

ASTRO 2 SERIES HOT WATER RE-CIRCULATION SYSTEM | INSTALLATION AND OPERATING INSTRUCTIONS

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1.0 TYPICAL APPLICATIONS

Armstrong Astro 2 Hot water re-circulation systems automatically circulate water through domestic hot water distribution pipes. This helps to ensure that everyone in the household has **instant** hot water at the tap when they need it, while also helping to conserve water and save water heating energy costs. All systems are assembled, wired, tested, and then shipped from the factory, ready for installation.



2.0 HOW IT WORKS

In normal operation, the Astro 2 automatically starts re-circulating water throughout the hot water distribution system whenever the timer enables activation. The timer can be set for one or more activation periods per day. An activation period consists of a multiple (up to 96) of 15 minute time intervals. The timer includes manual on and off overrides to normal automatic operation.

Some models are equipped with an Aquastat, intended for use on metallic piping. The Aquastat enables operation only when the sensed water temperature is below 85°F (25°C). Once activated, the circulator operates until either the water temperature reaches 105°F (41°C), or the current timed activation period ends.

3.0 TECHNICAL DATA

TECHNICAL DATA	
Power Connection	6.0 ft (1.8 m) power cord, molded duplex plug with ground
Environment	Indoor use only
Max. working pressure	150 psi (1034 kPa)
Ambient temperature	39°F (4°C) to 104°F (40°C)
Max. water temperature	230°F (110°C)
Low temperature switchpoint [Ⓢ]	85°F (29°C) ±10%
High temperature switchpoint [Ⓢ]	105°F (40°C) ±10%
Clock/timer	12-hour analog clock with AM/PM indication
Timer settings	Individual mechanical toggles for each 15 minute interval over 24 hours
Manual override	3 position slide switch; on/auto/off

[Ⓢ] High/low temperature switch points are as measured on pipe surface with the Aquastat (-TA models only).

MATERIALS OF CONSTRUCTION (WETTED PARTS)

Pump casing	Lead free bronze* or Stainless steel*
Pump shaft	Ceramic
Impeller	Noryl
Bearings	Ceramic
Bearing seal	EPDM

*Certified to NSF-372 Complies with section 116875 of the California Health and Safety Code and Vermont Act 193 (Lead content of wetted surface is 0.25% or less.)

ITEM	MODEL	CONNECTION	SIZE	CORD	TIMER	AQUASTAT	ELECTRICAL DATA	WEIGHT
110223B-140	ASTRO 220SSU050S-TA*	Sweat	½"	✓	✓	✓	115 Vac, 60 Hz, 0.29 A, 33W	7.50 (3.40)
110223B-141	ASTRO 220SSU075S-TA*	Sweat	¾"	✓	✓	✓	115 Vac, 60 Hz, 0.29 A, 33W	7.50 (3.40)
110223B-142	ASTRO 225BS050S-TA	Sweat	½"	✓	✓	✓	115 Vac, 60 Hz, 0.64 A, 75W	7.00 (3.18)
110223B-143	ASTRO 225BS075S-TA	Sweat	¾"	✓	✓	✓	115 Vac, 60 Hz, 0.64 A, 75W	7.00 (3.18)
110223B-144	ASTRO 220SSU-TA	NPSM union	1¼"	✓	✓	✓	115 Vac, 60 Hz, 0.29 A, 33W	7.50 (3.40)
110223B-145	ASTRO 225SSU-TA	NPSM union	1¼"	✓	✓	✓	115 Vac, 60 Hz, 0.69 A, 83W	7.50 (3.40)
110223B-148	ASTRO 230SS-TA	2 bolt flange	2 bolt flange	✓	✓	✓	115 Vac, 60 Hz, 0.81 A, 97W	10.00 (4.54)
110223B-149	ASTRO 250SS-TA	2 bolt flange	2 bolt flange	✓	✓	✓	115 Vac, 60 Hz, 0.98 A, 117W	10.00 (4.54)
110223B-240	ASTRO 220SSU050S-T*	Sweat	½"	✓	✓	—	115 Vac, 60 Hz, 0.29 A, 33W	7.50 (3.40)
110223B-241	ASTRO 220SSU075S-T*	Sweat	¾"	✓	✓	—	115 Vac, 60 Hz, 0.29 A, 33W	7.50 (3.40)
110223B-242	ASTRO 225BS050S-T	Sweat	½"	✓	✓	—	115 Vac, 60 Hz, 0.64 A, 75W	7.00 (3.18)
110223B-243	ASTRO 225BS075S-T	Sweat	¾"	✓	✓	—	115 Vac, 60 Hz, 0.64 A, 75W	7.00 (3.18)
110223B-244	ASTRO 220SSU-T	NPSM union	1¼"	✓	✓	—	115 Vac, 60 Hz, 0.29 A, 33W	7.50 (3.40)
110223B-245	ASTRO 225SSU-T	NPSM union	1¼"	✓	✓	—	115 Vac, 60 Hz, 0.69 A, 83W	7.50 (3.40)
110223B-248	ASTRO 230SS-T	2 bolt flange	2 bolt flange	✓	✓	—	115 Vac, 60 Hz, 0.81 A, 97W	10.00 (4.54)
110223B-249	ASTRO 250SS-T	2 bolt flange	2 bolt flange	✓	✓	—	115 Vac, 60 Hz, 0.98 A, 117W	10.00 (4.54)
110223-340	ASTRO 220SSU050S-LC*	Sweat	½"	✓	—	—	115 Vac, 60 Hz, 0.29 A, 33W	7.00 (3.18)
110223-341	ASTRO 220SSU075S-LC*	Sweat	¾"	✓	—	—	115 Vac, 60 Hz, 0.29 A, 33W	7.00 (3.18)
110223-342	ASTRO 225BS050S-LC	Sweat	½"	✓	—	—	115 Vac, 60 Hz, 0.64 A, 75W	6.50 (2.95)
110223-343	ASTRO 225BS075S-LC	Sweat	¾"	✓	—	—	115 Vac, 60 Hz, 0.64 A, 75W	6.50 (2.95)
110223-344	ASTRO 220SSU-LC	NPSM union	1¼"	✓	—	—	115 Vac, 60 Hz, 0.29 A, 33W	7.00 (3.18)
110223-345	ASTRO 225SSU-LC	NPSM union	1¼"	✓	—	—	115 Vac, 60 Hz, 0.69 A, 83W	7.00 (3.18)
110223-348	ASTRO 230SS-LC	2 bolt flange	2 bolt flange	✓	—	—	115 Vac, 60 Hz, 0.81 A, 97W	9.00 (4.08)
110223-349	ASTRO 250SS-LC	2 bolt flange	2 bolt flange	✓	—	—	115 Vac, 60 Hz, 0.98 A, 117W	9.00 (4.08)

NOTE: All weights are in lbs. (kg) *Union model with sweat hardware kit.

4.0 INSTALLATION

WARNING



- Installation should only be completed by qualified personnel, in accordance with all applicable codes, and following generally accepted installation practices.
- Ensure the hot water supply is turned off before installation, to avoid personal injury or damage to property.
- Read and understand these instructions thoroughly before beginning the installation.

WARNING



Risk of electric shock - This pump is supplied with a grounding conductor and grounding-type attachment plug. To reduce the risk of electric shock, be certain that it is connected only to a properly grounded, grounding-type receptacle.

CAUTION



Prior to installation, flush all piping of any foreign material to prevent pump blockage and prevent damage.

CAUTION



This Circulator Has Been Evaluated for Use With Water Only and Water/ Glycol Mixture (Ethylene, Propylene only)

PROCEDURE

If required please see below union/ flange kit chart

LEAD FREE UNION FITTING SETS*
(contains two (2) half unions & gaskets)

Model	Part No.	Connection	Wt. (lbs.)
ASTRO 220SSU/225SSU	810120-320	1.25" NPSM × 0.5" Sweat Lead Free	2
ASTRO 220SSU/225SSU	810120-322	1.25" NPSM × 0.75" Sweat Lead Free	2
ASTRO 220SSU/225SSU	810120-324	1.25" NPSM × 0.75" FNPT Lead Free	2

LEAD FREE BRONZE FLANGE KIT
(contains two flanges, gaskets and nuts/bolts)

Model	Part No.	Pipe Size	Wt. (lbs.)
ASTRO 230/250SS	816013-841	0.75"	2
ASTRO 230/250SS	816012-841	1"	2
ASTRO 230/250SS	816011-841	1.25"	2
ASTRO 230/250SS	816009-841	1.5"	3

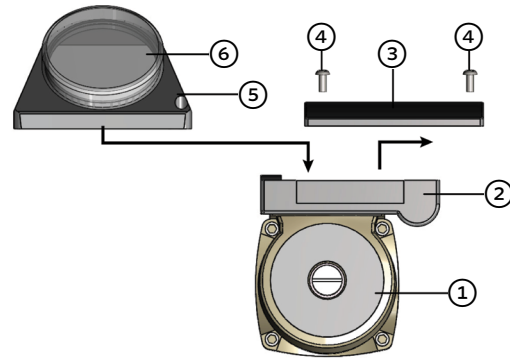
1 Timer installation and wiring

Note: Numerical component designations included in Steps I through VIII refer to circulator and timer components shown in **FIG. 1**. Steps 1 & 3 apply to retrofit installations.

- I Disconnect the electrical supply to the circulator
- II Unfasten the mounting 2 screws (4) and remove the terminal box cover (3).
- III Disconnect wire leads from the power supply.
- IV Connect power supply wires (black, white and green) to the timer unit and to the circulator terminals (as shown in **FIG.2**). Note: Lead Wiring Specification - Minimum, 6" (152 mm) long, 14 awg, rated minimum 140°F (60°C). Provided with r/c crimp connectors for attachment to the ground.
- V Place the timer box cover (5) using the 2 mounting screws (4). Insure that all lead wires are inside the timer assembly.
- VI Program the timer according to instructions provided on page 5
- VII Connect the unit to electrical supply.
- VIII Start the circulator

Assembly - Exploded Layout

FIG. 1 Astro 2 Series circulator and 24-Hour Timer assembly drawing



- ① Pump
- ② Terminal box base
- ③ Terminal box cover
- ④ Mounting screw
- ⑤ Timer box cover
- ⑥ Timer module cover

FIG. 2 Astro 2 Series circulator and 24-Hour Timer wiring diagram

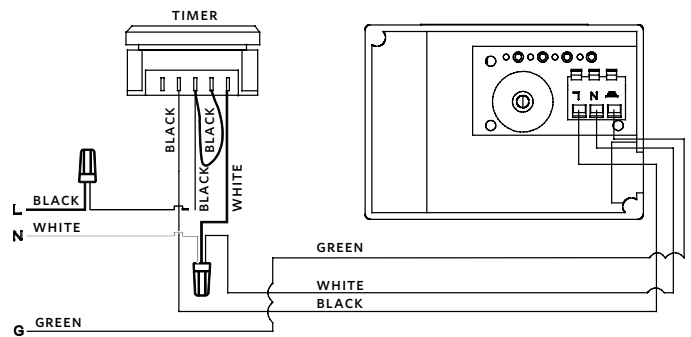
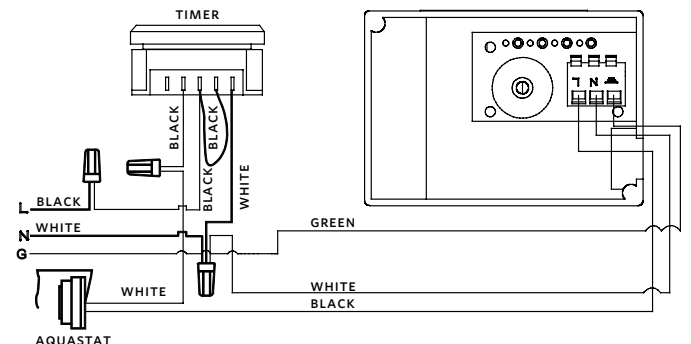
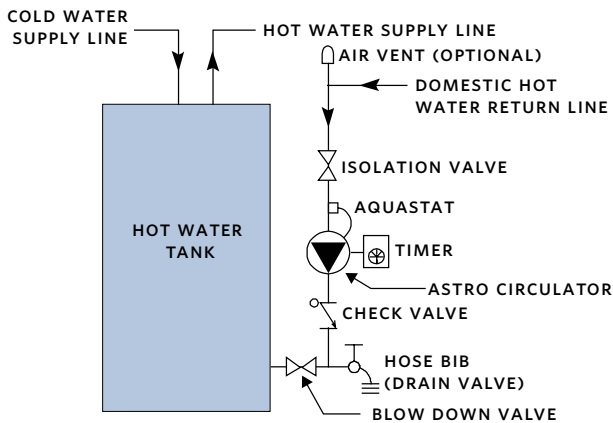


FIG. 3 Astro 2 Series circulator and 24-Hour Timer and Aquastat Control wiring diagram

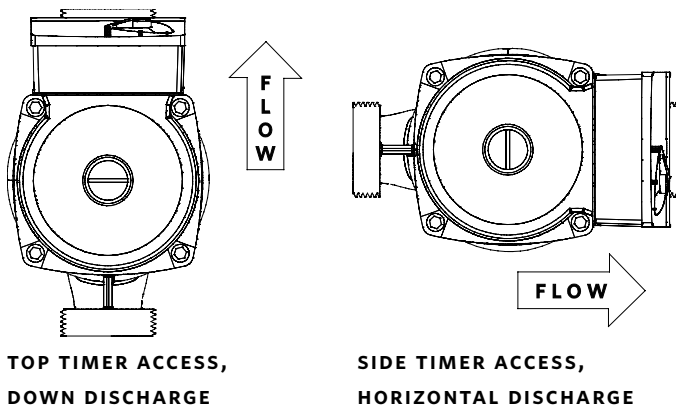


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- 2 Select a suitable location for system installation. Typically, the Astro system is mounted near the hot water heater. The inlet is connected to a return line from the furthest hot water tap in the system. The discharge is connected into the hot water heater drain line.
- 3 Ensure the following conditions are met when the system is mounted:
 - I The circulator shaft is horizontal.
 - II The clock/timer face is accessible for viewing and adjustment.
 - III The direction of water flow matches the arrow on the circulator casing.
 - IV The piping is sufficiently rigid to support the system in operation.
 - V Neither the clock/timer nor black terminal box is under the circulator.
- 4 The Astro system is shipped fully assembled and tested to suit either down discharge orientation with the clock timer facing up, or horizontal discharge with the clock timer facing the water supply side. For alternate orientation, see **Rotating the circulator casing**.



TIMER/DISCHARGE ORIENTATION (AS SHIPPED)



- 5 Connect the hot water return line to the circulator, verifying proper flow direction.
- 6 Attach the Aquastat by the integral spring clip, to either the circulator inlet or discharge piping, whichever is most convenient. Ensure the concave sensor face of the Aquastat remains in direct contact with the pipe surface.
- 7 Supply water to the system and inspect connections and components for leaks.
- 8 In order to purge the air from the recirculation line:
 - I Make sure that the system is connected to the cold water line and no fixtures are in use in the building.
 - II Close the blow down valve.
 - III Open the drain valve. Wait until all the air is purged from the system and the water flow is steady through the drain valve.
 - IV Close the drain valve.

Vent the circulator to remove trapped air:

- V Place a one gallon or larger container under the circulator.
 - VI Loosen the brass plug in the end of the circulator with a slotted screwdriver until water just begins to run out into the container.
 - VII When the vented water is free of air bubbles, gently retighten the brass plug until sealed.
 - VIII Open the blow down valve.
- The system is purged by air and ready for operation.
- 9 Verify that the timer's manual override switch is in the **OFF** position.
 - 10 Plug the power cord into a standard 115 V ac electrical receptacle.
 - 11 To perform an initial system test for basic operation, see **Operation**.

ROTATING THE CIRCULATOR CASING

Prior to connecting the system to the hot water piping, if alternate orientation of either the circulator discharge or clock timer is required, proceed as follows:

- 1 Remove the four hex socket head screws that hold the casing to the circulator.
- 2 Gently pull the casing from the circulator body, taking care not to damage the gasket or impeller.
- 3 Rotate the casing as required to meet circulator discharge and clock timer orientation requirements.
- 4 Tighten the four hex socket head screws evenly, ensuring the gasket seals the mating surfaces.

- 5 To verify the circulator shaft still spins freely:
 - I Remove the plug from the end of circulator with a slotted screwdriver.
 - II Insert the screwdriver in the slot in the end of the shaft.
 - III Ensure the shaft turns freely and smoothly in both directions.
 - IV Replace the plug and gently tighten.

5.0 OPERATION

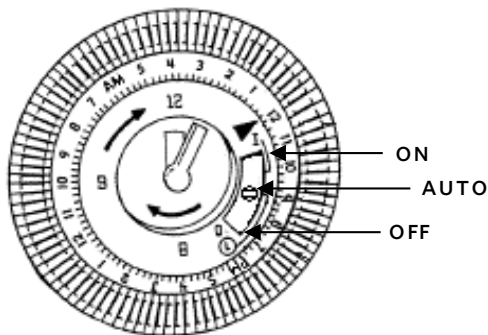
CAUTION



Never operate the system 'dry' or permanent damage may occur to the circulator. Never shut off the water supply or restrict flow in any way while the circulator is operating.

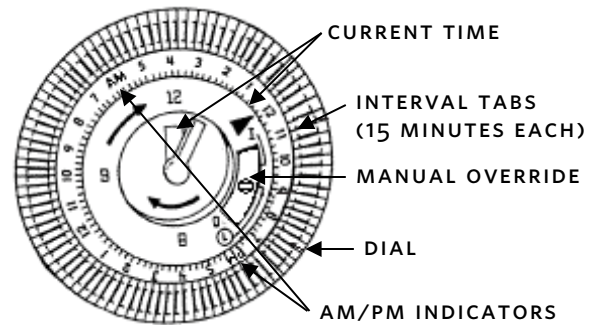
- 1 Verify water is present at the circulator.
- 2 Verify the power cord is plugged into an appropriate household electrical receptacle.
- 3 To continuously run the circulator or test for initial operation, set the manual override switch to the **ON** position and verify the circulator operates smoothly and quietly.
- 4 To prevent circulator operation, such as for extended periods that the residence will be vacated, set the manual override switch to the **OFF** position.
- 5 For normal automatic operation, set the clock/timer as required and move the manual override switch to the **AUTO** position.

MANUAL OVERRIDE SWITCH POSITIONS



6.0 SETTING THE CLOCK/TIMER

- 1 Rotate the dial in a clockwise direction until both the time shown, and the appropriate AM or PM indicator, correspond to the current time of day. (This adjustment is required for initial operation, following a power interruption, to adjust for daylight savings time, or for periodic time correction.)
- 2 Remove the clear plastic cover from the dial.
- 3 The outer ring of the dial has an adjustable tab for each 15 minute time interval of a 24 hour day. To enable circulator operation for a specific time interval, slide the corresponding interval tab toward the perimeter of the dial. All tabs positioned toward the center of the dial disable circulator operation for those time intervals.
- 4 Verify the manual override switch is in the **AUTO** position.
- 5 Replace the clear plastic cover on the dial.



7.0 REPLACEMENT PARTS

ASTRO MODELS (PUMP ONLY)	ITEM NUMBER
Astro 220SSU w/ 1/2" SWT	110223-301
Astro 220SSU w/ 3/4" SWT	110223-302
Astro 225BS 1/2" SWT	110223-303
Astro 225BS 3/4" SWT	110223-304
Astro 230SS	110223-306
Astro 250SS	110223-308
Astro 220SSU	110223-309
Astro 225SSU	110223-310

PART DESCRIPTION	ITEM NUMBER
24-Hour timer	810223-130
Timer cover	110223-041
1/2" Aquastat	110123-120
3/4" Aquastat	110123-121

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