F-Series
Ultrasonic Generator Kits and Stack Components

40, 35, 30, 20 and 15 kHz Models Available
WARNING
This Sonics & Materials manufactured ultrasonic generator kits and sequencing boards are designed for use as an internal electrical component. They should only be electrically powered after being properly mounted and earth grounded inside of an industry standard NEMA type electrical enclosure.

F-Series Generator Kit
F800 - 40 kHz @ 800 Watts Power
F1200 - 20 kHz @ 1200 Watts Power
F1700 - 20 kHz @ 1700 Watts Power
F2200 - 20 kHz @ 2200 Watts Power

Optional Sequencing Boards

Converter

Horn

Booster

Ultrasonic Stack

20 kHz

Air Cooling Line

RF Cable

40 kHz
GLOSSARY OF TERMS

AIR COOLING: Air cooling of the converter and stack components may be required when running ultrasonic stacks in a continuous duty mode or with short duty cycle. The mechanical expansion and contraction of the internal converter PZT crystals, booster and horn can cause heat to build in the stack components which can result in a drop in frequency. This drop in frequency can then result in inconsistent welds and/or a generator overload condition.

AMPLITUDE: The extent of vibratory movement or, peak-to-peak vibration distance.

BOOSTER: Aluminum or titanium machined component between the ultrasonic converter and horn. Interchangeable and depending on gain ratio, is used to increase or decrease horn face amplitude.

CONVERTER: Also referred to as a transducer, ultrasonic component that contains piezoelectric (PZT) crystals and converts a high frequency electrical signal to mechanical vibration.

FREQUENCY: The number of occurrences within a given time period. (Usually 1 second.) At 20 kHz, the frequency of modulation is 20,000 times per second. At 40 kHz, the frequency of modulation is 40,000 times per second.

GAIN: Similar to amplification, expressed as the ratio of input to output.

GENERATOR KIT: Also referred to as a Power Supply, ultrasonic generator which converts low frequency (50/60 Hz) electrical input cycle to a higher output frequency such as 20 kHz or 40 kHz. Mounts internally to a properly rated NEMA type electrical enclosure.

HIGH VOLTAGE MULTIPLEXER: Also referred to as a Sequencer. Ultrasonic RF relay switching board which provides sequential switching of multiple converter stacks from a single ultrasonic generator or power supply.

HORN: An acoustical tool, typically machined from aluminum or titanium, which mechanically vibrates at a specific frequency. Stretches and shrinks in length creating amplitude at the face of the horn.

JOULES: Units of energy, also known as watt-seconds. One Joule is a measure of energy equal to 1 watt second.

KILOHERTZ (kHz): Common measurement for frequency of ultrasonic vibration. One kHz is 1000 cycles per second.

NODAL POINT: The point in an acoustical tool (such as a horn or booster) where little or no ultrasonic motion occurs.

RF CABLE: Cable that connects the ultrasonic converter to its RF output source. Single RF output source direct from an ultrasonic generator or multiple RF output sources from an ultrasonic sequencer.

SEQUENCER: Ultrasonic RF relay switching board which provides sequential switching of multiple converter stacks from a single ultrasonic generator or power supply.

SEQUENCING: PLC controlled method in which multiple ultrasonic stacks are fired in sequential order from a single ultrasonic generator or power supply.

STACK: Ultrasonic converter, booster and horn assembly. (Some applications do not require a booster in the stack.)

US: Abbreviation for ultrasonics.

WATT-SECONDS: Units of energy, also known as Joules.
COOLING: Three cooling fans are supplied and mounted to respective heat sinks on the kit's main board. *NEMA enclosure must be fan powered and air vented for proper cooling of other heat sensitive components.*

LINE VOLTAGE: Incoming line voltage must be noise filtered and correctly earth grounded. DIN rail mounted contact blocks are provided on the PLL board side of the kit for these connections.

220 VAC single phase is standard incoming source power unless optional 110 VAC was ordered prior to shipment on 800 or 1200 watt units.

ELECTRICAL NOISE: Due to potential for electrical noise interference, all RF cables and cable connections should be routed as far away from other electrical components as possible.

SINGLE RF CABLES (See Figure 1): RF cable out from the ultrasonic generator kit and direct to a single ultrasonic converter should not exceed 30’ in length. **Contact Sonics if a longer RF cable length is required.**

MULTIPLE RF CABLES (See Figure 2): When sequencing multiple converters from a single generator kit, all RF cables out from the sequencer to individual ultrasonic converters should not exceed 30’ in length. **Contact Sonics if a longer RF cable lengths are required.**

CONTACT BLOCKS: All user incoming line voltage, RF cable and PLC I/O interface connections are made to the DIN rail mounted contact blocks. There are no user connections to the generator kit's main board or PLL board.

*Figure 1*

**Warning**

Using RF converter cables in excess of 30' in length will increase amplitude and cause non-warranty converter damage.

Contact Sonics & Materials if longer cable lengths are required.
**Figure 2**

**Important Note - RF CONVERTER CABLES**

When sequencing multiple converters from a single generator kit.  

*All converter RF cables must be equal in length. Varying cable lengths will cause cable capacitance variations which will result in inconsistent stack-to-stack weld results.*

**DO NOT CUT OR SHORTEN RF CONVERTER CABLES**

**ALWAYS COIL AND ZIP-TIE EXCESS RF CABLE LENGTHS**
MAIN BOARD: Similar to a computer's motherboard, the kit's main board is the primary ultrasonic power source.

No line voltage power, RF signal, or PLC interface connections are made by the user to the main board.

Per the 2" and 12" center-to-center distances as shown on the kit's front view, secure the kit to the NEMA enclosures internal sub-plate using four (4) ¼" screws.

CAUTION

Always disconnect main electrical power before servicing or making connections.
PLL BOARD (Phase-Lock-Loop): Working in tandem with the main board, the PLL board (also referred to as a control board) comprises of automatic frequency tuning, energy functions and variable amplitude settings.

PLC INTERFACING: Included with this manual is Sonics Drawing #E-3163 which details customer supplied PLC I/O (input and output) connections to the kit's various contact blocks.

- Contacts 1 through 8: PLC outputs
- Contacts 9 through 16: PLC input return

Proper connections and PLC programming will allow the following user functions and capabilities.

✓ Time base ultrasonic's on/off weld cycle.
✓ 0 to 10 volt output signal that can correlate watts being applied during the weld cycle.
✓ Weld energy monitoring.
✓ Variable amplitude setting.
✓ System overload signal.
✓ External overload reset.
✓ System ready signal.

CAUTION
Always disconnect main electrical power before servicing or making connections.
WARNING

Allowing contaminants such as oil or moisture to enter the converter through the air cooling port will cause non-warranty converter damage.

ALL AIR COOLING LINES MUST BE CLEAN AND DRY AT ALL TIMES

NOTE

Converter design and dimensional data is for reference only and subject to change without notice.

Drawings are not to scale.

Contact Sonics & Materials to verify current converter models, designs and dimensions.
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**40 kHz ULTRASONIC CONVERTERS**

**WARNING**

Allowing contaminants such as oil or moisture to enter the converter through the air cooling port will cause non-warranty converter damage.

ALL AIR COOLING LINES MUST BE CLEAN AND DRY AT ALL TIMES

**NOTE**

Converter design and dimensional data is for reference only and subject to change without notice.

Drawings are not to scale.

Contact Sonics & Materials to verify current converter models, designs and dimensions.
CONVERTER RF CABLES

201-0246: 40 kHz @ 10' with SHV Type Connector

201-0292: 40 kHz @ 15' with LEMO Type Connector

201-0247: 20 kHz @ 10' with LEMO Type Connector

Important Notes - RF CONVERTER CABLES

1. When sequencing multiple converters from a single generator kit. All converter RF cables must be equal in length. Varying cable lengths will cause cable capacitance variations resulting in inconsistent stack-to-stack weld results.

   DO NOT CUT OR SHORTEN RF CONVERTER CABLES
   ALWAYS COIL AND ZIP-TIE EXCESS RF CABLE LENGTHS

2. For customer supplied RF cables, use only RG58 coaxial cable rated for 1400 volts RMS or higher. (Alpha Wire #9058C recommended.)

3. Due to potential for electrical noise interference, all RF cables and cable connections should be routed as far away from other electrical components as possible.

4. When sequencing multiple converters from a single power supply kit, all RF cables out from the NEMA enclosure to individual ultrasonic converters should not exceed 15’ in length. Contact Sonics if longer RF cable lengths are required.
# Boosters

## Aluminum O-Ring Style Boosters

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>FREQ. (kHz)</th>
<th>HORN THREAD</th>
<th>COLOR CODE AND GAIN RATIO</th>
</tr>
</thead>
<tbody>
<tr>
<td>BHN15GD BOOSTER</td>
<td>20</td>
<td>3/8-24</td>
<td>GOLD +1.50 GAIN</td>
</tr>
<tr>
<td>BHN15BR BOOSTER</td>
<td>20</td>
<td>3/8-24</td>
<td>BROWN +1.25 GAIN</td>
</tr>
<tr>
<td>BHN15GR BOOSTER</td>
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<td>3/8-24</td>
<td>GREEN +1.00 GAIN</td>
</tr>
<tr>
<td>BHN15BU BOOSTER</td>
<td>20</td>
<td>3/8-24</td>
<td>BLUE -0.50 GAIN</td>
</tr>
<tr>
<td>BHN15PU BOOSTER</td>
<td>20</td>
<td>3/8-24</td>
<td>PURPLE -0.75 GAIN</td>
</tr>
<tr>
<td>BHN23BK BOOSTER</td>
<td>40</td>
<td>8 MM</td>
<td>BLACK +2.50 GAIN</td>
</tr>
<tr>
<td>BHN23SI BOOSTER</td>
<td>40</td>
<td>8 MM</td>
<td>SILVER +2.00 GAIN</td>
</tr>
<tr>
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## Titanium O-Ring Style Boosters

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<tr>
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<tr>
<td>BHN15TGD BOOSTER</td>
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Actual length varies depending on booster gain ratio and final acoustically tuned length.
CONTROL BOARD CONNECTIONS

DIN RAIL CONNECTION

CUSTOMER I/O CONNECTIONS

J5-1 (+15V) BLU
SONIC START
J5-12 WH/BLU
J4-12 WH/GRY

OVERLOAD RESET
J4-11 (GND) GRY
J4-1 (+) RED

AMPLITUDE SET INPUT
J4-2 (GND) WH/RED

POWER OUT
J4-3 (+) BLK
J4-4 (GND) WH/BLK

J4-9 VCC

G.L. INDICATOR

J4-8 BHN

SMPS READY (SYSTEM READY)

J4-8 ORN

FREQ. TUNE LOCK

J4-7 WH

FREQ./18 (PULSE OUT)

J4-10 (COMMON) (METER) YEL

OVERLOAD INDICATION

NPN OPEN COLLECTOR SINKING OUTPUT
30 VDC 28mA MAX
NO INTERNAL LMF RESISTOR

J4-18

SWITCH OR SOLID STATE DEVICE
15VAC @ 28mA
MAINTAIN FOR DESIRED DURATION

OR

SWITCH OR SOLID STATE DEVICE
15VAC @ 28mA
MOMENTARY CLOSURE (28mA MAX)

CUSTOMER SUPPLIED VOLTAGE SOURCE
8 – 19 VDC @ 1 mA (18 VDC=100% AMPLITUDE)

NOTES
1. J4-18 IS A COMMON Emitter TO 4 OUTPUTS.
2. DIN RAIL POSITIONS 13-16 ARE CONNECTED TOGETHER WITH A BUSbar.
3. DIN RAIL POSITIONS COUNT FROM TOP TO BOTTOM.

PSKIT749-3

I/O CONNECTIONS

FUNCTIONAL

AMOUNT

CONFLICTING INFORMATION

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