

Safety Volt Transformer

Installation Guide



IMPORTANT! Read This Guide Before Installing or Operating Your Equipment
Installer: This document is Purchaser's property and is to remain with the Equipment Owner

SECTION 1 - GENERAL INFORMATION

1.1 Contacting AquaCal AutoPilot


If you should need to call AquaCal AutoPilot for questions, service, or parts, please have your model and date code available. This is located on the dataplate(s) on the side of the transformer.


Web	www.AquaCal.com
Phone	(727) 823-5642 8-5 pm, Eastern, M-F
Fax	(727) 821-7471

1.2 Safety

For personal safety, and to avoid damage to transformers, follow all safety instructions displayed on the transformer and within this guide. Should you suspect your transformer is not performing properly, refer to the section in this guide entitled: "Troubleshooting," to determine if a call for service is required. Failure to properly install, operate, maintain, or repair transformer will void factory warranty.

Follow all National Electric Codes (NEC) unless State or Local guidelines supersede. When installing and using your transformer, basic safety precautions must always be followed, including the following:

-  **WARNING** - Failure to heed the following may result in injury or death.
- There is a risk of shock or electrocution when performing electrical work, especially around water, which could result in serious injury or death. We strongly advise that wiring of the Safety Volt Transformers be referred to a licensed electrician.
 - Transformers contain no owner-repairable components. Repairs must not be attempted by untrained and/or unqualified individuals. If service is deemed necessary, contact installing dealer or AquaCal Customer Support.
 - Local code requirements for wiring vary; the local code regulations must be followed, with permits and inspections obtained.
 - The installer should read and follow the associated electrical component owner's manuals and instructions.
 - Confirm that power to transformer circuit is switched off at the service panel prior to inspections, wiring, or repairs.
 - Never operate a transformer that has not been properly grounded.

-  **CAUTION** - Failure to heed the following may result in equipment damage.
- The Safety Volt Transformer is designed as an aboveground, surface mounted device. Do not install this device inside a wall, under ground, in a pool deck, or where rising water can occur.
 - Never connect unused taps together. Insulate any unused wiretaps individually with wire nuts.
 - Improper wiring may damage to equipment and void the manufacturer's warranty.

SAVE THESE INSTRUCTIONS

1.3 Specifications

Safety Volt transformers are designed to reduce the input voltage to a safe, low voltage for low-voltage fixtures. Please see chart below for available models and capabilities.

MODELS	TAP TYPE	MAXIMUM WATTAGE (WATTS)	INPUT SPECIFICATIONS		OUTPUT SPECIFICATIONS	
			VOLTAGE (VOLTS A.C.)	CURRENT (AMPS)	VOLTAGE (VOLTS A.C.)	CURRENT (MAX AMPS)
ST-100-12	Single-tap	100	120	0.9	12	8.3
ST-300-12	Single-tap	300	120	2.5	12	25.0
CP-300-220	Single-tap	300	220	1.3	12	25.0
CP-300-240	Single-tap	300	240	1.3	12	25.0
MT-100	Multi-tap	100	120	0.9	12,13, or 14	8.3
MT-300	Multi-tap	300	120	2.5	12,13, or 14	25.0
MT-400	Multi-tap	400	120	3.4	12,13, or 14	33.0
CP-300-220M	Multi-tap	300	220	1.3	12,13, or 14	25.0
CP-300-240M	Multi-tap	300	240	1.3	12,13, or 14	25.0

Figure 1

SECTION 2 - INSTALLATION

2.1 Agency Approvals

AGENCY	DESCRIPTION
Intertek	A representative sample of the listed devices have been tested, investigated and found to comply with the requirements of the Standard(s) for Specialty Transformers (UL-506) and are identified with the ETL Listed Mark.

Figure 2

2.2 Mounting Instructions

The Safety Volt Transformer is designed as an above-ground, surface-mounted device. Do not install this device inside a wall, under ground, in a pool deck, or where rising water can occur. A cover can be used as long as adequate ventilation is provided for cooling. Follow code UL-506 and any applicable local codes when installing this device.

- 1) Remove applicable knockouts for incoming and outgoing wiring from the enclosure.
- 2) Plan to install the enclosure perpendicular on the wall with sufficient clearance around enclosure for proper ventilation. See Figure 3 for unit dimensions. The enclosure should be a minimum of one (1) foot above ground or deck level.
- 3) Confirm the enclosure will be attached to a stable surface that will hold the weight of the enclosure and any related wiring or components. Also confirm placement will not damage any underlying equipment behind enclosure.
- 4) Utilize the enclosure to mark mounting hole drill points on wall.
- 5) Drill holes and install any applicable screw anchors.
- 6) Position the enclosure again, then insert and tighten mounting screws into the drilled holes. Do not over-tighten.

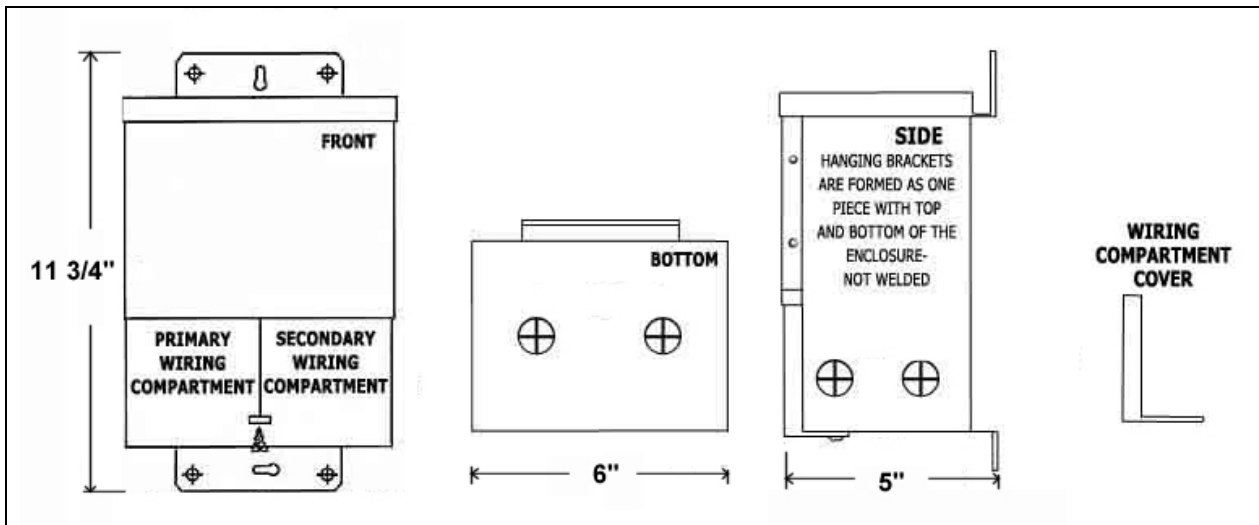


Figure 3

2.3 Wiring Instructions

2.3.a Incoming voltage

- 1) Based on the transformer's specifications and the appropriate local code, determine the required input voltage of the unit. Ensure the circuit breaker panel feeding the input of the transformer will handle the extra load and the circuit breaker is properly dimensioned.
- 2) Based on the transformer's specifications, determine the wire gauge to be used on the input of the transformer.
- 3) Feed incoming voltage wiring through knockout and into primary wiring compartment. Refer to wiring diagram on the inside cover of the transformer for correct hook-up to primary wiring contacts.
- 4) Use the grounding lug located between the primary and secondary wiring compartment to properly ground the transformer and light fixtures.

2.3.b Outgoing Voltage

- 1) Determine the following for each load:
 - a. Power consumption (in Watts). Please note - Total load must not exceed maximum capacity of the unit. See section entitled "Specifications" for your model's maximum wattage. If your unit is a single tap model, please go to step three in this section.
 - b. Distance from transformer (in Feet).
 - c. Proper wire size. The wire size is based on power consumption and distance from the transformer. Use National Electric Code and local regulations to determine which wire size is to be used.
 - d. Copper wire's multiplier using Figure 4.

Copper Wire Size	Multiplier (k)
6 AWG	0.000043
8 AWG	0.000065
10 AWG	0.000105
12 AWG	0.000168
14 AWG	0.000265

Figure 4

- 2) With the load's power consumption, distance from the transformer and wire multiplier, use the formula in Figure 5 to determine which voltage tap is to be used. Refer to the wiring diagram on the transformer for tap locations.
- 3) Insulate any unused wire taps individually with wire nuts.
- 4) Add total wattage for all loads and confirm total is under the maximum power rating of the transformer.

$12 + (k \times W \times D) = VT$	
12 =	Required Voltage for load
K =	Multiplying factor dependent on the wire gauge of the wire used
W =	Power Consumption of the load (in watts)
D =	Distance from the transformer (in feet)
VT =	Transformer's Voltage Tap to be used. (12V, 13V, or 14V)

Figure 5

Example:

<p>Load 1:</p> <p>A model MT-300 transformer is used to connect a 40-Watt light located 50 feet from the transformer. The local code in this case is stating that a #12 AWG wire size should be used. (See <i>local codes for your application</i>.)</p> <p style="text-align: center;">The calculation is $12 + (0.000168 \times 40 \times 50) = 12 + .336 = 12.336$ or 12.3, therefore you can use a 12-volt tap. (<i>Always rounding up to next highest tap</i>)</p>
<p>Load 2:</p> <p>A second load, a 60-Watt light, is located 100 feet from the transformer. The local code in this case is stating that a #12 AWG wire size should be used. (See <i>local codes for your application</i>.)</p> <p>The calculation is $12 + (0.000168 \times 60 \times 100) = 12 + 1.008 = 13.008$ or 13.0, therefore you can use a 13-volt tap. (<i>Always rounding up to next highest tap</i>)</p>
<p>Total of all loads:</p> <p>The total wattage of the loads are added together and subtracted from the transformer's power capacity. In this example the maximum wattage of the MT-300 transformer is 300-Watts. (See <i>Figure 1 for your model's maximum wattage</i>.)</p> <p>The calculation is $300 \text{ Watts} - (40 + 60) = 300 - 100 = 200 \text{ Watts available}$.</p>

Figure 6

SECTION 3 - TROUBLESHOOTING

3.1 Symptom / Resolution Chart

SYMPTOM	TO RULE OUT	RESOLUTION
Lights cycle off / on every 10 to 20 minutes	Circuit Overload	Measure the amperage in the low-voltage side of the transformer to determine if exceeding transformer power rating. Remove loads if necessary. See chart in section entitled "Specifications" for model's output current in amps.
	Defective Wiring	Check wiring to load. Improperly insulated wiring or moisture in the wiring can cause the thermal safety to cycle.
	Taps Connected Together	Determine if the unused taps are connected together on multi-tap units. If they are wired together, the transformer will make a loud buzzing noise and turn off very quickly. If left unattended, the lead wires can melt. Insulate any unused wiretaps individually with wire nuts.
	Insufficient Ventilation of Transformer	If the transformer has improper ventilation, the transformer will become hot and the thermal safety overload will trip.
Transformer is buzzing	Taps Connected Together	Determine if the unused taps are connected together on multi-tap units. If they are wired together, the transformer will make a loud buzzing noise and turn off very quickly. If left unattended, the lead wires can melt. Insulate any unused wiretaps individually with wire nuts.
Lights cycle off / on every few seconds	Confirm transformer shuts off in less than 10 minute intervals	This is not a problem with the transformer. It is an indication of a load issue and equipment connected to transformer will need to be checked.
	Failed Light Sensor	There may be a problem with the load, e.g. a bad sensor in the light fixture. Only the manufacturer of the light fixture can address this problem.
	Failed Low Water Sensor	It may be an indication that the low-water cut-off sensor in the light fixture is bad. Only the manufacturer of the light fixture can address this problem.
The transformer is putting out voltage, but the lamp isn't working	Outside Wiring	If the transformer is working and the lamp isn't lighting, the problem is not with the transformer. Check for the integrity of wiring to the load or the load itself.
The transformer is working fine, but it is warm to the touch	Insufficient Ventilation of Transformer	A transformer under full load will be warm to the touch and the surface temperature can reach 130° F. This is normal. If the transformer has improper ventilation, the transformer will become hot and the thermal safety overload will trip.
An electrical meter shows only two (2) volts output from the transformer	Wrong Meter Setting Used	If there is full voltage going to the transformer it should be producing a full 12-volt output. Ensure the output voltage is being measured with a voltmeter set on the AC voltage setting - not the DC setting.
	Incorrect Usage of Transformer	It is a common misconception that transformers change AC-voltage to DC-voltage. A Transformer only reduces voltage. As an example, the Safety Volt transformer can reduce 120-volts AC to 12-volts AC, 13-volts AC, or 14-volts AC.

Figure 7

SECTION 4 - FREQUENTLY ASKED QUESTIONS

- A meter is used and shows continuity through the wiring. Does this mean the filament on the lamp is good?
No. Continuity can also come from shorted wires, cracked insulation, water or moisture in the line. The only way to truly check the filament in a lamp is to remove it and check between the center post and the sidewall of the base.
- Are Safety Volt transformers “listed”?
Safety Volt transformers are listed with the ETL, an internationally recognized testing laboratory. Transformers are manufactured and tested to UL standard 506.
- Can the transformer be covered with a box or non-permanent enclosure?
The transformer is enclosed within a weather resistant enclosure and can be placed outdoors under most conditions. A cover can be placed over it as long as there is adequate ventilation to allow cooling.
- Can the transformer be installed upside-down to make it easier to get to the wiring?
No. The transformer is designed to dissipate heat through the top and sides of the enclosure. In addition, an upside-down transformer can collect water and short out. Improper wiring such as this voids the factory warranty.
- Can the transformer be put in a “vault” in the pool deck, buried in the ground, or put into a box or some other type of enclosure?
No. Most building codes require electrical equipment to be mounted above ground in case of rising water. The enclosure of our transformer is not designed for ground contact.
- How do you hook up more than one lamp to a multi-tap transformer? Do you wire a different lamp to the different lead wires?
Multiple lamp installations must have parallel wiring. That means that all of the white wires from the lamp fixtures are connected to the appropriate tap as calculated in Figure 5.
- How many amps will the transformer draw on the high voltage (primary) side?
See chart on “Specifications” for specific amp draw.
- How many lights can be put on a transformer?
Transformers can handle any number of lights as long as the total wattage of the lamps does not exceed the rating of the transformer.
- Can the transformer be hidden inside a wall and then bricked or dry walled over?
No! The Safety Volt Transformer is designed as an aboveground, surface mounted device.
- Is grounding necessary?
Yes. The most important wire in any electrical installation is the ground wire. Ground wires are usually green in color, but sometimes a bare copper wire may be used. In a typical installation, a continuous ground connection is made between the power panel feeding the high voltage side of the transformer and the light fixture itself. The ground wire from the power panel and the ground wire from the light fixture are joined at the grounding block located in the front of the wiring compartment of the transformer.
- What is a voltage tap and why is it needed?
In all electrical wiring, there is a resistance to the flow of electricity through the circuit. This resistance can cause a significant voltage drop that will reduce light output. The greater the distance between the transformer and the light fixture, the greater the voltage loss will be. There are two ways to compensate for voltage drop. The first is to use larger and more expensive wire. The second is to start out with a slightly higher transformer output voltage that will result in 12 volts being delivered to the fixture.



Safety Volt Transformer Warranty

This Limited Warranty applies to the models listed in this guide (all versions and voltages) purchased through an authorized dealer and installed inside the contiguous United States after May 01, 2011. This warranty shall begin upon the date of purchase as verified by the owner/operator's proof of purchase documents. In lieu of owner documents, the warranty initiation date shall be sixty-days (60) from the date of manufacture (as verified by factory production records). AquaCal AutoPilot, Inc. (hereafter referred to as: "Manufacturer") warrants the following models (hereafter referred to as: "product"), to the original owner and installation site, to be free of material or workmanship defects for a limited term.

Residential and Commercial	5 Years Parts
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Replacement parts are additionally warranted for a period of one year or the end of the original warranty term, whichever is greater.

- 1) This warranty does not include transportation charges for equipment or component parts to, or from, the Manufacturer. The owner/operator shall be responsible for any travel charges imposed by the warranty center or servicing agent.
- 2) At its sole discretion, the Manufacturer reserves the right to replace defective parts with new or refurbished replacement parts.
- 3) At the option of the Manufacturer, the Owner may be required to return the product to the factory, freight prepaid, to provide warranty service. This may become necessary if the product was installed in an area not supported by a Factory Authorized Service Center.
- 4) Claims for warranty reimbursement must have prior authorization by the Manufacturer and be performed by a Factory Authorized Service Center.
- 5) The use of parts other than genuine Manufacturer parts will void this limited warranty.
- 6) Purchasing original and / or replacement equipment through an un-authorized dealer will void this limited warranty.
- 7) This warranty is applicable only if the product has been installed, operated, and maintained expressly and completely in accordance with this product's installation guide.
- 8) This warranty is void if the product is repaired, replaced, or altered in any way by any persons or agencies other than a Factory Authorized Service Center, and is in lieu of all other warranties, expressed or implied, written or oral.
- 9) The liability of the Manufacturer shall not exceed the repair or replacement of defective parts under the referenced limited warranty term and shall not include applicable consumables.
- 10) This warranty does not include damage due to freezing conditions, negligence or abuse, installations in corrosive environments or atmospheres, nor acts of God.
- 11) There are no implied warranties of merchantability or fitness for a particular purpose that apply to this product. Under no circumstances shall the Manufacturer be liable for any loss, damage, or injury, whether direct, consequential or incidental, arising out of the use or inability to use this product.
- 12) Each application has its own individual requirements. This limited warranty does not warrant that this product will supply 100% of those requirements.
- 13) No dealer, distributor, or other similar person has any authority to make or extend any warranties or representations concerning Manufacturer's products beyond the express terms contained herein. Manufacturer assumes no responsibility for any warranties beyond the expressed terms contained in this limited warranty. Customer releases and holds Manufacturer harmless from any claims stemming from any unauthorized representations.
- 14) The foregoing limited warranty gives the Customer specific legal rights that may vary from state to state, and accordingly, some of the listed conditions and exclusions may not apply to Customers living in certain states. Any dispute between Customer and Manufacturer will be settled by binding arbitration, conducted in Pinellas County, Florida, under the rules of the American Arbitration Association, and an award of attorney's fees and costs will go to the prevailing party.