AUTO-CONE®
Owner's Manual

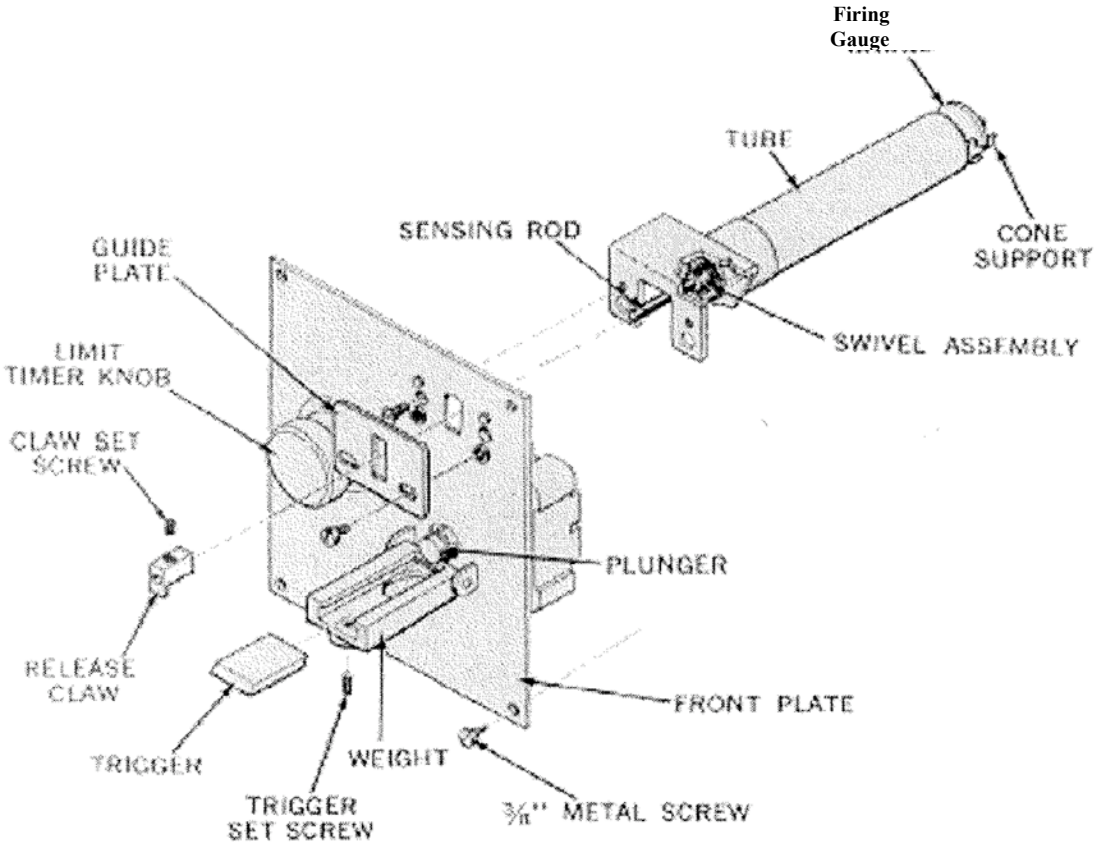
Models AC-10, AC-20, and AC-P

The AUTO-CONE® is designed to stop the firing process once your kiln has achieved the desired amount of heat work. Heat work is defined as the combined effect of both time and temperature related to the firing of ceramic ware. Utilizing a small standard Orton cone or bar, the AUTO-CONE® switch will disengage and break the power supply to the kilns heating elements when the cone reaches its equivalent heat work temperature.

The AUTO-CONE® Model AC-10 and AC-20 is supplied with an electrically powered synchronous timer that the operator sets to the estimated time (hours) needed to complete the desired firing. If a malfunction were to occur with the cone or bar the timer will shut the kiln off when it times out without regard for the cone or bar. The timer is provided as a backup to reduce the likelihood of damage to your kiln from over firing.

The AUTO-CONE® requires very little maintenance but may need an occasional adjustment. With proper care and maintenance your AUTO-CONE® should provide you with many years of trouble free service. Replacement parts such as the tube assembly, cone supports or sensing rod are available to extend the operating life of your AUTO-CONE®. Frequency of replacement depends on the type of firing, type of clay used, proper venting and the moisture content of the pieces being fired.

Table of Contents



AUTO-CONE® PARTS IDENTIFICATION

Although your AUTO-CONE® was installed by your kiln manufacturer it may require adjustment prior to firing your kiln. Please follow your kiln manufacturer's instructions for the initial firing of your kiln. The instructions for adjusting your AUTO-CONE® found within this manual will guide you through the adjustment process.

To insure that your AUTO-CONE® is properly adjusted, follow the instructions on the following pages and conduct a test firing of your kiln with the AUTO-CONE® before you do anything else. For the test firing, load the kiln with kiln shelves and posts only. Do not attempt to fire any clayware at this time.

ADJUSTMENT/REPLACEMENT PROCEEDURE

Conduct this procedure whenever a new device is used for the first time or after replacing a tube assembly.

1. Turn all switches to "off"and disconnect kiln from the power supply. (Unplug the kiln from the power outlet)

2. Install the firing gauge.

Normally the firing gauge is in position when your kiln is shipped from the factory (held by a rubber band at the end of the AUTO-CONE® tube.) If it has been removed, it should now be replaced over the sensing rod and cone supports, as shown in Figure 1.

CAUTION: Remove firing gauge before operating kiln.

Figure 1.

3. Check the position of holding claw and trigger weight.

First, check your kiln with a level to make sure it is not set on an uneven floor, if it is not level, the weight may not fall when released.

WARNING: Do not fire your kiln over or near FLAMMABLE material (i.e. wood floor, carpeting, etc.)

With the firing gauge in position, swing the weight up against the guide plate. Push the claw down (against the slight play in the swivel/pivot assembly) and check for a 1/16th inch spacing between the inside tip of the claw and the face of the trigger as shown in Figure 2. The set screw on top of the claw may be loosened if the adjustment of the claw position is necessary. The claw should be flush with the end of the sensing rod. Retighten the set screw firmly. The height of the trigger can be adjusted by loosening the set screw as seen in figure 3. The setscrew must be firmly tightened or the force of repeated falling of the weight may cause the trigger to creep out of adjustment.

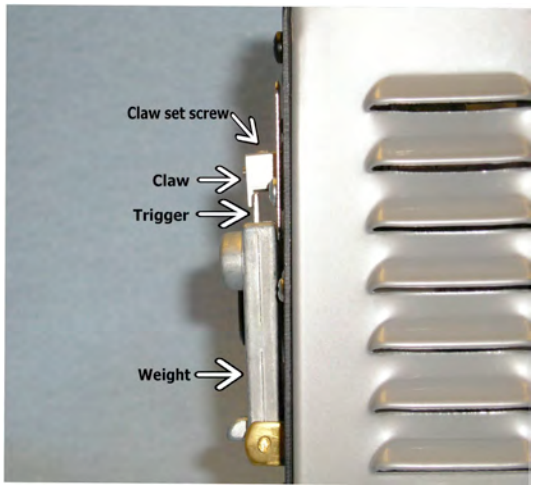


Figure 2.

Figure 3.

When the weight swings forward, the trigger should just clear the underside tip of the claw.

4. Verify free travel of sensing rod.

THE FIRING GAUGE SHOULD NOW BE REMOVED BUT KEPT FOR FUTURE PERIODIC ADJUSTMENTS. The sensing rod is now free to travel vertically within the tube cavity. It should travel freely in the center of the cavity without touching the sides at any point. If necessary, the sensing rod may be centered by loosening the guide plate screws in front of the AUTO-CONE® and moving the guide plate right or left as required. After making your adjustments, be sure the guide plate screws are firmly tightened. When these adjustments have been made, you are ready to test fire.

TEST FIRING

Firing tests are made with the kiln **empty.** To expedite the process it is recommended that you use small Orton cones, which mature at a relatively low temperature, typically a cone 019. This allows you to complete the test firing in the shortest possible time. Additional cones are available from your dealer or direct from Orton on our website store www.ortonceramic.com.

1. MAKE SURE THAT THE FIRING GAUGE HAS BEEN REMOVED.

2. APPLY KILN WASH, to the underside of the sensing rod and the tips of the cone supports and allow it to dry.

(A small nail polish bottle with brush is ideal for this purpose.) Mix Hi-Fire kiln wash with water to a creamy consistency. Apply a THIN coat to the cone supports and the sensing rod where they will come in contact with the cone. Do not apply kiln wash to the cone or to the end of the porcelain tube. Allow wash to dry thoroughly. Do not allow kiln wash to build up and accumulate. It will dry to a white color.

3. RAISE WEIGHT UP AGAINST GUIDE PLATE.

4. **PRESS CLAW DOWN LIGHTLY UNTIL IT ENGAGES TRIGGER.**

5. INSERT CONE

While holding the claw down over the trigger, carefully place one of the test cones flat on the cone supports with the number facing down. See Figure 8. The cone should be back against the metal step of the cone support with the center of the cone parallel with the end of the tube.

CAUTION: Since the softening and bending of the cone shuts off your kiln, consistency is important for proper firing.

Figure 8

IF THE CONE IS DISLODGED BY ACCIDENT OR ALLOWED TO COME IN CONTACT WITH THE PORCELAIN TUBE, AN OVER-FIRING MAY RESULT WHICH COULD CAUSE SERIOUS DAMAGE TO YOUR KILN

The cone should now hold the claw engaged so that the weight is supported and your hands are free. You are now ready to close the kiln and begin the test fire.

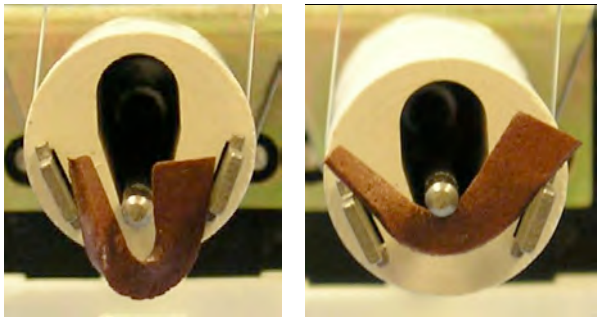
6. TURN ALL SWITCHES to the OFF position.

7. TURN THE LIMIT TIMER KNOB CLOCKWISE TO 2 HOURS ON THE SCALE.

8. INSERT A FINGER INTO THE HOLE IN THE TRIGGER WEIGHT AND PUSH THE PLUNGER UNTIL IT LOCKS. (Refer to figure 3)

9. FIRE THE KILN, SETTING THE KILN SWITCHES AS INSTRUCTED BY THE KILN MANUFACTURER. (For purposes of test firing, when the kiln is empty, the highest kiln switch setting may be used.)

In approximately 1 ½ TO 2 hours the AUTO-CONE® weight will drop, shutting off the kiln. When the kiln is cool you may open it and inspect the cone. If all adjustments have been made correctly, the cone will be bent to an approximate 90-degree angle with a shape similar to the illustration in Figure 9. However, if it is bent similar to the "over-fired" illustration, reduce the kiln switch settings. This will increase the firing time, reduce the rate of climb and allow the cone to mature properly.



Over fired Properly fired

Figure 9.

The best way to verify that your load has achieved proper Heat work is by using witness cones. These are valuable and inexpensive instruments that reliably measure actual firing performance. Witness cones are made in two sizes, Large or Self-supporting. Your kiln manufacturer recommends using witness cones during test firings and also during normal firing operations, as a check for consistent firing performance, for information on witness cones, refer to page 8, Witness Cones, or the Orton Ceramic Foundation website, www.ortonceramic.com.

You are now ready to begin normal firing operations.

NORMAL FIRING OPERATION

It is the responsibility of the AUTO-CONE® user to become familiar with the proper operation and adjustment of the AUTO-CONE®. If the simple steps and precautions, outlined in this manual, are followed with care, it will serve you as a valuable and reliable instrument for greater success and enjoyment in your ceramic firing. When you have assured that the AUTO-CONE® is in proper adjustment, by test firing, as described in that section, you are ready for normal firing operation.

1. CHECK THE SENSING ROD

Before each firing check the sensing rod for free and centered travel. In spite of precautions, the swivel/pivot of the tube assembly can become corroded or contaminated and alter the normal shut off. If the sensing rod moves sluggishly, does not fall freely or you have inconsistent firings, immediately replace the tube assembly.

2. TURN ALL KILN SWITCHES OFF

The life of the AUTO-CONE® switch will be increased if kiln switches are off before engaging the AUTO-CONE®

3. APPLY KILN WASH

Apply a THIN coat of Hi-Fire kiln wash to the cone supports and sensing rod where they will come in contact with the cone. Allow the kiln wash to dry thoroughly. We suggest two pair of supports be available. This allows you to prepare a clean pair while the other pair is being used in the firing.

4. STACK WARE IN THE KILN

When loading your kiln, care should be taken to keep the AUTO-CONE® tube, cone supports, and cone or bar visible from above at all times. If the tube is covered from view, the cone or bar could accidentally be dislodged from its proper position without being noticed and cause a malfunction of the AUTO-CONE® shutoff. Shelves and ware should be positioned at least an inch above or below the AUTO-CONE® tube so that the normal shut-off function will not be obstructed. Be sure to place witness cones on each shelf. Orton has a helpful video “Loading your Kiln” available for purchase on our website, http://www.ortonceramic.com/store/home.php?cat=249

5. RAISE THE WEIGHT UP AGAINST THE GUIDE PLATE

6. PRESS THE CLAW DOWN LIGHTLY UNTIL IT ENGAGES THE TRIGGER

7. INSERT THE CONE (Small size cones or bars are used on AUTO-CONE®)

While holding the claw down over the trigger, carefully place the cone or bar, selected for your firing, flat on the metal cone supports with the inside edge of the number circle even with the outside edge of the cone supports. See Figure 8. The cone or bar should be against the metal step with the center of the cone or bar parallel with the end of the tube. Consistent placement of the cone or bar in this manner will lead to consistent firing control. The cone or bar now holds the claw engaged so that the weight is supported and your hands are free.

8. CHECK THE POSITION OF THE CONE OR BAR

As a last step before closing the kiln, always check to see that the cone or bar is in its proper position and free of obstructions. AN IMPROPERLY PLACED CONE OR BAR COULD CAUSE AN OVERFIRING AND DAMAGE YOUR KILN AND WARE.

9. CLOSE THE KILN All switches are off at this point.

1O. SET THE LIMIT TIMER KNOB

The timing knob will not allow the plunger assembly to engage when in the OFF position. Always set the timer prior to switch engagement (pushing in the plunger.)

How to **use the Limit Timer**

The limit timer is a safety shut-off device to protect your kiln from over-firing in case the AUTO-CONE© fails, through some malfunction, to shut off the kiln when the pyrometric cone or bar has matured. The numbers on the limit timer control knob indicate 20-hours of firing time. If your firing requires a longer period, the knob may be reset during firing for this additional time. Since the function of the limit timer is to override the actual firing time, it should always be set for a longer period than the estimated firing time. After you have become familiar with the firing of your particular kiln, you can set the limit time as low as 1/4-hour longer than the estimated firing time. Until you have reached that degree of familiarity, it is safer to set the limit timer 1/2-hour longer than the estimated firing time.

The limit timer may also be used as a timing device to aid you while you are learning to estimate firing times. For example, if the timer knob is set at "7" before firing, and the indicator is on *"1"* when firing is completed, you know that the elapsed time was 6-hours.

Caution: The timing knob should never be set beyond 20-hours. If the timing motor should be inoperative, such action could jam the switch assembly, possibly causing an over-firing.

11.VENTING

Venting of the kiln for the entire firing period will add years of life to your AUTO-CONE© tube assembly. Use of the Orton Vent Master kiln vent will also help increase the element life and reduce metal degradation.

If you do not have a vented kiln, you should leave the lid open 1 inch and remove the top peephole. After the inside of the kiln begins to glow a dull red, close the lid.

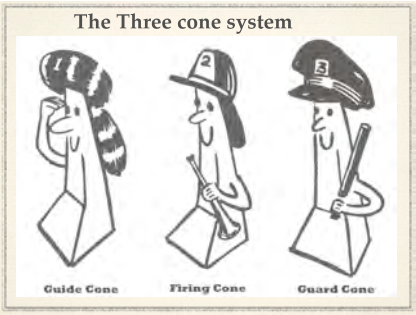
12. INSERT A FINGER INTO THE HOLE IN THE TRIGGER WEIGHT AND PUSH FIRMLY IN ON THE PLUNGER UNTIL IT LOCKS.

13. WEIGHT CLEARANCE

The area outside the kiln should be clear of obstructions so the free fall of the weight is not impeded.

14. FIRE THE KILN BY USING THE REGULAR KILN SWITCHES, AS INSTRUCTED BY THE KILN MANUFACTURER.
DO NOT LEAVE THE KILN UNATTENDED BEYOND THE ESTIMATED FIRING TIME. An uncontrollable accident, such as greenware falling against the end of the AUTO-CONE© tube, may cause an over-firing, which could damage your kiln. Should this occur, the operator should be in attendance to manually shut off the kiln.

WITNESS CONES



An Orton pyrometric cone is a slender triangular pyramid composed of materials that will react to time and temperature in the same way as the ware you place in your kiln. The cone is a most valuable tool for determining the accuracy of you kiln. Orton manufactures four types of pyrometric cones; Self-supporting, Large, small and bar. The self-supporting cone and large cone are used to monitor heat work. Heat work is the combined effect of time and temperature applied to a heated item. These cones are placed throughout the kiln next to the ware to measure the heat work on each shelf. Small cones or bars are primarily used in the Autocone.

Even though small cones or bars are used in the AUTO-CONE©, the use of large or self-supporting cones is highly recommended when firing your kiln with an AUTO-CONE©. The Large or Self-supporting cones, also called witness cones, help you determine whether the AUTO-CONE© is properly adjusted. Conducting test firings will help you to learn your kiln's "personality" or its heat distribution.

When firing, you will need three different large cones mounted into a plaque (or three self-supporting cones). A plaque is a porous clay base designed to hold three large size cones at an angle of 8-degrees from vertical. The first cone in the group is called the GUIDE CONE. It is one cone number cooler than the firing cone. The guide cone matures at a temperature approximately 30-degrees lower than the firing cone. When it bends, it serves warning that shut-off time is near. The cone number we wish to fire to is placed in the middle. It is called the FIRING CONE. In most cases it is the same cone number as the cone on your AUTO-CONE©. When it bends over with the tip close to, but not quite touching, the base, you know that the desired heat treatment has been reached.

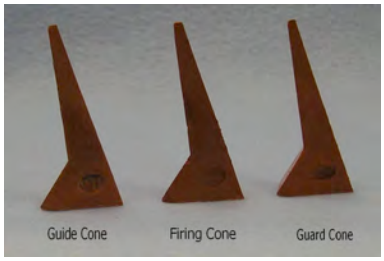


Figure 14

The final cone in the series is one number hotter than the firing cone, It is called the GUARD CONE. If it bends at all, you know that the kiln has fired beyond the pre-selected point. The three cones should be placed on a shelf close to the level of the AUTO-CONE© tube and on any additional shelves used to load the kiln since temperatures vary at different levels within a kiln.
Please note, because a shelf supported by stilts is not completely stable, the height of the shelf should be one inch above or one inch below the tube. This will prevent a possible jamming of the normal AUTO-CONE© shut-off function should the shelf expand or tilt in the direction of the tube.

When setting your kiln shelves, follow the kiln manufacturer's instructions. The spacing between shelves will depend upon the objects you wish to fire. This spacing, as well as the size and weight of your ware, has an affect on heat distribution.

After firing is completed, you will see some differences in the appearance of the cones. If for example your firing was made with two or more shelves, the lower shelf will usually show less bending of the cones than the plaque located on a shelf near the top of the kiln. This range of heat treatment normally will be within the range recommended for your materials. The shelf locations, and amount of material placed on each shelf, and the switching sequence, will have some affect upon the heat distribution in your kiln. But as long as each set of cones show cone values within the range recommended for your material, you can be sure it is receiving proper heat treatment.

Now fire the kiln in the manner recommended by the kiln manufacturer. Use the proper switch sequence and follow venting procedures for necessary air circulation.
If witness cones, after the first test fire, appear similar to those illustrated in Figure *14,* you will know that the AUTO-CONE© is in proper adjustment. But make a second test firing exactly as you did before. This will serve as a double check and indicate the consistency of firing performance.

If the witness FIRING cone is UNBENT, then test fire a second time using a hotter cone on the AUTO-CONE© (one number higher.) If a second test fire, as recommended above, does not cause proper maturing of the witness cones, as illustrated in Figure 14, then it is recommended that you recheck all adjustments, as described in that section and repeat the two test fires.

MAINTENANCE OF YOUR KILN-SITTER

Your AUTO-CONE© is manufactured from the finest materials available ... selected for strength, durability and resistance to heat and corrosion. However, during the firing operation, moisture and corrosive gasses are created which can, in time, alter the normal shut off function. Below are maintenance procedures and operating recommendations which will keep your AUTO-CONE© doing its job. Careful attention to these instructions will reward you with trouble free firing

NEVER USE LUBRICANTS OF ANY KIND ON THE AUTO-CONE ©

PERIODIC ADJUSTMENTS

The AUTO-CONE© may get out of adjustment during use and we suggest you repeat an adjustment check every 30 firings as described under "Adjustment Procedures".

VENTING THE KILN

Orton recommends using the Vent Master kiln vent for all kiln firings. Venting will reduce deterioration of the kiln's metal parts and increase the life of the tube assembly. In the event that no vent is in use**, t**he top peephole should be left open for the entire firing period. Information on the Vent master can be seen on the Orton Website www.ortonceramic.com

CARE OF CONE SUPPORTS

It is important that excess kiln wash not be allowed to accumulate on the supports. We recommend they be cleaned after every firing with a small wire brush. In the event the kiln wash or cone glaze cannot be removed, rotate the supports to the clean side or replace them. We suggest two pair of supports be available. This allows you to prepare a clean pair while the other pair is being used in the firing.

CARE OF THE SWIVEL/PIVOT (Tube Assembly)

The swivel/pivot of the tube assembly is the most sensitive part of the AUTO-CONE© and can become corroded and contaminated during normal firing. This can cause sluggish movement of the sensing rod and alter the shut off of the AUTO-CONE©. We recommend, as good insurance against a mishap, that the guide plate be removed and the swivel/pivot of the tube assembly be examined every 6 to 12 months. The frequency of inspection depends on the type of firing, clay composition and moisture content, and humidity in the area. Evidence of contamination or sluggish movement would indicate the need for immediate replacement of the tube assembly

SENSING ROD

Continued operation at high-fire temperatures will eventually cause the end of the rod to deteriorate or bend. This will, in turn, affect the adjustment of the trigger and claw. If this occurs, the rod must be replaced.

OPERATIONAL TEMPERATURE

The AUTO-CONE© is engineered to withstand kiln temperature up to and including Cone 8. Temperatures higher than this limit will reduce the normal lifetime of the cone supports and sensing rod.