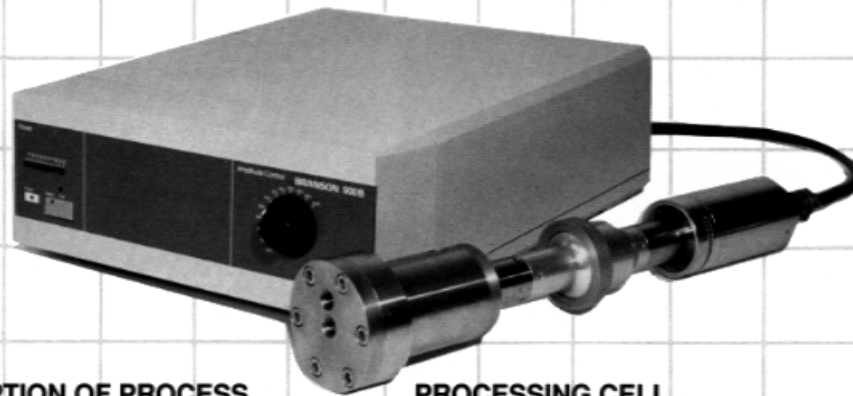


# ULTRASONIC LIQUID PROCESSING



## GENERAL DESCRIPTION OF PROCESS

Ultrasonic processing uses high frequency vibrations (20,000 cycles per second) to produce intense cavitation in liquids. Cavitation bubbles develop localized energy levels many times greater than energy levels achieved by mechanical mixing or high pressure devices.

Typical applications for the liquid processing cell include emulsification, dispersion, extraction, biological cell disruption, and acceleration of chemical reactions. Other cavitation applications involve removing entrapped gas, impregnation, cleaning microscopic contamination from hard-to-reach areas, and the breaking of crystals along their natural lines of cleavage.

Ultrasonics is usually most cost effective as a final treatment process or on applications which cannot be completed satisfactorily using conventional equipment and methods. Highly viscose materials will adapt more readily to cavitation if they can be heated to reduce viscosity or treated under pressure.

The Model 910BC processing system is designed for low volume production or for determining those scale-up variables which need to be investigated such as flow rate, pressure, ultrasonic power, horn amplitude, liquid temperature and viscosity. Once these have been established, a production system can be designed to produce the desired results and required volumes.

## HOW ULTRASONICS WORK

A power supply transforms 117V line current to high frequency electrical energy at 20 kHz. This is fed to a piezoelectric element, called a converter, which changes the electrical energy to 20 kHz mechanical vibratory energy.

These vibrations are coupled to the horn which transmits the high frequency vibrations into the solution to produce intense cavitation.

## PROCESSING CELL

Two processing cells are available, one for use with the 1" diameter horn and the other for a 1-1/2" diameter horn. Both cells are constructed of 300 series stainless steel; the orifice adapter is made of titanium. "O" rings made of Viton seal the chamber to the horn. The cells are capable of operating at 392°F (200°C) and pressures up to 500 psig (3448 kPa). The inlet and outlet ports are 3/8" IPS (9.5 mm).

Output rate will vary depending on the application and the amount of ultrasonic energy required to accomplish the desired results. Ten gallons per minute would be considered a lower energy application. Less than one gallon per minute would be considered a high energy application.

## SCALE-UP

Complete systems can be configured to meet a wide variety of operating conditions. Performance can be predictably scaled from data obtained from small scale process evaluation. The most economical method for increasing capacity by a factor of 2 to 6 is using standard processing cells in parallel. For large scale factors, special chambers consisting of horn arrays with input and output manifolds can be designed.

Batch lots can usually be treated during transfer to storage vessels by selecting ultrasonic equipment necessary to process the batch in allowable time. Processing heat sensitive materials requiring high ultrasonic energy input may require passing the material through multiple processing cells in series with heat exchangers between stages.

## WARRANTY

The Branson Model 910BC Power Supply carries a one-year warranty on all parts and workmanship. (Note: This warranty applies to power supplies purchased and operated in the United States. For warranty information on units purchased outside the U.S., contact your local representative.)

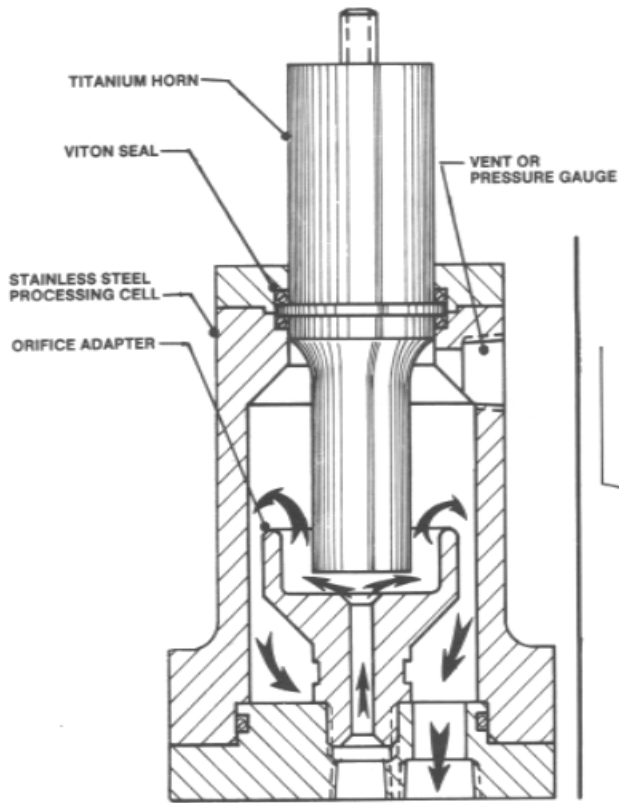


41 EAGLE ROAD, DANBURY, CONNECTICUT 06813-1961

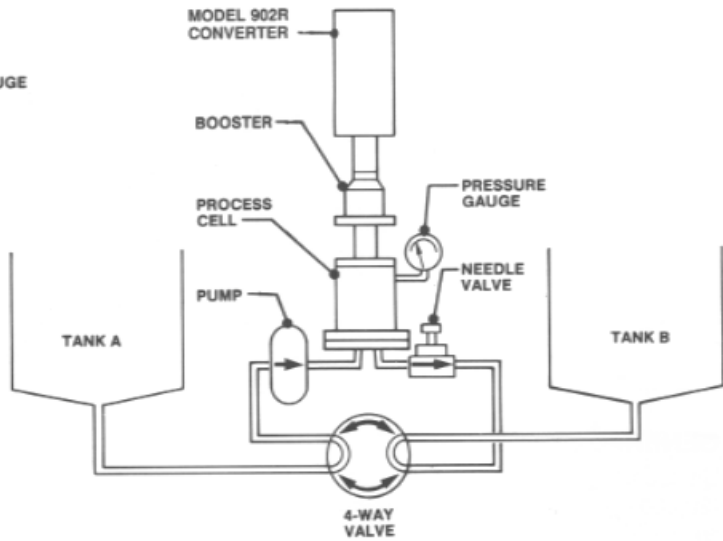
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Revised, 8/91, Printed in U.S.A. 8/91

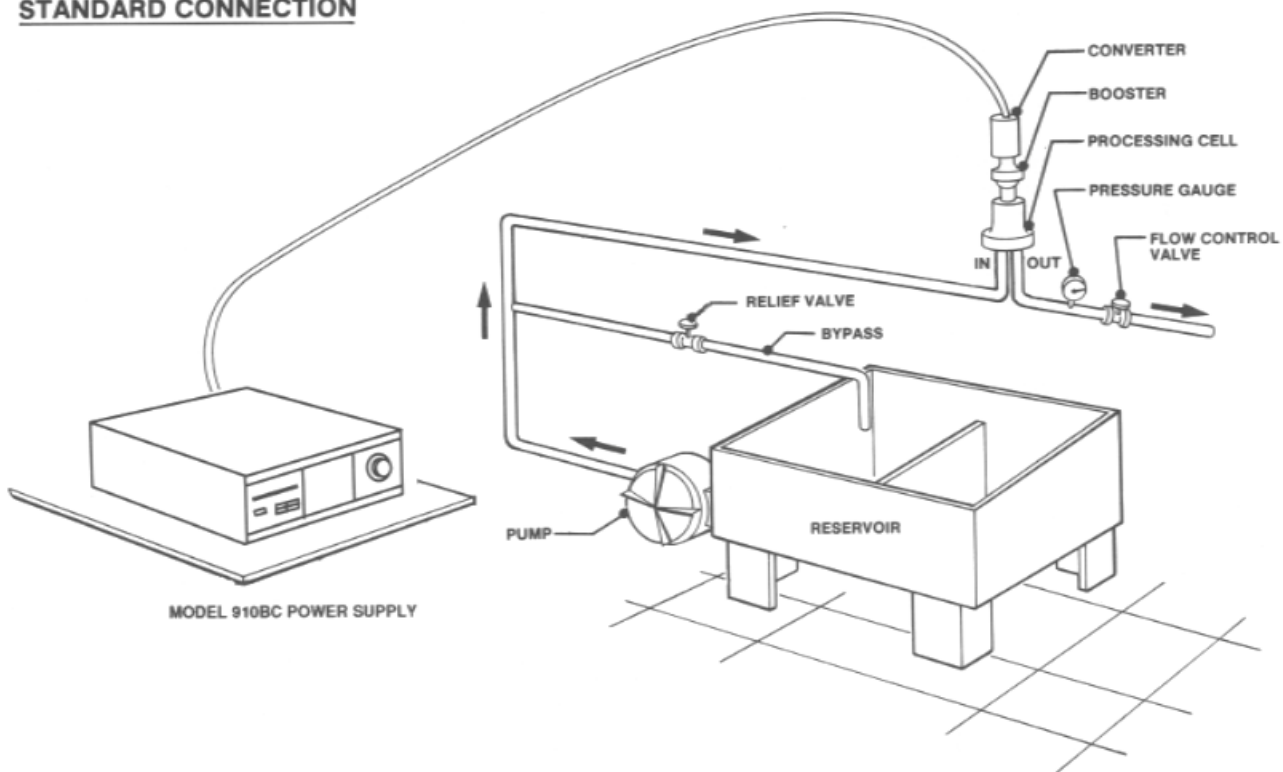
**HOW IT WORKS** — Intense mixing is achieved when liquid enters the cell and is exposed to the face of the horn which is vibrating at 20,000 Hz.



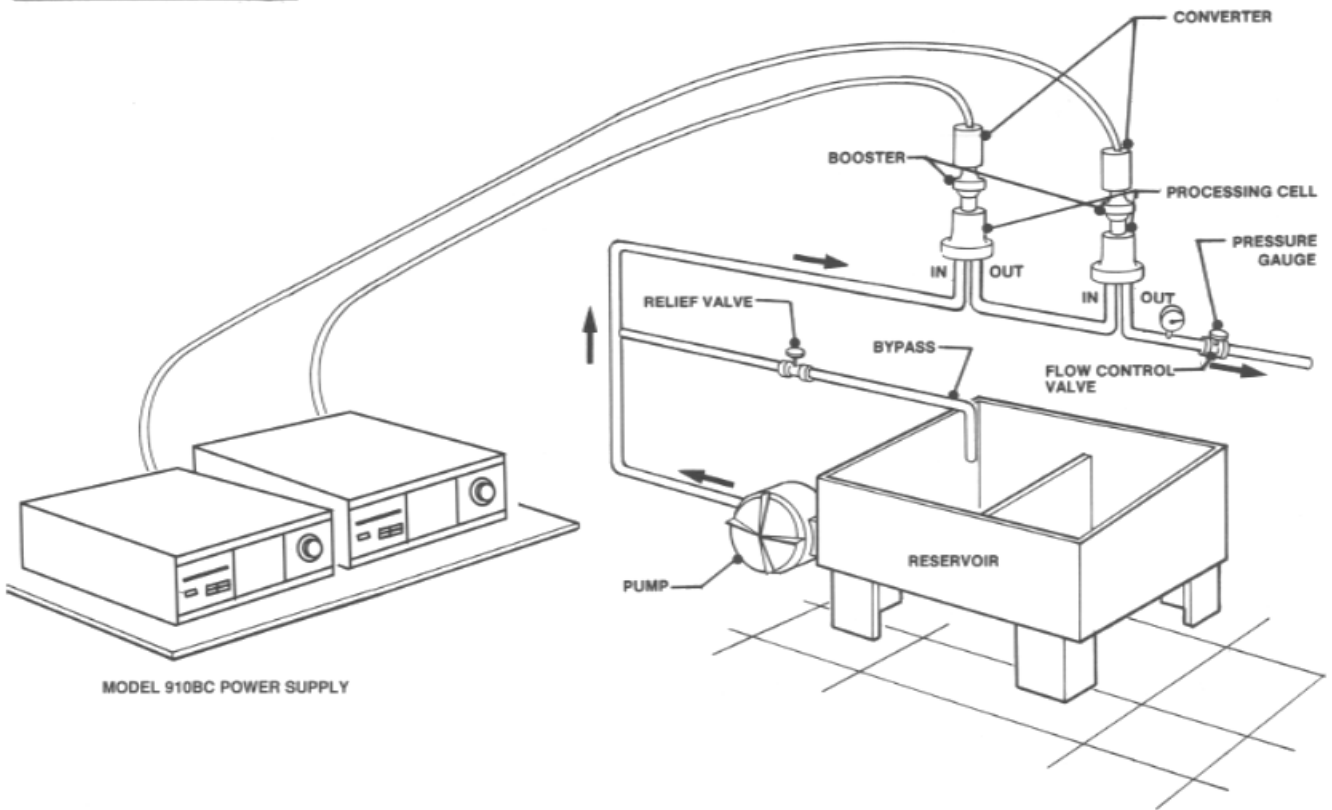
**MULTIPLE PASS BATCH SYSTEM**



**STANDARD CONNECTION**

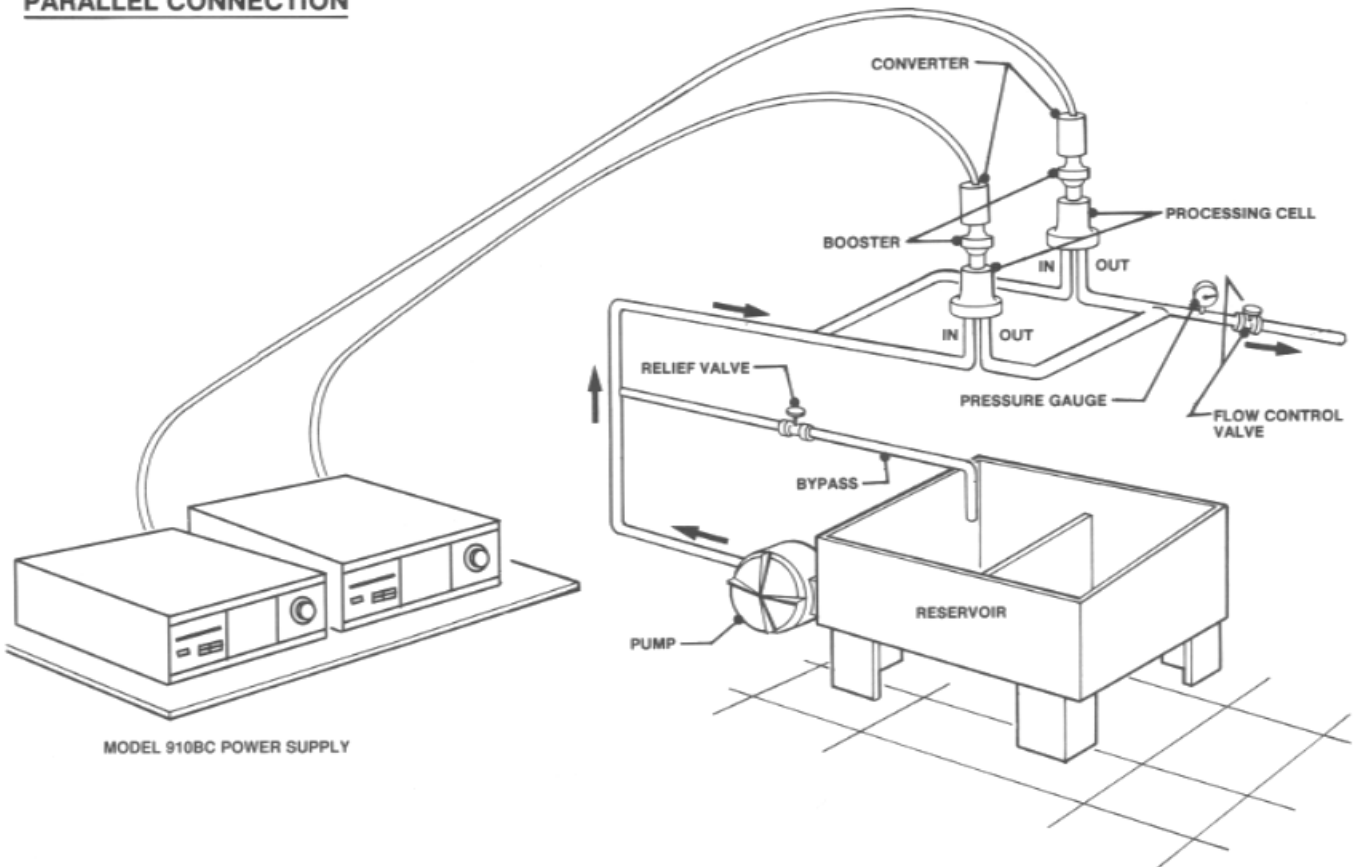


## SERIES CONNECTION



MODEL 910BC POWER SUPPLY

## PARALLEL CONNECTION



MODEL 910BC POWER SUPPLY

## KEY EQUIPMENT FEATURES

- **Exclusive System Protection Monitor/Autotune (SPM/AT) Circuitry** ensures maximum reliability by necessitating correct operating conditions, terminating ultrasonic power when the system is operated under adverse conditions (e.g., excessive power supply loading, improper, loose, or failed horns or booster), thereby protecting power supply and other system components.
- **Patented Autotune** feature allows the power supply to track and compensate for changes in stack frequency that occur over time during production due to increased horn temperatures, wear to the horn face, or material buildup on the horn.
- **Automatic amplitude compensation** provides constant horn amplitude over the full range of rated power encountered during the operating cycle.
- **An internal amplitude control** may be used to vary horn amplitude and power output.
- **Fast response LED meter** displays power loading in 5% increments and provides excellent visibility and storage of the peak power achieved during the weld cycle; 100% of rated output of power supply is delivered at full meter reading.

## MECHANICAL SPECIFICATIONS

### Power Supply

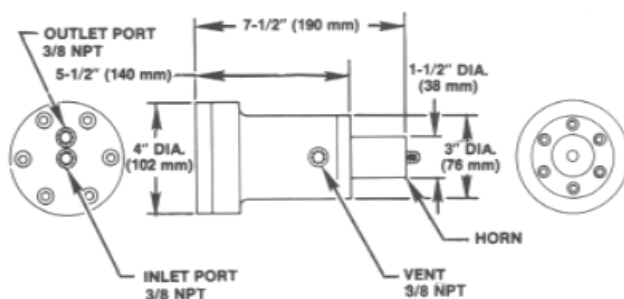
#### Dimensions:

|         |   |
|---------|---|
| Height: | 6-1/4" (159 mm)                                       |
| Width:  | 16-5/8" (422 mm)                                      |
| Depth:  | 19-3/8" (492 mm)<br>(plus 3" [76 mm] cable clearance) |

**Weight:** 36 lbs. (16.3 kg)

### Processing Cell

**Weight:** 9 lbs. (4.1 kg)



*Note: Dimensions are nominal.*

## ELECTRICAL SPECIFICATIONS

### Power Requirements:

|                |         |
|----------------|---------|
| Line voltage:  | 117V AC |
| Input current: | 14 Amps |

**Electrical Connection:** NEMA 5-15P plug provided, requires NEMA 5-15R receptacle.

### Output Power:

|  |            |
|--|------------|
| Output power to converter:                   | 1000 watts |
| Output power to load at 100% meter reading:  | 950 watts  |
| Output power, continuous duty (max. recom.): | 800 watts  |

**Frequency:** 20 kHz

### External inputs/outputs:

|                                      |  |
|--------------------------------------|--|
| Overload indication: }<br>Weld on: } | Both 24V DC, 24mA negative logic and dry (clean) contact closure (120V AC, 60 VA) available. |
| External reset:                      | + 24V external input (24V DC, 25mA)  |
| 0-5V power signal: (optional)        | 200k ohm min. load impedance   |

*Note: All specifications subject to change without notice.*

## ORDERING INFORMATION

### Branson EDP No.

|   |             |
|---|-------------|
| 910BC Power Supply, 117V, 50/60Hz; with 902R converter (air cooled) * and 8' J931 cable. For continuous duty. | 101-063-292 |
| Processing cell with seals and orifice adaptor for use with 1" titanium horn.                                 | 101-123-007 |
| Processing cell with seals and orifice adaptor for use with 1" titanium horn with carbide face.               | 101-123-008 |
| 1" diameter titanium horn (for use in processing cell).   | 101-147-051 |
| 1" diameter titanium horn with carbide face (for use in processing cell).                                     | 101-147-054 |
| Processing cell with seals and orifice adaptor with 1-1/2" titanium horn.                                     | 101-123-009 |
| Processing cell with seals and orifice adaptor for use with 1-1/2" titanium horn with carbide face.           | 101-123-010 |
| 1-1/2" diameter titanium horn (for use in processing cell).   | 101-147-052 |
| 1-1/2" diameter titanium horn with carbide face (for use in processing cell).                                 | 101-147-053 |
| Processing cell with seals and orifice adaptor for use with 1" horn.  | 109-043-144 |
| Processing cell with seals and orifice adaptor for use with 1-1/2" horn.                                      | 109-043-145 |
| Booster horn, ratio 1:1.5 (gold)  | 101-149-092 |
| Booster horn, ratio 1:2 (silver)  | 101-149-094 |
| Booster horn, titanium, ratio 1:2.5 (black)   | 101-149-091 |

\*Converter requires 60 standard cubic ft/hr of compressed air for cooling.

## BRANSON ULTRASONICS CORPORATION

41 Eagle Road, Danbury, CT 06813-1961

(203) 796-0400



## 900 Series Models 900MA and 900BCA 20 and 40 kHz Advanced Ultrasonic Power Supplies

### General Description

Branson's *Advanced* power supplies are a revolutionary advance in ultrasonic power technology and process control. Although transparent to the user, the patented circuitry with closed loop amplitude control provides significant benefits in performance, consistency, and higher productivity, especially in applications requiring a high level of process control and weld quality. In many cases, it will reduce the standard deviation, thus increasing the Cpk (capability index) of the welding process.

Advanced models include the features and controls of standard 900M, B, and BC units, plus the following unique features and benefits.

### Key Features

- **Electronic Amplitude Control** - Amplitude is an extremely important variable in ultrasonic welding. Electronic amplitude control makes it possible to not only set amplitude, but also to change amplitude *during* a weld cycle, and to maintain the specified amplitude regardless of variations in the incoming line voltage or applied load.
- **Amplitude Change** - Amplitude can be *increased or decreased* instantaneously *during* the weld, making possible a level of control of the process not previously feasible. (See Figure 1.) Infinitely variable control allows internal/external control of amplitude by a potentiometer or electronic signal. The control signal can come from a user-provided source, or from Branson's WPC-1 or WPC-2 Weld Profile Controllers. The working amplitude range is from 10 to 100%.

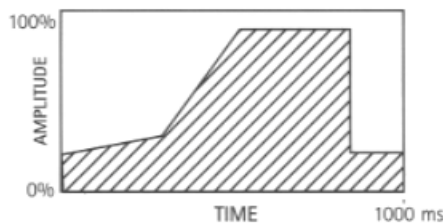
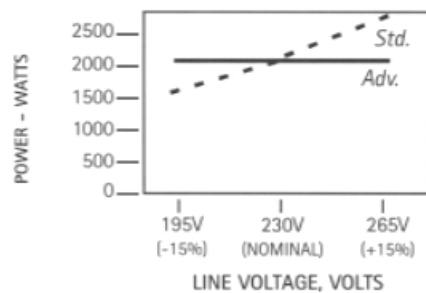


Figure 1. Sample Amplitude Profile

- **Line Regulation** - Output amplitude is maintained with a variation of only  $\pm 2\%$  with line voltage variations of  $\pm 15\%$ , providing the func-

tion of a constant voltage transformer. This corrects for variations due to power source fluctuations (Figure 2) through closed loop amplitude control. It ensures *constant power in welding, and provides greater weld consistency and reliability*. The 200-245V unit has four user-selectable settings to most closely match the incoming line voltage.



Adv. = Advanced Power Supply, Std. = Standard Power Supply

Figure 2. Constant Amplitude/Power

- **Load Regulation** - Regardless of load, the power supply will deliver the selected amplitude from the converter. (Figure 3.)

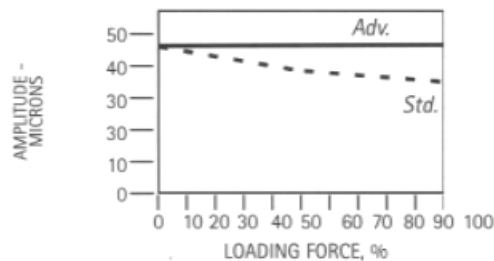


Figure 3. Amplitude vs. Loading

- **Force Requirement** - Because of constant amplitude, *significantly* less force, or conversely, less stack amplitude, is required to accomplish a weld using these power supplies. (Figure 4.)

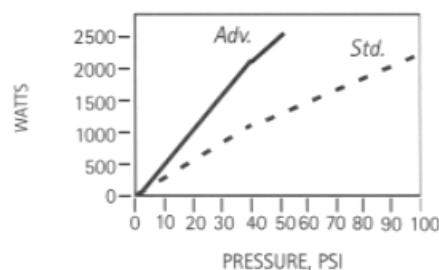


Figure 4. Power Output vs. Pressure

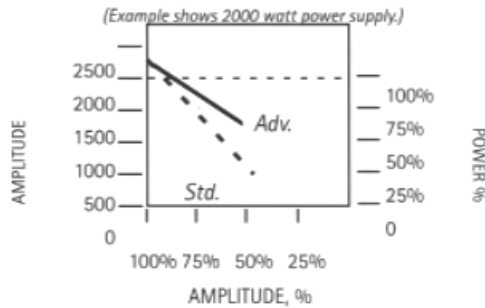
**Applied  
Technologies  
Group**

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Fax (203) 796-9838  
Email: info@bransonultrasonics.com

\*3000 Watt units maintain +15% and -10%.

The advantages of lower force are less flash and less deflection of thin-walled parts during welding. The advantages of lower amplitude are the reduced possibility of part marking and the welding of more delicate parts.

- **Power vs. Amplitude Setting** - When changes in amplitude are made, the maximum power available also changes. With electronic amplitude, a direct relationship is maintained between amplitude setting and power. (Figure 5.)



Adv. = Advanced Power Supply; Std. = Standard Power Supply

Figure 5. Maximum Power Output - 2000 Watt Unit

- **Autotune plus Memory (AT/M)** - Provides fully-automatic tuning in a range of  $\pm 500$  Hz centered around 19.950 kHz for 20 kHz horns, and  $\pm 100$  around 39.900 kHz for 40 kHz horns, and stores horn frequency at the end of each weld. Horn frequency may also be stored with each Auto Seek function.
- **Auto Seek** is used to track the operating frequency when the system is idle. It automatically measures horn frequency by running the horn at a low-level amplitude (5%) to find and lock on to the horn operating frequency and store it in memory. Four selectable Auto Seek choices are available:
  1. On power-up
  2. Externally with automation controller
  3. Depressing "test" switch
  4. By once/minute timer to track heating, cooling, and other effects (e.g., in continuous and high cycle rate applications, the horn can increase in temperature and change frequency).
- **Selectable Starting Rates** - Dipswitch selectable start rates - 10, 35, 80, 105 milliseconds, to accommodate starting characteristics of a wide variety (range) of horns. (Figure 6.)

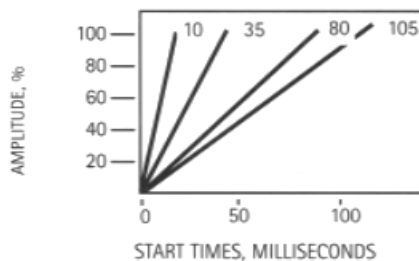


Figure 6. Selectable Start Rates

- **System Protection Monitor (SPM)** circuitry ensures maximum reliability by necessitating correct operating conditions to protect power supply, converter, and other system components. Three levels of power supply protection are provided: 1) phasing, 2) over voltage, 3) over current. This prevents operation outside the acceptable levels of performance of the components. The benefit of this circuitry is to avoid equipment failures and, thereby, downtime, as well as to provide greater weld accuracy and repeatability, and to reduce rejects.
- **High Cycle Rate** - The Advanced power supply is capable of in excess of 200 welds per minute. Actual cycle rate is dependent upon the application and controls.
- **Improved Power Measurement** - Power measurement includes both RF voltage and current, and is corrected for any amplitude setting. This provides accuracy and more consistent values when welding in the energy and peak power modes, or when using these parameters for limits.

## Actuator/Converter Compatibility and Specifications

Actuator and converter compatibility, mechanical and electrical specifications for the Model 900 BCA are the same as the 900 B power supplies and may be found on data sheet 900-4 for 20 kHz and 900-11, 40 kHz. compatibility and specifications for the 900MA are the same as those for the 900M power supplies and are included on data sheet 900-1 (20 kHz) and 900-5 (40 kHz). For 3000 watt Advanced power supplies, refer to data sheet 900-22.

## Ordering Information

All sales shall be subject to the Supplier's terms and conditions of sale as described in Branson's quotations and sales contracts.

Note: All of the following models are available in CE units. Contact Branson, Danbury, to order.

### Branson EDP No.

|   |             |
|---|-------------|
| Model 910MA Advanced Power Supply, 117V, 20 kHz, 1000W      | 101-132-268 |
| Model 920MA Advanced Power Supply, 200-245V, 20 kHz, 2000W  | 101-132-212 |
| Model 910BCA Advanced Power Supply, 117V, 20 kHz, 1000W     | 101-132-265 |
| Model 920BCA Advanced Power Supply, 200-245V, 20 kHz, 2000W | 101-132-269 |
| Model 947MA Advanced Power Supply, 117V, 40 kHz, 700W       | 101-132-271 |
| Model 947BCA Advanced Power Supply, 117V, 40 kHz, 700W      | 101-132-273 |

J954 Advanced features accessory cable 101-240-128

Recommended MBOS - 11.xx

## Branson Worldwide Headquarters

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