DUKANE

Intelligent Assembly Solutions

Dynamic Process Controller DPC™ IV Plus Generator

User's Manual

Dukane Part No. 403–557–09

Dukane Corporation • Ultrasonics Division • 2900 Dukane Drive • St. Charles, Illinois 60174 USA • TEL +1 630 797 4900 • FAX +1 630 797

ISO 9001:2000 Dukane products are manufactured in ISO registered facilities

www.dukane.com/us

Printed in the United States of America.

Dukane Part Number: 403-557-09

Revision History DPC–4 Manual

Revision Number	Revision History	Date
–00	DPC–4 Manual original release.	1997–Jun–30
–01	Entire manual edited, formatted, and updated corresponding to firmware version 2.60.	1999–Mar–01
–02	Manual edited to reflect change made with firmware version 3.20 and removed references to *Amplitude Profiling*. Version 2.70 Update was integrated into the manual. Customer input, output connection drawings revised (C-2 to C-8) in Appendix C. Update USA, Canada, Mexico and International Warranties to reflect changes made Sept. 1999. Revised Table of Contents and Index.	2000–Jan–18
Addendum 1	Correct CALIBRATION menu option in Section 5, Page 48.	2001–Jul–12
–03	Incorporate CALIBRATION addendum into manual. Updated Generator Model No. in Tables 5–1 and 12–1. Updated Interpreting DPC Model No. in Figure 12–2. Change Table D–2 to reflect circuit board changes.	2002–Feb–15
Addendum 2	Corrections to Top–Of–Stroke connector pinout diagram Revise Figure C–8 on page C–XVI in Appendix C.	2002–Jul–22
–04	Incorporate Addendum 2 into manual Clarify corrected Figure C–8 in Appendix C. Update Table 12–1 and Figure 12–2.	2003–Jan–07
–05	Add DPC–4 Plus Advanced I/O options to Section 5. Expand definition of Active High and Low states in Section 5 – Advanced I/O on page 56. New front and rear panel layouts in Section 3 to reflect front keypad and rear connector layout of DPC–4 Plus. Dual DPC–4 and DPC–4 Plus menu commands throughout manual. Update menu structures in manual and Appendix F. Update Telephone & Fax numbers and Email in Section 15. Add interface circuit schematics and connector pinouts for Advanced I/O option in Appendix C	2004–Jan–30
Addendum 3	Update Remote Sequencing in Section 10 – page 115 Correct footnote [3]RSB 1–4 for Table C–3 in Appendix C. Missing text ***(Factory Default)*** in Figures C–4, C–5 and C–6. Revise Tables C–8 and C–9 in Appendix C for J901. Add information about Remote Setup file selection and display.	2004–Mar–31

(Continued on next page)

Revision History DPC–4 (Continued)

Revision Number	Revision History	Date
–06	Incorporate Addendum 3 into manual	2004–Apr–14
Addendum 4	Add Table A–4 which provide descriptions of CSV tag numbers. Table appears on page A–VIII in Appendix A Updated Table of Contents and Table Listing on page xviii	2004–Aug–30
–07	Incorporate Addendum 4 into manual Update Table 12-I regarding AC Power requirements	2005–Apr–22
–08	Revise Table 12-I Update Dukane Contacts	2008–Sep–18
–09	Addendum 5 added as an independent 4 page unit placed before Table of Contents about these four items: • When to use lockout/tagout devices • Placing the Generator When Used in an Active Seismic Region • IP Rating • Lifting the Equipment	2009–May–26

ADDENDUM 5

Applies to: P/N 403-557-09 and all prior editions
Effective: May 26, 2009
This addendum of four pages contains four subject areas as listed below:

A. When to use Lockout / Tagout Devices
B. Placing the Generator When Used in an Active Seismic Region
C. IP (International Protection) Rating
D. Lifting the Equipment

A. When to Use Lockout / Tagout Devices

Lockout Device In Open Position, Unlocked

Bottom Lockout Device In Closed Position, Locked

WARNING

Electrical safety hazards exist inside the DPC-4 Plus chassis. Before making any internal adjustments to the DPC-IV Plus, apply a lockout/ tagout (LOTO) device to the DPC-IV Plus chassis.

Two examples of when a LOTO device would be needed:

1) Fixture Installation – See Page 52 of the DPC-IV Plus User's Manual; and,

2) Jumper Configuration – See Appendix C, Page VII.

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

Continued on next page.

Procedure to use BEFORE making any internal adjustments to the DPC-IV Plus generator:

1. Push the DPC-IV Plus front panel AC power switch/breaker to the OFF position.

2. Unplug the DPC-IV Plus electrical cord from its source.

3. Authorized personnel apply a lockout/tagout (LOTO) device to the plug end of the DPC-IV Plus 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 DPC-IV Plus to discharge its electrical energy.

5. After taking these steps, make the necessary adjustments to the DPC-IV Plus generator.

Assuming the DPC-IV Plus generator is being put back into service. . .

Procedure to use AFTER making any internal adjustments to the DPC-IV Plus generator:

1. Authorized personnel remove the lockout/tagout device from the plug end of the DPC-IV Plus 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 DPC-IV Plus electrical cord into its AC power source.

3. Push the DPC-IV Plus front panel AC power switch/breaker to the ON position.

B. Placing the Generator When Used in an Active Seismic Region

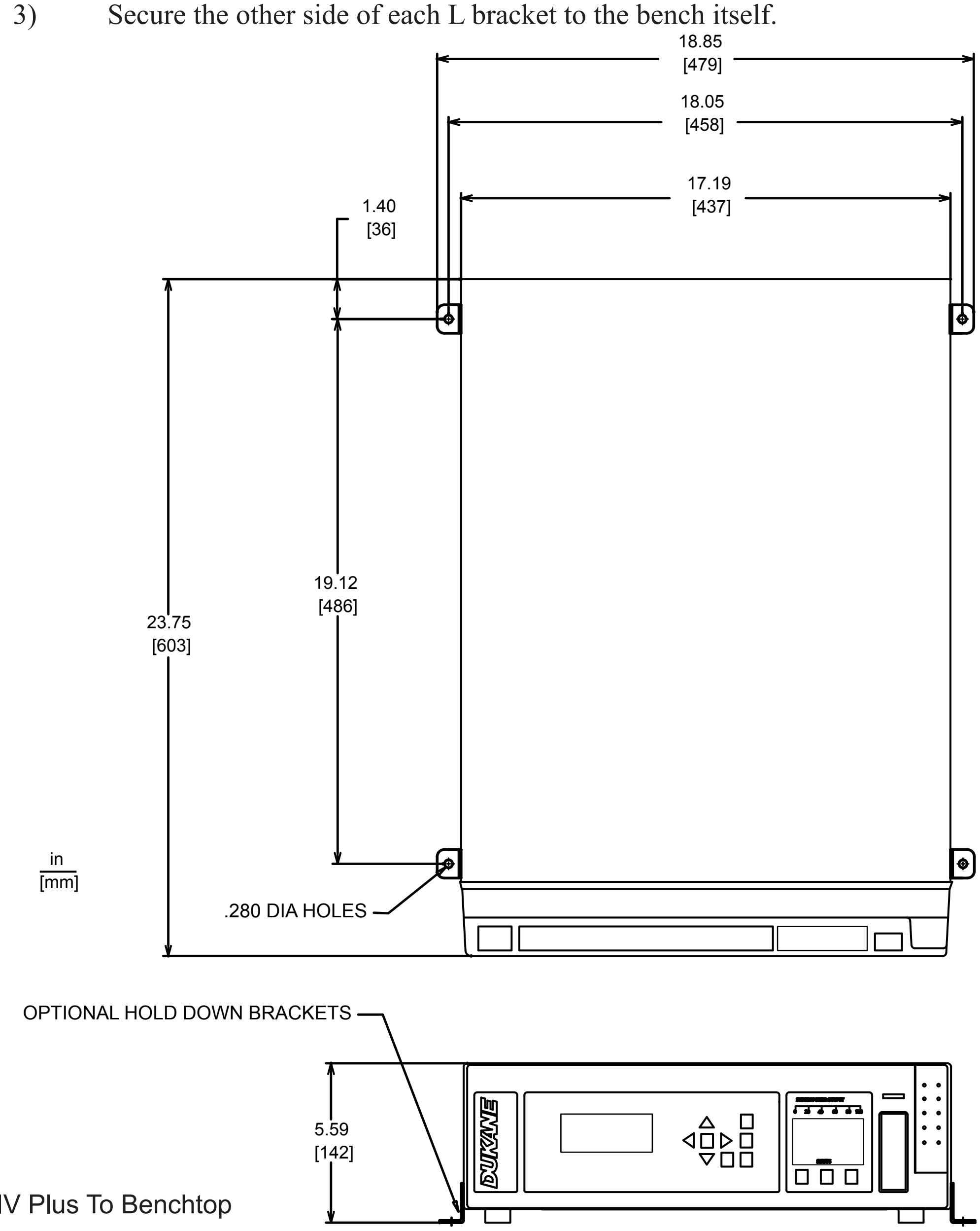
Placing the DPC-IV Plus in an active seismic region means you will need to secure the unit by rack-mounting it or by securing the unit to a benchtop.

Rack Mounting

If the DPC-IV Plus is being used in a seismic active region, it should be rack mounted according to the instructions on Page 12 of the DPC-IV Plus User's Manual.

Benchtop Mounting

1) If the generator is a benchtop unit, then install the four (4) optional hold down brackets. See the drawing below.
2) Secure one side of each L bracket to the unit's sheet metal cover.
3) Secure the other side of each L bracket to the bench itself.



Securing DPC IV Plus To Benchtop

C. IP (International Protection) Rating

The DPC IV Plus has an IP rating from the IEC (International Electrotechnical Commission). The rating is IP2X, in compliance with finger-safe industry standards.

D. Lifting the Equipment

Weight of DPC-IV Plus Generator (with packaging): 50 lb (22.7 kg)

Weight of DPC-IV Plus Generator (without packaging): 41 lb (18.6 kg)

CAUTION

Take care in lifting this equipment. Because of its weight, we recommend using a mechanical lift device to assist.

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.

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

Table of Contents

Section 1 Introduction and Safety

Section 2 Installation

Section 3 The Control Panel

Section 4 Network – Naming the DPC

Section 5 Hardware Setup

Section 6 Security

Section 7 Process Setup – Process Control

Section 8 Process Setup – Process Limits

Section 9 Process Setup – Utilities

Section 10 Process Setup – Sequencing

Section 11 Operate

Section 12 Specifications

Section 13 Care and Troubleshooting

Section 14 DPC/MMI Firmware Upgrade

Section 15 Dukane Corporation Contacts and Warranty

Section 16 Appendices

Index

Table of Contents

Figures

Table of Contents

Figures, continued

Table of Contents

Figures, continued

Table of Contents

Figures, continued

Table of Contents

Figures, continued

Appendices

Table of Contents

Figures, continued

Tables

This page intentionally left blank.

This page intentionally left blank

SECTION 1

Introduction and Safety

- This section gives a general introduction to the DPC, and deals with safety considerations.

This page intentionally left blank

Before Operating Equipment

Before you operate the equipment, please follow the recommendations given here.

Read this Manual First

Before operating the Dynamic Process Controller™ (DPC) IV or IV Plus, read this User's Manual to become familiar with the DPC.

Read the Supplementary MMI Manual (Optional)

If you have the optional Man-Machine Interface (MMI), please read its User's Manual (Dukane Part No. 403-565) before operating it. The MMI manual is a companion to this DPC User's Manual and supplements information provided here.

By reading the DPC and MMI manuals you will have gained basic understanding. This will be helpful as you learn the potential of these control devices through practical, hands-on process work.

Watch for Special Paragraphs

Watch for these special kinds of paragraphs in this manual:

NOTE

Note statements highlight procedures or provide information.

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.

About this Manual

Contents

This manual:

- explains the installation and setup necessary for the Dukane DPC IV and DPC IV Plus,
- provides basic programming information to achieve precise ultrasonic welding,
- gives process control information about advanced programming techniques,
- contains details to monitor process data, and
- provides equipment specifications and troubleshooting information.

Organization

Before Welding: Sections 1–6

Section 1 Introduction and Safety gives a general explanation of the DPC, and covers safety considerations.

Section 2 Installation explains DPC setup and shows cable connections for a typical system.

Section 3 The Control Panel introduces panel components and their functions, the Main Menu, and the basics of moving within the menus.

Section 4 Network – Naming the DPC explains when to name the DPC.

Section 5 Hardware Setup describes how to set some start-up parameters, and how to set other parameters during normal operation.

Section 6 Security explains how to enable password protection for virtually all DPC menus.

Basics of Process Control: Section 7

Section 7 Process Setup – Process Control describes using the extensive array of process control menus to program the DPC.

Beyond the Basics of Process Control: Sections 8-10

Section 8 Process Setup – Process Limits describes process characteristics and shows how to establish limits to define bad and suspect parts.

Section 9 Process Setup – Utilities gives information on using the setup management tools and diagnostic features this menu provides.

Section 10 Process Setup – Sequencing describes how the DPC can be used for jobs that need multiple welds in a single setup.

Monitoring the Welding Process: Section 11

Section 11 Operate describes ways to accomplish real-time monitoring of the process control functions.

Supporting Information: Sections 12 -16

Section 12 Specifications is a summary of the DPC power and space requirements.

Section 13 Care and Troubleshooting describes equipment care, provides elementary diagnostic information, and identifies firmware revision level.

Section 14 MMI Firmware Upgrade describes how to upgrade firmware using the DPC rear panel serial port.

Section 15 Contacting Dukane gives information on support from the Dukane Ultrasonics factory team, and provides warranty information.

Section 16 Appendices contain technical reference data.

The **Index** provides page references for terms the manual uses.

DPC Overview

The DPC IV and IV Plus are the most technologically advanced models in a line of process controllers offered by Dukane Corporation and used with Dukane ultrasonic welding systems.

A selection of DPC models helps meet different needs. For instance, one model can be a reliable power source for welding applications. Another model can function with a single, hand-held ultrasonic probe, while another model can be linked to a larger, stationary press, and another model might be networked with a group of DPCs to control an extensive array of ultrasonic systems.

The fully integrated process controller provides essential control and monitoring features for ultrasonic welding operations. Its modular design provides tailor-made flexibility in meeting a wide variety of process requirements in one, space-saving unit.

The advanced programming capabilities of the DPC improve the welding process. Process characteristics and equipment settings are made so that parts are joined precisely and consistently.

The DPC is capable of being a one-point source for data collection and display. When the DPC is coupled with the Man-Machine Interface (MMI), a visual display and data entry device, real-time process information and characteristic graphs are more easily viewed using the MMI touch screen. The DPC and MMI are a powerful pair making process control easier and more efficient.

Key Features

- **Modular Design** makes upgrades and retrofits easy when application requirements change.

- **Weld Process Control** is accomplished using the primary controls of time, distance, absolute distance, energy, and peak power. Enabling secondary controls adds an even greater level of precision in process control.
  Two sets of limits for as many as 25 process characteristics can be made. Weld cycles can then be monitored to detect parts whose process characteristics are outside the preset limits.

- **Progressive Pressure** for holding and welding are available in combination with the Dukane thruster that incorporates dual pressure capability.

- **Interface Versatility** means there is the front panel display and the ability to integrate the DPC with automation equipment, printer, computer, additional DPCs, and Dukane's MMI.

- **Automatic Setup Change** is used when parts require more than one assembly operation and more than one set of process parameters.

- **Pulse Width Modulation** is Dukane's patented circuitry giving the DPC power supply the ability to efficiently change the voltage sent to the transducer.

- **Auto-Trac Tuning** automatically tracks the resonant frequency of the acoustic stack (horn booster, transducer), and adjusts the generator output frequency to match it.*

- **Line Voltage Regulation** automatically maintains constant amplitude regardless of line voltage deviation.*

- **Load Regulation** provides constant amplitude automatically regardless of load (power draw).*

- **Power Factor Correction** with this feature, electrical power consumption for the DPC will be reduced by approximately 25%.

- **Worldwide Auto-Ranging Universal Voltage Input** means that the DPC will operate anywhere in the world. No manual power adjustments are needed.

**Within specified ranges.*

Health and Safety Recommendations

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

"System" in this manual refers to a complete group of components associated with the welding of plastic or metal parts, also known as an ultrasonic assembly system. A typical system consists of a generator and/or ultrasonic process controller, a thruster or press, switches, controls, cables, transducer, booster, horn, and fixture.

NOTE

These recommendations apply to the welding system, that is, the DPC, the MMI and the other components associated with joining plastic and/or metal parts ultrasonically.

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.

Grounded Electrical Power - Operate this equipment only with a grounded electrical connection. (See Electrical Safety Grounding Instructions on the next page.)

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

CAUTION

Parts being joined ultrasonically sometimes vibrate at audible frequencies. Wear ear protectors to reduce annoying or uncomfortable sounds. In addition, ultrasound baffles, sound enclosures, or materials that absorb sound may be located to surround the system.

Special Health Notice – Plastics

Before using any Dukane ultrasonic system, become familiar with OSHA regulations from the U.S. Department of Labor about the particular type of plastic(s) you are using.

When plastic materials are being processed, they may emit fumes and/or gases that could be hazardous.

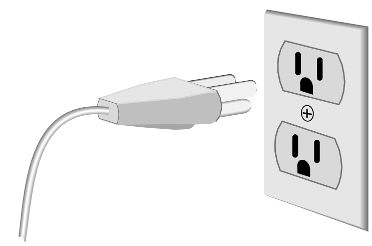
Make sure there is proper ventilation whenever these plastics are processed.

Electrical Safety Grounding Instructions

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

CAUTION

If you must use 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 1-1 and 1-2.



Approved 2 pole, 3 wire grounding receptacle BRYANT No. 5261 or equivalent to NEMA 5-15R OR 5-20R

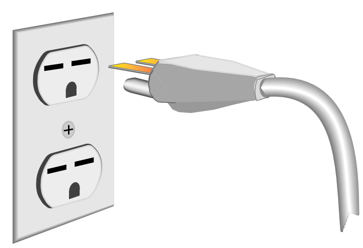
Figure 1-1 *Example of 120 V, Grounded, 3-Prong Receptacle*

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.

Extension Cord: If an extension cord is needed, use a three-wire cord that's in good condition. The cord should be large enough to do the job safely. It, too, must be plugged into a grounded receptacle. Do not use a two-wire extension cord with this product.



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

Figure 1-2 *Example of 220 V, Grounded, 3-Prong Receptacle*

120 Volt Ground Adapter

If it is impossible to change the wall receptacle to an approved grounding-type, and where local codes permit, you may use an adapter to connect the three-prong grounding plug to the two-prong receptacle. (See Figure 1-3.)

1 - Power cord w/ 3 - prong plug
2 - Adapter assembly
3 - Wall Plate
4 - Receptacle
5 - Cold water pipe (metal)
6 - Ground clamp
7 - Mounting screw
8 - Green ground lead
9 - 14 AWG (1.63mm ø) Ground wire

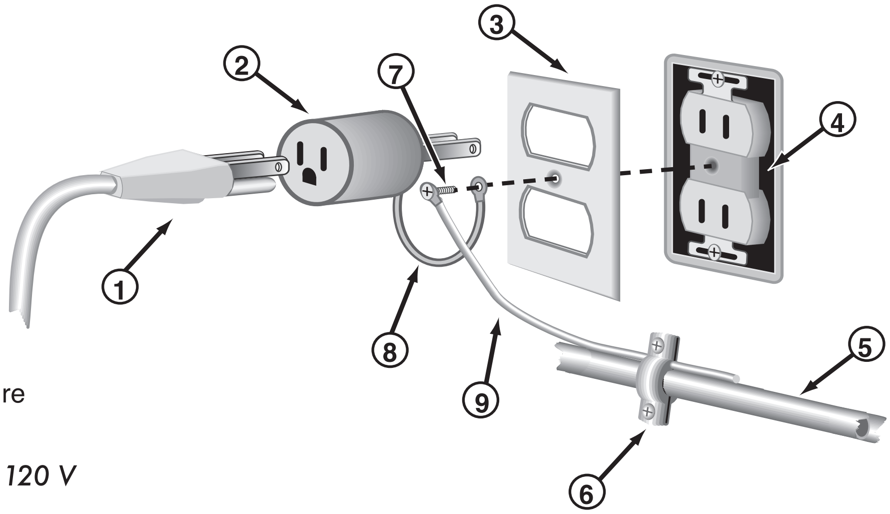


Figure 1-3 *Example of Proper 120 V Ground Adapter Hookup*

CAUTION
The green pigtail on the adapter MUST BE CONNECTED TO GROUND.

If the receptacle is grounded, the ground lead (marked as 8 in Figure 1–3) may be connected to it.

If the receptacle is not grounded, connect a separate 14 AWG (1.63mm = 0.064" dia.) ground wire from the receptacle to the nearest effectively grounded metal cold–water pipe or equivalent grounding electrode.

International Grounding

The power cable normally provided for international use is compatible with many power outlets. (Refer to Figure 1-4.) However, if your application requires another type of cable, check with the local Dukane products representative, and follow local regulations concerning proper wiring and grounding.

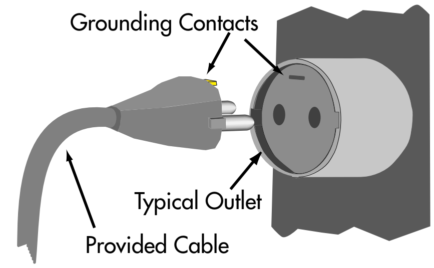


Figure 1-4 *Example of International 220/240V Grounding*

Additional Grounding

Grounding lugs have been provided on the DPC, base, and thruster (See Figure 1-5.) to meet grounding requirements.
Use at least 14 AWG ground wire for the ground connection between the press, the thruster and the DPC.

RFI Filter Considerations

In addition to the safety considerations above, proper grounding at the generator power cord is essential for the effective operation of the RFI (Radio Frequency Interference) filter in every Dukane generator. The filter prevents line noise from entering the control circuitry of the ultrasonic equipment, as well as blocking ultrasonic RFI from the power line.

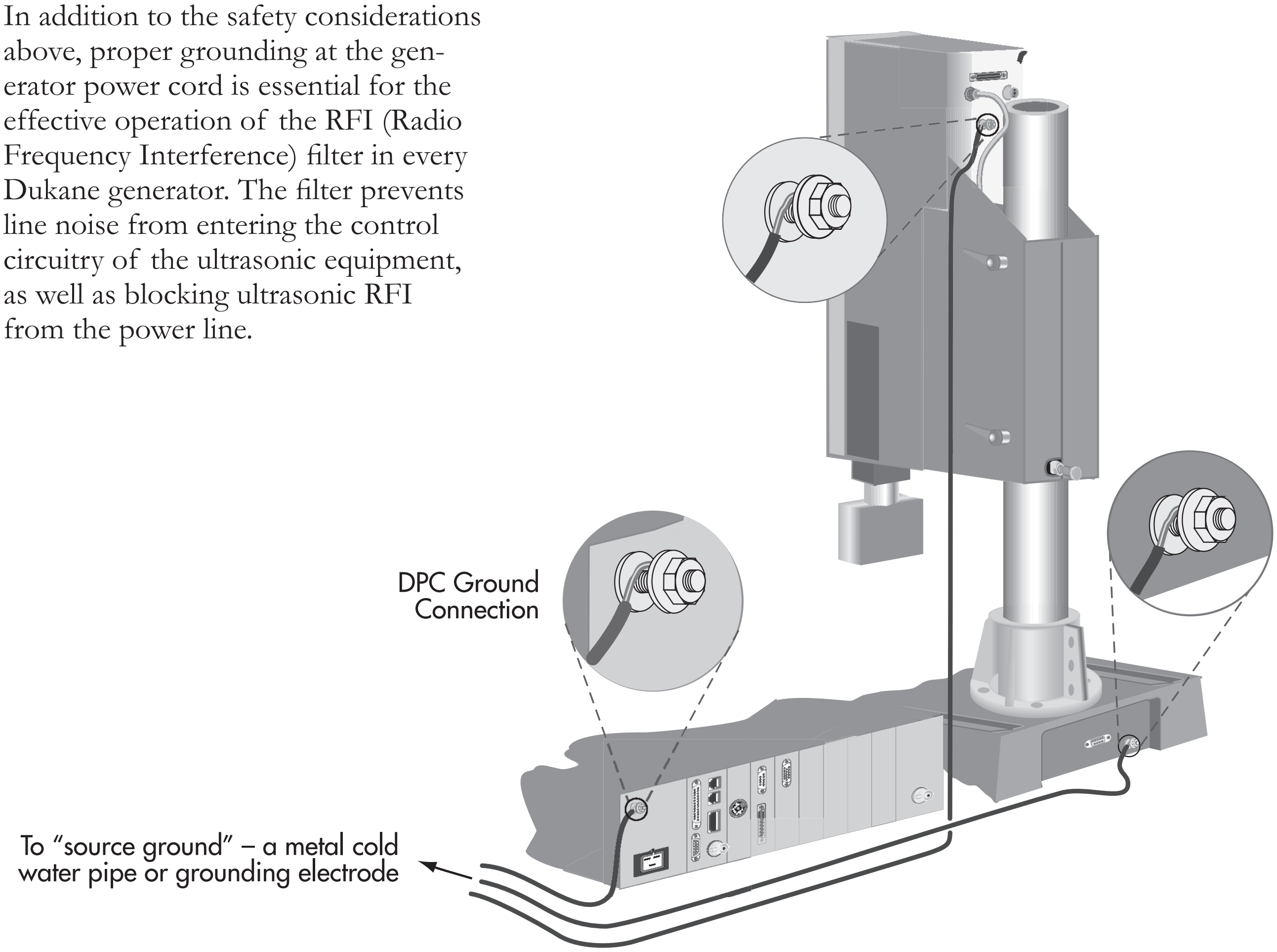


Figure 1-5 *Typical Equipment Grounding Arrangement*

This page intentionally left blank

SECTION 2

Installation

- This section deals with basic installation: locating and cabling the DPC.

Unpacking

Carefully open the shipping container, and make sure it has the items shown in Table 2-1.

Quantity	Item	Part Number
1	DPC-4 Plus	**
1	DPC-4 Plus User's Manual	403-557-05
AC power cord and cables as specified. See your Packing List. Compare with Table 2-3.		

Table 2-1 *Contents of DPC Shipping Container*

** See Section 12, *Specifications*, for an explanation of the DPC part number.

Inspect the DPC for damage. Immediately report any that is found to Dukane Ultrasonics Support/Service.

NOTE

If there are questions or problems concerning the order, please contact your Dukane sales representative or the Sales Department at Dukane Corporation Headquarters. See Section 15 for contact information.

DPC Placement

Placement of the DPC depends on what type it is, benchtop or rack-mounted.

Benchtop

Place the DPC near the ultrasonic press on a flat surface with its front panel easily accessible. Make certain the placement and cabling do not interfere with press operation.

Allow 5 inches (12 cm) at the rear of the DPC for cable clearance. Allow 6 inches (15 cm) of space on either side of the DPC for air

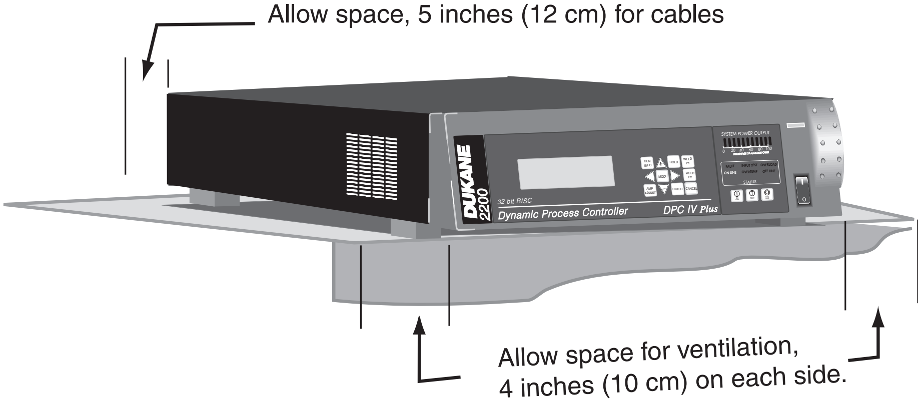
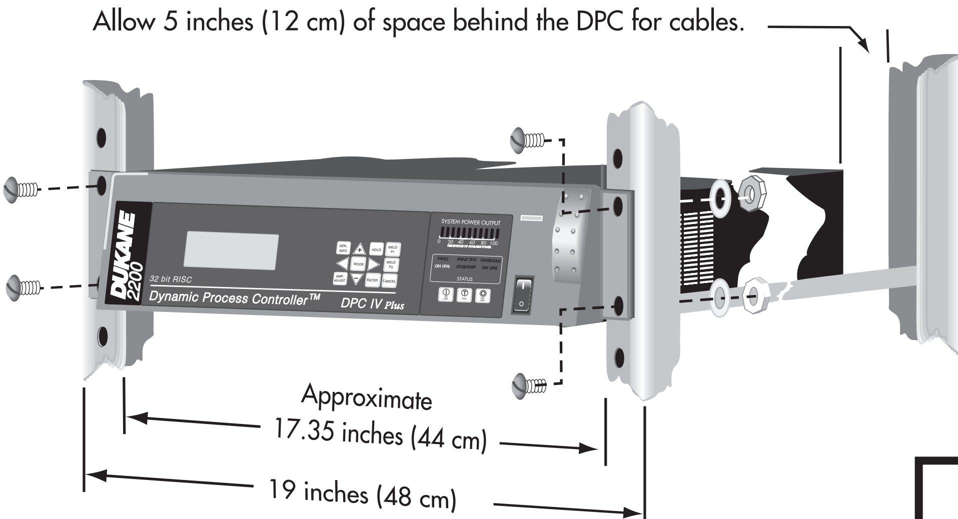


Figure 2-1 *Placing a Benchtop DPC–4 Plus*

Rack-mounted

There are two options for rack-mounting:

1. Figure 2-2a shows the use of a bracket kit in mounting a DPC to a 19-inch equipment rack. (Contact Ultrasonic Sales at Dukane, and ask for the kit as Part Number US-1155.) The DPC illustrated has the standard, angled front panel of impact-resistant ABS plastic.



2. Figure 2-2b shows the second option: a flat, steel front panel. The panel (along with the rest of the unit) is designed to be bolted directly to an equipment rack.
   (The flat panel kit is Part Number 110-3727.)

CAUTION

Remove any obstructions that would prevent the free flow of air around the DPC.

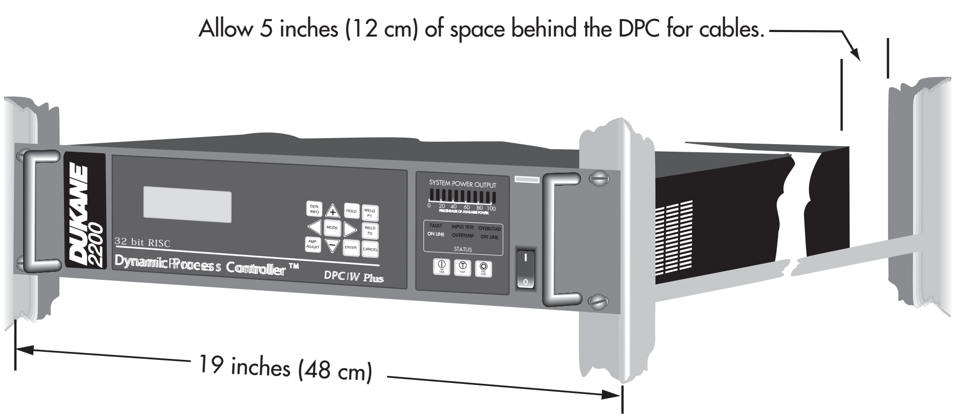


Figure 2-2b *Rack-mounted Flat Panel DPC–4 Plus*

Rear Panel Layout

Familiarize yourself with the connection points for power and ground, and all communication ports on the DPC rear panel; see Figure 2-3 below and Table 2-2, on the next page.

> **NOTE**
>
> *See Appendix D,* Connector Pinout Descriptions*, for the Press Cable (Port J201), the Press Base Cable (Port J202) and, the User I/O Cable (Port J602) .*

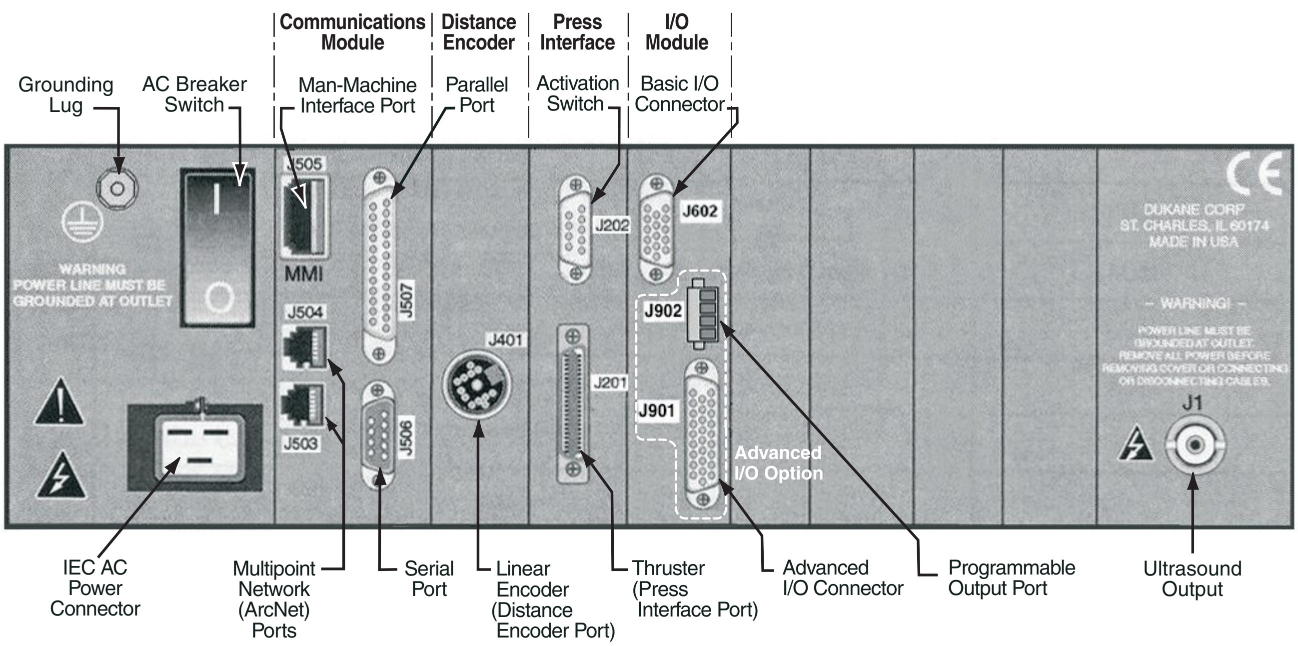


Figure 2-3 *DPC–4 Plus Rear Panel*

> **NOTE**
>
> *See Appendix E,* Rear Panel I/O*, for more detail about the functions of the rear panel ports.*

Continued

Connection Point/Port	Name	Function
Ground	Electrical Ground	Connection point to establish electrical ground for minimizing RFI interference.
IEC AC Input	AC Power Source Input	Receptacle accepts all approved AC power cords.
J1	Ultrasound Output	High voltage ultrasound output to press, thruster, or probe system.
J201	TO THRUSTER (Press Interface Port)	Control for pressure transducer, pressure regulator, force transducer, and air valves.
J202	BASE/ABORT (Activation Switch)	Connects cycle activation switches and the press base display to the DPC.
J401	TO LINEAR ENCODER (Distance Encoder)	Connection to the optical linear distance encoder (mounted on the side of the press).
J503	Multipoint Network Port	Provides for monitoring and control of each networked press from one DPC.
J504	Multipoint Network Port	
J505	MMI (Man-Machine Interface)	Connection for the optional MMI to the DPC.
J506	SERIAL-DCE	Connects the DPC to printers or data processing systems.
J507	PARALLEL	
J602	BASIC I/O	Provides basic input and output signals for interfacing to automation equipment.
J901	Advanced I/O	Additional I/O Status Outputs and Automation Inputs not provided on the Basic I/O connector (J602)
J902	Programmable Outputs	Two additional High-Power Outputs

Table 2-2 *Rear Panel Connection Points/Ports*

Ground the System

Make sure the system is properly grounded.

> CAUTION
> ***Is the system properly grounded? Before proceeding, make sure you have followed the instructions of Section 1 relating to electrical grounding.***

Connect the Cables

> **CAUTION**
> ***Make sure electrical power is off before connecting or disconnecting cables to the DPC. Put both the front panel ON/OFF switch and the rear panel AC breaker switch in the OFF position whenever cables are connected to or disconnected from the DPC.***

Complete the cable connections for your system using Figure 2-4 and Table 2-3 as guides.
The power cable is the last one to be connected, but do not turn on the power to the DPC as yet.

> **NOTE**
> *Systems may or may not have cables as shown. Compare your equipment order with the cables that were received.*

> **CAUTION**
> ***The power cord is equipped with a three-prong, gounded-type plug for your safety. Whenever a two-slot receptacle is encountered, we strongly recommend that it is replaced with a properly grounded three-lead receptacle. Have a qualified electrician do the replacement in accordance with the National Elecrical Code and local codes and ordinances.***
>
> ***DO NOT cut off the power cord grounding prong or alter the plug in any way.***

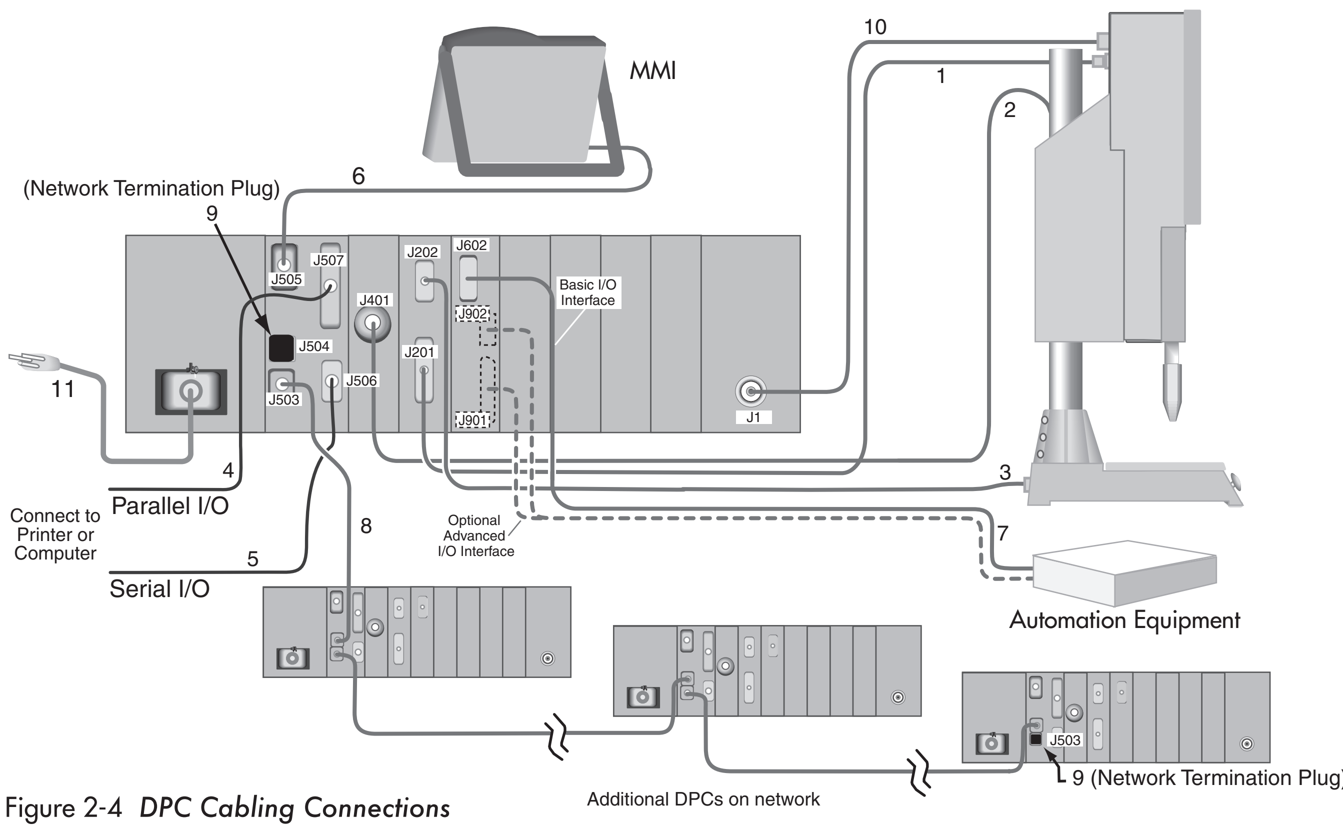


Figure 2-4 *DPC Cabling Connections*

Cable No.	Part Number	Cable Type	Length (m)	From DPC	To	Remarks
1	200-1104	36-Pin 3M	2.4	J201	J7 on Thruster	See Appendix D,Table D-1.
2	625-14	12-Pin	3.0	J401	Linear Encoder	
3	200-1124	9-Pin SUBD	3.0	J202	J35 on Press Base	See Appendix D,Table D-2.
4	200-1127	25-Pin SUBD	3.0	J507	Parallel connector on printer or processor	
5	200-1126	9-Pin SUBD	3.0	J506	Serial connector on printer	
6	200-1128	8-Pin	2	J505	J1 on MMI	
7	200-1203	15-Pin SUBD	3.0	J602	Input/Output cable	Customer automation. See Appendix D,Table D-3.
8	200-1141	6-Pin Modular	2.0	J503/J504	Other DPC network J504/J503	
9	597-477	6-Pin Modular	NA	Network Termination Plug for J504/ J503 on DPC		Two plugs are required. See "Network Termination Plug" on the next page.
10	200-479	Coaxial	2.4	J1	J1 on Thruster	
11	200-1276-202	AC (120V)	2	IEC AC Input	3-prong AC receptacle	See Section 1, Figures 1-1 to 1-4.
	200-1276-201	AC (240V)	2			
	200-1276-203	AC Continental Europe	2			

Table 2-3 *DPC Cables*

Network Termination Plug

What is a Termination Plug?

The small, 6-pin plug is a resistor with a value equal to the characteristic impedance of the DPC-MMI cable.

What does it do?

The plug prevents unwanted signals from reflecting from the ends of the network bus back to the cable (like an echo).

When are the plugs used?

The plugs are used if there is a single DPC or if there are multiple DPCs networked together.

Single DPC System: One termination plug is used.

Insert the plug into the 6-pin connection point, J504, on the back of the DPC.

Multiple DPC System: Two plugs are used.

Insert one plug into the first DPC (Port J504). This is the DPC connected to the MMI. Insert the second plug into the last DPC (Port J503) in the network chain.

Cabling DPCs Together

When multiple DPCs are used in a network, run a 6-pin modular cable from Port J503 on the first DPC to Port J504 on the next DPC.

Repeat this arrangement for additional DPCs connected to the network as shown in Figure 2-4. Insert a termination plug into Port J503 or J504 on the last DPC in the network.

Hand Probe System Connections

A probe system requires two connections to the DPC:
Auxiliary Input/Output (Port J602), and Ultrasound Output, (Port J1) as shown in Figure 2-5 below.

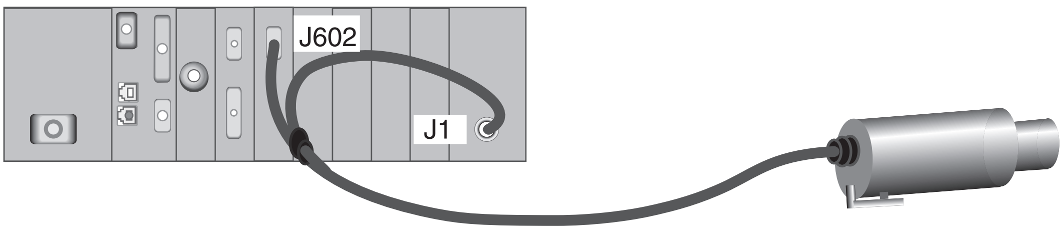


Figure 2-5 *Probe Cabling*

Display Monitor Connections

Part data may be displayed on the Falco or Sherwood terminals, or on a computer monitor. See Appendix B for these connections.

Ground Detect Feature Connections

If a DPC system has the ground detect feature, refer to Section 5, Pages 51-52. Complete the installation steps explained there before checking the connections and before electrical power is applied.

Recheck Connections

Recheck all connections, and when they are all secure, you are ready to connect electrical power.

Connect Electrical Power

As a final step in the cabling process, connect electrical power from an AC power source to the DPC.
Figure 2-4 shows this as Cable 11.

SECTION 3

The Control Panel

- Front panel control functions are described. Also, orientation to the menu structure, and to selecting and changing parameters is provided.

This page intentionally left blank

Overview

This section introduces the Dynamic Process Controller (DPC) control panel.

- First, control panel arrangement and functions of panel components are discussed.
- Next, the start-up display is shown.
- Finally, beginning with the Main Menu, some basic operating concepts are explained to familiarize you with the ways the panel is typically used.

Control Panel Layout

The DPC front control panel is arranged into three sections shown below in Figure 3–1a and Figure 3–1b

- DPC Menu Display and Menu Function Keys
- Generator Status Panel containing the Power Output Display, the STATUS Display and the Mode Keys
- AC Power section containing the Power Light and the AC Power Switch/Breaker

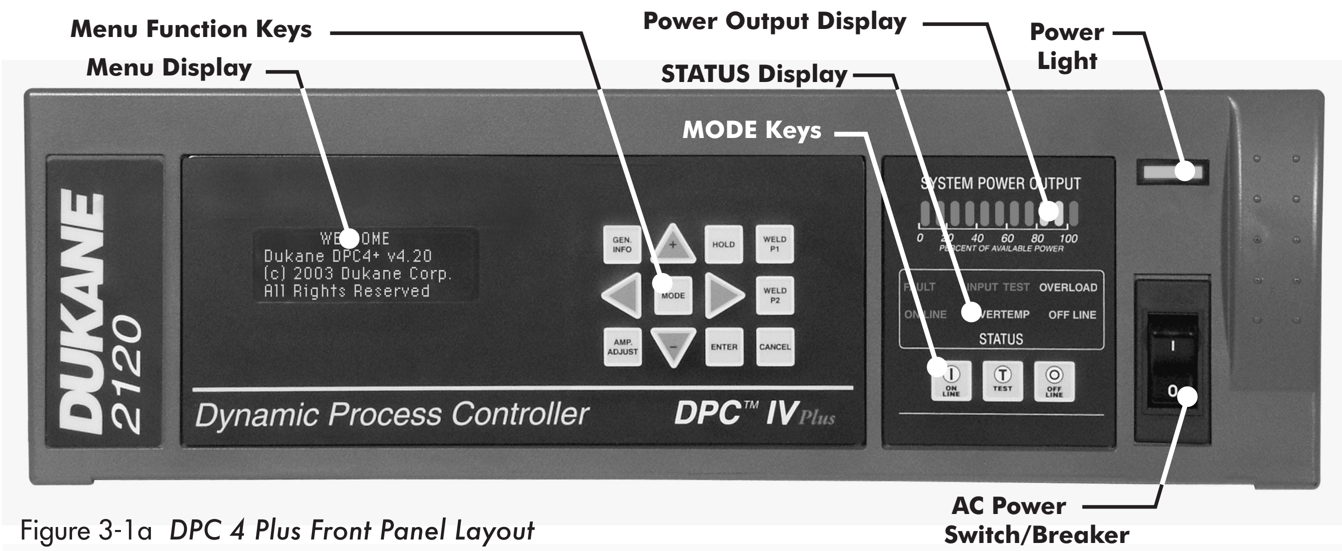


Figure 3-1a *DPC 4 Plus Front Panel Layout*

Figure 3-1b *DPC 4 Front Panel Layout*

DPC Display and Keypad

Display

The display shows up to four lines of twenty characters per line. Nineteen characters can be used for normal data. The twentieth character is used either to show scroll direction or to show which parameter is being reviewed or changed. Figure 3-2 shows the display layout.

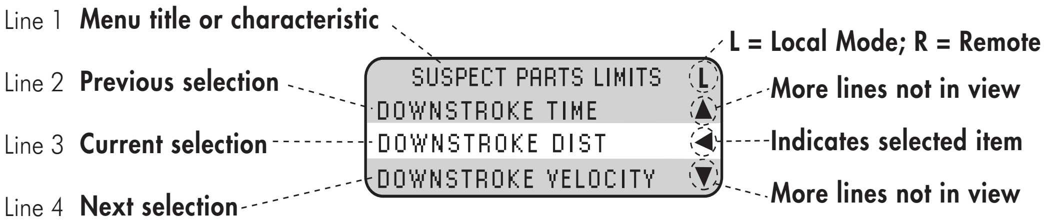


Figure 3-2 *DPC Display Layout*

Display Lines Explained

Line 1 contains the menu title or characteristic. When the DPC is networked, the line also contains L or R in the twentieth position. L means that the DPC is operating in a local mode. R means remote monitoring or operation of another DPC.

Line 2 has the previously selected parameter. If parameters precede the one shown on Line 2, a pointer at the end of the line indicates there are more lines not in view. Use the DPC–4 Plus key or the DPC–4 key to scroll up to see the other parameters.

Line 3 shows the selected page, menu, or parameter. The menu screen pointer ◀ at the end of the line indicates the selection.

Line 4 displays the next menu or parameter in the sequence. If parameters follow the one shown on Line 4, a pointer at the end of the line indicates there are more lines not in view. Use the DPC–4 Plus key or the DPC–4 key to scroll down to see the other parameters.

Keypad

The operator uses the menu keys (shown Figure 3-3) to access data that appears in the four-line display. The operator can scroll through the various menus, make changes in the operating parameters and select specific operations to be monitored.

DPC4 Plus

The plus up arrow key moves the cursor up one line on a menu selection screen. This key also increments the data value each time it is pushed. Holding the key in continuously increments the value.

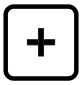
DPC4

The plain up arrow key is used to move the cursor up one line on a menu selection screen.

NOTE

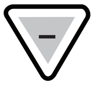
The DPC–4 Plus function key combines the functions of the two DPC–4 function keys and +.

The DPC–4 Plus function key combines the functions of the two DPC–4 function keys and –.



DPC4

The plus key increments the data value each time it is pushed. Holding the key in continuously increments the value.

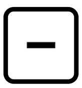


DPC4 Plus

The minus down arrow key move the cursor down one line on a menu selection screen. This key also decrements the data value each time it is pushed. Holding the key in continuously decrements the value.


DPC4

The plain down arrow key is used to move the cursor down one line on a menu selection screen.



DPC4

The minus key decrements the data value each time it is pushed. Holding the key in continuously decrements the value.

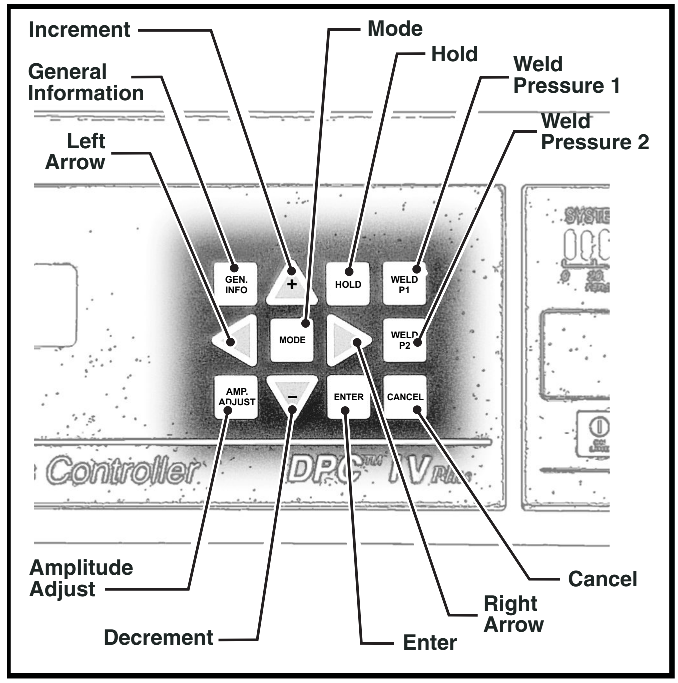
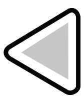
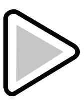


Figure 3-3 *DPC4 Plus Menu Key Functions*

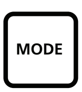


Pressing the left arrow key selects the next digit to the left of a parameter setting. The key is used when entering values and moves the flashing bar under the selected digit. The selection wraps around to the right digit after the left most digit position is reached.



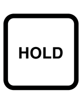
Pressing the right arrow key selects the next digit to the right of a parameter setting. The key is used when entering values and moves the flashing bar under the selected digit. The selection wraps around to the left digit after the right most digit position is reached.

Pressing the DPC–4 HOME key returns you to the Main menu.

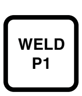


Pressing the DPC–4 Plus MODE key toggles between the Weld mode (displays values for last weld cycle) and the Setup mode (displays main Process Setup menu).

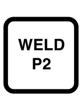
Pressing the DPC–4 Plus GEN. INFO key displays the model number, the firmware version and the installed modules. Press CANCEL to return to the previous menu.



Pressing the HOLD key immediately brings you to the Hold Time data entry menu. You can quickly check and/or change the setting using the four arrow keys. Pressing ENTER completes the process and returns you to your last menu screen.



The WELD P1 key displays the parameter(s) for the first pressure setting. The value(s) can be quickly checked and/or altered without going back through the menu sequence. Pressing ENTER completes the process and returns you to your last menu screen.



The WELD P2 key displays the parameter(s) for the second pressure setting only if a dual pressure mode has been previously selected. The value(s) can be quickly checked and/or altered without going back through the menu sequence. Pressing ENTER completes the process and returns you to your last menu screen.

The AMP. ADJUST key displays the current ultrasound amplitude setting. This can be adjusted from 40% to 100% using the + and − keys. Press ENTER to confirm the value.

Pressing the ENTER key completes the menu operation and plays the next decision or navigation menu.

Pressing the CANCEL key discards any values you may have changed and returns you to the previous decision or navigation menu.

> **TIP – DPC4 *PLUS***
>
> For any of the four '*hot*' keys (HOLD, WELD P1, WELD P2 or AMP. ADJUST), pressing the CANCEL key instead of ENTER returns you to the last menu screen

Generator Status Panel

The Generator Status Panel has three sections:

• Generator Control, • System Status, and • System Power Output.

Generator Control

Generator Control has three keys, shown in Figure 3-4.

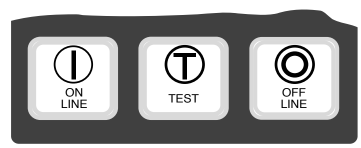


Figure 3-4 *Generator Control Keys*

ON LINE Key – Pressing this key makes the generator operational so it can produce the ultrasound signals.

TEST Key – After ON LINE has been pressed, when the TEST key is pressed, the generator activates and produces an ultrasound signal. The DPC display shows the power, frequency, and amplitude of the acoustic stack being tested. At the same time, the SYSTEM POWER OUTPUT display shows generator output in percent.

OFF LINE Key – Press this key to make the generator no longer operational. This prevents production of ultrasound signals.

System Status

The STATUS display shows the status of six conditions. If a condition's status is "active", a corresponding word(s) is lighted in the System Status Display. In Figure 3–5, ON LINE is active.

The conditions are explained below.

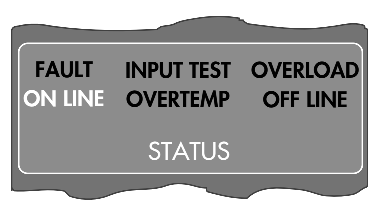


Figure 3-5 *System Status Display*

ON LINE and OFF LINE – One or the other of these generator conditions can be active at once. The corresponding words showing the active status are lit in the System Status Display.

OVERTEMP – This indicator lights if input or output power modules overheat. The generator then automatically shuts down and resets (when it reaches 75^0 C).

OVERLOAD – This indicator lights when either of the following conditions occurs:

- An instantaneous overload caused by a mismatch between the ultrasound signal and the vibrational characteristics of the acoustic stack (transducer, booster and horn).
- Excess power beyond the generator power rating is being drawn from the generator.

INPUT TEST – This indicator flashes during the power-up test sequence. It will also light if a fault occurs on the input module circuit.

FAULT – This indicator lights when out of tolerance voltage fluctuations occur that are related to one of the following:

- AC line voltage.
- An internal DC power supply (+5 VDC; -12 VDC; +12 VDC; or, +24 VDC).
- The power factor circuits and/or the 360 VDC bus.

System Power Output

The three color SYSTEM POWER OUTPUT display indicates the percentage of ultrasonic power being drawn by the load.

- GREEN indicates normal operation.

Figure 3–6 shows the group of “normal” indicators.

- YELLOW warns that a potential overload condition exists.
- RED warns that an overload condition exists.

Figure 3–7 shows which indicators warn of overload conditions.

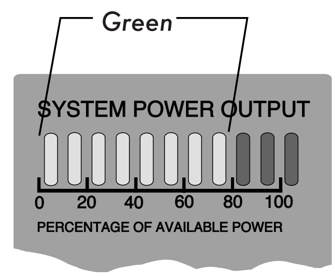


Figure 3-6 *Normal Operation Indicators*

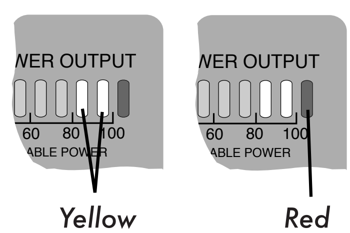


Figure 3-7 *Warning Indicators*

NOTE

The red warning indicator in the SYSTEM POWER OUTPUT *section of the panel lights just prior to an average overload indication.* **See** Figure 3-8. *The ultrasound signal is shut down when an overload occurs.*

AC Power

The AC power section has:

- An ON/OFF switch for AC electrical power.
- A green LED indicator that lights when power has been switched "on".

> **NOTE**
>
> *The ON/OFF switch is also a circuit breaker that provides overload protection for the DPC. This switch works together with a similar AC breaker switch on the rear panel.*

Start-up

1. Push the rear panel AC breaker switch to ON.
2. Push the ON LINE generator control key on the front panel.
3. Push the front panel AC power switch to ON.

When the DPC is turned on:

- A single tone from the buzzer is heard.
- INPUT TEST flashes (red) briefly as the power-up test is run.
- The green "on" indicator in the AC power section lights.

Next, three separate displays appear in sequence:

- The Start-up Display as seen in Figure 3-8 appears for several seconds before the next message appears.
- Then a message appears identifying the generator by frequency and rated power output. See Figure 3-9.
- Next, the Part Count display appears. When starting for the first time, the display will look as it does in Figure 3-10. When normal operation begins, however, selected parts count data will be displayed.

Figure 3-8 *Start-up Display*

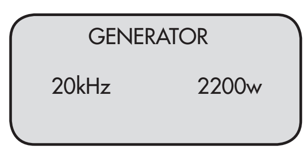


Figure 3-9 *Generator*

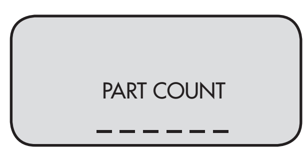


Figure 3-10 *Part Count Display at Initial Start-up*

During normal operation, the initial Part Count display will be somewhat different from the display shown in Figure 3-10.
For instance, Figure 3-11 shows how the Part Count display might appear after the DPC has been set up.

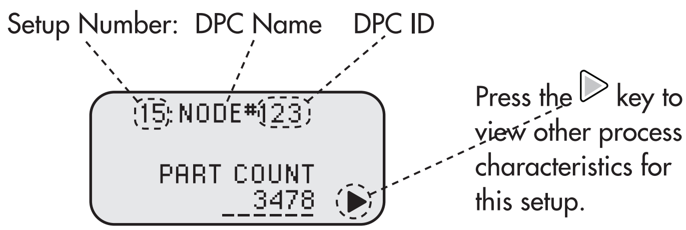


Figure 3-11 *Part Count Display During Normal Operation*

Stopping the Weld Cycle

Normal Conditions

The cycle stops when the programmed cycle ends.

Emergency Conditions

Manual System

Press the red Emergency OFF switch on the press base plate.

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 DPC at connector J602. See Figure 2-4, Page 16.

Control inputs (Pins 9 and 10), labeled "Software Abort" are shown in Figures C-2, and C-3, Appendix C, Pages C-X and C-XI respectively. When these inputs are activated, the press system will stop.

See Figure C-7, Appendix C, Page C-XV, to wire an emergency stop switch to the DPC.

The Main Menu

After initial start-up, press ENTER to go to the Main Menu.

There are two selections in the display as shown in Figure 3-12:
OPERATE and PROCESS SETUP.
The "down" pointer at the end of the PROCESS SETUP line indicates that there are other selections (not in view).

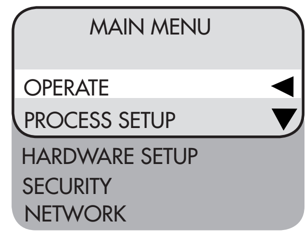


Figure 3-12 *Main Menu*

> **NOTE**
>
> *Figures in this manual show menu items not in view in a shaded area below the display.*
> *For instance, in* Figure 3-12 *items not in view are:*
> *HARDWARE SETUP, SECURITY and NETWORK.*

Use the scroll key (on the DPC–4) to bring HARDWARE SETUP, and its sub menus into the display.

See Figure 3-13 on the next page for an overview of the DPC's entire menu structure.

> **NOTE**
>
> *For a detailed look at all menus, see Appendix F,* Reference Guide to DPC Menu Structure *(at the back of this manual) .*

Dynamic Process Controller
MENU Structure Overview
and Corresponding User Guide Reference Pages

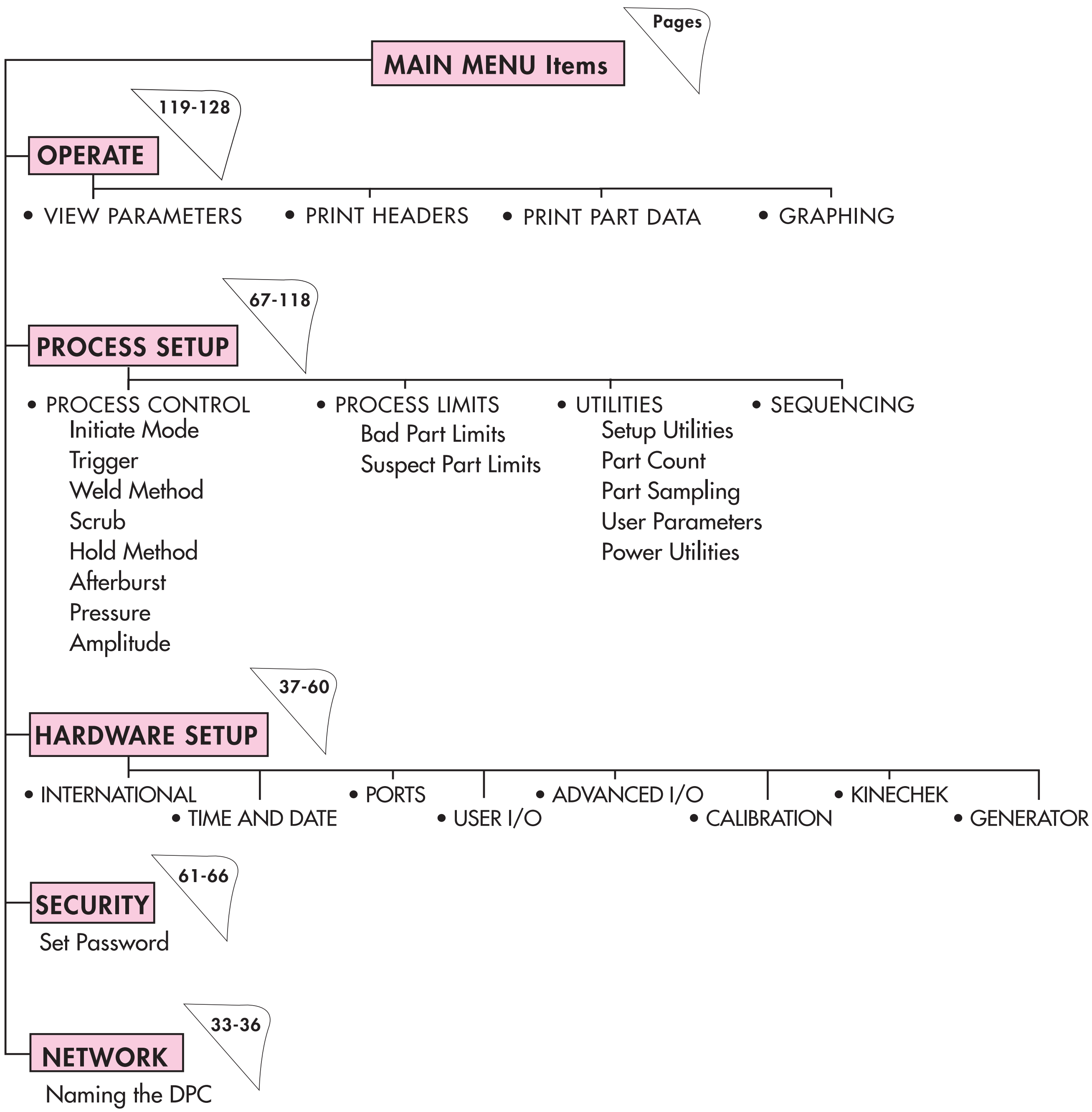


Figure 3-13 *Menu Structure Overview*

From the Main Menu: An Example

This example starts with the Main Menu and moves through PROCESS SETUP to PROCESS CONTROL.

> **NOTE**
>
> *This may be a good time to review the* Reference Guide to DPC Menu Structure *in Appendix F for an overview of DPC*

1. From the Main Menu, select PROCESS SETUP.
   The display will look like Figure 3-14. The select pointer (◄) indicates that Line 3 of the Main Menu is selected.
   Access or changes will be made to the selected line.
   Remember that the display shows four lines, so SECURITY and NETWORK are not in view.

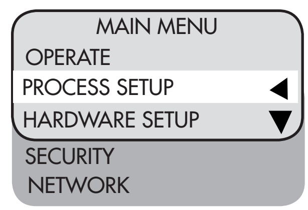


Figure 3-14 *Main Menu Choices*

> **NOTE**
>
> *If PROCESS SETUP is below menu Line 3, press (use on the DPC–4) until it moves up into position.*
>
> *If PROCESS SETUP is above menu Line 3, press (use on the DPC–4) until it moves down into position.*

2. When the desired selection (PROCESS SETUP in this case) is on Line 3, press ENTER.

3. PROCESS SETUP will now appear on Line 1, and the next group of menu choices appears starting on Line 3 as shown in Figure 3-15.

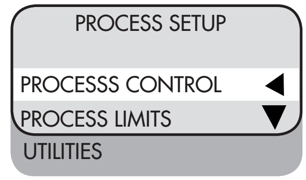


Figure 3-15 *Process Setup Choices*

4. With PROCESS CONTROL on Line 3, press ENTER .

5. PROCESS CONTROL will now appear on Line 1, and its parameter choices appear starting on Line 3 as shown in Figure 3-16.

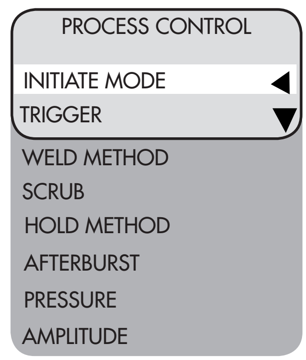


Figure 3-16 *Process Control Choices*

Selecting and Changing Parameters

Gain some familiarity with selecting and changing parameters by following the numbered steps below.

Selecting Parameters

1. Position the parameter you want on Line 3 of the display.
   Press ENTER .

The parameter selected then becomes the Line 1 of a new display where further choices are presented.

2. Select TRIGGER from the PROCESS CONTROL menu.
   See Figure 3-17.

3. Press ENTER .

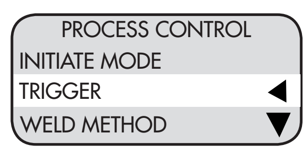


Figure 3-17 *Select Trigger*

TRIGGER moves to Line 1, and the variables for Trigger appear below it as shown in Figure 3-18.

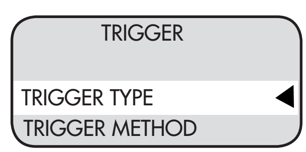


Figure 3-18 *Trigger Variables*

After making a selection (in our example, TRIGGER was selected) one of three things happens:

- If no more information is needed, the next parameter in the sequence appears after ENTER is pressed, or
- A numerical value is needed for the variable selected, or
- Some alphanumeric value (other than numerical) is needed for the variable selected.

4. Select TRIGGER TYPE, and press ENTER.

The variables for TRIGGER TYPE appear on the display as shown in Figure 3-19.

5. Scroll down to FORCE, and press ENTER.
   The display will look like Figure 3-20.

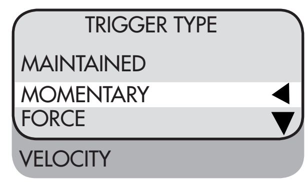


Figure 3-19 *Available Variables for Trigger Type*

Changing Numerical Parameters

Figure 3-20 shows that FORCE (the variable on Line 3) has a value of 45 lb (value appears on Line 4). A cursor appears beneath the value's least significant digit.

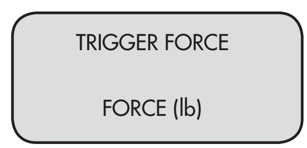


Figure 3-20 *Numerical Value Entry Example*

Use the DPC–4 Plus △ and ▽ keys (+ and − on the DPC–4) to increase or decrease the digit's value respectively.
Press ◁ to move the cursor to the next digit on the left. Press ▷ to move the cursor to the next digit on the right.

Change that digit's value as described before, and press ENTER after the desired values have been selected.

The new value will be stored in memory, and the display will change to the next set of parameters in the sequence.

NOTE

When there are no more variables to change, press MODE *. The display returns to PROCESS CONTROL for more variable/parameter selection.*
Press MODE *or* HOME *again to return to the Main Menu.*

Changing Other Parameters

Follow the steps below to gain some familiarity in changing parameters with values that are not strictly numerical.

1. From the Main Menu, select PROCESS SETUP, and then UTILITIES. The display will look like Figure 3-21.

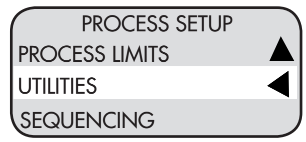


Figure 3-21 *Selecting Utilities*

2. Press ENTER, and the display changes to list the UTILITIES submenu choices. Scroll down until USER PARAMETERS is on Line 3 as shown in Figure 3-22.

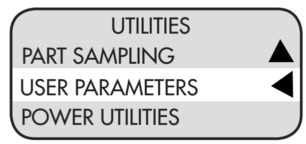


Figure 3-22 *Selecting User*

3. Press ENTER, and the display changes again, this time listing User Parameters. Scroll down, and select FIXTURE as shown in Figure 3-23.

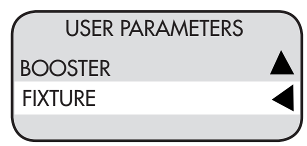


Figure 3-23 *Selecting Fixture*

4. Press ENTER. The display changes to FIXTURE with the current fixture name on Line 3, and the cursor under the left-most character as shown in Figure 3-24.

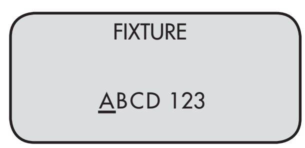


Figure 3-24 *Changing Values*

5. Press + (+ on the DPC–4) until the appropriate character appears at the cursor position. If a character is passed up, restore it by pressing − (− on the DPC–4).

Press ▷ to move the cursor to the next position.

When all characters are inserted, press ENTER .

Exiting the Menu or Parameter List

There are two ways of exiting.

1. Press MODE. This will return the display to the Main Menu.
   If any changes were made but not stored, they will be lost.

2. Press CANCEL. This returns the display to the previous menu.
   If any changes were made and not stored, they will be lost.

SECTION 4

Network – Naming the DPC

- This section explains how to name the DPC.

This page intentionally left blank

Name Each DPC

After the DPC has been installed (Read Section 2 for installation.), decide whether to name the DPC(s) by considering when naming is needed, and when it is optional.

When Naming is Needed

Naming must be done when multiple DPCs are networked together. The DPC name (also called a "node name") is chosen by the user to identify each node of the network.

When Naming is Optional

Naming is optional when there is only one DPC or where there are several DPCs but they are not networked together.

NOTE

If you decide to name your DPC(s), continue with the rest of this section. If you decide not to name the DPC, go to Section 5, Hardware Setup.

Naming Procedure

Using the LCD display and keypad on the DPC you want to name, do the following:

NOTE

Repeat these steps for each DPC in the network.

1. Move to the Main Menu.
2. From there, select NETWORK.
3. Then, select DPC NAME.

   Line 1 shows "DPC NAME", and the cursor is on Line 4. Characters selected will appear on Line 3 in the space(s) above the cursor.

4. Use the + and − keys to choose the characters for each space of the name (as many as 10 characters).
   When the character wanted appears in its space, move to the next space to the right.

NOTE
The ◁ and ▷ keys move the cursor left and right respectively.

When finished, press ENTER .

In Figure 4-1 below, NODE #1 is the DPC name.

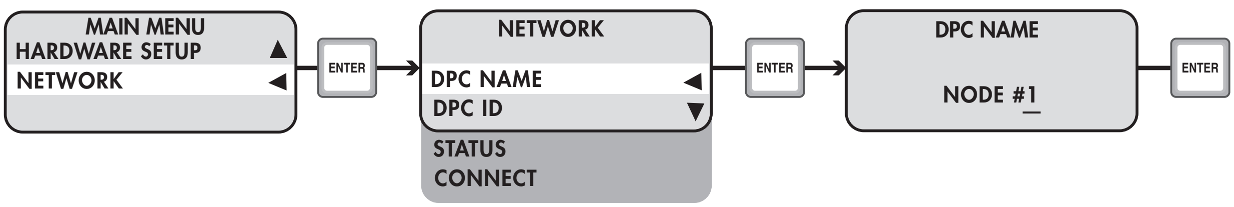


Figure 4-1 *Selecting the DPC Name*

NOTE
Creating a blank space: *In "NODE #1" (the name of the DPC in the above example), a space follows the "E" in NODE.* *To create the space, use the ▷ key to move from the E right two spaces to where the # would be. This leaves a space between the E and #.* *But,* if you forget to leave the space*, and later want to add one, do the following:* *At the place where you want a blank space to appear:* *Use the △ and ▽ keys (use + and − on the DPC–4) to move through the character set to the right arrow symbol –>.* *The next time the △ (or +) key is touched, nothing will be displayed. That is the "blank space" in the character set.* *Touch the △ (or +) key again, and the exclamation point, !, shows up.* *So the blank space is between –> and ! in the character set.* *When the blank space is where you want it, move to the next space, and select the character needed.*

DPC ID

DPC ID is a user-assigned number of one to three digits (chosen from numbers 1 to 255) given to each DPC interconnected on the same network. The number identifies an individual DPC and can be used to access any DPC in the network.

NOTE

Each networked DPC MUST have a unique ID number. If not, the units will be unable to communi-

Follow the screen sequence shown in Figure 4-2 to enter the ID number(s). See Figure 3-11a on Page 24 to see how the name and ID number would appear on the front panel.

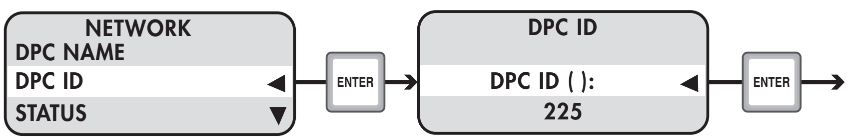


Figure 4-2 *Selecting the DPC ID Number*

Status

The Status option displays a 4-digit hexadecimal number (0 through F) that indicates the network status of the DPC. An odd second digit from the right indicates that the DPC *is* connected to the network. An even second digit from the right indicates that the DPC *is not* connected to the network. No status indication will appear if a DPC is turned off, disconnected, or removed from the network in any way.
See Figure 4-3.

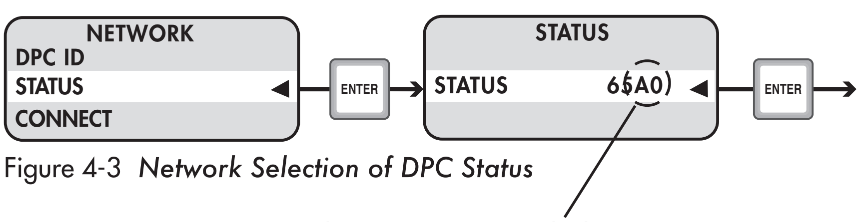


Figure 4-3 *Network Selection of DPC Status*

In this example, "A" ,which represents the even number 10, is the second digit from the right. See the 0 through F Table to the right.

ASCII	Hexadecimal Equivalent
0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
A	10
B	11
C	12
D	13
E	14
F	15

Connect

When CONNECT is selected, all the active nodes in the network are listed. A node name will not appear in the list if a DPC is turned off, disconnected, or removed from the network in any way.

> **NOTE**
>
> *As many as seven DPCs and one Man-Machine Interface (MMI) unit can be connected on a net-*

SECTION 5

Hardware Setup

- This section outlines the settings that have to be considered before ultrasonic system start-up.

This page intentionally left blank

Overview

The Hardware Setup menus can be used if:

- Installation (Section 2) of the DPC is complete,
- You are comfortable in using the keypad to move through the DPC menus (Section 3), and
- The DPC has been named (Section 4).

To explain how Hardware Setup is typically used, this User's Manual divides the menus into "Before Start-Up" and "During Normal Operation" groups.

Before Start-up – The first group of menus deals with choices made before the ultrasonic assembly system is started up for the first time. In many cases these are one-time-only choices.

This group, includes these menus:

INTERNATIONAL	(Pages 38-39),
TIME AND DATE	(Page 40),
PORTS	(Pages 41-47), and
CALIBRATION	(Page 48).

During Normal Operation – A second group of menus deals with the requirements of normal system operation, and includes provisions for monitoring and/or adjusting the generator when necessary.

This group includes these menus:

USER I/O	(Pages 49-55),
ADVANCED I/O	(Page 56),
KINECHEK	(Page 57), and
GENERATOR	(Pages 58-60).

Before Start-Up

International

From this menu, LANGUAGE, UNITS, and DATE FORMAT are set.

1. Move to the Main Menu by pressing ENTER.

2. From there, select HARDWARE SETUP.

3. Then, select INTERNATIONAL.

Language

Use this menu to choose a language for DPC display and/or any printed data output. Use Figure 5-1 below as a guide in making that choice.

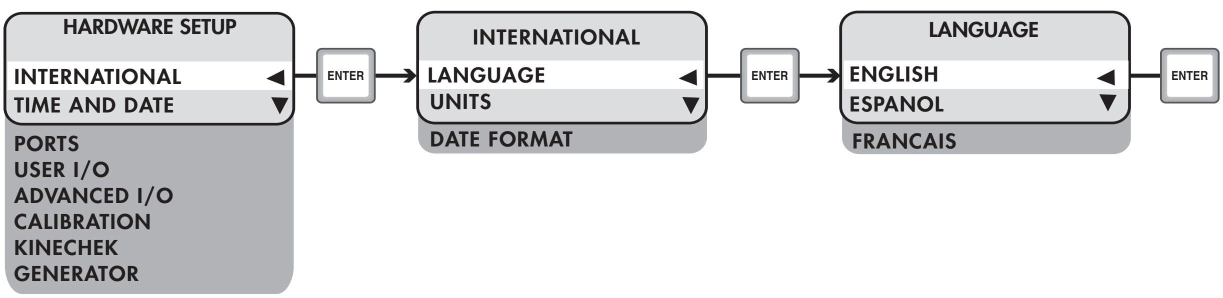


Figure 5-1 *Choosing a Display Language*

Units

Use this menu to select a system of measurement for display and data output:

English = inch (in); pound (lb); pounds per square inch (psi).

Metric = millimeter (mm); kilogram (kg); kPascals (kPa).

> **NOTE**
>
> *Time, frequency and watts are the same in either the English system or the metric system.*

See Figure 5-2 as a guide in choosing a measurement system.

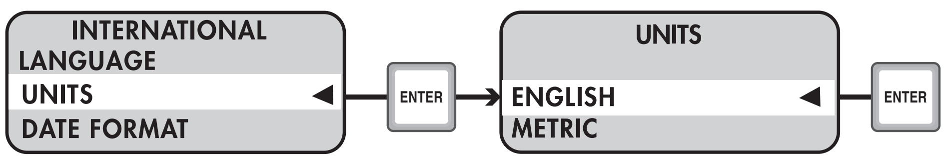


Figure 5-2 *Choosing Units of Measure*

Date Format

Use this menu to choose from one of three ways to display the date:

- Month, Day, Year (MM, DD, YY)
- Day, Month, Year (DD, MM, YY), or
- Year, Month, Day (YY, MM, DD)

See Figure 5-3 as a guide to choosing DATE FORMAT.

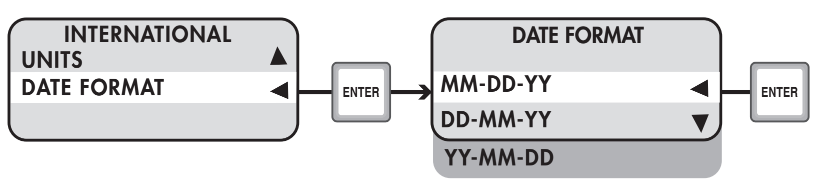


Figure 5-3 *Choosing Date Format*

Time and Date

From this menu, use SET TIME and SET DATE to set the current time and date respectively, and check whether the DPC's real-time clock/calendar is working properly.

> **TIP**
> Use this feature to "time-tag" your weld records.

Set Time

The time displays in the 24 hour format and uses two digits each for hour, minute, and second.

EXAMPLE

The display for 1:15 pm (exactly) would be 13:15:00 (thirteeth hour, fifteenth minute and no seconds).

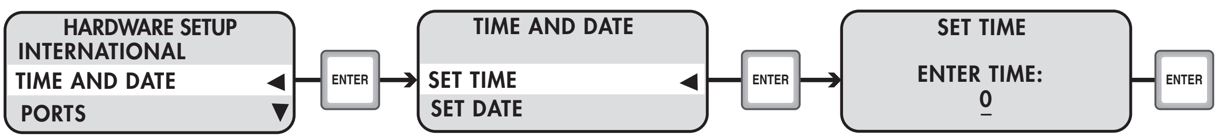


Figure 5-4 *Setting Time*

Set Date

The way the date displays is determined by the choice made in the DATE FORMAT menu above (See Figure 5-3.)

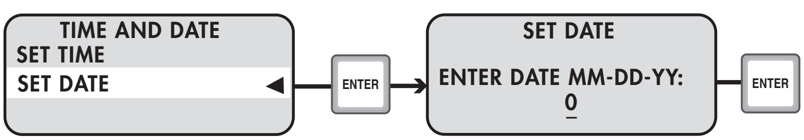


Figure 5-5 *Setting Date*

> **NOTE**
> *Even though the year input is in a two-digit format, it will be output in a Y2K compliant four-digit year format.*

Ports

NOTE

PORTS applies only if the DPC has a communication module.

The PORTS menus have all of the selections that enable the DPC to communicate with both serial and parallel external devices such as printers and computers.
Figure 5-6 shows the serial port menu. Figure 5-7 shows the parallel port menu.

NOTE

The parallel port menu offers no PROTOCOL or BAUD RATE selections, and the OUTPUT DEVICE menu does not offer a "Computer/Printer" option. Otherwise, it offers the same choices as the serial port menu.
Figures 5-8 *through* 5-17 *show the selections that are possible with the serial and parallel ports menus.*

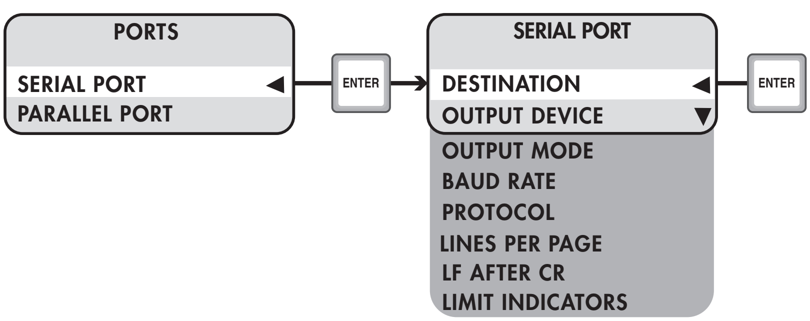


Figure 5-6 *Making Serial Port Selections*

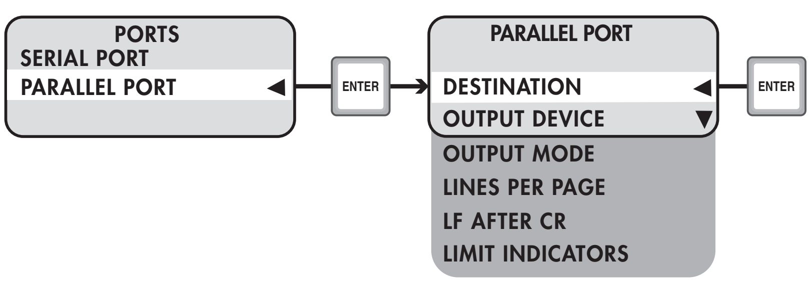


Figure 5-7 *Making Parallel Port Selections*

Destination

Choose LOCAL when there is only one DPC in a single press environment. Choose REMOTE when more than one DPC is used in a network (ArcNet) configuration. See Figure 5-8.

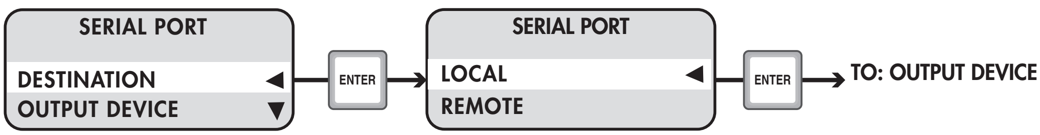


Figure 5-8 *Choosing Destination*

Output Device

Output Device defines the type of device connected to the DPC. This device definition, then, controls both the format of the output data and the available functions.

Choose the appropriate serial/parallel device.
See Figure 5-9, and Figure 5-10.

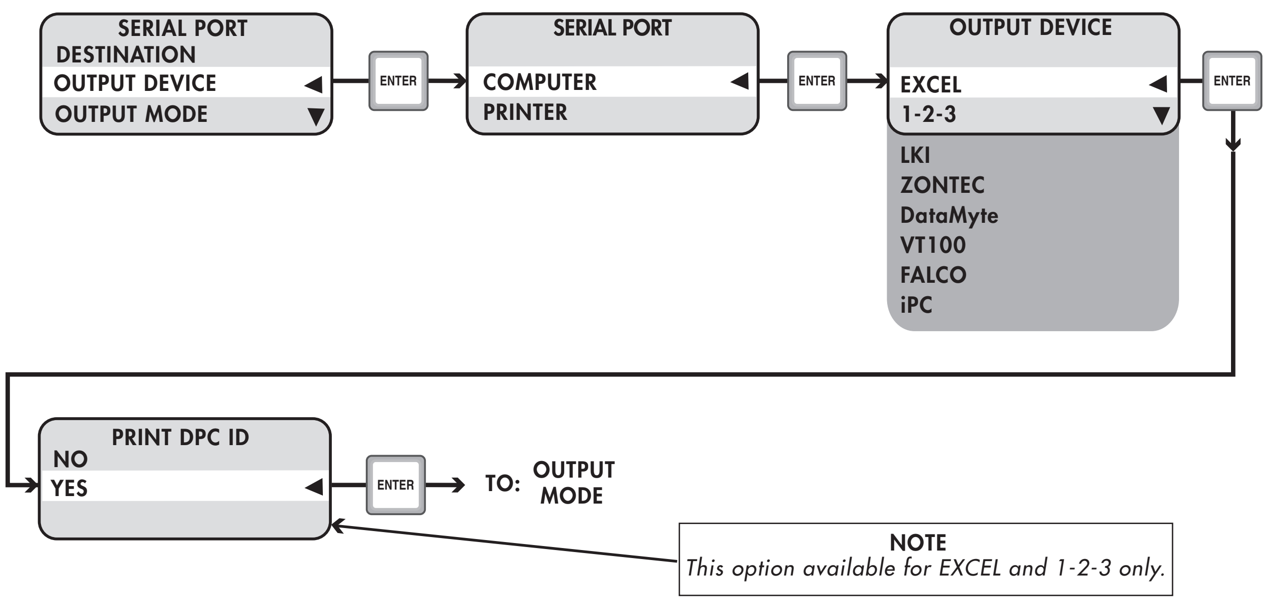


Figure 5-9 *Choosing an Output Device: Computer (Serial Port Only)*

NOTE

See Appendix A for more information about the output formats: Excel, 1-2-3, etc.

Print DPC ID - When either EXCEL or 1-2-3 is chosen, you will have a YES or NO choice for PRINT DPC ID. Choose YES if you want the DPC ID to appear along with the data output on a computer monitor or in a printout. Choose NO if you do not want the DPC ID to appear. See Figure 5-9.

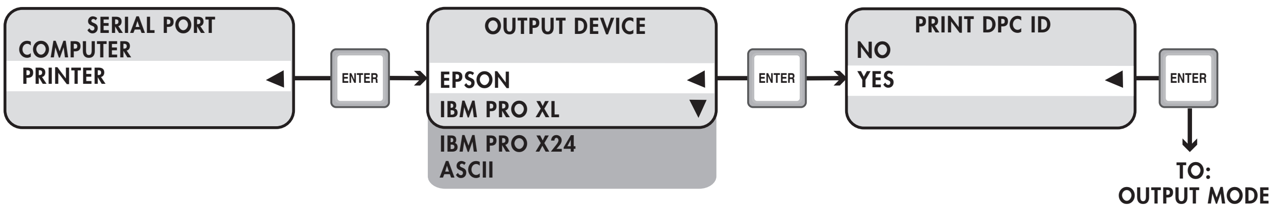


Figure 5-10 *Choosing an Output Device: Printer (Serial Port Only)*

When PRINTER is chosen, select from the four types shown in Figure 5-10.

Then the DPC display will show PRINT DPC ID. Press the ENTER key, and you will have a choice of YES or NO.
Select YES to add the DPC ID numbers to the printout.

This feature is used when multiple DPCs are networked, and all output goes to one computer or printer. Linking the DPC ID number with weld results simplifies record keeping while enabling analysis.

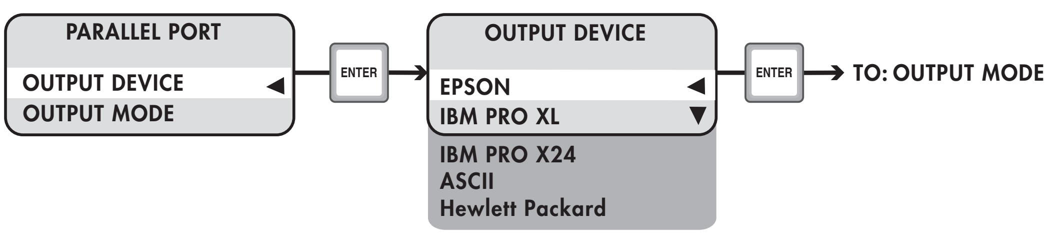


Figure 5-11 *Choosing an Output Device (Parallel Port Only)*

NOTE

The Hewlett Packard format is designed to work with any HP Laserjet and Inkjet printer or other brand that support HP's PCL 5 Printer Control Language. It can only be used for printing text. Select a dot–matrix printer for graphing.

Later HP printers with newer versions of PCL are backwards compatible with PCL 5. Listed below are some of the HP PCL 5 compatible printers –

HP LaserJet III/IIID/IIIP/IIISi
HP LaserJet 4/5/6/ Families
HP LaserJet 1100 Series
HP LaserJet 2100 Series
HP LaserJet 4000 Series
HP LaserJet 5000 Series
HP LaserJet 8000 Series
HP LaserJet 8100 Series
HP Color LaserJet
HP Color LaserJet 5/5M
HP Color LaserJet 4500 Series
HP Color LaserJet 8500 Series
HP DeskJet 1200C
HP DeskJet 1600C

Output Mode

Determine the type of data that will appear in the part record by making an OUTPUT MODE selection. See Figure 5-12.

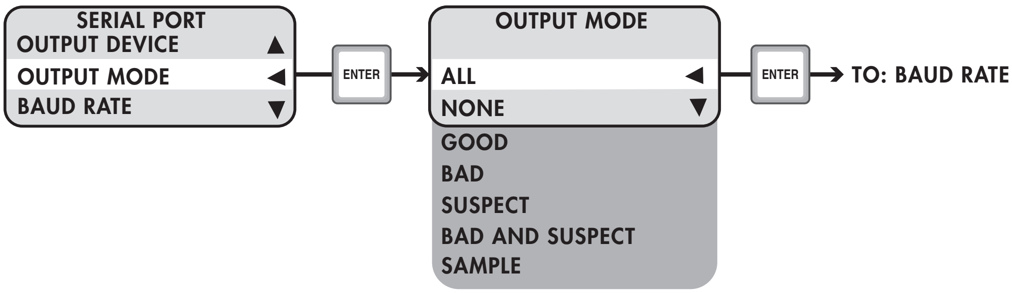


Figure 5-12 *Output Mode Selections*

Output Mode Definitions

- ALL – All parts are sent to the output device immediately after the cycle.

- NONE – No parts are sent to the output device.

- GOOD – Good parts are sent to the output device.This can be useful when part documentation for shipped parts is required.

- BAD – All bad parts are sent to the output device.

- SUSPECT – All Suspect parts are sent to the output device.

- BAD AND SUSPECT – All Bad and Suspect parts are sent to the output device.

- SAMPLE – All part data stored in sample memory are sent to the output device. (See *Part Sampling*, on Page 109 for more information.)

Baud Rate (Serial Port Only)

Baud rate is the serial port output speed in bits per second.

> **NOTE**
>
> *Baud rate settings on both the sending unit (DPC) and the receiving unit (computer, printer) must be the same for communication between the devices to work properly.*

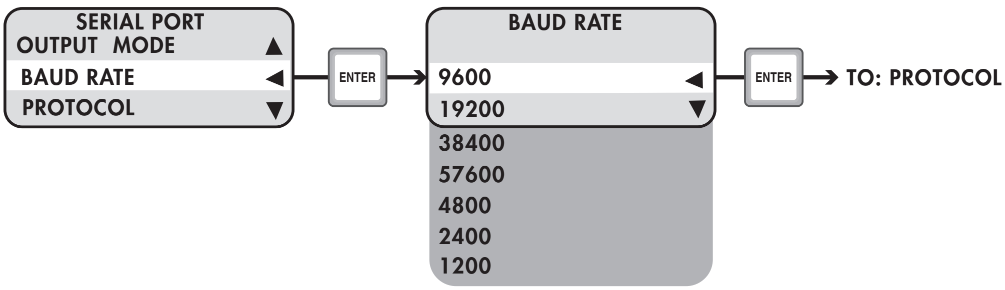


Figure 5-13 *Baud Rate Selections (Serial Port Only)*

Choose a baud rate appropriate for your output device.

Protocol (Serial Port Only)

Protocol refers to the programming rules established to ensure reliable communications between devices. In many cases, the rate at which a device can transmit information to the second device exceeds the second device's ability to process it.
When information is sent to a printer, the rate at which the printer receives and processes the information is much faster than its ability to print it. Eventually, the printer would run out of storage, or *buffer* space. This results in the loss of the excess information.
The printer and the DPC can provide acceptable transmission rate information to each other to regulate the flow of data between them. The two methods used by the DPC to control this information flow rate are Xon/Xoff and RTS/CTS as explained below:

Xon/Xoff

Xon/Xoff is a *software* protocol regulating the flow of information between two devices by sending an Xoff character (13H, ˆS) to stop the flow of information and an Xon character (11H, ˆQ) to resume the flow of information.

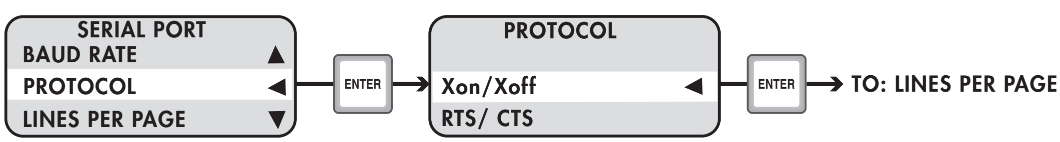


Figure 5-14 *Protocol Selection (Serial Port Only)*

RTS/CTS

RTS/CTS is a *hardware* protocol that uses two signals (RTS and CTS) to regulate the flow of information between devices.
Request to Send (RTS) is transmitted when a device has information to send to a second device. The second device acknowledges the RTS by sending a Clear to Send (CTS) signal when it can safely accept information.
If the second device's capacity to accept information has been exceeded, the CTS line is turned off until information can again be safely sent.

Lines Per Page

This selection allows the operator to set the number of lines to be printed on each page. See Figure 5-15.

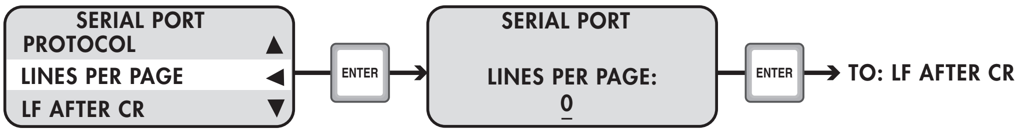


Figure 5-15 *Selecting Lines Per Page*

LF After CR

Each line of output ends with a *Carriage Return* (<CR>). Some devices automatically insert a *Line Feed* (<LF>) to advance the paper, while others do not. The LF AFTER CR function allows you to insert a line feed at the end of an output string. Refer to Figure 5-16.

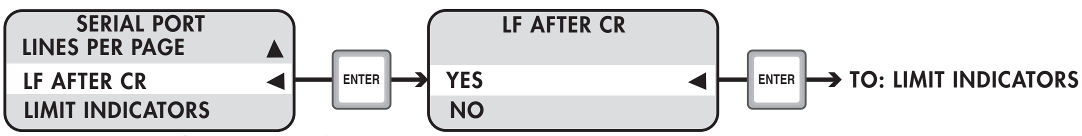


Figure 5-16 *Selecting LF After CR*

Select YES if you want data printed on every line.

Select NO if you want data printed on every other line.

Limit Indicators

Limit indicators are characters that appear in front of displayed or printed part data to indicate whether the data has reached or exceeded an upper or lower limit. The “greater than” sign (>) indicates that an upper limit has been exceeded; and the “less than” sign (<), indicates that a lower limit has not been reached. See Figure 5-17.

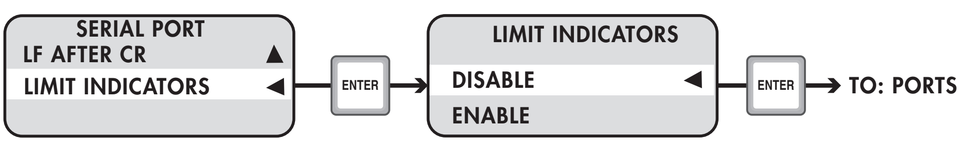


Figure 5-17 *Selecting Limit Indicators*

Select DISABLE if the limit indicator characters may confuse a program running an SPC or data collection application.

Select ENABLE to allow use of the limit indicators.

Calibration

During normal operation, the DPC is designed to continuously self-calibrate when the calibration feature is disabled.

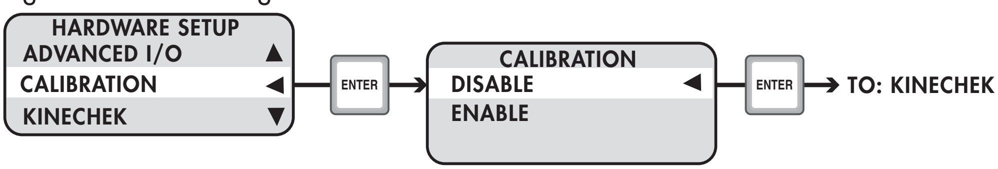
When Calibration is Disabled

Whenever the thruster of the ultrasonic assembly system is at rest, values for force, power, and pressure measurements are recalibrated for zero output.

How to Disable Calibration

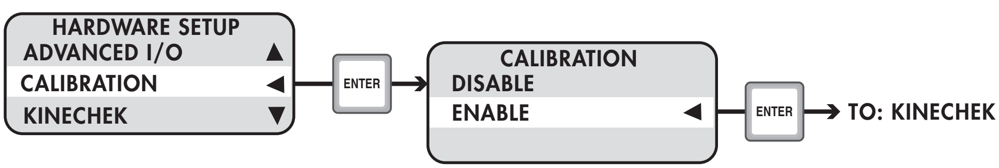
Select CALIBRATION from the HARDWARE SETUP menu. Then, select DISABLE. This is illustrated in Figure 5-18a.

Figure 5-18a Disabling Calibration



For service by factory technicians, select the CALIBRATION ENABLE option as illustrated in Figure 5-18b.

Figure 5-18b Enabling Calibration



This concludes the "Before Start-Up" group of menus. The remainder of this Hardware Setup section deals with the "During Normal Operation" group of menus.

NOTE
Do not use the CALIBRATION ENABLE option during normal operation. This feature is used by only factory personnel when servicing the DPC.

During Normal Operation

> **NOTE**
>
> *The second major group of Hardware Setup menus is typically used during normal operation of the ultrasonic system.*
> *This group includes these menus:*
> *USER I/O, ADVANCED I/O KINECHEK, and GENERATOR.*

User I/O (Standard or Basic I/O)

The DPC has a versatile input/output capability that allows it to interface with automated machinery and PLCs in a variety of configurations. The I/O menus allow the operator to customize the signal polarity and behavior of the I/O characteristics.

From HARDWARE SETUP, select USER I/O. See Figure 5-19.

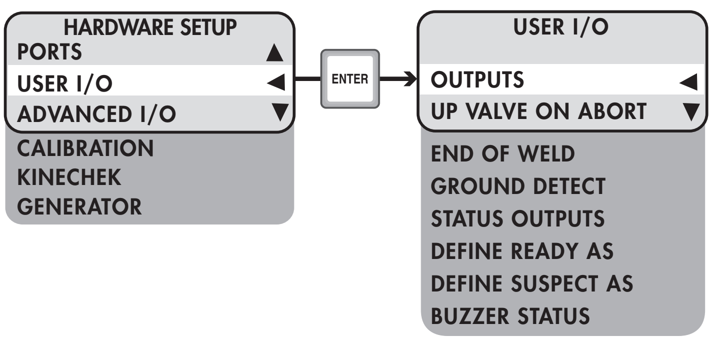


Figure 5-19 *Selecting User I/O*

Outputs

This selection defines the polarity of the output signal when the outputs on J602 (Basic I/O connector) are set or reset. OUTPUTS offers two choices of active states. Note that these signals are designed to interface to a PLC (approx. 10mA) not to drive a load.

ACTIVE HIGH refers to a signal that is on or a closed circuit, when the output is active. When the output is not active, the signal is off or an open circuit.

ACTIVE LOW refers to a signal that is off or an open circuit, when the output is active. When the output is not active, the signal is on or a closed circuit. See Figure 5-20.

NOTE

The outputs can either sink or source current, depending on whether the Output Common (Pin #7) is connected to Ground (Pin #2), or to +22VDC (Pin #1).

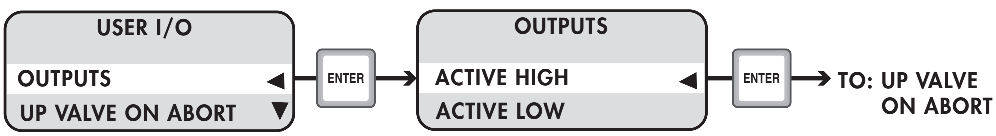


Figure 5-20 *Outputs Settings*

Up Valve on Abort

With UP VALVE ON ABORT set to ON, the DPC sends the press head up and out of the way of any fixtures if an abort happens. Why is this important?
The standard abort sequence turns off the up valve. So, if a heavy horn was being used, the press head would drop during the abort condition and hit whatever happened to be underneath it: a moving fixture for instance. See Figure 5-21.

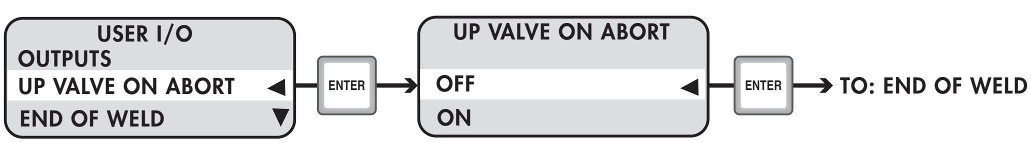


Figure 5-21 *Up Valve on Abort Settings*

CAUTION

Use the UP VALVE ON ABORT feature only if the ultrasonic press is inside an OSHA approved (USA only) enclosure. Outside the USA, the enclosure should be approved by the applicable authority governing occupational health and safety.

End of Weld

This menu item is used to determine if the End of Weld inputs are detected or ignored. See Figure 5-22.

Selecting DISABLE means inputs are ignored.

Selecting ENABLE means inputs are detected.

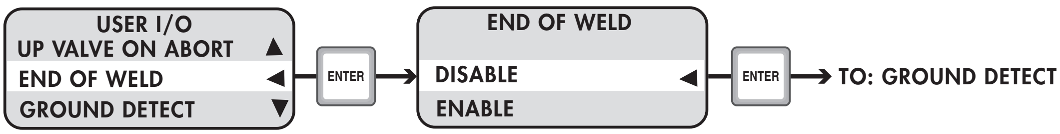


Figure 5-22 *End of Weld Settings*

> **NOTE**
>
> *The End of Weld input comes from the End of Weld press limit flag, and it is used to end the weld portion of the cycle based on the press head position. The flag can be manually raised or lowered to end the weld at an absolute distance. The DPC End of Weld feature is generally not used with a press or thruster equipped with a distance encoder.*

Ground Detect

When this feature is enabled, the ultrasonic signal is shut off when the horn touches the metal fixture during the welding process. See Figure 5-23.

Selecting DISABLE turns the feature off.

Selecting ENABLE turns the feature on.

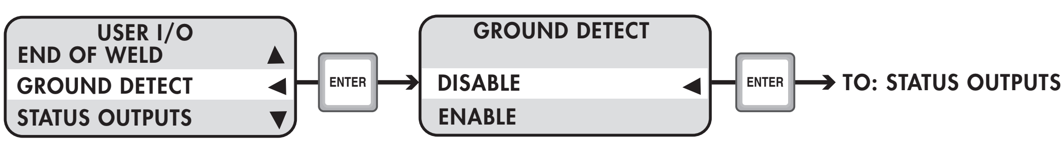


Figure 5-23 *Ground Detect Settings*

Fixture Installation

For the ground detect feature to function properly, isolate the fixture as it is fastened to the press base plate by completing the three numbered steps shown in Figure 5-23a below.

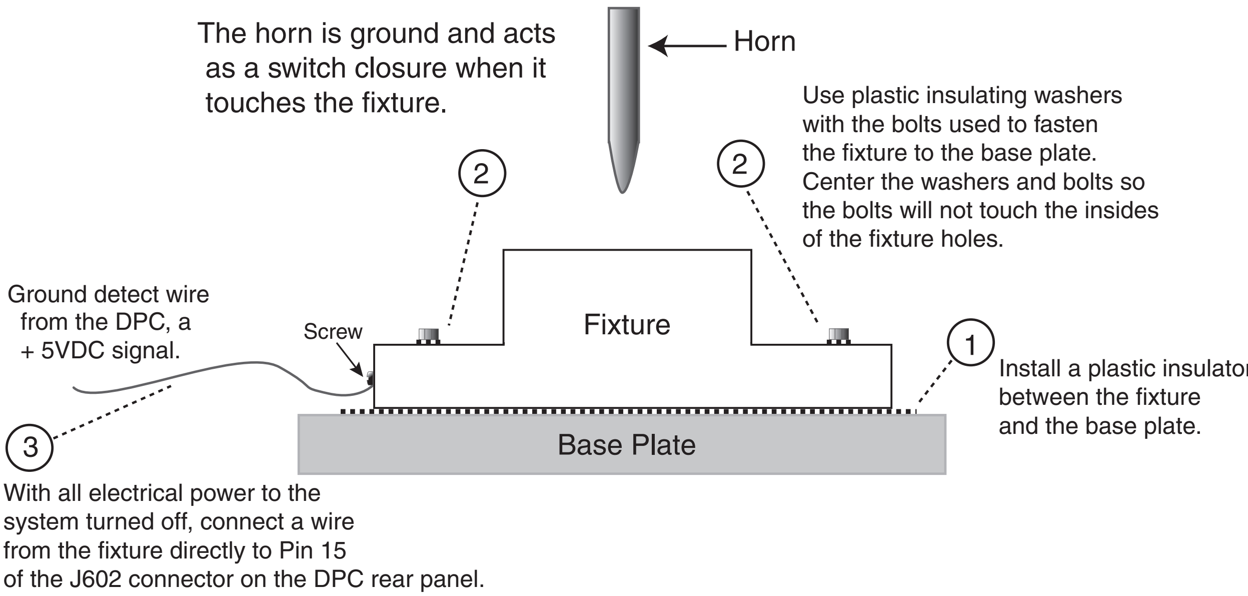


Figure 5-23a *Ground Detect Fixture Installation*

NOTE

Refer to Scrub, Page 86, for information related to Ground Detect.

Status Outputs

This feature allows a selection of either Maintained or Pulsed part status outputs. See Figure 5-24.
Part status outputs are: Bad Part Out; Suspect Part Out; and, Good Part Out.

MAINTAINED means that the outputs stay active until the start of the next weld cycle.
PULSED means that outputs are active for 100 ms before being reset.

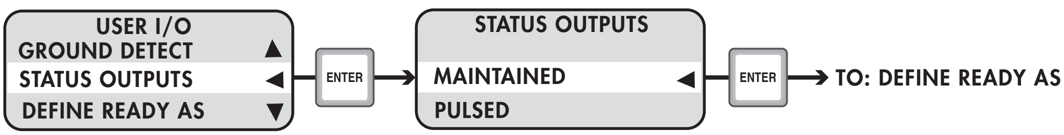


Figure 5-24 *Status Outputs Settings*

Define Ready As (J602 I/O Connection, Pin #6)

Using this menu, select from four choices to define when the ready output signal will be active. The choices are:

Ready – The weld is completed, and the system is ready to receive a new start signal.
In Cycle – This signal is active during the events of the Dukane weld cycle as defined in the NOTE below.
Sonics On – Whenever the ultrasound signal is on. (Depending on the options chosen, this includes triggering, the weld itself, scrub and afterburst signals.)
In Hold – The signal will be active during the Hold portion of the weld cycle. The feature can be used with automation setups where the operator needs to perform a task that occurs only during Hold.

NOTE

Ready and Top-of-Stroke are two different events. Each occurs at a different time in the weld cycle.
See the Weld Cycle Time Line on Page 77.

NOTE

The Dukane weld cycle is defined as a series of electrical events consisting of:
Start, Downstroke, Trigger, Weld, and Hold.
The physical lowering and raising of the head assembly, while related to these events, are not factors in defining the weld cycle.

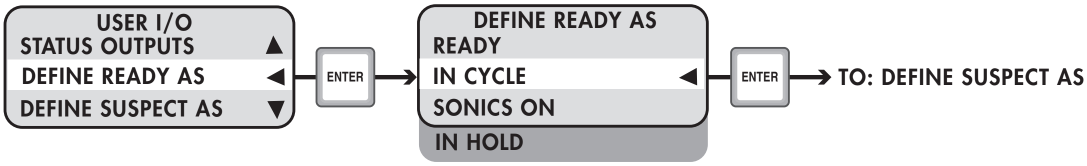


Figure 5-25 *Define Ready As Settings*

> NOTE
>
> *The default setting and the one most often chosen to define the Ready As signal is READY.*

> NOTE
>
> *Status Outputs: If set to Maintained, the active output signal lasts for the entire Hold portion of the weld cycle.*
> *If set to Pulsed, the active output signal lasts for only 100 ms.*

Define Suspect As (J602 I/O Connection, Pin #4)

Using this menu, select from three choices to define when the Suspect (part) output signal will be active. The choices are:

Suspect – The signal is activated when a process characteristic has exceeded a suspect limit.
Net Active – The signal is active when the DPC is turned on and is an active node connected to a network.
Sonics On – Whenever the ultrasound signal is on. (This depends on the options chosen, and can include triggering, the weld itself, scrub and afterburst signals.)

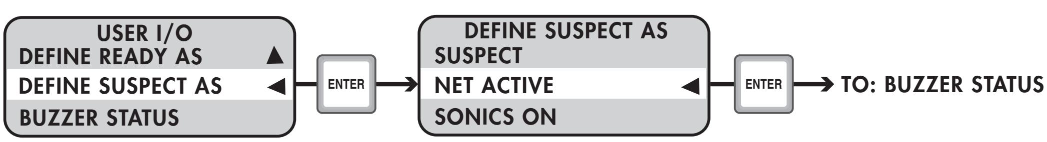


Figure 5-26 *Define Suspect As Settings*

Buzzer Status

Use the BUZZER STATUS display to turn the DPC internal buzzer on or off.

Off – The buzzer will not sound for any process conditon.
On – See Figure 5-27. Buzzer at Trigger, and then Buzzer at Reference are presented. Either or both of these can be ON or OFF.

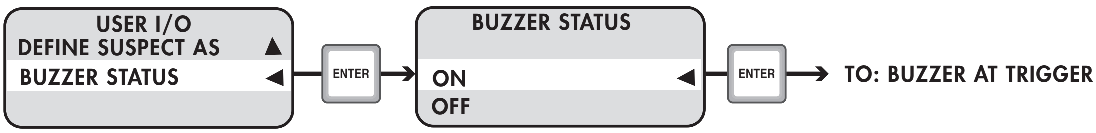


Figure 5-27 *Buzzer Status Settings*

NOTE
With Buzzer Status ON, the buzzer sounds when a bad or suspect part limit has been exceeded.

When BUZZER ON is chosen, the display changes to offer two choices for buzzer activation: BUZZER AT TRIGGER, or BUZZER AT REFERENCE.

Buzzer at Trigger – The buzzer sounds when the trigger point is reached.
Buzzer at Reference – The buzzer sounds when the weld head senses it is opposite the distance encoder's zero reference point.

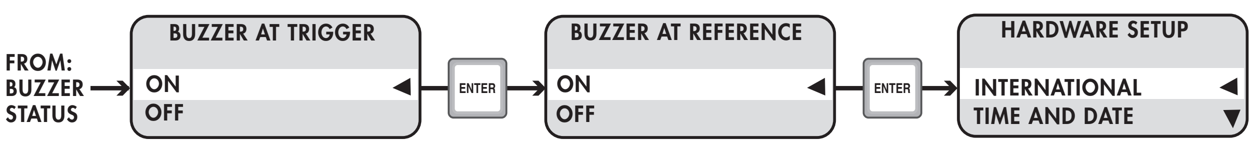


Figure 5-28 *Buzzer On Status Settings*

Advanced I/O

When the Advanced I/O option is ordered, the DPC 4 Plus comes with two extra connectors, one of which (J902) has two programmable outputs. This is shown in Figure 2–3. The signal on each output is selectable through the Advanced I/O Definition menu. From HARDWARE SETUP, select ADVANCED I/O as shown in Figure 5-29 below.

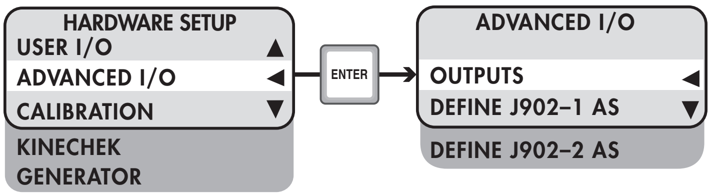


Figure 5-29 *Selecting Advanced I/O*

> **NOTE**
>
> *These two outputs are high power drivers designed to sink up to 2A at 25VDC.*

Outputs

This selection defines the state of the output signal when the outputs are active (see Figure 5-30). OUTPUTS offers two choices of active states.

ACTIVE HIGH refers to a signal that is on or a closed circuit, when the output is active. When the output is not active, the signal is off or an open circuit.

ACTIVE LOW refers to a signal that is off or an open circuit, when the output is active. When the output is not active, the signal is on or a closed circuit. See Figure 5-30.

Figure 5-30 *Outputs Setup*

Define J902–1 and J902–2

The last step is to select one of the seven available states that will define each output. The choices are shown in Figure 5-31.

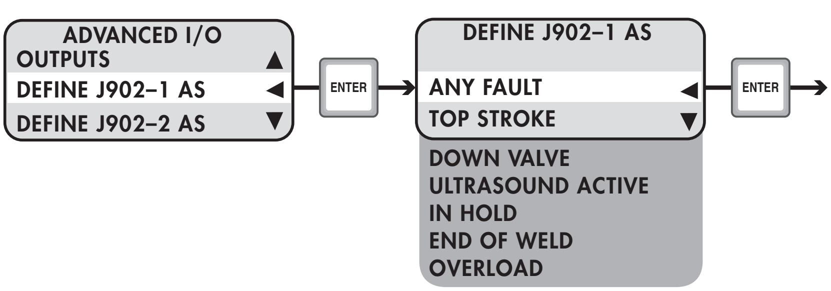


Figure 5-31 *Defining the J902 Outputs*

Kinechek®

Purpose of the Feature

The feature, compensates for initial inertia registered on the unit's load cell when the thruster head first moves.
For this feature to operate, the ultrasonic welding system must have a linear (distance) encoder (also known as a "load cell"), the Kinechek itself, and the DPC which is equipped with the distance "board".

NOTE

Kinechek is the name trademarked by Deschner Corporation for the hydraulic speed control Dukane Corporation uses in its ultrasonic press systems. Kinechek allows the operator to slow the thruster head assembly near the end of its stroke by setting a distance (from the end-of-stroke) where Kinechek takes effect.
Using Kinechek helps give assembly consistency for applications involving staking, inserting, swaging, and welding of shear joints.
Kinechek's one-inch stroke can be programmed along the entire range of the pneumatic thruster's stroke.

TIP

Adjust Kinechek to descend at a rate matching the material melt to achieve superior results.

Follow this four-step process in selecting the "Distance" value to enter through the DPC front panel:

1. Set up the Kinecheck for your press.
2. Bring the thruster head down so that it just touches the Kinechek switch. Record the distance from the distance encoder.
3. Add 0.1 inch to the measurement in Step 2.
4. Enter the result from Step 3 using the Kinechek menu as shown in Figure 5-32.

Use the △ and ▽ keys (+ and − keys on the DPC4) to change the distance digits.

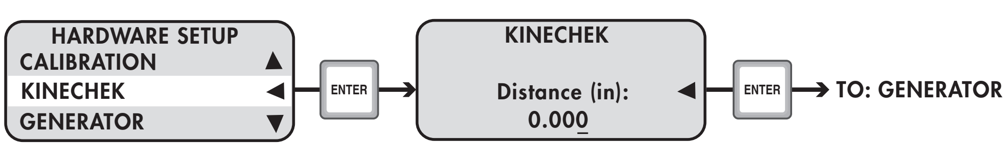


Figure 5-32 *Kinechek Setting*

Generator

Two choices are offered in the Generator menu:
DEFAULTS and SETTINGS. See Figure 5-33.

The choices allow the user to either accept default values or enter values for certain ultrasound parameters.

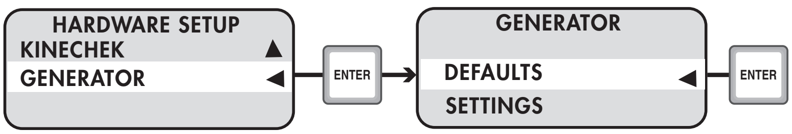


Figure 5-33 *Generator Selection and Settings*

Defaults

If DEFAULTS was selected from the Generator menu, and then YES was chosen in the SET DEFAULTS? menu, the generator's parameters are reset to factory specifications.

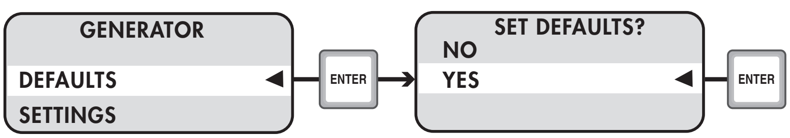


Figure 5-34 *Generator Set Defaults*

Settings

When SETTINGS is chosen, a list of parameters appears. These parameters have variables that can be set either to test the generator or to make operating adjustments.

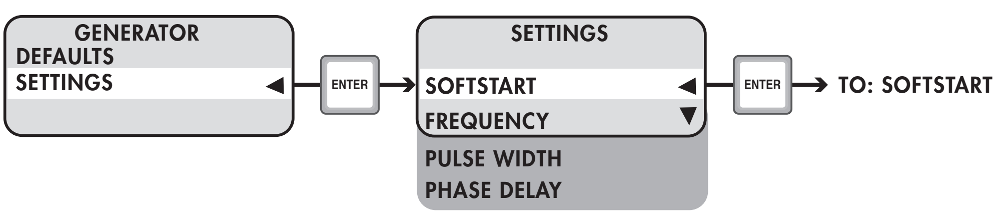


Figure 5-35 *Generator Settings*

Softstart

The softstart feature applies power and amplitude to start the stack assembly (transducer, booster, horn) *linearly*, rather than in two, instantaneous surges. The stack is brought up to operating amplitude smoothly, without shock stress.
Although the softstart time is factory set, it is variable and can be adjusted to account for starting characteristics of a particular horn. **Call Dukane Service before adjusting.**
The softstart setting depends on the generator load at the start of a cycle. See Figure 5-36

CAUTION

Call Dukane Service before making any changes to the Softstart, Frequency, Pulse Width or Phase Delay settings. For example, if Softstart is set for too short a time, an overload condition might result.

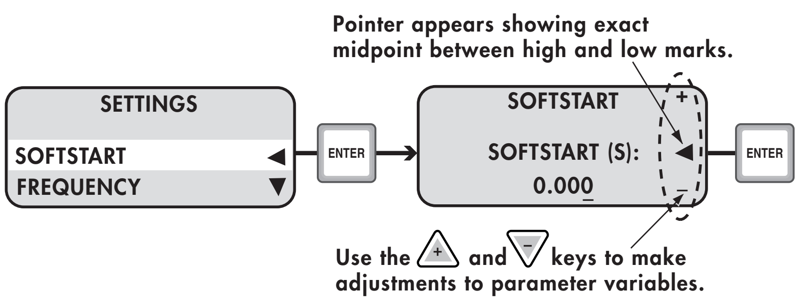


Figure 5-36 *Generator Softstart Setting*

Enter a value between .01 second and 1.275 seconds in .005 increments.

TIP

The use of larger horns or high clamp force causes a higher load to exist, and this could cause the stack to overload. By optimizing the phase of the generator, high load applications can be run efficiently with no overloading.
Call Dukane Service before adjusting.

Frequency

Horn frequency is monitored when the ultrasound signal is inactive, and is considered to be the "internal idling frequency" or the starting frequency of a softstart interval.

Adjustments can be made when the horn frequency is outside the range of the default settings limits.
Call Dukane Service before making any changes.
See Figure 5-37 and Table 5-1 below.

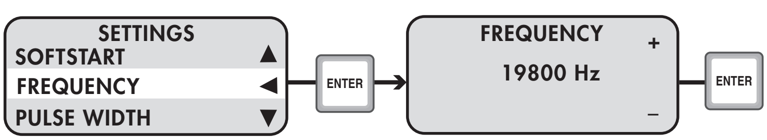


Figure 5-37 *Generator Frequency Setting*

Models	Frequency Settings (kHz)	
	Default	Adjustable Range (Typical)
15 kHz	15,000	14,950 to 15, 050
20 kHz	19,800	19,450 to 20,050
30 kHz	29,700	29,450 to 30,050
40 kHz	39,600	39,450 to 40,050
50 kHz	49,500	49,350 to 49,950
70 kHz	69,700	69,200 to 70,350

Table 5-1 *Frequency Settings*

Pulse Width

This selection lets you view the Pulse Width Modulation (PWM) setting during normal operation of the DPC.
Pulse width is factory set, and should not require adjustment.

Here are the maximum pulse widths:

• 20 kHz setting = 22 µsec • 40 kHz setting = 11 µsec

• 50 kHz setting = 9 µsec

NOTE

Generator values shown here and on the previous page are not absolute maximums and minimums. They do, however, represent reasonable ranges since individual system tolerances have an effect on actual values.

Phase Delay

Ultrasound generator phase adjustments can be made with this feature. This is helpful when there is a need to match generator and stack (transducer, booster, horn) phases.
Enter a value between +0.4 and +2.1 µsec (microsecond).
See Figure 5-38.

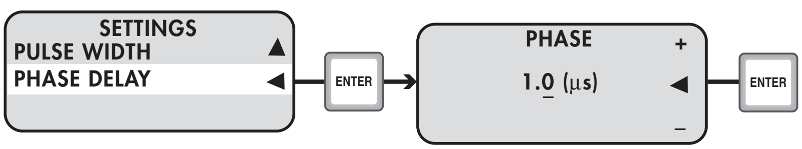


Figure 5-38 *Generator Phase Setting*

SECTION 6

Security

- This section describes the DPC security feature that provides password protection for all process parameters.

This page intentionally left blank

Overview

Security refers to the password protection feature introduced with DPC firmware version 2.60. With password protection, an operator can prevent unauthorized changes to all process control parameters.

> **NOTE**
>
> *VIEW PARAMETERS is the only menu without password protection since it involves only the viewing of process parameters on the front panel display.*

With password protection enabled, DPC menu items can be accessed and changed only if a password is properly entered.

Security Coverage – See Figure 6-1 on the next page to see what menus can be password protected.

Enabling Security – See Page 63 to enable this feature.

Disabling Security – Refer to Page 63.

Normal Use – This is covered on Page 65.

Password Forgotten? – See Page 66.

Security Coverage

Figure 6-1 shows that all but one menu item is covered when Security is enabled.

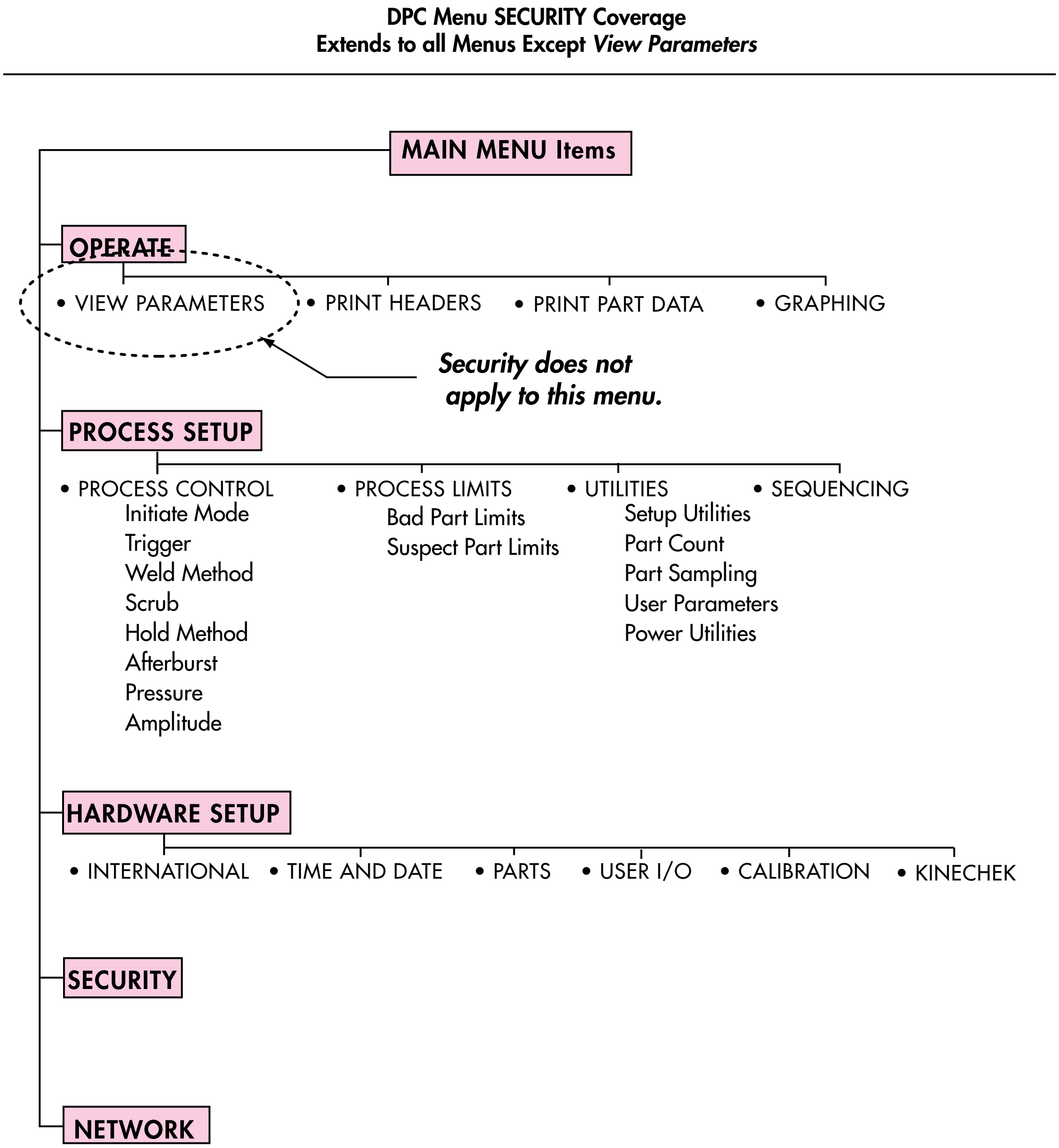


Figure 6-1 *Security Coverage*

Enabling Security

1. From the Main Menu, select SECURITY, and ENTER .
2. Select Enable, and ENTER.
3. Choose a password of up to four characters (any combination of numbers or letters). See Figure 6-2.

> **NOTE**
>
> *Review the procedure of selecting and entering characters in Section 4, <u>Network – Naming the DPC</u>, Pages 33-34.*

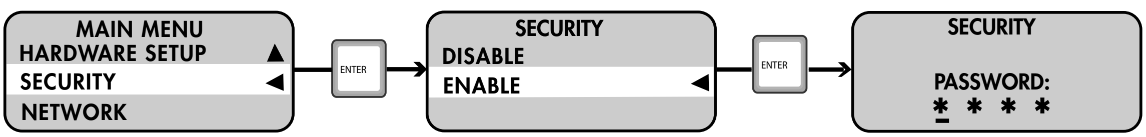


Figure 6-2 *Enabling Security*

Changed Your Mind?

If Security was enabled, but just before entering a password you changed your mind and decided not to use the security feature, press the ENTER key to return to the Main Menu.

Disabling Security

After deciding not to use the security feature, it needs to be disabled.

Press the ENTER key to return to the Main Menu.

1. Select SECURITY from the Main Menu, and press ENTER . Note that ENABLE is selected as shown below.

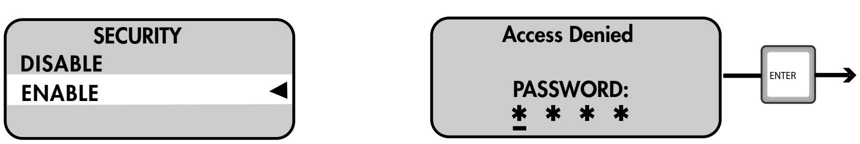


Figure 6-3 *Disabling Security, Step 1*

When you use the arrow keys to try to select DISABLE, the Access Denied display appears as seen in Figure 6-3 which is another indication that security is enabled.

Press ENTER .

NOTE

At this point "ENTER" is the password, so pressing the ENTER *key opens the SECURITY menu.*

2. Use the + key (on the DPC4) to select DISABLE, and the display will appear as shown in Figure 6-4.

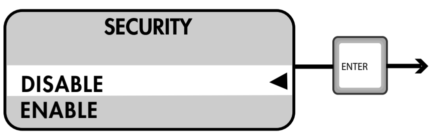


Figure 6-4 *Disabling Security, Step 2*

3. Press ENTER, and Security has been disabled.

Normal Use

The security feature is typically enabled after all of the setup options through the Network, Hardware Setup, Process Setup, and Operate menus have been made.

Access

With Security enabled, access to an option protected by password is prevented when the display in Figure 6-5 appears:

Figure 6-5 *Access Denied*

Changes

Items can be changed only after the password is given, and the ENTER key is pressed as shown in Figure 6-6.

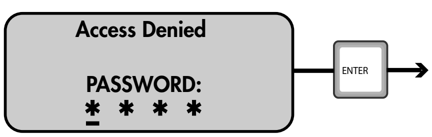


Figure 6-6 *Entering the Password*

> **TIP**
>
> Consider disabling the Security feature (See Page 63.) if several items in the program need changing. The feature can be turned on again when all changes have been made.
>
> If Security is not disabled, the password has to be given for each change made.

Forgotten Password?

Please contact Dukane Ultrasonics Support/Service, St. Charles, Illinois for assistance if you forget the password. See Section 15 for contact information.

Be prepared to give the following:

• DPC date (the date to which the internal DPC clock is set)

A temporary password will be issued by Dukane Service. This temporary password is valid for 24 hours. As soon as the system is unlocked, a new password should be set or Security should be disabled. If this is not done, the original password will go back into effect.

SECTION 7

Process Setup – Process Control

- This section gives process control basics as they apply to initial DPC setup and for use when changes to the ultrasonic assembly process become necessary.

Overview

If you worked through the example in Section 3 (starting with the Main Menu and moving through Process Setup to Process Control), you have some familiarity with the Process Setup menu.

Process Setup Organization

Figure 7-1 shows that the menu is organized into four submenus. Process Setup material is organized so that each submenu has its own section in this manual.

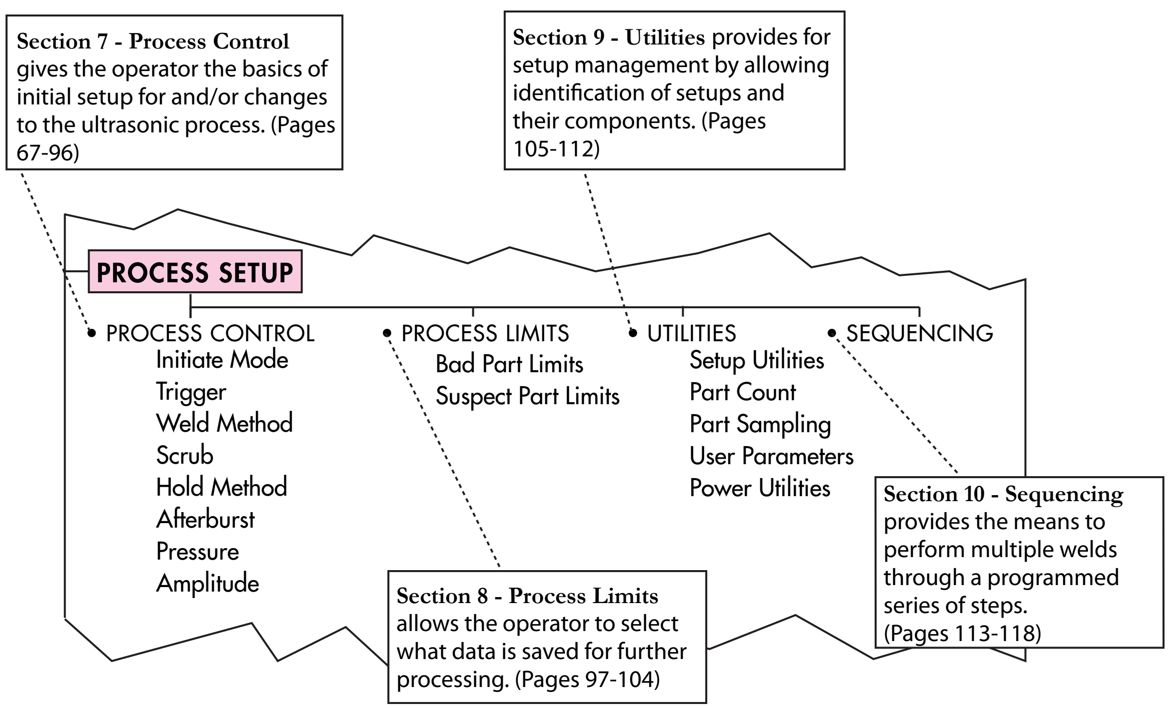


Figure 7-1 *Process Setup Menu*

Continue with this section to gain some understanding of Process Control information.

Process Control

Process Control contains the eight submenus shown in Figure 7-2. They deal with basic considerations typically made when controlling the steps of a process cycle.

As the cycle progresses, time, distance, power, and energy measurements, or *process characteristics*, are compiled for each portion of the cycle.

The process characteristics form a record for each part. The records can be analyzed, and limits can be calculated to determine if the process is "in control".

The DPC can report parts as Good, Bad, or Suspect depending on the process characteristics limits.

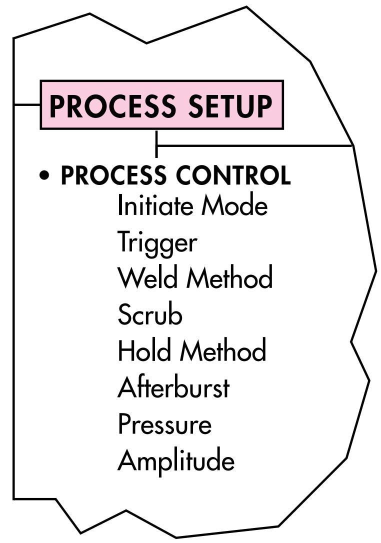


Figure 7-2 *Process Control Menu*

> **NOTE**
>
> *The Process Control information presented in this section follows DPC menu organization starting with Initiate Mode and finishing with Amplitude. This relates to the way a typical ultrasonic assembly system operates.*

Initiate Mode

Initiate Mode controls the way a cycle is started, using either of two modes, Manual or Auto.
Figure 7-4 illustrates how to select INITIATE MODE.

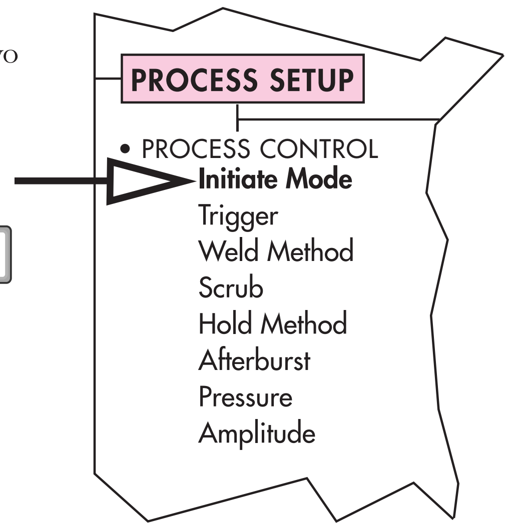


Figure 7-3 *Initiate Mode Menu*

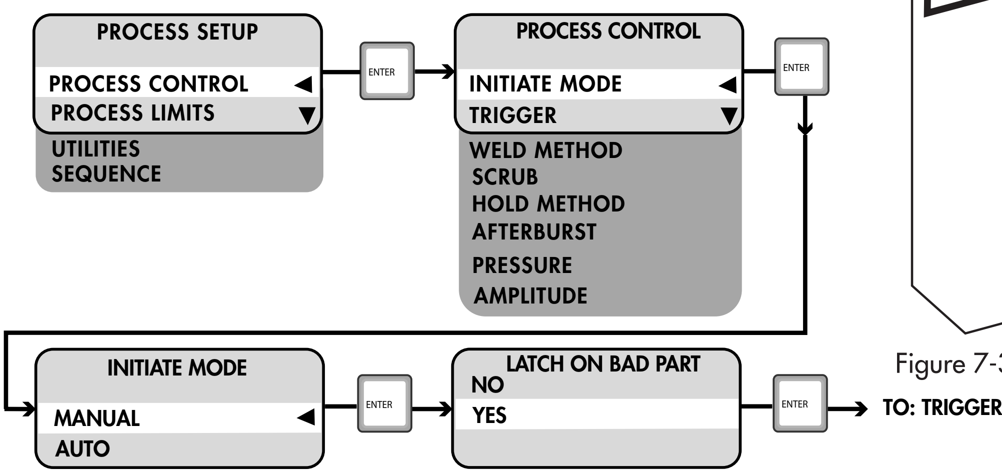


Figure 7-4 *Selecting Initiate Mode*

Manual

Manual mode operates in one of two ways depending on whether the Trigger Method is "Probe".

Probe Method (Hand Probe Only)

If PROBE is the trigger method, this manual cycle is started when the manual switch on the hand probe is pressed.
When the switch is released, the cycle terminates.

All Other Trigger Methods

With all other trigger methods, the cycle is started by depressing both activation switches (Activation Switch 1 and Activation Switch 2) within 0.5 second of each other.
Depress the activation switches continuously until the trigger switch on the press has closed or until the ultrasonic signal is applied.

Latch on Bad Part

NOTE

What is a "bad part"? Bad part limits define what is considered to be a bad part. See Section 8-Process Limits*, Page*

When this feature is active (It is available only with the Manual mode.), the system stops when a bad part is detected, and SYSTEM LOCKED appears on the DPC display. The operator must deal with the SYSTEM LOCKED message before a new cycle will start.

Unlocking the System

On the press base, push the red EMERGENCY STOP button all the way in; then pull the button all the way out.

This unlocks the system, and permits the next cycle to begin.

Removing the Message from the DPC Display

To remove the message manually from the DPC display, press the ENTER key on the front panel.

If you choose not to remove the message manually, it will automatically be removed when the next cycle begins.

Auto

Auto mode requires a signal from one of two sources: Power On, or an initialization signal from the previous cycle. Apply the auto input signal for a minimum of 50 milliseconds to ensure that the cycle has been started.

To use Auto Abort, choose ENABLE as shown in Figure 7-5.

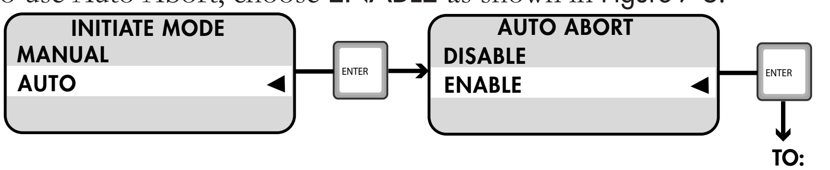


Figure 7-5 *Enabling Auto Abort*

When Auto Abort is enabled, the electrical states of two inputs on the input/output board are reversed at the same time. These inputs are switches (one normally closed type, and another that is a normally open type).
See Appendix C, Figure C-2 and Figure C-3

CAUTION

Using this form of abort does not comply with OSHA regulations.
If you use Auto Abort, an OSHA compliant enclosure must be installed to surround your system.

TIP
Limitations in Using the Auto-In Signal

Probes
If using a continuous mode probe, maintain the auto input signal until the end of the weld cycle.
If using a timed probe, use a momentary auto input signal.
Maximum time for momentary auto input: The auto input signal has to end before the “ready out” signal activates.
Presses
Maximum time for momentary auto input: The auto input signal has to end before the “ready out” signal is activated.
However, when using Delay till Auto-In as a trigger method (See Page 77.), the Auto-In signal that begins the cycle has to be momentary, and the second Auto-In signal has to be released before the end of the cycle (at Ready Out).

See Page 53 for more information about the ready output signal.

Trigger

"Trigger" defines the type of event that turns on the ultrasound signal. This event can be:

- a contact closure from the trigger switch in the press,
- an absolute encoder position as in the case of pre-triggering,
- a force level from the force transducer, or
- a velocity reached by the press.

Trigger Type and Trigger Method define the behavior of the system as it relates to Trigger.

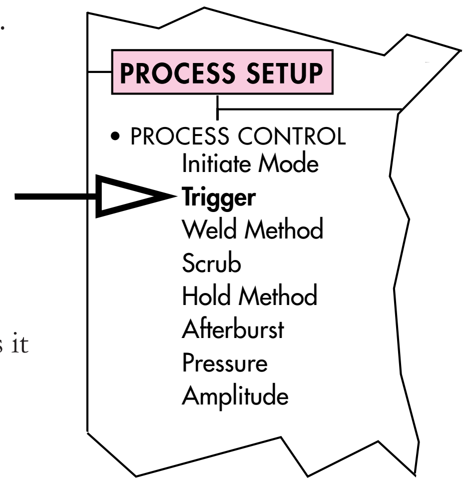


Figure 7-6 *Trigger Menu*

Trigger Type

The trigger type defines whether the signal that triggers the application of an ultrasonic signal is: Maintained, Momentary, Force (with the optional force transducer), or Velocity.

Maintained

A *maintained* trigger means that the trigger signal is active for the entire weld portion of the cycle. The signal comes from the pressure switch on the press.

If the signal is lost while the ultrasonic signal is on, the cycle is terminated, and one of two error messages is displayed:

#225 TRIGGER LOST WITHIN 100ms appears when the ultrasonic signal is lost within the first 100 milliseconds.

#226 TRIGGER LOST is displayed if the signal is lost after the ultrasonic

TIP

Here are some reasons the trigger switch may be lost: The application may need a light trigger setting and low pressure causing the press inertia at the start of the downstroke to close the trigger switch.
Another reason: Involves use of Kinechek (hydraulic speed control). If the material melts at a rate faster than the horn descends, presure is lost at the face of the horn, and the trigger switch can open.

Momentary

With a *momentary* trigger, the trigger switch is ignored after it closes once. If the trigger switch opens during the weld portion of the cycle, the weld continues normally. No error message is generated.

CAUTION

Be certain that the application of the ultrasonic signal is due to contact with the part, and not due to anything else. This can be determined by setting downstroke limits for distance and time.

CAUTION

Use extreme caution when using the Momentary trigger type. Opening the trigger switch will NOT terminate the weld cycle. Guard the horn/fixture "pinch point" to prevent hands, or fingers from being crushed by the vibrating horn.

Selecting any trigger type advances the display to TRIGGER METH-

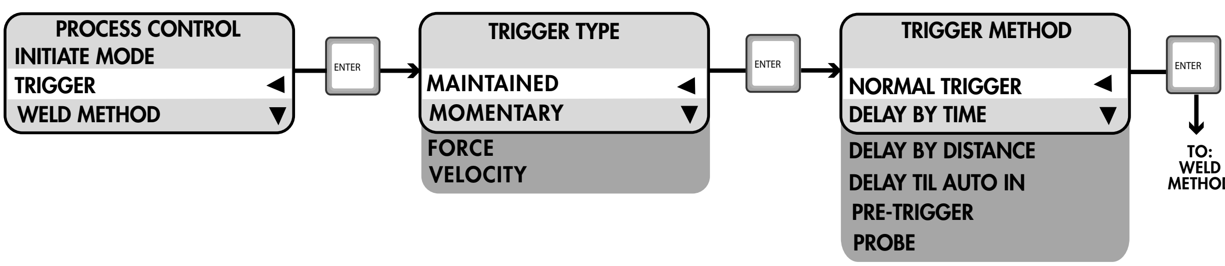


Figure 7-7 *Selection of Trigger Type and Method*

Force

If the ultrasonic press system has an electronic pressure transducer, or "force transducer", the trigger type will be FORCE. The force transducer takes the place of the mechanical trigger switch in the press.

> **NOTE**
>
> *In practice, a minimal force to use is about 10 pounds (44 Newtons).*

When FORCE is the trigger type, the display will ask for a trigger force value. See Figure 7-8 below.

The ultrasound signal can be triggered at a force between 0 and 736 pounds (or between 0 and 3276 Newtons).

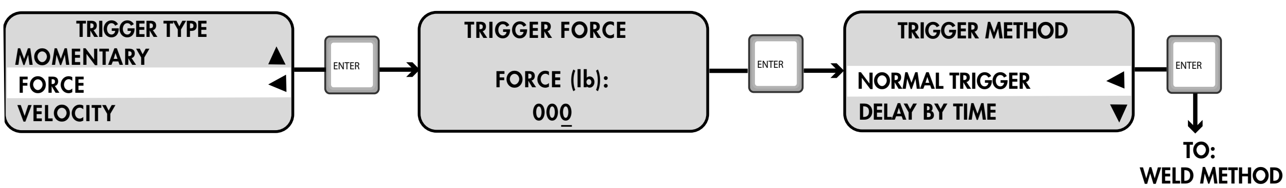


Figure 7-8 *Selecting Trigger Force*

Velocity

When the downstroke velocity of the thruster equals zero, the ultrasound signal is triggered.

VELOCITY is chosen when the operator wants the ultrasound signal to start as the horn touches the part to be welded.

Trigger Method

You may recall that there are six different trigger methods. They are shown in Figure 7-9 below.

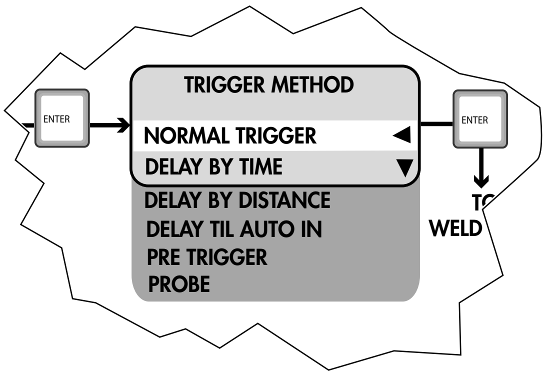


Figure 7-9 *Trigger Method*

Trigger Method 1: Normal Trigger

The ultrasound signal is activated when the trigger is initiated. Table 7-1 shows when the trigger is initiated according to trigger type.

	Trigger Type			
	Maintained	Momentary	Force	Velocity
When Initiated?	When the pressure switch on the press closes.		When the force transducer reaches desired force value.	When horn velocity reaches zero.

Table 7-1 *Normal Trigger Activation*

Trigger Method 2: Delay by Time

This method delays the start of the ultrasound signal by a specified time. Otherwise, this method is the same as "Normal Trigger".

Entering Trigger Delay by Time

Enter trigger delay time in seconds from 0 to 99.999 in increments of 1 millisecond. See Figure 7-10.

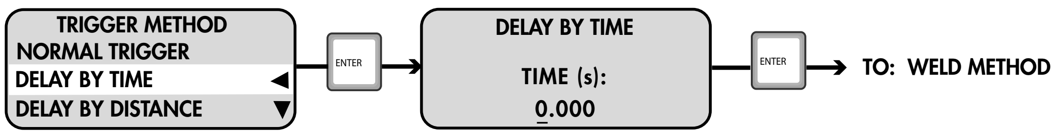


Figure 7-10 *Selecting Delay by Time*

Trigger Method 3: Delay by Distance (Systems with Distance Encoder Only)

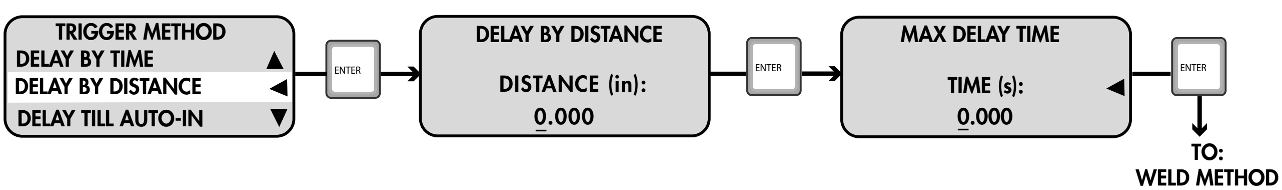
This method delays the start of the ultrasound signal by a specified distance from the normal trigger point. Otherwise, this method is the same as "Normal Trigger".

To prevent unnecessary delays when using this method, a MAXIMUM DELAY TIME value must also be entered.
See Figure 7-11.

Entering Trigger Delay by Distance and Max Time

Enter trigger delay distance in inches from 0 to 9.9999 in increments of 0.0001 inch. (Distance can also be entered in millimeters from 0 to 99.999 mm in increments of 0.001 mm.)

Next, enter MAX TIME in seconds from 0 to 99.999 in increments of 1 millisecond. See Figure 7-11 .



Trigger Method 4: Delay till Auto-In

This method delays the start of the ultrasound signal until an Auto-In input is received.

Delay till Auto-In can be used to synchronize timing of the ultrasound signal start in a multi-head situation.

Selecting Delay till Auto-In

Position DELAY TILL AUTO IN on Line 3 of the DPC display.

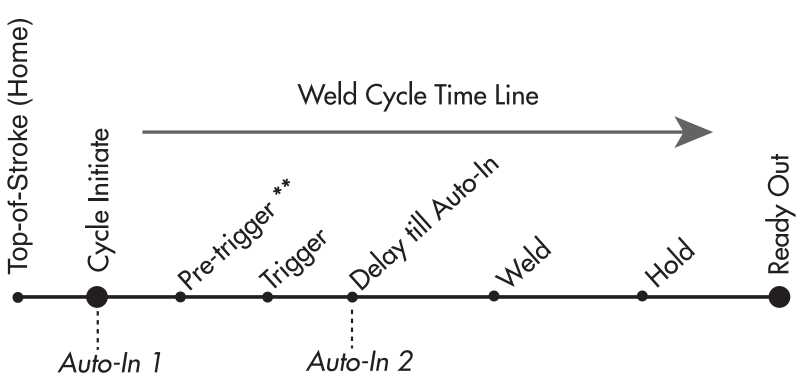
Then press ENTER .

There are no secondary selections to be made for this trigger method.

CAUTION

With Delay Till Auto-In as the trigger method, there are two auto-in signals: the first starts the cycle (Cycle Initiate) and the second starts the ultrasound signal. If the Initiate Mode is set to AUTO, take care to avoid confusion between these auto-in signals.

For Delay till Auto In to work, end the Auto-In (Cycle Initiate) signal before the trigger switch is activated. Otherwise, there will be no delay when the trigger switch activates, and the ultrasound signal will start too soon.



*** Pre-trigger can not be used if Delay till Auto-In is chosen as the trigger method.*

Trigger Method 5: Pre-trigger by Distance (Systems with Distance Encoder Only)

Pre-triggering is defined as turning on the ultrasound signal before the horn contacts the part. In this way the horn reaches full amplitude before part contact is made.
The ultrasound signal is turned on at a user-defined distance. This is measured from the reference mark (zero) of the distance encoder mounted on the press.

> **TIP**
> Insertion and staking can make good use of the Pre-trigger by Distance method.

> **NOTE**
> *The maximum travel of the press from the pre-trigger point (without closing the trigger switch or reaching the specified force level) is 0.75 inch (19.05 mm). Exceeding this distance results in an* #224 PRE TRIGGER > 0.75in ABOVE PART *error message, and the cycle terminates.*

Entering Pre-trigger by Distance

Enter the pre-trigger by distance value (inches or millimeters).
See Figure 7-12.

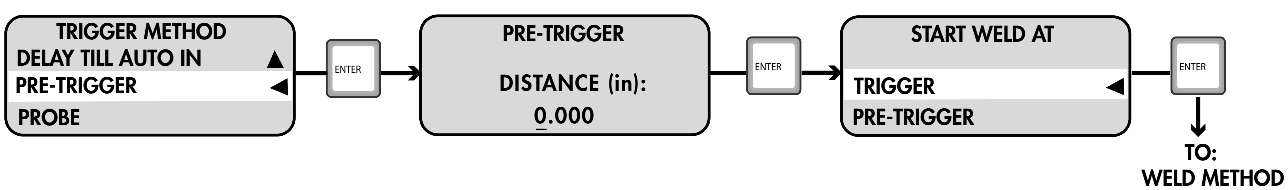


Figure 7-12 *Selecting Pre-trigger*

Start Weld At

When pre-triggering by distance, the horn contacts the part with the ultrasound signal turned on. From the time the horn contacts the part to closure of the trigger switch, welding is taking place. This may result in inconsistent weld times and weld distances.

In other cases, such as when working with small parts, insufficient pressure may keep the trigger switch from closing or prevent the force transducer from reaching its programmed force level.

To avoid these situations when pre-triggering, the user may choose to start the weld at the pre-trigger point or at the trigger point.

If the start of weld is at the pre-trigger point, then all weld parameters will be referenced from that point. If the start of weld is defined as the trigger point, then all weld parameters relate to the point at which the trigger is closed.

NOTE

The start of a cycle depends on the trigger type: Maintained, Momentary, or Force.

Trigger Method 6: Probe

Probe method is designed for use with a Dukane hand-held probe or custom designed probe system.

If this method is used as the trigger, only single pressure and continuous welding modes are allowed; dual pressure welding is disabled. In addition:

- All press functions are disabled.
- All distance related process methods will default to time.
- All distance process characteristics are disabled.

Entering Probe Delay Time

This option is available to give the probe a time delay before the ultrasound is started. See Figure 7-13.

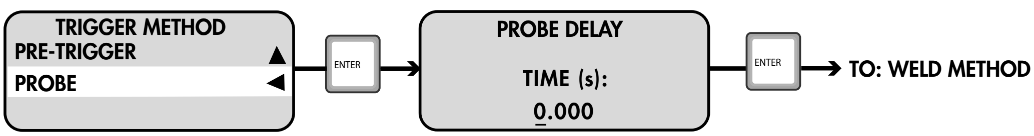


Figure 7-13 *Selecting Probe Delay Time*

Weld Method

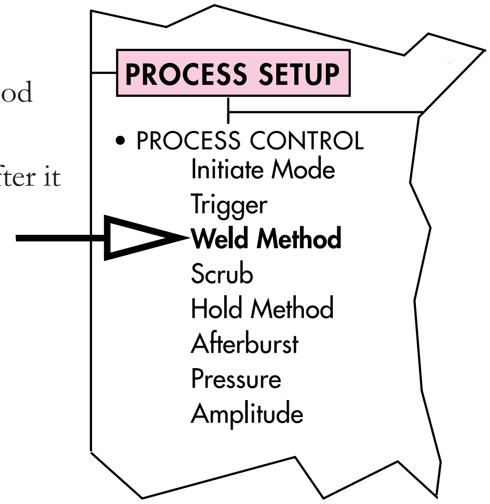
Process Control menu description continues with the Weld Method submenu.

Weld Method defines when the ultrasound signal is terminated after it has been triggered.

There are three methods of welding:

- Single Pressure,
- Dual Pressure, and
- Continuous

Choosing one method automatically deactivates the other two.



Fiaure 7-14 *Weld Method Menu*

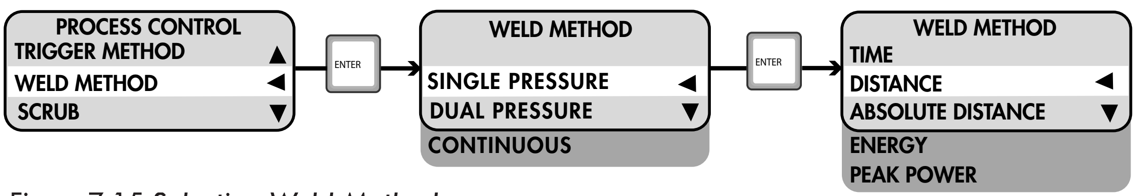


Figure 7-15 *Selecting Weld Method*

Single Pressure

Single Pressure** (designated as P1) is a preset pressure applied to the part during the weld process. The pressure continues until the control parameter (Time, Distance, Absolute Distance, Energy, or Peak Power) specified under the Weld Method submenu is reached.

Dual Pressure

When Dual Pressure** is chosen, two separate pressures are applied to the part (P1 and P2) while the ultrasound signal is on. When the control parameter is reached for P1, the pressure changes to Pressure 2. The weld continues until the control parameter for P2 is reached (or a process characteristic moves outside its process limits). Control parameters for P2 are the same as those used for P1, however the limits set for the parameters are specific to each pressure.
See Figure 7-16 on the next page.

> **TIP**
>
> Progressive pressure for **holding**: P1 is used when the ultrasonic signal is on. P2 is used during the Hold portion of the cycle.
> Progressive pressure for **welding**: P1 is used during the first part of the "ultrasonics on" cycle, then P2 is used to complete that part of the cycle as well as the Hold portion of the cycle. The result is a progressive, increasing application of force while the ultrasonic signal is on.

** Pressure is measured in pounds per square inch (psi) or in kPascals (kPa). The range is 0–100 psi or 0–690 kPa.

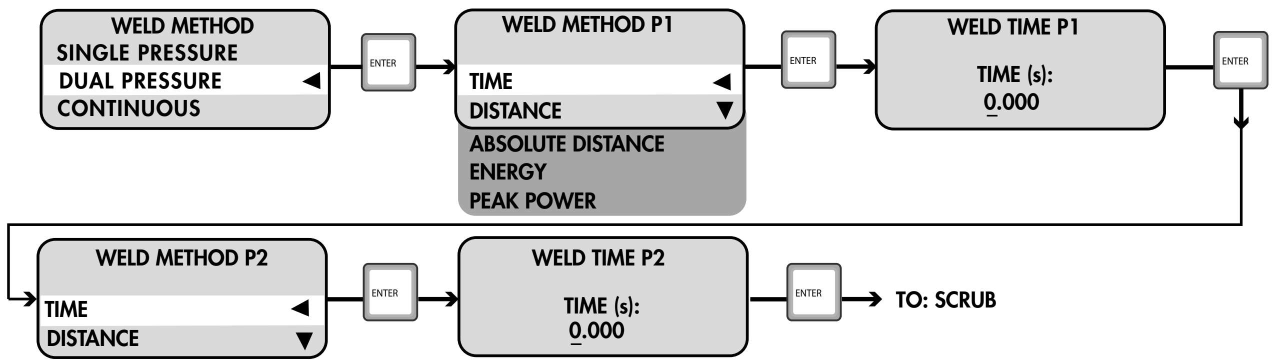


Figure 7-16 *Setting Dual Pressure Control*

Continuous

Continuous welding is used when the part to be welded moves continuously under the horn. Films and fabrics are examples of product types that require continuous welding.
Unlike single or dual pressure welding, this method has no control parameter to end the cycle. With continuous welding, the cycle is ended when the initiating signal is removed. The amount of material to be processed determines cycle length.

Entering Report Interval

The report interval is a user-defined period of time that tells the DPC when to output process data (to the output device, or to the MMI). The minimum interval is 250 ms.
With the exception of TOTAL CYCLE TIME, all process parameters are reset after each report interval.

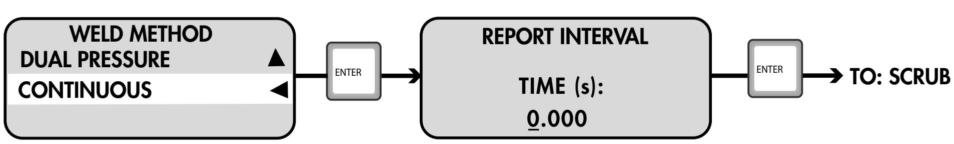


Figure 7-17 *Setting Report Interval*

Control Parameters – Single and Dual Pressure Welding

Time

Welding by time means that the DPC applies the ultrasound signal for a user-specified period. The range is from 0 to 99.999 seconds with a .001 second increment. See Figure 7-18.

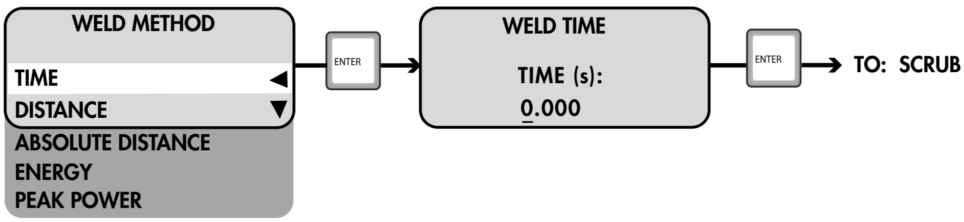


Figure 7-18 *Setting Weld Time*

Distance (For Systems with Distance Encoder Only)

Welding by distance means that the DPC applies the ultrasound signal until the press travels a user-defined distance from the trigger point. The range is from 0 to 9.9999 inches (0 to 99.999 mm) with a 0.0001 inch (0.001 mm) increment. See Figure 7-19.

A secondary control characteristic, MAX WELD TIME, must also be set to shut off the ultrasound signal if the thruster cannot reach the specified distance.

NOTE

MAX WELD TIME is a secondary characteristic of Distance, Absolute Distance, Energy and Peak Power. The time forces the weld portion of the cycle to stop even if the specified control parameter is not met.

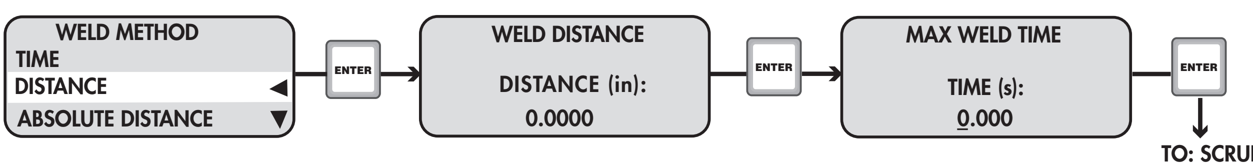


Figure 7-19 *Setting Weld Distance*

Absolute Distance (For Systems with Distance Encoder Only)

NOTE

Downstroke Distance = Distance the horn travels until the ultrasound trigger point is reached. Where pre-triggering is used, it is the distance the horn travels until the pre-trigger point is reached (and not the contact point of the part being welded).
Weld Distance = Distance the horn moves during the application of ultrasound to create the weld.
Hold Distance = Distance the horn moves during the hold or "cooling" portion of the weld cycle.
Absolute Distance = Downstroke Distance + Weld Distance.

Welding by absolute distance means the DPC turns off the ultrasound signal after the horn travels a user-defined distance from the distance encoder reference mark. (This is independent of when the horn touches the part to be welded.)
Absolute Distance terminates the ultrasound signal at the specified distance above the work piece.

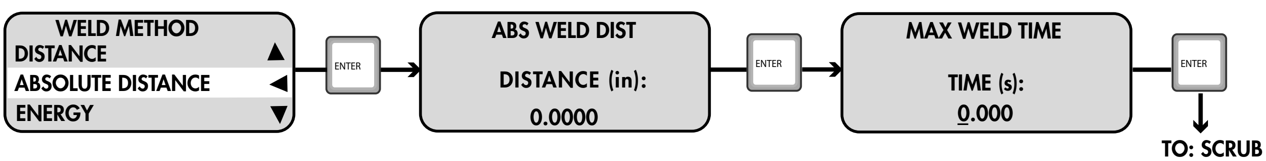


Figure 7-20 *Setting Absolute Distance*

Energy (For Systems with Energy Module Only)

With Energy as the selected weld control parameter, the system welds until the generator delivers a specified level of energy to the transducer while the horn is in contact with the part.
Energy, measured in joules, has a range of 0 to 99999.9, and has a 0.1 joule resolution

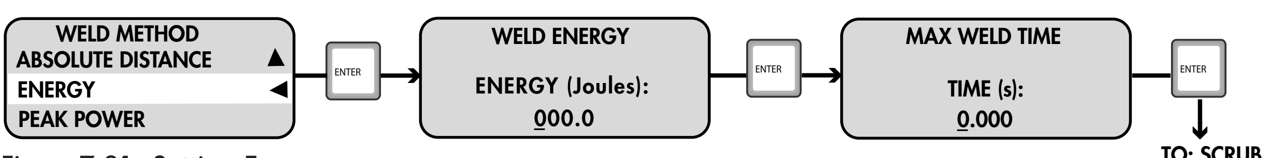


Figure 7-21 *Setting Energy*

Peak Power (For Systems with Energy Module Only)

With Peak Power as the selected weld control parameter, the system welds until the generator delivers a specified level of power to the transducer.
Peak Power, measured in watts, has a 1 watt resolution.
Peak Power range is dependent on generator output.

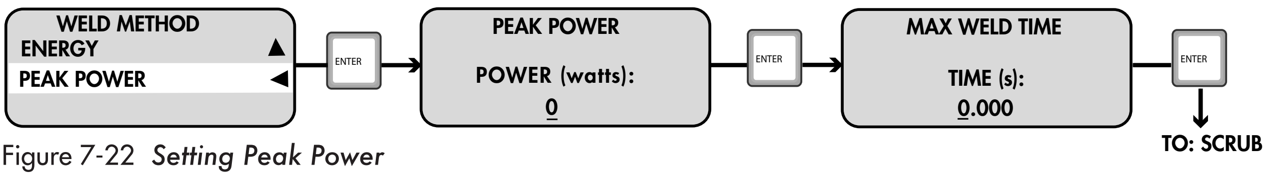


Figure 7-22 *Setting Peak Power*

Scrub

Scrub is an extension of the weld time generated when the weld portion of the cycle is ended by the ground detect input.

Typically this is used in cutting applications. Often the horn cuts through the material at a single point. This activates the ground detect and ends the weld portion of the cycle.
There may be an incomplete cut however.
Scrub time allows the cut to be completed by keeping the ultrasound signal on for a maximum of 100 milliseconds.

To use this feature, it must first be enabled. Secondly, a time will be entered.

In addition, the End of Weld and Ground Detect menu selections must be enabled. These are located in the Hardware Setup menu, and then in the I/O submenu. See Page 51 for more information.

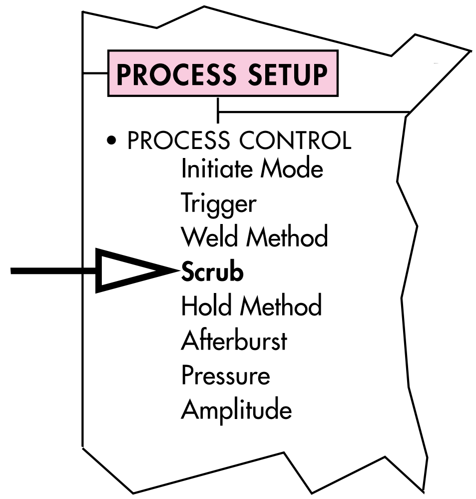


Figure 7-23 *Scrub Menu*

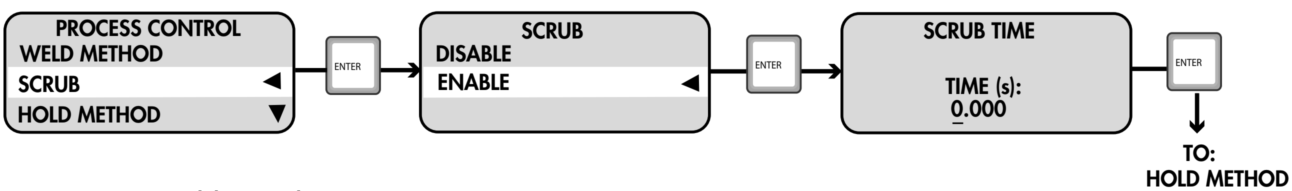


Figure 7-24 *Enable Scrub*

NOTE

The Hold cycle follows welding regardless of whether Scrub is enabled or disabled.

Hold Method

The Hold Method determines in what way pressure on the part is held after the ultrasound signal has ended. Holding allows the material to solidify (under pressure) before the press head retracts. Hold Method choices are:

- Time,
- Distance,
- Auto, or
- Disable.

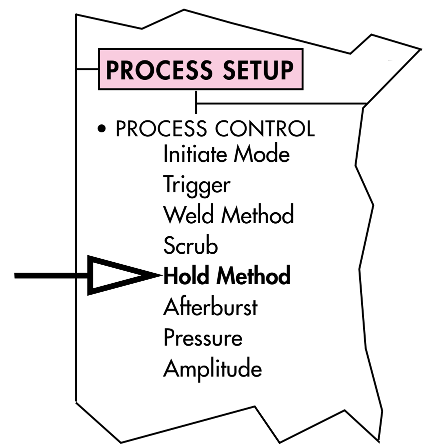


Figure 7-25 *Hold Method*

Time

The DPC will keep pressure on the part for the time specified.

Enter Hold Time

Choose a hold time and enter it using the menus as shown in Figure 7-26.

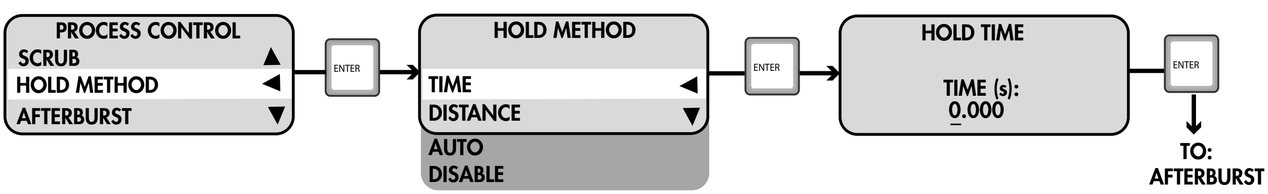


Figure 7-26 *Selecting Hold Method Parameters*

TIP

In multi-head applications, Hold Time can be used in conjunction with a secondary control on Total Cycle Time to force all heads to retract from a part at the same time.

Distance (For Systems with Distance Encoders Only)

Holding by distance involves keeping pressure on the part until a specified distance from the start of hold is reached.

As with the weld methods, to prevent the press from staying on the part indefinitely if the hold distance is not reached, a MAX HOLD TIME must be entered with this option.

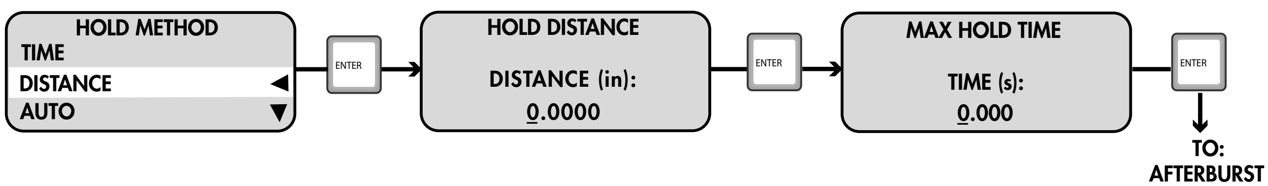


Figure 7-27 *Selecting Hold Distance*

Auto

Selecting Auto as the hold method keeps the part under pressure until the velocity of the press drops to zero. This mode is designed to optimize the hold process.

As with the Distance hold, a MAX HOLD TIME must be entered for Auto hold. Refer to Figure 7-27.

Disable

When Disable is selected, Hold Time and Distance are not available. Therefore, holding will not occur in this cycle.

Afterburst

In some applications the horn can stick to the part being welded as the head of the press retracts. Afterburst prevents this by sending a short burst of ultrasound on the upstroke.
Afterburst is defined by two values: the delay, and the duration.

Delay is the time from the start of the upstroke until the start of the afterburst.

Duration is how long the afterburst ultrasound signal is on.

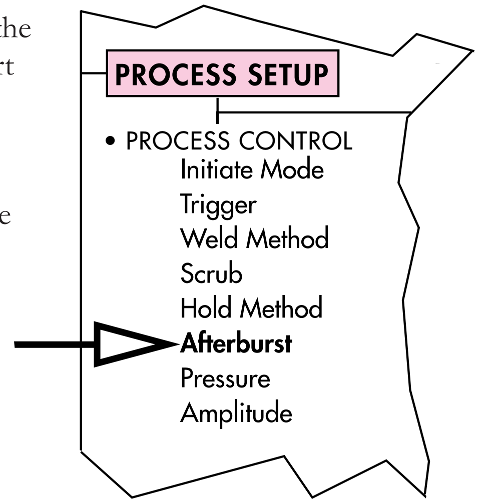


Figure 7-28 *Afterburst Menu*

NOTE
Both of the times, Delay and Duration, must each be greater than 50 milliseconds.

The afterburst feature can be turned off by choosing DISABLE, or it can be turned on by choosing ENABLE.

When enabled, the delay and duration times are then entered.
See Figure 7-29 below.

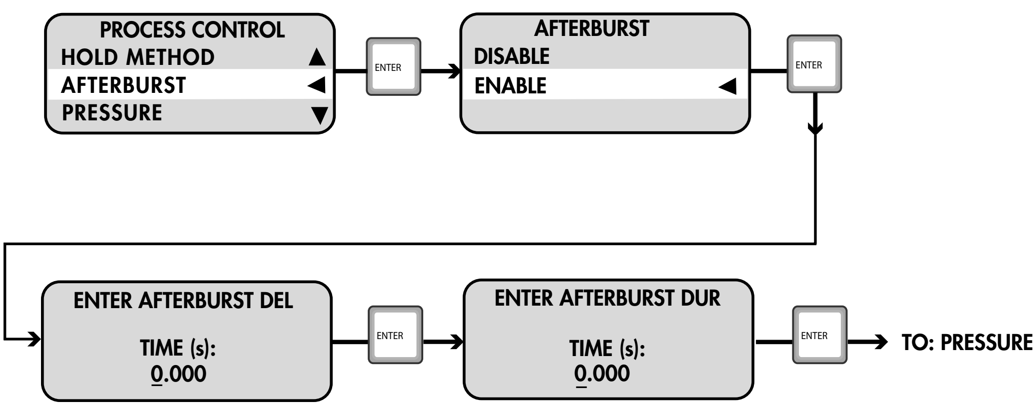


Figure 7-29 *Selecting Afterburst Parameters*

Pressure

Pressure selections begin with a choice of LOCAL or PROFILE.

LOCAL allows the operator to program a separate pressure for each of the five parts of the weld cycle:

• **Downstroke,** • **Weld P1,** • **Weld P2,** • **Hold,** and

• **Upstroke.**

PROFILE allows the operator to program ten pressures for Profile P1 when single pressure welding is used, and an additional ten pressures for Profile P2 if dual pressure welding is used.

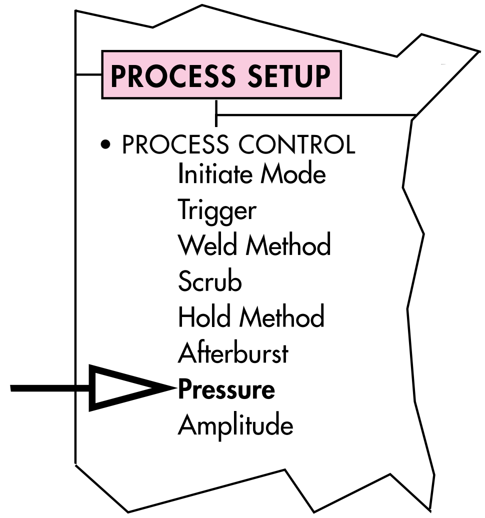


Figure 7-30 *Pressure Menu*

Local

These are the five pressures to be entered when LOCAL has been chosen:

Downstroke Pressure

Enter the pressure for the first part of the cycle (as the press head begins to come down).

> **NOTE**
>
> *Downstroke is measured in seconds and occurs from the beginning of the Cycle Initiate signal until one of two things happens:*
> *1) the trigger point is reached, or 2) the pre-trigger point is reached (and beginning the weld at the pre-trigger point has been chosen).*

Weld P1 Pressure

The P1 value is the pressure used in single pressure welding, and it is also the first of two pressures used with dual pressure welding. In presses with an electronic pressure regulator, this setting controls the air pressure.
In a manual press, P1 is a field to record the air pressure set for P1 on the thruster's front panel.
Enter the P1 value.

Weld P2 Pressure

Enter the pressure for P2 used during a dual pressure weld cycle. In presses with an electronic pressure regulator, this setting controls the air pressure. In manual presses it is a field for recording the P2 setting shown on the thruster front panel.

NOTE

Scrub Pressure: For the Scrub portion of the cycle, either P1 or P2 will be used. P1 is used if welding in single pressure mode, and P2 is used if welding in dual pressure mode.

Hold Pressure

Enter the pressure for the Hold portion of the cycle.

Upstroke Pressure

Enter the pressure for the last part of the cycle: as the press head

Using the DPC menu, step through the five portions of the weld cycle. See Figure 7-31 that shows with DOWNSTROKE how the DPC display will look.

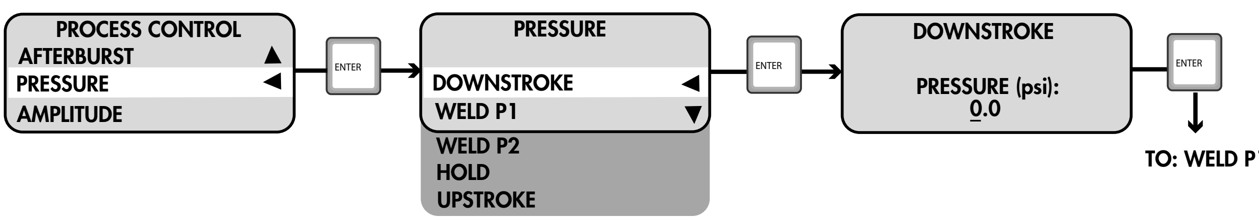


Figure 7-31 *Entering Downstroke Pressure*

Profile

The DPC has a pressure profiling feature. With it, up to ten different pressures can be programmed to occur during a single pressure weld cycle.

> **NOTE**
>
> *Pressure profiling is only available when the press is equipped with the pressure regulator feature.*

> **NOTE**
>
> *Use the DPC keypad to set up pressure profiling. Pressure profiling cannot be accomplished using the current version of the MMI.*

If welding with dual pressure, the DPC can be programmed for a total of twenty pressure "steps".

MMI User's Manual Reference

In the *MMI User's Manual* see Section 5, *Setup Mode – Process Control Page*.

> TIP
>
> Pressure profiling can be helpful with delicate parts. It can also help where a long weld cycle, on a large part, increases the power draw to the point of overload. Overload may be due to the increased mass "seen" by the generator as the weld bonds more and more of the component.

Pressure Profiling Instructions for the DPC

1. From the Main Menu, use the ▽ or ▼ key, and scroll to PROCESS SETUP.

> **NOTE**
>
> *If you are initially powering up the DPC, wait until the display reads 01: PART COUNT, then press* ENTER *once to bring up the Main Menu.*

2. Press ENTER.
3. Select PROCESS CONTROL by pressing ENTER.
4. Scroll down the Process Control menu to PRESSURE. Press ENTER .
5. Scroll down to PROFILE. Press ENTER .

The PROFILE P1 start screen appears as shown in Figure 7-32.

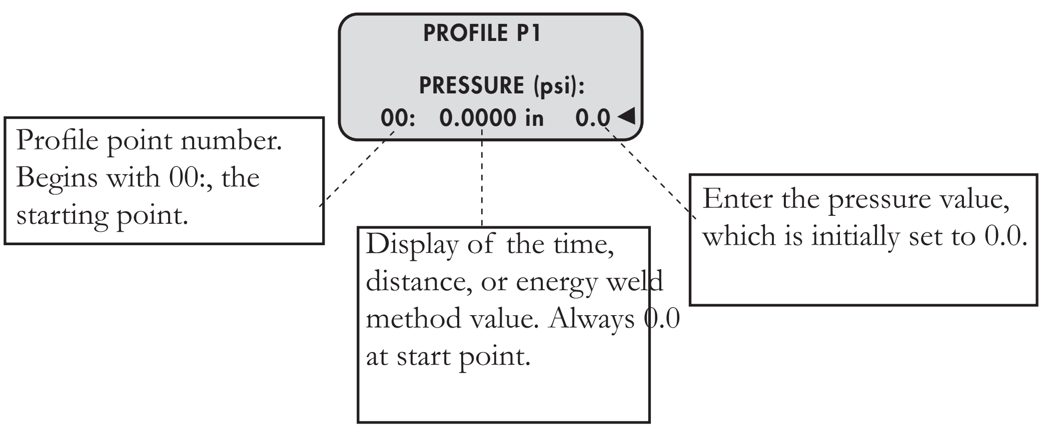


Figure 7-32 *Pressure Profile Display*

The DPC will automatically divide any time, distance, or energy value set in WELD METHOD (in the PROCESS CONTROL menu) by 10 and display those resulting values on consecutive 01: - 10: profile point screens after the start (00:) screen.

Pressure Profiling, continued

6. On the start (00: profile point) screen, press the or keys to change the cursor position.
   A. With the DPC–4 Plus, use the or keys to set the pressure value.
   B. With the DPC–4, use the and keys to set the pressure value.

   When finished, press .

   The 01: profile point screen will appear.

7. On the 01: profile point screen, press the or keys to change the cursor position.
   A. With the DPC–4 Plus, use the or keys to set the pressure value.
   B. With the DPC–4, use the and keys to set the pressure value.

   When finished, press .

   The 02: profile point screen will appear.

Continue until all ten profile point screens are programmed.

8. Once all ten P1 profile points are programmed, the PROFILE P2 start screen appears.

If you are welding with single pressure, press .
If you are welding with dual pressure, then program all of the P2 profile points as instructed above.

9. When all profile points are programmed, press twice.

The DPC will return to the Main Menu.

Amplitude

Amplitude selection is done through the LOCAL menu.

LOCAL allows the operator to set amplitude values for:

• **Weld,** • **Afterburst,** and • **Test.**

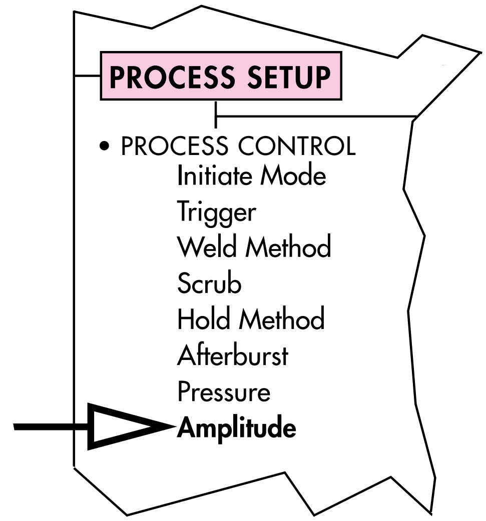


Figure 7-33 *Amplitude Menu*

> **NOTE**
>
> *Amplitude refers to the peak-to-peak excursion of the horn at its workface. Amplitude settings are given as a percent of the horn's nominal amplitude in the range of 37% - 100%.*

Weld

Enter the amplitude that is used for the whole weld cycle.

Afterburst

Enter the amplitude for the Afterburst portion of the system operation.

Test

Enter an amplitude to be used when testing acoustic stack components (transducer, booster, horn).

Entering an Amplitude Value

Using the Amplitude menu, move to the item appropriate for your process. See Figure 7-34 that illustrates with WELD how the DPC display will look.

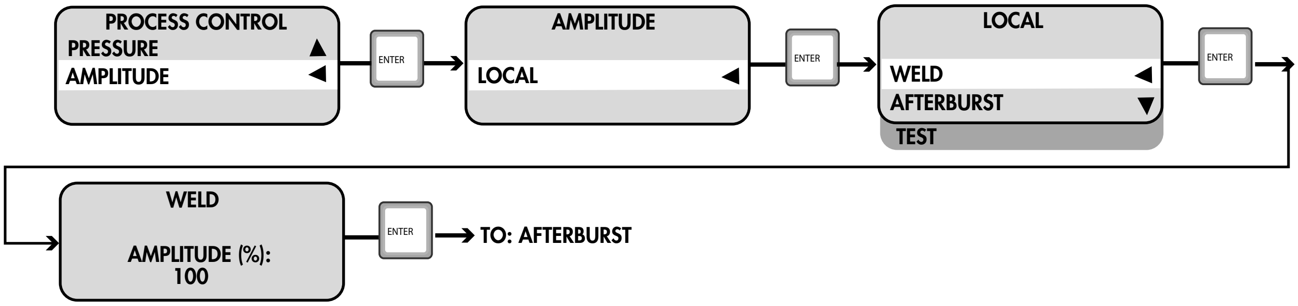


Figure 7-34 *Entering an Amplitude Value*

This page intentionally left blank

SECTION 8

Process Setup – Process Limits

- This section describes process characteristics and shows how to establish limits for them.

This page intentionally left blank

Overview

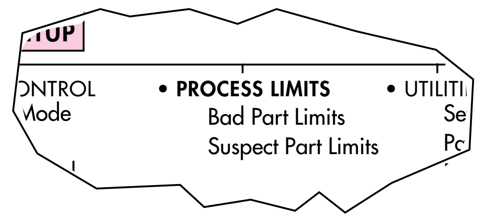


Figure 8-1 *Process Limits Menu*

As the weld cycle progresses, time, distance, power, and energy data are kept for each portion of the cycle. These measurements, also called *process characteristics,* form a process record for each part. Records' analysis can establish parts limits which then can be used to determine if the current process is "in control". The DPC can report the process characteristics as Bad or Suspect. The characteristics can also be displayed or printed without evaluation.

Limits are set using either statistical methods or physical system constraints. Statistical methods can be applied to pre-production parts that were evaluated for physical characteristics of quality (e.g., strength, appearance). Results of this evaluation are correlated to the process characteristics. Limits for the characteristics related to part quality are calculated. Other limits are determined by the system itself. For instance, Total Cycle Time limits may be established to end the cycle before an index table moves. Downstroke Distance may be set to detect a misload or incomplete assembly

Available Process Characteristics

NOTE

Of the available process characteristics the ones that apply to a particular part depend on the current DPC setup for that part.

Here is a list of the available process characteristics followed by brief descriptions of each characteristic.

1. Line Pressure
2. Downstroke Time
3. Downstroke Dist
4. Downstroke Velocity
5. Contact Pressure
6. Trigger Delay Time
7. Trigger Delay Distance
8. Weld Time P1
9. Weld Distance P1
10. Weld Energy P1
11. Peak Power P1
12. Weld Distance P2
13. Weld Time P2
14. Weld Energy P2
15. Peak Power P2
16. Absolute Distance
17. Total Weld Time
18. Total Weld Dist
19. Total Weld Energy
20. Hold Time
21. Hold Distance
22. Total Cycle Time
23. Total Stroke
24. Time
25. Date

Process Characteristics Defined

Line Pressure (Electronic Pressure Regulator Systems Only) – This is a measurement of line air pressure at the start of the cycle.

Downstroke Time – This is the time from the start of the welding cycle to the trigger point. Downstroke time can be used in all trigger modes except Probe.

Downstroke Distance (Distance Encoder Systems Only) – This is the distance from the distance encoder reference mark to the trigger point.

Downstroke Velocity (Distance Encoder Systems Only) – This is a measurement of how fast the press head moves in relation to the distance encoder reference point.

Contact Pressure (Electronic Pressure Regulator Systems Only) – This is a measurement of the line pressure at the trigger point.

Trigger Delay Time – The ultrasound signal can be delayed by a specified amount of time after the trigger switch has closed. The window (See *Window*, Page 101.) for this characteristic is set in microseconds.

Trigger Delay Distance – The ultrasound signal can be delayed until the press travels a specific distance beyond the trigger point. This window for this characteristic is set in inches.

Weld Time P1 – This is the length of time the ultrasound is applied to the part while Pressure 1 is applied to the part.

Weld Distance P1 (Distance Encoder Systems Only) – This is the distance the press travels while the ultrasound signal is applied to the part under Pressure 1.

Weld Energy P1 (Energy Systems Only) – This is the amount of energy drawn from the generator while the ultrasound signal is applied to the part under Pressure 1.

Peak Power P1 (Energy Systems Only) – This is the highest instantaneous power delivered to the transducer during the Pressure 1 portion of the weld cycle.

Weld Time P2 – This is the length of time the ultrasound is applied to the part while Pressure 2 is on the part.

Weld Distance P2 (Distance Encoder Systems Only) – This is the distance the press travels while the ultrasound signal is applied to the part under Pressure 2.

Weld Energy P2 (Energy Systems Only) – This is the amount of energy drawn from the generator while the ultrasound signal is applied to the part under Pressure 2.

Peak Power P2 (Energy Systems Only) – This is the highest instantaneous power delivered to the transducer during the Pressure 2 portion of the weld cycle.

Absolute Distance (Distance Encoder Systems Only) – This is the user-defined distance the horn travels from the distance encoder reference mark (regardless of when the horn contacts the part).

Total Weld Time – This is available when dual pressure welding is selected. It is the total of P1 and P2 weld times.

Total Weld Distance (Distance Encoder Systems Only) – This is available when dual pressure welding is selected. It is the total of P1 and P2 weld distances.

Total Weld Energy (Energy Systems Only) – This is available when dual pressure welding is selected. It is the total of P1 and P2 weld energies.

Hold Time – This is the time the horn maintains pressure on the part after the ultrasound signal has stopped, and while Pressure 2 is applied to the part.

Hold Distance – This is the distance the press travels while maintaining Pressure 2 on the part after the ultrasound signal has stopped.

Total Cycle Time – This is the period from the start of the weld cycle to the end of the weld cycle. The start of the cycle is defined as the point the auto input signal begins or when manual activation switches are closed. The end of the cycle is defined as the point the head retracts from the part.

Total Stroke (Distance Encoder Systems Only) – This is the absolute press position as measured from the distance encoder reference mark. It is active during the entire cycle.

Time – This is the current time of day according to the DPC timer.

Date – This is the current date according to the DPC timer.

Bad Part Limits

Bad part limits are used to establish boundaries that define unacceptable results for parts being processed.
If a "bad" limit is either not met or is exceeded, the weld cycle is terminated immediately, and the operator is notified in these ways:

Figure 8-2 *Bad Part Limits Menu*

- The front panel display shows a set of two "less than" (<<) or a set of two "greater than" (>>) symbols corresponding to limits not met, or limits exceeded respectively. The example in Figure 8-3 shows the Part Count display indicating that the Line Pressure limit was exceeded.

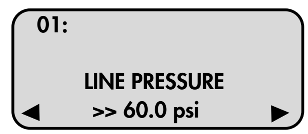


Figure 8-3 *Part Count Display*

- Two beeps are given (if the DPC buzzer is set to ON). (See Buzzer Status, Page 55.)

- The DPC bad part output is activated. (This output can be defined as maintained or pulsed depending on customer requirements. See Page 53.)

Refer to Figure 8-4 for an illustration of how to use the menus to select Bad Limits. LINE PRESSURE will be the example process characteristic we use here.

When LINE PRESSURE is on Line 3 of the Bad Limits display, press ENTER
.

The Line Pressure display shows three choices:
DISABLED, DISPLAY, and WINDOW. See Figure 8-5.

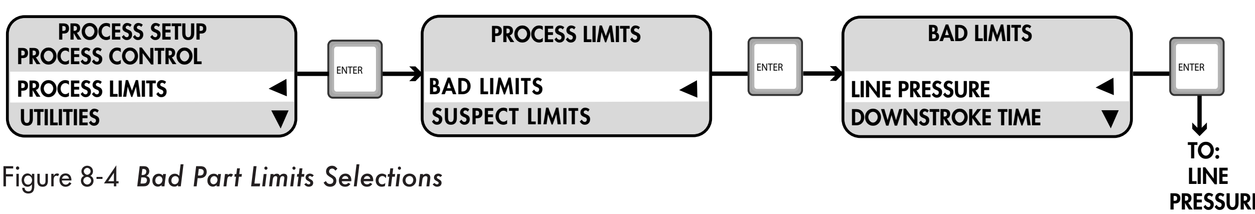


Figure 8-4 *Bad Part Limits Selections*

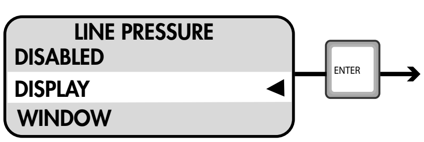


Figure 8-5 *Line Pressure Choices*

Disabled

If Disabled is chosen:

- weld characteristics are not monitored or stored in memory.

Display

If Display is chosen:

- process characteristics are stored in memory, and
- the selected characteristic(s) can be monitored on the display during normal operation.

Window

When Window is chosen:

- upper and lower limits for process characteristic parameters can be set initially or changed at a later time.
- the parameters are stored in memory, and
- the parameter(s) can be monitored on the display during normal operation, and
- if the limits for selected parameters are not reached, the assembly process is stopped, and the part is identified as a bad part.

Continuing with the example of LINE PRESSURE as the process characteristic, establish limits by entering values for MAX PRESSURE and MIN PRESSURE as shown in Figure 8-6.

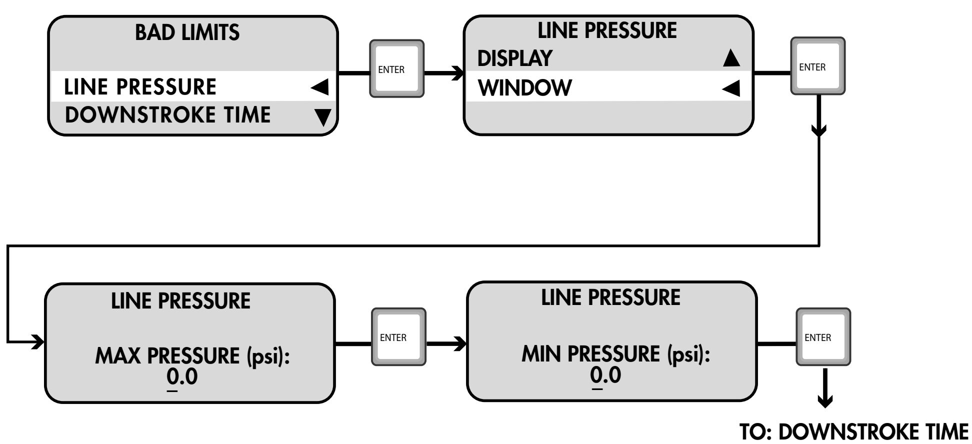


Figure 8-6 *Selecting Bad Part Limits*

Secondary Control

Secondary controls provide additional ways to end the weld portion of a cycle together with the primary control method specified. This means control of the weld process can be accomplished either by the primary control or by one or more secondary controls.

Not All Characteristics Have Secondary Control

Secondary controls can be selected for the following process characteristics:

Weld Energy P1

Peak Power P1

Weld Energy P2

Peak Power P2

Absolute Distance

Total Weld Time

Total Weld Distance

Total Weld Energy

Total Cycle Time

Total Stroke

EXAMPLE

If you are using dual pressure welding, and a P1 secondary control limit is reached, control is transferred to the P2 portion of the cycle. Otherwise, control is transferred to the Hold portion of the cycle (if it is enabled), or to the Upstroke portion of the cycle.

Suspect Part Limits

Suspect part limits detect out-of-limit conditions without ending the weld cycle. These limits are used when process characteristics are grouped within a "gray area" between good and bad. By using suspect part limits, good, bad and suspect parts can be sorted. Suspect parts can be inspected manually. The suspect limits can also be used as a form of pre-control in applications where statistical process control methods are being used.

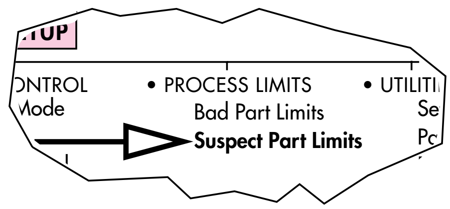


Figure 8-7 *Suspect Part Limits Menu*

To notify the operator that a suspect part limit has not been met or that it was exceeded, these events occur:

- The front panel display shows one "less than" (<) or one "greater than" (>) symbol corresponding to limits not reached, or limits exceeded, respectively. The example in Figure 8-8 shows the Part Count display indicating that the Line Pressure limit was not reached.
- One beep is given (if the DPC buzzer is set to ON). (See Buzzer Status, Page 55.)
- The DPC suspect output is activated. (This output can be defined as maintained or pulsed depending on customer requirements. See Page 53.)

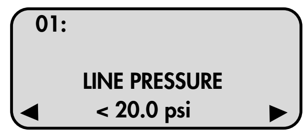


Figure 8-8 *Part Count Display*

When selecting suspect part limits you must select either Disabled or Enabled. The selections are explained below.

Disabled

If Disable is chosen:
- weld characteristics are not monitored or stored in memory.

Enabled

If Enable is chosen:
- the upper and lower process characteristic limits can be initially set or changed.
- the characteristics are stored in memory, and
- the characteristic(s) can be monitored on the display during normal operation, and
- if the selected process characteristic limits are not met, the part is identified as a suspect part.

See Figure 8-9 on the next page as a guide to the DPC menus.

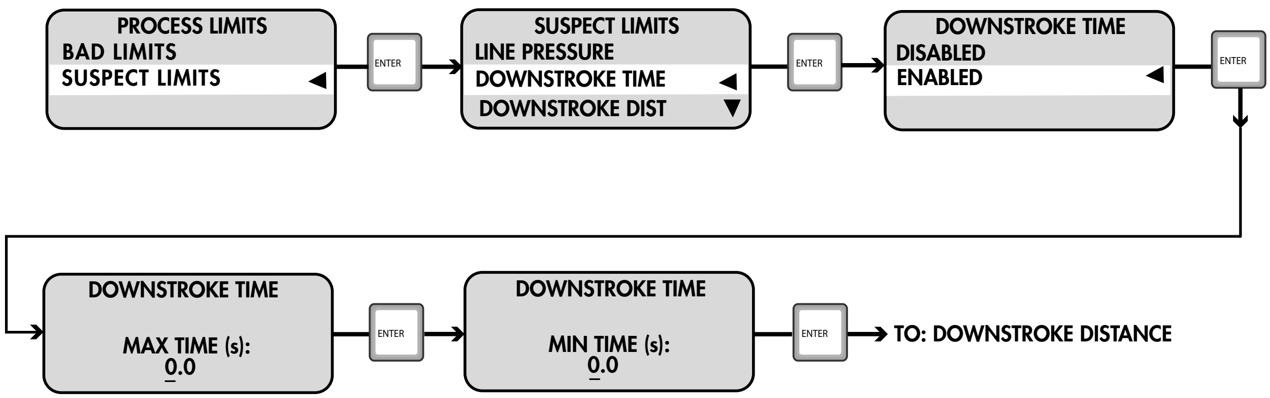


Figure 8-9 *Selecting Suspect Part Limits*

SECTION 9

Process Setup – Utilities

- This section describes how Utilities can be used for setup management and for diagnostic tools.

This page intentionally left blank

Overview

The Utilities series of menus provide setup management and diagnostic tools. User parameters are also included that allow a unique name to be assigned to each setup. In addition, names or descriptions of external system components such as the booster, and horn can be given.

When named, setups and components are identified, and this information can be used to recall setup conditions.

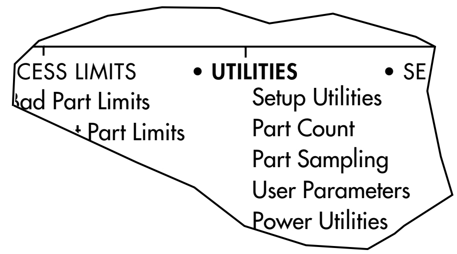


Figure 9-1 *Utilities Menu*

Setup Utilities

Setup Utilities uses these four submenus to manage setups:

- Select,
- Copy,
- Erase, and
- Print.

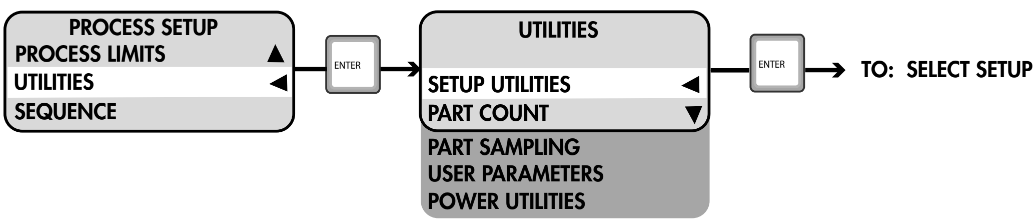


Figure 9-2 *Selecting Setup Utilities*

Select Setup

Press ENTER to choose Select Setup, and a list of 25 available setups is displayed. See Figure 9-3.

Figure 9-3 *Selecting a Setup*

Verify Setup Choice

Verify that your choice is the current setup by tapping the ENTER key to bring up the initial display where the setup number is shown as seen in Figure 9-3a below.

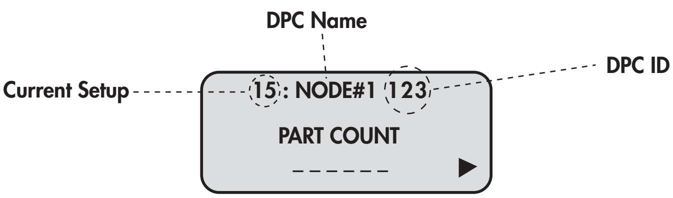


Figure 9-3a *Verify Setup Choice*

Copy a Setup

With COPY A SETUP data is copied from the chosen setup into the current setup.

CAUTION

Setup data may be erased accidentally! Proceed carefully through these menus for

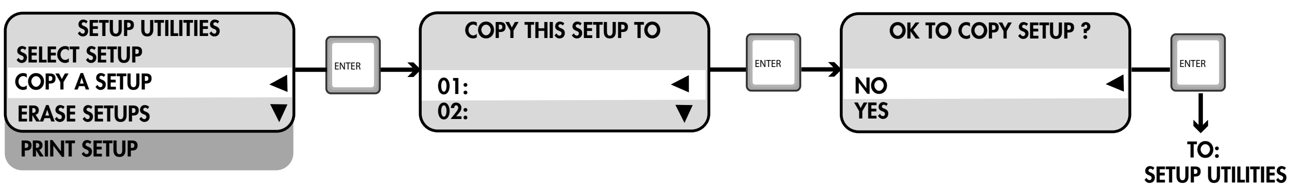


Figure 9-4 *Copying a Setup*

NOTE

To indicate that the DPC is accomplishing copy and erase functions, the word, WORKING *appears on the display.*

Erase Setups

Selecting ERASE SETUPS allows the operator to erase either the current setup or the entire list of setups. See Figure 9-5.

Current Setup

To erase the current setup from the DPC memory, choose ERASE CURRENT SETUP. A secondary display asks you to verify that this is what you want to do with the question,
"OK TO ERASE SETUP?"

> **CAUTION**
> ***Setup data may be erased accidentally!***
> ***Proceed carefully through these menus for***

All Setups

To erase all setups from the DPC memory, choose ERASE ALL SETUPS. A secondary display asks you to verify that this is what you want to do and asks, "OK TO ERASE MEMORY?"

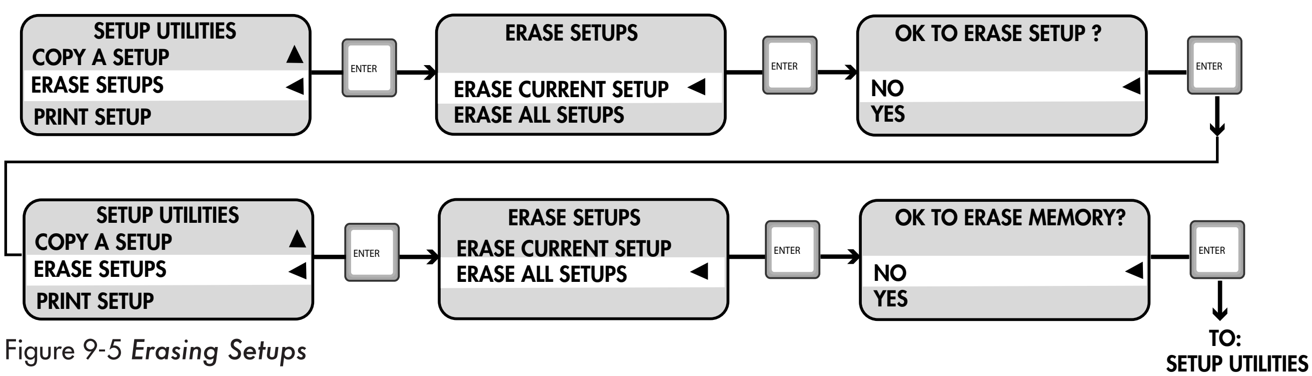


Figure 9-5 *Erasing Setups*

Print Setup

When PRINT SETUP is chosen, a hard copy printout of the selected setup will be made.

> **NOTE**
>
> *For this feature to work, see Section 5, Hardware Setup, Pages 41-46 on setting up the printer port.*

Part Count

This utility permits part count modification through its three sub-menus:

- Reset Part Count,
- Preset Part Count, and
- Count Bad Part

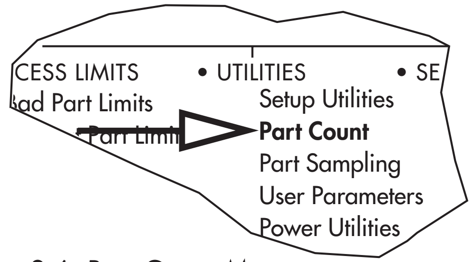
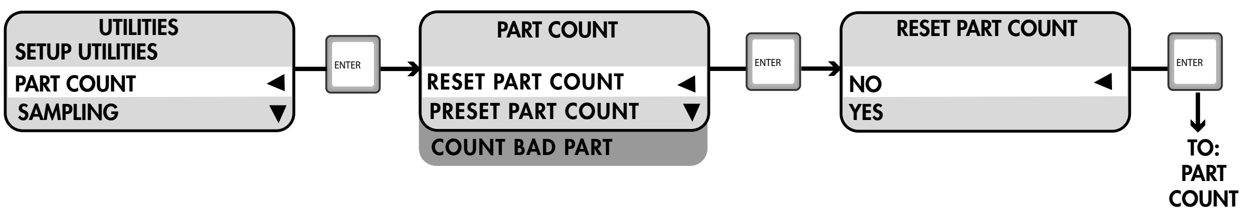


Figure 9-6 *Part Count Menu*

Reset Part Count

Selecting RESET PART COUNT makes these immediate changes:

- sets the part count to zero (0), and
- sets the sample counter to zero.



Preset Part Count

PRESET PART COUNT allows the operator to enter any number for the part count up to 999,999.

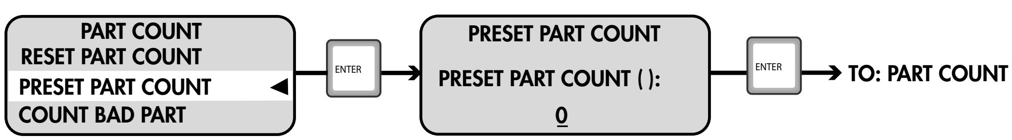


Figure 9-8 *Preset Part Count*

Count Bad Part

Use the COUNT BAD PART menu if you need a count of unacceptable parts.

Part Sampling

Part sampling can be used to record the amount and kind of parts processed. This is done with these submenus:

• Lot Size, • Sample Size, • Exclude, and • Store.

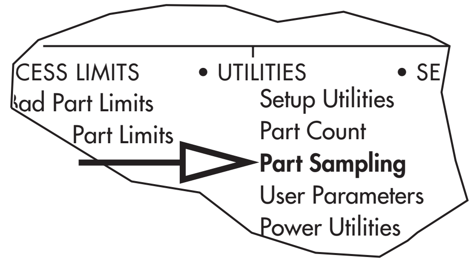


Figure 9-9 *Part Sampling Menu*

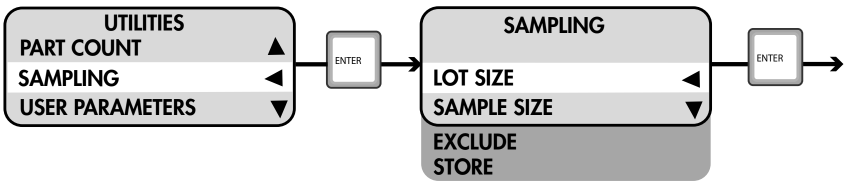


Figure 9-10 *Sampling Selection and Settings*

Lot Size

Lot size is the total number of parts in each group to be sampled.

Sample Size

Sample size is the number of parts in each lot to be sampled.

EXAMPLE

A lot of 10,000 parts has a sample size of 1,000 parts.

Exclude

Use EXCLUDE to enter a choice of part types to exclude, or avoid,

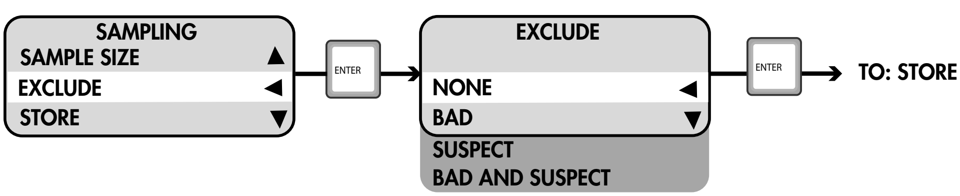


Figure 9-11 *Selecting Exclude*

Store

Use STORE to indicate the types of parts to be stored in memory regardless of the sample count.

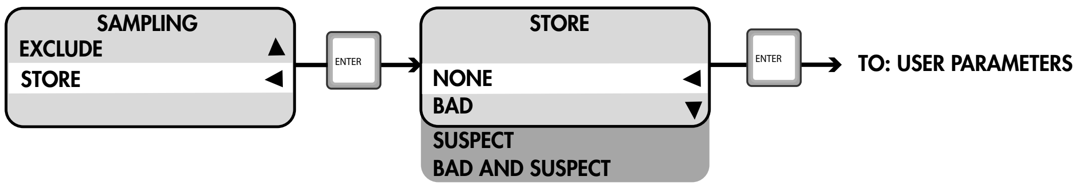


Figure 9-12 *Selecting Store*

User Parameters

Entries made with the User Parameter menus allow the operator to identify:

• Job, • Horn, • Booster, and • Fixture.

Displays for this identification consist of a field of 10-character text with a three digit numeric field.

When a setup is printed, user parameters are included in the print-out. This documents the job ID, and tooling used.

Documenting an application (and specific conditions) can save future setup time when trying to duplicate the same or similar setup.

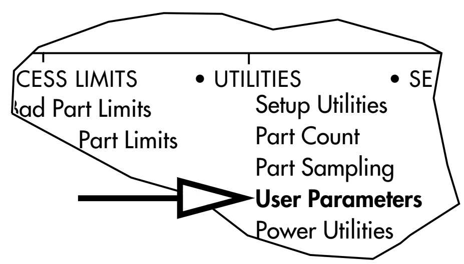


Figure 9-13 *User Parameters Menu*

Job ID

The Job ID can be a name or number given to identify the current job. This ID will appear at the top of each setup next to the setup number. When selecting a new setup, Job ID and setup number appear on the DPC's front panel display. See Figure 9-3a on Page 106.

A job can be selected by name or by number. See Figure 9-14.

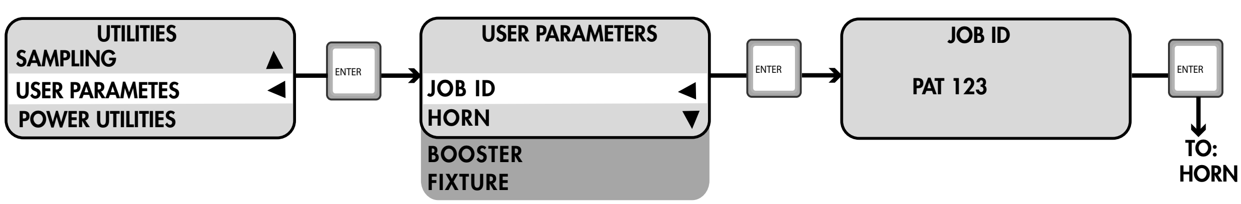


Figure 9-14 *Selecting Job ID*

Horn

Use the HORN menu, to enter a name or number to identify the horn.

Booster

Use the BOOSTER menu, to enter a name or number such as the gain ratio (Example: 2 to 1) to identify the booster.

Fixture

With the FIXTURE menu, the operator can enter a name or number identifying the fixture.

Power Utilities

Menus associated with Power Utilities allow the operator to display the present, instantaneous ultrasound power output level as measure by the DPC energy module.
The menu also allows for selection of a sampling rate when measuring the power output.

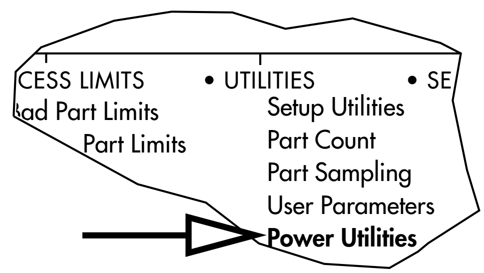


Figure 9-15 *Power Utilities Menu*

Power Averaging

Some applications, such as inserting and cutting generate "noise" in the ultrasonic signal which causes extreme fluctuations in the power measurement. Although these extremes do not affect system operation, they do limit the usefulness of power measurement for control and monitoring.

Power Averaging is used to "filter" the power measurement, limiting the amount of fluctuation, and providing for a "smooth" power vs. time curve.

Filtering is performed by a moving average. Selections are EIGHT, FOUR, TWO and DISABLED (one) power samples. These values represent the number of measurements that are averaged to get the present power measurement.

EXAMPLE

With the average set to eight, the last eight power measurements are averaged to get the latest power level. A new power measurement is taken every millisecond replacing the oldest of the last eight power measurements. See Figure 9-16.

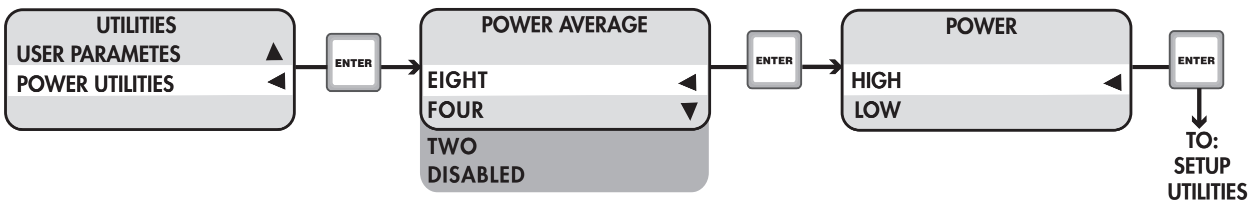


Figure 9-16 *Selecting Power Average*

High and Low Options

When Power Average is "Two", "Four", or "Eight"

High – Watt range is 0-400 watts. Resolution is 0.1 watt.

Low – Watt range is 0-4,000 watts. Resolution is 1 watt.

When Power Average is "Disabled"

High – When using weld by energy, the High setting controls energy to 0.1 joules.

Low – When using weld by energy, the Low setting controls energy to 0.01 joules.

SECTION 10

Process Setup – Sequencing

- This section describes how the DPC can be used for jobs needing multiple welds in a single setup.

This page intentionally left blank

Overview

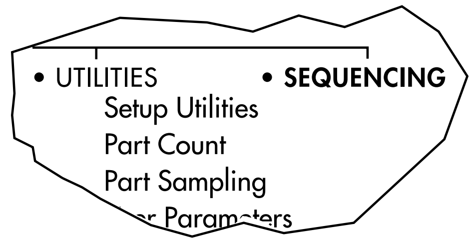


Figure 10-1 *Sequencing Menu*

The final submenu in Process Control is Sequencing.
Sequencing is typically used for operations where parts must be staked or inserted and need more than one processing step or more than one set of process parameters.

To use the sequencing feature, the operations performed on a part must be grouped according to a setup number. Once the setup parameters have been established for each group, determine the order in which the groups are to be processed.

This order of operations determines the order of the segments in the sequence definition.

(See, *Sequence Definition*, Page 118.)

Figure 10-2 gives a graphic representation of a sequence.

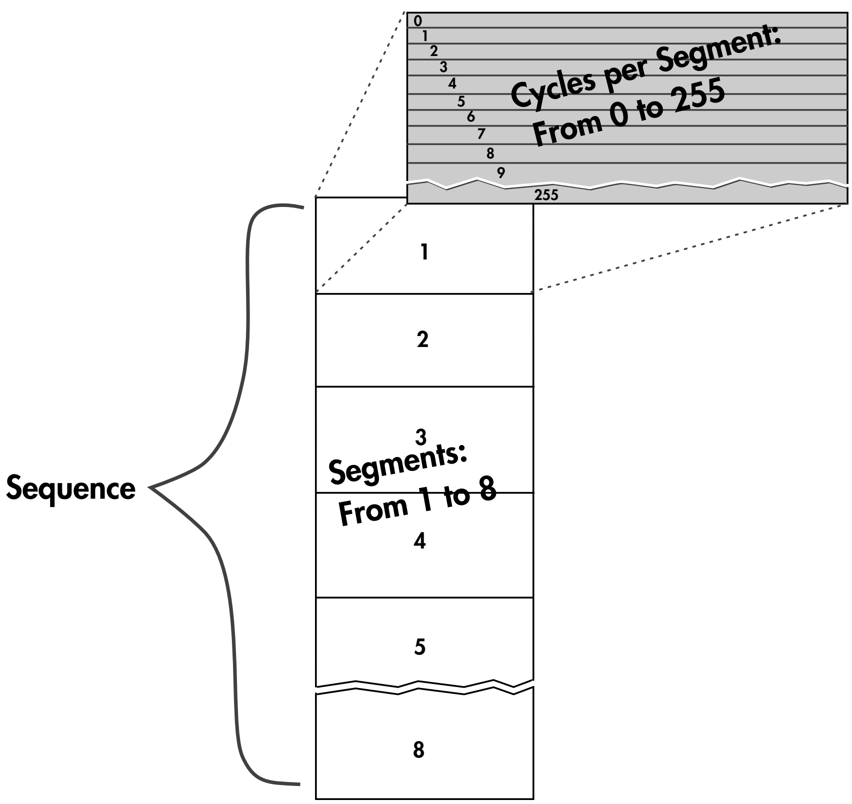


Figure 10-2 *What is a Sequence?*

EXAMPLE

In this example, a sequence to be used in an insert application has two segments. The first part of the sequence is known as Setup 01 which will process four #1 inserts. The second part of the sequence is Setup 02 which will process four #2 inserts.
Segment 1 deals with insert #1, and Segment 2 deals with insert #2. Each segment has four cycles. When the cycles are finished, the sequence is reset to begin processing another part.
Figure 10-3 gives a graphic representation of what this sequence might look like on an X-Y table.

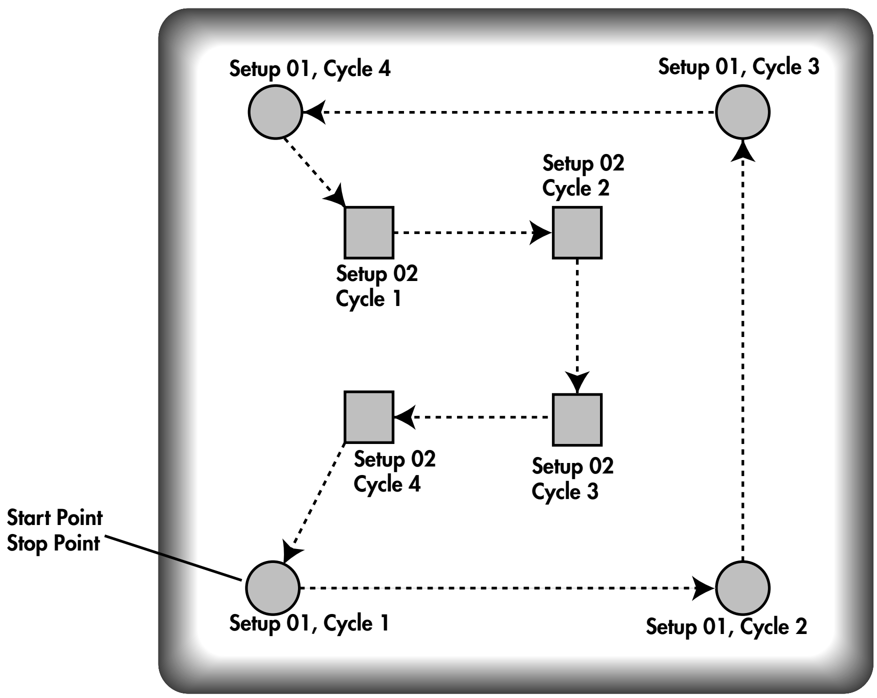


Figure 10-3 *Insertion Sequence Example*

Selecting Sequencing Settings

When SEQUENCING is chosen, its menus appear as shown in Figure 10-4.

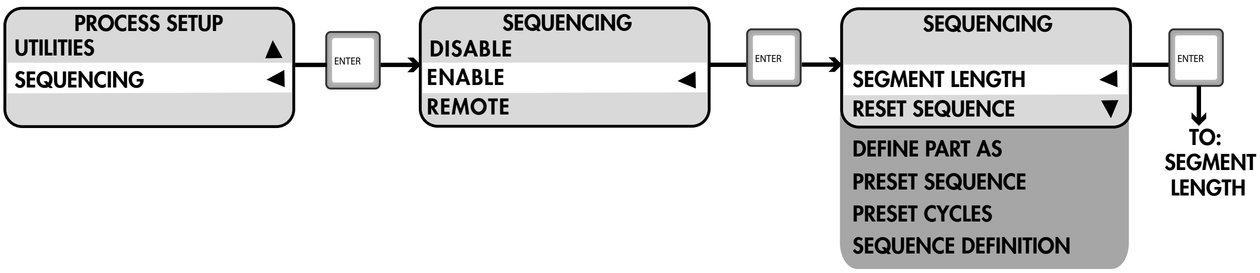


Figure 10-4 *Selecting Sequencing Settings*

Disable

Select DISABLE to prevent the use of Sequencing.

Enable

Select ENABLE so that a sequence can be specified.

As seen in Figure 10-4, when ENABLE is chosen, a list of six sequencing parameters appears. These parameters are explained beginning on the next page.

Remote

Remote file selection and sequencing is now supported in the DPC–4 Plus. This option is designed to allow a PLC or automation equipment to remotely select and switch setup files. This is accomplished by pins 3, 4, 5 and 6 on J901. Refer to Table C–3, C–8 and C–9 in Appendix C for pinout information.

When Sequencing Is Enabled

When Sequencing is enabled, six parameters that define the sequence need to be considered.

Segment Length

Set the number of segments in the sequence by choosing a number: 1 through 8.

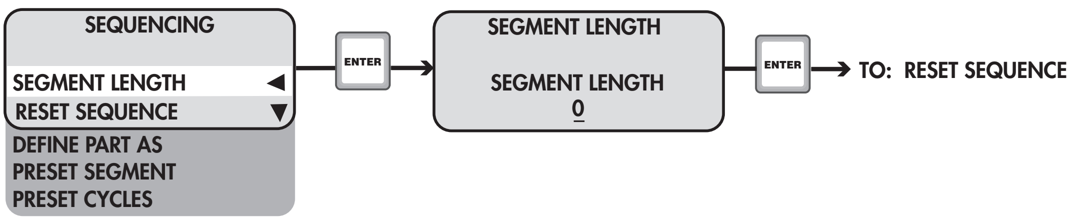


Figure 10-5 *Entering Segment Length*

Reset Sequence

Selecting YES means that an automatic sequence reset will occur for a selected event. This allows the system to return to the start of a sequence if a bad part, suspect part, or system abort occurs.

Select NO to disable the automatic sequence reset feature

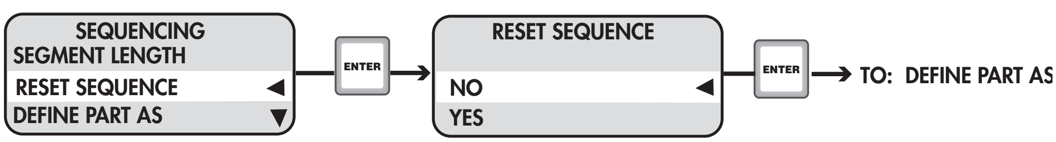


Figure 10-6 *Reset Sequence*

Define Part As

This selection controls how the system handles the part counter. When CYCLE is chosen, the part counter increments each time the system completes a weld. (Use CYCLE when the welding process is completed in a single cycle.)

When SEQUENCE is chosen, the part counter increments after every sequence. (Use SEQUENCE when welding a part needs more than one type of setup.)

In this way a single part number can be associated with a multi-operation assembly. All data generated for an entire assembly will have the same part number.

Preset Segment

This feature applies only to the first part that is welded. It is aimed at correcting a problem for one part at a time, the **first** part. Setting the segment pointer allows resetting or presetting a sequence in cases where a process problem requires that an operation or group of operations needs repeating.

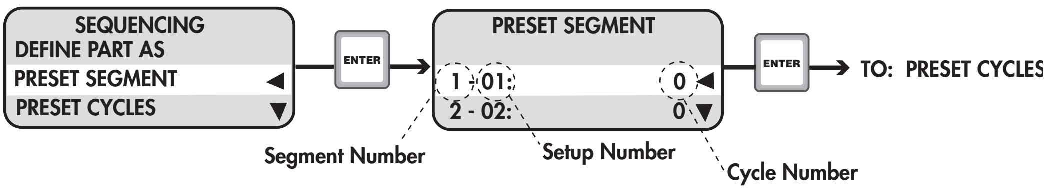


Figure 10-7 *Selecting Preset Segment*

Preset Cycles

The cycle pointer can be set manually by using Preset Cycles. This allows resetting or presetting of a sequence in cases where a process problem requires that an operation or group of operations needs re-peating. The feature works like the Preset Segment feature discussed above.

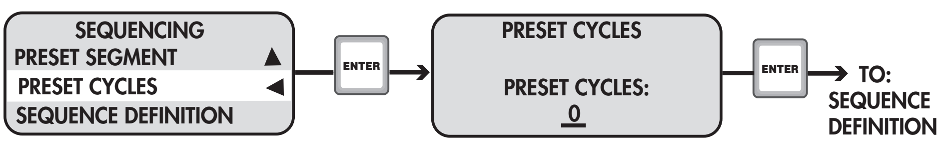


Figure 10-8 *Selecting Preset Cycles*

Sequence Definition

This Sequence Definition has three parts:
segment number, setup number, and number of cycles.
With this selection the operator can:
• choose to view a particular sequence definition,
• choose a setup (numbered 0-25) for modification, and
• choose the number of process cycles (0-255) for a given segment.

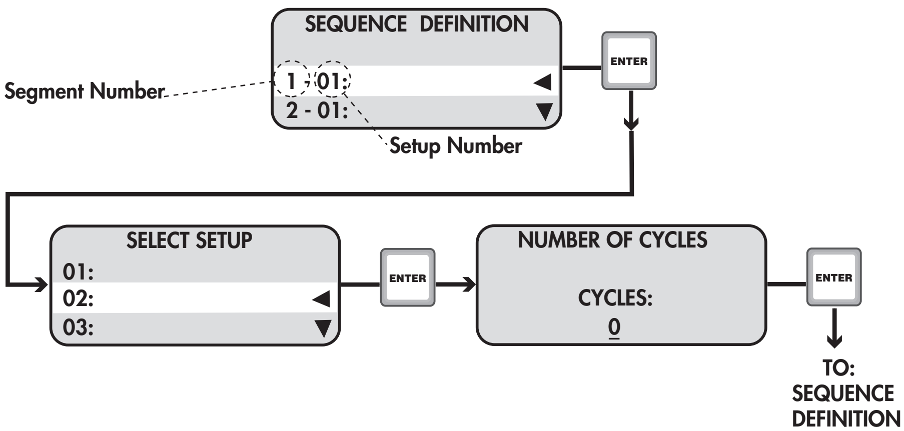


Figure 10-9 *Sequence Definition Selections*

SECTION 11

Operation

- This section describes ways to accomplish real-time monitoring of the process functions.

Overview

The Operate menu provides ways to monitor the process functions. It collects and sends process data as well. The menu is organized into four submenus as shown in Figure 11-1. Here is a brief description of each:

- VIEW PARAMETERS offers a monitoring function by providing a real-time look at a group of process parameters.
- PRINT HEADERS makes a provision for headers to be printed at the tops of columns identifying the data in the corresponding columns below.
- PRINT PART DATA provides a way to send accumulated parts data to a computer or printer.
- GRAPHING provides for setup and printing of graphs to show relationships between selected process characteristics.

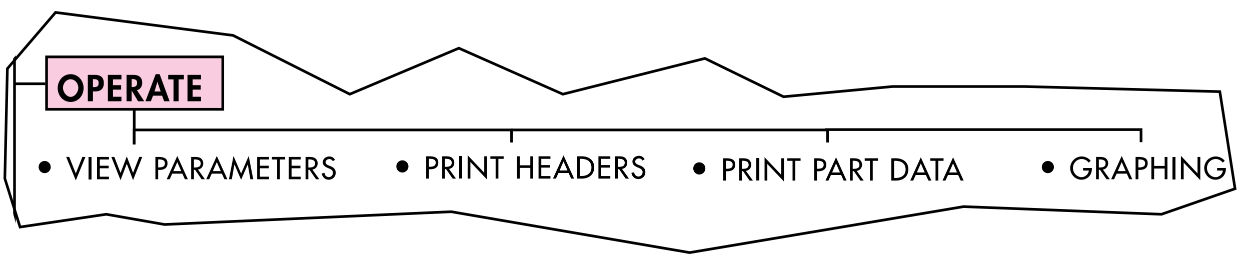


Figure 11-1 *Operate Menu*

View Parameters

VIEW PARAMETERS gives real-time monitoring of the following parameters during normal operation:

Distance (inches or millimeters)

Distance represents the position of the distance encoder. The measurement can be used to check whether the encoder is working. In addition, the reading can be used to determine where the top of a work part is.

Velocity (inches/millimeters per second)

The measurement shown is the operational speed of the thruster. When the system is not operating, the display is zero.

Power (watts)

The power level tells the operator if the energy/power subsystem of the DPC is operational. In addition it can be used to determine if the generator/stack subsytem is operating within normal limits.

Frequency (hertz)

The ultrasound signal frequency is displayed showing its fluctuations during normal operation, standby, and test.

Amplitude (percentage between 37 and 100)

The number displayed was entered through the Process Setup menu and represents the amplitude value for the part of the process being "viewed".

Force (pounds or newtons)

The display shows the amount of force applied to a part at the time the ultrasound signal is activated.

Pressure (pounds per square inch or kilopascals)

The display shows the amount of air pressure applied to the press. The operator can verify that the electronic pressure regulator and pressure transducer are working properly.

Memory (bytes)

The display shows the available memory in the DPC's CPU.

To view the parameters, go to the Main Menu, and select OPERATE. Then select VIEW PARAMETERS as shown in Figure 11-2.

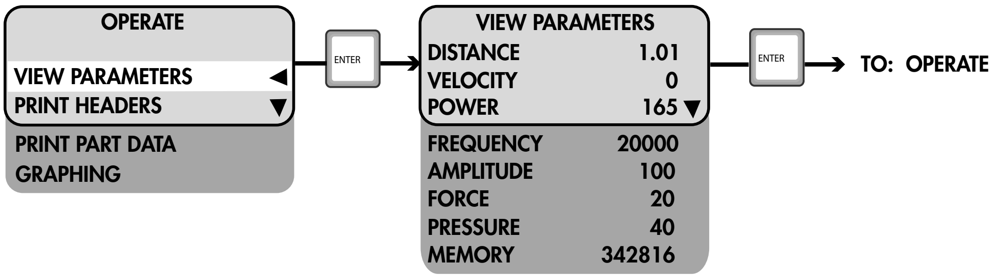


Figure 11-2 *Selecting Parameters*

Press until the parameters you want to see are on the DPC display.

Print Headers

Headers are titles that appear at the tops of data columns identifying what the data is in the corresponding columns below.

If you want headers to appear in the printout:

1. From the Operate menu, select PRINT HEADERS.

2. Next, select either PARALLEL or SERIAL. Your choice identifies the type of printer port you have.

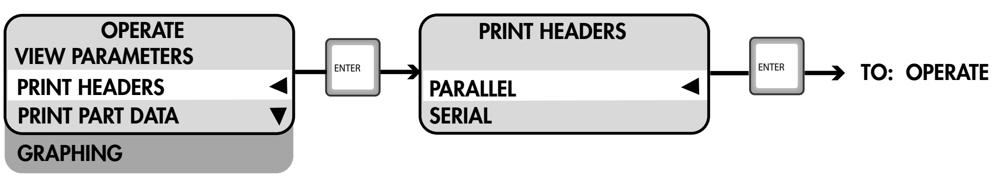


Figure 11-3 *Selecting Port*

See Figure 11-5 as an example of columns with headers.

Print Part Data

1. Select PRINT PART DATA from the Operate menu to send accumulated parts data to the assigned computer or printer. The data will be formatted together with headers (when the headers are enabled).

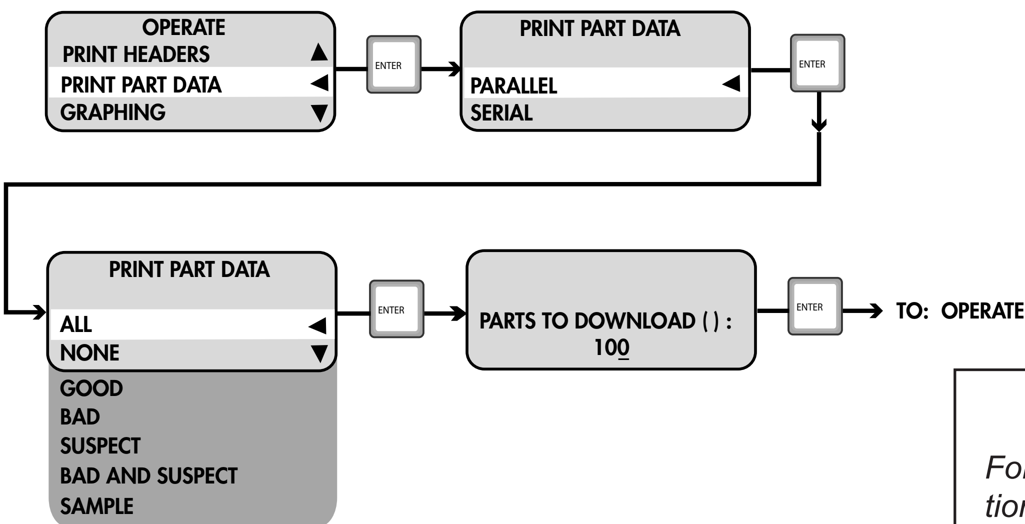


Figure 11-4 *Selecting Part Data*

NOTE

For more information about setting part limits, refer to Section 8, Process Setup – Process

2. Next, select which part data to print: All, None, Good, etc. from the list as shown in Figure 11-4.

3. Finally, enter the quantity of parts (up to six characters) to be printed. This number (of parts) is downloaded into the DPC memory, and held there until it is time to be released to the printer.

The data will be organized and printed out during normal operation of the ultrasonic assembly system. The printout could look something like that shown in Figure 11-5.

PART COUNT	LINE PRESSURE	DOWNSTROKE TIME	DOWNSTROKE DIST	DOWNSTROKE VELOCITY	CONTACT PRESSURE	TOTAL WELD ENERGY
1	41.4	0.670	4.0982	0.09819	35.4	2014.2
2	41.4	0.681	4.1003	0.09532	35.2	2013.8
3	44.9	0.688	4.0989	0.09390	35.4	2007.3
4	44.9	0.683	4.1002	0.09650	35.9	2003.4
5	45.4	0.691	4.1006	0.09552	35.9	2001.2
6	45.9	0.692	4.1009	0.09449	35.9	1999.5
7	45.9	0.693	4.0990	0.09754	35.4	1999.5
8	45.9	0.692	4.1004	0.09488	35.4	1995.6
9	47.9	0.696	4.0969	0.09468	35.4	1997.3
10	47.5	0.694	4.0952	0.09506	35.9	1989.5

Typical Header

Figure 11-5 *Example of Data Printout with Headers*

Graphing

1. To provide printed graphs of selected process characteristics, select GRAPHING from the Operate menu as the first of nine steps.

2. Select PRINT GRAPH, and then choose either PARALLEL or SERIAL. Your choice identifies your printer port type.

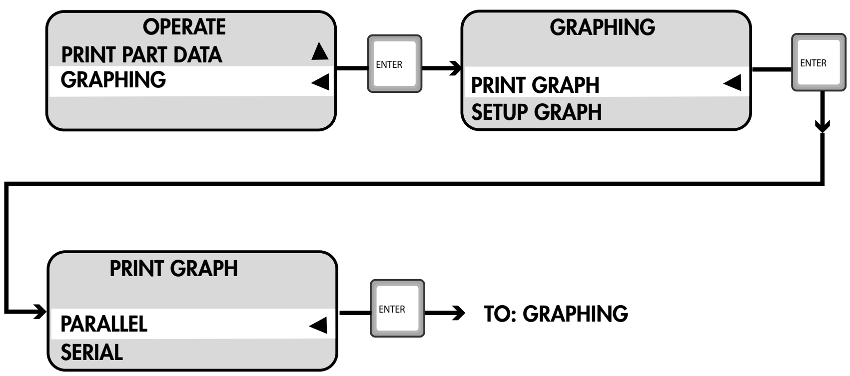


Figure 11-6 *Selecting Printer Port*

3. Select SETUP GRAPH so you can make choices about graph definition.

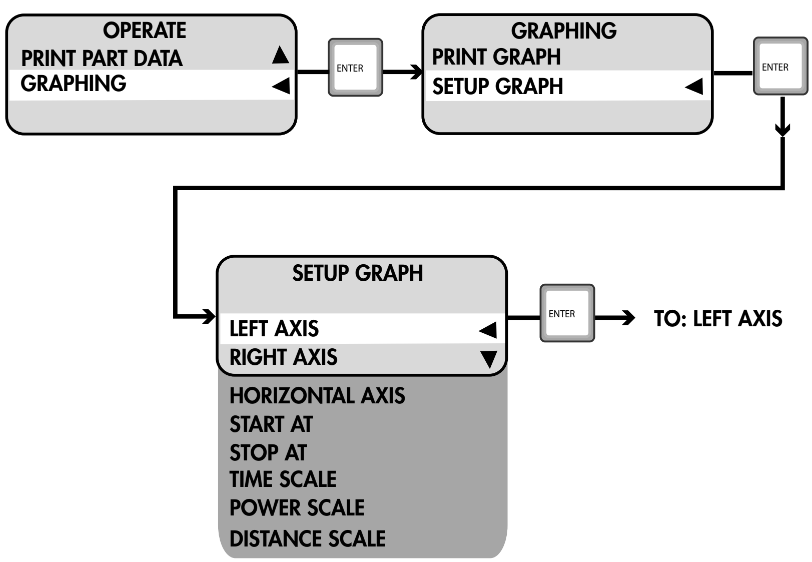
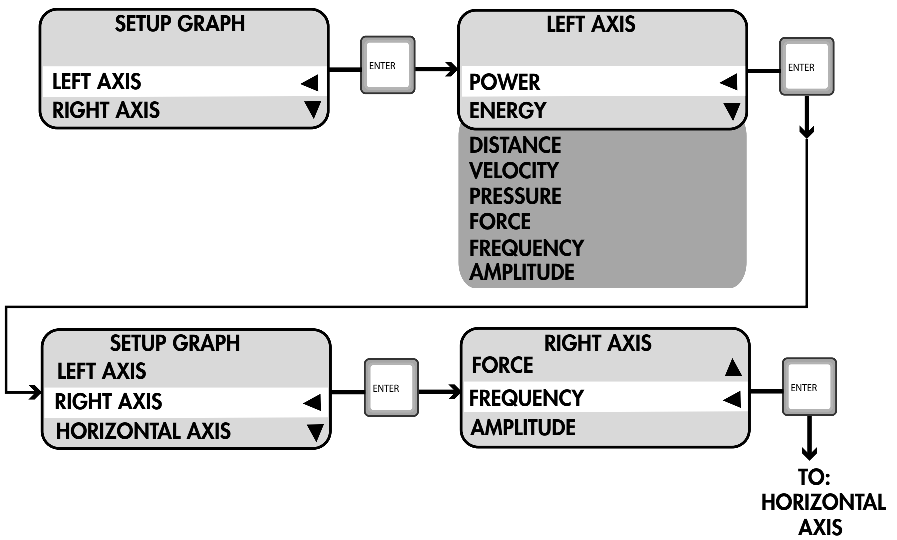


Figure 11-7 *Selecting Graph Setup Parameters*

4. Choose parameters for the left and right axes. These choices determine how process data is plotted vertically on the graph. In Figure 11-8 the left axis choice is POWER, and the right axis choice is FREQUENCY.



5. HORIZONTAL AXIS presents the next choice.
Figure 8-9 shows that TIME is selected.

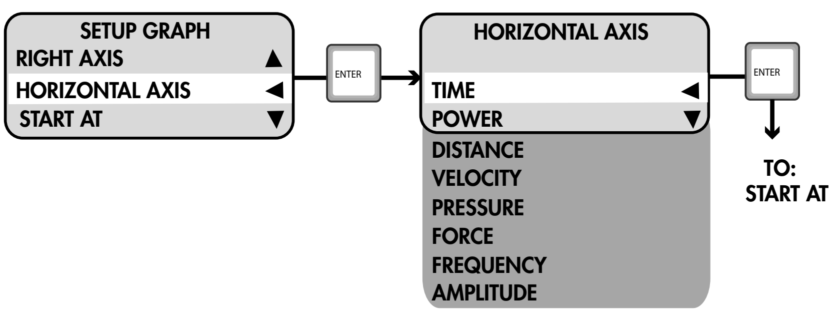


Figure 11-9 *Horizontal Axis Choice*

6. Select START AT to choose one of three events that will be the starting point for the graph:
   WELD, TRIGGER, or CYCLE START.

7. Select STOP AT to choose one of two events that will be the stopping point for the graph. The names of these events are:

   END OF WELD, and END OF HOLD.

NOTE

Step 8 applies only if Time, Power or Distance was chosen as the horizontal axis parameter.

8. Select only one of these three scales: TIME SCALE, POWER SCALE, or DISTANCE SCALE corresponding to either time, power or distance that was chosen as the horizontal axis parameter.

9. Next, choose the upper limit for the horizontal scale using one of two methods:

   Let the DPC Choose – Select AUTO. The DPC logic will pick an upper limit automatically, or

   Choose From a List – The operator may also choose from a list of specific values.

In the example shown in Figure 11-10, the horizontal scale is Time, so TIME SCALE was chosen. Next, a specific value (0.25 seconds) was chosen from the list as the scale's upper limit.

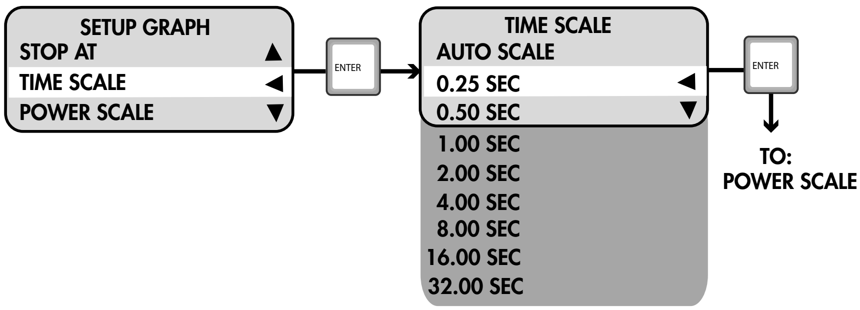


Figure 11-10 *Time Scale Settings*

NOTE
Ranges of Listed Choices:
Power Scale range is between 250 and 4,000 watts.
Distance Scale range is between .025 and 7.0 inches.

Figure 11-11 illustrates what a graph might look like. Notice that it incorporates the choices made in Steps 1-9 above.

NOTE
Be aware that graphs can be printed only when the welds occur, in real time. The DPC has no "storage area" from which graphing "images" can be retrieved later.

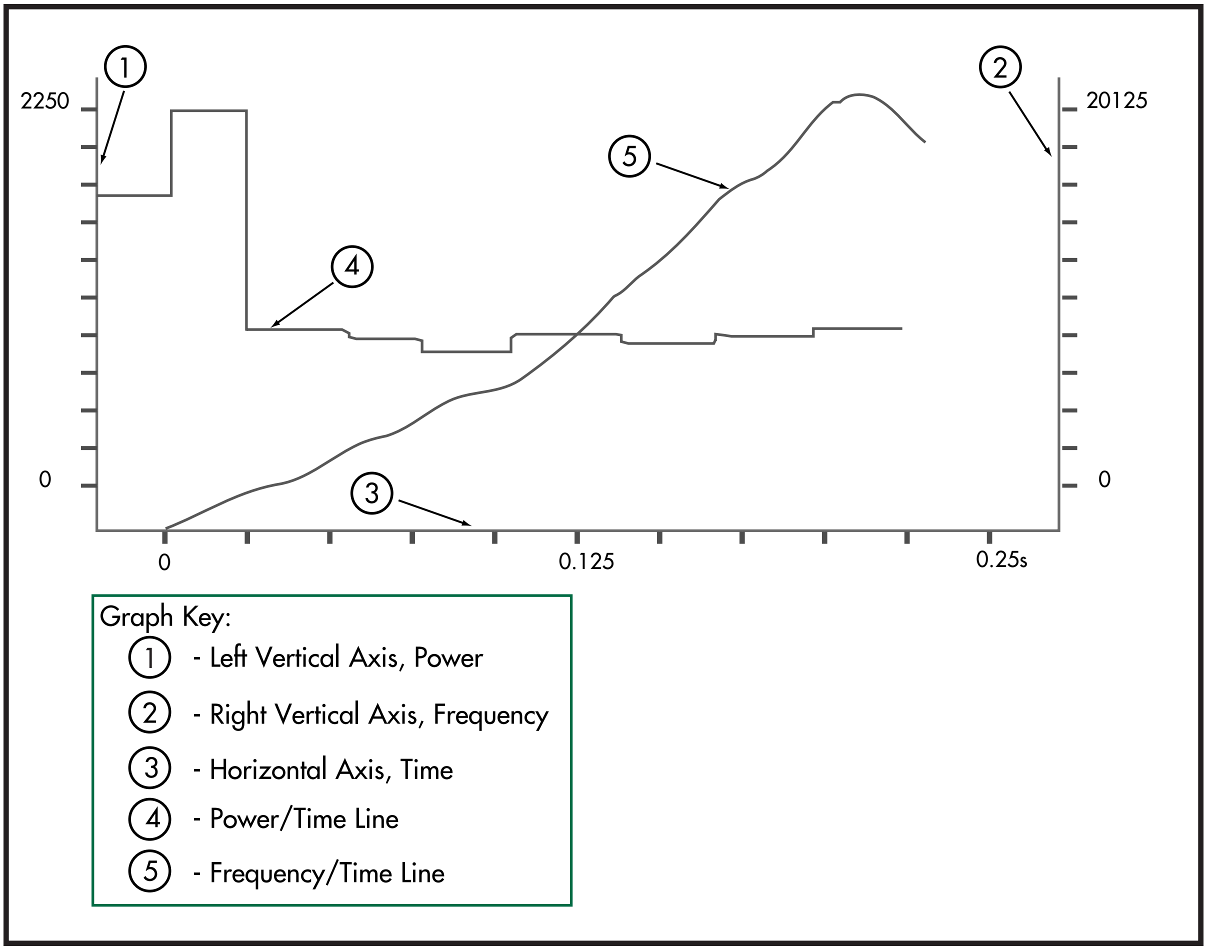


Figure 11-11 *Example of a Graph Printout*

> **NOTE**
>
> *Graph key, circled numbers, and labels were added to clarify graph components and do not appear in actual printouts.*

This page intentionally left blank

SECTION 12

Specifications

Regulatory Agency Compliance

FCC

The DPC IV complies with the following Federal Communications Commission regulations.

- The limits for FCC measurement procedure MP-5, “Methods of Measurement of Radio Noise Emissions from ISM Equipment”, pursuant to FCC Title 47 Part 18 for Ultrasonic Equipment.

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 Europeéne (European Conformity). The DPC IV complies with the following CE requirements.

- The EMC Directive 89/336/EEC for heavy industry —
  EN55011 and
  EN50082 using
    - EN61000–4–2
    - EN61000–4–3
    - EN61000–4–4
    - EN61000–4–5
    - EN61000–4–6
    - EN61000–4–8
    - ENV50204
- The Low Voltage Directive 73/23/EEC.
- The Machine Directive 89/392/EEC using EN60204–1:1993 Safety of Machinery – Electrical Equipment of Machines. Part 1: Specification for General Requirements.

CAUTION

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

Dimensions

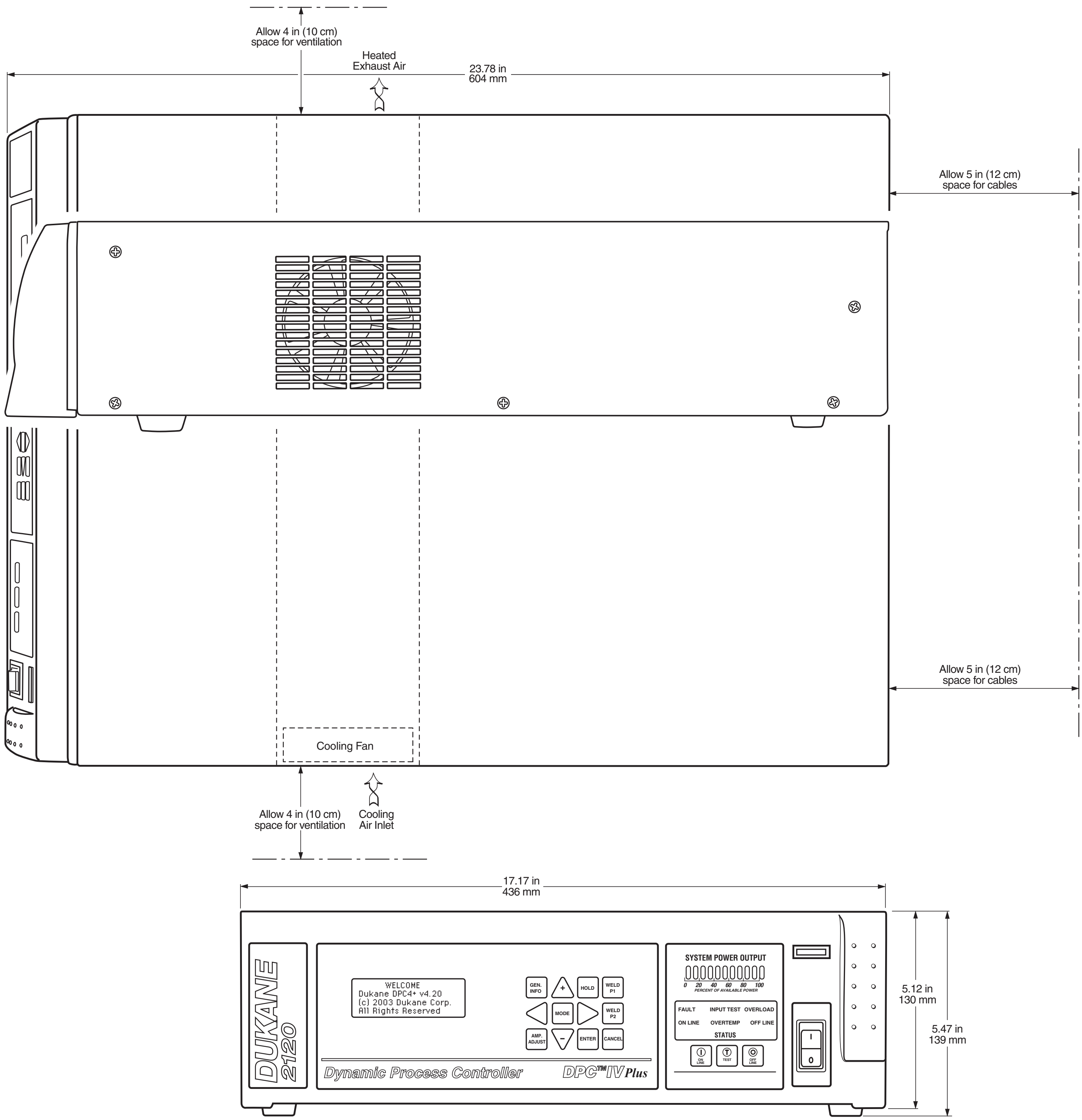


Figure12-1 *DPC–4 Plus Dimensions*

Generator AC Power Requirements

Table 12-1 lists the AC input power required for each DPC–4 Plus model.

Frequency	DPC–4 Plus Generator Model	Peak Power Rating (Watts)	Nominal Input Power Requirements	AC Outlet Current Rating
15 kHz	1400	4000	190–260V 50/60 Hz @ 30 Amps	30 Amps
20 kHz	2050	500	95–130V 50/60 Hz @ 8 Amps	15 Amps
			190–260V 50/60 Hz @ 4 Amps	15 Amps
	2120	1200	95–130V 50/60 Hz @ 15 Amps	15 Amps
			190–260V 50/60 Hz @ 8 Amps	15 Amps
	2170	1700	190–260V 50/60 Hz @ 12 Amps	15 Amps
	2220	2200	190–260V 50/60 Hz @ 15 Amps	15 Amps
	2300	3000	190–260V 50/60 Hz @ 25 Amps	30 Amps
30 kHz	3150	1500	190–260V 50/60 Hz @ 15 Amps	15 Amps
40 kHz	4035	350	95–130V 50/60 Hz @ 6 Amps	15 Amps
			190–260V 50/60 Hz @ 4 Amps	15 Amps
	4070	700	95–130V 50/60 Hz @ 12 Amps	15 Amps
			190–260V 50/60 Hz @ 8 Amps	15 Amps
	4100	1000	95–130V 50/60 Hz @ 15 Amps	15 Amps
			190–260V 50/60 Hz @ 8 Amps	15 Amps
50 kHz	5015	150	95–130V 50/60 Hz @ 6 Amps	15 Amps
			190–260V 50/60 Hz @ 4 Amps	15 Amps
70 kHz	7010	100	95–130V 50/60 Hz @ 6 Amps	15 Amps
			190–260V 50/60 Hz @ 4 Amps	15 Amps

Table 12-1 *Generator Models*

Operating Environment

Operate the DPC within these guidelines:

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

Pressure: **Ambient**

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

Interpreting the DPC Model Number

> **NOTE**
>
> **Figure 12-2** *is designed to help you determine which elements your DPC–4 Plus has. It is not meant to suggest that every combination of these elements is possible. Look on the DPC rear panel for the model number.*

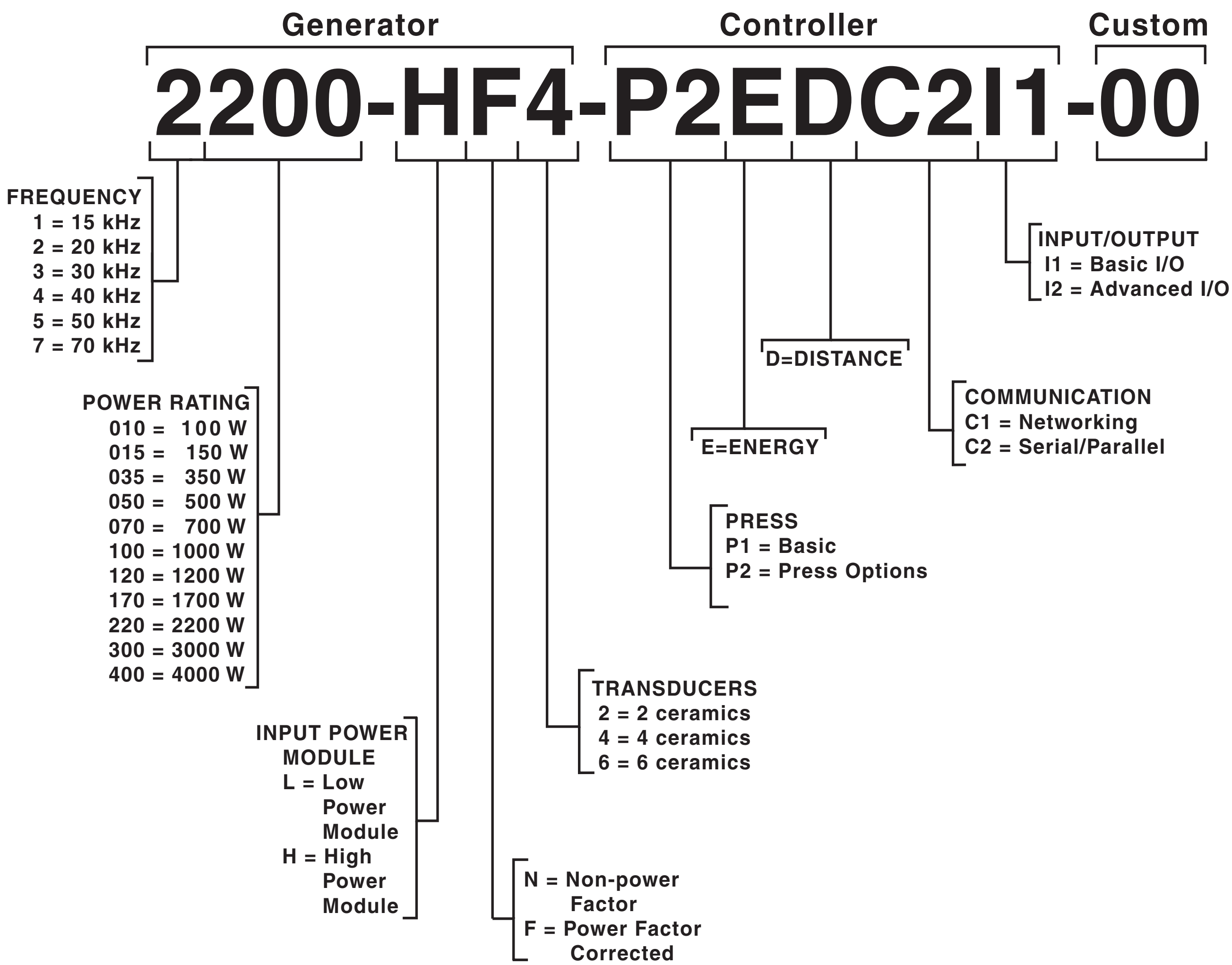


Figure12-2 *Interpreting the DPC–4 Plus Model Number*

SECTION 13

Care and Troubleshooting

This page intentionally left blank

Care

Environment

Prolong the life of your Dynamic Process Controller in these ways:

- Do not expose the DPC to moisture. Keep the unit dry.
- Minimize the DPC's exposure to, dust, dirt, smoke, and the extremes of temperature. All are factors which can shorten component life.
- Keep fingers clean. Because they will be touching the keypad, and can carry dirt, grease, etc., fingers should be as clean as possible.
- Handle the DPC with care. It is a sensitive electronic device, and should be treated accordingly. It is not designed to withstand high impact blows of any kind.

Front Panel

The operator controls on the front panel (keypad, generator control keys and AC power switch) respond to a gentle but firm touch. Never use a sharply pointed object to touch any of these controls.

CAUTION

PLEASE, do not use any sharply pointed object to touch any part of the DPC front panel!

Cleaning

When cleaning the DPC, put a small amount of computer cleaner on a soft cloth, and gently wipe the cloth and cleaner over the surface to be cleaned. Do not apply (spray or otherwise) any cleaner directly to the DPC.

Replaceable Parts

The DPC is a self-contained device and has no parts that are replaceable by the end user.
When parts need replacing, contact Dukane Corporation.
See Section 15 for contact information.

Troubleshooting

Problem	Possible Solution
Front panel display image disappears. Panel goes dark.	1. See that the green, LED power light is on for the DPC. If the light is not on, tighten all cable connections. 2. Make certain the DPC rear panel AC breaker switch and the front panel power switch are in the ON position.
MMI locks up; screen is unresponsive. **NOTE** *MMI version 2.60A firmware supports either the monochrome or the color MMI display.* *Version 2.60 supports only the color MMI display.*	Verify firmware versions. To communicate, DPC and MMI firmware versions have to be compatible as shown below: Compatible Firmware Versions: DPC MMI 1E or 1H ---------------------> 1E 2.00 ----------------------------> 2.00 2.60 ----------------------------> 2.60 or 2.60A 2.70 ----------------------------> 2.70 3.20 ----------------------------> 3.20
System Status Display shows OVERLOAD condition.	The ultrasound signal will shut down during an overload condition. If overloading continues, analysis of application and hardware may be needed. Contact Dukane Ultrasonics. See Section 15 for contact information.
Unit power-up sequence stops, and System Status Display INPUT TEST is flashing.	The self test routine for input power compatibility with the DPC has found a problem. The power-up sequence will not continue until the problem is resolved. Recheck line voltage and DPC system requirements. Another possibility: a fault may have occured on the DPC's input module circuit.

NOTE

Contact Dukane Corporation for servicing. (See Section 15.) The DPC and MMI are serviceable only by Dukane personnel. Unauthorized attempts to service either unit will void any warranty.

Message Overview

This material is designed to offer help in diagnosing certain problems that may be encountered while operating the DPC.

Error Messages

A typical display for an error message is shown in Figure 13-1. In some cases four lines are used to display the message. In other cases fewer lines will be used to display the message.

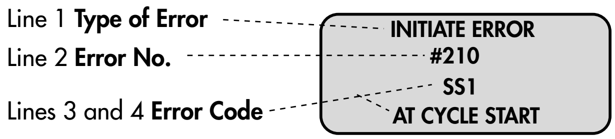


Figure 13-1 *Front Panel Error Display (Typical)*

Clearing Error Messages

Some error messages appear for only a second or two before clearing automatically. Others appear until the ENTER key is pressed.

When the condition that caused the error in the first place is removed, the error message will no longer appear.

Table 13-1 on the next page shows the messages you may see.

Error Number	Message	Explanation	Type	Remedy
210	SS1	This occurs when Initiate mode for Process Control is set to Manual and Activation Switch 1 is depressed at the start of the cycle.	Initiate Error At Cycle Start (The weld cycle will not start until the condition that caused the error is addressed.)	Release SS1.
211	SS2	This occurs when Initiate mode for Process Control is set to Manual and Activation Switch 2 is depressed at the start of the cycle.		Release SS2.
212	Auto	This occurs when Initiate mode for Process Control is set to Auto. There is an active Auto-In signal at system start-up, or an Auto-In signal has not been removed from the last cycle.		Remove active Auto-In signal.
213	Trigger	Trigger switch is closed at the start of a cycle.		Increase trigger pressure by turning knob on press.
214	Pre-Trigger	Pre-trigger flag active at the start of a cycle.		Lower the pre-trigger flag on the press.
215	End of Weld	End of Weld input is enabled at the start of a cycle.		Correct the End of Weld limit switch position on the press.
216	Ground Detect	Ground Detect input is enabled at the start of a cycle.		Make certain ground detect wiring from fixture to DPC is installed correctly.
224	Pre-Trigger > 0.75 in Above Part	Pre-trigger travel is limited to 0.75 in. If that distance is exceeded, the cycle stops.	During Weld Cycle	Increase pre-trigger distance.
225	Trigger Lost within 100 ms	Trigger conditions were met but lost within 100 ms of the start of the cycle. Usually this means that the trigger switch closed at the top of the press stroke.		Increase trigger switch setting.
226	Trigger Lost	With a Momentary trigger type, the loss of the trigger signal ends the weld.		Increase trigger pressure; increase Kinechek speed, or switch trigger type to Maintained.
402	Access Denied Invalid Password	An invalid password was entered, and access to the menu is denied.	Could occur during any part of the weld cycle.	Press Enter to clear the display. Use the correct password.
N/A	Display Buffer Overrun	LCD display exceeds normal range of operation.	Could occur during any part of the weld cycle.	Press Enter to clear the display. Contact Dukane Ultransoics Service Department.
N/A	Abort	Emergency Stop button on the press base was pressed.	Could occur during any part of the weld cycle.	Reset Emergency Stop button.

Table 13-1 *Error Messages*

EEPROM WRITE ERROR

This error occurs when an attempt to write to the EEPROM (**E**lectrically **E**rasable **P**rogrammable **R**ead-**O**nly **M**emory) fails. The EEPROM contains the setup information for the DPC. If updates to the setup memory fail, unintended operation of the DPC may result.

CAUTION

If the Write Error appears on the display, contact the Dukane Ultrasonics Service Department immediately.

Verifying Module Operation

Depending on the configuration of your system, the DPC contains several modules that provide interfaces from the DPC main digital board to encoders and transducers outside the system. These modules include the following:

- Distance Module
- Energy/Power Module
- Pressure Transducer
- Force Transducer (Load Cell)

Each of these modules has a corresponding "view" option in View Parameters through the Operate menu. View Parameters alllows you to see the current value of a control/monitor parameter. (Refer to Page 120 to review the View Parameters function.) In order for values to appear in the display, the system may have to be cycled or manipulated in some way.

Distance Module

The View Parameters display shows "Distance" which is the current encoder position. As the thruster head moves up or down, the displayed value changes. The value should increase as the head travels down and decrease as the head travels up. Upon power-up, the distance value internal to the DPC is set between -0.1 and -0.25 inches. This guarantees that the DPC does not "see" a useful number until the reference mark on the distance encoder is crossed.

To check all encoder functions, either remove air pressure from the press or depress the Emergency Stop switch that is grouped with the activation switches.

After the press head is in the down position, switch off power to the DPC. Switch the power to the DPC on again, and from the Operate menu, select VIEW PARAMETERS.

DISTANCE should get increasingly negative until the reference mark is crossed at the top of the stroke. When the reference mark is crossed, the encoder value goes to zero and then becomes negative as the head continues up.

(The reference mark is enabled upon start-up.)

Energy Module

POWER in the View Parameters menu is the current power applied to the transducer. This measurement can be seen on the front panel display. To test the energy module, press the TEST key on the generator status panel. (See Page 22.)

In the TEST position, the generator applies ultrasound to the transducer. The displayed power level should increase to the idle power of the generator/stack combination. When the TEST switch is released, the ultrasound signal stops; the power level should drop to zero. If the system will be run after testing the energy module, press the ON LINE key.

Electronic Pressure Regulator and the Pressure Transducer

The electronic pressure regulator and pressure transducer are components of the same system. The electronic pressure regulator accepts commands from the DPC and sets the air pressure to the desired user-selected value. The pressure transducer senses the pressure and transmits it to the DPC via a 4-20 mA current loop. To check the pressure, from the Operate menu, select VIEW PARAMETERS. Then, select PRESSURE from the View Parameters menu. The current Pressure 1 measurement is displayed. This value should correspond to the value set for Pressure 1. (See *Weld Method*, Page 81 and *Pressure*, Page 90.)

To display Pressure 2, the press has to go through a cycle. As it does, the pressure reading on the display will change from Pressure 1 to Pressure 2.

Force Transducer (Load Cell)

The force transducer senses force exerted on the part and controls when the ultrasound signal is applied. Check the force transducer by looking at the FORCE measurement on the View Parameters menu. The measurement should change when upward pressure is applied to the acoustic stack.

CAUTION

Avoid injury when touching the acoustic stack! Wear proper hand protection, and grasp the acoustic stack in areas that are smooth or dull. Then, carefully apply upward pressure until a change in the Force measurement is seen on the DPC display.

Checking the Operation of Two Inputs

Two inputs that are easily checked are:
- Activation Switches 1 and 2, and
- Trigger Switch

Each of these inputs is capable of producing an "Initiate Error At Cycle Start". This error mechanism can be used to determine if an input is being recognized by the system.
A procedure for each input is outlined below.

Activation Switches SS1 and SS2

With the Initiate mode set to Manual, press either of the activation switches for at least three seconds. Depending on which switch is pressed, either error #210 or #211, INITIATE ERROR SSx AT CYCLE START will appear on the display.

Trigger Switch

For a press without an Electronic Press Regulator:
Turn the trigger knob (on the press) clockwise until the green trigger LED lights and remains on. Within a few seconds, the error message #213 INITIATE ERROR TRIGGER AT CYCLE START should appear on the front panel display.

NOTE

To check a trigger on a system with no manual trigger knob, the operator will have to put that sytem through an actual weld cycle operation to know whether the trigger was properly activated.

Effects of I/O and System Errors on Process Flow

The welding cycle can be divided into a series of segments: Cycle Start, Downstroke, Trigger, Weld Pressure 1, Weld Pressure 2, and Hold. In each of these segments, operator action, rear panel inputs, and process limits can affect the flow of the process. What follows are examples of how some events can alter the flow of the welding process, and how they can be identified.

An Uninterrupted Cycle

Figure 13-2 shows the results of a weld process that was not interrupted by any I/O signal or system error. The setup conditions for this process were as follows:

- Normal Trigger
- Weld by Time for 50ms.
- Hold by Time for 1.0sec.

PART COUNT	DOWNSTROKE TIME	DOWNSTROKE DIST	WELD TIME PRESSURE 1	WELD DIST PRESSURE 1	WELD ENERGY PRESSURE 1	HOLD TIME	TOTAL CYCLE TIME	TOTAL STROKE
35	0.975	1.7921	0.050	0.0023	28.4	1.000	2.025	1.8090
36	0.879	1.7927	0.050	0.0020	28.4	1.000	1.929	1.8092
37	0.877	1.7928	0.050	0.0022	28.4	1.000	1.927	1.8092

Figure 13-2   *Data from an Uninterrupted Cycle*

The Cycle Terminates During Downstroke

The system is in downstroke when the cycle has been successfully started and the head travels towards the part. If the cycle is terminated during downstroke, all trigger, weld, and hold characteristics are displayed as zeroes.

Figure 13-3 shows results of a cycle terminated during downstroke due to either an end of weld/ground detect error or a condition where activation switches were released before the trigger (there is no error code for this condition).

PART COUNT	DOWNSTROKE TIME	DOWNSTROKE DIST	WELD TIME PRESSURE 1	WELD DIST PRESSURE 1	WELD ENERGY PRESSURE 1	HOLD TIME	TOTAL CYCLE TIME	TOTAL STROKE
39	0.655	1.1959	0	0	0	0	0.655	1.1959
40	0.748	1.4229	0	0	0	0	0.748	1.4229
41	0.819	1.7946	0	0	0	0	0.819	1.7946

Figure 13-3 *Cycle Terminated by I/O During Downstroke*

Process limits can be set for all process segments including downstroke. Figure 13-4 shows the effect of a high limit on Downstroke Time. In this example, the Downstroke Time was limited to 0.500 second. When the Downstroke Time reached 0.500 second, the cycle terminated and marked the part as Bad.

PART COUNT	DOWNSTROKE TIME	DOWNSTROKE DIST	WELD TIME PRESSURE 1	WELD DIST PRESSURE 1	WELD ENERGY PRESSURE 1	HOLD TIME	TOTAL CYCLE TIME	TOTAL STROKE
12	>>0.500	0.3462	0	0	0	0	0.500	0.3462

Figure 13-4 *Cycle Terminated by High Bad Limit During Downstroke*

When using pre-trigger, part contact must occur within 0.75 inch after the application of ultrasound. If the weld is not complete or the trigger switch does not close within 0.75 inch from the start of pre-trigger, the cycle is aborted. Figure 13-5 shows cycles terminated for this reason. The pre-trigger distance was set at 1.000 inch. Note that the Downstroke Distance is 1.7527 inch for part number 56. This is equal to the 1.000 inch pre-trigger distance plus the 0.75 inch overtravel. The system can overshoot slightly due to thruster momentum.

PART COUNT	DOWNSTROKE TIME	DOWNSTROKE DIST	WELD TIME PRESSURE 1	WELD DIST PRESSURE 1	WELD ENERGY PRESSURE 1	HOLD TIME	TOTAL CYCLE TIME	TOTAL STROKE
56	0.887	1.7527	0	0	0	0	0.887	1.7527
57	0.831	1.7522	0	0	0	0	0.831	1.7522
58	0.827	1.7516	0	0	0	0	0.827	1.7516

Figure 13-5 *Cycle Terminated Due to Pre-trigger Overtravel*

Premature Weld Termination

Weld Termination Due to End of Weld/Ground Detect

An End-of-Weld signal from the thruster limit switches and a Ground Detect signal to the J602 connector cause the Weld portion of the cycle to terminate. A characteristic of this type of weld termination is Hold Time. If the Hold portion of the cycle is executed, then the weld was terminated by an end of weld/ground detect error. Figure 13-6 illustrates this condition.

PART COUNT	DOWNSTROKE TIME	DOWNSTROKE DIST	WELD TIME PRESSURE 1	WELD DIST PRESSURE 1	WELD ENERGY PRESSURE 1	HOLD TIME	TOTAL CYCLE TIME	TOTAL STROKE
55	0.882	1.7928	0.015	0.0006	6.5	1.000	1.897	1.8094

Figure 13-6 *Weld Termination Due to End of Weld/Ground Detect*

Weld Termination Due to Trigger Lost

If the trigger type is set to Maintained, loss of the trigger signal causes an immediate termination of the cycle when the ultrasound is applied. This results in a shortened weld and zeroes for both Hold Time and Hold Distance. Figure 13-7 shows a cycle terminated by a lost trigger input.

PART COUNT	DOWNSTROKE TIME	DOWNSTROKE DIST	WELD TIME PRESSURE 1	WELD DIST PRESSURE 1	WELD ENERGY PRESSURE 1	HOLD TIME	TOTAL CYCLE TIME	TOTAL STROKE
55	0.882	1.7928	0.015	0.0006	6.5	0	1.897	1.8094

Figure 13-7 *Weld Termination Due to Trigger Lost*

Weld Termination Due to Secondary Control

Secondary controls are additional controls that allow the weld to be controlled by more than one process parameter. In this example, the weld portion of the cycle ends when either the primary control parameter (in this case, Weld by Time for 50ms) or the secondary control parameter (Weld Energy) is reached. In either case, the cycle proceeds to the hold portion of the cycle provided that no process characteristics fall outside of the bad limits. Figure 13-8 shows the results using Weld Energy as a secondary control.

PART COUNT	DOWNSTROKE TIME	DOWNSTROKE DIST	WELD TIME PRESSURE 1	WELD DIST PRESSURE 1	WELD ENERGY PRESSURE 1	HOLD TIME	TOTAL CYCLE TIME	TOTAL STROKE
3	0.999	1.7915	0.037	0.0024	20.3	1.000	2.036	1.8089
4	0.944	1.7919	0.038	0.0024	20.9	1.000	1.982	1.8089
5	0.906	1.7922	0.038	0.0021	20.9	1.000	1.944	1.8090

Figure 13-8 *Weld Segment Terminated by a Secondary Control*

Weld Termination Due to a Bad Limit

As with all bad part limits, falling outside of a limit results in an immediate termination of the process. Figure 13-9 illustrates the results when a bad part limit was exceeded for Weld Energy. The two "greater than" arrows (>>) preceding the Weld Energy measurement indicates that a bad part upper limit was exceeded. These arrows, known as *limit indicators*, are always displayed on the front panel display.

PART COUNT	DOWNSTROKE TIME	DOWNSTROKE DIST	WELD TIME PRESSURE 1	WELD DIST PRESSURE 1	WELD ENERGY PRESSURE 1	HOLD TIME	TOTAL CYCLE TIME	TOTAL STROKE
13	0.994	1.7916	0.038	0.0026	>>20.9	0	1.032	1.7942

Figure 13-9 *Weld Segment Terminated by a Bad Part Limit*

Miscellaneous

The DPC Won't Cycle

Just before a weld cycle starts, the DPC waits for an initiating signal. If an initiating signal is applied and the system does not begin to cycle, check the following:

- Make sure the DPC's Initiate Mode in the Process Control menu is set to the appropriate setting:

  Manual if using activation switches; Auto if the system is configured for use with an automated system.

NOTE

The Initiate Mode selection must be set for each setup *used. This is extremely important in the case of Sequencing and setup selection.*

- Remove all inhibiting inputs and check that no Cycle Start error messages are displayed (Errors #210 - #216).
- Ensure that cabling is connected properly and that user interface circuitry is operating.

No Ultrasound

- Push TEST on the generator status panel to verify that the generator is producing an ultrasonic signal.
- Next, push ON LINE on the generator status panel. This transfers generator regulation to the controller.
- Review the program. There should be a Weld Time P1 (and Weld Time P2 if dual presssure is used). Set the characteristic to "Display" (see, *Process Setup – Process Limits*, Page 101).

  Press ENTER to go to the Part Count display (See Figure 3-11a on Page 25.), and scroll left or right to check for the Weld Time process characteristic.

  Start the cycle, and view the reported Weld Time shown on the display. This tells that the controller has directed the generator to produce the ultrasonic signal for the programmed time.

- In addition to taking the steps outlined on the previous page, Power can be checked too.
  From the Main Menu, select OPERATE and then VIEW PARAMETERS.
  Scroll so that POWER is on the display.
  Start a cycle and record the Power reading from the display. This reading tells that the ultrasonic signal has been produced by the generator.

- Look over the process setup carefully to make certain there are no conflicts.

- You may want to remove all process characteristic windows, and simply set all to “display”. This can be done to make it easier to determine the source of a problem. Windows can then be reset after the source of the conflict has been identified.

SECTION 14

DPC/MMI Firmware Upgrade

- This section describes how to upgrade the DPC/MMI firmware through the DPC rear panel serial port.

This page intentionally left blank

NOTE 1

Use this procedure only with a DPC that has version r1.h or greater. Contact Dukane Corporation if your version number is lower.

NOTE 2

Use this procedure only with an MMI that has version 2.00 or greater. Contact Dukane Corporation if your version number is lower.

NOTE 3

When upgrading both the DPC and MMI, upgrade the DPC first.

Introduction

This section of the manual details the procedure to upgrade the DPC and MMI firmware using the DPC serial interface.

This procedure assumes the operator is using one of these Microsoft® operating systems: Windows ™ 3.1, Windows 3.11, Windows 95/98, or Windows NT.

If you do not have access to a computer that supports any of these operating environments/systems, please contact Dukane Corporation so that special arrangements can be made.

Cabling

To flashload firmware from the computer to the DPC, use a serial cable connecting the DPC to your computer.

The DPC serial connector is a DB-9P (P = pins).
Pin configuration is detailed in Table 14-1:

Pin (DPC)	Function	Pin (PC-9 Pin)	Pin (PC-25 Pin)
2	TXD-Transmit	3	2
3	RXD-Receive	2	3
4	DSR-Data Set Ready	6	6
5	GND-Ground	5	7
6	DTR-Data Terminal Ready	4	20
7	CTS-Clear to Send	8	5
8	RST-Request to Send	7	4

Table 14-1 *DPC Serial Connector Pin Configuration*

When going from the DPC to a PC with a 9-pin connector, generally a straight-through cable can be used. See Figure 14-1 below.

Required Lines

The only required lines are TXD, RXD, and GND.

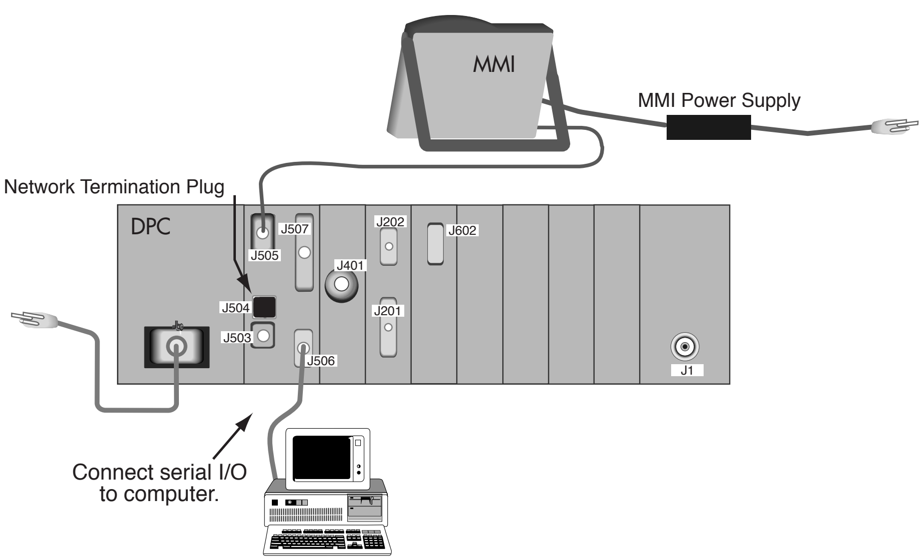


Figure 14-1 *Connecting the DPC to a Computer for Firmware*

Extracting the Files

The required files are delivered in a self-extracting ZIP file. This file is an executable file containing three files compressed into a single file.

When the ZIP file is run, the compressed files are expanded to their original form into the current directory.

Because the files are compressed to 25% of their original size, a 75% decrease in file download time is possible.

Files are named by product and version number.

For example:

dpcv2p00.exe	-	DPC file, version v2.00
mmiv2p00.exe	-	MMI file, version v2.00

To Expand the Files

1. Move the executable file to a directory you want.
2. Double-click on the file icon.

As the files begin to expand, a DOS window opens and displays the results of the expansion process.

When complete, the directory will contain the following files for version number v2.00:

File: dpcv2p00.exe —>	dpcv2p00.txt (The new firmware image)
	dpc.ht (Windows 95/98, NT HyperTerminal Config file)
	dpc.trm (Windows 3.1, Windows 3.11 Terminal Config file)
	readme.txt (Instructions to upgrade firmware via serial interface.)
File: mmiv2p00.exe —>	mmiv2p00.txt (The new firmware image)
	dpc.ht (Windows 95/98, NT HyperTerminal Config file)
	dpc.trm (Windows 3.1, Windows 3.11 Terminal Config file)
	readme.txt (Instructions to upgrade firmware via serial interface.)

NOTE

*The *.txt file has the same product and version number format as the executable file.*

Establishing a Connection with the DPC

Microsoft has provided communications programs in the Accessories Group within Windows as part of the operating system.

In Windows 3.1 and 3.11, the program is called Terminal.

In Windows 95/98, or NT the program provided is HyperTerminal.

If you are using Windows 3.1, or 3.11, proceed to the next section called "Using Terminal to Connect to the DPC".

If you are using Windows 95,98, or NT go to the section called "Using HyperTerminal to Connect to the DPC".

Using Terminal to Connect to the DPC

Configure the DPC

Set the DPC serial port set to LOCAL and the baud rate to 19200.

```
Main Menu —> Hardware Setup —> Ports —> Serial -+-> Destination = LOCAL
                                                |
                                                +—> Baud Rate  = 19200
```

Configure the PC

The file, dpc.trm, is a preconfigured Terminal configuration file. It contains information that causes Terminal to open with the following configuration:

Port:	COM1:
Baud:	19200
Parity:	None
Data Bits:	8
Stop Bit:	1

To open Terminal with above configuration, double-click on the dpc.trm file.

If the port setting needs to be changed (in case you're connected to COM2 for instance), select

Settings —> Communications

from the menu bar at the top of the Terminal program window.

Verifying the Connection

To verify that a connection has been established, press the ENTER key on the PC keyboard and a 'greater than' character prompt should appear in the Terminal program window.

Example:

```
>
>
>
```

If there is no response from the DPC when the ENTER key is pressed, check the port setting and the cable connections.

If the response is garbled, check to see if the baud rate on the DPC and the Terminal program are the same. We recommend 19200 baud.

Using Windows 95/98/NT HyperTerminal to Connect to the DPC

Configure the DPC

Set the DPC serial port to LOCAL, and set the baud rate to 19200.

```
Main Menu —> Hardware Setup —> Ports —> Serial -+-> Destination = LOCAL
                                                |
                                                +—> Baud Rate  = 19200
```

Configure the PC

The file, dpc.ht, is a preconfigured HyperTerminal configuration file.

It contains information that causes HyperTerminal to open with the following configuration:

Port:	COM1:
Baud:	19200
Parity:	None
Data Bits:	8
Stop Bit:	1

To open HyperTerminal with the above configuration, double-click on the dpc.ht file.

If the port setting needs to be changed (in case you're connected to COM2 for instance), select Properties from the HyperTerminal File menu bar. The Properties dialog box should appear.

Change "Connect Using" to COM1 or COM2, whichever you are connected to. When selected, click on the Configure box and verify that the settings are the same as described above. Using the Call menu selection, select Connect.

Verifying the Connection

A connection is established when pressing the ENTER key on the PC keyboard results in a 'greater than' character prompt appearing in the HyperTerminal program window.

Example:

```
>
>
>
```

If there is no response from the DPC when the ENTER key is pressed, check the port setting and cable connections.

If the response is garbled, check to see if the baud rate on the DPC and the HyperTerminal program are the same.

We recommend 19200 baud.

Sending a File to the DPC

Using Terminal (Windows 3.1 or Windows 3.11)

Once a connection to the DPC is established, the DPC firmware text file is transferred to the DPC.

To transfer a text file, select "Send Text File" from the Terminal window menu bar.

Transfers —> Send Text File

The "Send Text File" dialog box will appear and show the available text files in the current directory.

The DPC and/or MMI text files will appear in the file list if the Terminal program was launched from the DPC.trm configuration file provided.

Select the file, and click on OK. "Stop" and "Pause" buttons will appear in the lower left-hand corner of the screen with a progress bar to the right.

Using HyperTerminal (Windows 95/98/NT)

Once a connection to the DPC is established, the DPC firmware text file is transferred to the DPC.

To transfer a text file, select "Send File" from the HyperTerminal window menu bar.

Transfer —> Send Text File

The Send Text File dialog box will appear and show the available text files in the current directory. The DPC and/or MMI text files will appear in the file list if the HyperTerminal program was launched from the DPC.ht configuration file tjat was provided.

Select the file, and click on OPEN. There is no progress bar associated with HyperTerminal, although the process takes about ten minutes.

File Reception and Device Programming

The terminal window of Terminal and HyperTerminal is used to show the status and progress of the file transfer and device programming. The DPC can identify the file type and informs the user which file type is being transferred.

The following messages are displayed on the terminal window shortly after transferring the files.

Receiving DPC Program File

Receiving MMI Program File

When the file has been completely received, the following messages are displayed in the terminal window:

DPC File Received
MMI File Received

DPC Specific Messages

Once the DPC file has been received, the DPC erases the internal program memory devices. The devices are then reprogrammed and verified. When verified, the DPC restarts with the new program.

CAUTION
Do not shut off power to the DPC during this sequence.

The DPC displays the following messages during the erase-program cycle:

Erasing Devices
Erase Successful
Starting Programming
Verifying Programming
Verification Passed
Programming Successful - Restarting

MMI Specific Messages

Once the DPC has received the MMI program file, the file is transferred to the MMI over the ArcNet network. The MMI then erases and reprograms the internal memory devices and restarts. Success is indicated when no error tones are heard upon restart. The terminal window displays the following messages:

Receiving MMI Program File
MMI File Received
Transmitting File to MMI

Possible Problems and What to Do

Invalid Checksum

Every line in a DPC or MMI program file has a checksum. A checksum is a byte used to ensure each line is sent without errors. If an Invalid Checksum message is displayed after the "Receiving DPC/ MMI Program File", stop the file transfer and try again.

The Program files contain blank lines at the beginning to clear the DPC buffer. It is possible to see an Invalid Checksum at the start of the transfer as long as this happens before the "Receiving DPC/ MMI Program File" message.

Erase Failed – Contact Service

One or more devices failed to erase. Replacement program memory devices are required from the Dukane Ultrasonics Service Department.

Write Failure – Contact Service

One or more devices could not be written to. Replacement program memory devices are required from the Dukane Ultrasonics Service Department.

SECTION 15

Dukane Corporation Contacts and Warranty

- This section gives Dukane Corporation contact and warranty information.

This page intentionally left blank

Contacting Dukane Corporation

When contacting Dukane, especially if calling about a service-related problem, be prepared to give this information:

- DPC model number, firmware version, serial number, and line voltage.
- Any messages from the DPC display
- MMI model number and firmware version
- Description of the problem and steps taken to resolve it

Local Support

Your local Dukane representative can answer all of your questions regarding Dukane equipment, as well as provide information on pending orders and quotations. Each Dukane representative has received factory training and can assist you in all phases of project life cycle.

Try our Website

Dukane Corporation is on the worldwide web at:

http://www.dukane.com/us

> TIP
>
> At the website you can:
> - Get an introduction to a variety of joining technologies.
> - Learn about our products and see layout drawings.
> - Check out the Frequently Asked Questions section.
> - Order literature.
> - View a list of educational seminars.

Contacts in the Ultrasonics Division

Main Phone:	(630) 797–4900
Sales:	(630) 797–4918
Fax:	(630) 797–4949
Service & Parts Fax:	(630) 584–0796

See the next page for department extensions.

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

Ultrasonics Division E-mail Addresses:

Applications: .... usapps@dukane.com
Engineering: .... useng@dukane.com
Food Processing: .... usfoodproc@dukane.com
International Sales: .... usintl@dukane.com
Marketing: .... usmktg@dukane.com
Sales: .... ussales@dukane.com
Support/Service & Parts: ...... usservice@dukane.com
Tooling: .... ustooling@dukane.com
Training: .... ustraining@dukane.com

Ultrasonics Division Phone Numbers:

Application Support (630) 797–4930

For applications and/or process technology questions.

Engineering (630) 797–4950

For engineering of standard and customized systems.

Food Processing (630) 797–4920 or –4938

For information about using ultrasonics in food processing.

International (630) 797–4915

For questions about international locations, support, etc.

Marketing (630) 797–4905

For product literature, and trade show information.

Metal Welding (630) 797–4953

For information about any aspect of metal welding.

Sales (630) 797–4918

Although your local Dukane representative is the main source of Dukane product and order information, you may want to contact the Sales Department.

Service & Parts (630) 762–4987

For a service-related problem with your equipment.

Tooling Support (630) 797–4930

For information about tooling, horns, and fixturing.

Training Hotline (630) 797–4905

We offer a curriculum of educational programs at our corporate headquarters in St. Charles, Illinois.

Please call the Dukane Ultrasonics Training Hotline for a free Education Catalog or with any questions you may have.

24-hour Emergency Service
Effective May 10, 2004
(630) 797–4987

DUKANE CORPORATION

NORTH AMERICAN WARRANTY POLICY

Subject to the terms, limitations and exclusions set forth below, Dukane Corporation IAS Division (Dukane) warrants to the original Purchaser, unless otherwise expressly agreed to in writing by Dukane, that all equipment and tooling designed and built by Dukane will be free from defects in material or workmanship. Normal wear items are not covered by this warranty. Warranty duration shall be defined as documented herein and in conjunction with any exceptions or exclusions in the accompanying Dukane quotation to the Purchaser.

Equipment Type	Equipment Warranty Duration	Other Comments
Custom Systems	12 months on all Dukane designed and built content that is not part of our standard product.	Dukane standard product included in custom systems are covered by the applicable product warranty.
Hot Plate Welder	24 months	none
Laser Welder	For all laser sources, Original equipment manufacturer (OEM) warranty is applicable.	All internal laser optics and external beam delivery optics are warranted for only 30 days.
Spin Welder	24 months	none
Thermal Press	24 months	none
Ultrasonic Welder	36 months	See WARRANTY EXCLUSIONS OR EXCEPTIONS below.
Vibration Welder	24 months	none
All Production Tooling	12 months, one-time replacement. (6-month, one-time replacement for carbide tipped horns)	none
Prototype Tooling	• All tooling made from Renshape 460 (Renwood) are only warranted for 200 part-cycles. • All other prototype tooling is warranted as described in each specific proposal.	Prototype Renshape 460 (Renwood) tools employ reusable content, and therefore remain the property of Dukane.

All Dukane warranties commence on the date of the original shipment of the equipment or tooling, and duration is based upon a single shift per day, five day per week operation. The warranty period on rentals of new equipment that are converted to a purchase are deemed to have commenced on the initial date of rental.

These warranties are limited to equipment and tooling operated and maintained per Dukane's written instructions, and used under normal operating conditions. These warranties do not include normal wear or normal wear items, and do not cover damage attributable to misuse, improper installation, faulty repair, unauthorized alteration or modification, neglect, or accident. Misuse includes operation of equipment with tooling that is not qualified for the equipment or properly installed on the equipment.

The warranty on all Dukane equipment and tooling purchased and installed in North America is a parts and labor warranty only. Equipment installed outside of North America, regardless of where it was purchased, is covered by Dukane's International Warranty Policy. In all cases, when on-site service is required, Travel & Living (T&L) expenses will be billed at cost. Warranty service labor (including travel time) at the customer's site is provided on a Monday through Friday (excluding holidays), 7 a.m. to 7 p.m. basis. Any warranty service requested outside of these hours is available on a charge basis equal to 150% of Dukane's prevailing rate for technical service work.

Any equipment or tooling that proves to be defective in material or workmanship during the stated warranty period will be repaired or replaced at the sole discretion of Dukane Corporation when Dukane is promptly notified in writing. During the warranty period, defective equipment, components, or tooling that are returned properly packed with all transportation charges prepaid will be repaired or replaced and returned to the end-user without charge. Shipments of warranty parts will be via standard, non-expedited delivery service. Expedited shipment requests are subject to freight charges to the Purchaser.

Computers, PLCs, CRTs, LCDs, touch screens, and keyboards separate and/or incorporated as an integral part of a system will carry a one (1) year warranty from the date of shipment when used under normal operating conditions, and not subjected to misuse, abuse, or neglect. For all other equipment, components, or parts included in equipment or systems from Dukane, but not manufactured by Dukane or its affiliates, this warranty shall be limited in time and extent to the warranty given to Dukane by the OEM.

EQUIPMENT WARRANTY EXCLUSIONS OR EXCEPTIONS:
When specified in our quotation, a limited warranty may apply to certain components of the equipment, and/or for certain types of applications of the equipment, including those noted below.

- ❑ This warranty is void if the ultrasonic welder and/or tooling [i.e., horn(s) and fixture(s)] are used for applications requiring metal-to-metal contact, when the ultrasonic exposure period (weld cycle) exceeds 250 milliseconds.
- ❑ Ultrasonic Equipment and tooling used in continuous duty cycle modes such as, but not limited to, continuous cut and seal, and food processing are warranted for 2000 hours or 12 months from shipment, whichever occurs first.
- ❑ Any ultrasonic horn or tool quoted and sold as "Experimental" is not warranted.
- ❑ This warranty does not cover failures of equipment and components attributable to improper cooling or overheating of the transducer.
- ❑ Ultrasonic Horn Analyzers have a 12-month warranty.
- ❑ Ultrasonic Transducers have a one-time replacement warranty.
- ❑ Normal wear items and consumables excluded from any warranty coverage include, but are not limited to, filters, fuses, light bulbs, lubricants, gaskets and seals, cast urethane fixture components, laser flashlamps, laser beam delivery optics, and lasing gases.

The forgoing warranty is the sole and exclusive warranty and is made in lieu of all other warranties, express, implied or statutory, including without limitation any warranties of merchantability, fitness for a particular purpose, description, quality, productiveness or any other warranty. The remedy set forth in this warranty policy is the sole and exclusive remedy of Purchaser and in no event shall Dukane be liable for any compensatory, consequential, special, punitive or contingent damages or for damages arising from any delay in performance by Dukane under this warranty.

DUKANE CORPORATION

INTERNATIONAL WARRANTY POLICY

Subject to the terms, limitations and exclusions set forth below, Dukane Corporation IAS Division (Dukane) warrants to the original Purchaser, unless otherwise expressly agreed to in writing by Dukane, that all equipment and tooling designed and built by Dukane will be free from defects in material or workmanship. Normal wear items are not covered by this warranty. Warranty duration shall be defined as documented herein and in conjunction with any exceptions or exclusions in the accompanying Dukane quotation to the Purchaser.

Equipment Type	Equipment Warranty Duration	Other Comments
Custom Systems	12 months on all Dukane designed and built content that is not part of our standard product.	Dukane standard product included in custom systems are covered by the applicable product warranty.
Hot Plate Welder	12 months	none
Laser Welder	For all laser sources, Original equipment manufacturer (OEM) warranty is applicable.	All internal laser optics and external beam delivery optics are warranted for only 30 days.
Spin Welder	12 months	none
Thermal Press	12 months	none
Ultrasonic Welder	12 months	See WARRANTY EXCLUSIONS OR EXCEPTIONS below.
Vibration Welder	12 months	none
All Production Tooling	12 months, one-time replacement. (6-month, one-time replacement for carbide tipped horns)	none
Prototype Tooling	• All tooling made from Renshape 460 (Renwood) are only warranted for 200 part-cycles. • All other prototype tooling is warranted as described in each specific proposal.	Prototype Renshape 460 (Renwood) tools employ reusable content, and therefore remain the property of Dukane.

All Dukane warranties commence on the date of the original shipment of the equipment or tooling, and duration is based upon a single shift per day, five day per week operation. The warranty period on rentals of new equipment that are converted to a purchase are deemed to have commenced on the initial date of rental.

These warranties are limited to equipment and tooling operated and maintained per Dukane's written instructions, and used under normal operating conditions. These warranties do not include normal wear or normal wear items, and do not cover damage attributable to misuse, improper installation, faulty repair, unauthorized alteration or modification, neglect, or accident. Misuse includes operation of equipment with tooling that is not qualified for the equipment or properly installed on the equipment.

The warranty on all Dukane equipment and tooling purchased and installed in North America is a parts and labor warranty only. Equipment installed outside of North America, regardless of where it was purchased, is covered by Dukane's International Warranty Policy. In all cases, when on-site service is required, Travel & Living (T&L) expenses will be billed at cost. Warranty service labor (including travel time) at the customer's site is provided on a Monday through Friday (excluding holidays), 7 a.m. to 7 p.m. basis. Any warranty service requested outside of these hours is available on a charge basis equal to 150% of Dukane's prevailing rate for technical service work.

Any equipment or tooling that proves to be defective in material or workmanship during the stated warranty period will be repaired or replaced at the sole discretion of Dukane Corporation when Dukane is promptly notified in writing. During the warranty period, defective equipment, components, or tooling that are returned properly packed with all transportation charges prepaid will be repaired or replaced and returned to the end-user without charge. Shipments of warranty parts will be via standard, non-expedited delivery service. Expedited shipment requests are subject to freight charges to the Purchaser.

Computers, PLCs, CRTs, LCDs, touch screens, and keyboards separate and/or incorporated as an integral part of a system will carry a one (1) year warranty from the date of shipment when used under normal operating conditions, and not subjected to misuse, abuse, or neglect. For all other equipment, components, or parts included in equipment or systems from Dukane, but not manufactured by Dukane or its affiliates, this warranty shall be limited in time and extent to the warranty given to Dukane by the OEM.

EQUIPMENT WARRANTY EXCLUSIONS OR EXCEPTIONS:

When specified in our quotation, a limited warranty may apply to certain components of the equipment, and/or for certain types of applications of the equipment, including those noted below.

- ❑ This warranty is void if the ultrasonic welder and/or tooling [i.e., horn(s) and fixture(s)] are used for applications requiring metal-to-metal contact, when the ultrasonic exposure period (weld cycle) exceeds 250 milliseconds.
- ❑ Ultrasonic Equipment and tooling used in continuous duty cycle modes such as, but not limited to, continuous cut and seal, and food processing are warranted for 2000 hours or 12 months from shipment, whichever occurs first.
- ❑ Any ultrasonic horn or tool quoted and sold as "Experimental" is not warranted.
- ❑ This warranty does not cover failures of equipment and components attributable to improper cooling or overheating of the transducer.
- ❑ Ultrasonic Horn Analyzers have a 12-month warranty.
- ❑ Ultrasonic Transducers have a one-time replacement warranty.
- ❑ Normal wear items and consumables excluded from any warranty coverage include, but are not limited to, filters, fuses, light bulbs, lubricants, gaskets and seals, cast urethane fixture components, laser flashlamps, laser beam delivery optics, and lasing gases.

The forgoing warranty is the sole and exclusive warranty and is made in lieu of all other warranties, express, implied or statutory, including without limitation any warranties of merchantability, fitness for a particular purpose, description, quality, productiveness or any other warranty. The remedy set forth in this warranty policy is the sole and exclusive remedy of Purchaser and in no event shall Dukane be liable for any compensatory, consequential, special, punitive or contingent damages or for damages arising from any delay in performance by Dukane under this warranty.

SECTION 16

Appendices

- Appendix A – External Serial Device Support
- Appendix B – Display Monitor Connections
- Appendix C – Automation Equipment Interface
- Appendix D – Connector Pinout Descriptions
- Appendix E – Rear Panel I/O
- Appendix F – Reference Guide to DPC Menu Structure

This page intentionally left blank

Appendix A
External Serial Device Support

Overview

The DPC has a rear panel serial port (J506) to use with data collectors and computer software such as statistical process control (SPC) and data analysis programs. This port matches RS-232 mechanical and electrical specifications.

This Appendix has information about:

- Signal Definitions
- Printer Support, and
- Communication Equipment Types
- Output Formats.

Signal Definitions

The serial interface uses a 5-pin connection. Numbers for each of the five signals (pins) refer to the DPC rear panel serial connector and are stated as "J506.x" where *x* is the pin number. The five signals are listed below.

NOTE

Serial cables generally use 24 AWG (American Wire Gauge) wire and should be shielded for best results.

J506.7 – Signal Ground

Signal Ground provides a common reference for all of the signals exchanged between the DPC and the external serial device.

J506.2 – Receive (RXD)

Serial data is received by the DPC from the Receive (RXD) line. This signal is generated by the Transmit (TXD) line of a connected serial device.

J506.3 – Transmit (TXD)

The DPC sends out information on the Transmit (TXD) line to other serial devices. This line connects to the Receive input of the connected serial device.

J506.4 – Clear to Send (CTS)

The Clear to Send signal is required only when the DPC is using RTS/CTS protocol. This line informs the DPC that the connected device has information to transmit (to the DPC). The DPC sets the Request to Send (RTS) line in response to the CTS line when it is ready to accept information from the connected device. If the DPC cannot receive information, the RTS line is reset. CTS input is connected to the RTS output of the connected device.

J506.5 – Request to Send (RTS)

As with Clear to Send, Request to Send (RTS) is only required when using the RTS/CTS protocol. The DPC sets the RTS line when it is ready to send information to another serial device. The CTS line is checked to see if the connected device can receive information. RTS output is connected to the CTS input of the connected device.

Communication Equipment Types

DCE and DTE refer to **D**ata **C**ommunication **E**quipment and **D**ata **T**erminal **E**quipment, respectively.

Data Communication Equipment

The DPC's serial port is defined as a DCE. See Table A-1 for DCE device signals and pin numbers:

Data Terminal Equipment

Other devices, such as the Advanced Programmer and printers, are defined as DTEs. See Table A-1 for DTE device signals and pin numbers.

Equipment Type	Signal with Pin Number				
	Receive	Transmit	Clear to Send	Request to Send	Ground
DCE	2	3	4	5	7
DTE	3	2	5	4	7

Table A-1 *DCE/DTE Signals with Pin Numbers*

When a DCE is connected to a DTE by a straight-through cable (i.e., Pin 2 to Pin 2, Pin 3 to Pin 3, etc.), communication can take place. In other words, a Receive line must be connected to a Transmit line and a Clear to Send line must be connected to a Request to Send line.

If the two connected devices are both DCEs or DTEs, no communication can occur because Receive is connected to Receive, Transmit is connected to Transmit, etc.

Figure A-1 shows correct connections between DCE and DTE devices.

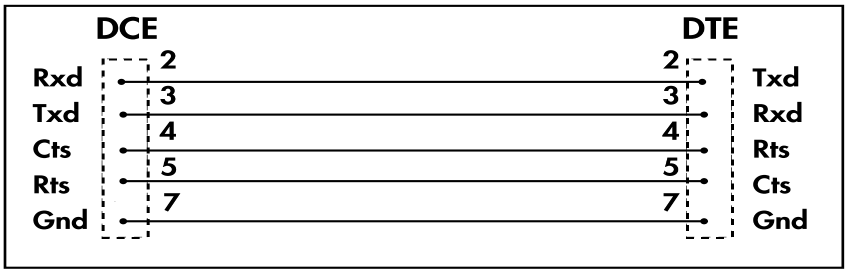


Figure A-1 *DCE to DTE Serial Connections*

Printer Support

Serial vs. Parallel

The DPC uses a serial or parallel interface for its printer connection. To determine whether your printer's interface is serial or parallel, consult the printer's user manual or compare the printer's interface connector to Figure A-2.

Figure A-2 shows the difference between serial and parallel connectors. If your printer has the parallel interface connector, a serial interface card with a serial interface connector can be purchased from the printer manufacturer or from a local computer supply store. As an alternative to a serial interface card, a parallel-to-serial converter may be used.

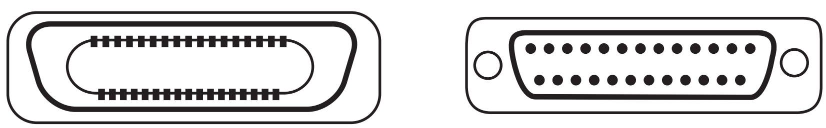


Figure A-2 *Parallel and Serial Interface Connectors*

Determining Printer Software Compatibility

Printers use control characters and escape sequences to control the way the output is printed. These control codes vary from manufacturer to manufacturer and often vary within a manufacturer's product line. The DPC supports three printer types (and the generic ASCII) to ensure compatibility with most printers currently on the market. These printer types are:

- Epson
- IBM ProPrinter XL
- IBM ProPrinter X24

If your printer is not on this list, the printer can probably emulate or imitate, one of the above printers. Consult your printer's user manual to determine the available emulation modes. If your printer manual is not clear on which printer emulations are supported, compare the printer codes listed in Table A-2 to the codes listed in the Command Reference section of your printer manual to determine compatibility.

NOTE

Should you have questions about printer compatibility, please refer to the printer manufacturer. When this manual was printed, these were the contacts for IBM and Epson respectively:

IBM PC Help Center: 1-800-772-2227 (USA only)
IBM website: http://www.ibm.com
Epson website: http://www.epson.com

Dukane recommends these Epson printers for use with the DPC:
LQ570+ (8.5" x 11") and LQ2080 (11" x 17")

	Epson	IBM ProPrinter XL	IBM ProPrinter X24
Pica	12H ESC P	12H	12H
Elite	12H ESC M	ESC ! 1H	12H ESC :
Compressed Pica	ESC P 0FH	ESC ! 4H	12H 0FH
Compressed Elite	ESC M 0FH	ESC ! 5H	ESC : 0FH
Block Graphics	ESC t 1	N/A	N/A
Reset	18H	18H	18H
Line Spacing	ESC 33H n	ESC 33H n	ESC 33H n
Graphics	ESC K n n	ESC K n n	ESC K n n
Exit Graphics	N/A	N/A	N/A

Table A-2 *Printer Control Codes*

Output Formats

Printer Output Format

When part record information is sent to a printer, each characteristic is embedded into a 12-character field and delimited by spaces. The location of the characteristic is determined by the number of characters allowed for the characteristic's data type (e.g., time, distance, power, etc.).

Three spaces are reserved at the beginning of each field to serve as placeholders for the limit indicators (e.g., <<, >>) and a negative sign. Each line is preceded by printer control codes to set the pitch of the type. An 80-column printer is assumed. Each line of output is followed by a carriage return (<CR>) and an optional linefeed (<LF>). The number of characters printed is equal to 12 times the number of fields (characteristics plus the part count). Table A-3 below shows which character pitch is used per line length. Refer to this table to determine your printer control codes as they relate to the printer pitch type.

Printer Pitch	Characters Printed Per Line
Pica	1 – 80
Elite	81 – 96
Compressed Pica	97 – 138
Compressed Elite	139 – 160

Table A-3 *Printer Pitch per Characters Printed*

ASCII Output Format

The ASCII output format is essentially the same as the printer output format. The only difference is that with the ASCII format no control codes or escape sequences are transmitted. This allows the input of data into programs or devices that would not understand the printer-specific control codes. Examples of this type of device are:

- Unsupported printers
- Communications programs (CrossTalk, QModem, etc.)
- PLCs with serial ports

As with the printer output format, each characteristic is embedded in a 12-character field and delimited by spaces. The location of the characteristic is determined by the number of characters allowed for the characteristic's data type. Three spaces are reserved at the beginning of each field to serve as placeholders for the limit indicators (e.g., <<, >>) and a negative sign. Each line is preceded by printer control codes to set the pitch of the type. Each line of output is followed by a carriage return (<CR>) and an optional linefeed (<LF>). Figure A-3 shows an example of the output format for each data type.

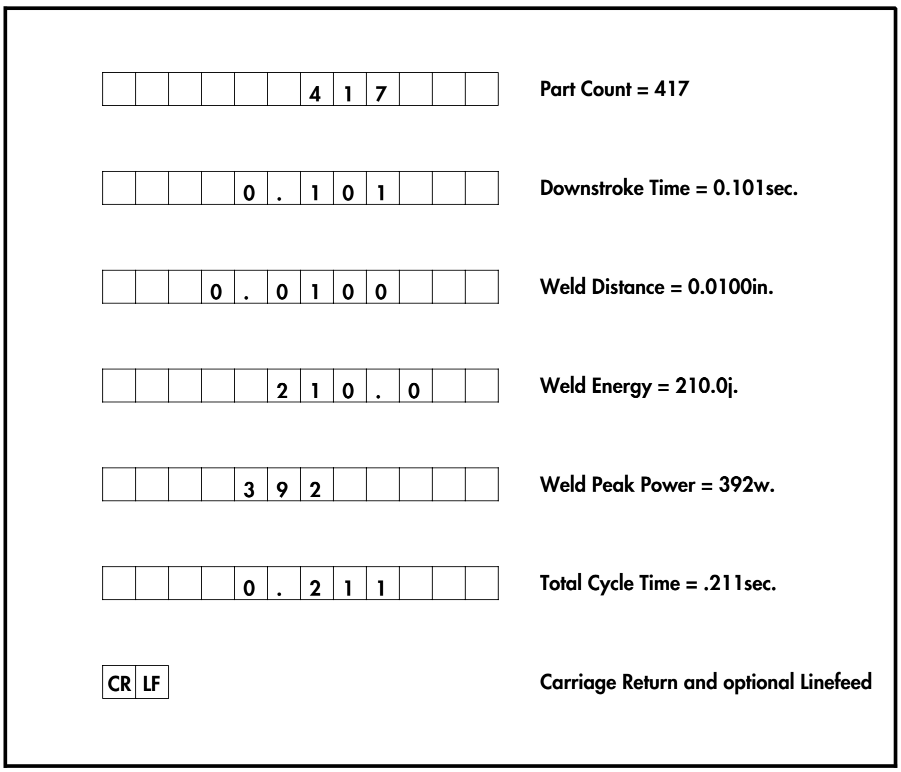


Figure A-3 *ASCII Output Format*

1-2-3 Format

The 1-2-3 format is a comma delimited format that allows for collecting the part data into a computer file and then import that file into a compatible spreadsheet program, such as Lotus 1-2-3 or Microsoft Excel, for analysis or the creation of presentation quality graphics. Each characteristic is right justified in an 11-character field followed by a carriage return (<CR>) and an optional linefeed (<LF>). Figure A-4 shows an example of the output format.

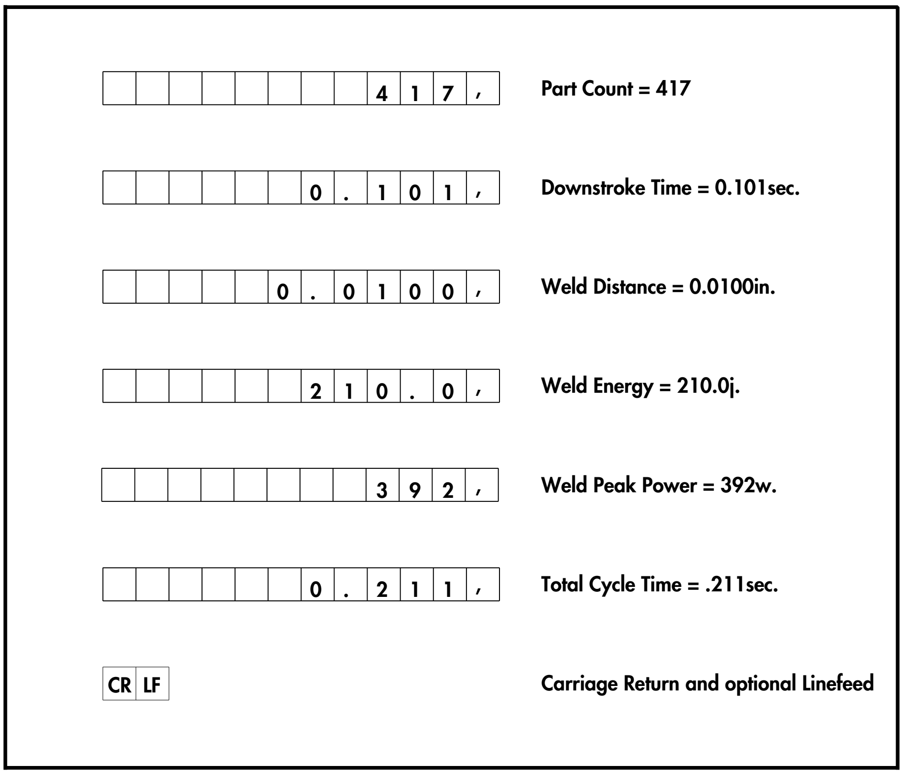


Figure A-4 *1-2-3 Output Format*

CSV or LKI Format (Also known as LKS for Lyle-Kearsly Systems)

LKI (also known as LKS for Lyle-Kearsly Systems) is a CSV (Comma Separated Value) format used by some statistical process control (SPC) programs. With this format, each characteristic value is output with an additional tag value. The tag value is a two-digit number unique to the characteristic. This allows a program to identify each individual characteristic and store it in an appropriate file regardless of the order in which the characteristic is received. Each line of output is followed by a carriage return (<CR>) and an optional linefeed (<LF>). Figure A-5 shows an example of this output format and Table A-4 provides the tag description for each tag value.

Part Count = 417

0	0	0	0							4	1	7	,

Downstroke Time = 0.101 second

0	0	0	2					0	.	1	0	1	,

Weld Distance = 0.0100 inch

0	0	0	9			0	.	0	1	0	0	0	,

Weld Energy = 210.0 joules

0	0	1	0					2	1	0	.	0	,

Weld Peak Power = 392 watt

0	0	1	1							3	9	2	,

Total Cycle Time = 0.211 second

0	0	2	5					0	.	2	1	1	,

Carriage Return and optional Linefeed

CR	LF

Figure A-5 *CSV/LKI Output Format*

Tag Description	Tag Number Decimal	Hex
Part Count	0	00H
Line Pressure	1	01H
Downstroke Time	2	02H
Downstroke Distance	3	03H
Contact Pressure	4	04H
Trigger Delay Time	5	05H
Trigger Delay Distance	6	06H
Reserved	7	07H
Weld Time Pressure 1	8	08H
Weld Distance Pressure 1	9	09H
Weld Energy Pressure 1	10	0AH
Peak Power Pressure 1	11	0BH
Reserved	12	0CH
Weld Time Pressure 2	13	0DH
Weld Distance Pressure 2	14	0EH
Weld Energy Pressure 2	15	0FH
Peak Power Pressure 2	16	10H
Reserved	17	11H
Absolute Weld Distance	18	12H
Total Weld Time	19	13H
Total Weld Distance	20	14H
Total Weld Energy	21	15H
Hold Time	22	16H
Hold Distance	23	17H
Reserved	24	18H
Total Cycle Time	25	19H
Total Stroke	26	1AH
Time Stamp Real-Time Clock	27	1BH

Table A–4 *CSV/LKI Tag Description and Tag*

Zontec Format

The Zontec format is designed for use with the Zontec SPC Timesaver Advanced program and conforms to the Zontec ASCII 2 Device Interface Specification. As data is received by the Zontec program, it is routed to characteristic files based on a channel number. The channel number is a four-character number that contains the tag value of the characteristic. The channel number and the characteristic value field are separated by a comma. The characteristic value is embedded in an eight-character field and is terminated by a carriage return (<CR>) and a linefeed (<LF>). Figure A-6 shows an example of this output format.

0	0	0	0	,						4	1	7	CR	LF	**Part Count = 417**
0	0	0	2	,				0	.	1	0	1	CR	LF	**Downstroke Time = 0.101sec.**
0	0	0	9	,			0	.	0	1	0	0	CR	LF	**Weld Distance = 0.0100in.**
0	0	1	0	,				2	1	0	.	0	CR	LF	**Weld Energy = 210.0j.**
0	0	1	1	,						3	9	2	CR	LF	**Weld Peak Power = 392w.**
0	0	2	5	,				0	.	2	1	1	CR	LF	**Total Cycle Time = .211sec.**

Figure A-6 *Zontec Output Format*

DataMyte Format

Some models of the DataMyte data collectors do not accept characteristics without decimal points. When in DataMyte mode, the DPC adds a decimal point to the power measurements and suppresses the compression of a "0.000" parameter to a single zero (0). All characteristics are right-justified in a twelve-character field.

Computerized Data Collection

With the serial interface, it is very easy to collect data from the DPC to a computer. Any one of the commercially available communications software packages can be used.

Appendix B
Display Monitor and Computer Connections

> **NOTE**
>
> *These instructions for connecting a monitor to the DPC are provided for part data display only.*

Connecting the Falco or Sherwood Display Monitor to the DPC

> **NOTE**
>
> *Start this process with the electrical power turned off on both the DPC and the monitor.*

1. Use a typical modem-type cable to establish a connection between the serial ports of the DPC and the monitor.
   The connector on the DPC is a 9-pin male, and the Falco or Sherwood connector is a 25-pin female.

2. Turn on power to the monitor, and then to the DPC.

3. Enter the following commands in the DPC from the main menu.

   Press ENTER, and scroll to HARDWARE.

   Press ENTER, and scroll to PORTS.

   Press ENTER, and select SERIAL.

   Press ENTER, and select OUTPUT DEVICE.

   Press ENTER, and select COMPUTER.

   Press ENTER, and select FALCO.

   Press ENTER.

4. Press the MODE key on the DPC–4 three or four times.
   Press the MODE key on the DPC–4 Plus once.

5. If there are no Data Headers on the monitor, turn off power to the DPC and monitor, and then turn the power on again, and the headers will appear.

> **NOTE**
>
> *It may also be necessary to cycle the ultrasonic press before data appears on the monitor.*

Increasing the Number of Process Characteristics to be Viewed

Falco Monitor

1. Press CNTRL and ESC, and the Falco directory appears.

2. Select TERMINAL using the keyboard arrow → key.

3. Press END.

4. Using the arrow → key, on the terminal setup page, go to 80 COL.

5. Press END, and 80 COL should change to 132 COL.

6. Use the arrow → key to move to SAVE.

7. Press END.

8. Turn off the DPC and the Falco monitor, then turn them back on again.

> **NOTE**
>
> *It may also be necessary to cycle the ultrasonic press before data appears on the monitor.*

Sherwood Monitor

1. Press SHIFT and ESC, and the Sherwood directory appears.

2. Select DISPLAY using the right arrow → key.

3. Use the down arrow ↓ to select COLUMNS.

4. Select 132 using the right arrow → key.

5. Press ESC.

6. Turn off the DPC, and then turn it back on again.

NOTE

The Sherwood monitor does NOT need to be turned off and then on.
It may also be necessary to cycle the ultrasonic press before data appears on the monitor.

Connecting a Computer to the DPC

NOTE

This procedure is done only for display of parts data.

1. Establish a connection between the serial ports of the DPC and the computer. (The connector on the DPC is a 9-pin male, and it is likely that there is also a 9-pin male connector on the computer.

2. After the DPC and computer have been connected, turn on the computer, and then turn on the DPC.

3. Enter the folowing commands in the DPC from the main menu:

Press ENTER, and scroll to HARDWARE.

Press ENTER, and scroll to PORTS.

Press ENTER, and select, SERIAL.

Press ENTER, and select, OUTPUT DEVICE.

Press ENTER, and select, COMPUTER.

Press ENTER, and select, VT100.

Press ENTER.

4. Turn on the computer and do the following:

From PROGRAM MANAGER,

Open MICROSOFT ACCESSORIES.

Open TERMINAL.

Go to File, select NEW.

Go to Settings,

Select TERMINAL EMULATION,

Select DEC VT-100 (ANSI),

Select OK.

Go to Settings,

Select COMMUNICATIONS,

Select COM 1 or COM 2,

Select 9600.

NOTE

All other settings should default to the following:

Data Bits: 8

Parity: None

Flow Control: Xon/Xoff

Stop Bits: 1

NOTE

It may be necessary to turn off the DPC and turn it back on to have Process Characteristics appear.

Please remember to select DISPLAY for the process characteristics you want to see on the computer monitor. (Selecting "Display" for the process characteristics is done through the DPC and its PROCESS SETUP ➔ PROCESS LIMITS menus.)

This page intentionally left blank

Appendix C
Interfacing with Automation Equipment

Introduction

This information describes how to interface the Dukane Dynamic Process Controller™ integrated process control system with automation equipment.

Descriptions (including function) of the various inputs and outputs are provided.
In addition, connections are explained, and examples of interfacing with external equipment are given.

Signal Descriptions

There are several ways to interface to each I/O line. Optocouplers, relays, switches, and indicators are most commonly used to interface to the I/O signals. Interfacing in a specific application is best determined by those integrating the DPC into the other systems.

The DPC provides I/O for starting a welding cycle, aborting a cycle in process, status outputs, alarm outputs and other specialized I/O. Some of the signals are electrically isolated and some are not. If electrical isolation is desired for the nonisolated signals, use external means such as relays or optocouplers.

J202 Signals

Pin No.	Color	Input/ Output	Signal Name	Signal Description	Iso- lated?
1	Wht	Input	Activation Switch 1	Normally open; connect to ground to activate.	No
2	Grn	Input	Activation Switch 2	Normally open; connect to ground to activate.	No
3	Blu	Input	Hard Abort Power In	Normally closed; connect to Pin 9 to operate system. Open to remove power from actuator.	No
4	Orn	Input	Abort	Normally open; connect to ground to activate.	No
5	Brn/Blk	Not Used			
6	Grn/Blk	Gnd	Ground	Internal signal ground	No
7	Blk	Gnd	Ground	Internal signal ground	No
8	Wht/Blk	Input	Automation Input	Normally open; connect to ground to activate.	No
9	Brn	Output	Hard Abort Power Output	Normally closed; connect to Pin 3 to operate system. Open to remove power from actuator.	No

Table C–1 *Signals: J202*

J202-1,2 Activation Switch Inputs: These signals are used to start a cycle in a manual system. These signals are connected to two hand-operated switches that, when pressed, start a new cycle. The signals must be activated within 0.5 seconds of each other, and must be held until the trigger switch on the actuator is activated. The activation of the trigger switch in the actuator indicates the actuator has contacted the part, and there is no longer a gap between the horn and the part. If either signal is deactivated prior to trigger switch activation, the system immediately terminates the current cycle and the actuator retracts. Both signals must be deactivated before a new cycle can begin. These inputs are enabled under the Initiate Menu in the Process Control portion of the setup menus. To enable these inputs select Manual under the Initiate menu.

J202-3,9 Hard Abort: For normal system operation pin 3 and pin 9 must be connected together either though a switch or hardwired. **When these pins are not connected together, power is removed from the actuator and it will not operate.**

J202-8 Automation Input: This input is used in automated systems to start a new cycle. Connect this signal to ground to activate. A 50 millisecond or longer activation of this signal will start a new cycle and cause the actuator to extend. Proper guarding must be provided to prevent access to the actuator when the system is activated. This input is enabled under the Initiate Menu in the Process Control portion of the setup menus. To enable this input select Auto under the Initiate menu.

Basic I/O Interface

J602 Signals

Pin No.	Color	Input/ Output	Signal Name	Signal Description	Isolated?
1	Red	Power	Internal DC Power Supply	Internal +22Volt power supply. Maximum 0.5 Amps can power external relay.	No
2	Blk	Gnd	Internal Gound	Ground	No
3	Blu/Blk	Output	Bad Part	Solid state relay output	Yes
4	Grn/Wht	Output	Suspect Part	Solid state relay output	Yes
5	Blu/Wht	Output	Good Part	Solid state relay output	Yes
6	Red/Blk	Output	Ready	Solid state relay output	Yes
7	Wht/Blk	Output	Output Common	Output Common. Connect to plus (+) to make outputs sourcing. Connect to minus (−) to make output sinking.	Yes
8	Wht	Input	Automation Input	Activate to start cycle.	Yes**
9	Orn	Input	Abort Input/Normally Closed	Activate to abort cycle.	Yes**
10	Blu	Input	Abort Input/Normally Open	Deactivate to abort cycle.	Yes**
11	Orn/Blk	Input	Input 1	Not Used.	Yes**
12	Red/Wh	Input	Input Common/External Supply	Input common if inputs are set up as isolated; otherwise not used.	Yes
13	Grn/Blk	Gnd	Ground		No
14	Blk/Wht	Output	Input Mode Select	Connect to Pin 13 to isolate inputs, in open inputs are not isolated.	No
15	Grn	Input	Ground Detect Input	Normally open; connect to ground to terminate weld portion of cycle.	No

Table C–2 *Signals: J602*

**** Note: for inputs J602-8 to J602-11, inputs are isolated if J602-13 is connected to J602-14. If J602-14 is open inputs J602-8 through J602-11 are not isolated and are powered using internal power supply.***

<u>J602-3 Bad Part Output:</u> Output is activated when a parameter is greater than or equal to the upper bad part limit or is less than the lower bad part limit set in the Process Limits menu. Output can be sourcing or sinking depending on how the output common is connected. Output logic can be reversed in the Output menu in the User I/O section of Hardware Setup.

<u>J602-4 Suspect Part Output:</u> Output is activated when a parameter is greater than or equal to the upper suspect part limit or less than the lower suspect part limit set in the Process Limits menu. Output can be sourcing or sinking depending on how the output common is connected. Output logic can be reversed in the Output menu in the User I/O section of Hardware Setup. **See Page 54, Define Suspect As (J602 I/O Connection, Pin #4).**

J602-5 Good Part Output: Output is activated when no upper or lower limits are exceeded. Output can be sourcing or sinking depending on how output common is connected. Logic of output can be reversed in the Output menu in the User I/O section of Hardware Setup.

J602-6 Ready Output: Output is activated when the system is ready to start a new cycle. Output can be sourcing or sinking depending on how output common is connected. Logic of the output can be reversed using the Output menu in the User I/O section of Hardware Setup. Note that Ready Out is not the same as Top-of-Stroke.
See Page 53, Define Ready As (J602 I/O Connection, Pin #6).

J602-7 Output Common: This is the common for outputs on J602-3 through J604-6. Outputs will be sourcing if output common is connected to the positive terminal of the power supply. Outputs will be sinking if output common is connected to the minus terminal of the power supply.

J602-8 Automation Input: This input is used in automated systems to start a new cycle. A 50 millisecond or longer activation of this signal will start a new cycle and cause the actuator to extend. Proper guarding must be provided to prevent access to the actuator when the system is activated. This input is enabled under the Initiate menu in the Process Control portion of the setup menus. To enable this input, select Auto under the Initiate menu. This input has the same functionality as J202-8. The input can be electrically isolated by externally connecting J602-14 to J602-13. The input signal will need sourcing if J602-12 is connected to the negative terminal of the power supply. The input will need sinking if J602-12 is connected to the positive power supply termninal. If J602-14 is not externally connected to J602-13, the input signal is not isolated and is activated by making a connection to ground.

J602-9, J602-10 Abort Inputs: The current cycle is aborted and a new cycle prevented when J602-9 is activated and J602-10 is deactivated. The input signal can be electrically isolated by externally connecting J602-14 to J602-13. The input will then need sourcing if J602-12 is connected to the power supply negative terminal. The input signal will need sinking if J602-12 is connected to the positive terminal of the power supply. If J602-14 is not externally connected to J602-13, the input signal is not isolated and is activated when connected to ground.

J602-13, J602-14 Input Mode Select: Externally connect Pin 14 to 13 to electrically isolate inputs on Pins 8 through 11. If not connected, inputs are not electrically isolated and use internal power.

J602-15 Ground Detect Input: To activate this input, connect it to ground. When activated, the signal terminates weld portion of cycle. It is generally used to detect when the horn contacts an electrically isolated anvil. The ground detect input is connected to the electrically isolated anvil. When the horn, which is always at ground potential, contacts the anvil the ground detect input is activated.

Advanced I/O Automation Interface

System–In and Status–Out Signals

The J901 Advanced Automation Interface connector (see Figure 2–3) provides a communications link between the DPC–4 Plus and user automation equipment. This HD–26 connector provides status signals that can be used to monitor the operation status of welding system hardware and welding cycle events. It also provides the automation with dedicated communication links that permit the automation to control the welding sequence setup, and to stop the welding sequence. The signals and their pinouts are listed in Table C–3 below.

Pin	Signal Name	Signal Description
1	F P Lock	Front Panel Lockout Input [1]
2	BP Stat R	Bad Part Status Reset Input [2]
3	RSB1	Remote Setup Bit No. 1 (LSB) [3]
4	RSB2	Remote Setup Bit No. 2 [3]
5	RSB3	Remote Setup Bit No. 3 [3]
6	RSB4	Remote Setup Bit No. 4 (MSB) [3]
7	Auto EOW	Automation End–Of–Weld Input [4]
8	Auto CS	Automation Cycle Stop Input [5]
9	Iso In Com	Common Pin for Input Signals on Pins 1 – 8
10	DV Stat	Down Valve Status Output
11	Trig Stat	Trigger Status Output
12	WP1 Stat	Weld Pressure 1 Status Output
13	WP2 Stat	Weld Pressure 2 Status Output
14	EOW Stat	End–Of–Weld Status Output
15	H Stat	Hold Status Output
16	TOS Stat	Top–Of–Stroke Status Output
17	EM Stop	Emergency Stop Switch Output
18	Gnd	Power Supply Return
19	AF Stat	Any Fault Isolated Status Output
20	U/S Act	Ultrasound Active Isolated Status Output
21	OL Stat	Overload Isolated Status Output
22	OT Stat	Overtemperature Isolated Status Output
23	Iso Out Com	Common Pin for Output Signals on Pins 19 –22
24	Gnd	Power Supply Return
25	Gnd	Power Supply Return
26	Pwr	+22V DC (500mA Max.)

Table C–3 *J901 Automation Signals*

[1] FP Lock — Activation of this system input will disable the controller interface to the DPC–4 Plus welding system. The keypad for the DPC–4 Plus controller will remain disabled for the duration of the activation signal.

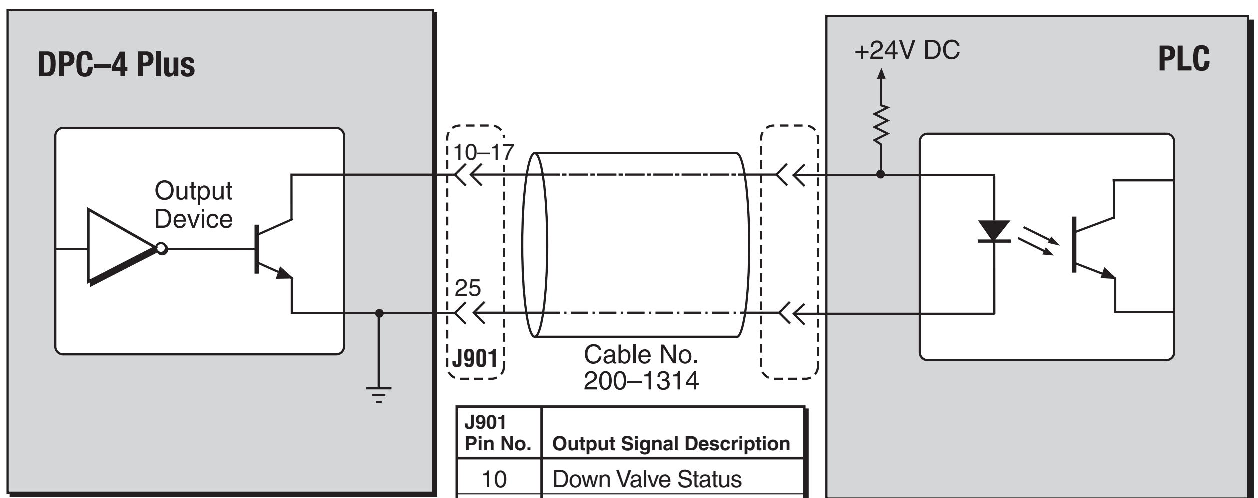
[2] BP Stat R — A momentary activation of this system input (100msec min.) will reset the Bad Part status output signal on J602 Pin 3 to its default status. Please refer to the Process Limits section of the manual for further details pertaining to the use of the Bad Part status feature.

[3] RSB 1–4 — These four inputs are activated in a binary combination that represents the setup that will be used for the next welding cycle. The binary code must remain active and stable for both a minimum of 100msec prior to initiating the welding cycle and until the READY status of J602 Pin 6 has deactivated. Refer to the Sequencing section of this manual for more information on enabling Remote Setup.

[4] Auto EOW — A momentary activation of this input (100msec min.) during the welding cycle will terminate the remaining portion of the weld cycle. The DPC–4 Plus will continue processing all other remaining weld cycle tasks that are processed after the weld portion of the cycle.

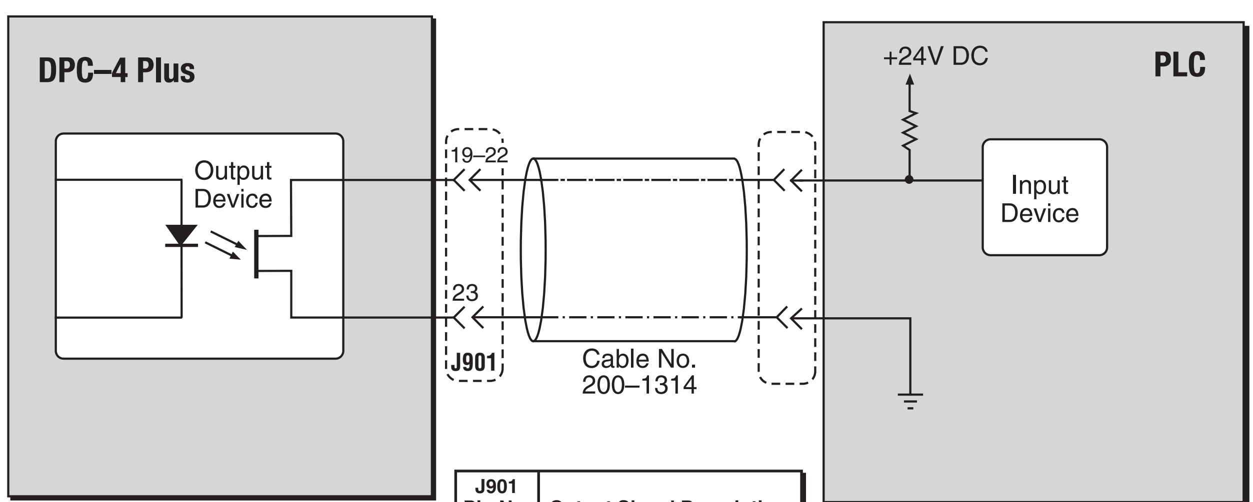
[5] Auto CS — A momentary activation of this input (100msec min.) during the welding cycle will terminate all remaining portions of the welding cycle.

J901 Status Output Interface Examples



J901 Pin No.	Output Signal Description
10	Down Valve Status
11	Trigger Status
12	Weld Pressure 1 Status
13	Weld Pressure 2 Status
14	End–Of–Weld Status
15	Hold Time Status
16	Top–Of–Stroke Status
17	Emergency Stop Status

Figure C–1 *DPC–4 Plus Status Output Configuration For use With a PLC Requiring Sinking Inputs*



J901 Pin No.	Output Signal Description
19	Any Fault Status
20	Ultrasound Active Status
21	Overload Status
22	Overtemperature Status

Figure C–2 *DPC–4 Plus Isolated Status Output Configuration For use With a PLC Requiring Sinking Inputs*

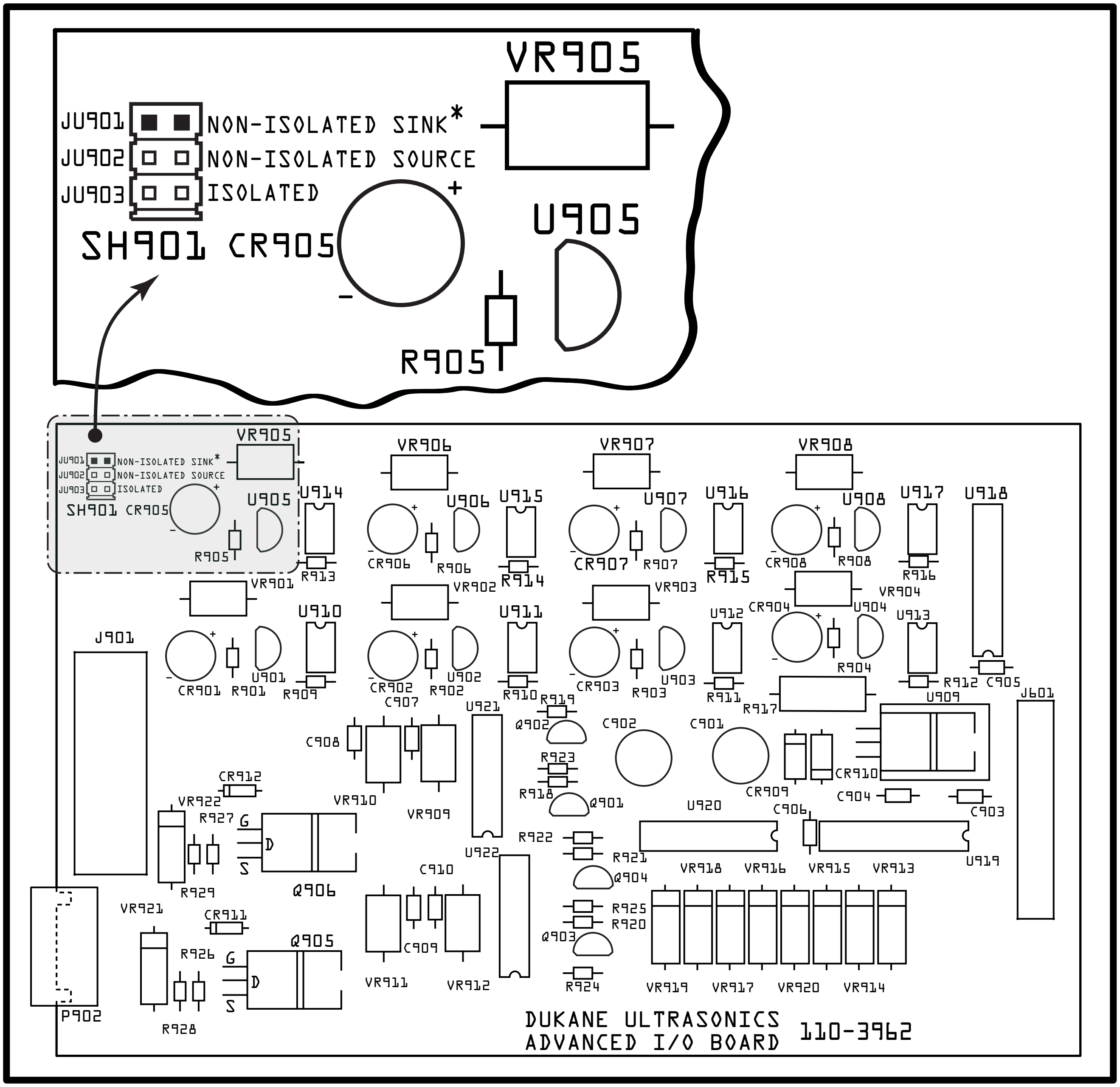


Figure C–3 *DPC–4 Plus Advanced I/O SH901 Jumper Configuration*

System Input Signal Configuration

There are eight input signals on the J901 Advanced Automation Interface connector. All of the inputs can be configured as —

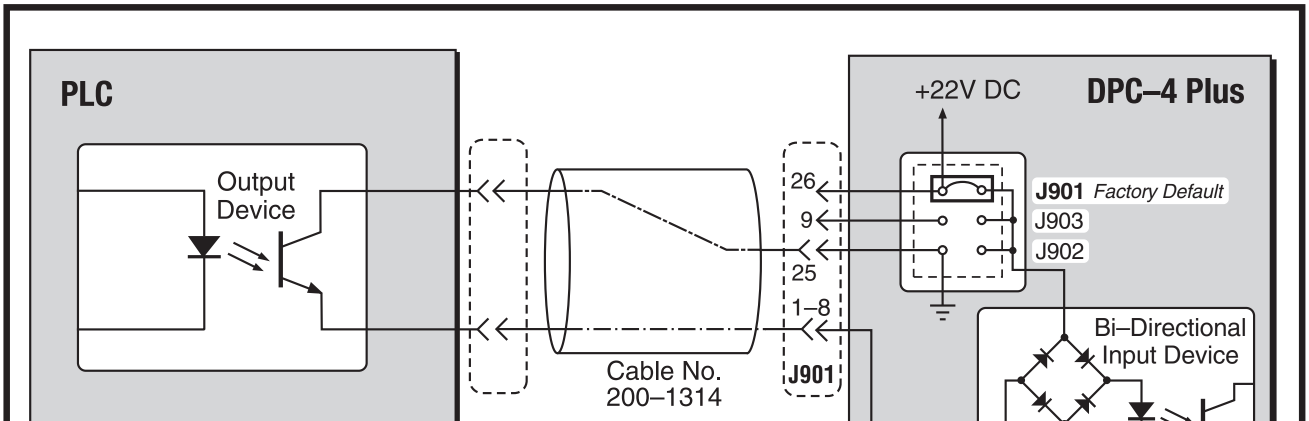
- Non–Isolated Sinking Inputs (Factory Default)
- Non–Isolated Sourcing Inputs or
- Isolated Sourcing Inputs.

The selection is made by configuring the SH901 jumper (see Figure C–3 above) on the 110–3962 PC board located inside the DPC–4 Plus chassis.

WARNING

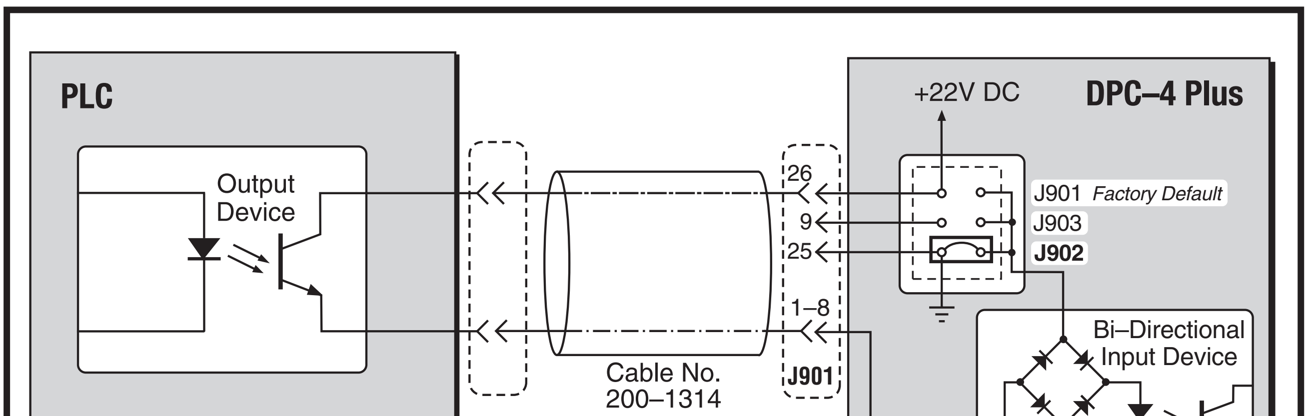
Electrical safety hazards exist within the DPC–4 Plus chassis. Remove all AC voltage from the power cord and the DPC–4 Plus. Turn off the DPC and allow 5 minutes for it to discharge.

J901 System Input Interface Examples



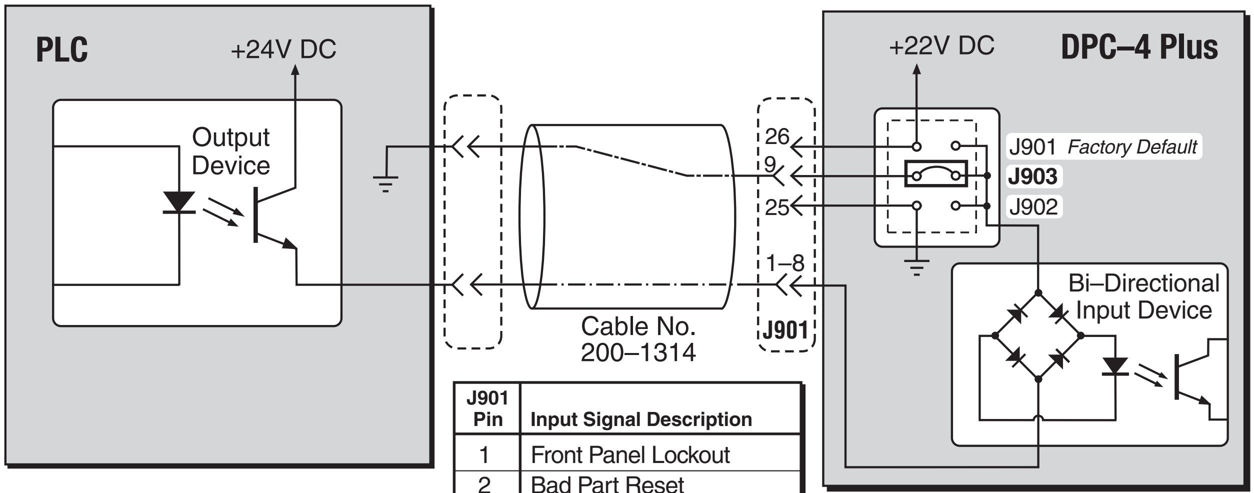
J901 Pin	Input Signal Description
1	Front Panel Lockout
2	Bad Part Reset
3	Remote Setup Bit 1
4	Remote Setup Bit 2
5	Remote Setup Bit 3
6	Remote Setup Bit 4
7	Automation End–Of–Weld
8	Automation Cycle Stop

Figure C–4 *DPC–4 Plus System Input Configuration For Use With Devices That Provide Contact Closure Signals With No Input Voltage To The DPC Inputs*



J901 Pin	Input Signal Description
1	Front Panel Lockout
2	Bad Part Reset
3	Remote Setup Bit 1
4	Remote Setup Bit 2
5	Remote Setup Bit 3
6	Remote Setup Bit 4
7	Automation End–Of–Weld
8	Automation Cycle Stop

Figure C–5 *DPC–4 Plus System Input Configuration For Use With Devices That Utilize the DPC Power Supply to Source Voltage to the DPC Inputs.*



J901 Pin	Input Signal Description
1	Front Panel Lockout
2	Bad Part Reset
3	Remote Setup Bit 1
4	Remote Setup Bit 2
5	Remote Setup Bit 3
6	Remote Setup Bit 4
7	Automation End–Of–Weld
8	Automation Cycle Stop

Figure C–6 *DPC–4 Plus System Input Configuration For Use With Devices That Source Voltage to the DPC Inputs.*

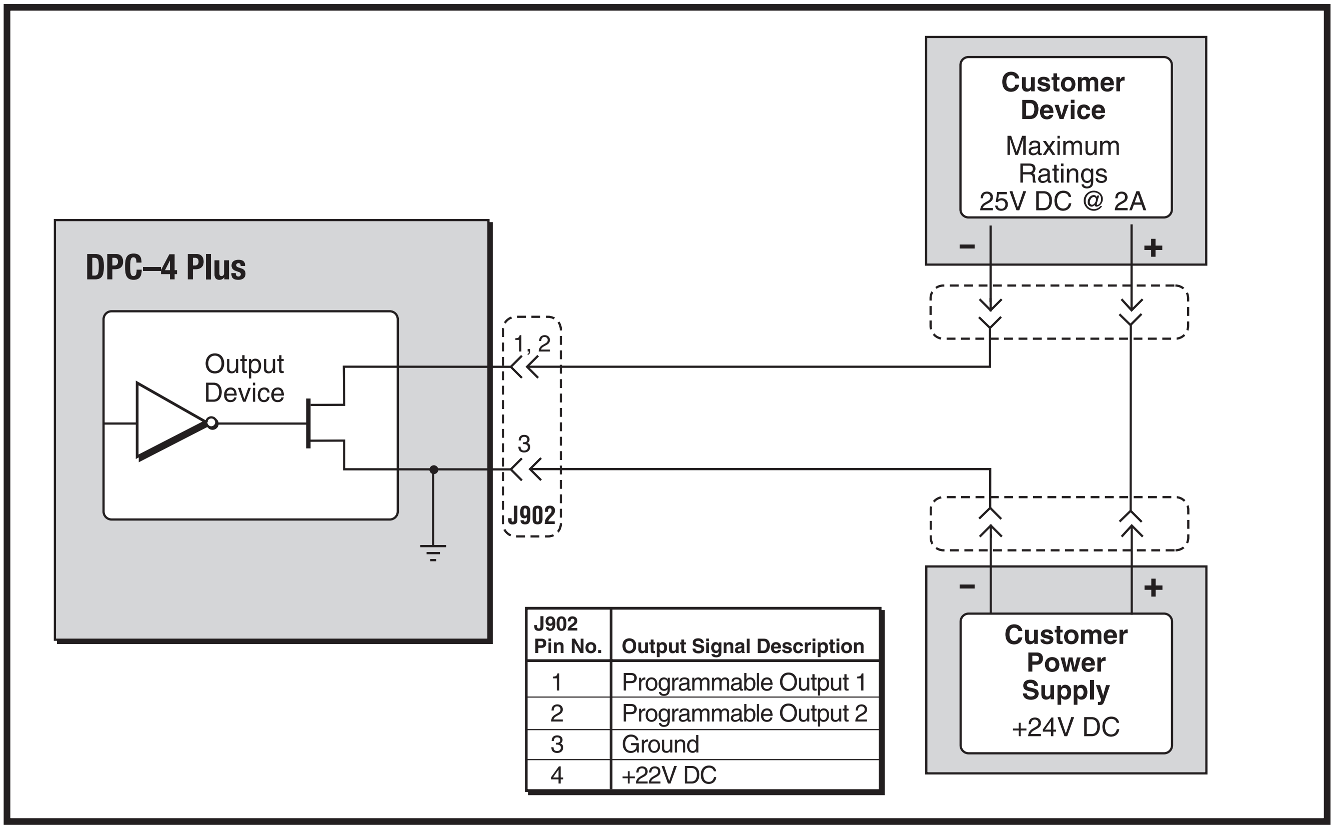
> NOTE
> The drawings and circuits shown in this section are intended solely for purposes of example. Since there are many variables and requirements associated with any particular installation, Dukane does not assume responsibility or liability for actual

J902 Programmable Output Signals

The two output signals on J902 (see Figure 2–3 for the connector location) are programmable to any one of seven available states. Refer back to Figure 5–31 for instruction on defining each of the outputs. Figure C–7 on the next page below shows a sample interface. The pinouts for J902 are listed below in Table C–4 below.

Pin No.	Name	Signal Description
1	Output 1	Programmable Output No. 1 – Sinks 2A @ 25V Max
2	Output 2	Programmable Output No. 2 – Sinks 2A @ 25V Max
3	Ground	Power Supply Return
4	Power	+22 VDC Supply (500mA Max.)

Table C-4 *J902 Programmable Output Signals*



J902 Pin No.	Output Signal Description
1	Programmable Output 1
2	Programmable Output 2
3	Ground
4	+22V DC

Figure C–7 *DPC–4 Plus Programmable Output Interface Configuration*

Dukane Universal Adapter (Accessory)

The Universal Adapter (Part No. 43A400) is a junction box approximately 2.4 inches (60 mm) deep, 8 inches (203 mm) tall, and 4.7 inches (119 mm) wide. A front view in Figure C–8 below shows its connectors. The Universal Adapter allows the DPC to communicate with certain types of Dukane ultrasonic presses. Check with your Dukane representative to see if the Universal Adapter will suit your purposes.

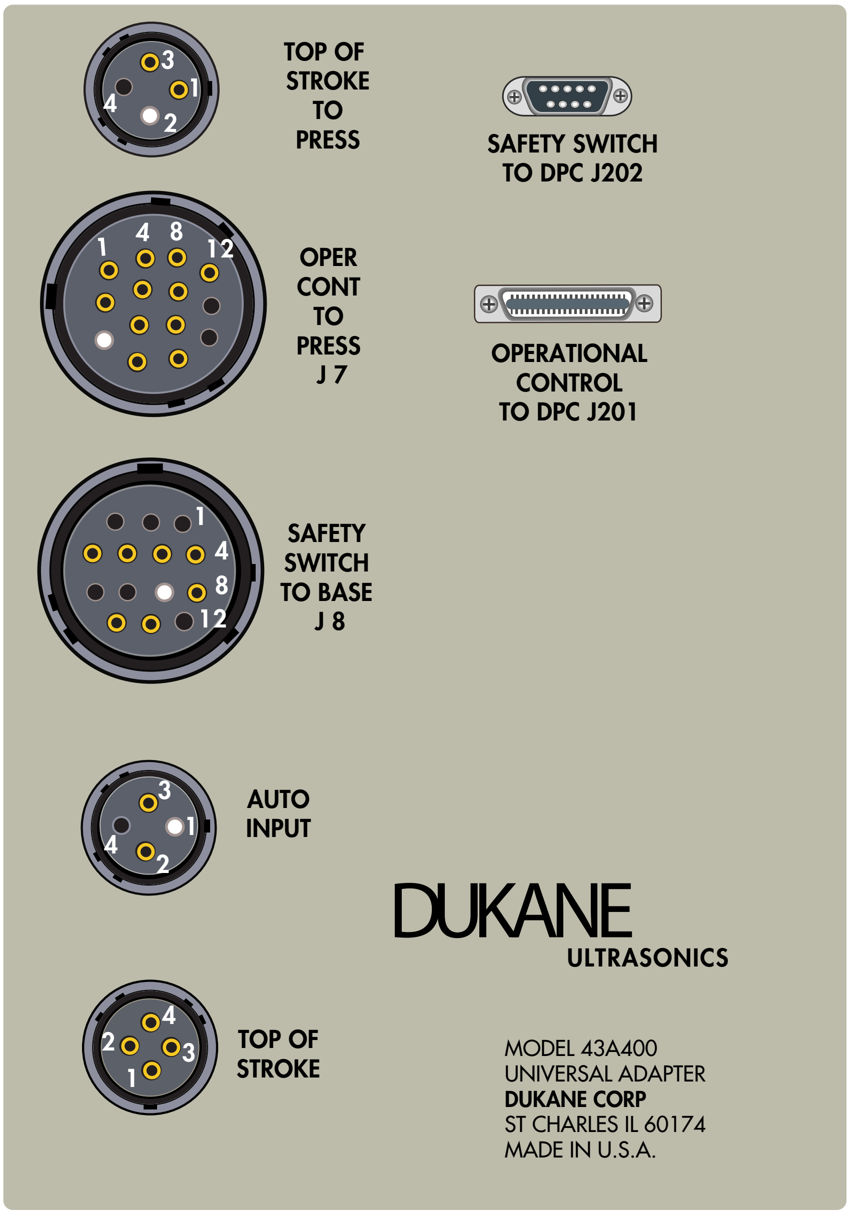


Figure C–8 *Dukane Universal Adapter, Front View*

ACTIVATION SWITCH TO BASE J8 Connector

Table C–5 below shows an overview of J8 signals.

Pin No.	Color 200-707	Color 200-607	Input/-Output	Signal Name	Signal Description	Isolated
4	Wht		Gnd	Ground		No
5	Yel		Input	Activation Switch 2	Normally open. Connect to ground to activate.	No
6	Red	Blk	Gnd	Ground		No
7	Grn	Wht	Input	Abort	Normally open. Connect to ground to activate.	No
8	Blk		Input	Activation Switch 1	Normally open. Connect to ground to activate.	No
13	Brn	Red	Output	Hard Abort Power Out	Normally closed. Connect to Pin 14 to operate system. Open to remove power from actuator.	No
14	Blu	Brn	Input	Hard Abort Power In	Normally closed. Connect to Pin 13 to operate system. Open to remove power from actuator.	No

Table C–5 *Signals: J8 ACTIVATION SWITCH TO BASE*

The signals on the Universal Adapter's J8 connector are the same signals as on the DPC connector J202 (shown above in Table C–5). Table C–6 below shows the relationship between connector pin numbers and signal. See the description of J202 for more information.

Signal	Connectors and their Pin Numbers	
	Universal Adapter – J8	DPC – J202
Activation Switch 2	5	2
Abort	7	4
Activation Switch 1	8	1
Hard Abort Power Out	13	9
Hard Abort Power In	14	3

Table C-6 *Signals: J8 and J202*

NOTE

When the Universal Adapter is part of the system, J8 on the Adapter is used in place of J202 on the DPC.

AUTO INPUT Connector

Pin 2 and Pin 3 for the Universal Adapter's AUTO(mation) INPUT connector have the same functions as J202-7 and J202-8 on the DPC. They are the same signals. Table C-7 below shows the relationship between the connectors.

Connecting these two pins together starts a new cycle when Initiate Mode is set to Auto.

Signal	Device and Connector with Pin Numbers	
	Universal Adapter AUTO INPUT	DPC – J202
Ground	2	7
Automation Input	3	8

Table C–7 *Signals: AUTO INPUT and J202*

Start Signals

There are two ways to start a cycle: one for manual systems, and another for automated systems. Program the DPC for the desired method through the Initiate menu in the Process Control portion of the setup menus.

Manual Systems

One start signal method is used with manually operated systems where two hand-operated switches are pressed by the operator to start a new cycle. Signals for these switches are found on Pins J202-1 and J202-2 or J8-5 and J8-8. J8 is used if a Dukane Universal Adapter (Part No. 43A400) is part of the system, otherwise J202 on the DPC is used.

One side of a normally open switch is connected to the signal, and the other side is connected to ground. When the switch is pressed, the signal is activated. The signals must be activated within 0.5 second of each other to start a cycle. The signals must stay activated until the pressure switch signal in the actuator is activated. Activation of the trigger switch in the actuator indicates the actuator has contacted the part, and there is no longer a gap between the horn and the part.

If either signal is deactivated prior to trigger switch activation, the system immediately terminates the current cycle, and the actuator retracts. Both signals must be deactivated before a new cycle can begin. These inputs are enabled under the Initiate Menu in the Process Control portion of the setup menus. To enable these inputs select Manual under the Initiate menu.

Automated Systems

Automated systems can use the automation input to start a cycle. A 50 millisecond or longer activation of this signal will start a new cycle and cause the actuator to extend.

CAUTION

Proper guarding must be provided to prevent access to the actuator when the ultrasonic system is activated.

This input is enabled under the Initiate Menu in the Process Control portion of the DPC setup menus. To enable this input, select Auto under the Initiate menu.

The automation input is found on J202-8 or J602-8. It is up to the system integrator to decide which signal to use. If a Dukane Universal Adapter (Part No. 43A400) is part of the system, the AUTO INPUT on the 43A400 is used instead of J202-8. See J202 or J602 for more information.

Abort Signals

The abort signals, when activated, cause the system to stop the current cycle. The system will remain disabled and unable to start a new cycle until the abort signal is deactivated. The abort signal is on J202-4 or J602-9 and J602-10.

It is up to the system integrator to decide which signal to use. If a Dukane Universal Adapter (Part No. 43A400) is part of the system, J8-7 on the 43A400 is used instead of J202-4. See J202 or J602 for more information.

There is also a method to accomplish a hard abort for the actuator.
J202-3 must be connected to J202-9 to provide power to the actuator.

NOTE

If using the Dukane Universal Adapter (Part No. 43A400), substitute J8-14 and J8-13 for J202-3 and J202-9.

If J202-3 is disconnected from J202-9, power is removed from the press. The DPC will continue the current cycle, and ultrasound will stay on but there will be force applied to the part by the actuator. The system integrator will decide if this situation is desirable.

Status Signals

Ready

The Ready signal indicates the system is ready to start a new cycle when it is active. The Ready signal is on J602-6.

> **NOTE**
>
> *The Ready signal is not the same as Top-of-Stroke. See Page 53 for further information.*

Home Position

The actuator has a home or top-of-stroke switch to indicate the actuator is in the up position. This indicates when it is safe to index other elements of an automated system.

Other Control Signals

Ground Detect

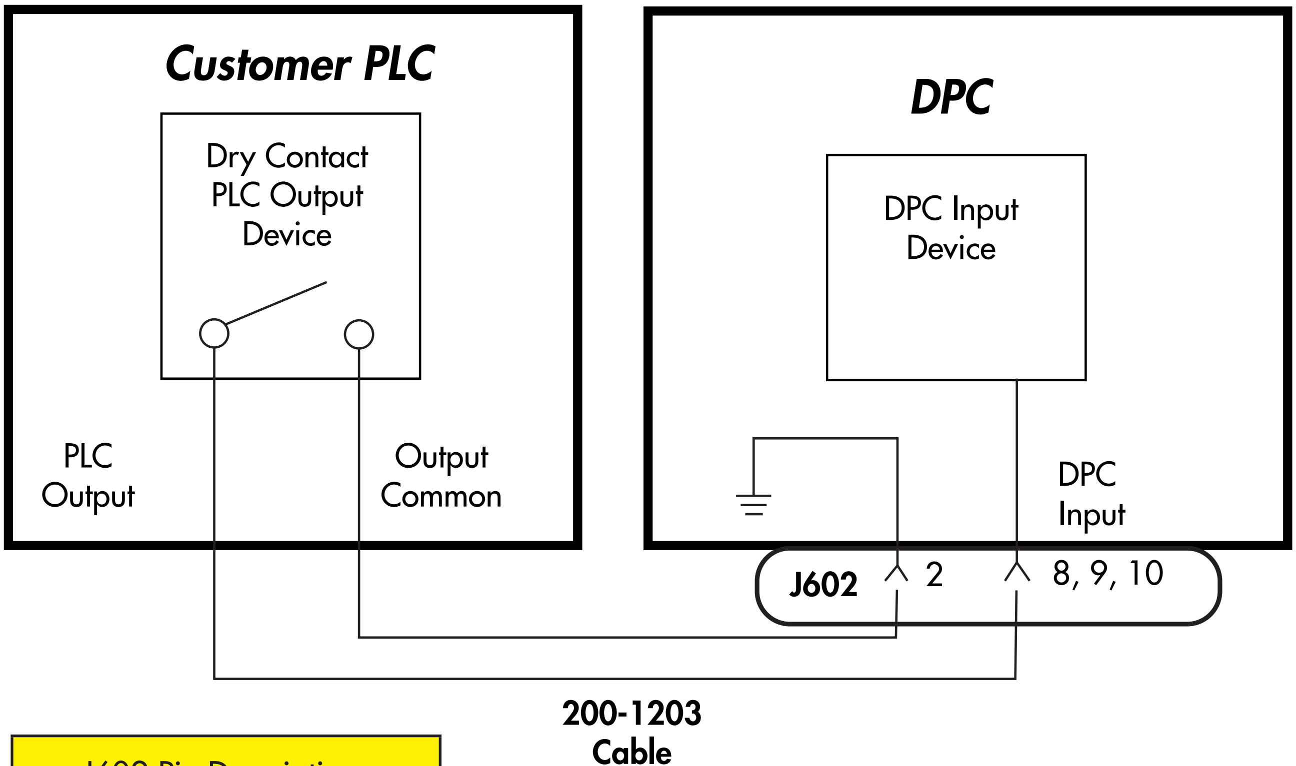
Ground Detect input on J602-15, when activated, terminates the weld portion of the cycle. Generally it is used to detect when the horn contacts an electrically isolated anvil. Ground Detect Input is connected to the electrically isolated anvil. When the horn, which is always at ground potential, contacts the anvil, the ground detect input is activated. The weld portion of the cycle is then terminated. The system will not start a new cycle until the ground detect input is deactivated.

Alarm Signals

There are three alarm signals available: Good Part, Suspect Part, and Bad Part.

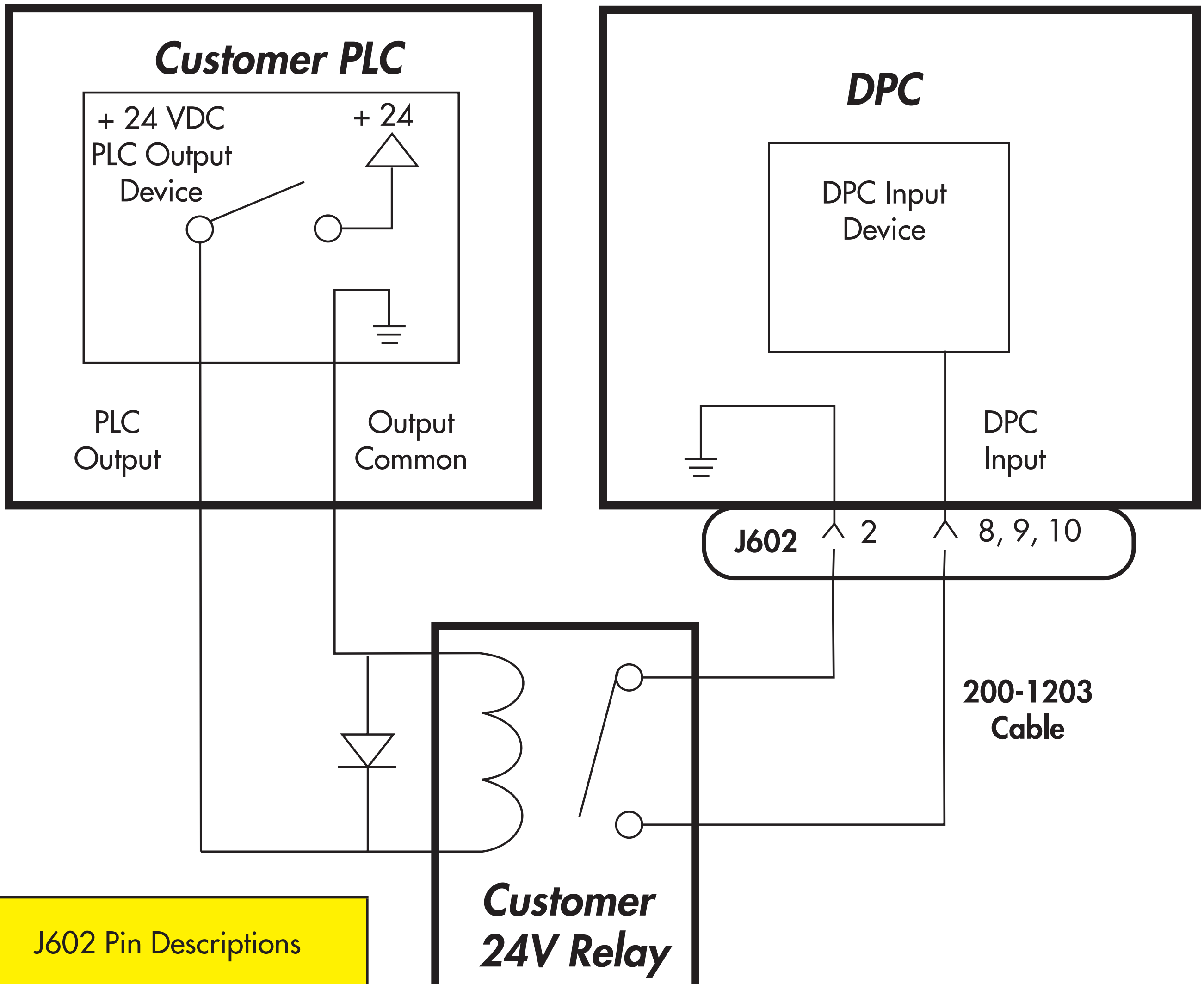
These signals are at J602-5, J602-4, and J602-3 respectively. The suspect part alarm is associated with the suspect parts limits in the Process Limits menus. The bad part alarm is associated with the bad parts limits in the Process Limits menus. The good part signal indicates neither suspect nor bad part limits were exceeded.

> **NOTE**
>
> *With the DPC buzzer set to ON, audible tones can be heard when suspect or bad parts are detected. There will not be any audible tone to signal good parts.*



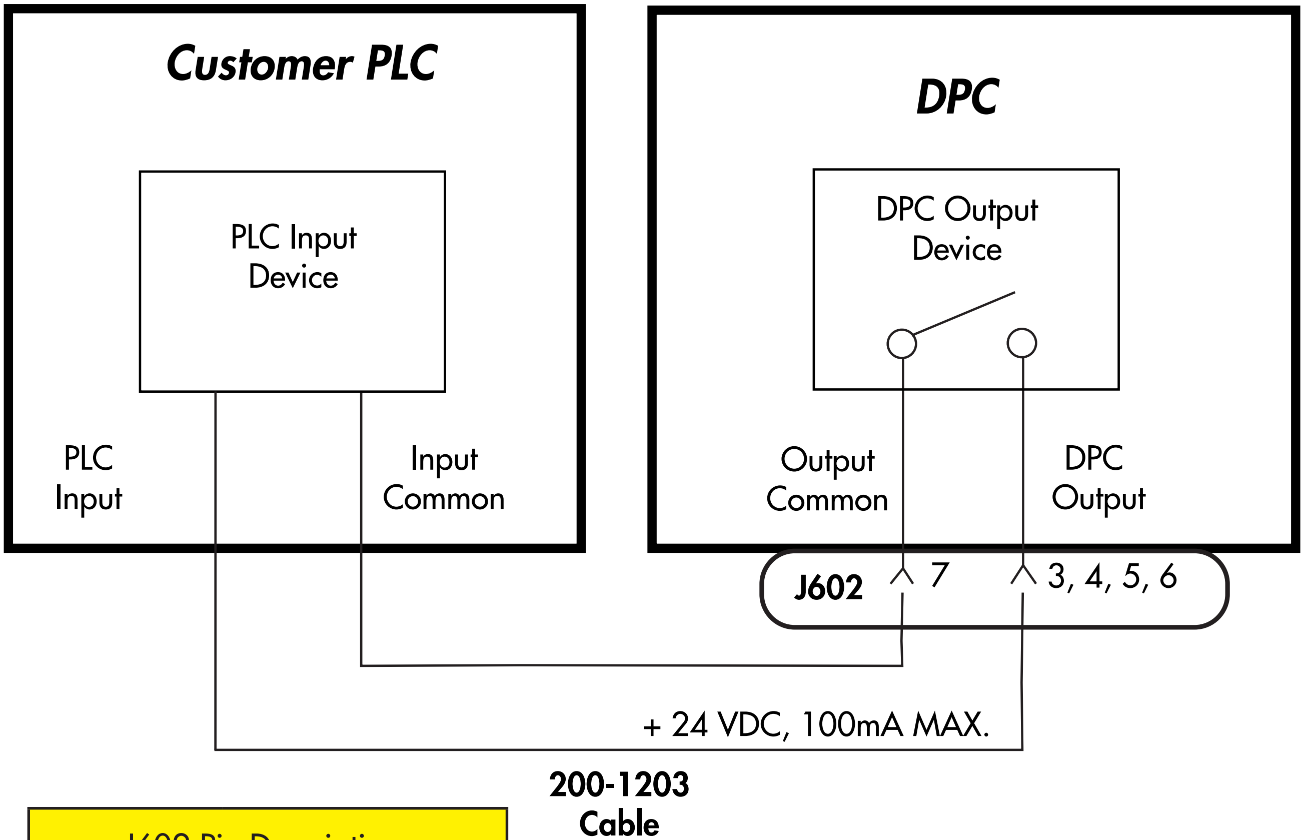
J602 Pin Descriptions	
Pin	Description
2	Ground
8	Automation Input
9	Software Abort (Normally Closed)
10	Software Abort (Normally Open)

Figure C–9 *DPC Input Configuration 1*



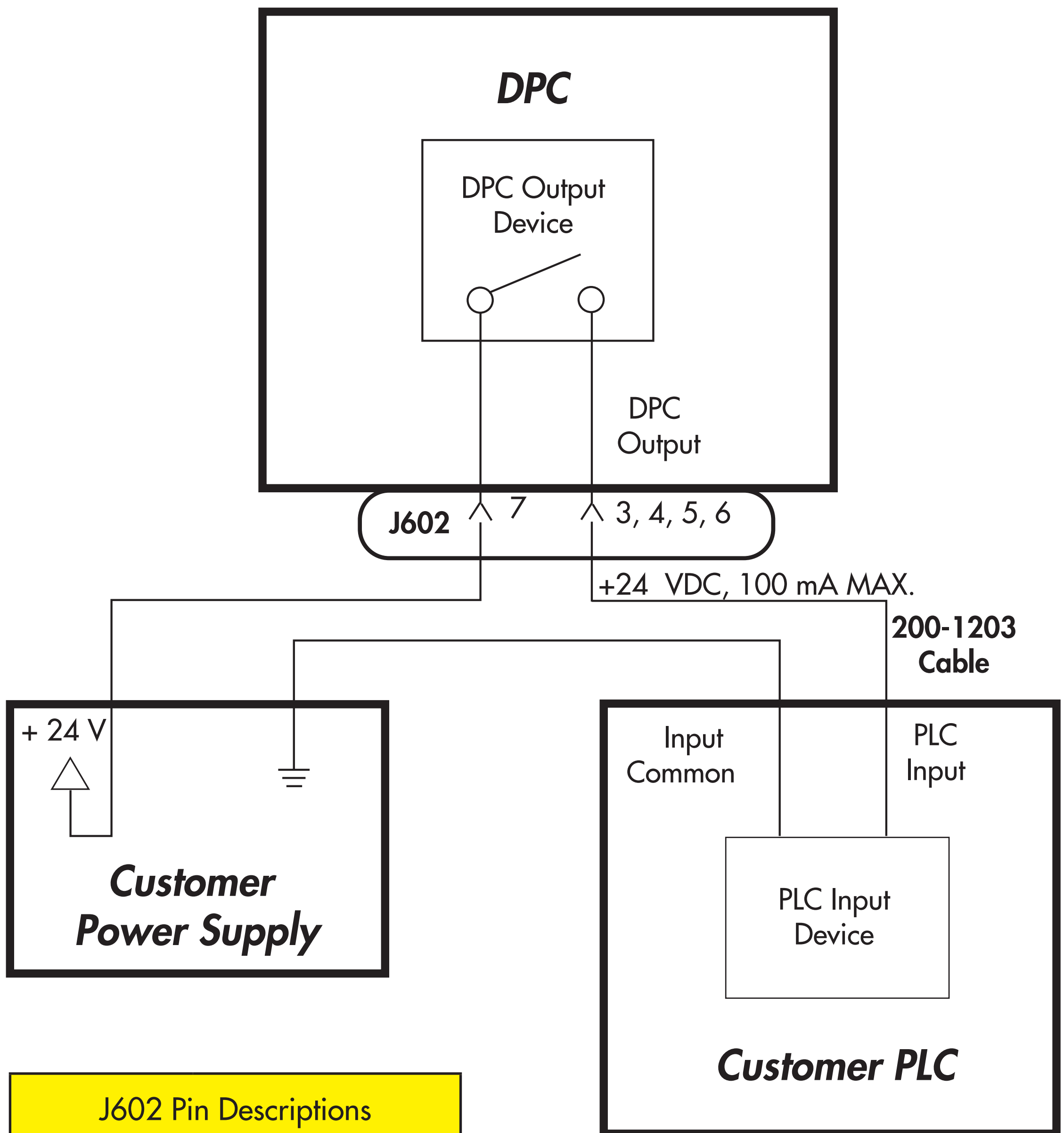
J602 Pin Descriptions	
Pin	Description
2	Ground
8	Automation Input
9	Software Abort (Normally Closed)
10	Software Abort (Normally Open)

Figure C–10 *DPC Input Configuration 2*



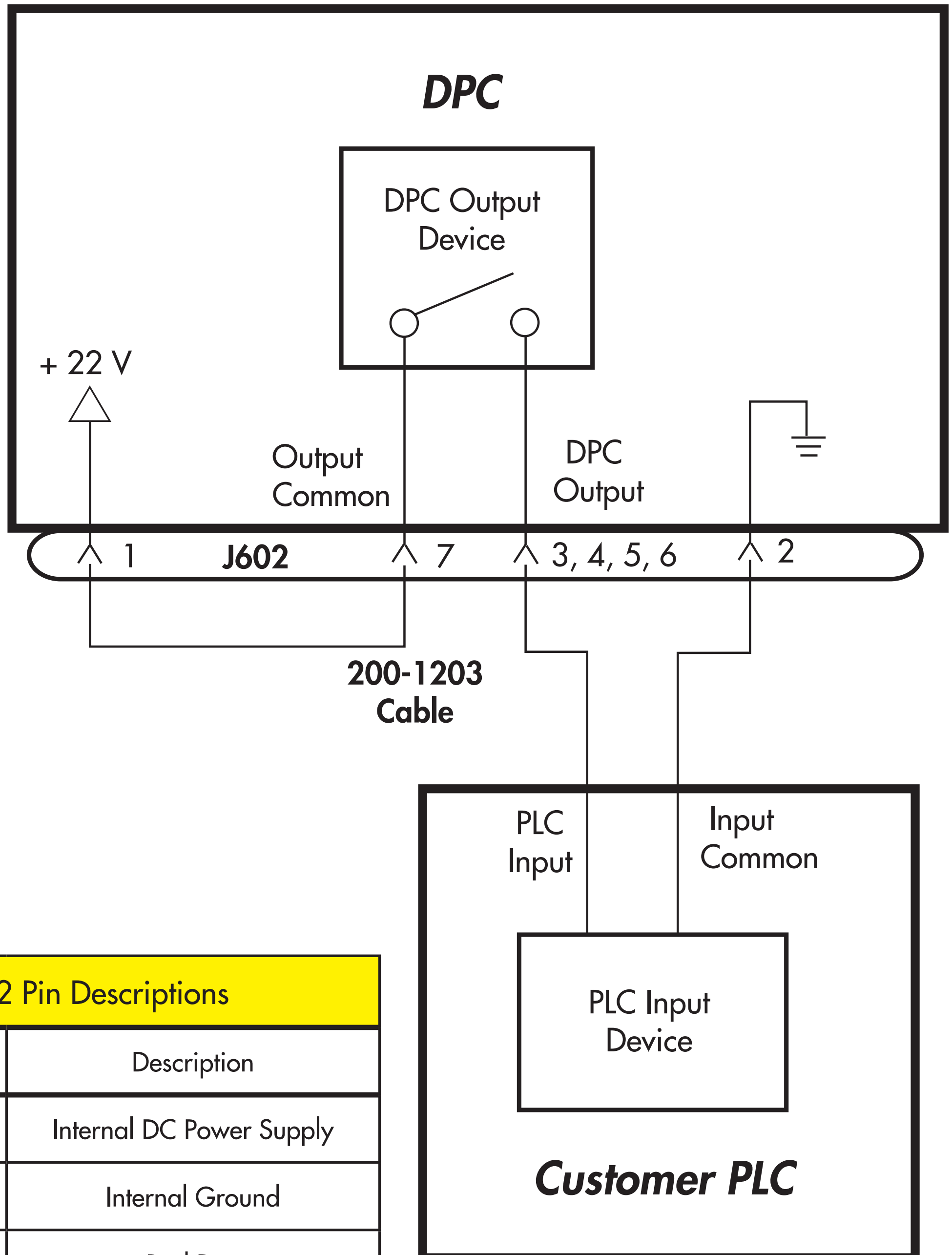
J602 Pin Descriptions	
Pin	Description
3	Bad Part
4	Suspect Part
5	Good Part
6	Ready
7	Output Common

Figure C–11 *DPC Output Configuration*



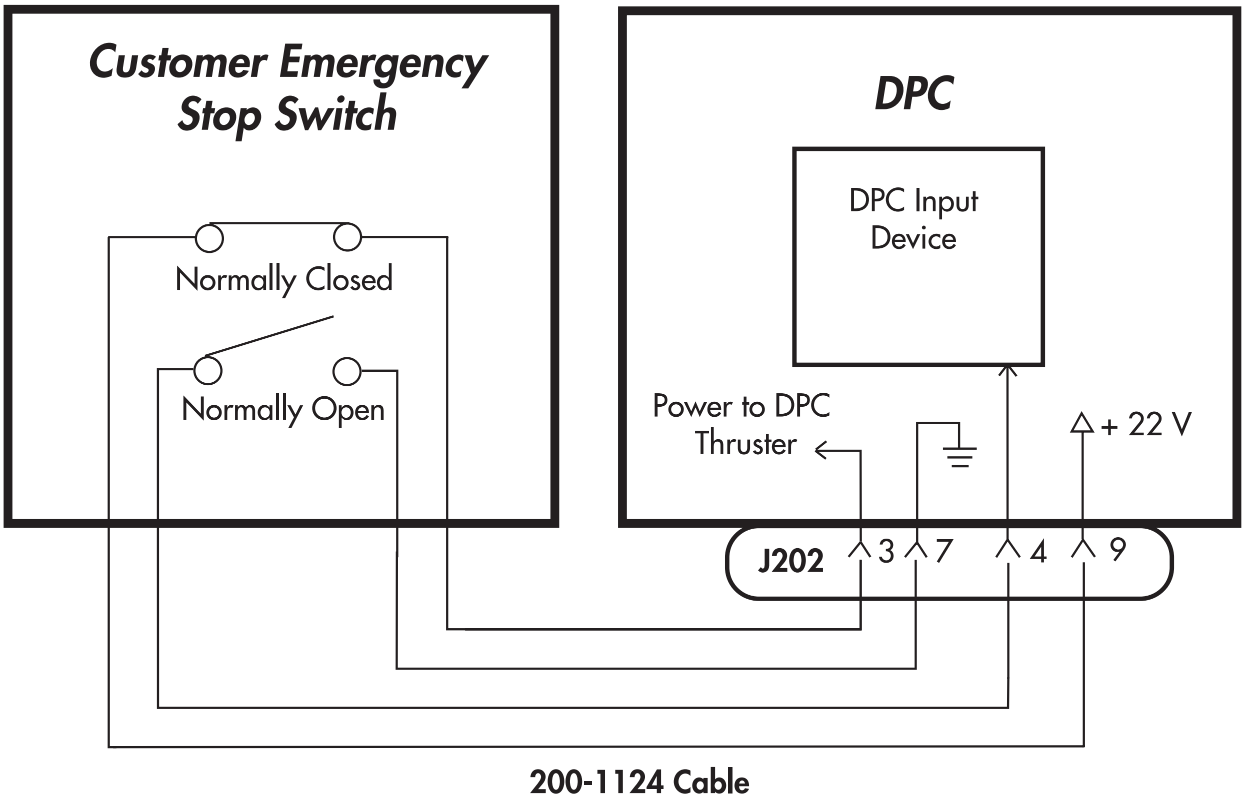
J602 Pin Descriptions	
Pin	Description
3	Bad Part
4	Suspect Part
5	Good Part
6	Ready
7	Output Common

Figure C–12 *DPC Output Configuration 2*



J602 Pin Descriptions	
Pin	Description
1	Internal DC Power Supply
2	Internal Ground
3	Bad Part
4	Suspect Part
5	Good Part
6	Ready
7	Output Common

Figure C–13 *DPC Output Configuration 3*

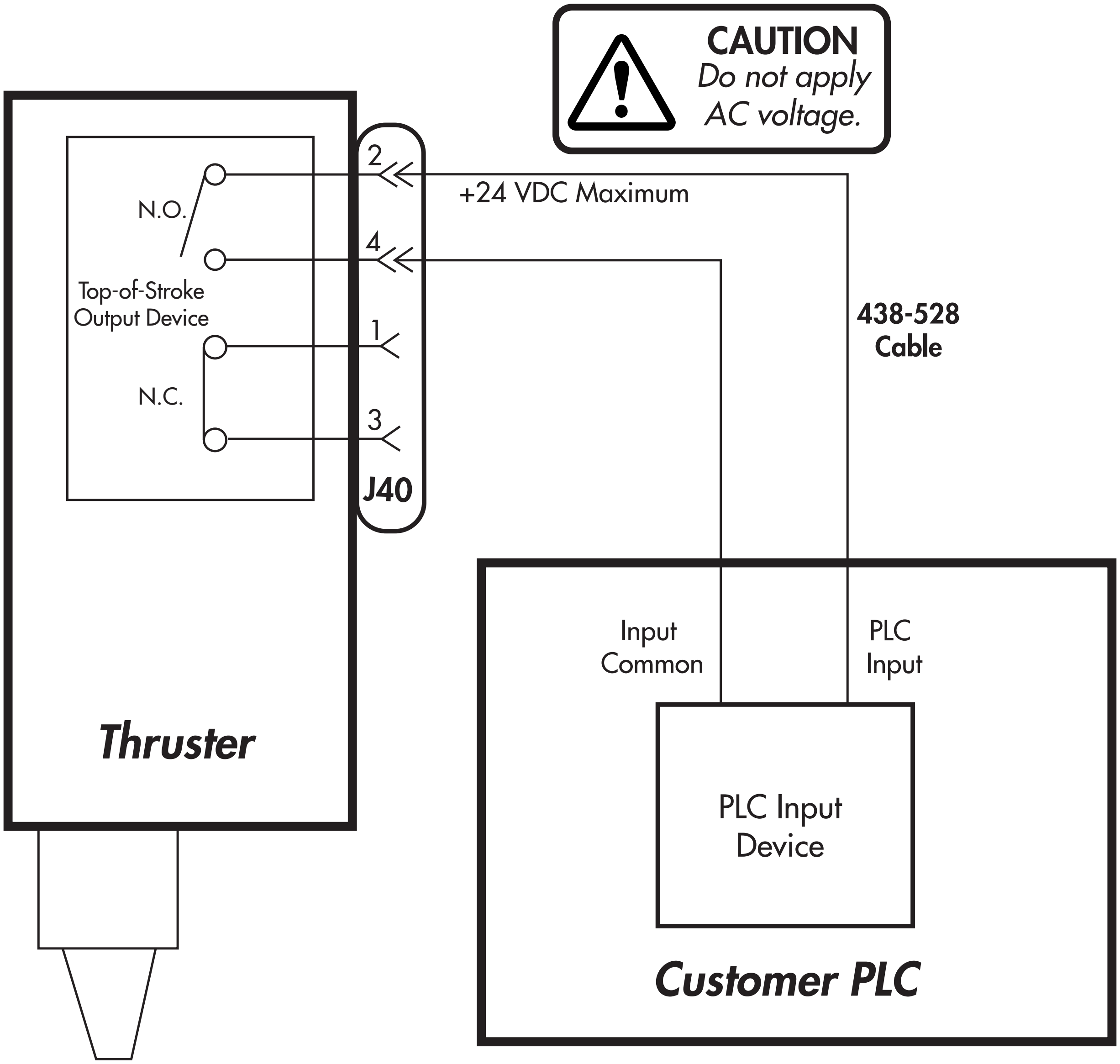


J202 Pin Descriptions	
PIn	Description
3	Hardware Abort Power In
4	Software Abort
7	Internal Ground
9	Hardware Abort Power Out

NOTE:

If J602 connections utilize the abort inputs on Pin 9 and Pin 10, then the normally open contacts connected to Pin 4 of J202 are not required.

Figure C–14 *DPC Input for Emergency Stop Switch*



NOTE: *This output device diagram indicates the switch position when the thruster is at the top-of-stroke position. The connector on the thruster is labeled "J40" or "TOP-OF-STROKE SWITCH".*
The customer can choose either set of pins in the connector:
Use Pins 1 and 3 for a normally closed (N.C.) switch;
Use Pins 2 and 4 for a normally open (N.O.) switch.

Figure C–15 *PLC Input for Thruster Top-of-Stroke Switch*

Remote Setup Switching Option (Requires Advanced I/O Board Option)

Remote setup switching allows a PLC to change the setup file used for the next weld cycle in the DPC–4 Plus. This is useful if there are different welds on the same system that need different welding conditions without requiring operator intervention to make the changes. Using the four inputs on connector J901 allows a PLC to switch between 16 different setups.

J901 Remote Setup Inputs

Pin No.	Wire Color	Signal Type	Signal Name	Signal Description	Isolated?
3	Red	Input	RSB 1	(LSB) N.O. – Ground to activate	No
4	Green	Input	RSB 2	N.O. – Ground to activate	No
5	Orange	Input	RSB 3	N.O. – Ground to activate	No
6	Blue	Input	RSB 4	(MSB) N.O. – Ground to activate	No
25	Grn/Blk/Wht	Ground	Gnd	Internal Signal Ground.	No

Table C–8 *Remote File Setup Inputs on J901*

Table C–8 assumes that you are using the factory default jumper setting for SH901 as shown in Figure C–4. To activate a RSB input on J901 (pins 3, 4, 5 or 6), connect it to ground (pin 25). The wire colors in column two refer to the Dukane Advanced I/O cable Part No. 200–1314–xx (where xx is the length in feet — 10, 15, 20, 25 or 30). The setup file used for the next weld is determined by the state of the RSB Inputs 1–4 at the time a new cycle is started. There is a delay time of 10 milliseconds on RSB Inputs 1–4. The inputs must be stable for at least 10 milliseconds prior to starting a new cycle. Table C–9 on the next page shows the relationship between the setup file number and the binary–coded inputs.

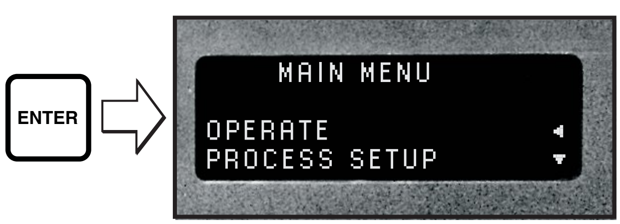
Setup File vs RSB Input Code (Requires Advanced I/O Board Option)

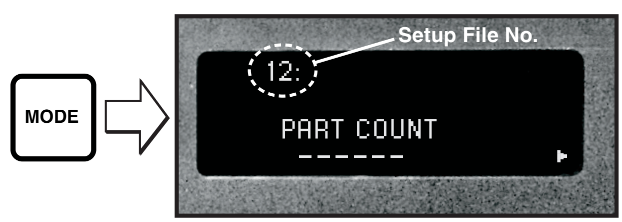
Setup No.	Binary Code	J901 RSB Inputs			
		Pin 6 (MSB)	Pin 5	Pin 4	Pin 3 (LSB)
1	0	0 = Open	0 = Open	0 = Open	0 = Open
2	1	0 = Open	0 = Open	0 = Open	1 = Gnd
3	2	0 = Open	0 = Open	1 = Gnd	0 = Open
4	3	0 = Open	0 = Open	1 = Gnd	1 = Gnd
5	4	0 = Open	1 = Gnd	0 = Open	0 = Open
6	5	0 = Open	1 = Gnd	0 = Open	1 = Gnd
7	6	0 = Open	1 = Gnd	1 = Gnd	0 = Open
8	7	0 = Open	1 = Gnd	1 = Gnd	1 = Gnd
9	8	1 = Gnd	0 = Open	0 = Open	0 = Open
10	9	1 = Gnd	0 = Open	0 = Open	1 = Gnd
11	10	1 = Gnd	0 = Open	1 = Gnd	0 = Open
12	11	1 = Gnd	0 = Open	1 = Gnd	1 = Gnd
13	12	1 = Gnd	1 = Gnd	0 = Open	0 = Open
14	13	1 = Gnd	1 = Gnd	0 = Open	1 = Gnd
15	14	1 = Gnd	1 = Gnd	1 = Gnd	0 = Open
16	15	1 = Gnd	1 = Gnd	1 = Gnd	1 = Gnd

Table C–9 *Setup File Number and Binary Equivalent vs. RSB Inputs*

The term 0 = Open means an open circuit or no connection to that pin. The term 1 = Gnd means that pin is connected to DPC Ground. Use Pin 25 for ground when using the factory default jumper setting for SH901 as shown in Figure C–4. If you use a different SH901 jumper setting, use the appropriate connection to Pin 26 (Figure C–5) or Pin 9 (Figure C–6).

The DPC–4 Plus will display the setup file currently being used. To determine the file number, first press the ENTER key, then the MODE key. The setup file number will be on the top line of the display.





Appendix D
Connector Pinout Descriptions

The tables in this Appendix give descriptions of the pins for DPC connectors J201 (Thruster Cable), J202 (Press Base Cable), and J602 (Basic Input/Output Cable).

NOTE
All unlisted pins are unused and should remain unconnected from all external equipment.

J201 Thruster Cable Connections

Pin No.	Input/Output	Function	Signal Types
1	Output	Dual Pressure Valve	Low side Mosfet driver to ground.
2	Output	Trigger LED	Low side Mosfet driver to ground.
3	Output	Up Valve	Low side Mosfet driver to ground.
5	Output	Down Valve	Low side Mosfet driver to ground.
7	Output	Pressure Regulator	0 to 60 mA current transmitter.
9	Output	Pressure Regulator	4 to 20 mA current transmitter.
11	Input	Top of Stroke	Normally open dry contact switch closure to ground.
13	Input	Dual Pressure Switch	Normally open dry contact switch closure to ground.
15	Input	Trigger	Normally open dry contact switch closure to ground.
17	Input	Pre-trigger	Normally open dry contact switch closure to ground.
18	Input	Force Transducer	4 to 20 mA.
19, 20, 22, 24, 26	Output	Press Power	Internal power to press.
32	Output	Pressure Regulator Return	Pressure Regulator Return.
34	Input	Force Transducer Return	Force Transducer Return.
35	Input	Pressure Transducer	4 to 20 mA.
36	Output	Pressure Transducer Return	Pressure Transducer Return.

Table D-1 *J201 Thruster Cable Connections*

NOTICE

All unlisted pins are unused and should remain unconnected from all external equipment.

J202 Press Base Cable Connections

Pin No.	Input/Output	Function	Signal Types
1	Input	Safety Switch 1	Normally open dry contact switch closure to ground
2	Input	Safety Switch 2	Normally open dry contact switch closure to ground
3	Input	Hardware Abort Power In	Normally closed emergency switch contact
4	Input	Software Abort	Normally open dry contact switch closure to ground
7	Ground	Internal Ground	Internal Ground
8	Input	Automation Input	Normally open dry contact switch closure to ground
9	Output	Hardware Abort Power Out	Normally closed emergency switch contact

Table D-2 *J202 Press Base Cable Connections*

NOTICE
All unlisted pins are unused and should remain unconnected from all external equipment.

J602 Customer Input/Output Cable Connections

Pin No.	Input/Output	Function	Signal Types
1	Power	Internal DC Power Supply	+22 VDC (0.5 amp max).
2	Ground	Internal Ground	Internal Ground.
3	Output	Bad Part	Solid state relay contacts (24 VDC 100 mA max) to output common.
4	Output	Suspect Part	Solid state relay contacts (24 VDC 100 mA max) to output common.
5	Output	Good Part	Solid state relay contacts (24 VDC 100 mA max) to output common.
6	Output	Ready	Solid state relay contacts (24 VDC 100 mA max) to output common.
7	Output	Output Common	Common solid state relay contact for all solid state relay outputs.
8	Input	Automation Input	Normally open dry contact switch closure to ground.
9	Input	Software Abort	Normally closed dry contact switch closure to ground.
10	Input	Software Abort	Normally open dry contact switch closure to ground.
12	Input	Not Used	————
13	Input	Not Used	————
14	Input	Not Used	————
15	Input	Ground Detect Input	Press Ground.

Table D-3 *J602 Basic Input/Output Cable Connections*

This page intentionally left blank

Appendix E
Rear Panel I/O
Introduction

All cable connections to the DPC are made from the rear panel ports shown in Table E-1.

<table>
<tr><th>Connection Point/Port</th><th>Name</th><th>Function</th></tr>
<tr><td>Ground</td><td>Electrical Ground</td><td>Connection point to establish electrical ground.</td></tr>
<tr><td>IEC AC Input</td><td>AC Power Source Input</td><td>Receptacle accepts all approved AC power cords.</td></tr>
<tr><td>J1</td><td>Ultrasound Output</td><td>High voltage ultrasond output to press, thruster, or probe system.</td></tr>
<tr><td>J201</td><td>TO THRUSTER
(Press Interface Port)</td><td>Control for pressure transducer, pressure regulator, force transducer, and air valves.</td></tr>
<tr><td>J202</td><td>BASE/ABORT
(Activation Switch)</td><td>Connects cycle activation switches and the press base display to the DPC.</td></tr>
<tr><td>J401</td><td>TO LINEAR ENCODER
(Distance Encoder)</td><td>Connection to the optical linear distance encoder (mounted on the side of the press).</td></tr>
<tr><td>J503</td><td>Multipoint Network Port</td><td rowspan="2">Provides for monitoring and control of each networked press from one DPC.</td></tr>
<tr><td>J504</td><td>Multipoint Network Port</td></tr>
<tr><td>J505</td><td>MMI (Man-Machine Interface)</td><td>Connection for the optional MMI to the DPC.</td></tr>
<tr><td>J506</td><td>SERIAL-DCE</td><td rowspan="2">Connects the DPC to printers or data processing systems.</td></tr>
<tr><td>J507</td><td>PARALLEL</td></tr>
<tr><td>J602</td><td>USER INTERFACE
(Auxiliary Input/Output)</td><td>Gives access to equipment (Automation Input, ground Detect) and/or functions (Bad Part Output, Good part Output, Suspect Part Output, Ready Output) not already provided through other connections.</td></tr>
</table>

Table E-1 *Rear Panel Connection Ports*

NOTE

See Section 2, Installation, *for more information about rear panel connections.*

IEC AC Input - AC Power Source Input

The DPC has an AC line voltage power cord designed for the voltage in your country. Dukane's power cords meet all applicable IEC, NEC, and CE code standards and restrictions.

CAUTION

If you replace this power cord, be certain the replacement meets all applicable safety codes and restrictions.

See Table 2-3, Page 16 for power cord part numbers.

J1 - Ultrasound Output

This is the port for the high voltage ultrasound signal going to the press, thruster or probe.

J201 - Press Interface Port

This port provides for a connection with the press/thruster. Three DPC outputs control the UP, DOWN, and DUAL PRESSURE valves within the thruster. Two lines report the staus of the Trigger and of the End of Weld limit switches.

If your system has the optional Electronic Pressure Control, or Electronic Load Cell, all control and feedback signals go through J201.

J202 - Press Base Cable Port

This port has inputs for both the manual safety switches and the system emergency stop. In a manual system, this port is normally attached to a set of safety switches. These switches allow the system to be placed "in cycle" when both switches are activated within 0.5 second of each other.

An emergency stop switch is also provided with the safety switches. When this is pressed, the system is put into the emergencey stop state, the current cycle comes to a stop, and the 24-volt power supplied to the thruster terminates.

J401 - To Linear Encoder (Distance Encoder) Port

This port is for distance systems only and it routes the signals from the thruster-mounted distance encoder to the DPC. The encoder cable is a special purpose, double-shielded cable for the transmission of low level electrical signals.

WARNING

Never cut or splice the encoder cable into an electrical panel or to any other cable. If extension cables are needed, contact your local Dukane representative.

J503 and J504 - Multipoint Network (Arcnet) Ports

These ports use cables with telephone-type jacks and plugs to connect two or more DPCs into a multipoint network. This provides monitoring and control of several presses or thrusters from one location. Any program changes can be made to any active units through this port from any DPC in the network.

Termination Plugs

A termination plug should be inserted into J504 of the first DPC in the chain, and another plug should be inserted into J503 of the last DPC in the chain.

J505 - MMI (Man-Machine Interface) Port

The MMI port is used in connecting the optional MMI to the DPC. The cable used for this is a telephone-type with 8-pin connectors.

J506 - Serial-DCE (RS-232) Port

This port transmits output part and setup informaton to a serial device such as a printer, computer, or other data collection device. In addition, the serial port can be connected to an optional display device. This would allow for full-screen viewing of both part and setup data.

J507 - Parallel Port

The port has the same purpose as J506, although data transmitted goes to a parallel device.

J602 - User Interface – Basic Input/Output

The port contains inuts and outputs that interface with external equipment such as PLCs and automation controls.

See Table D-3 in Appendix D for detailed information about this port.

J901 - User Interface – Advanced I/O

The port contains additional inuts and outputs that interface with external equipment such as PLCs and automation controls. See Table C–3 in Appendix C for detailed information about this port.

902 - User Interface – Programmable Outputs

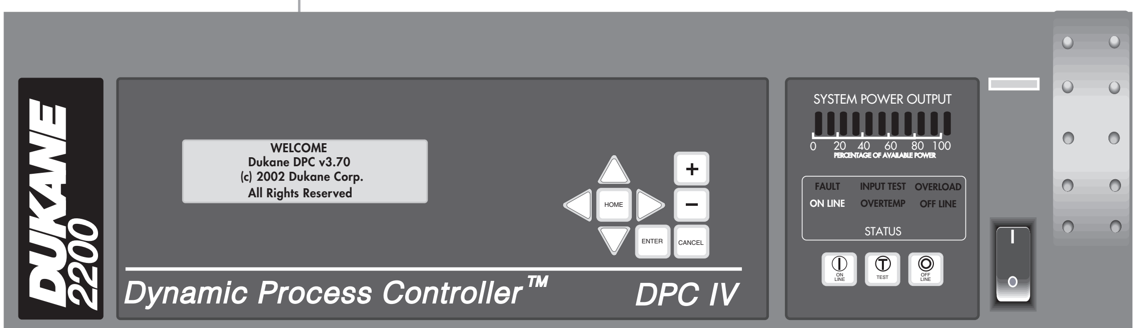
The port contains additional inuts and outputs that interface with external equipment such as PLCs and automation controls. See Table C–4 in Appendix C for detailed information about this port.

MAIN MENU
OPERATE
PROCESS SETUP
HARDWARE SETUP

PROCESS SETUP
PROCESS CONTROL
PROCESS LIMITS

Dynamic Process Controller DPC IV and IV Plus

Reference Guide to DPC Menu Structure



DPC IV Firmware v3.70

DPC IV Plus Firmware v4.20

PROCESS CONTROL
INITIATE MODE
TRIGGER
WELD METHOD

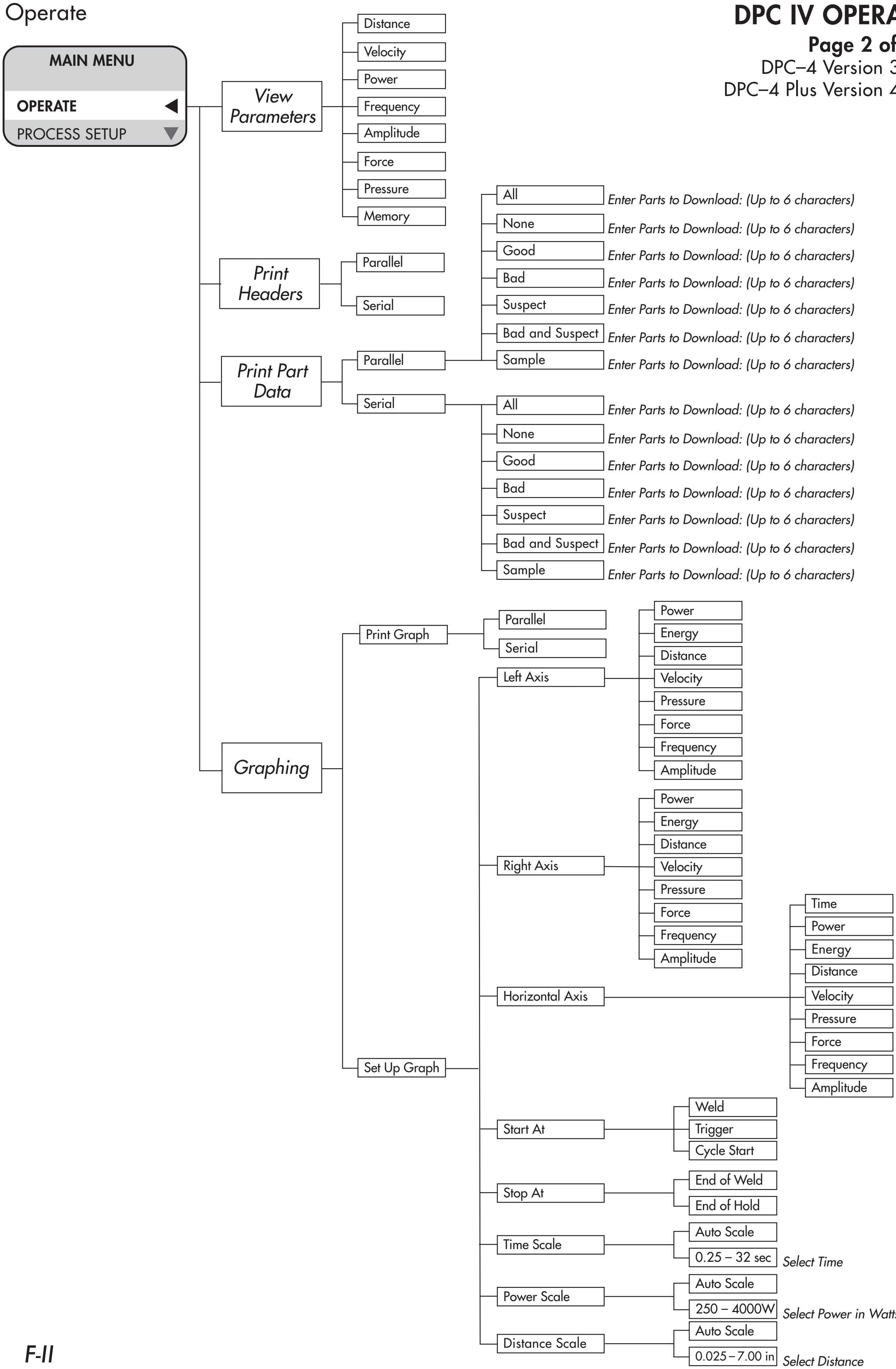
TRIGGER
TRIGGER TYPE
TRIGGER METHOD

TRIGGER TYPE
MAINTAINED
MOMENTARY
FORCE

Operate

DPC IV OPERATE

Page 2 of 10
DPC–4 Version 3.70
DPC–4 Plus Version 4.20



Process Setup

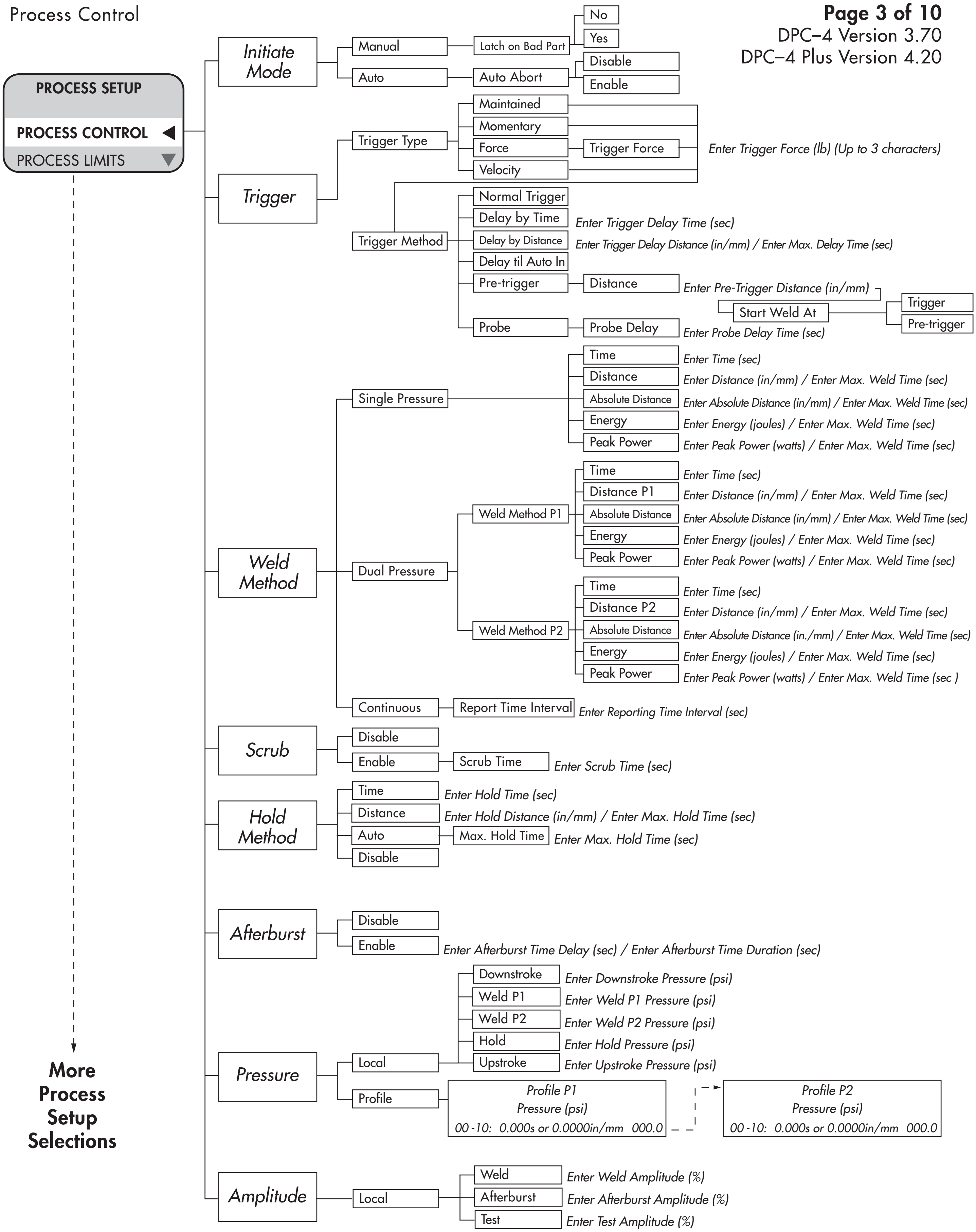
Process Control

DPC IV PROCESS CONTROL

Page 3 of 10

DPC–4 Version 3.70

DPC–4 Plus Version 4.20



DPC IV PROCESS LIMITS – BAD PARTS

Page 4 of 10

DPC–4 Version 3.70

DPC–4 Plus Version 4.20

Process Setup

Process Limits

PROCESS SETUP
- PROCESS CONTROL
- **PROCESS LIMITS**
- UTILITIES

Bad Part Limits
- Line Pressure
  - Disabled
  - Display
  - Window
    - Max – *Enter Max Pressure (psi)*
    - Min – *Enter Min Pressure (psi)*
- Downstroke Time
  - Disabled
  - Display
  - Window
    - Max – *Enter Max Time (sec)*
    - Min – *Enter Min Time (sec)*
- Downstroke Distance
  - Disabled
  - Display
  - Window
    - Max – *Enter Max Distance (in)*
    - Min – *Enter Min Distance (in)*
- Downstroke Velocity
  - Disabled
  - Display
  - Window
    - Max – *Enter Max Velocity (in/sec)*
    - Min – *Enter Min Velocity (in/sec)*
- Contact Pressure
  - Disabled
  - Display
  - Window
    - Max – *Enter Max Pressure (psi)*
    - Min – *Enter Min Pressure (psi)*
- Trigger Delay Time
  - Disabled
  - Display
  - Window
    - Max – *Enter Max Time (sec)*
    - Min – *Enter Min Time (sec)*
- Trigger Delay Dist
  - Disabled
  - Display
  - Window
    - Max – *Enter Max Distance (in)*
    - Min – *Enter Min Distance (in)*
- Weld Time P1
  - Disabled
  - Display
  - Window
    - Max – *Enter Max Time (sec)*
    - Min – *Enter Min Time (sec)*
- Weld Distance P1
  - Disabled
  - Display
  - Window
    - Max – *Enter Max Distance (in)*
    - Min – *Enter Min Distance (in)*
  - Secondary Control
    - Max – *Enter Max Distance (in)*
    - Min – *Enter Min Distance (in)*
- Weld Energy P1
  - Disabled
  - Display
  - Window
    - Max – *Enter Max Energy (joules)*
    - Min – *Enter Min Energy (joules)*
  - Secondary Control
    - Max – *Enter Max Energy (joules)*
    - Min – *Enter Min Energy (joules)*
- Peak Power P1
  - Disabled
  - Display
  - Window
    - Max – *Enter Max Power (watts)*
    - Min – *Enter Min Power (watts)*
  - Secondary Control
    - Max – *Enter Max Power (watts)*
    - Min – *Enter Min Power (watts)*
- Absolute Distance
  - Disabled
  - Display
  - Window
    - Max – *Enter Max Distance (in)*
    - Min – *Enter Min Distance (in)*
  - Secondary Control
    - Max – *Enter Max Distance (in)*
    - Min – *Enter Min Distance (in)*
- Hold Time
  - Disabled
  - Display
  - Window
    - Max – *Enter Max Time (sec)*
    - Min – *Enter Min Time (sec)*
- Hold Distance
  - Disabled
  - Display
  - Window
    - Max – *Enter Max Distance (in)*
    - Min – *Enter Min Distance (in)*
- Total Cycle Time
  - Disabled
  - Display
  - Window
    - Max – *Enter Max Time (sec)*
    - Min – *Enter Min Time (sec)*
  - Secondary Control
    - Max – *Enter Max Time (sec)*
    - Min – *Enter Min Time (sec)*
- Total Stroke
  - Disabled
  - Display
  - Window
    - Max – *Enter Max Distance (in)*
    - Min – *Enter Min Distance (in)*
  - Secondary Control
    - Max – *Enter Max Distance (in)*
    - Min – *Enter Min Distance (in)*
- Time
  - Disabled
  - Display
- Date
  - Disabled
  - Display

To Suspect Part Limits Menus

> **NOTE**
>
> *If the weld method is Dual Pressure, limits for* **Weld Time P2**, **Weld Distance P2**, **Weld Energy P2**, *and* **Peak Power P2** *will be added.*
>
> *Also* **Total Weld Time**, **Total Weld Distance** *and* **Total Weld Energy** *will then follow the P2 limits.*

More Process Setup Selections

DPC IV PROCESS LIMITS – SUSPECT PARTS

Page 5 of 10

DPC–4 Version 3.70

DPC–4 Plus Version 4.20

Process Setup

Process Limits

PROCESS SETUP
PROCESS CONTROL
PROCESS LIMITS ◀
UTILITIES ▼

- *Suspect Part Limits*
  - Line Pressure
    - Disabled
    - Enabled
      - Max — *Enter Max Pressure (psi)*
      - Min — *Enter Min Pressure (psi)*
  - Downstroke Time
    - Disabled
    - Enabled
      - Max — *Enter Max Time (sec)*
      - Min — *Enter Min Time (sec)*
  - Downstroke Distance
    - Disabled
    - Enabled
      - Max — *Enter Max Distance (in)*
      - Min — *Enter Min Distance (in)*
  - Downstroke Velocity
    - Disabled
    - Enabled
      - Max — *Enter Max Velocity (in/sec)*
      - Min — *Enter Min Velocity (in/sec)*
  - Contact Pressure
    - Disabled
    - Enabled
      - Max — *Enter Max Pressure (psi)*
      - Min — *Enter Min Pressure (psi)*
  - Trigger Delay Time
    - Disabled
    - Enabled
      - Max — *Enter Max Time (sec)*
      - Min — *Enter Min Time (sec)*
  - Trigger Delay Dist
    - Disabled
    - Enabled
      - Max — *Enter Max Distance (in)*
      - Min — *Enter Min Distance (in)*
  - Weld Time P1
    - Disabled
    - Enabled
      - Max — *Enter Max Time (sec)*
      - Min — *Enter Min Time (sec)*
  - Weld Distance P1
    - Disabled
    - Enabled
      - Max — *Enter Max Distance (in)*
      - Min — *Enter Min Distance (in)*
  - Weld Energy P1
    - Disabled
    - Enabled
      - Max — *Enter Max Energy (joules)*
      - Min — *Enter Min Energy (joules)*
  - Peak Power P1
    - Disabled
    - Enabled
      - Max — *Enter Max Power (watts)*
      - Min — *Enter Min Power (watts)*
  - Absolute Distance
    - Disabled
    - Enabled
      - Max — *Enter Max Distance (in)*
      - Min — *Enter Min Distance (in)*
  - Hold Time
    - Disabled
    - Enabled
      - Max — *Enter Max Time (sec)*
      - Min — *Enter Min Time (sec)*
  - Hold Distance
    - Disabled
    - Enabled
      - Max — *Enter Max Distance (in)*
      - Min — *Enter Min Distance (in)*
  - Total Cycle Time
    - Disabled
    - Enabled
      - Max — *Enter Max Time (sec)*
      - Min — *Enter Min Time (sec)*
  - Total Stroke
    - Disabled
    - Enabled
      - Max — *Enter Max Distance (in)*
      - Min — *Enter Min Distance (in)*

To Bad Part Limits Menus

NOTE

If the weld method is Dual Pressure, limits for **Weld Time P2**, **Weld Distance P2**, **Weld Energy P2**, *and* **Peak Power P2** *will be added.*

Also **Total Weld Time**, **Total Weld Distance** *and* **Total Weld Energy** *will then follow the P2 limits.*

More Process Setup Selections

Process Setup

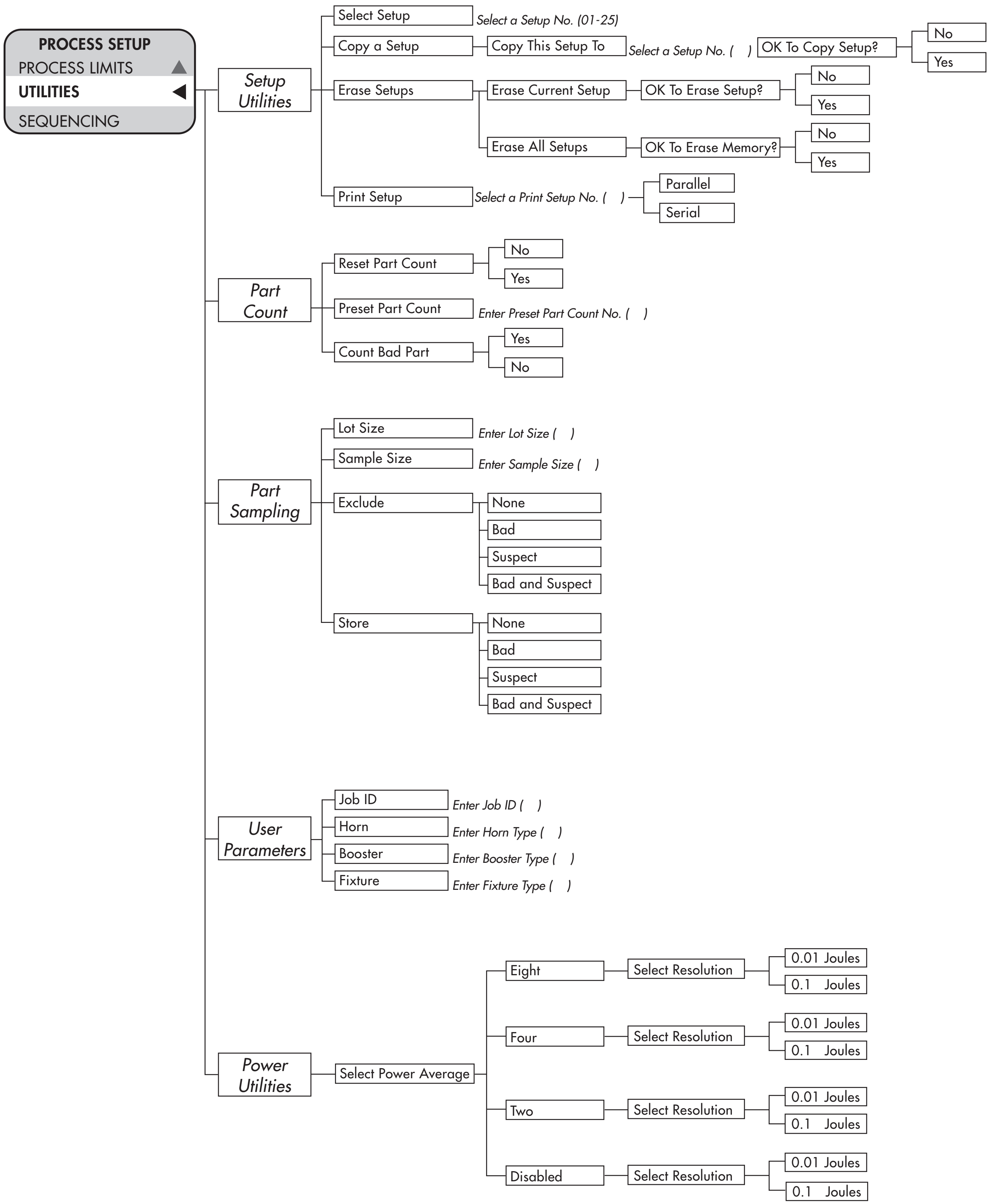
Utilities

DPC IV UTILITIES

Page 6 of 10

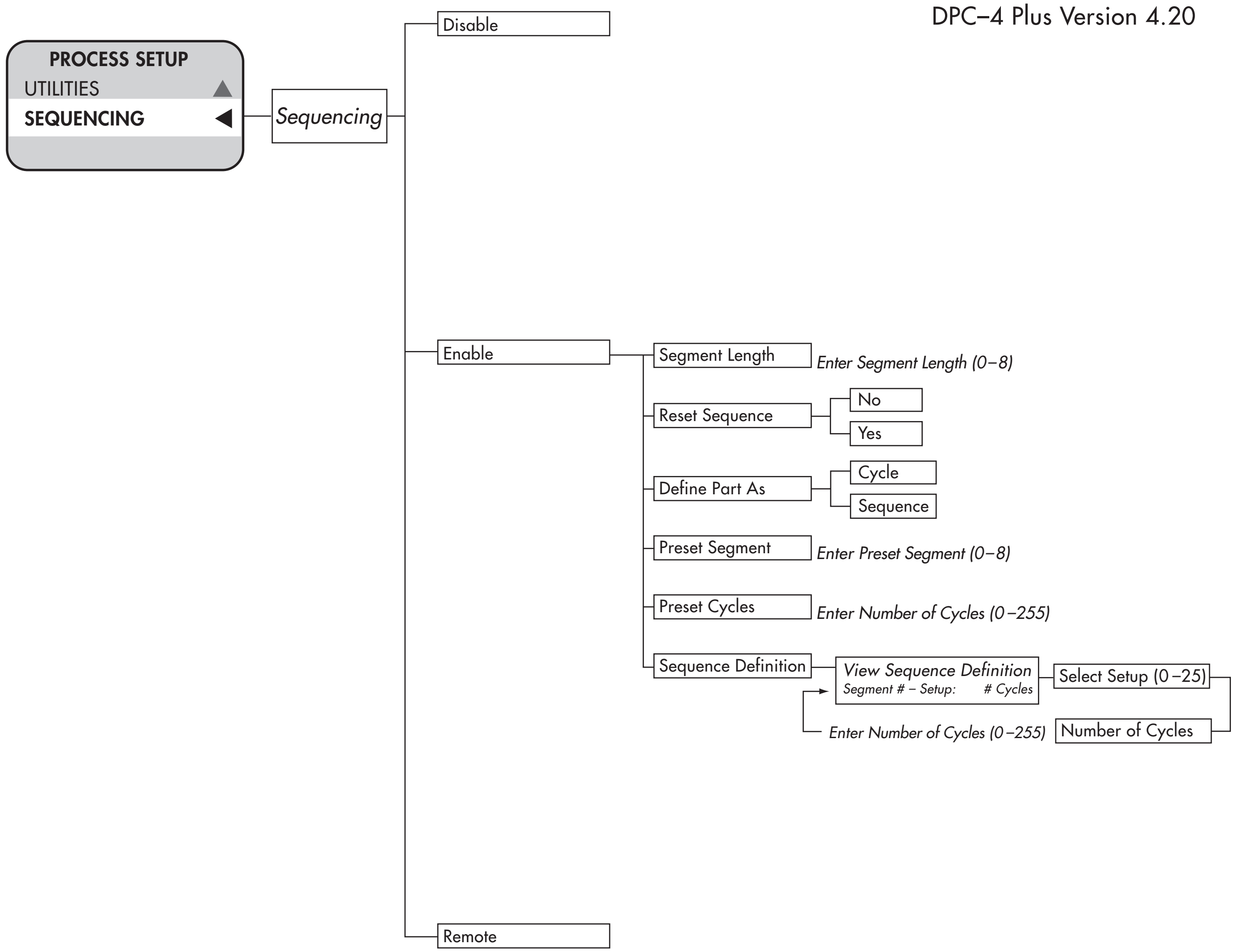
DPC–4 Version 3.70

DPC–4 Plus Version 4.20



Process Setup
Sequencing

DPC IV SEQUENCING
Page 7 of 10
DPC–4 Version 3.70
DPC–4 Plus Version 4.20



Hardware Setup

DPC IV HARDWARE SETUP

Page 8 of 10
DPC–4 Version 3.70
DPC–4 Plus Version 4.20

MAIN MENU
- PROCESS SETUP
- **HARDWARE SETUP**
- SECURITY

- INTERNATIONAL
  - Language
    - English
    - Espanol
    - Francais
  - Units
    - English
    - Metric
  - Date Format
    - MM-DD-YY
    - DD-MM-YY
    - YY-MM-DD
- TIME AND DATE
  - Set Time
    - Enter Time ( ) ?? : ?? : ??
  - Set Date
    - Enter Date MM-DD-YY ?? - ?? - ??
- PORTS
  - Serial
    - Destination
      - Local
      - Remote
    - Output Device
      - Computer
        - EXCEL
        - 1 - 2- 3
        - LKI
        - Zontec
        - DataMyte
        - VT100
        - Falco
        - iPC
      - Printer
        - Epson
        - IBM PRO XL
        - IBM PRO X24
        - ASCII
      - Print DPC ID (EXCEL, 1 - 2- 3, Epson, IBM PRO XL, IBM PRO X24, ASCII)
        - Yes
        - No
    - Output Mode
      - All
      - None
      - Good
      - Bad
      - Suspect
      - Bad & Suspect
      - Sample
    - Baud Rate
      - 9,600
      - 19,200
      - 38,400
      - 57,600
      - 4,800
      - 2,400
      - 1,200
    - Protocol
      - XON/XOFF
      - RTS/CTS
    - Lines Per Page
    - LF After CR
      - Yes
      - No
    - Limit Indicators
      - Disable
      - Enable
  - Parallel
    - Destination
      - Local
      - Remote
    - Output Device
      - Epson
      - IBM PRO XL
      - IBM PRO X24
      - ASCII
      - (Epson, IBM PRO XL, IBM PRO X24, ASCII: *Graphs and Text*)
      - Hewlett Packard *(Text Only)*
    - Output Mode
      - All
      - None
      - Good
      - Bad
      - Suspect
      - Bad & Suspect
      - Sample
    - Lines Per Page
    - LF After CR
      - Yes
      - No
    - Limit Indicators
      - Disable
      - Enable
- USER I/O
  - Outputs
    - Active High
    - Active Low
  - Up Valve On Abort
    - Off
    - On
  - End of Weld
    - Disable
    - Enable
  - Ground Detect
    - Disable
    - Enable
  - Status Outputs
    - Maintained
    - Pulsed
  - Define Ready As
    - Ready
    - In Cycle
    - Sonics On
    - In Hold
  - Define Suspect As
    - Suspect
    - Net Active
    - Sonics On
  - Buzzer Status
    - On
      - Buzzer At Trigger
        - Off
        - On
      - Buzzer At Reference
        - Off
        - On
    - Off
- CALIBRATION
  - Disable
  - Enable
- KINECHEK
  - *Enter Distance (in./mm)*
- GENERATOR
  - Defaults
    - Set Defaults
      - No
      - Yes
  - Settings
    - Phase — *Enter Value Between 0.4 – 2.1 µsec*
    - SoftStart — *Enter Value Between 0.1 – 1.275 sec*
    - Frequency — *Enter Frequency Between*
      - 14,950 – 15,050 Hz
      - 19,450 – 20,050 Hz
      - 29,450 – 30,050 Hz
      - 39,450 – 40,050 Hz
      - 49,350 – 49,950 Hz
      - 69, 200 – 70,350 Hz
    - Pulse Width — *View Pulse Width*

CAUTION

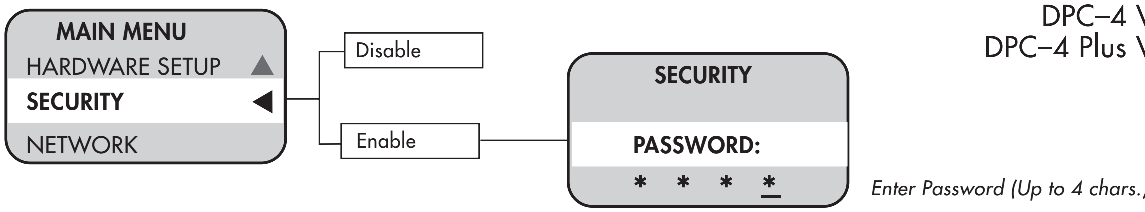
⚠ Call Dukane Service before making any changes to Phase, Softstart or Frequency settings.

Security

DPC IV SECURITY

Page 9 of 10

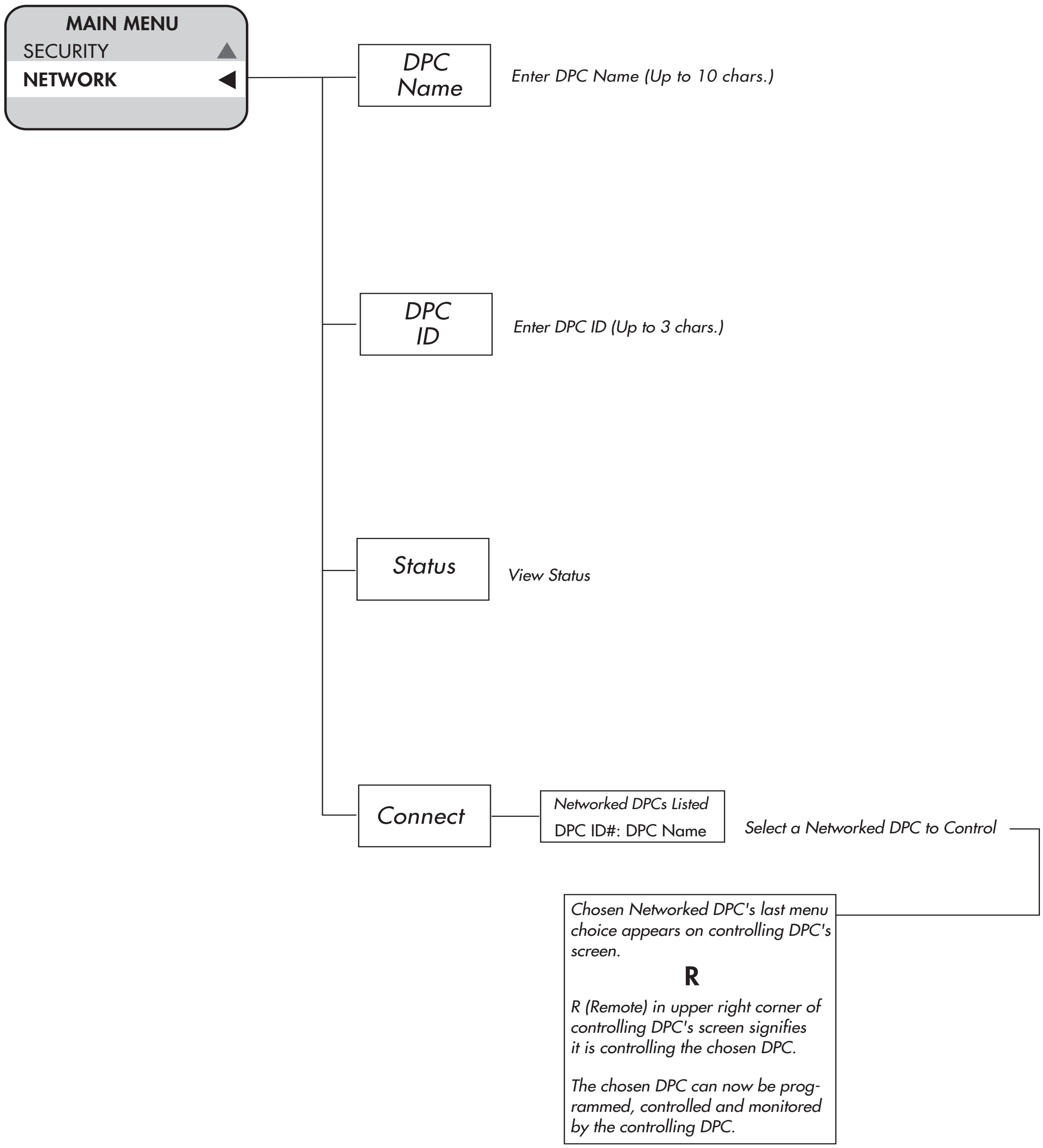
DPC–4 Version 3.70
DPC–4 Plus Version 4.20



Network

DPC IV NETWORK

Page 10 of 10
DPC–4 Version 3.70
DPC–4 Plus Version 4.20



Index

This page intentionally left blank

A

B

C

D

E

J

K

L

M

M

N

O

P

R

S

U

V

W

X

Z

Dukane ISO

ISO CERTIFICATION

Dukane chose to become ISO 9001 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 certification, you must prove to one of the quality system registrar groups that you meet three requirements:

1. Leadership
2. Involvement
3. Quality in Line Organizations and Quality System Infrastructure.

The ISO 9001 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.

ISO
CERTIFIED

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

www.dukane.com/us

Printed in the United States of America

Dukane Corporation • Ultrasonics Division • 2900 Dukane Drive • St. Charles, Illinois 60174 USA • TEL +1 630 797 4900 • FAX +1 630 797 4949