FAQs

Common to All Systems

Please explain correction factors. If I am 2,000 feet above sea level, why do I need to correct the baro for this? Doesn't the station pressure reading indicate the pressure at the altitude and temperature where the barometer is located?

The dyno uses correction factor information (Baro P, Vapor P, and Air Temp) to compute a power correction formula so raw power measured at 2,000 feet can be corrected to sea-level power levels. The only reason to correct the Baro is to set it properly once to a known baro P reference. It is like setting your watch to the correct time—you do not repeatedly correct the Baro.

Please explain the friction torque correction. Aren't the power levels already affected by the current friction within the engine?

No. The measured torque is what is left over for the power-absorption unit to measure. Therefore, friction torque was already "consumed" inside the engine, so when you apply the correction factor (a percentage multiplier), you want to correct *all* torque produced by the combustion process. To do this:

1. Add the estimated friction torque to the measured torque.
2. Apply the sea-level correction factor.
3. Subtract the estimated friction torque to derive the sea-level corrected torque value.

Lambda Probe

I had to cut the handles off the O2 probes for clearance and plan to cut the 90-degree junction at the back. What is the reason for the 90-degree junction?

SuperFlow added the 90-degree angle to address issues with the Lambda sensor. It is the preferred design. Any modifications to the piece are at your own risk. We do not recommend putting the aluminum plenum on straight.

Does leaded gas affect lambda probes?

Leaded gas will eventually foul the sensor. So will Methyl Tertiary Butyl Ether (MTBE) and ethanol. Consult the lambda sensor manufacturer's information for specifics. However, many of our customers use the sensors with leaded gas even though it shortens the sensor's life expectancy to an unknown degree.

How do I place different loads on the eddy current for warm-up purposes?

Use the curved blue-arrow key on the handheld controller to manually apply a percentage of load from 0–100%. This can be done at any time during warm-up.

Servo Control

My SF-901 has an S&S 124 cu.in. V-twin motor running and cannot get the motor to hold a constant rpm. I've tried various settings between the capacity valve and the boost valve, but the solenoid seems to wander when pulling down to starting rpm. The motor creates approximately 140 lb•ft of torque and 120 hp.

The difference between manual control and servo control is that we close the load controller loop onto the tachometer. The computer in the console attempts to control the motor to rpm using the servo valve. The most likely cause is an intermittent rpm signal to the console.

Remove the tach pickup (*very carefully*) and inspect the tip for cracks or obvious damage. Pins 1 and 2 should read approximately 150 ohms, although the resistance is not critical.

1. Push a long, thin, common screwdriver down the hole of the tach pickup and engage the 60-tooth tach gear.
2. Tap the gear using the screwdriver and a small hammer. If it budges, then it's loose and you must go in through the front of the absorber (remove the motor, input shaft, and drive hub) to tighten it.
3. You could try to run a manual valve ramp test which closely simulates the accel test. It does not matter what the engine rpm is because it simply decays the servo valve from wherever you place it to wherever the upper rpm is reached.

Contact SuperFlow Customer Service at **service@superflow.com** if you need help with this procedure.

If the above SF-901 problem were due to an intermittent rpm signal, wouldn't that also be apparent in the rpm indication on the console?

The control system needs to respond much faster than the console display could ever respond. The display is slow and may not show the intermittent signal.

You can, however, watch an analog representation of the rpm signal on pin 13 of the 802 board in the console. SuperFlow creates a signal that is directly proportional to the tachometer frequency.

- 0V = 0 rpm
- 10V = 10K rpm

The control system controls to the "analog tach." Use your voltmeter to watch it with the engine running. It should be steady with the rpm signal.

The 802 board is the small board to the right of the large Central Processing Unit (CPU) board. Count the edge connectors from left to right. Edge connector #13 is your measuring point.

Engine Dynos

At times my engine dyno cannot load, and it flares at higher rpm. Also, at one point the prime light would not go off and the dyno made a howling noise. Is the dyno seal bad?

For the dyno to operate properly, the absorber must pump water into it from the sump tank below it. For the absorber's internal pump to work, it must first be primed. If your system is wired as a standard SuperFlow engine dyno, when you turn on the ignition, a solenoid valve under the absorber opens and allows water from the supply (under pressure) to enter the pump cavity and bearing seal feed. When the pump cavity is full of water and the engine starts, the internal pump is primed and pumps the water upward as it should.

If the pump cavity does not have water in it, the pump is not primed and will not pump water. When you open the pressure boost valve, it forces water into the pump cavity, and the pump then starts working. The noise you hear is air pumping through the absorber.

The pump will not prime because:

1. If you do not leave the ignition on long enough before starting the engine, the dyno prime line does not have enough time to fill the pump cavity. SuperFlow recommends waiting 15 to 20 minutes after turning the ignition on before starting the engine.
2. The dyno prime line is plugged and water cannot flow through it to the pump cavity and pump seal. This can be relatively dangerous because if water is not getting to the main bearing seal, it will damage the seal. You can check this by pulling the small black nylon hose off the tee fitting on the bottom of the absorber. With the ignition on, a stream of water should flow out.
3. The pump cavity cannot hold the water because of a defective foot valve in the pickup tube.

Always look at the absorber water outlet after the engine starts to ensure water is pouring out which indicates the pump is working. If not, crack it open to get the pump working; then after testing the engine, find out why it didn't prime later.

How do we improve our dyno's water supply cooling system to ensure consistency during development testing? How much engine output is converted to heat in the absorber, and how much heat goes into the engine cooling water? How large should the cooling tower be?

Keeping the water supply to less than 100°F (preferably < 80°F) is the ideal target on captured water supplies (recirculated).

It all depends on the power level of the engine under test and how long the power is applied to the water system. You can use some crude rules of thumb for quick answers such as 1 gallon of fuel (gasoline) will heat 100 gallons of water.

The overall heat load is approximately 50/50 (depends on efficiencies); another rule of thumb is that the required water use is about 10 gpm/100 hp.

Below are examples of how to look at using water for the dynamometer and engine. The engine in the example is a spark ignition engine that will produce 500 Bhp (power at the flywheel – observed). The engine cooling tower provides makeup water for the engine cooling system with the outlet water flowing back to the original reservoir. The exit temperature is 180°F. The water going into the absorber should not exceed 80°F. Plan on the delta T across the absorber at 80°F.

- *How much water flow is required to dissipate the heat independent of the reservoir thermal mass?*

$$\mathbf{gpm} = \frac{(\mathbf{Cxhp})}{\mathbf{deltaT}} = \frac{(\mathbf{5.1x500})}{\mathbf{30}} = \mathbf{85gpm}$$

for absorber for 70°F in and 100°F out. This number changes to a flow of 32 gpm for a delta of 80° across the absorber (absorber out temp of 150°F):

$$\mathbf{gpm} = \frac{(\mathbf{5.1x165})}{\mathbf{100}} = \mathbf{8.4gpm}$$

for non-pressurized cooling tower 80°F in and 180°F out. This shows that the rule of thumb of 50 gpm is a good number for an estimate.

$$\mathbf{TotalGPM} = \frac{(\mathbf{5.1x665})}{\mathbf{30}} = \mathbf{113.05gpm}$$

NOTE: *This calculation is for only the delta of 30°F for the system.*

- *If the water reservoir is only 500 gal. and starts at 70°F, how long can it run before testing must stop at 100°F with the absorber and engine cooling into the same reservoir?*

$$\mathbf{Time} = \frac{\mathbf{WtH2O(deltaT)}}{\mathbf{BTUmin}} = \frac{(\mathbf{4,170x30})}{\mathbf{28,220}} = \mathbf{4.43minutes}$$

based on thermal mass.

- *How much volume would be required to run the system for 1 hr. and not exceed 100°F?*

$$\mathbf{WtH2O} = \frac{(\mathbf{60minutes})(\mathbf{28,220})}{\mathbf{30}} = \mathbf{56,440lbs} \times \frac{\mathbf{1gal}}{\mathbf{8.3lbs}} = \mathbf{6,800gallons}$$

- *If the system volume is maintained at only 500 gal., what level of auxiliary cooling (heat exchanger) is required to keep the water reservoir to less than 100°F?*

  Delta T across the system is < 30°F, so what capacity of heat exchanger would be required? The total heat load is 500 + 165 = 665. The flow through the heat exchanger must dissipate the heat load, and the delta T across the heat exchanger would be 30°F. The heat exchanger would be a tube and shell design about 10" in diameter times approximately 7 ft. long. The cooling water flow needed would be approximately 200 gpm.

  This configuration would require delivering the water at 70°F and disposing the heated water (as in an industrial chiller design application). If using a radiator, the required radiator would be approximately 12,000 square inches of surface area (83 square feet, or roughly 9 feet by 9 feet) exposed to high-velocity air flow. With a fan capacity of 77,000 cfm, the velocity is about 10.5 mph. A radiator this size would weigh about 6,300 lbs. and hold about 100 gallons.

It is most often easier and more cost effective to increase the thermal mass (volume of water available). If using an auxiliary radiator, it should have high-velocity ambient air flowing across it. If a radiator is used for engine cooling, the heat transfers to the air, and the air must be of sufficient volume and velocity to carry away the heat necessary to decrease the heat load on the reservoir.

SuperFlow suggests consulting the book titled *Engine Testing Theory and Practice* by M. Plint and A. Martyr, 1995, Butterworth-Heinmann, ISBN 0-7506-1668-7 for an additional reference when considering test cell configurations.

Why do my oil pumps break when running Sprint car engines on the engine dynamometer?

Neither our service engineers nor mechanical engineers have never heard of this problem, so we queried an outside source:

On Sprint car engines, the same drive mechanism sometimes drives both the oil pumps (dry sump type) and mechanical fuel injection pumps. Timing belts typically drive the oil pumps (and sometimes the fuel pumps) but they can also be driven off the front of the camshaft and connected through a solid hex drive. It should be no problem to run the engine on any dyno, regardless of the drive mechanism used.

However, the dynamometer is more forgiving of torsional vibration transmission of energy to drive the oil pump through a timing belt (sometimes called a Gilmer belt or other variation). If driving the dyno through a torsional isolation device such as a drive plate, the torsional vibrations are damped between the engine and the power absorber. If it is driving through a spud drive (female splined hub connected directly to the crankshaft), then no appreciable dampening occurs.

In modern Sprint car engines, it is common to seriously lighten the crankshaft (generally prone to more torsional ringing), and if the oil pump is prone to cavitation problems, then the connection between the engine and the oil pump would be more prone to fail.

Also, if the base circle of the camshaft is reduced for stroke/rod clearance, the cam is more prone to ringing. If the oil pump drive is off the back of the camshaft, the ringing of the sometimes too-flexible camshaft would cause a level of problems.

Essentially, testing on a dynamometer does not aggravate damaging the oil pump. As an example, every NASCAR engine that sees a dyno also has a dry sump with an external oil pump on it, but the engines are driven from the front of the crankshaft.

I have an SF-901 engine dynamometer with a Televideo M910 terminal. The printouts all contain a header with the old address and telephone information. Is there any way to change the old information?

SuperFlow no longer supports the SF-901 Televideo and DOS software; therefore, at this time you have two options:

1. Completely upgrade the SF-901 electronics to SuperFlow's current SF-902 data acquisition and control system (you keep the mechanical parts of the system).
2. Purchase a WinDyn™ upgrade for the SF-901. For the upgrade you will need a Microsoft® Windows® 95/98/XP computer with a serial port that can be configured for either Com1 or Com2 to utilize this software. The SF-902 utilizes EtherNet communication with WinDyn. Both options allow the user to enter the header information.

Why is the outlet on the SF-902 sump tank so large? I must downsize this coupling to make it work. Why isn't the downsizing coupling provided with each system?

The outlet on the SF-902 tank is large because if we assume a customer is testing a 1,000-hp engine, the water flow into the tank will be 100 gpm (10 gpm per 100 hp being tested). The tank was designed hook to a large outlet because many customers use a gravity drain (SuperFlow also uses a gravity drain), and the large plumbing size was necessary for testing these high-power engines with high water flows.

SuperFlow provides a Dixon coupling with the system that adapts the quick connect to a Ø4" FNPT thread. However, Home Depot and Lowes do not carry plumbing fittings above Ø3", but a plumbing supply store does. These fittings are also readily available from McMaster-Carr and Grainger (click the blue links below to visit the sites):

- **http://www.mcmaster.com/** (in the **Find** text box, type **cam groove hose couplings**)
- **http://www.grainger.com/** (in the **Search** text box, type **cam groove**)

Chassis Dynos

AutoDyn

Which SuperFlow AutoDyn is best suited for my needs?

Because each system is unique, it is best to contact a Sales technician to match the best dyno and performance to your specific needs. Contact **sales@superflow.com** or call 1-800-471-7701 and ask for Sales.

What's the difference between a SuperFlow AutoDyn and a Dynojet chassis dyno?

The SuperFlow AutoDyn was designed for performance and engineering testing from the beginning. An inertia dynamometer is basically an accelerometer; it calculates horsepower by measuring the rate of acceleration of a known mass. While this method can provide quick results, it is hardly the most accurate way to test a vehicle. SuperFlow created the AutoDyn to provide more sophisticated testing than an inertia-only dynamometer.

Why do I need an eddy brake power absorber on my AutoDyn?

An eddy brake provides the means to load a vehicle during tests. As vehicles become more sophisticated, inertia-only testing masks more problems than it reveals. With today's computer-controlled vehicles, you need to be able to test a vehicle for drive ability, meaning, you need to provide a load. Another advantage of the eddy brake is its ability to hold a steady speed while testing. This makes fuel injection mapping easier and faster. The AutoDyn uses a load cell to measure actual torque produced during a test, and our WinDyn software can display horsepower and torque readings during a test even under steady load.

How does the handheld unit make testing easier?

The handheld control unit enables the AutoDyn operator to control the entire system while seated in the vehicle. Using the handheld unit, you can select tests to run, view data during a test, change vehicle specifications, and many other operator commands. This saves time because only one person is required to operate the AutoDyn, and this can be done without running back and forth from the vehicle to the computer.

How do you measure tire slip on the AutoDyn?

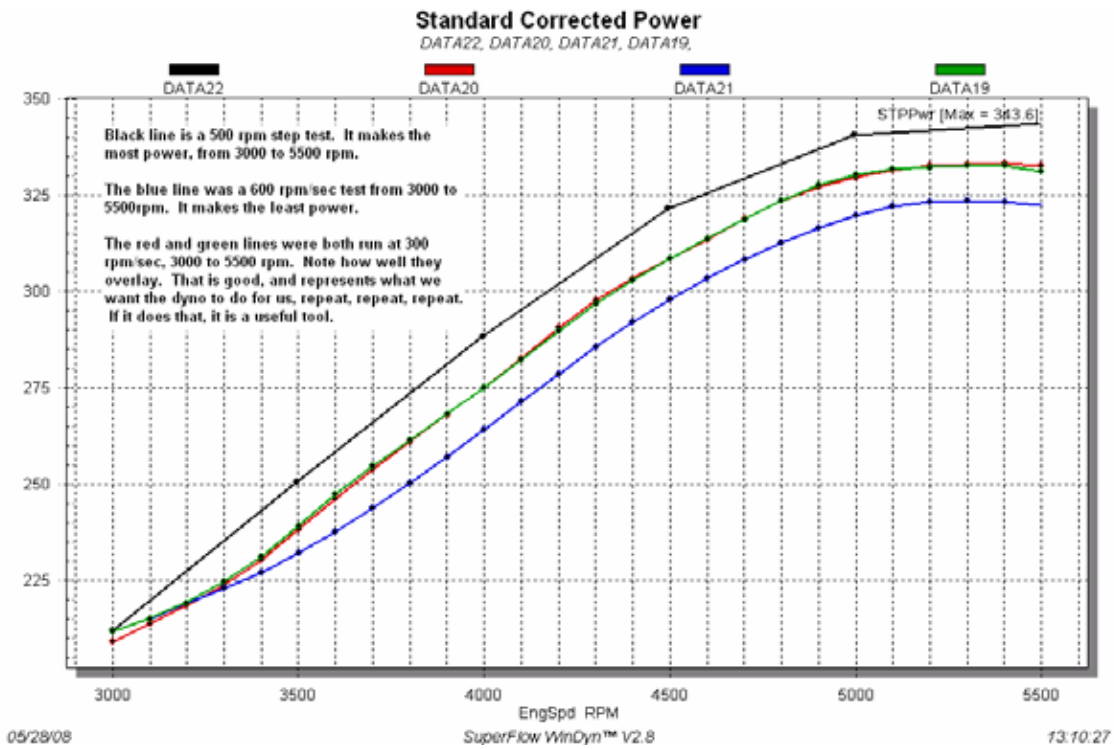
The more power a vehicle generates, the greater the chance of tires slipping on the rolls. When this happens, the dynamometer records less power than it would without the slip. Some companies recommend tying the vehicle down tighter, but this can inhibit tire growth that reduces the power the dynamometer sees. SuperFlow uses a non-contact, infrared optical wheel speed tachometer to compare roll speed to tire speed; the difference in speeds equates to wheel slip. The software can monitor this number and save it for later analysis.

Does testing in different gears result in different horsepower?

Many factors contribute to reasons why the reported horsepower (hp) is different when testing in different gears, but none have anything to do with the calculations present in the dyno. These factors include:

- Vehicle inertia is assumed in the dyno software. The value is fixed. If it is not a perfect match to the vehicle, then changing the rate of acceleration changes the dyno results.
- Altering the rate of acceleration changes parasitic losses in the vehicle drivetrain due to stress loads changing on gear faces.
- Altering the rate of acceleration changes the inertia of the air / fuel charge in the vehicle intake, thus changing the power output of the engine.
- Altering the rate of acceleration changes the amount of power "left over" at the wheels because it uses more of the engine's power output to accelerate itself and driveline components. Nothing is free.

The best choice is to dyno at the same rate because changing the rate will surely change the outcome of your test data. Below is an example of three different rates of accel on the same engine on an engine dyno (with no vehicle inertia).



From this information, decide how much a faster rate of accel will affect the output data from a dyno test performed on a chassis dyno.

Does the AutoDyn take atmospheric conditions into account?

Every AutoDyn ships with an automatic atmospheric measurement standard. Our sensor box constantly measures ambient air temperature, relative humidity, and barometric pressure. It uses its collected data to provide real-time power correction factors such as Society of Automotive Engineers (SAE) and Standard Temperature and Pressure (STP). You can view both uncorrected or corrected data through WinDyn.

The calculation of horsepower or the accuracy of the AutoDyn is not dependent on the location or conditions during a test. The performance of the internal combustion engine, however, is sensitive to atmospheric conditions, especially air density and air temperature. To compare power measurements taken at different times or places, it is necessary to compensate for differing atmospheric conditions.

What is the difference between manual load control and computer load control?

Although it is always possible to just apply a percentage of load using manual input, the AutoDyn is equipped with a computer-controlled unit for accuracy. Computerized systems can control faster and with more accuracy than manual control could ever achieve. Using computer control allows the operator to choose from several automated tests such as step tests and controlled acceleration tests. These types of tests are difficult, if not impossible, with a manual control setup.

Can I use my lambda sensor or exhaust gas analyzer with the AutoDyn?

A variety of lambda sensors or exhaust gas analyzers can be used with the AutoDyn. Because of the differences in voltages supplied by different manufacturers, the AutoDyn can be equipped with an analog voltage input panel that can accept the most common voltages. The WinDyn® software can be configured to interpret the analog voltage to lambda or to a gas reading for ease of analysis. We also offer a variety of lambda and exhaust gas analyzers ready to use with the AutoDyn.

What type of horsepower can the AutoDyn handle?

When using the AutoDyn to measure wheel power in an acceleration mode (inertia only), the maximum power measurement is only limited by the ability to connect the tire to the roll. SuperFlow dynos do not impose any software or hardware acceleration measurement limit.

Can I mount the AutoDyn in a pit?

The SuperFlow AutoDyn is designed to mount either above ground or in a pit. We offer installation kits for either choice. For AutoDyn room recommendations, contact **sales@superflow.com** or call 1-800-471-7701 and ask for Sales.

Can I upgrade the AutoDyn?

Yes, SuperFlow has made the AutoDyn modular so you can upgrade your system as needs increase. We offer a variety of upgrade packages, including eddy current power absorbers, temperature measurement, pressure measurement, and lambda measurement.

What types of tests can the AutoDyn perform?

You can find detailed explanations of the AutoDyn tests in our supporting document titled, “Tests Available with Eddy Current Absorbers” (call our service department to request a copy). Our inertia AutoDyn (SF-820) is capable of inertia acceleration tests. Our eddy current AutoDyns (SF- 830 and SF-840) are capable of inertia acceleration, controlled acceleration, speed step, drive cycle, deceleration, and special data collection tests.

CycleDyn

The calibration values on the cal sheet do not match those in the system. The system had default values for dual blowers. Why?

Calibration values for CycleDyn blowers are always defaulted. We are unable to test the CycleDyn blowers above 150 mph because the parasitic losses are higher than the electric motor can deliver. Therefore, we use default data for the blower parasitics.

Why does the right-hand blower on the CycleDyn blower sounds like it's grinding itself to death.

First check to see if the blowers are causing the noise. To do this, remove the drive belt. While rolling the roll, remove it from the pulley. It also goes back on without difficulty. It's very possible that the bearings in the blowers are wearing out. The pulley-side bearing in the right blower bears all of the load from the belt, so the most likely culprit is that bearing.

Diesel Engine and Chassis Dynamometers

When I try to access the fuel pumps from the handheld controller, a message appears stating, "Fuel system not responding." What does that mean?

The handheld controller communicates with the fuel system through the network configuration or Local Area Network (LAN). This is the coax cable setup that runs from the computer to the sensor box to the fuel system. Sometimes when a break occurs in the cable network or when the data stream is interrupted, the LAN communication stops and must be re-synchronized.

1. Verify that the fuel system is on and operating. The fuel card is located in the top chamber of the roll-around cabinet or on the slide-out tray on the left side of the cabinet on upgraded SF-601 systems. (Some sites may locate the card in a different area.)
   - The card has seven red Light-Emitting Diode (LED) lights on it—one group of three and another group of four.
   - Normal operation is the group with all three lights on. The group of four should have three lights off and one flashing.
2. Power the fuel system off. On the roll-around cabinet, the power switch is located on the left side of the cabinet. On upgraded systems the power supply is configured in several different ways.
   - Some sites have a power switch on the front panel of the 601 cabinet to control the fuel card.
   - Others plug the power supply directly into a power terminal that requires locating and removing (call SuperFlow Technical Support if you are not certain how to power off the fuel card.)
   - Wait for one minute; then turn the fuel system power back on. Check for proper operation.

3. Power the entire system off. This includes the sensor box, computer, fuel system, and console (if applicable).
   - Wait at least one minute.
   - Turn the power on in the following sequence:
     - Fuel system
     - Sensor box
     - Console (if applicable)
     - Computer
   - Check for proper operation. It may take several attempts before the system synchronizes.

Contact SuperFlow Technical Support at **service@superflow.com** if the problem persists.

Flowbenches

SF-300 with Motor Controller

I have replaced six 120V motor controller blowers on my SF-300. When powering up the stand, the motors come on in stages: main power on, three motors, FlowCom on, then the remaining three motors. The stand appears to be creating heat rapidly, and we lose FlowCom when the main motor power is turned off. Do we need motors with more power?

You have the correct motors for your application. Your bench uses six 120V motors. These are wired in three pairs across 240V. The three pairs are M1 and M7, M2 and M8, M4 and M5. Each pair contains 120V motors wired in series across 240V. Your problem is a neutral wire connected between each pair. This was appropriate for your bench before the motor controller was installed. Now the motor controllers' SCR switch has control over one leg of the 240V with the other leg connected directly to one motor, which is correct, but you have a neutral wire connected that is allowing current flow between one leg of 240V and neutral through three motors.

To resolve this problem, remove the back panel from the flowbench. Make sure the power is disconnected, and remove the blue wire where it is connected to the power cord coming in to the bench. Then cap that blue wire with a wire nut. It is connected to AC, so make sure it is isolated.

The main motor power switch on the flowbench must remain on to power the FlowCom. This is normal operation because power is supplied to the FlowCom from the motor controller. You can turn the blowers on and off with the FlowCom motor switch.

The fluid for the incline manometer has left the reservoir and filled the inclined tub. No amount of warm-up time or use moves the fluid back to the reservoir. What should I do?

You have blockage. The two elbows on top of the incline manometers are valves that have approximately 1/8" of leeway for the elbows to be too open or too closed.

1. Slowly adjust either valve until the oil drops quickly. The oil will start to level.
2. Take a piece of carburetor gauge hose and attach it to left elbow, then gently suck until you reach approximately 100 percent of range.
3. Then apply the tip of your tongue to produce suction to hold the oil. At this point, if the oil drops, adjust the elbow until it holds.

After you stabilize the left side, repeat the process on the right elbow. This will get you within the 1/8" window needed to test.

SF-120 with FlowCom

We are using an SF-120 with FlowCom to test our work on Harley heads. The cfm readings at 10" convert to any other test pressure by way of conversion factors. Do the velocity readings convert using the same factors? (Meaning, 180 fps at 10" would equal 300 fps at 28": 180 x 1.67) If not, is a chart of conversion factors available, or is there no difference?

The discharge coefficient of most devices is relatively constant across a range of test pressures. That is why the flow can be estimated quite accurately using the square of the pressures. This is a good estimate, as the much more accurate estimate according to ASTM specs is very math and measurement intensive and only provides a slight improvement on the above formula.

Technically speaking, air is a compressible fluid, so our simple formula is only accurate as long as the Reynold's number for the two different flow conditions does not change by more than a factor of 10. The good news is that just switching from a test pressure of 10 to a test pressure of 28 is nowhere near enough to make the Reynold's number change that dramatically.

$$\mathbf{FlowAt28inches} = \mathbf{FlowAt10inches} \times \frac{\sqrt{28}}{\sqrt{10}}$$

To get velocity, think about the system in terms of the physics occurring. Let's assume we have a cross-sectional area in our port of 1 in^2 (small, but simple).

If the flow is 60 cfm (again, using simple numbers) it is equivalent to 103,680 cubic inches per minute or 1,728 in^3 per second. If the cross-sectional area of the port is 1 in^2, an average velocity is:

$$\frac{\mathbf{Flow}}{\mathbf{CSA}} = \frac{\mathbf{1,728in^3PerSec}}{\mathbf{1in^2}} = \mathbf{1,728inchesPerSec}(\mathbf{144feetPerSec})$$

If you perform the same calculation using the flow at 28" it looks like this:

$$\mathbf{FlowAt28inches} = \frac{\sqrt{28}}{\sqrt{10}} = \mathbf{100.4cfm}$$

100.4 cfm is equivalent to 2,891 in^3/second. The cross-sectional area is still the same at 1 in^2, so the average velocity is just flow/CSA again.

$$\text{AverageVelocity} = \frac{2,891\text{in}^3\text{PerSec}}{1\text{in}^2} = 2,891\text{inPerSec}(241\text{ftPerSec})$$

After all of this, we discover that:

$$241 = 144 \times \frac{\sqrt{28}}{\sqrt{10}}$$

So yes, the same correction factor can be applied to average flow velocity.

Actual flow velocity (at precise positions in the port) will deviate from this formula somewhat as the boundary layer changes shape, and the flow will separate from the wall more at a radius with higher flow velocities, but it is still predominately covered by the same formula above.

SF-1020 Flowbench

I have an SF-1020 flowbench and am getting lower test results than companies using the SF-300 & SF-600 flowbench. How do I calibrate my flowbench?

Like any tool, a flowbench is only as good as how it is calibrated and how it is used.

You can re-calibrate your flowbench using a set of calibrated orifice plates that SuperFlow can rent to you (you pay for shipping both ways). After flowing the plates, send SuperFlow the data, and we will provide you with new calibration values.

SF-1020 SuperBench

Is the SF-1020 SuperBench set up to capture the output from mass airflow (MAF) that contains integrated intake air temperature sensors? If not, is it capable? If so, how is this done?

The SF-1020 SuperBench has two analog voltage and two frequency inputs. This means you can acquire two frequency and two analog voltage channels simultaneously. The SF-1020 SuperBench is already set up to do this, meaning, the channels are defined. You may wish to assign those channels appropriate names, change the engineering units, or even create arithmetic calculations from those measured inputs. The choice is yours. The documentation for this procedure is included in your *WinDyn Users Guide*. SuperFlow technicians also have a copy of the software configuration backed up on file and can make changes for you at any time. We then send the changes to the SuperBench location where you install them by copying files.

If you want to measure another voltage coming from the MAF sensor, we need to know:

1. Where is the voltage available on the MAF connector?
2. What is the expected range of voltage response? Most shops are limited to 0–10V which normally is not a problem.
3. How to translate the sensors' voltage response to a temperature. This is usually done with a lookup interpolation table the WinDyn software can accommodate. Decide whether you want to see the voltage response or add a lookup table to the configuration that translates the voltage to a temperature. This translation is up to you to define. After you define it, a SuperFlow technician can help you implement it into the configuration. Of course, your SuperBench measures the air temperature as it enters the base plate (just after it passes through your device under test). Because you already have the temperature, you could compare the MAF sensors' air temperature sensors' voltage to that.

Software

WinDyn

When I start my computer or open a test group, a message appears stating, "No Dyno Communications."

WinDyn communicates with the dyno through a network Local Area Network (LAN) or through a serial cable on the SF-901 and SF-742. If this connection is not established, the computer cannot transfer files to or read data from the dyno. When the computer is turned on and WinDyn starts or when opening a test group, this signals WinDyn to check communication so it can transfer the required files to the dyno as set up in the test group. If it cannot communicate, the error message appears. It is normally followed by another message: **Test Group Not Loaded**. Click **OK** on both message dialog boxes.

1. Power down the entire system. Leave off for at least one minute. Turn on any other devices in the system (such as Fuel, Console, etc.) first.
2. Turn the sensor box power on, then start the computer last. For SF-901 and SF-742, turn on the console and then the computer. In most cases this will re-establish communications.
3. Check the cables.
   - On an SF-901 or SF-742, check the serial cable.
   - New NGE systems use LAN cables on the network port.
   - Coax cables require a 50-ohm terminator at each end of the cable chain.
   - Verify power to T-Base-T network hubs if used with Category 5 (Cat-5) cables.
4. Verify the proper settings in the computer.
   - On SF-901 and SF-742, check the COM port settings and verify the cable is plugged into the correct port.
   - On NGE systems check the network configuration. An adapter for the network card must be installed. The dyno uses NetBEUI protocol, and it must be set as default.
5. Verify that the sensor box is actually turned on.
   - If it is, verify the light flashes within the sensor box. On the 1200A-1942 or 1200A-2242 card, this light is on. If these lights do not seem to operate correctly, perform a power cycle as described in step 1.
   - The 1200A-1942 Printed Circuit Board (PCB) card is part of the two-card set in the large sensor box. It is on the side toward the front panel. The lights are on the right-hand side of the card. A series of seven lights is installed with either card: six on and one flashing, or three on and four cycling back and forth.
   - The1200A-2242 PCB card is mounted on the inside of the sensor box front panel. The lights are on the lower side of the card. A series of seven lights is installed with either card: six on and one flashing, or three on and four cycling back and forth.

If the condition still exists, contact SuperFlow Customer Service at **service@superflow.com** for further assistance.

What kind of network do I need for WinDyn, and how do I install it?

SuperFlow suggests an Ethernet Workgroup Hub. We have several in use here and rarely have any problems with them. Various products are available, but we recommend a Linksys model number EWHUB. It has eight ports, one of which is a BNC type connector. A 10-port model is also available. It is important that the hub has a BNC port because the dyno uses BNC type connectors.

1. To install the Ethernet hub on your network, first place a BNC "T" on the hub. Then locate the network connection on the back of both computers. You should find a BNC T-connector with a coax cable on one side and a 50-ohm terminator on the other. Remove the 50-ohm terminator from both computers.
2. Install a similar coax cable from the open T on each computer to the workgroup hub. Be sure the type of coax cable is the same as the cable currently used. We supplied RG58U cable with BNC connectors which should be available at local electronic or computer stores. If not, we have plenty.
3. Now configure the dyno network with a 50-ohm terminator on the fuel cabinets, a T on the circuit card in the fuel cabinet, and a cable running to the interconnect box up the boom to the sensor box where it connects with another cable on a T. That cable runs back down the boom through the interconnect box to a T on the computers.
4. Connect a cable to the workgroup hub. This setup is basically one long chain. If any part of that chain disconnects, the network goes down. To connect to the house network, uplink the workgroup hub to the network. Follow instructions for the model hub you selected.
5. Let your network administrator know this information:
   - The dyno broadcasts a steady stream of data over the network. This may disrupt or slow down your normal network traffic.
   - The dyno uses NetBEUI protocol. If you use a different protocol and a programmable workgroup hub, the dyno data traffic can be blocked off your house network. Those hubs are more expensive but can eliminate a potential problem. Our network administrator recently had to do that because the traffic from a half dozen dynos was bogging down the network. The disadvantage is that the operator cannot access the real-time data from the dyno on the desktop computer.

Can SuperFlow dynamometers export the data from a test and give it to end users to view the data on their own computer?

You can export data from a SuperFlow dynamometer running WinDyn software in one of three ways:

1. The easiest and best method is to use the Customer Data Pack feature in WinDyn to export the data files, then create a ZIP file using the WinDyn Stored Data Viewer program. You can then transfer the file to another computer, install the stored program, and view the data as you would on the dyno computer.
2. View the data using the Stored Viewer program by copying the data files to a removable storage medium (CD or flash drive), or e-mail them to the end user (SuperFlow data files have an .sfd extension). The user can then visit our Web site at **www.superflow.com** and select **Products>>WinDyn Software>>Downloads**. Download the free **Stored Data Viewer** program and install it on a Microsoft® Windows® computer to view the data as it would appear on the dyno computer.
3. Export the data to a Comma-Separated Value (CSV) file using the **Export** feature in the Stored Data Viewer program. Then import the CSV file into a spreadsheet program (Excel, Lotus, etc.).

ProFilter

How does the smoothing amount work?

This is the identical algorithm used in WinDyn's **Post Processing Filter** feature. The filter basically averages the number of raw data points selected in the smoothing amount to produce the filtered output. For instance, a smoothing amount of 10 uses the 10 points surrounding the midpoint to create its point.

What is the exact range limitation on the engine speed increment?

The range is 0–999 (0 means no even-increment processing).

Is the ProFilter channel **number** *dependent or channel* **name** *dependent?*

Channel *number* dependent.

How does ProFilter recognize what channel in the config is defined as engine speed?

It is implied by the **Engine Speed Channel** ProFilter parameter. If you change this frequency data in the CFA file, the calculated channel based on this frequency channel also changes.

Always remember: Calculated channel values are *not* stored in SFD files; they are calculated on the fly when you view the data. So it works on any calculated channel using channels 7–12 (based on the one implied by the setup parameters).

Can the calculated channel limit using ProFilter on another channel such as distance, etc.?

Yes. ProFilter converts a calculated channel to even increments. The data must be recorded at a minimum data rate of 100 lines / sec (100 Hz).

ProFilter assumes a calculation of **Speed = Freq/Spec*60** where **Freq** is the frequency channel (7–12) that has the raw speed pickup, **Spec** is the specification channel that holds the conversion factor for translating the raw frequency measurement into rpm, and **Speed** is the even-incremented channel. You must give ProFilter the Freq and Spec channel numbers so it can convert back and forth between the raw frequency data and the calculated rpm value (calculated channel values are *not* stored in the SFD file, and ProFilter needs to convert both directions to determine what raw freq values equate to the desired calculated even-increment values).

The limitations are:

1. The raw measurement must be on a freq channel (7–12).
2. The data must be recorded at 100 Hz (or faster).
3. The conversion from the freq channel data to the calculated data must be constant (meaning, it must be the same value for every data line in the test file).
4. ProFilter assumes the *60 term in the conversion. If this term is not warranted, you must create a spec value that cancels it out.

Does the Noise Rejection feature cause serious phase shifting of data?

It is doubtful that noise rejection itself could cause any phase shift. An observed phase shift is more likely caused by too high a smoothing value for the data set. You can prove this by setting the smoothing value to zero.

However, a phase shift could be caused by a test that idles before actually starting to accelerate. Removing some data lines at the beginning of the test using the SFBrowser tool can help obtain the correct results. Another problem can be that the noise rejection “noise threshold” was set too high for the data set. The default noise threshold was 60%. The noise threshold is another ProFilter parameter accessible through the ProFilter setup window.

Pro Filter does not work on chassis dynos if a “gear shift” occurs when running an acceleration test. This makes the feature unusable for vehicles equipped with automatic transmissions notorious for shifting during the acceleration run.

Does SuperFlow have any plans to fix the ProFilter gear shift problem on chassis dynos?

No. ProFilter was designed for engine dynamometers running pure acceleration tests. It was SuperFlow's intention to support only engine dynos and only pure acceleration tests. This means ProFilter has some built-in limitations on chassis dynos, but with the right test procedures it will work.

CycleDyn Model	Standard Electronics	Advanced Electronics	Minimum Sensor Options	Extensive Sensor Options	EC Absorber Module	Inertia Only
CycleDyn Sport	X		X			X
CycleDyn Sport EC	X		X		X	
CycleDyn Expert	X			X		X
CycleDyn Expert EC	X			X	X	
CycleDyn PRO EC		X		X	X	