This manual assumes the reader has basic knowledge of partial denture framework design. For denture detailed instruction of partial denture design, please visit our website for training schedule or call one of our highly skilled technicians at 800.833.2343

**SURVEY AND DESIGN**
Surveying requires the use of a surveyor and a survey table that is adjustable and can be locked into a fixed position.

Select a path of insertion for the framework by tilting the model on the surveyor table. Undercut areas are those areas below the height of the contour line.

**BLOCK OUT**
A maxillary model may require palatal beading. Once the block out procedure is completed the model is ready for duplicating.

**DUPPLICATION**
Normally the cooking temperature of the hydrocolloid is between 190°F (88°C) and 195°F (91°C). The cool temperature should be between 130°F (54°C) and 135°F (57°C) for pouring. See manufacturer’s instructions.

Soak the master model in warm water 110°F (43°C) for 10-20 minutes depending on the stone used, the stronger the stone, the longer the soak time.

**HYDROCOLLOID CONDITIONERS**
Remove the model from the water and gently shake or use a towel to remove the excess water.

Place model on the flask base and place flask top into position. Pour the colloid into the flask, fill to the top. Hydrocolloid should be about a “pencil-size” stream when entering flask.

Bench set the flask for 10 minutes. Place in water 55°F (13°C) to 70°F (21°C) with the water level just over the base of the flask for 20 minutes, then bring the water up over the flask for an extra 10 minutes. Test the warmth of the flask by placing your knuckle onto the center part of the flask, if it’s still warm place it back in the water for another 10 minutes.
Remove the flask from the water, remove the base of the flask, drop the set colloid out of the flask, remove the model from the colloid and replace the colloid back into the flask. Be careful not to trap any small amounts of colloid between the flask and the colloid mold.

**REFRACTORY MODEL**

For spruing through the model, place the Nobilium Sprue Former in the colloid and center of the frame.

Mix the investment of your choice as per investment instructions.

Once the refractory model has been removed from the colloid as per investment instructions, trim the refractory model to provide a base at least 1/2” (13 mm) thick at its thinnest point, and angles to create undercuts between 70° and 80° on all sides. Clean excess dust from the model.

Place the model in a Model Drying Oven at 450°F (232°C) for at least 1 hour. Remove the refractory model from the oven and immediately submerge it into rosin dip for approximately 8-10 seconds or as recommended by rosin dip manufacturer’s instructions. The rosin dip should be at a temperature of 250°F (121°C).

Remove the refractory model from the rosin dip and place the model on its heels or posterior section to allow for cooling and drainage prior to waxing.

**WAXING**

Use a red pencil and draw the design on the refractory model. Flood a small amount of wax in areas that could be thin. Paint tacky liquid on the model to help attach the plastic pattern. Place all the parts on the model and wax together with hard wax. Place sprues and a cone (if spruing from above). Wax everything together smoothly. Place waxed-up model into a casting ring. Invest the model as per investment instructions.

**BURNOUT**

Remove the casting ring and place the mold in a room temperature furnace. Heat furnace to 400°F-500°F (204°C-260°C) and hold for 1 hour. Then increase temperatures to 1600°F-1800°F (871°C-982°C) and hold for 1 hour before casting.
INDUCTION CASTING

Place alloy in the casting machine and follow the casting instructions for your machine.

NOTE: At least 50% new alloy is required at all times for each casting.

FINISHING AND POLISHING

Allow at least 45 minutes to cool prior to deflasking. Removing sprues with high-speed lathe and separating disc. Sandblast to remove investment and oxides.

***SEE TROUBLESHOOTING GUIDE***

ON THE FOLLOWING PAGES

PN E678-1 ELECTRO POLISHER

Use electro polishing solution in an electro-polisher to pre-shine the frame

PN 2008M CASTING MACHINGS PN 2010M

PN 5228 POLISHING BRUSH

Use rubber wheels and rubber points to achieve a smooth surface. Final high shine is achieved by using felt wheels, felt points, bristle brush, and high-shine compound.

PN 5000 SEPARATING DISC

PN 3170A1R/3170A4 SANDBLASTER

PN E272 (ACID)
TROUBLESHOOTING

REFRACTORY MODELS

Problem: Bubbles in the hydrocolloid impression.

Cause: Master model is not allowed to soak properly to remove all air. Model should be allowed to soak at least 30 minutes in warm water prior to duplication.

Cause: Hydrocolloid is too cold when poured. Adjust the pour temperature to 130°F (54°C).

Problem: Refractory model too soft.

Cause: Liquid is too cold. Investment is setting too slowly. Liquid should be 70°F (21°C) to allow for the proper setting time of the investment – keep in mind that humidity may also affect the setting time.

Cause: Hydrocolloid material may be too cold. The material should not be allowed to chill in a refrigerator or ice bath. The temperature of the water bath should be 55°-70°F (13°-21°C).

Cause: Model removed from the hydrocolloid prematurely – allow 55 minutes setting time from pouring to recovering the refractory model.

Problem: Too soft after dipping.

Cause: Temperature of the drying oven or dip is too cold. The refractory model should be allowed to dehydrate 1 hour in a model drying oven at a temperature of 450°F (232°C). Rosin dip should be at a temperature of 250°F (121°C) and the refractory dipped for 5 seconds.

Problem: Plastic patterns will not adhere to model.

Cause: Tackyfier is too thin.

Cause: Tackyfier is not allowed to dry sufficiently.

Cause: Refractory model is too cold.

MOLDS

Problem: Investment cracking.

Cause: Investment taking too long to set-up on vibrator. See manufacturers instructions for correct setting times for investment used. Humidity may effect the setting time.

Cause: Liquid is too cold. Remove liquid from refrigerator at least 1 hour prior to usage. Ideal temperature for liquid is 70°F (21°C).

Cause: Liquid is not accurately measured and/or improperly mixed.

Cause: Investment setting too rapidly. Liquid may not have cooled to room temperature. Improper ratios and/or mixing of liquids.

Cause: Lack of good vibration with Ethyl Silicate investments. See manufacturers instructions for the investment used.

Cause: Investment is too thick when pouring the outer ring. Check the liquid to powder ratio recommended by the manufacturer for the investment used.

Cause: Improper removal of the crust once the investment has set. If the complete layer of crust is not removed, the cracking formed in the crust may extend into the main body of the casting ring, causing internal cracking in the mold or fins in the casting.

Cause: Case allowed to bench set too long before the crust is removed.

Cause: Refractory models not properly dehydrated. Allow the refractory models to dehydrate 1 hour at 450°F (232°C) prior to rosin dipping.

Problem: Thermal cracking - Ethyl Silicate

Cause: Oven run up too fast on low fire. Burnout is important! Temperature should rise from room temperature to 700°F (371°C) in 1 hour.
From 700°F (371°C) to reaching mature temperature should take approximately 1 to 1-1/4 hours and then be allowed to heat soak for an additional 30 minutes. The longer the heat soak, the greater the expansion. (Tighter fits = less time.) This soak time is especially crucial for palatal castings as this also hardens the investment.

**Cause:** Case left too long on the bench after investing or overnight. Cases should be placed in the furnace within 3 hours of investing and trimming. Should the period be longer before placing into a warm furnace, the cases must be refrigerated or placed in a humidified state (plastic bag and moist towel) until ready to be introduced into the furnace. Cases may be placed in the oven in the plastic bag along with the moist towel.

**Cause:** Furnace not warm when the cases are loaded. Make sure invested cases are placed into a warm furnace at about 200°F (93°C). If your oven does not possess this capability, the cases must be placed in a plastic bag with a moist towel if burnout cycle is not started within 3 hours of pouring investment.

**Cause:** Outer investment layer is too thin at the outer wall. The pattern or model must be at least 1/4” (6 mm) from the outer wall of the investment.

**Cause:** Sharp angles or corners on the refractory models.

**Cause:** Stacking rings in the oven improperly. Make sure the rings are layered and staggered.

**Cause:** Improper mixing of the liquids.

**Cause:** Improper mixing ratio of liquid to investment.

**Cause:** Not enough vibration to eliminate the proper amount of liquid from the investment as it sets. Moderate vibration is required. Vibration should continue until the investment reaches its initial set, 20 minutes.

**Cause:** Low-fire burnout not long enough to thoroughly dry models and eliminate wax completely, causing pressure or steam buildup inside the ring. Low-fire burnout is 400°-500°F (204°-260°C), holding for 1 hour.

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### Problem: Thermal cracking - Phosphate Investment

**Cause:** Too much vibration

**Cause:** Incorrect ramp of furnace temperature. See manufactures instructions.

**Cause:** Placed in a hot furnace when casting the next day. Phosphate investment should not be allowed to cool down prior to ramping up the furnace.

**Cause:** Not bench set for the correct time.

### PITS IN THE CASTINGS

**Problem:** Black pits with sharp edges, open up when trimming.

**Cause:** Sprues too long, too small, button too small or short spin. “Suck Back Holes” Check for tapered connections where the sprue connects to the wax-up. If sprue connections are good, consider using a reservoir.

**Problem:** White pits

**Cause:** Investment getting into the casting. Look for sharp edges that can break off during casting. Check the junction where the sprues contact the frame. Check the cone hole for investment.

**Problem:** Tiny round black pits, hard to remove.

**Cause:** These are usually from carbon buildup in the furnace. After casting, bring the furnace up to it’s highest temperature and hold for 1 hour. Allow to cool with the door closed.

**Problem:** Granular pitting, like dust

**Cause:** Button or ingots dirty, wash all sand from sandblasted buttons before using.

**Problem:** Green or black lumps in the frame.

**Cause:** Not cleaning out the crucible correctly, old burnt alloy getting into the frame during the next casting. Removal from the oven just prior to casting, remove the
case from the oven and gently tap tongs while the case is secure in tongs. Make sure the sprue hole is facing down when removing any loose investment from the sprue hole.

**Cause:** Trash in the crucible. Check crucible for scraps of old or burnt alloy. Also, examine the crucible for pitting, cracking or other defects.

**Cause:** Imperfections in the sprue hole. Check to see if there are bubbles or rough surfaces in the sprue hole or the refractory model before dehydrating and rosin dipping. Smooth any rough surfaces of the sprue hole once removed from the hydrocolloid.

**Cause:** Dirty rosin dip. The rosin pot should be cleaned periodically. Debris and investment particles from the refractory models tend to settle in the rosin dip and may become stirred and adhere to the freshly dipped model.

**Cause:** Thin areas of investment. Take care in the investing process as well as with the refractory models not to create thin slivers or sharp, thin angles in the investment.

**Problem:** Bubbles on the surface of the castings.

**Cause:** Green Paint-On, NobilCoat or Niranium Precoat applied too thickly.

**Cause:** Paint-on investment not allowed to dry properly must set at least 15 minutes prior to pouring investment. Check manufacturer’s recommendations.

**Cause:** Paint-on investment allowed to dry too long. Prolonged bench-set of the paint-on will produce cracking and rough geographic castings.

**Cause:** Premature removal of refractory model from hydrocolloid. Allow 55 minutes set-time from pouring to recovery of refractory model.

**Cause:** Debubblelizer not allowed to properly dry.

**Problem:** Short castings – clasp and retention areas not completely cast.
**Cause:** Improper metal oxidation during the burnout procedure. These cases should be among the first to be cast. Heat-soak no longer than 20 minutes. The normal heat-soak is 30 minutes, however, with hinges keep as much oxidation as possible, therefore the lower soak time.

**Problem:** Fins on sprues.

**Cause:** Weak investment. Check the liquid mixing ratio as well as the liquid/powder ratio.

**Cause:** Cases introduced into the oven too soon. Invested rings must be allowed to cure 1 hour prior to being placed in a warm oven.

**Problem:** Internal fins on castings.

**Cause:** Not enough vibration when investing. The invested ring must have sufficient vibration to allow the proper amount of liquid to escape.

**Problem:** Fins around the clasps, mesh and borders of the castings.

**Cause:** Too much tackyfier.

**Cause:** Excessive wax used in sealing down the patterns.

**Cause:** Rosin dip not absorbed by the refractory model or model too cold when dipped. Refractory model should be allowed to dehydrate 1 hour in a Model Drying Oven at a temperature of 450°F (232°C). The rosin dip should be at 250°F (121°C) and refractory model dipped for 5 seconds.

**Problem:** Material separation in pails.

**Cause:** Vibration from transportation.

**Remedy:** Roll pails on the ground to remix.

**Problem:** Lumps in investment powder.

**Cause:** Pails left open will absorb moisture.

**Remedy:** Keep pails sealed when not in use.

**BUTTONS**

Alloy correctly cast. The button will have a concave dimpled/rippled top and a sharp edge with smooth walls.

Alloy too cold. The button will have rounded edges with smooth walls, it may also have a convex top edge.

Alloy overheated. The button will have a convex rounded top edge with pitted walls.
IMPORTANT PROCEDURES & PRECAUTIONS FOR PROCESSING NOBILIUM PARTIAL DENTURES

1. Adequate local exhaust ventilation should be provided for all operations such as grinding, polishing and finishing. Good industrial hygiene practices will eliminate any possible hazard from dust created by investments, grinding wheels, sandblasters, alloys, etc.

2. Adequate general ventilation should be provided to all laboratory areas.

3. Dust removal from clothing and cleaning machinery should be accomplished by power suction methods, not by air hoses.

4. Every employee should be appraised of these recommendations.

5. Dental laboratories, like all other industries, must conform to OSHA regulations. Obtain a copy of all applicable standards as issued and conduct regular inspections to insure your laboratory is properly equipped and that all OSHA requirements are observed at all times.