iQ Series
ULTRASONIC PRESS SYSTEM

User's Manual

Dukane Part No. 403–586-02
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Dukane Intelligent Assembly Solutions
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Specifications subject to change without notice.

This user’s manual documents product features, hardware, and controls software available at the time this user’s manual was published.

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### SECTION 1

**Introduction**

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General User Information

Read This Manual First
Before operating your ultrasonic system, read this User’s Manual to become familiar with the equipment. This will ensure correct and safe operation. The manual is organized to allow you to learn how to safely operate this equipment. The examples given are chosen for their simplicity to illustrate basic operation concepts.

This manual provides information to set up, operate, and interface this generator/power supply as an integral part of Dukane’s iQ Series LE press system. Particular models are listed in Section 12 - Specifications.

Notes, Cautions and Warnings
Throughout this manual we use NOTES to provide information that is important for the successful application and understanding of the product. A NOTE block is shown to the right.

In addition, we use special notices to make you aware of safety considerations. These are the CAUTION and WARNING blocks as shown here. They represent increasing levels of important information. These statements help you to identify and avoid hazards and recognize the consequences. One of three different symbols also accompany the CAUTION and WARNING blocks to indicate whether the notice pertains to a condition or practice, an electrical safety issue or an operator protection issue.

Drawings and Tables
The figures and tables are identified by the section number followed by a sequence number. The sequence number begins with one in each section. The figures and tables are numbered separately. The figures use Arabic sequence numbers (e.g. –1, –2, –3) while the tables use roman sequence numerals (e.g. –I, –II, –III). As an example, Figure 3–2 would be the second illustration in section three while Table 3–II would be the second table in section three.

NOTE
Note statements provide additional information or highlight procedures.

CAUTION
Caution statements identify conditions or practices that could result in damage to the equipment or other property.

WARNING
Warning statements point out conditions or practices that could result in personal injury or loss of life.

Condition or Practice
Electrical Safety Issue
Operator Protection (hearing)
Press System Overview

An iQ Series Ultrasonic Press System LE consists of these components: the iQ generator, and press (with thruster, switches, controls, and cables). Typically, transducer, booster, horn, and fixture are included as well.

The iQ Series LE generator has rugged internal ultrasonic circuitry and ensures a continuous resonant frequency lock at the start of each weld.

The generator’s compact size allows multiple units to be placed into an industrial equipment cabinet. This generator will operate at the same international line voltage input specifications as the other generators of this product family. It also includes an RFI line filter that passes FCC and strict CE test specifications for global applications.

Key Generator Features

- **Generator Interface** has a 5.2" LCD display and soft keys that enhance the intuitive menu navigation.
- **Digital Control** of all power supply functions, including digital frequency synthesis, and parameters allows for unique configurations and allows for future upgrades. **Process Parameters** such as frequency, amplitude and power are all updated at a 0.5 ms rate.
- **Pulse Width Modulation** incorporates patented circuitry giving the power supply the ability to efficiently change the output amplitude. This makes it possible to start large horns with reduced power. It also provides more power-efficient switch-mode generator operation and increased reliability.
- **Linear Ramp Soft-Start** circuitry allows the acoustic stack to be brought to operating amplitude smoothly, minimizing start-up surges and abnormal stress to the stack and generator.
- **Digi-Trac Tuning** tracks the resonant frequency of the acoustic stack (horn, booster, transducer) and adjusts the generator output frequency to match it. This is done for every weld cycle and eliminates the need to manually tune the generator.
- **Line Voltage Regulation** automatically maintains constant amplitude regardless of line voltage deviation. The available output power is maintained with any voltage input within the specified range. This provides consistent system performance regardless of line voltage fluctuations. It also eliminates the need for bulky, external constant–voltage transformers.
- **Load Regulation** provides constant ultrasound amplitude automatically regardless of power draw. The ultrasonic output amplitude level is held to within ±1% to provide weld process consistency and reduced weld cycle times.
- **High Line Voltage Power Supply** means that standard systems will operate worldwide at the local high line voltage level, whether it is 200VAC @60Hz in Japan, 240VAC @50Hz in Europe or 208VAC @60Hz in the United States. There are no internal transformer taps to change for worldwide operation.
- **Low Line Voltage Power Supply** - This optional 120V power supply is designed for North American applications.
- **Flow Through Cooling Tunnel** with a matched high–performance heatsink and thermostatically controlled fan reduces thermal gradients and increases component life.
- **AC Power Inrush** protection reduces electrical stress on the internal components by protecting them from AC power startup transient current surges.
- **Multiple Electronic Overload** protection circuits prevent instantaneous component failure in the event of extreme output overload conditions. The overload power limit is based on the actual true RMS power output level.
- **Process Limits** include: time, energy and distance if supported. These programmable limits provide the means to adapt to a wide variety of welding applications.
- **Rear Panel Expansion Slot** is available to allow for custom configurations for OEM and cost effective solutions.
- **RS232 Serial Configuration Port** is used for field software upgrades, troubleshooting and advanced hardware setup with optional PC-based configurator.
- **CE Certification** means that the system meets the required European standards to be sold and used in Europe (high line voltage models only).
- **ISO 9001 Certification** means that this system has been manufactured to high quality standards and assures you of manufacturing excellence.
SECTION 2

Health and Safety

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General Considerations

Please observe these health and safety recommendations for safe, efficient, and injury-free operation of your equipment.

Proper Installation - Operate system components only after they are properly installed.

No Unauthorized Modifications - Do not modify your system in any way unless authorized to do so by Dukane Corporation. Unauthorized modifications could cause equipment damage and/or injury to the operator. In addition, unauthorized modifications will void equipment warranty.

Keep the Cover On - Do not remove any equipment cover unless directed to do so by Dukane Corporation. The generator produces hazardous electrical voltages which could cause injury.

Grounded Electrical Power - Operate this equipment only with a grounded electrical connection.

See Electrical Safety for grounding instructions, Page 8.

Comply with Regulations - You may be required to add accessories to bring the system into compliance with applicable regulations (OSHA in the USA) for machine guarding and noise exposure.

Use Eye Protection - Wear ANSI approved safety impact goggles.

Acoustic Stack Hazard - When an acoustic stack (transducer, booster, horn and tip) is energized by the ultrasound signal, it presents a potential hazard. Stay clear of an energized stack.

System Abort Switch - Install a system abort switch at each operator station when ultrasonic plastic assembly equipment is used with automatic material handling equipment in an automated system.

Foot Switch - Using a foot switch in place of the optical touch finger switches (activation switches) violates OSHA regulations.

NOTE
These recommendations apply to the welding system. System in this manual refers to a complete group of components associated with the welding of parts, also known as an ultrasonic assembly system. A typical iQ Series System consists of the iQ generator, a press with thruster, switches, controls, cables, transducer, booster, horn, and fixture.

WARNING
Any fixture manufactured by a third party must comply with all OSHA and ANSI requirements. All fixtures must be guarded as necessary.

Dukane Corporation does not assume any responsibility or liability for fixtures manufactured by the customer or any third party manufacturer.

WARNING
Never operate the generator with the cover off. This is an unsafe practice and may cause injury.

CAUTION
At some time you may be asked to remove equipment covers by the Dukane Service Dept. personnel. Before doing so, disconnect the unit electrically from the incoming line AC power. If the unit is a press/thruster, lock the Air Lockout Valve, located on the rear panel, in its closed position.
Continued from Previous Page

General Considerations

Pre-trigger Switch Adjustment - The pre-trigger switch option starts the horn vibrating before contacting the part to be welded. To ensure safe operation, adjust the pre-trigger so the ultrasound signal will not activate if the horn is more than ¼ in (7 mm) from the part to be welded.

System Electrical Cabling - Electrical power must be off when connecting or disconnecting electrical cables.

Do Not Wear Loose Clothing or Jewelry - They can become caught in moving parts.

Stay Alert - Watch what you are doing at all times. Use common sense. Do not operate the press when you are tired or distracted from the job at hand.

Do not Operate the Equipment - Your judgement or reflexes could be impaired while taking prescription medications. If so, do not operate the equipment. Be familiar with warning labels and recommended activity restrictions that accompany your prescription medications. If you have any doubt, do not operate the equipment.

Plastics Health Notice

Certain plastic materials, when being processed, may emit fumes and/or gases that may be hazardous to the operator’s health. Proper ventilation of the work station should be provided where such materials are processed. Inquiries should be made to the U.S. Department of Labor concerning OSHA regulations for a particular plastic prior to processing with Dukane ultrasonic equipment.

Electrical Safety

The iq Series generator provides the operating power and power returns. Make sure the generator is grounded properly.

In addition to the safety considerations, proper grounding is essential for the effective suppression of RFI (Radio Frequency Interference). Every generator contains a RFI filter which blocks noise on the AC power line from entering the generator control circuitry. This filter also prevents ultrasonic RFI from being fed back into the AC power line.

If you experience problems with RFI from the press, run an additional grounding wire from the press base grounding stud to the nearest grounded metal pipe or equivalent earth ground by means of a ground clamp. Use at least 14 AWG wire for the connection to the press base.
Domestic Power Grounding

For safety, the power cords used on this product have a three-wire, grounding-type power cord. Figure 2-1 illustrates the appropriate electrical outlet to use with the power cord that is included with systems shipped to North America.

Approved 2 pole, 3 wire grounding receptacle HUBBELL No. 5652 or equivalent to NEMA 6–15R or 6–20R

Figure 2–1 Example of 220/240 Volt, Grounded, 3-Prong Receptacle

International Power Grounding

The power cable normally provided for international use is compatible with the power outlet used in many Continental European countries (Refer to Figure 2–2.) However, if your application requires another type of power cord, check with your equipment supplier, and follow local regulations concerning proper wiring and grounding.

100/120 Volt Systems (North America or Japan)

The power cord (including strain relief) supplied with the 100/120 AC systems is permanently attached to the rear of the generator. Units with this power cord are for use in North America or Japan.

CAUTION

If you have a two-prong electrical receptacle, we strongly recommend that you replace it with a properly grounded three-prong type. Have a qualified electrician replace it following the National Electric Code and any local codes and ordinances that apply.

See Figures 2–1 and 2–2.

CAUTION

If there is any question about the grounding of your receptacle, have it checked by a qualified electrician. Do not cut off the power cord grounding prong, or alter the plug in any way. If an extension cord is needed, use a three-wire cord that is in good condition. The cord should have an adequate power rating to do the job safely. It must be plugged into a grounded receptacle. Do not use a two-wire extension cord with this product.
Lifting the Equipment

How to Lift Safely

• Before lifting, take a moment to think about what you’re about to do.
• Examine the object for sharp corners, slippery spots or other potential hazards. Know your limit and don’t try to exceed it.
• Ask for help if needed, or if possible, divide the load to make it lighter.
• Know where you are going to set the item down, and make sure it and your path are free of obstructions. Then follow these steps:

  Step 1. Stand close to the load with your feet spread apart about shoulder width, with one foot slightly in front of the other for balance.

  Step 2. Squat down bending at the knees (not your waist). Tuck your chin while keeping your back as vertical as possible.

  Step 3. Get a firm grasp of the object before beginning the lift. Begin slowly lifting with your LEGS by straightening them. Never twist your body during this step.

  Step 4. Once the lift is complete, keep the object as close to the body as possible. As the load’s center of gravity moves away from the body, there is a dramatic increase in stress to the lumbar region of the back.

  Step 5. If you must turn while carrying the load, turn using your feet—not your torso. To place the object below the level of your waist, follow the same procedures in reverse order. Remember, keep your back as vertical as possible and bend at the knees.
SECTION 3

Installation

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Before Installation

As you plan for the installation of your system, including generator and press, please consider these important subjects as listed below:

- When to use lockout / tagout devices
- Lifting the equipment safely - See Section 2 - Health and Safety, Page 10.
- Utilities
- Placement

When to Use Lockout / Tagout Devices

The typical kind of LOTO device for a generator is a clam shell type device (with lockout capability). The LOTO device is placed over the plug end of the generator electrical cord. This effectively prevents access to the energy isolation point. See the example of one such device in the figure above.

The figure to the right shows the lockout device in the closed, locked position.

**WARNING**

Electrical safety hazards exist inside the generator chassis. Before making any internal adjustments to the generator, apply a lockout/tagout (LOTO) device to the generator chassis.

---

*Figure 3-1*  Lockout Device In Open Position, Unlocked

*Figure 3-2*  Bottom Lockout Device In Closed Position, Locked

Continued
**Lockout/Tagout**

Procedure to use BEFORE making any internal adjustments to the generator:

1. Push the generator's AC power switch/breaker to the OFF position.
2. Unplug the generator's electrical cord from its source.
3. Authorized personnel apply a lockout/tagout (LOTO) device to the plug end of the generator's electrical cord. Using a typical clam shell type LOTO device:
   1) Open the clam shell.
   2) Place the electrical cord plug end inside the shell.
   3) Close the shell.
   4) Secure the shell with its lock, and lock it.
4. Wait a minimum of five minutes for the generator to discharge its electrical energy.
5. After taking these steps, make the necessary adjustments to the generator.

Assuming the generator is being put back into service.

Procedure to use AFTER making any internal adjustments to the generator:

1. Authorized personnel remove the lockout/tagout device from the plug end of the generator's electrical cord. Using a typical clam shell type LOTO device:
   1) Unlock the protective shell.
   2) Open the shell, exposing the electrical cord end.
   3) Remove the LOTO device, and set it aside.
2. Plug the generator's electrical cord into its AC power source.
3. Push the generator's AC power switch/breaker to the ON position.

**Utilities**

Provide for electricity to meet the equipment specifications as shown in *Section 12, Specifications*.

**CAUTION**

If transducer cooling air is used, this compressed air must be clean, dry and oil free. Any particulate, oil contamination or moisture can coat or clog the transducer. This can result in premature failure of the transducer. Air pressure is determined by the application, transducer power draw and ambient air temperature.

**Placement**

Check that enough space has been set aside for the installation. Equipment dimensions are shown in *Section 12, Specifications*.

In addition, take extra precautions when the installation is made in an active seismic region. See the recommendations for generator installation on the following two pages.
Placing the Generator when Used in an Active Seismic Region

If the \( iQ \) generator is to be used in an active seismic region, secure the unit by rack-mounting it or by securing the unit to a benchtop.

**Rack-Mounting**

Install the four brackets from Dukane’s rack-mount kit to the generator. See Table 3-I, and Figure 3-3 (showing a low profile unit) below.

Mount the generator to a 19-inch equipment rack.

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<td>147-4721</td>
</tr>
<tr>
<td>Low Profile</td>
<td>147-4720</td>
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**Table 3-I** Rack Mount Bracket Part Numbers

**NOTE**

The figure shows how a typical \( iQ \) generator is rack mounted. Your generator’s appearance may be different from what is shown here.

**Figure 3-3** Rack Mounting \( iQ \) Generator - Representative Low-Profile Model Shown

*Continued*
Benchtop Mounting

If you choose to mount the generator on a benchtop follow these instructions:

1. Install the four (4) optional hold down brackets. See Figure 3-4 below.
2. Secure one side of each L bracket to the generator's sheet metal cover.
3. Secure the other side of each L bracket to the bench itself.

NOTE

The figure shows how a representative iQ generator could be benchtop mounted. Your generator’s appearance may be different from what is shown here.

Figure 3-4  Securing iQ Generator to Benchtop - Representative High-Profile Model Shown
Rear Panel Layout Overview

This section provides an overview of the generator rear panel layout, which includes panel areas dedicated to various standard system functions and options that are available. Figure 3-5 illustrates a typical panel layout.

![Figure 3-5 Typical iQ LE Generator Rear Panel Layout](image)

### AC Power Inlet Panel
- **A** IEC Power Inlet Connector – Attaches to an IEC style power cord.
- **B** Power Switch – Circuit Breaker – Used to switch system power ON and OFF.
- **C** Chassis Grounding Stud – Chassis connection for a protective earth ground.

### The System I/O Panel
- **D** System Input Connector (J2) – Connections for system control input signals.
- **E** System Output Connector (J3) – Connections for system status output signals.
- **F** Ultrasound Output Connector (J1) – Coaxial high voltage connection to ultrasonic stack.
- **G** Configuration Port Connector (J4) – Digital control port to modify system parameters.

### Options Module Panel
- **H** Expansion Boards
- **K** Press Interface Module (See NOTE below.)

*Shown in the example above are these ports:
  - J6 - Base/Abort
  - J5 - Thruster
  - J11 - Encoder*

**NOTE**

The press interface module is available in several different configurations. See *Section 6, Options* for more information about the Press Interface Module.
AC Power Inlet Panel
The standard AC power inlet panel is described in this section.

IEC AC Power Inlet Connector
The IEC AC power inlet connector mounted on the system AC power inlet panel requires a properly configured IEC compliant power cord, which enables worldwide system operation by simply changing the power cord.

Low profile systems are equipped with a 10 amp rated IEC inlet connector. The high profile systems include a 16/20 amp rated IEC inlet connector. 120VAC and 3600/4800W systems include a non-detachable power cord.

An appropriately rated power cord must be securely attached to the welding system’s IEC inlet connector. If the correct power cord configuration is not included with the system for the local AC power outlet at your location, an appropriate IEC power cord should be available from a local electrical parts supplier. Note that the system under-voltage lockout will inhibit system operation if a North American power cord configured for 120V is connected to the system. A minimum of 200V is required for the system to operate.

Power Switch/Circuit Breaker
The power switch/circuit breaker has a rocker type actuator switch that will activate or deactivate the AC power to the system. The power ON position is marked with the internationally recognized I symbol, the power OFF position is marked with the 0 symbol. This power switch also integrates an appropriately sized over-current protection circuit breaker function in the generator.

If an over-current condition trips the circuit breaker, it will automatically switch to the OFF position. If the overload current that caused the circuit breaker to trip is due to a transient condition, the circuit breaker can be reset by switching the actuator back to the ON position. If when resetting the circuit breaker after it has tripped, it immediately trips again, there is likely an internal system malfunction, and the generator will require service.

Do not repeatedly try to reset the circuit breaker. If it trips, this will only cause more damage to the generator.

Chassis Grounding Stud
The chassis grounding stud is used to attach a protective earth ground to the generator. This will aid in the suppression of electrical interference or radio frequency interference (RFI) that is common in an industrial environment. The chassis ground stud is \( \Box \) in Figure 3-6. Proper system grounding is discussed on Page 9.

System I/O Panel
The standard system I/O panel is described in this section. See Figure 3-7.

System Inputs Connector
The SYSTEM INPUTS connector mounted on the system I/O panel includes connections for all of the basic system control input signals, that will typically come from an automated control system. The cable attached to this connector includes all of the available system control signals, which will be controlled by an output card or output port on the automation controller.

The user can determine which signals to use for each particular welding application, but there must be at least one connection to this connector in order to activate the ultrasound output. All of the input signals on this connector are electrically isolated (signals are NOT referenced to chassis ground) and can be driven from an automation controller output that is either sinking (NPN) or sourcing (PNP), depending upon how the isolated common connection is terminated. Signals are activated when the voltage difference between the signal and the isolated common pin is 24V.

All inputs sink or source 10mA of current from a 24VDC power supply.

Continued
Note that a simple switch closure (relay contact) connected to a control input cannot activate the input without adding an external power supply to power the input. Adding jumper connections to pins available on the System Inputs connector, can configure switch closure inputs to operate referenced to generator chassis ground (non-isolated), without adding a separate power supply, if desired.


System Inputs Connector Pinout
The SYSTEM INPUTS connector is a HD-15F (high density D-subminiature 15 circuit female) connector. Connector pin numbers for this connector are shown in Figure 3-8. The male connector on the cable is a mirror image of the panel-mounted connector and is shown in Figure 3-9. Table 3-II lists the signal names and descriptions, with more detailed descriptions that follow. The wire color coding for the system input cable is listed in Table 3-II, to assist with custom automation system wiring and assembly.

NOTE
Refer to Section 6, Options for information on optional features.
System Inputs Signal Descriptions

**Pin 1 (+22V)**
This pin can supply +22VDC at up to 250mA to power the user’s automation controls.

**Pin 2 (Power Gnd)**
Pin 2 is the 22VDC return and is tied to the system chassis ground.

**Pin 3 (Remote Setup Selection Bit 0 Input)**
Pin 3 is the Remote Setup Selection Bit 0, which is the least significant bit used to select different welding setups with an automation control system.

**Pin 4 (Remote Setup Selection Bit 1 Input)**
Pin 4 is the Remote Setup Selection Bit 1, which is the second least significant bit used to select different welding setups with an automation control system.

---

Table 3-II  Generator Input Signals (J2)

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal Name</th>
<th>Cable Color Code</th>
<th>Signal Option Requirements</th>
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<td>1</td>
<td>+22V</td>
<td>BLK</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Power Ground</td>
<td>WHT</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Remote Setup Selection Bit 0 Input</td>
<td>RED</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Remote Setup Selection Bit 1 Input</td>
<td>GRN</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Remote Setup Selection Bit 2 Input</td>
<td>ORN</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Remote Setup Selection Bit 3 Input</td>
<td>BLU</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Remote Setup Selection Bit 4 Input</td>
<td>WHT/BLK</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Ultrasound Activation/Cycle Start Input</td>
<td>RED/BLK</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Not Used</td>
<td>GRN/BLK</td>
<td>Not Used</td>
</tr>
<tr>
<td>10</td>
<td>Front Panel Control Lock Input</td>
<td>ORN/BLK</td>
<td>Not Used</td>
</tr>
<tr>
<td>11</td>
<td>Press Inhibit for Hand Probes</td>
<td>BLU/BLK</td>
<td>Hand Probe</td>
</tr>
<tr>
<td>12</td>
<td>System Latch Reset Input</td>
<td>BLK/WHT</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Isolated Common</td>
<td>RED/WHT</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Not Used</td>
<td>GRN/WHT</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Automation Cycle Stop Input</td>
<td>BLU/WHT</td>
<td></td>
</tr>
</tbody>
</table>

---

Continued from Previous Page
**Pin 5 (Remote Setup Selection Bit 2 Input)**
Pin 5 is the Remote Setup Selection Bit 2, which is the third least significant bit used to select different welding setups with an automation control system.

**Pin 6 (Remote Setup Selection Bit 3 Input)**
Pin 6 is the Remote Setup Selection Bit 3, which is the second most significant bit used to select different welding setups with an automation control system.

**Pin 7 (Remote Setup Selection Bit 4 Input)**
Pin 7 is the Remote Setup Selection Bit 4, which is the most significant bit used to select different welding setups with an automation control system.

**Pin 8 (Ultrasound Activation/ Cycle Start Input)**
Pin 8 is used to activate the generator ultrasound output. Activation of this control input will switch the ultrasound output ON, and deactivating this signal will switch ultrasound OFF. This input signal will also function as a cycle start input, where the ultrasound activation and timing are completely under the control of the process controller. Depending on the welding process controller setup, this input signal could be activated momentarily to start a welding cycle.

**Pin 9 (Not Used)**

**Pin 10 (Not Used)**

**Pin 11 (Press Inhibit for Hand Probes)**
Pin 11 is used to disconnect power applied to a press or thruster, if a hand probe is connected to the system input connector, for safety considerations. The hand probe cable connector is wired to apply chassis ground to this pin, when it is attached to the system, which activates a press inhibit relay that disconnects power from the pneumatic press valves. This prevents the hand probe activation switch from unexpectedly starting a welding cycle that activates a press or thruster to the down position. This pin must be left open whenever a press control board is installed. Connecting this pin to chassis ground will inhibit press operation.

**Pin 12 (System Latch Reset Input)**
Pin 12 is used to reset the Any Fault or System Overload status outputs (See Status Output descriptions.). If a fault occurs during a weld cycle, these outputs will normally remain active until the next weld cycle is initiated. Activating this input will reset the status output faults and may simplify automation programming.

**Pin 13 (Isolated Common)**
Pin 13 is electrically isolated from chassis ground. Using isolated sourcing (PNP) output drivers, this common line would be connected to isolated ground potential. Using isolated sinking (NPN) output drivers, this common line would be connected to the isolated positive supply voltage output.

**Pin 14 (Not Used)**
Pin 14 is an open connection.

**Pin 15 (Automation Cycle Stop Input)**
Pin 15 is an input control signal that when enabled, can be used by the automation control system as a redundant signal to shut the ultrasound output off. This signal could also be reconfigured through menu selections to function as an automation end-of-weld control signal input.
### Table 3-III  System Output Connector Signals (J3)

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal Name</th>
<th>Cable Color Code</th>
<th>Signal Option Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+22V</td>
<td>BLK</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Spare Output</td>
<td>WHT</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>+22V Power Ground</td>
<td>RED</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Programmable Status Output 1</td>
<td>GRN</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Programmable Status Output 2</td>
<td>ORN</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Ultrasound Active Status Output</td>
<td>BLU</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Any Fault Status Output</td>
<td>WHT/BLK</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Press Trigger Status Output</td>
<td>RED/BLK</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>System Overload Status Output</td>
<td>GRN/BLK</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>System Online Status Output</td>
<td>ORN/BLK</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Press Top of Stroke Status Output</td>
<td>BLU/BLK</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Current Loop OK Status Output</td>
<td>BLK/WHT</td>
<td>Not Used</td>
</tr>
<tr>
<td>13</td>
<td>Analog Monitor Signal Common</td>
<td>RED/WHT</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Not Used</td>
<td>GRN/WHT</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Power Signal Monitor Output</td>
<td>BLU/WHT</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Amplitude Monitor Output</td>
<td>BLK/RED</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Amplitude/Power Regulation Status Output</td>
<td>WHT/RED</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>MPC Ready Status Output</td>
<td>ORN/RED</td>
<td>Not Used</td>
</tr>
<tr>
<td>19</td>
<td>System Power OK Status Output</td>
<td>BLU/RED</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Bad Part Status Output</td>
<td>RED/GRN</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Good Part Status Output</td>
<td>ORN/GRN</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>System Ready Status Output</td>
<td>BLK/WHT/RED</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Suspect Part Status Output</td>
<td>WHT/BLK/RED</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Isolated Common</td>
<td>RED/BLK/WHT</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Not Used</td>
<td>GRN/BLK/WHT</td>
<td></td>
</tr>
</tbody>
</table>

**System Outputs Connector**

The SYSTEM OUTPUTS connector mounted on the generator I/O panel includes connections for all of the basic system status and monitor output signals, which will typically connect to an automated control system. The cable attached to this connector includes all of the available system output signals, which will be read or monitored by a digital input card or analog inputs on the user-supplied automation controller.

The user can determine which signals are appropriate for each welding application.

The system monitor output signals are analog signals used to monitor ultrasonic amplitude setting and ultrasonic output power levels, referenced to the Monitor Common (Pin 13). This is at system chassis ground potential (non-isolated).
All of the digital output status signals on this connector, are isolated (signals are not referenced to generator chassis ground). When a status output signal is activated, it will sink current (500mA Max. sourced by a 24VDC supply) to isolated common. In automation terms, the outputs are NPN (sinking) and would drive a PNP (sourcing) input that is referenced to the Isolated Common pin.

System Outputs Connector Pinout
The SYSTEM OUTPUTS connector is a DB-25F (standard D-subminiature 25 circuit female) connector. Connector pin numbers for this connector are shown in Figure 3-10. The male connector on the cable is a mirror image of the panel mounted connector and is shown in Figure 3-11. Table 3-III lists the signal names. Detailed descriptions are listed in System Outputs Signal Descriptions that follow. To assist with custom automation system wiring and assembly, the wire color coding for the system outputs cable is listed in Table 3-III.

System Outputs Signal Descriptions
Pin 1 (+22V Power Supply)
This pin can supply +22VDC at up to 250mA to power the user’s automation controls.
Pin 2 (Not Used)
Pin 2 is an open connection.
Pin 3 (+22V Power Ground)
Pin 3 is the 22VDC return and is tied to the system chassis ground.

Pin 4 (Programmable Status Output 1)
Pin 4 is a digital status output that can be reprogrammed and assigned to other system status signals (from the available selections) from the front panel Advanced Settings menu.

Pin 5 (Programmable Status Output 2)
Pin 5 is a digital status output that can be reprogrammed and assigned to another system status signal (from the available selections) from the front panel Advanced Settings menu.

Pin 6 (Ultrasound Active Status Output)
Pin 6 is a digital status output that activates when the system is delivering ultrasonic power to the load attached to the ultrasound output connector. This output will be an open circuit when the ultrasound output is off.

Pin 7 (Any Fault Status Output)
Pin 7 is a digital status output that activates whenever any fault condition is detected that inhibits ultrasound output and normal system operation. This output will be an open circuit when no system fault conditions are detected. In the case of an overload, this output stays active until the start of the next cycle or until cleared using the front panel keypad or system input Pin 12 (System Latch Reset input).
Generator faults that will activate the Any Fault output:
- Overload (Average, Peak, or Frequency)
- Overtemperature Fault
- System Power Fault

Pin 8 (Press Trigger Status Output)
Pin 8 is a digital status output that activates when the specified trigger type has occurred. It will remain active until the end of cycle. This output will be an open circuit when a trigger condition hasn’t been detected.

Continued from Previous Page
Pin 9 (System Overload Status Output)
Pin 9 is a digital status output that activates whenever any overload condition is tripped. Activation of the overload status output signal could be caused by an average overload, a positive peak overload or a negative peak overload condition. After the overload status output activates, it will remain active until the next ultrasound activation cycle begins or until cleared via the front panel keypad or system input Pin 12 (System Latch Reset Input). This output will be an open circuit when no overload conditions have been detected.

Pin 10 (System On-Line Status Output)
Pin 10 is a digital status output that activates when the system is in the ON LINE operating mode, which enables the activation of the ultrasonic output. This output will be an open circuit if the system is switched to the OFF LINE operating mode, which will prevent the start of a welding cycle or activation of the ultrasound output. Note that an automation controlled process can not weld any parts, if the system is, accidentally or otherwise, switched to the OFF LINE operating mode.

Pin 11 (Press Top of Stroke Status Output)
Pin 11 is a digital status output that activates when the press/thruster head is in the top of stroke position. This output will be an open circuit when the press/thruster head is not at the top of stroke position.

Pin 12 (Not Used)
Pin 13 (Analog Monitor Signal Common)
Pin 13 is the signal common (ground) connection for all of the analog monitor signals (on Pins 15 and 16). This signal common pin is connected to system chassis ground and is not isolated from the generator chassis. This is an analog signal ground connection. Do not connect anything to this ground connection, except the wiring to the inputs of the analog instrumentation devices used to measure the monitor output signals.

Pin 14 (Not Used)
Pin 14 is connected to the system chassis ground.

Pin 15 (Power Signal Monitor Output)
Pin 15 is an analog output signal used to monitor the power output from the welding system. The scaling on this output signal is as shown below:
- 15kHz, 20kHz, 30kHz and 40kHz systems
  1 Watt = 0.001 VDC (1mV per Watt)
- 50kHz and higher systems
  1 Watt = 0.010 VDC (10mV per Watt)
Examples:
- 20kHz system measures 0.525 VDC on Power Monitor Output = 525 Watts
- 50kHz system measures 0.525 VDC on Power Monitor Output = 52.5 Watts

Pin 16 (Amplitude Monitor Output)
Pin 16 is an analog output signal used to monitor the system amplitude setting. The scaling on this output signal is 100% amplitude = 10.0 VDC, or 0.1 VDC per 1% amplitude. This monitor signal output would typically be used when a remote control option board is installed in the system. The automation control system will adjust the system’s amplitude setting remotely, using a 4-20mA current loop attached to the input of the remote control board. Using this monitor output, the control system can verify that the amplitude is set to the expected programmed amplitude level.
Pin 17 (Amplitude/Power Regulation Status Output)  
(Contact your sales representative about Power Regulation availability.)

This status signal is most useful when the power regulation mode is selected. This Out of Regulation status signal would indicate that due to inadequate pressure against the ultrasonic horn, the power regulation level setting cannot be achieved when the amplitude level is set to the maximum level of 100%.

In the amplitude regulation mode, this signal will be activated at the end of the ramp-up time until the beginning of the ramp-down time. This status signal will be active for the time the ultrasound is at the programmed amplitude setting.

Pin 17 is a digital status output that activates when the system is regulating the amplitude or power level correctly. This output becomes an open circuit when the system falls out of regulation. When that happens, it cannot adjust the system output to the output level that was programmed as the regulation set point.

Pin 18 (Not Used)

Pin 19 (System Power OK Status Output)

Pin 19 is a digital status output that activates when no fault conditions are detected by any of the power fault detection circuits included in the system. This output will be an open circuit when any power related fault is detected in the system.

Pin 20 (Bad Part Status Output)

Pin 20 is a digital status output that activates, either momentarily or until the start of the next welding cycle, when the welding parameters recorded during the previous welding cycle are outside of the programmed bad part limits. This output will be an open circuit when a bad part has not been detected.

Pin 21 (Good Part Status Output)

Pin 21 is a digital status output that activates, either momentarily or until the start of the next welding cycle, when the welding parameters recorded during the previous welding cycle do not exceed the programmed suspect or bad part limits. This output will be an open circuit after a welding cycle when either a suspect or bad part has been detected.

Pin 22 (System Ready Status Output)

This status output signal will activate only when the system is ready to activate ultrasound or begin a weld cycle. Pin 22 is a digital status output that activates when a weld processing cycle is completed and the welding process control system is ready to start the next welding cycle. This output will be an open circuit when the welding process controller determines that the next welding cycle cannot be started. This includes system faults or off line active, but not a process fault like Overload.

Pin 23 (Suspect Part Status Output)

Pin 23 is a digital status output that activates, either momentarily or until the start of the next welding cycle, when the welding parameters recorded during the previous welding cycle are outside of the programmed suspect part limits. This output will be an open circuit after a welding cycle when a suspect part has not been detected.

Pin 24 (Isolated Common)

Pin 24 is electrically isolated from chassis ground. This common line should be connected to negative output at a user-provided isolated 24VDC power supply. The isolated NPN status output signals can drive PNP inputs.

Pin 25 (Not Used)

Pin 25 is an open connection.
Ultrasound Output Connector

The ultrasound output connector used with all standard generators is a high voltage (5000V) coaxial style SHV-BNC connector. This connector provides superior shielding of electrical noise, compared to other types of connectors. The ultrasound output connector mates with fully shielded coaxial ultrasound cables that are secured with a simple and reliable quarter-turn bayonet style attachment mechanism.

Figure 3-12 Ultrasound Output Connector

Configuration Port Connector

The configuration port connector is a DB-9M (standard D-subminiature 9 circuit male) typically used for RS-232 serial communications. This serial port (DTE) connects to a serial port (DCE) on a computer via a standard 9 pin serial cable. If the computer does not have a serial port, you may use a USB-to-serial conversion cable.

This port is used for field updates to the generator firmware, without removing the enclosure cover. This port can also be used with a software application running on a Windows PC to modify the factory default system settings and hardware configurations. Contact your local sales representative for software availability information and access to documentation that will allow you to make use of the configuration port features.

Figure 3-13 Configuration Port Connector

CAUTION

The ultrasonic output from this connector (that drives the attached ultrasonic load) is a very high AC voltage (1200VAC). At high power levels this can exceed 2 amperes of current and must be securely terminated via the ultrasound cable for safe operation. Use original equipment ultrasound cables for safe and reliable system operation. Improperly assembled ultrasound cables can result in high voltage arcing and will destroy the ultrasound connectors.

Do not use your generator if there is any evidence of arcing (black carbon deposits) on either the ultrasound output connector or the ultrasound cable connectors.
RFI Grounding

The *iQ Series* generator provides the operating power and power returns. Make sure the generator is grounded properly.

In addition to the safety considerations, proper grounding is essential for the effective suppression of RFI (Radio Frequency Interference). Every generator contains a RFI filter which blocks noise on the AC power line from entering the generator control circuitry. This filter also prevents ultrasonic RFI from being fed back into the AC power line.

If you experience problems with RFI from the press, run an additional grounding wire from the press base grounding stud to the nearest grounded metal pipe or equivalent earth ground by means of a ground clamp. Use at least 14 AWG wire for the connection to the press base.

**CAUTION**

To minimize electrical noise and eliminate ground currents, ground the chassis as shown. Use a STAR configuration (illustrated below). Do not DAISY CHAIN the grounds.

---

![Diagram of RFI Grounding](image-url)

**Chassis Grounding Stud**

**Fixed Probe Mount or 2nd Chassis Grounding Stud**

**Recommended protective earth ground connection wire color:** green or green with yellow stripe.

**Earth Ground**

**#14 Gauge Stranded or Solid Wire**

**3rd Chassis Grounding Stud**
Connecting Generator Cables

Step 1. **Ground the generator** chassis with the supplied 14-Gauge wire, and attach it to the grounding stud. See Figure 3-6.

Step 2. **Ultrasound (J1)** - This output connects the Ultrasound Output of the *iQ Series* generator to the transducer, through a coaxial cable. The electrical welding signal is transmitted through this cable.

Step 3. **Operational Control (J201)** - This cable runs from J201 on the thruster to the generator’s Thruster connector (J5). The generator provides controls for triggering the weld, operating the thruster’s pneumatic system, and providing 24 VDC operating voltage through this cable. The press driver card in the generator also provides monitoring for these functions.

Step 4. **Base/Abort Cable (J6)** - Connects to the press base plate connector (J35) or an automation PLC.

Step 5. **Connect the AC power cord** to the IEC power inlet connector on the ultrasonic generator, and plug the other end into an approved AC outlet.

### Power Cords

The AC line cords supplied with the standard generators are matched to the ultrasonic output power rating and the continent of specified use. See Table 3-IV.

<table>
<thead>
<tr>
<th>Continent of Use</th>
<th>Power Cord Part Number</th>
<th>Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>North America</td>
<td>200 - 1110</td>
<td>240V, 15A</td>
</tr>
<tr>
<td></td>
<td>200 - 1541</td>
<td>240V, 10A</td>
</tr>
<tr>
<td>Continental Europe</td>
<td>200 - 1111</td>
<td>240V, 16A</td>
</tr>
<tr>
<td></td>
<td>200 - 1542</td>
<td>240V, 10A</td>
</tr>
</tbody>
</table>

**Table 3-IV** Power Cords
Installing the Press System

The press system consists of a thruster, ergonomic base and support package. It is assembled at the factory for shipment.

Unpacking

The system has been assembled and packaged at the factory for shipment. Depending on the system, there may be multiple crates or boxes to deal with.

Press

The press is secured to a wooden pallet and covered with a wooden crate. Components inside the crate are secured with metal bands, and with additional packing materials to give reinforcement when needed.

Before unpacking the press, take care and use mechanical assistance to move it close to the location where it will be installed.

1. Carefully remove the wooden crate from the base to expose the contents.

2. Remove the packing material, and temporarily set aside any other system components, leaving the press on the shipping base.

3. Inspect the assembly for any damage before placing it in position.

Placement

Do not lift the press by hand. Use mechanical means to put the press into place.

To place the press on the work area, use a pallet lift platform or equivalent. Raise the assembly until the bottom edge of the base is even with the top of the work area as shown in Figure 3-14. Then, carefully slide the press system on to the work area.

CAUTION

DO NOT LIFT the press manually. Lifting and/or moving the press manually could result in personal injury. Use mechanical means to move and place the press.

See Section 2, Health and Safety, Page 10 on safe lifting practices.
Installing the Press System Without Machine Base

In this configuration, secure the flange to a rigid, level stationary structure. We recommend socket-head cap screws M12-1.75 with a minimum length of 40 mm for securing the flange to the supporting structure. We recommend a minimum of 1 inch (25.4 mm) full thread engagement of the cap screws into the supporting structure. Depending upon the thickness and material of the supporting structure, longer screws and/or additional hardware may be required.

A full scale template is provided for locating and drilling holes in the supporting structure. The template is Figure 3-20 on Page 35.

Press Height Adjustment

The height of the thruster on the column is adjustable. Adjustment is made by first turning the two handles located on the left rear side of the press.

- To loosen the grip on the column, turn the handles counterclockwise, as shown in Figure 3-15a. The counterbalance spring on the column supports the weight of the thruster while the handles are loose. If a thruster is not installed, the unloaded column may rise up unexpectedly, so be careful to avoid injury.

- Adjust the column to the desired height.

- Turn the handles clockwise, as shown in Figure 3-15b, until tight.

- To rotate the handles out of the way without loosening or tightening, pull the handles outward, rotate and release, as shown in Figure 3-16.

CAUTION

Exercise caution if a thruster is not installed on the support housing. The counterbalance spring on the unloaded housing may cause the assembly to rise up unexpectedly when the height adjustment handles are loosened.

Figure 3-15 Using Handles to Make Adjustments

Figure 3-16 To Relocate Handles
Installing the Thruster

Secure the thruster to a rigid stationary structure by placing the back of the thruster onto the support frame. Align the bolt holes in the thruster with the bolt slots in the support frame. Insert the two (hex head) mounting bolts (M10-1.5 x 40mm), with flat washers, as shown in Figure 3-17. Align the thruster with the work surface in both the horizontal and vertical planes to assure parallelism. Tighten the bolts.

When mounted to a Dukane column as in the press configuration, the height of the thruster is adjustable on the column. If the height of the thruster is not adjustable in your mounting arrangement, you must consider the distance from the horn tip to the work surface when determining the position of the thruster.

The distance between the tip of the retracted horn and the parts in the fixture must be less than the maximum travelling distance (stroke) of the thruster slide assembly. If greater, the horn will be unable to contact the parts during operation.

A shorter distance between the retracted horn tip and the parts in the fixture means a shorter travelling distance (stroke) during operation which results in two advantages:

- A more stable thruster when applying pressure to the parts
- A shorter duty cycle for a faster production rate

However, make certain, that there is sufficient room for the placement and removal of parts.

**NOTE**

Total Stroke = 7 inches (177.800mm)

This is the thruster's maximum available distance of travel.
Connecting Press Cables

The press is not equipped with its own source of compressed air, electrical power, or electrical control and monitoring. These functions are provided through the connectors located on the rear of the thruster. (Refer to Figure 3-18):

- **Top of Stroke (J207)** - This receptacle is factory wired to a switch in the press/thruster that opens when the press/thruster slide assembly begins extending and closes when the slide assembly returns to the fully retracted (i.e. top-of-stroke) position. This contact closure is typically used in automated systems to indicate to the controlling mechanism (*supplied by the end user*) when the slide assembly is fully retracted. A Dukane cable (Part Number 438-528) mates with this receptacle to allow access to the switch contacts.

  **NOTE**

  Under normal usage, do not apply more than 24 VDC @ 2 Amps to the switch contacts at J207.

- **Ultrasound (J1)** - This input connects the transducer to the Ultrasound Output (J1) of the *iQ Series* generator, through a coaxial cable. The electrical welding signal is transmitted through this cable.

- **Operational Control (J201)** - This cable runs from J201 on the thruster to the generator's Press Port (J5). The generator provides controls for triggering the weld, operating the thruster’s pneumatic system, and providing 24VDC operating voltage through this cable. The press driver card in the generator also provides monitoring for these functions.

- **Air In** - This is a 1/4 NPT threaded receptacle for a compressed air supply that provides the thruster with the required pressure of 80-110 psi (5.4 - 7.5 atmospheres) to operate the pneumatic system.

  This connector is attached to an air filter on the press. The input to the filter comes from the air shut-off valve, located on the back, near the bottom of the press.
• **Encoder (Optional)** - The purpose of the encoder cable is to connect the distance encoder option to the generator’s Encoder Port (J11). For details on the Encoder, see Section 6: Options.

• **Ergonomic Base (J35)** - Connects the base controls and display to the Base/Abort Port (J7) on the generator.

The press system requires three cables for proper operation. These cables are part of the cable package that is shipped with the press. A customer-provided air hose (5/16 inch dia.) is also required.

Connect the following lines and cables to the press system:

• Connect the ultrasound coaxial cable from J1 on the generator to J1 on the thruster.

**DO NOT** operate the generator unless this cable is connected and the transducer is installed in the thruster — Otherwise, an overload condition could occur, with possible damage to the generator.

• Connect the operational control cable from J5 on the generator to J201 on the thruster.

• Connect clean, dry air from an air source to the fitting located at the lower portion of the support package.

Figure 3-20 shows the locations of the connections.

• Encoder cable (optional) - If the press is equipped with an encoder, the cable will already be wired in.

• Connect the nine-pin ergonomic base cable from J7 on the generator to J35 on the back of the base.

**Thruste Only**

For thrusters, the only required connections are the air line, ultrasound cable, and the operational control cable. Figure 3-19 shows the location of the thruster connections.

Because the thruster does not use a support package, the air source is connected directly to the “Air In” fitting.

Thruster systems require that Dukane’s cable (Part Number 200-1546-03) is installed in the \textit{iQ} generator’s J7 receptacle.

See Table 3-V.
Figure 3-20  Flange Template

No Scaling - Actual Size
## Controls

<table>
<thead>
<tr>
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<th>Page</th>
</tr>
</thead>
<tbody>
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<td>Generator Front Panel Controls</td>
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<tr>
<td>System Operating Mode Keys</td>
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Generator Front Panel Controls

This section introduces the *iQ* Series ultrasonic generator LE control panel and LCD display with this information:

- Functions of the panel components shown in Figure 4-1 below are discussed.
- These screen basics are introduced:
  - Making selections,
  - Interpreting on-screen arrows,
  - Taking a look at setup identification.

NOTE

Do not touch the display. Touch only the keys that are on the front panel.

Cleaning - If the display is dirty, clean it by first putting a mild cleaning solution on a clean, soft cloth. Then, gently wipe the cloth over the screen.

![Diagram of iQ Generator Display and Control Keys](image)

Figure 4-1  *iQ* Generator Display and Control Keys
System Operating Mode Keys

**ON LINE** - After AC power has been activated and the generator is operating normally, ON LINE is the normal operating mode. The generator can produce ultrasound signals in this mode.

The word, Online appears in a white outlined box in the upper right of the display.

**TEST** - After AC power has been activated and the generator is operating normally, in the ON LINE mode, the TEST key can be pushed.

This activates a momentary ultrasound pulse allowing the operator to test system function. The display will show the real time settings for Amplitude, Power, Operating Frequency, and Distance (does not appear if distance is not supported). This information is useful in troubleshooting.

While pushing the TEST key, look at the System Power Output Level bar graph (See Figure 4-3.) There should be at least one segment lit.

**IMPORTANT** - If more than three segments are lit, with no load applied to the ultrasonic stack, make sure the stack is properly assembled and not damaged. During normal operation, the peak level LED segment remains lit (approximately 1 second) until the next cycle begins.

**OFFLINE** - After AC power has been activated and the generator is operating normally, the OFFLINE key may be pressed to put the generator into the offline mode. In this mode the generator cannot generate an ultrasound signal.

The word, Offline appears in a white outlined box in the display's upper right corner.

---

![Operating Mode Indicator](image)

**Figure 4-2** Display Detail, Operating Mode Indicator

---

![System Power Output Level Bar Graph](image)

**Figure 4-3** Display Detail, Power Output Level

---

**CAUTION**

If a transducer is not connected to the ultrasound output connector, the system should be set to the OFFLINE mode. Do not activate the ultrasound output without a transducer connected. Make sure that the stack is properly assembled before it is connected to the system. The horn should never come in direct contact with a metal fixture or anvil with ultrasound activated.
Navigation Keys (4)

Moving the Cursor - Press the left and right navigation keys (← →) to move the display’s cursor left or right respectively.
Press the up and down navigation keys (+ or -) to scroll through menu lists. Also, use the ← → keys to move to a digit and change the value of a selected digit with the + or - keys.

ENTER Key
Press ENTER to confirm and store a selection in memory.
*Example:* After entering a time value, press ENTER.

CANCEL Key
Press the CANCEL key to stop editing a value without saving changes to the value or to leave secondary menu screens.

INFO Key
Press the INFO key, and the menu shown to the right in Figure 4-5 appears.

Soft Keys Bordering the Display (3)
Use the three keys bordering the left side of the display to make selections from the choices shown on the display.

Not all keys will be active on any given screen.

*Example:* For the display shown in Figure 4-6 below, two of the three soft keys are active:

Weld, and Afterburst.

NOTE
For more information about the INFO menus, please see *Section 5 - Operation.*
Hot Keys (8)

Each of the eight hot keys under the display, when pressed, brings up one of these portions of the generator menu:

- **AMP** - Adjust amplitude for Weld, Pre-Trigger and Afterburst portions of the weld cycle.
- **PRE-WELD** - Select operating Mode; disable or set Pre-Trigger values; and, select Trigger type, trigger maximum time, and trigger delay.
- **WELD** - Choose weld type (time, energy, distance, position or ground detect).
- **POST WELD** - Set parameters for Hold and Afterburst parts of the cycle.
- **LIMITS** - Set which weld characteristics to be displayed, and which will have their bad part or suspect part limits enabled.
- **SETUPS** - Choose setup control, name setups, copy and erase setups.
- **OPERATE** - This is a display-only screen showing cycle data from the last cycle. Only those selected to be displayed or have process limits set will be shown.
- **LIVE** - This is a display-only screen showing real time Amplitude, Power, Operating Frequency, and Position. (If position is not supported, it is not displayed.)

See the next section, OPERATION for more detail on the functions of these hot key sub-menus.

**NOTE**
The white bar along the bottom of the LCD display indicates what Hot Key menu is being displayed.
**System Power Output Level (Bar Graph)**

A bar graph displays the percentage of ultrasonic power being drawn by the load. See Figure 4-7 to the right.

**Peak Detect Feature**

To indicate the maximum peak power achieved during a weld cycle, the segment in the bar graph corresponding to the peak level remains on (for about one second) after the weld cycle has been completed.

**Flash on Overload at 90%**

The OVERLOAD indicator begins to flash when the generator produces 90% of the overload power rating. This feature alerts the operator to an impending overload fault condition.

**Bar Graph Power Scaling**

Power scaling is related to amplitude. At 100% amplitude the whole graph is lit, and the generator is operating at 100% power. At 50% amplitude the entire graph is lit, and the generator is operating at 50% power.

If the amplitude setting is lowered, the graph rescales automatically according to the revised amplitude.

*Example:* With a 1200W generator, at 50% amplitude, if the whole graph is lit, that represents 600W.

**Power On Light**

This front panel light glows after the rear panel AC power switch/circuit breaker is turned ON:

On start-up, the light flashes RED for a few seconds, and then turns steady GREEN. This indicates AC power has activated the generator.

When the AC power switch is turned to the OFF position, the front panel light goes out indicating the generator no longer has power.
Screen Basics
Making Selections

Figure 4-8 below shows there are several ways to show that an item has been selected:

- An area of white highlights a selected item.
- The cursor shows what digit is selected.

Interpreting On-screen Arrows

Arrows pointing up and down, give visual cues that more text is available in the direction the arrow points. An example is shown below in Figure 4-9. For this screen, the + and - (up or down) navigation keys are used to move in the direction of the on-screen arrow.

Figure 4-9  Arrows Indicate Direction of More Text
Setup Identification

Setup identification can be seen at the top of the screen as shown in the figure below.

The example shown in Figure 4-10 illustrates that setup control is by automation (Auto 01).

![Figure 4-10 Main Menu Detail - Setup Identification]

Use *iQ 01* if the setup selection is controlled by generator. Use *Auto 01* when controlled by automation. This is the name of the setup being edited if in Automation mode. Otherwise, the setup shown is the one in use.
Press Controls

This section describes the manual controls, indicators and features of the Press/Thruster System.

If desired, the controls on the front of the thruster can be used to manually set parameters for a given process.

Features used on the control panel are:

- Indicators associated with the controls to provide a visual indication of the control settings.
- Metric measurements

Manual Thruster Controls

Refer to Figure 4-11 for the location of the controls.

Down Speed Adjustment

This control adjusts the downward velocity of the press/ thruster slide assembly. Turning the knob clockwise decreases the speed. Turning it counterclockwise increases the speed of descent.

Hydraulic Slow Speed Control (Optional)

This control is used to adjust the point in the downstroke where the hydraulic speed damper is engaged. The SLOW SPEED Control knob adjusts to a point along the 7 inches (177.8 mm) of total available downstroke distance that the hydraulic Speed Control engages.

Refer to Section 6: Options, for detailed information on the Hydraulic Slow Speed Control.

NOTE

Total Stroke = 7 inches (177.800mm)

This is the thruster's maximum available distance of travel.

Continued
Hydraulic Slow Speed Adjustment

The hydraulic slow speed adjustment is an integral part of the optional hydraulic slow speed control. It sets the amount of velocity damping of the hydraulic unit. (See Figure 4-11.) For detailed information on this adjustment, refer to Section 6: Options.

Mechanical Stop Adjustment

The function of the mechanical stop is to halt the downstroke at a predetermined point. It is used in two ways:

- To stop the downstroke at a particular depth of travel relative to the fixture/anvil.
- To prevent the horn from contacting the fixture when there is no part present. This prevents possible damage to the horn and/or fixture. Never allow the horn to contact the fixture while ultrasonic power is applied to the horn. Metal–to–metal contact can void the horn and/or tooling warranty.

Pressure 1 Regulator

Pressure 1 regulator is used to set the amount of air pressure applied to the air cylinder during the press downstroke and weld cycle.

Pressure 2 Regulator

In some applications the Pressure 2 regulator is set to be maintained during the hold portion of the weld cycle.

Regulator Select Switch

The Regulator Select switch is used to select Pressure 1 regulator (Weld Pressure) or Pressure 2 regulator (Hold Pressure) to set the required pressure on each regulator and for monitoring the pressure gauge.

CAUTION

Do not allow the horn to contact the fixture while ultrasonic power is applied to the horn. Metal–to–metal contact can void the horn and/or tooling warranty.
To properly set the indicator flags, adjust the control until the middle of the flag lines up with the desired setting.
The example to the left is set for 2 cm.

Figure 4-11 (Manual) Press/Thruster Controls and Indicators - Model 220 Shown
Pre-Trigger Control (Optional)
The pre-trigger control turns the ultrasound on at a preset point in the thruster downstroke. This control is normally used in staking and inserting applications. This control should be set for a distance of approximately 6.25 mm (.25 inch) above the part.

Trigger Control
Setting the trigger control determines the amount of preload on the part before turning on the ultrasonics.
(Numbers displayed are for reference only.)

End-of-Weld Control (Optional)
This adjustment is set at the point in the stroke of horn travel (absolute distance) where the ultrasound turns off.

NOTE
The actual amount of force applied to the part depends on the following four factors:
• The setting of the regulator(s)
• The area of the air cylinder
• The mass of the horn used
• The surface area of the horn

NOTE
The pre-trigger switch option starts the horn vibrating before contacting the part to be welded. To ensure safe operation, adjust the pre-trigger so the ultrasound signal will not activate if the horn is more than ¼ in (7 mm) from the part to be welded.
Thruster Indicators

Pressure Gauge
The pressure gauge shows the amount of air pressure applied to the upper portion of the air cylinder for the weld-and-hold operation.

Ultrasound Active Status Light
This LED indicator lights up when the generator is applying ultrasonic power to the horn.

Stroke Position Indicator Flag
The stroke position indicator flag is not preset prior to press operation. It moves with the slide assembly as the assembly moves down and up.

Mechanical Stop Indicator Flag
This setting indicates where the downstroke will end.

Slow Speed Indicator Flag (Optional)
This indicator flag is set by the Slow Speed Control. It is included as part of the Slow Speed Control option. When set, it indicates the point in the downstroke where the plunger on the hydraulic speed control is engaged.

Press Ergonomic Base
The ergonomic base, shown in Figure 4-12, consists of a base plate, cycle activation switches (black finger switches), abort switch (red palm switch), and a status display screen. At the back of the base is a cable connector for an interface between the iQ Series generator and the base front panel.

Base Plate
The machined base plate is bolted to the top of the ergonomic base. It has drilled and tapped holes that line up with leveling screws in the fixtures to allow easy fixture leveling for alignment with the horn. For details on the alignment and leveling of the base plate, see Section 7: Stack/Fixture Setup.
Activation (Operate) Switches

Located on either side of the base are two optical (RUN) switches. These are shown in Figure 4-12. These switches use Infrared (IR) sensors. They comply with OSHA and CE safety standards. Both switches are identical.

Each optical–touch switch has a small red LED that is dimly illuminated whenever the power is on, as shown in Figure 4-13. When the operator places their finger in the tray, the LED brightens and a second LED in the opposite corner of the tray illuminates to indicate the switch has been activated as shown in Figure 4-14. Both switches must be activated simultaneously to initiate a weld cycle.

**WARNING**

Any modifications to the Activation Switch (also known as the Operate Switch) circuit must comply with all OSHA and ANSI requirements. Compliance with all local building and electrical codes is also required.

Dukane Corporation does not assume any responsibility or liability for circuitry modifications made by the customer or by any third party manufacturer.
Emergency Stop (Abort) Switch

A red Emergency–Stop (E-STOP) switch is located in the center of the base as shown in Figure 4-12. The emergency stop switch must be in its reset position before the operate switches will function.

To reset the Emergency Stop, twist the large red button about 45 degrees to the right, which will cause the button to spring out. This is shown in Figure 4-15.

The abort switch applies 24 VDC power to the thruster/press. Pressing the abort switch causes the generator to:

- Immediately turn off the ultrasound,
- Remove electrical power from the press, and
- Initiate a software abort sequence.

Base Status Display

The function of the display is to indicate one of three status conditions of the press:

- **READY** - When the abort switch is pulled out, the green READY status light indicates that power is applied to the press and it is ready for operation.

- **ABORT** - When the abort switch is pushed in, the red ABORT status indicator illuminates. Press operation is no longer possible.

- **IN CYCLE** - When both activation switches are pressed, the IN CYCLE display of the status indicator is ON for the duration of the finger switch activation.

![Figure 4-15 Setting and Resetting the E–STOP](image)

**WARNING**

Any modifications to the Emergency Stop Switch (also known as the E-STOP or Abort Switch) circuit must comply with all OSHA and ANSI requirements. Compliance with all local building and electrical codes is also required.

Dukane Corporation does not assume any responsibility or liability for circuitry modifications made by the customer or by any third party manufacturer.
SECTION 5

Operation

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Overview

The **iQ Series** generator, model LE, is typically part of a system. System major components would be:

- **iQ** generator,
- **iQ** Press System, or
- **iQ** Probe System.

With this type of system, the user controls nearly all aspects of the welding process through the front panel of the **iQ** LE generator.

Generator Start-up Sequence

1) Press the rear panel AC breaker switch to **ON**. See Figure 5-1.

2) The front panel power on light (See Figure 5-2.) will flash RED a few times, then will glow a steady **GREEN**.

The display's initial screen identifies the Dukane **iQ** Series generator and its major components.

The start-up sequence ends when the **OPERATE** screen is displayed.

NOTE

Press, acoustic stack, and tooling will require their own individual adjustments as those components are integrated into your particular system.

Helpful information on a wide variety of assembly equipment, processes and techniques can be found at the Dukane website:

Stopping the Weld Cycle

Normal Conditions
The cycle stops when the programmed welding cycle ends.

Emergency Conditions

Manual System
Do either of these things:

1) Press the OFFLINE front panel key to stop the ultrasound signal. This may be done under any condition, OR

2) If the generator's front panel power light is on, move the rear panel AC breaker switch to the OFF position, and the front panel power light goes out.

Automated System
Customer-supplied external controls provide the means to stop the cycle for an automated system.

An auxiliary cable connects these external controls to the iQ generator at connector J2.

Control input labeled, “Automation Cycle Stop Input” (Pin 15) when activated will stop the weld cycle if configured as “End of Weld”.

Using the Menus

The figure below provides an overview for the menu structure and a beginning page number reference for the item. The user can access the menus through the generator’s eight hot keys and through the INFO key.

**NOTE**
The unique hardware configuration of the generator determines what menus are available.

---

**Figure 5-3**  Generator Menu Overview

---

_Dukane Manual Part No. 403-586-02_
NOTE

For all menus - When a button is pressed to access the menu, the last access parameter will be selected and ready to change if applicable.

Example: If the PRE WELD button is pressed, and the Trigger Distance value was the setting last accessed in that menu, then Trigger Distance is highlighted and ready to change.

NOTE

On screen Prompts - Watch for and follow on screen prompts where they appear.

Example: In Figure 5-4 below the prompts are:
PRESS ENTER TO ACCEPT, or PRESS CANCEL TO ABORT

AMP

The menu in Figure 5-4 is the default display showing WELD with its amplitude value ready to be changed.

This is the only menu available if MODE is set to AUTOMATED PROBE.

This same menu is displayed if MODE is set to iQ CONTROLLED PROBE MODE, and TRIGGER BY POWER is disabled, or if PRE-TRIGGER is disabled in either of the press modes.

If iQ CONTROLLED PROBE MODE is selected, and AFTERBURST is enabled in the POST WELD menu, then the AFTERBURST soft key is also displayed as shown in Figure 5-5 to the right. The parameter value last accessed will be highlighted and ready to change.
If MANUAL or AUTOMATED PRESS MODE is selected, and PRE-TRIGGER is enabled in the PRE-WELD menu, then PRE-TRIGGER amplitude is available. See Figure 5-6 to the right.

Pressing the AMP button when TRIGGER BY POWER is enabled, brings up the screen shown to the right. This menu has START as the top soft key. The value last accessed is highlighted and ready to be changed. In the example shown in Figure 5-7, that is START > AMPLITUDE.

---

**NOTE**

Amplitude Range = 20-100%
PRE-WELD

The PRE WELD menu is shown in Figure 5-8. The selected mode is highlighted (AUTOMATED PROBE). To change to a different mode, move arrow to desired mode, and press ENTER.

PROBE DELAY menu is shown in Figure 5-9 at right.

NOTE

PROBE DELAY is only available in AUTOMATED PROBE MODE.
Continued from Previous Page

The PRE WELD menu shown in Figure 5-10 has the selected mode highlighted (iQ CONTROLLED PROBE). To change to a different mode, move arrow to desired mode, and press ENTER.

![Figure 5-10 Pre Weld Menu, Mode is iQ Controlled Probe](image)

The TRIGGER menu is shown in Figure 5-11.

![Figure 5-11 Pre Weld Menu, Trigger Menu](image)

Making the selection of trigger type is shown in Figure 5-12.

![Figure 5-12 Pre Weld Menu, Trigger Selection](image)

TRIGGER BY POWER has been chosen as the trigger type as shown in Figure 5-13.

![Figure 5-13 Pre Weld Menu, Trigger By Power Selected](image)
The PRE WELD menu is shown in Figure 5-14. The selected mode is highlighted (Manual Press). To change to a different mode, move arrow to desired mode, and press ENTER.

Figure 5-14 Pre Weld Menu, Manual Press Mode

Trigger menu with Maintained trigger method selected is shown in Figure 5-15.

Figure 5-15 Pre Weld Menu, Maintained Trigger Selected

The menu display seen in Figure 5-16 at the right shows the display when ENTER was pressed with the arrow pointing to type, but the press does not support distance.

Figure 5-16 Pre Weld Menu, Press Does Not Support Distance

The menu in Figure 5-17 to the right shows the display when ENTER was pressed with the arrow pointing to type with a press that supports distance.

Figure 5-17 Pre Weld Menu, Press Supports Distance

Continued
The PRE WELD menu shown in Figure 5-18 has PRE-TRIGGER disabled. The selection is made by pressing ENTER.

The PRE WELD menu shown in Figure 5-19 shows the PRE-TRIGGER menu, but the press does not support DISTANCE.

The PRE WELD menu shown in Figure 5-20 has PRE-TRIGGER enabled, and the press does support DISTANCE.

The PRE WELD menu shown in Figure 5-21 shows the PRE-TRIGGER menu, when TIME is selected.

The PRE WELD menu shown in Figure 5-22 shows the PRE-TRIGGER menu, when POSITION is selected.
WELD

The WELD menu seen in Figure 5-23, shows the message that is displayed if the MODE was set to AUTOMATED PROBE.

The WELD menu shown in Figure 5-24 has the MODE set to iQ CONTROLLED PROBE.

The menu shown in Figure 5-25 at the right appears when the MODE is MANUAL or AUTOMATED PRESS, and DISTANCE is not supported by the generator.

The menu shown in Figure 5-26 at the right appears when the MODE is MANUAL or AUTOMATED PRESS. ENERGY has been selected, and a value for energy will be entered.

Continued
The menu shown in Figure 5-27 at the right appears when the MODE is MANUAL or AUTOMATED PRESS, and DISTANCE is supported by the generator.

The menu shown in Figure 5-28 at the right appears when the ENERGY value is being entered. (Range in Joules: 0-99999.9)

MAX TIME, a secondary parameter, can be programmed in its range of 0-30.00 seconds.

**NOTE**

Weld Time: Range is 0-30 seconds.
POST-WELD

The POST WELD menu seen in Figure 5-29, shows the message that is displayed if the mode was set to AUTOMATED PROBE MODE using the PRE WELD display.

When TIME has been selected as the HOLD control method, the menu appears as shown in Figure 5-30 to the right.

Note that TIME is highlighted, ready to be changed.

The menu shown in Figure 5-31 at the right appears if the AFTERBURST soft key has been pressed in the PRE WELD menu.

The menu to the right in Figure 5-32, is displayed when AFTERBURST is enabled.

NOTE

HOLD and AFTERBURST are not available as soft keys if AUTOMATED PROBE MODE was selected in the PRE WELD menu. Also, DISTANCE is not shown for HOLD if DISTANCE is not supported by the press.

Figure 5-29  Post Weld Menu, Mode: Automated Probe

Figure 5-30  Post Weld Menu, Time Setting

Figure 5-31  Post Weld Menu, Afterburst Disabled

Figure 5-32  Post Weld Menu, Afterburst Enabled
LIMITS

The LIMITS menu seen in Figure 5-33, shows what is displayed when in a PROBE MODE (either iQ CONTROLLED PROBE or AUTOMATED PROBE).

In the example shown to the right, the DISPLAY ENABLED soft key was pressed to select ENABLED. Press the key again to select DISABLED.

The LIMITS menu, shown in Figure 5-34 at the right, when in PRESS MODE, and DISTANCE is not supported.

TRIGGER DELAY (on PRE WELD screen) and HOLD (on POST WELD screen) are only shown when they are ENABLED.

The LIMITS menu shown in Figure 5-35 at the right appears when in PRESS MODE, and DISTANCE is supported.

Figure 5-33  Limits Menu, in Probe Mode

Figure 5-34  Limits Menu, Press Mode, Distance Not Supported

Figure 5-35  Limits Menu, Press Mode, Distance Is Supported

Continued
When the BAD soft key is pressed (in the menu shown in Figure 5-35 above), the display will appear as it does in Figure 5-36 to the right. [Press SUSPECT to move to the Suspect version of this screen.]

Selecting ENABLED will change the menu to what is shown in Figure 5-37.

The LIMITS menu shown in Figure 5-37 allows setting upper and lower limits. Use the soft keys to highlight the parameter value to be changed. Press DONE to return to the main LIMITS menu.

The example menu shown in Figure 5-38 appears when BAD PART LIMITS are enabled for TIME.
SETUPS

Setup Control

The SETUPS menu seen in Figure 5-39, shows that IQ SYSTEM is the default setup control setting for this menu.

SELECT SETUP is the bottom soft key in this case.

If AUTOMATION is selected, the bottom soft key would be: EDIT SETUP.

Press SELECT SETUP, and a screen similar to the one shown in Figure 5-40 to the right is displayed.

When the > is next to the desired setup, press the SELECT SETUP soft key, or the ENTER key.

Then, the previous screen will be displayed.

Pressing CANCEL would display the previous screen without any setup being chosen.

Name Setup

The menu shown to the right in Figure 5-41 is displayed when the > is moved to NAME SETUP.

The name of the current setup that is being edited (dependent on SETUP CONTROL) is highlighted and ready for editing.

Pressing ENTER saves the name.

Pressing ERASE NAME changes the name back to the default. (In this example, Setup #1).

When the setup name is not highlighted, there is a box around it. This indicates that pressing the soft key next to the box allows the box to be edited.

A total of 8 (eight) setups can be made.

NOTE

Continued
Copying a Setup

Move the > next to COPY SETUP as shown in Figure 5-42.

The current setup being used or edited is displayed under COPY FROM.

Copy From

When the COPY FROM soft key is pressed, a list of setups, as shown in Figure 5-43 to the right, is displayed.

Use the + and - keys to scroll through the list.

Press ENTER to make the setup the COPY FROM selection.

Copy To

Pressing the COPY TO soft key will bring up the same menu once again (Figure 5-43).

Use the + and - keys to scroll through the list.

Press ENTER to make the setup the COPY TO selection.

When the COPY SETUP soft key is pressed, the screen shown in Figure 5-44 is displayed - for about 5 seconds.

The next screen displayed is the COPY SETUP screen as shown in Figure 5-42 above.

Continued from Previous Page
Erase Setup

Move the > next to ERASE SETUP as shown in the Figure 5-45.

The current setup or all setups can be erased.

Erase Current Setup

Press the CURRENT SETUP soft key to bring up the display shown in Figure 5-46.

Pressing YES will return the setup (that is currently being run or edited) to default values.

Pressing NO or CANCEL will return the display to the SETUPS menu without erasing anything.

Erase All Setups

Pressing ALL SETUPS (as seen in Figure 5-45 above) affects all setups in the generator returning them all to default values.

The screen message, if ALL SETUPS was selected, would read:

ARE YOU SURE YOU WANT TO ERASE ALL SETUPS?

Confirm Erase

When YES is pressed, the screen shown in Figure 5-47 is displayed for about 5 seconds. Then, the ERASE setup menu is shown.

If ALL SETUPS was chosen in the setup menu, the message would be: ALL SETUPS ERASED.
When the generator is powered up, there is an initial screen that shows system information. That is followed by the Operate screen as shown in Figure 5-48 above.

This is a display only screen. The values displayed are from the last weld cycle. The operator can access this screen by pressing the OPERATE hot key.

The process characteristics shown in Figure 5-48 above are the ones where part limits have been enabled, or are those that have been selected to display.

As an example, here is a list of all possible characteristics that a distance press could have. (If distance is not supported, then these characteristics would not be available.)

- Downstroke Time
- Downstroke Distance
- Trigger Delay Time
- Trigger Delay Distance
- Time
- Peak Power
- Energy

- Weld Distance
- Weld End Position
- Hold End Position
- Hold Time
- Hold Distance
- Total Cycle Time
- Total Cycle Distance

Continued
When the **PROCESS STATISTICS** soft key is pressed, the display as shown in Figure 5-49 is seen. The total part count along with subtotals for good, bad, and suspect parts are displayed.

Percentages shown are of the total part count.

**Example:** Number of **GOOD** parts divided by the total **PART COUNT** multiplied by 100 equals the percentage of **GOOD** parts.

![Figure 5-49 Operate Screen - II](image-url)
**LIVE**
When the LIVE hot key is pressed, the display as shown in Figure 5-50 to the right is seen.

This is also called the Live Data screen.

The screen shows the current value of the parameters shown. These values are shown regardless of whether the generator is in cycle or not.

If distance is not supported, it would not be displayed.

**IN CYCLE**
When the LIVE hot key has been pressed, and the generator is in cycle, the screen shown in Figure 5-51 is displayed.

The screen shows the current value of the parameters shown.

If DISTANCE is not supported, it would not be displayed.

**TEST**
When the TEST soft key has been pressed, and the generator is online, the screen shown in Figure 5-52 is displayed.

The screen shows the current value of the parameters shown.

If DISTANCE is not supported, it would not be displayed.
Using the INFO Menus

Press the INFO key, and the menu shown to the right in Figure 5-53 appears.

**SYSTEM INFO** - To display information about the generator hardware, press the SYSTEM INFO button. Figure 5-54 shows an example display of that information.

**REGIONAL SETTINGS** - Pressing the REGIONAL SETTINGS button allows setup for LANGUAGE (Figure 5-55), and it allows setup for UNITS.

**UNITS** - To set up preference for units press the INFO key, go to the REGIONAL SETTINGS MENU, and then to the UNITS key. See Figure 5-56.

Figure 5-53 Info Menu Display

Dukane Corporation/IAS Division
IQ LE Series Ultrasonic Generator
Model# 20HS2401ZP5          Serial# 236853
Front Panel Code v1.00.00   Motherboard Code vXX.XX.XX
www.dukane.com/us
Boot Code: MB v1.03 / FP v1.00

Figure 5-54 System Info

Figure 5-55 Regional Settings, Language Menu

Figure 5-56 Regional Settings, Units Menu

Continued
ADVANCED SETTINGS - This part of the INFO menu gives access to the three sub-menus, Adv Process Control, System Status IO, and Miscellaneous and their menu items as shown below in Figure 5-57.

- Adv Process Control
  - Phase Shift
  - Free Run Freq
  - Freq Lock and Hold
  - System Freq Limits
  - Ramp Up Time
  - Ramp Down Time

- System Status IO
  - Auto Start Input
  - Auto Stop Input
  - J3 Pin 4
  - J3 Pin 5
  - Output Duration

- Miscellaneous
  - Buzzer
  - External Control
  - Restore Factory Defaults

Figure 5-57 Advanced Settings Menu Overview

Pressing the ADVANCED SETTINGS button brings up the ADV PROCESS CONTROL sub-menu first. See Figure 5-58.

WARNING

Modifying Advanced Settings may damage the unit or ultrasonic stack.
If the RESTORE DEFAULTS key is pressed while the Adv Process Control menu is displayed, the screen shown at right (Figure 5-59) is seen.

If the defaults are restored, the display with the confirmation message shown in Figure 5-60 at right is shown for 5 seconds. After that, the display will once again appear as it does in Figure 5-58.
Adv Process Control Sub-menu Items

The six sub-menu items and their corresponding displays are shown (See Figure 5-61.) and described below and on the next page:

1) Phase Shift
Phase shift is used to adjust the timing of the ultrasound output driving pulses. A positive number delays the start of the output pulses and a negative number causes the signal output to start earlier.

*Phase Shift range is + 20° to - 20°*

2) Free Run Freq
Free run is the frequency at which the generator drives the ultrasound output pulses until a valid feedback signal is detected. Typically this value should be below the operating frequency of the stack.

*Adjust manually within the prescribed limitations for your particular generator model.*

3) Freq Lock and Hold
When frequency lock and hold is disabled the frequency of the stack is tracked by changing the frequency of the ultrasound driving pulses to match the feedback signal frequency. When enabled the frequency of the feedback is tracked until lock is achieved then it is ignored and the ultrasound output remains at a fixed frequency until the end of the weld.

*Enable or Disable this feature.*

---

Moving to the Next Sub-menu

When > is next to RAMP DOWN TIME, and the down key (minus) is pressed, the next sub-menu for System Status IO replaces the Adv Process Control sub-menu.

*Figure 5-61  Advanced Process Control Sub-menu Items*

*Continued*
4) **System Freq Limits**

Limits can be: **Wide**, **Normal**, **Narrow**, or **Manual**.

**Wide** - In wide mode the upper and lower frequency limits are set to the maximum and minimum allowed frequencies for the generator. These values are dependent on the system frequency of the generator.

**Normal** - In Normal mode the upper and lower frequency limits equal the free run frequency - 500Hz.

**Narrow** - In Narrow mode the upper and lower frequency limits equal the free run frequency - 200Hz.

**Manual** - In Manual mode the user sets the upper and lower frequency limits. To be valid, the settings must be within the maximum and minimum values for the generator and at least 25Hz greater than the "upper" free run frequency and 25Hz less than "lower" free run frequency.

**Manual** - *Enter Upper and Lower Limits*

**Normal**, **Narrow**, or **Wide** - *Enter Upper and Lower Limits within prescribed limitations for your particular generator.*

5) **Ramp Up Time**

Ramp up time increases the amplitude linearly in the programmed time period at the start of the weld, from zero to the programmed amplitude level. This brings the stack up to operating amplitude smoothly preventing shock stress.

*Range is 0.000 to 1.250 seconds.*

6) **Ramp Down Time**

Ramp down time decreases the amplitude linearly to zero in the programmed time period following the end of the weld, when ultrasound is shutting off.

*Range is 0.000 to 0.250 seconds.*
SYSTEM STATUS I/O Sub-menu

The SYSTEM STATUS I/O sub-menu is displayed in Figure 5-62.

If the RESTORE DEFAULTS key is pressed while, the SYSTEM STATUS I/O sub-menu is displayed, the screen shown in Figure 5-63 is seen.

If YES is chosen, the defaults are restored, and the display with the confirmation message shown in Figure 5-64 is shown for 5 seconds.

After that, the display will once again appear as it does in Figure 5-62.
System Status I/O Sub-menu Items

The five sub-menu items and their corresponding displays (Figure 5-65) are shown below:

1) **Auto Start Input**
   - Solid State, or
   - Mechanical - If this is chosen, a value (0.000 to 0.100 seconds) must be given for Debounce.

2) **Auto Stop Input**
   - Choose to Disable this, or select End of Weld, or End of Cycle.

3) **J3 Pin 4**
   - Choose the output signal for J3 Pin 4:
     - E-Stop, or Overtemp

4) **J3 Pin 5**
   - Choose the output signal for J3 Pin 5:
     - Hold, In Cycle, or In Cycle No AB

5) **Output Duration**
   - Choose either Maintained, or 100mS Pulse.

**Moving to the Next Sub-menu**

When > is next to OUTPUT DURATION, and the down key (minus) is pressed, the next sub-menu for MISCEL-LANEOUS replaces the SYSTEM STATUS IO sub-menu.

*Figure 5-65 System Status I/O Sub-menu Items*
**Miscellaneous Sub-menu Items**
The three sub-menu items and their corresponding displays (Figure 5-66) are shown below:

1) **Buzzer**
   Set the audible buzzer to sound:
   - At Top of Stroke - Enable or Disable, or
   - At Trigger - Enable or Disable

2) **External Control**
   Choices are:
   - Disabled,
   - Serial, or
   - Profibus (*Range of 1 to 125*)

3) **Restore Factory Defaults**
   Choose Restore to erase ALL setups and factory defaults.

An intermediate display allows for confirmation.

If confirmed, then another message is displayed as shown to the right.

---

**Figure 5-66** Miscellaneous Sub-menu Items
## ALARMS

**Terminology:** Alarm refers to any fault, or error the generator might produce.

An alarm condition may occur. Figure 6-67 shows the format for a typical alarm display.

The list below gives general reference information for each alarm condition.

### Table 5-I  Alarm Messages

<table>
<thead>
<tr>
<th>FAULTS:</th>
<th>PROCESS ERRORS:</th>
</tr>
</thead>
<tbody>
<tr>
<td>U100  Configuration Fault (Default Setup Corrupted, Model Number Incorrect, Serial Number Incorrect, Feedback Scaling Incorrect, etc)</td>
<td>U400  Weld Limits enabled for continuous Operation</td>
</tr>
<tr>
<td>U103  Hardware Fault (Hardware Changed, Remote Amp Card removed?)</td>
<td>U401  Weld Time set to Zero</td>
</tr>
<tr>
<td>U104  Frequency Overload Fault 1 (PLL Lock Fail)</td>
<td>U402  Weld Power set to Zero</td>
</tr>
<tr>
<td>U105  Frequency Overload Fault 2 (PLL Lock Lost)</td>
<td>U403  Weld Energy set to Zero</td>
</tr>
<tr>
<td>U106  POS Peak Overload Fault</td>
<td>U404  Weld Distance set to Zero</td>
</tr>
<tr>
<td>U107  NEG Peak Overload Fault</td>
<td>U405  Weld Position set to Zero</td>
</tr>
<tr>
<td>U108  Average Overload Fault</td>
<td>U406  Max Trigger Time set to Zero</td>
</tr>
<tr>
<td>U109  Bad Current Loop Fault</td>
<td>U407  Forced Shutdown Fault</td>
</tr>
<tr>
<td>U110  Power not OK Fault</td>
<td>U408  Trig Lost Early Fault</td>
</tr>
<tr>
<td>U111  Over Temperature Fault</td>
<td>U409  Trig Lost Weld Fault</td>
</tr>
<tr>
<td>U112  Frequency Overload Fault 3 (PLL Limit Exceeded)</td>
<td>U410  Pre-trigger Overtake Fault</td>
</tr>
</tbody>
</table>

**INITIATE ERRORS:**

- U300  Operate Switch 1 Pressed before Cycle Start
- U301  Operate Switch 2 Pressed before Cycle Start
- U302  Auto In switch closed at End of Cycle
- U304  Trigger switch closed before Cycle Start
- U305  Pre-trigger switch closed before Cycle Start
- U306  End Weld input enabled before Cycle Start
- U307  Ground Detect input enabled before Cycle Start
- U308  Generator or Press Not Ready

### Figure 5-67  Alarm Message Screen

Terminology: Alarm refers to any fault, or error the generator might produce.

An alarm condition may occur. Figure 6-67 shows the format for a typical alarm display.

The list below gives general reference information for each alarm condition.
This page intentionally left blank
SECTION 6

Options

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Power Inlet Options ................................ 88
Press Interface Module ............................ 90
Hydraulic Speed Control ......................... 91
Distance Encoder ................................. 93
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Overview

This section of the User’s Manual provides a general overview of some options/upgrades for the basic ultrasonic generator and for the press/thruster, all of which are subject to availability.

These options/upgrades are:

**Generator**
- Power Inlet
- Press Interface Module

**Press/Thruster**
- Hydraulic Speed Control
- Distance Encoder

**Additional Options**

Dukane can provide high-quality automation equipment for efficient handling and assembly of parts. This equipment is tailored specifically to your needs. Some of the available options include pick and place automation, rotary tables, in-line indexing, conveyors, and walking beams.

Dukane can also provide standard and custom sound enclosures. The additional options are not covered in this manual due to their specialized applications.

Contact your local Dukane representative for more specific information, or visit the Dukane website:

```
www.dukane.com/us/PCU_custom.htm
```
Power Inlet Options

120V Systems for North America and Japan

120V systems for North America and Japan have a fixed (non-detachable) power cord.

This option is available on generators with power ratings of 1200 watts or less and with operating frequencies of 20kHz, 30kHz, or 40kHz.

See Table 12-II in Section 12, Specifications.

Electrical Safety

120V Power Ground

For safety, the power cords used on all Dukane products have a three-prong, grounding-type plug.

CAUTION
If you have a two-prong electrical receptacle, we strongly recommend that you replace it with a properly grounded three-prong type. Have a qualified electrician replace it following the National Electric Code and any local codes and ordinances that apply.

CAUTION
If there is any question about the grounding of your receptacle, have it checked by a qualified electrician. Do not cut off the power cord grounding prong, or alter the plug in any way. If an extension cord is needed, use a three-wire cord that is in good condition. The cord should have an adequate power rating to do the job safely. It must be plugged into a grounded receptacle. Do not use a two-wire extension cord with this product.

Figure 6-1 Example of 120 Volt, Grounded, 3-Prong Receptacle
AC Power Inlet Panel
The optional AC power inlet panel is described here.

AC Power Cord
The AC power cord (A in Figure 6-2) is appropriately rated and permanently mounted to the power inlet panel.

Power Switch/Circuit Breaker
The power switch/circuit breaker (B in Figure 6-2) has a rocker type actuator switch that will activate or deactivate the AC power to the system. The power ON position is marked with the internationally recognized I symbol, the power OFF position is marked with the 0 symbol. This power switch also integrates an appropriately sized over-current protection circuit breaker function in the generator.

If an over-current condition trips the circuit breaker, it will automatically switch to the OFF position. If the overload current that caused the circuit breaker to trip is due to a transient condition, the circuit breaker can be reset by switching the actuator back to the ON position. If when resetting the circuit breaker after it has tripped, it immediately trips again, there is likely an internal system malfunction, and the generator will require service.

Do not repeatedly try to reset the circuit breaker. If it trips, this will only cause more damage to the generator.

Chassis Ground Stud
The chassis ground stud is used to attach a protective earth ground to the generator. This will aid in the suppression of electrical interference or radio frequency interference (RFI) that is common in an industrial environment. The chassis ground stud is C in Figure 6-2. Proper system grounding is discussed on Page 9.
Press Interface Module

This module is also known as the Options Slot Module. Module location is shown on Page 17, Figure 3-5.

Modules support two different press series: iQ Series, and Ultra Series, and those modules are described here in general terms.

Welding with Two Pressures

With modules P4 or P8 (as shown in the table below), two pressures can be used to create strong, reliable welds. Clamp force is increased to improve the plastic melt and flow during the weld portion (Pressure 1) of a cycle, and this assures tight assembly during the hold portion (Pressure 2) by welding parts at one pressure and holding them together at a second, higher pressure.

iQ Series

The iQ Series module, P4, supports press system operation through two connectors:

- **J5 - Thruster** - Provides control for thruster operation. (Dukane Cable P/N 200-1556-XXM)
- **J6 - Base/Abort** - Provides the signal for the press base control.
  (Dukane Cable P/N 200-1545-XXM)

Ultra Series

The P8 module offers connectivity for Dukane Ultra Series systems. It supports three connectors:

- **J7 - Thruster** - Provides control for thruster operation. (Dukane Cable P/N 200-1556-XXM)
- **J8 - Base/Abort** - Provides the signal for the press base control.
  (Dukane Cable P/N 200-1545-XXM)
- **TOS (Top of Stroke)** - Provides the signal for top of stroke - when thruster is fully retracted.
  (Dukane Cable P/N 200-1545-XXM)

Welding with Two Pressures and Distance

The P5 or P9 module enhances the P4 or P8 module respectively by adding a distance mode.

The Weld by Distance mode controls the melt collapse distance to ensure that the same volume of material melts on each part. The result: finished joint strength is consistent.

All distance parameters - downstroke, trigger delay, weld hold, absolute weld, total weld, and total stroke distance - are monitored to show upper and lower limits for bad and suspect parts. This will verify part quality and uniformity.

Dukane's linear optical encoder has a one-micron resolution to insure exceptional precision and repeatability.

iQ Series

The iQ Series module, P5, adds support for distance, and that requires a third connector:

- **J11 - Encoder** - This connector is configured to deliver control for the distance encoder.
  (An extender cable, that is required in some applications: Dukane Cable P/N 200-1613-XXM.)

Ultra Series

The P9 module adds support for distance, and that requires a third connector:

- **J12 - Encoder** - This connector is configured to deliver control for the distance encoder.
  (An extender cable, that is required in some applications: Dukane Cable P/N 200-1613-XXM.)

<table>
<thead>
<tr>
<th>Press Interface Modules</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Generator Series</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>iQ</td>
</tr>
<tr>
<td>Ultra</td>
</tr>
</tbody>
</table>

Table 6-I  Press Interface Modules
Hydraulic Speed Control

SLOW SPEED Control and Indicator Flags

The thruster has a knob labelled SLOW SPEED near the bottom of the front panel and a SLOW SPEED indicator flag. Refer to Figure 6-3.

The knob and the indicator flag are part of the optional Hydraulic Speed Control Kit.

The purpose of the hydraulic speed control is to match the downstroke speed to the material melt flow. This will produce the strongest joint. The Slow Speed Setting knob adjusts the point along the 7 inch (177.8 mm) downstroke distance at which the hydraulic speed control will engage. It should be set to engage just before the horn contacts the part. The maximum distance over which this kit can control the downstroke speed is 1 inch (25.4 mm).

The middle of the indicator flag, when referenced to the scale beside the flag slot, shows where the 1 inch (25.4 mm) of slow speed is set to begin.

Hydraulic Speed Control Kit Operation

The hydraulic speed control kit, shown in Figure 6-4, is a combination impact absorber and hydraulic check valve.

The kit contains a sealed hydraulic cylinder with an external plunger. The cylinder is mounted to the stationary part of the thruster.

The kit also has a contact block that is mounted to the slide assembly of the thruster. When the slide assembly descends, the contact block descends until it engages the plunger of the stationary hydraulic cylinder and pushes the plunger down into the cylinder. The design of the cylinder resists the downward motion of the plunger by metering the pure silicone fluid through an adjustable internal flow aperture, resulting in a constant speed of the slide assembly.

The hydraulic cylinder is mounted in a clamping block. The block is threaded onto a long rod.

NOTE

Slow Speed range is limited to 1" (2.5 cm) below the Stroke Position set point.

The optional air cylinders (1.5", 2", and 3" in diameter) are factory installed and do not require any field adjustments.
Hydraulic Speed Control Kit Operation

Turning the SLOW SPEED knob rotates the rod.

This in turn causes the contact block to ride up or down on the rod, moving the contact point closer to or further from the hydraulic cylinder at rest.

This distance determines how far the contact block, and therefore the slide assembly, must travel before the block contacts the plunger of the hydraulic cylinder.

The plunger has a maximum travelling distance of one inch (25.4 mm). The first 1/4 inch (6.4 mm) of travel decelerates the speed of the slide assembly. The remaining 3/4 inch (19.1 mm) of travel allows the slide assembly to descend at a constant slow speed set by the operator.

The slide assembly can only travel downward a maximum of one inch (25.4 mm) after the block contacts the plunger.

Hydraulic Speed Control Adjustment

Rotating this shaft adjusts the internal metering aperture which regulates the flow of the silicone fluid. There are two ways to adjust the hydraulic speed control setting. First make sure that the slide assembly is fully retracted (up position). This will uncover the hydraulic damper and shaft.

- Insert the end of a small screwdriver or similar tool into the hole (Figure 6-5) in the adjustment shaft of the hydraulic cylinder, OR,
- Locate the slot on the bottom of the cylinder (Figure 6-6). Insert a screwdriver in the slot and adjust the setting.

Just above the shaft is a scale with 30 divisions. On the adjustment shaft is a vertical groove that indicates where along the scale the speed is set. Zero (0) is the fastest setting, and thirty (30) is the slowest setting.
Distance Encoder

Purpose
To install and calibrate the distance encoder in order to accurately measure the distance of thruster travel.

Requirements

Parts
Kit (P/N 438-783) consisting of the following:

- Encoder (two pieces; P/N 625-18),
- Encoder head cable cover bracket, and
- Mounting screws and hardware.

Tools

- Phillips-head screwdriver
- Feeler gauge set (0-.050 inches) or metric equivalent
- 6 inch ruler or metric equivalent

Installation Instructions

Dismantling
1. Facing the front of the press, remove the panel from the right side of the press. (See Figure 6-7.)

Reassembly
1. Mount the cable cover bracket from the kit and secure it with flat head screws.

2. Attach the encoder scale to the mounting screw holes in the right side of the thruster with pan-head screws. Do not tighten.

3. Remove the back panel from the press and route the encoder head cable, being careful not to interfere with the press movement.

4. Connect the encoder cable to the generator connector J-11 (Encoder).

5. Replace the rear panel on the press.
Reassembly
6. Gently slide the encoder head down until the mounting screw holes in the press support base appear in the head’s mounting slots.
7. Center the screw holes in the mounting slots. Secure the encoder head with the two pan-screws but do not tighten them yet.

Alignment
The purpose of this alignment is to set the internal reference mark for the encoder. This reference mark resets the distance register in the generator after each thruster cycle and ensures repeatable distance measurements from cycle to cycle.
1. Check the position of the encoder scale’s mounting hole slots using the 6” ruler. Measure the distance from the center of the screw to the edge of the slot in both directions. When the screws are centered horizontally, carefully tighten the screws.
2. Measure a vertical distance of 1.375 inches (34.92 mm) up from the bottom edge of the encoder scale, as shown in Figure 6-8.
3. Adjust the bottom edge of the encoder head to align to this distance and tighten the screws on the encoder head.
   Turn on the generator, and set it to measure distance.
5. Set the air pressure to the desired level.
6. Perform the following procedure to test the encoder for the proper setting:
   • Pull out the ABORT button (on the press base). Allow the thruster to return to top of stroke.
   • If the encoder position reads -0.06" to 0.30", then the encoder is set correctly.
   • Secure the two screws. Proceed to Step 7.

Figure 6-8  Distance Encoder Alignment

WARNING
Keep hands and clothing away from an activated press.
Alignment

7. Set the gap between the encoder scale and head, using the feeler gauge .039 inch (1 mm) blade.

8. Measure the gap at the top and bottom of the stroke. Allowable tolerance, as specified by the encoder manufacturer, is ±.005. This is a range of from .034 to .044 inches (.864 to 1.12 mm).

9. Tighten all the screws and check the measurements again.

10. Replace the press/thruster right side panel.
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SECTION 7

Acoustic Stack/Fixture Setup

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  Stack Removal ............................................. 101
  Stack Disassembly ....................................... 102
  Removing a Detachable Tip .............................. 102
  Stack Assembly and Torque Values .................... 103
  Installing a Detachable Tip ......................... 104
  Installing the Stack ................................... 104
Fixture Installation ........................................... 105
  Fixture Alignment ..................................... 105
  Fixture Leveling .................................... 106
Overview

A Dukane press/thruster and a iQ Series generator can be used to assemble an unlimited variety of parts for every conceivable market segment, including Automotive, Medical, Appliance, Consumer, Packaging and Toy industries. Various techniques and processes, such as welding, staking, swaging, inserting, and spot welding can be used for the different applications.

This variety is made possible through the interchange of some system components. Of these components, the horn and fixture are usually custom-made for each application, and the booster that is selected for a job depends on the required horn output amplitude. Also, the press/thruster controls are specifically adjusted for each application.

This section provides instructions for setting up these components of the system in a new installation or when changing applications.
Stack Description

The acoustic stack shown in Figure 7-1 consists of three parts:

- Transducer
- Booster
- Horn

The transducer and the booster are normally shipped assembled and installed in the press. The horn and/or the fixture may be shipped separately.

The stack is easily removed from or installed in the press/thruster. This makes it possible to change the horn or booster. It also makes it easier to perform regular inspections and/or maintenance of the stack components.

Figure 7-1 Stack Components
Changing Stack Components

Stack Removal

Before removing the stack, perform the following steps:

1. Activate the E-STOP (Abort) switch on the front of the press base.
2. Power down the generator.

These two steps are necessary to ensure that no power will be accidently applied while removing the stack.

3. While supporting the stack with one hand, loosen the two or four socket-head screws that secure the stack access door.
4. If the door has two screws, swing it open. If it has four screws, remove it completely.
5. Pull the stack forward and down until the transducer clears the electrical contact. Refer to Figure 7-2.
6. Lift the stack out of the housing.

CAUTION

The stack access door on the press/thruster holds the stack components in the stack housing. Hold the stack by the HORN or the exposed part of the BOOSTER when removing or installing the access door. This will prevent the stack from falling out and being damaged.

NOTE

When changing or inspecting any of the stack components, ALWAYS remove the stack from the thruster.

CAUTION

There may be an electrical charge stored in the transducer. To avoid any electrical shock, do not touch the contact button when removing the stack.

CAUTION

The stack may be hot.

Figure 7-2  Stack Removal
Stack Disassembly
To separate the stack component carefully follow the instructions below:

1. Use the two spanner wrenches (wrench A and B) provided with the press. Place wrench A on the component to be removed (Refer to Figure 7-3) and wrench B on the one next to it. Turn wrench A in the direction indicated.

   Once the component is loose, it can be removed by hand.

2. To maintain structural integrity, NEVER hold a transducer by the housing or the booster by the mounting rings while separating components. Doing so will result in damage to the unit.

3. Use only the tools recommended by Dukane. NEVER clamp a horn, booster, or transducer in a vise or use tools such as pliers, visegrips, etc. Doing so will result in scratches and/or gouges, resulting in stress areas on the surface. This condition will affect the stack operation and could lead to failure of each stack component.

Removing a Detachable Tip
If the horn has a detachable tip, do the following:

1. Use a spanner wrench to hold the horn, as shown in Figure 7-4.

2. Turn a properly sized open end wrench to loosen the tip.

   NEVER clamp the horn or use a vise to hold it.
Stack Assembly

Before assembling a stack, inspect all of the components for possible damage — especially the surfaces that are to be joined. Look for non-flat surfaces (concave, convex), stress cracks, chips, or gouges. Any of these irregularities will affect the operation of the stack and could cause further damage. Contact the Dukane Ultrasonics Tooling Department concerning a damaged component.

When the components have been inspected and are found to be free of any damage, continue with the following steps:

1. Inspect the contact surfaces for smoothness and cleanliness. Pitting or a buildup of old grease and dirt on the surface will interfere with the transfer of energy from one component to another.

2. Remove any foreign matter from the threaded stud and the mating hole. Tighten the stud in the stack component that is most distant from the transducer according to the following stud torque values:

<table>
<thead>
<tr>
<th>Stud Thread Size</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>inch-lbs</td>
</tr>
<tr>
<td>1/2 in. x 20</td>
<td>12-18</td>
</tr>
<tr>
<td>3/8 in. x 24</td>
<td>12-18</td>
</tr>
<tr>
<td>M8 x 1.25</td>
<td>12-18</td>
</tr>
</tbody>
</table>

Table 7-I Stud Torque Values

3. Coat one of the contact surfaces with a thin coat of high-pressure grease. A small packet is supplied with the system. We recommend Dow–Corning #4 (or #111 as an alternate).

4. Thread the components together and tighten (Refer to Table 7-II) by applying torque as follows:

<table>
<thead>
<tr>
<th>Stack kHz</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>inch-lbs</td>
</tr>
<tr>
<td>15</td>
<td>540</td>
</tr>
<tr>
<td>20</td>
<td>420</td>
</tr>
<tr>
<td>30</td>
<td>216</td>
</tr>
<tr>
<td>40</td>
<td>216</td>
</tr>
</tbody>
</table>

Table 7-II Horn/Booster Torque Values

**NOTE**

Do not apply any grease or lubricant to the stud.
Installing a Detachable Tip

If the horn has a detachable tip, do the following:

1. Inspect the surfaces of the tip and the horn for any stress cracks, chips or gouges.

2. Coat one of the contact surfaces with a thin coat of high-pressure grease or lubricant. We recommend Dow–Corning #4 (or #111 as an alternate).

3. Thread the tip into the horn. To tighten the tip, use the open-end wrench for the tip and a spanner wrench to hold the horn, as shown in Figure 7-6.

Tighten the tip to the following specifications:

<table>
<thead>
<tr>
<th>Tip Stud Thread Size</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>inch-lbs</td>
</tr>
<tr>
<td>1/2 in. x 20</td>
<td>360</td>
</tr>
<tr>
<td>3/8 in. x 24</td>
<td>336</td>
</tr>
<tr>
<td>5/16 in. x 24</td>
<td>300</td>
</tr>
<tr>
<td>1/4 in. x 28</td>
<td>240</td>
</tr>
</tbody>
</table>

Table 7-III Replaceable Tip Torque Values

Installing the Stack

1. With the stack at the angle shown in Figure 7-7, rest the booster mounting ring on the pin of the stack housing.

2. Brace the stack at point A in Figure 7-7, and swing the stack to a vertical position. The ultrasound contact button on the transducer should snap under the electrical contact leaf of the housing.

3. While still supporting the stack in this vertical position, install the stack access door, and thread the two or four socket-head bolts (that hold the door closed) into their holes.

4. If the horn is not properly aligned with the fixture, rotate the stack to align the horn with the fixture.

5. Finish tightening the socket head bolts until snug.

   DO NOT OVER-TIGHTEN!

NOTE

Do not apply any lubricant to the tip threads.

NOTE

When all door screws are tightened, a small gap between the door and stack housing is normally present.
Fixture Installation

There are three steps involved in installing a fixture.
• Aligning the fixture with the horn,
• Leveling the fixture to provide the necessary support, and
• Rigidly securing the fixture to the mounting surface.

Fixture Alignment

To safely align the fixture under the horn, use the following procedure. (Refer to Figure 7-8.)

1. Depress the E-STOP (Abort) switch. This allows the acoustic stack assembly to be lowered by hand and prevents the system from accidentally cycling.
2. Turn off the power to the generator to prevent accidental ultrasound operation.
3. Place the fixture, with parts, under the horn.
4. Initially align the two slots in the fixture over two of the seven mounting holes on the base plate.
5. Install the two hold-down bolts with washers, and finger tighten.

WARNING
Any fixture manufactured by a third party must comply with all OSHA and ANSI requirements. All fixtures must be guarded as necessary.

Dukane Corporation does not assume any responsibility or liability for fixtures manufactured by the customer or any third party manufacturer.

Figure 7-8  Fixture/Base Layout
Fixture Alignment

6. Place a part in the fixture.
7. Grasping the horn firmly, pull the acoustic stack assembly down until the horn is as close to the part as necessary to align the fixture.
8. Align the fixture with the horn, and tighten the hold-down bolts, or cap screws, to prevent the fixture from moving.
9. Adjust the mechanical stop of the press so that the horn stops above the fixture. This prevents pinch points and avoids horn damage if the acoustic stack assembly descends when a part is not in the fixture.

Fixture Leveling

For most applications, the fixture must be mounted so that the contacting surfaces on the horn are parallel to the contacted surfaces on the plastic part. This ensures that a consistent, even weld will result. To level the fixture, do the following:

1. Place a part in the fixture.
2. Loosen (turn counterclockwise) the hold-down bolts or cap screws and the four leveling jack screws on the fixture plate. Refer to Figure 7-9.
3. Pull the acoustic stack assembly down to the fixture. Allow the horn and the part to align.
4. Turn the four jack screws clockwise until a slight resistance is felt. Refer to Figure 7-10.
5. Tighten the hold-down cap screws by turning them clockwise until a firm resistance is felt.

NOTE

The fixture should be flat on the base. If the fixture is equipped with leveling jack screws, adjust the screws so that they do not interfere with seating of the fixture on the base plate.

NOTE

Some applications may require the horn to be a few thousandths of an inch from contact with the fixture.

Special applications may require the Mechanical (MEC) stop to be lowered so the horn makes contact with the fixture or anvil. When this is required, a ground-detect circuit is needed to terminate the weld cycle.

NOTE

Do not overtighten the cap screws. This may flex the fixture plate.

Figure 7-9  Loosening the Hold–Down Cap Screws and Jack Screws

Figure 7-10  Tightening the Hold–Down Cap Screws and Jack Screws

Continued
Fixture Leveling

6. If any readjustment is necessary, loosen the hold-down screws first. Then readjust the jack screws.

The following procedure may be helpful in leveling the fixture in some applications. To perform this procedure, use a piece of carbon paper and a piece of white paper.

1. Place a sample part in the fixture.
2. Place a piece of white paper on top of the sample part.
3. Place a piece of carbon paper, carbon side down, on top of the white paper.
4. Enter the following parameters into the generator:
   
   Weld Time = 0.05
   Hold Time = 0.00

   System parameters = Use default settings. See examples on Application Setup Worksheet.
5. Set pressure to a value from 20 to 40 psi.
6. Set the trigger control on the thruster so that the pressure switch closes after some pressure is applied.
7. Press the ONLINE button on the generator.
8. Cycle the equipment by activating both finger switches on the base or by triggering the automation switch.

When one cycle is completed, the pressure developed between the horn and the sample part will have left marks from the carbon paper on the white paper. If the fixture is not level, the carbon markings will be darker in some areas than in others. All carbon markings will be uniform when all adjustments have been made properly.

Adjust the leveling of the fixture and repeat this procedure as necessary until you are confident that the fixture is level.
 '#' \textbf{SECTION 8} \hfill

\textbf{Stack Maintenance}

---

Inspection of the Acoustic Stack Components \ldots 111

Reconditioning Stack Components \ldots \ldots 112

Torque Values \ldots \ldots \ldots \ldots \ldots \ldots 113
Inspection of the Acoustic Stack Components

It is essential that the mating faces between an ultrasonic transducer/booster and a booster/horn be absolutely flat and parallel. If there is any air gap, there will be a loss in power output and efficiency. Coupling may be so poor as to prevent the startup of vibration from the stack, due to the excessive power draw at the mating surfaces.

The condition of excessive crowning, or uneven contact surfaces, is normally made evident by a burnished appearance around the bolt hole areas of the contact surfaces. This condition indicates that contact between the parts occurs only at the burnished areas and not across the full faces of the mating surfaces. (See Figure 8-1.)

The following flatness tolerances are specified for Dukane transducers, boosters, and horns used in 20 kHz applications:

- Transducer .0005 inch
- Booster .0005 inch
- Horn .0005 inch

To check if there may be a flatness problem, first disassemble the stack and look at the mating surfaces. If there are burnished areas at the periphery of a contact surface, that surface may be crowned in the center. Place a straight edge along the face. Refer to Figure 8-2. If light can be seen along the edges, it is crowned.

The surface may also be depressed in the bolt area. Refer to Figure 8-3. In this case, there will be contact only at the peripheral edges and light will be visible beneath the straight edge in the center region.
Reconditioning Stack Components

To restore the interface to the proper condition, do the following:

1. Disassemble the transducer/booster/horn stack and wipe interfaces with a clean cloth or paper towel.

2. Examine all interfaces. If any interface is corroded or shows a dark, hard deposit, it should be reconditioned.

3. If the interfaces appear to be in good condition, go to Step 11.

4. If necessary, remove the mounting studs.

5. Tape a clean sheet of #400 grit (or finer) silicon carbide wet-or-dry paper to a clean, smooth, flat surface. A piece of plate glass is usually suitable.

6. Hold the part to be conditioned at its lower end with your thumb over a spanner wrench hole. Carefully stroke the part once in one direction (toward you) across the abrasive paper, as shown in Figure 8-4. Do not apply downward pressure. The component’s weight alone provides sufficient pressure. Perform a second stroke.

7. Rotate the part 120° (1/3 rotation) to the next spanner wrench hole. Repeat the procedure outlined in Step 6.

8. Rotate the part the remaining 120° and repeat. Be certain to perform the same number of strokes at each orientation: Two strokes per rotation.

9. Before reinserting a stud in any horn, perform the following for proper engagement of the threads:
   a. Visually inspect and clean the stud.
   b. Clean the threaded hole using a clean cloth or towel.
   c. Tighten the stud to the torque specifications listed in Table 7-I.

NOTE
The operating efficiency of the equipment will be greatly affected if the mating interfaces of the transducer/booster/horn stack are not flat, make poor contact with each other, or become corroded. A poor contact condition wastes power output, makes tuning difficult, can affect the noise level, and can cause possible heat damage to the transducer.

CAUTION
Use extreme care to avoid tilting the part. Loss of flatness of interface surfaces may render the welding system inoperative.

CAUTION
Use extreme care to avoid multiple strokes at each 1/3 rotation of the part. Loss of flatness and perpendicularity of the interface surface to the centering axis of the part may render the welding system inoperative.

Continued
Reconditioning Stack Components

10. Reexamine the interface surface and repeat Steps 6 through 9 until most of the contaminate has been removed. This should not take more than 2 or 3 complete rotations of the part being reconditioned.

11. Reassemble and install the stack, using the procedure in Section 7 of this manual. Recheck the power supply tuning.

Torque Values

See Section 7, Acoustic Stack/Fixture Setup for torque values:

Table 7-I - Stud Torque Values
Table 7-II - Horn/Booster Torque Values
Table 7-III - Replaceable Tip Torque Values

NOTE

Thread deformation may occur if the studs are overtightened. Removal of the stud could damage the threads in the horn. If this occurs, re-tap the horn threads and replace the stud with a new one. Use studs recommended by Dukane.

NOTE

Overtightening stack components may result in horn/booster studs loosening and unexplained overloads.
SECTION 9

Troubleshooting

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Overview

The Troubleshooting section of this manual contains a listing of problems that may occur when using this equipment along with probable causes and recommended solutions for the problems.

Regarding solutions, please note the following:

Where the solutions section refers to changing a setting for a primary weld characteristic or altering the position of the End-of-Weld limit switch, these adjustment capabilities and controls must be available on your equipment.

Primary Weld Characteristics

Primary weld characteristics refers to methods used to control the welding process. The characteristics include Time, Distance, Position and Energy.

To be functional in your system, each characteristic needs corresponding hardware/software support from the generator.

Table 9-I shows each characteristic and its equipment requirements.

<table>
<thead>
<tr>
<th>Primary Weld Characteristic</th>
<th>Equipment Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>Generator with a digital timer or process controller with a time function.</td>
</tr>
<tr>
<td>Distance</td>
<td>Process controller with a distance measurement function and a press/thruster equipped with an optical distance encoder.</td>
</tr>
<tr>
<td>Position</td>
<td>Process controller with a distance measurement function and a press/thruster equipped with an optical distance encoder, or a press/thruster with an End-of-Weld limit switch installed.</td>
</tr>
<tr>
<td>Energy</td>
<td>Process controller with an energy measurement function.</td>
</tr>
</tbody>
</table>

Table 9-I  Weld Characteristics and Equipment Requirements

End-of-Weld Limit Switch

The End-of-Weld limit switch is used to terminate the ultrasound power burst during a weld cycle as determined by the stroke position of the press head.

The switch is generally not used with a system that contains a process controller with a distance measurement function or a press/thruster equipped with an optical distance encoder.
# Welding

## Flash (See also: Uneven Welding)

<table>
<thead>
<tr>
<th>Probable Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy director is too large.</td>
<td>Reduce the size of the energy director.</td>
</tr>
<tr>
<td></td>
<td>Reduce the weld time/primary weld characteristic.</td>
</tr>
<tr>
<td></td>
<td>Reduce the air pressure.</td>
</tr>
<tr>
<td></td>
<td>Use an interrupted energy director.</td>
</tr>
<tr>
<td>Shear interference is too great.</td>
<td>Reduce the amount of interference.</td>
</tr>
<tr>
<td>Weld time is too long.</td>
<td>Reduce the weld time.</td>
</tr>
<tr>
<td>Non-uniform joint dimensions.</td>
<td>Re-dimension the joint.</td>
</tr>
<tr>
<td></td>
<td>Redesign the joint to be a shear joint or a tongue-in-groove joint.</td>
</tr>
<tr>
<td></td>
<td>Contact Dukane's Applications Lab.</td>
</tr>
<tr>
<td></td>
<td>Check the processing conditions.</td>
</tr>
<tr>
<td>Part fit or tolerances.</td>
<td>Loosen the part fit.</td>
</tr>
<tr>
<td></td>
<td>Loosen the part tolerances.</td>
</tr>
</tbody>
</table>

## Misalignment of the welded assembly

<table>
<thead>
<tr>
<th>Probable Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parts are not self-aligning.</td>
<td>Design a means of alignment into the tooling (fixturing).</td>
</tr>
<tr>
<td></td>
<td>Add a means of alignment (e.g., pins and sockets) to the mating part halves.</td>
</tr>
<tr>
<td>Improper support in the fixture.</td>
<td>Redesign the fixture for proper support.</td>
</tr>
<tr>
<td>Wall flexure.</td>
<td>Add ribs or gussets to the part.</td>
</tr>
<tr>
<td></td>
<td>With a resilient fixture, if large sections of urethane are deflecting, add a rigid backup.</td>
</tr>
<tr>
<td>Joint design is not properly dimensioned.</td>
<td>Re-dimension the parts.</td>
</tr>
<tr>
<td>Incorrect part tolerance/poor molding.</td>
<td>Tighten the part tolerance.</td>
</tr>
<tr>
<td></td>
<td>Check the processing conditions.</td>
</tr>
</tbody>
</table>
## Welding

### Problem
Internal components are welding together.

<table>
<thead>
<tr>
<th>Probable Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>The internal components are made of the same material.</td>
<td>Make the internal components out of different materials.</td>
</tr>
<tr>
<td></td>
<td>Carefully lubricate the internal parts.</td>
</tr>
<tr>
<td></td>
<td>Use less horn amplitude by changing to a lower gain booster.</td>
</tr>
</tbody>
</table>

### Problem
Diaphragm Damage

<table>
<thead>
<tr>
<th>Probable Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excessive horn amplitude.</td>
<td>Reduce the horn amplitude.</td>
</tr>
<tr>
<td></td>
<td>Dampen the welding area to absorb the amplitude.</td>
</tr>
<tr>
<td>Excessive exposure to ultrasound.</td>
<td>Reduce the weld time and increase the horn amplitude and/or air pressure.</td>
</tr>
<tr>
<td>Improper gate location/design/thin-wall sections.</td>
<td>Check gate placement.</td>
</tr>
<tr>
<td></td>
<td>Change the shape of the gate.</td>
</tr>
<tr>
<td></td>
<td>Add stiffening ribs to the part.</td>
</tr>
<tr>
<td></td>
<td>Increase the thickness of the material on the underside of the gate area.</td>
</tr>
<tr>
<td></td>
<td>If using a 20 kHz system, consider using a 30 kHz or 40 kHz system.</td>
</tr>
<tr>
<td>The type of horn and/or its placement.</td>
<td>Check for the proper horn/part fit.</td>
</tr>
<tr>
<td></td>
<td>Change the horn.</td>
</tr>
</tbody>
</table>

### Problem
Overwelding

<table>
<thead>
<tr>
<th>Probable Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Too much energy is being transmitted to the part.</td>
<td>Reduce the air pressure.</td>
</tr>
<tr>
<td></td>
<td>Reduce the weld time/primary weld characteristic.</td>
</tr>
<tr>
<td></td>
<td>Change to a lower gain booster to reduce the horn amplitude.</td>
</tr>
<tr>
<td></td>
<td>Reduce downstroke speed.</td>
</tr>
</tbody>
</table>
Welding

Problem

Internal components of work piece damaged during welding.

Probable Cause  Solution
Excessive horn amplitude  Reduce the horn amplitude by changing to a lower gain booster.
Dampen the excess horn amplitude.
Excessive exposure to ultrasound.  Reduce the primary weld time and increase the horn amplitude by changing to a higher gain booster.
Too much energy transmitted into the part.  Reduce the horn amplitude.
Reduce the air pressure.
Reduce the weld time/primary weld characteristic.
The components are improperly mounted (e.g., parts are mounted too close to the joint area).  Ensure that internal components are mounted properly.
Isolate internal components from the part.
Move the internal components away from areas of high energy.
Use an external device to dampen energy locally.

Problem

Melting or fracturing of the part (outside of the joint area).

Probable Cause  Solution
Sharp internal corners/thin sections.  Radius all sharp corners.
Dampen motion for any damaged area, if possible.
Excessive horn amplitude.  Reduce the horn amplitude by changing to a lower gain booster.
A long weld time.  Decrease the weld time and increase the horn amplitude and/or the air pressure.
Inherent stress.  Check the molding conditions.
Check the part design.
Reduce the horn amplitude.
Welding

Problem

Underwelding

Probable Cause
Insufficient energy is being transmitted to the part.

Solution
Increase the air pressure.
Increase the weld time/primary weld characteristic.
Change to a higher gain booster to increase the horn amplitude.
Use a more powerful assembly system.

Energy is being absorbed into the fixture.
Change the type of fixture being used.

Problem

Uneven welding

Probable Cause
Warped part(s).

Solution
Check part dimensions.
Check the molding conditions.
Use a higher trigger pressure.
Use a higher hold pressure.

The energy director varies in height.
Redesign the energy director to ensure uniform height.
Use an interrupted energy director.

Lack of parallelism between the horn, the fixture, and the part.
Make sure the thruster is perpendicular to the part.
Check the part dimensions.

Wall flexure is occurring.
Add ribs to the part.
Modify the fixture to prevent outward flexure.

The knockout pin location is in the joint area
Redesign the part so the knockout pin is not in the joint area (Make sure knockout pins are flush with the surface)

There is insufficient support in the fixture.
Redesign the fixture to improve the support in critical areas.
Change to a rigid fixture.
If large sections of urethane are deflecting with a resilient fixture, add a rigid backup.

Continued
## Welding

<table>
<thead>
<tr>
<th>Problem</th>
<th>Continued from Previous Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uneven welding</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Probable Cause</th>
<th>Solution</th>
</tr>
</thead>
</table>
| Part dimensions are incorrect. | Check the part dimensions.  
Re-dimension the part, if necessary.  
Check the molding conditions. |
| The parts are improperly aligned. | Check for part shifting during welding.  
Check the alignment of mating parts.  
Check for parallelism of the horn, the part, and/or the fixture. |
| There is a lack of intimate contact around the joint area. | Check the part dimensions.  
Check the part tolerances.  
Check for knockout pin marks in the joint area.  
Check for misalignment of the mating part halves.  
Check for sinks. |
| Non-uniform horn contact is occurring. | Check the fit of the part to the horn.  
Check for proper support in the fixture. |
| Mold release is on the joint surface(s). | Clean the mating surfaces. |
| There is a non-uniform distribution of filler in the plastic material. | Check the molding conditions.  
Check the mold design. |
| The joint design is incorrect. | Redesign the joint. |
| There is a material or resin grade incompatibility problem. | Consult with the resin supplier(s). |
| There is a regrind problem. | Check with the molder.  
Check the molding conditions. |
| There is moisture in the molded parts. | Specify the parts to be “dry as molded”.  
Dry the parts by heating them prior to welding. |

Continued
**Welding**

**Problem**

The parts are marking.

<table>
<thead>
<tr>
<th>Probable Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>The horn heats up.</td>
<td>Check for a loose stud, tighten if loose.</td>
</tr>
<tr>
<td></td>
<td>Loosen and then retighten the horn tip.</td>
</tr>
<tr>
<td></td>
<td>(Refer to Section 7).</td>
</tr>
<tr>
<td>There are high spots in the part.</td>
<td>Check the part dimensions.</td>
</tr>
<tr>
<td>Use of raised lettering.</td>
<td>Check the fit of the horn to the part.</td>
</tr>
<tr>
<td>The part does not fit the fixture properly.</td>
<td>Check the fixture for proper support.</td>
</tr>
<tr>
<td></td>
<td>Check for cavity-to-cavity variations.</td>
</tr>
<tr>
<td></td>
<td>Redesign the fixture.</td>
</tr>
<tr>
<td>Oxide from the horn is being transferred to</td>
<td>Place polyethylene film between the horn and the part.</td>
</tr>
<tr>
<td>the part.</td>
<td>Use a chrome-plated horn and/or fixture.</td>
</tr>
<tr>
<td>The parts contain fillers.</td>
<td>Check the processing conditions.</td>
</tr>
<tr>
<td></td>
<td>Reduce the amount of filler in the plastic.</td>
</tr>
</tbody>
</table>

**Problem**

Welding process not in control (inconsistent weld results on a part-to-part basis).

<table>
<thead>
<tr>
<th>Probable Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>A mold release agent is used.</td>
<td>Clean the mating surfaces.</td>
</tr>
<tr>
<td></td>
<td>If a mold release agent is necessary, use a paintable/printable grade.</td>
</tr>
<tr>
<td>Incorrect part tolerances.</td>
<td>Tighten the part tolerances.</td>
</tr>
<tr>
<td></td>
<td>Check the part dimensions.</td>
</tr>
<tr>
<td>There are cavity-to-cavity variations.</td>
<td>Check the molding dimensions.</td>
</tr>
<tr>
<td></td>
<td>Check the part dimensions and tolerances.</td>
</tr>
<tr>
<td></td>
<td>Check for cavity wear.</td>
</tr>
<tr>
<td></td>
<td>Check the molding conditions.</td>
</tr>
</tbody>
</table>

---

*Continued*
Welding

### Problem

Welding process not in control (inconsistent weld results on a part-to-part basis).

<table>
<thead>
<tr>
<th>Probable Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part dimensions vary due to mold cavity variations.</td>
<td>Perform a statistical study to see if a pattern develops with certain cavity combinations.</td>
</tr>
<tr>
<td>The resin contains regrind or degraded plastic.</td>
<td>Consult with the molder. Check the molding conditions. Reduce the percentage of regrind. Improve the quality of the regrind.</td>
</tr>
<tr>
<td>Fluctuations in the AC line voltage supplied to the generator.</td>
<td>Upgrade to a generator with line regulation.</td>
</tr>
<tr>
<td>Fluctuations in the air line pressure.</td>
<td>Upgrade to a system with electronic pressure regulation. Add a surge tank with a check valve to the air line. Raise the compressor output pressure.</td>
</tr>
<tr>
<td>The plastic’s filler content is too high.</td>
<td>Reduce the percentage of filler in the plastic. Check the processing conditions. Change the type of filler (e.g., from short to long glass fibers).</td>
</tr>
<tr>
<td>The horn doesn’t fit the part correctly.</td>
<td>Check the part dimensions. Check for cavity-to-cavity variations. Obtain a new horn.</td>
</tr>
<tr>
<td>The weld cycle is too long.</td>
<td>Reduce the weld cycle time and increase the horn amplitude or air pressure. Increase the dynamic trigger force.</td>
</tr>
<tr>
<td>There is a lack of parallelism between the horn, part, and/or fixture.</td>
<td>Check for parallelism between the horn, part, and fixture. Check the horn/part fit. Check the part/fixture fit. Level the fixture, where necessary.</td>
</tr>
<tr>
<td>Rigid fixture reflects vibratory energy.</td>
<td>Dampen the energy by using teflon, neoprene, cork, or urethane in the nest of the fixture.</td>
</tr>
</tbody>
</table>
## Insertion

### Problem

The insert pulls out easily in use.

<table>
<thead>
<tr>
<th>Probable Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>There is insufficient interference between the hole and the insert.</td>
<td>Reduce the size of the molded hole in the plastic.</td>
</tr>
<tr>
<td>The screw bottoms out in the hole.</td>
<td>Use a shorter screw. (Applies to internally-threaded insert).</td>
</tr>
<tr>
<td>The insert gets pushed into the plastic before the plastic melts.</td>
<td>Deepen the hole.</td>
</tr>
<tr>
<td>The ultrasound remains on after insertion is complete.</td>
<td>Use hydraulic speed control. Increase the horn amplitude and/or decrease the air pressure. Use pre-triggering.</td>
</tr>
<tr>
<td>The horn retracts before the plastic around the insert is solidified.</td>
<td>Decrease the primary weld characteristic. Increase the hold time.</td>
</tr>
</tbody>
</table>

### Problem

Inconsistent insertion of multiple inserts on the same part.

<table>
<thead>
<tr>
<th>Probable Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>The plastic is not melting consistently around all inserts.</td>
<td>Increase the horn amplitude.</td>
</tr>
<tr>
<td>Inserts are pushed into the plastic before the plastic has melted.</td>
<td>Use hydraulic speed control. Reduce the down speed. Use pre-triggering.</td>
</tr>
<tr>
<td>Inserts are seated at different heights within the same part.</td>
<td>Evaluate the support provided by the fixture. If required, re-level or shim the fixture. Measure the horn tip length to check for dimensional consistency. If a varying length is found, send the horn to Dukane for modification.</td>
</tr>
</tbody>
</table>
# Insertion

## Problem
The boss or the plastic around the boss cracks after insertion.

### Probable Cause
- The insert is pushed in before the plastic has melted.
- The gauge pressure is set too high.
- The boss wall is too thin.
- There is too much interference between the insert and the hole.

### Solution
- Reduce the down speed, air pressure, and/or horn amplitude.
- Use pre-triggering.
- Reduce the air pressure.
- Increase the thickness of the boss wall.
- Increase the hole diameter.
- Use a smaller insert.

## Problem
The insert is not driven to the desired depth.

### Probable Cause
- The ultrasound is not on long enough.
- Flash fills the hole. (Applies to an internally-threaded insert.)
- There is insufficient air pressure and/or ultrasonic power.

### Solution
- Increase the primary weld characteristic. Check the bottom stop setting.
- Increase the depth of the hole.
- Increase the air pressure, the ultrasonic power, or the horn amplitude.

## Problem
The cycle time is too long.

### Probable Cause
- There is insufficient ultrasonic power or the generator overloads.
- There is too much interference between the hole and the insert.
- The area of the part being inserted is not being rigidly supported.
- The down speed is slow.

### Solution
- If using a power control, increase the power. Use a more powerful generator.
- Increase the hole diameter, if possible. Use a smaller insert.
- Support the part directly under the boss. Install a metal post directly under the part being inserted.
- Increase the down speed.

---

*Continued*
# Insertion

## Problem
Plastic flows over the top of the insert.

<table>
<thead>
<tr>
<th>Probable Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>The weld time is too long.</td>
<td>Decrease the primary weld characteristic.</td>
</tr>
<tr>
<td>The insert is being driven too deep.</td>
<td>Reset the bottom stop.</td>
</tr>
<tr>
<td>There is too much interference between the hole and the insert.</td>
<td>Decrease the primary weld characteristic.</td>
</tr>
</tbody>
</table>

## Problem
Melted plastic fills the hole (applies to internally-threaded inserts).

<table>
<thead>
<tr>
<th>Probable Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>The insert is too long or the hole is too shallow.</td>
<td>Use a shorter insert or make the hole deeper.</td>
</tr>
<tr>
<td>There is too much interference between the hole and the insert.</td>
<td>Increase the hole diameter. Use smaller inserts.</td>
</tr>
<tr>
<td>The insert is being driven too deep.</td>
<td>Reset the bottom stop. Decrease the primary weld characteristic.</td>
</tr>
</tbody>
</table>
# Staking

## Problem

A ragged or irregularly shaped stake head is formed.

<table>
<thead>
<tr>
<th>Probable Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>The staking cavity is too large.</td>
<td>Change to a smaller cavity in the horn.</td>
</tr>
<tr>
<td>The volume of plastic in the stud is insufficient.</td>
<td>Increase the stud height/diameter.</td>
</tr>
<tr>
<td>The stud is melting at the base.</td>
<td>See the problem section that follows entitled “The base is melting before the head forms.”</td>
</tr>
</tbody>
</table>

## Problem

There is excessive flash around the stake head.

<table>
<thead>
<tr>
<th>Probable Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>The staking cavity is too small.</td>
<td>Use a larger cavity in the horn.</td>
</tr>
<tr>
<td>The volume of plastic in the stud is excessive.</td>
<td>Decrease the stud height and/or diameter.</td>
</tr>
<tr>
<td>The stud is not centered in the horn cavity.</td>
<td>Center the stud under the horn cavity.</td>
</tr>
</tbody>
</table>

## Problem

The surface below the stake head is distorted.

<table>
<thead>
<tr>
<th>Probable Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>The part is not supported directly beneath the stud being staked.</td>
<td>Support the fixture with a metal post beneath the stud being staked.</td>
</tr>
<tr>
<td>The trigger force is too high.</td>
<td>Reduce the trigger force. Use pre-trIGGERING.</td>
</tr>
</tbody>
</table>

## Problem

There is a loose fit between the staked head and the part being attached.

<table>
<thead>
<tr>
<th>Probable Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>The hole diameter relative to the stud diameter is too large.</td>
<td>Reduce the hole diameter.</td>
</tr>
</tbody>
</table>

Continued
# Staking

## Problem

Continued from Previous Page

There is a loose fit between the staked head and the part being attached.

<table>
<thead>
<tr>
<th>Probable Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>The holding force was removed before the stud head could solidify.</td>
<td>If using a dual pressure system, use Pressure 2 in the hold portion of the weld cycle (Pressure 2 should be higher than Pressure 1). Increase the hold time/distance. Increase the stud diameter. Reduce the size of the staking cavity.</td>
</tr>
<tr>
<td>Insufficient force is being applied to the staked head during the hold time.</td>
<td>Lower the bottom stop for the horn’s travel.</td>
</tr>
</tbody>
</table>

## Problem

The stud is collapsing at its base.

<table>
<thead>
<tr>
<th>Probable Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>There is a sharp corner near the base of the stud.</td>
<td>Radius the stud at the base.</td>
</tr>
<tr>
<td>The stud is not centered in the horn cavity.</td>
<td>Center the stud under the horn cavity. Use a knurled tip</td>
</tr>
<tr>
<td>The base is melting before the head forms.</td>
<td>See the problem section below entitled “The base is melting before the head forms.”</td>
</tr>
<tr>
<td>Too much pressure is applied before the ultrasound is activated.</td>
<td>Use pre-triggering.</td>
</tr>
</tbody>
</table>

## Problem

The base is melting before the head forms.

<table>
<thead>
<tr>
<th>Probable Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>The trigger force is too high.</td>
<td>Reduce the trigger force. Pre-trigger the ultrasound.</td>
</tr>
<tr>
<td>The horn amplitude is insufficient.</td>
<td>Increase the amplitude.</td>
</tr>
<tr>
<td>The downstroke speed is too fast.</td>
<td>Use hydraulic speed control. Use a slower downstroke speed.</td>
</tr>
</tbody>
</table>

Continued
Staking

Problem

The formed stud head stays in the staking cavity as the horn retracts.

Probable Cause       Solution
The stud head has not solidified before                      Increase the hold time.
the horn retracts.

The horn tip is heating and not                             Cool the horn tip.
allowing the stud to solidify.                             Use afterburst.

NOTE

The use of a knurled horn tip and a pointed stud can help solve many of the above problems.
# Continuous Welding

<table>
<thead>
<tr>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seal not meeting strength requirements.</td>
<td></td>
</tr>
<tr>
<td><strong>Probable Cause</strong></td>
<td><strong>Solution</strong></td>
</tr>
<tr>
<td>Material traveling too quickly.</td>
<td>Decrease speed.</td>
</tr>
<tr>
<td>Not enough horn amplitude.</td>
<td>Increase booster ratio.</td>
</tr>
<tr>
<td>Inconsistent blends of synthetic material.</td>
<td>Evaluate material.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inconsistent welding.</td>
<td></td>
</tr>
<tr>
<td><strong>Probable Cause</strong></td>
<td><strong>Solution</strong></td>
</tr>
<tr>
<td>Non-uniform amplitude horn.</td>
<td>Have horn analyzed for amplitude uniformity.</td>
</tr>
<tr>
<td>Variations in anvil (fixture).</td>
<td>Check fixture design and dimensions.</td>
</tr>
<tr>
<td>Inconsistency of material.</td>
<td>Evaluate material.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seal area too great, causing flash.</td>
<td></td>
</tr>
<tr>
<td><strong>Probable Cause</strong></td>
<td><strong>Solution</strong></td>
</tr>
<tr>
<td>Material traveling too slow.</td>
<td>Increase speed.</td>
</tr>
<tr>
<td>Too much amplitude.</td>
<td>Reduce booster ratio.</td>
</tr>
<tr>
<td>Excessive air pressure.</td>
<td>Reduce air pressure.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transducer and/or horn heating up.</td>
<td></td>
</tr>
<tr>
<td><strong>Probable Cause</strong></td>
<td><strong>Solution</strong></td>
</tr>
<tr>
<td>Not enough air flow to dissipate heat buildup.</td>
<td>Continuous duty applications require cooling air (refrigerated air, in some applications). Supply air to the stack interfaces and the horn tips.</td>
</tr>
</tbody>
</table>
Continuous Welding

Problem
Excessive horn wear.

Probable Cause  Solution
Metal-to-metal contact between  Use carbide inserts or have horn face
the horn and anvil.  carbide-coated.
Reduce metal-to-metal contact.

Problem
Overloading generators.  ** See the NOTE below.

Probable Cause  Solution
Loose stack components.  Disassemble, clean and reassemble stack.
Horn failure.  Replace horn.
Transducer failure  Replace transducer.
Booster failure.  Replace booster.
Stack operating frequency shifted  Cool stack with air.
out of tolerance.

NOTE
Table 5-1, Page 83, shows alarm messages that indicate generator status, and appear only on display-capable generators.

**
SECTION 10

System Maintenance

Press/Thruster Six-Month Periodic Maintenance . . . 135
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Press/Thruster Six-Month Periodic Maintenance

1. Disconnect the generator AC power cord from the AC line receptacle. Then, remove the thruster left and right side covers.

2. Check that all socket-head cap screws in the press/thruster are tight. Check the air cylinder mounting.

3. Wipe or blow away all dirt and grease in the press/thruster.

4. Wipe away all excess oil and any dirt accumulation, especially at the exhaust openings in the transducer housing. There should be very little, if any, oil accumulation at the air exhaust opening. We recommend that no oil get into the press/thruster pneumatics. Regular accumulation of oil at the air exhaust opening means that some oil is getting into the pneumatics. To rectify this problem, route the air for the press/thruster through an “oil mist reclassifier”.

5. Check the press/thruster slide operation for smooth downward motion. Wipe away any accumulated grease, but do not apply any solvents. If movement is not smooth, the lower bearing may be greased with AFB lithium grease in the standard grease fitting provided.

6. Ensure that all wire and cable connections are secure in the press/thruster and are not rubbing or showing wear. If they do show wear or rubbing then reroute to eliminate the problem.

7. Remount and secure the press/thruster covers and reconnect the generator AC power cord to the AC line receptacle.
This page intentionally left blank
Contacting Dukane

Identify Equipment

When contacting Dukane about a service–related problem, be prepared to give the following information:

• Model number, line voltage and serial number.
• Alarm indicators from the generator display.
• Software version.
• Problem description and steps taken to resolve it.

Many problems can be solved over the telephone, so it is best to call from a telephone located near the equipment.

Intelligent Assembly Solutions

Mailing Address: Dukane Ultrasonics
2900 Dukane Drive
St. Charles, IL 60174 US

Phone: (630) 797–4900

E-mail: ussales@dukane.com

Fax:
Main (630) 797–4949

Service & Parts (630) 584–0796

Website
The website has information about our products, processes, solutions, and technical data. Downloads are available for many kinds of literature.

Here is the address for the main website:
www.dukane.com/us/

You can locate your local representative at:
www.dukane.com/us/sales/intsales.htm
SECTION 12
Specifications

Drawings. ................................. 143-148
Pneumatic Schematic. .................. 145
Electrical Schematic .................... 146
Weights, Dimensions, Operating Environment. .... 149
Compressed Air Requirements .......... 150
AC Power Requirements ................. 150
Interpreting the Model Number Codes .. 151
Replacement Parts ....................... 153
Regulatory Agency Compliance ......... 154
Figure 12-1  Layout - 220 Thruster

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Figure 12-2 Layout - 220 Press
Figure 12-4  Electric Schematic 220
Figure 12-5  iQ LE Basic Generator Layout

NOTE: [mm]

POWER LIGHT
OPERATOR
CONTROLS
OPERATOR DISPLAY

ALLOW 5" EA SIDE FOR COOLING
ALLOW 3" IN BACK FOR CABLING

AC POWER ENTRY
OPTIONS CARD/CAGE
ULTRASOUND & SYSTEM I/O'S

POWER SWITCH
COOLING FAN

WEIGHT: 25 LBS

Dukane Manual Part No. 403-586-02
Figure 12-6  iQ LE 4800W Generator Layout
Weights

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Press (includes base and column)</th>
<th>Thruster</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pounds</td>
<td>Kilograms</td>
</tr>
<tr>
<td>43Q220</td>
<td>170</td>
<td>77</td>
</tr>
</tbody>
</table>

**Shipping:** Add 10 pounds (2.3 kg) to unit weight for packing materials

Table 12-I  Weights

Dimensions

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Press (includes base and column)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Height</td>
<td>Width</td>
</tr>
<tr>
<td>43Q220</td>
<td>56.94 (1450)</td>
<td>18.6 (475)</td>
</tr>
</tbody>
</table>

**NOTE:** Add 4" (100 mm) behind the press/thruster for air input line and cable connections.

Table 12-II  Dimensions

Operating Environment

Operate the equipment within these guidelines:

**Temperature:** 40°F to 100°F (+5°C to +38°C)

**Air Particulates:** Keep the equipment dry.
Minimize exposure to moisture, dust, dirt, smoke and mold.

**Humidity:** 5% to 95% Non–condensing @ +5°C to +30°C

Non Operating storage guidelines:

**Temperature:** -4°F to 158°F (-20°C to +70°C)

**Air Particulates:** Keep the equipment dry.
Minimize exposure to moisture, dust, dirt, smoke and mold.

**Humidity:** 5% to 95% Non–condensing @ 0°C to +30°C
Compressed Air Requirements

For all press/thruster models, Dukane recommends 80-110 psi of clean, dry air.

**Maximum available clamping pressure:**

<table>
<thead>
<tr>
<th>Model</th>
<th>Force Generated at 110 psi (lb)</th>
<th>Standard Air Cylinder Diameter (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>43Q220</td>
<td>540</td>
<td>2.50</td>
</tr>
</tbody>
</table>

*Table 12-III  Clamping Pressure*

AC Power Requirements

The press/thruster uses 24VDC @ 2 Amps, obtained from the *iQ Series* generator to which it is connected. The AC line voltage and current needed depend on whichever generator has been chosen for your system. See the table below.

<table>
<thead>
<tr>
<th>Operating Frequency</th>
<th>Generator Model Number</th>
<th>Overload Power Ratings (Watts)</th>
<th>Input AC Power Requirements Nominal AC Volt @ Maximum RMS Current</th>
<th>North America/ Japan AC Outlet Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>20kHz</td>
<td>20XX120-1X-XX-XX</td>
<td>1200</td>
<td>100-120V 50/60 Hz @ 15 Amps</td>
<td>15 Amps</td>
</tr>
<tr>
<td>20kHz</td>
<td>20XX120-2X-XX-XX</td>
<td>1200</td>
<td>200-240V 50/60 Hz @ 8 Amps</td>
<td>15 Amps</td>
</tr>
<tr>
<td>20kHz</td>
<td>20XX240-2X-XX-XX</td>
<td>2400</td>
<td>200-240V 50/60 Hz @ 15 Amps</td>
<td>30 Amps</td>
</tr>
<tr>
<td>20kHz</td>
<td>20XX360-2X-XX-XX</td>
<td>3600</td>
<td>200-240V 50/60 Hz @ 25 Amps</td>
<td>30 Amps</td>
</tr>
</tbody>
</table>

*Table 12-IV  AC Power Requirements*

**NOTES:**

An X used above in the Model Numbers is a “wildcard” character meaning any valid character code combination.

Maximum line current requirement is specified at the minimum nominal AC line voltage and the rated power level.
Interpreting the Model Number Codes

Model numbers use combinations of letters and numbers to identify each system and its major components. Codes are given here for:

- \(iQ\) Series LE - Overall System Models (See Figure 12-7 below),
- Thruster Models (See Table 12-V below), and
- Generator Models (See Figure 12-8 on the next page).

### \(iQ\) Series LE - Overall System Model Number Codes

<table>
<thead>
<tr>
<th>Nominal U/S Frequency</th>
<th>Power Level</th>
<th>Controller</th>
<th>Press Card</th>
<th>Custom Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 = 20 kHz</td>
<td>24 = 2400 Watts</td>
<td>Z = Graphic front panel</td>
<td>P4 = (iQ) Dual Pressure Card</td>
<td>LC = Less Cables</td>
</tr>
<tr>
<td></td>
<td>18 = 1800 Watts</td>
<td></td>
<td>P5 = (iQ) Distance Card</td>
<td></td>
</tr>
<tr>
<td></td>
<td>12 = 1200 Watts</td>
<td></td>
<td>P8 = Ultra Dual Pressure Card</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>P9 = Ultra Distance Card</td>
<td></td>
</tr>
</tbody>
</table>

**Example System Number Shown Above:**

2024.2Z - P4H3.S

**System Detailed Description:**

20kHz, 2,400 Watt, 220-240 VAC, generator with graphic front panel, module for dual pressure, hydraulic speed control, with 3” air cylinder, and a standard press column.

**Figure 12-7** System Model Numbers

### \(iQ\) Series LE Press/Thruster

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Power</th>
<th>Standard Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>43Q220</td>
<td>20kHz</td>
<td>D P H S</td>
</tr>
</tbody>
</table>

**Table 12-V** Interpreting the Thruster Model Number

<table>
<thead>
<tr>
<th>X = available</th>
<th>D = Distance encoder</th>
<th>P = Basic dual air pressure</th>
<th>H = Hydraulic speed control</th>
<th>S = Pre-trigger/end of weld limit switches</th>
</tr>
</thead>
</table>
Generator Model Numbers

2 generator model number codes

20HS120-2Q-P4

Example system number shown above:

System Assembly Detailed Description:

20kHz 1,200 Watt Press System in a 5.25" tall chassis which operates on a 100-120V AC line with a rear panel mounted breaker & Time and Energy Weld Controller & Pressure Press option board. The system power cord (if needed) is listed as 200W/1.200W/240V for 5.25" Tall Chassis.

1800 W and 2400 W only,

1200 W and below

1 = 100-120V for 5.25" Tall Chassis

(fixed power cord)

Figure 12-8

System Process Control

Press System Options

A = ES Blank Front Panel w/ iQ Explorer (Time & Energy)
Q = ES Graphics Color LCD w/ iQ Explorer (Time & Energy)
Z = LE Graphics LCD (Time & Energy)

Press Interface Board

ES Series Options (A and Q)
P4 = Press Interface Board
P5 = Press Interface Board w/ Distance
P6 = Press Interface Board w/ Distance & Press Options
P7 = Servo Press Interface Board
C2 = Communications Board (A only)
C3 = SUWSI Board

LE Series Controller Options (Z)
P4 = Press Interface Board
P5 = Press Interface Board w/ Distance
P8 = Ultra Press Board
P9 = Ultra Press Board w/ Distance
C3 = SUWSI LITE Board

Options Slot #2

ES Series Options (A and Q)
P4 = Press Interface Board
P5 = Press Interface Board w/ Distance
P6 = Press Interface Board w/ Distance & Press Options
P7 = Servo Press Interface Board
C2 = Communications Board (A only)
C3 = SUWSI Board

LE Series Controller Options (Z)
P4 = Press Interface Board
P5 = Press Interface Board w/ Distance
P8 = Ultra Press Board
P9 = Ultra Press Board w/ Distance
C3 = SUWSI LITE Board

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Dukane Manual Part No. 403-586-02
## Replacement Parts - *iQ* Series LE Presses

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Part Description</th>
<th>Press Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>474-33</td>
<td>High pressure grease packet</td>
<td>X</td>
</tr>
<tr>
<td>430-03-0026</td>
<td>iQ main valve assembly</td>
<td>X</td>
</tr>
<tr>
<td>697-113</td>
<td>Air pressure gauge (NOT needed if standard option E is installed)</td>
<td>X</td>
</tr>
<tr>
<td>721-31-00056</td>
<td>Transducer door hex key 43Q220/43Q340</td>
<td>O</td>
</tr>
<tr>
<td>721-68</td>
<td>43Q215/43Q220 spanner wrench</td>
<td>X</td>
</tr>
<tr>
<td>804-33</td>
<td>Primary air cylinder, 2 1/2 &quot; bore X 7&quot;</td>
<td>O</td>
</tr>
<tr>
<td>804-52</td>
<td>Air pressure regulator (NOT needed if standard option E is installed)</td>
<td>X</td>
</tr>
<tr>
<td>804-62</td>
<td>Primary air cylinder 3&quot; bore X 7&quot;</td>
<td>X</td>
</tr>
<tr>
<td>804-63</td>
<td>Counter balance air cylinder 9/16&quot; bore X 11&quot;</td>
<td>O</td>
</tr>
<tr>
<td>804-71</td>
<td>Counter balance air cylinder 1 1/16 bore X 11&quot;</td>
<td>X</td>
</tr>
<tr>
<td>625-18</td>
<td>Optical distance encoder (when optional E feature is installed)</td>
<td>X</td>
</tr>
<tr>
<td>430-03-0045</td>
<td>Dual pressure valve assembly (when optional P feature is installed)</td>
<td>X</td>
</tr>
<tr>
<td>430-03-0035</td>
<td>Dual pressure valve assembly (when optional P feature is installed)</td>
<td>O</td>
</tr>
<tr>
<td>804-18</td>
<td>Hydraulic speed control cylinder (when optional H feature is installed)</td>
<td>O</td>
</tr>
</tbody>
</table>

### Table 12-VI Replacement Parts

- **X** = available
- **O** = unavailable
Regulatory Agency Compliance

FCC
The generator complies with the following Federal Communications Commission regulations.


CE Marking
This mark on your equipment certifies that it meets the requirements of the EU (European Union) concerning interference causing equipment regulations. CE stands for Conformité Europééne (European Conformity). The equipment complies with the following CE requirements.

- The EMC Directive 2004/108/EC for Heavy Industrial —
  EN 61000-6-4: 2001
  EN 55011: 2003
  EN 61000-6-2: 2005
  EN61000–4–2
  EN61000–4–3
  EN61000–4–4
  EN61000–4–5
  EN61000–4–6
  EN61000–4–8
  EN61000–4–11

- The Low Voltage Directive 2006/95/EC.
- The Machinery Directive 2006/42/EC.
  EN 60204: 2006

IP (International Protection) Rating
The iQ generator has an IP rating from the IEC (International Electrotechnical Commission). The rating is IP2X, in compliance with finger-safe industry standards.

CAUTION
DO NOT make any modifications to the generator or associated cables as the changes may result in violating one or more regulations under which this equipment is manufactured.
SECTION 13

Appendices

Appendix A, List of Figures ......................... 157
Appendix B, List of Tables ............................ 161
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### Appendix A  List of Figures

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-1</td>
<td>Example of 220/240 Volt, Grounded, 3-Prong Receptacle</td>
<td>9</td>
</tr>
<tr>
<td>2-2</td>
<td>International 220/240V Grounding</td>
<td>9</td>
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Dukane chose to become ISO 9001:2008 certified in order to demonstrate to our customers our continuing commitment to being a quality vendor. By passing its audit, Dukane can assure you that we have in place a well-defined and systematic approach to quality design, manufacturing, delivery and service. This certificate reinforces Dukane’s status as a quality vendor of technology and products.

To achieve ISO 9001:2008 certification, you must prove to one of the quality system registrar groups that you meet three requirements:

1. Leadership
2. Involvement

The ISO 9001:2008 standard establishes a minimum requirement for these requirements and starts transitioning the company from a traditional inspection–oriented quality system to one based on partnership for continuous improvement. This concept is key in that Dukane no longer focuses on inspection, but on individual processes.

Dukane’s quality management system is based on the following three objectives:

1. Customer oriented quality. The aim is to improve customer satisfaction.
2. Quality is determined by people. The aim is to improve the internal organization and cooperation between staff members.
3. Quality is a continuous improvement. The aim is to continuously improve the internal organization and the competitive position.

Dukane products are manufactured in ISO registered facilities.
Please refer to our website at:

www.dukane.com/us/sales/intsales.htm

to locate your local representative.