



**EMERSON**<sup>TM</sup>

Original Instructions  
4000869 - REV. 01



# DCX A

## Power Supply

Rack Mount Version

# Operating Manual

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**BRANSON**

## Manual Change Information

At Branson, we strive to maintain our position as the leader in ultrasonics plastics joining, metal welding, cleaning and related technologies by continually improving our circuits and components in our equipment. These improvements are incorporated as soon as they are developed and thoroughly tested.

Information concerning any improvements will be added to the appropriate technical documentation at its next revision and printing. Therefore, when requesting service assistance for specific units, note the Revision information found on this document, and refer to the printing date which appears on this page.

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## Foreword

Congratulations on your choice of a Branson Ultrasonics Corporation system!

The Branson DCX A Power Supply system is process equipment for the joining of plastic parts using ultrasonic energy. It is the newest generation of product using this sophisticated technology for a variety of customer applications. This Operating Manual is part of the documentation set for this system, and should be kept with the equipment.

Thank you for choosing Branson!

## Introduction

This manual is arranged into several structured chapters which will help you find the information you may need to know to safely handle, install, set up, program, operate, and/or maintain this product. Please refer to the [Table Of Contents](#) and/or the [Index](#) of this manual to find the information you may be looking for. In the event you require additional assistance or information, please contact our Product Support department (see [1.3 How to Contact Branson](#) for information on how to contact them) or your local Branson representative.



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## 1.1 Safety Requirements and Warnings

This chapter contains an explanation of the different Safety Notice symbols and icons found both in this manual and on the product itself and provides additional safety information for ultrasonic welding. This chapter also describes how to contact Branson for assistance.

### 1.1.1 Symbols Found in this Manual

These symbols used throughout this manual warrant special attention:

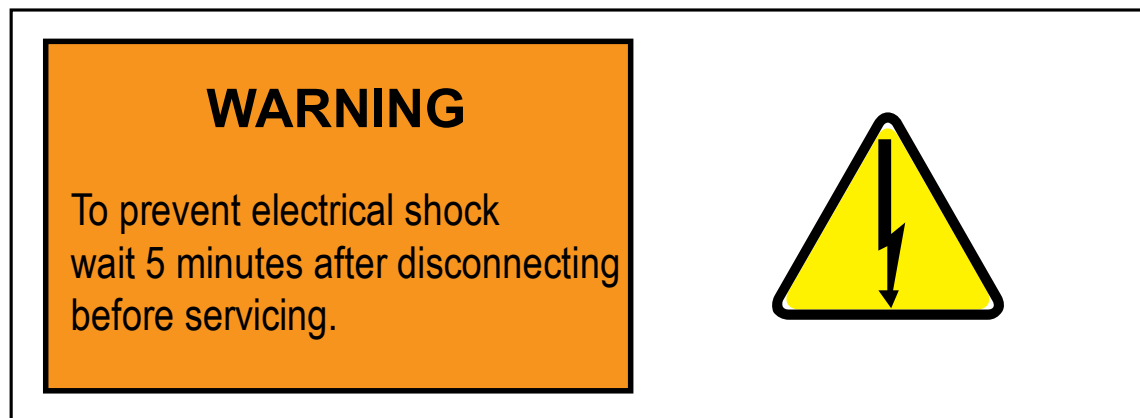
| WARNING                                                                             | Indicates a possible danger                                                   |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|
|    | If these risks are not avoided, death or severe injury might result.          |
| WARNING                                                                             | High Voltage Hazard                                                           |
|   | High voltage. Turn power off before servicing.                                |
| WARNING                                                                             | Corrosive Material Hazard                                                     |
|  | Corrosive material. Avoid contact with eyes and skin. Wear proper protection. |
| CAUTION                                                                             | Indicates a possible danger                                                   |
|  | If these risks are not avoided, slight or minor injury might result.          |

| CAUTION                                                                            | Loud Noise Hazard                                                                                                                                                                      |
|------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|   | Loud noise hazard. Ear protection must be worn.                                                                                                                                        |
| CAUTION                                                                            | Heavy Object                                                                                                                                                                           |
|   | Heavy object. To avoid muscle strain or back injury, use lifting aids and proper lifting techniques.                                                                                   |
| NOTICE                                                                             | Indicates a possible damaging situation                                                                                                                                                |
|  | <p>If this situation is not avoided, the system or something in its vicinity might get damaged.</p> <p>Application types and other important or useful information are emphasized.</p> |

## 1.1.2 Symbols Found on the Product

The DCX A Power Supply has several safety-related labels on it to indicate the presence of hazardous voltages inside the unit.

**Figure 1.1** Safety-related Labels found on the DCX A Power Supply



**Figure 1.2** Safety-related Labels found on the DCX A Power Supply



|                |                                                                                    |                                                                                                                                                                                                                      |
|----------------|------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MADE IN MEXICO |  | <div data-bbox="1052 812 1437 913">  <b>WARNING</b> </div> <div data-bbox="1052 913 1437 1039">GROUND UNIT BEFORE OPERATING</div> |
|----------------|------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## 1.2 Warranty Statement, Disclaimer

The following excerpts from the "Terms and Conditions of Sale" (found on the back of your Invoice) are essential guidelines for the product Warranty issued with your Branson ultrasonic welding components. The items listed in this section specifically address issues involving the delivery, shipment, and warranty period provided. If you have any questions, please refer to the back of the Invoice included with your system, which lists all of the Terms and Conditions of Sale, or contact your Branson representative.

### TERMS AND CONDITIONS OF SALE

Branson Ultrasonics Corporation is herein referred to as the "Seller" and the customer or person or entity purchasing products ("Products") from Seller is referred to as the "Buyer." Buyer's acceptance of the Products will manifest Buyer's assent to these Terms and Conditions.

### ULTRASONIC JOINING EQUIPMENT NORTH AMERICAN WARRANTY POLICY

Each product manufactured by Branson is guaranteed to be free from defects in material and workmanship for a period of time specified in [Table 1.1 Warranty Period](#) from the date of shipment.

**Table 1.1** Warranty Period

| Product                                              | Period                                         |
|------------------------------------------------------|------------------------------------------------|
| Power Supplies                                       | 36 months                                      |
| Accessories                                          | 36 months                                      |
| Converters                                           | 36 months<br>(limited to one-time replacement) |
| Non-Branson equipment<br>(i.e. printers, etc.)       | Warranted by the manufacturer                  |
| Horns                                                | 12 months<br>(limited to one-time replacement) |
| Boosters                                             | 36 months                                      |
| Handheld devices                                     | 12 months                                      |
| Rental Equipment                                     | Same as purchased equipment                    |
| Specials and products with EDP<br>prefix 159-xxx-xxx | 12 months                                      |
| Specials and products with EDP<br>prefix 125-xxx-xxx | 12 months                                      |

## **The warranty does not apply to:**

- Any product which has been subject to misuse, misapplication, neglect (including without limitation inadequate maintenance), accident or improper installation, modification or adjustment
- Applications requiring metal-to-metal contact when the ultrasonic exposure time exceeds 1.5 seconds
- Any product exposed to adverse environments, improper repair or repairs using non-Branson methods or material
- Non-Branson equipment (i.e., horns, boosters, converters) or improperly tuned horns
- Set-up/installation of equipment and software updates

## **Warranty Service covers the following:**

Repair service at Branson's main repair facility or a regional office.

- Includes parts and labor performed at Branson authorized repair facilities. The customer must return the equipment properly packed with all shipping charges prepaid

## **Repair service at the customer site**

- Includes parts and labor at the customer site performed by a Branson technician. The customer is responsible for all travel-related charges

## **Module trade-in:**

- Includes serialized components for work performed by the customer. The customer orders the replacement components from the Parts Store and issues a P.O. When the failed components are returned to Branson the warranty status is verified and a credit is issued. The customer is responsible for all shipping charges
- Additional Warranty Notes
- Components replaced during in-warranty repair carry the remainder of the original warranty
- Serialized assemblies replaced during the repair of out-of-warranty equipment are warranted for a period of 12 months
- Travel charges for Branson service personnel will be waived on service calls performed within 30 days of invoice date
- Non-serialized parts replaced during the repair of out-of-warranty equipment are warranted for 3 months
- Trade in allowance: Branson out-of-warranty serialized components are entitled to a 25% trade in allowance regardless of age or condition, however, converters must be less than 5 years old to qualify for the trade in

If you have any questions concerning the warranty coverage (including coverage outside of North America), please contact your Branson representative or Branson Customer Support.

## 1.3 How to Contact Branson

Branson is here to help you. We appreciate your business and are interested in helping you successfully use our products. To contact Branson for help, use the following telephone numbers, or contact the field office nearest you (business hours from 8 a.m. to 4 p.m. Central and Eastern Time Zones):

- **North American Headquarters (all Departments):** (203) 796-0400
- **Parts Store (direct number):** (877) 330-0406
- **Repair department:** (877)-330-0405
- **For emergency after-hours service (5 p.m. – 8 a.m. EST):** (203) 796-0500 (US phone numbers only)

Tell the operator which product you have and which person or department you need ([Table 1.2 Branson Contacts](#)). If after hours, please leave a voice message with your name and return telephone number.

### 1.3.1 Before Calling Branson for Assistance

This manual provides information for troubleshooting and resolving problems that could occur with the equipment (see [Chapter 8: Maintenance](#)). If you still require assistance, Branson Product Support is here to help you. To help identify the problem, use the following questionnaire which lists the common questions you will be asked when you contact the Product Support department.

Before calling, determine the following information:

1. Your company name and location.
2. Your return telephone number.
3. Have your manual with you. If troubleshooting a problem, refer to [Chapter 8: Maintenance](#).
4. Know your equipment model and serial numbers (found on a gray data label on the units). Information about the horn (part number, gain, etc.) or other tooling may be etched into the tooling. Software- or firmware-based systems may provide a BOS or software version number, which may be required.
5. What tooling (horn) and booster are being used?
6. What are the setup parameters and mode?
7. Is your equipment in an automated system? If so, what is supplying the "start" signal?
8. Describe the problem; provide as much detail as possible. For example, is the problem intermittent? How often does it occur? How long before it occurs if you are just powering up? If an error is occurring, which error (give error number or name)?
9. List the steps you have already taken.
10. What is your application, including the materials being processed?
11. Have a list of service or spare parts you have on hand (tips, horns, etc.)
12. Notes:

---

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## 1.4 Returning Equipment for Repair

Before sending equipment for repair, provide as much information with the equipment to help determine the problem with the system. Use the following page to record necessary information.

| NOTICE                                                                            |                                                                                                                                                      |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>To return equipment to Branson, you must first obtain an RGA number from a Branson representative, or the shipment may be delayed or refused.</p> |

If you are returning equipment to Branson for repair, you must first call the Repair department to obtain a **Returned Goods Authorization** (RGA) number. (If you request it, the repair department will fax a Returned Goods Authorization form to fill out and return with your equipment).

Branson Repair Department, C/O Zuniga Logistics, LTD

12013 Sara Road, Killam Industrial Park

Laredo, Texas 78045 U.S.A.

Direct telephone number: (877) 330-0405

Fax number: (877) 330-0404

- Provide as much information as possible that will help identify the need for repair
- Carefully pack the equipment in original packing cartons
- Clearly label all shipping cartons with the RGA number on the outside of cartons as well as on your packing slip, along with the reason for return
- Return general repairs by any convenient method. Send priority repairs by air freight
- You must prepay the transportation charges FOB Laredo, Texas, U.S.A.

### 1.4.1 Get an RGA Number

RGA#

---

If you are returning equipment to Branson, please call the Repair Department to obtain a Returned Goods Authorization (RGA) number. (At your request, the Repair Department will fax an RGA form to fill out and return with the equipment.)

## 1.4.2 Record Information About the Problem

Before sending equipment for repair, record the following information and send a copy of it with the equipment. This will greatly increase Branson's ability to address the problem.

1. Describe the problem; provide as much detail as possible. For example, is the problem intermittent? How often does it occur? How long before it occurs after powering up?

---

---

---

2. Is your equipment in an automated system?

---

3. If the problem is with an external signal, which signal?

---

4. If known, include plug/pin # (e.g., P29, pin #3) for that signal:

---

5. What are the Weld Parameters?

---

---

---

6. What is your application? (Type of weld, plastic material, etc.):

---

---

7. Name and phone number of the person most familiar with the problem:

---

---

Contact the Branson office prior to shipping the equipment.

For equipment not covered by warranty, to avoid delay, include a Purchase Order.

**Send a copy of this page with the equipment being returned for repair.**

### 1.4.3 Departments to Contact

Call your local Branson Representative, or contact Branson by calling and asking for the appropriate department, as indicated in [Table 1.2 Branson Contacts](#) below.

**Table 1.2** Branson Contacts

| What you need help with or information about          | Whom to Call                                       | At this Phone Number...      |
|-------------------------------------------------------|----------------------------------------------------|------------------------------|
| Information about new welding systems or components   | Your local Branson Rep or Branson Customer Service | 203-796-0400<br>Ext 384      |
| Application and setup questions on the welding system | Welding Applications Lab                           | 203-796-0400<br>Ext 368      |
| Application assistance on the horns and tooling       | ATG Lab                                            | 203-796-0400<br>Ext 495      |
| Technical questions about the welding system          | Welding Product Support                            | 203-796-0400<br>Ext 355, 551 |
| Technical questions about horns and tooling           | ATG Lab                                            | 203-796-0400<br>Ext 495      |
| Ordering new parts                                    | Parts Store                                        | 877-330-0406                 |
| RGA's, request for repair, status of a repair         | Welding Repair Department                          | 877-330-0405                 |
| System automation/hookup information                  | Product Support                                    | 203-796-0400<br>Ext 355, 551 |

My Local Branson Representative's name is:

---



---

I can reach this representative at:

---



---

### 1.4.4 Pack and Ship the Equipment

- Carefully pack the system in original packing material to avoid shipping damage. Plainly show the RGA number on the outside of cartons as well as inside the carton along with the reason for return. Make a list of all components packed in the box. KEEP YOUR MANUAL.
- Return general repairs by any convenient method. Send priority repairs by air freight. Prepay the transportation charges FOB the repair site.

| NOTICE                                                                              |                                                      |
|-------------------------------------------------------------------------------------|------------------------------------------------------|
|  | Items that are sent Freight Collect will be refused. |

## 1.5 Obtaining Replacement Parts

You can reach Branson Parts Store at the following telephone numbers:

Branson Part Store

Direct telephone number: 877-330-0406

Fax number: 877-330-0404

Many parts can be shipped the same day if ordered before 2:30 p.m., Eastern time.

A parts list is found in [Chapter 8: Maintenance](#) of this manual, listing descriptions and EDP part numbers. If you need replacement parts, coordinate the following with your purchasing agent:

- Purchase order number
- Ship to information
- Bill to information
- Shipping instructions (air freight, truck, etc.)
- Any special instructions (for example, "Hold at the airport and call"). Be sure to give a name and phone number
- Contact name information

---

## Chapter 2: Introduction

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|            |                                                  |           |
|------------|--------------------------------------------------|-----------|
| <b>2.1</b> | <b>Models Covered</b>                            | <b>14</b> |
| <b>2.2</b> | <b>Compatibility with other Branson Products</b> | <b>16</b> |
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| <b>2.4</b> | <b>Controls and Indicators</b>                   | <b>20</b> |
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## 2.1 Models Covered

This manual covers all models of the DCX A Power Supply.

**Table 2.1** Models Covered in this Manual

| Frequency | Power  | EDP          |
|-----------|--------|--------------|
| 20 kHz    | 1250 W | 101-132-2057 |
|           | 2500 W | 101-132-2058 |
|           | 4000 W | 101-132-2059 |
| 30 kHz    | 1500 W | 101-132-2056 |
| 40 kHz    | 800 W  | 101-132-2055 |

### 2.1.1 Overview of these Models

**Figure 2.1** The DCX A Power Supply



The DCX A Power Supply generates ultrasonic energy through an ultrasonic converter for welding plastics. Several models are available, depending on the desired frequency (for example, 20 kHz) and the desired power range (for example, 4.0 kW). The power supply also contains a microprocessor-based controller module that provides for control and monitoring of welding operations.

The power supply provides the following features:

**End of Weld Store:** Allows the power supply to track and store the frequency of the last weld.

**Timed Seek:** Tracks and starts the stack on the correct frequency. It does this by running the horn at a low-level amplitude (10 %) to find and lock on to the stack operating frequency. Seeks are timed from the moment sonics was last activated.

**Line Regulation:** Maintains converter amplitude by regulating for variances in the line voltages.

**Load Regulation:** Maintains converter amplitude over the full range of rated power.

**System Protection:** Protects the power supply by providing six levels of protection.

- Voltage
- Current
- Phase
- Temperature
- Power
- Frequency

**Web Page Interface:** Provides access, via Ethernet connection, to power supply information, diagnostics, and configuration web pages.

## 2.2 Compatibility with other Branson Products

**Table 2.2** Power Supply Compatibility with Branson Converters

| DCX A Models | Converter              |
|--------------|------------------------|
| 20 kHz       | CR-20S                 |
|              | CR-20C                 |
|              | CH-20S<br>(932 AH SPL) |
|              | CH-20C                 |
|              | CS-20S                 |
|              | CS-20C                 |
| 30 kHz       | CR-30S                 |
|              | CR-30C                 |
|              | CH-30S                 |
|              | CH-30C                 |
|              | CS-30S                 |
|              | CS-30C                 |
| 40 kHz       | CR-40S<br>(4TH)        |
|              | CR-40C                 |
|              | 4TP                    |

## 2.3 Features

### 2.3.1 The Welding System

The welding system consists of a DCX A Power Supply and a converter-booster-horn stack. The system can perform ultrasonic welding, inserting, staking, spot welding, swaging, degating, and continuous ultrasonic operations. It is designed for automated, semi-automated and/or manual production operations.

### 2.3.2 The Power Supply

The DCX A Power Supply consists of an ultrasonic power supply assembly with a system controller and user interfaces. The ultrasonic power supply assembly converts conventional 50/60 Hz line current to 20 kHz, 30 kHz or 40 kHz electrical energy. The system controller controls the welding system.

Listed below are the control features of the Branson DCX A Power Supply ultrasonic welding system:

**Table 2.3** Control Features

| Name                         | Description                                                                                                                                                                                                                                                                                       |
|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Autotuning                   | Branson power supply tuning ensures that the system is running at peak efficiency.                                                                                                                                                                                                                |
| Digital Amplitude Setting    | This feature allows you to set the exact amplitude necessary for your application, allowing increased range and setting repeatability over analog systems.                                                                                                                                        |
| Frequency Offset             | This process feature allows a user to set an offset relative to the starting frequency, for certain specific applications, where the force imparted on the fixture or anvil causes a frequency shift in the stack's operation. You should only use this feature when advised to do so by Branson. |
| Horn Signature               | Using the DCX A Power Supply Web Page Interface, you may scan your ultrasonic stack to view its operating frequency on your computer, using digital readouts to give you the best picture of the stack's operation.                                                                               |
| LCD (Liquid Crystal Display) | Provides a clear visual interface to monitor and configure the system.                                                                                                                                                                                                                            |
| Line Regulation              | Maintains converter amplitude by regulating for variances in the line voltages.                                                                                                                                                                                                                   |
| Load Regulation              | Maintains converter amplitude over the full range of rated power.                                                                                                                                                                                                                                 |
| Membrane Keys                | Front panel controls are designed for high reliability and immunity from factory dust and oils.                                                                                                                                                                                                   |
| User ID and Passcodes        | Allows for keeping track of user access to the DCX A Power Supply Web Page Interface.                                                                                                                                                                                                             |
| Ramp Starting                | The starting of the DCX A Power Supply and horn is done at a rate that helps reduce electrical and mechanical stress on the system. The horn start rate may be adjusted for some tough-to-start applications.                                                                                     |

**Table 2.3** Control Features

| Name                 | Description                                                                                                                                                                                                                    |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Seek                 | Ensures operation at resonance; minimizes tuning errors; and operates the stack at low amplitude (10%), then provides a means of sensing and storing the resonant operating frequency value.                                   |
| Start-up Diagnostics | At start-up, the controls test the major internal components.                                                                                                                                                                  |
| System Protection    | Protects the power supply by providing six levels of protection: voltage, current, phase, temperature, power, and frequency.                                                                                                   |
| Timed Seek           | When enabled, will do a Seek once every minute to update horn resonant frequency to memory. This is especially useful when the welding process affects the actual temperature of the horn, causing a resonant frequency shift. |
| True Watt-meter      | The controls on the power supply include a true watt-meter for accurate measurement of power and energy.                                                                                                                       |
| Web Page Interface   | Provides access, via Ethernet connection, to power supply information, diagnostics, and configuration web pages.                                                                                                               |

### **2.3.3 The Actuator**

The DCX A Power Supply can interface with actuator signals.

### **2.3.4 Converter/Booster/Horn Assembly**

#### **The Converter**

The ultrasonic electrical energy from the power supply is applied to the converter (sometimes called the transducer). This transforms the high frequency electrical oscillations into mechanical vibrations at the same frequency as the electrical oscillations. The heart of the converter is piezoelectric ceramic elements. When subjected to an alternating voltage, these elements alternately expand and contract, resulting in better than 90% conversion of electrical to mechanical energy.

#### **The Booster**

Success in ultrasonic assembly depends on the right amplitude of movement at the horn face. Amplitude is a function of horn shape, which is largely determined by the size and form of the parts to be assembled. The booster can be used as a mechanical transformer to increase or decrease the amplitude of vibrations applied to the parts through the horn.

The booster is a resonant half-wave section of aluminum or titanium. It is mounted between the converter and the horn, as part of the ultrasonic stack. It also provides a clamping point for rigid stack mounting.

Boosters are designed to resonate at the same frequency as the converter with which they are used. Boosters are usually mounted at a nodal (minimum vibration) point of axial motion. This minimizes the loss of energy and prevents vibration from being transmitted to the stack supporting structure.

#### **The Horn**

The horn is selected or designed for a specific application. Each horn is tuned typically as a half-wave section that applies the necessary force and vibration uniformly to the parts to be assembled. It transfers ultrasonic vibrations from the converter to the workpiece. The horn is mounted to the booster as part of the ultrasonic stack.

Depending on their profile, horns are referred to as stepped, conical, exponential, bar, or catenoidal. The shape of the horn determines the amplitude at the face of the horn. Depending on the application, horns can be made from titanium alloys, aluminum, or steel. Titanium alloys are the best materials for horn fabrication due to their high level of strength and low loss. Aluminum horns are usually chrome- or nickel-plated or hard-coated to reduce wear. Steel horns are for low amplitude requiring hardness, such as ultrasonic insertion applications.

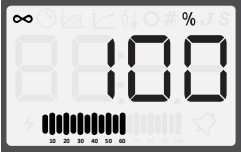
2.4 Controls and Indicators

2.4.1 DCX A Power Supply Front Panel

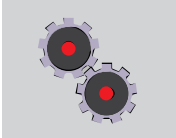
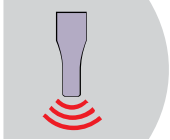
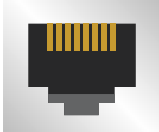
Figure 2.2 DCX A Power Supply Front Panel Controls and Indicators



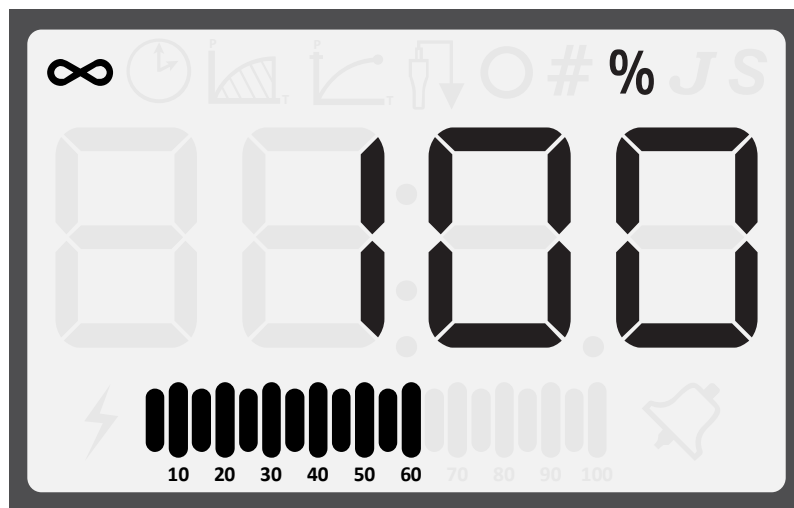
Table 2.4 DCX A Power Supply Front Panel Controls and Indicators

| Reference                                                                           | Description                                                                                                                                                                                                                            |
|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p><b>LCD</b></p> <p>For detailed information refer to <a href="#">Figure 2.3 LCD Description</a> and <a href="#">Table 2.5 LCD Description</a>.</p>                                                                                   |
|  | <p><b>Up/Down Keys</b></p> <p>Use to adjust the amplitude of ultrasonic vibrations (10% to 100%). Also used to adjust weld mode parameters, select registers and edit register values.</p>                                             |
|  | <p><b>Alarm Reset Key</b></p> <p>Use the Reset key to reset alarms.</p> <p>When changing system registers, use the Reset key to set a register back to its default value after entering the register and before editing the value.</p> |

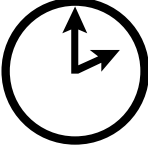
**Table 2.4** DCX A Power Supply Front Panel Controls and Indicators

| Reference                                                                           | Description                                                                                                                                                                                                                                                                         |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    | <p><b>Configuration Key</b></p> <p>Use the Configuration key to change system registers. Registers are used to change system parameters. For information on using the Configuration key to set system registers see <a href="#">7.5 Configuring the Power Supply Registers</a>.</p> |
|    | <p><b>Ultrasonics Test Key</b></p> <p>Use the Test key to perform an ultrasonic test. Test performs a seek and then ramps the amplitude to the current setting.</p>                                                                                                                 |
|    | <p><b>Ethernet Port</b></p> <p>Use the Ethernet Port to connect to the DCX A Power Supply Web Page Interface.</p>                                                                                                                                                                   |
|  | <p><b>Power-On Indicator</b></p> <p>Lights when the power supply is connected to main power and the power is on.</p>                                                                                                                                                                |
|  | <p><b>24 V Indicator</b></p> <p>Lights when 24 V DC are supplied to the DCX A Power Supply.</p>                                                                                                                                                                                     |

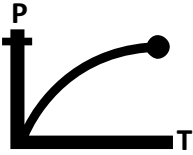
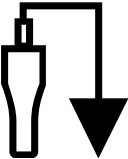
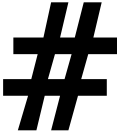
**Figure 2.3** LCD Description



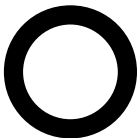
**Table 2.5** LCD Description

| Reference                                                                           | Description                                                                                                                                                                                                                                                                                                               |
|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|   | <b>Numeric Display</b><br>Displays the Power Supply amplitude settings, weld time settings, weld energy settings, peak power settings, scrub time settings, register numbers, register values or alarm numbers.                                                                                                           |
|  | <b>Continuous Mode Icon</b><br>Indicates the power supply is running in Continuous mode. When in Continuous mode, the amplitude setting is shown on the numeric display in conjunction with the % icon. The amplitude setting may range from 10% to 100%. For more information see <a href="#">Chapter 7: Operation</a> . |
|  | <b>Time Mode Icon</b><br>Indicates the power supply is running in Time mode. When in Time mode, the weld time setting is shown on the numeric display in conjunction with the S icon. The weld time setting can range from 10 ms to 30 seconds. For more information see <a href="#">Chapter 7: Operation</a> .           |
|  | <b>Energy Mode Icon</b><br>Indicates the power supply is running in Energy mode. When in Energy mode, the weld energy setting is shown on the numeric display in conjunction with the J icon. The energy setting may range from 1 Joule to 9999 Joules. For more information see <a href="#">Chapter 7: Operation</a> .   |

**Table 2.5** LCD Description

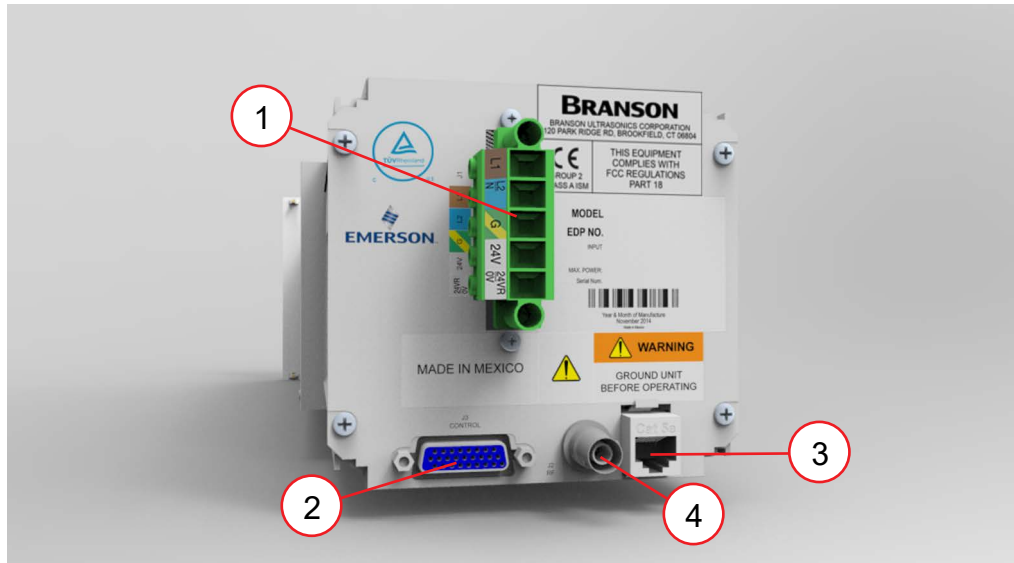
| Reference                                                                           | Description                                                                                                                                                                                                                                                                                                                                                       |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    | <b>Peak Power Icon</b><br>Indicates the power supply is running in Peak Power mode. When in Peak Power mode, the peak power percentage is shown on the numeric display in conjunction with the % icon. The peak power setting may range from 1% to 100% of the maximum power supply output power. For more information see <a href="#">Chapter 7: Operation</a> . |
|    | <b>Ground Detect Icon</b><br>Indicates the power supply is running in Ground Detect mode. When in Ground Detect mode, the scrub time setting will be shown on the numeric display in conjunction with the S icon. Scrub time setting may range from 1 millisecond to 500 milliseconds. For more information see <a href="#">Chapter 7: Operation</a> .            |
|   | <b>Sonics Active Indicator</b><br>Indicates ultrasonics is running.                                                                                                                                                                                                                                                                                               |
|  | <b>Time Icon</b><br>Indicates that the value shown on the numeric display represents time in seconds.                                                                                                                                                                                                                                                             |
|  | <b>Joule Icon</b><br>Indicates that the value shown on the numeric display represents energy.                                                                                                                                                                                                                                                                     |
|  | <b>Percentage Icon</b><br>Indicates that the value shown on the numeric display represents a percentage. When in Peak Power mode, the value shown on the numeric display represents a percentage of the power supply rated power. If not in Peak Power mode, the value shown on the numeric represents the amplitude setting.                                     |
|  | <b>Number Sign Icon</b><br>Indicates that the value shown on the numeric display is a register number. Use up and down keys to select a register. For more information see <a href="#">7.5 Configuring the Power Supply Registers</a> .                                                                                                                           |

**Table 2.5** LCD Description

| Reference                                                                         | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <b>Circle Icon</b><br>Indicates that the value shown on the numeric display is a register value. Use up and down keys to modify the register value. For more information see <a href="#">7.5 Configuring the Power Supply Registers</a> .                                                                                                                                                                                                                                                                                                      |
|  | <b>Alarm Icon</b><br>A flashing icon which indicates an alarm condition.                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|  | <b>Power/Frequency Bar-Graph</b><br>Shows the true percentage of ultrasonic power during a weld cycle. The bar-graph can be configured to show the peak power or the memory frequency at the end of each weld or test cycle. For instructions on how to modify this setting see <a href="#">7.5 Configuring the Power Supply Registers</a> .<br><br>For detailed bar-graph description and bar-graph reading examples, see <a href="#">7.7.1 Power Bar-Graph Interpretation</a> and <a href="#">7.7.2 Frequency Bar-Graph Interpretation</a> . |

## 2.4.2 DCX A Power Supply Connections

**Figure 2.4** DCX A Power Supply Back Panel



**Table 2.6** Connections to the DCX A Power Supply

| Item | Name                 | Function                                                                                                                                                                                                                                         |
|------|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | Line Input Connector | Detachable connector block for connecting the input power. For wiring details refer to <a href="#">Chapter 5: Installation and Setup</a> .                                                                                                       |
| 2    | User I/O Connector   | Provides the necessary input/output signals to interface with actuators, user automation or control interfaces. For detailed information on interfacing with the DCX A Power Supply refer to <a href="#">Chapter 5: Installation and Setup</a> . |
| 3    | Ethernet Port        | Use the Ethernet Port to connect to the DCX A Power Supply Web Page Interface.                                                                                                                                                                   |
| 4    | RF Connector         | SHV connector for RF cable, which provides ultrasonic energy to the converter.                                                                                                                                                                   |

## **2.5 Welding Systems**

### **2.5.1 Principle of Operation**

Thermoplastic parts are welded ultrasonically by applying high frequency vibrations to the parts being assembled. The vibrations, through surface and intermolecular friction, produce a sharp rise in temperature at the welding interface.

When the temperature is high enough to melt the plastic, there is a flow of material between the parts. When the vibrations stop, the material solidifies under pressure and a weld results.

### **2.5.2 Weld System Applications**

DCX A Power Supply weld systems can be used for the following applications:

- Ultrasonic welding
- Cutting and sealing thermoplastic fabric and film
- Staking, spot welding, swaging, and degating thermoplastic parts
- Other ultrasonic processing applications

## 2.6 Glossary

The following terminology may be encountered when using or operating a DCX A Power Supply ultrasonic welding system:

**Table 2.7** Glossary

| Name                       | Description                                                                                                                                                                                                                                                                                                            |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Actuator                   | The unit which houses the converter/booster/horn stack assembly in a rigid mounting, allowing the stack to move up and down, either mechanically or pneumatically, applying force to the part at a user-adjustable force and velocity.                                                                                 |
| Alarm                      | Visual indication of error.                                                                                                                                                                                                                                                                                            |
| Amplitude Control          | The ability to set amplitude digitally or by an external control.                                                                                                                                                                                                                                                      |
| Amplitude                  | The peak-to-peak movement at the horn face. Always expressed as a percentage of the maximum.                                                                                                                                                                                                                           |
| Booster                    | A one-half-wavelength-long resonant metal section mounted between the converter and horn, sometimes having a change in cross-sectional area between the input and output surfaces. The booster mechanically alters the amplitude of vibrations received from the converter, and imparts the new amplitude to the horn. |
| Clamping Force             | The pounds or kilograms exerted by the horn onto the workpiece.                                                                                                                                                                                                                                                        |
| Cold Start                 | Restores the settings of the power supply back to its original condition.                                                                                                                                                                                                                                              |
| Converter                  | The device that converts electrical energy into mechanical vibrations at a high frequency (an ultrasonic rate).                                                                                                                                                                                                        |
| Counters                   | A record of the number of preset cycles recorded in the power supply.                                                                                                                                                                                                                                                  |
| Degating                   | Removing a molded part from its runner system                                                                                                                                                                                                                                                                          |
| Energy Director            | A triangular-shaped projection of plastic material which concentrates the ultrasonic energy at the joint interface of a plastic part.                                                                                                                                                                                  |
| External Amplitude Control | Enables you to access real-time amplitude control directly via the user I/O connector.                                                                                                                                                                                                                                 |
| External Frequency Control | Enables you to access real-time frequency offset control directly via the user I/O connector.                                                                                                                                                                                                                          |
| Fixture                    | A device for holding a part in position for assembly.                                                                                                                                                                                                                                                                  |
| Flash                      | Material displaced from the joint area.                                                                                                                                                                                                                                                                                |
| Forming                    | Reshaping a section of thermoplastic.                                                                                                                                                                                                                                                                                  |
| Fretting Corrosion         | A black surface condition, that results from friction between metal parts, that appears on the converter-booster-horn stack mating surfaces.                                                                                                                                                                           |
| Frequency                  | The operating frequency of the ultrasonic stack. The frequency stored is measured at the end of the ultrasonic portion of the cycle (when ultrasonics are terminated).                                                                                                                                                 |

**Table 2.7** Glossary

| Name               | Description                                                                                                                                                                                                               |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Frequency Offset   | An offset factor applied to the ultrasonic frequency stored in the power supply.                                                                                                                                          |
| Gain               | The ratio of output to input amplitude of a horn or booster.                                                                                                                                                              |
| Horn               | A bar or metal section, usually one half-wavelength-long which transfers vibratory energy to the workpiece.                                                                                                               |
| Horn Amplitude     | The peak-to-peak displacement of a horn at its work face.                                                                                                                                                                 |
| Horn Signature     | A scan to enhance selection of operating frequency and control parameters.                                                                                                                                                |
| Insertion          | The process of embedding a metal component in plastic.                                                                                                                                                                    |
| Interface          | 1. The contact surface of two mating parts.<br>2. The connection between two pieces of equipment.                                                                                                                         |
| Joint              | The weld surfaces.                                                                                                                                                                                                        |
| Parameter          | A unique factor or element which affects the welding operation in a particular mode.                                                                                                                                      |
| Parameter Range    | Valid range of parameters accepted for a particular setup.                                                                                                                                                                |
| Power Supply       | The electronic instrument in an ultrasonic assembly system which changes conventional 50/60 Hz electrical power into high frequency electrical power at 20 kHz, 30 kHz or 40 kHz.                                         |
| Seek               | The activation of ultrasonics at a low-level (10%) amplitude, for the purpose of finding the resonant frequency of the stack.                                                                                             |
| Staking            | The process of melting and reforming a plastic stud to mechanically lock a dissimilar material in place.                                                                                                                  |
| Swaging            | The process of capturing another component of an assembly by melting and reforming a ridge of plastic.                                                                                                                    |
| Thermoplastic      | A polymer which undergoes a reversible change of state when subjected to heat.                                                                                                                                            |
| Thermoset          | A polymer which undergoes an irreversible change when subjected to heat.                                                                                                                                                  |
| Ultrasonic Power   | Presence of ultrasonic power at the horn face.                                                                                                                                                                            |
| Ultrasonic Welding | The use of ultrasonic vibrations to generate heat and subsequently melt the mating surfaces of two thermoplastic parts. When ultrasonic vibrations stop, the molten material resolidifies, and a weld occurs.             |
| User ID            | A unique 12 character long alphanumeric ID used to keep track of user access to the web page interface.                                                                                                                   |
| Weld System        | A combination of components required to perform an ultrasonic operation. Usually consists of a power supply, converter, booster, and horn, with either an actuator or a handheld device, or in a fixed, mounted location. |

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## Chapter 3: Delivery and Handling

---

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| <b>3.5</b> | <b>Returning Equipment</b>           | <b>34</b> |

## 3.1 Shipping and Handling

| CAUTION                                                                           | Heavy Object                                                                                                                                                     |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>The power supply may be heavy. Handling, unpacking, and installation may require the assistance of a colleague or the use of lifting platforms or hoists.</p> |

### 3.1.1 Environmental Specifications

The DCX A Power Supply is an electronic unit that converts line voltage to ultrasonic energy and responds to user input for regulating the weld process. Its internal components are sensitive to static discharge, and many of its components can be harmed if the unit is dropped, shipped under improper conditions, or otherwise mishandled.

The following environmental guidelines should be respected in the shipping of the power supply.

**Table 3.1** Shipping Specifications

| Environmental Condition        | Acceptable Range                                                            |
|--------------------------------|-----------------------------------------------------------------------------|
| Storage / Shipping Temperature | -25° C / -13° F to +55° C / +131° F<br>(+70° C / +158° F for 24 hours)      |
| Shock / Vibration (transit)    | 45 g shock / 0.5 g and (3 to 100 Hz) vibration per ASTM 3332-88 and 3580-90 |
| Drop Test                      | ISTA Procedure 1 & 2A (while packaged)                                      |
| Humidity                       | Maximum 95%, non-condensing                                                 |

## 3.2 Receiving

The DCX A Power Supply is a sensitive electronic device. Many of its components can be harmed if the unit is dropped or otherwise mishandled.

### Scope of Delivery

Branson equipment is carefully checked and packed before dispatch. It is recommended, however, that you follow the procedure below upon receiving your DCX A Power Supply.

### Inspect the Power Supply when it is delivered, take the following steps:

**Table 3.2** Inspect the Power Supply

| Step | Action                                                                                         |
|------|------------------------------------------------------------------------------------------------|
| 1    | Verify that all parts are complete according to the packing slip.                              |
| 2    | Check the packing and the unit for damage (visual inspection).                                 |
| 3    | Report any damage claims to your carrier immediately.                                          |
| 4    | Determine if any component has become loose during shipping and, if necessary, tighten screws. |

| NOTICE                                                                              |                                                                                                                                                                                                   |
|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>If the goods delivered have been damaged during shipping, please contact the forwarding agent immediately. Retain packing material (for possible inspection or for sending back the unit).</p> |

### 3.3 Unpacking the Power Supply

| NOTICE                                                                            |                                                                                                                                                                                      |
|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | If there are any visible signs of damage to the shipping containers or the product, or you later discover hidden damage, NOTIFY YOUR CARRIER IMMEDIATELY. Save the packing material. |

The power supply is fully assembled. It is shipped in a sturdy cardboard box. Some additional items are shipped in the box with the power supply. Note orientation of packaging material in case return/repack is necessary. When unpacking the power supply, take the following steps:

**Table 3.3** Unpacking the Power Supply

| Step | Action                                                                                        |
|------|-----------------------------------------------------------------------------------------------|
| 1    | Unpack the power supply as soon as it arrives. Save the packing material.                     |
| 2    | Verify you have all of the equipment ordered. Some components are packed inside other boxes.  |
| 3    | Inspect the controls, indicators, and surface for signs of damage.                            |
| 4    | Remove the cover of the power supply to check if any components became loose during shipping. |

## 3.4 Take Inventory of Small Parts

**Table 3.4** Small Parts included with the Power Supply Assemblies

| Part or Kit                     | 20 kHz | 30 kHz | 40 kHz |
|---------------------------------|--------|--------|--------|
| Mylar®* plastic film Washer Kit | X      | X      |        |
| Silicone Grease                 |        |        | X      |
| Spanners (2)                    | X      | X      | X      |

\* Mylar is a registered trademark of DuPont Teijin Films.

### 3.4.1 Cables

The RF cable connects the power supply to the converter. For automated systems you will also need a user I/O cable to monitor and control the power supply. Check your invoice for cable types and cable lengths.

**Table 3.5** DCX A Power Supply System Cables

| P/N         | Description                         |
|-------------|-------------------------------------|
| 100-240-383 | Cable, RF 8 ft (2.5 m)              |
| 100-240-384 | Cable, RF 15 ft (4.5 m)             |
| 100-240-385 | Cable, RF 25 ft (7.5 m)             |
| 100-240-387 | Cable, RF right angle 8 ft (2.5 m)  |
| 100-240-388 | Cable, RF right angle 15 ft (4.5 m) |
| 100-240-389 | Cable, RF right angle 25 ft (7.5 m) |
| 100-240-392 | Cable, User I/O 25 ft (7.5 m)       |
| 100-240-393 | Cable, User I/O 50 ft (15 m)        |
| 200-240-396 | Cable Ethernet Cat 5e 7 ft (2.1 m)  |

## 3.5 Returning Equipment

If you are returning equipment to Branson Ultrasonic Corporation, please call your Customer Service Representative to receive approval to return the goods. Refer to [1.3 How to Contact Branson](#).

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## Chapter 4: Technical Specifications

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|            |                                               |           |
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## 4.1 Technical Specifications

| NOTICE                                                                            |                                                          |
|-----------------------------------------------------------------------------------|----------------------------------------------------------|
|  | All specifications are subject to change without notice. |

### 4.1.1 Environmental Specifications

The DCX A Power Supply has the following environmental specifications:

**Table 4.1** Environmental Specifications

| Environmental Condition        | Acceptable Range                     |
|--------------------------------|--------------------------------------|
| Ambient Operating Temperature  | +41° F to +104° F (+5° C to +40° C)  |
| Storage / Shipping Temperature | -13° F to +131° F (-25° C to +55° C) |
| Operating Altitude             | Up to 6560 ft (2000 m)               |
| Humidity                       | Maximum 95%, non-condensing          |
| IP Rating                      | 2X                                   |
| Altitude                       | Up to 3280ft (1000m)                 |
| Pollution degree               | 2                                    |
| Overvoltage category           | II                                   |

### 4.1.2 Electrical Specifications

The following tables list input voltage and current requirements for the DCX A Power Supply.

#### Electrical Input Operating Voltages

**Table 4.2** Electrical Input Operating Voltages

| Power Supply Rating | Input Operating Voltage                                                          |
|---------------------|----------------------------------------------------------------------------------|
| All Models          | 200 V to 240 V Nominal (180 V Min.* to 253 V Max.), 50 Hz or 60 Hz, Single Phase |
|                     | 24 VDC, 2.5 A                                                                    |

\* 200 V Min. for 4 kW units.

## Input Current and Fuse Specifications

**Table 4.3** Input Current and Fuse Specifications

| Model  | Power  | Current Rating                      |
|--------|--------|-------------------------------------|
| 20 kHz | 1250 W | 7 A Max. @ 200 - 240 V / 15 A Fuse  |
|        | 2500 W | 14 A Max. @ 200 - 240 V / 15 A Fuse |
|        | 4000 W | 25 A Max. @ 200 - 240 V / 25 A Fuse |
| 30 kHz | 1500 W | 10 A Max. @ 200 - 240 V / 15 A Fuse |
| 40 kHz | 800 W  | 5 A Max. @ 200 - 240 V / 15 A Fuse  |

## Continuous Duty Maximum Power

**Table 4.4** Continuous Duty Maximum Power

| Model  | Power  | Continuous Duty Max. Power |
|--------|--------|----------------------------|
| 20 kHz | 1250 W | 375 W                      |
|        | 2500 W | 750 W                      |
|        | 4000 W | 1200 W                     |
| 30 kHz | 1500 W | 450 W                      |
| 40 kHz | 800 W  | 240 W                      |

### NOTICE



High duty cycles require additional cooling for the converter. For information on converter cooling refer to [5.7 Converter Cooling](#) in [Chapter 5: Installation and Setup](#).

### NOTICE



System average power must be limited to the specified continuous maximum. Duty cycle for each power and frequency is 1 second on and 2.4 seconds off.

Cycle Rate – up to 200 cpm. Cycle rate including off time is application and stack dependent.

4.2 Physical Description

This section describes the physical dimensions of the DCX A Power Supply.

| NOTICE                                                                            |                         |
|-----------------------------------------------------------------------------------|-------------------------|
|  | Dimensions are nominal. |

**Table 4.5** Dimensions and Weights of DCX A Power Supply

| Size   | Width          | Height          | Depth         | Weight          |
|--------|----------------|-----------------|---------------|-----------------|
| Small  | 4.2"<br>106 mm | 5.07"<br>128 mm | 22"<br>560 mm | 8 lb<br>3.6 kg  |
| Medium | 5.6"<br>142 mm |                 |               | 12 lb<br>5.4kg  |
| Large  | 8.4"<br>213 mm |                 |               | 15 lb<br>6.8 kg |

For detailed dimensional information refer to [Chapter 5: Installation and Setup](#).

## 4.3 EU Declaration of Conformity

Figure 4.1 EU Declaration of Conformity

EU DECLARATION OF CONFORMITY



We, the manufacturer

**BRANSON ULTRASONICS CORPORATION**  
120 Park Ridge Rd.  
Brookfield, CT 06804  
USA

represented in the community by

BRANSON ULTRASONICS, a.s.  
Piestanska 1202  
91501 Nove Mesto nad Vahom  
Slovak Republic

expressly declare under our sole responsibility that the following electrical equipment product:

Ultrasonic Assembly System consisting of an Ultrasonic Power Supply, model:

|                                          |                                                         |
|------------------------------------------|---------------------------------------------------------|
| 0.80 DCX(S, A, f-EIP, or f-DP) 40 RACKMT | 0.40DCX(s, v, a, f-dp or f-eip)40(VRT, V, H or HOR)     |
| 1.50 DCX(S, A, f-EIP, or f-DP) 30 RACKMT | 0.80DCX(s, v, a, f-dp or f-eip)40(VRT, V, H or HOR)     |
| 1.25 DCX(S, A, f-EIP, or f-DP) 20 RACKMT | 0.75DCX(s, v, a, f-dp or f-eip)30(VRT, V, H or HOR)     |
| 2.50 DCX(S, A, f-EIP, or f-DP) 20 RACKMT | 1.50DCX(s, v, a, f-dp or f-eip)30(VRT, V, H or HOR)     |
| 4.00 DCX(S, A, f-EIP, or f-DP) 20 RACKMT | 1.25DCX(s, v, a, f-dp or f-eip)20(VRT, V, H or HOR)     |
| DCX RM 222 STD                           | 2.50DCX(S+, s, v, a, f-dp or f-eip)20(VRT, V, H or HOR) |
| DCX RM 240 STD                           | 4.00DCX(S+, s, v, a, f-dp or f-eip)20(VRT, V, H or HOR) |
| DCX RM 222 B                             | 4.00DCXs20HD -V                                         |
| DCX RM 240 B                             | P/S 0.8 DCX S HD 40 VRT                                 |
| DCX RM 480 STD                           | 1.50 DCX-S HD 30 HOR                                    |
| DCX RM 315 STD                           | 1.50 DCX-S HD 30 VRT                                    |
| DCX RM 211 STD                           | 4.00DCXs20HD -H                                         |
| DCX RM 480 B                             | P/S 0.8 DCX S HD 40 HOR                                 |
| DCX RM 315 B                             | P/S 4.0KW 20KHZ DCX S LIM RES                           |
| DCX RM 211 B                             | 1.6DCX(a, f-dp or f-eip)40(B2H or B2V)                  |
| P/S 2.20 DCX STD 20 SIG                  |                                                         |

used with converter model: CR-20S, CR-20C, CH-20C, CS-20S, CS-20C, CR-30, CR-30C, CH-30, CH-30C, CS-30S, CS-30C, CR-40C, 4TH, 4TP or 932, and associated cables.

in the state in which it was placed on the market, fulfills all the relevant provisions and their amendments of:

Low Voltage Directive 2014/35/EU  
EMC Directive 2014/30/EU  
RoHS Directive 2011/65/EU

The object of this declaration is in conformity with relevant Union harmonization legislation. The electrical equipment product, to which this declaration relates, is in conformity with the following standards:

EN 61010-1:2010+A1:2019  
EN 55011:2016/A11:2020  
EN 61000-6-2:2005/AC:2005

Brookfield, CT, USA

Luis Benavides  
Luis Benavides (Sep 23, 2024 10:10 CDT)  
Sr. Engineering Manager / Product Safety Officer

## 4.4 UK Declaration of Conformity

Figure 4.2 UK Declaration of Conformity



### UK DECLARATION OF CONFORMITY

We, the manufacturer

**BRANSON ULTRASONICS CORPORATION**  
120 Park Ridge Rd.  
Brookfield, CT 06804  
USA

expressly declare under our sole responsibility that the following electrical equipment product:

Ultrasonic Assembly System consisting of an Ultrasonic Power Supply, model:

|                                          |                                                         |
|------------------------------------------|---------------------------------------------------------|
| 0.80 DCX(S, A, f-EIP, or f-DP) 40 RACKMT | 0.40DCX(s, v, a, f-dp or f-eip)40(VRT, V, H or HOR)     |
| 1.50 DCX(S, A, f-EIP, or f-DP) 30 RACKMT | 0.80DCX(s, v, a, f-dp or f-eip)40(VRT, V, H or HOR)     |
| 1.25 DCX(S, A, f-EIP, or f-DP) 20 RACKMT | 0.75DCX(s, v, a, f-dp or f-eip)30(VRT, V, H or HOR)     |
| 2.50 DCX(S, A, f-EIP, or f-DP) 20 RACKMT | 1.50DCX(s, v, a, f-dp or f-eip)30(VRT, V, H or HOR)     |
| 4.00 DCX(S, A, f-EIP, or f-DP) 20 RACKMT | 1.25DCX(s, v, a, f-dp or f-eip)20(VRT, V, H or HOR)     |
| DCX RM 222 STD                           | 2.50DCX(S+, s, v, a, f-dp or f-eip)20(VRT, V, H or HOR) |
| DCX RM 240 STD                           | 4.00DCX(S+, s, v, a, f-dp or f-eip)20(VRT, V, H or HOR) |
| DCX RM 222 B                             | 4.00DCXs20HD -V                                         |
| DCX RM 240 B                             | P/S 0.8 DCX S HD 40 VRT                                 |
| DCX RM 480 STD                           | 1.50 DCX-S HD 30 HOR                                    |
| DCX RM 315 STD                           | 1.50 DCX-S HD 30 VRT                                    |
| DCX RM 211 STD                           | 4.00DCXs20HD -H                                         |
| DCX RM 480 B                             | P/S 0.8 DCX S HD 40 HOR                                 |
| DCX RM 315 B                             | P/S 4.0KW 20KHZ DCX S LIM RES                           |
| DCX RM 211 B                             | 1.6DCX(a, f-dp or f-eip)40(B2H or B2V)                  |
| P/S 2.20 DCX STD 20 SIG                  |                                                         |

used with converter model: CR-20S, CR-20C, CH-20C, CS-20S, CS-20C, CR-30, CR-30C, CH-30, CH-30C, CS-30S, CS-30C, CR-40C, 4TH, 4TP or 932, and associated cables.

in the state in which it was placed on the market, fulfills all the relevant provisions and their amendments of:

Electrical Equipment (Safety) Regulations 2016  
Electromagnetic Compatibility Regulations 2016  
Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012.

The electrical equipment product, to which this declaration relates, is in conformity with the following designated standards:

EN 61010-1:2010+A1:2019  
EN 55011:2016/A11:2020  
EN 61000-6-2:2005/AC:2005

Brookfield, CT, USA

*Luis Benavides*

Luis Benavides (Sep 23, 2024 10:10 CDT)

Sr. Engineering Manager / Product Safety Officer

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## Chapter 5: Installation and Setup

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## 5.1 About Installation

This chapter is intended to help the installer with the basic installation and setup of your new DCX A Power Supply.

| CAUTION                                                                           | Heavy Object                                                                                                                                                                   |
|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | The power supply, and related components are heavy. Handling, unpacking, and installation may require the assistance of a colleague or the use of lifting platforms or hoists. |

International safety-related labels are found on the power supply. Those that are of importance during installation of the system are identified in [Figure 1.1 Safety-related Labels found on the DCX A Power Supply](#).

## 5.2 Installation Requirements

This section covers the location requirements, mounting options, power supply dimensions, environmental requirements, and electrical requirements, to help you plan and execute your installation successfully.

### 5.2.1 Installing the DCX A Power Supply in a Customer Rack

The power supply units can be installed in any rack complying with the 19" industrial standard.

For successful installation in a rack, the respective demands on the electric and cooling system have to be met.

- If multiple drawers are to be installed in a rack we recommend to provide three phase power to the rack in order to provide each drawer with a dedicated supply and one phase to each drawer
- Particular care has to be taken that the heat generated during operation is dissipated. The heat generated depends on the power output by the module and the ambient conditions
- The heat sink of the module is mounted on the right. Make sure that the cooling device is mounted in a way allowing the cooling air to pass freely on this side
- For each group of four power supply modules installed one cooling drawer is required. The cooling drawers must be installed directly under the power supplies in order to ensure sufficient cooling
- In case a filter element is used to clean the intake air, regular inspection and cleaning of the filter depending on the ambient conditions is required to maintain the airflow volume
- To prevent thermal overload, the system is protected by thermostats which are reset automatically after cooling down

| NOTICE                                                                              |                                                                                     |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|  | <p>Three 105 CFM fans must be placed directly underneath each unit for cooling.</p> |

### 5.2.2 Location

The power supply should be accessible for parameter changes and settings. The power supply should be located in an area away from radiators or heating vents.

The DCX A Power Supply must not be positioned so that is difficult to plug in or unplug the main power plug.

### 5.2.3 Dimensions

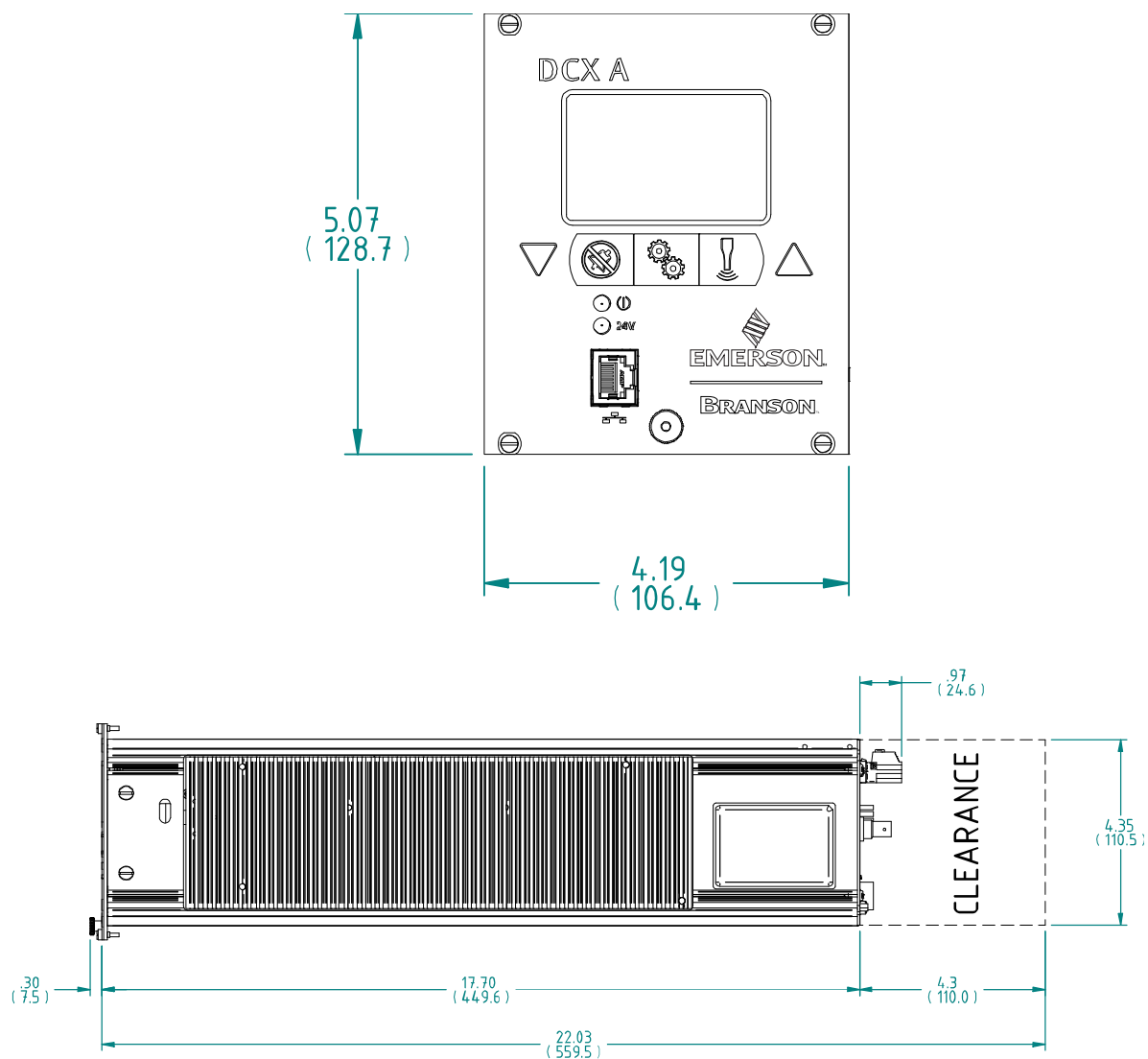
Refer to the illustrations on the pages that follow for dimensional drawings. All dimensions are approximate and may vary slightly:

[Figure 5.1 DCX A Power Supply Dimensional Drawing \(Small\)](#)

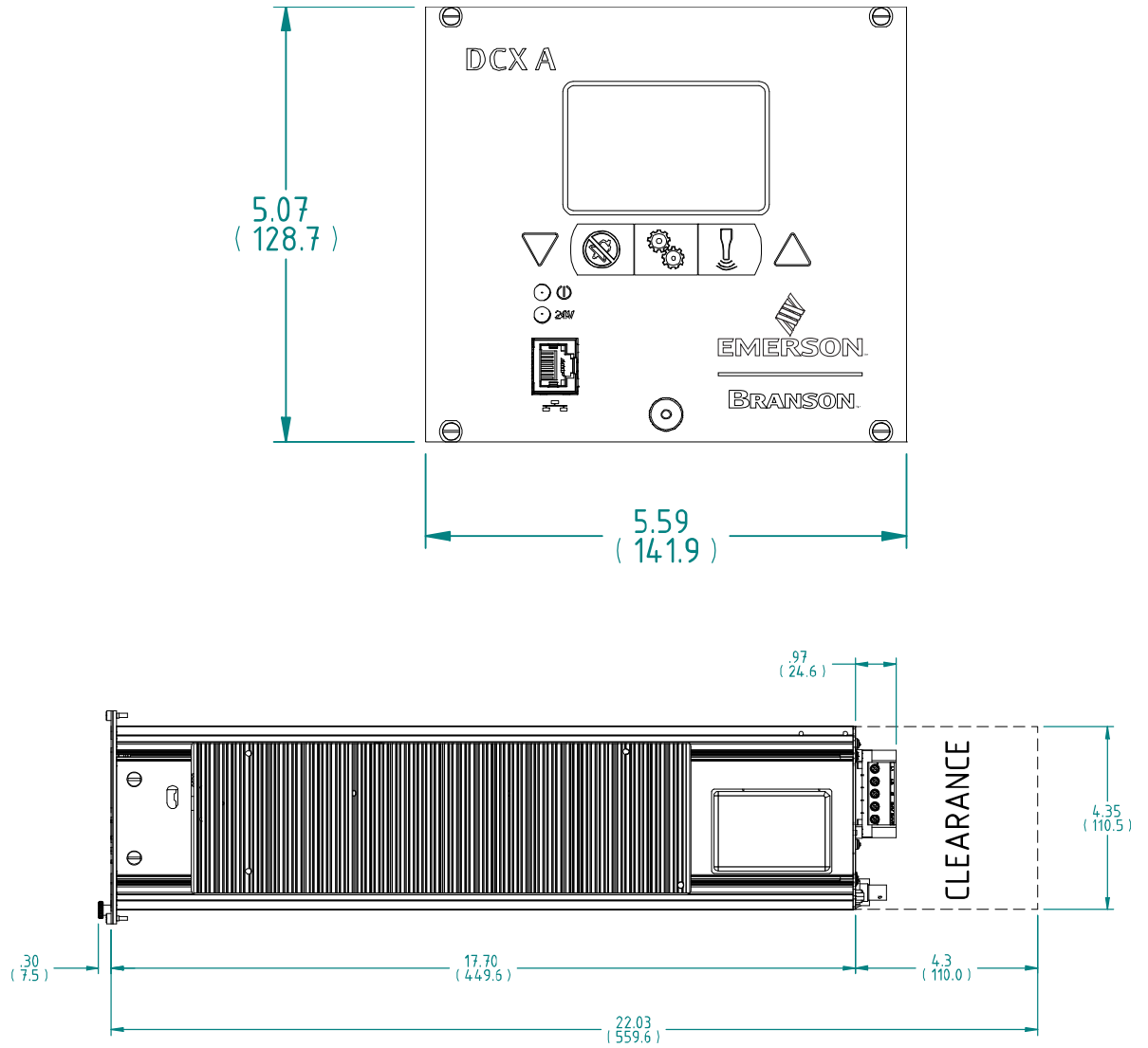
[Figure 5.2 DCX A Power Supply Dimensional Drawing \(Medium\)](#)

[Figure 5.3 DCX A Power Supply Dimensional Drawing \(Large\)](#)

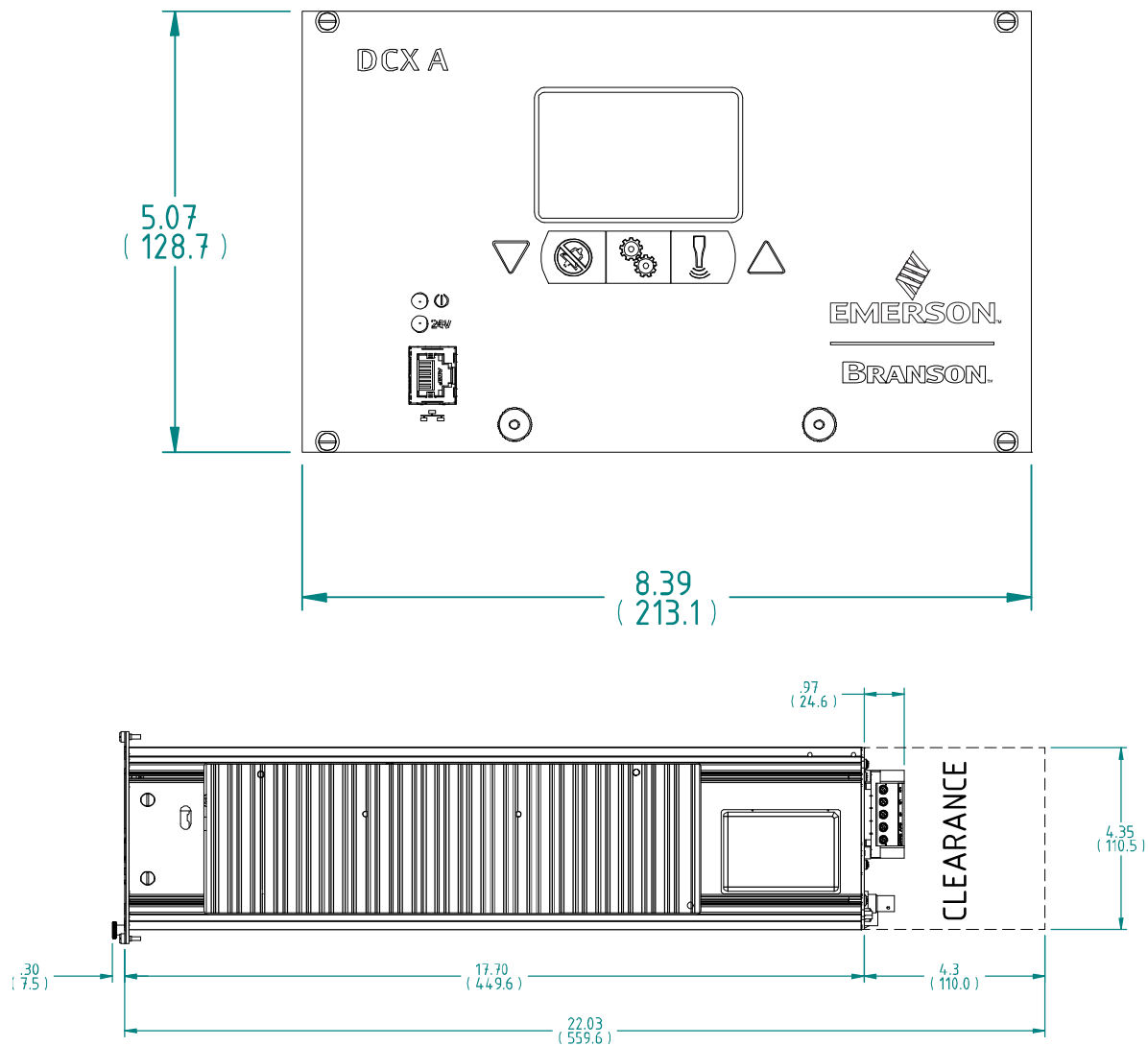
**Figure 5.1** DCX A Power Supply Dimensional Drawing (Small)



**Figure 5.2** DCX A Power Supply Dimensional Drawing (Medium)



**Figure 5.3** DCX A Power Supply Dimensional Drawing (Large)



### 5.2.4 Environmental Requirements

Verify the DCX A Power Supply is operated in an environment that meets the temperature and humidity requirements indicated in [Table 5.1 Environmental Requirements](#).

**Table 5.1** Environmental Requirements

| Environmental Condition        | Acceptable Range                     |
|--------------------------------|--------------------------------------|
| Ambient Operating Temperature  | +41° F to +104° F (+5° C to +40° C)  |
| Storage / Shipping Temperature | -13° F to +131° F (-25° C to +55° C) |
| Operating Altitude             | Up to 6560 ft (2000 m)               |
| Humidity                       | Maximum 95%, non-condensing          |
| IP Rating                      | 2X                                   |
| Altitude                       | Up to 3280ft (1000m)                 |
| Pollution degree               | 2                                    |
| Overvoltage category           | II                                   |

### 5.2.5 Electrical Input Power Ratings

Connect the power supply to a single-phase, grounded, 3-wire, 50 Hz or 60 Hz 200 V to 240 V power source. [Table 5.2 Input Current and Circuit Breaker Specifications](#) lists the current and breaker ratings for the various models.

**Table 5.2** Input Current and Circuit Breaker Specifications

| Model  | Power  | Current Rating                         |
|--------|--------|----------------------------------------|
| 20 kHz | 1250 W | 7 A Max. @ 200 - 240 V / 15 A Breaker  |
|        | 2500 W | 14 A Max. @ 200 - 240 V / 15 A Breaker |
|        | 4000 W | 25 A Max. @ 200 - 240 V / 25 A Breaker |
| 30 kHz | 1500 W | 10 A Max. @ 200 - 240 V / 15 A Breaker |
| 40 kHz | 800 W  | 5 A Max. @ 200 - 240 V / 10 A Breaker  |

### 5.2.6 Pneumatic Requirements

Your welding system may require a cooling air stream for the converters. In continuous operations, or applications with longer duty cycles, it may be necessary to cool the horn as well as the converter.

Typically 80 cubic feet (2.26 m<sup>3</sup>) per hour of clean, dry, compressed air are required to cool most welding operations.

To verify the 80 cubic feet (2.26 m<sup>3</sup>) per hour cooling air stream required for your welding system, refer to [5.7 Converter Cooling](#).

## 5.3 Installation Steps

| WARNING                                                                           | High Voltage Hazard                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>To prevent the possibility of an electrical shock:</p> <ul style="list-style-type: none"><li>• Ensure the power source is disconnected before beginning work on line connections</li><li>• Always plug the power supply into a grounded power source</li><li>• To prevent the possibility of an electrical shock, ground the power supply by securing an AWG #14 grounded conductor to the ground screw located next to the air outlet</li><li>• Ensure power supply installation is performed by qualified personnel and in accordance with local standards and regulations</li></ul> |

All persons who are involved with installation, commissioning, operation and maintenance must have the required qualification, strictly follow this operating manual.

### Basic installation notes:

- To avoid problems associated with EMI, you should route high power lines (AC and Ultrasonic RF) away from low power lines (controls signals)
- You should consider future troubleshooting and repair when installing all wiring. All wiring should be either color coded or tagged with industrial wire tags
- The minimum cable bend radius is 5 times the cable outer diameter for RF cables
- The minimum cable bend radius is 10 times the cable outer diameter for user I/O & Ethernet cables
- Ground wires should not be shared with other equipment
- All inductive coils must be suppressed with appropriate devices, such as diodes or RC networks

### 5.3.1 Mount the Power Supply

The cable lengths are limited based on the operating frequency of the welding system. Performance and results can suffer if the RF cable is crushed, pinched, damaged or modified. Contact your Branson Representative if you have special cable requirements.

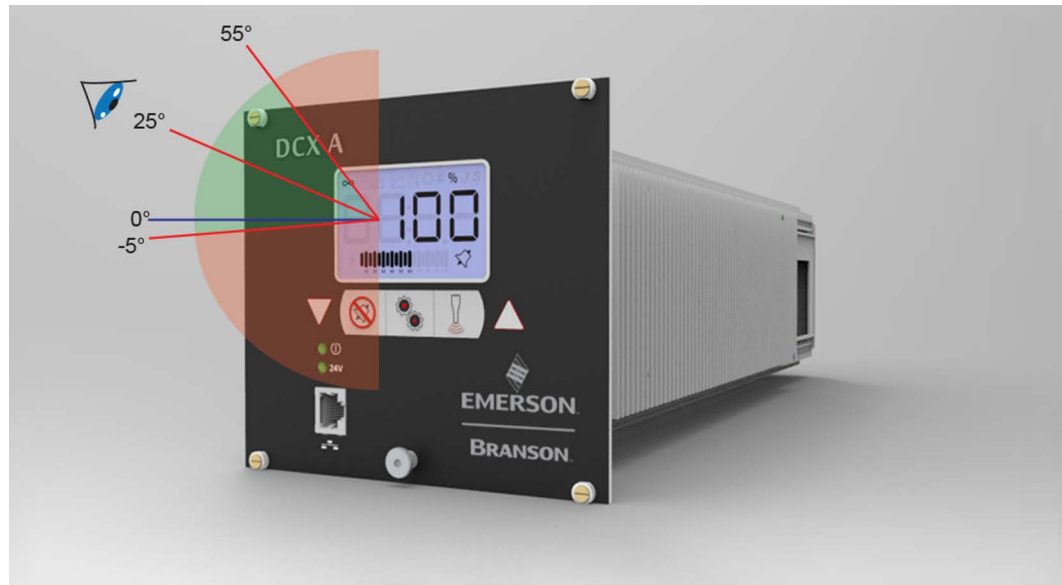
Do not place the power supply on the floor or in other locations that will allow dust, dirt or contaminants to be drawn into the power supply.

| NOTICE                                                                            |                                                                                                            |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|
|  |                                                                                                            |
|                                                                                   | Do not block exhaust and intake air circulation, which is needed to maintain a safe operating temperature. |

### 5.3.2 Mounting Considerations

In addition to the considerations mentioned above, the LCD's viewing angle should be taken into account when selecting a location for your DCX A Power Supply. The LCD is designed to be viewed from the top. Please refer to [Figure 5.4 LCD Viewing Angle](#) below when selecting a location for your DCX A Power Supply.

**Figure 5.4** LCD Viewing Angle



| NOTICE                                                                              |                                                                                 |
|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|
|  |                                                                                 |
|                                                                                     | Optimal viewing angle is 25° above the normal to the display (indicated by 0°). |

5.3.3 Electrical Connections

Figure 5.5 DCX A Power Supply Connections

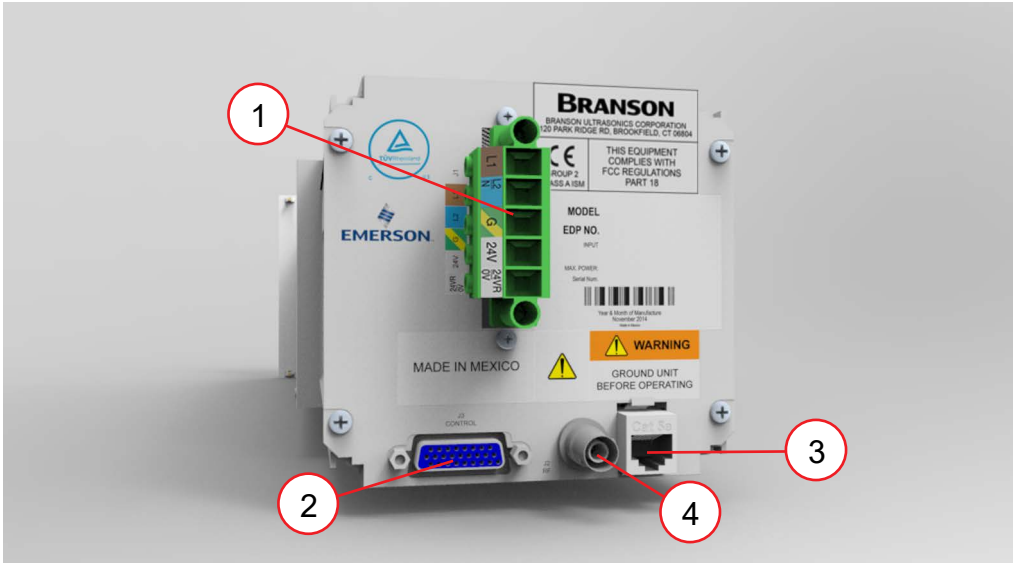


Table 5.3 DCX A Power Supply Connections

| Item | Name                 |
|------|----------------------|
| 1    | Line Input Connector |
| 2    | User I/O Connector   |
| 3    | Ethernet Port        |
| 4    | RF Connector         |

## 5.4 User I/O

### 5.4.1 User I/O Connections

| NOTICE                                                                            |                                                      |
|-----------------------------------------------------------------------------------|------------------------------------------------------|
|  | User I/O interface is only available in manual mode. |

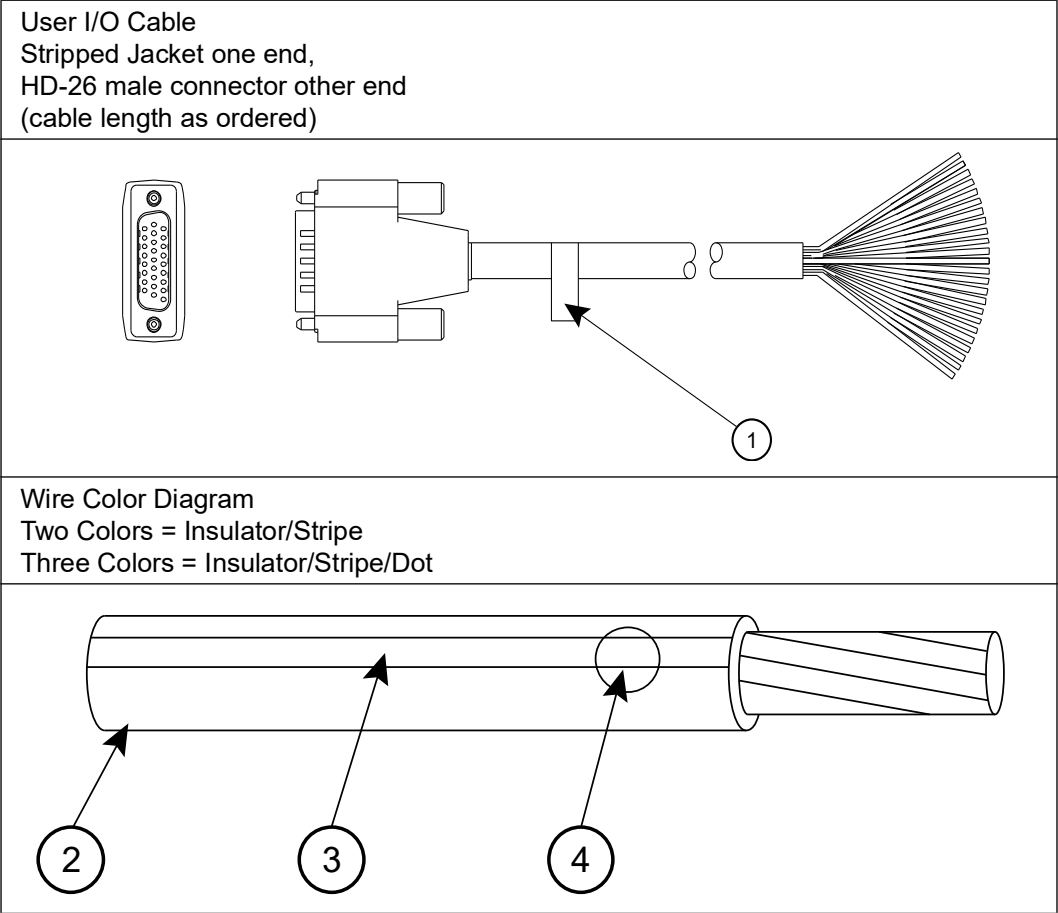
The user I/O is a standard interface for automation, provided on the power supply. It provides the ability to make your own interface for your automation, actuator interface, special control, or reporting needs. The interface cable has a 26-pin HD male D-Sub connector on one end, and wires on the other end. Pins are wired to ICEA standard color code (see [Figure 5.6 User I/O Cable Identification and Wire Color Diagram](#) and [Table 5.5 User I/O Cable Pin Assignments](#)).

| NOTICE                                                                              |                                                                                                           |
|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
|  | Ensure all unused wires are properly isolated. Failure to do so may result in a power supply malfunction. |

Digital I/O functions can be configured to either active-high or active-low using the DCX A Power Supply Web Page Interface. [Table 5.7 Digital Input Functions](#) to [Table 5.10 Analog Output Functions](#) list the input and output functions available on the DCX A Power Supply. See [Table 5.6 Default Branson User I/O Connector Pin Assignments](#) for the default user I/O pin assignments.

[Figure 5.7 Typical Digital I/O Wiring Examples](#) and [Figure 5.8 Typical Analog I/O Wiring Examples](#) show typical wiring examples.

**Figure 5.6** User I/O Cable Identification and Wire Color Diagram



**Table 5.4** User I/O Cable Identification and Wire Color Diagram

| Item | Description |
|------|-------------|
| 1    | Part number |
| 2    | Insulation  |
| 3    | Stripe      |
| 4    | Dot         |

## 5.4.2 User I/O Cable Pin Assignments

**Table 5.5** User I/O Cable Pin Assignments

| Pin | Input/Output  | Available Function                                     | Signal Type    | Signal Range                     | Color       |
|-----|---------------|--------------------------------------------------------|----------------|----------------------------------|-------------|
| 1   | Digital in 1  | See <a href="#">Table 5.7 Digital Input Functions</a>  | Digital Input  | 0V to 24V $\pm 10\%$ , 12mA      | Blk         |
| 2   | Digital in 2  |                                                        |                |                                  | Wht         |
| 3   | Digital in 3  |                                                        |                |                                  | Red         |
| 4   | Digital in 4  |                                                        |                |                                  | Grn         |
| 5   | +24V          | N/A                                                    | 24V Source     | 24V $\pm 10\%$ , 250mA Max       | Orn         |
| 6   |               |                                                        |                |                                  | Blu         |
| 7   | Digital out 1 | See <a href="#">Table 5.8 Digital Output Functions</a> | Digital Output | 0V to 24V, $\pm 10\%$ , 25mA Max | Wht/Blk     |
| 8   | Digital out 2 |                                                        |                |                                  | Red/Blk     |
| 9   | Digital out 3 |                                                        |                |                                  | Grn/Blk     |
| 10  | Digital out 4 |                                                        |                |                                  | Orn/Blk     |
| 11  | Digital in 5  | See <a href="#">Table 5.7 Digital Input Functions</a>  | Digital Input  | 0V to 24V $\pm 10\%$ , 12mA      | Blu/Blk     |
| 12  | Digital in 6  |                                                        |                |                                  | Blk/Wht     |
| 13  | Digital in 7  |                                                        |                |                                  | Red/Wht     |
| 14  | Ground        | N/A                                                    | 24V Ground     | 0V                               | Grn/Wht     |
| 15  |               |                                                        |                |                                  | Blu/Wht     |
| 16  | Digital in 8  | See <a href="#">Table 5.7 Digital Input Functions</a>  | Digital Input  | 0V to 24V $\pm 10\%$ , 12mA      | Blk/Red     |
| 17  | Analog in 1   | See <a href="#">Table 5.9 Analog Input Functions</a>   | Analog Input   | 0V to +10V, 2mA                  | Wht/Red     |
| 18  | Analog in 2   |                                                        |                |                                  | Orn/Red     |
| 19  | Digital out 5 | See <a href="#">Table 5.8 Digital Output Functions</a> | Digital Output | 0V to 24V $\pm 10\%$ , 12mA Max  | Blu/Red     |
| 20  | Digital out 6 |                                                        |                |                                  | Red/Grn     |
| 21  | Digital out 7 |                                                        |                |                                  | Orn/Grn     |
| 22  | Digital out 8 |                                                        |                |                                  | Blk/Wht/Red |
| 23  | Digital in 9  | See <a href="#">Table 5.7 Digital Input Functions</a>  | Digital Input  | 0V to 24V $\pm 10\%$ , 12mA      | Wht/Blk/Red |

**Table 5.5** User I/O Cable Pin Assignments

| Pin | Input/Output  | Available Function                                     | Signal Type   | Signal Range                  | Color       |
|-----|---------------|--------------------------------------------------------|---------------|-------------------------------|-------------|
| 24  | Analog out 1  | See <a href="#">Table 5.10 Analog Output Functions</a> | Analog Output | 0V to 10V $\pm 5\%$ , 1mA Max | Red/Blk/Wht |
| 25  | Analog out 2  |                                                        |               |                               | Grn/Blk/Wht |
| 26  | Analog Ground | N/A                                                    | Analog Ground | 0V                            | Orn/Blk/Wht |

### 5.4.3 Default Branson User I/O Connector Pin Assignments

**Table 5.6** Default Branson User I/O Connector Pin Assignments

| Pin | Input/Output                     | Signal Type       | Signal Description                                                                                                                                              |
|-----|----------------------------------|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | STD-External Start               | Digital Input     | Apply +24VDC to run cycle<br><b>NOTICE</b><br>Power supply must be in ready mode before External Start<br><b>NOTICE</b><br>Signal must be held for 10ms minimum |
| 2   | STD-External Seek                |                   | Apply +24VDC to perform a seek                                                                                                                                  |
| 3   | STD-External Reset               |                   | Apply +24VDC to reset alarm                                                                                                                                     |
| 4   | STD-Memory Clear                 |                   | Apply +24VDC to clear memory                                                                                                                                    |
| 5   | +24VDC Source                    | I/O Signal Source | +24V, 250mA Max                                                                                                                                                 |
| 6   |                                  |                   |                                                                                                                                                                 |
| 7   | STD-Ready                        | Digital Output    | +24V indicates the system is ready                                                                                                                              |
| 8   | STD-Sonics Active                |                   | +24V indicates ultrasonics are active                                                                                                                           |
| 9   | STD-General Alarm                |                   | +24V indicates an alarm occurred                                                                                                                                |
| 10  | STD-Seek/Scan Out                |                   | +24V indicates either Seek or a Scan is in progress                                                                                                             |
| 11  | STD-Recall Preset 1              | Digital Input     | Bit 0 for preset recall binary code                                                                                                                             |
| 12  | STD-Recall Preset 2              |                   | Bit 1 for preset recall binary code                                                                                                                             |
| 13  | ACT-Ground Detect                |                   | Apply +24 VDC to activate ground detect                                                                                                                         |
| 14  | +24VDC Return and I/O Return     | I/O Signal Return | Return for all pins except pins 17, 18, 24, and 25                                                                                                              |
| 15  |                                  |                   |                                                                                                                                                                 |
| 16  | ACT-Cycle Abort                  | Digital Input     | Apply +24 VDC to abort cycle                                                                                                                                    |
| 17  | Amplitude In                     | Analog Input      | +1V to +10V (10% to 100%)*                                                                                                                                      |
| 18  | Frequency Offset                 |                   | +1V to +9V (5V is zero offset)                                                                                                                                  |
| 19  | STD-Confirm Preset Change        | Digital Output    | +24V indicates a load new preset request has occurred and the preset was successfully recalled                                                                  |
| 20  | STD-Overload Alarm               |                   | +24V indicates an overload alarm occurred                                                                                                                       |
| 21  | STD-Plus Peak Power Limit Alarm  |                   | +24 V indicates a +peak power limit alarm occurred                                                                                                              |
| 22  | STD-Minus Peak Power Limit Alarm |                   | +24V indicates a -peak power limit alarm occurred                                                                                                               |

**Table 5.6** Default Branson User I/O Connector Pin Assignments

| Pin | Input/Output         | Signal Type          | Signal Description                 |
|-----|----------------------|----------------------|------------------------------------|
| 23  | STD-Display Lock     | Digital Input        | Apply +24 VDC to lock the display  |
| 24  | Power Out            | Analog Output        | 0V to +10V (0% to 100%)            |
| 25  | Amplitude Out        |                      | 0V to +10V (0% to 100%)            |
| 26  | Analog Signal Return | Analog Signal Return | Return for pins 17, 18, 24, and 25 |

\*If the input signals are not within their valid range, or if left unconnected, the power supply will use 50% amplitude and zero frequency offset, respectively.

### 5.4.4 Digital Input Functions

**Table 5.7** Digital Input Functions

| Function                      | Description                                                                                                                                                                                              |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ACT-Actuator Present          | Must be active at power up to activate TRS, ULS, Interlock, Part in Place.                                                                                                                               |
| ACT-Cycle Abort               | Will immediately terminate the current weld cycle and not accept another External Start until removed. Reset required is user settable.                                                                  |
| ACT-Ground Detect             | Will start scrub time. When scrub time expires, ultrasonics will be turned off.                                                                                                                          |
| ACT-Interlock In Place        | Prevents a cycle from starting until the signal becomes active.                                                                                                                                          |
| ACT-Part In Place             | When enabled, signal must be active before weld cycle is started.                                                                                                                                        |
| ACT-Trigger Switch (TRS)      | Indicates the power supply to start ultrasonics.                                                                                                                                                         |
| ACT-Upperlimit Switch (ULS)   | Tells the power supply that the actuator is at home position.                                                                                                                                            |
| RF-Feedback A, B, C, D        | Indicates which relay the RF switch has changed to. Bit 0 to bit 3 are binary coded values indicating the selected RF switch. It can also be uncoded. This function is user settable.                    |
| RF-Status Feedback            | Indicates the RF switch has changed to the proper relay.<br><b>NOTICE</b><br>Single value. Not coded/uncoded like RF-Feedback A, B, C, D.                                                                |
| STD-Cable Detect              | When enabled 24 volts must be present on pin at all times. If 24 volts is removed, suggesting that the cable has been removed, ultrasonics will not be allowed to run and will stop if already running.  |
| STD-Display Lock              | Locks the front panel display controls. Registers are read only when signal is active.                                                                                                                   |
| STD-External Amp Step Trigger | When set to +24 V sets amplitude to Amplitude 2. If set again to 0 V during a weld cycle will set amplitude back to Amplitude 1. Used only if amplitude stepping is turned on and set to external input. |
| STD-External Horn Scan        | Starts horn scan. Signal must be maintained during the scan.                                                                                                                                             |
| STD-External Reset            | Resets alarm conditions.                                                                                                                                                                                 |
| STD-External Seek             | Activates ultrasonic energy at 10% amplitude for the purpose of finding the ultrasonic stack resonant frequency.                                                                                         |

**Table 5.7** Digital Input Functions

| Function                             | Description                                                                                                                                                                                                                                                                                                                                                                |
|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| STD-External Sonics Delay            | Delays the start of ultrasonics even if a trigger occurs. This can be used to enable an external operation to be complete before continuing the cycle (e. g. test device or part marking operation). If the delay is maintained for 1 minute, the cycle is aborted and all inputs must be cycled again.                                                                    |
| STD-External Start                   | <p>Activates ultrasonic energy at the currently set amplitude.</p> <p><b>NOTICE</b><br/>DCX A Power Supply must be in ready mode before External Start.</p> <p><b>WARNING</b><br/>When using 0 V to activate ultrasonics (External Start signal), it is recommended to assign one input as Cable Detect to prevent sonics from activating if 24 V is lost by accident.</p> |
| STD-External Test                    | Performs a test cycle. Signal must be maintained.                                                                                                                                                                                                                                                                                                                          |
| STD-Load New Preset                  | Loads a weld preset as defined by Recall Preset Bits 1-32.                                                                                                                                                                                                                                                                                                                 |
| STD-Memory Clear                     | Centers the power supply start frequency.                                                                                                                                                                                                                                                                                                                                  |
| STD-Recall Preset 1, 2, 4, 8, 16, 32 | Bit 0 to bit 5 for preset recall binary code. This code will be used to recall a preset when Load Preset input is activated.                                                                                                                                                                                                                                               |
| STD-Sonics Disable                   | Prevents ultrasonics from coming on. If active throughout a weld cycle, the cycle will be performed but without ultrasonics. Should the weld mode be time indeterminate (energy, power, etc) then the weld time will extend to the cutoff time.                                                                                                                            |
| STD-Start Cycle                      | Starts a cycle.                                                                                                                                                                                                                                                                                                                                                            |

### 5.4.5 Digital Output Functions

**Table 5.8** Digital Output Functions

| Function                              | Description                                                                                                                             |
|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| ACT-Actuator Home                     | Indicates that a ULS input has been received.                                                                                           |
| ACT-Afterburst Delay                  | Indicates if the weld cycle is in the Afterburst Delay state.                                                                           |
| ACT-Afterburst Time                   | Indicates if the weld cycle is in the Afterburst state.                                                                                 |
| ACT-End of Hold Time                  | Indicates the system has reached the end of Hold since the cycle started.                                                               |
| ACT-Holdtime                          | Indicates if the weld cycle is in the Hold Time state.                                                                                  |
| RF-Select A-D                         | Output to select stacks 1 to 4 or a binary coded value (bit 0-3) to select RF relay.                                                    |
| STD-Amp1<br>Amp2                      | If output is 0 V, indicates the amplitude setting is Amplitude 1.<br>If output is 24 V, indicates the amplitude setting is Amplitude 2. |
| STD-Confirm<br>Preset Change          | Output will go active when a preset has been recalled.                                                                                  |
| STD-Custom<br>Alarm                   | Indicates a Custom Alarm has occurred. This function is user defined.                                                                   |
| STD-Cycle Okay                        | Output will go inactive with cycle start input, and will go high at the end of the cycle if no alarms occurred.                         |
| STD-Cycle Start<br>Out                | Indicates start signal is active. It will stay active through weld time and hold time.                                                  |
| STD-General<br>Alarm                  | Indicates an alarm occurred. This function is user configurable.                                                                        |
| STD-Minus<br>Energy Limit<br>Alarm    | Indicates the weld did not reach the minimum energy set.                                                                                |
| STD-Minus Time<br>Limit Alarm         | Indicates the weld time has not reached the minimum time set.                                                                           |
| STD-Minus<br>Peakpower Limit<br>Alarm | Indicates the weld has not reached the minimum peak power set.                                                                          |
| STD-Overload<br>Alarm                 | Indicates an overload alarm has occurred.                                                                                               |
| STD-Plus<br>Energy Limit<br>Alarm     | Indicates the weld has exceeded the maximum energy set.                                                                                 |

**Table 5.8** Digital Output Functions

| Function                       | Description                                                                                                                                                                                                                             |
|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| STD-Plus Time Limit Alarm      | Indicates the weld time did exceed the maximum time set.                                                                                                                                                                                |
| STD-Plus Peakpower Limit Alarm | Indicates the weld has exceeded the maximum peak power set.                                                                                                                                                                             |
| STD-Ready                      | If active, indicates the system is ready to start a weld cycle, enter test mode, or start a horn scan. If inactive, it indicates the system is already cycling, in test mode, performing a horn scan, or has a reset-required alarm.    |
| STD-Seek/Scan Out              | Indicates either a seek or a horn scan is in progress.                                                                                                                                                                                  |
| STD-Sonics Active              | Indicates sonics are active.                                                                                                                                                                                                            |
| STD-Start Signal Release       | If output is active, it indicates the start signal can be removed. If output is inactive, it indicates start signal is either inactive or that it cannot yet be removed.                                                                |
| STD-Status                     | To be used to drive an external beeper. Single 0.5 second beeps will occur when trigger is received. Three Beeps indicate an alarm occurred (e.g. overload alarm). Beeps 0.5 seconds on, 0.5 seconds off long are in between each beep. |
| STD-Weldcycle Complete         | Indicates if a weld cycle is no longer in process.                                                                                                                                                                                      |

## 5.4.6 Analog Input Functions

**Table 5.9** Analog Input Functions

| Function         | Description                                                                                                                           |              | Valid Range                         |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------|--------------|-------------------------------------|
| Amplitude In     | Controls the amplitude of ultrasonic energy that will be delivered by the power supply.                                               |              | 1 V to 10 V*<br>(10% to 100%)       |
| Frequency Offset | Controls the frequency offset to the power supply operating frequency. Actual offset depends on the power supply operating frequency: |              | 1 V to 9 V*<br>(5 V is zero offset) |
|                  | Frequency                                                                                                                             | Offset Range |                                     |
|                  | 20 kHz                                                                                                                                | +/- 400 Hz   |                                     |
|                  | 30 kHz                                                                                                                                | +/- 600 Hz   |                                     |
|                  | 40 kHz                                                                                                                                | +/- 800 Hz   |                                     |

\* If the input signals are not within their valid range, or if left unconnected, the power supply will use 50% amplitude and zero frequency offset, respectively.

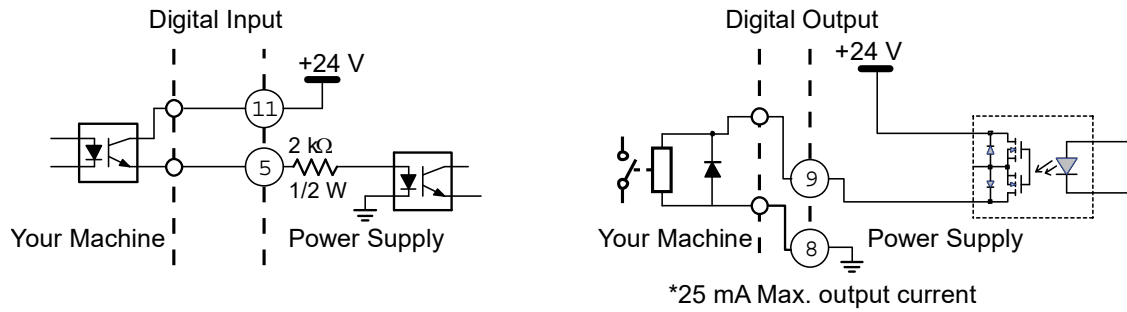
### 5.4.7 Analog Output Functions

**Table 5.10** Analog Output Functions

| Function      | Description                                                                                                                               |                              |                               | Valid Range                         |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|-------------------------------|-------------------------------------|
| Amplitude Out | Provides a 0 V to 10 V output signal proportional to amplitude (0% to 100%).                                                              |                              |                               | 0 V to 10 V<br>(0% to 100%)         |
| Power Out     | Provides a 0 V to 10 V output signal proportional to ultrasonic power output (0% to 100%).                                                |                              |                               | 0 V to 10 V<br>(0% to 100%)         |
| Frequency Out | Provides a 0 V to 10 V output signal that indicates memory plus offset. Actual frequency depends on the power supply operating frequency: |                              |                               | 0 V to 10 V<br>(5 V is zero offset) |
|               | <b>Frequency</b>                                                                                                                          | <b>Lower Limit<br/>(0 V)</b> | <b>Upper Limit<br/>(10 V)</b> |                                     |
|               | 20 kHz                                                                                                                                    | 19,450 Hz                    | 20,450 Hz                     |                                     |
|               | 30 kHz                                                                                                                                    | 29,250 Hz                    | 30,750 Hz                     |                                     |
|               | 40 kHz                                                                                                                                    | 38,900 Hz                    | 40,900 Hz                     |                                     |

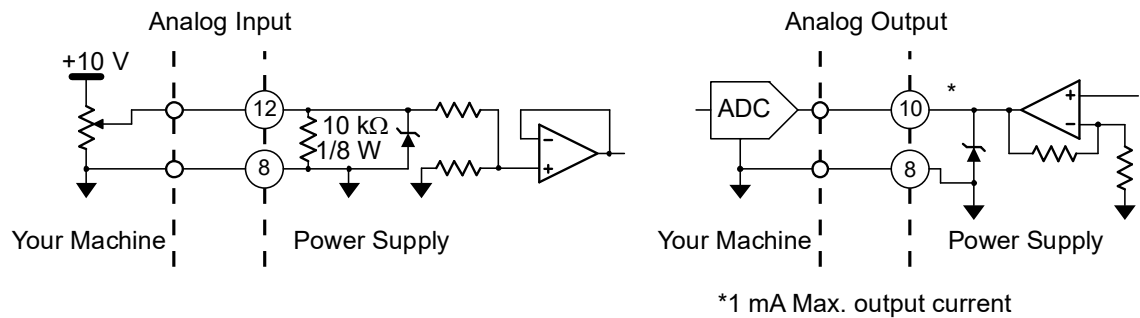
## 5.4.8 Typical Digital I/O Wiring Examples

**Figure 5.7** Typical Digital I/O Wiring Examples



## 5.4.9 Typical Analog I/O Wiring Examples

**Figure 5.8** Typical Analog I/O Wiring Examples



5.4.10 Output Power (RF Cable) Connection

Ultrasonic energy is delivered to the SHV connector on the power supply, which is then transmitted to the converter via the RF cable. The RF connector position depends on the power supply configuration. For Horizontal models it is located on the rear panel of the power supply. For Vertical models it is located on the bottom panel of the power supply.

To reduce electromagnetic interference (EMI), RF cables are equipped with a ferrite core (plastic case) on one end. This end is meant to be connected to the power supply.

| WARNING                                                                           | High Voltage Hazard                                                                                    |
|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
|  | Operating the System with the RF Cable disconnected or damaged can present an electrical shock hazard. |

| WARNING                                                                            | High Voltage Hazard                                                                    |
|------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
|  | To avoid the possibility of electrical shock, converters need to be properly grounded. |

| NOTICE                                                                              |                                                                                                                                                                                                                     |
|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | To avoid the possibility of EMI interference, ensure the RF connection to the power supply is made with the cable end that has the ferrite core box attached (see <a href="#">Figure 5.9 RF Cable Connection</a> ). |

Figure 5.9 RF Cable Connection

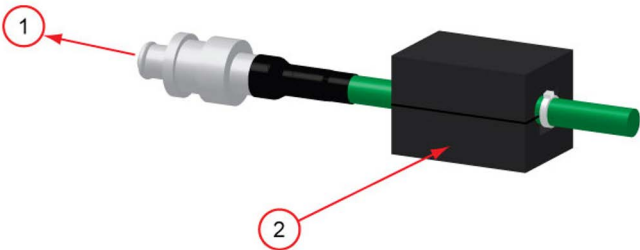


Table 5.11 RF Cable Connection

| Item | Description      |
|------|------------------|
| 1    | To Power Supply  |
| 2    | Ferrite Core Box |

### 5.4.11 Input Power Connection

| WARNING                                                                           | High Voltage Hazard                                                                                                                                                                                                                                                                           |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>Ensure all electrical power is off when wiring input power to your DCX A Power Supply connector block.</p> <p>To prevent the possibility of an electrical shock, ground the power supply by securing an AWG #14 grounded conductor to the ground screw located next to the air outlet.</p> |

| WARNING                                                                           | High Voltage Hazard                                                            |
|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------|
|  | <p>If miss-wired, the power supply can present an electrical shock hazard.</p> |

| NOTICE                                                                              |                                                                                                                                         |
|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>The power supply can be permanently damaged if it is connected to the incorrect line voltage, or if the connection is mis-wired.</p> |

Use the following procedure to connect the power supply to a 24 VDC 2.5A external power supply and to a single-phase, grounded 3-wire, 50 Hz or 60 Hz 200 V to 230 V power source. The 24 VDC power supply must be safety certified and agency approved.

**Table 5.12** Input Power Connection

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | Detach the connector block on the back of the power supply.                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 2    | Use two properly sized wires (according to local standards) to connect a 24 VDC 2.5A power supply as shown on <a href="#">Figure 5.5 DCX A Power Supply Connections</a> .                                                                                                                                                                                                                                                                                                                                                |
| 3    | Use three properly sized wires (AWG #12, 2.5 mm or according to local standards) to connect the line 1, line 2, and ground to the connector block as shown on <a href="#">Figure 5.5 DCX A Power Supply Connections</a> . Choose wires according to the current rating as specified in <a href="#">Table 5.2 Input Current and Circuit Breaker Specifications</a> and on the label located on the back of the unit. Be sure to use agency approved wiring and use sleeving or tubing on each wire for double insulation. |
| 4    | Secure an AWG #12 grounded conductor to the ground screw located next to the air outlet.                                                                                                                                                                                                                                                                                                                                                                                                                                 |

**Table 5.12** Input Power Connection

| Step | Action                                                                                                                                           |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| 5    | Connect the converter-booster-horn stack to the power supply using the RF cable. See <a href="#">5.4.10 Output Power (RF Cable) Connection</a> . |
| 6    | Ensure the power of the unit is disconnected. Plug the connector block back into the power supply. Tighten the two securing screws.              |
| 7    | Connect the power supply to a single-phase, grounded, 3-wire, 50 Hz or 60 Hz 200 V to 230 V power source.                                        |

## 5.5 Power Supply Setup

Certain power supply configurations can be modified from the factory setting if needed. Although not usually requiring modifications from the factory setting, the following features are selectable:

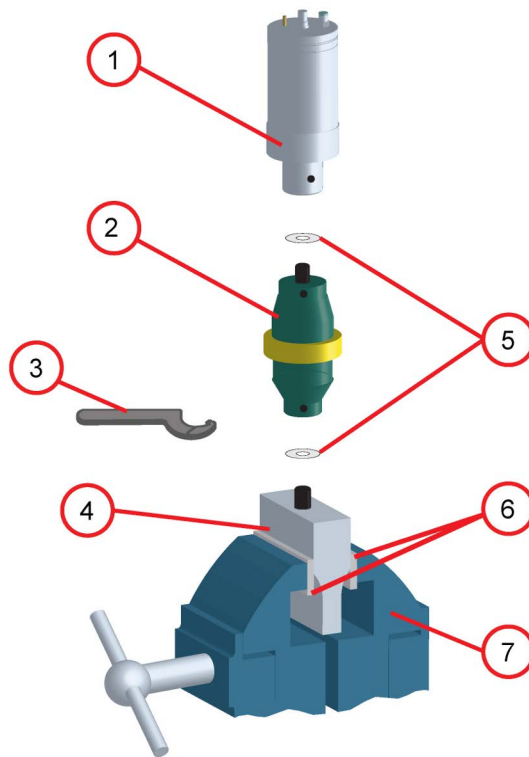
**Table 5.13** Power Supply Features

| Name              | Description                                                                                                                                                                                                                                                                                                                     |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Afterburst        | Allows for a short activation of ultrasonics at the end of the weld cycle to reliably release parts from the horn.                                                                                                                                                                                                              |
| Cutoffs           | Allows for setting parameter values for immediately terminating a weld cycle: Time (S); Energy (J); Peak Power (%); Frequency Low (Hz); Frequency High (Hz); Custom Input1 (V); and Custom Input2 (v).                                                                                                                          |
| End of Weld Store | Provides an option for selecting if the stack frequency is stored at the end of each weld cycle.                                                                                                                                                                                                                                |
| Energy Brake      | Allows the user to set the power supply to reduce the amplitude before the sonics are shut off.                                                                                                                                                                                                                                 |
| Frequency Offset  | Allows for varying the start frequency by way of external controls (analog signal applied through the user I/O analog input) or setting a fixed value using the web page interface. This is useful for certain applications, where the force applied on the fixture or anvil causes a frequency shift in the stack's operation. |
| Limits            | Allows for setting up limits within a weld mode: +/- Continuous; +/- Time (s); +/- Energy (J); or +/- Peak Power (%).                                                                                                                                                                                                           |
| Mode              | Allows for selecting the weld mode from the different available options: Continuous; Time (s); Energy (J); Peak Power (%); and Ground detect.                                                                                                                                                                                   |
| Power Up          | Allows an option to configure the power supply to perform a seek on power up; a horn scan on power up; or to perform no action at power up.                                                                                                                                                                                     |
| Seek Ramp         | Provides a selection for different power supply seek ramp times.                                                                                                                                                                                                                                                                |
| Seek Time         | Provides an option for selecting seek duration.                                                                                                                                                                                                                                                                                 |
| Start Ramp        | Provides a selection for different start ramp times. This controls how fast the amplitude of the horn rises from 0 to 100. Long ramp times may be useful when using large horns or high gain stacks.                                                                                                                            |
| Timed Seek        | Provides an option for monitoring, and storing the operating frequency at timed intervals (60 seconds). Periodic frequency seeks may be helpful when welder is not used for long periods of time. Seeks are timed from the moment sonics was last activated.                                                                    |
| Weld Amplitude    | Allows for varying the amplitude (10% to 100%) using the front panel LCD, the web page interface, or by way of external controls (analog signal applied through the user I/O analog input). Via the web page interface scrub amplitude, afterburst amplitude, and amplitude stepping options may also be configured.            |

For instruction on how to change the power supply settings refer to [7.5 Configuring the Power Supply Registers](#) in [Chapter 7: Operation](#).

## 5.6 Assembling the Acoustic Stack

| CAUTION                                                                             | General Warning                                                                                                                                                                                                                                                                     |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    | <p>The following procedure must be performed by a setup person. If necessary, secure the largest portion of a square or rectangular horn in a soft jawed vise. NEVER attempt to assemble or remove a horn by holding the converter housing or the booster clamp ring in a vise.</p> |
| CAUTION                                                                             | General Warning                                                                                                                                                                                                                                                                     |
|    | <p>Do not use silicone grease with Mylar plastic film washers. Use only 1 (one) Mylar plastic film washer of the correct inside and outside diameters at each interface.</p>                                                                                                        |
| NOTICE                                                                              |                                                                                                                                                                                                                                                                                     |
|  | <p>The use of a Branson torque wrench or the equivalent is recommended. P/N 101-063-787 for 20 kHz, and 30 kHz systems and 101-063-618 for 40 kHz systems.</p>                                                                                                                      |

**Figure 5.10** Assembling the Acoustic Stack

## Acoustic Stack Description

**Table 5.14** Acoustic Stack Description

| Item | Description                                  |
|------|----------------------------------------------|
| 1    | Converter                                    |
| 2    | Booster                                      |
| 3    | Spanner (provided)                           |
| 4    | Horn                                         |
| 5    | See stack assembly procedure                 |
| 6    | Vise Jaw protectors (aluminum or soft metal) |
| 7    | Vise                                         |

## Stack Torque Values

**Table 5.15** Stack Torque Values

| Frequency | Torque                |
|-----------|-----------------------|
| 20 kHz    | 220 in·lb (24.85 N·m) |
| 30 kHz    | 185 in·lb (21 N·m)    |
| 40 kHz    | 95 in·lb (10.73 N·m)  |

## Tools

**Table 5.16** Tools

| Tool                                 | EDP Number  |
|--------------------------------------|-------------|
| 20 kHz, and 30 kHz Torque Wrench Kit | 101-063-787 |
| 40 kHz Torque Wrench                 | 101-063-618 |
| 20 kHz Spanner Wrench                | 101-118-039 |
| 30 kHz Spanner Wrench                | 201-118-033 |
| 40 kHz Spanner Wrench                | 201-118-024 |
| Silicone Grease                      | 101-053-002 |
| Mylar Plastic Film Washers (20 kHz)  | 100-063-357 |
| Mylar Plastic Film Washers (30 kHz)  | 100-063-632 |

### 5.6.1 For a 20 kHz System

**Table 5.17** 20 kHz System

| Step | Action                                                                                                                                   |
|------|------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | Ensure that the mating surfaces of the converter, booster, and horn are clean, and that the threaded holes are free of foreign material. |
| 2    | Install a single Mylar plastic film washer (matching the size of the washer to the stud) to each interface.                              |
| 3    | Assemble the converter to the booster and the booster to the horn.                                                                       |
| 4    | Torque to 220 in·lb (24.85 N·m) at each interface.                                                                                       |

### 5.6.2 For a 30 kHz System

**Table 5.18** 30 kHz System

| Step | Action                                                                                                                                   |
|------|------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | Ensure that the mating surfaces of the converter, booster, and horn are clean, and that the threaded holes are free of foreign material. |
| 2    | Install a single Mylar plastic film washer (matching the size of the washer to the stud) to each interface.                              |
| 3    | Assemble the converter to the booster and the booster to the horn.                                                                       |
| 4    | Torque to 185 in·lb (21 N·m) at each interface.                                                                                          |

### 5.6.3 For a 40 kHz System

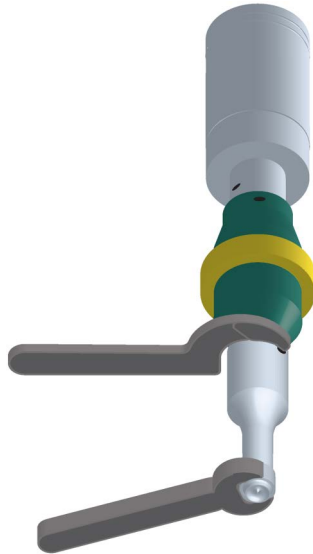
**Table 5.19** 40 kHz System

| Step | Action                                                                                                                                   |
|------|------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | Ensure that the mating surfaces of the converter, booster, and horn are clean, and that the threaded holes are free of foreign material. |
| 2    | Coat each interface surface with a thin film of silicon grease - but do not apply silicon grease to a threaded stud or tip.              |
| 3    | Assemble the converter to the booster and the booster to the horn.                                                                       |
| 4    | Torque to 95 in·lb (10.73 N·m) at each interface.                                                                                        |

## 5.6.4 Connecting Tip to Horn

1. Ensure that the mating surfaces of the tip and horn are clean. Remove any foreign matter from the threaded stud and hole.
2. Hand assemble the tip to the horn. Assemble dry. Do not use any silicone grease.
3. Use the spanner wrench and an open-end wrench (refer to [Figure 5.11 Connecting Tip to Horn](#)) and tighten to the following torque tip specifications:

**Figure 5.11** Connecting Tip to Horn



**Table 5.20** Tip to horn torque values

| Tip Thread | Torque                 |
|------------|------------------------|
| 1/4 - 28   | 110 in·bs (12.42 N·m)  |
| 3/8 - 24   | 180 in·lbs (20.33 N·m) |

## 5.7 Converter Cooling

Converter performance and reliability can be adversely affected if the converter ceramics are subjected to temperatures above 140° F (60° C). The converter front driver temperature should not exceed 122° F (50° C).

To prolong converter life and maintain a high degree of system reliability, the converter should be cooled with clean, dry, compressed air, particularly if your application calls for continuous ultrasonic operation. Converter cooling is especially critical in 40 kHz applications.

Use one of the following procedures to determine if a converter is operating close to the maximum allowable temperature. Check converter temperature immediately after substantial machine operation and without power applied to the horn.

- Press a pyrometer probe (or similar temperature measuring device) against the front driver of the converter assembly. Wait for the probe to reach the temperature of the shell. If the temperature is 120° F (49° C) or higher, the converter requires a cooling air stream
- If a temperature measuring device is unavailable, use your hand to feel the shell of the converter. If the converter is hot to touch, the converter requires a cooling air stream

High duty cycles require additional cooling for the converter. System average power must be limited to the specified continuous maximum. Higher peak power, up to the maximum acceptable power limit, with an on time of up to 10 seconds may be obtained, if appropriate off time ensures that, on average, the continuous duty maximum power is not exceeded.

**Table 5.21** Continuous Duty Max. Power & Full Power Duty Cycle

| Configuration   | Continuous Duty Max. Power | Full Power Duty Cycle             |
|-----------------|----------------------------|-----------------------------------|
| 20 kHz / 1250 W | 375 W                      | 1 s on 2.4 s off (30% Duty Cycle) |
| 20 kHz / 2500 W | 750 W                      | 1 s on 2.4 s off (30% Duty Cycle) |
| 20 kHz / 4000 W | 1200 W                     | 1 s on 2.4 s off (30% Duty Cycle) |
| 30 kHz / 1500 W | 450 W                      | 1 s on 2.4 s off (30% Duty Cycle) |
| 40 kHz / 800 W  | 240 W                      | 1 s on 2.4 s off (30% Duty Cycle) |

If converter cooling is required, use the following steps:

**Table 5.22** Converter Cooling Procedure

| Step | Action                                                                                                                                                  |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | Start with a 50 psi (345 kPa) air source or higher from a 0.06 in (1.5 mm) I.D. orifice                                                                 |
| 2    | Perform a run of welding operations.                                                                                                                    |
| 3    | Immediately after completing the welding run, check the converter temperature.                                                                          |
| 4    | If the converter is still too hot, increase the diameter of the orifice in small increments until the temperature falls within the ranges in the chart. |

A 0.06 in (1.5 mm) orifice at 50 psi (345 kPa) will result in a reading of 80 ft<sup>3</sup> (2.26 m<sup>3</sup>) per hour. This should be sufficient to cool most operations requiring a cooling air stream. In continuous welding operations, or applications with longer duty cycles, it may be necessary to cool the horn as well as the converter. Horns may require cooling because of the heat transfer from contacting the work piece.

## 5.8 Testing the Installation

To test the power supply follow the procedure described in [7.8 Ultrasonics Test Procedure](#) in [Chapter 7: Operation](#).

## 5.9 Still Need Help?

Branson is pleased that you chose our product and we are here for you! If you need parts or technical assistance with your DCX A Power Supply system, call your local Branson representative. Please refer to [1.3 How to Contact Branson](#) for a list of Branson key contacts.

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## **Chapter 6: Converters and Boosters**

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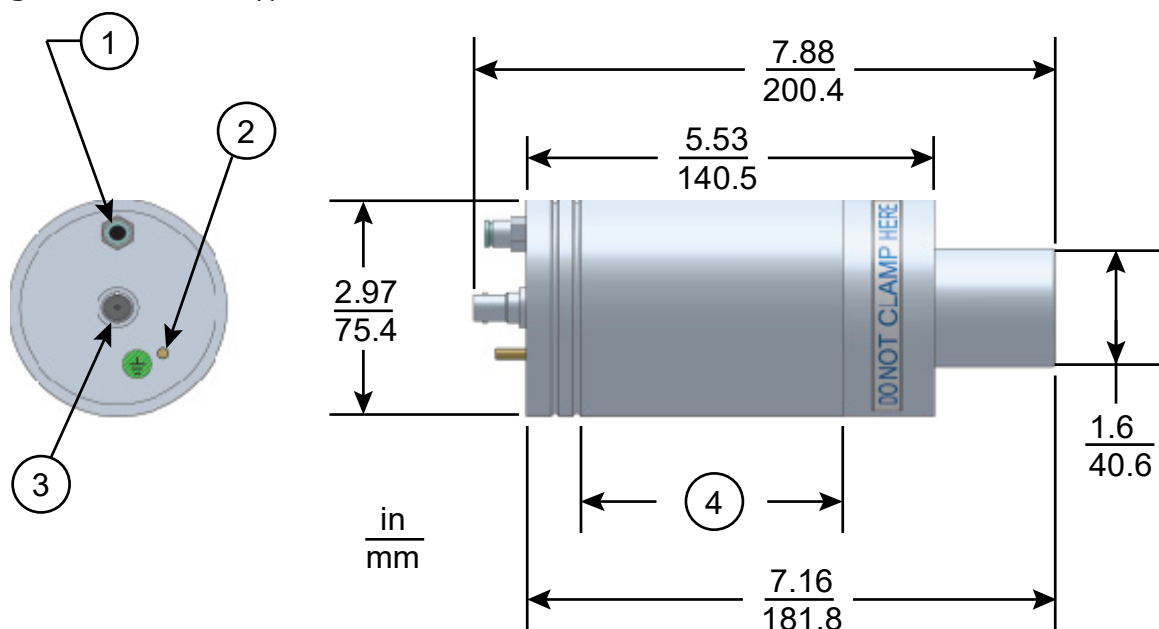
|                                          |           |
|------------------------------------------|-----------|
| <b>6.1 Converters and Boosters .....</b> | <b>78</b> |
|------------------------------------------|-----------|

## 6.1 Converters and Boosters

A variety of converters and boosters available for use with the DCX A Power Supply are illustrated in the following pages.

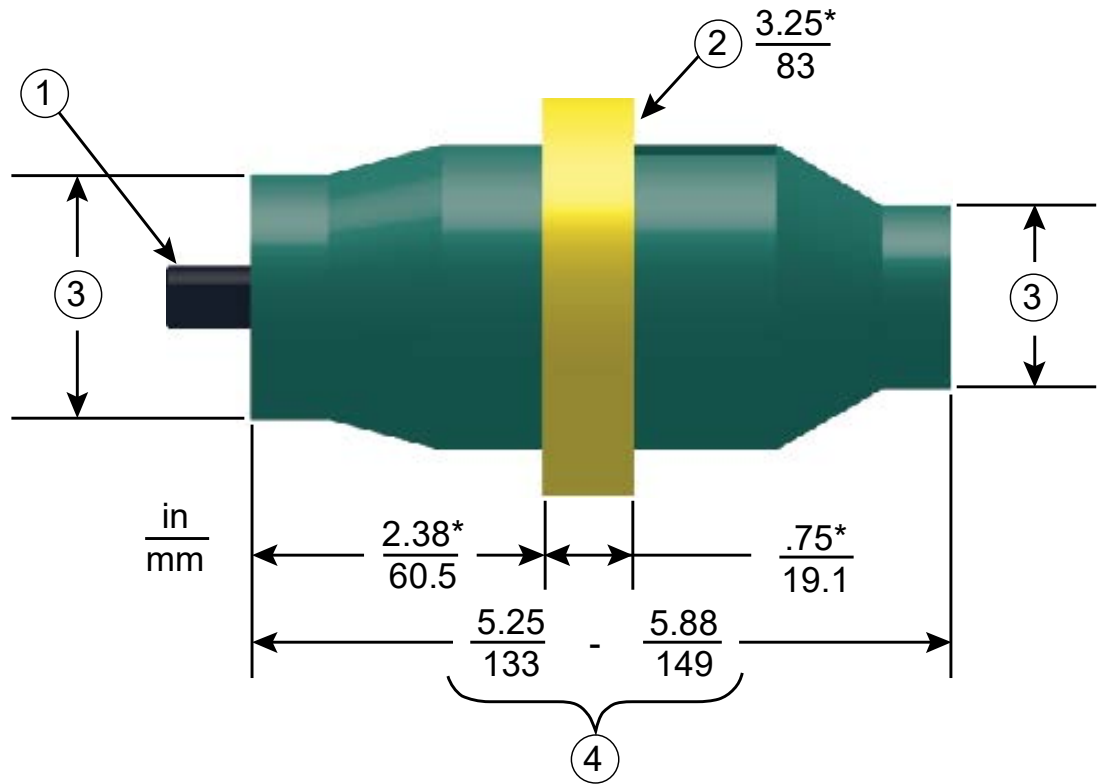
| WARNING                                                                           | High Voltage Hazard                                                                    |
|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
|  | To avoid the possibility of electrical shock, converters need to be properly grounded. |

**Figure 6.1** 20 kHz typical Converter Dimensions



**Table 6.1** 20 kHz Converter

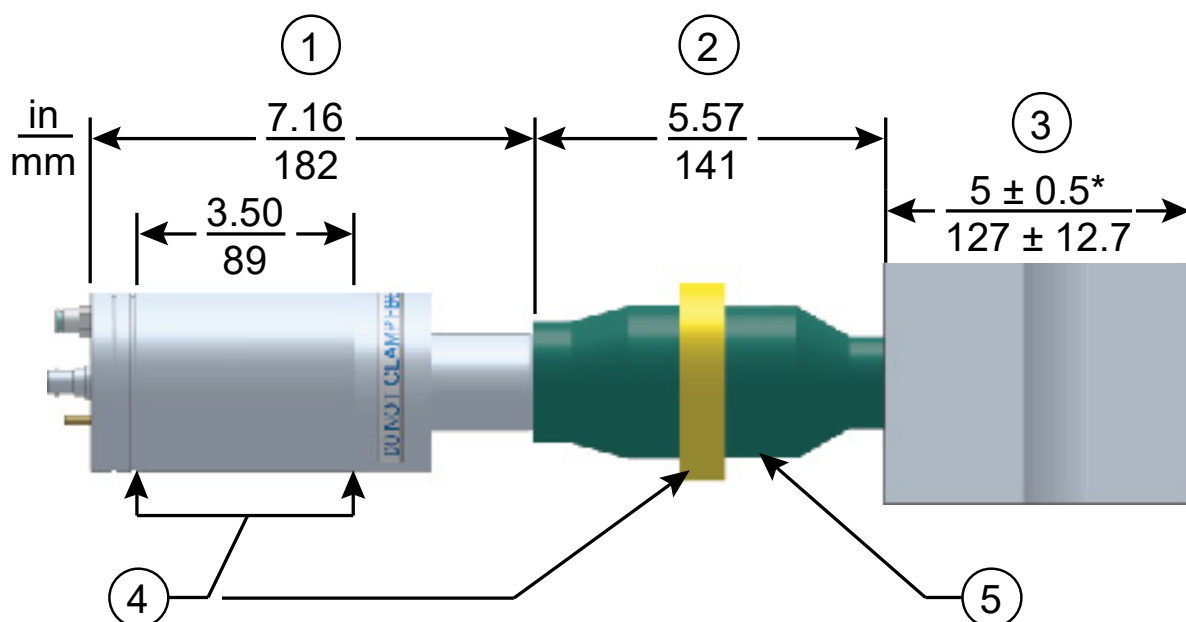
| Item | Description   |
|------|---------------|
| 1    | Air inlet     |
| 2    | Ground stud   |
| 3    | SHV connector |
| 4    | Grip area     |

**Figure 6.2** 20 kHz Booster Dimensions**Table 6.2** 20 kHz Booster

| Item | Description                                                                    |
|------|--------------------------------------------------------------------------------|
| 1    | 1/2 - 20 x 1 - 1/4 stud (Ti boosters)<br>1/2 - 20 x 1 - 1/2 stud (Al boosters) |
| 2    | Grip Ring Diameter                                                             |
| 3    | Variable                                                                       |
| 4    | Varies with tuning and gain                                                    |

\* These dimensions do not vary.

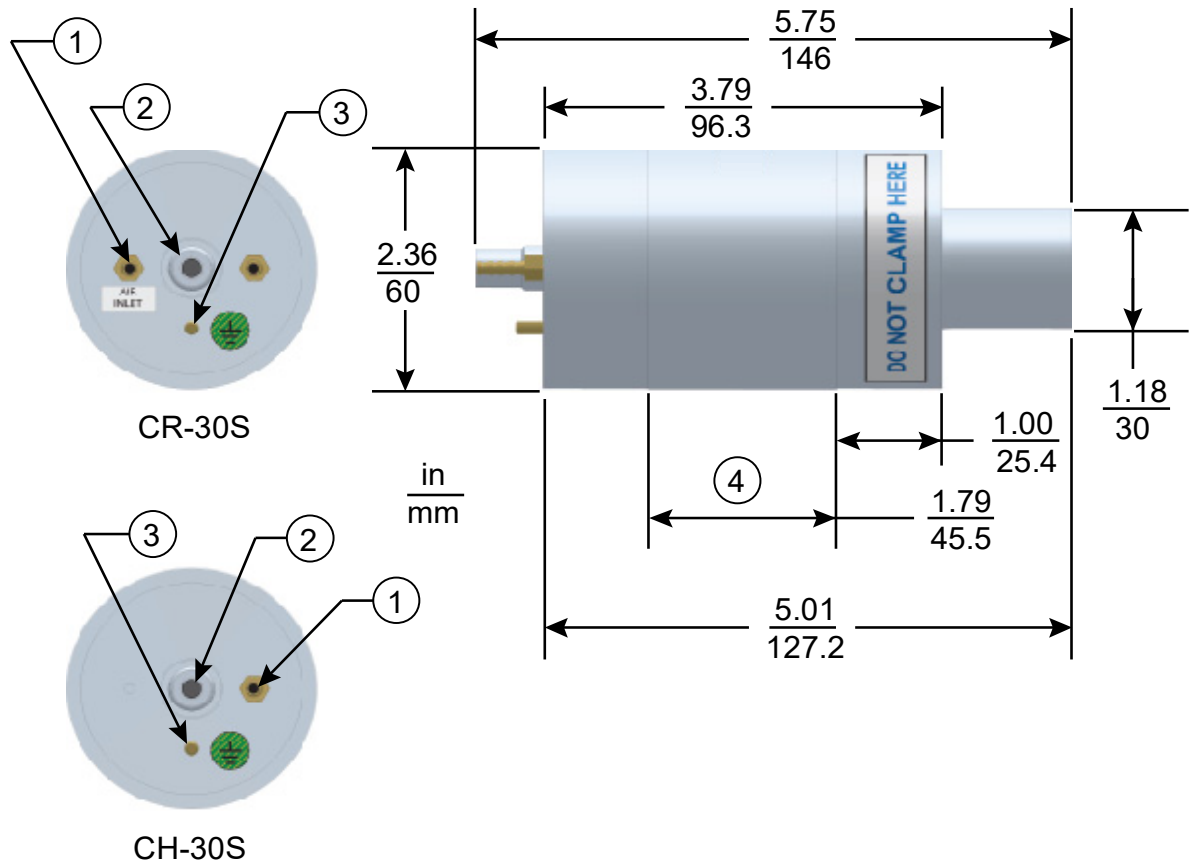
**Figure 6.3** 20 kHz Converter/Booster/Horn, Typical Dimensions



**Table 6.3** 20 kHz Converter/Booster/Horn

| Item | Description                                         |
|------|-----------------------------------------------------|
| 1    | Converter                                           |
| 2    | Booster                                             |
| 3    | One-half wavelength horn                            |
| 4    | Recommended clamping area                           |
| 5    | Booster front end diameter will vary with amplitude |

\* Overall horn length can vary beyond these typical dimensions depending on the application.

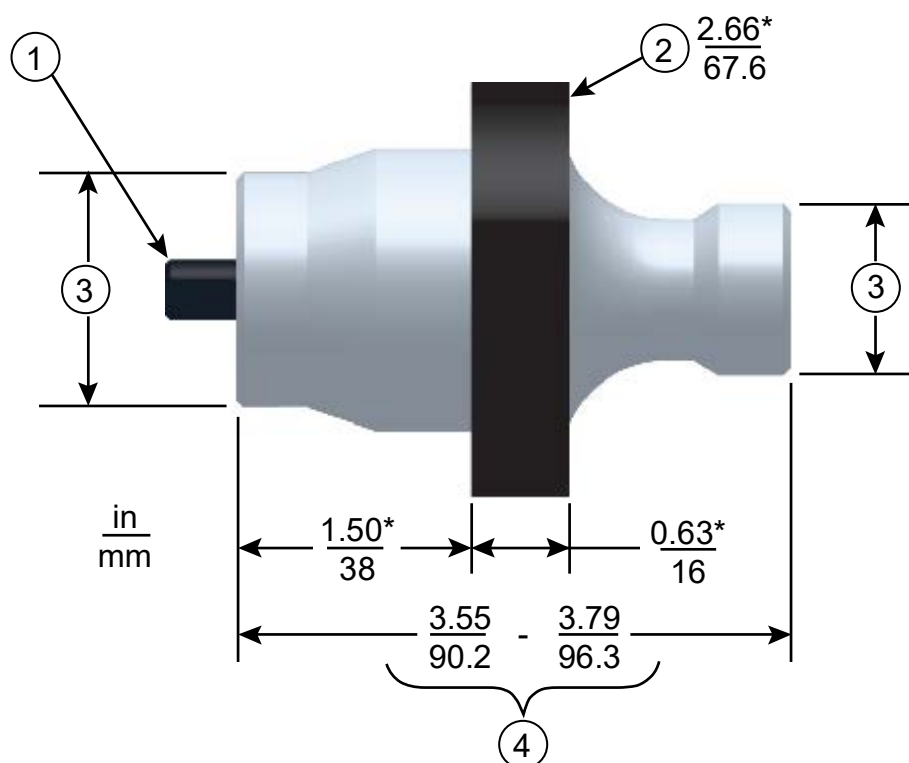
**Figure 6.4** 30 kHz Converter Dimensions**Table 6.4** 30 kHz Converter

| Item | Description   |
|------|---------------|
| 1    | Air inlet     |
| 2    | SHV connector |
| 3    | Ground stud   |
| 4    | Grip area     |

CR-30S and CH-30S are dimensionally identical, and differ only in their respective cooling feature.

CR-30S has flow through cooling, and CH-30S has closed loop cooling (air circulates in the converter and returns to its source).

**Figure 6.5** 30 kHz Booster Dimensions

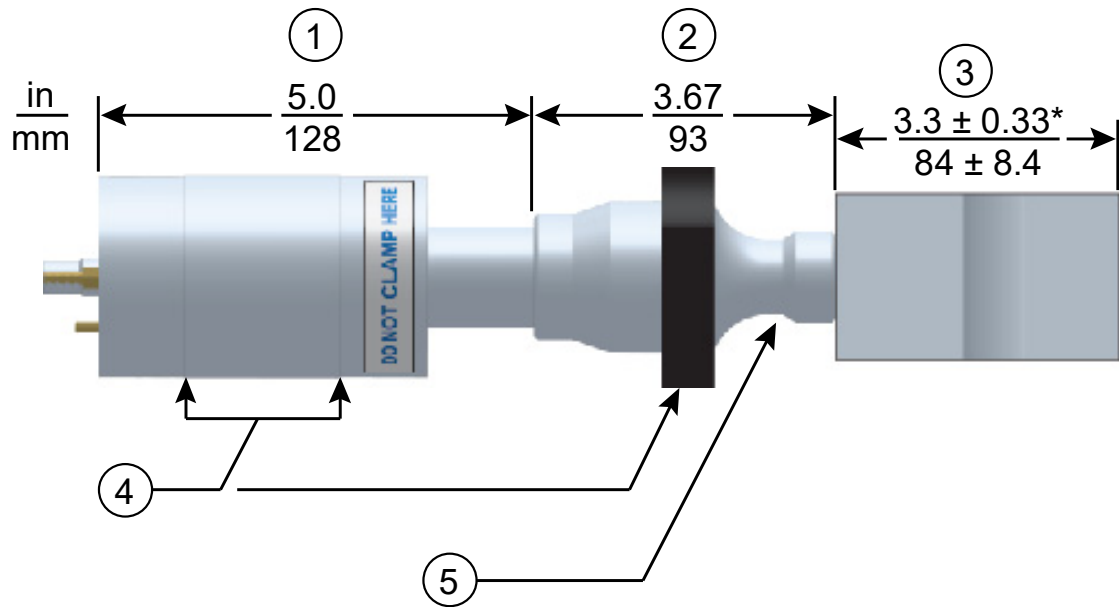


**Table 6.5** 30 kHz Booster

| Item | Description                 |
|------|-----------------------------|
| 1    | 3/8 - 24 x 1 - 1/4 stud     |
| 2    | Grip Ring Diameter          |
| 3    | Variable                    |
| 4    | Varies with tuning and gain |

\* These dimensions do not vary.

**Figure 6.6** 30 kHz Converter/Booster/Horn, Typical Dimensions

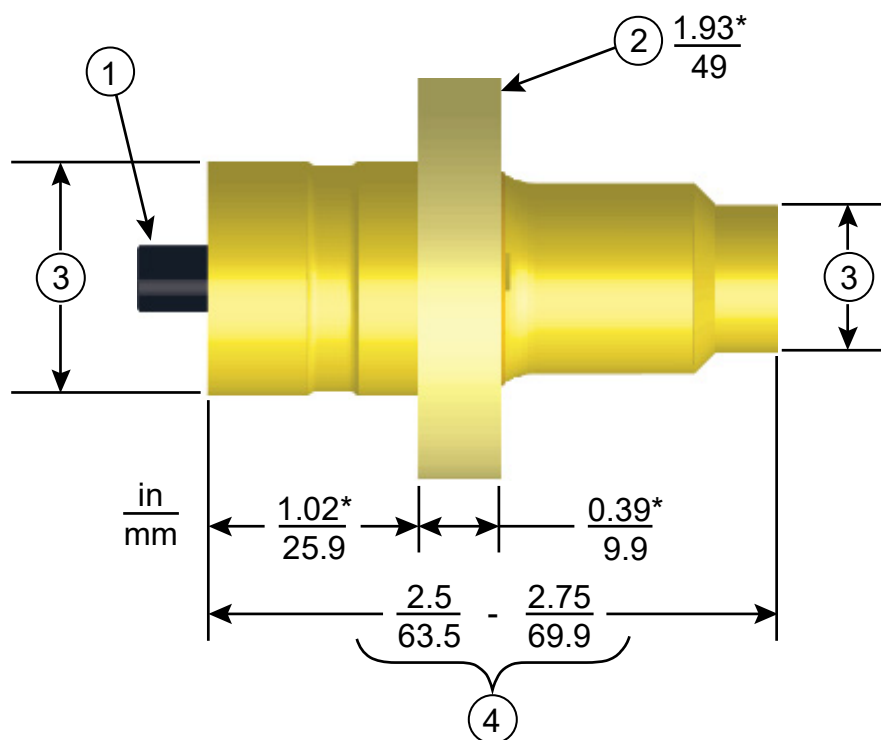


**Table 6.6** 30 kHz Converter/Booster/Horn

| Item | Description                                         |
|------|-----------------------------------------------------|
| 1    | Converter                                           |
| 2    | Booster                                             |
| 3    | One-half wavelength horn                            |
| 4    | Recommended clamping area                           |
| 5    | Booster front end diameter will vary with amplitude |

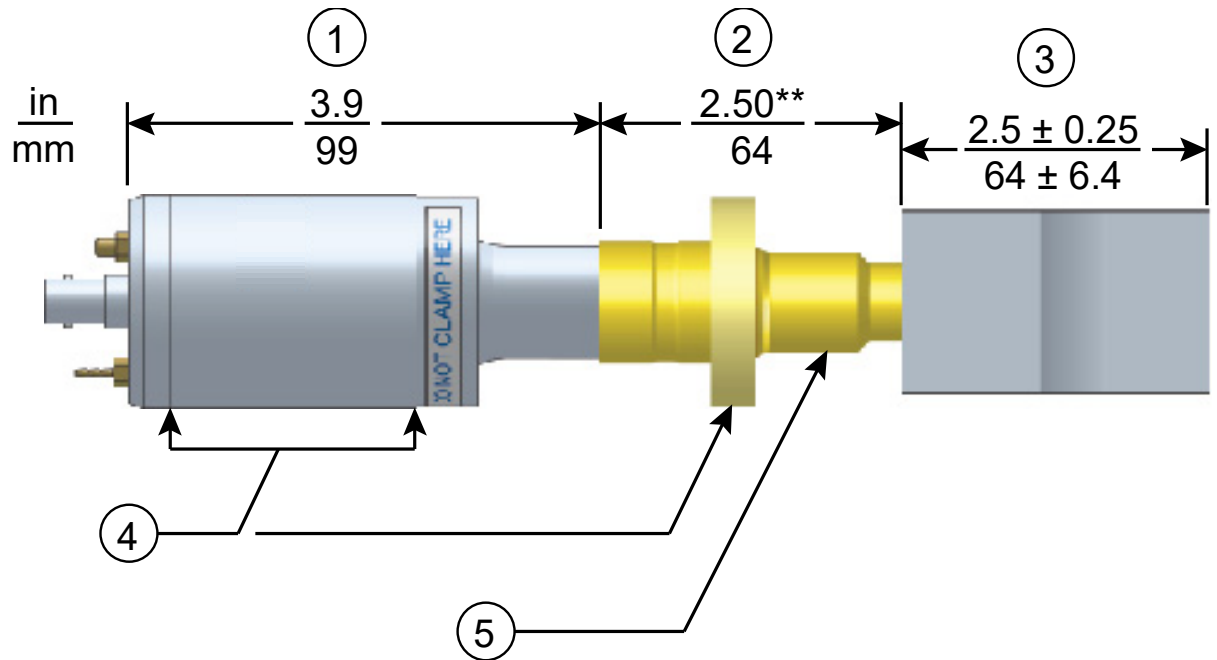
\* Overall horn length can vary beyond these typical dimensions depending on the application.

**Figure 6.7** 40 kHz Booster Dimensions



**Table 6.7** 40 kHz Booster

| Item | Description                                                        |
|------|--------------------------------------------------------------------|
| 1    | M8 x 1 - 1/4 stud (Ti boosters)<br>M8 x 1 - 1/2 stud (Al boosters) |
| 2    | Grip ring diameter                                                 |
| 3    | Variable                                                           |
| 4    | Varies with tuning and gain                                        |

**Figure 6.8** 40 kHz Converter/Booster/Horn, Typical Dimensions**Table 6.8** 40 kHz Converter/Booster/Horn

| Item | Description                                         |
|------|-----------------------------------------------------|
| 1    | Converter                                           |
| 2    | Booster                                             |
| 3    | One-half wavelength horn                            |
| 4    | Recommended clamping area                           |
| 5    | Booster front end diameter will vary with amplitude |

\* Overall horn length can vary beyond these typical dimensions depending on the application.

\*\* Dimension varies with tuning and gain.

## 6.1.1 Component Functional Description

### Ultrasonic Stack

#### Converter

The converter is mounted in the customer's automation as part of the ultrasonic stack. The ultrasonic electrical energy from the power supply is applied to the converter (sometimes called the transducer). This transforms the high frequency electrical oscillations into mechanical vibrations at the same frequency as the electrical oscillations. The heart of the converter are piezoelectric ceramic elements. When subjected to an alternating voltage, these elements alternately expand and contract, resulting in better than 90% conversion of electrical to mechanical energy.

#### Booster

It is important to be able to modify the horn face amplitude for successful ultrasonic assembly. The booster provides a means to modify the amplitude. It is designed to couple different ratios of ultrasonic energy to the horn, which will in turn increase or decrease the amplitude at the face of the horn. This is accomplished by varying the ratios of the masses of the input and output half sections of the booster.

The booster is a resonant half-wave section of aluminum or titanium. It is mounted between the converter and the horn, as part of the ultrasonic stack. It also provides a clamping point for rigid stack mounting.

#### Horn

The horn is selected or designed for a specific application. Each horn is tuned typically as a half-wave section that applies the necessary force and vibration uniformly to the parts to be assembled. It transfers ultrasonic vibrations from the converter to the workpiece. The horn is mounted to the booster as part of the ultrasonic stack.

Depending on their profile, horns are referred to as stepped, conical, exponential, bar, or catenoidal. The shape of the horn determines the amplitude at the face of the horn. Depending on the application, horns can be made from titanium alloys, aluminum, or steel. Titanium alloys are the best materials for horn fabrication due to their high level of strength and low loss. Aluminum horns are usually chrome- or nickel-plated or hard-coated to reduce wear. Steel horns are for low amplitude requiring hardness, such as ultrasonic insertion applications.

## **Solid Mount Boosters**

The solid mount booster is a one-half wave-length resonant section made exclusively of titanium. It is mounted between the converter and the horn, modifying the amplitude of vibration applied to the horn and providing a clamping point.

The solid mount booster is superior to prior versions in that deflection is minimized. This is the result of a redesigned clamp-ring which employs a metal-to-metal press fit rather than an O-ring assembly.

The advantage this booster offers is its improved rigidity. For continuous applications, this means more energy delivered to the product, while in plunge applications, improved alignment is possible. The solid mount provides improved positional alignment and will benefit continuous applications where high force, high side load, or high cycle rates are necessary. In plunge welding applications, overall deflection is reduced by an average of 0.0025 in. (0.064 mm) over a wide variety of materials, joint designs, and operating conditions. The results of this testing in combination with information drawn from field testing indicate that the solid mount will benefit plunge applications where precision alignment is necessary (such as staking, swaging, or insertion) or where concentricity/parallelism is critical.



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## Chapter 7: Operation

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|            |                                                    |            |
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## 7.1 Setting Primary Parameters

After analyzing your specific application, you can determine the Weld Mode to use to weld your parts. A Weld Mode is a set of parameters that governs the weld. Contact the Branson Ultrasonics Applications Laboratory for more information on determining the best mode for welding your application. See [1.3 How to Contact Branson](#).

There are five Weld Modes to choose from Continuous, Time, Energy, Peak Power, and Ground Detect Modes. The following table describes each mode:

**Table 7.1** Summary of Weld Modes

| Weld Mode     | Description                                                                                                                                                                                                                                                                                                                                                |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Continuous    | On this mode, ultrasonic energy will be delivered continuously while the start signal is present.                                                                                                                                                                                                                                                          |
| Time          | You select the length of time (in seconds) that ultrasonic energy will be transmitted to your parts.                                                                                                                                                                                                                                                       |
| Energy        | You select the amount of energy (in Joules) that will be transmitted to your parts. (A Joule is one Watt-Second.)                                                                                                                                                                                                                                          |
| Peak Power    | You select the peak power level (as a percentage of full power) at which the weld is terminated.                                                                                                                                                                                                                                                           |
| Ground Detect | <p>The DCX A Power Supply provides ultrasonic energy until the horn comes in contact with your electrically isolated fixture or with the anvil, providing that you made an electrical connection between the actuator and your fixture or anvil.</p> <p><b>NOTICE</b><br/>Ground detect signal is required to terminate the weld and enter scrub time.</p> |

| NOTICE                                                                              |                                                            |
|-------------------------------------------------------------------------------------|------------------------------------------------------------|
|  | In these modes, cutoffs can be used as secondary controls. |

### 7.1.1 Continuous Mode

In this mode, ultrasonic energy will be delivered continuously while the start signal is present. Within Continuous Mode, you can also select several other parameters, ranging from afterburst to limits and cutoffs. For more information on setting the optional parameters within Continuous Mode, or any other welding mode, refer to the DCX A/F Series Web Page Instruction Manual.

**Table 7.2** Continuous Mode Operational Sequence

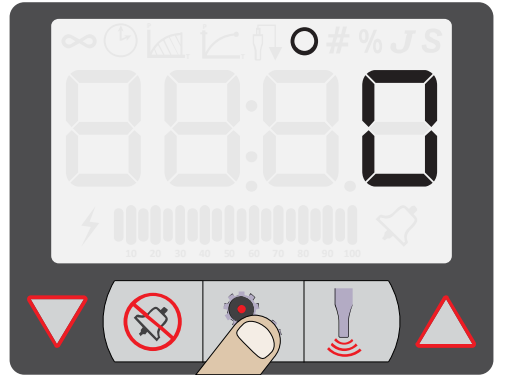
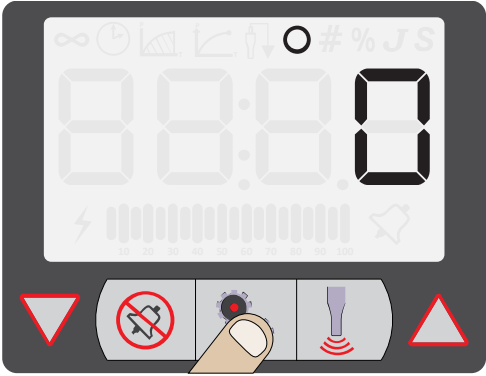
| Step | Action                                                                                                                                                                          | Reference                                                                             |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 1    | Press the Configuration key until the number icon (#) appears on the LCD.<br>The power supply will display register 101 at every power up.                                      |    |
| 2    | Press and release the Up/Down arrow keys to select register 138. For a detailed description of available registers refer to <a href="#">Table 7.26 Power Supply Registers</a> . |  |
| 3    | Once you have reached register 138, press the Configuration key. The register value will be displayed; this is indicated by the circle icon.                                    |  |

Table 7.2 Continuous Mode Operational Sequence

| Step | Action                                                                                                                     | Reference                                                                           |
|------|----------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| 4    | Use the Up/Down arrow keys to select value 0 (Continuous mode), then press the Configuration key to confirm the selection. |   |
| 5    | Continuous mode icon and amplitude value will be displayed.                                                                |  |

### 7.1.2 Time Mode

You can use Time Mode to select the length of time that ultrasonic energy is applied to your parts. Within Time Mode, you can also select several other parameters, ranging from afterburst to limits and cutoffs. For more information on setting the optional parameters within Time Mode, or any other welding mode, refer to the DCX A/F Series Web Page Instruction Manual.

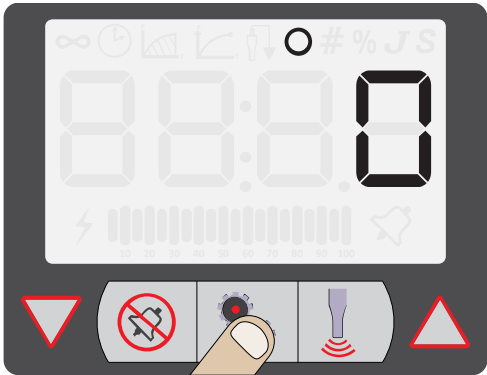
**Table 7.3** Time Mode Parameters

| Parameter | Default       | Max. Value | Min. Value    |
|-----------|---------------|------------|---------------|
| Time      | 0.010 seconds | 30 seconds | 0.010 seconds |

**Table 7.4** Time Mode Operational Sequence

| Step | Action                                                                                                                                                                          | Reference                                                                                                                                                                                                                                                                                                                                                                                     |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | Press the Configuration key until the number icon (#) appears on the LCD.<br>The power supply will display register 101 at every power up.                                      |  The image shows a digital LCD screen with the number '101' displayed in large digits. Above the number is a '#' symbol. The screen has various icons at the top and bottom, including a power button, a warning symbol, and a configuration key icon. A finger is shown pressing the configuration key.  |
| 2    | Press and release the Up/Down arrow keys to select register 138. For a detailed description of available registers refer to <a href="#">Table 7.26 Power Supply Registers</a> . |  The image shows a digital LCD screen with the number '138' displayed in large digits. Above the number is a '#' symbol. The screen has various icons at the top and bottom, including a power button, a warning symbol, and a configuration key icon. A finger is shown pressing the configuration key. |

**Table 7.4** Time Mode Operational Sequence

| Step | Action                                                                                                                                                                           | Reference                                                                            |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 3    | Once you have reached register 138, press the Configuration key. The register value will be displayed; this is indicated by the circle icon.                                     |    |
| 4    | Use the Up/Down arrow keys to select value 1 (Time mode), then press the Configuration key to confirm the selection.                                                             |   |
| 5    | Time mode icon and parameter value will be displayed. Use the Up/Down keys to enter the desired parameter value, then press the Configuration key to confirm the selected value. |  |

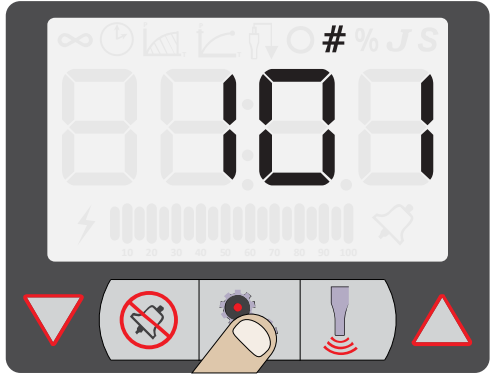
### 7.1.3 Energy Mode

You can use Energy Mode to select the amount of ultrasonic energy that is applied to your parts. Within Energy Mode, you can also select several other parameters, ranging from afterburst to limits and cutoffs. For more information on setting the optional parameters within Energy Mode, or any other welding mode, refer to the DCX A/F Series Web Page Instruction Manual.

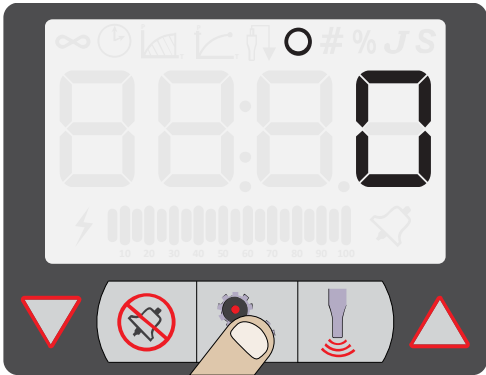
**Table 7.5** Energy Mode Parameters

| Parameter | Default    | Max. Value  | Min. Value |
|-----------|------------|-------------|------------|
| Energy    | 500 Joules | 9999 Joules | 0.1 Joules |

**Table 7.6** Energy Mode Operational Sequence

| Step | Action                                                                                                                                                                          | Reference                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | Press the Configuration key until the number icon (#) appears on the LCD.<br>The power supply will display register 101 at every power up.                                      |  The image shows a digital LCD screen with a black background and white icons. At the top, there are several small icons including infinity, a clock, a fan, a left arrow, a right arrow, a circle with a dot, and a hash symbol (#). The main display shows the number '101' in large digits. Below the number is a horizontal bar graph with 10 segments. At the bottom of the screen, there are four buttons: a red triangle pointing down, a button with a crossed-out lightning bolt, a button with a red dot, and a button with a red triangle pointing up. A finger is shown pressing the button with the red dot. |
| 2    | Press and release the Up/Down arrow keys to select register 138. For a detailed description of available registers refer to <a href="#">Table 7.26 Power Supply Registers</a> . |  The image shows the same digital LCD screen as in step 1, but the main display now shows the number '138'. The finger is shown pressing the button with the red triangle pointing up.                                                                                                                                                                                                                                                                                                                                                                                                                                   |

**Table 7.6** Energy Mode Operational Sequence

| Step | Action                                                                                                                                                                             | Reference                                                                            |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 3    | Once you have reached register 138, press the Configuration key. The register value will be displayed; this is indicated by the circle icon.                                       |    |
| 4    | Use the Up/Down arrow keys to select value 2 (Energy mode), then press the Configuration key to confirm the selection.                                                             |   |
| 5    | Energy mode icon and parameter value will be displayed. Use the Up/Down keys to enter the desired parameter value, then press the Configuration key to confirm the selected value. |  |

### 7.1.4 Peak Power Mode

You can use Peak Power Mode to select the maximum percentage of the total available power that will be used to process your welds. When the power level you set is reached, ultrasonics will be terminated. From within Peak Power Mode, you can also select several other parameters, ranging from afterburst to limits and cutoffs. For more information on setting the optional parameters within Peak Power Mode, or any other welding mode, refer to the DCX A/F Series Web Page Instruction Manual.

**Table 7.7** Peak Power Mode Parameters

| Parameter  | Default | Max. Value | Min. Value |
|------------|---------|------------|------------|
| Peak Power | 1%      | 100%       | 1%         |

**Table 7.8** Peak Power Mode Operational Sequence

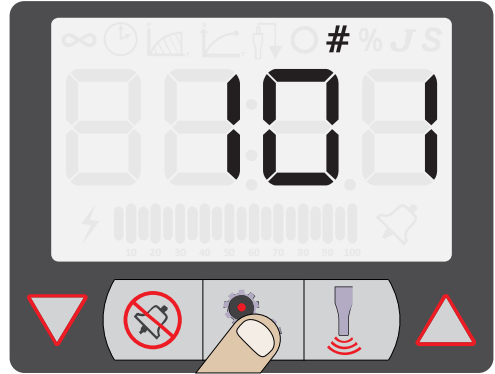
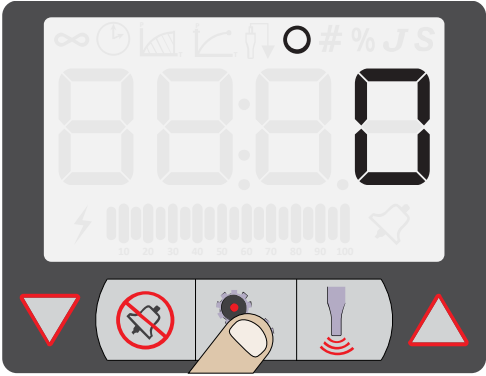
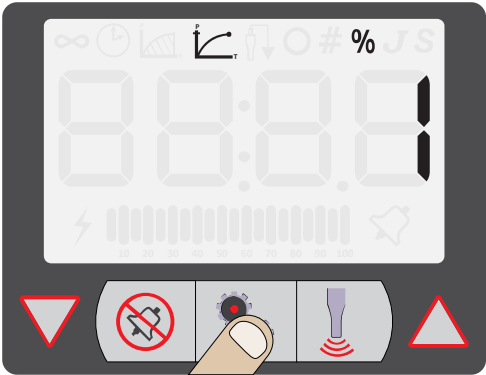
| Step | Action                                                                                                                                                                             | Reference                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | Press the Configuration key until the number icon (#) appears on the LCD.<br>The power supply will display register 101 at every power up.                                         |  The image shows a close-up of the Branson DCX A/F Series LCD. The top row of icons includes infinity, a clock, a fan, a left arrow, a right arrow, a circle with a dot, and a hash symbol (#). The main display shows the number '101' in large digits. Below the number is a horizontal bar graph with 10 segments. At the bottom, there are four icons: a red triangle pointing down, a red circle with a diagonal line through it, a red circle with a dot, and a red triangle pointing up. A finger is shown pressing the red circle with a dot icon. |
| 2    | Press and release the Up/Down arrow keys to select register 138.<br>For a detailed description of available registers refer to <a href="#">Table 7.26 Power Supply Registers</a> . |  The image shows a close-up of the Branson DCX A/F Series LCD. The top row of icons is the same as in the previous image. The main display shows the number '138' in large digits. Below the number is a horizontal bar graph with 10 segments. At the bottom, there are four icons: a red triangle pointing down, a red circle with a diagonal line through it, a red circle with a dot, and a red triangle pointing up. A finger is shown pressing the red triangle pointing up icon.                                                                   |

Table 7.8 Peak Power Mode Operational Sequence

| Step | Action                                                                                                                                                                                 | Reference                                                                            |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 3    | Once you have reached register 138, press the Configuration key. The register value will be displayed; this is indicated by the circle icon.                                           |    |
| 4    | Use the Up/Down arrow keys to select value 3 (Peak Power mode), then press the Configuration key to confirm the selection.                                                             |   |
| 5    | Peak Power mode icon and parameter value will be displayed. Use the Up/Down keys to enter the desired parameter value, then press the Configuration key to confirm the selected value. |  |

### 7.1.5 Ground Detect Mode

You can use Ground Detect Weld Mode to have ultrasonic energy turn off when the horn comes in contact with your electrically isolated fixture or anvil.

From within Ground Detect Mode, you can also select several other parameters, ranging from Hold Time (in seconds) to Suspect and Reject Limits. For more information on setting the optional parameters within Ground Detect Mode, or any other welding mode, refer to the DCX A/F Series Web Page Instruction Manual.

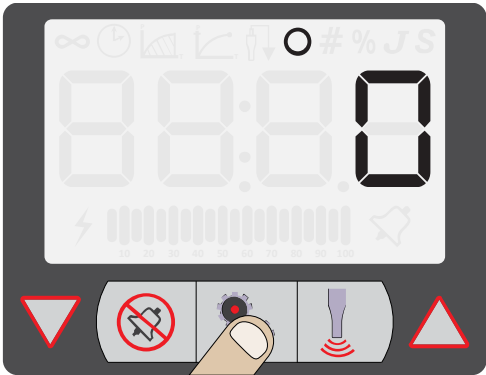
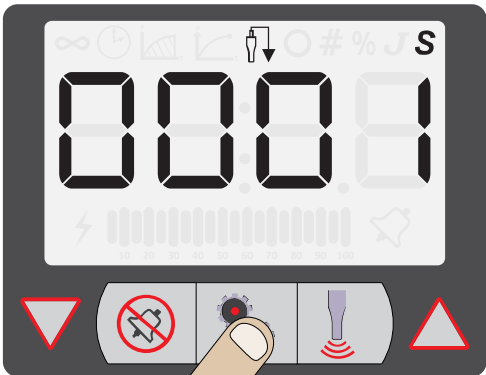
**Table 7.9** Ground Detect Mode Parameters

| Parameter     | Default       | Max. Value    | Min. Value    |
|---------------|---------------|---------------|---------------|
| Ground Detect | 0.001 seconds | 0.500 seconds | 0.001 seconds |

**Table 7.10** Ground Detect Mode Operational Sequence

| Step | Action                                                                                                                                                                             | Reference                                                                             |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 1    | Press the Configuration key until the number icon (#) appears on the LCD.<br>The power supply will display register 101 at every power up.                                         |   |
| 2    | Press and release the Up/Down arrow keys to select register 138.<br>For a detailed description of available registers refer to <a href="#">Table 7.26 Power Supply Registers</a> . |  |

**Table 7.10** Ground Detect Mode Operational Sequence

| Step | Action                                                                                                                                                                                    | Reference                                                                            |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 3    | Once you have reached register 138, press the Configuration key. The register value will be displayed; this is indicated by the circle icon.                                              |    |
| 4    | Use the Up/Down arrow keys to select value 4 (Ground Detect mode), then press the Configuration key to confirm the selection.                                                             |   |
| 5    | Ground Detect mode icon and parameter value will be displayed. Use the Up/Down keys to enter the desired parameter value, then press the Configuration key to confirm the selected value. |  |

## 7.2 Setting Limits

| NOTICE                                                                            |                                                                                                                                                 |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
|  | Register 114 (Limits) must be set to On before proceeding. See <a href="#">7.5 Configuring the Power Supply Registers</a> for more information. |

### 7.2.1 Time Window Limit High

**Table 7.11** Time Window Limit High Parameters

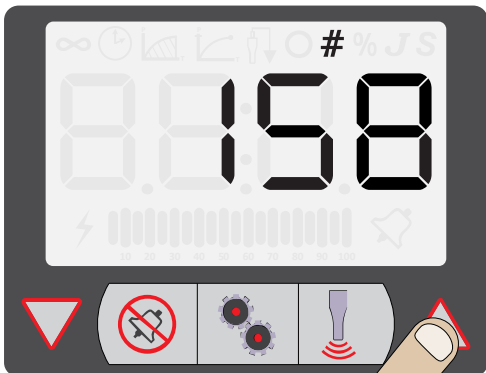
| Parameter              | Default | Max. Value | Min. Value |
|------------------------|---------|------------|------------|
| Time Window Limit High | 30.00s  | 30.00s     | 0.010s     |

| NOTICE                                                                              |                                                                 |
|-------------------------------------------------------------------------------------|-----------------------------------------------------------------|
|  | Minimum value should be higher than the window limit low value. |

| NOTICE                                                                              |                                                     |
|-------------------------------------------------------------------------------------|-----------------------------------------------------|
|  | Set value to 0 to set the window limit high to off. |

| NOTICE                                                                              |                                                   |
|-------------------------------------------------------------------------------------|---------------------------------------------------|
|  | Time window limits must be set in multiples of 1. |

**Table 7.12** Time Window Limit High Operational Sequence

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                                                         | Reference                                                                            |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 1    | Press the Configuration key until the number icon (#) appears on the LCD.<br>The power supply will display register 101 at every power up.                                                                                                                                                                                                                                                                                     |    |
| 2    | Press and release the Up/Down arrow keys to select register 158. For a detailed description of available registers refer to <a href="#">Table 7.26 Power Supply Registers</a> .                                                                                                                                                                                                                                                |   |
| 3    | Once you have reached register 158, press the Configuration key. The register value will be displayed; this is indicated by the circle icon.<br>Use the Up/Down arrow keys to select the desired time window limit high value, then press the Configuration key to confirm the selection.<br><b>NOTICE</b><br>Register 114 (Limits) must be set to On before proceeding. Otherwise, the value of the limits cannot be changed. |  |

## 7.2.2 Time Window Limit Low

**Table 7.13** Time Window Limit Low Parameters

| Parameter             | Default | Max. Value | Min. Value |
|-----------------------|---------|------------|------------|
| Time Window Limit Low | 0s      | 30.00s     | 0.010s     |

### NOTICE



Maximum value should be lower than the window limit high value.

### NOTICE



Set value to 0 to set the window limit high to off.

### NOTICE



Time window limits must be set in multiples of 1.

**Table 7.14** Time Window Limit Low Operational Sequence

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                                                                        | Reference                                                                            |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 1    | <p>Press the Configuration key until the number icon (#) appears on the LCD.</p> <p>The power supply will display register 101 at every power up.</p>                                                                                                                                                                                                                                                                                         |    |
| 2    | <p>Press and release the Up/Down arrow keys to select register 159.</p> <p>For a detailed description of available registers refer to <a href="#">Table 7.26 Power Supply Registers</a>.</p>                                                                                                                                                                                                                                                  |   |
| 3    | <p>Once you have reached register 159, press the Configuration key. The register value will be displayed; this is indicated by the circle icon.</p> <p>Use the Up/Down arrow keys to select the desired time window limit low value, then press the Configuration key to confirm the selection.</p> <p><b>NOTICE</b><br/>Register 114 (Limits) must be set to On before proceeding. Otherwise, the value of the limits cannot be changed.</p> |  |

### 7.2.3 Energy Window Limit High

**Table 7.15** Energy Window Limit High Parameters

| Parameter                | Default | Max. Value | Min. Value |
|--------------------------|---------|------------|------------|
| Energy Window Limit High | 0J      | 9999J      | 0.1J       |

#### NOTICE



Minimum value should be higher than the window limit low value.

#### NOTICE



Set value to 0 to set the window limit high to off.

#### NOTICE



Energy window limits must be set in multiples of 1.

**Table 7.16** Energy Window Limit High Operational Sequence

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                                                                              | Reference                                                                            |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 1    | <p>Press the Configuration key until the number icon (#) appears on the LCD.</p> <p>The power supply will display register 101 at every power up.</p>                                                                                                                                                                                                                                                                                               |    |
| 2    | <p>Press and release the Up/Down arrow keys to select register 160.</p> <p>For a detailed description of available registers refer to <a href="#">Table 7.26 Power Supply Registers</a>.</p>                                                                                                                                                                                                                                                        |   |
| 3    | <p>Once you have reached register 160, press the Configuration key. The register value will be displayed; this is indicated by the circle icon.</p> <p>Use the Up/Down arrow keys to select the desired energy window limit high value, then press the Configuration key to confirm the selection.</p> <p><b>NOTICE</b></p> <p>Register 114 (Limits) must be set to On before proceeding. Otherwise, the value of the limits cannot be changed.</p> |  |

## 7.2.4 Energy Window Limit Low

**Table 7.17** Energy Window Limit Low Parameters

| Parameter               | Default | Max. Value | Min. Value |
|-------------------------|---------|------------|------------|
| Energy Window Limit Low | 0J      | 9999J      | 0.1J       |

### NOTICE



Maximum value should be lower than the window limit high value.

### NOTICE



Set value to 0 to set the window limit high to off.

### NOTICE



Energy window limits must be set in multiples of 1.

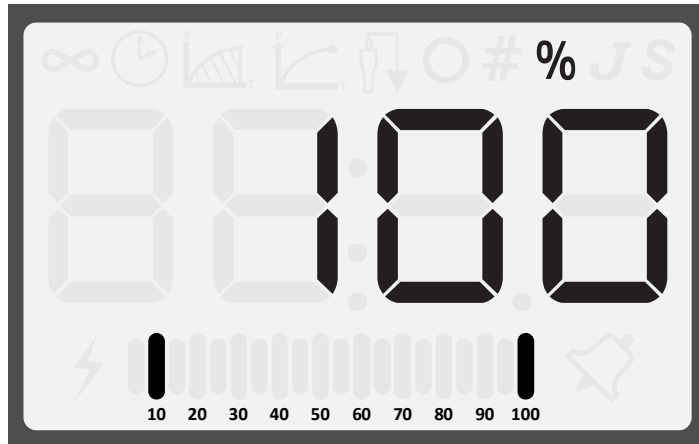
**Table 7.18** Energy Window Limit Low Operational Sequence

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                                                                          | Reference                                                                            |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 1    | <p>Press the Configuration key until the number icon (#) appears on the LCD.</p> <p>The power supply will display register 101 at every power up.</p>                                                                                                                                                                                                                                                                                           |    |
| 2    | <p>Press and release the Up/Down arrow keys to select register 161. For a detailed description of available registers refer to <a href="#">Table 7.26 Power Supply Registers</a>.</p>                                                                                                                                                                                                                                                           |   |
| 3    | <p>Once you have reached register 161, press the Configuration key. The register value will be displayed; this is indicated by the circle icon.</p> <p>Use the Up/Down arrow keys to select the desired energy window limit low value, then press the Configuration key to confirm the selection.</p> <p><b>NOTICE</b><br/>Register 114 (Limits) must be set to On before proceeding. Otherwise, the value of the limits cannot be changed.</p> |  |

### 7.2.5 Setting Power Window Limits

If power window high or power window low limits are enabled, it will display a single slowly blinking segment for the high limit and a single slowly blinking segment for the low limit in the bar-graph. In case of a window limit alarm, the respective segment will blink faster.

**Figure 7.1** Power Window Limits



7.2.6 Power Window Limit High

Table 7.19 Power Window Limit High Parameters

| Parameter               | Default | Max. Value | Min. Value |
|-------------------------|---------|------------|------------|
| Power Window Limit High | 0%      | 100%       | 1%         |

NOTICE



Minimum value should be higher than the window limit low value.

NOTICE



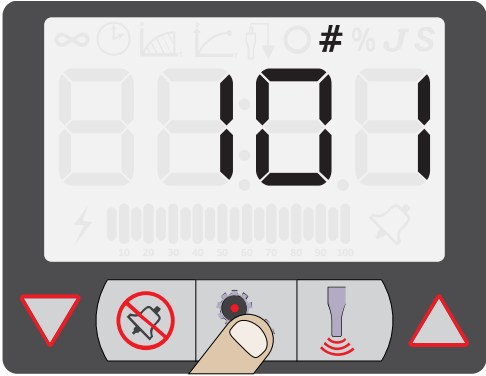
Set value to 0 to set the window limit high to off.

NOTICE



Power window limits must be set in multiples of 1.

**Table 7.20** Power Window Limit High Operational Sequence

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                                                                             | Reference                                                                             |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 1    | <p>Press the Configuration key until the number icon (#) appears on the LCD.</p> <p>The power supply will display register 101 at every power up.</p>                                                                                                                                                                                                                                                                                              |    |
| 2    | <p>Press and release the Up/Down arrow keys to select register 162. For a detailed description of available registers refer to <a href="#">Table 7.26 Power Supply Registers</a>.</p>                                                                                                                                                                                                                                                              |   |
| 3    | <p>Once you have reached register 162, press the Configuration key. The register value will be displayed; this is indicated by the circle icon.</p> <p>Use the Up/Down arrow keys to select the desired power window limit high value, then press the Configuration key to confirm the selection.</p> <p><b>NOTICE</b></p> <p>Register 114 (Limits) must be set to On before proceeding. Otherwise, the value of the limits cannot be changed.</p> |  |

7.2.7 Power Window Limit Low

Table 7.21 Power Window Limit Low Parameters

| Parameter              | Default | Max. Value | Min. Value |
|------------------------|---------|------------|------------|
| Power Window Limit Low | 0%      | 100%       | 1%         |

| NOTICE                                                                            |                                                                 |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------|
|  | Maximum value should be lower than the window limit high value. |

| NOTICE                                                                             |                                                     |
|------------------------------------------------------------------------------------|-----------------------------------------------------|
|  | Set value to 0 to set the window limit high to off. |

| NOTICE                                                                              |                                                    |
|-------------------------------------------------------------------------------------|----------------------------------------------------|
|  | Power window limits must be set in multiples of 1. |

**Table 7.22** Power Window Limit Low Operational Sequence

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                                                                         | Reference                                                                             |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 1    | <p>Press the Configuration key until the number icon (#) appears on the LCD.</p> <p>The power supply will display register 101 at every power up.</p>                                                                                                                                                                                                                                                                                          |    |
| 2    | <p>Press and release the Up/Down arrow keys to select register 163. For a detailed description of available registers refer to <a href="#">Table 7.26 Power Supply Registers</a>.</p>                                                                                                                                                                                                                                                          |   |
| 3    | <p>Once you have reached register 163, press the Configuration key. The register value will be displayed; this is indicated by the circle icon.</p> <p>Use the Up/Down arrow keys to select the desired power window limit low value, then press the Configuration key to confirm the selection.</p> <p><b>NOTICE</b><br/>Register 114 (Limits) must be set to On before proceeding. Otherwise, the value of the limits cannot be changed.</p> |  |

### 7.2.8 Using the Web Page Interface

Window limits can be set to a user specified value using the web page interface. For more information, refer to the DCX A/F Rack Mount Series Web Page Interface Instruction Manual.

7.3 Setting the Amplitude

7.3.1 Using the Front Panel Controls

At power up the DCX A Power Supply will display the last amplitude setting on the LCD. It can also be set to show weld mode.

Figure 7.2 LCD at Power Up

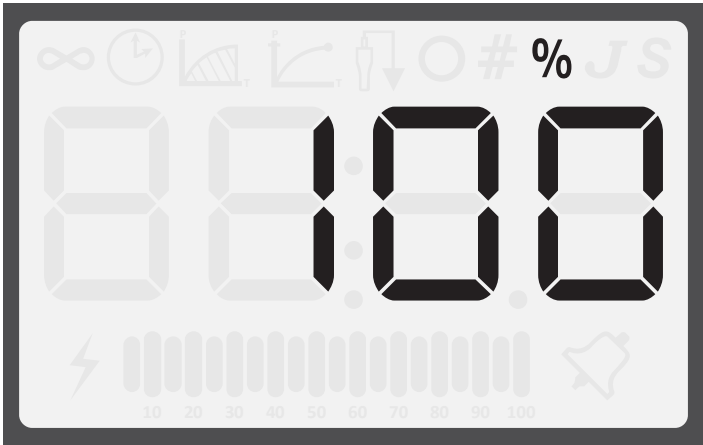


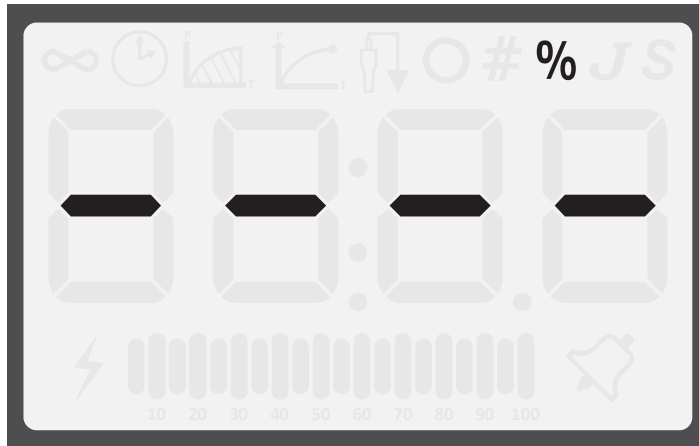
Table 7.23 Setting the Amplitude Using the Front Panel Controls

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                      | Reference |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| 1    | Press the Configuration key until the percentage icon (%) and no mode icons are displaying on the LCD.                                                                                                                                                                                                                                                                                      |           |
| 2    | <p>Press and release the Up or Down arrow keys to select the desired amplitude at 1% increments.</p> <p>Press and hold down the Up or Down arrow keys and the Amplitude will auto increment at 1% increments every quarter of a second.</p> <p>After holding down an arrow key for four straight seconds, the amplitude will auto increment at 5% increments every quarter of a second.</p> |           |

### 7.3.2 Using External Amplitude Control

When External Amplitude Control is enabled, the front panel amplitude control is disabled and the LCD displays four dashes (see [Figure 7.3 LCD when in External Amplitude Control Mode](#) below).

**Figure 7.3** LCD when in External Amplitude Control Mode



The ultrasonic amplitude can be controlled using one of the two analog input pins on the user I/O connector (pins 17 and 18).

### 7.3.3 Using the Web Page Interface

The ultrasonic amplitude can be set to a user specified value using the web page interface. For more information, refer to the DCX A/F Series Web Page Instruction Manual.

## 7.4 Resetting the Power Supply Alarms

You need to reset the weld system when you get an overload. When there is an overload, the alarm icon appears on the front panel LCD and the General Alarm output on the user I/O connector becomes active. The procedure for resetting the power supply depends on the power supply alarm settings. Refer to [Table 7.24 Resetting the DCX A Power Supply](#) for reset procedures.

**Table 7.24** Resetting the DCX A Power Supply

| Alarm Setting     | Reset Procedure                                                              |
|-------------------|------------------------------------------------------------------------------|
| Reset Required    | Press the front panel Reset key. You can also send an External Reset signal. |
| No Reset Required | Remove and re-apply the start signal.                                        |

For more information on interfacing the DCX A Power Supply using the user I/O connections refer to [5.4.1 User I/O Connections](#) in [Chapter 5: Installation and Setup](#).

## 7.5 Configuring the Power Supply Registers

At power up the DCX A Power Supply will display the last amplitude setting, this is indicated by the percentage icon (%) on the LCD. Refer to [Figure 7.2 LCD at Power Up](#).

**Table 7.25** Steps to Configure the Power Supply Registers

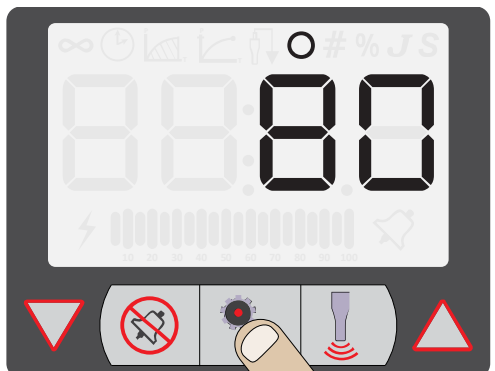
| Step | Action                                                                                                                                                                                     | Reference                                                                             |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 1    | Press the Configuration key until the number icon (#) appears on the LCD.<br>The power supply will display register 101 at every power up.                                                 |    |
| 2    | Press and release the Up or Down arrow keys to select the desired register. For a detailed description of available registers refer to <a href="#">Table 7.26 Power Supply Registers</a> . |   |
| 3    | Once you have reached the desired register, press the Configuration key. The register value will be displayed, this is indicated by the circle icon.                                       |  |

Table 7.25 Steps to Configure the Power Supply Registers

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Reference                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4    | <p>Press and release the Up or Down arrow keys to enter the desired value at 1 increments.</p> <p>Press and hold down the Up and Down arrow keys and the value will auto increment at 1 increments every quarter of a second.</p> <p>After holding down an arrow key for four straight seconds, the value will auto increment at 5 increments every quarter of a second.</p> <p>Or press the Reset key to enter the default value. For detailed default values of available registers refer to <a href="#">Table 7.26 Power Supply Registers</a>.</p> |  <p>The image shows a digital display with the number 150. Above the display are several icons: infinity, a clock, a fan, a downward arrow, a circle with a dot, and symbols for hash, percent, J, and S. Below the display is a battery level indicator. At the bottom of the device are four buttons: a left arrow, a 'no touch' symbol, a gear (configuration), and a bell (alarm), flanked by two red triangles. A hand is shown pressing the left arrow button.</p> |
| 5    | <p>Press the Configuration key to save the value. The current amplitude setting will be displayed only for continuous mode. For all the other modes, it will display the primary parameter of that mode.</p>                                                                                                                                                                                                                                                                                                                                          |  <p>The image shows the same digital display, but now it shows the number 100. The 'no touch' button (the second button from the left) is now highlighted with a red circle, and a hand is shown pressing it.</p>                                                                                                                                                                                                                                                       |

## 7.5.1 Power Supply Registers

**Table 7.26** Power Supply Registers

| Register | Description                                                                   | Default Value | Max. Value | Min. Value |
|----------|-------------------------------------------------------------------------------|---------------|------------|------------|
| 101      | Software version                                                              | N/A           | N/A        | N/A        |
| 102      | Bar graph identification after weld complete<br>0: Power<br>1: Frequency      | 0             | 1          | 0          |
| 104      | External amplitude control - user analog input or fieldbus<br>0: Off<br>1: On | 0             | 1          | 0          |
| 105      | Start ramp time (ms)                                                          | 80            | 1000       | 10         |
| 106      | Store frequency at end of weld<br>0: Off<br>1: On                             | 1             | 1          | 0          |
| 107      | Power up seek/scan<br>0: Off<br>1: Seek,<br>2: Scan                           | 1             | 2          | 0          |
| 108      | Seek ramp time (ms)                                                           | 80            | 1000       | 10         |
| 109      | Timed seek (every 60 seconds)<br>0: Off<br>1: On                              | 0             | 1          | 0          |
| 110      | Seek time (ms)                                                                | 500           | 1000       | 10         |
| 111      | External Frequency Offset<br>0: Off<br>1: On                                  | 0             | 1          | 0          |
| 112      | Frequency Offset Value                                                        | 0             |            |            |
| 113      | Cutoffs<br>0: Off<br>1: On                                                    | 0             | 1          | 0          |
| 114      | Limits<br>0: Off<br>1: On                                                     | 0             | 1          | 0          |

**Table 7.26** Power Supply Registers

| Register | Description                                                                                     | Default Value | Max. Value | Min. Value |
|----------|-------------------------------------------------------------------------------------------------|---------------|------------|------------|
| 115      | Restore Defaults<br>0: Off<br>1: Just weld preset<br>2: System defaults                         | 0             | 2          | 0          |
| 116      | IP Address - 1                                                                                  | 192           | 255        | 0          |
| 117      | IP Address - 2                                                                                  | 168           | 255        | 0          |
| 118      | IP Address - 3                                                                                  | 10            | 255        | 0          |
| 119      | IP Address - 4                                                                                  | 100           | 255        | 0          |
| 120      | Gateway for IP Address - 1                                                                      | 192           | 255        | 0          |
| 121      | Gateway for IP Address - 2                                                                      | 168           | 255        | 0          |
| 122      | Gateway for IP Address - 3                                                                      | 10            | 255        | 0          |
| 123      | Gateway for IP Address - 4                                                                      | 1             | 255        | 0          |
| 124      | Subnet Mask for IP Address - 1                                                                  | 255           | 255        | 0          |
| 125      | Subnet Mask for IP Address - 2                                                                  | 255           | 255        | 0          |
| 126      | Subnet Mask for IP Address - 3                                                                  | 255           | 255        | 0          |
| 127      | Subnet Mask for IP Address - 4                                                                  | 0             | 255        | 0          |
| 128      | DHCP Settings<br>0: Server<br>1: Client<br>2: Static<br>3: Restore Registers 116-128 to default | 2             | 3          | 0          |
| 134      | Backlight Timeout (s)<br>0: Always on                                                           | 600           | 9999       | 0          |
| 135      | Auto scroll step size                                                                           | 5             | 50         | 1          |
| 136      | Power on display<br>0: Weld Mode<br>1: Amplitude                                                | 1             | 1          | 0          |
| 138      | Weld Mode<br>0: Continuous<br>1: Time<br>2: Energy<br>3: Peak Power<br>4: Ground Detect         | 0             | 4          | 0          |
| 139      | MAC Address 1                                                                                   | N/A           | FFFF       | 0          |

**Table 7.26** Power Supply Registers

| Register | Description                                                                 | Default Value | Max. Value | Min. Value |
|----------|-----------------------------------------------------------------------------|---------------|------------|------------|
| 140      | MAC Address 2                                                               | N/A           | FFFF       | 0          |
| 141      | MAC Address 3                                                               | N/A           | FFFF       | 0          |
| 158      | +Time Limit<br>0: Select to disable limit<br>0.010-30.00s: Set -Time Limit  | 0             | 30.00s     | 0.010s     |
| 159      | -Time Limit<br>0: Select to disable limit<br>0.010-30.00s: Set +Time Limit  | 0             | 30.00s     | 0.010s     |
| 160      | +Energy Limit<br>0: Select to disable limit<br>0.1-9999J: Set -Energy Limit | 0             | 9999J      | 0.1J       |
| 161      | -Energy Limit<br>0: Select to disable limit<br>0.1-9999J: Set +Energy Limit | 0             | 9999J      | 0.1J       |
| 162      | +Power Limit<br>0: Select to disable limit<br>1-100%: Set -Power Limit      | 0             | 100%       | 1%         |
| 163      | -Power Limit<br>0: Select to disable limit<br>1-100%: Set +Power Limit      | 0             | 100%       | 1%         |

## 7.6 Save/Recall Presets

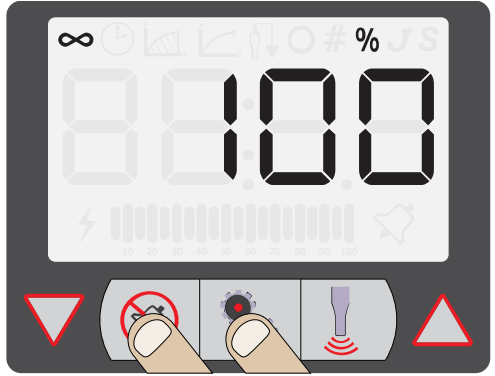
If you wish to save your current weld cycle settings for later use, you can save it into a preset location. 32 preset locations are available. Preset settings are saved until they are over-written, and are maintained in memory even if the system is turned off or unplugged.

### 7.6.1 Save Preset

**Table 7.27** Save Preset

| Step | Action                                                                                                                                                                                                                    | Reference                                                                            |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 1    | Set the desired weld mode and parameters. See <a href="#">7.1 Setting Primary Parameters</a> for more information.                                                                                                        |   |
| 2    | Press the Configuration key until the preset location screen (Pr:XX) appears on the LCD.                                                                                                                                  |  |
| 3    | Press the Up or Down arrow keys to select the desired preset location to use.<br>Once you have reached the desired preset location, press the Configuration key to select it.<br>You will be returned to the main screen. |  |

**Table 7.27** Save Preset

| Step | Action                                                                                                                                                                                                                                                                                               | Reference                                                                           |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| 4    | <p>While on the main screen, press and hold the Reset key. While holding down the Reset key, press the Configuration to save your current control mode and parameters into the selected preset location (Pr:XX).</p> <p>The LCD will blink twice to confirm that the preset was saved correctly.</p> |  |

## 7.6.2 Recall Preset

**Table 7.28** Recall Preset

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                     | Reference                                                                             |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 1    | <p>Press the Configuration key until the preset location screen (Pr:XX) appears on the LCD.</p>                                                                                                                                                                                                                                                                                            |  |
| 2    | <p>Press the Up or Down arrow keys to select the desired preset location to recall.</p> <p>Once you have reached the desired preset location, press and hold the Reset key. While holding down the Reset key, press the Configuration for 3 seconds to recall the selected preset location (Pr:XX).</p> <p>The LCD will blink twice to confirm that the preset was recalled correctly.</p> |  |

Table 7.28 Recall Preset

| Step | Action                                                                              | Reference                                                                          |
|------|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| 3    | You will be returned to the main screen with the recalled preset location settings. |  |

## 7.7 LCD Bar-Graph

While ultrasonic power is active the LCD will always display the power value on the 20-segment LCD bar-graph as a percentage of the maximum output power.

At the end of a weld or test cycle, the bar-graph is factory set to represent the cycle's peak power as a percentage of the maximum output power.

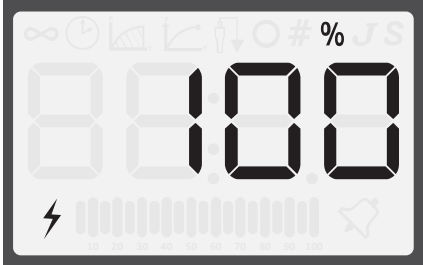
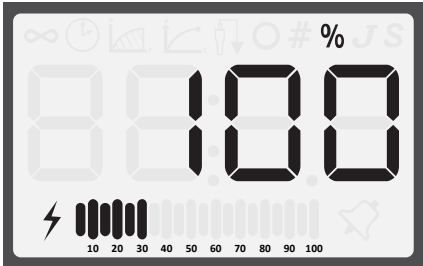
The power supply can also be configured to show a single bar on the LCD bar-graph to represent the stack operating frequency stored at the end of each weld or test cycle. This option can be used to troubleshoot operating frequency changes as a result of heating effects, coupling, tooling wear, etc.

For information on how to set the power supply registers see [7.5 Configuring the Power Supply Registers](#).

### 7.7.1 Power Bar-Graph Interpretation

The lightning bolt left of the bar-graph indicates ultrasonic power is running. Each of the segments represent 5% increments of the maximum output power. The segments will only appear if the output power has exceeded the value represented. For example if the power is 4% only the lightning bolt will be on. When it reaches 5% the first bar-graph segment will appear.

**Table 7.29** Power Bar-Graph Interpretation Examples

| Description                                                                                                                                                                                        | Reference                                                                             |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| <p>In this example only the lightning bolt appears left of the bar-graph. This means power is between 0% and 5%. If the power supply is 800 W the actual output power is between 0 W and 40 W.</p> |  |
| <p>In this example the first six segments appear on the bar-graph. This means power is between 30% and 35%. If the power supply is 800 W, the actual output power is between 240 W and 280 W.</p>  |  |

7.7.2 Frequency Bar-Graph Interpretation

The actual frequency depends on the power supply’s operating frequency. Use [Table 7.30](#) to [Table 7.32](#) below to interpret frequency bar-graph readings.

| NOTICE                                                                            |                                                                                                                                  |
|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
|  | If there is a test overload or an external memory reset signal is received, then the 50% segment will be displayed and blinking. |

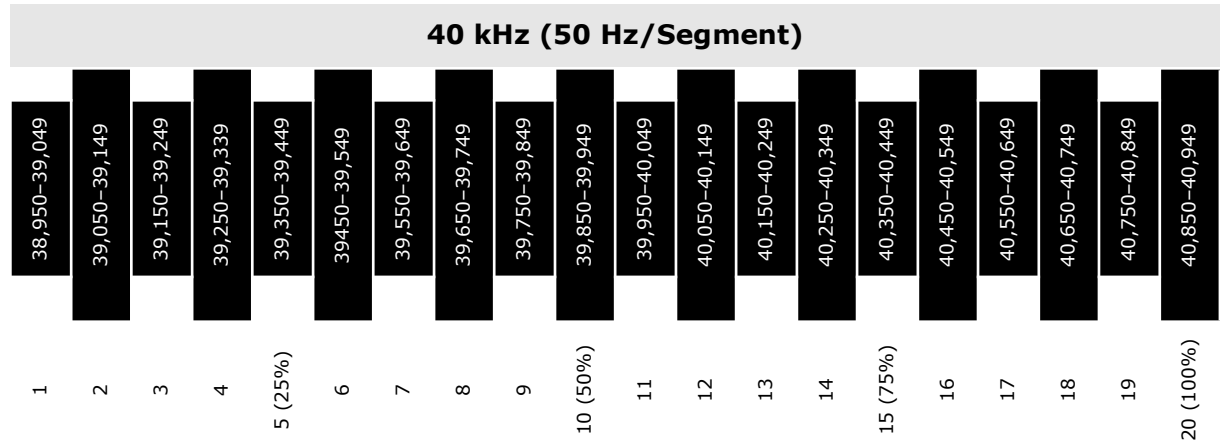
Table 7.30 Frequency Bar-Graph Interpretation - 20 kHz (50 Hz Segment)

| 20 kHz (50 Hz/Segment) |               |
|------------------------|---------------|
| 1                      | 19,475-19,524 |
| 2                      | 19,525-19,574 |
| 3                      | 19,575-19,624 |
| 4                      | 19,625-19,674 |
| 5 (25%)                | 19,675-19,724 |
| 6                      | 19,725-19,774 |
| 7                      | 19,775-19,824 |
| 8                      | 19,825-19,874 |
| 9                      | 19,875-19,924 |
| 10 (50%)               | 19,925-19,974 |
| 11                     | 19,975-20,024 |
| 12                     | 20,025-20,074 |
| 13                     | 20,075-20,124 |
| 14                     | 20,125-20,174 |
| 15 (75%)               | 20,175-20,224 |
| 16                     | 20,225-20,274 |
| 17                     | 20,275-20,324 |
| 18                     | 20,325-20,374 |
| 19                     | 20,375-20,424 |
| 20 (100%)              | 20,425-20,474 |

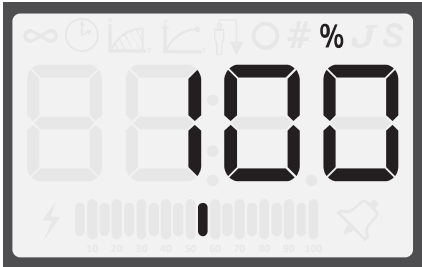
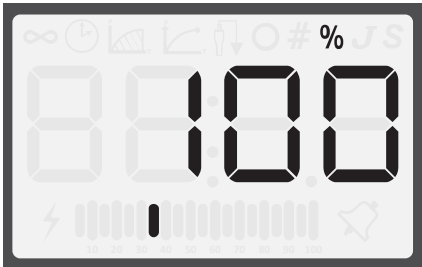
Table 7.31 Frequency Bar-Graph Interpretation - 30 kHz (76 Hz Segment)

| 30 kHz (76 Hz/Segment) |               |
|------------------------|---------------|
| 1                      | 29,278-29,353 |
| 2                      | 29,357-29,429 |
| 3                      | 29,430-29,501 |
| 4                      | 29,502-29,581 |
| 5 (25%)                | 29,582-29,657 |
| 6                      | 29,658-29,733 |
| 7                      | 29,734-29,809 |
| 8                      | 29,810-29,885 |
| 9                      | 29,886-29,961 |
| 10 (50%)               | 29,962-30,037 |
| 11                     | 30,038-30,113 |
| 12                     | 30,114-30,189 |
| 13                     | 30,190-30,265 |
| 14                     | 30,266-30,341 |
| 15 (75%)               | 30,342-30,417 |
| 16                     | 30,418-30,493 |
| 17                     | 30,494-30,569 |
| 18                     | 30,570-30,645 |
| 19                     | 30,646-30,721 |
| 20 (100%)              | 30,722-30,797 |

**Table 7.32** Frequency Bar-Graph Interpretation - 40 kHz (100 Hz/Segment)



**Table 7.33** Frequency Bar-Graph Interpretation Examples

| Description                                                                                                                                                                      | Reference                                                                             |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| In this example the bar is located in the 11 <sup>th</sup> segment. If the power supply is a 20 kHz unit, the stack is running in the frequency range of 19,975 Hz to 20,024 Hz. |   |
| In this example the bar is located in the 7 <sup>th</sup> segment. If the power supply is a 20 kHz unit, the stack is running in the frequency range of 19,775 Hz to 19,824 Hz.  |  |

7.8 Ultrasonics Test Procedure

The Ultrasonics Test function measures ultrasonic power dissipated by the ultrasonic stack with no load. The ultrasonics test procedure involves an automatic matching of the frequency of the power supply to the frequency of the converter-booster-horn stack.

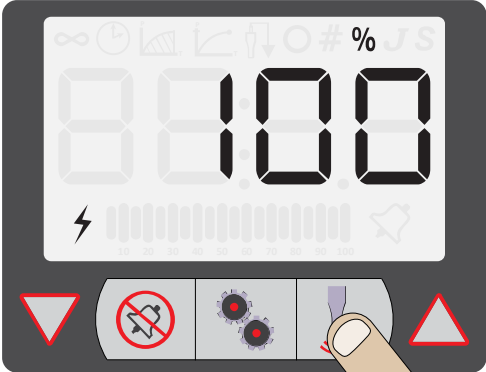
| WARNING                                                                           | High Voltage Hazard                                                                                                                                                       |
|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | Ensure that no one is in contact with the horn when testing the power supply.<br><br>Do not cycle the welding system if either the RF cable or converter is disconnected. |

| WARNING                                                                           | High Voltage Hazard                                                                                     |
|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
|  | Ensure the power supply is properly connected, as indicated in <a href="#">5.3 Installation Steps</a> . |

7.8.1 Using the Front Panel Controls

| NOTICE                                                                              |                                                                                      |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
|  | To use the front panel controls, the DCX A Power Supply unit must be in manual mode. |

Table 7.34 Power Supply Ultrasonic Test Procedure (Front Panel)

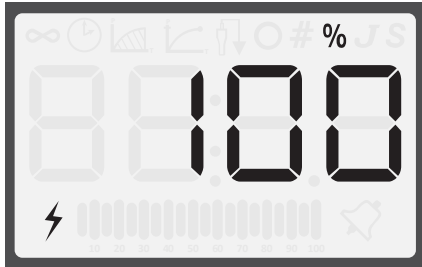
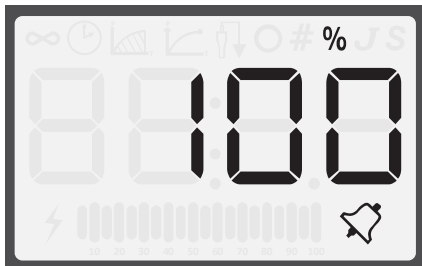
| Step | Action                                                                                                                                                                                                    | Reference                                                                            |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 1    | Press the test key for 1-2 seconds, then release. The Sonics Active indicator appears while the test key is pressed. If the power supply alarm indicator does not appear, the test procedure is finished. |  |

**Table 7.34** Power Supply Ultrasonic Test Procedure (Front Panel)

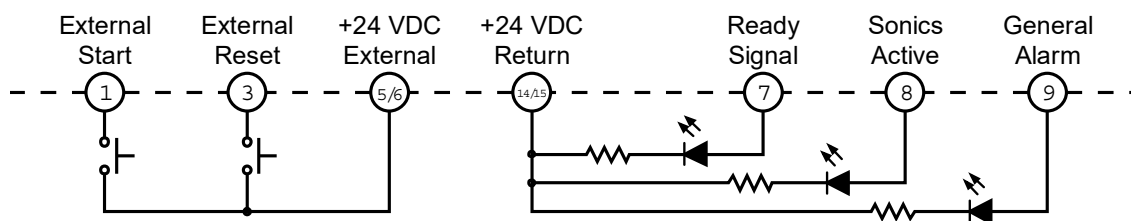
| Step | Action                                                                                                                                                                                                                                           | Reference                                                                           |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| 2    | <p>If the alarm indicator appears, press the alarm reset key and repeat step 2 one time only. If the alarm persists, refer to <a href="#">8.5 Troubleshooting</a>.</p> <p>See <a href="#">Appendix A: Alarms</a> for additional information.</p> |  |

## 7.9 Using the I/O Connections

**Table 7.35** Power Supply Ultrasonic Test Procedure (User I/O)

| Step | Action                                                                                                                                                                                                                                                                                                                                          | Reference                                                                           |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| 1    | Wire the necessary I/O signals as shown on <a href="#">Figure 7.4 Test Connections</a> , or using a similar setup.                                                                                                                                                                                                                              | Refer to <a href="#">Figure 7.4 Test Connections</a> below.                         |
| 2    | Send an External Test signal for 1-2 seconds. The Sonics Active output will become active and the Sonics Active indicator appears while the External Start Signal is present. If the General Alarm output/ alarm indicator does not become active, the test procedure is finished.<br><br><b>NOTICE</b><br>Power supply must be in manual mode. |   |
| 3    | If the General Alarm output/alarm indicator becomes active, send an External Reset signal and repeat step 2 one time only. If the alarm persists, refer to <a href="#">8.5 Troubleshooting</a> .                                                                                                                                                |  |

**Figure 7.4** Test Connections



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## Chapter 8: Maintenance

---

|            |                                                            |            |
|------------|------------------------------------------------------------|------------|
| <b>8.1</b> | <b>General Maintenance Considerations . . . . .</b>        | <b>132</b> |
| <b>8.2</b> | <b>DCX A Power Supply Preventive Maintenance . . . . .</b> | <b>134</b> |
| <b>8.3</b> | <b>Recommended Spare Stock . . . . .</b>                   | <b>140</b> |
| <b>8.4</b> | <b>Circuit Diagram. . . . .</b>                            | <b>146</b> |
| <b>8.5</b> | <b>Troubleshooting . . . . .</b>                           | <b>147</b> |
| <b>8.6</b> | <b>Cold Start Procedure . . . . .</b>                      | <b>151</b> |

## 8.1 General Maintenance Considerations

| WARNING                                                                           | High Voltage Hazard                                                                                                                                                  |
|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | Power supplies produce high voltage. To avoid the possibility of an electrical shock, you should always power down your system prior to repairing any portion of it. |

| CAUTION                                                                           | General Warning                                                                                  |
|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
|  | When performing maintenance on the welder, make sure that no other automated systems are active. |

| NOTICE                                                                              |                                                                                                                                  |
|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
|  | There are no customer replaceable components inside the power supply. Have all servicing done by a qualified Branson technician. |

| NOTICE                                                                              |                                                                                             |
|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|
|  | When returning printed circuit boards, make sure to enclose them in an anti-static package. |

| NOTICE                                                                              |                                                                                                                                                              |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | Connectors may not be keyed and wires may not be color-coded. Therefore, when disconnecting cables and wires, label them so you can reconnect them properly. |

| NOTICE                                                                            |                                                                                                                                                                                |
|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>To prevent circuit damage from electrostatic discharge, always service the power supply on a static-dissipative surface, while wearing a properly grounded wrist strap.</p> |

| NOTICE                                                                            |                                                                                               |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
|  | <p>When the battery is worn out, dispose it under the ordinance of each local government.</p> |

| CAUTION                                                                            | Corrosive Material Hazard                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>First aid measures (in case of electrolyte leakage from the battery):</p> <p><b>Eye Contact:</b> Flush the eyes with plenty of clean water for at least 15 minutes immediately, without rubbing. Get immediate medical treatment.</p> <p>If appropriate procedures are not taken, this may cause eye injury.</p> <p><b>Skin Contact:</b> Wash the affected area under tepid running water using a mild soap. If appropriate procedures are not taken, this may cause sores on the skin. Get medical attention if irritation develops or persists.</p> <p><b>Inhalation:</b> Remove to fresh air immediately. Get medical treatment immediately.</p> |

## 8.2 DCX A Power Supply Preventive Maintenance

The following preventive measures help assure long term operation of your Branson DCX A Power Supply equipment.

### 8.2.1 Periodically Clean the Equipment

| NOTICE                                                                            |                                                                                                           |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
|  | Use only anti-static vacuum cleaners to prevent damage from electrostatic discharge to your power supply. |

Air is continuously drawn into the power supply. Periodically disconnect the unit from power, remove the cover and vacuum out any accumulated dust and debris. Remove material adhering to:

- Power supply heat sink cooling fins
- Transformers
- Circuit boards
- Cooling intake vents
- Exhaust ports

External covers may be cleaned with a damp sponge or cloth using a solution of mild soap and water. Do not allow cleaning solution to enter the unit.

To prevent rust in areas of high humidity, exposed steel surfaces, may require a very light film of rust preventing oil, such as WD-40®\*.

\* WD-40 is a registered trademark of WD-40 Manufacturing Company.

## 8.2.2 Recondition the Stack (Converter, Booster, and Horn)

| NOTICE                                                                            |                                                                                                            |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|
|  | <p>Never clean the converter-booster-horn stack mating surfaces by using a buffing wheel or by filing.</p> |

Welding system components work most efficiently when the converter-booster-horn stack mating surfaces are flat, in solid contact, and free from fretting corrosion. Poor contact between mating surfaces wastes power output, makes tuning difficult, increases noise and heat, and may cause damage to the converter.

For standard 20 kHz and 30 kHz products, a Branson Mylar polyester film washer should be installed between the horn and booster, and horn and converter. Replace the washer if torn or perforated. Stacks using Mylar plastic film washers should be inspected every three months.

Stacks used with silicone grease, as with certain 20 kHz, 30 kHz and all 40 kHz products, should be periodically reconditioned to eliminate fretting corrosion. A stack using silicone grease should be inspected every two weeks for corrosion. When experience is gained for specific stacks, the inspection interval can be adjusted to a longer or shorter period as required.

### Stack Reconditioning Procedure

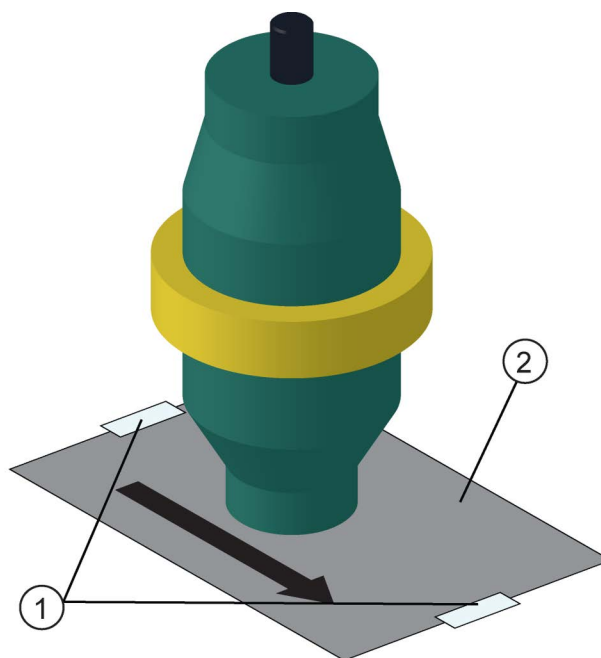
To recondition stack mating surfaces, take the following steps:

**Table 8.1** Stack Reconditioning Procedure

| Step | Action                                                                                                                                                                                                                                                                                 |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | Disassemble the converter-booster-horn stack and wipe the mating surfaces with a clean cloth or paper towel.                                                                                                                                                                           |
| 2    | Examine all mating surfaces. If any mating surface shows corrosion or a hard, dark deposit, recondition it.                                                                                                                                                                            |
| 3    | If necessary, remove the threaded stud from the part.                                                                                                                                                                                                                                  |
| 4    | Tape a clean sheet of #400 (or finer) grit emery cloth to a clean, smooth, flat surface (such as a sheet of plate glass), as in <a href="#">Figure 8.1 Reconditioning Stack Mating Surfaces</a> .                                                                                      |
| 5    | Place the interface surface on the emery cloth. Grasp the part at the lower end, with your thumb over the spanner-wrench hole, and lap the part in a straight line across the emery cloth. Do not apply downward pressure — the weight of the part alone provides sufficient pressure. |
| 6    | Lap the part, two or three times, in the same direction against the emery cloth. (See <a href="#">Figure 8.1 Reconditioning Stack Mating Surfaces</a> .)                                                                                                                               |
| 7    | Rotate the part 120 degrees, placing your thumb over the spanner-wrench hole, and repeat the lapping procedure in step 6.                                                                                                                                                              |

**Table 8.1** Stack Reconditioning Procedure

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 8    | Rotate the part another 120 degrees to the next spanner-wrench hole, and repeat the lapping procedure in step 6.                                                                                                                                                                                                                                                                                                                                                                                             |
| 9    | Re-examine the mating surface. If necessary, repeat steps 2-5 until you remove most of the contaminant. Remember, this should not require more than two to three complete rotations for an aluminum horn or booster; a titanium component may require more rotations.                                                                                                                                                                                                                                        |
| 10   | <p>Before re-inserting a threaded stud in an aluminum booster or horn:<br/>Using a file card or wire brush, clean any aluminum bits from the knurled end of the stud.</p> <p>Using a clean cloth or towel, clean the threaded hole.</p> <p>Examine the knurled end of the stud. If worn, replace the stud. Also, examine the stud and threaded hole for stripped threads.</p> <p><b>NOTICE</b><br/>Threaded studs cannot be reused in titanium horns or boosters. Replace all studs in these components.</p> |
| 11   | Assemble and install the stack.                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

**Figure 8.1** Reconditioning Stack Mating Surfaces**Table 8.2** Reconditioning Stack Mating Surfaces

| Item | Description      |
|------|------------------|
| 1    | Tape             |
| 2    | #400 Emery Cloth |

### 8.2.3 Stack Torque Values

**Table 8.3** Stack Torque Values

| Frequency | Torque             |
|-----------|--------------------|
| 20 kHz    | 220 in·lb (25 N·m) |
| 30 kHz    | 185 in·lb (21 N·m) |
| 40 kHz    | 95 in·lb (11 N·m)  |

### For a 20 kHz System

**Table 8.4** Stack Reassembly for a 20 kHz System

| Step | Action                                                                                                                                                                       |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | Clean the mating surfaces of the converter, booster, and horn. Remove any foreign material from the threaded holes.                                                          |
| 2    | Install the threaded stud into the top of the booster. Torque to 450 in·lb (50.84 N·m). If the stud is dry, apply 1 or 2 drops of a light lubricating oil before installing. |
| 3    | Install the threaded stud into the top of the horn. Torque to 450 in·lb (50.84 N·m). If the stud is dry, apply 1 or 2 drops of a light lubricating oil before installing.    |
| 4    | Install a single Mylar plastic film washer (matching the size of the washer to the stud) to each interface.                                                                  |
| 5    | Assemble the converter to the booster and the booster to the horn.                                                                                                           |
| 6    | Torque to 220 in·lb (24.85 N·m) at each interface.                                                                                                                           |

## For a 30 kHz System

**Table 8.5** Stack Reassembly for a 30 kHz System

| Step | Action                                                                                                                                                                       |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | Clean the mating surfaces of the converter, booster, and horn. Remove any foreign material from the threaded holes.                                                          |
| 2    | Install the threaded stud into the top of the booster. Torque to 290 in·lb (32.76 N·m). If the stud is dry, apply 1 or 2 drops of a light lubricating oil before installing. |
| 3    | Install the threaded stud into the top of the horn. Torque to 290 in·lb (32.76 N·m). If the stud is dry, apply 1 or 2 drops of a light lubricating oil before installing.    |
| 4    | Install a single Mylar plastic film washer (matching the size of the washer to the stud) to each interface.                                                                  |
| 5    | Assemble the converter to the booster and the booster to the horn.                                                                                                           |
| 6    | Torque to 185 in·lb (21 N·m) at each interface.                                                                                                                              |

## For a 40 kHz System

**Table 8.6** Stack Reassembly for a 40 kHz System

| Step | Action                                                                                                                                                                          |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | Clean the mating surfaces of the converter, booster, and horn. Remove any foreign material from the threaded holes.                                                             |
| 2    | Apply a drop of Loctite®* 290 threadlocker (or equivalent) to the studs for the booster and horn.                                                                               |
| 3    | Install the threaded stud into the top of the booster. Torque to 70 in·lb (7.91 N·m). Remove excess Loctite 290 threadlocker from the booster face and let cure for 30 minutes. |
| 4    | Install the threaded stud into the top of the horn. Torque to 70 in·lb (7.91 N·m). Remove excess Loctite 290 threadlocker from the horn face and let cure for 30 minutes.       |
| 5    | Coat each interface surface with a thin film of silicon grease - but do not apply silicon grease to a threaded stud or tip.                                                     |
| 6    | Torque to 95 in·lb (10.73 N·m) at each interface.                                                                                                                               |

\* Loctite is a registered trademark of Henkel Corporation, U.S.A.

## 8.2.4 Stud Torque Values

**Table 8.7** Stud Torque Values

| Used on | Stud Size                                   | Torque               | EDP #        |
|---------|---------------------------------------------|----------------------|--------------|
| 20 kHz  | 1/2 in x 20 x 1-1/4 in                      | 450 in·lb, 50.84 N·m | 100-098-370  |
|         | 1/2 in x 20 x 1-1/2 in                      |                      | 100-098-123  |
| 30 kHz  | 3/8 in x 24 x 1 in                          | 290 in·lb, 32.76 N·m | 100-298-170R |
| 40 kHz* | M8X1.25 X 20<br>(40 kHz horns and boosters) | 70 in·lb, 7.91 N·m   | 100-098-790  |

\* Add a drop of Loctite 290 threadlocker to the stud. Torque and let cure for 30 minutes before using.

## 8.3 Recommended Spare Stock

This section provides lists of replacement parts, system cables, and suggested spares.

### 8.3.1 System Cables

You can order the following cables:

**Table 8.8** DCX A Power Supply System Cables

| P/N         | Description                         |
|-------------|-------------------------------------|
| 100-240-383 | Cable, RF 8 ft (2.5 m)              |
| 100-240-384 | Cable, RF 15 ft (4.5 m)             |
| 100-240-385 | Cable, RF 25 ft (7.5 m)             |
| 100-240-387 | Cable, RF right angle 8 ft (2.5 m)  |
| 100-240-388 | Cable, RF right angle 15 ft (4.5 m) |
| 100-240-389 | Cable, RF right angle 25 ft (7.5 m) |
| 100-240-392 | Cable, User I/O 25 ft (7.5 m)       |
| 100-240-393 | Cable, User I/O 50 ft (15 m)        |
| 200-240-396 | Cable Ethernet Cat 5e 7 ft (2.1 m)  |

### 8.3.2 Suggested Spares

**Table 8.9** Suggested Spares

| Description                   | EDP#                                                                                  | 1-4 Units | 6-12 Units | 14+ Units |
|-------------------------------|---------------------------------------------------------------------------------------|-----------|------------|-----------|
| Converter                     | Refer to <a href="#">Table 8.10 Converters Compatible with the DCX A Power Supply</a> | 0         | 1          | 2         |
| Booster                       | Refer to <a href="#">Table 8.11 DCX A Power Supply Compatible Boosters</a>            | 0         | 1          | 2         |
| Horn                          | As Ordered                                                                            | 1         | 1          | 2         |
| Studs                         | Refer to <a href="#">Table 8.12 Other Items used with the DCX A Power Supply</a>      | 4         | 6          | 8         |
| Mylar Plastic Film Washer Kit | Refer to <a href="#">Table 8.12 Other Items used with the DCX A Power Supply</a>      | 1         | 1          | 1         |

### 8.3.3 Converters Compatible with the DCX A Power Supply

**Table 8.10** Converters Compatible with the DCX A Power Supply

| Where used                                            | Model               | Connector                             | Part Number  |
|-------------------------------------------------------|---------------------|---------------------------------------|--------------|
| 20 kHz / 1250 W<br>20 kHz / 2500 W<br>20 kHz / 4000 W | CR-20S              | SHV connector                         | 125-135-115R |
|                                                       | CR-20C              | SHV connector with 3 ft (0.9 m) cable | 159-135-210R |
|                                                       | CH-20S (932 AH SPL) | SHV connector                         | 159-135-075R |
|                                                       | CH-20C              | SHV connector with 3 ft (0.9 m) cable | 159-135-211R |
|                                                       | CS-20S              | SHV connector                         | 159-135-138R |
|                                                       | CS-20C              | SHV connector with 3 ft (0.9 m) cable | 159-135-209R |
| 30 kHz / 1500 W                                       | CR-30S              | SHV connectors                        | 101-135-081R |
|                                                       | CR-30C              | SHV connector with 3 ft (0.9 m) cable | 159-135-213R |
|                                                       | CH-30S              | SHV connector                         | 101-135-071R |
|                                                       | CH-30C              | SHV connector with 3 ft (0.9 m) cable | 159-135-214R |
|                                                       | CS-30S              | SHV connector                         | 159-135-110R |
|                                                       | CS-30C              | SHV connector with 3 ft (0.9 m) cable | 159-135-212R |
| 40 kHz / 800 W                                        | 4TP                 | SHV connector (platen mount)          | 101-135-068R |
|                                                       | CR-40S (4TH)        | SHV connector                         | 101-135-067R |
|                                                       | CR-40C              | SHV connector with 3 ft (0.9 m) cable | 159-135-215R |

### 8.3.4 DCX A Power Supply Compatible Boosters

**Table 8.11** DCX A Power Supply Compatible Boosters

| Type of Booster                                 | Description              | Part Number |
|-------------------------------------------------|--------------------------|-------------|
| Solid Mount<br>(1/2-20 horn stud)<br>20 kHz     | Titanium, 1:0.6 (Purple) | 101-149-095 |
|                                                 | Titanium, 1:1 (Green)    | 101-149-096 |
|                                                 | Titanium, 1:1.5 (Gold)   | 101-149-097 |
|                                                 | Titanium, 1:2 (Silver)   | 101-149-098 |
|                                                 | Titanium, 1:2.5 (Black)  | 101-149-099 |
| Solid Mount<br>(M8 x 1.25 horn stud)<br>40 kHz  | Titanium, 1:0.6 (Purple) | 109-041-178 |
|                                                 | Titanium, 1:1 (Green)    | 109-041-177 |
|                                                 | Titanium, 1:1.5 (Gold)   | 109-041-176 |
|                                                 | Titanium, 1:2 (Silver)   | 109-041-175 |
|                                                 | Titanium, 1:2.5 (Black)  | 109-041-174 |
| Standard Series<br>(1/2-20 horn stud)<br>20 kHz | Aluminum, 1:0.6 (Purple) | 101-149-055 |
|                                                 | Aluminum, 1:1 (Green)    | 101-149-051 |
|                                                 | Aluminum, 1:1.5 (Gold)   | 101-149-052 |
|                                                 | Aluminum, 1:2 (Silver)   | 101-149-053 |
|                                                 | Titanium, 1:0.6 (Purple) | 101-149-060 |
|                                                 | Titanium, 1:1 (Green)    | 101-149-056 |
|                                                 | Titanium, 1:1.5 (Gold)   | 101-149-057 |
|                                                 | Titanium, 1:2 (Silver)   | 101-149-058 |
|                                                 | Titanium, 1:2.5 (Black)  | 101-149-059 |
| Standard Series<br>(3/8-24 horn stud)<br>30 kHz | Titanium, 1:2.5 (Black)  | 101-149-103 |
|                                                 | Titanium, 1:2 (Silver)   | 101-149-104 |
|                                                 | Titanium, 1:1.5 (Gold)   | 101-149-105 |
|                                                 | Titanium, 1:1 (Green)    | 101-149-106 |

**Table 8.11** DCX A Power Supply Compatible Boosters

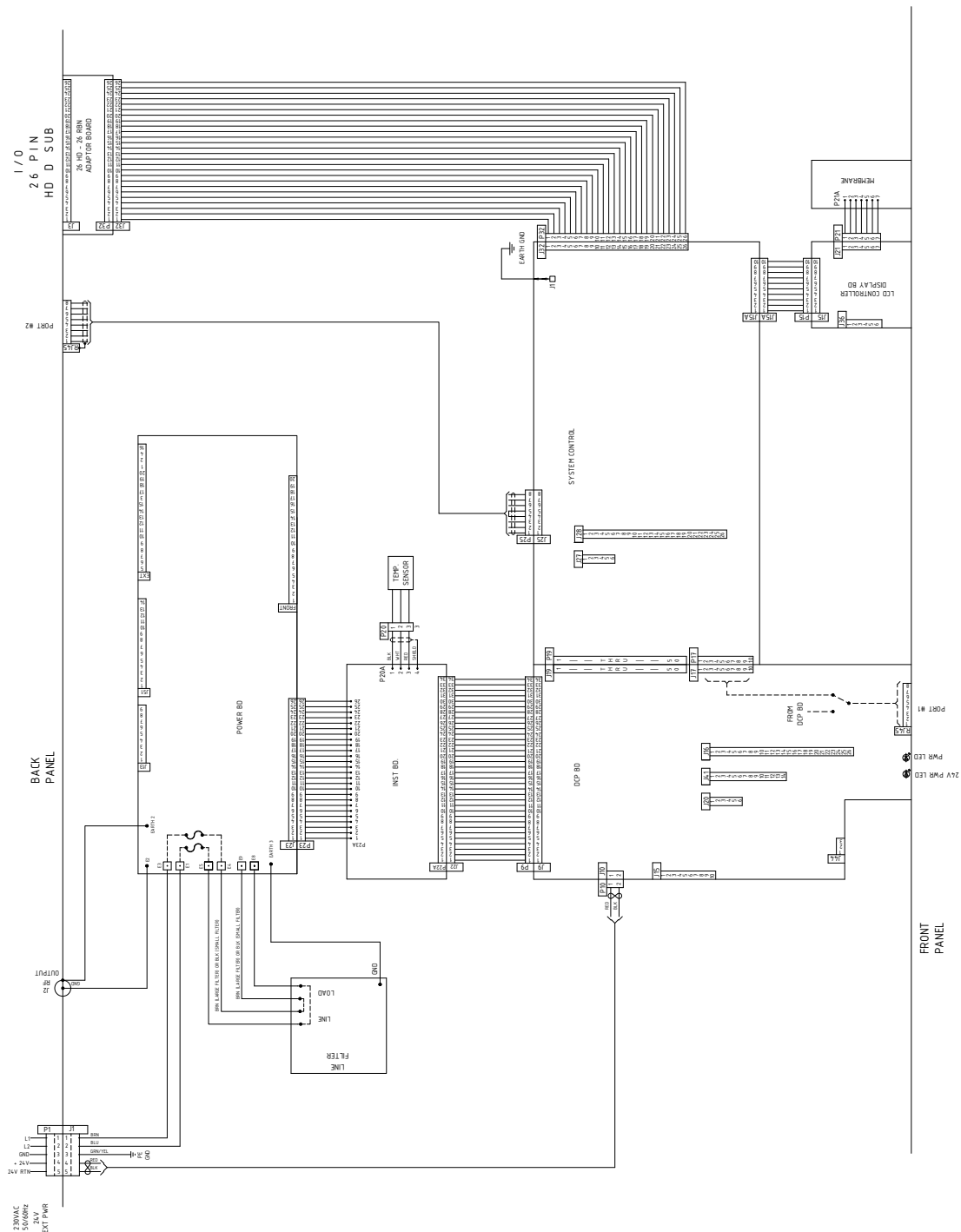
| Type of Booster                                    | Description              | Part Number  |
|----------------------------------------------------|--------------------------|--------------|
| Standard Series<br>(M8 x 1.25 horn stud)<br>40 kHz | Aluminum, 1:0.6 (Purple) | 101-149-087  |
|                                                    | Aluminum, 1:1 (Green)    | 101-149-079  |
|                                                    | Aluminum, 1:1.5 (Gold)   | 101-149-080  |
|                                                    | Aluminum, 1:2 (Silver)   | 101-149-081R |
|                                                    | Aluminum, 1:2.5 (Black)  | 101-149-082  |
|                                                    | Titanium, 1:1 (Green)    | 101-149-085  |
|                                                    | Titanium, 1:1.5 (Gold)   | 101-149-086  |
|                                                    | Titanium, 1:2 (Silver)   | 101-149-083  |
|                                                    | Titanium, 1:2.5 (Black)  | 101-149-084  |

### 8.3.5 Other Items used with the DCX A Power Supply

**Table 8.12** Other Items used with the DCX A Power Supply

| Product                                            | Description                                         | Part No.     |
|----------------------------------------------------|-----------------------------------------------------|--------------|
| Silicone grease                                    | For use with 40 kHz systems                         | 101-053-002  |
| Mylar Plastic Film Washers<br>(for 20 kHz systems) | Kit, 10 each (1/2 in. and 3/8 in.)                  | 100-063-357  |
|                                                    | Kit, 150 each (1/2 in.)                             | 100-063-471  |
|                                                    | Kit, 150 each (3/8 in.)                             | 100-063-472  |
| Mylar Plastic Film Washers<br>(for 30 kHz systems) | Kit, 10 each (3/8 in.)                              | 100-063-632  |
|                                                    | Kit, 150 each (3/8 in.)                             | 100-063-712  |
| Tool Kit                                           | 20 kHz<br>(spanner wrench and 10 pc washer kit)     | 101-063-208R |
|                                                    | 30 kHz<br>(spanner wrench and 10 pc washer kit)     | 101-063-636R |
|                                                    | 40 kHz<br>(spanner wrench and silicone grease)      | 101-063-176R |
| Spanner wrench                                     | 20 kHz                                              | 101-118-039  |
|                                                    | 30 kHz                                              | 201-118-033  |
|                                                    | 40 kHz                                              | 201-118-024  |
| Studs                                              | 1/2-20 x 1-1/4 (titanium horns)                     | 100-098-370  |
|                                                    | 1/2-20 x 1-1/2<br>(aluminum horns, 20 kHz boosters) | 100-098-123  |
|                                                    | 3/8-24 x 1<br>(30 kHz titanium horns and boosters)  | 100-298-170R |
|                                                    | M8X1.25 X 20<br>(40 kHz horns and boosters)         | 100-098-790  |

## 8.4 Circuit Diagram



## 8.5 Troubleshooting

If you have a problem operating the DCX A Power Supply, take the following steps:

**Table 8.13** Troubleshooting

| Step | Action                                                                                                                                             |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | Make sure the converter-booster-horn stack is properly assembled and installed.                                                                    |
| 2    | For instructions on reconditioning stack component surfaces, refer to <a href="#">8.2.2 Recondition the Stack (Converter, Booster, and Horn)</a> . |
| 3    | If you need additional help, call your local Branson representative, refer to <a href="#">1.3 How to Contact Branson</a> .                         |

| NOTICE                                                                            |                                                                                                                                                                                                                                                             |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | DCX A Power Supply should be serviced only by qualified technicians using Branson-approved test and repair equipment, repair procedures, and replacement parts. Unauthorized attempts at repair or modification of the power supply will void the warranty. |

### 8.5.1 Common Electrical Problems

**Table 8.14** Troubleshooting Common Electrical Problems

| Problem                                                                          | Check                                          | Solution                      |
|----------------------------------------------------------------------------------|------------------------------------------------|-------------------------------|
| When touching a component of the weld system, you get a slight electrical shock. | Ensure the Ground cable is connected properly. | N/A                           |
|                                                                                  | Inspect the line cables.                       | If failed, repair or replace. |

## 8.5.2 Ultrasonic Power Problems

**Table 8.15** Troubleshooting Ultrasonic Power Problems

| Problem                                                                  | Check                                                                 | Solution                                                                            |
|--------------------------------------------------------------------------|-----------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Ultrasonic power delivered to horn; no indication on bar graph.          | Check connector cables, replace if failed.                            | Replace defective cables.                                                           |
|                                                                          | Test power supply.                                                    | See <a href="#">7.8 Ultrasonics Test Procedure</a> .                                |
| No ultrasonic power generated when Test key pressed; no Alarm indicator. | Failed or missing stack.                                              | Replace.                                                                            |
|                                                                          | RF cable unplugged or failed; replace if failed.                      | Plug in or replace.                                                                 |
|                                                                          | Test power supply ( <a href="#">7.8 Ultrasonics Test Procedure</a> ). | If defective, send unit for repair.                                                 |
| Unable to adjust amplitude using the front panel keypad.                 | Register setting configured to "External Amplitude Control"           | Reset if required. See <a href="#">7.5 Configuring the Power Supply Registers</a> . |
| Unable to remote control.                                                | I/O cabling                                                           | Repair or replace.                                                                  |
|                                                                          | Customer's switching device                                           | Test/inspect/repair/replace.                                                        |

## 8.5.3 Weld Cycle Problems

**Table 8.16** Troubleshooting Weld Cycle Problems

| Problem                                                                           | Check                                                                      | Solution                                                                         |
|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| Full ultrasonic power not delivered.                                              | Unsuitable horn or booster selection.                                      | Contact Branson Applications Lab                                                 |
|                                                                                   | Plastic part material varies.                                              |                                                                                  |
|                                                                                   | Mold release lubricant in weld area.                                       |                                                                                  |
|                                                                                   | Unsuitable joint design.                                                   |                                                                                  |
|                                                                                   | Unsuitable or misaligned part fixture.                                     |                                                                                  |
|                                                                                   | Amplitude setting                                                          | Adjust if required.                                                              |
| No ultrasonic power passed to horn.                                               | Power supply overheating.                                                  | If defective, send unit for repair.                                              |
| Alarm indicator illuminates when you press the Test key or during the weld cycle. | Check converter-booster-horn stack interface for fretting corrosion.       | See <a href="#">8.2.2 Recondition the Stack (Converter, Booster, and Horn)</a> . |
|                                                                                   | Check for loose or failed horn converter or booster.                       | Tighten or replace as needed.                                                    |
|                                                                                   | Check for loose or failed horn or booster stud.                            |                                                                                  |
|                                                                                   | Failed RF cable                                                            | Replace if failed.                                                               |
| Excessively warm horn, booster, and converter; occasional overloads.              | Check converter-booster-horn stack mating surfaces for fretting corrosion. | See <a href="#">8.2.2 Recondition the Stack (Converter, Booster, and Horn)</a> . |
|                                                                                   | Be certain proper cooling has been provided.                               | If defective, send unit for repair.                                              |

## 8.6 Cold Start Procedure

The power supply internal memory stores the system default settings and the registers that you set. It also provides temporary storage to support the power supply internal functions. A cold start clears and restores all the power supply settings back to the original factory defaults. It is not necessary to perform a cold start during normal operation and servicing, but you might find a cold start helpful when:

- You suspect the system is not operating properly
- You want to make a new setup
- Some system memory registers, such as Software version, will not be cleared by this Cold Start procedure

### 8.6.1 Performing a Cold Start

| NOTICE                                                                            |                                                                                                                                                                                                                                                                                   |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  |                                                                                                                                                                                                                                                                                   |
|                                                                                   | Using the Cold Start procedure will erase the current Amplitude Setting, the IP address and some of the Registers that you set. Be sure you have a record of your setup if you want to retain it or use the system backup feature from the DCX A Power Supply Web Page Interface. |

**Table 8.17** Steps to Perform a Cold Start

| Step | Action                                                           |
|------|------------------------------------------------------------------|
| 1    | Turn off the power supply.                                       |
| 2    | Connect together pins 4 and 10 on the 26-pin User I/O Connector. |
| 3    | Turn on the power supply.                                        |
| 4    | After the power up sequence ends, turn off the power supply      |
| 5    | Disconnect pins 4 and 10 of the 26-pin on User I/O Connector.    |



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## Appendix A: Alarms

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|             |                                               |            |
|-------------|-----------------------------------------------|------------|
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## A.1 Overload Alarms (Group 0)

This group includes all overload alarms that can occur during a weld cycle. This overload group will abort the weld cycle after stopping the sonics.

**Table A.1** Overload Alarms (Group 0)

| LCD Alarm Code | Alarm                             | Description                                                                                                                                                                                                                               |
|----------------|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| E0:01          | Weld Overload - Phase             | This alarm is generated in case of weld phase is out of weld phase limit for weld phase limit time period.                                                                                                                                |
| E0:02          | Weld Overload - Current           | This alarm is generated in case of weld current reaches to peak RF current limit of the system.                                                                                                                                           |
| E0:03          | Weld Overload - Frequency         | This alarm is generated in case of weld frequency is out of weld frequency low and high limit window.                                                                                                                                     |
| E0:04          | Weld Overload - Power             | This alarm is generated in case of weld power reaches to peak RF power limit of the system.                                                                                                                                               |
| E0:05          | Weld Overload - Voltage           | This alarm is generated in case of voltage during weld reaches to peak RF voltage limit of the system.                                                                                                                                    |
| E0:06          | Weld Overload - Temperature       | <p>This alarm is generated in case of temperature inside the system (at the heat sink) reaches to 85° C (<math>\pm 5^\circ</math> C).</p> <p><b>NOTICE</b><br/>Alarm cannot be cleared until the temperature returns below threshold.</p> |
| E0:11          | Energy Brake Overload - Phase     | This alarm is generated in case of phase is out of weld phase limit for weld phase limit time period during energy breaking.                                                                                                              |
| E0:12          | Energy Brake Overload - Current   | This alarm is generated in case of weld current reaches to peak RF current limit of the system during energy breaking.                                                                                                                    |
| E0:13          | Energy Brake Overload - Frequency | This alarm is generated in case of weld frequency is out of weld frequency low and high limit window during energy breaking.                                                                                                              |
| E0:14          | Energy Brake Overload - Power     | This alarm is generated in case of weld power reaches to peak RF power limit of the system during energy breaking.                                                                                                                        |
| E0:15          | Energy Brake Overload - Voltage   | This alarm is generated in case of voltage during weld reaches to peak RF voltage limit of the system during energy breaking.                                                                                                             |

**Table A.1** Overload Alarms (Group 0)

| LCD Alarm Code | Alarm                               | Description                                                                                                                                                                                                                                                      |
|----------------|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| E0:16          | Energy Brake Overload - Temperature | <p>This alarm is generated in case of temperature inside the system (at the heat sink) reaches to 85° C (<math>\pm 5^\circ</math> C) during energy breaking.</p> <p><b>NOTICE</b><br/>Alarm cannot be cleared until the temperature returns below threshold.</p> |

## A.2 Cutoff Alarms (Group 1)

This groups includes all cutoff alarms. Cutoff alarms are defined as a limit on a parameter, that when exceeded, will stop ultrasonics. The remaining portion of a weld cycle will continue.

**Table A.2** Cutoff Alarms (Group 1)

| LCD Alarm Code | Alarm                          | Description                                                                                                                                                                                                                          |
|----------------|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| E1:02          | Energy Cutoff                  | Energy cutoff alarm is generated if the energy value during sonics on exceeded to the set cutoff value during a weld.                                                                                                                |
| E1:03          | Power Cutoff                   | Power cutoff alarm is generated if the peak power value during sonics on exceeded to the set cutoff value.                                                                                                                           |
| E1:04          | Custom Input1 Cutoff           | User can configure one of the user analog input as a Custom Input1 and also set a cutoff value from that input. System will generate custom Input1 Cutoff alarm if the user input voltage exceeds from the cutoff value set by user. |
| E1:05          | Time Cutoff (Maximum Time-out) | User can set a time cutoff for weld and the alarm will be generated if the sonic on time during weld exceeds to the set value.                                                                                                       |
| E1:06          | Frequency Low Cutoff           | User can set frequency low cutoff (negative offset to be applied from weld start frequency) for weld and the alarm will be generated if the frequency during weld goes below to the weld start frequency minus set value.            |
| E1:07          | Frequency High Cutoff          | User can set frequency high cutoff (positive offset to be applied from weld start frequency) for weld and the alarm will be generated if the frequency during weld goes above to the weld start frequency plus set value.            |
| E1:08          | Custom Input2 Cutoff           | User can configure one of the user analog input as a Custom Input2 and also set a cutoff value from that input. System will generate Custom Input2 cutoff alarm if the user input voltage exceeds from the cutoff value set by user. |

## A.3 Setup Alarms (Group 2)

This group includes all alarms that can occur during setup.

**Table A.3** Setup Alarms (Group 2)

| LCD Alarm Code | Alarm          | Description                            |
|----------------|----------------|----------------------------------------|
| E2:03          | Invalid Preset | Recalling invalid preset. Preset > 32. |

## A.4 Cycle Modified Alarms (Group 3)

Cycle modified alarms cause the cycle to be modified from the intended parameters. This can be caused by the user or equipment conditions changing. This group of alarms will always abort the cycle.

**Table A.4** Cycle Modified Alarms (Group 3)

| LCD Alarm Code | Alarm                            | Description                                                                                                                                                                                |
|----------------|----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| E3:01          | Trigger Lost During Weld Or Hold | This alarm is generated during a weld cycle in case actuator is present and trigger input is lost before completing the weld (in case of time, energy, peak power and ground detect mode). |
| E3:02          | Cycle Aborted Via User I/O       | This alarm is generated if user aborts the cycle using cycle abort user input.                                                                                                             |

## A.5 Warning Alarms (Group 4)

Warnings occur when a condition is happening that may have been unexpected. This group of alarms does not abort the cycle. This group includes overloads during afterburst because they do not abort the cycle.

**Table A.5** Warning Alarms (Group 4)

| LCD Alarm Code | Alarm                             | Description                                                                                                                                                        |
|----------------|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| E4:04          | Amplitude Step Not Reached        | This alarm is generated if Amplitude Stepping is ON but weld cycle finishes before stepping take places.                                                           |
| E4:05          | Sonics Disabled Via User I/O      | This alarm indicates the user has enabled an input pin as "Sonics Disable" and has run a cycle with this input active.                                             |
| E4:11          | Afterburst Overload - Phase       | This alarm is generated in case of afterburst phase is out of Weld Phase limit for Weld Phase limit time period.                                                   |
| E4:12          | Afterburst Overload - Current     | This Alarm is generated in case of weld current reaches to peak RF current limit of the system during afterburst.                                                  |
| E4:13          | Afterburst Overload - Frequency   | This alarm is generated in case of Weld Frequency is out of Weld Frequency Low and High limit window during afterburst.                                            |
| E4:14          | Afterburst Overload - Power       | This alarm is generated in case of weld power reaches to peak RF power limit of the system during afterburst.                                                      |
| E4:15          | Afterburst Overload - Voltage     | This alarm is generated in case of weld voltage reaches to peak RF voltage limit of the system during afterburst.                                                  |
| E4:16          | Afterburst Overload - Temperature | <p>The internal heat sink temperature is greater than allowed.</p> <p><b>NOTICE</b><br/>Alarm cannot be cleared until the temperature returns below threshold.</p> |

## A.6 Limit Alarms (Group 5)

Limits will be reported at the end of the weld, but, unlike cutoffs, will not stop the sonics or abort the cycle.

**Table A.6** Limit Alarms (Group 5)

| LCD Alarm Code | Alarm                | Description                                                                                                     |
|----------------|----------------------|-----------------------------------------------------------------------------------------------------------------|
| E5:03          | Power - Minus Limit  | This alarm is generated at the end of the cycle in case of Weld peak power is lower than the Power Minus limit. |
| E5:04          | Power - Plus Limit   | This alarm is generated at the end of the cycle in case of Weld peak power is bigger than the Power Plus limit. |
| E5:05          | Time - Minus Limit   | This alarm is generated at the end of the cycle in case of Weld time is lower than the Time Minus limit.        |
| E5:06          | Time - Plus Limit    | This alarm is generated at the end of the cycle in case of Weld time is bigger than the time Plus limit.        |
| E5:07          | Energy - Minus Limit | This alarm is generated at the end of the cycle in case of Weld energy is lower than the energy Minus limit.    |
| E5:08          | Energy - Plus Limit  | This alarm is generated at the end of the cycle in case of Weld energy is bigger than the energy Plus limit.    |

## A.7 Equipment Failure Alarms (Group 6)

Equipment alarms are caused by user equipment malfunction. These alarms occur before a cycle starts and therefore, will prevent a cycle from starting until the malfunction is corrected.

| NOTICE                                                                            |                                                                  |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------|
|  | Alarm message will not reset until the malfunction is corrected. |

**Table A.7** Equipment Failure Alarms (Group 6)

| LCD Alarm Code | Alarm                           | Description                                                                                                                                                                           |
|----------------|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| E6:01          | Start Input Still Active        | This alarm is generated if External Start/ Cycle Start/Trigger signal is active for more than 4 seconds after finishing the weld or while system is waiting to come into ready state. |
| E6:02          | Trigger Active While ULS Active | This alarm is generated any time if Trigger and ULS both becomes active.                                                                                                              |
| E6:03          | Trigger Active In Ready         | This alarm is generated if Trigger signal becomes active while system is in ready state and actuator is present.                                                                      |
| E6:04          | ULS Not Active In Ready         | This alarm is generated if actuator is present and ULS is not active while system is already in ready state.                                                                          |
| E6:05          | Ground Detect Active In Ready   | This alarm is generated if ground detect signal becomes active while system is in ready state.                                                                                        |
| E6:07          | Cable Failure - User I/O        | The cable detect user I/O feature has been enabled and detected that the assigned pin does not have the voltage applied.                                                              |
| E6:09          | Start Input Lost                | This alarm is generated when source of cycle start is removed before Trigger comes.                                                                                                   |
| E6:10          | Cycle Abort In Ready            | This alarm is generated if Cycle Abort signal becomes active while system is in ready state.                                                                                          |
| E6:11          | ULS Time Out                    | This alarm is generated if Actuator is present and ULS does not become active with a time-out at the end of the cycle.                                                                |

**Table A.7** Equipment Failure Alarms (Group 6)

| LCD Alarm Code | Alarm                  | Description                                                                                                                                                                                                                                           |
|----------------|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| E6:12          | ULS Active During Weld | This alarm is generated if System is waiting for TRS and ULS becomes active. After TRS is active and system jumps to next state of cycle this alarm is generated when ULS becomes active during cycle along with "TRS active while ULS Active" alarm. |

## A.8 No Cycle Alarms (Group 7)

No cycle alarms are caused by possible mechanical setup errors or user errors. These are usually time out errors because an expected input did not occur in time. They will prevent a cycle from continuing. So although a cycle may have started, the cycle will be aborted.

**Table A.8** No Cycle Alarms (Group 7)

| LCD Alarm Code | Alarm                                     | Description                                                                                                                                           |
|----------------|-------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| E7:01          | ULS Time-Out (Start Of Cycle)             | A cycle start has been received but the upper limit switch has not gone inactive within the time-out specified by the system.                         |
| E7:02          | Trigger Time-Out                          | A cycle has been started, but the trigger input has not gone active within the time-out specified by the system.                                      |
| E7:03          | External Sonics Delay Time-Out (User I/O) | The system is waiting for an external user defined input (if configured), but has not received the input within the time-out specified by the system. |
| E7:04          | Interlock Not In Place (User I/O)         | The system is waiting for a valid status from a user defined Interlock input (if configured), but the input is not active at the time of Cycle start. |
| E7:05          | RF Switch Feedback Failure                | A feedback signal from the RF switch not was not received within the time specified by the user.                                                      |
| E7:06          | Part Not In Place (User I/O)              | The system is waiting for an external user defined input, but the input is not active at the Cycle Start.                                             |
| E7:07          | Stack Number Not Valid For RF Switching   | An invalid horn number is being requested from the preset. Any values outside the range of 16 horn numbers will cause an alarm.                       |

## A.9 Communication Failure Alarms (Group 8)

This group handles any communication issue that occur between processors. This is generally the result of noisy environments or other conditions that interrupt communications. Physical cable failures will be included in the Hardware Failure group. Because data cannot be transmitted between internal hardware, the cycle will be aborted.

| NOTICE                                                                            |                                                                  |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------|
|  | Alarm message will not reset until the malfunction is corrected. |

**Table A.9** Communication Failure Alarms (Group 8)

| LCD Alarm Code | Alarm                        | Description                                                                               |
|----------------|------------------------------|-------------------------------------------------------------------------------------------|
| E8:01          | Modbus Communication Failure | Internal communication failure.                                                           |
| E8:02          | LCD Communication Failure    | Communication between the LCD user interface and the internal weld controller has failed. |

## A.10 Hardware Alarms (Group A)

This group of alarms will deal with internal equipment failures. This will generally be equipment that is supplied by Branson as part in the internal workings of the power supply. Cycles cannot be started if there is a Hardware alarm. If a cycle is in process when the alarm is detected then the cycle is aborted.

| NOTICE                                                                            |                                                                  |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------|
|  | Alarm message will not reset until the malfunction is corrected. |

**Table A.10** Hardware Alarms (Group A)

| LCD Alarm Code | Alarm                          | Description                                                                      |
|----------------|--------------------------------|----------------------------------------------------------------------------------|
| EA:01          | LCD NOVRAM Failure             | LCD NOVRAM is not working.                                                       |
| EA:02          | FRAM or NOVRAM Failure         | FRAM or NOVRAM is not working.                                                   |
| EA:03          | SD RAM Failure                 | SD RAM is now working.                                                           |
| EA:04          | Connection Failure - WC to LCD | The physical connection between the WC board and LCD board is missing or broken. |
| EA:05          | Connection Failure - WC to DCP | The physical connection between the WC board and DCP board is missing or broken. |
| EA:06          | AC Line Voltage Lost           | The AC line voltage to the system is lost but the 24 V supply is still present.  |
|                |                                | ES bit activated, check ZSW1 Low Byte.                                           |

## A.11 Non-Cycle Overload Alarms (Group B)

This group deals with overloads that occur outside of a weld cycle. By definition a weld is not in process so the weld cycle counter is not affected and the weld is not aborted.

**Table A.11** Non-Cycle Overload Alarms (Group B)

| LCD Alarm Code | Alarm                       | Description                                                                                                                                                                                                                                           |
|----------------|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Eb:01          | Seek Overload - Phase       | This alarm is generated in case of phase during Seek reaches to peak RF phase limit of the system.                                                                                                                                                    |
| Eb:02          | Seek Overload - Current     | This alarm is generated in case of current during Seek reaches to peak RF current limit of the system.                                                                                                                                                |
| Eb:03          | Seek Overload - Frequency   | This alarm is generated in case of Frequency during seek is out of Seek Frequency Low and High limit window.                                                                                                                                          |
| Eb:04          | Seek Overload - Power       | This alarm is generated in case of Power during seek reaches to peak RF Power limit of the system.                                                                                                                                                    |
| Eb:05          | Seek Overload - Voltage     | This alarm is generated in case of Voltage during seek reaches to peak RF voltage limit of the system.                                                                                                                                                |
| Eb:06          | Seek Overload - Temperature | <p>This alarm is generated in case of temperature inside the system (at the heat sink) reaches to 85° C (<math>\pm 5^\circ</math> C) during Seek.</p> <p><b>NOTICE</b><br/>Alarm cannot be cleared until the temperature returns below threshold.</p> |
| Eb:11          | Test Overload - Phase       | This alarm is generated in case of phase during Test reaches to peak RF phase limit of the system.                                                                                                                                                    |
| Eb:12          | Test Overload - Current     | This alarm is generated in case of current during Test reaches to peak RF current limit of the system.                                                                                                                                                |
| Eb:13          | Test Overload - Frequency   | This alarm is generated in case of Frequency during seek is out of Test Frequency Low and High limit window.                                                                                                                                          |
| Eb:14          | Test Overload - Power       | This alarm is generated in case of Power during Test reaches to peak RF Power limit of the system.                                                                                                                                                    |
| Eb:15          | Test Overload - Voltage     | This Alarm is generated in case of Voltage during Test reaches to peak RF voltage limit of the system.                                                                                                                                                |

**Table A.11** Non-Cycle Overload Alarms (Group B)

| LCD Alarm Code | Alarm                       | Description                                                                                                                                                                                                                                           |
|----------------|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Eb:16          | Test Overload - Temperature | <p>This alarm is generated in case of temperature inside the system (at the heat sink) reaches to 85° C (<math>\pm 5^\circ</math> C) during Test.</p> <p><b>NOTICE</b><br/>Alarm cannot be cleared until the temperature returns below threshold.</p> |



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# Appendix B: Timing Diagrams

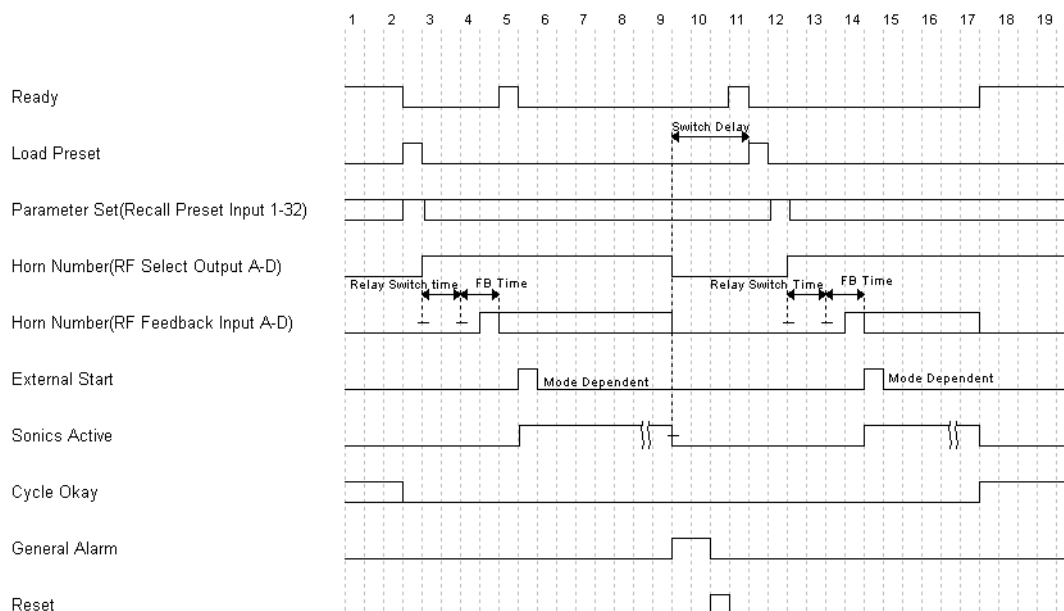
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**B.1 Timing Diagrams ..... 170**

## B.1 Timing Diagrams

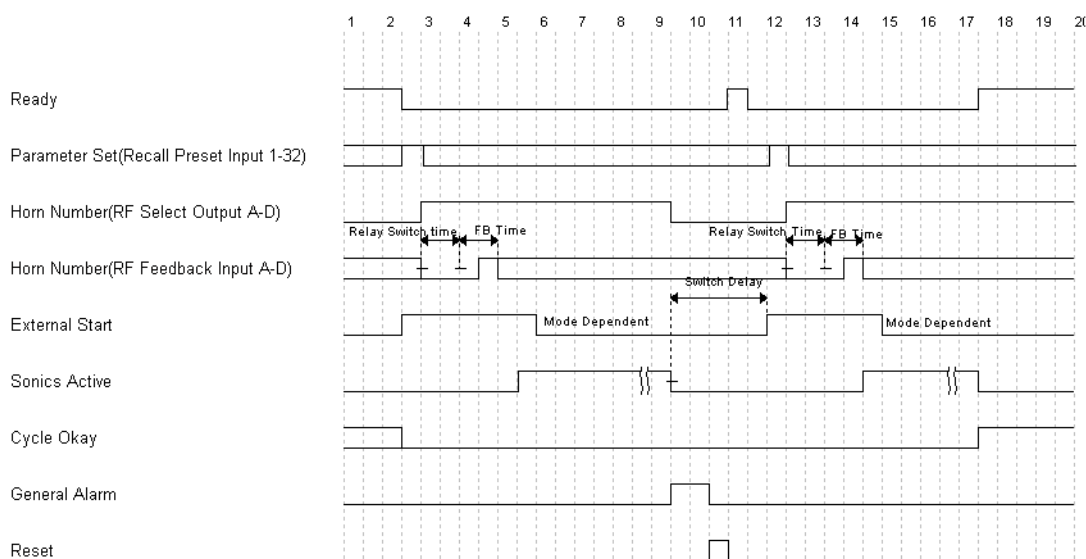
### B.1.1 RF Switching I/O Direct With Feedback With And Without Alarm

**Figure B.1** RF Switching I/O Direct With Feedback With And Without Alarm



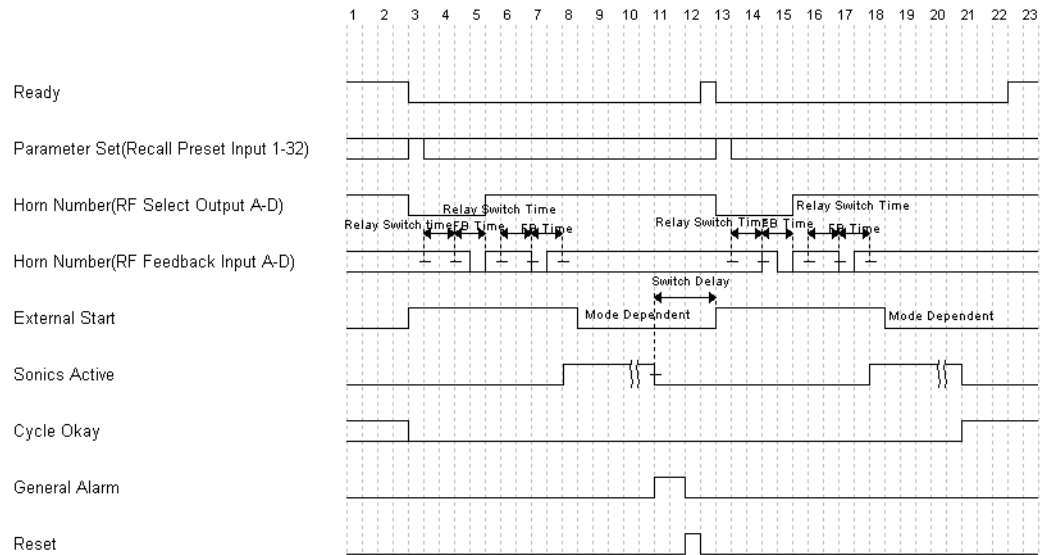
### B.1.2 RF Switching I/O Direct With Feedback With And Without Alarm And Load On Start

**Figure B.2** RF Switching I/O Direct With Feedback With And Without Alarm And Load On Start



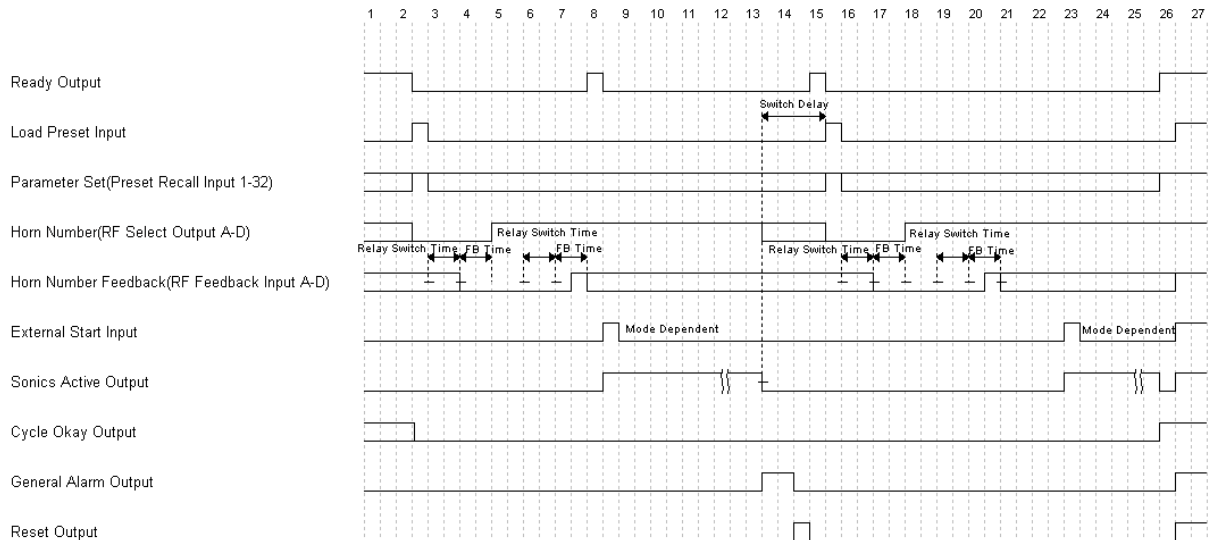
## B.1.3 RF Switching I/O With Off With And Without Alarm And Load On Start

**Figure B.3** RF Switching I/O With Off With And Without Alarm And Load On Start



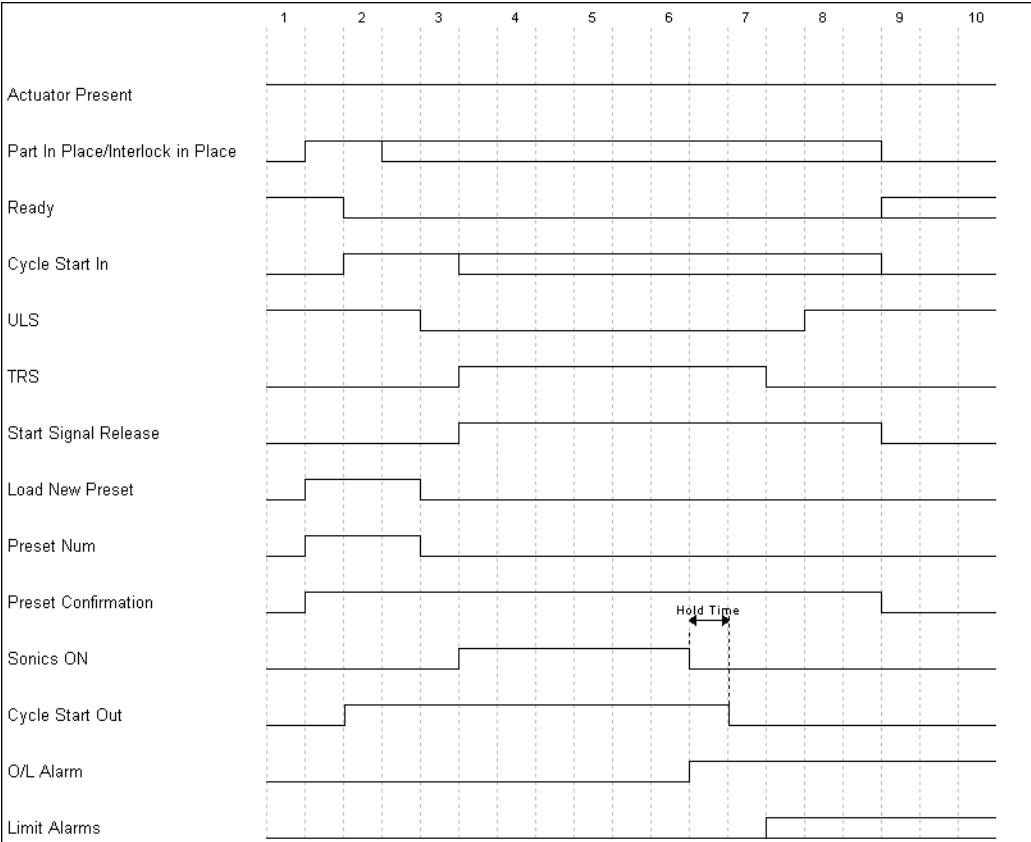
## B.1.4 RF Switching I/O With Off With Feedback With And Without Alarm

**Figure B.4** RF Switching I/O With Off With Feedback With And Without Alarm



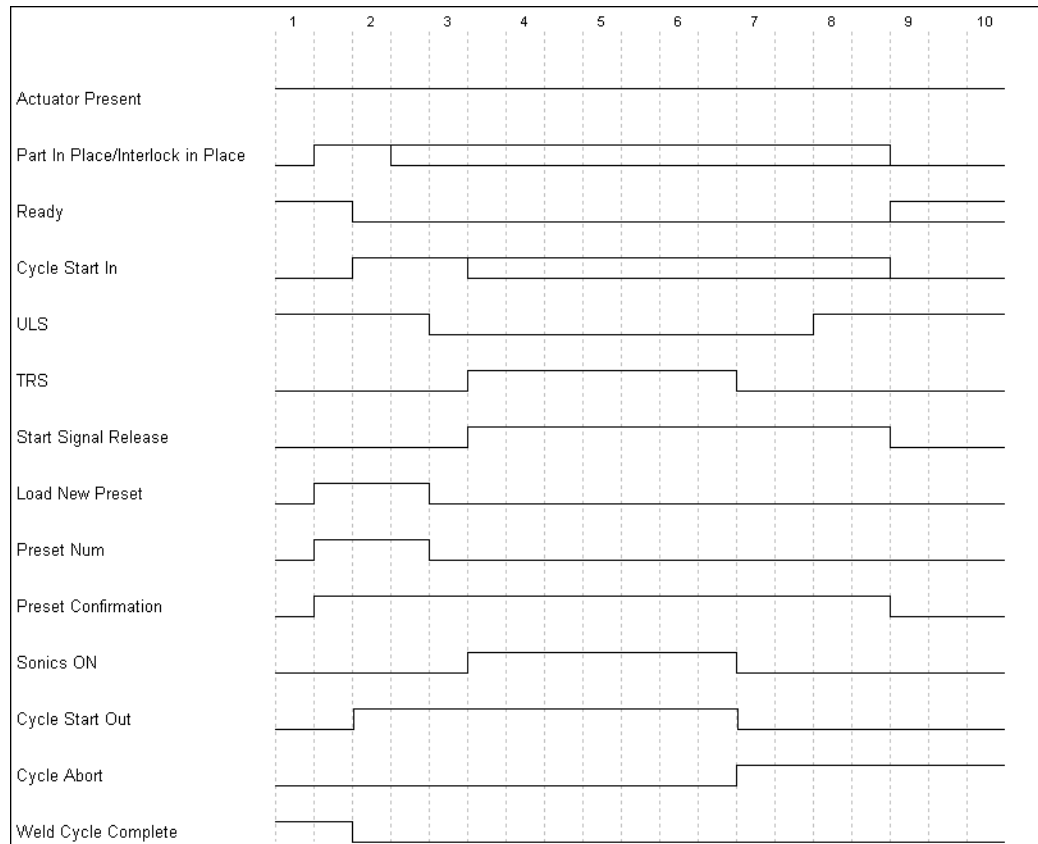
B.1.5 Timing Diagram For All Other Modes With Actuator

Figure B.5 Timing Diagram For All Other Modes With Actuator



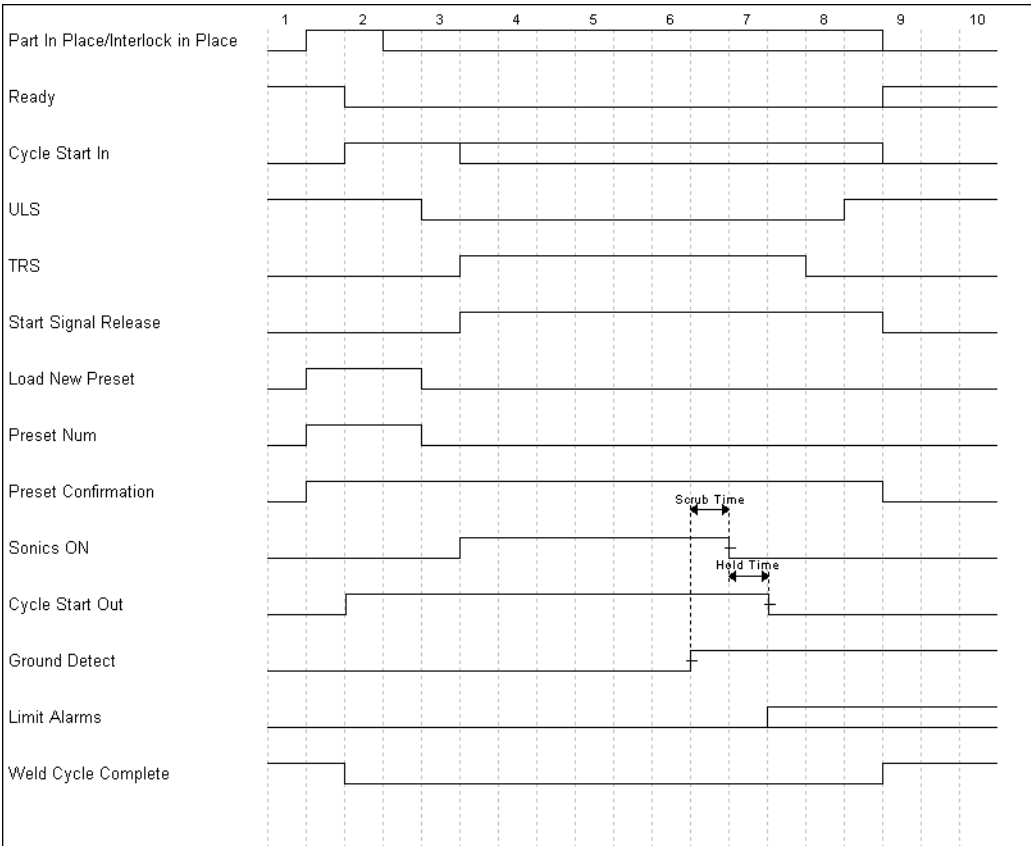
## B.1.6 Timing Diagram For Cycle Abort With Actuator

**Figure B.6** Timing Diagram For Cycle Abort With Actuator



B.1.7 Timing Diagram For Ground Detect With Actuator

Figure B.7 Timing Diagram For Ground Detect With Actuator



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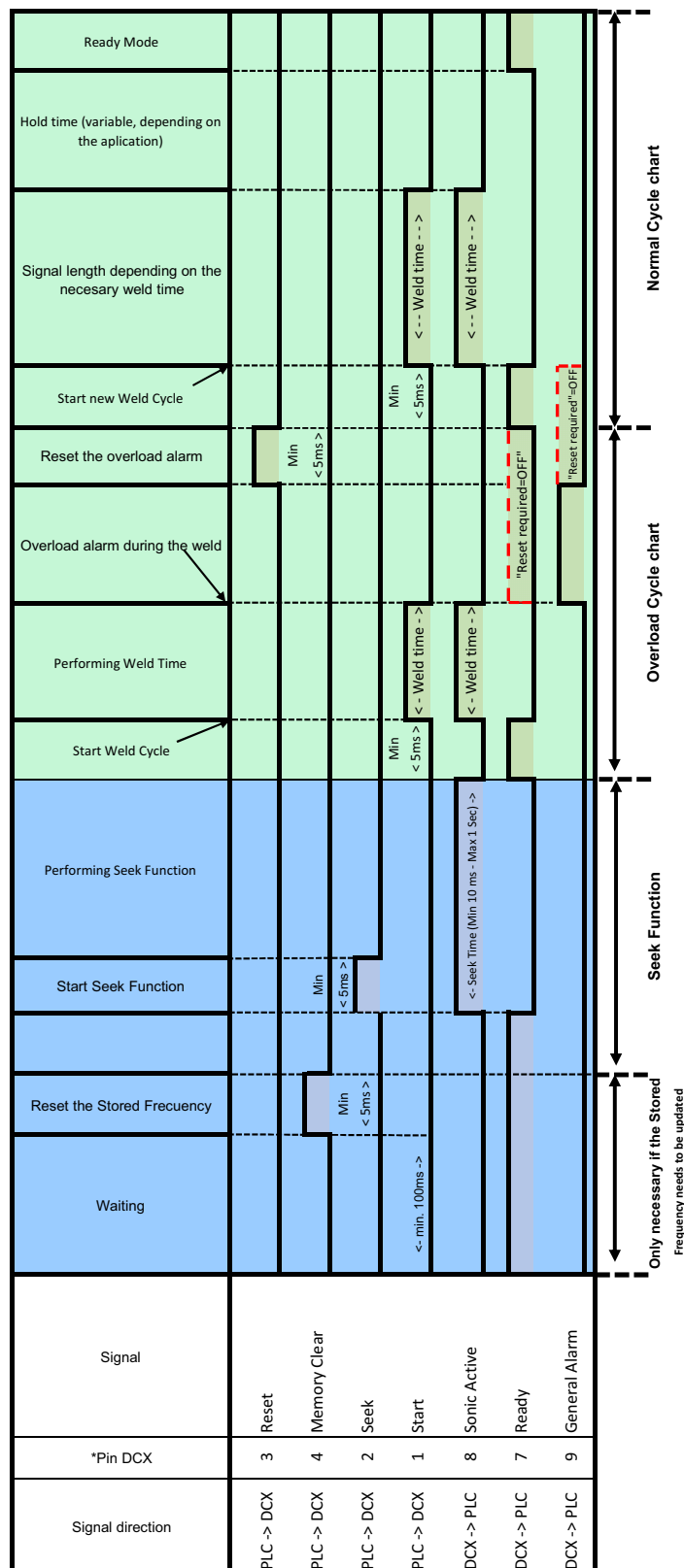
# Appendix C: Signal Diagrams

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**C.1   Signal Diagrams . . . . . 176**

## C.1 Signal Diagrams

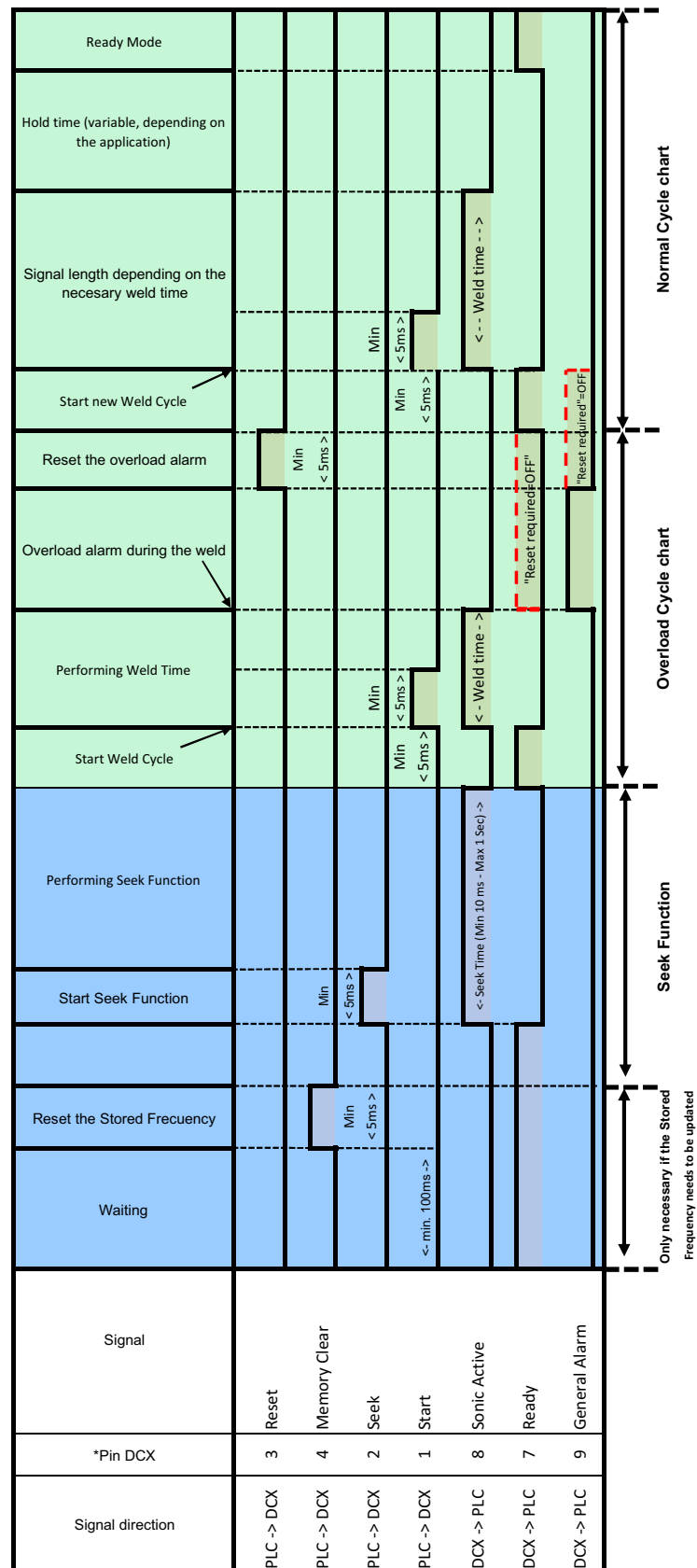
Figure C.1 Continuous Mode



\*Inputs/Outputs are configurable on the User I/O Configuration webpage.

--- If Reset Required is unchecked for Overload in Alarm Webpage interface, Ready signal will be enabled after Start switch is released.

**Figure C.2** Time Mode



\*Inputs/Outputs are configurable on the User I/O Configuration webpage.

--- If Reset Required is unchecked for Overload in Alarm Webpage interface, Ready signal will be enabled when General Alarm becomes active.



---

## **Appendix D: Manual's Revisions**

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|            |                                     |            |
|------------|-------------------------------------|------------|
| <b>D.1</b> | <b>Manual's Revisions . . . . .</b> | <b>180</b> |
|------------|-------------------------------------|------------|

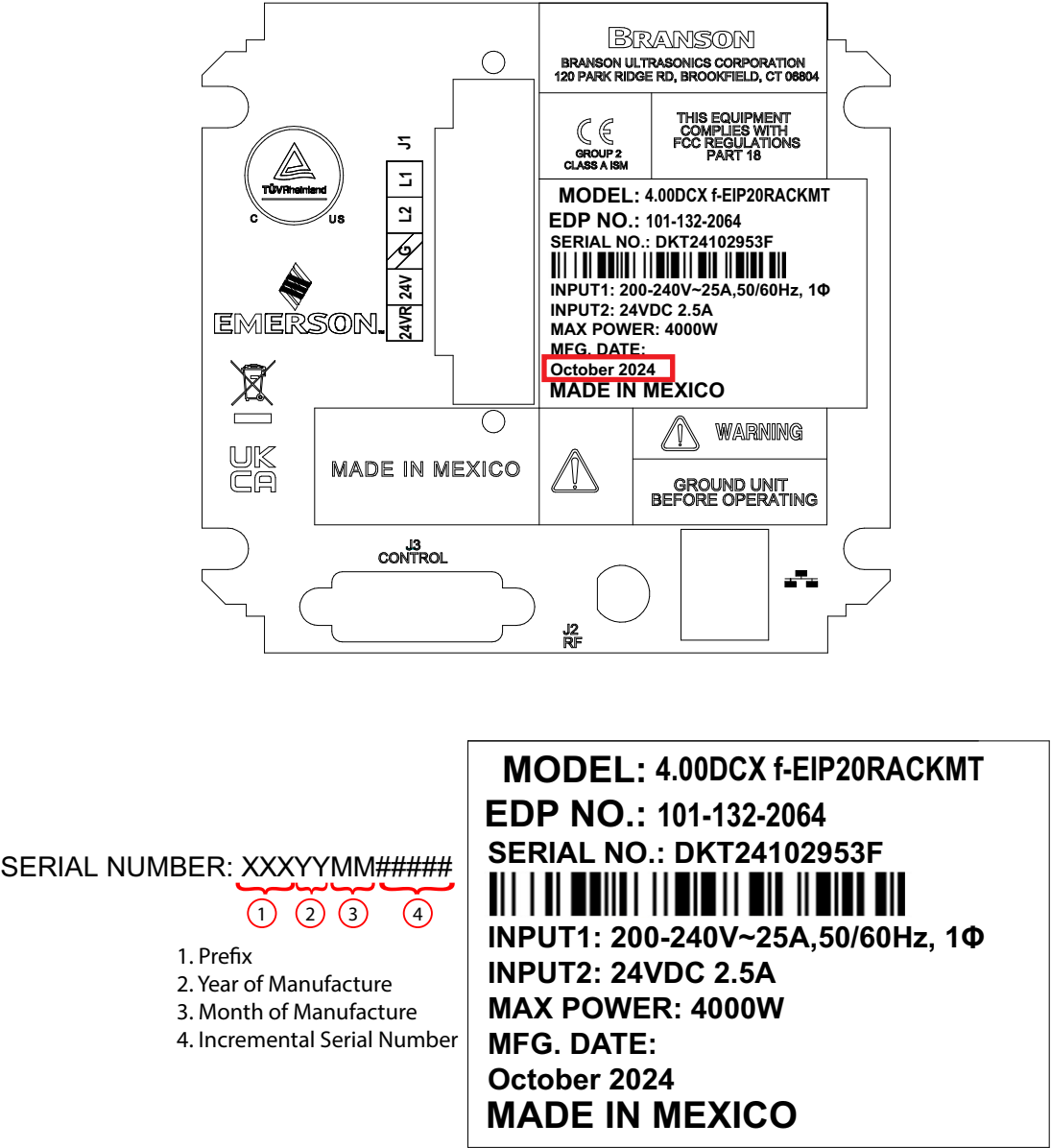
D.1 Manual’s Revisions

Refer to the table below for the appropriate manual revision depending on your Power Supply’s manufacturing date.

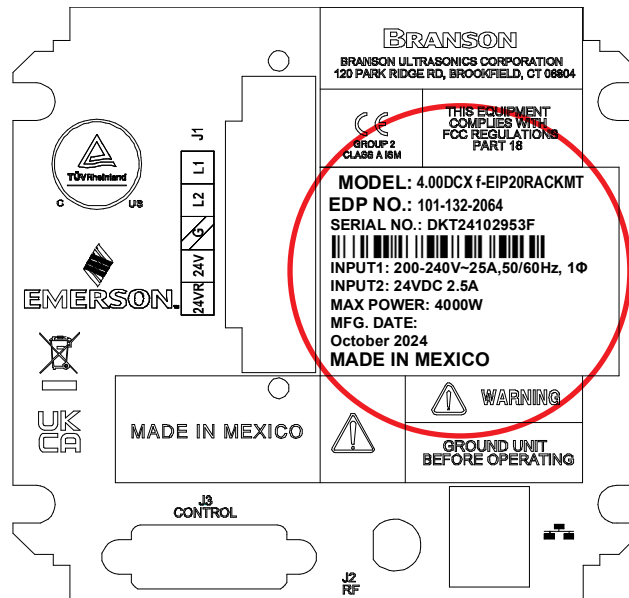
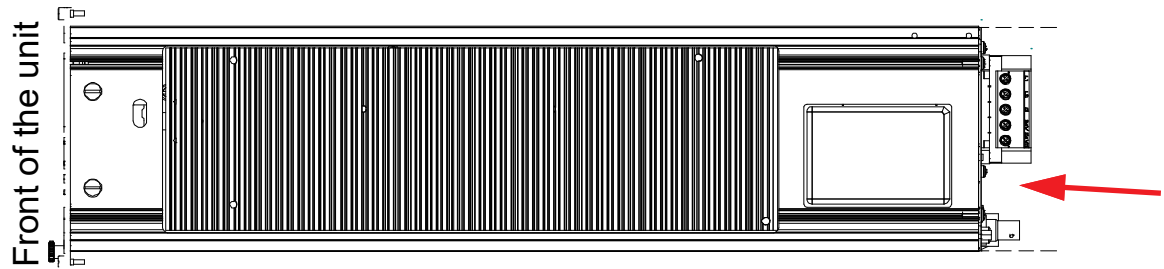
Table D.1 Manual’s Revisions

| Manual’s Revisions | Power Supply’s Manufacturing Date |                |
|--------------------|-----------------------------------|----------------|
|                    | From                              | To             |
| 00                 | May 2022                          | September 2024 |
| 01                 | October 2024                      | To date        |

Figure D.1 Manufacturing date on the Information label



**Figure D.2** Location of the Information label on the back of the DCX A Power Supply Rack Mount





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