

***How To Create An
Energy Efficient Pool***

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Introduction

This special report will teach you how to create an energy efficient swimming pool. It includes a detailed and comprehensive review of an extraordinary new pool heating process and valve called “Flowreversal™”. Both the flowreversal valve and the flowreversal process are patented and very unique. See U. S. Patents 4,655,252 and 4,621,613.

In addition, this report will describe “in floor circulation systems” and some other attributes of energy efficient swimming pools. This includes what a pool blanket really does and how to properly use it. Applications of energy efficiency are for both aboveground and inground pools. In fact, large aboveground pools have the same heating needs as inground pools. Why have an energy efficient pool? For the same reasons you want to have an energy efficient house. Like homes, some simple and relatively inexpensive techniques can make a dramatic difference in your pool heating [energy] costs. This in turn can dramatically affect how much you and your family really enjoy or use the pool.

The conclusion you should arrive at if you read this entire report is that it is relatively inexpensive to heat your swimming pool when you have the right equipment. Why didn't your pool contractor tell you this information when you bought the pool? The contractor was selling a very expensive pool and he did not want to add to the cost of the pool. OR, he wanted to avoid a discussion of pool heating. OR, he was ignorant about energy efficient pools. Even today—many pool contractors are still uninformed about energy efficient pools and how to heat them inexpensively using the PCS1 [described later]. Read on to discover how to create an energy efficient pool and how to heat it.

Background

Flowreversal™ is a trademark of Mark Urban of Tustin, California. Mark Urban manufactures a line of specialty valves designed specifically for the pool and spa industry. The flowreversal™ valve is only one example. Mark was issued a patent that covers this unique valve on November 11, 1986.

Despite the valve's availability for an estimated 10 years, it is just now getting the recognition it deserves. Some pool contractors are reluctant to install the valves at the time a pool is constructed because it "adds to the cost of the new pool". Progressive pool builders, however, are quick to use the valve because of its many benefits. Today, some new pools are being constructed with an "in-floor" circulation system which uses a different approach to some of the flowreversal™ concepts. This is discussed later.

Exactly what is flowreversal™? What does it mean to you as a pool owner? These questions and others will be answered in this report as we explore the concept of having an "energy efficient pool" with the flowreversal™ valve. Graphic diagrams have been included to help explain the concepts described and to provide the reader with a good visual understanding of the valve itself and how it is plumbed into the support system of the pool.

Be patient! You may have to read and study this material to gain a complete understanding. It took the Patent and Trademark Office in Washington, D.C. nearly eight years before they granted a patent. Why? Because examiners at the Patent Office could not grasp the fact that water can flow through the flowreversal™ valve in two separate circuit paths at the same time.

Traditional Plumbing

To understand flowreversal™, you must first understand that literally millions of pools have been built with a certain “traditional” plumbing configuration. This “traditional” plumbing means that a “**main drain**” is physically located on the bottom of the pool and sucks the pool water out of the pool where it is then filtered and returned to a set of “**return lines**” which are located at the top of the pool a few inches just below the water line.

When a heater is employed, it is connected just after the filter. **The heated water is then returned through the return lines to the top of the pool.** What does heat do? It rises! Where is 60-70% of the heat loss on a pool located? It is directly from the surface of the pool! Heating the pool this “traditional” way is tantamount to trying to apply heat to the top of your pan of water when cooking noodles for spaghetti. It doesn't make sense, does it?

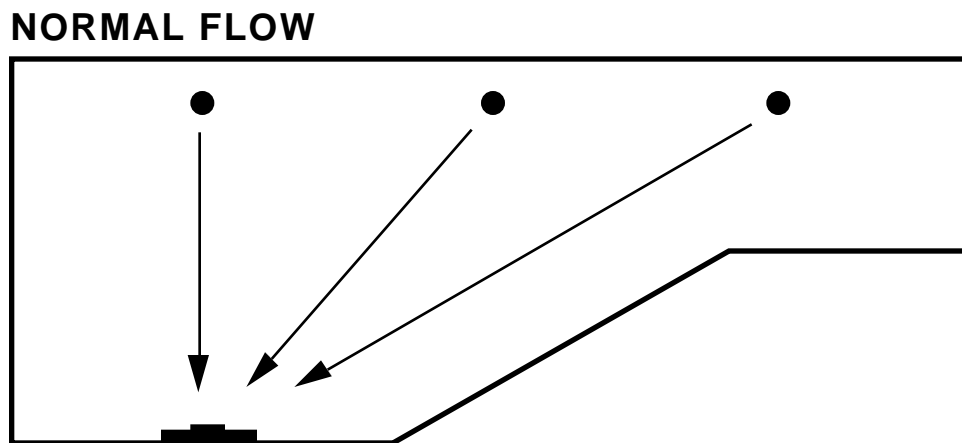
Why has pool construction been done this way and for the most part continue on this way? **Tradition!** It's always been done that way! It all originates back to the original pool designer and his design concepts. A main drain was located at the bottom of the pool where, in theory, particulate matter would gravitate downward and into the main drain. This “collected” particulate matter [dirt, sand, etc.] would then be trapped by the filter and clean water returned to the top of the pool via the “return lines”. If a heater was employed, it didn't matter much because energy was cheap in those early years as swimming pools were introduced.

What's wrong with the traditional design of the pool? It doesn't work out the way it was designed! For openers, **the dirt and other particulate matter does not all reach the main drain.** Decades of experience has shown that about 2-3 feet around the main drain will stay clean from the suction while the pool owner must then "vacuum" the rest of the pool's bottom to ensure its cleanliness.

Second is the fact that "cheap energy" is a past luxury no longer existing. Pool owners heating with "gas" in any form can wind up paying hundreds of dollars each month in energy costs. And, anyone unfortunate enough to have installed an electric heater is facing an even worse energy situation.

Third, and again, is the fact that heat rises even if particulate matter sinks!

The graphic below labeled "NORMAL FLOW" shows how the typical pool is plumbed. This is a side view of a typical pool. The pool's main drain is shown on the bottom and the pool's return lines are represented by the three black circles at the top. **Note:** this is a graphical depiction of the pool's plumbing for comparison purposes only and is not designed to be representative of how your particular pool has been plumbed.



The arrows emanating from the “return lines” depict the traditional flow of water. Water flows from the top of the pool downward where it is drawn into the main drain by the pump’s suction. This is normally the path of particulate matter. Again, in theory, all the dirt and other particulate matter would sink downward and be drawn into the pool’s main drain where it would be trapped in the strainer basket of the pool’s filtration pump if it were large and would be trapped in the filter if it were small.

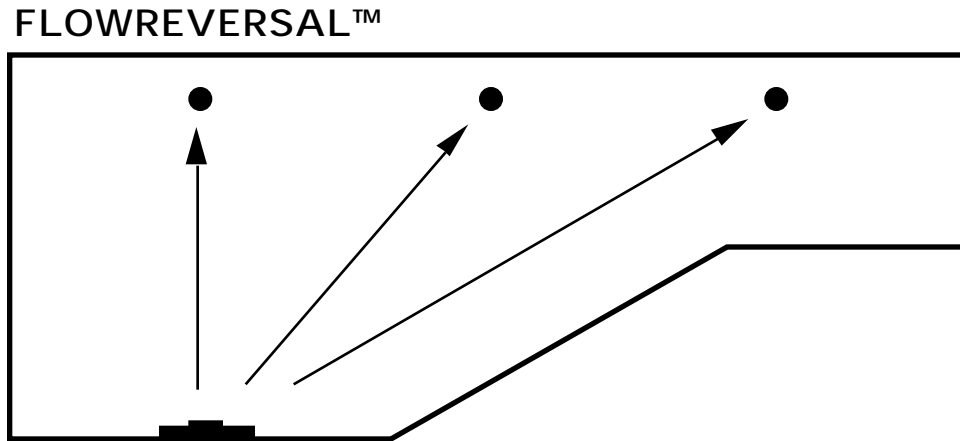
We know, however, that this traditional plumbing does not fulfill its design goal of keeping the pool clean. As a pool owner, you have to vacuum the bottom of the pool and use a “debris collector” basket to grab leaves and other large debris from the bottom of the pool. In some instances, automatic pool robots clean the bottom of the pool. Enough said about the “traditional” design of the pool.

Reversing The Flow

Why couldn’t we just plumb the pool backwards? Well, you could if you never needed to drain the pool. However, you still need the option of this “NORMAL FLOW” to drain out the pool water for maintenance and repairs of the pool. As you will see later, the flowreversal™ valve maintains this capability.

What is flowreversal™? By now you should have guessed. If you think it is simply reversing the flow of water so that water is sucked out of the “return lines” and returned into the “main drain” --- you are absolutely right!

The graphic below labeled “Flowreversal™” shows this process. Note that the arrows which indicate the direction of water flow are now opposite. The water flows from the “main drain” upwards and into the “return lines”.



So far this concept is pretty easy to understand. **What are the benefits?** Studies have shown that heating a pool in this manner results in a **significant reduction of heating costs!** As much as 1/2 to 2/3 rd's the cost of heating the pool in the “Normal Flow” mode. Makes sense doesn't it? Common Sense!

Remember, heat rises! In addition, water is an excellent retainer of heat. As heat rises from the main drain, it is transferred from molecule to molecule of water. Instead of that hot two inch layer you dive or jump through only to wind up in the cold water below -- you will now have an even distribution of heat throughout the pool's depth. No more hot & then cold experiences. If your pool benefits from direct solar radiation onto the pool's surface -- this free heat will be immediately taken off the surface and reintroduced at the bottom of the pool. This further reduces your pool heating costs and is another direct benefit of the flowreversal™ valve.

Skimmer Consideration

In pool plumbing, the skimmers are usually tied directly to the “**main drain**” line with a gate valve for shutoff. If we simply reversed the flow of water in the pool without doing something to the skimmers, the skimmers would blow water out onto the surface of the pool instead of “sucking” surface debris in the flowreversal™ mode.

This issue is handled by a companion valve to the flowreversal™ valve. It is called a “proportioner valve”. This “proportioner valve” is connected directly to the skimmer line, the flowreversal™ valve, and the pump’s intake suction line. The function of this valve is to adjust the proper suction on the skimmers during reverse flow. The valve “proportions” the suction from the pump to the flowreversal™ valve and the skimmer line. It is set one time for proper skimmer suction but can be used to channel all of the pump’s suction into the skimmer line if desired. [This is desirable when the vacuum line is connected to the skimmer line.] This “proportioner valve” is not discussed further in this report. See the swimming pool plumbing diagrams at the back of this report. They provide a systems perspective on how these special valves are installed and used.

Temperature Reading

A quick note about your pool’s temperature sensor. Ever wonder if it is right? You know, those times you’ve jumped in and froze! Well, remember this, the temperature sensor may more accurately reflect the top layers of heat on the pool which are caused by solar radiation, normal flow and pool blanket use. With flowreversal™, the water is rising from the bottom of the pool and your temperature sensor will reflect a more accurate indication of the overall pool temperature.

Pool Blankets

Some thoughts about pool blankets. Perhaps the main reason pool blanket's exist is to answer a sales objection raised by pool buyers. You know, the one where the pool buyer says: "Do I need to heat the pool?" And, the typical response is: "No, in fact, this pool blanket is all you'll need." Finished by: "We are including it free of charge."

Did your pool seller ever tell you what a pain in the neck the blanket was? Did they tell you it would heat your pool? What's your experience? The real facts are: A) Pool blankets keep the heat already inside the pool from escaping from the surface where 60-70% of the heat losses occur. B) Pool blankets do not heat a pool. C) People who use blankets eventually find out they need a heater to get the most out of their pools. D) Blankets are a pain in the neck. E) Pool sellers don't like to talk about heating pools. Why over sell? Besides, who would buy a pool knowing it would cost them literally hundreds a month in gas energy bills or having to look at "ugly & obtrusive" solar panels on their roof?

Low Cost Pool Heating

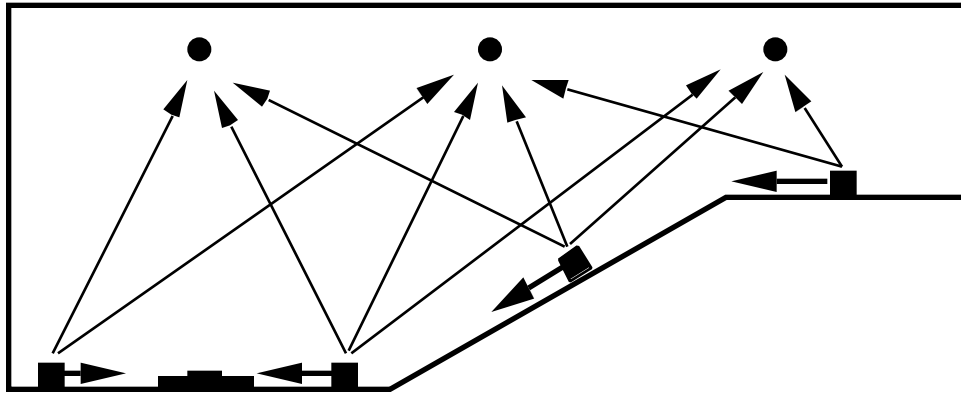
First, your pool needs to be efficient to heat. This is accomplished by two main factors: A) Flowreversal™ and B) Blanket use during periods of extended non use. Once you've created an efficient pool heating environment, you'll want the most efficient heater available. That's the PCS1 which is short for "**Pool Convection System One**".

Using flowreversal™, the PCS1, and a blanket during periods of extended non use will provide you with an **extended swimming season**. Three powerful approaches to equipping your pool. Simply put, you will be in your pool earlier and out of your pool later in the year. Some areas can enjoy a year around swimming season. In most areas, you will find that you'll only need the blanket during early Spring and late Fall.

In Floor Circulation System

Some newer pools are equipped with an infloor circulation system. The flowreversal™ valve will work in conjunction with some of these. Others, however, have incorporated some unique features such as "pop-ups" in the floor of the pool. These pop-ups cycle sequentially and rotate. They in essence perform two functions. First, as they rotate -- they "sweep" the dirt on the floor towards the main drain. They also allow the water to rise in the pool creating a more efficient heating environment. If you have an infloor system, consult with your pool builder to determine whether or not you'll need the flowreversal™ valves. Some systems will benefit from it while others won't.

IN FLOOR SYSTEM



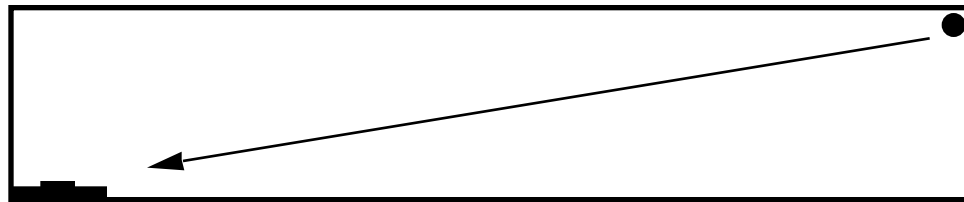
The thick arrows indicate the direction the pop ups will sweep the particulate matter which is towards the main drain. The narrower arrows show a more extensive water flow pattern created from several openings in the floor of the pool.

Aboveground Pools

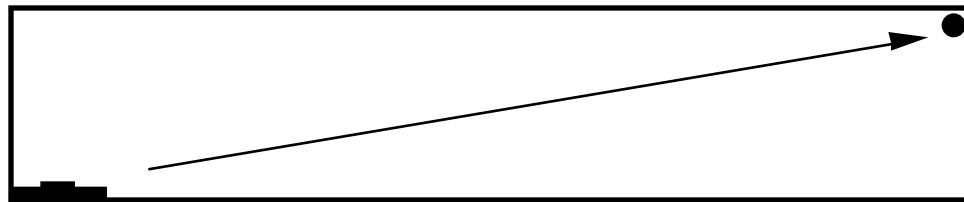
Owners of aboveground pools do not need the flowreversal™ valve. They can plumb the pool so that the water rises and is drawn off of the top. This can be an important consideration since cost is a sensitive area on aboveground pools. Aboveground pool owners should not attempt to install “single” valves to create a flowreversal™ environment. It is estimated that between 6-8 gate valves would be required to duplicate the action of the single flowreversal™ valve. This would result in a higher cost and would be extremely confusing to use.

The objectives for plumbing are: A) Being able to drain the pool; B) Being able to allow the water to rise from the bottom and towards the top; and, C) Being able to winterize the pool if needed. Since the plumbing is exposed, aboveground pool owners have more options they can consider.

If cost is not a problem, using the flowreversal™ valve may be the best approach for aboveground pool owners. The support system plumbing will be better organized. [This assumes a main drain is used which is not usually the case.]



Normal Flow



Reverse Flow

In the modified plumbing shown above as “REVERSE FLOW”, water will flow from the “main drain” located in one corner of the aboveground pool in a circular fashion to the “return line” which is located in an opposite corner of the pool.

Now that you have a good idea of what the flowreversal™ valve does, lets examine the physical aspects of the valve.

Physical Description

The flowreversal™ valve is a four port “X” shaped valve. One port is connected directly to the pool’s “main drain” line. A second port is connected directly to the pool’s “return line.” A third port is connected to the return line for the balance of the support system [i.e. line coming directly from chemical dispenser and PCS1 heater]. The fourth port is connected to the pump’s intake suction line via the proportioner valve previously discussed. All ports are two inch CPVC and can be reduced down to inch and a half PVC or CPVC pipe for cementing with PVC pipe cement. The top of the valve contains eight philips screws for removal of the valve’s top cover and internal diverter. Either a manual handle or an automatic 24 volt a-c valve operator [VOR] can be installed on the valve.

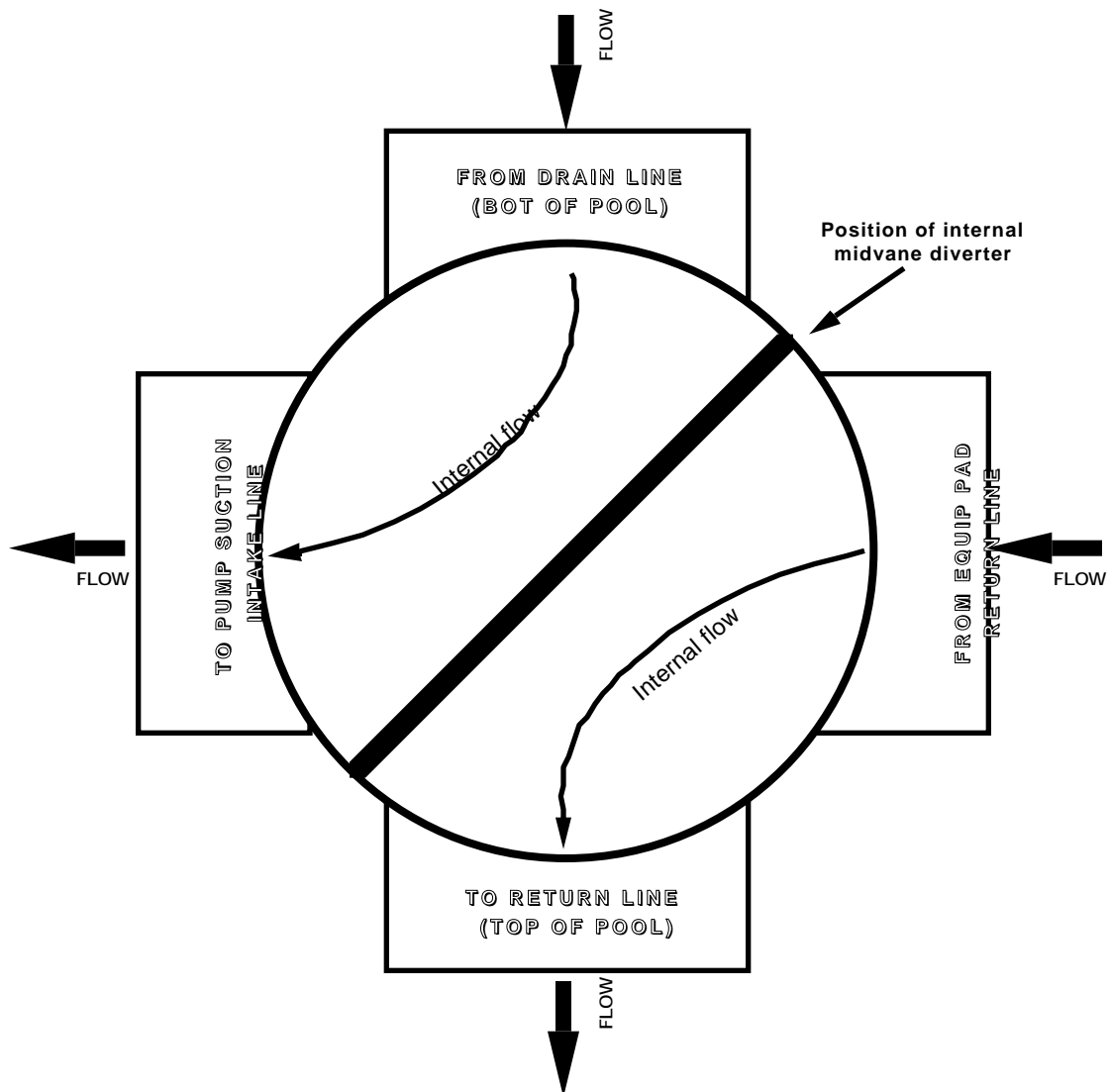
Inside of the flowreversal™ valve is a midvane diverter which splits the valve into two separate sections. Water flows simultaneously into two ports and out of two corresponding ports as the midvane diverter in essence creates two separate and distinct water flow paths. No water is mixed in the valve. Just routed in different directions.

Operation

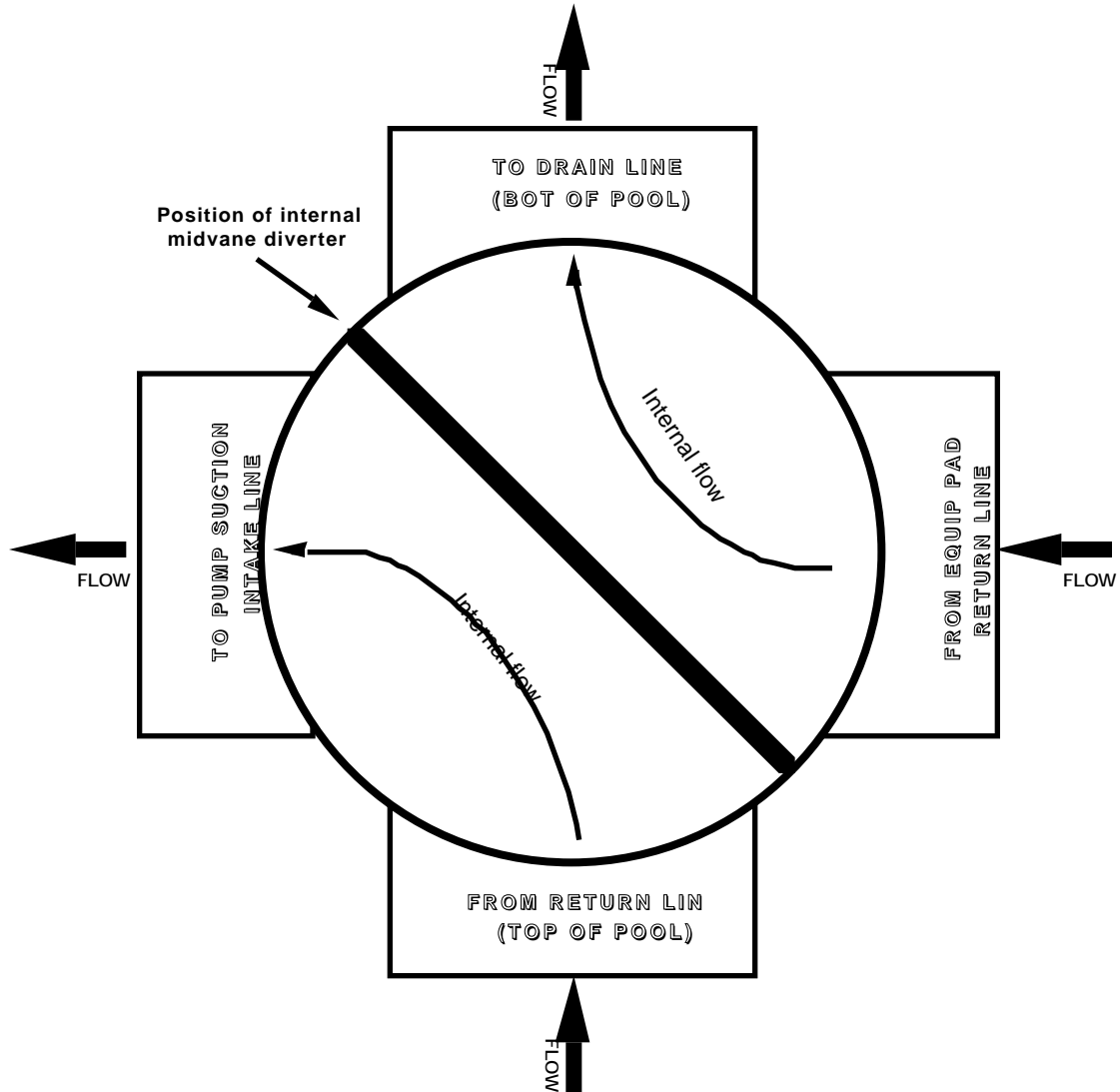
Manual operation of the flowreversal™ valve is accomplished by the 90° turn of a single valve stem. When the valve is turned ninety degrees, the input to the support system which is normally the main drain is switched to the return line. Likewise, the output from the support system which normally goes to the return lines is switched so that the output of the support system goes into the main drain.

The following two valve graphic diagrams show the Flowreversal™ valve in its operating modes. A third graphic shows the Flowreversal™ valve with an automatic valve operator installed on top. **Note:** these graphics are smaller than the actual valve and are not drawn to any scale. System plumbing diagrams follow.

NORMAL FLOW

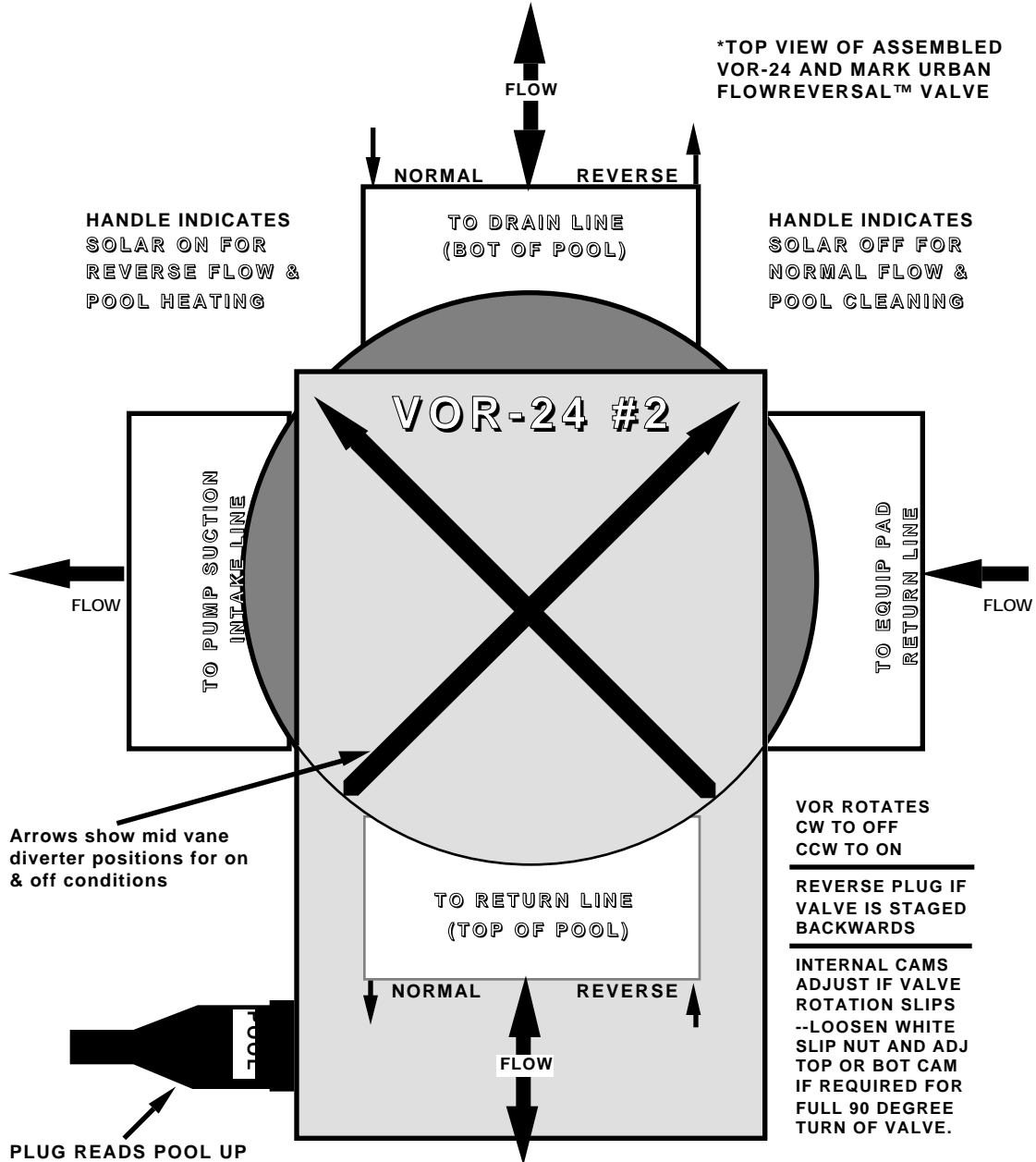


REVERSE FLOW



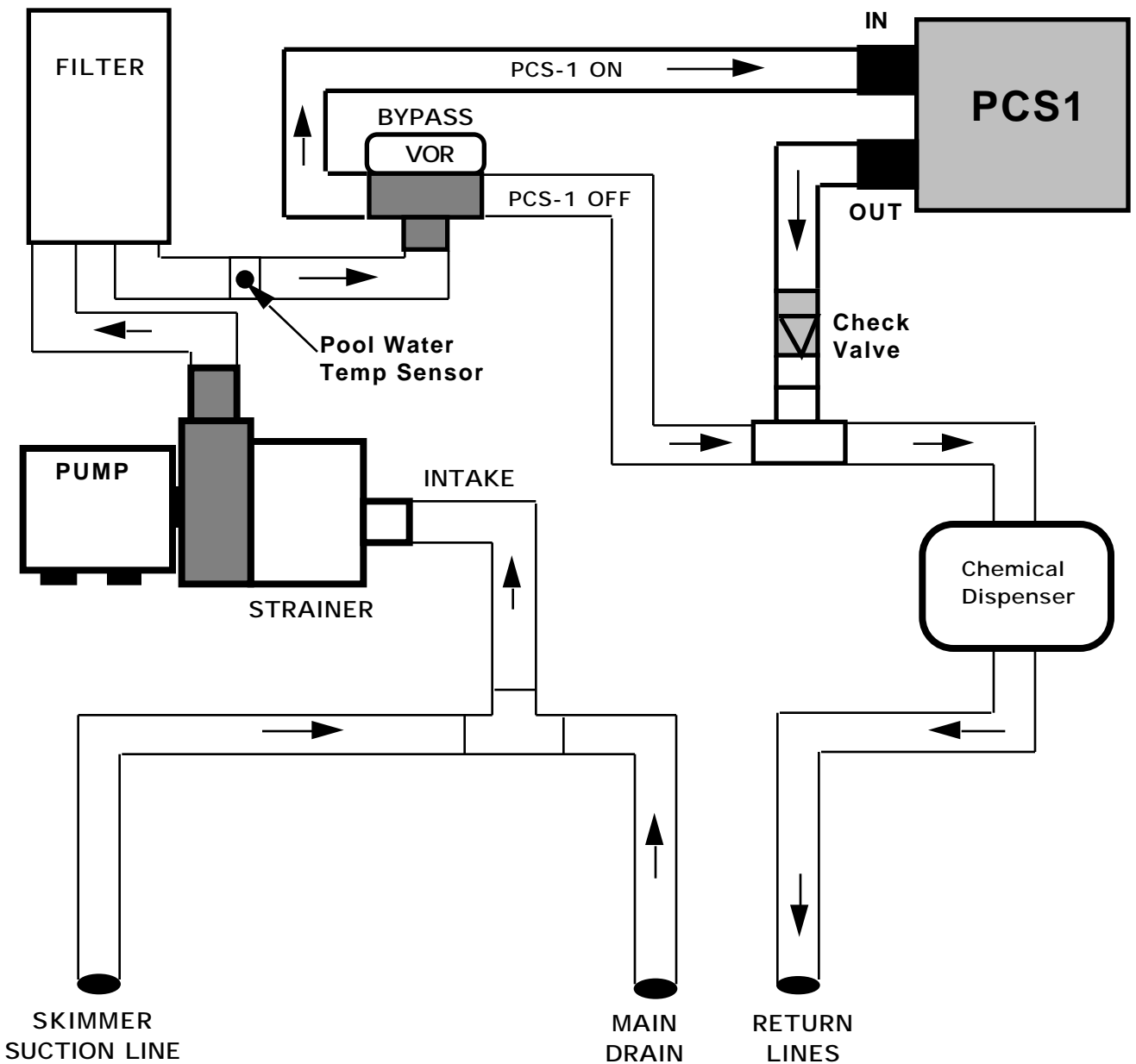
Automatic operation of the flowreversal™ valve can be effected with a second 24 volt a-c valve operator [VOR] using Compool's LX220 solar controller. Experience has shown that the manual flowreversal™ valve is sufficient. It is simply left in reverse flow unless the pool is being drained or cleaned. In these instances, normal flow of water into the main drain is required.

AUTOMATED FLOWREVERSAL™



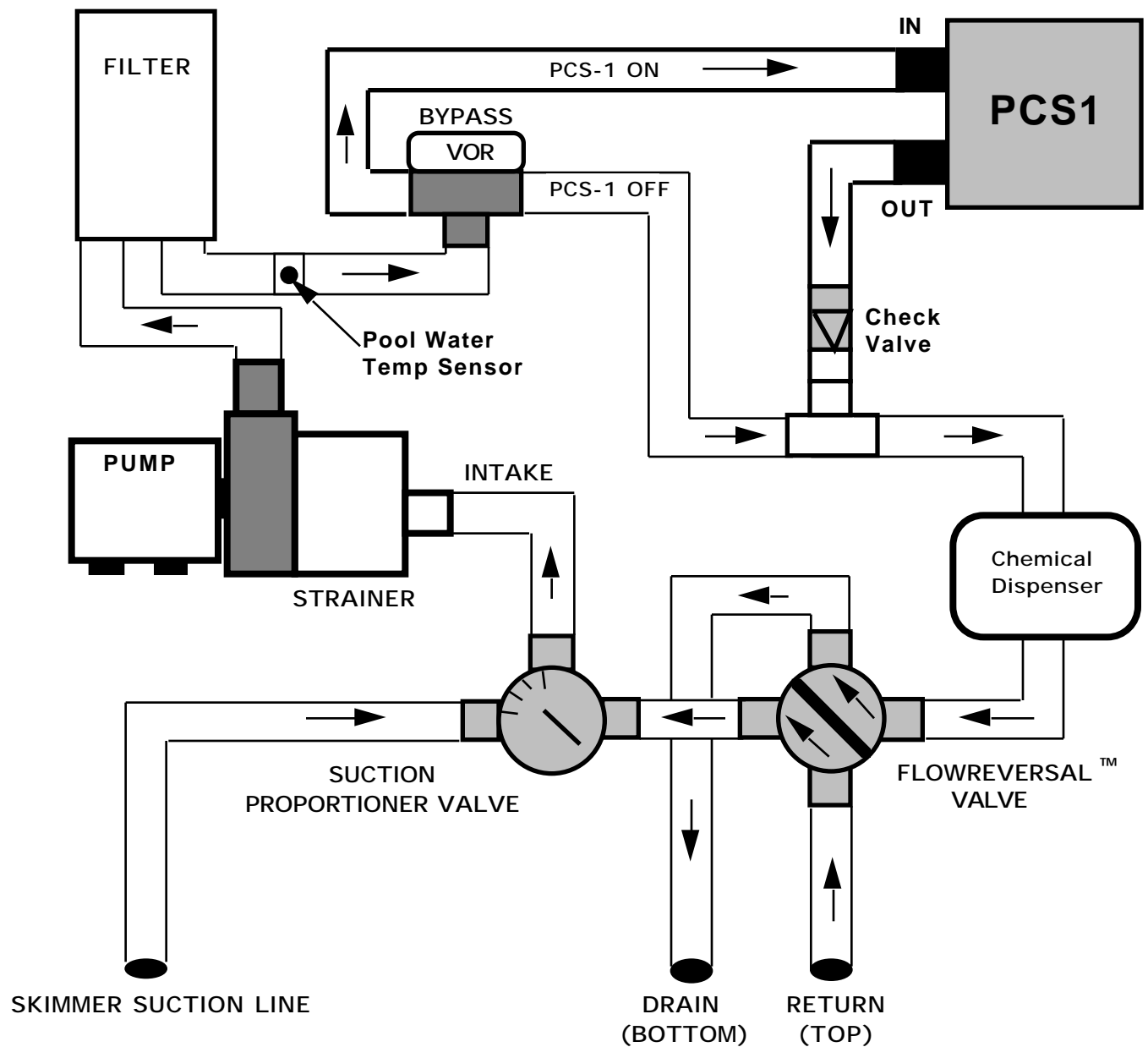
BASIC PLUMBING DIAGRAM

Without Flowreversal™ Valves



PLUMBING DIAGRAM

With Flowreversal™ Valves Showing Reverse Flow



It has already been stated that manual flowreversal™ is sufficient. In this case, the pool appears visually the same as in normal flow. An area of 2-3 feet around the main drain appears clean and the rest of the pool's floor has to be vacuumed. In theory, an automated flowreversal™ valve will yield the best of both worlds [heating & cleaning]. When the pool is being heated with the PCS1, the reverse flow mode is used. When the pool is not being heated, the normal flow mode is being used. To automate flowreversal, an additional electronic module is added to the LX220 controller to accept the second 24 volt a-c valve operator [VOR].

This author, however, fails to see much benefit from automating the flowreversal™ valve and recommends a manual valve be installed. In this manner, water is constantly be recirculated from top to bottom regardless of whether the pool is being heated. In essence, the support system optimizes the heating of the pool instead of the filtration. No visual difference has been noted in filtration or cleaning of the pool. The heating difference, however, is substantial!

Conclusion

An energy efficient pool has three key elements. A pool blanket that can be used with discretion to minimize the surface heat losses of the pool. Losses of heat from the surface are estimated to account for 60-70% of the pool's heat losses. The second element is the flowreversal™ valve described in this report. Having a reverse flow mode in your pool's support system allows your pool to be an efficient user of energy regardless of the type of heater you may have. The third element is the PCS1 which is a new solar heater that mounts inside your attic. The PCS1 uses the solar energy collected by your roof and attic to heat your swimming pool.

The PCS1 costs only \$11.00 per month or less to operate. The PCS1 [acronym for “pool convection system one”] gives you free solar energy from your roof and attic structure. Your roof functions as a massive solar collector. Your pool gets free renewable solar energy without having to use roof mounted solar panels.

The cost of operating the PCS1 can be contrasted against hundreds of dollars per month for other heaters that burn fossil fuel or use electricity. See our special report “How To Calculate Pool Heating Costs” for further information on what different types of heaters cost to operate.

You now know what an energy efficient pool is. You also know that you don't have to pay outlandish energy bills each month to heat your swimming pool.

I might ask the questions: “Can you relax swimming in a cold pool?” I can't! “Would you like a solar heating system for your swimming pool that did not use ‘ugly and obtrusive’ panels on the roof?” For further information, you can write, phone, or Fax:

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