iQ Series
ULTRASONIC GENERATOR/POWER SUPPLY
Auto-Plus

User’s Manual
## Revision History

<table>
<thead>
<tr>
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<th>Revision Summary</th>
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<tbody>
<tr>
<td>- 00</td>
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# Contents

**Section 1 - Installation** ....................................................... 1
  - General User Information ........................................ 3
  - Generator Overview .................................................. 4
  - Key Generator Features ............................................. 4
  - Thermal Considerations ............................................ 5

**Section 2 - Health and Safety** ............................................. 7
  - General Considerations ............................................. 9
  - Plastics Health Notice ............................................. 10
  - Electrical Safety .................................................... 10

**Section 3 - Installation** ...................................................... 13
  - Unpacking ............................................................. 15
  - Placement ............................................................. 15
  - Power Grounding ..................................................... 16
  - Chassis Grounding Stud ............................................ 16
  - Connecting Cables .................................................. 17
  - MPC Module Installation Guide .................................. 22

**Section 4 - System Operation** .............................................. 25
  - Introduction .......................................................... 27
  - iQ Auto-Plus System Operational Test .......................... 28
  - iQ Auto-Plus System with MPC Module Operational Test .... 29
  - LED Indication ....................................................... 31

**Section 5 - Options** .............................................................. 33
  - Heat Sink ............................................................... 35
  - Distance Option ....................................................... 36
  - ANYBUS Option ......................................................... 36

**Section 6 - Automation Interface** ........................................ 37
  - Input/Output Connection Examples ................................ 39
  - Dedicated E-Stop Switch Wiring Diagram ........................ 43
  - Automation System Safety Circuit Wiring Diagram .............. 43
  - iQLinQ™ ................................................................. 44
  - iQ Commander™ ....................................................... 45
Contents

Section 7 - Contacting Dukane ....................... 47

Section 8 - Specifications ............................ 51
  Generator Outline Drawing .......................... 53
  Weight, Operating Environment ..................... 54
  AC Power Requirements .............................. 55
  Interpreting the Model Number ..................... 56
  iQ Auto to iQ Auto Plus Inputs /Outputs Comparison .... 57
  Regulatory Agency Compliance ....................... 58

Section 9 - Appendices ................................. 59
  Appendix A, List of Figures ......................... 60
  Appendix B, List of Tables ......................... 61

Index .................................................. 62
SECTION 1

Introduction

General User Information ........................................... 3
  Read The Manual First ........................................... 3
  Notes, Cautions and Warnings ................................. 3
  Drawings and Tables ............................................ 3

Generator Overview ............................................... 4

Key Generator Features ........................................... 4

Thermal Considerations .......................................... 5
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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.

Particular models are listed in Section 8 - 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 a 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.
Generator Overview

This generator is designed for ultrasonic applications controlled by a Programmable Logic Controller (PLC). Using the available system control inputs and outputs, the generator can easily be integrated into a wide variety of automated systems.

The generator design accepts several control input signals, provides system output signals, has a variety of status LED indicators, and built-in USB and EtherNet connectors.

The Multi-Probe Control (MPC) interface allows the generator to power multiple probes selected by an automated control system.

This product’s rugged internal ultrasonic generator circuitry ensures a continuous resonant frequency lock at the start of each weld. Users can modify generator performance to meet a wide variety of ultrasonic processing requirements if needed.

The generator’s compact size allows multiple units to be placed into an industrial equipment cabinet, and the 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 strict CE test specifications for global applications.

Key Generator Features

- **Compact Enclosure Size** requires a small footprint for either vertical or horizontal mounting into your equipment cabinet.

- **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 ramp up to operating amplitude smoothly, minimizing the startup surges and abnormal stress to the stack and generator.

- **Automatic 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 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.

- **Power Factor Corrected Universal AC Power Source** means that standard 600 watt systems will operate worldwide at all industrial high line voltage levels, whether it is 100-200VAC @60Hz in Japan, 240VAC @50Hz in Europe or 100-240VAC @60Hz in the United States. There are no internal transformer taps to change for worldwide operation.

- **Amplitude Adjustment Control** allows the peak-to-peak excursion of the horn at its workface to be adjusted between 20% and 100% of the horn’s nominal amplitude.

- **Multiple Electronic Overload protection circuits** prevent instantaneous component failure in the event of extreme output overload conditions and rated overload power limit is based on the actual true RMS power output level.

- **Optional Weld by Distance Feature** to monitor up to four analog 0-10 VDC encoders (requires customer supplied encoders).

- **CE Certification** means that the system meets the required European standards to be sold and used in Europe.

- **ISO Certified** means that this system has been manufactured to high quality standards and assures you of manufacturing excellence.

- **TÜV Certification** - TÜV Rheinland certifies Dukane products comply with applicable UL (Underwriters Laboratories) and CSA (Canadian Standards Association) requirements.
Thermal Considerations

The thermal design of this generator is for applications that require 100% of rated power at no more than a 50% duty cycle.

NOTE
Add transducer cooling as necessary to keep front mass temperature to 110 °F or less.
SECTION 2

Health and Safety

General Considerations.......................... 9
Plastics Health Notice ......................... 10
Electrical Safety .................................. 10

Power Grounding Connection ................. 11
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. 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. 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 10.

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

Foot Switch - Do not use a foot switch. Using a foot switch in place of the optical touch finger switches (operate switches) violates OSHA regulations. Do not install a foot switch.

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, 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 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 AC power line.

Continued
General Considerations

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.

Always connect the included ground wire from the PE ground of the generator to the nearest grounded metal pipe or equivalent earth ground by means of a ground clamp.

CAUTION

See TUV test report number 31370614.003 for more detail on specific model numbers and frequencies.

WARNING

Keep head, hands, limbs and body at least six inches (152 mm) away from an operating press/thruster. A vibrating, descending horn can cause burns and/or crushing injuries.

CAUTION

When making cable connections to system equipment or disconnecting cables from system equipment, make sure electrical power to the system is turned off, and AC power cords are removed from their receptacles. After the cables have been securely connected and the connections and cable routing checked a final time, the power may be restored.
Electrical Safety
Power Grounding Connection

Figure 2-1 illustrates how the AC line is connected to the iQ Auto-Plus generator.

**Figure 2–1 AC Line Connection**

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Wire Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>L (Live)</td>
<td>Black</td>
</tr>
<tr>
<td></td>
<td>Lt. Brown</td>
</tr>
<tr>
<td>G (Ground)</td>
<td>Green</td>
</tr>
<tr>
<td></td>
<td>Green w/yellow stripe</td>
</tr>
<tr>
<td>N (Neutral)</td>
<td>White</td>
</tr>
<tr>
<td></td>
<td>Lt. Blue</td>
</tr>
</tbody>
</table>

**Table 2-I Conventional Wire Color Code**

**CAUTION**
If there is any question about grounding of your equipment and/or its electrical power source, contact a qualified electrician.

**CAUTION**
For safe system operation: To avoid the risk of fire, electrical shock, serious injury or death, the power line safety ground must be securely connected to the center terminal on the (pluggable) AC line connector.
SECTION 3

Installation

Unpacking .......................................................... 15
Placement .......................................................... 15
Power Grounding .................................................. 16
Chassis Grounding Stud ......................................... 16
Connecting Cables ................................................ 17
  Basic Connections ............................................. 17
  P1 System I/O Connector Pinout. ............................ 18
  Multi-Probe Control (MPC) ................................. 20
MPC Module Installation Guide ............................... 22
  Connecting Cables ............................................. 23
  MPC Module Status LEDs ................................. 24
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Unpacking
Carefully open your shipping container, and make sure it contains the items shown on the shipping documents. Inspect all items, and report any missing items or damage immediately.

Placement
Make certain generator placement and cable routing do not interfere with normal operation. Maintain easy access to your equipment.

The operator should have unobstructed access to cables and wiring.

Two sets of removable mounting brackets are attached to the generator. See Figure 3-1, below. Use them to securely mount the unit vertically or horizontally in your equipment cabinet.

If the generator is installed inside an enclosure with a door, be sure there is adequate clearance for the system cables with the door closed.

NOTE
For equipment weights see Page 54, in Section 8, Specifications.

NOTE
Heat Dissipation - Provide enough air flow for heat dissipation. For best heat dissipation, mount the generator vertically as shown in Figure 5-1 on page 35.

Figure 3-1  Mounting Brackets - Rear and Bottom

Placement in a 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.

Refer to Dukane’s website for more information about installation in a seismic zone. See Application Note AN511 - https://documents.dukane.com/AppNote/An511.pdf
Power Grounding

For safety, the iQ Auto chassis must be properly grounded. The power line ground connection is located on the center screw terminal on the AC Power Inlet pluggable screw terminal connector.

This system ground connection must be attached to an earth ground potential at the electrical box that supplies power to the enclosure or cabinet in which the iQ Auto system is installed.

The ground connection should comply with all of the requirements specified by the National Electrical code and any other local codes or ordinances that are applicable.

Chassis Grounding Stud (PE)

Proper grounding for the generator chassis is essential for the effective suppression of electrical noise or RFI (Radio Frequency Interference). Every ultrasonic generator contains a RFI filter that blocks noise on the AC power line from entering the system control circuitry. This filter also prevents ultrasonic frequency noise from being fed back into the AC power line. For the RFI filter to operate effectively, it is necessary to correctly ground the system. The power line ground previously mentioned is mandatory.

Additionally, the included grounding wire must be connected from the grounding PE stud connection (see Figure 3-1) to the nearest grounded metal pipe or equivalent earth ground.

This will improve the chassis ground connection and may be needed in noisy industrial environments.

See Connecting Cables on the next page.
Connecting Cables
Basic Connections

Complete these basic connections for the standard configuration as shown below:

- AC Line Input
- System Control Inputs/Status Outputs
- Ultrasound Output
- Grounding

Details about the various system connectors and their pin assignments are covered in the next section.

1. Wire the AC line connector, and attach it to the generator’s power inlet connector, matching the power source line, ground, and neutral with the generator’s line, ground, and neutral connector pins - A in Figure 3–4. (See Figure 2-1 also.)

2. If used, wire the user-supplied automation system control inputs/status outputs to the P1 SYSTEM I/O connector, and attach it to the P1 SYSTEM I/O port - B in Figure 3-4.

3. Attach a high–voltage coaxial ultrasound cable (from the ultrasonic probe) to J1, the ultrasound output connector - C in Figure 3-2.

4. Connect the included ground wire from the grounding stud, D in Figure 3-4, to earth ground.

**NOTE**
Connecting Cables

Two-piece pluggable terminal block connectors are used for the System I/O connections and the AC Power Inlet connections. This type of connector allows the wiring to be attached to the spring loaded terminal connector, which plugs into the mating connector on the iQ Auto system front panel. In the event a field replacement unit is required, the screw terminal connectors with the wires can be easily detached and then plugged into the replacement unit.

**NOTE**
AC Power Inlet

The unit does not include a power switch, and is powered ON whenever the AC line power is live. The unit can be switched ON/OFF with a user-supplied AC circuit breaker wired to the AC power inlet connection.

---

**Figure 3-2** Generator Front View
P1 System I/O Connector Pinout

The P1 SYSTEM I/O connector is a two-piece pluggable terminal block connector.

Table 3-I lists the signal names and descriptions, with more detailed descriptions listed below and on the next page.

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Enable Out (+22VDC Current Limited)</td>
</tr>
<tr>
<td>2</td>
<td>Enable In (Jumper to Pin 1, without an E-Stop switch)</td>
</tr>
<tr>
<td>3</td>
<td>Overload Out (System overload status output)</td>
</tr>
<tr>
<td>4</td>
<td>Ready Out</td>
</tr>
<tr>
<td>5</td>
<td>Any Fault Out</td>
</tr>
<tr>
<td>6</td>
<td>U/S Status Out</td>
</tr>
<tr>
<td>7</td>
<td>Output Common (Isolated)</td>
</tr>
<tr>
<td>8</td>
<td>Remote Setup 0 Input</td>
</tr>
<tr>
<td>9</td>
<td>Remote Setup 1 Input</td>
</tr>
<tr>
<td>10</td>
<td>Remote Setup 2 Input</td>
</tr>
<tr>
<td>11</td>
<td>Remote Setup 3 Input</td>
</tr>
<tr>
<td>12</td>
<td>Remote Common (Isolated)</td>
</tr>
<tr>
<td>13</td>
<td>U/S Activate</td>
</tr>
<tr>
<td>14</td>
<td>U/S Common (Isolated)</td>
</tr>
</tbody>
</table>

Table 3-I  P1 System I/O Connector Signals

Pin 1  (Enable Out)

This is a current limited +22VDC voltage source output intended to connect to an E-Stop circuit. If an E-STOP circuit is not used, Pin 1 must be jumpered to Pin 2 for ultrasound operation to be enabled.

Pin 2  (Enable In)

The output from the E-STOP circuit is connected to this pin when an E-STOP circuit is used. Otherwise, this pin must be jumpered to Pin 1 for ultrasound operation to be enabled. See Figure 6-5 for E-STOP circuit wiring examples.

Pin 3  (Overload Out)

Pin 3 is an isolated digital NPN/PNP status output that activates when an output overload condition is tripped. This output will be an open circuit if an output overload condition is not tripped. This output will remain latched ON until the U/S Activate input is switched OFF and then ON again.

Pin 4  (Ready Out)

Pin 4 is an isolated digital NPN/PNP status output signal. The signal will activate when the system is ready to begin a weld cycle. This output will be an open circuit when the welding process controller determines that the next welding cycle cannot be started. This will occur if the system is in cycle, a system fault is active, or the system is in E-STOP, but not as a result of a process fault like Overload.

When an MPC module is connected, this output will also be an open circuit when the MPC system is not ready for a weld cycle to begin. This status output signal will also be open if a fault condition is detected inside the MPC system. If this status output will not activate when using an MPC module, check for a RED fault status indication (SYSTEM STATUS LED) on the front panel of the MPC module.
**Pin 5 (Any Fault Out)**
Pin 5 is an isolated digital NPN/PNP 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 active.

**Pin 6 (U/S Status Out)**
Pin 6 is a digital NPN/PNP 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 (Output Common)**
Pin 7 is electrically isolated from chassis ground. This common line should be connected to the negative output of a user-provided isolated 24VDC power supply for a PLC sourcing input card. For a PLC Sinking input card this line is connected to the positive output of the isolated 24VDC power supply.

**Pin 8 (Remote Setup 0 Input)**
Pin 8 represents Setup Bit 0. This is the least significant bit used to select different probe channels when a Multi-Probe Control (MPC) Interface is used. This MPC control bit is used on all MPC systems.

**Pin 9 (Remote Setup 1 Input)**
Pin 9 represents Setup Bit 1. This is the second least significant bit used to select different probe channels when a MPC Interface is used. This MPC control bit is used on MPC systems with three or more channels.

**Pin 10 (Remote Setup 2 Input)**
Pin 10 represents Setup Bit 2. This is the third least significant bit used to select different probe channels when a MPC Interface is used. This MPC control bit is used on MPC systems with five or more channels.

**Pin 11 (Remote Setup 3 Input)**
Pin 11 represents Setup Bit 3. This is the second most significant bit used to select different probe channels when a MPC Interface is used. This MPC control bit is used on MPC systems with nine or more channels.

**Pin 12 (Remote Common)**
Pin 12 is electrically isolated from chassis ground. Using sourcing (PNP) output drivers, this common line would be connected to the automation system ground potential. Using sinking (NPN) output drivers, this common line would be connected to the automation system positive supply voltage output. Refer to Section 6 for wiring examples to connect input signals.

**Pin 13 (U/S Activate)**
Pin 13 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 14 (U/S Common)**
Pin 14 is electrically isolated from chassis ground. Using sourcing (PNP) output drivers, this common line would be connected to the automation system ground potential. Using sinking (NPN) output drivers, this common line would be connected to the automation system positive supply voltage output. Refer to Section 6 for wiring examples to connect input signals.
Multi-Point Control (MPC) Interface

The MPC Interface connector powers and controls an external MPC module. This external module must be purchased in addition to a basic generator for a fully functional MPC system. It can be ordered with a minimum of two probe controls and up to a maximum of 16 probe controls.

MPC Interface Connector (J2)
Connections required for the external MPC module are described below.

- MPC I/O - MPC control/input signals and status output signals are carried in the I/O cable that should already be connected. See Table 3-II on Page 21 for further information.

- MPC INTERFACE - Attach one end of the MPC Interface cable (Dukane # 200-1408-XX) to the MPC connector on the iQ generator panel in Figure 4-2. Connect the other end of the cable to the MPC INTERFACE connector on the right rear of the MPC module.

NOTE
This information is for the MPC/MPCQ models only. If connecting to a MPC-E models, see document 403-617 MPC-E Multi-Point Controller Quick Start Guide.

Refer to Dukane’s website for more information about the MPC-E Quick Start Guide at the link below:
https://documents.dukane.com/Manuals/403-617.pdf

NOTE
The MPC Interface cable is a separate line item on the iQ generator system order. The -XX at the end of the cable number specifies cable length. This will vary depending on your MPC installation.

Figure 3-3  MPC Interface Connector
### MPC I/O Connections

Signal names and Pin numbers and the connectors related to the MPC option are shown in the table below. See the pages referred to in the table for more information about the signals.

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal Name</th>
<th>Connector</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>Setup Bit 0 Input</td>
<td>P1 (Page 19)</td>
</tr>
<tr>
<td>9</td>
<td>Setup Bit 1 Input</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Setup Bit 2 Input</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Setup Bit 3 Input</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Ready Out</td>
<td>P1 (Page 18)</td>
</tr>
</tbody>
</table>

**Table 3-II  MPC I/O Connector Signals**

### MPC Probe Control

When the optional MPC module and MPC I/O are used, the generator has the capability of controlling as many as sixteen compatible probes. One probe can be turned on at a time while the sequence of probe activation is determined by the user’s automation. Table 3-III shows how the setup bit inputs correspond to the probes.

<table>
<thead>
<tr>
<th>System I/O Remote Setup Inputs</th>
<th>Probe Selected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off Off Off Off</td>
<td>1</td>
</tr>
<tr>
<td>Off Off Off On</td>
<td>2</td>
</tr>
<tr>
<td>Off Off On Off</td>
<td>3</td>
</tr>
<tr>
<td>Off Off On On</td>
<td>4</td>
</tr>
<tr>
<td>Off On Off Off</td>
<td>5</td>
</tr>
<tr>
<td>Off On Off On</td>
<td>6</td>
</tr>
<tr>
<td>Off On On Off</td>
<td>7</td>
</tr>
<tr>
<td>Off On On On</td>
<td>8</td>
</tr>
<tr>
<td>On Off Off Off</td>
<td>9</td>
</tr>
<tr>
<td>On Off Off On</td>
<td>10</td>
</tr>
<tr>
<td>On Off On Off</td>
<td>11</td>
</tr>
<tr>
<td>On Off On On</td>
<td>12</td>
</tr>
<tr>
<td>On On Off Off</td>
<td>13</td>
</tr>
<tr>
<td>On On Off On</td>
<td>14</td>
</tr>
<tr>
<td>On On On Off</td>
<td>15</td>
</tr>
<tr>
<td>On On On On</td>
<td>16</td>
</tr>
</tbody>
</table>

**Table 3-III  System I/O Remote Setup Inputs**

---

**CAUTION**

**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.

The ultrasonic output from this connector (that drives the attached ultrasonic load) is a very high AC voltage. At high power levels this can exceed 4 amps 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 the generator if there is any evidence arcing (black carbon deposits) on either the ultrasound output connector or the ultrasonic cable connectors.
MPC Module Installation Guide

MPC modules are designed for assembly systems where one ultrasonic generator is sequenced to as many as 16 ultrasonic probes. The MPC module is typically supplied as a stand-alone bench-top unit, or as a component that can be mounted in a through-panel configuration.

No special installation is needed for a stand-alone MPC module that can be put on a bench top or a shelf.

Use the following installation recommendations for a panel mounted MPC module.

Cut Outs

For panel mounted modules:

Use Figure 3-4 below to determine the size of the cut needed for your equipment panel. Make the appropriate cut, and install the MPC module securing the mounting flange to the equipment panel before continuing with the cable connections.

---

### Figure 3-4  MPC Module Cutout Guide

<table>
<thead>
<tr>
<th>MODEL</th>
<th>&quot;A&quot;</th>
<th>&quot;B&quot;</th>
<th>&quot;C&quot;</th>
<th>&quot;D&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPC0404</td>
<td>7.12</td>
<td>1.75</td>
<td>8.75</td>
<td>2.25</td>
</tr>
<tr>
<td></td>
<td>[181 mm]</td>
<td>[45 mm]</td>
<td>[171.5 mm]</td>
<td>[57.2 mm]</td>
</tr>
<tr>
<td>MPC0808</td>
<td>10.88</td>
<td>1.75</td>
<td>10.50</td>
<td>2.25</td>
</tr>
<tr>
<td></td>
<td>[277 mm]</td>
<td>[45 mm]</td>
<td>[266.7 mm]</td>
<td>[57.2 mm]</td>
</tr>
<tr>
<td>MPC1616</td>
<td>18.25</td>
<td>1.75</td>
<td>18.00</td>
<td>2.25</td>
</tr>
<tr>
<td></td>
<td>[464 mm]</td>
<td>[45 mm]</td>
<td>[457.2 mm]</td>
<td>[57.2 mm]</td>
</tr>
</tbody>
</table>
Connecting Cables

For stand-alone modules and securely installed panel mounted modules:

Rear Connections

Refer to Figure 3-5 below. Complete these connections.

1. Earth ground - Connect one end of a user-supplied 14-Gauge ground wire to the ground connection at the rear of the MPC - A in Figure 3-5. Connect the other end of the wire to an earth ground potential at the electrical box that supplies power to the equipment (or to the equipment enclosure into which your system is installed).

2. U/S (ultrasonic) cable (Dukane P/N 200-479-XXM - Order the correct cable length for your installation.) - Connect one end of the cable to the left rear U/S connector of the MPC module - B in Figure 3-5. The other end of the cable connects to J1 of the ultrasonic generator.

3. MPC Interface cable (Dukane P/N 200-1408-XXM - Order the correct cable length for your installation.) - Connect one end of the cable to the right rear MPC Interface connector - C in Figure 3-5. The other end of the cable connects to the MPC INTERFACE connector on the ultrasonic generator.

Front Connections

Refer to Figure 3-6 below. Complete these connections.

1. Probe Cable(s) - Beginning with PROBE 1, connect one end of the ultrasound cable (See Table 3-IV below.) to the ultrasound connector on the MPC’s front panel - D in Figure 3-6. Connect the other end of the cable to the corresponding probe for your specific welding application.

2. Repeat Step 1 for each of the remaining probes (in sequence: 2, 3, 4, etc.) in your system.

![Figure 3-6 MPC Module Front Connectors](image)

![Figure 3-5 MPC Module Rear Connectors](image)

<table>
<thead>
<tr>
<th>System Frequency</th>
<th>Probe P/N</th>
<th>Cable P/N : MPC to Probe</th>
</tr>
</thead>
<tbody>
<tr>
<td>20kHz</td>
<td>41Q20RE or 41Q20RS</td>
<td>200-479-XXM</td>
</tr>
<tr>
<td>30kHz</td>
<td>41A60E or 41A60S</td>
<td>200-479-XXM</td>
</tr>
<tr>
<td>40kHz</td>
<td>41A40</td>
<td>200-615-XXM</td>
</tr>
</tbody>
</table>

**Table 3-IV** Probe Cables

XX = length in meters
MPC Module Status LEDs

System Status
The front panel SYSTEM STATUS LED lights up GREEN when the system is powered and ready - E in Figure 3-7.

If this LED is lit with a YELLOW/ORANGE color, a recoverable fault condition has tripped. This indicates that the system is operational, but a fault condition has occurred preventing normal operation. Examples of this type of fault would be a generator overload that will automatically reset when the next weld cycle begins, or the automation control system is selecting a channel that doesn’t exist - trying to select channel 10 for an 8 channel system, for instance.

If this LED lights up RED, a hardware fault has been sensed, and the unit should be returned to Dukane for servicing.

Probe Selection Status
The PROBE SELECTION STATUS LED - F in Figure 3-7 - lights up GREEN indicating it is the selected probe.
A probe’s LED turns to RED (from GREEN) when ultrasonic power is activated.

NOTE
Refer to Section 4, System Operation, for more information.
SECTION 4

System Operation

Introduction .................................................. 27
iQ Auto-Plus System Operational Test ................. 28
iQ Auto-Plus System with MPC Module Operational Test .... 29
LED Indication ................................................. 31
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Introduction

The ultrasonic iQ Auto-Plus generator/power supply, is specifically designed to meet the machine builder’s requirements. This unit is automation ready and may be used as a stand-alone generator, or with its integrated Multi-Point Controller (MPC) Interface. The MPC interface, when connected to the Dukane MPC module, allows one generator to control up to 16 probes.

The generator’s USB, EtherNet and ANYBUS ports extend communication and control functions depending on the specifications of a particular generator model.

This section deals primarily with basic operational testing and troubleshooting.
iQ Auto-Plus System Operational Test

1. Verify that the standard system installation is complete and all cables are connected. If using an MPC module verify that the MPC installation is also complete.
   Refer to installation instructions included in Section 3, if needed.
   Refer to Section 6 - Automation Interface for information on wiring system controls, if needed.

2. After completing Step 1, activate line power to the iQ Auto-Plus system.
   **Normal Condition:**
   GREEN - The POWER and STATUS LEDs on the iQ Auto-Plus panel should both light up GREEN.
   The system is now ready to operate.

**Troubleshooting Abnormal iQ Auto-Plus System Conditions**

**POWER LED**
RED - If this LED lights up RED, check line voltage level.
GRAY - If this LED is a gray color (not lit), check line input.

**Optional System Status Output to Monitor:**
Optionally the Any Fault Status Out status output can be monitored on system I/O connector Pin 5.
This status output signal will activate when power is not OK.
Optionally the READY output can be monitored. This status output signal will activate when the generator is ready to operate.

3. After completing Step 2, test ultrasound output by activating system I/O connector Pin 13.
   **Normal Condition:**
The system is operating properly when power is delivered to the attached stack.

**Ultrasound Activation Connections:**
Usually an automated control system is wired to this control input.

**Optionally** - A manual switch could be wired to this control input.

**Options for U/S Activation Connections:**
Optionally, monitor the U/S Activate status output on system I/O connector Pin 13.
This status output signal will activate when U/S is ON.

4. **Other Options the Operator can Check:**
   • Fault Status output signals
   **Fault Status** output signals are available for:
   Overload (Pin 3), or
   Any Fault (Pin 5).
   These status outputs will activate when there is a fault:

Continued
An **Overload Fault** latches until the next time U/S is activated.

**Any Fault** status activates when any fault is detected by the system. It latches until the start of the next cycle, unless it is activated due to Overtemperature or Power Not OK fault.

Five fault conditions are monitored by the *iQ* Auto-Plus system for Any Fault:

- **Average Overload**
  (Automatically resets on next cycle)
- **Peak Overload**
  (Resets same as Average Overload)
- **Overtemperature**
  (Automatically resets on cool-down)
- **Power Not OK**
  (AC line voltage under minimum voltage)
- **Frequency Overload**
  (Automatically resets on next cycle)

### iQ Auto-Plus System with MPC Module Operational Test

1. Verify that the system installation (with the MPC option) is completed and all cables are connected.
   
   Refer to the *iQ* Auto-Plus installation instructions in Section 3, if needed.

   Refer to *Section 6 - Automation Interface* - for information on wiring system controls, if needed.

2. After completing Step 1, activate line power to the standard *iQ* Auto-Plus system.

   **Normal Condition:**
   
   The *POWER* LED on the *iQ* Auto-Plus front panel should light up GREEN.

   The *STATUS* LED on the *iQ* Auto-Plus front panel should light up GREEN.

   The MPC module SYSTEM STATUS LED should light up GREEN.

   The system is ready to operate when all status LEDs light up GREEN.

### Troubleshooting Abnormal *iQ* Auto-Plus System Conditions

**POWER LED**

RED - If this LED lights up RED, check line voltage level.

GRAY - If this LED is a gray color (not lit), check line input.

**STATUS LED**

Not Green - If the status LED is not GREEN, refer to Table 4-I for more information.

### Troubleshooting Abnormal MPC Module Conditions

MPC Module SYSTEM STATUS LED is ORANGE/YELLOW (resettable fault):

- Check for an *iQ* Auto-Plus overload on the previous welding cycle.

- Check for an invalid channel selection input control code - selection code is greater than the number of installed channels.

MPC SYSTEM STATUS LED is RED (non-recoverable fault).

Check for POWER OK fault on the *iQ* Auto-Plus System.

- Resolve any *iQ* Auto-Plus power problem first.

- There could be a circuit failure in the MPC module. *If a circuit failure is discovered, return the MPC Module to Dukane for service.*

3. After completing Step 2, test ultrasound output by activating system I/O Connector Pin 13.

   **Normal Condition:**
   
   The system is operating properly when power is delivered to the attached stack.

   **Ultrasound Activation Connections:**
   
   Usually an automated control system is wired to this control input.

   **Optionally** - A manual switch could be wired to this control input.

   **Continued**
Options for U/S Activation Connections:

- Optionally monitor the U/S Active status output on I/O connector Pin 4.
  This status output signal will activate when U/S is ON.

- Optionally monitor the Ready status output on system I/O connector Pin 4.
  This status output signal will activate when the system, including the MPC module is ready.

4. Other options the operator can check:

  • **Fault Status** output signals

  **Fault Status** output signals are available for Overload (Pin 3) or Any Fault (Pin 5).

  These status outputs will activate when a fault occurs:

  - An **Overload Fault** latches until the next time U/S is activated.
  - **Any Fault** status activates when any fault is detected by the system. The output will latch until U/S is activated unless the fault is Overtemperature or Power Not OK.

  Five fault conditions are monitored by the **iq** Auto-Plus system for Any Fault:

    • **Average Overload**
      (Automatically resets on next cycle)

    • **Peak Overload**
      (Resets same as Average Overload)

    • **Overtemperature**
      (Automatically resets on cool-down)

    • **Power Not OK**
      (AC line voltage under minimum voltage)

    • **Frequency Overload**
      (Automatically resets on next cycle)

    • **Over Voltage Overload**
      (Automatically resets on next cycle)

5. Check MPC Channels

Check that all MPC channels can be selected and activated. The automation control system activates input selection bits.

**Select a channel:** PROBE SELECTION STATUS indicator illuminates GREEN when it is the selected channel.

**Activate ultrasound:** Activate the **iq** Auto-Plus ultrasound output on I/O connector Pin 12. The PROBE SELECTION STATUS indicator on the selected channel should switch to RED (from GREEN).

The probe on the selected channel should deliver ultrasonic power.

Repeat this test for all MPC channels.
LED Indication

There are six LEDs on the iQ Auto-Plus generator:

- POWER (1)
- ETHERNET (2)
- MOD (1)
- NET (1)
- STATUS (1)

Figure 4-2 shows LED location, and Table 4-I shows their indications.
<table>
<thead>
<tr>
<th>LED</th>
<th>COLOR</th>
<th>INDICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>POWER</td>
<td>Gray</td>
<td>OFF - No AC line voltage.</td>
</tr>
<tr>
<td></td>
<td>Green - Steady</td>
<td>Generator is Ready</td>
</tr>
<tr>
<td></td>
<td>Red - Steady</td>
<td>AC Voltage problem. Check AC Line Voltage level</td>
</tr>
<tr>
<td>ETHERNET</td>
<td>Amber - Steady</td>
<td>On - Operating as a 1000 Mbps connection</td>
</tr>
<tr>
<td>Left - Speed Indicator</td>
<td>Green - Steady</td>
<td>On - Operating as a 100 Mbps connection</td>
</tr>
<tr>
<td></td>
<td>Off</td>
<td>Operating as a 10 Mbps connection</td>
</tr>
<tr>
<td>Right - Activity Indicator</td>
<td>Yellow - Blinking</td>
<td>There is communications activity.</td>
</tr>
<tr>
<td>MOD</td>
<td>Red - Steady</td>
<td>Unrecoverable Fault</td>
</tr>
<tr>
<td></td>
<td>Red - Blinking</td>
<td>Minor Fault</td>
</tr>
<tr>
<td></td>
<td>Green - Steady</td>
<td>Device is Operational</td>
</tr>
<tr>
<td></td>
<td>Green - Blinking</td>
<td>Standby</td>
</tr>
<tr>
<td></td>
<td>Gray</td>
<td>Off - No power.</td>
</tr>
<tr>
<td>NET</td>
<td>Red - Steady</td>
<td>Duplicate IP Address (Not Supported)</td>
</tr>
<tr>
<td></td>
<td>Red - Blinking</td>
<td>Connection Time Out</td>
</tr>
<tr>
<td></td>
<td>Green - Steady</td>
<td>Connection</td>
</tr>
<tr>
<td></td>
<td>Green - Blinking</td>
<td>No Connection</td>
</tr>
<tr>
<td>STATUS</td>
<td>Green - Steady</td>
<td>Ready</td>
</tr>
<tr>
<td></td>
<td>Yellow - Steady</td>
<td>E-STOP is Active</td>
</tr>
<tr>
<td></td>
<td>Orange - Steady</td>
<td>In Cycle</td>
</tr>
<tr>
<td></td>
<td>Red - Steady</td>
<td>Overload - Average</td>
</tr>
<tr>
<td></td>
<td>White - Steady</td>
<td>Over Temperature</td>
</tr>
<tr>
<td></td>
<td>Purple - Steady</td>
<td>Invalid Auto In</td>
</tr>
<tr>
<td></td>
<td>Red - Blinking</td>
<td>Overload - Peak</td>
</tr>
<tr>
<td></td>
<td>Orange - Steady</td>
<td>Overload - Over Voltage (Transducer)</td>
</tr>
<tr>
<td></td>
<td>Blue - Steady</td>
<td>Overload - Frequency Lock Failed</td>
</tr>
<tr>
<td></td>
<td>Light Blue - Blinking</td>
<td>Overload - Frequency Lock Lost</td>
</tr>
<tr>
<td></td>
<td>Green to Purple - Blinking</td>
<td>Invalid MPC Probe Selection</td>
</tr>
<tr>
<td></td>
<td>Red to Green - Blinking</td>
<td>Reduce Power Mode (600W)</td>
</tr>
<tr>
<td></td>
<td>Red to Yellow - Blinking</td>
<td>Hardware/Configuration Fault</td>
</tr>
<tr>
<td></td>
<td>Yellow - Blinking</td>
<td>Power Not OK / Under AC Line Voltage</td>
</tr>
<tr>
<td></td>
<td>Purple - Blinking</td>
<td>Cycle Start Reject</td>
</tr>
</tbody>
</table>

**Table 4-I**  LED Colors and Indication
SECTION 5

Options

Heat Sink .............................................. 35
Distance Option ..................................... 36
ANYBUS Option .................................... 36
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Heat Sink Option

The thermal design of this generator is for applications that require a power of 600 watts or less at duty cycles less than 50%.

For applications that require higher duty cycles, an optional cooling package is available. The Dukane Part Number for the package is 438-1020.

The cooling package is standard on 1200 watt models and includes a heat sink that mounts to the generator as shown in Figure 5-1 below.

When operating an iQ Auto-Plus generator with the optional heat sink, do so with the generator in the vertical position as shown in Figure 5-1. Air flow is enhanced, and the heat sink’s efficiency is maximized.

CAUTION
Operate the iQ Auto-Plus generator in the vertical position as shown in Figure 5-1. This allows for optimal air circulation enabling the heat sink to be most effective.
Distance Option

This option allows up to four analog 0-10VDC encoders to be monitored. A maximum of one customer supplied encoder per ultrasound channel. If more than one channel is needed a Dukane MPC module is required. With this option weld by position and distance functionality is available.

See https://documents.dukane.com/AppNote/AN528.pdf for more information.

ANYBUS Option

This option is required for iQLinQ communication via mounts, Profinet, ProfiBus, PowerLink, EtherCAT, or CC-Link.
SECTION 6

Automation Interface

Input/Output Connection Examples ............... 39

PLC Sourcing (PNP) Type Output Circuit ........ 39
PLC Sinking (NPN) Type Output Circuit .......... 40
PLC Sourcing (PNP) Type Input Circuit .......... 41
PLC Sinking (NPN) Type Input Circuit .......... 42

Dedicated E-Stop Switch Wiring Diagram ....... 43

Automation System Safety Circuit Wiring Diagram .... 43

iQLinQ™ ............................................. 44

iQ Commander™ .................................. 45
Input/Output Connection Examples

PLC Sourcing (PNP) Type Output Circuit

<table>
<thead>
<tr>
<th>Input Voltage Range</th>
<th>24VDC +/-10%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Current</td>
<td>10mA (typ) @ 24VDC input</td>
</tr>
</tbody>
</table>

Figure 6-1   PLC Sourcing (PNP) Type Output Circuit
**Input/Output Connection Examples**

**PLC Sinking (NPN) Type Output Circuit**

**Figure 6-2**  PLC Sinking (NPN) Type Output Circuit

<table>
<thead>
<tr>
<th>Input Voltage Range</th>
<th>24VDC +/-10%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Current</td>
<td>10mA (typ) @ 24VDC input</td>
</tr>
</tbody>
</table>
Input/Output Connection Examples

PLC Sourcing (PNP) Type Input Circuit

<table>
<thead>
<tr>
<th>Input Voltage Range</th>
<th>24VDC +/-10%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Current</td>
<td>10mA (typ) @ 24VDC input</td>
</tr>
<tr>
<td>Output Driver</td>
<td>PHOTOMOS RELAY</td>
</tr>
</tbody>
</table>

**Figure 6-3**  PLC Sourcing (PNP) Type Input Circuit
Input/Output Connection Examples
PLC Sinking (NPN) Type Input Circuit

<table>
<thead>
<tr>
<th>Input Voltage Range</th>
<th>24VDC +/-10%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Current</td>
<td>10mA (typ) @ 24VDC input</td>
</tr>
<tr>
<td>Output Driver</td>
<td>PHOTOMOS RELAY</td>
</tr>
</tbody>
</table>

**Figure 6-4**  PLC Sinking (NPN) Type Input Circuit
Dedicated E-Stop Switch Wiring Diagram

Automation System Safety Circuit Wiring Diagram

Figure 6-5 E-STOP Wiring and Automation System Safety Circuit
iQLinQ

iQLinQ™ communication options allow automated systems to monitor and change settings in iQ generators. These options provide machine builders the ability to integrate the generator into an electrical cabinet and to use the machine’s HMI to program or monitor weld settings.

All Dukane iQ Auto Plus generators include iQLinQ™ EtherNet/IP and Modbus TCP/IP communication protocol support. Using one of these protocols avoids adding expensive analog cards into PLC racks. iQLinQ™ is available for PROFIBUS, PowerLink, Profinet, EtherCAT, and CC-Link with the optional ANYBUS module.

iQLinQ™ templates are available to provide complete ladder logic and HMI screens that can be dropped into Allen Bradley (RSLogix 5000; Studio 5000 Logix Designer; Factory View Studio ME) Siemens (TIA Portal) and B&R (Automation Studio) PLC projects.

Contact your local Dukane representative for more information about the iQLinQ™ options.

iQLinQ™

The iQLinQ™ allows the iQ generator to connect to an industrial network.

Control Parameters available via iQLinQ™

1. Set weld method to Time, Energy, Peak Power, Distance, and/or Position. Set associated values in seconds, joules, watts, or millimeters/inches.
2. Set Amplitude, Ramp Up Time, and Ramp Down Time.
3. Enable and set Trigger by Power or Trigger By Position parameters.
4. Enable and set Hold time.
5. Enable and set Afterburst delay and duration.
6. Enable checking for Suspect Parts. Set maximum and minimum values for Time, Power Energy, Distance, and/or position.
7. Enable checking for Bad Parts. Set maximum and minimum values for Time, Power, Energy, Distance, and/or Position.
8. Configure advanced hardware settings including Frequency Tracking, Free Run Frequency, Frequency Lock and Hold, and Frequency limits.

Parameters that can be obtained via iQLinQ™

1. All parameters that are configured via iQLinQ™.
2. Real time data which includes welder state (ultrasound active or not), frequency, power, amplitude, and position.
3. Weld cycle data from previous weld which includes:
   - Cycle Count
   - Good, Bad, and Suspect Part information
   - Process Limit setting exceeded or not reached if Bad or Suspect Part checking is enabled
     - Weld Time
     - Weld Energy
     - Peak Power
     - Weld Distance
     - Weld End Position

For information on how to control and/or monitor specific parameters, iQ Generator iQLinQ™ Communication and Control documentation is available.

Signing a non-disclosure agreement is required to obtain this documentation.
iQ Commander™

Using Dukane’s PC interface tool, the Windows PC based software, connected via a standard USB cable (Dukane part number 200-1906), can be used to configure and monitor the iQ Auto-Plus generators. This tool allows the user to easily perform field firmware updates, product setup, parameter configuration, system diagnostics, and setting a IP address for a communications protocol.

Below is a link to download the software:
http://update.dukane.com

Operations that can be done via iQ Commander™

1. Update the iQ Auto Plus generator firmware.
2. Test the ultrasonic stack.
3. Scan an ultrasonic stack to determine the optimal Free Run Frequency.
4. Weld a part.
5. Select a probe when an MPC module is connected.
6. Set weld method to Time, Energy, Peak Power, Distance, or Position and the associated value in seconds, joules, watts, or millimeters.
7. Configure custom I/O.
9. Enable and set Trigger by Power parameters.
10. Enable and set Hold Time.
11. Enable and set Afterburst delay and duration.
12. Enable checking for Suspect Parts. Set maximum and minimum values for Time, Power, Energy, Distance, and/or Position.
13. Enable checking for Bad Parts. Set maximum and minimum values for Time, Power, Energy, Distance, and/or Position.
14. Configure advanced hardware settings including, Free Run Frequency, Frequency Tracking, Frequency Lock and Hold, and Frequency Limits.

Parameters that can be obtained via iQ Commander™

1. All parameters that are configured via iQ Commander™.
2. Real time data which includes welder state (ultrasound active or not), frequency, power, position, and amplitude.
3. Weld cycle data from previous weld which includes: Cycle Count; Good, Bad, and Suspect Part information; Process Limit setting exceeded or not reached if Bad or Suspect Part checking is enabled; Weld Time; Weld Energy; Peak Power; Weld Distance; Weld Position.

To install iQ Commander™

1. Download the installation file from (http://update.dukane.com/) and save to the desired location on the PC.
2. Double-click on the installation file.
3. Once prompted, click on “Next >” on the “Welcome to the InstallShield Wizard for iQ Commander” page. The executable will start the installation process.
4. When the progress bar is nearly full, a new window will appear asking to install the FTDI CDM Drivers. This window may appear behind the iQ Commander™ installation window. If the FTDI CDM Driver window is not visible, move the iQ Commander™ installation window to the side to see the FTDI CDM Drivers installation window.
5. On the FTDI CDM Drivers installation window, click on “Extract”, “Next >”, accept the agreement, “Next >”, and then “Finish” to install the first set of FTDI drivers.
6. Another window will pop up asking to install another set of FTDI CDM Drivers. Repeat step 5 to install the second set of drivers.
7. Once the drivers are installed, Click on “Finish” to complete the process. The user can connect a USB cable from the PC to the AiM generator and start the program.
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SECTION 7

Contacting Dukane
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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
• Fault/error indicators from the Status LED and/or \textit{iQ Commander}.
• Software version (Displayed in the “MAIN” tab in \textit{iQ Commander}.
• 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.

**Mailing Address:**

Dukane  
2900 Dukane Drive  
St. Charles, IL 60174  USA

**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.

This is the address for the main website:  
\url{www.dukane.com}

**Local Contact**

You can locate your local representative at:  
\url{www.dukane.com/contact-us/}
SECTION 8
Specifications

Generator Outline Drawing ........................................... 53
Weight ................................................................. 54
Operating Environment ............................................... 54
AC Power Requirements ............................................. 55
Interpreting the Model Number ................................. 56
iQ Auto to iQ Auto Plus Inputs/Outputs Comparison .... 57
Regulatory Agency Compliance ................................. 58
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Figure 8-1  Generator Outline Drawing
Weight

Standard Model: 10 pounds (4.54 kg)

Shipping: Add 5 pounds (2.3 kg) to unit weight for packing materials.

Operating Environment

Operate the generator 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

Nonoperating 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
## AC Power Requirements

<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>
</tr>
</thead>
<tbody>
<tr>
<td>20kHz</td>
<td>20AT060-UX-XX</td>
<td>600</td>
<td>100-240V 50/60 Hz @ 15 Amps Max</td>
</tr>
<tr>
<td>20kHz</td>
<td>20AT120-2X-XX</td>
<td>1200</td>
<td>200-240V 50/60 Hz @ 15 Amps Max</td>
</tr>
<tr>
<td>30kHz</td>
<td>30AT060-UX-XX</td>
<td>600</td>
<td>100-240V 50/60 Hz @ 15 Amps Max</td>
</tr>
<tr>
<td>30kHz</td>
<td>30AT120-2X-XX</td>
<td>1200</td>
<td>200-240V 50/60 Hz @ 15 Amps Max</td>
</tr>
<tr>
<td>35kHz</td>
<td>35AT060-UX-XX</td>
<td>600</td>
<td>100-240V 50/60 Hz @ 15 Amps Max</td>
</tr>
<tr>
<td>35kHz</td>
<td>35AT120-2X-XX</td>
<td>1200</td>
<td>200-240V 50/60 Hz @ 15 Amps Max</td>
</tr>
<tr>
<td>40kHz</td>
<td>40AT060-UX-XX</td>
<td>600</td>
<td>100-240V 50/60 Hz @ 15 Amps Max</td>
</tr>
<tr>
<td>50kHz</td>
<td>50AT060-UX-XX</td>
<td>600</td>
<td>100-240V 50/60 Hz @ 15 Amps Max</td>
</tr>
<tr>
<td>70kHz</td>
<td>70AT012-UX-XX</td>
<td>120</td>
<td>100-240V 50/60 Hz @ 15 Amps Max</td>
</tr>
</tbody>
</table>

**Table 8-I** AC Power Requirements
Interpreting the Model Number

Example System Number shown above:

20AT060-UF-C5

- **Nominal Output Power**: 600 Watts
- **Power Level**: 060
- **AC Line Input**: 200-240V
- **Probe System Options**: M
- **System Process Control**: C5
- **Chassis Style**: AT
- **Power Switch Configuration**: F
- **Nominal Line Frequency**: 50-60Hz
- **Power Level**: 20
- **AT = Auto Series Panel Mount Chassis
- **AP = Auto Series Panel Mount Chassis
- **HP = Hand Probe Series Bench Chassis
- **AL = Automation Limited Bench Chassis

Notes:
- **AT**, **AP**, **AL**, and **HP** Series Systems support a POWERLINK communications module installed.

System Assembly Detailed Description:

- **A** = Auto Plus 2-kHz 600 Watt System that operates on 100-240V AC Line with a POWERLINK communications module installed.

- **U** = Universal 2-kHz 600 Watt System that operates on 100-240V AC Line with a POWERLINK communications module installed.
### iQ Auto to iQ Auto Plus - Inputs/Outputs Comparison

<table>
<thead>
<tr>
<th>System I/O Connector</th>
<th>iQ Auto</th>
<th>iQ Auto Plus</th>
<th>iQ Auto Plus Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pin</strong></td>
<td><strong>Signal Name</strong></td>
<td><strong>Pin</strong></td>
<td><strong>Signal Name</strong></td>
</tr>
<tr>
<td>1</td>
<td>Enable Out</td>
<td>1</td>
<td>Enable Out</td>
</tr>
<tr>
<td>2</td>
<td>Enable In</td>
<td>2</td>
<td>Enable In</td>
</tr>
<tr>
<td>3</td>
<td>Overload Out</td>
<td>3</td>
<td>Overload Out</td>
</tr>
<tr>
<td>4</td>
<td>U/S Status Out</td>
<td>6</td>
<td>U/S Status Out</td>
</tr>
<tr>
<td>5</td>
<td>Any Fault Out</td>
<td>5</td>
<td>Any Fault Out</td>
</tr>
<tr>
<td>6</td>
<td>Power OK Out</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Output Common (non-isolated)</td>
<td>7</td>
<td>Output Common (isolated)</td>
</tr>
<tr>
<td>8</td>
<td>Spare Status Out</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Analog Power Out-</td>
<td>10</td>
<td>Analog Power Out-</td>
</tr>
<tr>
<td>11</td>
<td>Fault Reset Input</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>U/S Activate Input</td>
<td>13</td>
<td>U/S Activate</td>
</tr>
<tr>
<td>13</td>
<td>Input Common (isolated)</td>
<td>14</td>
<td>U/S Common (isolated)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MPC I/O Connector</th>
<th>iQ Auto</th>
<th>iQ Auto Plus</th>
<th>iQ Auto Plus Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pin</strong></td>
<td><strong>Signal Name</strong></td>
<td><strong>Pin</strong></td>
<td><strong>Signal Name</strong></td>
</tr>
<tr>
<td>1</td>
<td>Setup Bit 0 Input</td>
<td>8</td>
<td>Remote Setup Bit 0 Input</td>
</tr>
<tr>
<td>2</td>
<td>Setup Bit 1 Input</td>
<td>9</td>
<td>Remote Setup Bit 1 Input</td>
</tr>
<tr>
<td>3</td>
<td>Setup Bit 2 Input</td>
<td>10</td>
<td>Remote Setup Bit 2 Input</td>
</tr>
<tr>
<td>4</td>
<td>Setup Bit 3 Input</td>
<td>11</td>
<td>Remote Setup Bit 3 Input</td>
</tr>
<tr>
<td>6</td>
<td>MPC Ready Out</td>
<td>4</td>
<td>Ready Out</td>
</tr>
<tr>
<td>7</td>
<td>Output Common</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table 8-II** iQ Auto to iQ Auto Plus Inputs/Outputs Comparison
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 Européenne (European Conformity). The equipment complies with the following CE requirements.

- The EMC Directive 2014/30/EU for Heavy Industrial —
  - EN 61000-6-4:
    - EN 55011
  - EN 61000-6-2:
    - 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 2014/35/EU.
- The Machinery Directive 2006/42/EC.
- EN ISO 12100: Safety of Machinery - General principles of design, risk assessment, and risk reduction.

IP Rating
The iq generator has an IP (International Protection) rating from the IEC (International Electrotechnical Commission).

The rating is IP2X, in compliance with finger-safe industry standards.

UL
The iq generator complies with these standards:

Tested to Underwriters Laboratories:
UL 61010–1, IEC 61010-1
and
National Standards of Canada:
CAN/CSA C22.2 No. 61010–1–12

as verified by TÜV Rheinland.

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 9

Appendices

Appendix A, List of Figures ....................... 60
Appendix B, List of Tables ........................ 61
### Appendix A

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-1</td>
<td>Thermal and Power Considerations for iQ Auto Generators</td>
<td>5</td>
</tr>
<tr>
<td>2-1</td>
<td>AC Line Connection</td>
<td>11</td>
</tr>
<tr>
<td>3-1</td>
<td>Mounting Brackets - Rear and Bottom</td>
<td>15</td>
</tr>
<tr>
<td>3-2</td>
<td>Generator Front View</td>
<td>17</td>
</tr>
<tr>
<td>3-3</td>
<td>MPC Interface Connector</td>
<td>20</td>
</tr>
<tr>
<td>3-4</td>
<td>MPC Module Cutout Guide</td>
<td>22</td>
</tr>
<tr>
<td>3-5</td>
<td>MPC Module Rear Connectors</td>
<td>23</td>
</tr>
<tr>
<td>3-6</td>
<td>MPC Module Front Connectors</td>
<td>23</td>
</tr>
<tr>
<td>3-7</td>
<td>MPC Module Status LED's</td>
<td>24</td>
</tr>
<tr>
<td>4-1</td>
<td>Generator POWER LED Detail</td>
<td>28</td>
</tr>
<tr>
<td>4-2</td>
<td>LED Locations</td>
<td>31</td>
</tr>
<tr>
<td>5-1</td>
<td>Generator with Heat Sink Option</td>
<td>35</td>
</tr>
<tr>
<td>6-1</td>
<td>PLC Sourcing (PNP) Type Output Circuit</td>
<td>39</td>
</tr>
<tr>
<td>6-2</td>
<td>PLC Sinking (NPN) Type Output Circuit</td>
<td>40</td>
</tr>
<tr>
<td>6-3</td>
<td>PLC Sourcing (PNP) Type Input Circuit</td>
<td>41</td>
</tr>
<tr>
<td>6-4</td>
<td>PLC Sinking (NPN) Type Input Circuit</td>
<td>42</td>
</tr>
<tr>
<td>6-5</td>
<td>E-STOP Wiring and Automation System Safety Circuit</td>
<td>43</td>
</tr>
<tr>
<td>8-1</td>
<td>Generator Outline Drawing</td>
<td>53</td>
</tr>
<tr>
<td>8-2</td>
<td>Interpreting the Model Number</td>
<td>56</td>
</tr>
</tbody>
</table>
## Appendix B
### List of Tables

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-I</td>
<td>P1 System I/O Connector Signals</td>
<td>18</td>
</tr>
<tr>
<td>3-II</td>
<td>SMPC I/O Connector Signals</td>
<td>21</td>
</tr>
<tr>
<td>3-III</td>
<td>System I/O Remote Setup Inputs</td>
<td>21</td>
</tr>
<tr>
<td>3-IV</td>
<td>Probe Cables</td>
<td>23</td>
</tr>
<tr>
<td>4-I</td>
<td>LED Colors and Indication</td>
<td>32</td>
</tr>
<tr>
<td>8-I</td>
<td>AC Power Requirements</td>
<td>55</td>
</tr>
<tr>
<td>8-II</td>
<td>iQ Auto to iQ Auto Plus Inputs/Outputs Comparison</td>
<td>57</td>
</tr>
</tbody>
</table>
Index

A
Agency Compliance  58
  CE Marking  58
  FCC  58
  IP (International Protection) Rating  58
Appendix A - List of Figures  60
Appendix B - List of Tables  61
Automation Interface  37

C
Chassis Grounding Stud  16
Contact Dukane
  Email  49
  Phone  49
  Service and Parts  49
  www.dukane.com/us/  49

E
Electrical Safety
  Power Grounding Connection  11
EtherNet I/P Communications  44

F
FCC  58

G
General User Information  3
  Drawings and Tables  3
  Notes, Cautions and Warnings  3
  Read This Manual First  3
Generator Overview
  Key Features  4
  Generator Overview  4
  Thermal Considerations  5

H
Health and Safety
  Electrical Safety  10
  General Considerations  9
  Plastics Health Notice  10
  Recommendations  9
  Heat Sink  35

I
Installation
  Connecting Cables  17
    MPC Interface Connections  20
    P1 System I/O Connector Pinout  18
  MPC Module Installation Guide  22
  Placement  15
  Placement in a Seismic Region  15
  Power Grounding  16
  Unpacking  15
  Interpreting the Model Number  56
  IP (International Protection) Rating  58
  iQ Auto to iQ Auto Plus - Inputs/Outputs Comparison  57
  iQLinQ  44

M
MPC Module Installation Guide  22
MPC Module Status LEDs  24
MPC Probe Control  21
Multi-Probe Control (MPC)  20

N
Notes, Cautions and Warnings  3
Index

O
Options
  Heat Sink  35
  Distance  36
  ANYBUS  36

P
P1 System I/O Connector Pinout  18

R
Regulatory Agency Compliance  58

S
Specifications
  AC Power Requirements  55
  Interpreting the Model Number  56
  iQ Auto to iQ Auto Plus - Inputs/Outputs Comparison  57
  Operating Environment  54
  Weight  54
System Operation
  Introduction  27
  iQ Auto-Plus System Operational Test  28
  LED Indication  31

T
Thermal Considerations  5
Dukane ISO

ISO CERTIFICATION

Dukane chose to become ISO 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 certification, you must prove to one of the quality system registrar groups that you meet three requirements:
1. Leadership
2. Involvement

The ISO standards establish 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

View the Dukane ISO certificate of compliance at: www.dukane.com/support/downloads/
Please refer to our website at:

www.dukane.com/contact-us/

to locate your local representative.