repeatability for that flow rate.
 - If the second test provides unacceptable results, consult the Troubleshooting section at the end of this procedure.
- 9) When all tests are completed, remove the meter from the test bench.




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Troubleshooting

PROBLEM	POSSIBLE CAUSE	REMEDY
Meter tested slow	Air in line	Flush meter a little longer and try again.
	Exceeded capacity of test hose or test bench.	Reduce flow rate and run test again.
	Incorrect start read or end read	Confirm reads and test meter again.
	Portable Test Meter's accuracy curve was not considered	Each portable test meter has its own flow characteristics that need to be considered when performing a field test. A test meter's calibration can alter the Octave's apparent accuracy by an additional $\pm 1.5\%$. Consult Field Testing Procedures Step 8.
	Insufficient resolution on the register	Increase test quantity size or lower resolution on the Octave register. For more detailed explanation of register resolution, see the Pre-test Setup and Information section at the beginning of this procedure.
	Improper installation	Consult installation guide to make sure the installation, and not the distribution system is the source of the air. Test port is too close to the meter. It is recommended that any type of tee, including test ports, are a minimum of 2 times the pipe diameter downstream of the Octave. Move the test port further downstream.
	Transducers are blocked or dirty.	Remove meter to ensure debris is not in the line. Clear out debris or clean off transducers.
Meter tested fast	Leak by on a downstream valve	Cycle valve and make sure it is completely turned off.
	Incorrect start read or end read	Confirm reads and test meter again.
	Portable Test Meter's accuracy curve was not considered	Each portable test meter has its own flow characteristics that need to be considered when performing a field test. A test meter's calibration can alter the Octave's apparent accuracy by an additional $\pm 1.5\%$. Consult Field Testing Procedures Step 8.
	Improper installation	Consult installation guide to make sure the installation, and not the distribution system is the source of the air.
	Insufficient resolution on the register	For more detailed explanation, see the Pre-test Setup and Information section at the beginning of this procedure.



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PROBLEM	POSSIBLE CAUSE	REMEDY
Meter tested fast...(cont.)	One isolation valve on test meter is partially open.	Ensure valves not in use are off.
Meter stops registering during test	Air in line	When air is in the line for less than 3 seconds the Rate of Flow will stop or drastically fall off. If air is in line for greater than 3 seconds the Alert / Alarm icon will be illuminated.  In both cases, air must be purged completely or test uncertainties and errors will continue.
	Exceeded capacity of test hose or test bench.	Reduce flow rate and run test again.
	Improper installation	Consult installation guide to make sure the installation, and not the distribution system is the source of the air.
Meter does not register water when running a test	Air in line	See above remedy for air in line.
	Valve is off	During the test, the upstream or inlet valve must remain on.
	Improper installation	Consult installation guide to make sure the installation, and not the distribution system is the source of the air.
	Flow is below programmed low flow cut off	Increase flow rate and meter will begin registering
	Flow is above programmed high flow cut off	Increase flow rate and meter will begin registering
After each field test is completed, the meter continues to run a little forwards and backwards	Pressure surge	This is common when using a flexible fire hose, or other non-rigid pipe to run water to a test meter. Due to the flow sensitivity of the Octave picking up flow as low as 1/16 th a GPM, some movement in the pipe due to pressure surges will be registered.



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Table 1 – Sample Octave Test Flows

Size	Normal Operating Range - Low Flow Rate								
	Flow Rate†		Recommended Minimum Display Resolution ‡			Test Quantity*			Accuracy Limits §
	GPM	Lt/s	USG	FT ³	M ³	USG	FT ³	M ³	
2"	0.5	0.03	0.01	0.001	0.00001	10	1	0.05	98.5% - 101.5%
3"	1	0.06	0.01	0.001	0.00001	10	1	0.05	98.5% - 101.5%
4"	1.5	0.09	0.01	0.001	0.00001	10	1	0.05	98.5% - 101.5%
6"	3	0.18	0.1	0.01	0.00001	10	1	0.05	98.5% - 101.5%
8"	5	0.32	0.1	0.01	0.0001	10	1	0.05	98.5% - 101.5%
10" & 12"	14	0.88	0.1	0.01	0.0001	100	10	0.5	98.5% - 101.5%

Size	Normal Operating Range - Intermediate Flow Rate								
	Flow Rate†		Recommended Minimum Display Resolution ‡			Test Quantity*			Accuracy Limits §
	GPM	Lt/s	USG	FT ³	M ³	USG	FT ³	M ³	
2"	2	0.12	0.01	0.001	0.00001	10	1	0.05	98.5% - 101.5%
3"	4	0.25	0.01	0.001	0.00001	10	1	0.05	98.5% - 101.5%
4"	6	0.37	0.01	0.001	0.00001	100	10	0.5	98.5% - 101.5%
6"	12	0.75	0.01	0.001	0.00001	100	10	0.5	98.5% - 101.5%
8"	20	1.25	0.01	0.001	0.00001	100	10	0.5	98.5% - 101.5%
10" & 12"	50	3.15	0.01	0.001	0.00001	100	10	0.5	98.5% - 101.5%

Size	Normal Operating Range - High Flow Rate								
	Flow Rate†		Recommended Minimum Display Resolution ‡			Test Quantity*			Accuracy Limits §
	GPM	Lt/s	USG	FT ³	M ³	USG	FT ³	M ³	
2"	100	6	0.1	0.01	0.001	500	50	3	98.5% - 101.5%
3"	200	13	1	0.1	0.001	1,000	100	5	98.5% - 101.5%
4"	300	19	1	0.1	0.001	1,000	100	5	98.5% - 101.5%
6"	400	25	1	0.1	0.01	2,000	200	10	98.5% - 101.5%
8"	500	32	1	0.1	0.01	2,000	200	10	98.5% - 101.5%
10" & 12"	500	32	1	0.1	0.01	2,000	200	10	98.5% - 101.5%

- † Flow rates for testing should not exceed the maximum capacity of the field testing port size or test bench capacity. For example, a field testing port size of 2" should not exceed a maximum flow rate of approximately 250 GPM (depending on system pressure). If the test hose does not remain fully pressurized, lower the flow rate and restart the test.
- ‡ Master Meter recommends a minimum display resolution on the Octave register of at least 1/1000th of the test quantity. For example, the Octave should display 0.1 gallons if the test quantity is 100 gallons. This allows maximum resolution to the 1/10 of a percentage. To help keep the visual reading at a desired resolution, Master Meter recommends all SW 4.00 meters utilize the full 12 digit display and leave all 12 digits active.
- * These test quantities are suggested volumes. Longer test quantities help to eliminate any system or testing errors. If smaller quantities are required, the total test time should not drop below 2 minutes.
- § Accuracy Limits are based upon the Octave register displaying the appropriate resolution for a specified test flow. If you do not have the recommended display resolution programmed on your Octave display, it is important to consider the following:
 - Display resolution of 1/100th of the test quantity could have a displayed accuracy variance of 1% due to the way the actual registration is visually displayed.
 - Display resolution of 1/10th of the test quantity could have a displayed accuracy variance of 10% due to the way the actual registration is visually displayed.