

Horn Troubleshooting

Ultrasonic Welding

A horn is the “custom-tailored” portion of an ultrasonic plastics assembly system and the first component that should be tested when a problem arises. The following conditions can indicate possible horn-related malfunctions:

1. **Loud, high-pitched noise.** The most easily recognized symptom of a horn problem is a loud, high-pitched noise in the area of the stack (converter/booster/horn assembly), which can be indicative of a cracked horn.
2. **Power supply overload.** In some instances the power supply will not run at all or will indicate an overload condition, especially when tuning the horn in air. 900 and 2000 Series equipment, which incorporates an autotune feature, will not operate if there is a problem with the horn. With 2000 Series, it may be necessary to use the digital tuning option for difficult horns.
3. **Power supply fails to tune to low meter reading when horn is operated in air.** The power supply should be able to be tuned to a low power usage reading (10% or less) unless the horn is very large or has unusual design characteristics. Note: On 900 Series equipment, check the test scale level; it can read up to 30% if set on the 3X scale.
4. **Diminished or inconsistent weld quality.** During the setup of production equipment, specific welding parameters are established for optimum performance and repeatability. The mechanical load meter in 800 Series or LED storage meter in 900 and 2000 Series equipment indicate the power level that is being delivered to each welded part. If the power level begins to increase or decrease, it is possible that the horn may be contributing to the problem.

Horn Troubleshooting Procedure

To diagnose the problem, use the following standard procedure if any of the above conditions occurs:

1. Disassemble the horn from the stack and depress the test button. The load meter on the front panel of the welder should indicate a low power reading similar to the reading obtained with a good horn in place. If the squealing noise has been eliminated and the load meter indicates a low power reading, the horn should be tested further. If the equipment can be tuned and operated without the horn in place or with a reliable substitute horn in place, there is a good chance that the horn is the problem. Reassemble the horn to the stack and retest the welder. If the symptoms return, the horn should be removed to prevent possible damage to the converter.
2. The next step is to check the tightness of the horn stud. Many

times a minor problem such as a loose stud will have a major effect on the equipment operation. It is best to replace the stud with a new one tightened to the required specifications. If a new stud is not available, check the old stud to ensure that the knurled end has enough clean teeth to provide a good locking bond between the horn material and the stud. This is most important when using titanium horns.

3. While the horn is disassembled from the welding stack, it is also a good practice to recondition the converter/horn/booster interface. Information explaining this procedure is discussed under the heading of “Reconditioning Converter/ Booster/ Horn Stack Interfaces.”
4. When a loud, high-pitched noise occurs, it may indicate a failed horn. First make a visual check to see if a crack can be located. Primary areas for inspection are the nodal area of the horn, the slot ends which are high stress areas, thin sidewall areas, and the stud area of the horn. If no visible cracks are located, a light feel test will detect any “hot spots” on the horn surface. High stress will cause these hot spots, as will the friction of high frequency vibration in a cracked area. *The equipment should be turned off before conducting the feel test to avoid possible injury. Please use caution, because the vibration friction can create high temperature spots at the crack locations.* Another method for locating horn cracks is the use of a “spot-check” spray. These sprays, which contain a penetrant dye, are sprayed on the horn surface. After a period of time, depending on the horn material, the dye is

removed using a cleaning cloth with no solvents. After the dye is removed from the horn surface, a developer is sprayed on the horn. If a crack is present, it will be indicated by the developer where the dye has penetrated into the cracked area. One such spray, "Spot Check," is available from Magnaflux of Chicago, Illinois.

5. If the horn incorporates replaceable tips, check to ensure that the tips are tight and that tip/horn interfaces are clean. If a horn frequency analyzer is available, it is advisable to check the horn frequency. When a horn fails, its natural frequency will normally decrease.

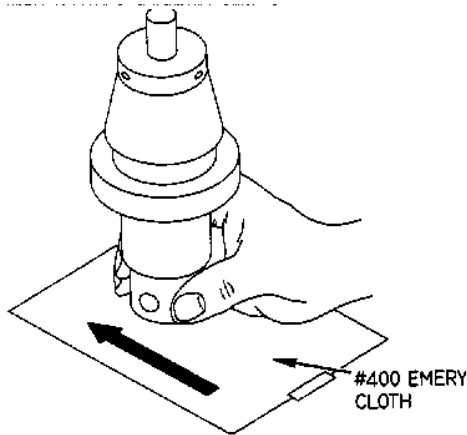
If after all of these various tests no crack or problem can be located, the horn should be sent to Branson for evaluation.

Reconditioning Converter/Booster/ Horn Stack Interfaces

The operating efficiency of the equipment will be greatly affected if the mating interfaces of the converter/booster/horn stack are not flat, make poor contact with each other, or become corroded. A poor contact condition wastes power, makes tuning difficult, can affect the noise level, and can possibly cause heat damage to the converter. These conditions may occur especially if the equipment is run in continuous operation. Follow the steps outlined below to recondition the converter/booster/horn interfaces.

1. Disassemble the converter/booster/horn stack and wipe the interface with a clean cloth or paper towel.
2. Examine all interfaces carefully. If any interface is corroded or shows a dark, hard deposit, it should be reconditioned.
3. If the interfaces appear to be in good condition, go to step 8.
4. Remove the studs from the components to be reconditioned.
5. Tape a clean sheet of #400 grit (or finer) emery cloth to a clean, smooth, flat surface. A surface plate or ground steel plate is usually suitable.
6. Hold the part to be conditioned at its lower end and carefully stroke it *in one direction* across the emery cloth. (See illustration and instructions.) For best results, do not push down. Push the component gently.
7. Re-examine the interface and repeat step 6 until the contaminate has been removed. This should not take more than 2 to 3 complete rotations of the part being reconditioned.
8. Before reinserting a stud which has been used in an aluminum horn or booster, use a file or

IMPORTANT: To maintain interface flatness, do not allow part to tilt when stroking. Do not apply downward pressure; the weight of the component is sufficient.



- a. Thumb over spanner wrench hole.
- b. Rotate the part 120 degrees (1/3) to the next hole.
- c. Provide equal number of strokes at each location (2 or 3).

wire brush to clean the aluminum bits from the knurled end of the stud. Also clean the threaded hole using a clean cloth or towel. Replace studs used in titanium horns. Studs tightened in titanium horns experience damage to the knurled end preventing satisfactory locking when reused. Studs used in titanium horns should be disposed of and a new one used. Loose studs will cause overloads or intermittent operation.

9. Stud Tightening Specification — When replacing studs use torque value of 290 inchpounds (32.77 Newton-meters) for seating 3/8-24 studs, and 450 inch-pounds (47.08 Newton-meters) for 1/2-20 studs. Failure to follow these torque specifications may result in the horn/booster stud loosening, stud breakage, and unexplained overloads.
10. To minimize future corrosion, Mylar® washers should be utilized instead of the silicone grease. If you do not have any, contact either your local Branson representative or the Danbury facility. If you are going to continue to use silicone grease, coat only one of the mating surfaces with grease. Use an amount about the size of a paper match head. **DO NOT APPLY GREASE TO THE THREADED STUD.** Reassemble the stack using the procedure outlined in the instruction manual.
11. Install the stack and recheck power supply tuning.