



Polaris

Ultrasonic Welder

Advanced Model

User Manual

Branson Ultrasonics Corporation
29185 Cabot Drive
Novi, MI 48377
(203) 796-0400
<https://www.emerson.com>

BRANSON

[This page intentionally left blank]

User Manual Change Information

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

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

Copyright and Trademark Notice

Copyright © 2026 Branson Ultrasonics Corporation. All rights reserved. Contents of this publication may not be reproduced in any form without the written permission of Branson Ultrasonics Corporation.

LOCTITE® is a registered trademark of Henkel AG & Co. KGaA (or its affiliated companies). WD-40® is a registered trademark of WD-40 Company. Microsoft® and Windows® are registered trademarks of Microsoft Corporation.

All other trademarks, service marks, and trade names referenced in this document are the property of their respective owners.

[This page intentionally left blank]

Table of Contents

Chapter 1: Safety

1.1	Introduction	6
1.2	Safety Messages	7
1.3	Safety Labels	8
1.4	General Precautions	13
1.5	Declaration of Conformity	17
1.6	Cybersecurity Vulnerability Reporting	18

Chapter 2: Introduction

2.1	Overview	20
2.2	Principle of Operation	21
2.3	System Components	22
2.4	System Information Labels	27

Chapter 3: Technical Specifications

3.1	Environmental Specifications	30
3.2	Electrical Specifications	31
3.3	Actuator Specifications	32
3.4	Storage	33
3.5	Air Supply	34
3.6	Physical Description	35
3.7	Dimensional Drawings	36

Chapter 4: Installation and Setup

4.1	About Installation	44
4.2	Handling and Unpacking	45
4.3	Mounting the Base	50
4.4	Air Supply	52
4.5	HMI	53
4.6	Input Power Connection	58
4.7	User I/O	60
4.8	Ground Detect Cable	62
4.9	Safety Devices	63
4.10	Ultrasonic Stack	66
4.11	Installing the Ultrasonic Stack in the Actuator	77
4.12	Mounting the Workpiece Fixture	79
4.13	Leveling Plate	84
4.14	Alignment and Leveling	85
4.15	USB Accessories	90
4.16	USB Mass Storage Devices	91
4.17	Barcode Scanner	92
4.18	Reset Dongle	93
4.19	LED Work Light	94

Chapter 5: Operation

5.1	Introduction	98
5.2	Actuator Controls and Indicators	99
5.3	Power Supply Controls and Indicators	104
5.4	Polaris System Power On and Login	106

5.5	Date & Time.....	108
5.6	Main Menu & User Settings	109
5.7	Recipes.....	111
5.8	Production	131
5.9	Analytics	132
5.10	System	136
5.11	System Information	159
5.12	Calibration	162
5.13	Actuator Setup.....	164
5.14	Diagnostics	166
5.15	Generate Report.....	178
5.16	Language.....	186
5.17	Units	187
5.18	Change Password	188
 Chapter 6: Maintenance		
6.1	General Maintenance Considerations.....	190
6.2	Calibration	191
6.3	Periodically Clean the Equipment.....	192
6.4	Routine Component Replacement	193
6.5	Recondition the Ultrasonic Stack	194
6.6	Ultrasonic Stack Components	196
6.7	System Components.....	198
6.8	Accessories & Cables.....	201
 Chapter 7: Support		
7.1	Warranty	204
7.2	Contact Us.....	205
 Appendix A: Alarms		
A.1	Introduction	208
A.2	Overload Alarms	209
A.3	Cycle Modified Alarms	211
A.4	Warning Alarms	212
A.5	Reject Alarms	213
A.6	Suspect Alarms.....	214
A.7	Hardware Failure Alarms.....	215
A.8	No Cycle Alarms.....	218
A.9	No Cycle Overload Alarms.....	219
A.10	AC Safety Faults	221
 Appendix B: PC HMI		
B.1	Remote Operation Using the PC HMI	224
B.2	PC HMI Installation	225
B.3	Configure the PC Network Connection.....	226
B.4	Connect to a Welder	227
B.5	Monitor Multiple Welders.....	229
B.6	Access the Full Welder HMI	230
B.7	Disconnect a Welder	231
 Appendix C: System Automation		
C.1	Polaris Automation Assembly Manual	234
 Appendix D: LDAP		
D.1	Purpose	236
D.2	Scope	237
D.3	Installation Procedure for Microsoft Active Directory LDAP Server	238

D.4	LDAP Configuration for the OpenLDAP Server	246
D.5	LDAP Setup Block Diagram	257
D.6	Preconditions	258
D.7	LDAP Server Configuration via HMI	259
D.8	LDAP Client Certificate Upload	260
D.9	LDAP Server Configuration and Secure TLS Connection	262
D.10	Responsibilities	265
D.11	Login Credential Requirements	266
D.12	Troubleshooting	267

Appendix E: OPC UA

E.1	Purpose	270
E.2	Prerequisites	271
E.3	OPC UA Server HMI Settings	272
E.4	Prosyst OPC UA Browser	277

Appendix F: Industrial Ethernet

F.1	EtherNet/IP	284
F.2	PROFINET	285

Appendix G: Third-Party Software and Open Source Software Notices

G.1	Third Party Software and Open Source Software Notice	288
-----	--	-----

Chapter 1: Safety

1.1	Introduction	6
1.2	Safety Messages.....	7
1.3	Safety Labels	8
1.4	General Precautions	13
1.5	Declaration of Conformity	17
1.6	Cybersecurity Vulnerability Reporting.....	18

1.1 Introduction

This chapter provides important safety information for the safe installation, operation, and maintenance of this equipment. Throughout this manual, safety messages are used to alert users to potential hazards and to specify actions required to avoid injury or equipment damage.

Safety messages are identified by signal words such as WARNING, CAUTION, and NOTICE, each indicating a different level of hazard severity. These messages follow a standardized format to clearly communicate the nature of the hazard, the potential consequences, and the measures required to prevent harm.

In addition to the safety messages included in this manual, safety labels are affixed to the machine to provide on-equipment hazard identification. These labels must be observed at all times and should not be removed, altered, or obscured.

Read and follow all safety instructions before working with the equipment. Failure to comply with these instructions may result in personal injury, equipment damage, or reduced system performance.

Observe the following safety information in these operating instructions; this information will warn you about risks and their consequences.

1.2 Safety Messages

	⚠WARNING
	Indicates a hazardous situation which, if not avoided, could result in death or serious injury.
	⚠CAUTION
	Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
	NOTICE
	Is used to address practices not related to physical injury. If this situation is not avoided, the system or something in its vicinity might be damaged. Application types and other important or useful information are emphasized.
	NOTE
	Provides additional information, clarification, or explanation that helps the user understand a procedure, feature, or concept.

1.3 Safety Labels

NOTICE	
	Only Branson service personnel or Branson trained representatives are allowed to open, maintain and service the system. Unauthorized tampering with, modifying, or opening the unit will void the warranty.

1.3.1 Power Supply

Figure 1.1 Safety labels on the back of the power supply



Table 1.1 Safety labels on the back of the power supply

Label	Description
	High Voltage Hazard Hazardous voltage inside will cause death or severe injury. De-energize system before removing covers. Authorized personnel only.

1.3.2 Actuator

Figure 1.2 Safety labels on the back of the actuator



Table 1.2 Safety labels on the back of the actuator

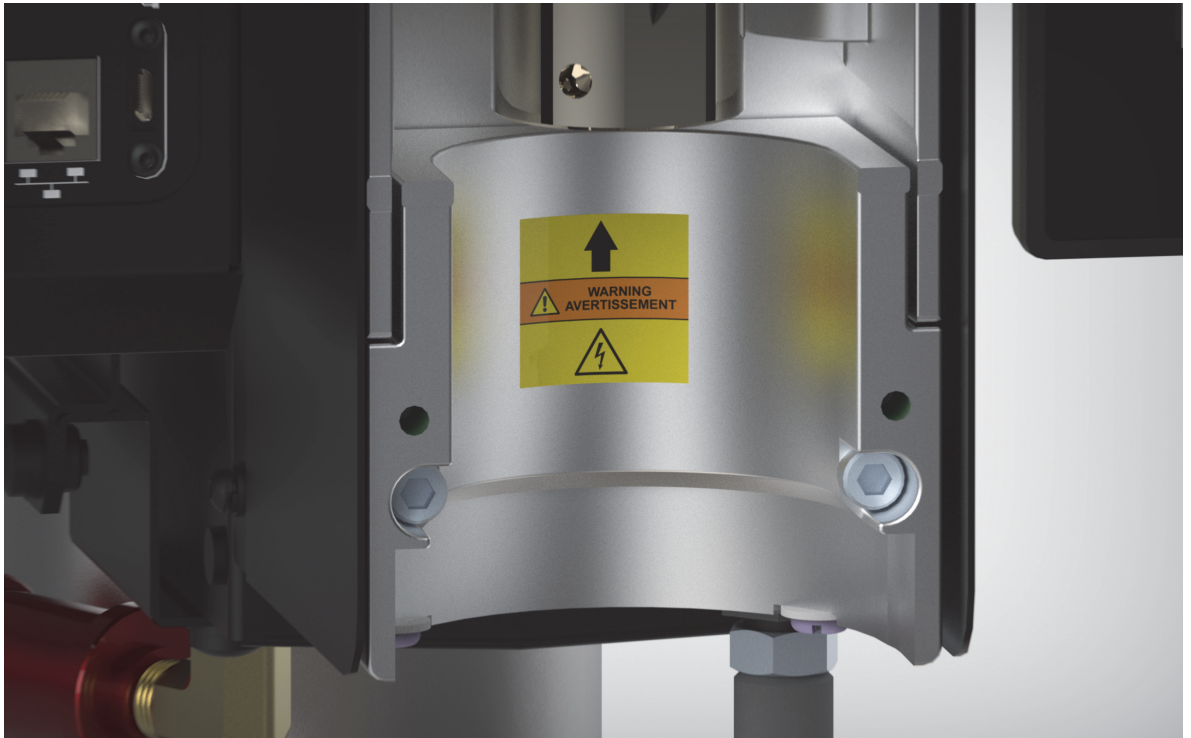
Label	Description
 CAUTION ATTENTION AIR SUPPLY MUST BE FREE OF OIL AND WATER MAX. PRESSURE 100 PSI / 690 kPa / 6.89 bar L'ALIMENTATION EN AIR DOIT ÊTRE EXEMPTÉ D'HUILE ET D'EAU PRESSION MAXIMALE 100 PSI / 690 kPa / 6.89 bar	Compressed Air Air supply must be free of oil and water. Max. pressure 100 psi/690 kPa/6.89 bar
	Ground Grounding point.
GROUND UNIT BEFORE OPERATING DISCONNECT AIR AND POWER BEFORE SERVICING  METTRE L'UNITÉ À LA TERRE AVANT LE FONCTIONNEMENT COUPER L'ALIMENTATION EN AIR ET ÉLECTRIQUE AVANT DE PROCÉDER À L'ENTRETIEN	High Voltage Hazard Ground unit before operating. Disconnect air and power before servicing.

Figure 1.3 Safety labels on the front of the actuator



Table 1.3 Safety labels on the front of the actuator

Label	Description
	Caution • High Voltage Hazard • Flying Debris and Loud Noise Hazards • Burn Hazard
	High Voltage Hazard Disconnect power before servicing.
	Flying Debris and Loud Noise Hazards Eye and ear protection must be worn.
	Burn Hazard Hot surfaces. Do not touch the tooling.

Figure 1.4 Safety labels inside of the actuator**Table 1.4** Safety labels inside of the actuator

Label	Description
	High Voltage Hazard Disconnect power before servicing.

1.3.3 Base

Figure 1.5 Safety labels on the base



Table 1.5 Safety labels on the base

Label	Description
	Crush Hazard Moving parts present. Can result in serious injury to hands or fingers. Keep hands away from moving ultrasonic horn.
	Emergency Stop Button In case of emergency, push button to stop cycle.
	Burn Hazard Hot surfaces. Do not touch the tooling.

1.4 General Precautions

Ensure that the Polaris system installation is performed by qualified personnel and in accordance with local standards and regulations.

⚠ WARNING	
	Electrical Hazard Risk of electric shock from high-voltage components. Contact with live electrical parts can cause severe injury. • Always plug the power supply into a properly grounded power source. • Do not operate the system with covers or safety guards removed. • Disconnect power before performing any maintenance or service. • Inspect power cord, system cables, and connectors regularly for damage; replace if defective. • Do not cycle the welding system if either the RF cable or converter is disconnected.
⚠ CAUTION	
	Crushing Hazard Risk of injury from ultrasonic horn downforce and ultrasonic vibrations. Fingers or hands caught under the ultrasonic horn or between components can be crushed or severely injured. • Keep hands and other body parts away from the area beneath the ultrasonic horn at all times. • Do not place fingers or objects between the ultrasonic horn and the workpiece fixture during operation. • When using larger ultrasonic horns, avoid situations where fingers could be pinched between the ultrasonic horn and the workpiece fixture. • Ensure the system is powered off and locked out before performing adjustments or maintenance near the ultrasonic horn. • All welding, setup and maintenance functions must be performed by only one person.
⚠ CAUTION	
	Loud Noise Hazard High noise levels and audible vibrations during ultrasonic welding. Prolonged exposure can cause hearing damage or loss. Noise levels depend on several factors: • Type of application • Size, shape, and composition of the material being assembled • Shape and material of the holding workpiece fixture • Welder setup parameters • Tool design Some parts may vibrate at audible frequencies during the process, creating uncomfortable noise. • When noise levels exceed permissible limits, provide operators with appropriate hearing protection as required by local regulations. • Implement engineering or administrative controls to reduce noise where feasible. • Limit time spent near the machine during extended production runs.

⚠ CAUTION	
	Chemical Exposure Hazard Electrolyte leakage from the battery contains corrosive substances. Contact with leaked electrolyte can cause eye injury, skin irritation, or respiratory issues if inhaled. • Handle batteries with care to prevent damage or leakage. • Wear appropriate personal protective equipment (PPE), such as gloves and safety goggles, when handling batteries. • Do not attempt to open, crush, or incinerate batteries. First Aid Measures: • Eye Contact: Flush the eyes with plenty of clean water for at least 15 minutes immediately, without rubbing. Get immediate medical treatment. If appropriate procedures are not taken, this may cause eye injury. • Skin Contact: Wash the affected area under tepid running water using a mild soap. If appropriate procedures are not taken, this may cause sores on the skin. Get medical attention if irritation develops or persists. Inhalation: Remove to fresh air immediately. Get medical treatment immediately.
⚠ CAUTION	
	Eye Hazard Risk of eye injury from debris or dust during ultrasonic welding operations. Failure to protect eyes can result in irritation or serious eye injury. • Always wear safety glasses when operating or working near the welder. • Ensure protective eyewear is clean and in good condition before use. • Do not operate the system if proper eye protection is not available.
⚠ CAUTION	
	Burn Hazard The ultrasonic horn, tooling, or part may become hot during operation and may cause burn injury. • Do not touch the ultrasonic horn, tooling, or part while the actuator is operating. • Allow the part to cool before handling. • Allow the ultrasonic horn and tooling to cool before contact.
⚠ CAUTION	
	Impact Hazard Unexpected movement of equipment or components can cause serious injury. • Stored energy, emergency stops during motion, or improperly secured equipment may result in uncontrolled movement or falling parts. Keep clear of moving components and secure equipment before operation or service.

1.4.1 Emissions

Because of the various types of toxic or injurious gases that may be liberated during the welding based on the material being processed, sufficient ventilation should be provided to prevent a concentration of these gases beyond recommended levels. Check with your materials suppliers for recommended protection when processing their materials.

⚠ CAUTION	
	Respiratory Hazard Processing certain materials during ultrasonic welding may generate hazardous fumes and particulates that could result in serious respiratory injury. • Identify the materials being processed and assess potential emission hazards. • Provide adequate ventilation to remove fumes from the work area. • Wear appropriate personal protective equipment (PPE), such as respirators, when required. • Follow all applicable safety regulations and Safety Data Sheet (SDS) recommendations.
i NOTICE	
	Processing certain materials may generate emissions that can corrode or damage equipment. Use appropriate ventilation and follow material handling guidelines to minimize exposure.

1.4.2 Intended Use of the System

The Polaris components are designed to be used as part of an ultrasonic welding system. These are designed for a wide variety of welding or processing applications.

If the equipment is used in a manner not specified by Branson, the protection provided by the equipment may be impaired.

i NOTICE	
	Branson Ultrasonics Corporation designs and manufactures machines giving the first priority to safety precautions, to allow customers to use the machines safely and effectively. Only trained personnel should operate the equipment. Untrained operators can misuse the equipment or ignore safety instructions that can result in personal injury or equipment damage. It is essential that all operators pay attention to safety instructions when operating the equipment. • To be considered a trained operator, it is mandatory to read and understand this user manual in its entirety. Operating the equipment without full knowledge of the procedures, safety precautions, and maintenance requirements outlined in this manual may result in improper use and potential hazards. • If the equipment is used in a manner not specified by Branson, the protection provided by the equipment may be impaired. The Polaris system is designed for indoor use only.
⚠ CAUTION	
	Crushing Hazard Activation of the palm buttons by another person can cause the ultrasonic horn to descend and crush hands or fingers, resulting in serious injury. • This equipment is designed to be operated by one person (1) only. Never allow more than one person to operate the machine at the same time.

1.4.3 Setting up the Workplace

Measures for setting up a workplace for safe operation of the ultrasonic welder are outlined in [Chapter 4: Installation and Setup](#).

1.4.4 Regulatory Compliance

This product meets electrical safety requirements and EMC (Electromagnetic Compliance) requirements for North America and the European Union.

1.5 Declaration of Conformity

Figure 1.6 Declaration of Conformity

EC DECLARATION OF INCORPORATION According to the Machinery Directive 2006/42/EC

We, the manufacturer

BRANSON ULTRASONICS CORPORATION
29185 Cabot Drive
Novi, MI 48377
USA

expressly declare under our sole responsibility that the equipment Ultrasonic Welding System consisting of:

Branson Ultrasonic power supply model: P/S POLARIS (20:1.25, 20:2.5, 20:4.0, 30:1.5, or 40:0.8) or
P/S IND-ETH POLARIS (20:1.25, 20:2.5, 20:4.0, 30:1.5, or 40:0.8)

with serial Number: PPPYYMMXXXX

where: PPP=Prefix (LKS, LKU, LKX, LKZ, LLB, LLD, LLF, LLH, LLJ, LLL)
YY=Year, MM=Month, XXXX=Sequential Number
Manufacturing date: September 2026 or later

used with a Branson actuator model: ACTUATOR POLARIS CORE (40, 50, 63, or 80) MM, or
ACTUATOR POLARIS ADVANCED (40, 50, 63, or 80) MM, or
ACT POLARIS ADVANCED SS (40, 50, 63, or 80) MM,

used with converter model: CJ20, CJ-30, CA30, or 4TJ, and associated cables,

fulfills the relevant provisions of the Machinery Directive **2006/42/EC** except below listed sections, which were not completely applied with regard to intended use of this equipment. Requirements of following sections need to be applied by final integrator: 1.1.2, 1.2.1, 1.2.2, 1.2.3, 1.2.4, 1.3.1, 1.3.7, 1.3.8, 1.4, 1.6. The safety objectives set out in the Low Voltage Directive 2014/35/EU were kept in accordance Annex 1 No. 1.5.1 of the Machinery Directive 2006/42/EC. This declaration has been issued under the sole responsibility of the manufacturer.

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

EN ISO 12100:2010	EN 61326-1:2021
EN 61010-1:2010+A1:2019	EN 61326-3-1:2017
EN 60204-1:2018	EN ISO 13849-1:2023
EN 55011:2016 + A1:2017 + A2:2021 + A11:2020	

We are committing to present any information relevant to health and safety and, in particular, the relevant technical documentation, in response to a duly reasoned request from the market surveillance authorities of one of the Member States.

IT IS FORBIDDEN TO PUT THIS EQUIPMENT INTO SERVICE UNTIL THE MACHINERY INTO WHICH IT IS TO BE INCORPORATED HAS BEEN DECLARED IN CONFORMITY WITH THE PROVISIONS OF THE MACHINERY DIRECTIVE.

Person authorised to compile the relevant technical documentation:

BRANSON ULTRASONICS, a.s.
Piestanska 1202
915 01 Nove Mesto nad Vahom
Slovak Republic

Luis Benavides
Luis Benavides (Sep 22, 2026 11:44:06 CDT)

Novi, MI, USA
September 22, 2026

Luis Benavides
Director of Engineering, Systems / Product Safety Officer

1.6 Cybersecurity Vulnerability Reporting

In accordance with the EU Cyber Resilience Act, we provide a Single Point of Contact for reporting cybersecurity vulnerabilities or security incidents related to this product.

If you discover a potential vulnerability, please report it to us using the dedicated contact channel: Branson.PSIRT@emerson.com or via the reporting form available at <https://emerson.com/reportvulnerability>.

Chapter 2: Introduction

2.1	Overview	20
2.2	Principle of Operation.....	21
2.3	System Components	22
2.4	System Information Labels	27

2.1 Overview

The Polaris ultrasonic welding system is a modular welding platform designed for integration into benchtop and automated production environments. The system combines advanced ultrasonic welding technology with a modern control interface to provide precise process control, repeatable weld quality, and flexible system configuration.

Figure 2.1 Polaris System



Polaris systems are available in multiple mechanical configurations to accommodate a wide range of application requirements. The actuator can be mounted on either a round column or a square column assembly. The modular design enables the system to be configured for standalone workstation use or integrated into automated manufacturing equipment.

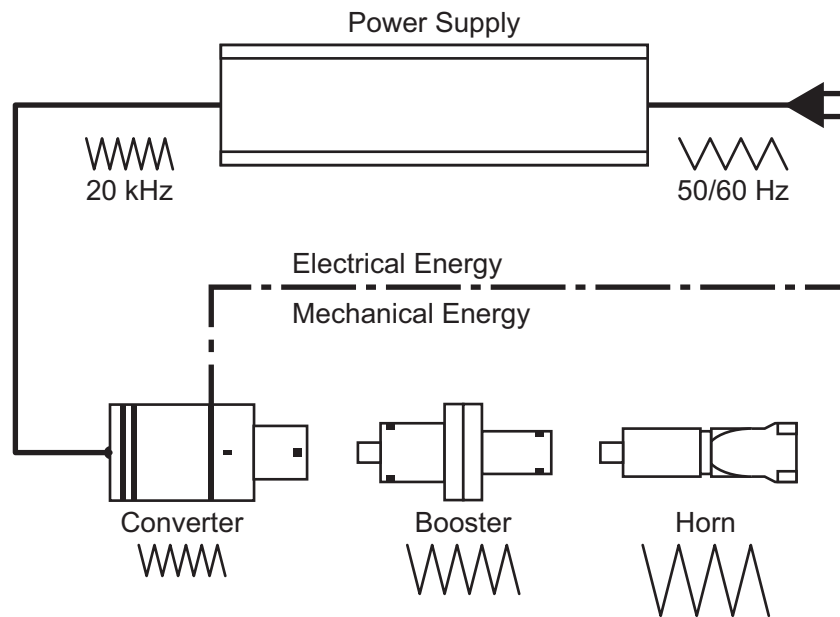
2.2 Principle of Operation

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

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

Most plastics welders operate at a frequency above the range of human hearing (18 kHz) and are thus called ultrasonic.

Figure 2.2 How does ultrasonic welding work?



2.2.1 Benefits of ultrasonic welding

Ultrasonic welding exhibits unique welding properties that include:

- Low heat build up during the ultrasonic process (no annealing of materials)
- Compensation for normal surface variations of the material
- Ability to weld large areas using minimal energy
- Ability to weld thin materials to thick materials
- Low cost per weld

2.3 System Components

2.3.1 Power Supply

The power supply consists of an ultrasonic power supply module and a system controller. The ultrasonic power supply module converts conventional 50/60 Hz line current to 20 kHz, 30 kHz or 40 kHz electrical energy. The system controller monitors and controls the welding system.

Figure 2.3 Power Supply



The power supply provides the following features:

- **AutoTune with Memory (AT/M):** Allows the power supply to track and store the ultrasonic horn frequency of the last weld.
- **Auto Seek:** Tracks and starts the ultrasonic horn on the correct frequency. It does this by running the ultrasonic horn at a low-level amplitude (10%) to find and lock on to the ultrasonic horn operating frequency.
- **S-Beam Load Cell:** Provides an indication of the force on a part during a weld. This indication can be used to determine when to trigger ultrasonics and also to produce a force/distance graph of the operating cycle.
- **Line Regulation:** Maintains converter amplitude by regulating for variances in the line voltages.
- **Load Regulation:** Maintains converter amplitude over the full range of rated power.
- **System Protection:** Protects the power supply by providing five levels of protection:
 - Voltage
 - Current
 - Phase
 - Temperature
 - Power

2.3.2 Actuator

The actuator is a compact, rigid unit designed for use in manual, semi-automated, and automated ultrasonic welding systems. The actuator can be mounted directly on an I-beam (or similar machine frame), or it can be mounted on a column and base with start switches and used in a manual or benchtop system. The actuator is designed to be operated in an upright position, but is capable of running horizontally or inverted. If you are mounting your equipment in an inverted position, contact Branson for further recommendations (see section [7.2 Contact Us](#) for more information).

The actuator requires a power supply for power and control of the actuator's operation and to provide ultrasonic power to the converter in the actuator.

Figure 2.4 Actuator



2.3.3 S-Beam Load Cell and Dynamic Follow-Through

Many welding applications require force to be built up on the part before ultrasonic energy is activated. To achieve this, the actuator contains an S-Beam load cell, located between the air cylinder and the converter, which initiates (triggers) ultrasonics after a preset force is applied to the part. Dynamic follow-through maintains a consistent force on the part during the weld collapse. This system helps provide uniform weld quality.

The dynamic triggering and follow-through process operates as follows: upon activation of the operating cycle, the solenoid valve delivers regulated air to the upper portion of the cylinder, and exhausts air through the Downspeed control from the bottom of the cylinder, causing the ultrasonic horn to advance and contact the workpiece. When the load cell measurement of the force on the part indicates part contact, and the desired trigger force is reached, a signal is sent to the power supply, which then starts the weld cycle. At this time, the actuator locks into a cycle and timing begins. The palm buttons may be released after the trigger condition is met. As melting of the plastic occurs, the load cell dynamic follow through maintains consistent force on the part, ensuring smooth, efficient transmission of ultrasonic energy into the part.

2.3.4 The Carriage and Slide System

The actuator's carriage is driven by a double-acting air cylinder. It is mounted on a linear ball-bearing slide. The slide system is based on eight sets of preloaded, permanently lubricated bearings and provides consistent, precise alignment of the ultrasonic horn, smooth linear motion, and long-term reliability.

2.3.5 Encoder

The encoder measures the distance the ultrasonic horn has traveled. Depending on the power supply settings, it can:

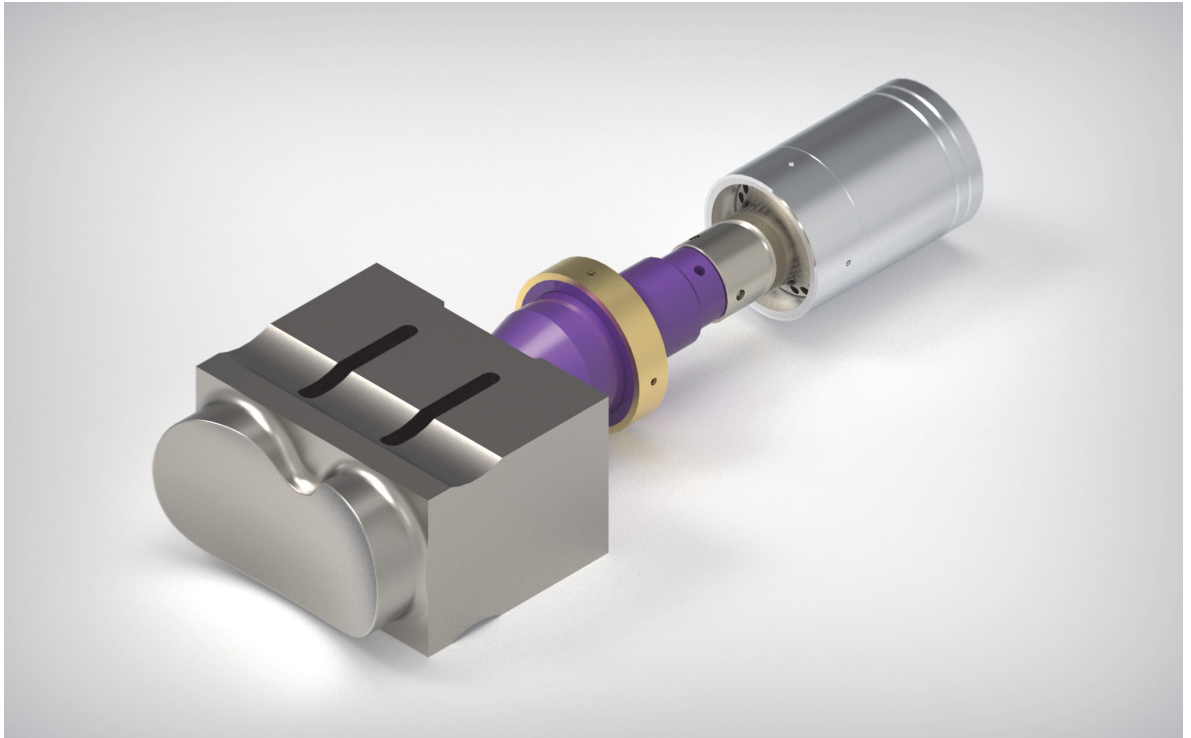
- Allow for distance welding in absolute and collapse modes
- Detect improper setup controls
- Monitor the distance data of the weld

2.3.6 The Pneumatic System

The pneumatic system included on the Polaris system is contained within the actuator's sheet-metal enclosure and consists of solenoid valves, an air cylinder, and a pressure regulator. The ultrasonic horn's rate of descent is adjusted by the Downspeed Control in the HMI. The rate of return is fixed.

2.3.7 The Ultrasonic Stack

Figure 2.5 The ultrasonic stack



2.3.7.1 Converter

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

Figure 2.6 Converter



2.3.7.2 Booster

Success in ultrasonic assembly depends on the right amplitude of movement at the ultrasonic horn face. Amplitude is a function of the ultrasonic horn shape, which is largely determined by the size and form of the parts to be assembled.

The booster can be used as a mechanical transformer to increase or decrease the amplitude of vibrations applied to the parts through the ultrasonic horn. The booster is a resonant half-wave section of aluminum or titanium. It is mounted between the converter and the ultrasonic horn, as part of the ultrasonic stack. It also provides a clamping point for rigid stack mounting.

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

Figure 2.7 Booster

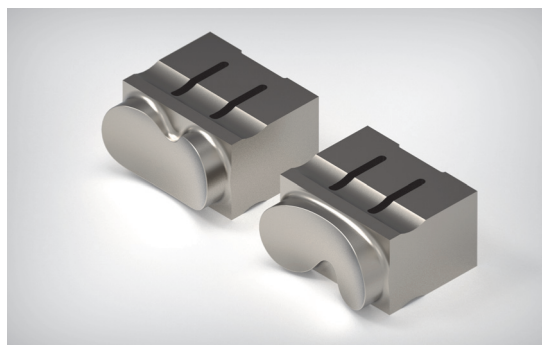


2.3.7.3 Ultrasonic Horn

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

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

Figure 2.8 Ultrasonic horn



2.4 System Information Labels

2.4.1 Power Supply

Figure 2.9 System Information Label - Power Supply

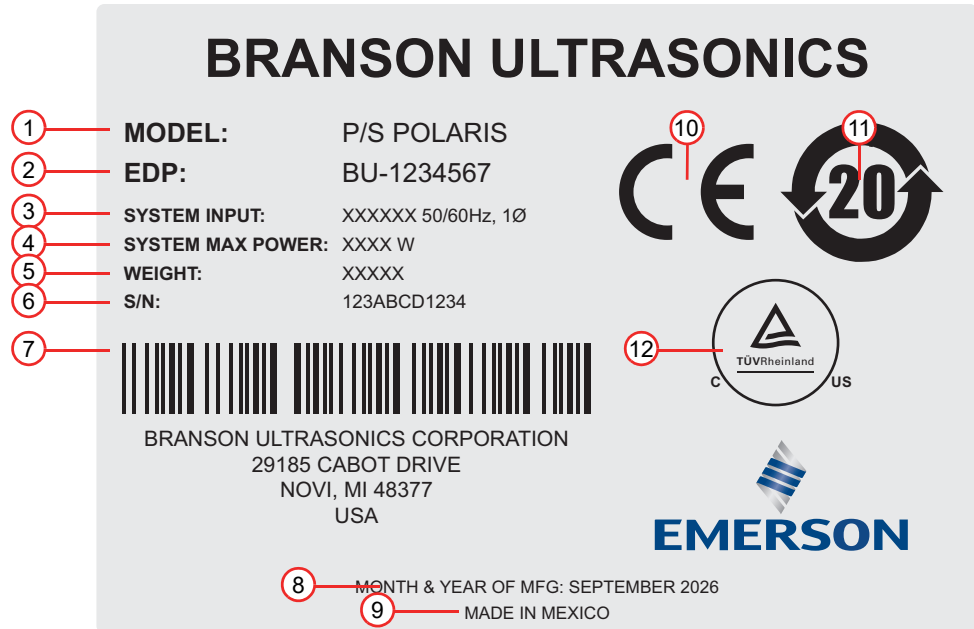


Table 2.1 System Information Label - Power Supply

Item	Description	Item	Description
1	System model	7	Barcode
2	EDP number	8	Month & year of manufacture
3	System input	9	Assembly location
4	System maximum power	10	CE marking
5	Weight	11	China RoHS marking
6	Serial number	12	TÜV marking

2.4.2 Actuator

Figure 2.10 System Information Label - Actuator

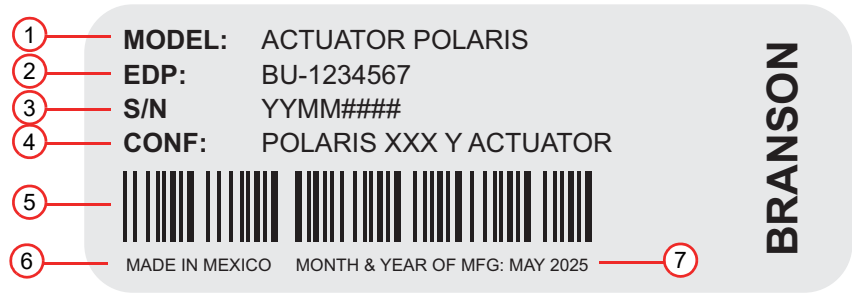


Table 2.2 System Information Label - Actuator

Item	Description	Item	Description
1	System model	5	Barcode
2	EDP number	6	Assembly location
3	Serial number	7	Month & year of manufacture
4	Actuator configuration		

2.4.3 Base

Figure 2.11 System Information Label - Base



Table 2.3 System Information Label - Base

Item	Description	Item	Description
1	EDP number	3	Barcode
2	Description	4	Assembly location

Chapter 3: Technical Specifications

3.1	Environmental Specifications	30
3.2	Electrical Specifications	31
3.3	Actuator Specifications.....	32
3.4	Storage	33
3.5	Air Supply	34
3.6	Physical Description	35
3.7	Dimensional Drawings	36

3.1 Environmental Specifications

	NOTICE
	Environmental specifications are subject to change without notice.

The Polaris system has the following environmental specifications:

Table 3.1 Environmental Specifications

Environmental Condition	Acceptable Range
Ambient Operating Temperature	+5°C to +40°C
	+41°F to +104°F
Storage / Shipping Temperature	-25°C to +55°C
	-13°F to +131°F
Operating Altitude	2000 m
	6561 ft
Humidity	95% maximum, non-condensing.
IP Rating	20 Protected against solid objects larger than 12.5 mm; no protection against water.
Pollution Degree	2 Only non-conductive pollution occurs; temporary conductivity caused by condensation may be expected.
Overvoltage Category	II Equipment intended to be supplied from the building wiring.

3.2 Electrical Specifications

	NOTICE
	Electrical specifications are subject to change without notice.

3.2.1 Power Supply

Table 3.2 Power Requirements

Frequency	Power Output	System Input Power Requirements
20 kHz	1250 W	200-240V~7 A 50/60Hz, Single Phase
	2500 W	200-240V~14 A 50/60Hz, Single Phase
	4000 W	200-240V~25 A 50/60Hz, Single Phase
30 kHz	1500 W	200-240V~10 A 50/60Hz, Single Phase
40 kHz	800 W	200-240V~5 A 50/60Hz, Single Phase

3.2.2 Continuous Duty Maximum Power

Table 3.3 Continuous Duty Maximum Power

Frequency	Power Output	Continuous Duty Max. Power	Full Power Duty Cycle
20 kHz	1250 W	800 W	10 seconds on, 10 seconds off (50% duty cycle)
	2500 W	1600 W	10 seconds on, 10 seconds off (50% duty cycle)
	4000 W	2000 W	5 seconds on, 15 seconds off (25% duty cycle)
30 kHz	1500 W	800 W	2 seconds on, 2 seconds off (50% duty cycle)
40 kHz	800 W	400 W	10 seconds on, 10 seconds off (50% duty cycle)

	NOTICE
	System average power must be limited to the specified continuous maximum.

3.3 Actuator Specifications

Table 3.4 Actuator Specifications

Feature	Specifications
Air Supply	240 to 690 kPa 35 to 100 psi
Actuator Dimensions (W x L x H)	108 mm x 356 mm x 800 mm 4.25" x 14" x 32"s
Stroke Length	95 mm 3.75"
Cylinder Size	40 mm 50 mm 63 mm 80 mm

Table 3.5 Actuator Performance

Cylinder Size (mm)	Clamp Force*	Dynamic Triggering Range**
40 mm	809 N 182 lbs	22-778 N 5-175 lbs
50 mm	1294 N 291 lbs	22-1219 N 5-274 lbs
63 mm	2090 N 470 lbs	44-1935 N 10-435 lbs
80 mm	3407 N 766 lbs	44-3118 N 10-701 lbs

Measurement Conditions			
Parameter	Pressure	Stroke	Stack Weight
*Clamp Force	690 kPa 100 psi	50 mm 2"	2.72 kg 6 lbs
**Dynamic Triggering Range	-	50 mm 2"	2.72 kg 6 lbs

3.4 Storage

The number of weld results, alarms, weld graphs, and recipes that can be stored depends on the selected storage option. Each tier is designed to meet different production and data retention needs.

Table 3.6 Storage

Storage Option	Weld Results	Alarms	Weld Graphs	Recipes
Standard	100,000	100	100	16
Advanced	500,000	500	500	50
Elite	1,000,000	1,000	1,000	1,000

3.5 Air Supply

The factory compressed air supply must be clean (to a 5 micron level), dry and unlubricated with a regulated maximum pressure of 690 kPa (100 psi). Depending on the application, the actuator requires between 240 to 690 kPa (35 to 100 psi). Systems include an in-line air filter.

NOTICE	
	Synthetic air compressor lubricants containing silicone or WD-40® can cause internal actuator damage and failure due to the solvents they contain. • Do not use lubricants containing silicone or WD-40 on any pneumatic components.

3.6 Physical Description

This section describes the physical dimensions of the Polaris Advanced system.

	NOTICE
	All dimensions are approximate.

Table 3.7 Dimensions and Weight of the Polaris System

Model	Width	Height	Depth	Weight
All models	50 cm	130 cm (max)	72 cm	85 kg
	20 in	51 in	28 in	190 lb

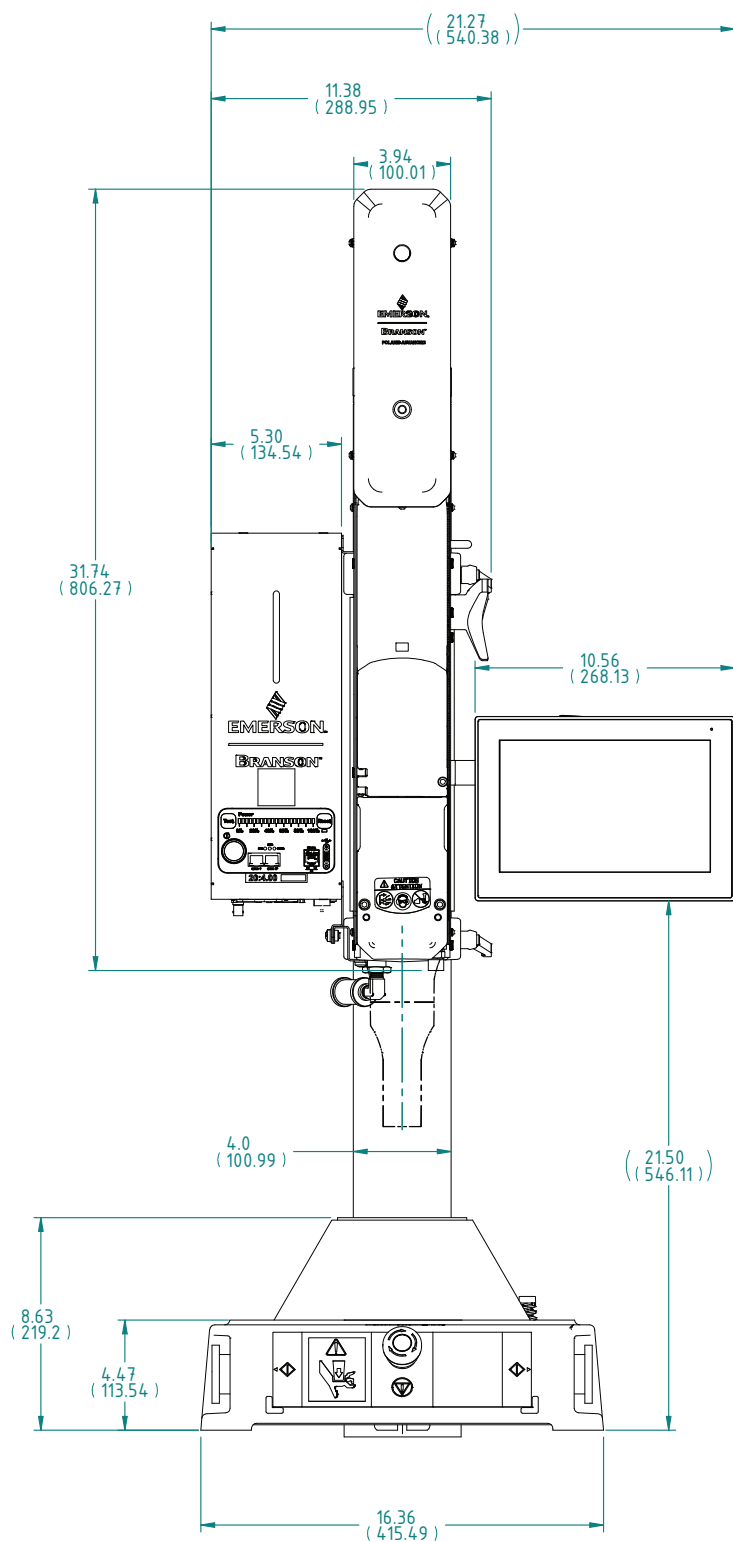
For detailed dimensional information refer to [3.7 Dimensional Drawings](#).

3.7 Dimensional Drawings

3.7.1 Round Column

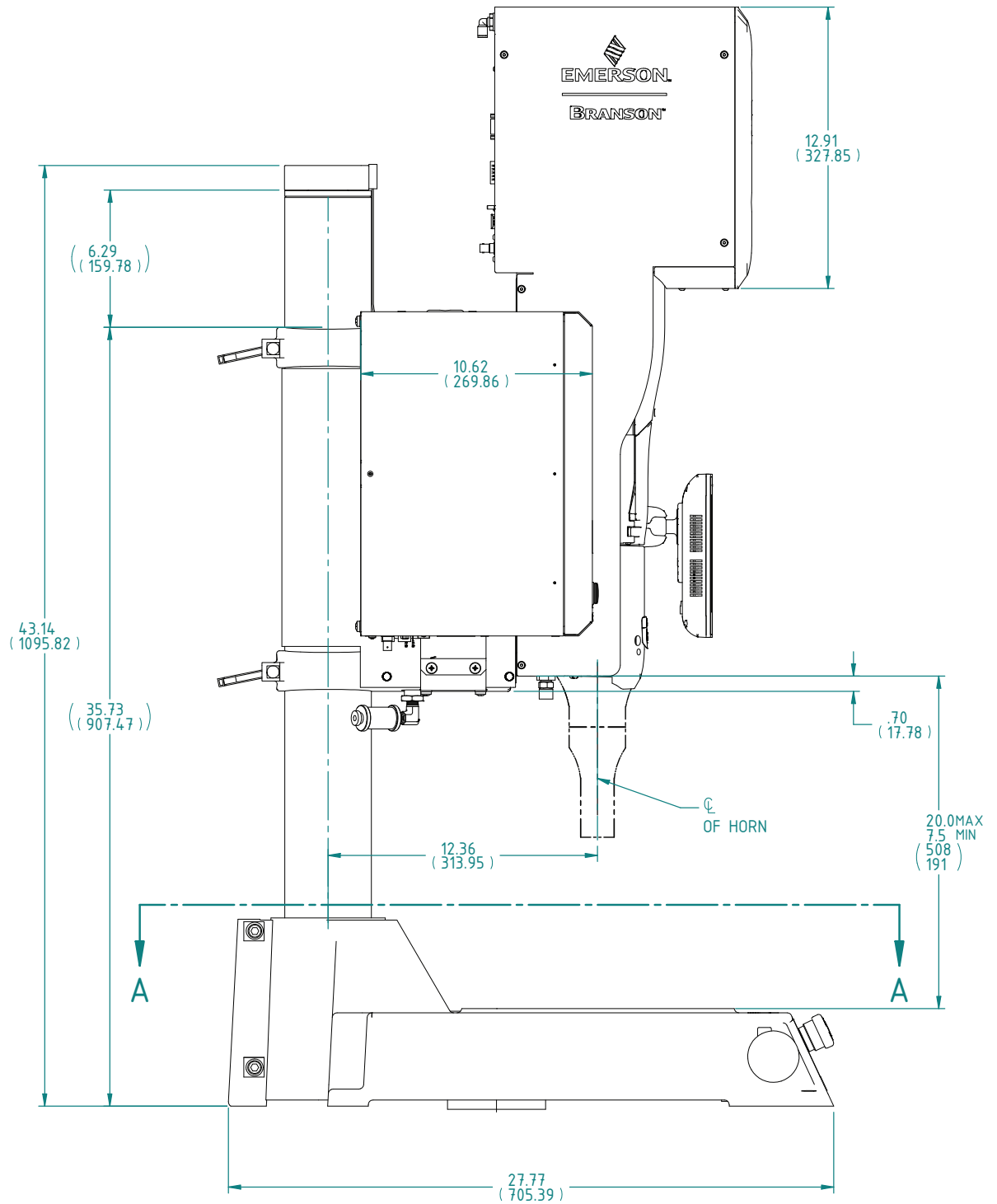
3.7.1.1 Front Side

Figure 3.1 Front Side



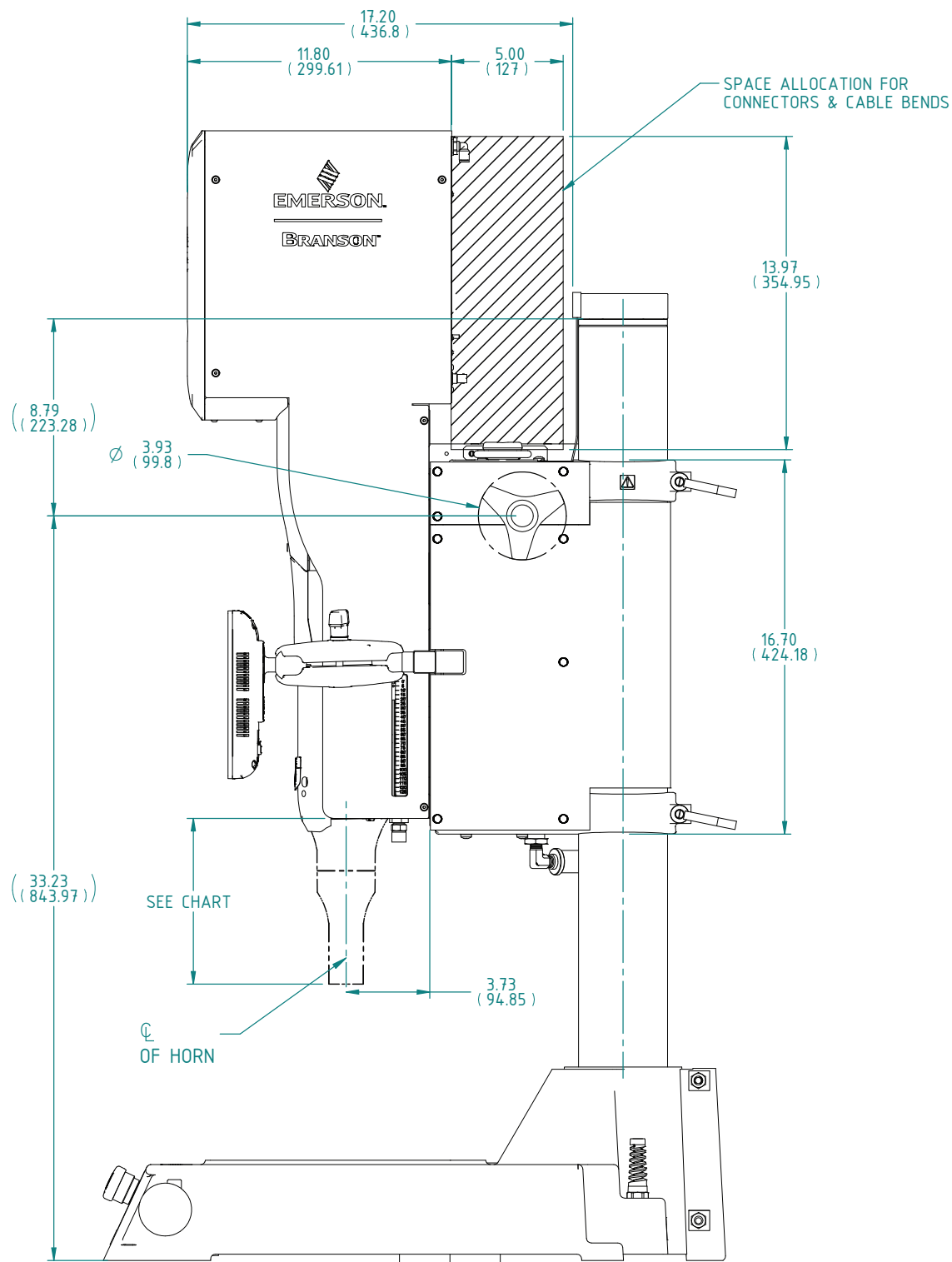
3.7.1.2 Left Side

Figure 3.2 Left Side



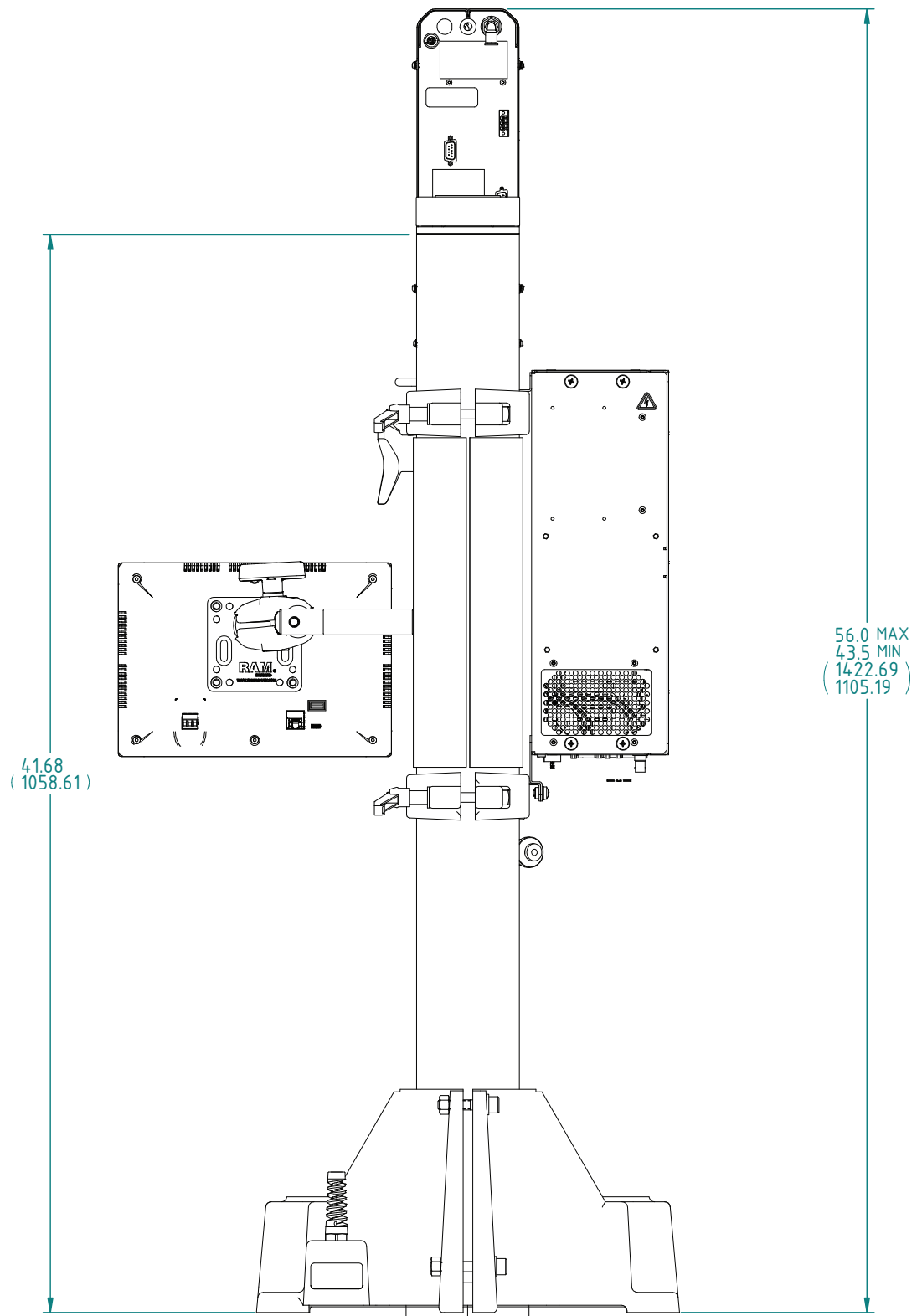
3.7.1.3 Right Side

Figure 3.3 Right Side



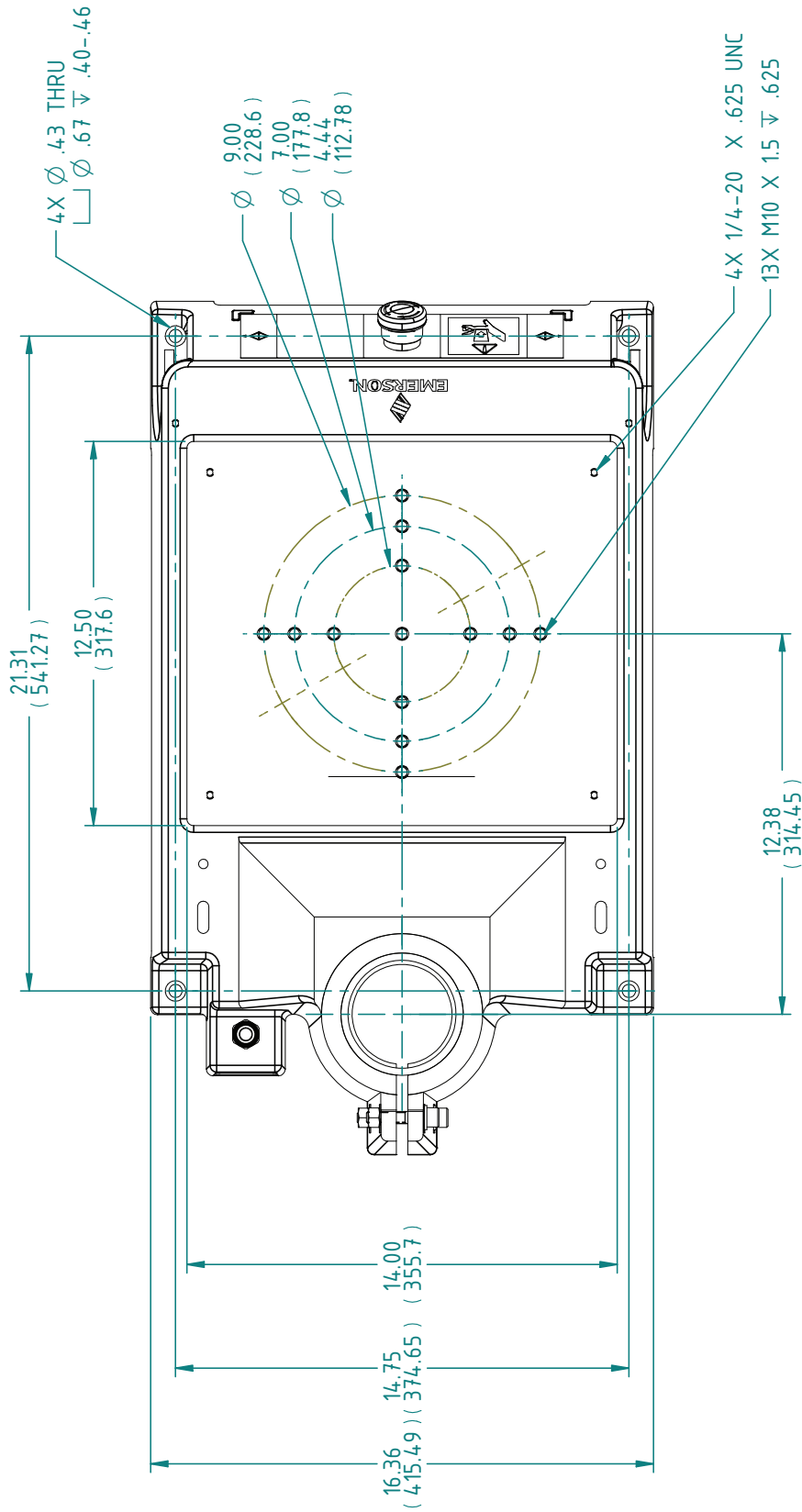
3.7.1.4 Back

Figure 3.4 Back



3.7.1.5 Base

Figure 3.5 Base

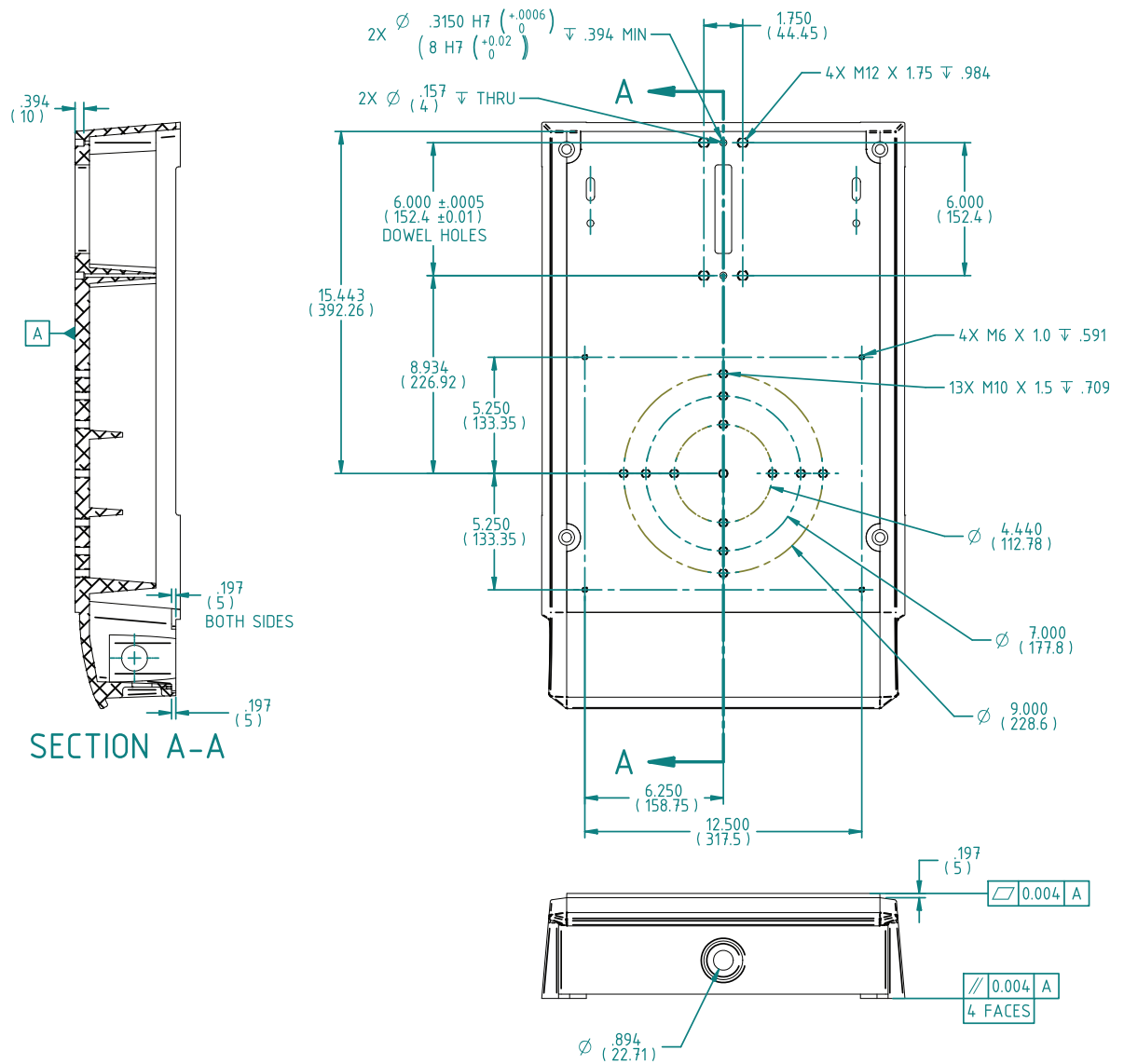


SECTION A-A

3.7.2 Square Column

3.7.2.1 Base

Figure 3.6 Base



[This page intentionally left blank]

Chapter 4: Installation and Setup

4.1	About Installation	44
4.2	Handling and Unpacking	45
4.3	Mounting the Base.....	50
4.4	Air Supply	52
4.5	HMI.....	53
4.6	Input Power Connection.....	58
4.7	User I/O	60
4.8	Ground Detect Cable	62
4.9	Safety Devices	63
4.10	Ultrasonic Stack.....	66
4.11	Installing the Ultrasonic Stack in the Actuator	77
4.12	Mounting the Workpiece Fixture.....	79
4.13	Leveling Plate.....	84
4.14	Alignment and Leveling	85
4.15	USB Accessories	90
4.16	USB Mass Storage Devices	91
4.17	Barcode Scanner	92
4.18	Reset Dongle.....	93
4.19	LED Work Light.....	94

4.1 About Installation

This chapter is intended to help the installer with the basic installation and setup of the Polaris system.

	NOTICE
	International safety labels are found on the Polaris system. Those that are of importance during installation of the system are identified in the figures in this and other chapters of the manual.
	⚠CAUTION
	Impact Hazard The column and column support are under spring tension from the counterbalance spring. Sudden release of spring tension can cause uncontrolled movement, leading to serious injury. • Do not attempt to disassemble the column from the stand. • Always keep the column support clamped together. • When making height adjustments: Slowly release the clamps to control motion. Hold the stand securely to prevent sudden movements. Only trained personnel should perform adjustments or maintenance on the column assembly.

4.2 Handling and Unpacking

	NOTICE
	If there are any visible signs of damage to the shipping containers or the product, or you later discover hidden damage, notify your carrier immediately. Save the packing material. 1. Unpack the Polaris components as soon as they arrive. Refer to the following procedures. 2. Verify you have all of the equipment ordered. Some components are packed inside other boxes. 3. Inspect the controls, indicators, and surfaces for signs of damage. 4. Save all packing material, including the pallets and wood spacer blocks. Evaluation systems will be returned using this packing material.

4.2.1 Unpacking Instructions

Table 4.1 Unpacking Instructions

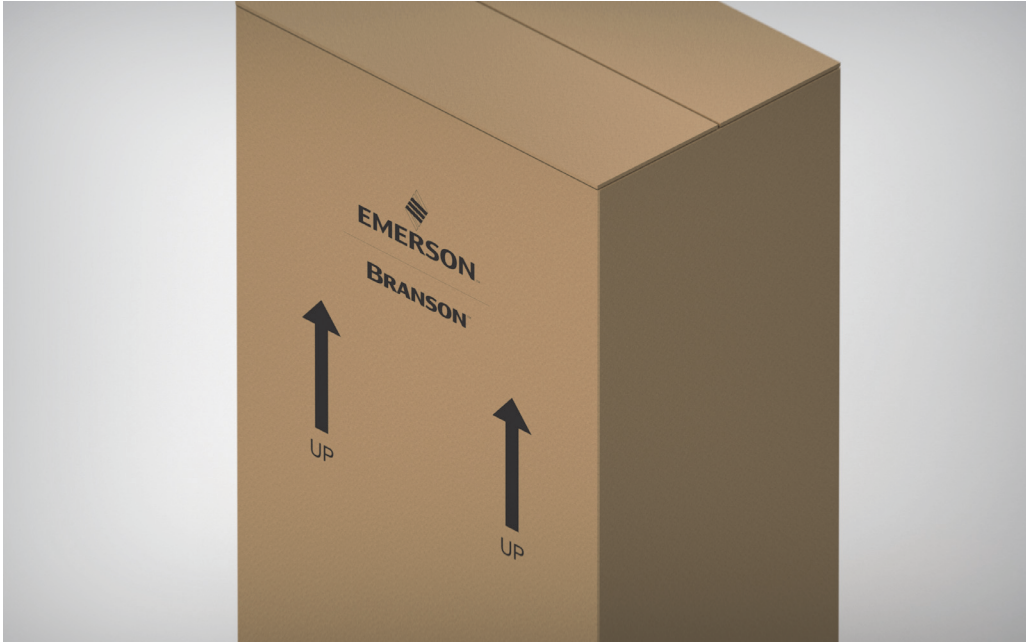
Step	Action
1	Heed the This End Up arrows instructions. The packaging is designed to be removed from the assemblies from an upright orientation only. 
2	Move the shipping container close to the intended installation location; leave it on the floor.

Table 4.1 Unpacking Instructions

Step	Action
3	Open the top of the box. Remove the insert from the top of the protective box. 
4	Remove the staples at the bottom of the protective box. Lift the protective box off the pallet. Remove the protective insert around the actuator. 
5	Cut the two packing straps around the base and pallet. Pry off the two wooden shipping blocks (to the rear of the base) which prevent the base from sliding on the pallet.
6	The system can now be moved into its desired location by sliding it off the pallet. Systems have a lifting hook for the use of overhead hoists to lift the assembly in place.
7	Unpack the toolkit from the insert box, and other parts (converter, booster, etc.) that may have shipped with the system. Save the packing material.

4.2.2 Lift Point

Use the designated lift point shown below when lifting or moving the Polaris system.

⚠ WARNING	
	Crushing Hazard The Polaris system is heavy and may shift during installation or adjustment, resulting in serious hand or foot injury. • Keep clear during movement. Do not loosen clamps unless instructed. • Use proper lifting equipment and designated lift points. • Use assistance when handling or installing the system.

4.2.2.1 Round Column

Figure 4.1 Lift Point Location - Round Column



Table 4.2 Lift Point Location - Round Column

Item	Description
1	Lift Point

4.2.2.2 Square Column

Figure 4.2 Lift Point Location - Square Column



Table 4.3 Lift Point Location - Square Column

Item	Description
1	Lift Point

4.2.3 Location

The Polaris system should only be operated in the vertical position. The system is manually operated, using its base-mounted palm buttons, and so is installed at a safe and comfortable workbench height with the operator sitting or standing in front of the system. To ensure optimal visibility and safe operation, the system must be placed in a well-illuminated area.

⚠ WARNING	
	Impact Hazard The system can fall if not properly secured, which may result in injury or equipment damage. • Install the stand on a sturdy, level surface that can support its weight. • Ensure the stand is stable and does not tip during adjustment. • Use the designated mounting points to secure the stand.

4.3 Mounting the Base

The base must be bolted to your workbench to prevent tipping or undesired movement. Four mounting bolt holes are provided at the corners of the casting, and will accept your M10 cap screws. Use flat washers against the metal casting to prevent gouging.

	⚠ WARNING
	Impact Hazard The system can fall if not properly secured, which may result in injury or equipment damage. • Secure the base to the work surface using four bolts. • Verify the work surface is level and capable of supporting the system. • Tighten all bolts securely.

Table 4.4 Mounting the base

Step	Action
1	Ensure there are no overhead obstructions and that no pinch or rub points exist. Remember that the welder is taller than the column when fully raised, and there are exposed connections.
2	Mount the base to your workbench using four M10 socket-head cap screws. Use flat washers against the metal casting to prevent gouging. The use of nylon lock nuts with your cap screws is suggested, to reduce loosening due to vibration and movement.

Figure 4.3 Round column - Base mounting centers

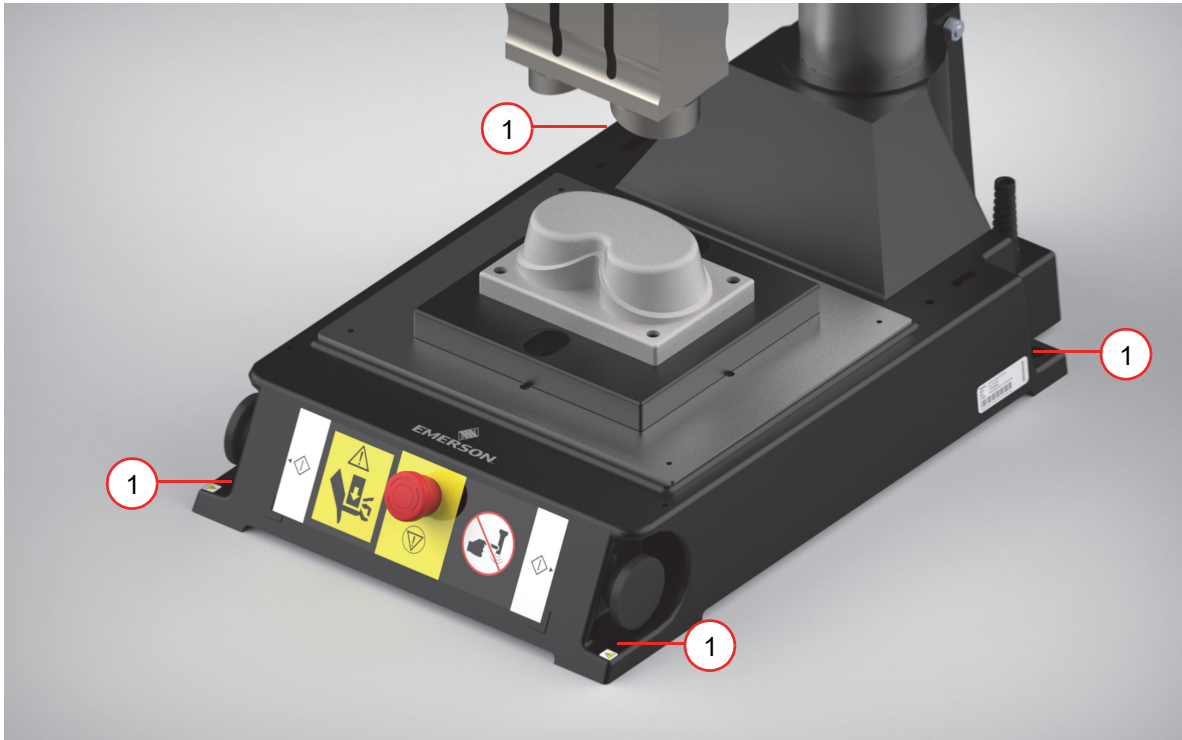


Table 4.5 Location of base mounting centers

Item	Description
1	Base mounting centers

Figure 4.4 Square column - Base mounting centers

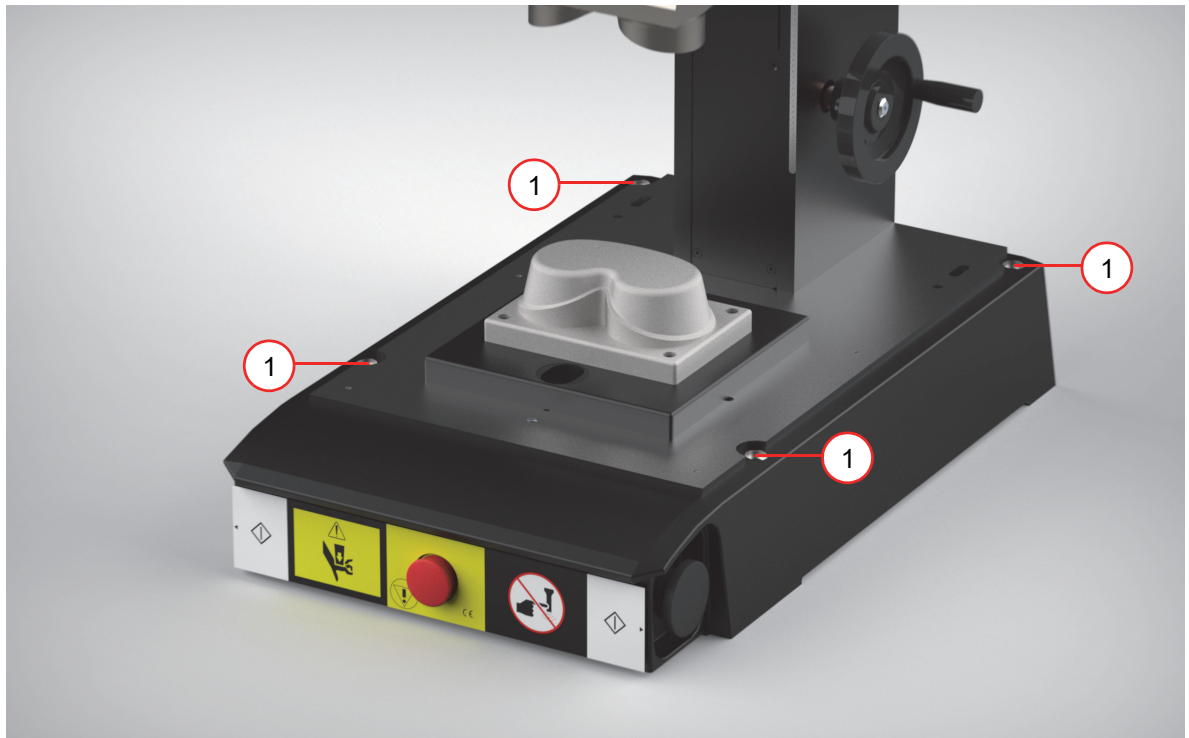


Table 4.6 Location of base mounting centers

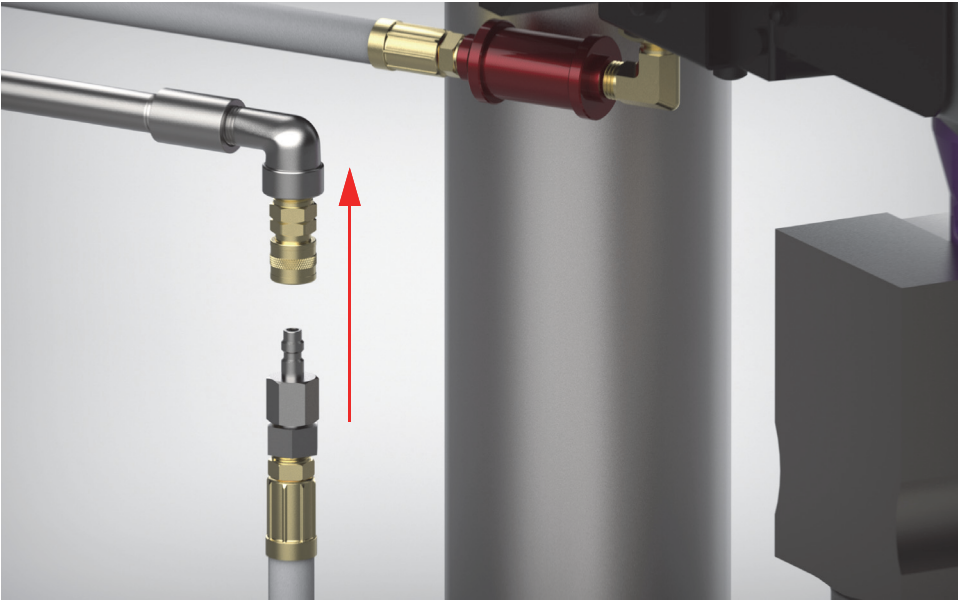
Item	Description
1	Base mounting centers

4.4 Air Supply

The air hose is pre-installed on the slide valve. The opposite end of the hose is supplied with a G1/4 adapter installed. If required, remove the G1/4 adapter to expose the 1/4" NPT fitting, then connect the hose to your facility's air supply line using an appropriate quick disconnect fitting.

4.4.1 Connecting Air Hose to Air Supply

Figure 4.5 Connecting Air Hose to Air Supply



	NOTICE
	The factory compressed air supply must be clean (to a 5 micron level), dry and unlubricated, with a regulated maximum pressure of 690 kPa (100 psi). Depending on your application, the system requires between 240 to 690 kPa (35 to 100 psi). System includes an inline air filter. A quick-disconnect fitting is suggested. Use a lockout device on the air line if required.

Table 4.7 Connecting Air Hose to the Air Supply

Step	Action
1	Ensure the system is powered off and depressurized.
2	Identify the fitting on the free end of the hose. The hose is supplied with a G1/4 adapter installed.
3	Check your facility air supply connection: • If compatible with G1/4, proceed to Step 5. • If 1/4" NPT is required, proceed to Step 4.
4	Remove the G1/4 adapter to expose the 1/4" NPT fitting.
5	Connect the hose to your facility's air supply line using an appropriate quick disconnect fitting (G1/4 or 1/4" NPT, as applicable)
6	Install a Lockout/Tagout (LOTO) device upstream of the connection point to allow safe isolation of the air supply during maintenance.
7	Turn on the air supply and check for leaks at the connection.

4.5 HMI

4.5.1 Round Column

4.5.1.1 Attaching HMI to Mounting Plate

Table 4.8 Attaching HMI to Mounting Plate

Step	Action
1	Unpack the HMI and lay it face-down on a soft, clean surface to avoid damage.
2	Identify the four threaded holes on the back of the HMI arranged in a 75x75 mm square pattern.
3	Position the mounting plate so that its holes align with the HMI's mounting holes. The ball should face outward, away from the HMI.
4	Using M4 screws, attach the mounting plate to the HMI. Tighten each screw evenly using a 3 mm hex wrench. Do not overtighten to avoid damaging the HMI.
5	Ensure the mounting plate is securely mounted and flush against the HMI. The mounting plate should be firmly attached and ready to connect to the socket arm.

Figure 4.6 Attaching HMI to Mounting Plate



Table 4.9 Attaching HMI to Mounting Plate

Item	Description
1	Mounting plate
2	HMI

4.5.1.2 Mounting & Connecting the HMI

Table 4.10 Mounting & Connecting the HMI

Step	Action
1	Loosen the knob on the double socket arm until both sockets are wide enough to accept the ball ends.
2	Place the ball attached to the mounting plate into one end of the socket arm.
3	Place the ball of the adapter post into the opposite end of the socket arm.
4	Rotate and angle the arm to the desired position. The double socket arm allows for a wide range of motion and tilt.
5	Once the desired position is set, tighten the knob on the socket arm firmly by hand.
6	Find the 24 VDC power input on the HMI. Take the pre-assembled 24 VDC connector block and align it with the HMI's power terminal. Insert the connector block into the terminal until it is fully seated.
7	Find the RJ45 Ethernet port on the HMI. Plug the Ethernet cable into the port until it clicks securely into place.

Figure 4.7 Mounting & Connecting the HMI

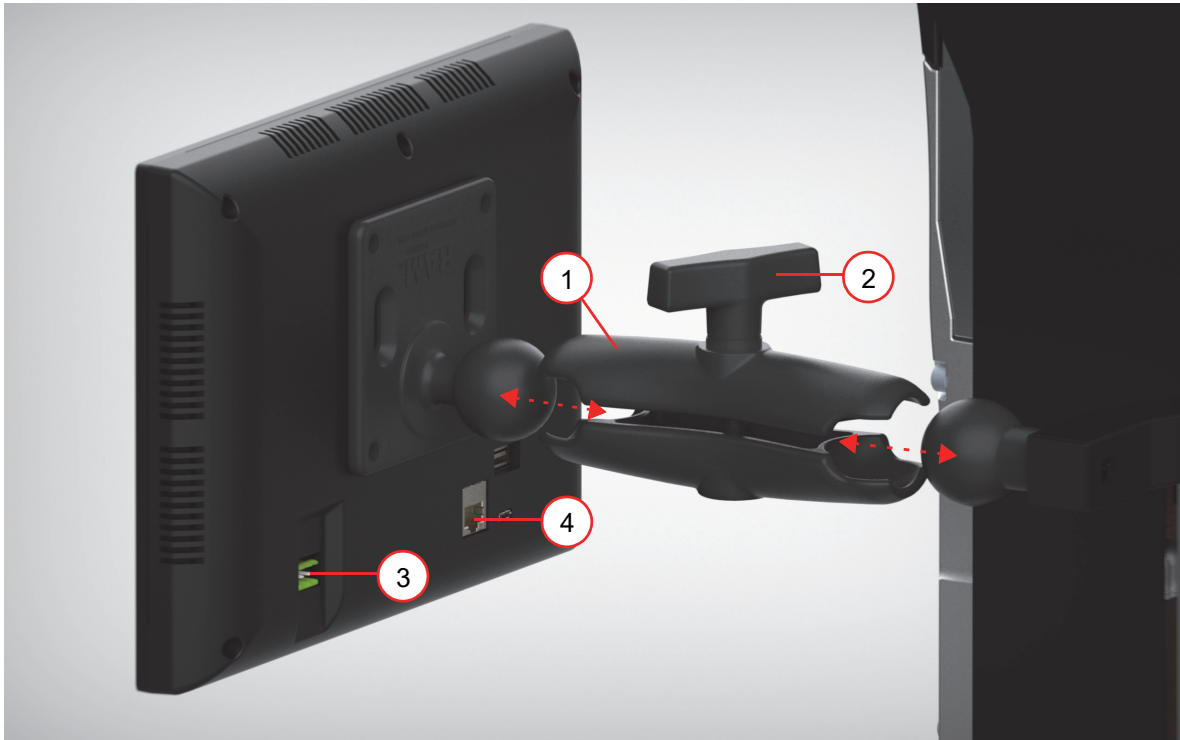


Table 4.11 Mounting & Connecting the HMI

Item	Description
1	Double socket arm
2	Knob
3	24 VDC Power Input
4	RJ45 Ethernet Port

4.5.2 Square Column

4.5.2.1 Attaching HMI to Arm

Table 4.12 Attaching HMI to Arm

Step	Action
1	Tilt the HMI back and lower onto the arm, so that the hook fits into the corresponding hole on the mounting bracket. Then rotate the bottom of the HMI back towards the arm until the tab snaps in place.
2	Find the 24 VDC power input on the HMI. Take the pre-assembled 24 VDC connector block and align it with the HMI's power terminal. Insert the connector block into the terminal until it is fully seated.
3	Find the RJ45 Ethernet port on the HMI. Plug the Ethernet cable into the port until it clicks securely into place.

Figure 4.8 Attaching HMI to Arm

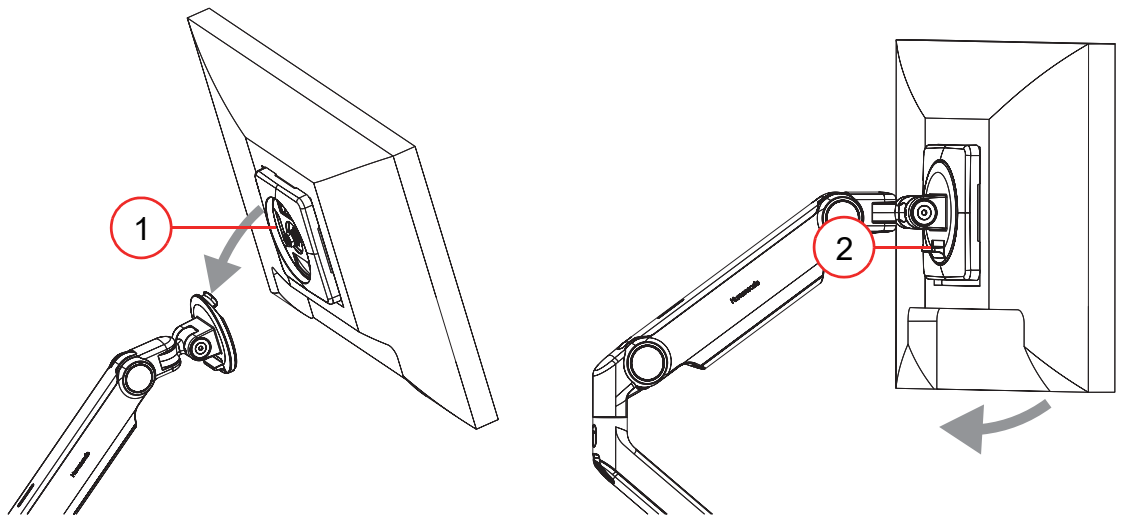


Table 4.13 Attaching HMI to Arm

Item	Description
1	Mounting bracket
2	Release tab

4.5.2.2 Arm Adjustments

The HMI should move up and down easily and stay in place once adjusted. If it is difficult to adjust or moves without assistance, it is not properly counter balanced.

Table 4.14 Arm Adjustments

Step	Action
1	Press the upper arm link downward until you see the adjustable screw.
2	Adjust the screw with a 4 mm hex key clockwise direction (towards +) to increase load tension and anticlockwise (towards -) to reduce load tension. NOTICE Do not over-tighten the screw as it can damage the screw head or thread. Remove hex key before moving the arm to avoid damage to the hinge area.
3	Move the HMI around to ensure that movement is smooth and the arm functions as desired. If required, repeat steps 1-2 to adjust the force as needed.

Figure 4.9 Arm Adjustments

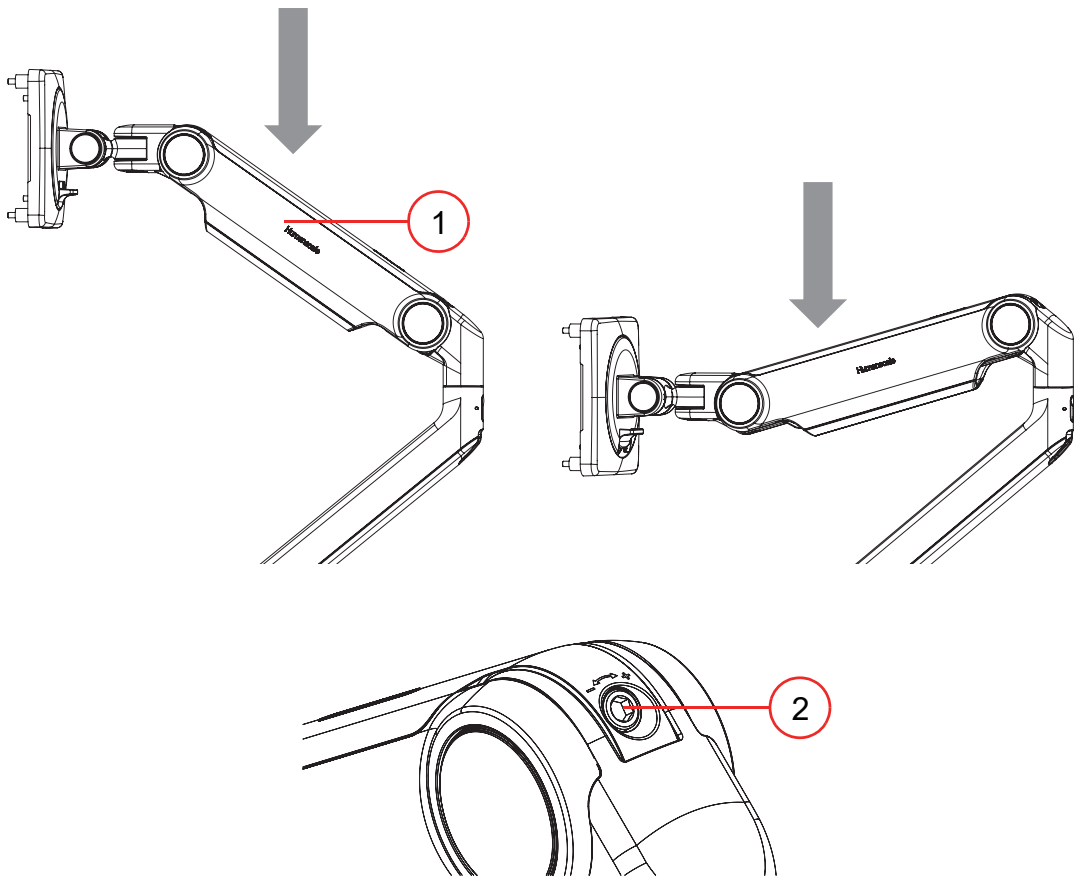


Table 4.15 Arm Screws

Item	Description
1	Upper arm link
2	Adjustable screw

4.5.3 HMI Connections

Figure 4.10 HMI Connections

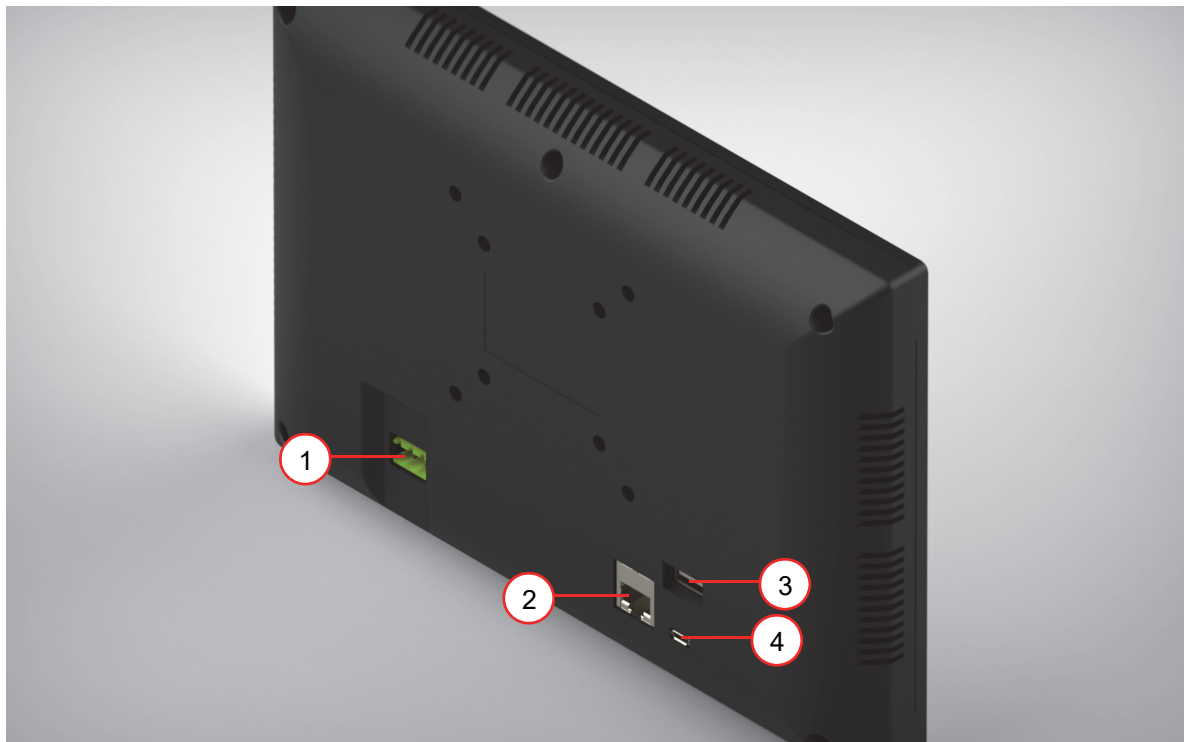


Table 4.16 HMI Connections

Item	Description	Item	Description
1	24 VDC Power Input	3	USB-A 2.0 Port
2	RJ45 Ethernet Port	4	USB-C Port

	NOTE
	The HMI Ethernet port is intended only for communication between the HMI and the Polaris power supply. Do not connect this port to any external network or network device.

	NOTE
	The USB-A 2.0 port is intended only for connecting a USB keyboard and/or mouse. Other USB devices are not supported. If both a keyboard and mouse are required simultaneously, connect them through a USB-A 2.0 hub.

	NOTE
	The USB-C port is reserved for Branson service and support functions only. Do not connect external devices to this port.

4.6 Input Power Connection

4.6.1 Power Supply

Use the following procedure to connect the power supply to a single-phase, grounded, 3-wire, 50/60 Hz 200/240 VAC power source. See section [3.2 Electrical Specifications](#) for more information.

⚠WARNING	
	Electrical Shock Hazard Contact with live circuits could result in serious injury. • Disconnect and lockout/tagout all electrical power before wiring the power supply. • Ground the power supply by securing an AWG 8 grounded conductor to the ground screw on the back of the actuator. • Verify all wiring is correct before applying power.
NOTICE	
	The power supply can be permanently damaged if connected to the wrong line voltage or if wiring is incorrect. • Verify the correct line voltage before making connections. • Follow the installation instructions when wiring the system. • Double-check all connections before applying power.

4.6.2 Input Power Plug

⚠ WARNING	
	Electrical Shock Hazard Incorrect line voltage or wiring could result in serious injury or death and may permanently damage the system.
	• Verify the correct line voltage before making connections. • Follow the installation instructions when wiring the system. • Ground the power supply by securing an AWG 8 grounded conductor to the ground screw on the actuator. • Verify all connections before applying power. • Use an appropriate disconnect device when permanently connecting the equipment, in accordance with local electrical codes.
i NOTICE	
	End user is responsible for installation of a plug onto the provided line cords. The provided plug must conform to the relevant specifications and safety requirements for the specific region the unit will be installed. See section 3.2 Electrical Specifications for more information.

If you add an input power plug, use the following color code for the conductors found in the international harmonized line cord. Add the plug that is appropriate for your input receptacle.

Figure 4.11 International Harmonized Line Cord Color Code

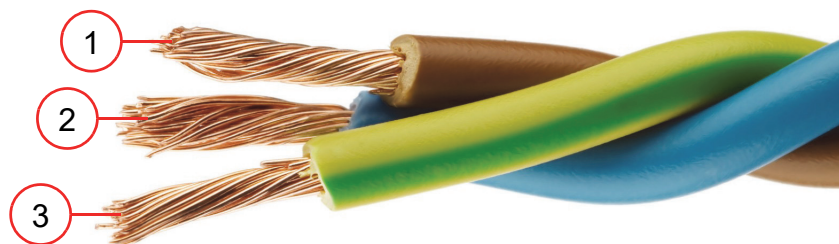


Table 4.17 Line Cord Color Code

Item	Description
1	Brown - Line
2	Blue - Neutral
3	Green/Yellow - Protective Earth (PE)

4.7 User I/O

The user I/O is an interface for automation. It provides the ability to make your own interface for your automation, actuator interface, special control, or reporting needs.



NOTICE

Failure to isolate unused wires or incorrect wiring may damage the system controller board.

- Individually isolate all unused wires.
- Verify all wiring connections are correct before applying power.



NOTICE

Incorrect wiring of Ground or +24 VDC pins may damage the system controller board.

- Verify that all Ground and +24 VDC pins are wired correctly.
- Verify all connections before applying power.

4.7.1 Power Supply I/O Connection

The interface cable has a 26-pin HD male D-Sub connector on one end, and wires on the other end. Pins are wired to ICEA standard color code.

See [Table 4.19](#) for the default user I/O pin assignments.

Figure 4.12 Power Supply User I/O Cable Identification and Wire Color Diagram

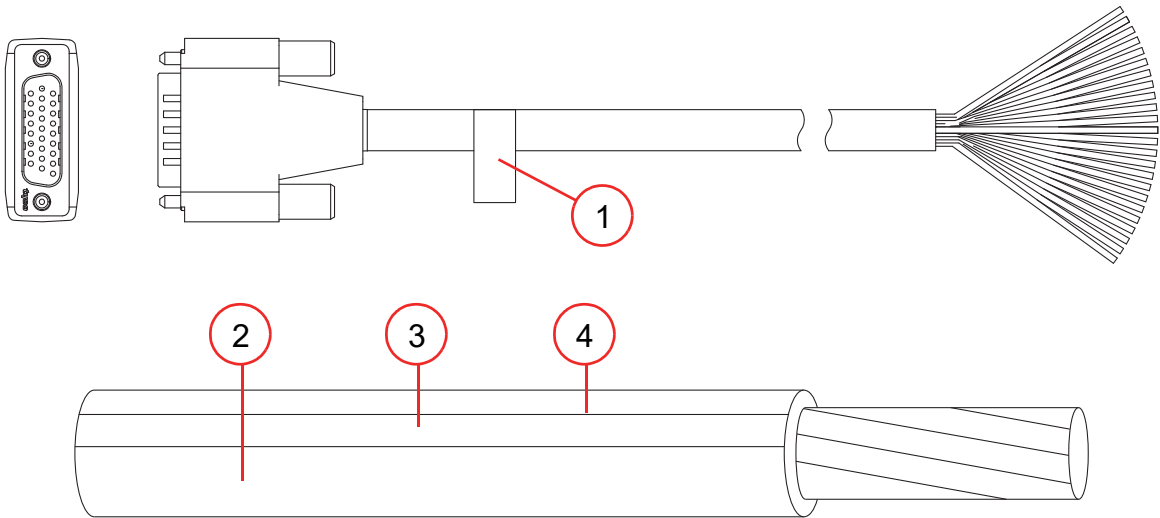


Table 4.18 User I/O Cable

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

4.7.2 Power Supply User I/O Cable Pin Assignments

Table 4.19 Default Power Supply I/O Configurations

Pin	Input/Output	Default Function	Signal Range	Cable Color (IEC)
1	Digital Input	Cycle Abort	0 VDC or 24 VDC $\pm$ 10% 12 mA	Black
2		U/S Disable		White
3		Alarm Reset		Red
4		Recipe Bit 1		Green
5	+24 VDC SRC	Supplied from the Polaris system	24 VDC $\pm$ 10% 250 mA Max	Orange
6	+24 VDC SRC			Blue
7	Digital Output	System Ready	0 VDC or 24 VDC $\pm$ 10% 25 mA Max	White/Black
8		Weld Time Active		Red/Black
9		Alarm General		Green/Black
10		Cycle Running		Orange/Black
11	Digital Input	Hold Delay	0 VDC or 24 VDC $\pm$ 10% 12 mA	Blue/Black
12		Horn Seek		Black/White
13		Cable Detect		Red/White
14	Ground	+24 VDC Common	0 VDC	Green/White
15				Blue/White
16	Digital Input	Recipe Bit 2	0 VDC or 24 VDC $\pm$ 10% 12 mA	Black/Red
17	Analog Input	Amplitude	0 VDC to 10 VDC 2 mA	White/Red
18		Frequency Offset		Orange/Red
19	Digital Output	Hold Time Active	0 VDC or 24 VDC $\pm$ 10% 12 mA Max	Blue/Red
20		Cycle OK		Red/Green
21		PB Release		Orange/Green
22		Alarm Reject part		Black/White/Red
23	Digital Input	Memory Clear	0 VDC or 24 VDC $\pm$ 10% 12 mA	White/Black/Red
24	Analog Output	Power	0 VDC to 10 VDC $\pm$ 5% 1 mA Max	Red/Black/White
25		Amplitude		Green/Black/White
26	Analog Ground	+24 VDC Common	0 VDC	Orange/Black/White

4.8 Ground Detect Cable

The power supply keeps on providing ultrasonic energy until the ultrasonic horn makes contact with the electrically insulated workpiece fixture, provided that there is an electrical connection between the actuator and the workpiece fixture.

Table 4.20 Ground Detect Cable

Step	Action
1	Connect the Ground Detect cable to the Ground Detect connector on the actuator.
2	Individually insulate the unused red and black wires.
3	Connect the white wire to the electrically insulated workpiece fixture using a customer-supplied electrical connection method appropriate for the application, such as a cable lug or other suitable terminal.



NOTICE

Failure to isolate unused wires or incorrect wiring may damage the system controller board.

- Individually isolate all unused wires.
- Verify all wiring connections are correct before applying power.

Figure 4.13 Ground Detect Cable

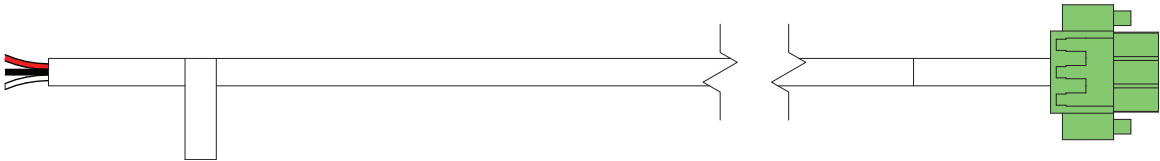


Table 4.21 Ground Detect Cable

Pin	Signal	Cable Color
1	+24 VDC	Red
2	Ground	Black
3	Ground Detect	White

4.9 Safety Devices

4.9.1 Emergency Stop Device

If you use the emergency stop button on the system to terminate a weld, twist the button to reset it. (The welder will not operate until this button is reset). If you are running automation, the system can also be reset through an external control system.

⚠ WARNING	
	Impact Hazard
	If the emergency stop button is pressed during motion, the ultrasonic horn will retract to the home position, which could result in injury. Keep clear of the ultrasonic horn and tooling during operation.

Figure 4.14 Emergency Stop Button



Table 4.22 Emergency Stop Button

Item	Description
1	Emergency stop button

⚠ WARNING	
	Crushing Hazard
	Failure to test the Emergency Stop function may result in an inoperative system, which could lead to serious injury. Test the Emergency Stop function every 8,760 hours (1 year).

4.9.2 Two-Hand Start Device

The Polaris system is equipped with two hand-operated palm buttons designed to ensure safe and intentional activation of the ultrasonic cycle.

To initiate machine operation, the operator must simultaneously press and hold both palm buttons. This dual-action requirement is a safety feature that ensures the operator’s hands are clear of the working area during activation.

Releasing either button during the cycle will immediately stop the operation, helping prevent accidental or unsafe use.

	NOTE
	The machine will not operate if only one button is pressed or if the buttons are not activated within the required time window.

Figure 4.15 Palm Buttons



Table 4.23 Palm Buttons

Item	Description
1	Palm buttons

4.9.3 Performance Level

Table 4.24 Performance Level

Safety Requirement	Two-hand	Emergency Stop
Category (ISO 13849-1)	2	2
Type	Type IIIA (ISO 13851)	Category 0 (ISO 13850)
PL	d	d
PFH	$7.008 \times 10^{-7} / \text{h}$	$6.734 \times 10^{-7} / \text{h}$
Response Time	30 ms	30 ms
Demand Frequency	High Demand	High Demand

4.10 Ultrasonic Stack

4.10.1 Safety

⚠ WARNING	
	Crushing Hazard Incorrect assembly or removal of the ultrasonic horn could result in serious injury or equipment damage.
	• Only trained personnel shall perform this procedure. • If necessary, secure the largest portion of a square or rectangular ultrasonic horn in a soft-jawed vise (brass or aluminum). • Do not clamp the converter housing or the booster clamp ring in a vise when assembling or removing a ultrasonic horn.
⚠ WARNING	
	Crushing Hazard Improper handling of tooling during installation could result in serious injury or equipment damage.
	• Perform a risk assessment of the tooling based on its design before installation. • Secure the largest portion of the tooling to prevent dropping. • Use appropriate lifting methods or assistance for heavy tooling. • Avoid contact with sharp edges when installing the ultrasonic stack in the actuator.
i NOTICE	
	Incorrect use of washers or lubricants may damage the system.
	• Do not use silicone grease with Mylar washers. • Use only one Mylar washer at each interface. • Verify the washer has the correct inner and outer diameters.

4.10.2 Torque Wrench Kit

Welding systems function with greatest efficiency when the ultrasonic stack components (converter, booster, and ultrasonic horn) are properly assembled and torqued.

Figure 4.16 Torque Wrench Kit



Benefits

- Ensures proper torque and eliminates failures from improper torquing
- Can be calibrated
- Reduces maintenance required because ultrasonic stacks are assembled correctly

Torque Guidelines

The charts in this section provide guidelines for applying torque with the kit.

4.10.3 Tool Kits and Miscellaneous

4.10.3.1 Torque Wrench Kit #1

For 20 kHz and 30 kHz ultrasonic stacks (EDP 101-063-787):

Table 4.25 Torque Wrench Kit #1

Replacement Parts	EDP
Torque Wrench	200-118-048
3/8" Adapter	200-121-067
3/16" Hex and Bit Driver	200-038-099
1/4" Hex and Bit Driver	200-038-098
Adapter, 20 kHz	101-118-044
Adapter, 30 kHz	100-115-088
1 1/4" Open end Wrench	200-121-071

4.10.3.2 Torque Wrench Kit #2

For 40 kHz ultrasonic stacks (EDP 101-063-618):

Table 4.26 Torque Wrench Kit #2

Replacement Parts	EDP
Torque Wrench	200-118-049
3/8" Adapter	200-121-067
5/32" Hex and Bit Driver	200-038-097
Adapter, 40 kHz	100-115-081

4.10.3.3 Miscellaneous

Table 4.27 Miscellaneous

Tool	EDP
20 kHz Spanner Wrench	201-118-019
30 kHz Spanner Wrench	201-118-033
40 kHz Spanner Wrench	201-118-024
Adjustable Face Spanner	201-118-027
Silicone Grease	101-053-002
Mylar Washer 150 CT for Kit 1/2"	100-063-471
Mylar Washer 150 CT for Kit 3/8"	100-063-712

4.10.4 Assembly Instructions

4.10.4.1 Assembly Instructions For a 20 kHz System

Table 4.28 Assembly Instructions For a 20 kHz System

Step	Action
1	Clean the mating surfaces of the converter, booster, and ultrasonic horn. Remove any foreign material from the threaded holes.
2	Install a single Mylar washer (matching the size of the washer to the stud) to each interface.
3	Assemble the converter to the booster, torque to 220 in · lbs, 24.9 N·m.
4	Assemble the booster to the ultrasonic horn, torque to 220 in · lbs, 24.9 N·m

4.10.4.2 Assembly Instructions For a 30 kHz System

Table 4.29 Assembly Instructions For a 30 kHz System

Step	Action
1	Clean the mating surfaces of the converter, booster, and ultrasonic horn. Remove any foreign material from the threaded holes.
2	Install a single Mylar washer (matching the size of the washer to the stud) to each interface.
3	Assemble the converter to the booster, torque to 185 in · lbs, 20.9 N·m.
4	Assemble the booster to the ultrasonic horn, 185 in · lbs, 20.9 N·m.

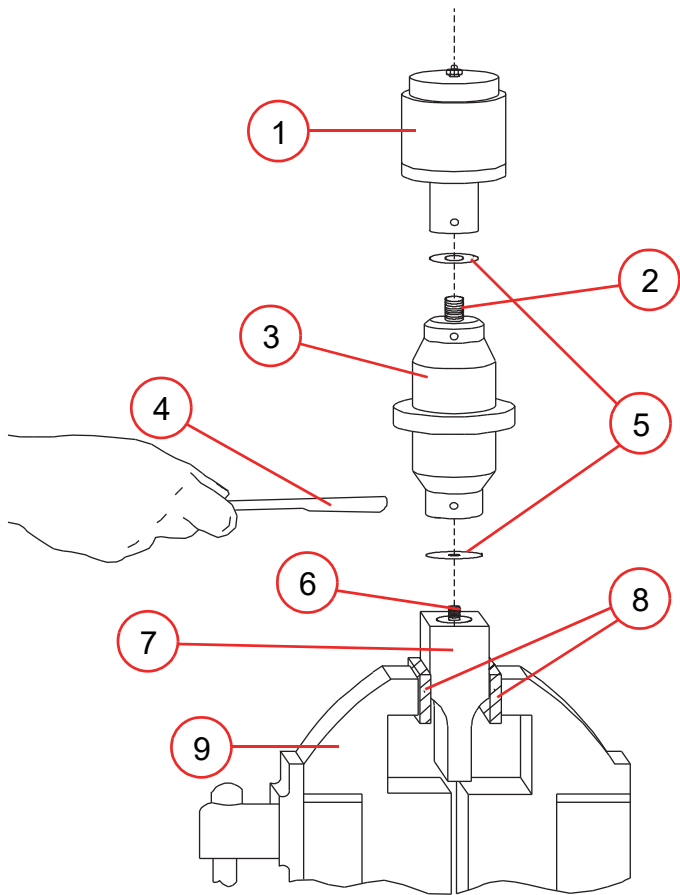
4.10.4.3 Assembly Instructions For a 40 kHz System

Table 4.30 Assembly Instructions For a 40 kHz System

Step	Action
1	Clean the mating surfaces of the converter, booster, and ultrasonic horn. Remove any foreign material from the threaded holes.
2	Coat each interface with a thin film of silicone grease - <i>but do not apply silicone grease to a threaded stud or tip.</i>
3	Assemble the converter to the booster, torque to 95 in · lbs, 10.7 N · m.
4	Slide the booster/ultrasonic horn assembly into the adapter sleeve, see Figure 4.18 . Screw on the adapter sleeve ring nut and leave loose.
5	Assemble the booster to the ultrasonic horn, 95 in · lbs, 10.7 N · m.
6	Securely tighten the adapter sleeve ring nut with the adjustable face spanner wrench shipped with the sleeve assembly.

4.10.5 Assembling the Ultrasonic Stack

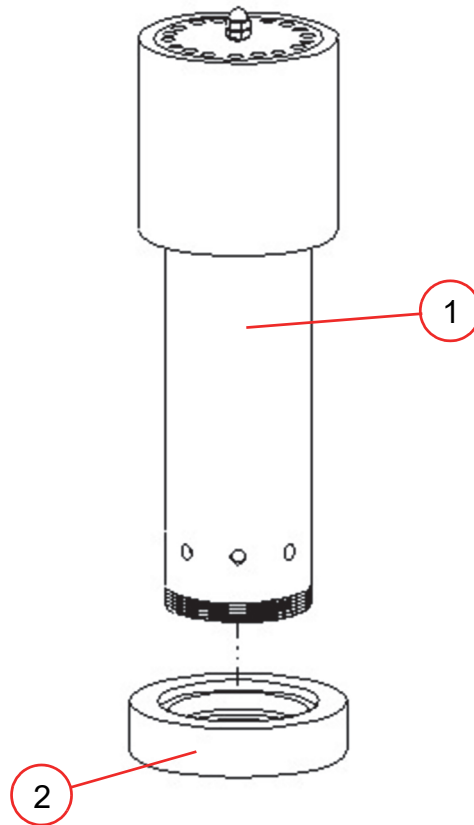
Figure 4.17 Assembling the ultrasonic stack



*Shown with rectangular ultrasonic horn secured in the vise

Table 4.31 Assembling the ultrasonic stack

Item	Description	Item	Description
1	Converter	6	Ultrasonic horn stud
2	Booster stud	7	Ultrasonic horn
3	Booster	8	Vise jaw protectors
4	Spanner	9	Vise

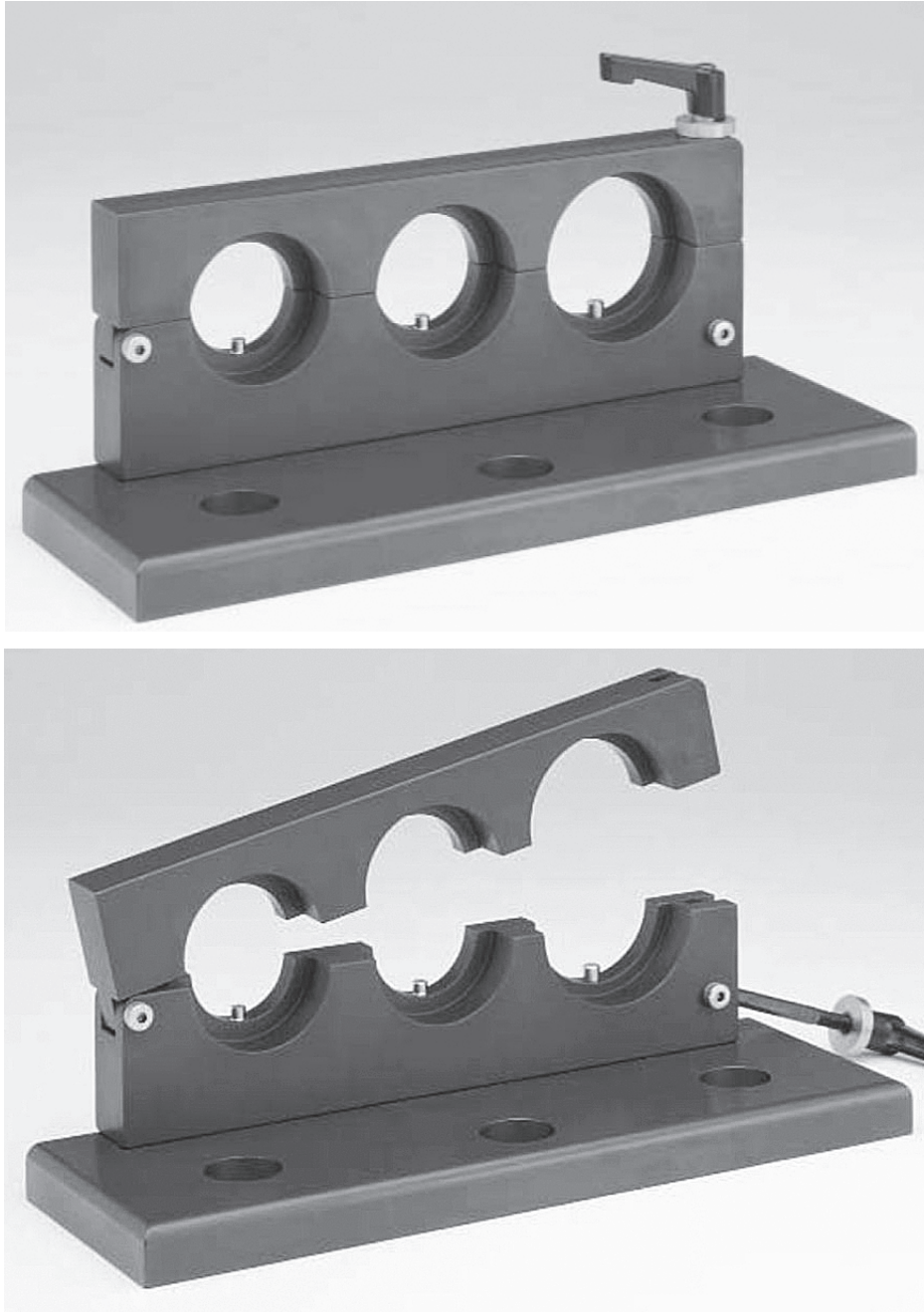
Figure 4.18 Sleeve Assembly**Table 4.32** Sleeve assembly

Item	Description
1	Sleeve assembly
2	Ring nut
N/A	Adjustable face spanner (not shown)

4.10.5.1 Universal 20 kHz Ultrasonic Stack Vise

The 20 kHz Universal Ultrasonic Stack Vise is used for the separation, assembly, and torquing of 20 kHz ultrasonic stacks. The Vise features three openings (1 1/2", 1 5/8" and 2") to fit most ultrasonic horns, boosters, and converters. The ultrasonic stack vise is made of aluminum to prevent marking on both the aluminum and titanium ultrasonic horns, boosters, and converters. It has bolt holes for permanent mounting on a bench top, or it can be simply clamped to a table top. This ultrasonic stack vise is to be used in conjunction with torque kits.

Figure 4.19 20 kHz Universal Ultrasonic Stack Vise, EDP 100-063-642



4.10.5.2 Procedure to replace a stud from an ultrasonic horn or booster

Table 4.33 Procedure to replace a stud from an ultrasonic horn or booster

Step	Action
1	Remove the studs from the ultrasonic horn and/or booster.
2	Before reinserting a stud which has been used in an aluminum ultrasonic horn or booster, use a file or wire brush to clean the aluminum bits from the knurled end of the stud. Also clean the threaded hole using a clean cloth or towel. Replace studs used in titanium ultrasonic horns. Studs tightened in titanium ultrasonic horns experience damage to the knurled end preventing satisfactory locking when reused. Studs used in titanium ultrasonic horns should be disposed of and a new one used. Do not apply grease to the new threaded stud.
3	Apply a drop of LOCTITE® 290 (or equivalent) to the studs for the ultrasonic horn and/or booster.
4	Install the threaded stud into the top of the ultrasonic horn and/or booster.
5	Using a torque wrench, tighten the studs at the torque specification shown in section 4.10.6.1 Studs for Ultrasonic Horns and Boosters . Failure to follow these torque specifications may result in the ultrasonic horn/booster stud loosening, stud breakage, and unexplained overloads.

4.10.6 Ultrasonic Stack Assembly Torque

NOTICE	
	Use a Branson torque wrench or an equivalent calibrated torque wrench to tighten ultrasonic stack components to the specified torque value. Improper torque can reduce weld performance and damage stack components. EDP 101-063-787 for 20 and 30 kHz systems, and EDP 101-063-618 for 40 kHz systems.

4.10.6.1 Studs for Ultrasonic Horns and Boosters

Table 4.34 Studs for Ultrasonic Horns

Stud Size	EDP#	Frequency	Ultrasonic Horn Material	Torque
1/2"-20 x 1-1/4"	100-098-370	20 kHz	Ti, Steel	51 N·m, 450 in·lbs
1/2"-20 x 1-1/2"	100-098-123		Al	51 N·m, 450 in·lbs
3/8"-24 x 1"	100-298-170R	30 kHz	Al, Ti, Steel	33 N·m, 290 in·lbs
M8-1.25mm	100-098-790	40 kHz	Al, Ti, Steel	8 N·m, 70 in·lbs

Table 4.35 Studs for boosters

Stud	EDP#	Frequency	Torque
1/2"-20 x 1-1/2"	100-098-123	20 kHz	51 N·m, 450 in·lbs
3/8"-24 x 1	100-298-170R	30 kHz	33 N·m, 290 in·lbs
M8-1.25 mm*	100-098-790	40 kHz	8 N·m, 70 in·lbs

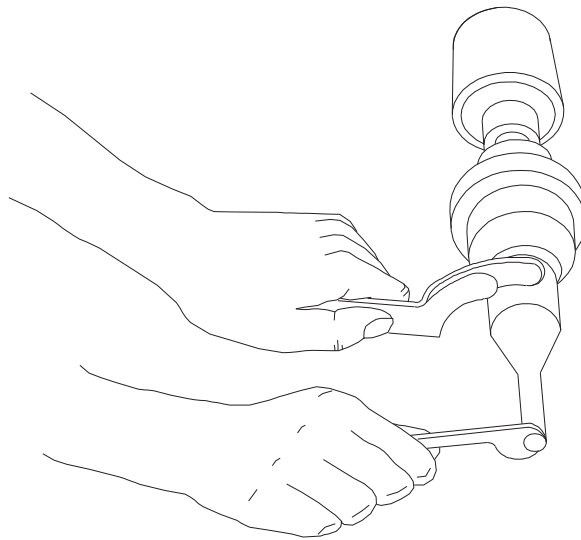
*Add a drop of LOCTITE 290 to the stud, torque, and let cure for 30 minutes before use.

4.10.6.2 Connecting Tip to Ultrasonic Horn

Table 4.36 Mounting the stand

Step	Action
1	Clean the mating surfaces of the ultrasonic horn and tip. Remove foreign matter from the threaded stud and hole.
2	Hand assemble the tip to the ultrasonic horn. Assemble dry. Do not use any silicone grease
3	Use the spanner wrench and an open-end wrench (refer to Figure 4.20 below) and tighten to the specifications in Table 4.37 Tip to Ultrasonic Horn Torque Specification

Figure 4.20 Connecting tip to ultrasonic horn



4.10.6.3 Tip to Ultrasonic Horn Torque Specifications

Table 4.37 Tip to Ultrasonic Horn Torque Specification

Tip Thread	Torque
1/4"-28	12 N?m, 110 in · lbs
3/8"-24	20 N?m, 180 in · lbs

4.10.6.4 Stud Washers

Table 4.38 Stud Washers - 20 kHz

Description	EDP	Torque
3/8"-24 to 3/8"-24	109-116-1224	33 N?m, 290 in · lbs
3/8"-24 to 1/2"-20	109-116-1334	51 N?m, 450 in · lbs
1/2"-20 to 3/8"-24	109-116-1225	33 N?m, 290 in · lbs
1/2"-20 to 1/2"-20	109-116-1124	51 N?m, 450 in · lbs

Table 4.39 Stud Washers - 40 kHz

Description	EDP	Torque
M8 to M8	109-116-1215	8 N?m, 70 in · lbs
M8 x 1.25 to 3/8"-24	109-116-1425	33 N?m, 290 in · lbs

Table 4.40 Step Studs for Ultrasonic Horns*

Stud Booster Side/ Ultrasonic Horn Side	EDP	For	Torque
3/8"-24 to 1/2"-20"	100-098-395	Titanium ultrasonic horns with 1/2"-20 threads	51 N?m, 450 in?lbs
3/8"-24 to 1/2"-20"	100-098-394	Aluminum ultrasonic horns with 1/2"-20 threads	51 N?m, 450 in?lbs
1/2"-20 to 3/8"-24	100-098-249	Titanium ultrasonic horns with 3/8"-24 threads	33 N?m, 290 in?lbs
1/2"-20 to 3/8"-24	100-098-363	Aluminum ultrasonic horns with 3/8"-24 threads	33 N?m, 290 in?lbs

*Step studs should only be used in prototype applications, NOT production.

4.10.6.5 Follow Up Notes

- Mylar washers are not available for 40 kHz systems.
- Always use Mylar washer between the booster and the ultrasonic horn surface. Do not use Mylar between stud washer and ultrasonic horn. Do not use a Mylar washer between stud washer and booster.
- These torque specifications do not apply to 15 kHz composite ultrasonic horns.

4.11 Installing the Ultrasonic Stack in the Actuator

Table 4.41 Installing the ultrasonic stack in the actuator

Step	Action
1	Make sure that the system power is turned off by disconnecting the power plug.
2	Engage the Emergency Stop.
3	Open the carriage latch with a 5 mm hex wrench.
4	While supporting the converter cover with one hand, loosen the two converter cover screws (labeled as <i>Cover Only</i>) with a 5 mm hex wrench.
5	Pull the carriage door straight off and set it aside.
6	Take the assembled ultrasonic stack and align the ring on the booster just above the support washer in the carriage. Firmly push the ultrasonic stack into place, with the acorn nut on the top of the converter making contact with the contactor in the top of the carriage.
7	Reinstall the carriage door and close the carriage latch.
8	Align the ultrasonic stack by rotating it, if necessary.

Figure 4.21 Installing the ultrasonic stack in the actuator

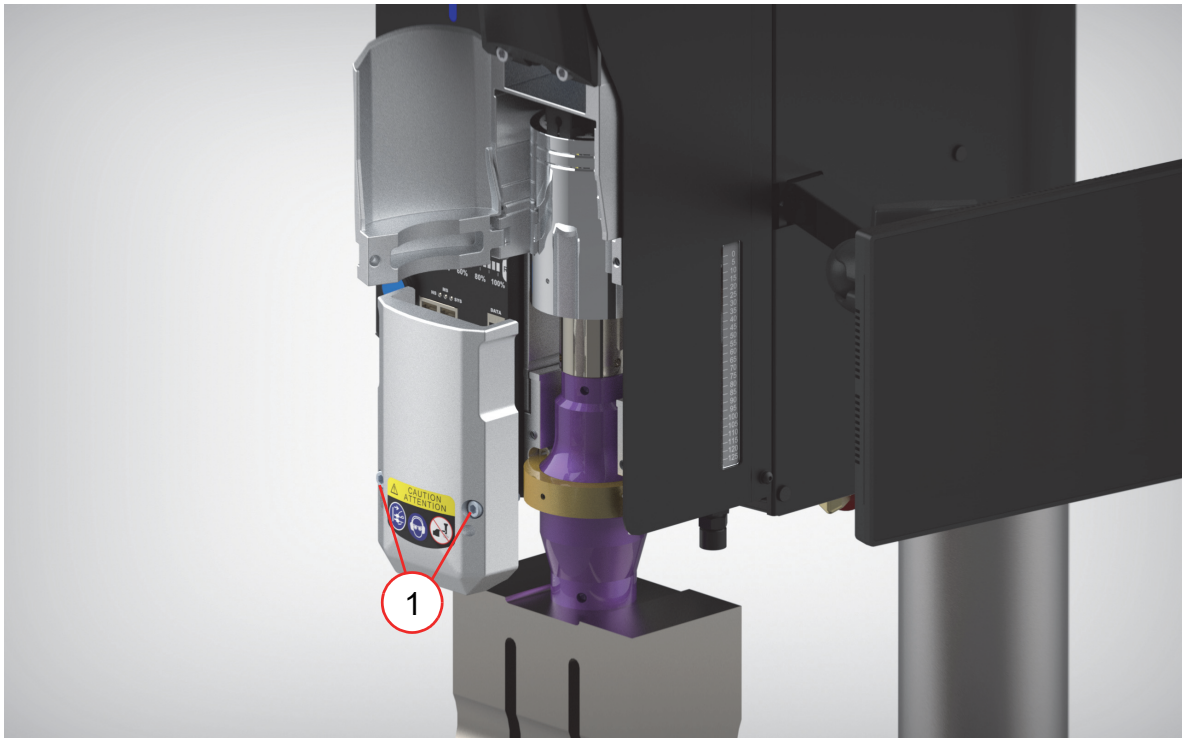


Table 4.42 Screws

Item	Description
1	Converter cover screws (Cover Only)

4.11.1 Quick Ultrasonic Stack Change

The ultrasonic stack and converter support can be removed together from the actuator to retain the ultrasonic stack alignment to your welding workpiece fixture. This enables quick tooling changeovers.

Table 4.43 Quick ultrasonic stack change

Step	Action
1	Make sure that the system power is turned off by disconnecting the power plug.
2	Engage the Emergency Stop.
3	Open the carriage latch with a 5 mm hex wrench.
4	Loosen the two converter support screws (labeled as <i>Full Assy</i>) with a 5 mm hex wrench.
5	Pull the ultrasonic stack and converter support straight off and store it for future uses.

Figure 4.22 Quick ultrasonic stack change

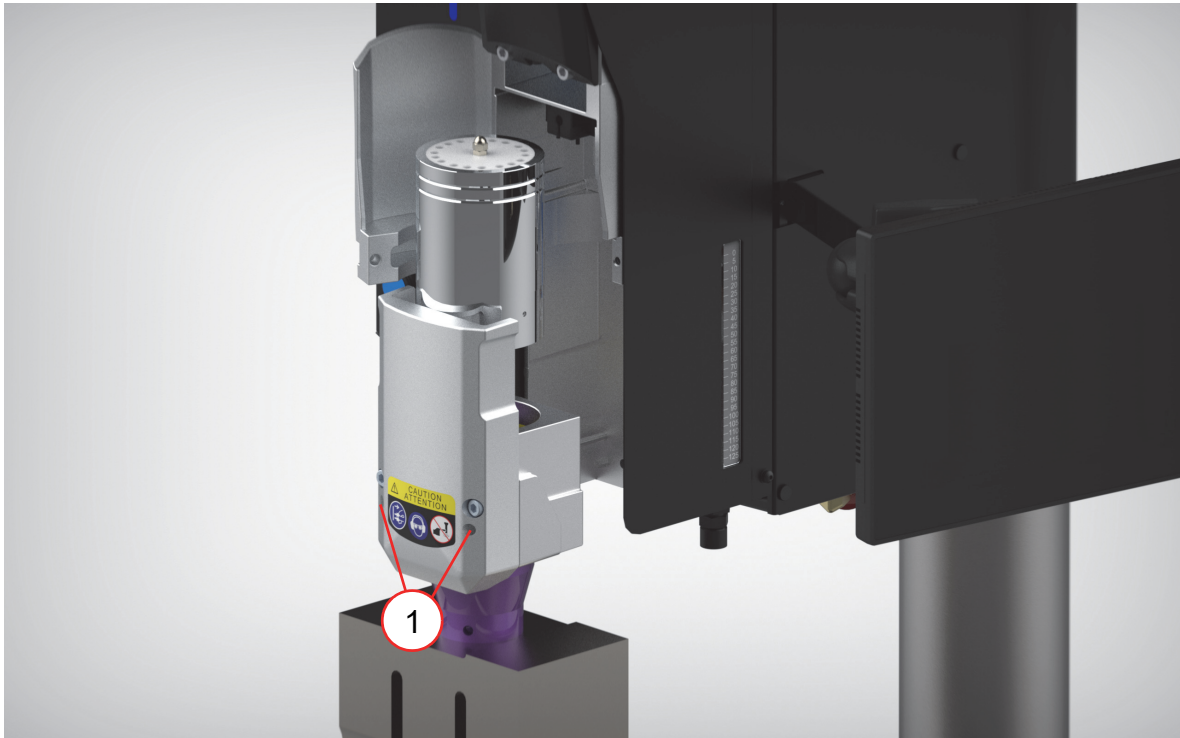


Table 4.44 Screws

Item	Description
1	Converter support screws (Full Assy)

4.12 Mounting the Workpiece Fixture

	⚠ WARNING
	Crushing Hazard Improper handling of tooling during installation could result in serious injury or equipment damage. • Perform a risk assessment of the tooling based on its design before installation. • Secure the largest portion of the tooling to prevent dropping. • Use appropriate lifting methods or assistance for heavy tooling. • Avoid contact with sharp edges when installing the ultrasonic stack in the actuator.

	NOTICE
	Overtightening mounting hardware may strip the base mounting holes. • Tighten hardware only enough to prevent movement of the workpiece fixture. • Do not overtighten bolts.

4.12.1 On the Base

The base provides mounting holes for your workpiece fixture. The base is tapped for metric M10-1.5 hardware. The mounting holes are arranged in three concentric bolt circles with the following dimensions.

	NOTE
	Mounting hardware is not included and must be supplied by the customer.

4.12.1.1 Round Column

Figure 4.23 Mounting Holes on Base - Round Column

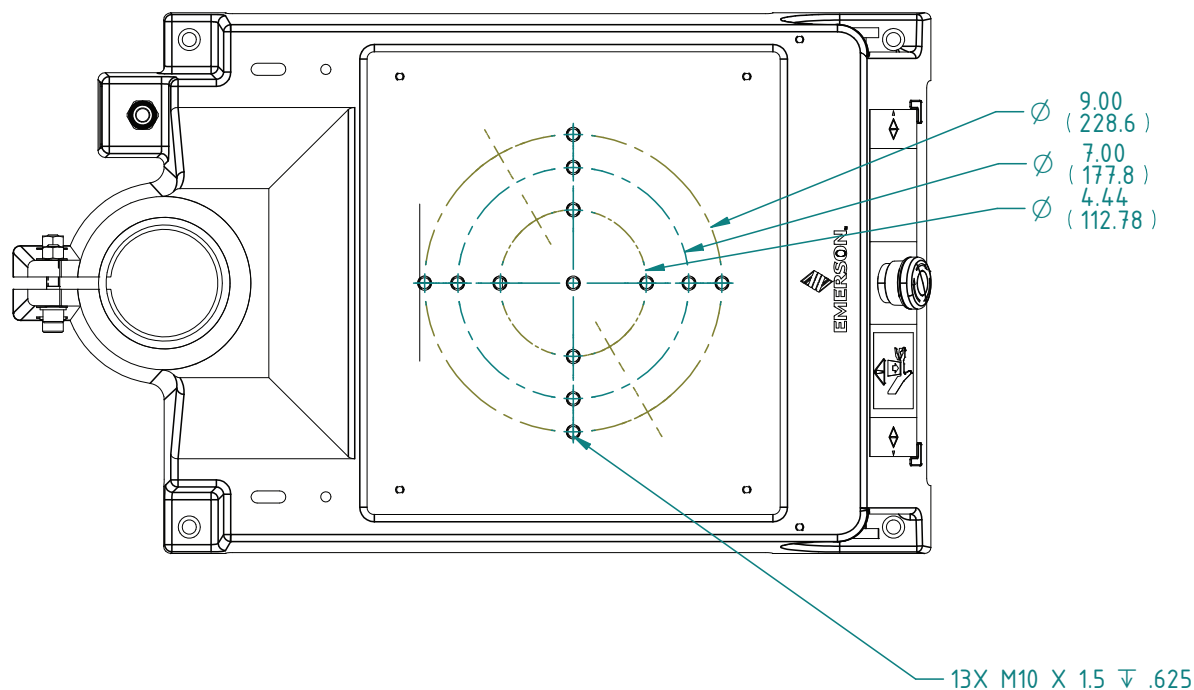
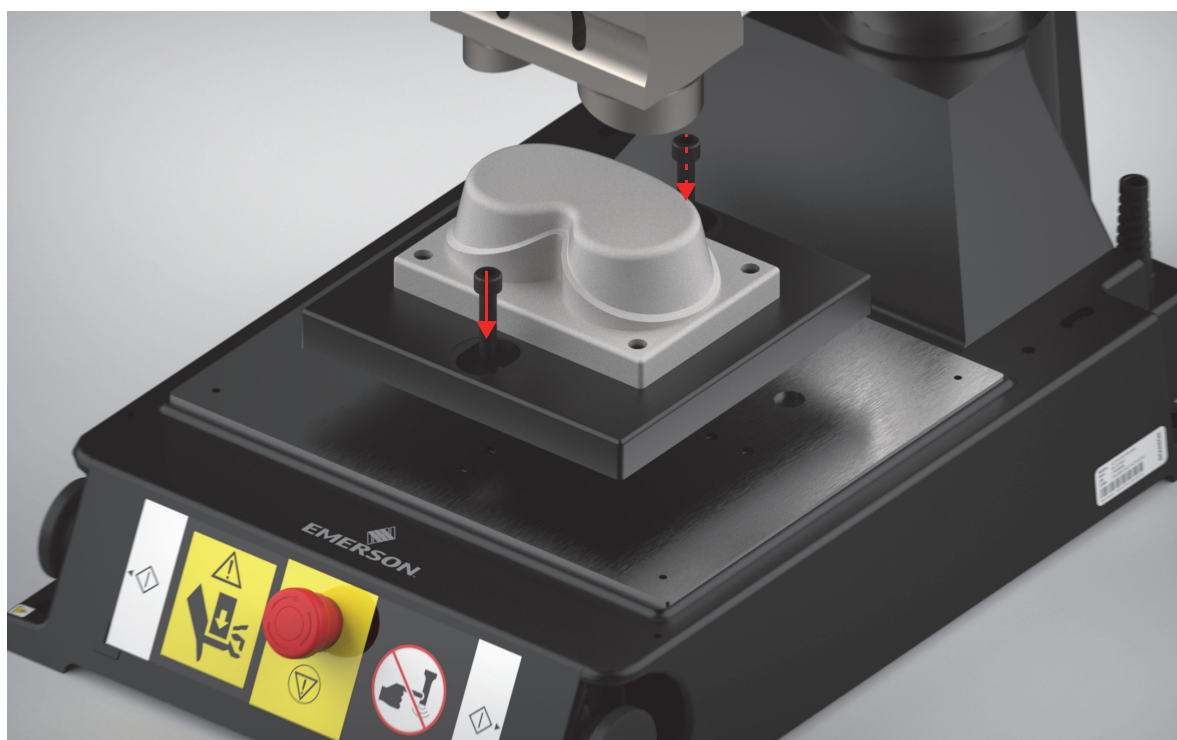


Figure 4.24 Mounting the Workpiece Fixture on the Base - Round Column



4.12.1.2 Square Column

Figure 4.25 Mounting Holes on Base - Square Column

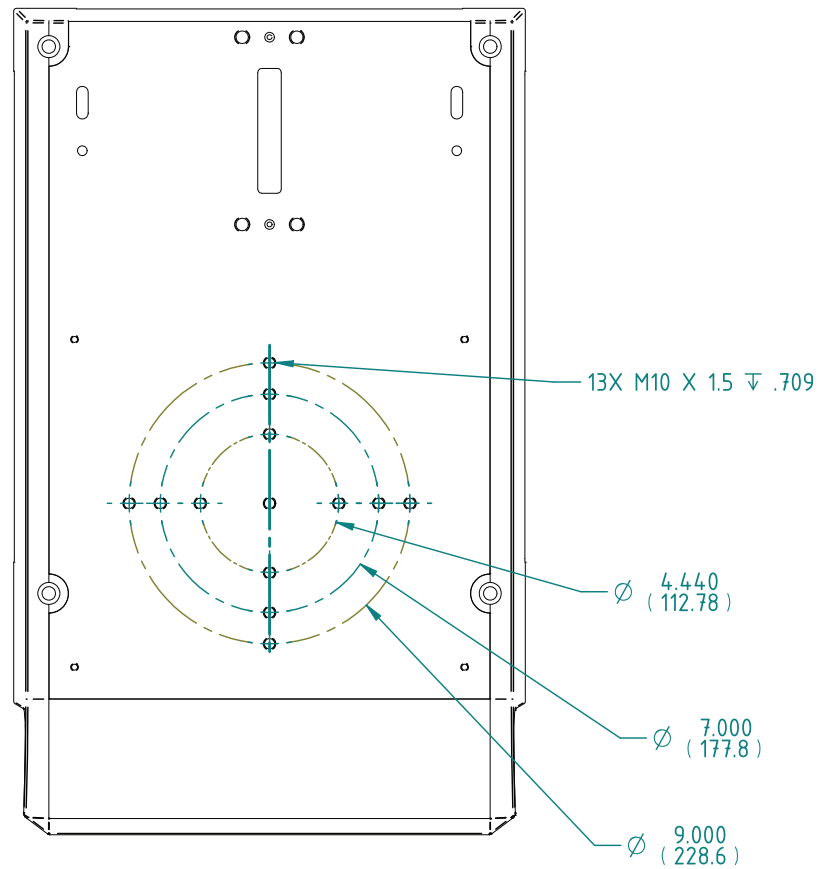
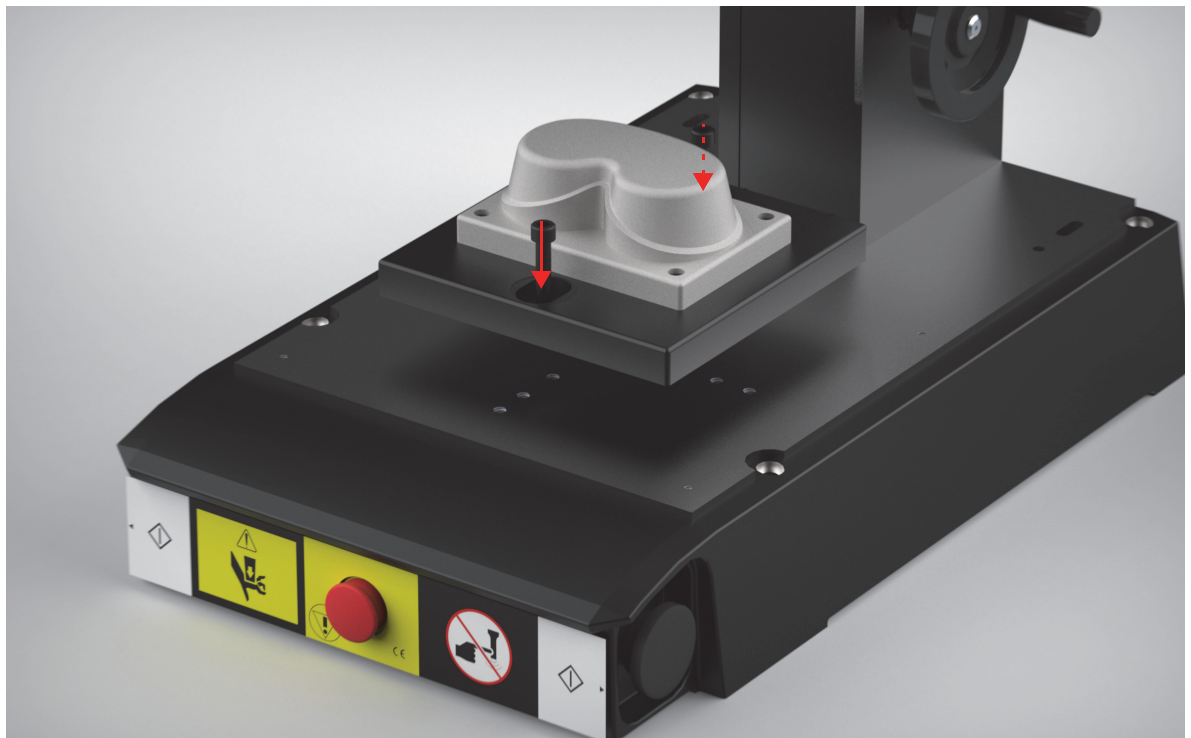


Figure 4.26 Mounting the Workpiece Fixture on the Base - Square Column

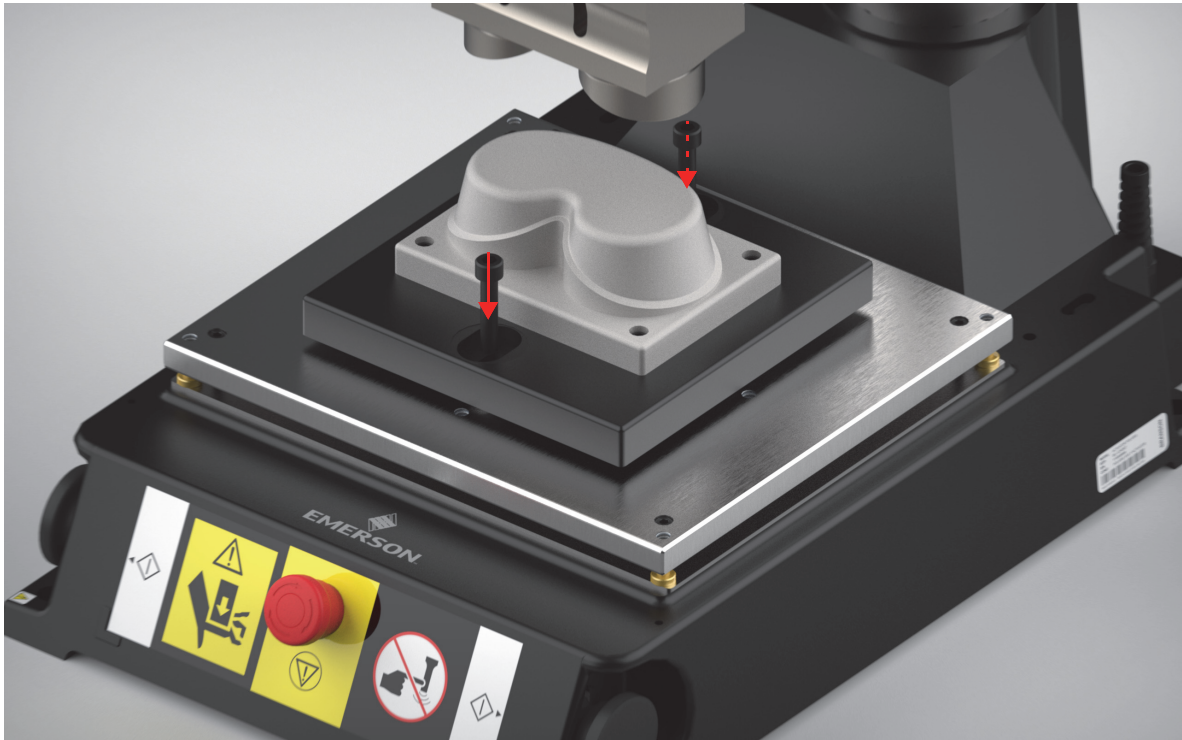


4.12.2 On the Leveling Plate

The leveling plate provides mounting holes for your workpiece fixture. Depending on the leveling plate kit provided, the mounting holes are tapped for either M10-1.5 hardware (metric) or 3/8-16 hardware (imperial). The mounting holes are arranged in three concentric bolt circles with the following dimensions.

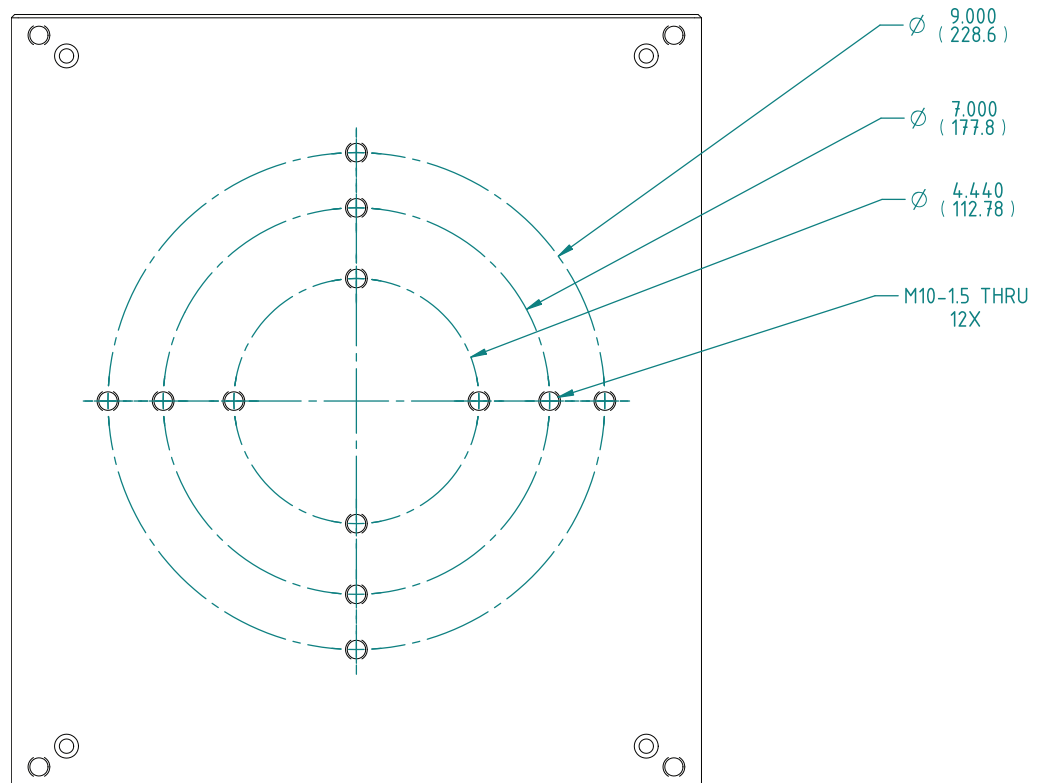
	NOTE
	Mounting hardware is not included and must be supplied by the customer.
	NOTE
	Metric Leveling Plate Kit (EDP 1015704); Imperial Leveling Plate Kit (EDP 101-063-358).

Figure 4.27 Mounting the Fixture on the Leveling Plate



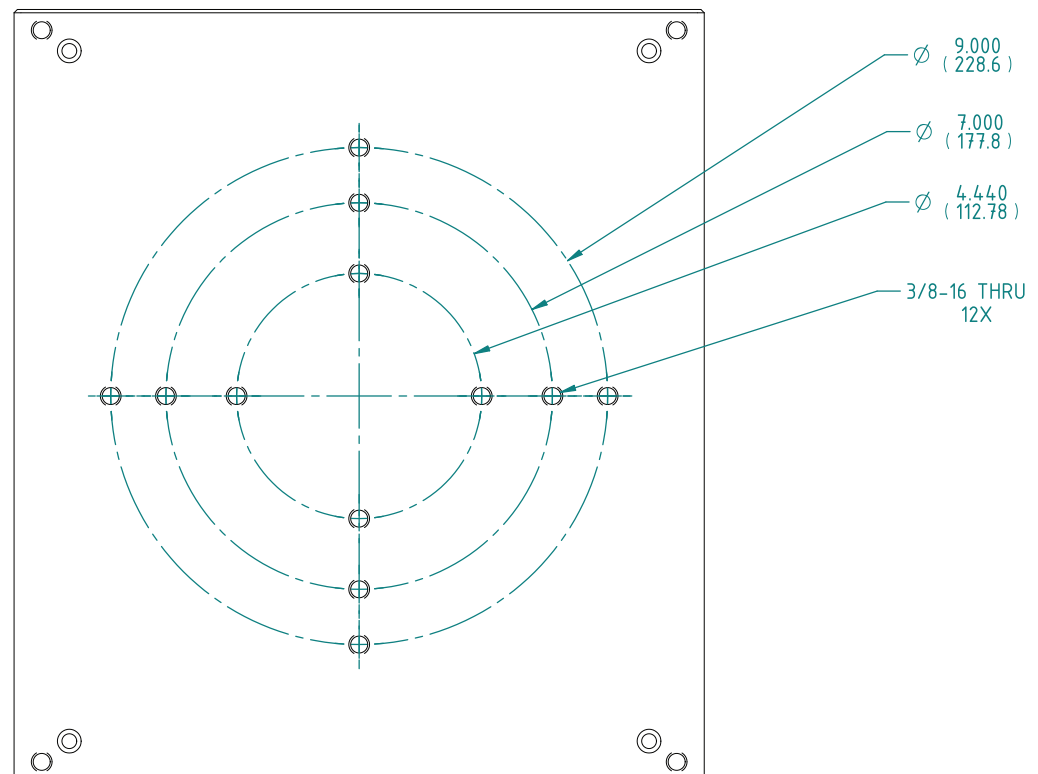
4.12.2.1 Metric Leveling Plate

Figure 4.28 Metric Leveling Plate



4.12.2.2 Imperial Leveling Plate

Figure 4.29 Imperial Leveling Plate



4.13 **Leveling Plate**

Branson’s leveling plate ensures that the alignment of the ultrasonic horn, part, and workpiece fixture is optimized for welding. The plate installs over a spherical-head pivot screw in the center of the base, allowing the leveling plate to *float* for setup. Four leveling screws enable precise positioning after alignment is achieved. Locking screws secure the assembly to the base. The mounting hole pattern on the leveling plate matches the pattern on the base.

Figure 4.30 Leveling Plate

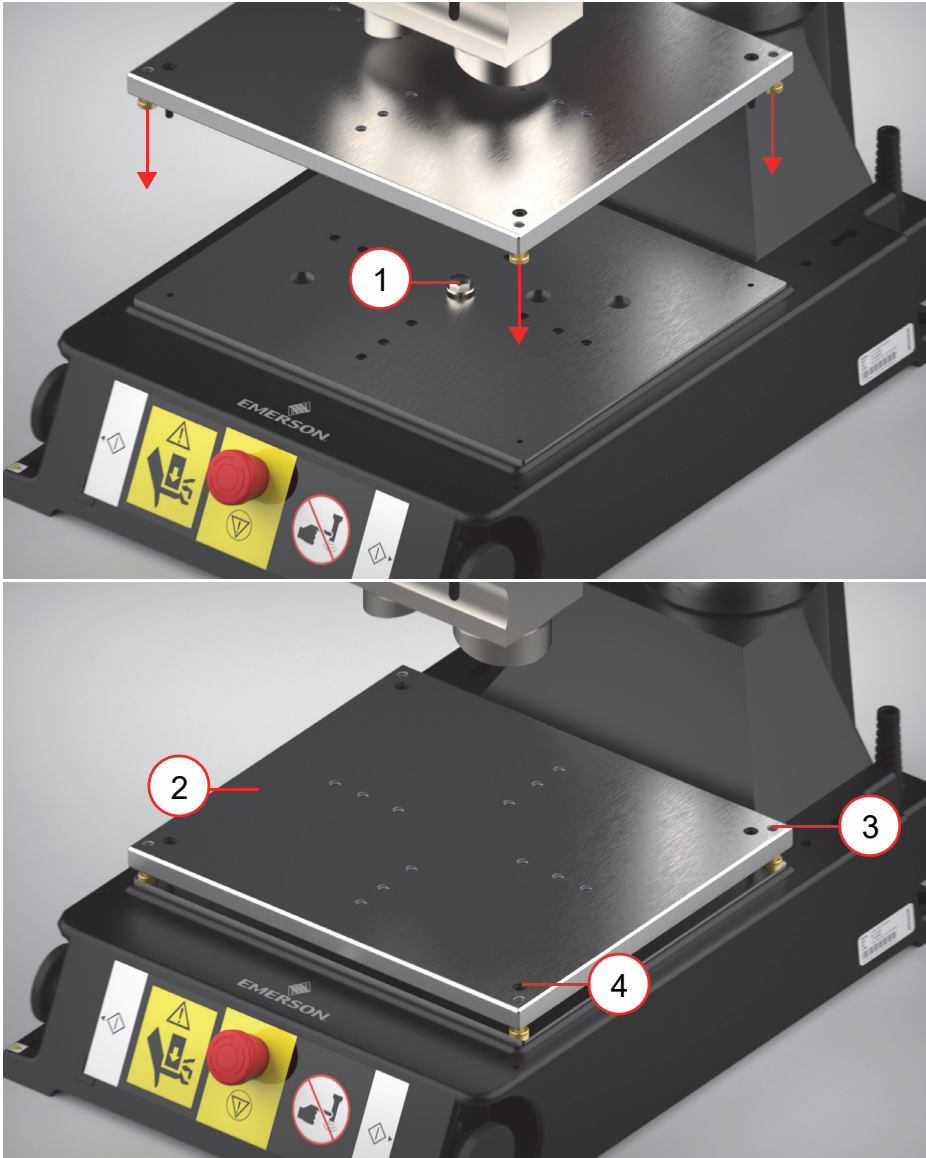


Table 4.45 Leveling Plate

Item	Description
1	Spherical-head Pivot Screw
2	Leveling Plate
3	Leveling screws (4)
4	Locking screws (4)

4.14 Alignment and Leveling

Alignment and leveling of the ultrasonic horn, part, and workpiece fixture are critical for successful ultrasonic welding. If an application is not properly aligned and leveled, over-welding may occur on one side of the part while under-welding may occur on the other. The following procedure is recommended to align and level the ultrasonic horn, part, and workpiece fixture for uniform welding.

4.14.1 Alignment

Table 4.46 Alignment

Step	Action
1	Round Column Adjust the actuator height by loosening the two actuator clamps on the column. Loosen the lower clamp slightly, then loosen the upper clamp, keeping both clamps engaged enough to support the actuator weight. Be sure to allow enough clearance to remove the part from the workpiece fixture, but without exceeding the stroke length of the actuator. ⚠ WARNING Crushing Hazard Loosening both actuator clamps at the same time can allow the actuator to slide down the column, which could result in serious injury or equipment damage. Loosen only one clamp at a time and support the actuator during adjustment. 
2	Tighten the actuator clamps, locking the actuator in place.

Table 4.46 Alignment

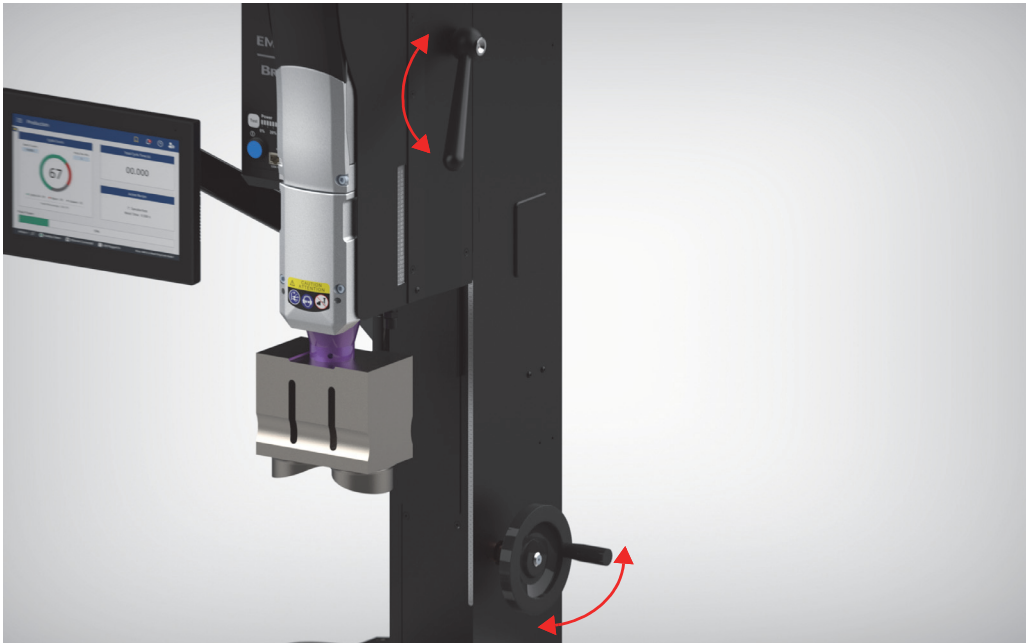
Step	Action
3	Square Column Pull the column locking handle upward to release the actuator carriage. Rotate the adjustment crank clockwise or counterclockwise to move the actuator up or down to the desired height. 
4	Slightly loosen the actuator door screws to allow the ultrasonic horn to rotate freely. Loosen the workpiece fixture screws to allow the workpiece fixture to move freely. When the actuator is positioned correctly, push the locking handle downward to lock the actuator carriage in place.
5	Insert a welded part into the workpiece fixture (it is recommended to use a <i>golden sample</i> for this part, as this can expedite setup). 
6	Remove air pressure from the actuator by setting the pressure equal to zero.

Table 4.46 Alignment

Step	Action
7	Manually lower the ultrasonic horn onto the part by pulling down on the ultrasonic horn itself. Adjust the ultrasonic horn and workpiece fixture as necessary. 
8	Tighten the actuator door screws, locking the ultrasonic horn in position.
9	Lower the ultrasonic horn back down onto the part and perform any final adjustments to the workpiece fixture position. Tighten the workpiece fixture screws.
10	Finally, adjust the mechanical stop mechanism until the ultrasonic horn is not able to contact the workpiece fixture. Be sure to allow the ultrasonic horn to travel far enough to complete the weld. Tighten the locking nut on the mechanical stop mechanism to lock it in place. See section 5.2.7 Mechanical Stop for more information.

4.14.2 Leveling

	⚠ WARNING
	Crushing Hazard The ultrasonic horn can descend unexpectedly during manual override operation. Failure to keep clear can result in serious injury to hands or fingers. • Before using manual override, make sure all hands are clear of the ultrasonic horn and base surface.

The following procedure is recommended for leveling with the use of a Branson Leveling Plate. Without a leveling plate, it may be necessary to use shims to properly align the ultrasonic horn and workpiece fixture.

Table 4.47 Alignment

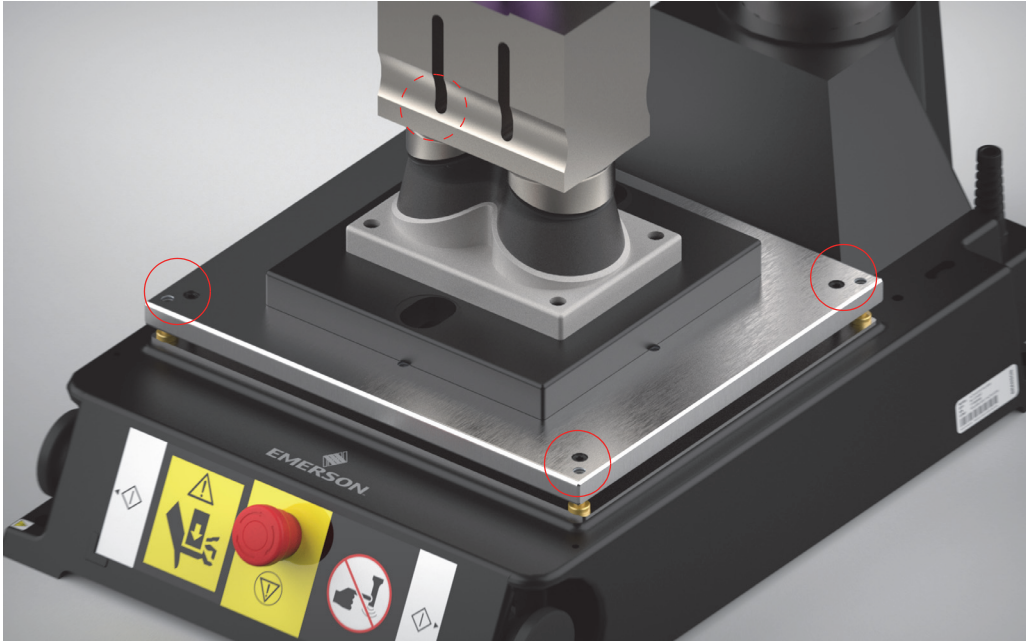
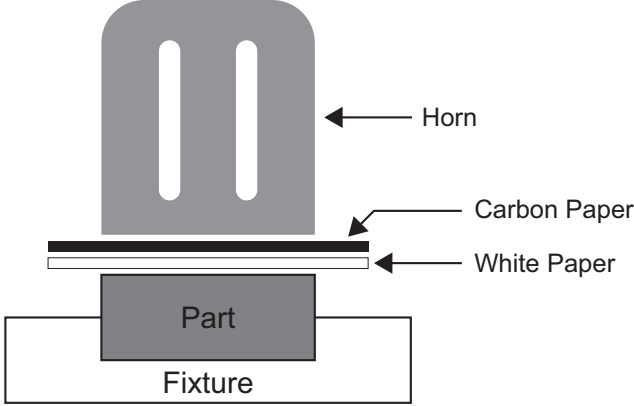
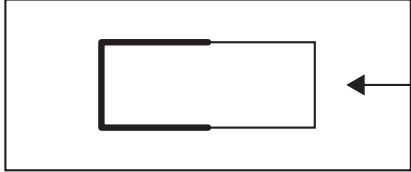
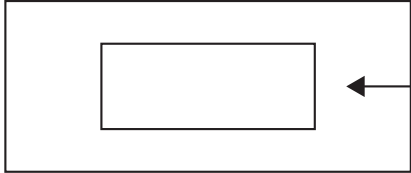
Step	Action
1	Bring the ultrasonic horn back to its home position by restoring air pressure to the actuator.
2	Using the <i>Actuator Setup > Horn Clamp</i> function press the palm buttons to bring the ultrasonic horn in contact with the part. See section 5.13 Actuator Setup for more information.
3	With the ultrasonic horn down, loosen the four locking screws as well as the four leveling screws on the leveling plate. This allows the leveling plate to <i>self-level</i> under the load from the ultrasonic horn. 
4	Slowly tighten the four leveling screws just until they contact the baseplate. Tighten the four locking screws on the leveling plate. Press the <i>Retract</i> button to return the ultrasonic horn to its home position.

Table 4.47 Alignment

Step	Action
5	Insert a piece of white paper and a piece of carbon paper between the ultrasonic horn and part. Use the <i>Actuator Setup</i> function again to create a carbon impression on the white paper.  5  Uneven impression indicates need for further adjustment  Consistent impression indicates precise alignment and leveling NOTICE If a visible impression is not produced using the <i>Actuator Setup</i> function, it may be necessary to run a short, 0.050 – 0.100 second weld on the paper.
6	Adjust the leveling plate until a uniform carbon impression is attained.

4.15 USB Accessories

USB (Universal Serial Bus) is a plug-and-play interface that allows the Polaris system to communicate with keyboards and mice.

The Polaris system is equipped with two USB ports located on the HMI.

Figure 4.31 USB Ports

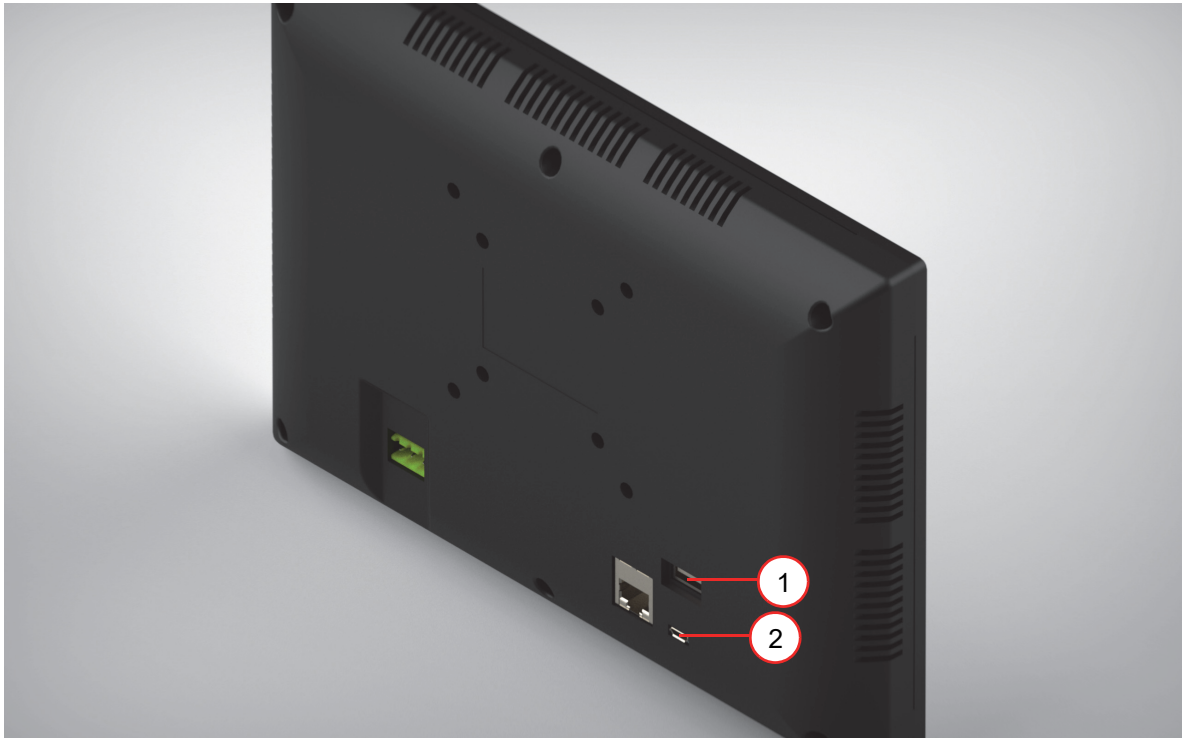


Table 4.48 USB Ports

Item	Description
1	USB-A 2.0 Port
2	USB-C Port

	NOTE
	The USB-A 2.0 port is intended only for connecting a USB keyboard and/or mouse. Other USB devices are not supported. If both a keyboard and mouse are required simultaneously, connect them through a USB-A 2.0 hub.

	NOTE
	The USB-C port is reserved for Branson service and support functions only. Do not connect external devices to this port.

4.16 USB Mass Storage Devices

USB mass storage devices are used with the Polaris system to store and transfer data. Typical applications include report generation, data streaming, and other features that save system data to removable storage.

To use these functions, connect a USB mass storage device to the USB-C port on the front of the power supply.

NOTE	
	USB mass storage devices used with the Polaris system must be formatted using the FAT or FAT32 file system.

Figure 4.32 Power Supply - USB port on the Polaris system

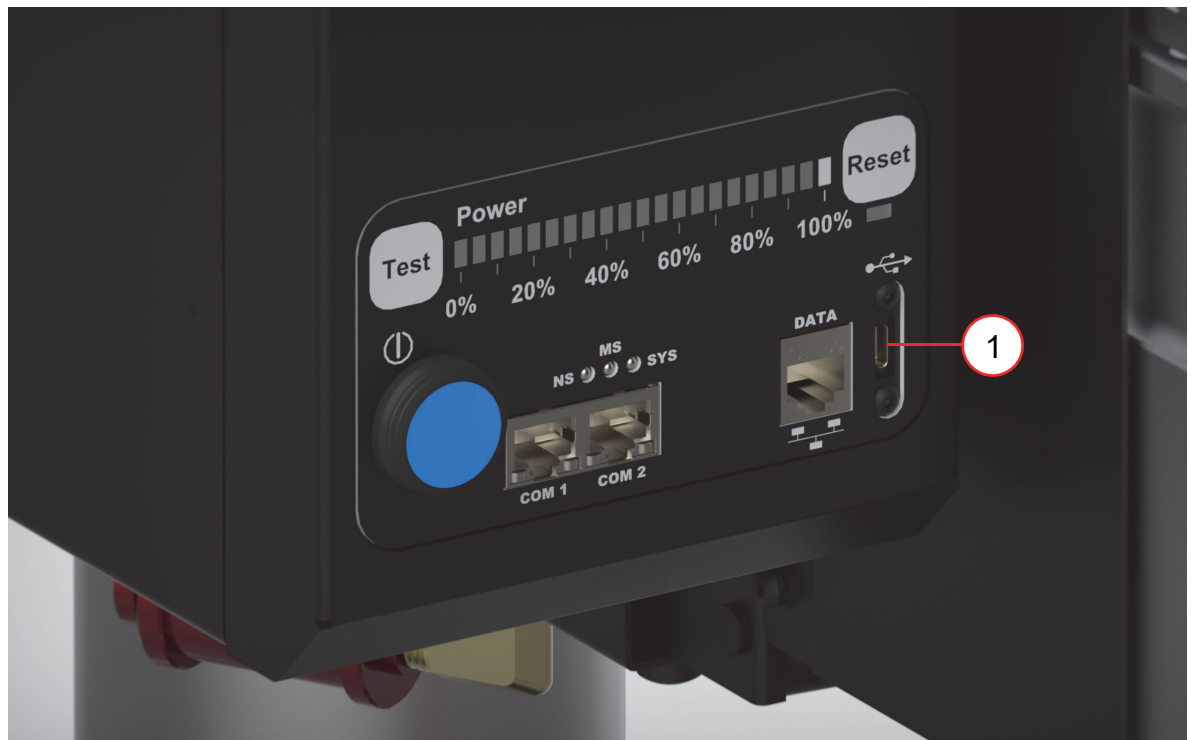


Table 4.49 Power Supply - USB port on the Polaris system

Item	Description
1	USB-C Port

4.17 Barcode Scanner

The Polaris system supports USB-C barcode scanners. The barcode scanner must have a keyboard emulation mode. The barcode scanner can be used to recall recipes and enter a Part ID of up to 50 characters by scanning 1D linear barcodes. (such as UPC and EAN codes) & 2D barcodes (such as QR and Data Matrix codes). See section [5.10.1 General](#) for more information.

Figure 4.33 Barcode scanner, 1D linear barcode & 2D barcode example



NOTICE	
	Barcode scanner must be connected to the USB-C port located on the power supply.

Figure 4.34 Power Supply - USB port on the Polaris system

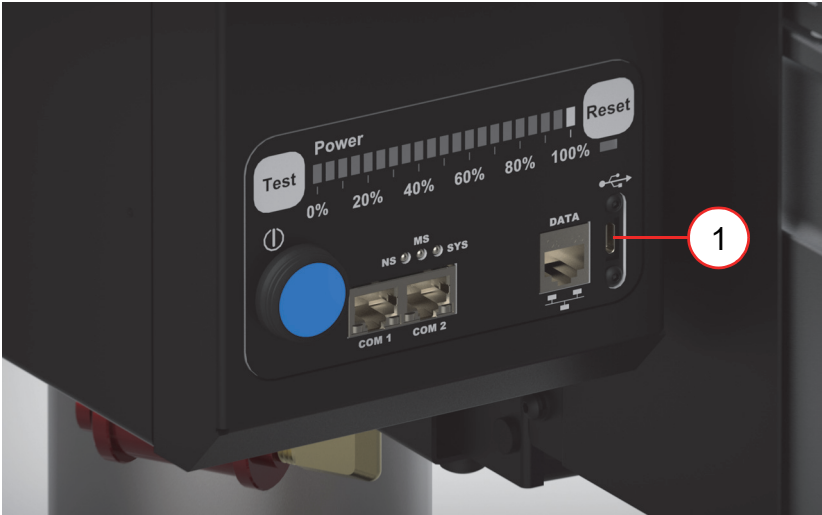


Table 4.50 Power Supply - USB port on the Polaris system

Item	Description
1	USB-C Port

4.18 Reset Dongle

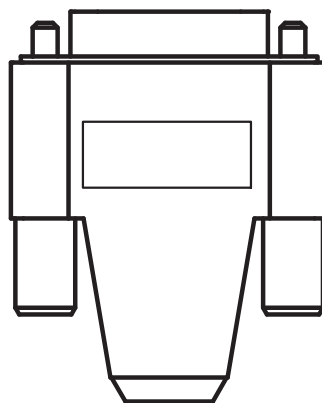
In the event that an Executive-level user cannot log into the system, the Reset Dongle can be used to recover the Executive user's ID and password. The Reset Dongle connects to the User I/O connector on the power supply.

	NOTE
	The Reset Dongle can be ordered from Branson. The EDP number is 1016041.

Table 4.51 Reset Dongle Instructions

Step	Action
1	Ensure the Polaris system is turned OFF.
2	Connect the Reset Dongle to the User I/O connector on the power supply.
3	Turn the Polaris system ON.
4	When the system starts, the User Management screen is displayed automatically. No other screens are accessible while the Reset Dongle is connected.
5	Navigate to the System Configuration/User Management section to Enable an user Executive account and view the user ID and password.
6	Perform one of the following actions: - Add a new user account. - Modify the password of an existing user account.
7	After completing the required changes, turn the Polaris system OFF.
8	Disconnect the Reset Dongle from the User I/O connector.
9	Turn the power supply ON and log in using the updated credentials.

Figure 4.35 Reset Dongle (EDP 1016041)



4.19 LED Work Light

The optional LED Work Light provides additional illumination of the work area. The work light is shipped separately and includes a factory-installed C-clamp mounting base.

4.19.1 Mounting the Work Light

4.19.1.1 Round Column

Table 4.52 Mounting the Work Light - Round Column

Step	Action
1	Open the C-clamp sufficiently to fit around the HMI arm.
2	Position the clamp on the HMI arm in a location that provides adequate illumination of the work area and does not interfere with operation of the HMI.
	
	NOTE Mounting the work light to the HMI arm is the recommended installation method for round column models.
3	Tighten the clamp securely.
4	Route the power cord so that it does not interfere with machine operation.
5	Insert the barrel connector from the power supply into the power input connector on the work light.
6	Connect the power supply to an appropriate electrical outlet.
7	Position the light to direct illumination toward the desired area.
8	Place the ON/OFF switch in the ON position to turn the light on.
9	Place the ON/OFF switch in the OFF position to turn the light off.

4.19.1.2 Square Column

Table 4.53 Mounting the Work Light - Square Column

Step	Action
1	Open the C-clamp and position it on the designated mounting feature provided on the machine. NOTE Mounting the work light to the designated mount is the recommended installation method for square column models. 
2	Tighten the clamp securely.
3	Route the power cord so that it does not interfere with machine operation.
4	Insert the barrel connector from the power supply into the power input connector on the work light.
5	Connect the power supply to an appropriate electrical outlet.
6	Position the light to direct illumination toward the desired area.
7	Place the ON/OFF switch in the ON position to turn the light on.
8	Place the ON/OFF switch in the OFF position to turn the light off.

[This page intentionally left blank]

Chapter 5: Operation

5.1	Introduction	98
5.2	Actuator Controls and Indicators	99
5.3	Power Supply Controls and Indicators.....	104
5.4	Polaris System Power On and Login	106
5.5	Date & Time	108
5.6	Main Menu & User Settings.....	109
5.7	Recipes	111
5.8	Production	131
5.9	Analytics	132
5.10	System.....	136
5.11	System Information.....	159
5.12	Calibration	162
5.13	Actuator Setup	164
5.14	Diagnostics	166
5.15	Generate Report.....	178
5.16	Language.....	186
5.17	Units.....	187
5.18	Change Password.....	188

5.1 Introduction

This section describes how to operate a weld cycle using the actuator and power supply.

⚠ WARNING	
	Crushing Hazard Down force and ultrasonic vibration during actuator setup or operation could result in serious injury. • Keep hands away from under the ultrasonic horn at all times. • Do not place any part of the body in the weld area while the actuator is energized.
⚠ CAUTION	
	Hearing Hazard Audible-frequency vibration may occur during welding, which may cause discomfort or minor injury. • Use hearing protection if vibration noise occurs during welding.
⚠ CAUTION	
	Crushing Hazard Fingers can be caught between the ultrasonic horn and the workpiece fixture, which may result in minor or moderate injury. • Avoid placing fingers between the ultrasonic horn and the workpiece fixture. • Use tools or appropriate handling methods to position parts safely.
⚠ CAUTION	
	Eye Hazard Debris or dust generated during operation may cause eye injury. • Wear safety glasses when operating or working near the equipment.
⚠ CAUTION	
	Burn Hazard The ultrasonic horn, tooling, or part may become hot during operation and may cause burn injury. • Do not touch the ultrasonic horn, tooling, or part while the actuator is operating. • Allow the part to cool before handling. • Allow the ultrasonic horn and tooling to cool before contact.
NOTICE	
	Contact between the ultrasonic horn and metal surfaces may damage the system. Do not allow the ultrasonically activated ultrasonic horn to contact a metal base or metal workpiece fixture.

5.2 Actuator Controls and Indicators

The front panel controls on the actuator are listed below.

Figure 5.1 Actuator Controls and Indicators



Table 5.1 Actuator Controls and Indicators

Item	Description
1	Indicator Light: Indicates that the actuator is connected to the power supply and that the power supply's main power is on.
2	Air Pressure Indicator: When sufficient air pressure is present, pins extend outward. If pressure is lost or insufficient, pins retract.
3	Mechanical Stop: The mechanical stop limits the downward travel of the ultrasonic horn. To prevent equipment damage, adjust the stop so that the ultrasonic horn will not contact the workpiece fixture when no workpiece is in place. NOTICE The mechanical stop is not intended for welding by distance. NOTICE Turning the mechanical stop too far can cause it to come apart.

5.2.1 Initial Actuator Settings

The actuator is controlled by the power supply, however there are several functions that are part of the actuator. These include:

- Slide valve
- Factory air source
- Mechanical stop
- Actuator position and height above workpiece fixture (ultrasonic horn travel)
- Emergency stop (on base, and provided as a user I/O signal for automation)

Each of these will affect the operation of the actuator.

5.2.2 Slide Valve

The slide valve allows the system to be pressurized or depressurized directly at the welder without shutting off the facility air supply.

Figure 5.2 Slide Valve



Table 5.2 Slide Valve

Step	Action
1	Slide the valve backward to open the air supply and allow compressed air to flow to the welder.
2	Slide the valve forward to shut off the air supply and vent the system to atmosphere.

5.2.3 Factory Air Source

After powering on the system, turn on the factory air supply to provide air pressure to the actuator's air pressure regulator.

If factory air is too low (below 35 psi maintained) the actuator will not weld or operate reliably. Factory air is also used to provide cooling air to the converter.

Factory air input may affect weld results for applications requiring more weld pressure buildup.

⚠ WARNING	
	Impact Hazard Supplying compressed air to an unpowered system can cause the actuator to move upward suddenly when electrical power is applied. If the system is depressurized and electrical power is OFF, turn ON electrical power before supplying compressed air to the system.
NOTICE	
	Factory air pressure must be greater than the maximum system requirements. The compressed air system must have sufficient capacity to serve all of the systems connected to it. The use of an accumulator may be required to provide continuous air flow.
NOTE	
	The Polaris system is equipped with a soft-start pneumatic valve. After opening the slide valve, the pneumatic system gradually pressurizes and may require approximately 10 seconds to reach the set pressure when supplied with 550 kPa (80 psi) factory air.

5.2.4 Regulated Air Pressure and Air Pressure Indicator

When factory air is present, it is delivered to the regulator located in the actuator.

⚠ WARNING	
	Crushing Hazard Loss of air pressure or shutting off the slide valve may cause the actuator to settle to a lower position, which could result in serious injury. - Keep hands and fingers away from under the ultrasonic horn and other pinch points. - Support the ultrasonic horn with a block of wood or other soft material to prevent it from dropping.
⚠ WARNING	
	Impact Hazard Supplying the actuator with air above 690 kPa (100 psi) could result in equipment damage and injury. - Set the pressure regulator to zero before connecting or disconnecting the air supply. - Do not exceed 690 kPa (100 psi).

Set the air to a low pressure setting. In the event something is incorrectly connected, a low air pressure setting will reduce any sudden movement. A typical initial setting is approximately 20-25 psi for a new or unproven setup.

5.2.5 Downspeed Control

The Downspeed Control regulates the velocity of the pneumatic cylinder during the downstroke. Downspeed has a significant effect on the force buildup on the workpiece, and hence the quality of the weld.

Downspeed is controlled through the HMI.

	NOTE
	As a starting point, set the Downspeed value between 20% and 25%. Adjust the setting as required for the application.

	NOTE
	For systems equipped with an 80 mm actuator, set Downspeed to 20% and the minimum air pressure to 138 kPa (20 psi) as a starting point. Adjust the settings as required for the application.

5.2.6 Actuator Alignment and Height (Ultrasonic Horn Travel)

The ultrasonic horn carriage will travel up and down on the actuator's slides. The actuator can also be adjusted up or down on the column. See section [4.14 Alignment and Leveling](#) for more information.

The distance between the workpiece fixture and ultrasonic horn should allow easy and ready access and removal of your parts.

- Minimum stroke cannot be less than 1/8"
- Maximum stroke cannot exceed 3-3/4" before part contact to allow for the operation of the dynamic flow through mechanism

Consistent weld results are best measured when the ultrasonic horn travel is more than 1/4 inch, because a shorter distance can be affected by other components of the welding system and a suitable build-up of pressure on the parts.

5.2.7 Mechanical Stop

The mechanical stop limits the downward travel of the ultrasonic horn. To prevent equipment damage, adjust the stop so that the ultrasonic horn will not contact the workpiece fixture when no workpiece is in place.

Figure 5.3 Mechanical Stop

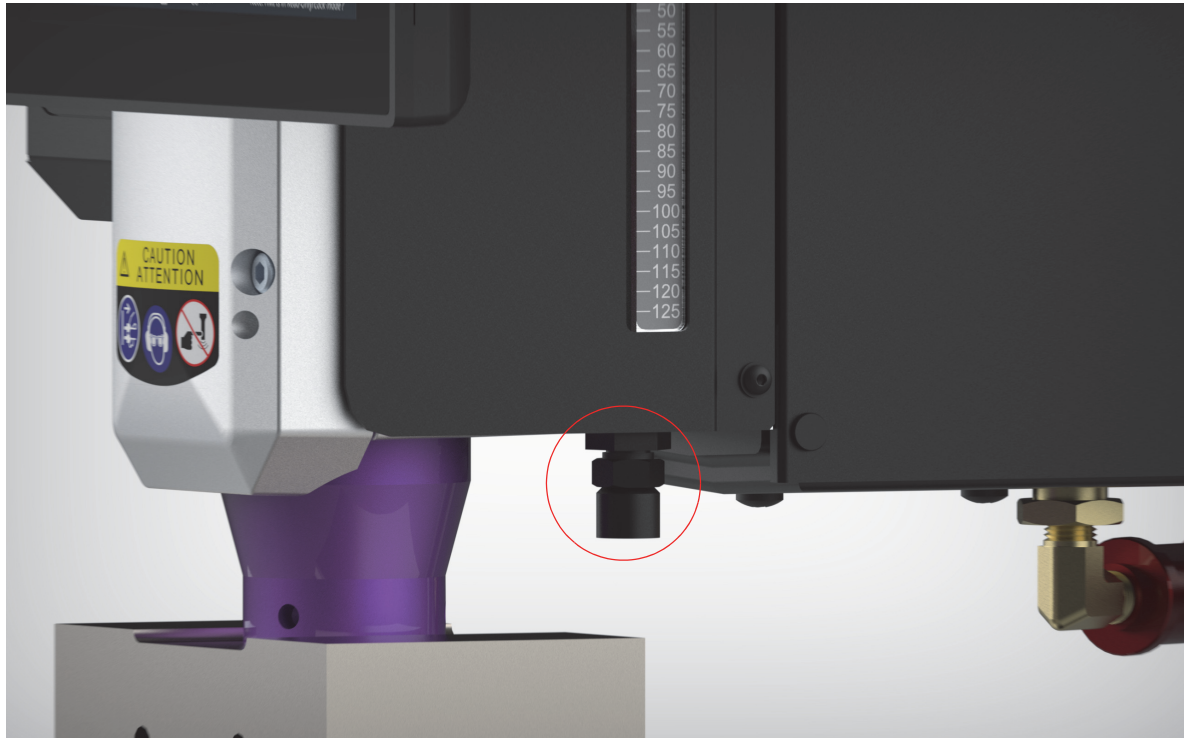


Table 5.3 Mechanical Stop

Step	Action
1	Reduce the air pressure to zero and manually lower the carriage until the ultrasonic horn is just above the workpiece fixture.
2	If the ultrasonic horn does not reach the workpiece fixture and has not traveled 100 mm (4 in.), loosen the lock nut and turn the mechanical stop adjusting knob clockwise until the carriage reaches the desired position. If the ultrasonic horn reaches the desired position before contacting the stop, turn the adjusting knob counterclockwise until the stop contacts the carriage.
3	Recheck the clearance between the ultrasonic horn and the workpiece fixture and make any necessary re-adjustments to the stop. You can use Horn Down to check this position while the welder is under pressure. NOTE Turning clockwise will increase the stroke length; turning counterclockwise will shorten the stroke length. Adjustment is approximately 1 mm/0.04 in per rotation.
4	When the desired setting is obtained, tighten the locknut. The locknut will keep the mechanical stop adjustment from vibrating loose during operation.
5	Place a workpiece in the workpiece fixture, adjust the air pressure and perform a test weld.
6	Re-adjust the mechanical stop, if necessary.

5.3 Power Supply Controls and Indicators

The front panel controls on the power supply are listed below.

Figure 5.4 Power Supply Controls and Indicators

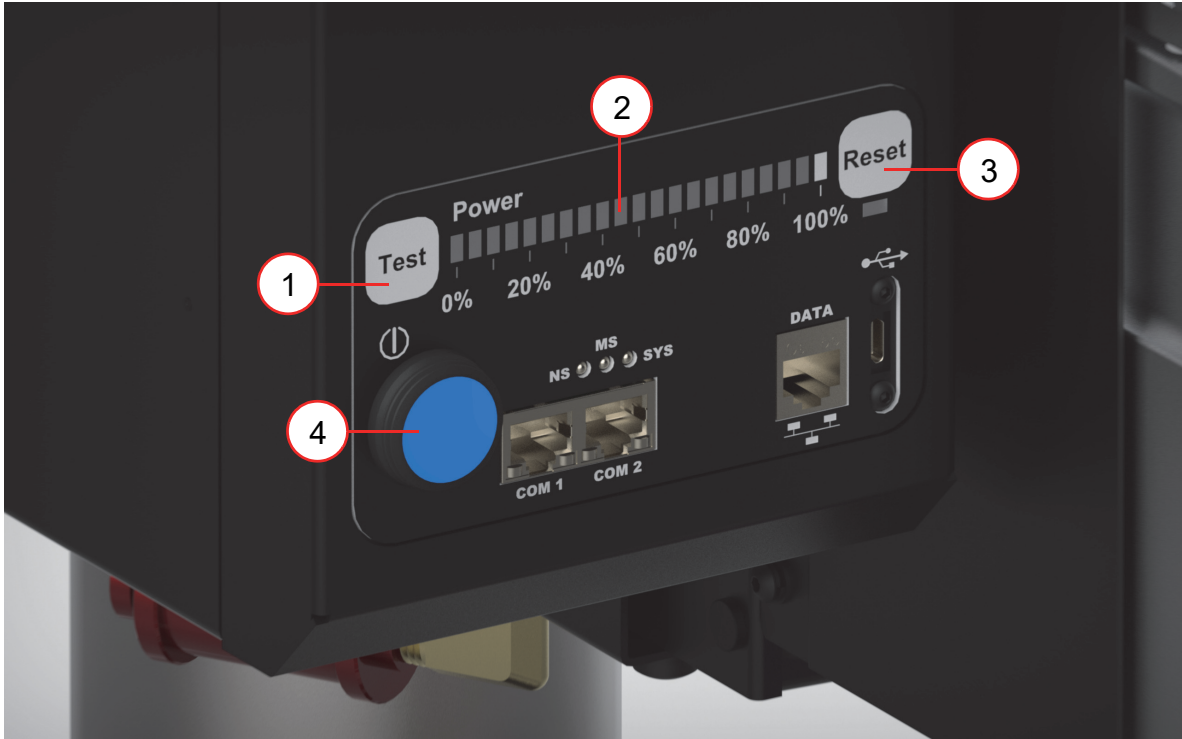


Table 5.4 Power Supply Controls and Indicators

Item	Description
1	Test Key: Press and hold to test the system. See section 5.3.1 Test Key for more information.
2	Power Bar Graph: Indicates the percentage of rated power delivered either during the last weld cycle or when Test is running.
3	Reset Key: The Reset key clears all active alarms. Alarms caused by conditions that are no longer present are cleared immediately when the Reset key is pressed. However, persistent alarms cannot be cleared while the underlying fault condition still exists. These alarms remain active until the cause of the alarm has been corrected.
4	Power Button: Press to turn the system On and Off. When you depress the button, it lights to indicate power is On.

5.3.1 Test Key

⚠ CAUTION	
	Burn Hazard
	The ultrasonic horn, tooling, or part may become hot during operation and may cause burn injury.
	• Do not touch the ultrasonic horn, tooling, or part while the actuator is operating. • Allow the part to cool before handling.
Allow the ultrasonic horn and tooling to cool before contact.	

The electrical and mechanical components of an ultrasonic welding system need optimum adaptation to each other. The ultrasonic test serves to test the system in this respect. For that purpose the power supply measures the power output without load, i. e. the ultrasonic horn vibrates freely in air. In case of trouble-free operation of the system without overload alarms, this power output without weld load remains constant (+/- 10%) for a longer period. Any increase in power output indicates an existing or arising problem.

In addition, the ultrasonic test serves to seek the frequency: Every ultrasonic stack has its own specific resonant frequency the power supply must adapt itself to. During the ultrasonic test the power supply determines this frequency.

Table 5.5 Test Key

Step	Action
1	Energize all components of the welding system and set the desired mode of operation.
2	Press the <i>Test</i> key for 6 to 7 seconds.
3	In case no overload state occurs the test is completed.
4	In case an overload occurs press the <i>Test</i> key again. The system can then tune itself.
5	In case of recurring overload alarms, please proceed as follows for error elimination: 1. Check all components of the ultrasonic stack for damage (wear, notches, cracks, etc.). 2. Check the mating surfaces between the individual components. 3. Make sure that all components are tightened with the correct torque. 4. In case the above measures do not solve the problem, please contact your Branson representative. See section 7.2 Contact Us for more information.

5.4 Polaris System Power On and Login

NOTICE	
	It is strongly recommended to create multiple administrator accounts. This provides a secure fallback in the event an administrator's password is lost or becomes inaccessible

Table 5.6 Polaris System Power On and Login

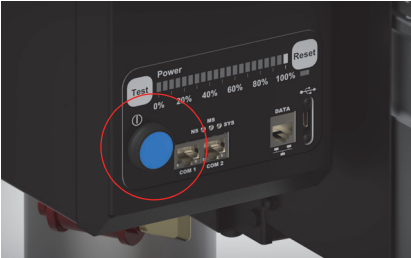
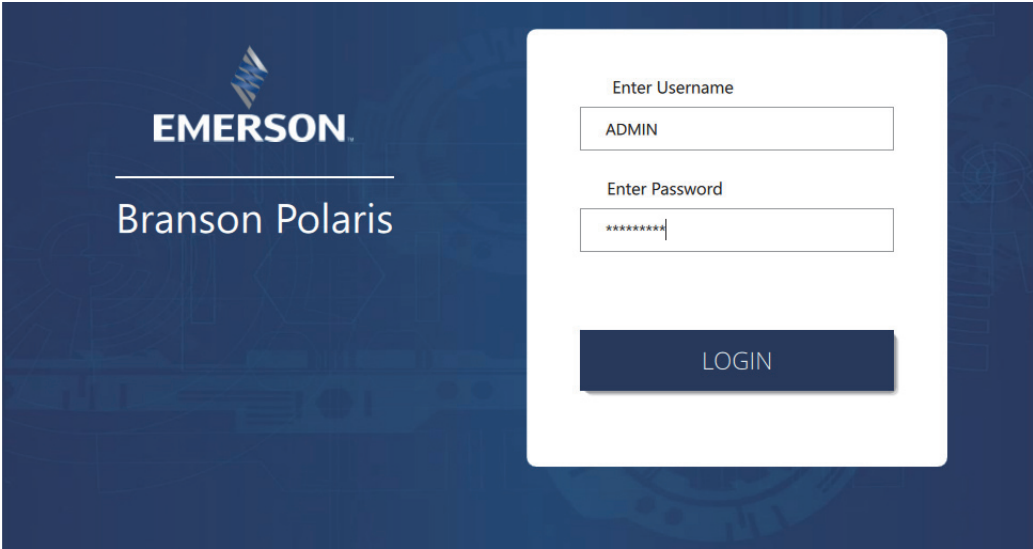
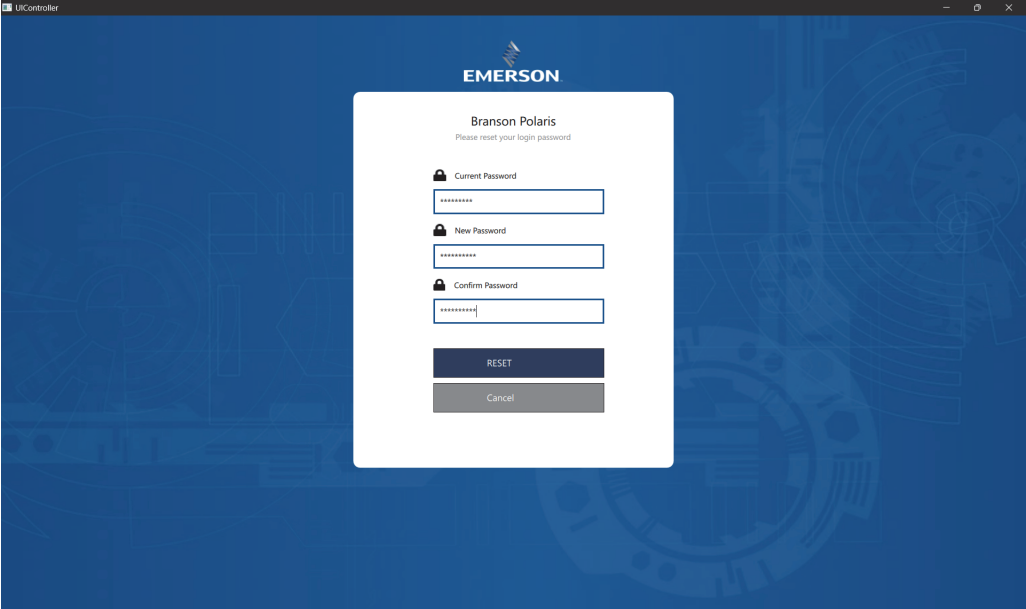
Step	Action
1	Press the power button to turn on the system. Figure 5.5 Power button on the Polaris system 
2	Log in with the default username and password. The Polaris system is shipped with the following credentials: • Username: Admin • Password: 123456Aa# 

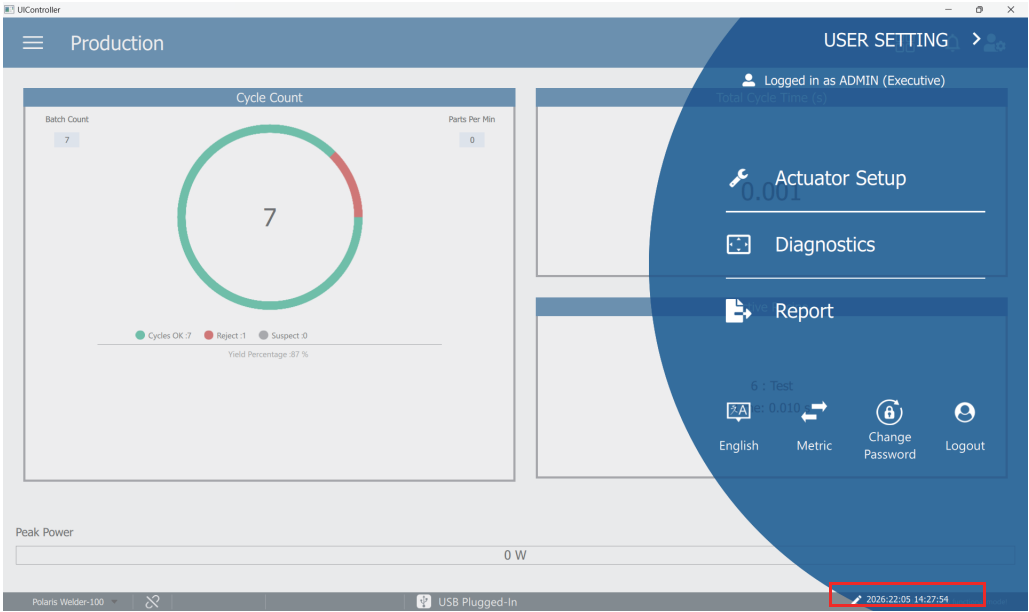
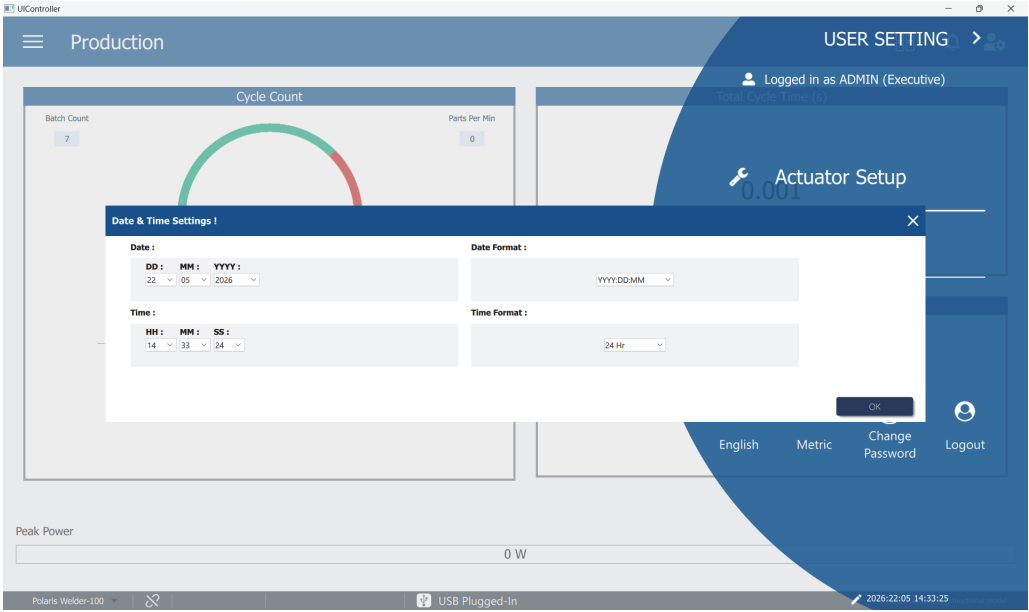
Table 5.6 Polaris System Power On and Login

Step	Action
3	At first time log in, a new password must be created. Enter the default password, and then enter and confirm the new password. 

5.5 Date & Time

The Polaris system assigns a time and date stamp to each weld cycle for production tracking and quality control. To ensure accurate logging, follow these steps to set the system date and time:

Table 5.7 Date & Time

Step	Action
1	Press the button on the upper-right corner to open the User Settings panel. Press the Date/Time field on the bottom-right section of the screen. 
2	Set the current date & time. Press OK to confirm. 

5.6 Main Menu & User Settings

5.6.1 Main Menu

The Main Menu provides access to key functions of the system through four primary buttons:

Figure 5.6 Main Menu

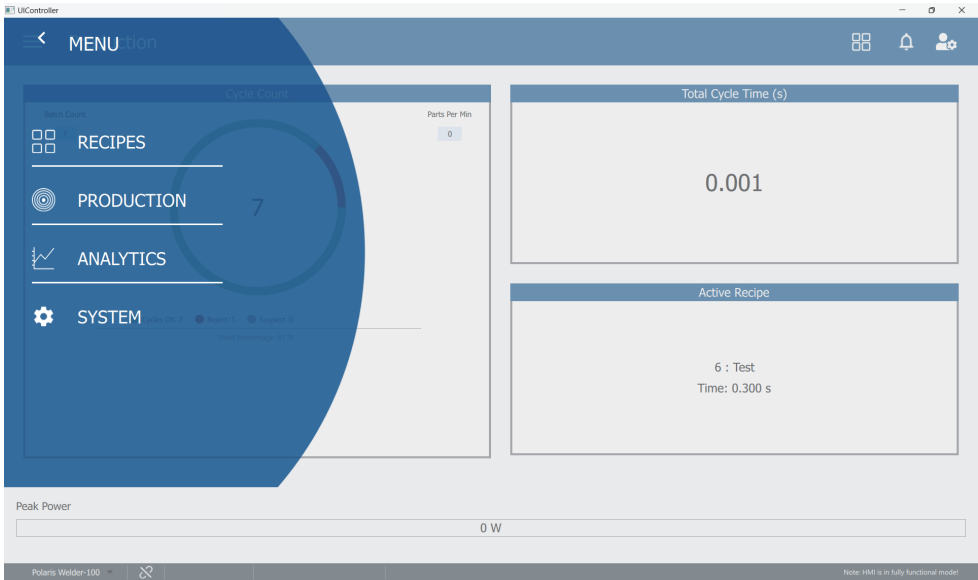


Table 5.8 Main Menu

Name	Description
Recipes	The Recipes button allows users to manage welding recipes. Users can: • Create and configure new recipes. • Recall saved recipes for quick setup. • Save current settings as a new recipe. This feature simplifies repeatable operations and ensures consistency across production runs.
Production	The Production button displays real-time operational data, including: • Current cycle count. • Total cycle time. • Active recipe in use. • Peak power measured during welding. This section helps monitor system performance and track production metrics.
Analytics	The Analytics button provides access to graphical data analysis. Users can view: • Weld results graphs such as amplitude, power, and frequency. • Trends and performance over time. This feature supports process optimization and troubleshooting.
System	The System button opens configuration and system information options. Users can: • Adjust system settings. • View software version, model number, and other system details. • Access calibration tools and procedures. This section is used for setup, maintenance, and diagnostics.

5.6.2 User Setting

Press the button on the top right corner to open the **User Setting** panel. The User Setting panel provides access to user-specific configuration, diagnostics, and data management tools.

Figure 5.7 User Settings

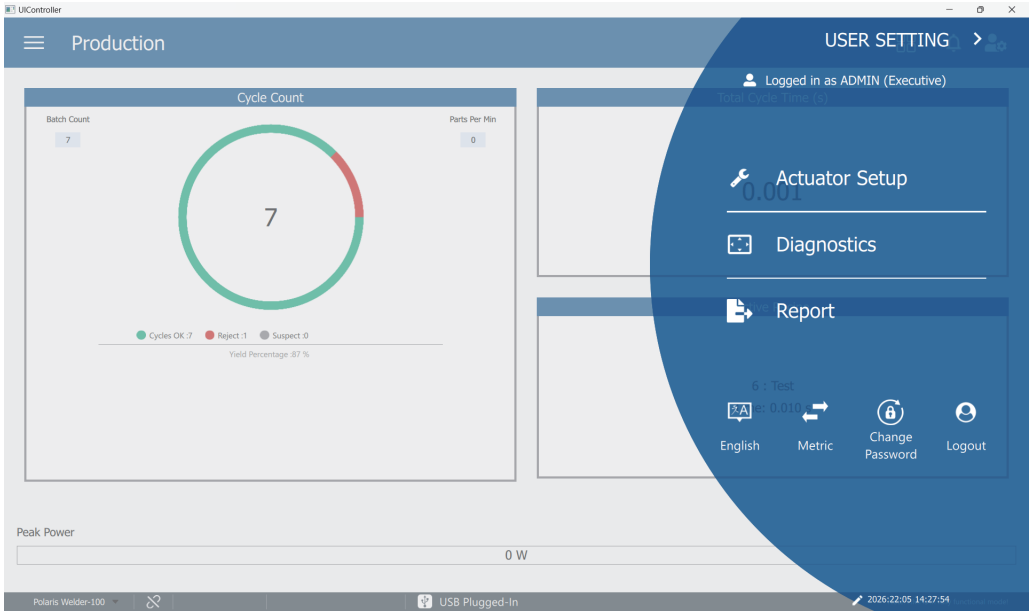


Table 5.9 User Setting

Name	Description
Username/Level	Displays the current user's username and access level (e.g., Operator, Technician, Supervisor).
Actuator Setup	Used for setup and alignment of the actuator and workpiece fixture without activating ultrasonics. This mode allows the user to verify pneumatic functionality, determine ultrasonic horn travel distance, and ensure proper workpiece fixture positioning.
Diagnostics	Access tools for system testing and troubleshooting: Scan, Test, Seek, Event Log, Alarm Log, User I/O
Generate Report	Create and export reports in CSV or PDF format to a USB drive. Available data includes: weld data, alarm history, event logs.
Language	Change the language of the Polaris interface to suit the user's preference.
Units	Switch between metric and imperial units for measurements displayed throughout the system.
Change Password	Update the password for the currently logged-in user.
Logout	End the current user session and return to the login screen.

5.7 Recipes

The Recipes function allows users to save, recall, and manage welding configurations tailored to specific applications. Each recipe stores a complete set of welding parameters, making it easy to switch between different setups without manually re-entering values. This feature enhances consistency, reduces setup time, and supports repeatable weld quality across production runs.

Figure 5.8 Recipes

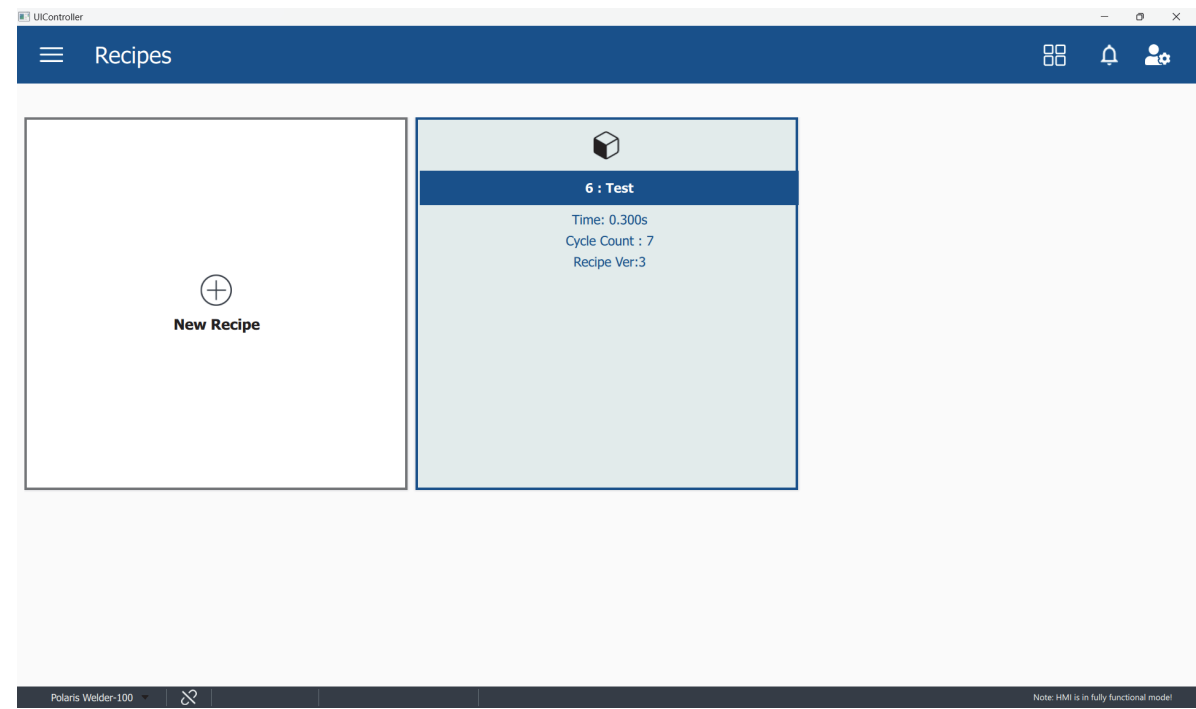


Table 5.10 Recipes

Name	Description
New Recipe	Press the + button to create a new recipe. This opens a new recipe screen with all default parameters where you can enter and save welding parameters for a new application.
Active Recipe	The currently selected recipe is highlighted in blue. This indicates which recipe is in use for welding operations.
Saved Recipes	All previously saved recipes are listed for easy access. You can set active, view, or modify these recipes as needed to suit different welding tasks.

	NOTICE
	An asterisk (*) displayed next to a recipe name indicates that unsaved changes have been made to that recipe. To preserve the changes, be sure to save the recipe before exiting or switching to another one.

5.7.1 Active Recipe Actions Menu

When a recipe is selected, an Actions Menu appears, providing quick access to essential tools for managing the recipe. These options allow users to edit parameters, manage batch settings, track weld cycles, and organize recipes efficiently. Each button in the menu is designed to streamline workflow and ensure precise control over welding operations.

Figure 5.9 Active Recipe Actions Menu

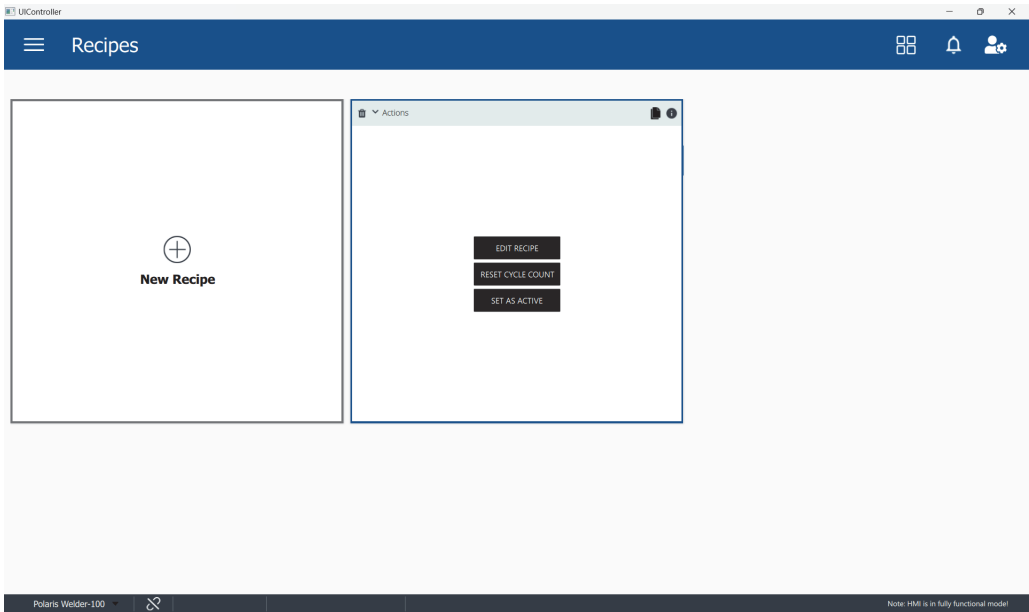


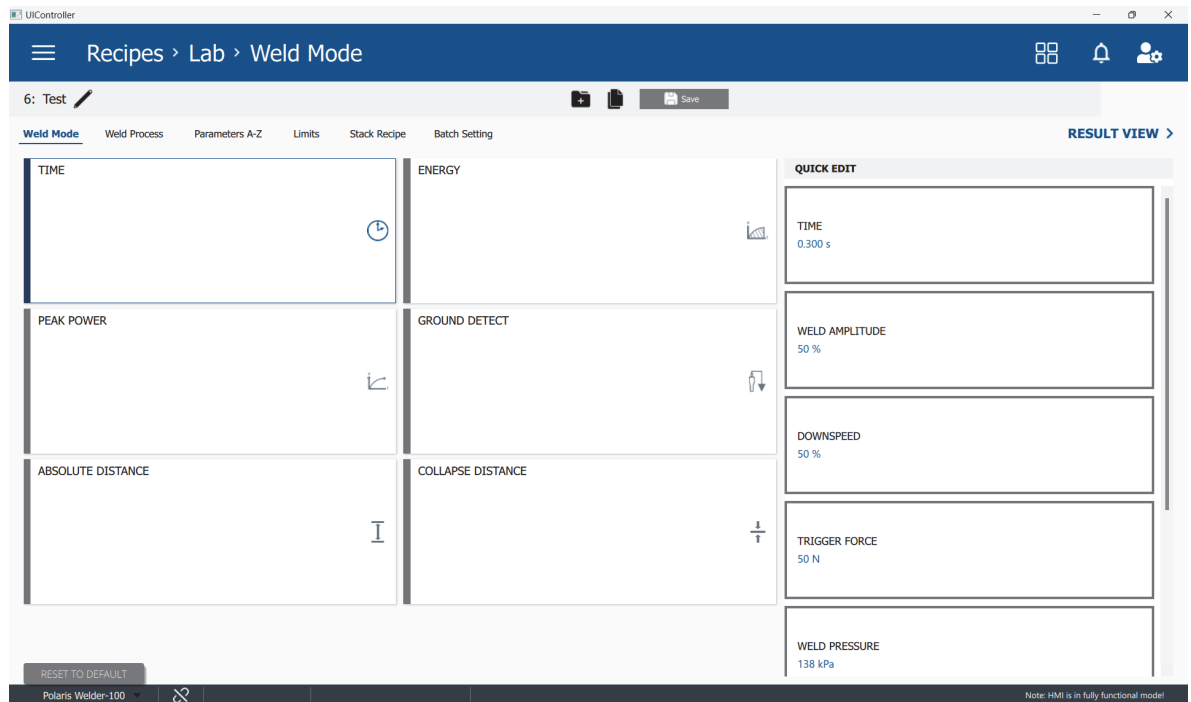
Table 5.11 Active Recipe Actions Menu

Name	Description
Edit Recipe	Opens the selected recipe’s settings screen, allowing you to modify welding parameters and configuration details.
Reset Cycle Count	Resets the cycle count for the selected recipe to zero. This is useful for tracking weld cycles from a known starting point.
Set as Active	Assigns the selected recipe as the current active recipe. The system will use this recipe’s parameters for all subsequent welds.
Copy Button	Creates a duplicate of the selected recipe. This is helpful for creating variations of existing setups without overwriting the original.
Delete Button	Deletes the selected recipe from the system. NOTE Active recipes cannot be deleted. To delete a recipe, first set a different recipe as active.

5.7.2 New Recipe

The New Recipe function allows users to create a customized welding setup tailored to a specific application. After analyzing the characteristics of the parts to be welded (such as material type, joint design, and weld requirements) you can determine the most suitable Weld Mode to achieve optimal results.

Figure 5.10 Weld Modes



5.7.3 Weld Modes

The following table describes each mode:

Table 5.12 Weld Modes

Mode	Description
Time	Use Time mode to select the length of time (in seconds) that ultrasonic energy is applied to your parts.
Energy	Use Energy mode to select the amount of ultrasonic energy (in joules) that is applied to your parts.
Collapse Distance	Use the Collapse Distance Mode to select the distance your part will be collapsed before ultrasonic energy is terminated.
Absolute Distance	Use the Absolute Distance Mode to select the distance the ultrasonic horn will travel from home before ultrasonic energy is terminated.
Peak Power	Use Peak Power mode to select the maximum power in Watts that will be used to determine when ultrasonics will be terminated.
Ground Detect	Use Ground Detect mode to have ultrasonic energy turn off when the ultrasonic horn comes in contact with your electrically isolated workpiece fixture. The electrically isolated workpiece fixture should be designed so that the insulator allows no continuity to the actuator base. It is necessary to install Ground Detect cable (see section 4.8 Ground Detect Cable for more information) from the connector on the side of the actuator to your isolated workpiece fixture in order to utilize this feature.

5.7.4 Weld Mode Parameters

Table 5.13 Weld Mode Parameters

Parameter	Description
Time	Set the length of time (in seconds) that ultrasonic energy will be transmitted to your parts. NOTE Only available in Time mode.
Energy	Set the amount of energy (in joules) that will be transmitted to your parts. NOTE Only available in Energy mode.
Peak Power	Set the peak power level (in watts) at which the weld is terminated. NOTE Only available in Peak Power mode.
Scrub Time	Sets the scrub time (in seconds) when ground detect mode is selected. NOTE Only available in Ground Detect mode.
Absolute Distance	Set the vertical distance (in millimeters) that the ultrasonic horn travels from the ready position before ultrasonics are terminated. NOTE Only available in Absolute Distance mode.
Collapse Distance	Set the vertical distance (in millimeters) that your part collapses before ultrasonics are terminated. NOTE Only available in Collapse Distance mode.
Weld Amplitude	You can set the amplitude of the ultrasonic energy that will be delivered in any welding mode. Default is to use 100% of the available amplitude. By changing the amplitude to some lesser percentage of the total available, or by setting the amplitude to begin at one level and finish at another, you can fine tune your overall welding procedure without making changes to your tooling.
Downspeed	Sets the percent air flow from the actuator's pneumatic cylinder for speed control. The settings can be made between 1 and 100%, and the speed will depend on air pressure and stroke length. The flow valve is motorized and does not change instantaneous with adjustments. NOTE For systems equipped with an 80 mm actuator, set Downspeed to 20% and the minimum air pressure to 138 kPa (20 psi) as a starting point. Adjust the settings as required for the application.
Trigger Force	Set the number of newtons of trigger force that will trigger ultrasonics. When the force on your part is equal or greater to the value you have set, ultrasonic energy is applied.
Weld Pressure	You can set the psi that will be delivered in any welding mode. The system default is to use 138 kPa (20 psi). By changing the pressure to some lesser psi, or by setting the pressure to begin at one level and finish at another, you can fine tune your overall welding procedure without making changes to your tooling (converter, booster, ultrasonic horn, or workpiece fixture).
Hold Time	Sets the duration (in seconds) of the Hold step (the step during which there is no ultrasonic energy transmitted to your part, but force is maintained).
Hold Pressure	Pressure set during hold time.

5.7.5 Weld Amplitude Stepping

NOTE	
	The Weld Amplitude Stepping function is available only on systems equipped with a P2200 Power Supply.

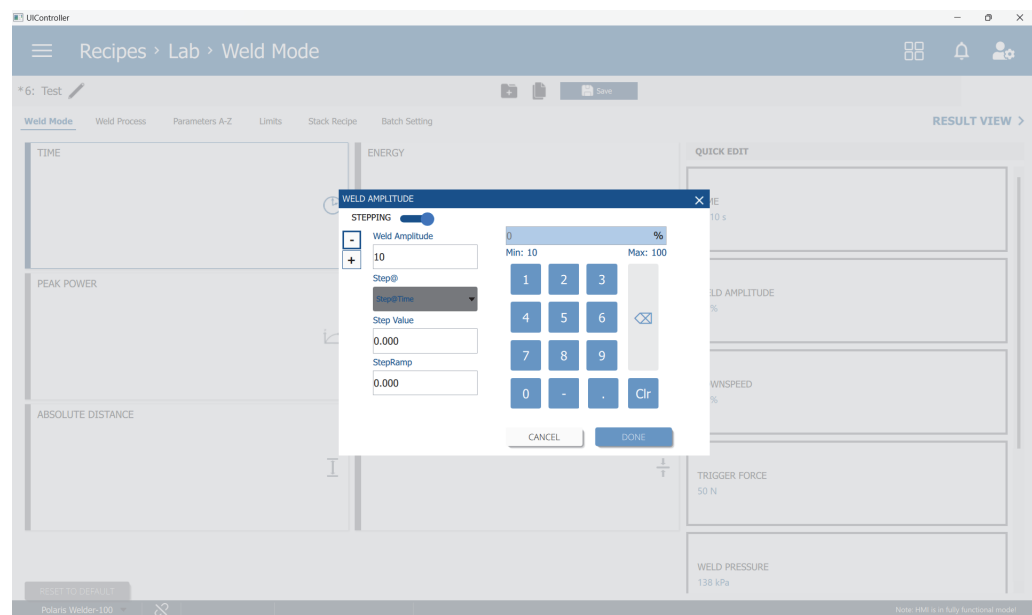
You can select whether to apply a fixed weld amplitude or a stepped weld amplitude to the part during welding. When Weld Amplitude Stepping is enabled, the system can change the weld amplitude at defined points in the weld cycle to help control the flow of plastic material.

Amplitude steps can be triggered by one of the following conditions:

- Time
- Energy
- Peak Power
- External Signal
- Absolute Distance
- Collapse Distance

This feature can help improve part consistency, increase weld strength, and control flash by adjusting the ultrasonic output as the weld progresses.

Figure 5.11 Amplitude Stepping



When Weld Amplitude Stepping is disabled, the system applies one fixed weld amplitude for the weld.

When Weld Amplitude Stepping is enabled, the weld starts at the configured initial weld amplitude. The system then changes to the next programmed amplitude when a configured step condition is reached.

For example, the weld can start at 80% amplitude and then change to 60% amplitude after 0.250 seconds, or after a specified energy, peak power, external signal, absolute distance, or collapse distance condition is reached.

5.7.5.1 Amplitude Steps & Step@ Parameters

You can configure up to 5 weld amplitude steps.

Each weld amplitude step requires:

- A Step@ parameter
- A Step value
- A weld amplitude percentage for that step

The Step@ parameter defines the condition that causes the system to change to that step. The step value defines when that condition is reached.

For example, if Step@ Time is selected, the step value must be entered in seconds. The value should be less than the total weld time so the step can occur before the weld ends.

The Step@ dropdown menu determines the trigger condition for the selected amplitude step.

Figure 5.12 Amplitude Steps & Step@ Parameters

Available Step@ options include:

Table 5.14 Step@ Options

Parameter	Description
Step@Time	Changes to the selected weld amplitude step when the programmed weld time is reached. Example: • Step@ = Time • Step value = 0.250 s • Weld amplitude = 60% In this example, the system changes to 60% amplitude 0.250 seconds after the weld starts.
Step@Energy	Changes to the selected amplitude step when the programmed weld energy value is reached.
Step@Pk Power	Changes to the selected amplitude step when the programmed peak power value is reached.
Step@Ext. Signal	Changes to the selected amplitude step when the required external signal is received.
Step@Absolute	Changes to the selected amplitude step when the programmed absolute distance value is reached.
Step@Collapse	Changes to the selected amplitude step when the programmed collapse distance value is reached.

5.7.5.2 Configuring Weld Amplitude Stepping

Figure 5.13 Configuring Weld Amplitude Stepping

WELD AMPLITUDE [X]

STEPPING ☒

1 Weld Amplitude 10 %

2 Step@

3 Step@Time ▼

4 Step Value

5 0.010

+ StepRamp

0.080

Min: 10 Max: 100

1 2 3

4 5 6

7 8 9

0 - . Clr

CANCEL DONE

Table 5.15 Configuring Weld Amplitude Stepping

Step	Action
1	Open the weld setup screen for the selected weld recipe.
2	Locate the Weld Amplitude parameter.
3	Turn on the Stepping toggle button.
4	Enter the initial Weld Amplitude percentage. The value must be between 10% and 100%.
5	To add a weld amplitude step, press the + button on the left side of the menu.
6	In Weld Amplitude Step 1, select the required trigger condition from the Step@ dropdown menu. Available options include: - Time - Energy - Peak Power - External Signal - Absolute Distance - Collapse Distance
7	Enter the step value for the selected Step@ parameter. The unit of measurement depends on the selected Step@ parameter. For example, if Step@ Time is selected, enter the step value in seconds.
8	Enter the Weld Amplitude percentage for Step 1. The value must be between 10% and 100%.
9	If additional amplitude steps are required, press the + button again and repeat the setup for each step. To remove a step, press the - button. You can configure up to 5 weld amplitude steps.
10	Press Cancel to discard changes, or press Done to confirm and save the Weld Amplitude Stepping configuration.

5.7.6 Pressure Stepping

NOTE	
	The Pressure Stepping function is available only on systems equipped with a P2200 Power Supply.

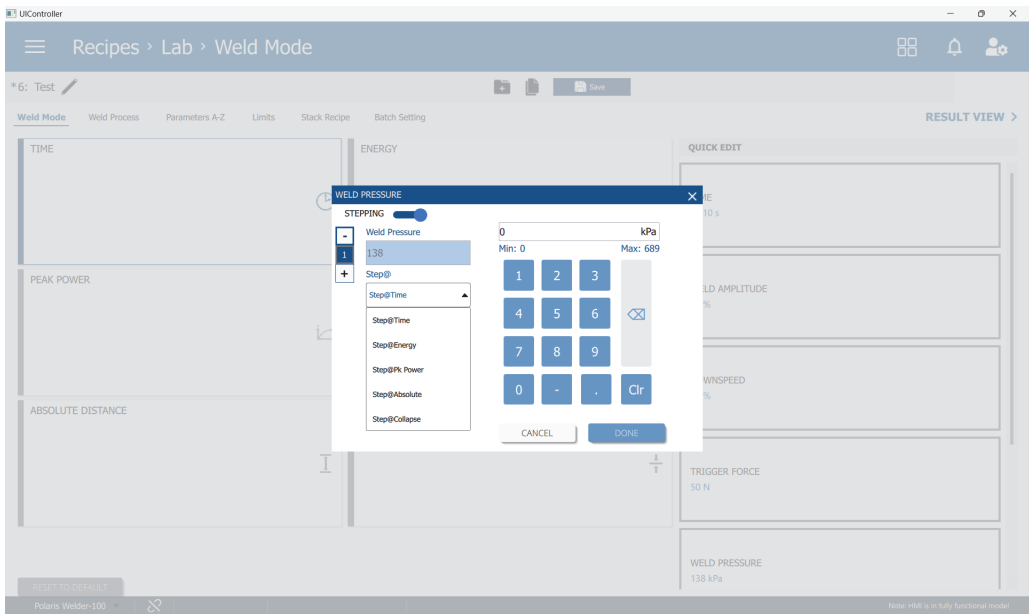
You can select whether to apply a fixed weld pressure or a stepped weld pressure to the part during welding. When Weld Pressure Stepping is enabled, the system can change the weld pressure at defined points in the weld cycle to control material flow and part compression.

Weld pressure steps can be triggered by one of the following conditions:

- Time
- Energy
- Peak Power
- Absolute Distance
- Collapse Distance

This feature can help improve part consistency, optimize weld strength, and control material displacement during the weld.

Figure 5.14 Pressure Stepping



When Weld Pressure Stepping is disabled, the system applies one fixed weld pressure for the entire weld cycle.

When Weld Pressure Stepping is enabled, the weld starts at the configured initial weld pressure. The system then changes to the next programmed pressure when a configured step condition is reached.

For example, the weld can start at a higher pressure to initiate material flow and then reduce pressure later to minimize flash.

5.7.6.1 Pressure Steps & Step@ Parameters

You can configure up to 5 weld pressure steps.

Each weld pressure step requires:

- A Step@ parameter
- A Step value
- A weld pressure value for that step

The Step@ parameter defines the condition that causes the system to change to that step. The step value defines when that condition is reached.

For example, if Step@ Time is selected, the step value must be entered in seconds. The value should be less than the total weld time so the step can occur before the weld ends.

The Step@ dropdown menu determines the trigger condition for the selected weld pressure step.

Figure 5.15 Weld Pressure Steps & Step@ Parameters

Available Step@ options include:

Table 5.16 Step@ Options

Parameter	Description
Step@Time	Changes to the selected weld pressure step when the programmed weld time is reached. Example: • Step@ = Time • Step value = 0.250 s • Weld pressure = 138 kPa In this example, the system changes to 138 kPa pressure 0.250 seconds after the weld starts.
Step@Energy	Changes to the selected weld pressure step when the programmed weld energy value is reached.
Step@Pk Power	Changes to the selected weld pressure step when the programmed peak power value is reached.
Step@Absolute	Changes to the selected weld pressure step when the programmed absolute distance value is reached.
Step@Collapse	Changes to the selected weld pressure step when the programmed collapse distance value is reached.

5.7.6.2 Configuring Weld Pressure Stepping

Figure 5.16 Configuring Weld Pressure Stepping

Table 5.17 Configuring Pressure Stepping

Step	Action
1	Open the weld setup screen for the selected weld recipe.
2	Locate the Weld Pressure parameter.
3	Turn on the Stepping toggle button.
4	Enter the initial Weld Pressure value.
5	To add an amplitude step, press the + button on the left side of the menu.
6	In Weld Pressure Step 1, select the required trigger condition from the Step@ dropdown menu. Available options include: • Time • Energy • Peak Power • Absolute Distance • Collapse Distance
7	Enter the step value for the selected Step@ parameter. The unit of measurement depends on the selected Step@ parameter. For example, if Step@ Time is selected, enter the step value in seconds.
8	Enter the weld pressure value for Step 1.
9	If additional pressure steps are required, press the + button again and repeat the setup for each step. To remove a step, press the – button. You can configure up to 5 pressure steps.
10	Press Cancel to discard changes, or press Done to confirm and save the Weld Pressure Stepping configuration.

5.7.7 Weld Process Parameters

5.7.7.1 Pretrigger

The Pretrigger feature allows ultrasonic energy to begin before the ultrasonic horn makes contact with the part. This can improve weld performance, especially in applications requiring early energy delivery. When Pretrigger is set to ON, you can configure:

- The distance or time at which ultrasonics will start before contact.
- The amplitude of the ultrasonic energy used during pretrigger.

If Auto Pretrigger is selected, ultrasonic energy will automatically start when the ultrasonic horn leaves the home position, streamlining the process for ease of setup.

Figure 5.17 Pretrigger

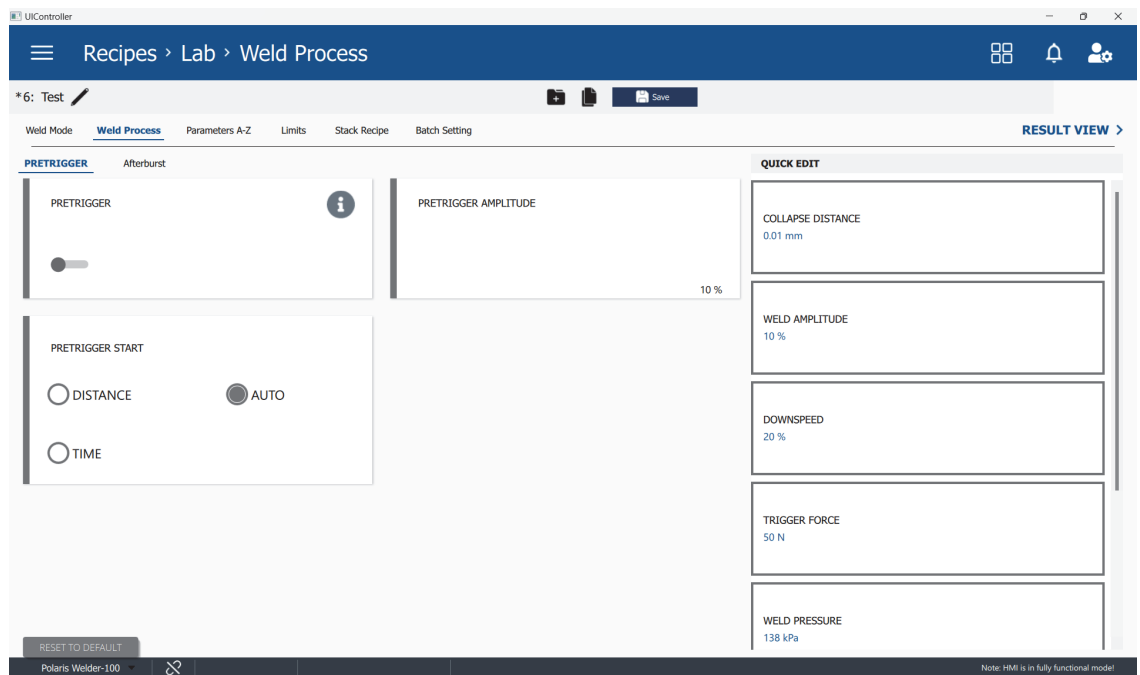


Table 5.18 Pretrigger

Function	Description
Pretrigger	Press the Pretrigger button to toggle the feature ON or OFF.
Pretrigger Amplitude	Sets the amplitude level of the ultrasonic energy delivered during the pretrigger phase. This value determines the intensity of the energy applied before contact. • Min: 10% • Max: 100%
Pretrigger Start	Defines how the pretrigger activation point is determined: • Distance: Ultrasonics start when the ultrasonic horn reaches a specified distance from home. • Auto: Ultrasonics start automatically when the ultrasonic horn leaves the home position. • Time: Ultrasonics start after a specified amount of time has elapsed from the moment the cycle begins, regardless of the ultrasonic horn's position.
Pretrigger Distance	Specifies the distance (in millimeters) from home at which the pretrigger ultrasonics will begin. This option is only available when Pretrigger Start is set to Distance.
Pretrigger Time	Sets the time delay (in seconds) after the weld cycle begins for the pretrigger ultrasonics to activate. This option is used when timing is preferred over distance-based activation.

5.7.7.2 Afterburst

The Afterburst feature activates a short burst of ultrasonic energy after the weld and hold phase. This helps release parts that may stick to the ultrasonic horn, improving cycle efficiency and reducing manual intervention. When Afterburst is set to ON, you can configure:

- The delay before the burst begins.
- The duration of the burst (in seconds).
- The amplitude of the ultrasonic energy used during the burst.

This feature is especially useful in high-throughput environments where part release reliability is critical.

Figure 5.18 Afterburst

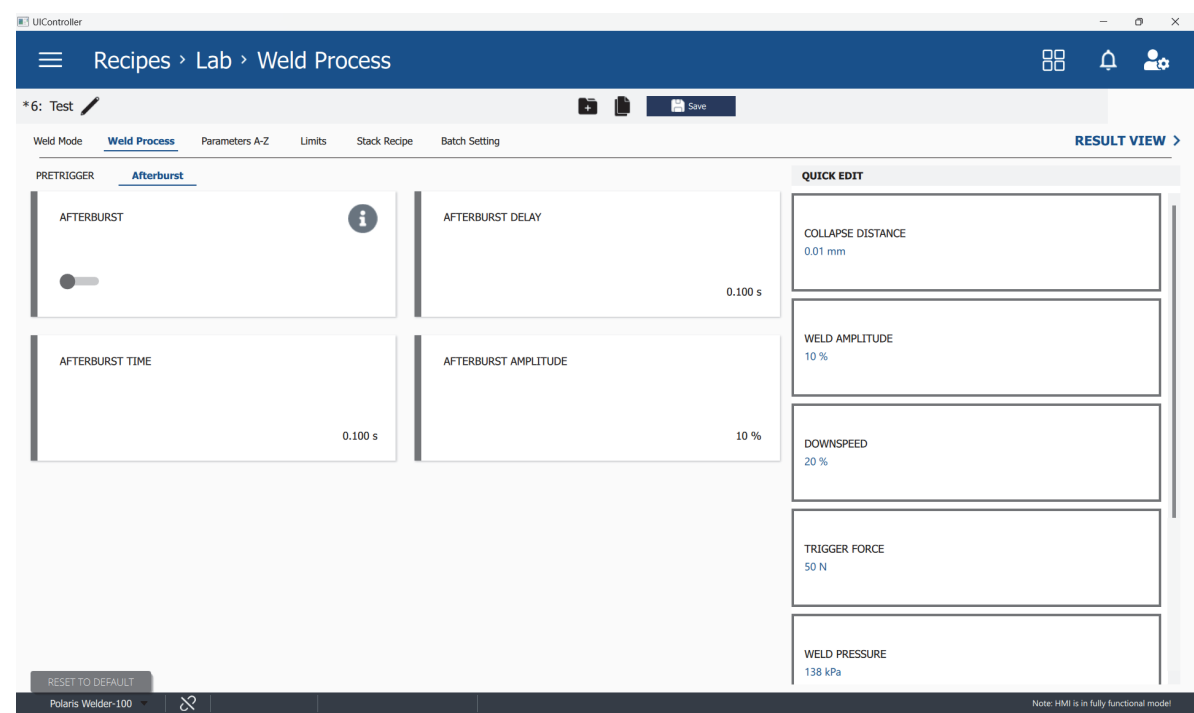


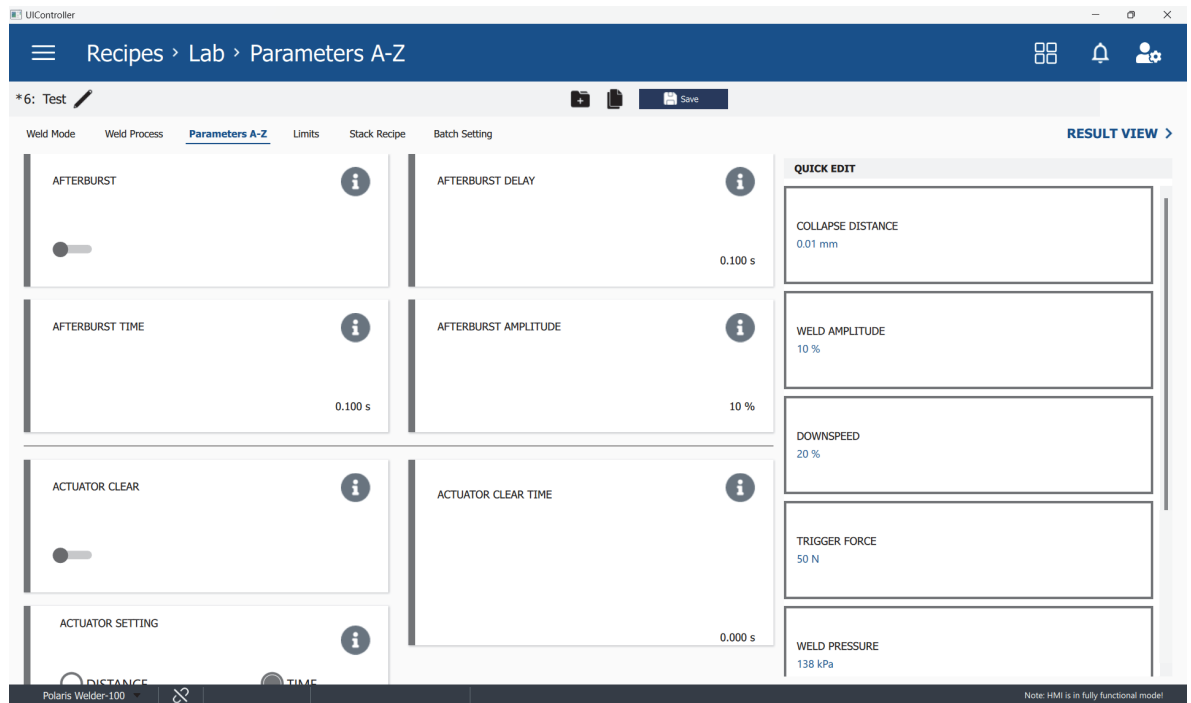
Table 5.19 Afterburst

Function	Description
Afterburst	Press the Afterburst button to toggle the feature ON or OFF. When enabled, a short burst of ultrasonic energy is applied after the weld and hold phases to help release parts that may stick to the ultrasonic horn.
Afterburst Delay	Sets the time delay (in seconds) between the end of the hold time and the start of the afterburst. This allows for a controlled pause before the ultrasonic energy is applied.
Afterburst Time	Defines the duration (in seconds) of the afterburst. This determines how long the ultrasonic energy will be active during the release phase.
Afterburst Amplitude	Sets the amplitude level of the ultrasonic energy used during the afterburst. This controls the intensity of the energy applied to assist in part release.

5.7.8 Parameters A-Z

Displays all the available parameters for the selected weld mode in alphabetic order.

Figure 5.19 Parameters A-Z



5.7.9 Suspect & Reject Limits

The Suspect & Reject function allows the Polaris system to evaluate each weld cycle against predefined limits. Based on these limits, the system can flag a weld as Suspect (requires inspection) or Reject (does not meet quality standards). This ensures consistent weld quality and process control.

Figure 5.20 Suspect & Reject Limits

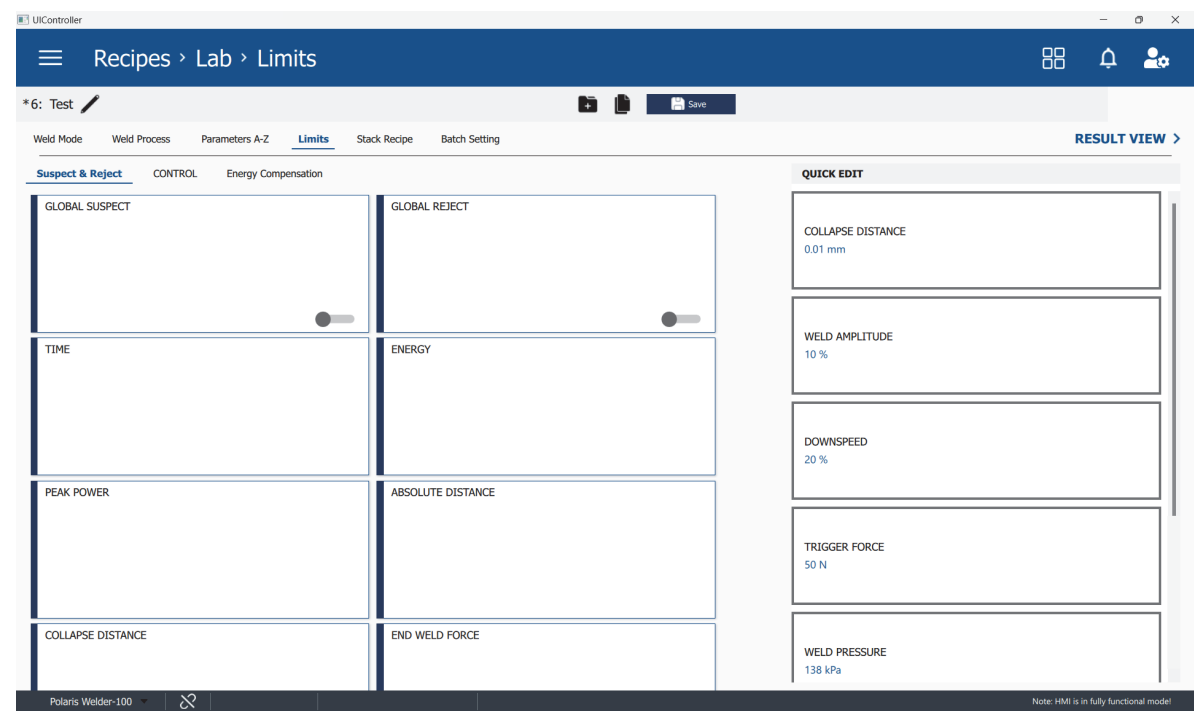


Table 5.20 Suspect & Reject Limits

Step	Instructions
1	Enable Global Suspect/Reject Monitoring Toggle On the following options as needed: - Global Suspect - Global Reject

Table 5.20 Suspect & Reject Limits

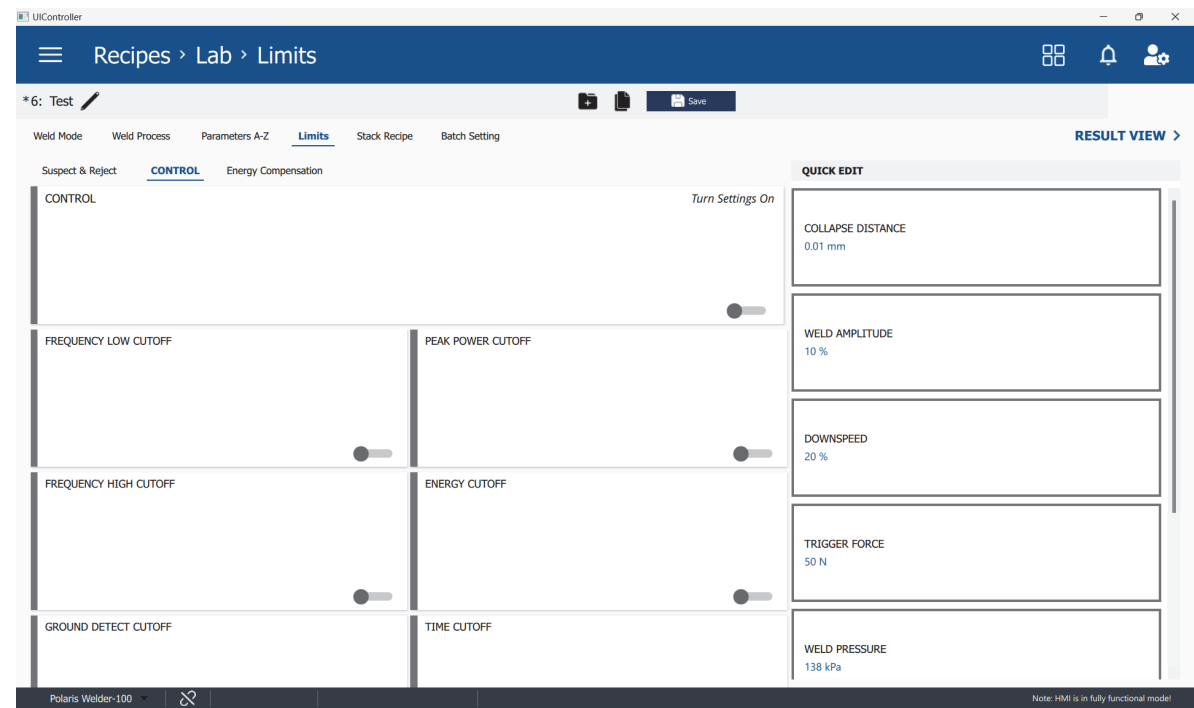
Step	Instructions
2	Configure Monitoring Parameters Select the parameters to monitor for suspect and reject conditions: • Time • Energy • Peak Power • Absolute Distance • Collapse Distance • Max Weld Force • Velocity • Frequency • Trigger Distance Limit  • Suspect and Reject limits use the same value thresholds.
3	Set Reset Behavior For each condition (Suspect or Reject), configure the Reset Required option: • Reset Required: YES The system will require the user to press the Reset key before welding the next part if an alarm is triggered. • Reset Required: NO The system will allow the next weld cycle to proceed without manual reset. See section 5.10.7 Alarm Management for more information.

5.7.10 Control Limits

The Control function allows the system to stop the weld cycle when specific cutoff conditions are reached. These cutoff conditions operate in addition to the primary weld mode parameters.

When Control Limits are enabled, you can configure one or more cutoff limits. If an enabled cutoff reaches its set value during the weld cycle, the system ends the weld phase according to that cutoff condition and then completes the configured hold time.

Figure 5.21 Control Limits



The following cutoffs can be enabled and configured:

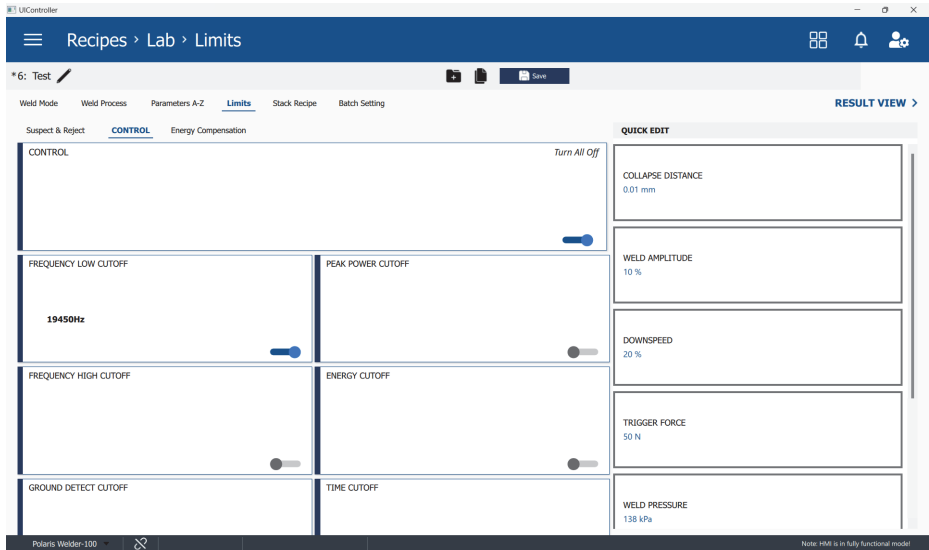
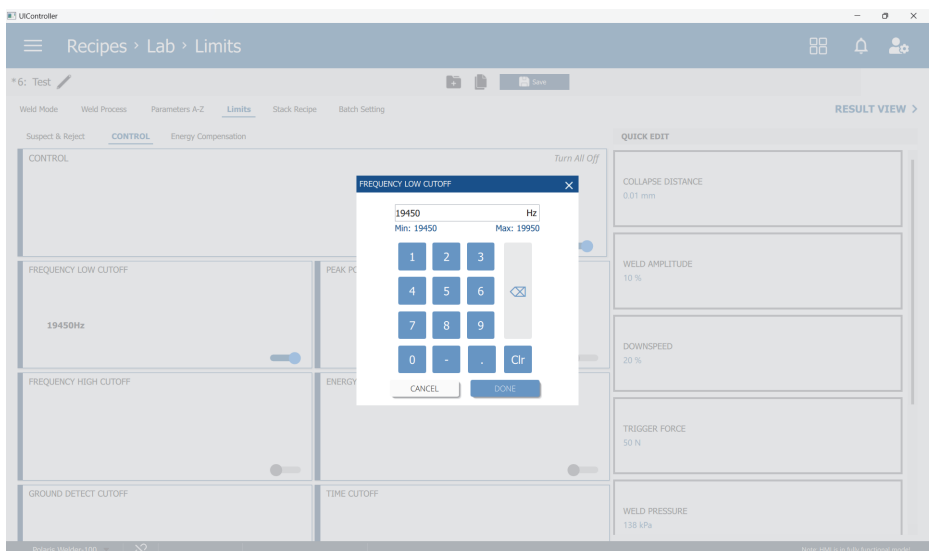
Table 5.21 Step@ Options

Parameter	Description
Frequency Low	Stops the weld cycle if the frequency drops to the set low-frequency limit.
Frequency High	Stops the weld cycle if the frequency rises to the set high-frequency limit.
Peak Power	Stops the weld cycle if the peak power reaches the set power limit.
Energy	Stops the weld cycle if the delivered energy reaches the set energy limit.
Ground Detect	Stops the weld cycle when ground detect is reached for the configured time.
Time	Stops the weld cycle when the configured weld time is reached.
Absolute Distance	Stops the weld cycle when the ultrasonic horn reaches the configured absolute distance.
Collapse Distance	Stops the weld cycle when the configured collapse distance is reached.

The valid value range for each cutoff is displayed on the screen.

5.7.10.1 Enabling Control Cutoffs

Table 5.22 Enabling Control Cutoffs

Step	Action
1	Navigate to the Control screen.
2	Set the main Control toggle to On. When the Control toggle is enabled, the available cutoff options become available for configuration. 
3	Select the cutoff that you want to configure. Set the cutoff toggle to On.
4	Enter the desired cutoff value. The minimum and maximum allowed values for the selected cutoff are displayed on the screen. 
5	Repeat steps 3 through 5 for each additional cutoff that you want to enable.
6	To disable an individual cutoff, set the cutoff toggle to Off. To disable all Control cutoffs, set the main Control toggle to Off.

5.7.11 Energy Compensation

The Energy Compensation feature helps ensure consistent weld quality by dynamically adjusting the weld time based on energy delivery. It allows the system to:

- Extend the weld time beyond the originally set weld time if the minimum energy threshold has not been reached.
- Terminate the weld early if the maximum energy threshold is reached before the set weld time.

This adaptive control helps maintain weld integrity across varying part conditions, material inconsistencies, or environmental factors.

NOTICE



This feature operates only in Time Mode and can extend the weld by no more than 50% of the set weld time.

Figure 5.22 Energy Compensation

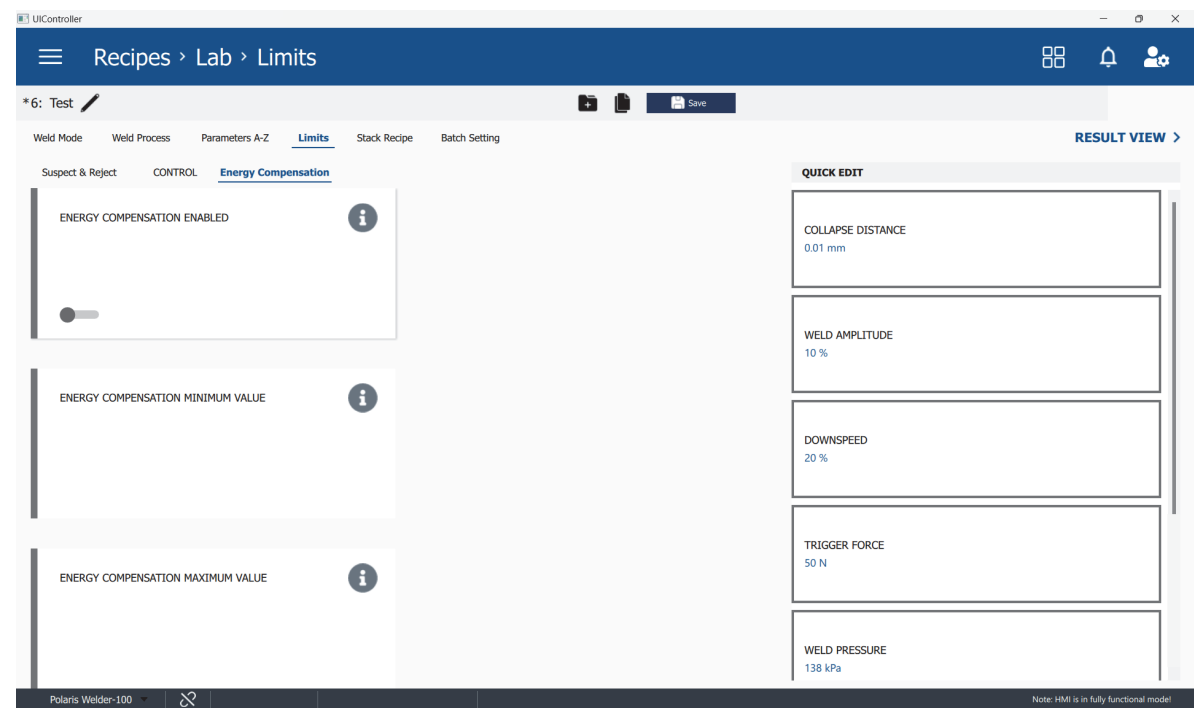


Table 5.23 Energy Compensation

Function	Description
Energy Compensation Enabled	Toggle this setting ON or OFF to activate or deactivate the Energy Compensation feature.
Energy Compensation Minimum Value	Sets the minimum energy (in joules) that must be delivered during the weld. If this value is not reached within the set weld time, the system may extend the weld duration to meet the requirement.
Energy Compensation Maximum Value	Sets the maximum energy (in joules) allowed during the weld. If this value is reached before the set weld time, the weld will end early to prevent over-welding or damage.

5.7.12 Ultrasonic Stack Recipe

The Ultrasonic Stack Recipe tab allows configuration of parameters that are specific to the ultrasonic stack, such as frequency tuning and ramp behavior. These settings help optimize weld performance based on the characteristics of the ultrasonic horn, booster, and transducer.

Figure 5.23 Ultrasonic Stack Recipe

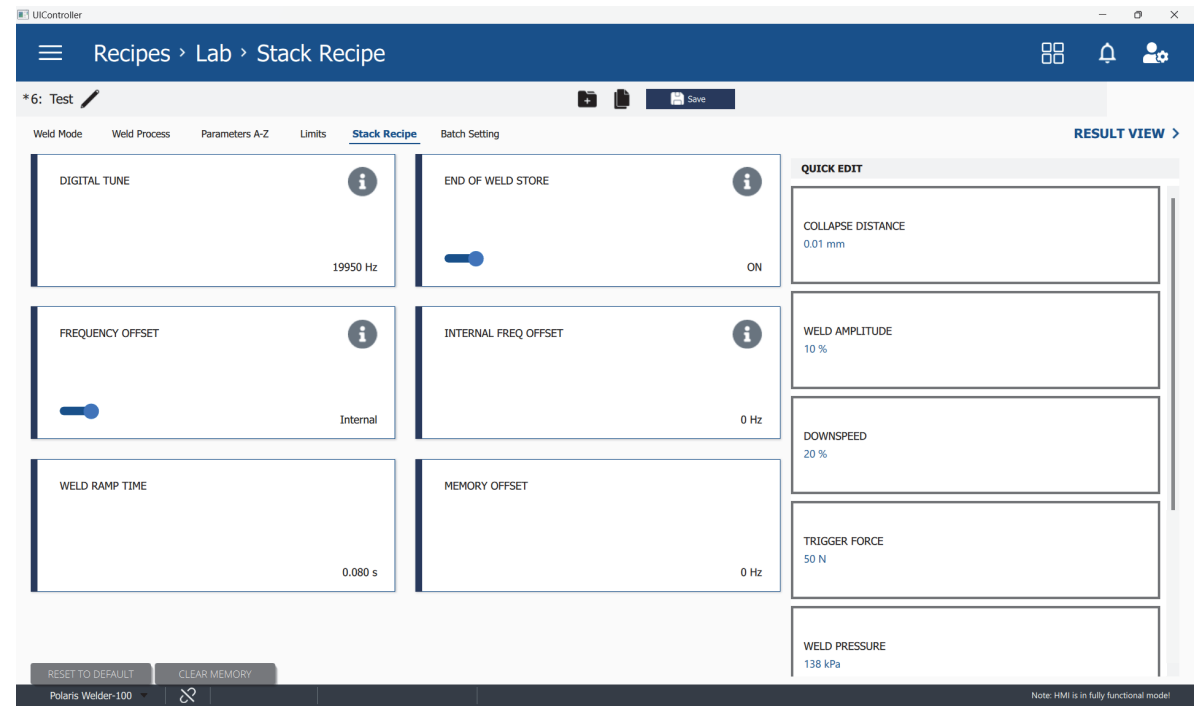


Table 5.24 Ultrasonic Stack Recipe

Function	Description
Digital Tune	Sets the operating frequency of the ultrasonic stack. This can be entered manually or automatically determined using the Set Digital Tune with Horn Scan feature from the Horn Scan menu. See section 5.14.1 Horn Scan for more information.
End of Weld Store	When enabled, stores the frequency at the end of a weld cycle and uses it as the starting frequency for the next weld. This helps maintain consistency in frequency tracking.

5.7.13 Batch Setting

The Batch Setting menu allows you to define and track weld batches for production monitoring and quality control. Follow these steps to configure batch parameters:

Figure 5.24 Batch Setting

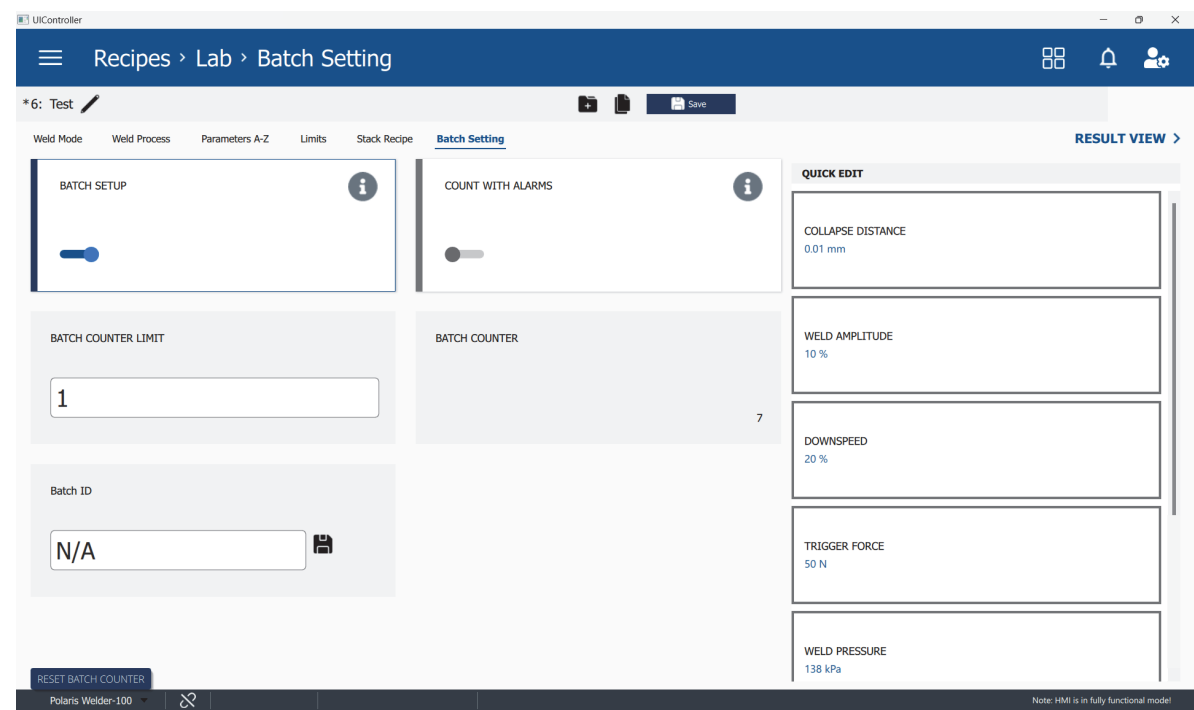


Table 5.25 Batch Setting

Name	Description
Batch Setup	Press the Batch Setup button to enable or disable batch tracking. When ON, the system will begin counting weld cycles as part of a batch.
Count With Alarms	If Count With Alarms is set to ON, weld cycles that trigger alarms will still be counted toward the batch total. If set to OFF, only successful welds will increment the batch counter
Batch Counter Limit	Enter the desired number of welds required to complete the batch. The system will track progress and notify you when the batch is complete.
Batch ID	Assign a unique Batch ID to identify and track each batch. NOTE If Batch ID is used, it must be updated before starting a new batch to ensure accurate record-keeping.
Reset Batch Counter	Press the Reset Batch Counter button to reset the current batch count to zero.

5.8 Production

The Production screen provides real-time operational data to help monitor system performance and track production metrics. When the Production button is pressed, the following key data is displayed:

Figure 5.25 Production Screen

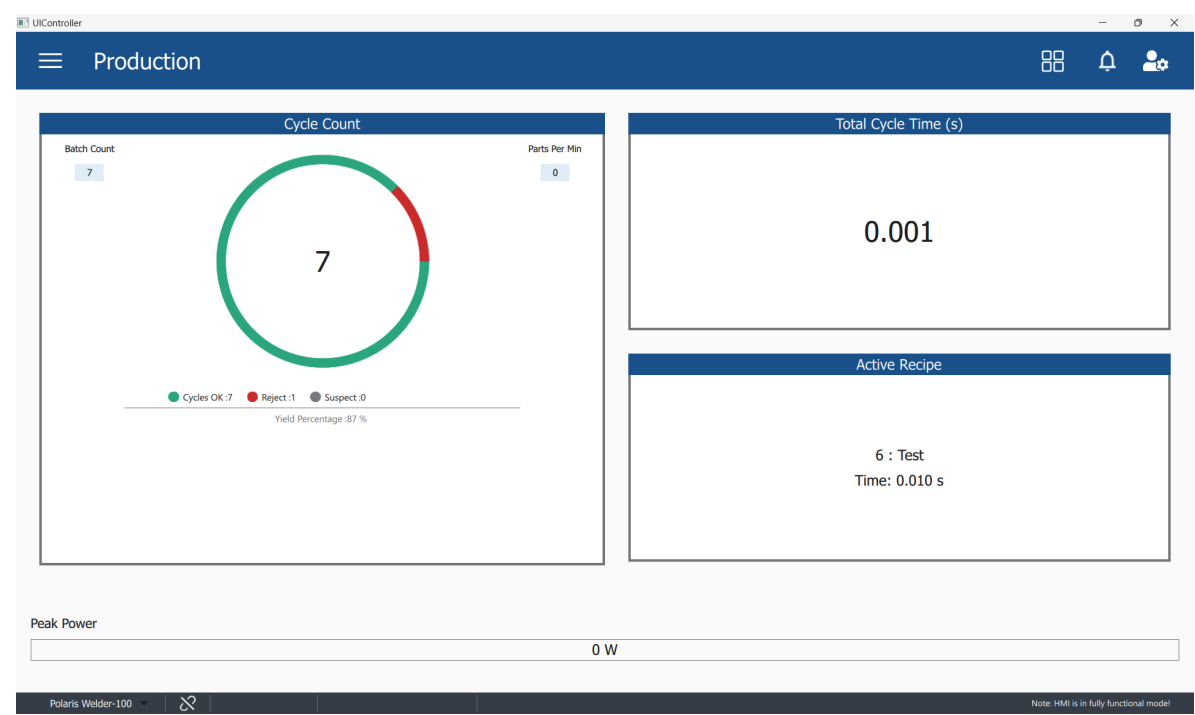


Table 5.26

Name	Description
Cycle Count	Shows the number of weld cycles completed for the active recipe since the last reset or batch start.
Total Cycle Time	Displays the cumulative time spent on welding operations, useful for tracking productivity and machine usage.
Active Recipe	Displays the recipe that is currently loaded and controlling all weld parameters during production.
Peak Power	Shows the highest power level reached during the most recent weld cycle, helping assess weld consistency and detect anomalies.

5.9 Analytics

5.9.1 Results

The Analytics screen provides powerful tools for visualizing and analyzing weld performance data. It combines historical weld records with detailed graphical representations of weld behavior, helping users monitor trends, troubleshoot issues, and optimize process parameters.

Figure 5.26 Results

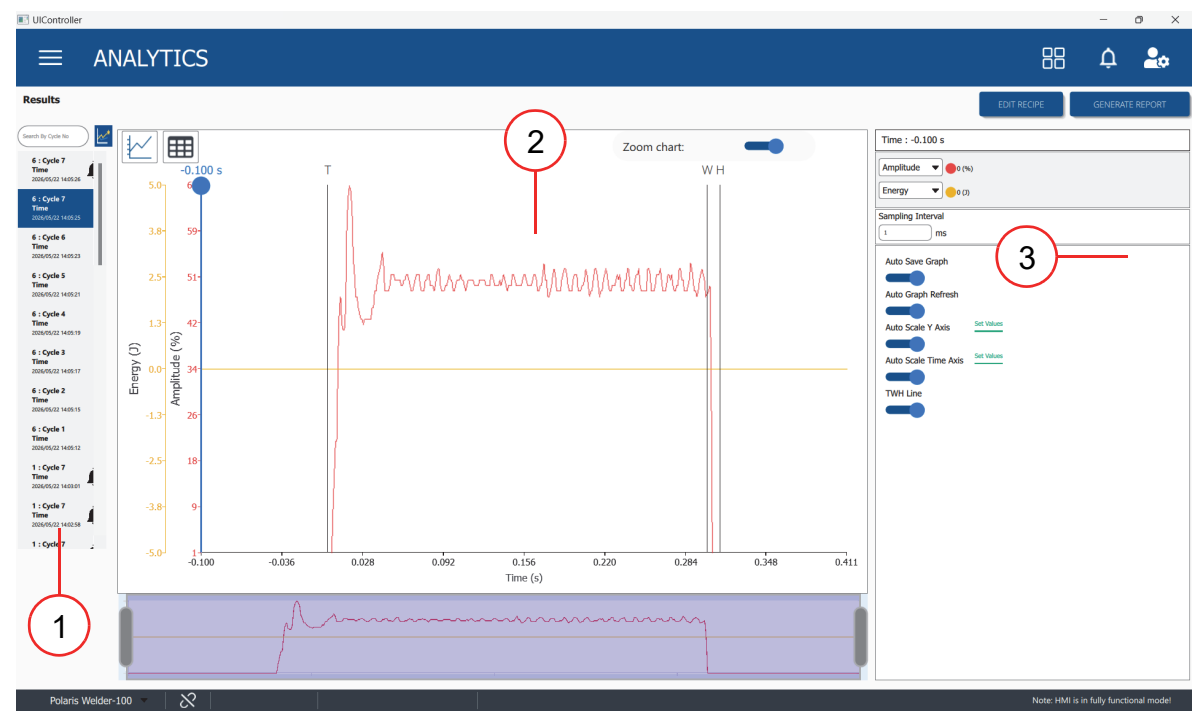


Table 5.27 Results

Name	Description
1. Weld Historical Data	Displays a list of all available weld records, including: • Recipe Number • Cycle Number • Weld Mode • Date and Time When a user selects a specific entry, it becomes highlighted, and the corresponding Weld Signature Graph is displayed. The bottom of the screen also shows the Recipe Number and its version for reference.

Table 5.27 Results

Name	Description
2. Weld Signature Graph	This graph visually represents weld behavior using two selectable parameters at a time: • Amplitude • Power • Frequency • Phase • Current • Energy • Force • Absolute Distance • Collapse Distance • Velocity Users can choose which parameters to display using a drop-down menu located on the right side of the graph. Graph Features: Position Tracking Ball: A draggable marker along the time axis that shows real-time values of the selected parameters at any point in the weld cycle. Zoom Chart Toggle: Enables zoom functionality for detailed analysis. Mini-Map View: A sliding region at the bottom of the graph allows users to select and magnify specific sections of the weld signature.
3. Settings and Controls	Sampling Interval Allows users to enter the data sampling rate in milliseconds, controlling the resolution of the weld graph. Auto Save Graph • When ON, the system automatically saves the weld signature graph after each cycle. • When OFF, the graph is not saved, and data will be lost when a new weld cycle begins. NOTE Saving graph data will reduce cycle rate. Auto Graph Refresh Automatically updates the graph with the latest weld data after each cycle, ensuring real-time visibility. Auto Scale Y Axis • When ON, the Y-axis limits adjust automatically based on the data range. • When OFF, users can manually set the Y-axis min and max values. Auto Scale Time Axis • When ON, the time axis scales automatically to fit the weld duration. • When OFF, users can manually define the time axis range. TWH Line On/Off Button Toggles the visibility of the Trigger, Weld, and Hold phase lines on the graph, helping users correlate weld behavior with process stages.

5.9.1.1 Edit Recipe, Generate Report, Table View

In addition to graphical weld analysis and historical data tracking, the Analytics Screen includes three key tools to enhance usability and data management:

Table 5.28 Edit Recipe

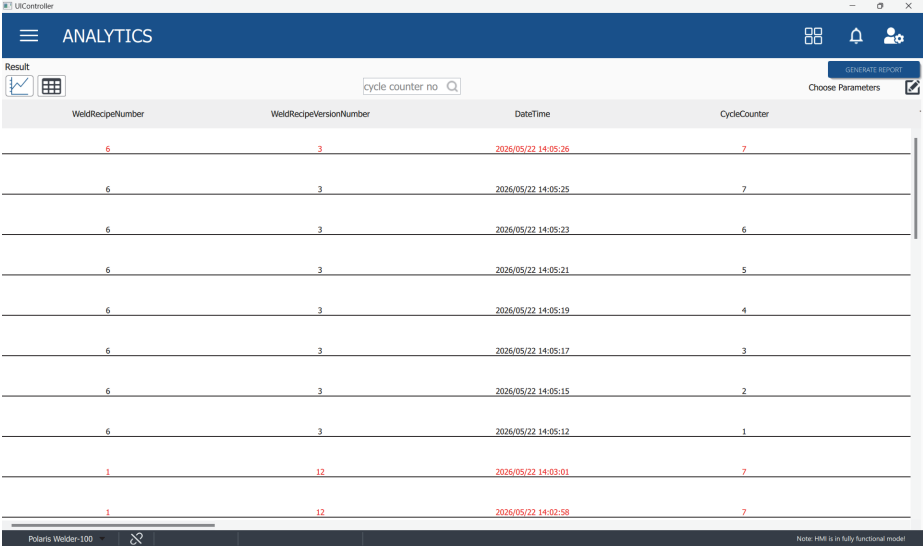
Name	Description
Edit Recipe Button	Allows users to directly access and modify the recipe associated with the selected weld data. This is useful for: • Making adjustments based on weld performance trends. • Quickly refining parameters without leaving the analytics view. • Ensuring recipe updates are informed by actual weld results. See section 5.7 Recipes for more information.
Generate Report Button	Opens the Generate Report screen, where you can create a detailed report based on the selected weld data and signature graph.
Table View Button	By clicking the Table View button at the top-left corner, users can switch from graphical analysis to a tabular representation of weld data. This view organizes weld results into rows and columns for easy comparison and filtering. NOTE Welds that contain alarms will appear in red text for easy identification. 

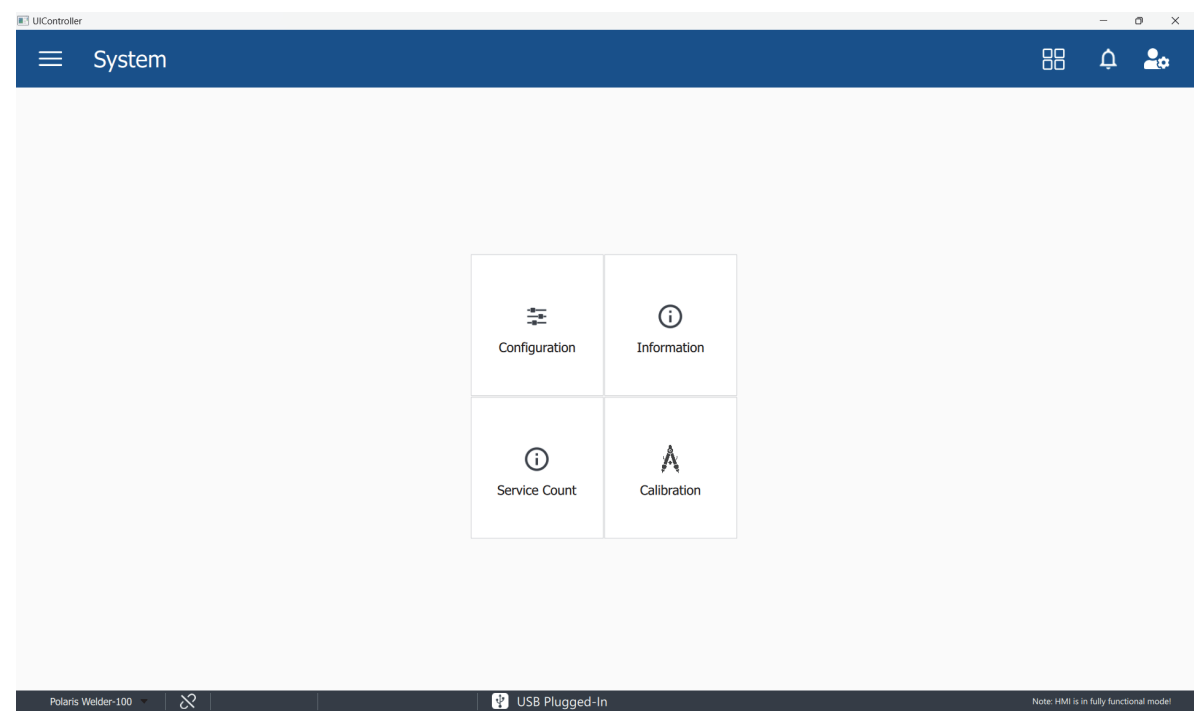
Table 5.28 Edit Recipe

Name	Description
Table View Button 	Displayed Parameters Include: • Weld Recipe Number • Weld Recipe Version Number • Date Time • Cycle Counter • Weld Mode • Weld Pressure (KPa) • Hold Pressure (KPa) • Max Weld Force (N) • Max Hold Force (N) • End Weld Force (N) • End Hold Force (N) • Weld Absolute (mm) • Total Absolute (mm) • Weld Collapse Distance (mm) • Hold Collapse Distance (mm) • Total Collapse Distance (mm) • Trigger Distance (mm) • Weld Time (S) • Weld Energy (J) • Weld PeakPower (W) • Start Frequency (Hz) • Frequency Change • Cycle Time • User Name • Part ID • Batch ID • Trigger Point • Weld Sonic Point (s) • Hold Point (s) • Alarm ID • Recipe Status • Stack Serial Number • Velocity (mm/s) Table View Features: Choose Parameters: Press this button to select which parameters to display from the available list. Drag to Reorder: Users can drag and rearrange columns to customize the sequence of displayed data. This view is ideal for production analysis, troubleshooting, and exporting data for external review.

5.10 System

Set and configure Polaris settings, calibration, and view system information.

Figure 5.27 System



5.10.1 General

The General tab in the Configuration Menu contains system-wide settings that define how the Polaris ultrasonic welder operates, communicates, and interacts with users and external devices. These settings support identification, memory management, user access control, barcode integration, and unit preferences.

Figure 5.28 General

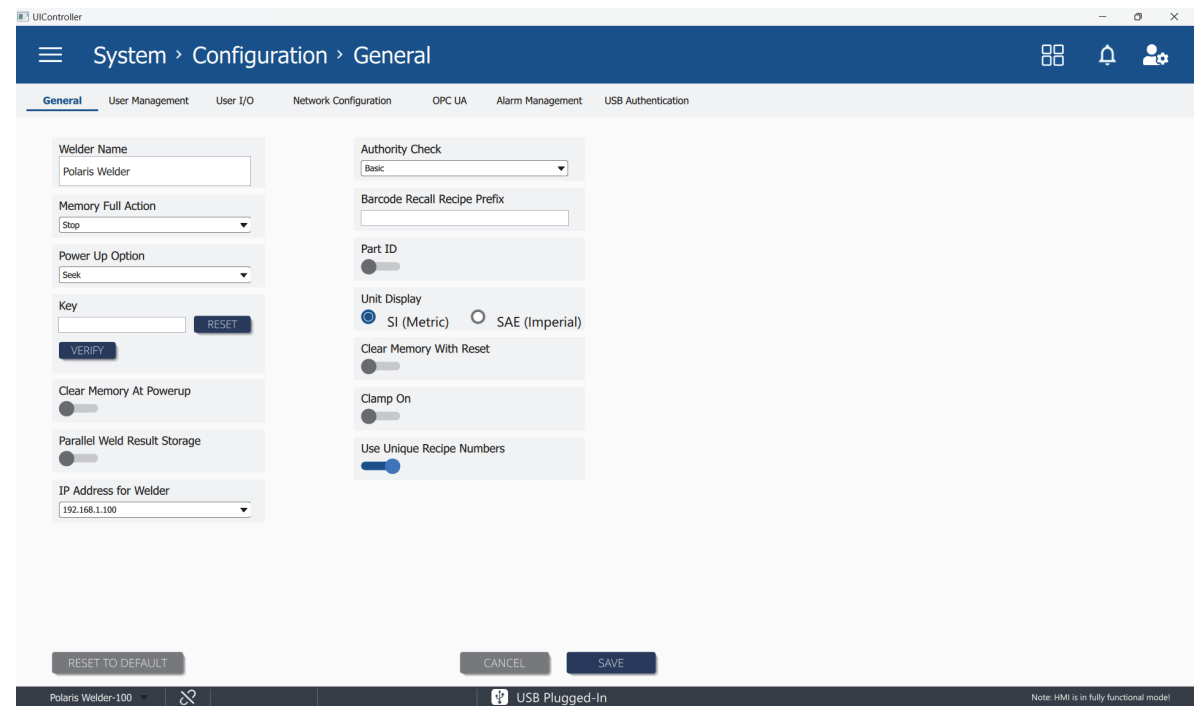


Table 5.29 General Settings

Name	Description
Welder Name	Assign a unique identification name to the Polaris system.
Memory Full Action	Determines system behavior when internal memory is full: Stop: Prevents further welding until memory is cleared. Continue: Overwrites older memory entries to allow uninterrupted operation.
Power Up Option	Choose the system's behavior at startup: Seek: Performs an ultrasonic horn frequency seek. Scan: Performs a full frequency scan. None: No seek or scan is performed at startup.
Authority Check	Enables user access control based on authority levels. When enabled, users must log in and will only have access to features permitted by their role.
Barcode Recall Recipe Prefix	Enter a character (letter or symbol) that will indicate a recipe is to be recalled when scanned with a barcode. The number following the character indicates which recipe number. Example; Barcode recall recipe prefix = R indicates if a barcode reader sees the letter R as the first character of a barcode, it will recall a recipe based on the number after R on the barcode.

Table 5.29 General Settings

Name	Description
Part ID	Users can scan a Part ID linear barcode and the system will associate the next weld with the scanned part ID. If set to ON, a USB barcode reader must read and record the Part ID before allowing the weld to occur. When set to ON and after a weld cycle, the welder will stay out of ready mode until another Part ID is read. If set to OFF, no Part ID reading is required before a weld. NOTE Part ID can be up to 50 characters in length.
Unit Display	Select the measurement system used throughout the interface: • SI (Metric) • SAE (Imperial)
Clear Memory at Powerup	If enabled, the system clears the stored frequency memory each time it powers up.
Clear Memory at Reset	If enabled, clears stored memory when a system reset is performed.
Parallel Weld Results Storage	The Parallel Weld Results Storage option is designed for customers who want to maximize throughput. When this feature is enabled, the Polaris system will begin the next weld cycle while the previous weld results are still being saved. • Helps maintain high cycle rates in fast-paced production environments. • Ideal for operations where speed and traceability are both critical.
Clamp On Alarm	The Clamp On Alarm feature keeps the ultrasonic horn clamped onto the part after a weld cycle ends with an alarm condition, such as an overload or failure. • Provides a visual and physical indication that the weld was unsuccessful. • Helps operators quickly identify faulty welds without relying solely on screen alerts. • Useful for quality control and manual inspection workflows.

5.10.2 User Management

The User Management tab provides tools for managing user access and permissions within the Polaris system. This section supports secure operation by allowing administrators to define who can access specific features based on authority levels.

NOTICE	
	Only executive level users can manage users.

5.10.2.1 User List

The User List tab displays all registered users along with the following details:

Figure 5.29 User Management

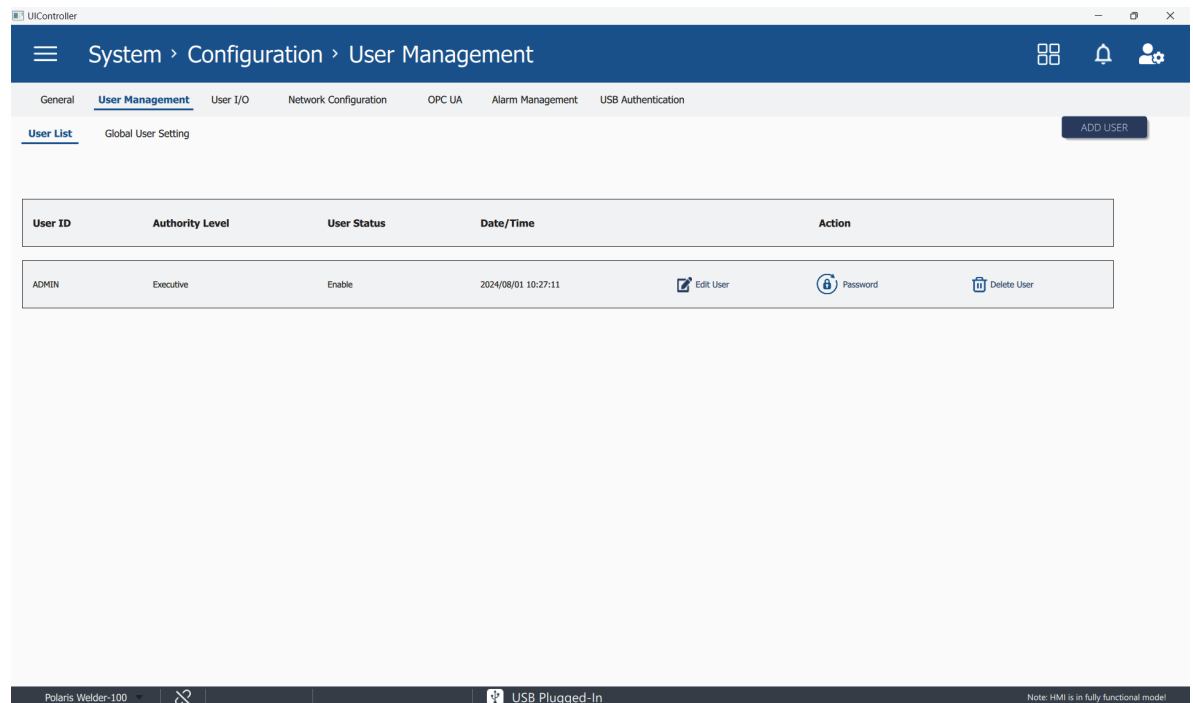


Table 5.30 User Management

Name	Description
User ID	The unique identifier assigned to each user.
Authority Level	Indicates the user's access rights (e.g., Operator, Technician, Supervisor).
User Status	Indicates whether the user account is Enabled or Disabled.
Creation/Modification Date	Displays when the user account was created or last updated.
Add User	Press the Add User button to create a new user account. You will be prompted to enter a User ID, assign an authority level, and set a password.
Edit User	Select an existing user to modify their details, such as authority level or password.
Delete User	Remove a user account from the system.

5.10.2.2 Add User

The Add User screen allows administrators to create new user accounts and assign appropriate access levels within the Polaris system. This ensures secure operation and role-based control over system features.

Figure 5.30 Add User

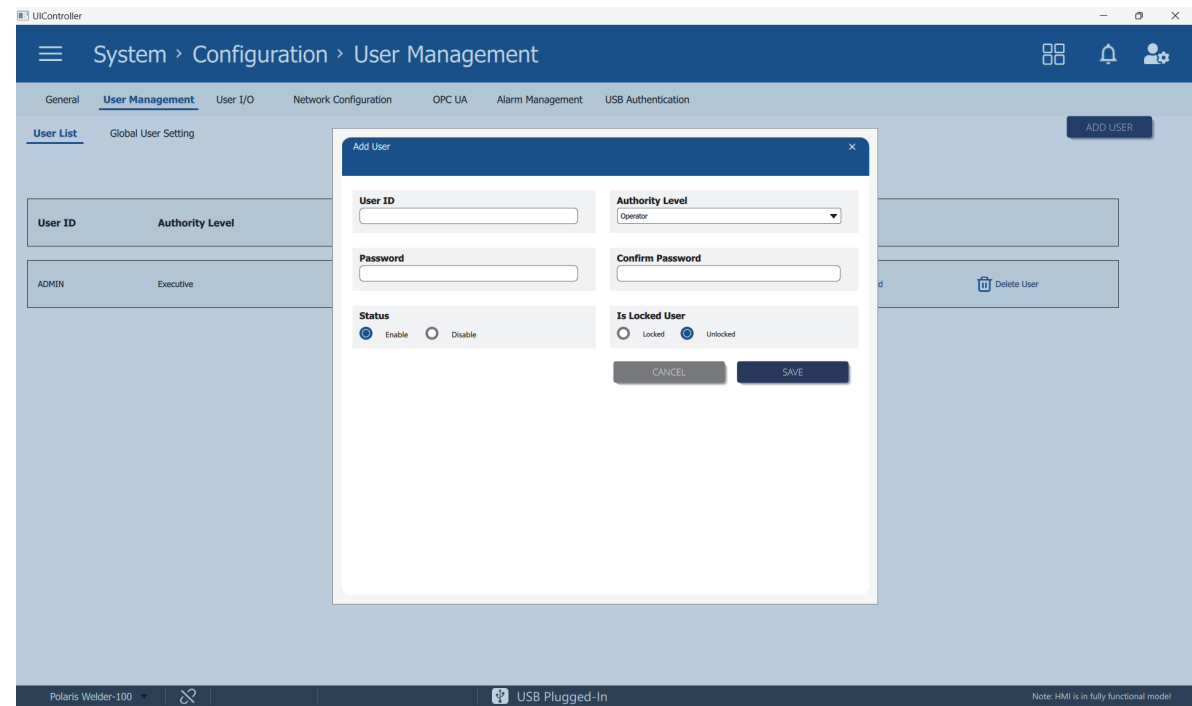


Table 5.31 Add User

Name	Description
User ID	Enter a unique identifier for the new user. This ID will be used for login and tracking user activity.
Password	Set a secure password for the user account. NOTE Passwords must be 8 to 20 characters in length. Each password must contain at least one uppercase letter, one lowercase letter, one number, and one of the following special characters: @, #, %, &, *, _, -, !.
Authority Level	Assign the user’s access level by selecting one of the following roles: Operator: Can run Validated Recipes, and view Setup, System Information, Weld History, Alarm Log, Event Log, and Weld Results. Technician: Includes all Operator permissions, plus access to Unvalidated Recipes, Horn Down, Sequencing, Recipe Changes, Calibration, and Diagnostics. Supervisor: Includes all Technician permissions, plus the ability to Validate Setup and modify System Configuration. Executive: Full access to all system settings and features.
Status	Choose whether the user account is active (Enabled) or inactive (Disabled). Disabled users cannot log in or access the system.

5.10.2.3 Global User Setting

The User Global Setting tab provides system-wide controls for user account behavior, session security, and login automation. These settings help enforce password policies, manage session timeouts, and streamline access for frequent users.

Figure 5.31 Global User Setting

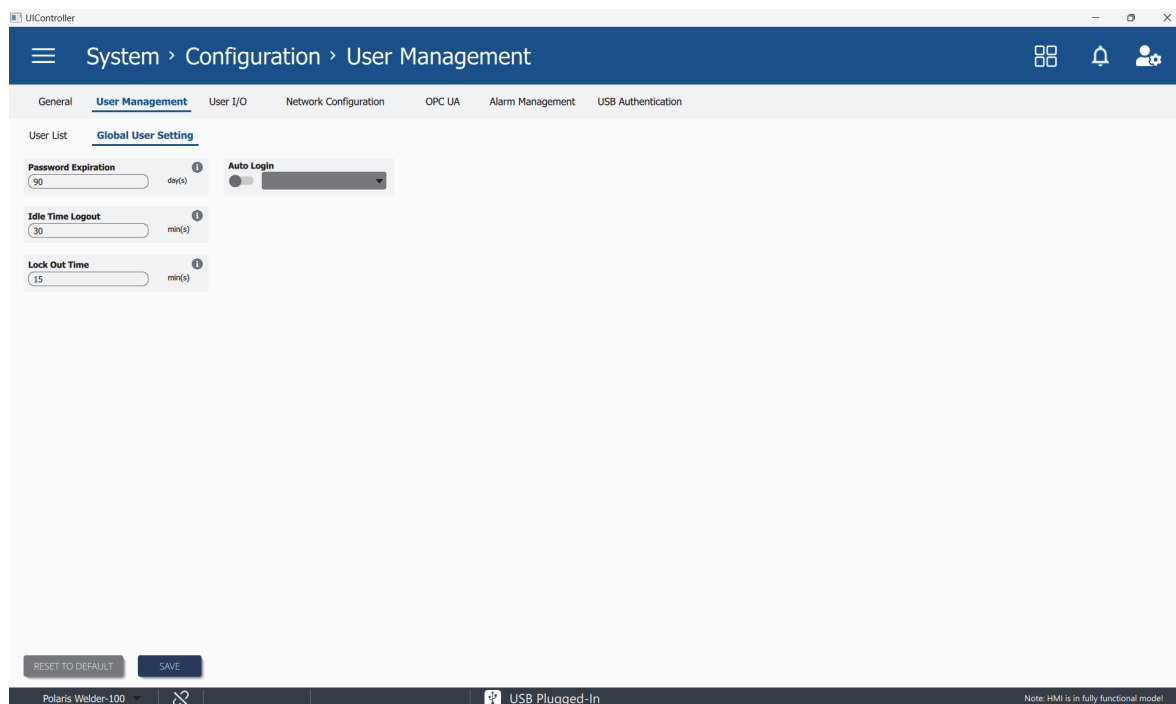


Table 5.32

Name	Description
Password Expiration	Defines how many days a user password remains valid before requiring a change. This helps maintain account security by enforcing regular password updates. If the value is set to 0, the password never expires.
Idle Time Logout	Sets the duration of inactivity (in minutes) after which a user is automatically logged out. This prevents unauthorized access if the system is left unattended. If the value is set to 0, automatic logout is disabled and the user remains logged in regardless of inactivity.
Lock Out Time	Specifies the time a user must wait before attempting to log in again after multiple failed login attempts. This protects against brute-force access attempts. If the Lock Out Time value is set to 0, a locked-out user remains locked out indefinitely and can be unlocked only by a user with Executive access level.
Auto Login	Allows the system to automatically log in a selected user at startup. Choose a User ID from the dropdown menu to enable auto login. This feature is useful in environments where a single operator consistently uses the system. Only users with the Operator access level can be assigned as the auto login user. Users with Technician, Supervisor, or Executive access levels cannot be configured for automatic login.

5.10.3 User I/O

Use this menu to configure the Polaris system I/O according to your specific interfacing needs. Use the buttons on the bottom to save settings, or restore to factory default settings.

5.10.3.1 Digital Inputs

Figure 5.32 Digital I/O

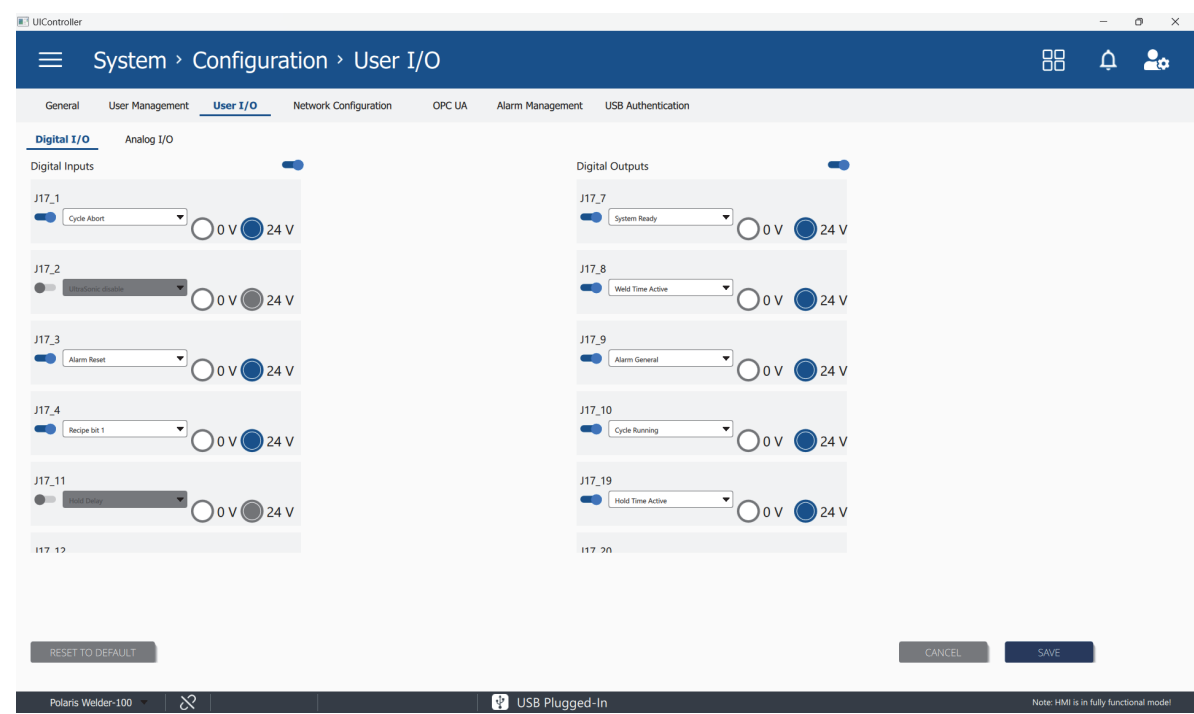


Table 5.33 Digital Inputs

Input	Signal Levels	Description	Default Value
Alarm Reset	0 VDC or 24 VDC	Resets all active alarms when the input is asserted. Alarms caused by conditions that are still present cannot be cleared until the condition is corrected.	24 VDC
Cable Detect	24 VDC	Indicates the presence of the communication cable. The input is expected to remain asserted during normal operation. If the input is deasserted, ultrasonic operation is stopped and prevented from starting. The Communication Cable alarm remains active until the input is asserted again. NOTE Input is fixed at 24 VDC and cannot be configured for 0 VDC operation.	24 VDC
Cycle Abort	0 VDC or 24 VDC	Stops the current weld cycle and returns the actuator to the Home position when asserted. The system also generates a No Cycle alarm.	24 VDC
Display Lock	0 VDC or 24 VDC	Locks the HMI display when the input is asserted. While locked, the HMI remains on the current screen and the user cannot navigate to other screens or modify any parameters. When the input is deasserted, the HMI display is unlocked and normal operation is restored.	24 VDC

Table 5.33 Digital Inputs

Input	Signal Levels	Description	Default Value
External Amplitude Trigger 1	0 VDC or 24 VDC	Select an external amplitude-step index based on the state of the three inputs. The selected amplitude step is determined by the combination of asserted and deasserted inputs. See Table 5.34 for more information.	24 VDC
External Amplitude Trigger 2			
External Amplitude Trigger 3			
External Tooling	0 VDC or 24 VDC	Indicates that the external tooling is ready for operation. When configured, a weld cycle cannot be started unless this input is asserted.	24 VDC
Hold Delay	0 VDC or 24 VDC	Extends the hold state after completion of the configured Hold Time. When enabled, the system remains in the hold state until this input is asserted. Once asserted, the system exits the hold state and continues the cycle sequence.	24 VDC
Horn Scan	0 VDC or 24 VDC	Starts a Horn Scan when the input is asserted. The input must remain asserted for the duration of the scan. If the input is deasserted before the scan is complete, the scan is aborted. This input is ignored while a Horn Scan is already in progress. To start a new Horn Scan, the input must first be deasserted and then asserted again.	24 VDC
Horn Seek	0 VDC or 24 VDC	Indicates a request to start a Horn Seek operation. When asserted, the system initiates a Horn Seek. This input is ignored while a Horn Seek is already in progress. The input must be deasserted before another Horn Seek can be started.	24 VDC
Horn Test	0 VDC or 24 VDC	Starts a Horn Test when the input is asserted. The Horn Test remains active while the input is asserted and stops when the input is deasserted.	24 VDC
Load Recipe	0 VDC or 24 VDC	Loads a recipe based on the value of the configured Recipe Bits when the input is asserted. If no weld cycle is in progress, the selected recipe becomes the active recipe immediately. If asserted during a weld cycle, the recipe change is deferred and takes effect before the start of the next weld cycle.	24 VDC
Memory Clear	0 VDC or 24 VDC	Indicates a request to clear the memory offset. When asserted, the system clears the current memory offset.	24 VDC
Part Present	0 VDC or 24 VDC	Indicates that a workpiece is present and ready for welding. When configured, a weld cycle cannot be started unless this input is asserted.	24 VDC
Recipe Bit 1	0 VDC or 24 VDC	The inputs represent binary weights of 1, 2, 4, and 8, respectively. The sum of the asserted inputs determines the recipe number to be loaded. For example, asserting Recipe Bit 1 and Recipe Bit 4 selects Recipe 5.	24 VDC
Recipe Bit 2			
Recipe Bit 4			
Recipe Bit 8			
U/S Disable	0 VDC or 24 VDC	Disables ultrasonic output when asserted, allowing the actuator to perform the weld sequence without generating ultrasonics.	24 VDC
Ultrasonic Delay	0 VDC or 24 VDC	Delays the start of ultrasonics following a trigger event, allowing an external operation to be completed before the weld cycle continues. If the delay exceeds 30 seconds, the weld cycle is aborted.	24 VDC

Table 5.34 External Amplitude Trigger

Trigger 1	Trigger 2	Trigger 3	Selected Function
Off	Off	Off	No External Amplitude Step
On	Off	Off	External Amplitude Step 0
Off	On	Off	External Amplitude Step 1
On	On	Off	External Amplitude Step 2
Off	Off	On	External Amplitude Step 3
On	Off	On	External Amplitude Step 4

5.10.3.2 Digital Outputs

Table 5.35 Digital Outputs

Output	Signal Levels	Description	Default Value
Actuator Clear	0 VDC or 24 VDC	Indicates that the actuator has cleared the workpiece after the weld cycle. The output is asserted during the return stroke after the configured clearance condition has been met. Depending on the active recipe, the clearance condition can be based on either elapsed time or actuator position. The output is deasserted at the start of the next weld cycle.	24 VDC
Actuator Home	0 VDC or 24 VDC	Indicates that the actuator has reached the Home position. The output is asserted when the actuator is at the upper limit position and deasserted when the actuator moves away from the upper limit position.	24 VDC
Afterburst Delay	0 VDC or 24 VDC	Indicates that the Afterburst Delay phase is active. The output is asserted during the Afterburst Delay interval and deasserted when the interval is complete.	24 VDC
Alarm Custom	0 VDC or 24 VDC	Indicates the presence of a custom alarm condition. The output is asserted when any custom alarm is active and deasserted when all custom alarms have been cleared.	24 VDC
Alarm Cutoff	0 VDC or 24 VDC	Indicates the presence of a cutoff alarm condition. The output is asserted when any cutoff alarm is active and deasserted when all cutoff alarms have been cleared.	24 VDC
Alarm General	0 VDC or 24 VDC	Indicates the presence of a general alarm condition. The output is asserted when any general alarm is active and deasserted when all general alarms have been cleared.	24 VDC
Alarm Overload	0 VDC or 24 VDC	Indicates the presence of an overload alarm condition. The output is asserted when any overload alarm is active and deasserted when all overload alarms have been cleared.	24 VDC
Alarm Reject Part	0 VDC or 24 VDC	Indicates that the current part has been rejected due to a configured reject-part alarm condition. The output is asserted when a reject-part alarm occurs and is deasserted when no reject-part alarm conditions are active.	24 VDC
Confirm Recipe	0 VDC or 24 VDC	Indicates that a recipe selected through the configured Recipe Bit inputs has been successfully loaded. The output is asserted when the requested recipe is accepted and becomes the active recipe. The output is deasserted when the requested recipe is invalid or cannot be loaded.	24 VDC
Cycle OK	0 VDC or 24 VDC	Indicates successful completion of a weld cycle. The output is asserted when the system returns to the Ready position without an active alarm.	24 VDC
Cycle Running	0 VDC or 24 VDC	Indicates that a weld cycle is in progress. The output is asserted while the weld cycle is running and deasserted when the cycle is not running.	24 VDC
External Tooling	0 VDC or 24 VDC	Indicates that a weld cycle has been started with the External Tooling input active. The output is asserted when the weld start request is accepted and remains asserted throughout the cycle. The output is deasserted when the actuator returns to the Home position and the PB Release conditions have been satisfied.	24 VDC
Hold Time Active	0 VDC or 24 VDC	Indicates that afterburst ultrasonics are active. The output is asserted while afterburst ultrasonics are enabled and deasserted when the afterburst phase is complete.	24 VDC

Table 5.35 Digital Outputs

Output	Signal Levels	Description	Default Value
Horn Scan	0 VDC or 24 VDC	Indicates that a Horn Scan operation is in progress. The output is asserted while the system is performing a Horn Scan and is deasserted when the Horn Scan operation is complete.	24 VDC
Horn Seek	0 VDC or 24 VDC	Indicates that a Horn Seek operation is in progress. The output is asserted while the Horn Seek operation is active and deasserted when the operation is not active.	24 VDC
Horn Test	0 VDC or 24 VDC	Indicates that a Horn Test operation is in progress. The output is asserted while the system is performing a Horn Test and is deasserted when the Horn Test operation is complete.	24 VDC
Memory Clear Active	0 VDC or 24 VDC	Indicates that the Memory Clear function is active. The output is asserted while the Memory Clear input is asserted and is deasserted when the Memory Clear input is deasserted.	24 VDC
PB Release	0 VDC or 24 VDC	Indicates that the palm-button start signal can be released. The output is asserted when the system enters an alarm state, exits the hold state, a weld trigger condition is met, or an alarm occurs during the weld cycle. The output is deasserted when the system returns to the Ready state.	24 VDC
Solenoid Active	0 VDC or 24 VDC	Indicates that the actuator downstroke is active. The output is asserted during actuator descent and is deasserted when the actuator returns, reaches the Ready state, or enters an alarm or emergency-stop condition.	24 VDC
System Ready	0 VDC or 24 VDC	Indicates that the system is ready to perform an operation. The output is asserted when no weld, Horn Seek, Horn Scan, Horn Test, or other operation is in progress. The output is deasserted when the system leaves the Ready state or when an active alarm requiring reset is present. Alarms that do not require a reset do not deassert this output.	24 VDC
Ultrasonics Active	0 VDC or 24 VDC	Indicates that ultrasonics are active. The output is asserted while ultrasonics are being generated during any operation, including a weld cycle, Horn Seek, Horn Scan, or Horn Test. The output is deasserted when ultrasonics are no longer active.	24 VDC
Weld Time Active	0 VDC or 24 VDC	Indicates that the weld phase is in progress and ultrasonics are active. The output is asserted when the system enters the weld phase and remains asserted for the duration of the weld. The output is deasserted when the weld phase is complete.	24 VDC

5.10.3.3 Analog Inputs

Figure 5.33 Analog I/O

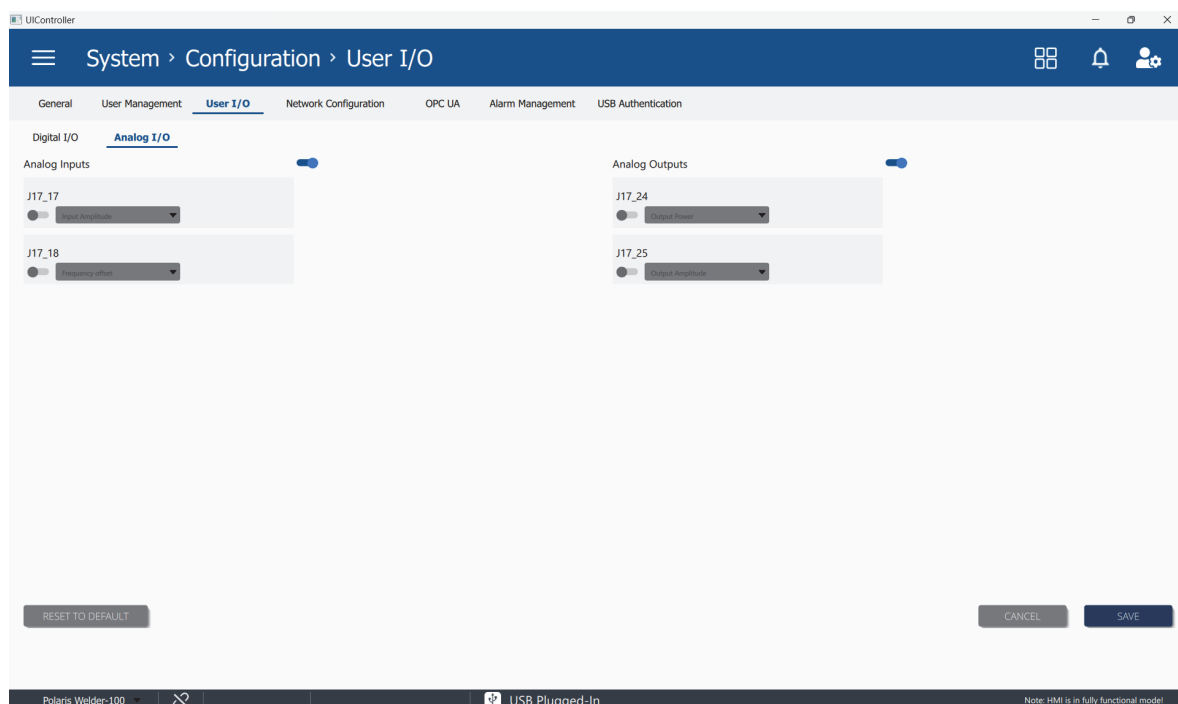


Table 5.36 Analog Inputs

Input	Description		Valid Range
Amplitude	Controls the amplitude of ultrasonic energy that will be delivered by the power supply.		1 V to 10 V (10% to 100%)
Frequency Offset	Controls the frequency offset to the power supply operating frequency. Actual offset depends on the power supply operating frequency:		0 V to 10 VDC (5 V is zero offset)
	Frequency	Offset Range	
	20 kHz	+/- 500 Hz	
	30 kHz	+/- 750 Hz	
	40 kHz	+/- 1000 Hz	

5.10.3.4 Analog Outputs

Table 5.37 Analog Outputs

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

5.10.4 LDAP

NOTE	
	This section provides an overview of the LDAP configuration fields. For detailed setup, configuration, certificate installation, and validation procedures, refer to Appendix D: LDAP .

5.10.4.1 LDAP Configuration

The LDAP Configuration allows the Polaris system to connect to an external directory service for user authentication and access control. This integration supports centralized user management, improves security, and simplifies login procedures across networked systems.

Figure 5.34 LDAP Configuration

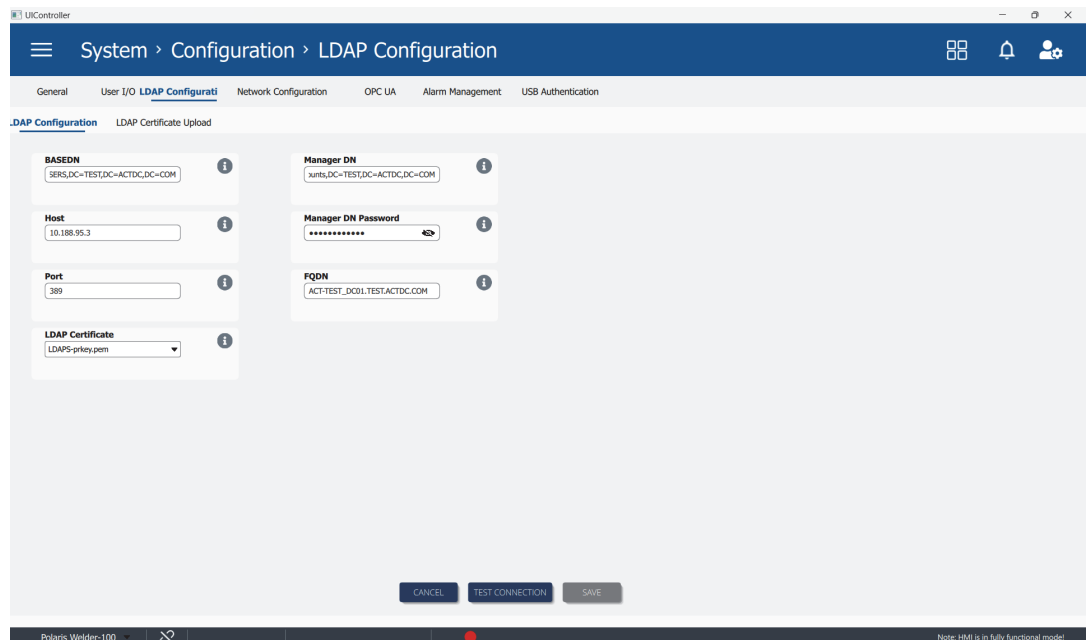


Table 5.38 LDAP Configuration

Name	Description
Base DN	Specifies the starting point in the directory tree for LDAP searches. Example format: dc=yourcompany,dc=com
Host	Enter the hostname or IP address of the LDAP server. Example: ldap.yourcompany.com or 192.168.1.100
Port	Define the network port used to communicate with the LDAP server. Common ports: 389 for standard LDAP, 636 for LDAP over SSL (LDAPS)
Manager DN	Enter the DN Name of the LDAP account with permission to perform directory searches.
Manager DN Password	Enter the password for the Manager DN account. This is used to authenticate the connection to the LDAP server.
Test Connection	Use the Test Connection button to verify successful communication with the LDAP server.

5.10.4.2 LDAP Certificate Upload

The LDAP Certificate Upload function allows the system to import a security certificate from a USB device for secure communication with an LDAP server.

Figure 5.35 LDAP Certificate Upload

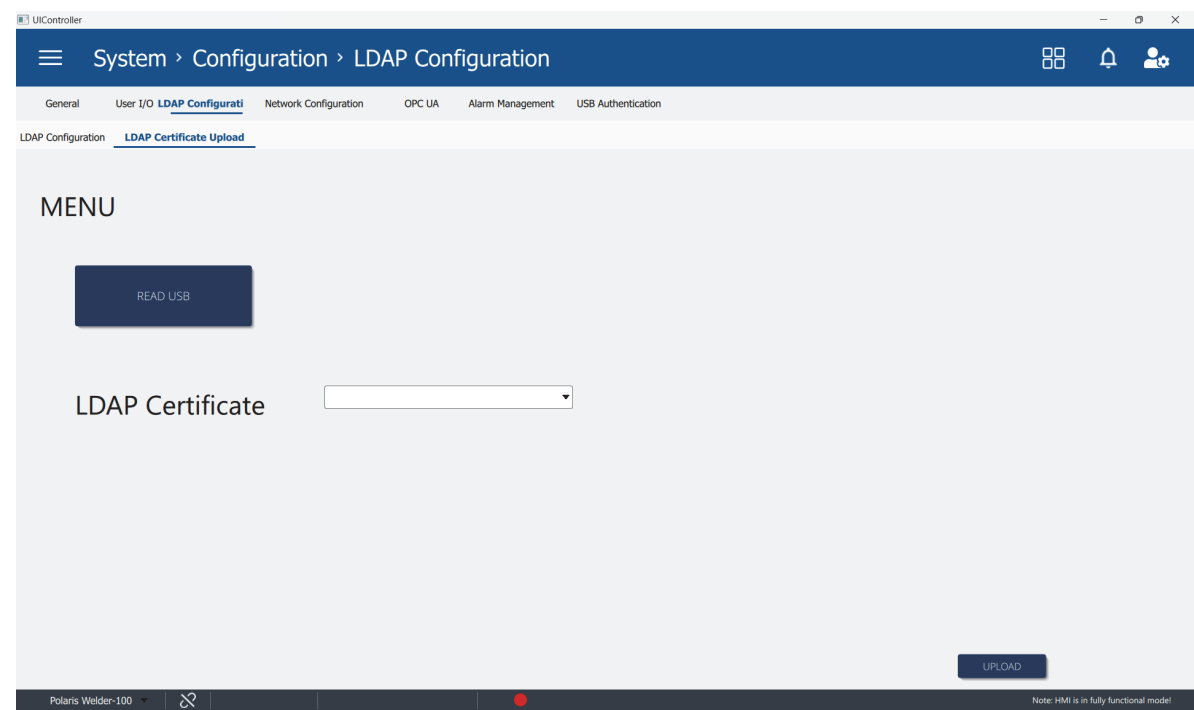


Table 5.39 LDAP Certificate Upload

Name	Description
Read USB	Scans the connected USB device for available LDAP certificate files.
LDAP Certificate	Displays the list of certificate files detected on the USB device.
Upload Button	Uploads and installs the selected LDAP certificate into the system.

5.10.5 Network Configuration

The Network Configuration menu allows users to set up and manage the Polaris system's network connectivity. This is essential for enabling remote access, data storage, and integration with factory systems.

5.10.5.1 IP Setup

This tab allows users to configure how the Polaris system obtains its IP address:

Figure 5.36 IP Setup

The screenshot shows the 'UIController' window with the 'System > Configuration > Network Configuration' path. The 'Network Configuration' tab is active, and the 'IP SETUP' sub-tab is selected. The 'Configuration - Communication' section shows 'STATIC IP' as the selected method. The 'IP ADDRESS' field contains '192.168.2.100', 'SUBNET MASK' contains '255.255.255.0', and 'DEFAULT GATEWAY' contains '192.168.2.1'. At the bottom, there are buttons for 'RESET TO DEFAULT', 'CANCEL', and 'SAVE'. The status bar at the very bottom indicates 'Polaris Welder-100', 'USB Plugged-In', and a note that 'HMI is in fully functional mode'.

Table 5.40 IP Setup

Configuration	Description
Static IP	Select this option to manually assign a fixed IP address to the system. This is recommended for stable network environments where the welder must always be reachable at the same address.
DHCP Client	Select this option to allow the system to automatically obtain an IP address from a DHCP server on the network.
IP Address	The unique address assigned to the Polaris system on the network (e.g., 192.168.1.100).
Subnet Mask	Defines the network segment (e.g., 255.255.255.0).
Default Gateway	The IP address of the router or gateway used to access external networks.

5.10.5.2 NFS Setup

This tab is used to configure Network File System (NFS) settings, allowing the Polaris system to store or access files on a remote server.

Figure 5.37 NFS Setup

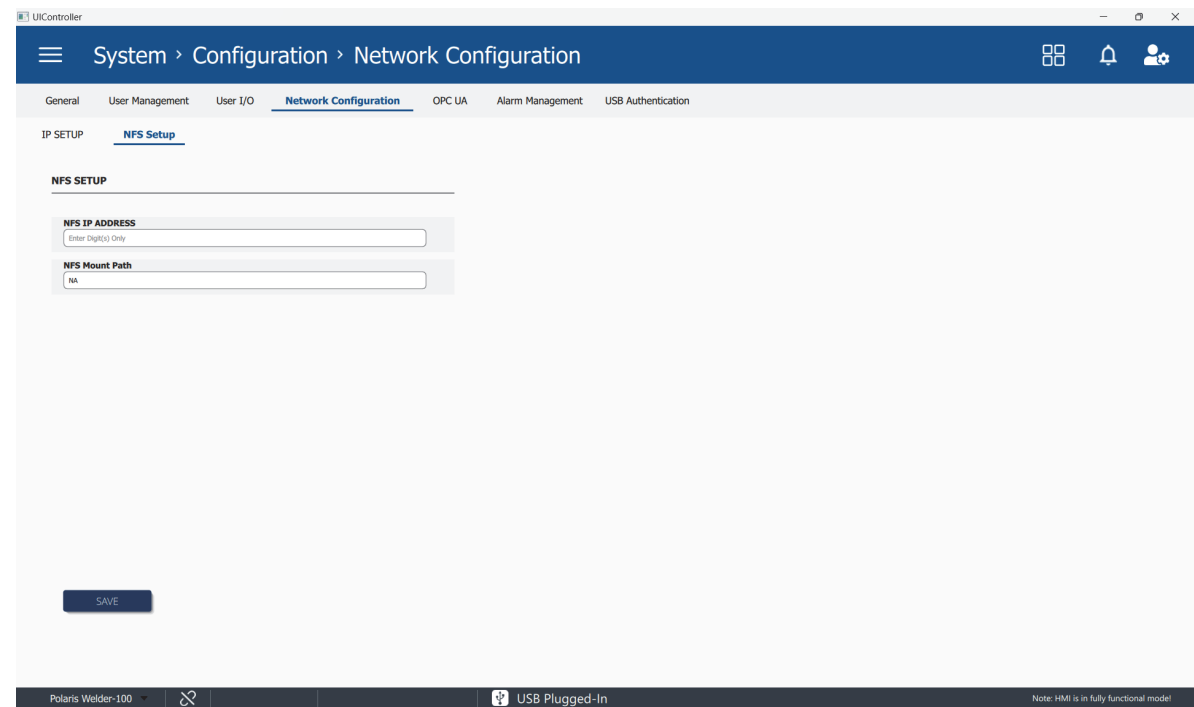
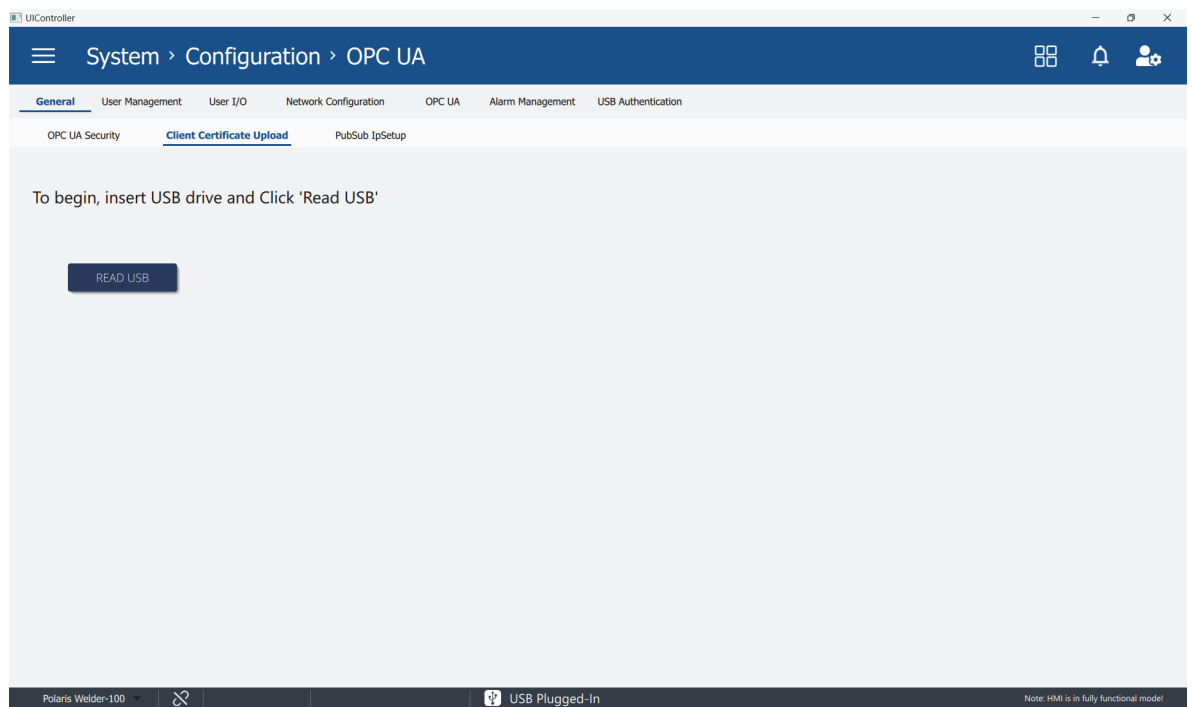


Table 5.41 IP Setup

Configuration	Description
NFS IP Address	The IP address of the NFS server where weld data or logs will be stored.
NFS Mount Path	The directory path on the NFS server where the Polaris system will read/write data (e.g., \mnt\polaris_data).

5.10.6 OPC UA

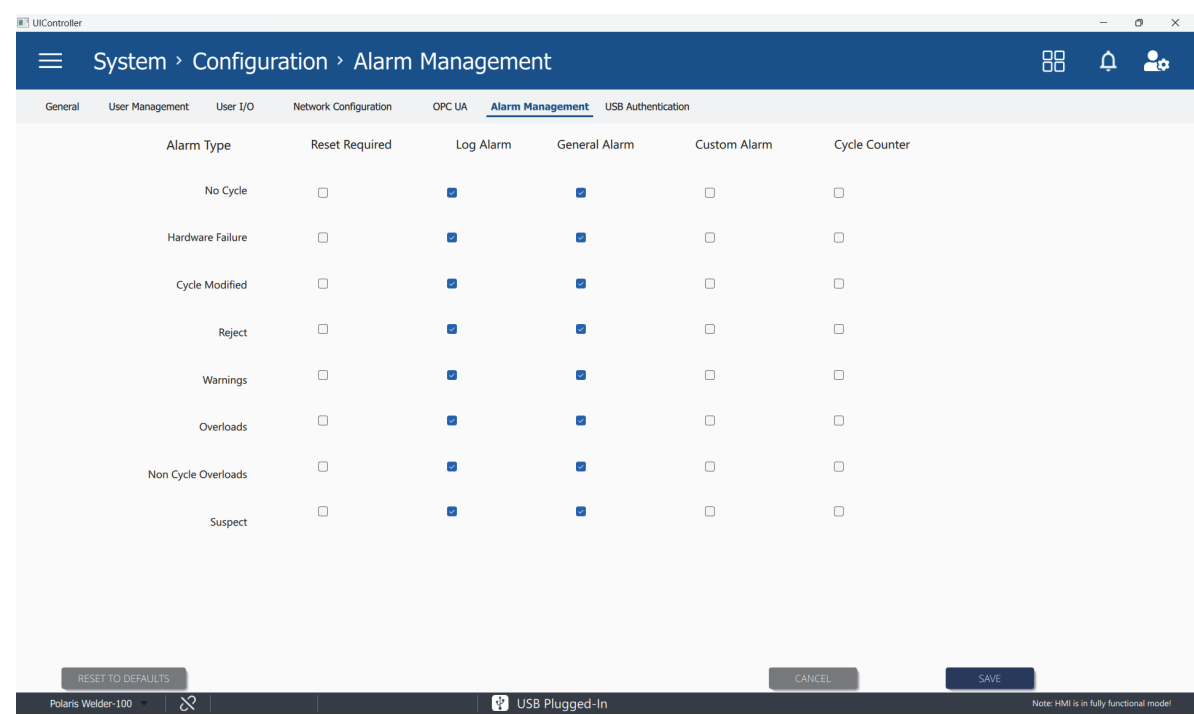
NOTE	
	For detailed information on OPC UA configuration, security, client connectivity, and data access, refer to Appendix E: OPC UA .



5.10.7 Alarm Management

The Alarm Management system in Polaris is designed to monitor, categorize, and respond to various fault conditions during the weld process. It ensures safety, quality control, and traceability by providing detailed alarm feedback and configurable responses.

Figure 5.38 Alarm Management



5.10.7.1 Alarm Categories

There are eight alarm groups, each representing a specific type of fault or condition.

Table 5.42 Alarm Categories

Alarm Type	Description
No Cycle	Triggered when a weld cycle fails to start or complete properly.
Hardware Failure	Indicate issues with system components such as sensors, actuators, or power modules.
Cycle Modified	Occur when a weld cycle is interrupted or altered unexpectedly.
Reject	Triggered when weld results exceed configured reject limits.
Warnings	Non-critical alerts that notify users of potential issues that may affect system performance or data integrity.
Overloads	Triggered when system limits are exceeded during the weld.
No Cycle Overloads	Overload conditions that occur before a weld cycle begins.
Suspect	Triggered when weld results fall within a suspect range.

5.10.7.2 Alarm Configuration Options

Each alarm group includes five configurable options.

Table 5.43 Alarm Categories

Configuration	Description
Reset Required	The Reset Required setting determines whether an alarm is latched or non-latched: • When enabled (ON): The alarm is latched, meaning the system will not allow another weld cycle to start until the operator manually presses the Alarm Reset button. This ensures that critical alarms are acknowledged and addressed before continuing operation. • When disabled (OFF): The alarm output will clear automatically either when the Alarm Reset button is pressed or when the next cycle begins, depending on system behavior and alarm type. This setting is especially important for alarms that require operator intervention or inspection before resuming production.
Log Alarm	When enabled, the alarm is recorded in the Alarm Log for traceability.
General Alarm	Activates the general alarm output.
Custom Alarm	Activates a custom alarm output.
Cycle Counter	When enabled, the cycle is counted toward the active recipe total, even if an alarm occurred.

5.10.8 USB Authentication

The USB Authentication feature ensures secure access to system functionalities by verifying registered USB devices. Only authenticated USB devices can perform operations such as import/export and data streaming.

5.10.8.1 USB Device Registration

Figure 5.39 USB Device Registration

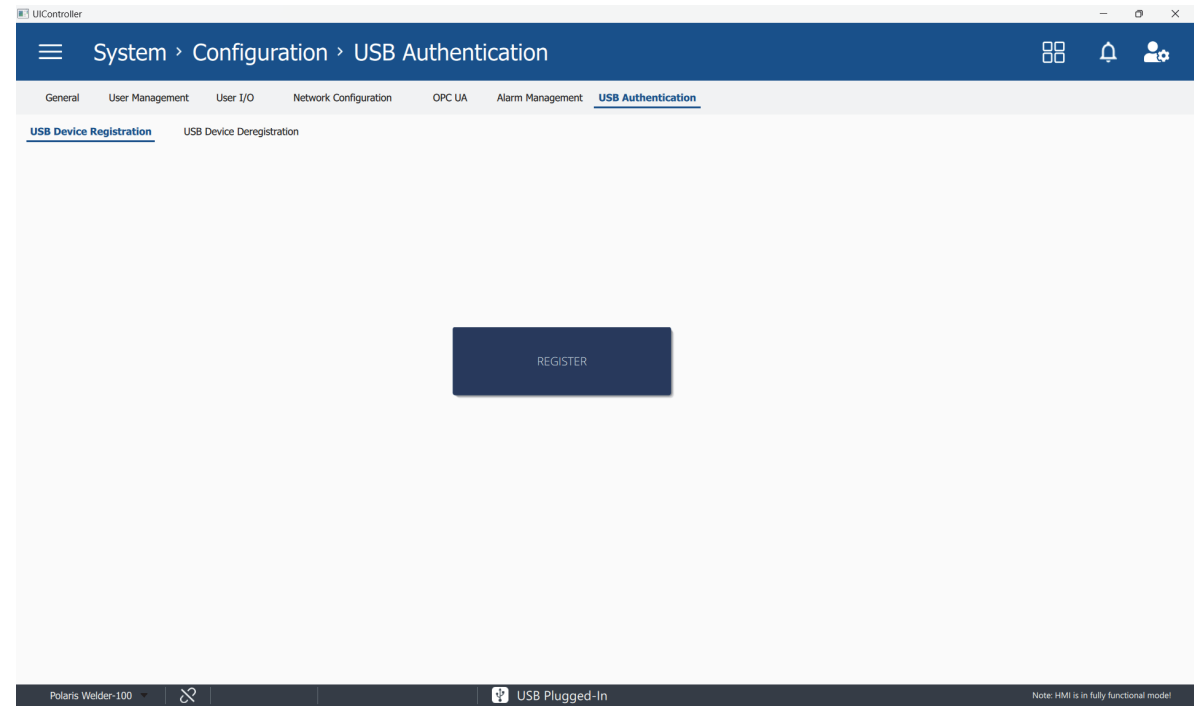


Table 5.44 USB Device Registration

Step	Instructions
1	Insert the USB device into the USB-C port on the power supply.
2	Open the USB Authentication screen and select the Registration tab.
3	Initiates the registration process for the connected USB device.

Table 5.44 USB Device Registration

Step

Instructions

Switch to the USB Device Deregistration tab. Confirm that the device appears in the Registered List with the following details:

- Device Name
- Vendor Code
- Product Code
- Serial Number
- Used Date

The screenshot shows the 'USB Authentication' configuration page in the 'UIController' application. The page has a dark blue header with a menu icon and the breadcrumb 'System > Configuration > USB Authentication'. Below the header is a navigation bar with tabs: 'General', 'User Management', 'User I/O', 'Network Configuration', 'OPC UA', 'Alarm Management', and 'USB Authentication'. The 'USB Authentication' tab is selected. Under this tab, there are two sub-tabs: 'USB Device Registration' and 'USB Device Deregistration'. The 'USB Device Deregistration' sub-tab is active. It displays a table with the following columns: 'Select', 'Device Name', 'Vendor Code', 'Product Code', 'Serial Number', and 'Used Date'. There is one row in the table with a checkbox in the 'Select' column, 'Device1' in the 'Device Name' column, '1320' in the 'Vendor Code' column, '1908' in the 'Product Code' column, a checkbox in the 'Serial Number' column, and '2026/05/22' in the 'Used Date' column. Below the table is a large blue button labeled 'DEREGISTER'. At the bottom of the page, there is a status bar with 'Polaris Welder-100' on the left, a USB icon in the center, and 'USB Plugged-In' on the right. A small note on the far right says 'Note: HMI is in fully functional model'.

4

NOTE

A maximum of 10 USB devices can be registered.

5.10.8.2 USB Device Deregistration

The USB Device Deregistration feature allows operators to remove previously authenticated USB devices from the system. Once deregistered, the USB device will no longer be authorized to perform functions such as data import, export, or streaming.

Figure 5.40 USB Device Deregistration

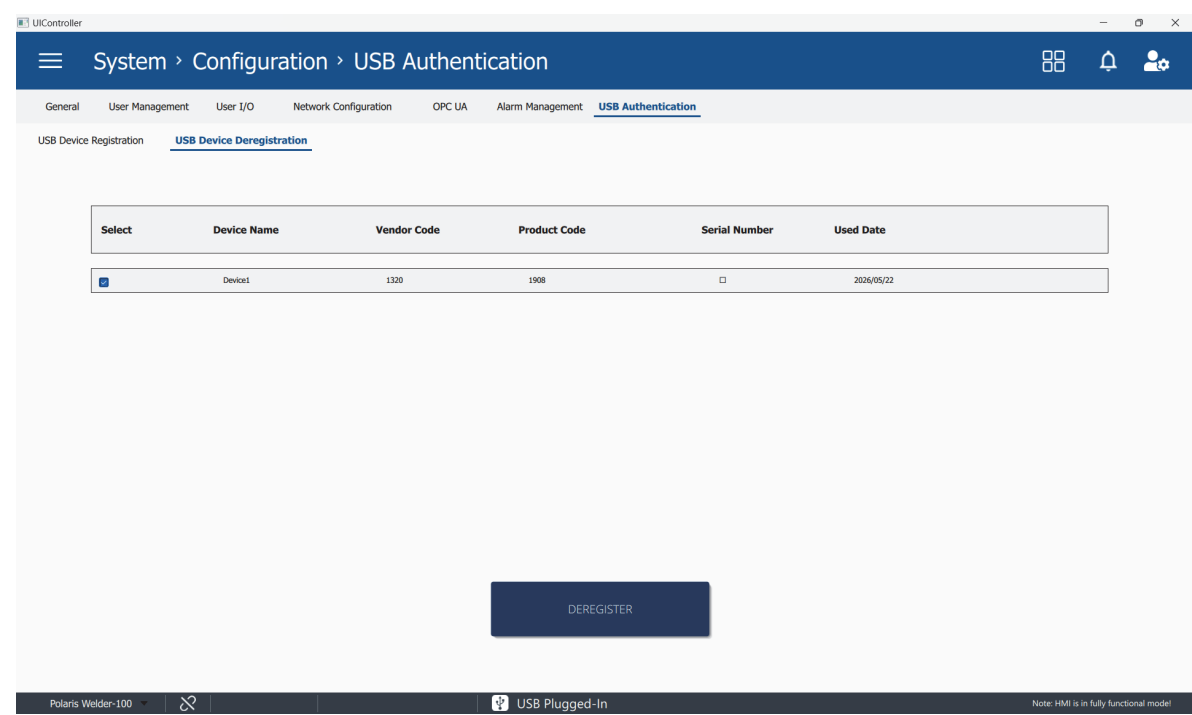
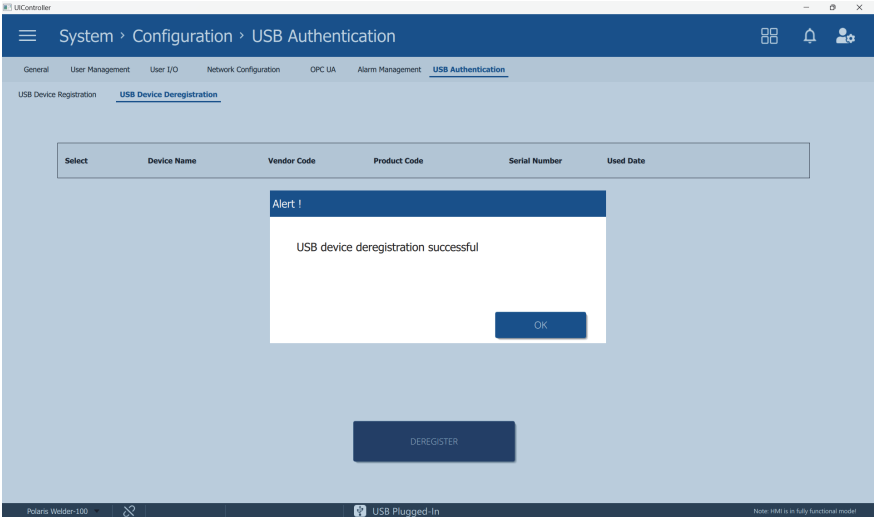


Table 5.45 USB Device Deregistration

Step	Instructions
1	Insert the USB device into the USB-C port on the power supply.
2	Open the USB Authentication screen and select the USB Device Deregistration tab.
3	Review the list of registered USB devices and locate the USB device to be removed. Select the corresponding checkbox next to the device name.
4	Press the Deregister button. 

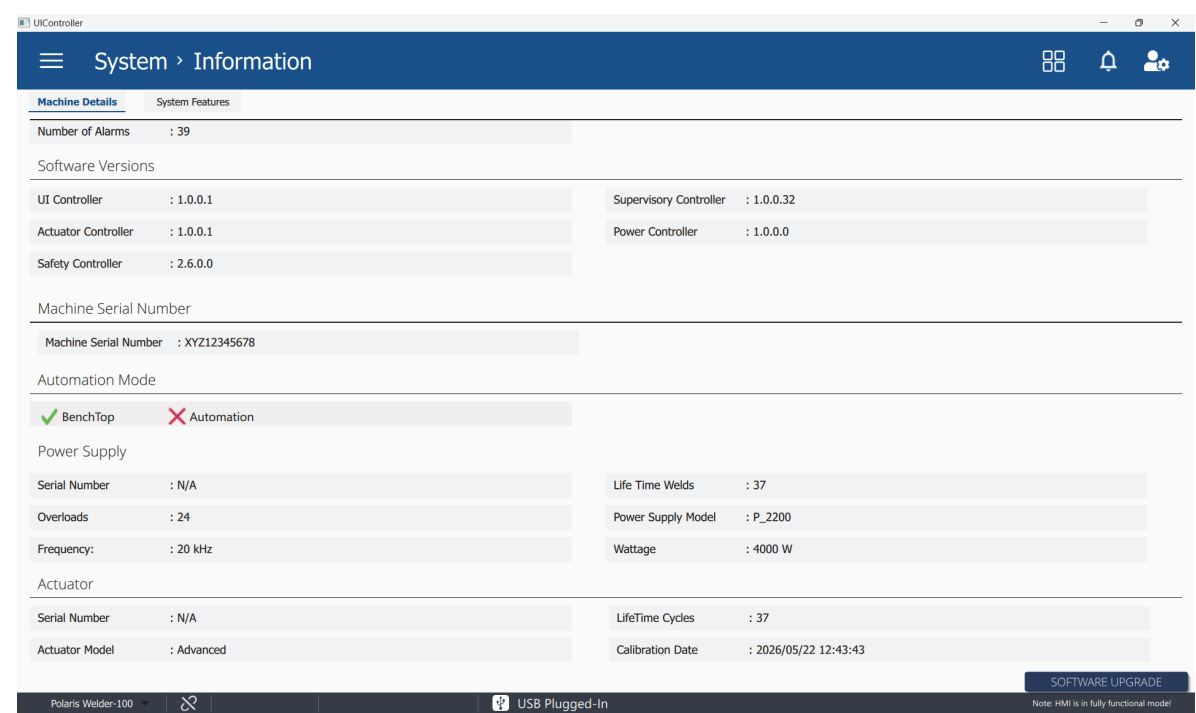
5.11 System Information

The System Information screen provides detailed insight into the machine configuration, software versions, hardware components, and supported system features. It is divided into two main tabs:

- Machine Details
- System Features

5.11.1 Machine Details

Figure 5.41 Machine Details



This tab displays key information about the Polaris system, including:

Table 5.46 Machine Details

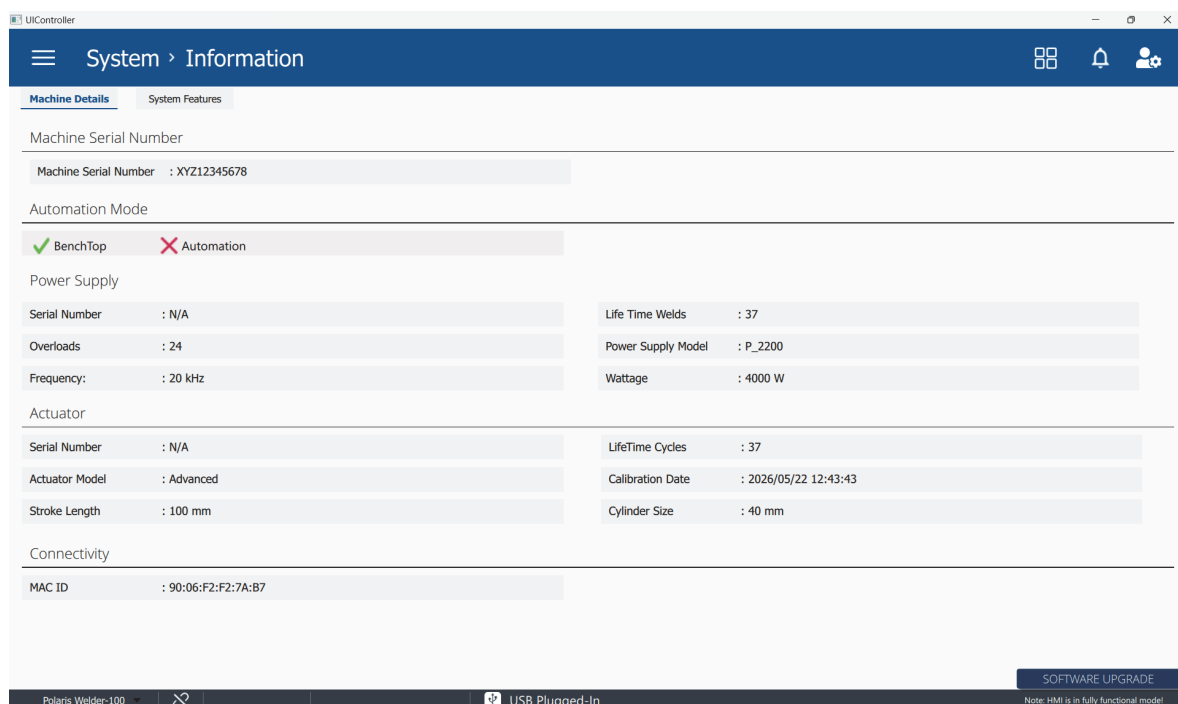
Information	Description
Software Versions	• UI Controller • Supervisory Controller • Actuator Controller • Power Controller • Safety Controller
Machine Identifications	• Machine Serial Number • System Mode: Benchtop or Automation
Power Supply Details	• Serial Number • Lifetime Welds • Overloads • Power Supply Model • Frequency • Wattage

Table 5.46 Machine Details

Information	Description
Actuator Details	• Serial Number • Lifetime Cycles • Actuator Model • Calibration Date • Stroke • Cylinder Size
Connectivity	• MAC ID of the system

5.11.2 System Features

Figure 5.42 System Features



This tab outlines the capabilities and supported features of the system:

Table 5.47 System Features

Feature	Status
Storage Tier	Basic/Advanced/Elite
Event Logging	Supported/Not Supported
Batch Control	Supported/Not Supported
User Access Level	Standard/Advanced
Barcode Scanner	Supported/Not Supported
User I/O Diagnostics	Supported/Not Supported
LDAP Integration	Supported/Not Supported
Bearing Type	Standard/Stainless Steel
Industrial Ethernet	Not Supported/EtherNet/IP/PROFINET
HMI Type	Local HMI/PC HMI

5.12 Calibration

Use the Calibration menu to calibrate the S-Beam load cell force readout. Quick Calibration may be required whenever the booster, ultrasonic horn, or regulator pressure is changed. It is recommended to perform a Quick Calibration the first time the system is powered on and whenever the ultrasonic stack is changed, particularly if there’s a significant change in stack weight greater than 2.3 kg (5 lb).

Table 5.48 Actuator Calibration (Quick Calibration)

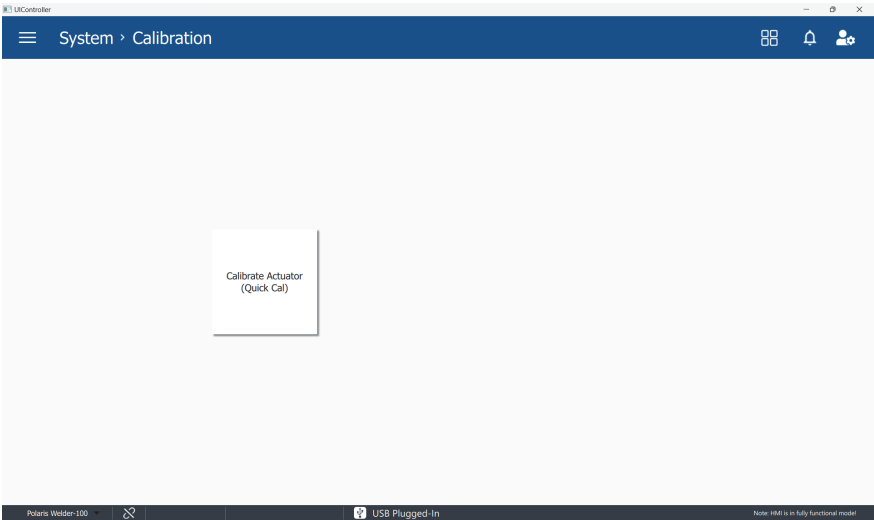
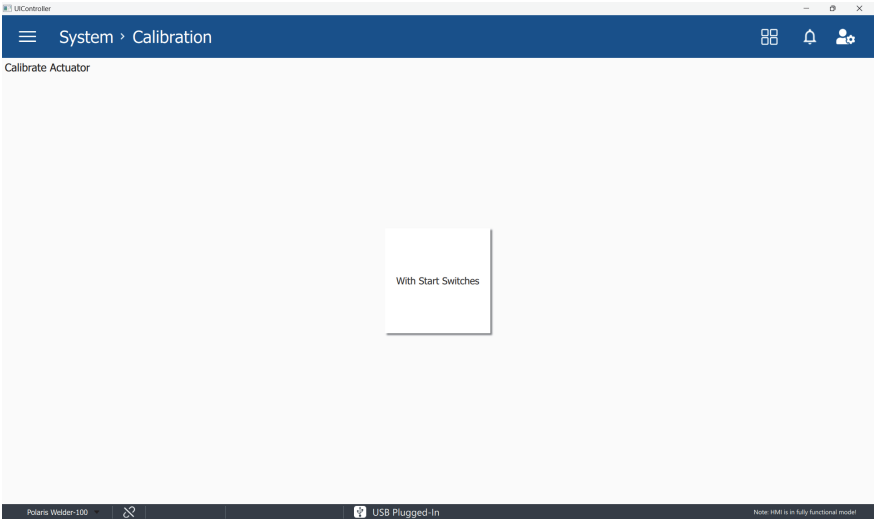
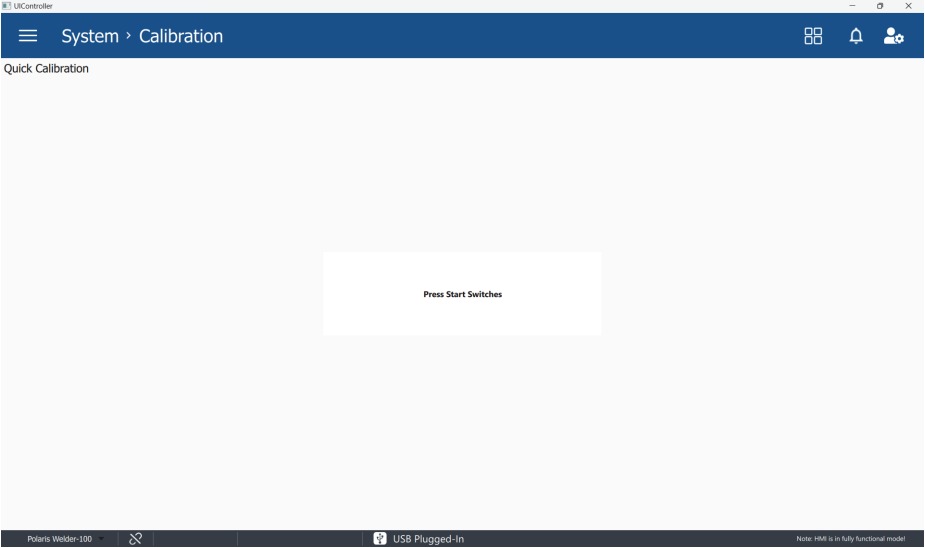
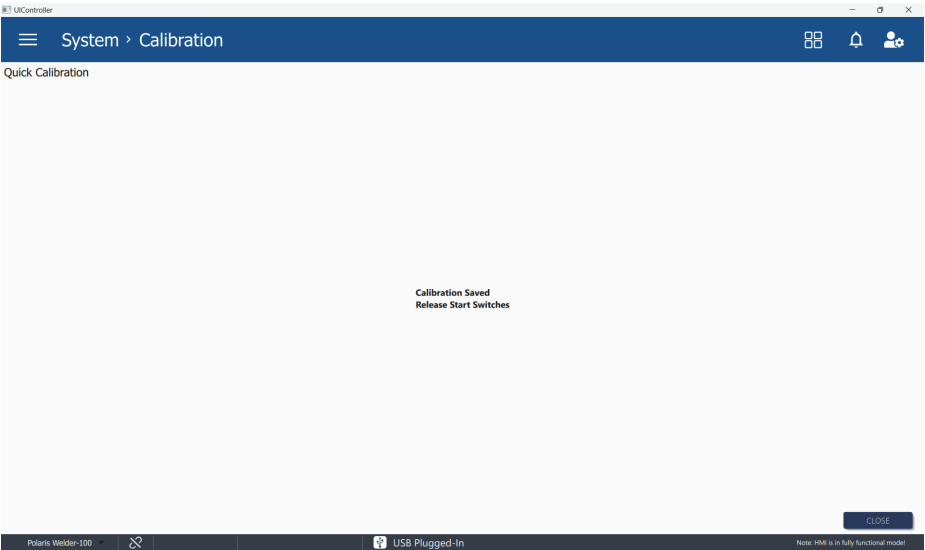
Step	Instructions
1	Navigate to System > Calibration .
2	Select Calibrate Actuator (Quick Cal) . 
3	Select With Start Switches . 

Table 5.48 Actuator Calibration (Quick Calibration)

Step	Instructions
4	When the Press Start Switches message appears, press and hold both start switches. 
5	Continue holding the start switches until the Calibration Saved. Release Start Switches message appears. 
6	Release the start switches.
7	The quick actuator calibration is now complete.

5.13 Actuator Setup

5.13.1 Horn Down



WARNING

Crushing Hazard

The ultrasonic horn can descend unexpectedly during manual override operation. Failure to keep clear can result in serious injury to hands or fingers.

- Before using manual override, make sure all hands are clear of the ultrasonic horn and base surface.

The Horn Down mode is used for setup and alignment of the actuator and workpiece fixture without activating ultrasonics. This mode allows the user to verify pneumatic functionality, determine ultrasonic horn travel distance, and ensure proper workpiece fixture positioning. See section [4.14.2 Leveling](#) for more information.

The following values are displayed during Horn Down mode:

- Pressure
- Absolute Position
- Force
- Velocity

These readings help the user determine appropriate process limits and cutoff values for production.

Figure 5.43 Actuator Setup

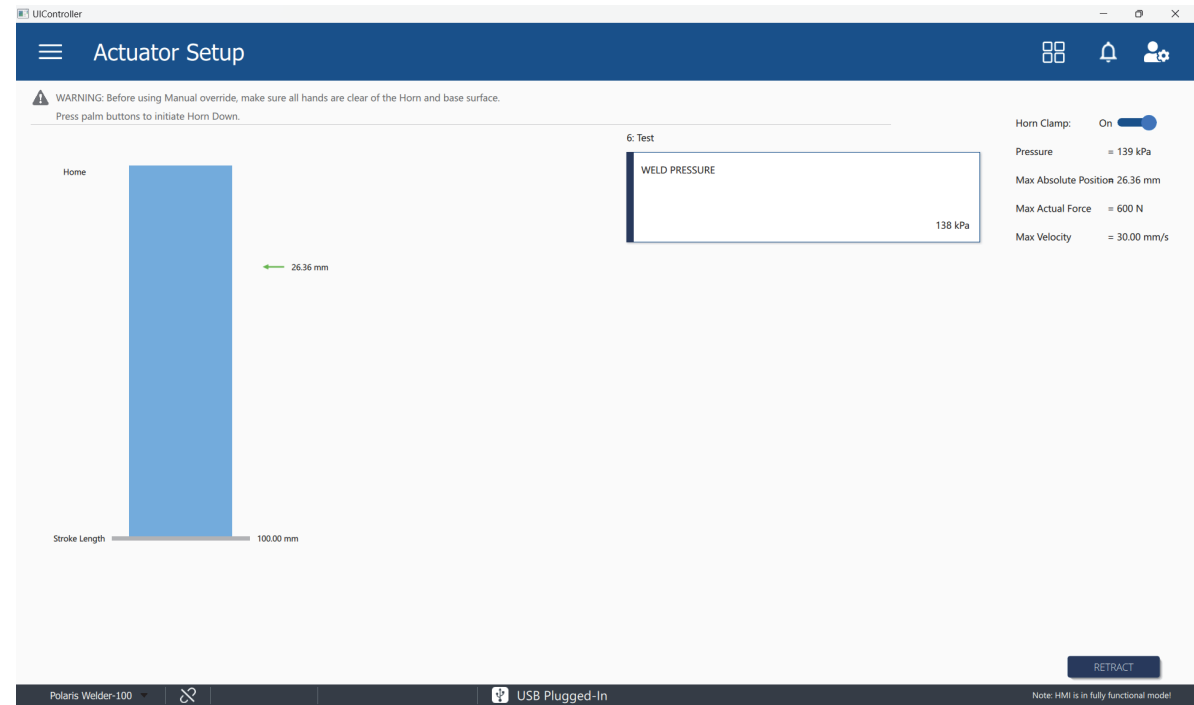


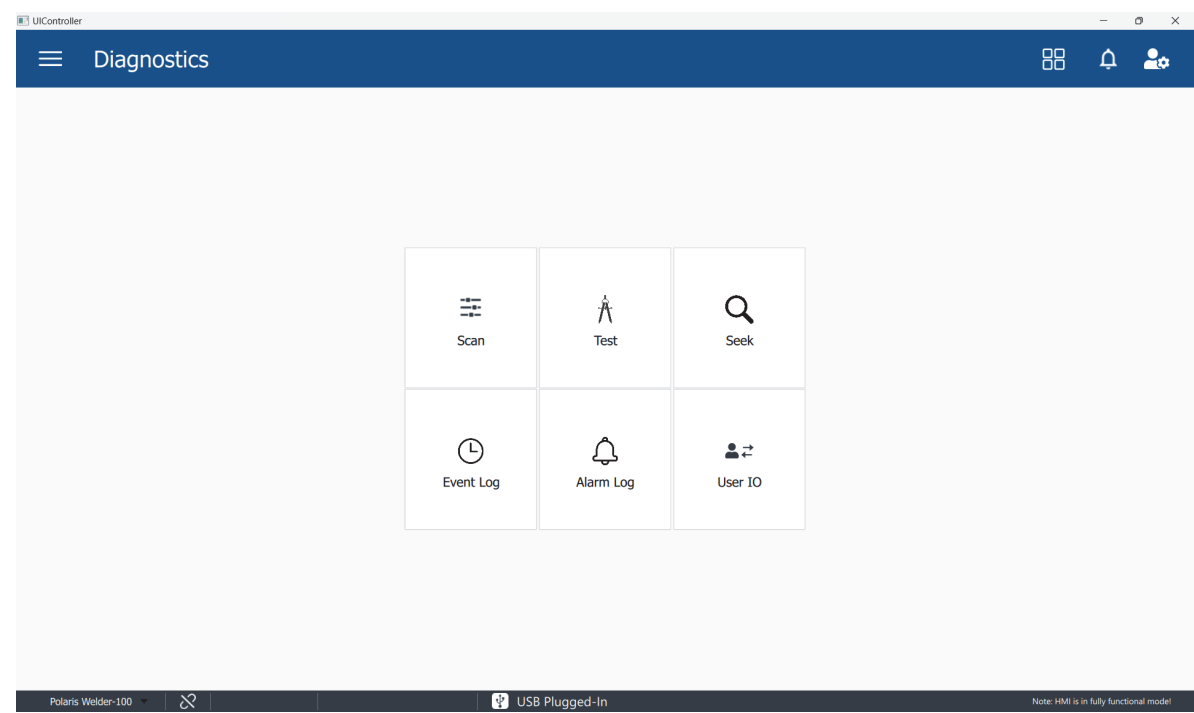
Table 5.49 Actuator Setup Instructions

Step	Instructions
1	Adjust Pressure Use the Weld Pressure field to set the desired pneumatic pressure for the actuator. This simulates actual welding conditions during setup.
2	Press and Hold the Palm Buttons Ultrasonics are locked out during Horn Down mode. Pressing the palm buttons causes the ultrasonic horn to descend to the workpiece fixture.
3	Verify Setup Use this position to check workpiece fixture alignment or measure the ultrasonic horn's travel distance.
4	Release the Palm Buttons • If Horn Clamp is Off, the ultrasonic horn will retract automatically. • If Horn Clamp is On, the ultrasonic horn will remain down until manually retracted (Retract button)

5.14 Diagnostics

The Diagnostics screen provides a centralized interface for monitoring system health, performing tests, and reviewing operational logs. It is designed to support maintenance, troubleshooting, and performance verification across key components of the Polaris system.

Figure 5.44 Diagnostics



5.14.1 Horn Scan

The Horn Scan function is used to enhance the selection of the operating frequency and optimize control parameters. It performs a scan of ultrasonic horn reactance to identify resonant frequencies, specifically at the zero crossover point from capacitive to inductive reactance. Ideally, only one resonant frequency should be present.

The Horn Scan screen includes:

- Historical Scan Results List (left panel)
- Horn Scan Graph for the selected scan, showing:
Horn Scan Cycle Number
Frequency
Parallel Resonant Frequencies (First, Second, Third)
Series Resonant Frequencies (First, Second, Third)

Graph Visibility Options for:

- Amplitude
- Current
- Phase

Figure 5.45 Horn Scan

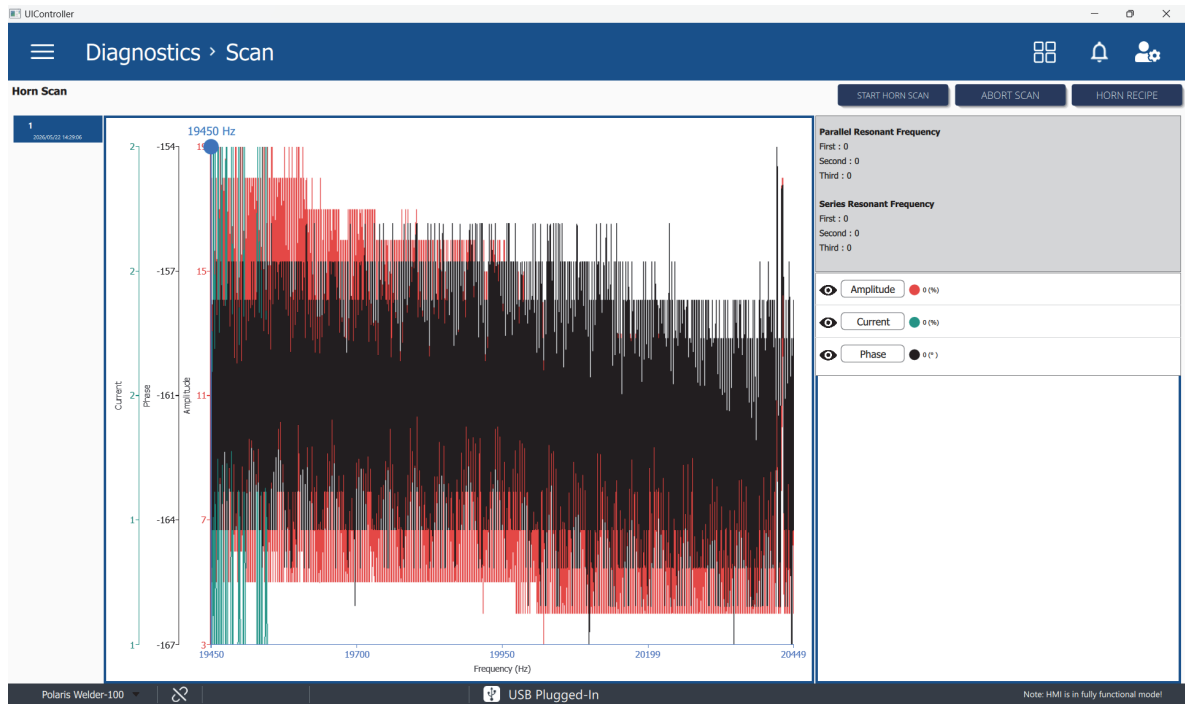


Table 5.50 Horn Scan

Name	Description
Start Horn Scan	Initiates the ultrasonic horn scan process. Displays a <i>Scan in Progress</i> popup during operation. Upon completion, the scan details and result graph are shown on screen.
Abort Scan	Allows the user to interrupt an ongoing scan. Displays a confirmation popup: <i>Are you sure to abort scan process?</i> • Pressing <i>Yes</i> aborts the scan. • Pressing <i>No</i> continues the scan without interruption.
Horn Scan Recipe	Navigates to the Horn Scan Recipe configuration screen.

5.14.1.1 Horn Scan Recipe

The following Horn Scan parameters can be set from this screen:

- Set Digital Tune with Horn Scan
- Scan Start Frequency
- Scan Stop Frequency

Figure 5.46 Horn Scan Recipe

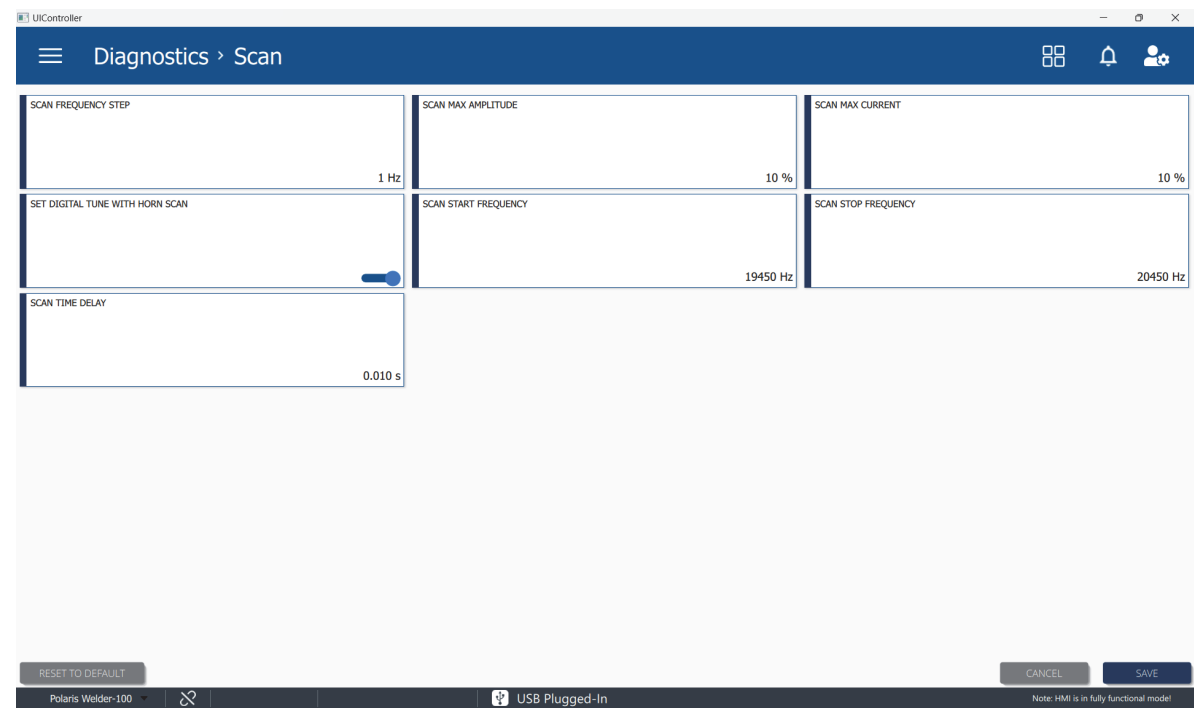


Table 5.51 Horn Scan Recipe

Name	Description
Reset to Default Button	Resets all configurable parameters to their default values.

5.14.2 Test

⚠ CAUTION	
	Burn Hazard The ultrasonic horn, tooling, or part may become hot during operation and may cause burn injury. • Do not touch the ultrasonic horn, tooling, or part while the actuator is operating. • Allow the part to cool before handling. Allow the ultrasonic horn and tooling to cool before contact.

The electrical and mechanical components of an ultrasonic welding system have to be optimally attuned to each other. You can use the ultrasonic test to check whether this is the case in your system. To do so, the power supply measures the load-free ultrasonic power output (in other words, the vibrations emitted into the air). If the system is working correctly, and no overload alarm occurs, the power when no welding load is present stays constant for a long period of time (+/- 10%). Any power increase indicates that there is a problem, or that one might occur.

Additionally the power supply uses the ultrasonic test to determine the frequency: Each resonance unit has its own resonance frequency to which the power supply has to adapt. This frequency is automatically determined during the ultrasonic test.

The Test screen includes:

- Frequency
- Stored Frequency
- Power Reading

An additional graph displays two selectable parameters simultaneously, chosen from dropdown menus:

- Amplitude
- Power
- Frequency
- Phase
- Current

Figure 5.47 Test



Table 5.52 Test

Name	Description
Start Test	Begins the ultrasonic test when the user presses and holds the button. Upon release, the test stops and the graphical data is displayed on screen.
Test Amplitude	The Test Amplitude field allows the user to specify the percentage of amplitude to be used during the ultrasonic test.
Test Recipe	Navigates the user to the Test Recipe configuration screen.

5.14.2.1 Test Recipe

The following Test parameters can be set from this screen:

- Test Frequency High
- Test Frequency Low
- Test Frequency Offset
- Clear Memory Before Test (On/Off toggle)
- Test Amplitude Ramp Time
- Test Amplitude

Figure 5.48 Test Recipe

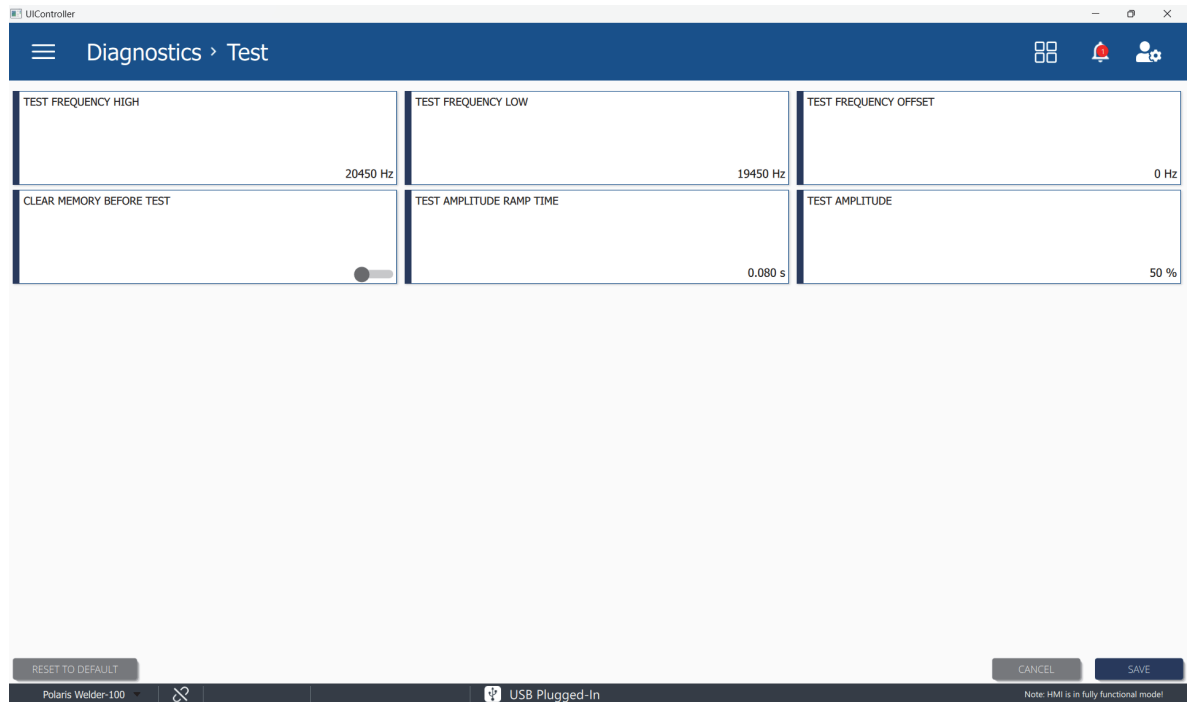


Table 5.53 Seek Recipe

Name	Description
Reset to Default Button	Resets all configurable parameters to their default values.

5.14.3 Seek

The Seek function is used to identify the resonant frequency of the ultrasonic stack. During this operation, ultrasonics are activated at 10% amplitude, allowing the system to detect the optimal frequency for welding.

The Seek screen provides the following information:

- Graphical representation of the performed seek operation
- Seek Frequency
- Operation Date and Time
- End Frequency

Figure 5.49 Seek

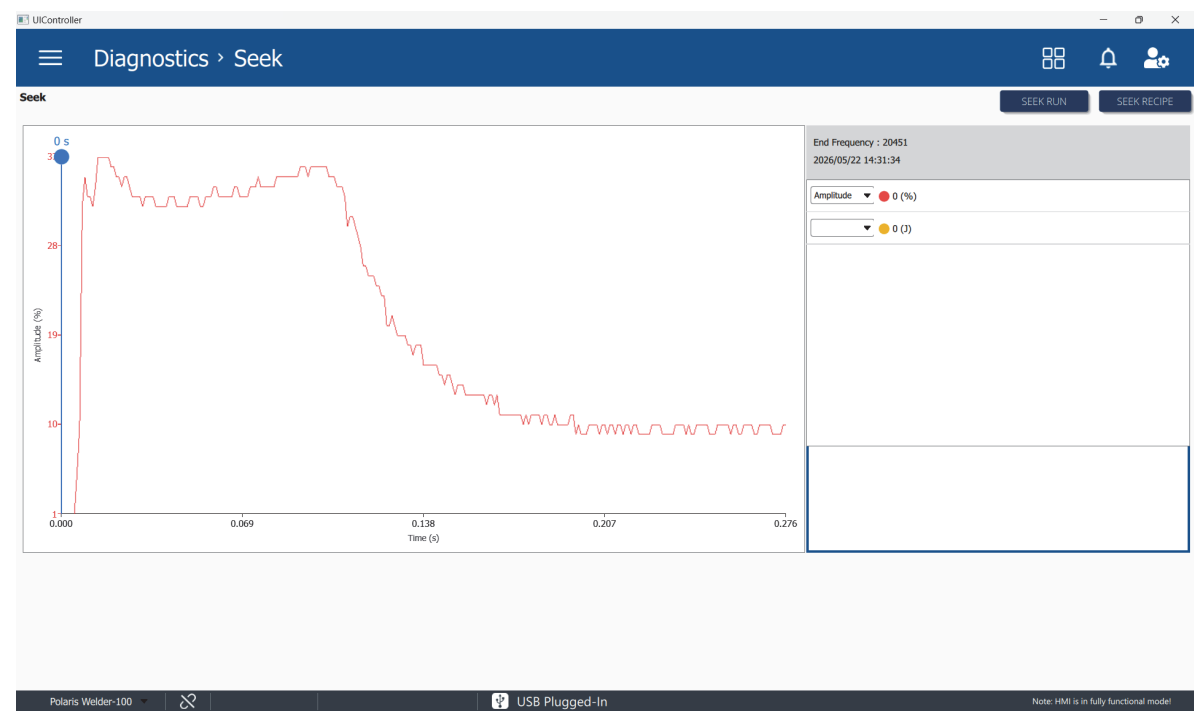


Table 5.54 Seek

Name	Description
Parameter Selection Dropdown	Allows the user to choose which parameter to display on the graph: • Amplitude • Power • Frequency • Phase • Current
Seek Run Button	Initiates the seek operation. Once completed, the seek data is displayed in graphical format on the screen.
Seek Recipe	Navigates the user to the Seek Recipe configuration screen.

5.14.3.1 Seek Recipe

The following Seek parameters can be set from this screen:

- Seek Frequency Limit High
- Seek Frequency Limit Low
- Seek Frequency Offset
- Memory Clear Before Seek
- Seek Time
- Seek Amplitude Ramp Time
- Seek Amplitude

Figure 5.50 Seek Recipe

UIController

Diagnosics > Seek

SEEK FREQUENCY LIMIT HIGH: 20450 Hz

SEEK FREQUENCY LIMIT LOW: 19450 Hz

SEEK FREQUENCY OFFSET: 0 Hz

MEMORY CLEAR BEFORE SEEK: ☐

SEEK TIME: 0.000 s

SEEK AMPLITUDE RAMP TIME: 0.000 s

SEEK AMPLITUDE: 10 %

RESET TO DEFAULT

CANCEL SAVE

Polaris Welder-100 USB Plugged-In Note: HMI is in fully functional mode!

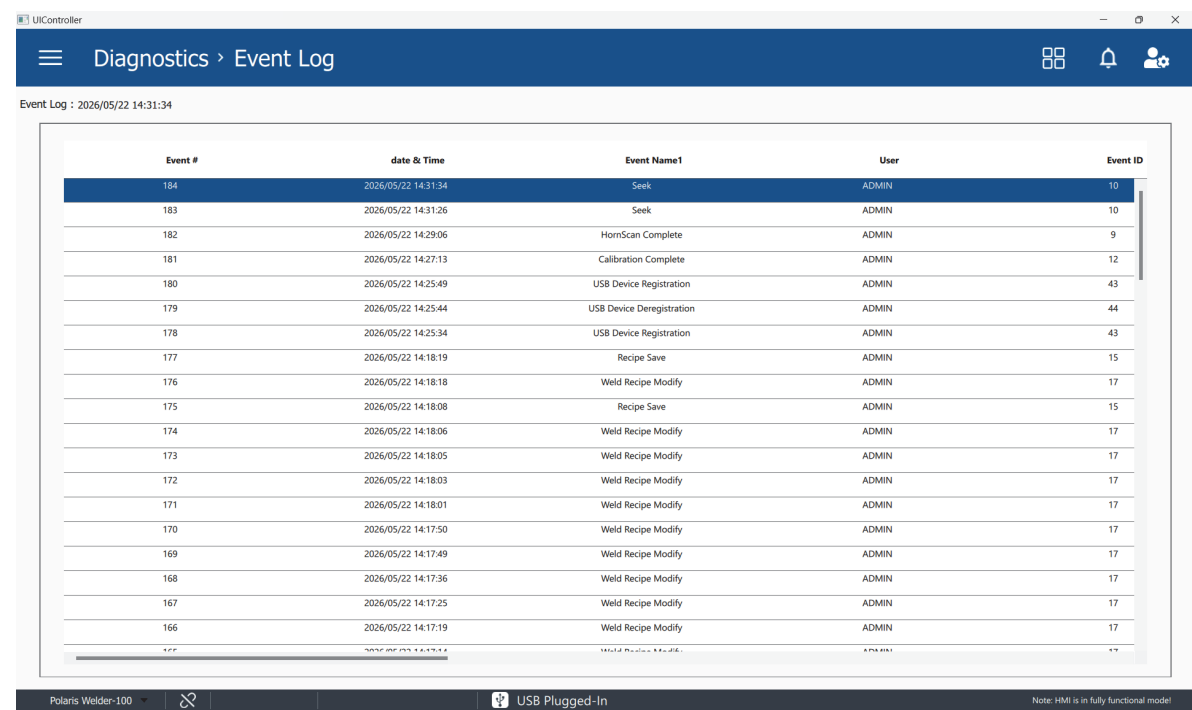
Table 5.55 Seek Recipe

Name	Description
Reset to Default Button	Resets all configurable parameters to their default values.

5.14.4 Event Log

The Event Log screen provides a detailed record of all user-performed activities within the system. It serves as an audit trail for tracking operational and user interactions.

Figure 5.51 Event Log



Each event entry is displayed with the following information:

Table 5.56 Event Log

Name	Description
Event #	Sequential identifier for each logged event.
Date & Time	Timestamp of when the event occurred.
Event Name	Description or title of the event.
User	Username of the individual who performed the action.
Event ID	Unique identifier for the event type.
From/To	Applicable range or values associated with the event.
Power Supply Serial #	Serial number of the power supply involved.
Actuator Serial #	Serial number of the actuator involved.
HMI Serial #	Serial number of the HMI involved.

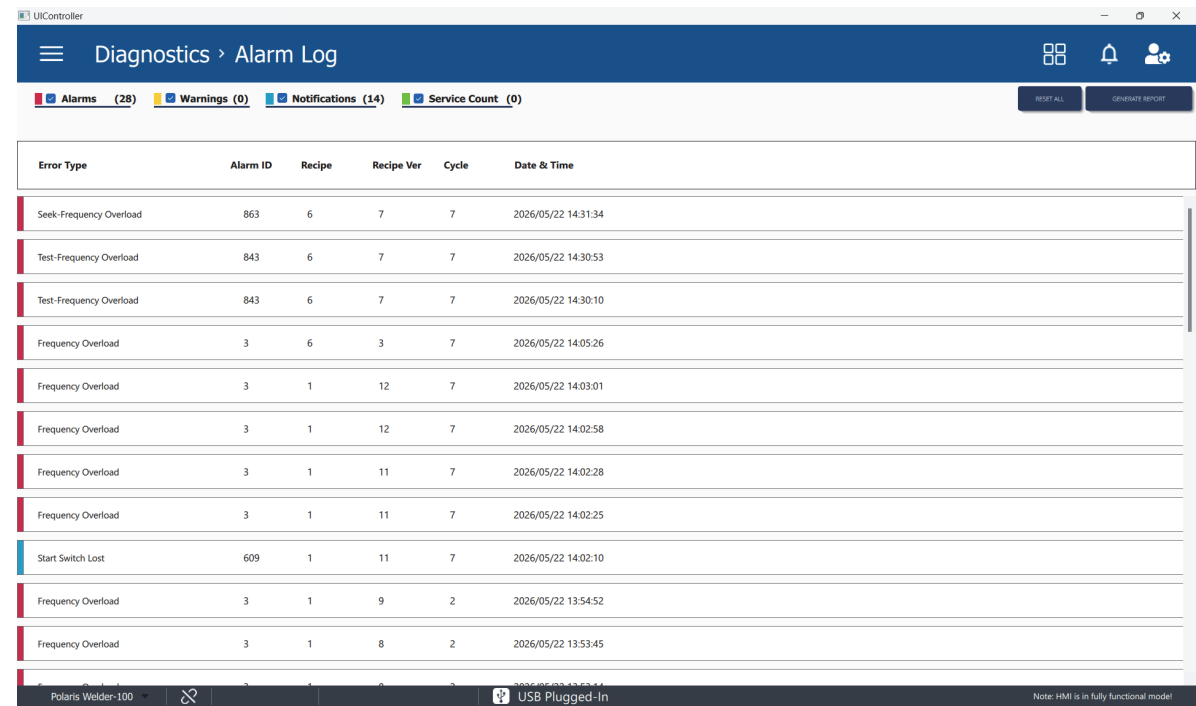
5.14.5 Alarm Log

The Alarm Log screen provides a centralized view of all logged system events, categorized into four distinct types:

- Alarms
- Warnings
- Notifications
- Service Count

Each category displays a count of its respective entries and can be filtered using checkboxes.

Figure 5.52 Alarm Log



5.14.5.1 Log Entry Display

Each log entry includes the following columns:

- Error Type
- Alarm ID
- Recipe
- Recipe Version
- Cycle #
- Date/Time

When a user clicks on a log entry, the system displays additional details:

- Description
- User Name
- Alarm Type

5.14.5.2 Action Buttons

Each log entry includes three action buttons:

Figure 5.53 Alarm Log - Action Buttons

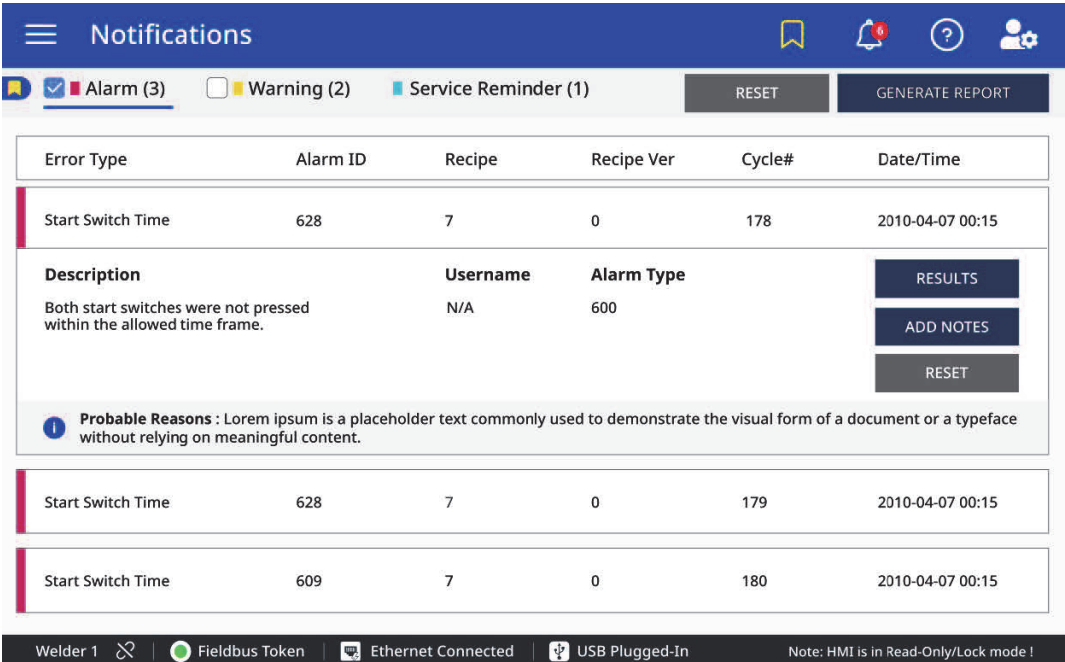


Table 5.57 Alarm Log - Action Buttons

Name	Description
Results	• Navigates the user to the Analytics Screen. • Displays weld result data with graphical representation for the selected cycle. See section 5.9 Analytics for more information.
Add Notes	Opens a popup window allowing the user to enter additional notes related to the selected alarm log.
Reset	• Resets the selected alarm. • Once reset, the Reset button becomes disabled for that entry to prevent repeated actions.

5.14.6 User I/O

Use this screen to monitor and interact with the system's Digital and Analog I/O signals. This diagnostic tool allows users to observe signal states and simulate output values for testing purposes.

Figure 5.54 Diagnostics - User I/O

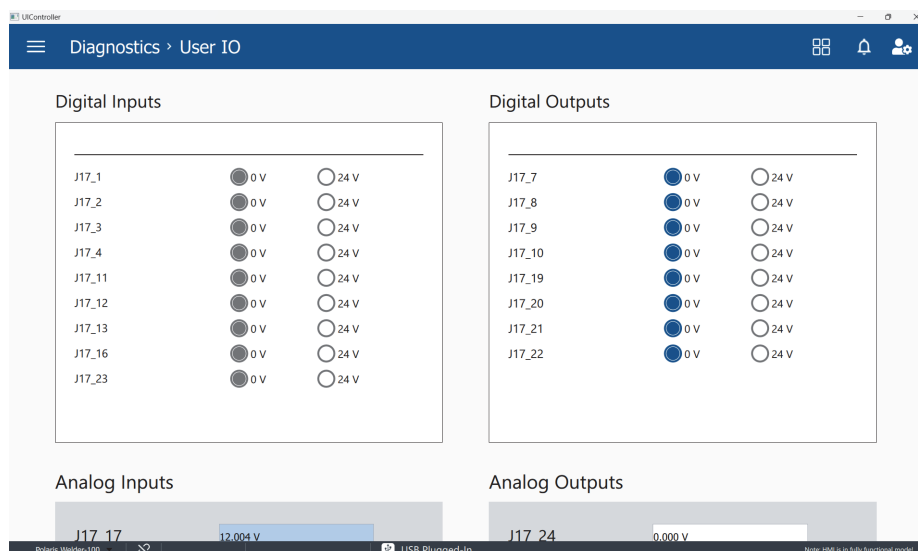


Table 5.58 Diagnostics - User I/O

Name	Description
Digital Inputs	Each digital input is represented by an LED icon. The LED will illuminate when the corresponding input is active.
Digital Outputs	Users can check the digital outputs they wish to activate. After selecting desired outputs, press Refresh Outputs to apply the changes.
Analog Input	Analog inputs are displayed in text boxes. Each text box shows the actual voltage being read from the corresponding input pin. After selecting the desired outputs, click Refresh Outputs to apply the changes.
Analog Output	Users can input a voltage value into the text box for each analog output. These values represent the desired voltage to be sent to the output pin.
Refresh Outputs Button	Pressing this button will output the appropriate signals to the connector.
Stop Button	Stops sending Digital Output and Analog Output values to the corresponding output pins.

NOTE	
	While in the User I/O Diagnostics screen, the system will not perform any assigned I/O functions. Only the signal levels can be monitored or simulated.

5.15 Generate Report

The Generate Report screen allows users to export key system data to an authenticated USB storage device in either CSV or PDF format. This feature is useful for documentation, analysis, and archiving purposes.

Only USB devices registered through the system’s USB Authentication process can be used to generate reports. See section [5.10.8 USB Authentication](#) for more information.

Users can select one or more of the following data categories to include in the report:

- Weld Data
- Alarm Data
- Event Data

	NOTE
	The USB device must be connected via a USB-C port. The storage capacity of the USB memory stick will determine how many reports can be saved.

Table 5.59 Generate Report

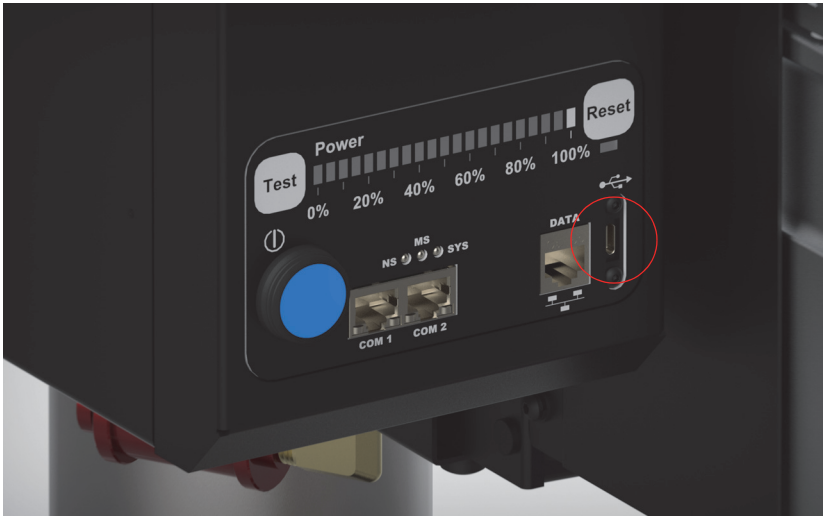
Step	Action
1	Insert the USB memory stick into the USB port located on the power supply. Figure 5.55 USB port on the Polaris system 

Table 5.59 Generate Report

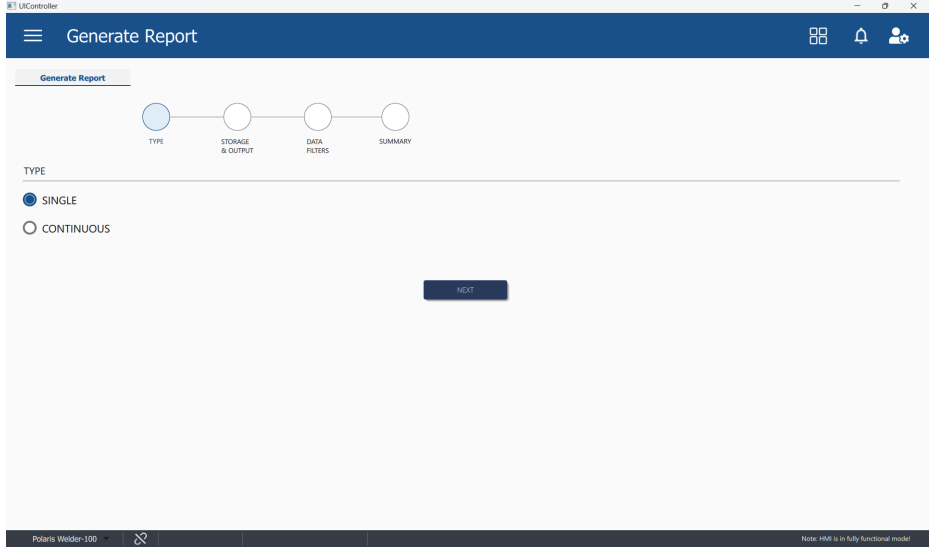
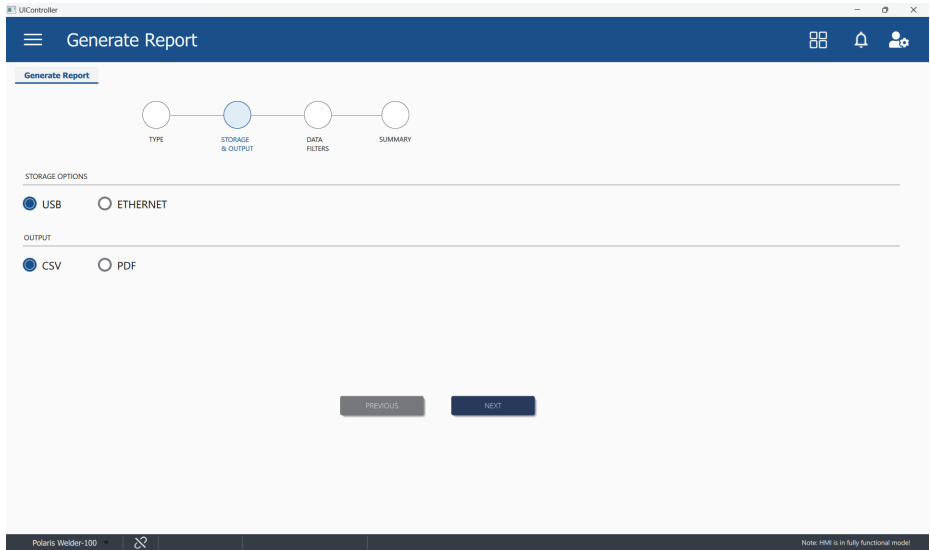
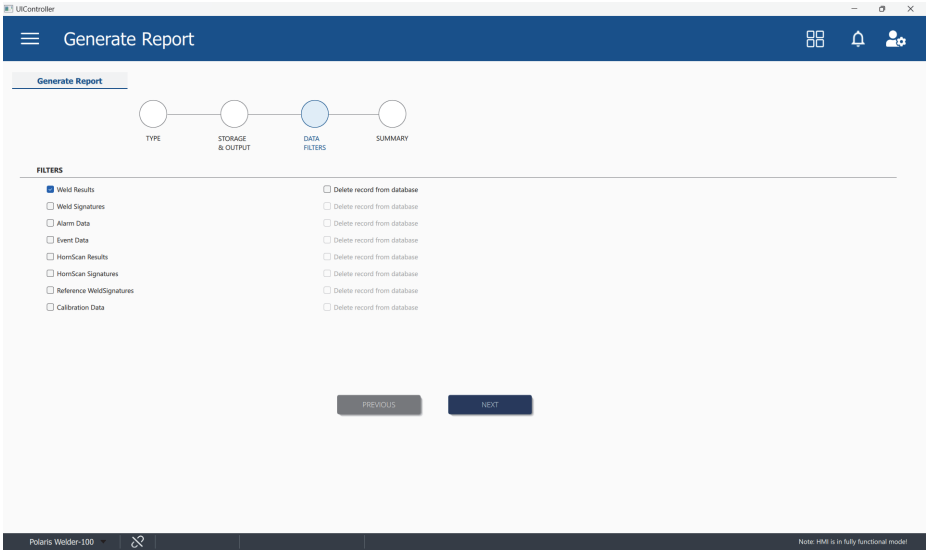
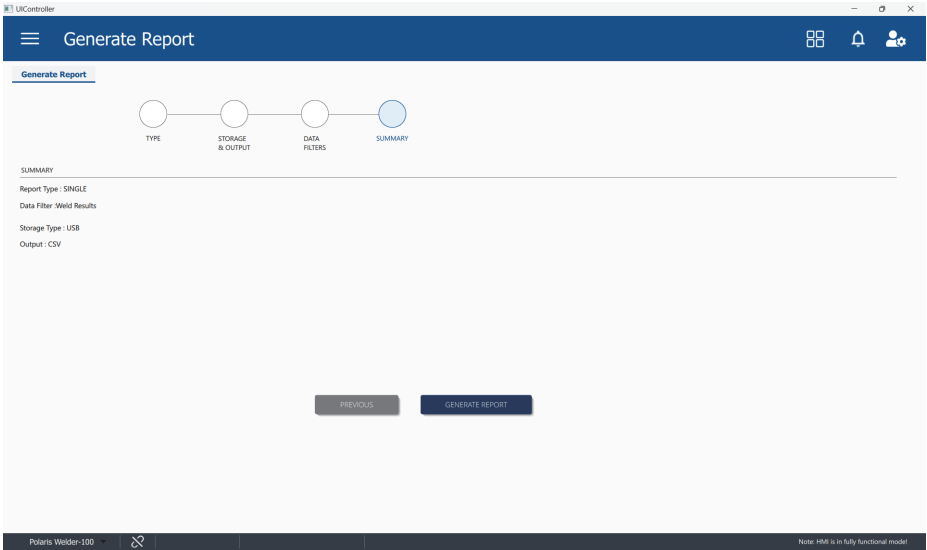
Step	Action
2	Press the <i>Single Report</i> button. 
3	Select the storage option, and select the type of format to be generated and press <i>Next</i>. Available options are:  • CSV • PDF

Table 5.59 Generate Report

Step	Action
4	Select the type of data to be generated. Available options are: • Weld Results • Weld Signatures • Alarm Data • Event Data • Horn Scan Results • Horn Scan Signatures • Reference Weld Signatures • Calibration Data  NOTE Select the <i>Delete record from database</i> option to delete the data from the Polaris system after exporting the data to the USB memory stick.
5	Press the <i>Generate Report</i> to generate and export the data to the USB memory stick. 

5.15.0.1 USB Data Streaming

This feature enables continuous streaming of weld results and graph data to an authenticated USB storage device. Only USB devices registered through the system's USB Authentication process can be used for streaming. See section [5.10.8 USB Authentication](#) for more information.

Streaming Conditions

- Data is streamed every X weld cycle, where X is configurable via the HMI.
- Only the X cycle's parameter values are included in the streamed data.
- If Save on Alarm is enabled, data is streamed when an alarm occurs during a weld cycle, regardless of the cycle count.
- Streaming must complete before the next weld cycle begins to ensure data integrity.

	NOTE
	Enabling data streaming can reduce the achievable parts-per-minute rate. The cycle rate may decrease as the number of streamed parameters increases because additional time is required to transfer the data before the next weld cycle can begin

Table 5.60 USB Data Streaming

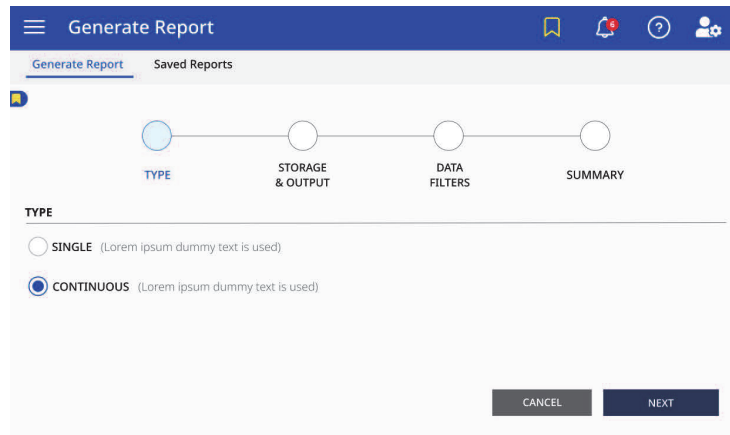
Step	Action
1	Navigate to the User Settings Menu Click on Generate Report.
2	Select Report Type Choose Continuous Report, then click Next. 

Table 5.60 USB Data Streaming

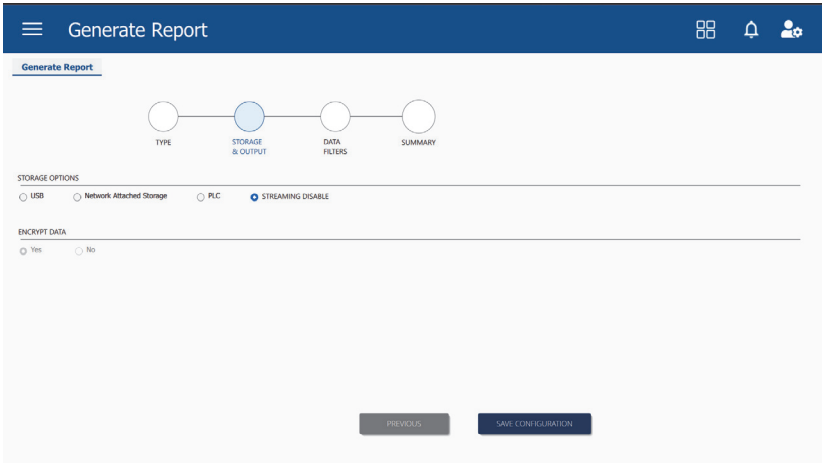
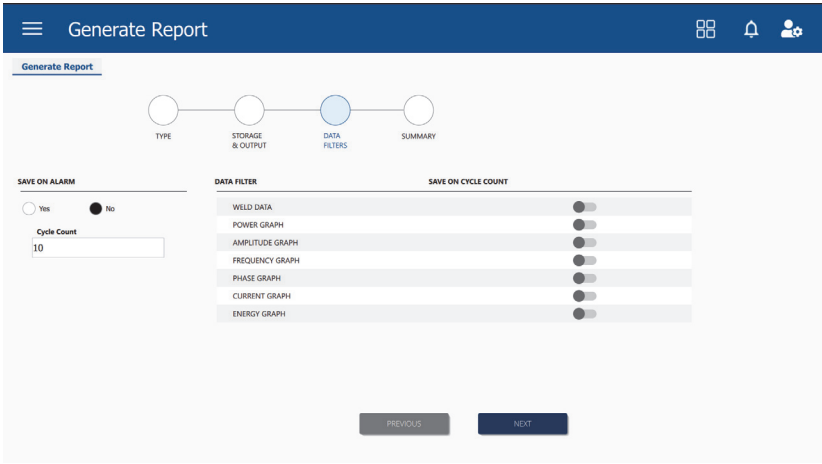
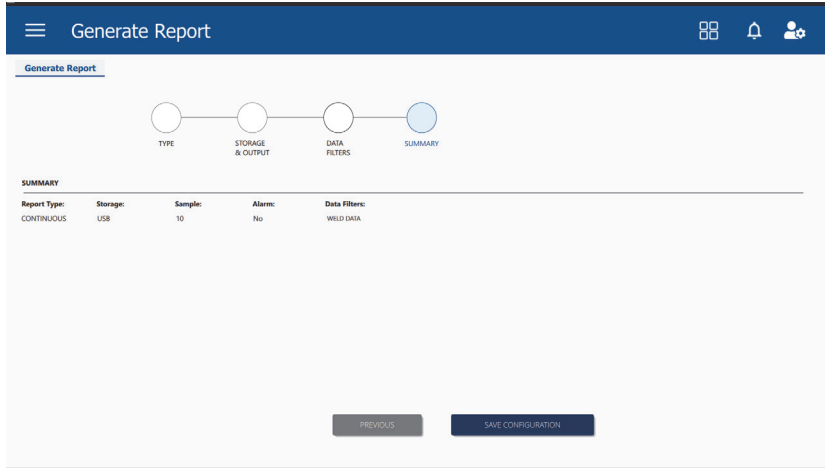
Step	Action
3	Choose Storage Option and Set Encryption Preferences - Select USB as the storage destination. - Choose Yes or No depending on whether encryption is required. NOTE If encryption is enabled, the streamed data is stored in an encrypted format. The PC HMI application is required to decrypt the data before it can be viewed or analyzed. 
4	Configure Alarm-Based Saving, Cycle Count and Data Filters - Set Save on Alarm to Yes or No. - Enter the value of X (e.g., every 5th cycle). - Choose which data types to stream. 

Table 5.60 USB Data Streaming

Step	Action
5	Finalize Configuration 
6	Start Weld Operation Begin welding. Data will stream to the USB device based on the configured settings.

5.15.0.2 USB Directory Structure

Upon detecting an authenticated USB device and initiating data streaming, the system creates a root directory named after the welder's serial number.

Subdirectory Structure Based on Actuator Type

- Electric_Actuator (Advanced Model)
- Manual_Actuator (Core Model)

Each actuator directory contains:

- Weld_Data
- Graphs

Each of these folders includes date-specific subdirectories for organizing daily data.

5.15.0.3 Weld Data Files

Weld results are appended to a single CSV file per day in the Weld_Data/Date directory. Headers Include:

- Weld Result Index
- Weld Recipe Number
- Weld Recipe Version Number
- Date/Time
- Ultrasonic Stack Serial Number
- Power Supply Serial Number
- Actuator Serial Number
- SC Serial Number
- Cycle Counter
- Weld Mode
- Weld Time
- Hold Time
- Weld Energy
- Weld Peak Power
- Start Frequency
- Frequency Change
- Cycle Time
- User Name
- Part ID
- Batch ID
- Trigger Point
- Weld Sonic Point
- Hold Point
- Alarm ID
- Weld Status
- Recipe Status
- Weld Pressure
- Hold Pressure
- Max Weld Force
- Max Hold Force
- End Weld Force
- End Hold Force
- Weld Absolute
- Total Absolute
- Velocity
- Downspeed
- Trigger Distance
- Weld Collapse Distance
- Hold Collapse Distance
- Total Collapse Distance

5.15.0.4 Graph Data Files

Graph data is stored in individual CSV files for each graph type in the Graphs/Date directory. Graphs include:

- Amplitude
- Power
- Phase
- Current
- Frequency
- Energy
- Request Amplitude
- Absolute Distance
- Collapse Distance
- Force
- Velocity

Each CSV file includes:

- Cycle Count
- Serial Number
- Recipe Number
- Time
- Graph-specific data points

5.15.0.5 Encryption and Alarm Handling

If encryption is enabled, weld data is stored in a separate encrypted file, appended per cycle.

Graph data is stored in encrypted files named:

<graphname_MM_DD_YYYY_HH_mm_ss>

5.16 Language

To change the system language, follow these steps:

Figure 5.56 Language

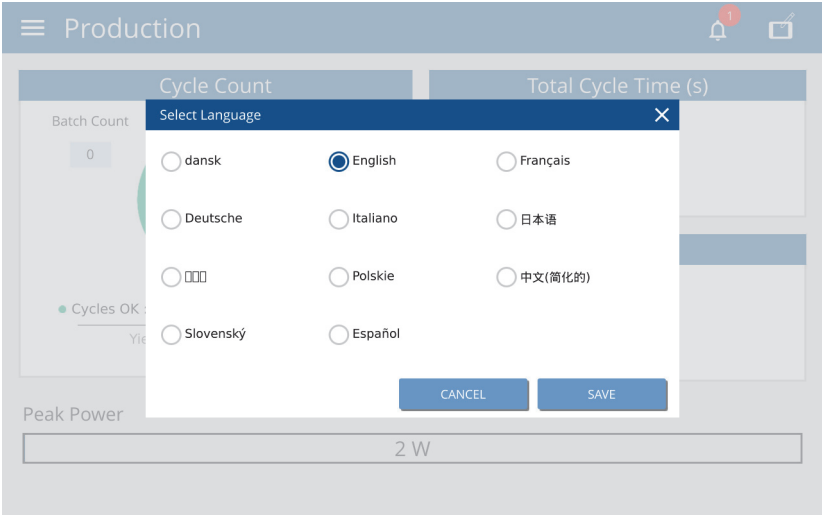


Table 5.61 Language

Step	Instructions
1	Navigate to the User Settings Menu Locate the language icon in the top or side action menu. The icon will display the currently selected language (e.g., English, Español). 
2	Press the Language Option A list of available languages will appear.
3	Confirm Selection Press Save to apply the selected language.
4	System Language Updated The interface will now display in the newly selected language.

5.17 Units

Use the Units option to switch between Metric and Imperial measurement systems.

Figure 5.57 Units

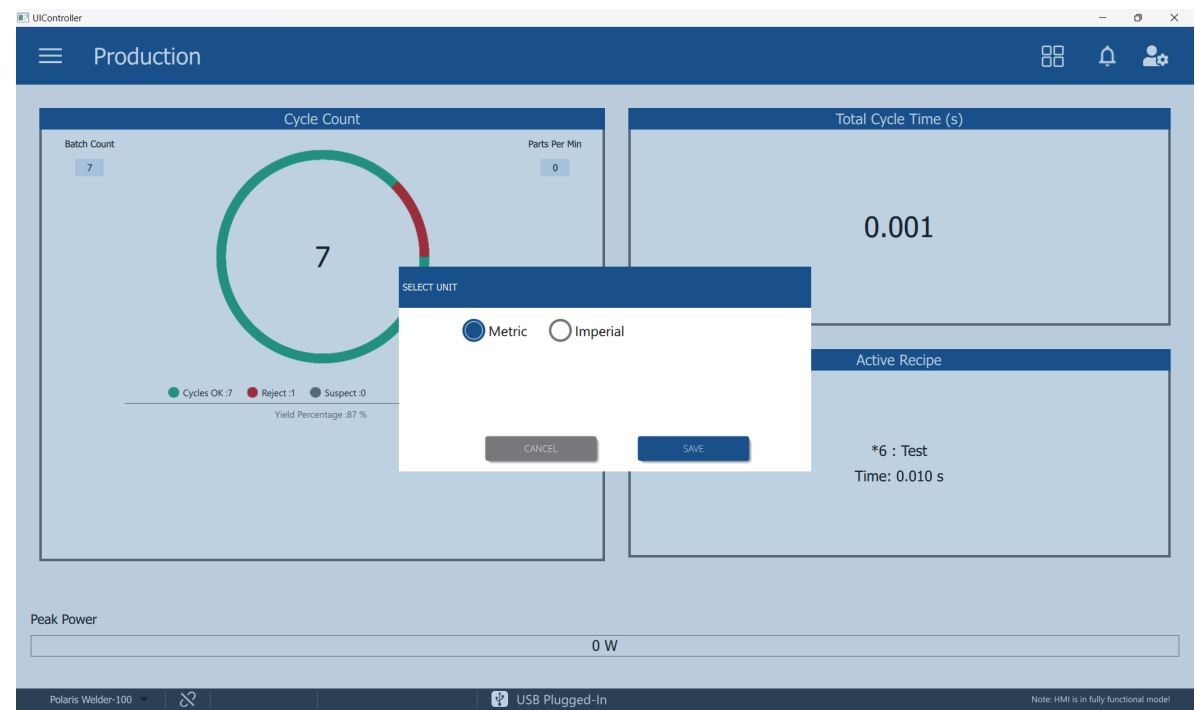


Table 5.62 Units

Step	Instructions
1	Navigate to the User Settings Menu Locate the Units icon in the right-side action menu. The icon displays the currently selected unit system (e.g., Metric or Imperial). 
2	Press the Units Option A popup window will appear with two checkboxes: • Metric • Imperial
3	Select Desired Unit System Check the box for the unit system you want to use. Only one option can be selected at a time.
4	Confirm Selection Press Save to apply the selected unit system. All relevant values on the HMI screen will be converted and displayed in the selected units. Pressing Cancel will close the popup without making any changes.

5.18 Change Password

Use this option to update the password for the currently logged-in user.

Figure 5.58 Change Password

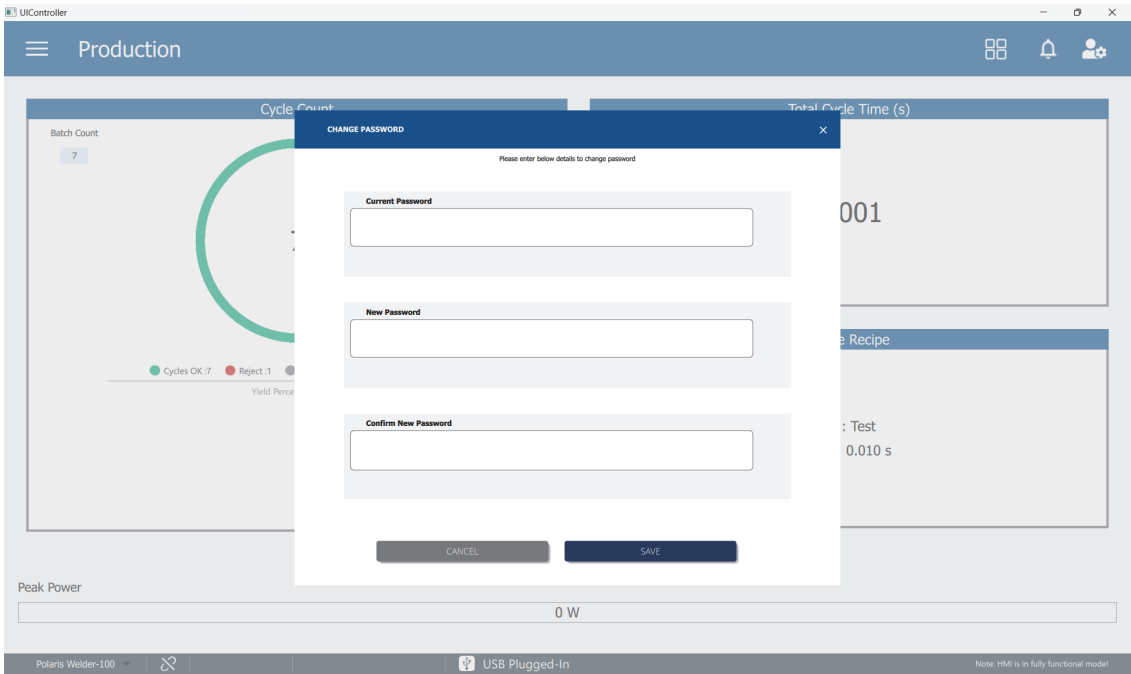


Table 5.63 Change Password

Step	Instructions
1	Navigate to the User Settings Menu Locate the Change Password icon.
2	Enter Password Information - Enter your current password. - Enter your new password. - Re-enter the new password in the confirmation field. NOTE Passwords must be 8 to 20 characters in length. Each password must contain at least one uppercase letter, one lowercase letter, one number, and one of the following special characters: @, #, %, &, *, -, ., !.
3	Press the Save Button If all fields are valid and match, the system will display a confirmation popup: <i>Password changed successfully. Please login again.</i>
4	Re-login to the System The system will redirect to the login screen. Enter your username and the new password to access the system.

Chapter 6: Maintenance

6.1	General Maintenance Considerations.....	190
6.2	Calibration	191
6.3	Periodically Clean the Equipment.....	192
6.4	Routine Component Replacement	193
6.5	Recondition the Ultrasonic Stack	194
6.6	Ultrasonic Stack Components	196
6.7	System Components	198
6.8	Accessories & Cables	201

6.1 General Maintenance Considerations

⚠ WARNING	
	Electrical Shock Hazard Failure to properly lockout/tagout (LOTO) the power source during maintenance could result in serious injury or death. • Use a lockable LOTO plug cover on the line cord plug during all maintenance.
⚠ CAUTION	
	Crushing Hazard Risk of injury from ultrasonic horn downforce and ultrasonic vibrations. Fingers or hands caught under the ultrasonic horn or between components can be crushed or severely injured. • Keep hands and other body parts away from the area beneath the ultrasonic horn at all times. • Do not place fingers or objects between the ultrasonic horn and the workpiece fixture during operation. • When using larger ultrasonic horns, avoid situations where fingers could be pinched between the ultrasonic horn and the workpiece fixture. Ensure the system is powered off and locked out before performing adjustments or maintenance near the ultrasonic horn.
NOTE	
	There are no customer replaceable components inside the system. Have all servicing done by a qualified Branson technician.
NOTE	
	When performing maintenance on the welder, make sure that no other automated systems are active.

6.2 Calibration

This product does not require scheduled Full System Calibration. However, if you are operating under requirements that mandate periodic calibration, for example, the FDA's Good Manufacturing Practices, you may need to calibrate the equipment according to that schedule a set of standards. Contact your Branson representative for additional information.

6.3 Periodically Clean the Equipment

6.3.1 External Covers

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

To prevent rust in areas of high humidity, exposed steel surfaces, may require a very light film of rust preventing oil.

6.3.2 HMI

When it is necessary to clean the HMI, wipe gently with a soft cloth dampened with a mild detergent. Give a final wipe to the entire screen with the soft damp cloth. Under no circumstances should you use solvents or ammonia to clean the HMI.

6.4 Routine Component Replacement

The lifetime of certain parts is based on the number of cycles the unit has completed, or on hours of operation (e.g., at 20,000 hours, cooling fans should be replaced). [Table 6.1](#) lists the average number of hours or cycles one should use in determining when actuator components should be replaced. Ambient operating temperature also affects lifetime. Higher temperatures reduce the number of cycles and hours before replacement is suggested. The charts below are for equipment operating at a temperature of 22 - 24°C (72 to 75°F).

The lifetime of system pneumatic components is influenced by the quality of the compressed air provided. All Branson systems require clean, dry, (normal) factory compressed air. When oil or moisture is present in the compressed air, the lifetime of the pneumatic components will be reduced. This table lists pneumatic parts with an average factory compressed air condition.

NOTICE	
	Only authorized Branson service personnel are permitted to carry out these replacements. Unauthorized servicing may void warranties and compromise machine performance and safety.

Table 6.1 Routine Component Replacement

Cycles	Component
At 10 Million Cycles	Air Cylinder
	Hydraulic Snubber
At 20 Million Cycles	Palm Buttons
	Solenoid Valves
At 40 Million Cycles	Pressure Regulator
	Air Filter
	Cooling Valve
	S-Beam & Load Cell Assembly
	Encoder Assembly
	Linear Bearing (2" stroke or greater)

For reference purposes:

1. A system operating at 60 welds per minute, 8 hours per day, 5 days per week, 50 weeks per year completes approximately 7.2 million cycles in 2000 hours
2. The same system at 24 hours per day, 5 days per week, in 50 weeks completes 21.6 million cycles in 6000 hours
3. 24 hours per day, 365 days per year produces 31.5 million cycles in 8760 hours

Please note that parts replaced during preventive maintenance constitute normal wear and tear. They are not covered by warranty.

6.5 Recondition the Ultrasonic Stack

NOTICE	
	Never clean ultrasonic stack mating surfaces using a buffing wheel or file. Altering the precision-machined mating surfaces can impair ultrasonic energy transmission, resulting in poor weld quality and damage to stack components.

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

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

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

6.5.1 Ultrasonic Stack Reconditioning Procedure

To recondition ultrasonic stack mating surfaces, take the following steps:

Table 6.2 Ultrasonic Stack Reconditioning Procedure

Step	Action
1	Disassemble the ultrasonic stack and wipe the mating surfaces with a clean cloth or paper towel.
2	Examine all mating surfaces. If any mating surface shows corrosion or a hard, dark deposit, recondition it.
3	If necessary, remove the threaded stud from the part.
4	Tape a clean sheet of #400 (or finer) grit emery cloth to a clean, smooth, flat surface (such as a sheet of plate glass).
5	Place the interface surface on the emery cloth. Grasp the part at the lower end, with your thumb over the spanner-wrench hole, and lap the part in a straight line across the emery cloth. Do not apply downward pressure — the weight of the part alone provides sufficient pressure.
6	Lap the part, two or three times, in the same direction against the emery cloth.
7	Rotate the part 120 degrees, placing your thumb over the spanner-wrench hole, and repeat the lapping procedure in Step 6.
8	Rotate the part another 120 degrees to the next spanner-wrench hole, and repeat the lapping procedure in Step 6.
9	Re-examine the mating surface. If necessary, repeat Steps 2-5 until you remove most of the contaminant. Remember, this should not require more than two to three complete rotations for an aluminum ultrasonic horn or booster; a titanium component may require more rotations.

Table 6.2 Ultrasonic Stack Reconditioning Procedure

Step	Action
10	Before re-inserting a threaded stud in an aluminum booster or ultrasonic horn: • Using a file card or wire brush, clean any aluminum bits from the knurled end of the stud. • Using a clean cloth or towel, clean the threaded hole. • Examine the knurled end of the stud. If worn, replace the stud. Also, examine the stud and threaded hole for stripped threads. NOTICE Threaded studs cannot be reused in titanium ultrasonic horns or boosters. Replace all studs in these components.
11	Assemble and install the ultrasonic stack.

6.5.2 Ultrasonic Stack Torque Values

Table 6.3 Ultrasonic Stack Torque Values

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

6.6 Ultrasonic Stack Components

6.6.1 Converters

Table 6.4 Converters

Description	EDP
CJ-20	101-135-059R
CA-30	101-135-114R
4TJ	101-135-041R

6.6.2 Boosters

6.6.2.1 20 kHz

Table 6.5 Boosters - 20 kHz

Type of Booster	Description	EDP
Standard Series 1/2-20 Input; 1/2-20 Output 20 kHz	Aluminum, 1:0.6 (Purple)	101-149-055
	Aluminum, 1:1 (Green)	101-149-051
	Aluminum, 1:1.5 (Gold)	101-149-052
	Aluminum, 1:2 (Silver)	101-149-053
	Titanium, 1:0.6 (Purple)	101-149-060
	Titanium, 1:1 (Green)	101-149-056
	Titanium, 1:1.5 (Gold)	101-149-057
	Titanium, 1:2 (Silver)	101-149-058
	Titanium, 1:2.5 (Black)	101-149-059
Solid Mount 1/2-20 Input; 1/2-20 Output 20 kHz	Titanium, 1:0.6 (Purple)	101-149-095
	Titanium, 1:1 (Green)	101-149-096
	Titanium, 1:1.5 (Gold)	101-149-097
	Titanium, 1:2 (Silver)	101-149-098
	Titanium, 1:2.5 (Black)	101-149-099

6.6.2.2 30 kHz

Table 6.6 Boosters - 30 kHz

Type of Booster	Description	EDP
Standard Series 3/8-24 Input; 3/8-24 Output 30 kHz	Titanium, 1:0:6 (Purple)	101-149-124
	Titanium, 1:1 (Green)	101-149-123
	Titanium, 1:1.5 (Gold)	101-149-122
	Titanium, 1:2 (Silver)	101-149-121
	Titanium, 1:2.5 (Black)	101-149-120
Solid Mount 3/8-24 Input; 3/8-24 Output 30 kHz	Titanium, 1:0:6 (Purple)	159-149-142
	Titanium, 1:1 (Green)	159-149-141
	Titanium, 1:1.5 (Gold)	159-149-140
	Titanium, 1:2 (Silver)	159-149-139
	Titanium, 1:2.5 (Black)	159-149-138
CA-30 Converter Adapter NOTE Requires CA-30 Converter Adapter (EDP 101-063-689).	Titanium, 1:2.5 (Black)	101-149-103
	Titanium, 1:2 (Silver)	101-149-104
	Titanium, 1:1.5 (Gold)	101-149-105
	Titanium, 1:1 (Green)	101-149-106

6.6.2.3 40 kHz

Table 6.7 Boosters - 40 kHz

Type of Booster	Description	EDP
Standard Series 8 mm 40 kHz	Aluminum, 1:0.6 (Purple)	101-149-087
	Aluminum, 1:1 (Green)	101-149-079
	Aluminum, 1:1.5 (Gold)	101-149-080
	Aluminum, 1:2 (Silver)	101-149-081R
	Aluminum, 1:2.5 (Black)	101-149-082
	Titanium, 1:1 (Green)	101-149-085
	Titanium, 1:1.5 (Gold)	101-149-086
	Titanium, 1:2 (Silver)	101-149-083
	Titanium, 1:2.5 (Black)	101-149-084
Solid Mount 8 mm 40 kHz	Titanium, 1:0:6 (Purple)	109-041-178
	Titanium, 1:1 (Green)	109-041-177
	Titanium, 1:1.5 (Gold)	109-041-176
	Titanium, 1:2 (Silver)	109-041-175
	Titanium, 1:2.5 (Black)	109-041-174

6.7 System Components

6.7.1 Actuator

6.7.1.1 Advanced/Core

Table 6.8 Advanced/Core

Name	Description	EDP
Polaris Advanced	ACTUATOR POLARIS ADVANCED 40MM 40 mm	BU-1039616
	ACTUATOR POLARIS ADVANCED 50MM 50 mm	BU-1039617
	ACTUATOR POLARIS ADVANCED 63MM 63 mm	BU-1039618
	ACTUATOR POLARIS ADVANCED 80MM 80 mm	BU-1039619
Polaris Core	ACTUATOR POLARIS CORE 40MM 40 mm	BU-1039612
	ACTUATOR POLARIS CORE 50MM 50 mm	BU-1039613
	ACTUATOR POLARIS CORE 63MM 63 mm	BU-1039614
	ACTUATOR POLARIS CORE 80MM 80 mm	BU-1039615

6.7.1.2 Advanced (Stainless Steel)

	NOTE
	Stainless steel actuators are automation-only models designed for clean room environments.

Table 6.9 Advanced (Stainless Steel)

Name	Description	EDP
Polaris Advanced Stainless Steel	ACTUATOR POLARIS ADVANCED SS 40MM Stainless Steel, 40 mm	BU-1044725
	ACTUATOR POLARIS ADVANCED SS 50MM Stainless Steel, 50 mm	BU-1044726
	ACTUATOR POLARIS ADVANCED SS63MM Stainless Steel, 63 mm	BU-1044727
	ACTUATOR POLARIS ADVANCED SS80MM Stainless Steel, 80 mm	BU-1044728

6.7.2 Base/Column

Table 6.10 Base/Column

Name	Description	EDP
ASSY POLARIS BASE/SPT/COL RND	Base Round column	BU-1039827
POLARIS HUB/SPT/RND-COL	Hub Round column	BU-1044682
POLARIS BASE/SPT/SQ-COL 20:4.0	Base Square column 20 kHz/4000 W	BU-1046263
POLARIS BASE/SPT/SQ-COL	Base Square column	BU-1046264
POLARIS HUB/SPT/SQ-COL	Hub Square column	BU-1046265
POLARIS HUB/SPT/SQ-COL 20:4.0	Hub Square column 20 kHz/4000 W	BU-1046266

6.7.3 Power Supply

Table 6.11 Power Supply

Name	Description	EDP
P/S POLARIS 20:1.25	Polaris Power Supply - 20 kHz/1250 W	BU-1039754
P/S POLARIS 20:2.5	Polaris Power Supply - 20 kHz/2500 W	BU-1039756
P/S POLARIS 20:4.0	Polaris Power Supply - 20 kHz/4000 W	BU-1039758
P/S POLARIS 30:1.5	Polaris Power Supply - 30 kHz/1500 W	BU-1039760
P/S POLARIS 40:0.8	Polaris Power Supply - 40 kHz/800 W	BU-1039762

6.7.4 Power Supply - Industrial Ethernet

Table 6.12 Power Supply - Industrial Ethernet

Name	Description	EDP
P/S IND-ETH POLARIS 20:1.25	Polaris Power Supply - 20 kHz/1250 W EtherNet/IP PROFINET	BU-1039764
P/S IND-ETH POLARIS 20:2.5	Polaris Power Supply - 20 kHz/2500 W EtherNet/IP PROFINET	BU-1039766
P/S IND-ETH POLARIS 20:4.0	Polaris Power Supply - 20 kHz/4000 W EtherNet/IP PROFINET	BU-1039768
P/S IND-ETH POLARIS 30:1.5	Polaris Power Supply - 30 kHz/1500 W EtherNet/IP PROFINET	BU-1039770
P/S IND-ETH POLARIS 40:0.8	Polaris Power Supply - 40 kHz/800 W EtherNet/IP PROFINET	BU-1039772

6.8 Accessories & Cables

Table 6.13 Accessories & Cables

Name	Description	EDP
Warranty		
Extended Warranty	6 months	800-101-006
	12 months	800-101-012
	18 months	800-101-024
Cables		
Ground Detect Cable	2.5 m	BU-1044059
User I/O Cable	2.5 m	1019375
	7.5 m	100-240-392
	15 m	100-240-393
Line Cord		1014991
	20 kHz/4000 W	1015997
Toolkits		
Polaris Actuator Toolkit Core Model		BU-1043261
Polaris Base/Hub Toolkit Core Model		BU-1043262
Polaris Actuator Toolkit Advanced Model		BU-1043263
Polaris Base/Hub Toolkit Advanced Model		BU-1043264
Polaris Actuator Mounting Kit		BU-1043265
Accessories		
Leveling Plate Kit	Metric	1015704
	Imperial	101-063-358
LED Work Light	Round Column	BU-1045768
	Square Column	BU-1048506
Barcode Scanner	Fixed Mount	BU-1046267
	Handheld	BU-1046268
HMI		BU-1043399
Base Guard Kit		101-063-550
CA-30 Converter Kit		101-063-689
Converter Sleeve		100-246-612
Reset Dongle		1016041

[This page intentionally left blank]

Chapter 7: Support

7.1	Warranty	204
7.2	Contact Us.....	205

7.1 Warranty

For warranty information please reference the warranty section of Terms and Conditions found at:
<https://www.branson.emerson.com/en/branson-terms-conditions>.

7.2 Contact Us



Our dedicated experts are here to assist you with any questions or concerns you may have, ensuring you get the help you need.

Visit <https://www.emerson.com/en/corporate/contact-us> to find the technical support information, documentation, and software updates you need for your Emerson products and systems.

[This page intentionally left blank]

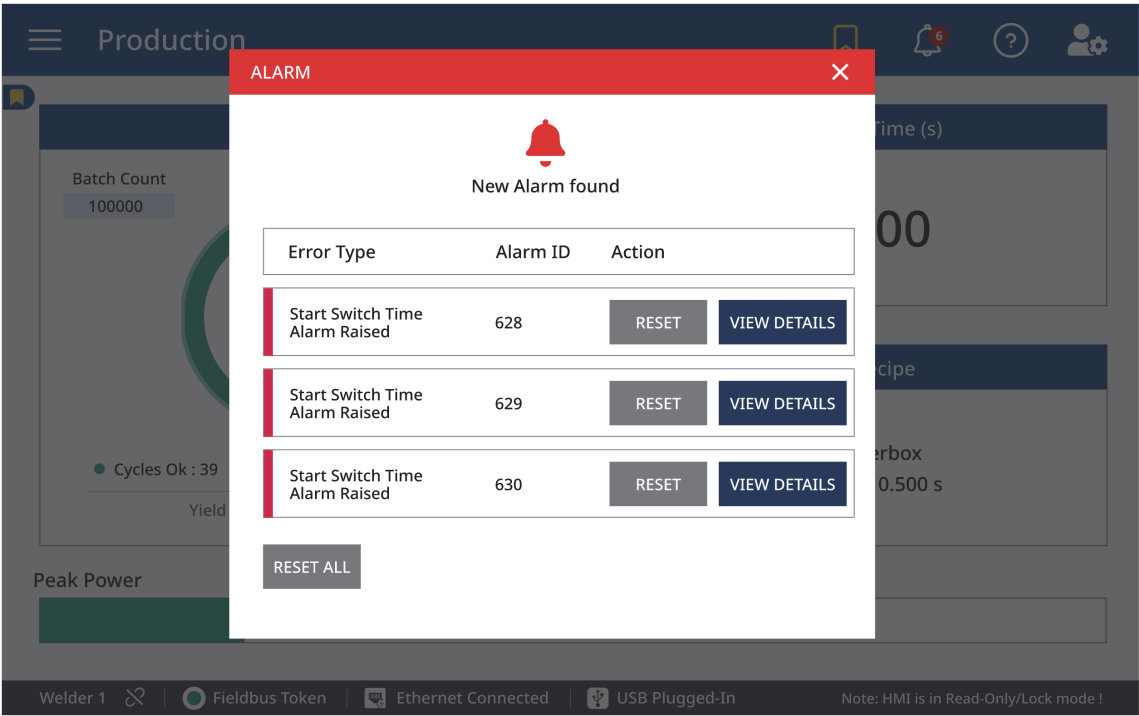
Appendix A: Alarms

A.1	Introduction	208
A.2	Overload Alarms	209
A.3	Cycle Modified Alarms.....	211
A.4	Warning Alarms	212
A.5	Reject Alarms	213
A.6	Suspect Alarms	214
A.7	Hardware Failure Alarms	215
A.8	No Cycle Alarms	218
A.9	No Cycle Overload Alarms	219
A.10	AC Safety Faults	221

A.1 Introduction

When the Polaris system encounters a condition outside normal operating parameters, an alarm is generated. When an alarm occurs, the HMI displays the alarm name and a brief description of the condition. To clear an alarm, press the **Reset** key on the power supply or press **Reset** on the HMI. Alarms are cleared only when the alarm condition is no longer present. If the underlying fault condition still exists, the alarm remains active until the condition has been corrected and the alarm is reset.

Figure A.1 Alarm



A.2 Overload Alarms

An Overload alarm occurs when the Polaris system has overloaded. The specific overload that has occurred is indicated by the message on the HMI.

Table A.1 Weld Overloads

Alarm ID	Name	Description
001	Weld - Phase Overload	Phase overload occurred during the weld.
002	Weld - Current Overload	Current overload occurred during the weld.
003	Weld - Frequency Overload	Frequency overload occurred during the weld.
004	Weld - Power Overload	Power overload occurred during the weld.
005	Weld - Voltage Overload	Voltage overload occurred during the weld.
006	Weld - Temperature Overload	Temperature overload occurred during the weld.
007	Weld - General Overload	General overload occurred during the weld.

Table A.2 Energy Brake Overloads

Alarm ID	Name	Description
011	Energy Brake - Phase Overload	Phase overload occurred during Energy Brake.
012	Energy Brake - Current Overload	Current overload occurred during Energy Brake.
013	Energy Brake - Frequency Overload	Frequency overload occurred during Energy Brake.
014	Energy Brake - Power Overload	Power overload occurred during Energy Brake.
015	Energy Brake - Voltage Overload	Voltage overload occurred during Energy Brake.
016	Energy Brake - Temperature Overload	Temperature overload occurred during Energy Brake.
017	Energy Brake - General Overload	General overload occurred during Energy Brake.

Table A.3 Afterburst Overloads

Alarm ID	Name	Description
021	Afterburst - Phase Overload	Phase overload occurred during Afterburst.
022	Afterburst - Current Overload	Current overload occurred during Afterburst.
023	Afterburst - Frequency Overload	Frequency overload occurred during Afterburst.
024	Afterburst - Power Overload	Power overload occurred during Afterburst.
025	Afterburst - Voltage Overload	Voltage overload occurred during Afterburst.
026	Afterburst - Temperature Overload	Temperature overload occurred during Afterburst.
027	Afterburst - General Overload	General overload occurred during Afterburst.

Table A.4 Post-Weld Seek Overloads

Alarm ID	Name	Description
031	Post-Weld Seek - Phase Overload	Phase overload occurred during Post-Weld Seek.
032	Post-Weld Seek - Current Overload	Current overload occurred during Post-Weld Seek.
033	Post-Weld Seek - Frequency Overload	Frequency overload occurred during Post-Weld Seek.
034	Post-Weld Seek - Power Overload	Power overload occurred during Post-Weld Seek.

Table A.4 Post-Weld Seek Overloads

Alarm ID	Name	Description
035	Post-Weld Seek - Voltage Overload	Voltage overload occurred during Post-Weld Seek.
036	Post-Weld Seek - Temperature Overload	Temperature overload occurred during Post-Weld Seek.
037	Post-Weld Seek - General Overload	General overload occurred during Post-Weld Seek.

A.3 Cycle Modified Alarms

A Cycle Modified alarm occurs when the most recent weld cycle has been modified by some event. The specific alarm that has occurred is indicated by the message on the HMI. If you encounter numerous or successive cycle modified alarms, review your weld parameter recipe.

Table A.5 Cycle Modified Alarms

Alarm ID	Name	Description
303	Ground Detect Abort	The Ground Detect Input has become active and the Cycle has been aborted.
304	Max Weld Time Exceeded	The maximum time allowed for Ultrasonic energy to be applied to the part has been reached.
306	No Amplitude Step	The amplitude step trigger was not reached.
307	No Pressure step	The pressure step trigger was not reached.
31B	Peak Power Cutoff	The Peak Power Cutoff value has been exceeded during the weld.
31C	Absolute Distance Cutoff	The Absolute Distance Cutoff value has been exceeded during the weld.
31F	Collapse Distance Cutoff	The Collapse Distance Cutoff value has been exceeded during the weld.
321	Ultrasonics disabled	The Ultrasonics Disable user input has been enabled during this cycle.
326	Frequency Low Cutoff	The Frequency Low Cutoff value has been exceeded during the weld.
327	Frequency High Cutoff	The Frequency High Cutoff value has been exceeded during the weld.
329	Energy Cutoff	The Energy Cutoff value has been exceeded during the weld.
32A	Ground Detect Cutoff	The Ground Detect Cutoff has triggered during the weld.
32B	Time Cutoff	The Time Cutoff value has been exceeded during the weld.
32C	Min Energy Compensation	Minimum Energy Compensation value not reached during weld.
32D	Max Energy Compensation	Maximum Energy Compensation value exceeded during weld.
32E	Incomplete Amplitude Steps	Not all amplitude steps occurred.
32F	Incomplete Pressure Steps	Not all pressure steps occurred.

A.4 Warning Alarms

Table A.6 Warning Alarms

Alarm ID	Name	Description
401	Trigger Force lost in Weld	The applied Force dropped below the minimum Trigger Force during the cycle.
402	Trigger Force lost in Hold	The applied Force dropped below the minimum Trigger Force during the Hold.
417	Actuator clear not reached	ULS is active and the actuator clear condition has not been met
422	USB Memory Nearly Full (80%)	USB memory is greater than 80% Full. Consider extracting data to an external storage drive to avoid loss of data.
423	Internal Storage Capacity Warning	Internal Storage is greater than 80% Full. Consider extracting data to USB to avoid loss of data.
445	Alarm Log Capacity Warning	Alarm Log Storage is greater than 80% Full.
446	Event Log Capacity Warning	Event Log Storage is greater than 80% Full.
447	Weld Result Capacity Warning	Weld Result Storage is greater than 80% Full.
448	Weld Graph Capacity Warning	Weld Graph Storage is greater than 80% Full.
449	Horn Scan Graph Capacity Warning	Horn Scan Graph Storage is greater than 80% Full.
451	Invalid actuator clear distance	Actuator clear distance configuration is invalid or wrong.
41E	Actuator Recalibration suggested	Invalid Actuator EEPROM values.

A.5 Reject Alarms

Reject alarms occurs when the most recent weld cycle fell outside your programmed limits. The specific alarm that has occurred is indicated by the message on the HMI. You should inspect any part that was welded during a cycle that resulted in an alarm. If you encounter numerous or successive alarms you should review your limits parameter setup.

Table A.7 Reject Alarms

Alarm ID	Name	Description
50B	-Absolute Distance Reject Limit	The total Absolute Distance did not exceed the lower limit value.
50C	+Absolute Distance Reject Limit	The total Absolute Distance exceeded the upper limit value.
509	-Collapse Distance Reject Limit	The total Collapse Distance did not exceed the lower limit value.
50A	+Collapse Distance Reject Limit	The total Collapse Distance exceeded the upper limit value.
507	-Energy Reject Limit	The total Weld Energy did not exceed the lower limit value.
508	+Energy Reject Limit	The total Weld Energy exceeded the upper limit value.
512	-Frequency Reject Limit	The Weld Frequency did not exceed the lower limit value.
513	+Frequency Reject Limit	The Weld Frequency exceeded the upper limit value.
503	-Peak Power Reject Limit	The Peak Power did not exceed the lower limit value.
504	+Peak Power Reject Limit	The Peak Power exceeded the upper limit value.
505	-Time Reject Limit	The total Weld Time did not exceed the lower limit value.
506	+Time Reject Limit	The total Weld Time exceeded the upper limit value.
50D	-Trigger Reject Limit	The Trigger Distance did not exceed the lower limit value.
50E	+Trigger Reject Limit	The Trigger Distance exceeded the upper limit value.
501	-Velocity Reject Limit	The Weld Velocity did not exceed the lower limit value.
502	+Velocity Reject Limit	The Weld Velocity exceeded the upper limit value.
50F	-Weld Force Reject Limit	The total Weld Force did not exceed the lower limit value.
510	+Weld Force Reject Limit	The total Weld Force exceeded the upper limit value.

A.6 Suspect Alarms

Suspect alarms occurs when the most recent weld cycle fell outside your programmed limits. The specific alarm that has occurred is indicated by the message on the HMI. You should inspect any part that was welded during a cycle that resulted in an alarm. If you encounter numerous or successive alarms you should review your limits parameter recipe.

Table A.8 Suspect Alarms

Alarm ID	Name	Description
557	-Absolute Distance Suspect Limit	The total Absolute Distance did not exceed the lower limit value.
558	+Absolute Distance Suspect Limit	The total Absolute Distance exceeded the upper limit value.
555	-Collapse Distance Suspect Limit	The total Collapse Distance did not exceed the lower limit value.
556	+Collapse Distance Suspect Limit	The total Collapse Distance exceeded the upper limit value.
551	-Energy Suspect Limit	The total Weld Energy did not exceed the lower limit value.
552	+Energy Suspect Limit	The total Weld Energy exceeded the upper limit value.
562	-Frequency Suspect Limit	The Weld Frequency did not exceed the lower limit value.
563	+Frequency Suspect Limit	The Weld Frequency exceeded the upper limit value.
553	-Peak Power Suspect Limit	The Peak Power did not exceed the lower limit value.
554	+Peak Power Suspect Limit	The Peak Power exceeded the upper limit value.
55D	-Time Suspect Limit	The total Weld Time did not exceed the lower limit value.
55E	+Time Suspect Limit	The total Weld Time exceeded the upper limit value.
559	-Trigger Distance Suspect Limit	The Trigger Distance did not exceed the lower limit value.
55A	+Trigger Distance Suspect Limit	The Trigger Distance exceeded the upper limit value.
560	-Velocity Suspect Limit	The Weld Velocity did not exceed the lower limit value.
561	+Velocity Suspect Limit	The Weld Velocity exceeded the upper limit value.
55B	-Weld Force Suspect Limit	The total Weld Force did not exceed the lower limit value.
55C	+Weld Force Suspect Limit	The total Weld Force exceeded the upper limit value.

A.7 Hardware Failure Alarms

Hardware Failure alarms are those which might occur for hardware failure, or hardware disconnected. The specific alarm that has occurred is indicated by the message on the HMI.

Table A.9 Hardware Failure Alarms

Alarm ID	Name	Description
601	Start Switch Still Active	The Start Switches are still active 6 seconds after the end of the Cycle.
602	ULS Still Active	The ULS has not become inactive after Trigger or Pretrigger has been reached.
604	ULS Not Active After Homing	The ULS is not active after an E-Stop or Alarm.
605	Ground Detect Before Trigger	The Ground Detect Input has become active before Trigger occurred.
609	Start Switch Lost	The Start Switches became inactive before Trigger occurred.
611	Alarm Log Capacity Reached	Alarm Log Storage is Full.
612	Event Log Capacity Reached	Event Log Storage is Full.
613	Weld Result Capacity Reached	Weld Result Storage is Full.
614	Weld Graph Capacity Reached	Weld Graph Storage is Full.
615	Horn Scan Graph Capacity Reached	Horn Scan Graph Storage is Full.
620	Pretrigger Timeout	Pretrigger has not occurred within 10 seconds of ULS going inactive.
624	Data Error	Corrupted data in the Recipe checked at power up.
625	Actuator Return Timeout	The carriage has not returned home in 4 seconds
626	Actuator NOVRAM	The actuator NOVRAM has corrupted data. This is checked at power up.
627	P/S NOVRAM	The power supply NOVRAM has corrupted data. This is checked at power up.
628	Start Switch Time	Both Start Switches were not pressed within the allowed time frame.
629	Data Storage Full	Internal Storage Device is full. Any operation which requires Data Storage will not be allowed.
62A	Internal Storage Failure	Contact Branson Service for Assistance.
62F	Recalibrate Actuator	Stack weight change detected, please perform quick calibration.
630	Actuator Clear Function	ULS is active before actuator clear condition was met.
631	External Tooling Active	The External Tooling Input has not become inactive for more than 4 seconds after the end of a cycle.
632	Actuator Type Changed	The actuator type detected at power up is different from power down or after an E-Stop.
633	System Pressure Incorrect	The set air pressure is not achieved.
634	Part Present Active	The Part Present Input is configured and is still active for more than 4 seconds after the end of a cycle.

Table A.9 Hardware Failure Alarms

Alarm ID	Name	Description
635	USB Memory Lost	The USB memory stick has been removed or is not functional. Since weld data was configured to be saved on the USB stick welding must be stopped until either the USB stick is functional or weld data is no longer required to be saved.
636	NFS Mounting Fail	NFS is not functional. Since weld data was configured to be saved on the NFS welding must be stopped until either the NFS is functional or weld data is no longer required to be saved.
638	Connection Lost	Communication between the HMI and the welder has been disconnected.
639	Internal Communication Link Lost	The internal communication link has been lost between the Supervisor and actuator
63A	Cable Failure	If Cable Detect is configured and the pin goes inactive.
63B	PROFINET or EtherNet/IP not responding	
63C	AC Line Voltage Lost	230 V input to the Power Supply is not ON.
63D	Trigger active in Ready	Trigger force is detected in the Ready State.
63F	Internal Keypad Bezel Communication Link Lost	The internal communication link has been lost between the Supervisor and Keypad Bezel.
640	RTC Low Battery	System time may not be reliable. Set system time.
641	Internal Communication Failure	No additional details available.
642	Internal Communication Failure	No additional details available.
643	Internal Communication Failure	No additional details available.
637	Internal Communication Failure	No additional details available.
644	Automation Configuration Failure	Automation cable detected, welder palm buttons are disabled.
645	Automation Configuration Failure	Automation mode requires EtherNet/IP/PROFINET support and an automation cable.
646	Automation Configuration Failure	Automation mode requires EtherNet/IP/PROFINET support.
647	Automation Configuration Failure	Automation cable detected, welder palm buttons are disabled.
648	Automation Configuration Failure	Automation mode enabled but special automation cable not installed.
649	Automation Configuration Failure	Wrong Hilscher stack configured, expected PROFINET, detected EtherNet/IP.
64A	Automation Configuration Failure	Wrong Hilscher stack configured, expected EtherNet/IP, detected PROFINET.
64B	Automation Configuration Failure	Unknown Hilscher stack detected, expected EtherNet/IP.
64C	Automation Configuration Failure	Unknown Hilscher stack detected, expected PROFINET.
64D	Automation Configuration Failure	The communication link between Hilscher and ASC has been lost.
64E	Analog Input 1 Overvoltage	Analog Input 1 has exceeded the maximum voltage level.
64F	Analog Input 2 Overvoltage	Analog Input 2 has exceeded the maximum voltage level.

Table A.9 Hardware Failure Alarms

Alarm ID	Name	Description
650	TCP/IP Connection Lost	TCP/IP client is not connected. Since weld data was configured to be saved through the TCP/IP client welding must be stopped until either the TCP/IP client is functional or weld data is no longer required to be saved.

A.8 No Cycle Alarms

A No Cycle alarm occurs when the most recent weld cycle was aborted before any weld took place. The specific alarm that has occurred is indicated by the message on the HMI.

Table A.10 No Cycle Alarms

Alarm ID	Name	Description
703	External Sonics Delay Timeout	Trigger Delay has been turned on, but the assigned input did not become inactive within the 30 seconds allowed.
704	Part Contact before Pretrigger Time	The Part Contact has been met before the defined Pretrigger Time.
708	Part Contact before Pretrigger Distance	The Part Contact has been met before the defined Pretrigger Distance.
714	External Tooling Input Lost	The External Tooling Input became inactive before Hold Time ended.
715	External Tooling Input Timeout	The External Tooling Input did not become active within the Tooling Delay Input time after the External Tooling Output became active.
716	Part Present Input Lost	The Part Present Input became inactive before the end of Hold Time.
717	Trigger Timeout	Trigger has not occurred within 10 seconds of ULS going inactive.
718	Ready Position Timeout	The Actuator did not return to the Ready Position within 4 seconds from end of Hold Time.
719	Recipe Not Valid	The External Recipe # is not valid through the I/O or Barcode scanner.
720	Power Supply Assembly Component Mismatch	The Power Supply Component Name defined in the System Configuration do not match the Name stored with this Recipe.
721	Actuator Assembly Component Mismatch	The Actuator Component Name defined in the System Configuration do not match the Name stored with this Recipe.
722	Ultrasonic Stack Assembly Component Mismatch	The Ultrasonic Stack Component Name defined in the System Configuration do not match the Name stored with this Recipe.
70A	External Cycle Abort	The Cycle Abort Digital Input has been activated before trigger occurred.
70C	Invalid Part Contact Distance	The Part Contact Distance is invalid or not set.
71A	Batch Count Complete	The target number of welds for this Batch has been met. Navigate to the Recipe Production Screen to reset the count.
71B	Active Recipe not Validated	The Operator is attempting to run a recipe that has not been Validated.
71C	Part Present Input Timeout	The Part Present Input did not become active within the Part Present Delay Input time.

A.9 No Cycle Overload Alarms

A No Cycle Overload alarm occurs when the Polaris system has overloaded before trigger or outside the weld cycle.

Table A.11 Test Overloads

Alarm ID	Name	Description
841	Test - Phase Overload	Phase overload occurred during Test.
842	Test - Current Overload	Current overload occurred during Test.
843	Test - Frequency Overload	Frequency overload occurred during Test.
844	Test - Power Overload	Power overload occurred during Test.
845	Test - Voltage Overload	Voltage overload occurred during Test.
846	Test - Temperature Overload	Temperature overload occurred during Test.
847	Test - General Overload	General overload occurred during Test.

Table A.12 Pretrigger Overloads

Alarm ID	Name	Description
851	Pretrigger - Phase Overload	Phase overload occurred during Pretrigger.
852	Pretrigger - Current Overload	Current overload occurred during Pretrigger.
853	Pretrigger - Frequency Overload	Frequency overload occurred during Pretrigger.
854	Pretrigger - Power Overload	Power overload occurred during Pretrigger.
855	Pretrigger - Voltage Overload	Voltage overload occurred during Pretrigger.
856	Pretrigger - Temperature Overload	Temperature overload occurred during Pretrigger.
857	Pretrigger - General Overload	General overload occurred during Pretrigger.

Table A.13 Seek Overloads

Alarm ID	Name	Description
861	Seek - Phase Overload	Phase overload occurred during Seek.
862	Seek - Current Overload	Current overload occurred during Seek.
863	Seek - Frequency Overload	Frequency overload occurred during Seek.
864	Seek - Power Overload	Power overload occurred during Seek.
865	Seek - Voltage Overload	Voltage overload occurred during Seek.
866	Seek - Temperature Overload	Temperature overload occurred during Seek.
867	Seek - General Overload	General overload occurred during Seek.

Table A.14 Pre-Weld Seek Overloads

Alarm ID	Name	Description
881	Pre-Weld Seek - Phase Overload	Phase overload occurred during Pre-Weld Seek.
882	Pre-Weld Seek - Current Overload	Current overload occurred during Pre-Weld Seek.
883	Pre-Weld Seek - Frequency Overload	Frequency overload occurred during Pre-Weld Seek.
884	Pre-Weld Seek - Power Overload	Power overload occurred during Pre-Weld Seek.

Table A.14 Pre-Weld Seek Overloads

Alarm ID	Name	Description
885	Pre-Weld Seek - Voltage Overload	Voltage overload occurred during Pre-Weld Seek.
886	Pre-Weld Seek - Temperature Overload	Temperature overload occurred during Pre-Weld Seek.
887	Post-Weld Seek - General Overload	General overload occurred during Post-Weld Seek.

A.10 AC Safety Faults

	NOTE
	If an AC Safety Fault occurs, verify all power supply and actuator connections, then restart the system by cycling power OFF and ON. If the alarm remains active after these checks, no further customer troubleshooting is available. Contact Branson Technical Support for assistance.

Table A.15 AC Safety Faults

Alarm ID	Name	Description
E01	EN Linear Encoder Phase Error	Linear Encoder Phase Error is detected.
E03	EN Linear Encoder drive on position	Linear Encoder position is not changed during drive on.
E04	EN Linear Encoder away position	Ultrasonic horn is at home position but Linear Encoder says at away position.
E05	EN Linear Encoder Reading Discrepancy	Linear encoder reports home position while upper limit switch indicates ultrasonic horn is away from home position.
E06	EN Both Palm button Drives Active	Both palm button drives are active at same time.
E07	EN Either one Palm button Drive Fail	Either one palm button drive is failed.
E08	EN Palm button pressed during power up	Palm buttons are pressed during power up.
E0A	EN Only one Palm button pressed during ready	Only one palm button is pressed during ready.
E0B	EN Palm buttons two hand timing not satisfied	Palm buttons two hand timing is not satisfied during ready.
E0C	EN One or both Palm button released during drive on	One or both Palm button released during drive on.
E0D	EN Palm button still pressed during fault	Palm button still pressed during fault.
E0E	EN UFail24 signal error	UFail24 signal error is detected.
E0F	EN EStop button error	Both EStop1 and Estop2 signals are same.
E10	EN Upper Limit Switch signal error	ULS is at home position and TRS is ON.
E11	EN SBeam Force Limit	SBeam Force Limit is exceeded.
E12	EN Trigger Switch signal error	TRS is On and ULS is at home position.
E13	EN SVRelay state not drive	SV1 relay input status does not match with SV1_HI relay output.
E14	EN Board Mismatch fault	Board Mismatch is detected.
E15	EN Sonics enable signal error	Sonics enable signal error is detected.
E16	EN BIST Register test fail	BIST Register test is failed.
E17	EN BIST RAM Safe Area test fail	BIST RAM Safe Area test is failed.
E18	EN BIST Program Counter test fail	BIST Program Counter test is failed.
E19	EN BIST RAM Data Area test fail	BIST RAM Data Area test is failed.
E1A	EN BIST ADC test fail	BIST ADC test is failed.

Table A.15 AC Safety Faults

Alarm ID	Name	Description
E1B	EN BIST RAM Ultrasonic Stack Area test fail	BIST RAM Ultrasonic Stack Area test is failed.
E1C	EN BIST Flash test1 fail	BIST Flash test1 is failed.
E1D	EN BIST Flash test2 fail	BIST Flash test2 is failed.
E1E	EN BIST Flash test3 fail	BIST Flash test3 is failed.
E1F	EN BIST Flash test4 fail	BIST Flash test4 is failed.
E20	EN Incorrect Status	Incorrect alarm status is received.
E21	AC Variant Detection Fail	Variant Detection is failed.
E22	AC Linear Encoder Fault	Linear Encoder fault is detected.
E23	AC Pressure Regulator Fault	Pressure Regulator fault is detected.
E24	AC Safety Micro Fault	Safety Micro communication fault is detected.
E25	AC EEPROM Fault	EEPROM fault is detected.
E26	AC Incorrect ASC Frame	Incorrect ASC Frame is received.
E27	AC ASC Communication Timeout	ASC Communication Timeout is detected.
E28	AC GDS Active Power Up	GDS signal is active during Power Up.
E29	AC ULS Inactive during Power Up	ULS signal is inactive during Power Up.
E2A	AC TRS Active during Power Up	TRS signal is active during Power Up.
E2B	AC ULS Inactive during Ready	ULS signal is inactive during Ready.
E2C	AC J72 Cable removed	AC J72 Cable removed.
E2D	AC GDS Active during Ready	GDS signal is active during Ready.
E2E	AC TRS Active during Ready	TRS signal is active during Ready.
E2F	AC Fail24V Active during Downstroke	Fail24V signal is active during Downstroke.
E30	AC GDS Active during Downstroke	GDS signal is active during Downstroke.
E31	AC Fail24V Active during Return Stroke	Fail24V signal is active during Return Stroke.
E32	AC GDS Active during Return Stroke	GDS signal is active during Return Stroke.
E33	AC ULS Active during Hold	ULS signal is active during Hold.
E34	AC Fail24V Active during Hold	Fail24V signal is active during Hold.
E35	AC GDS Active during Hold	GDS signal is active during Hold.
E36	EN Safety-Interlock is Open	Automation Safety-Interlock Switch is Open.
E37	AC Only One Palm Button is pressed during Ready	Only one palm button is pressed during Ready state.
E38	EN BIST STACK OVERFLOW test fail	BIST STACK OVERFLOW test failed.
E39	EN WATCHDOG test fail.	WATCHDOG test failed

Appendix B: PC HMI

B.1	Remote Operation Using the PC HMI	224
B.2	PC HMI Installation	225
B.3	Configure the PC Network Connection	226
B.4	Connect to a Welder	227
B.5	Monitor Multiple Welders	229
B.6	Access the Full Welder HMI.....	230
B.7	Disconnect a Welder	231

B.1 Remote Operation Using the PC HMI

The PC HMI application allows a Microsoft® Windows® computer to remotely access and monitor Polaris ultrasonic welders over an Ethernet network. The PC HMI provides the same user interface, navigation, and functionality as the local HMI installed on the welder.

Unlike the local HMI, the PC HMI can connect to and monitor up to four Polaris welders simultaneously. This allows operators, supervisors, and manufacturing personnel to monitor production data and access multiple systems from a single workstation.

The PC HMI is intended for use on a Windows 11 computer connected to the same network as the Polaris welders.

Figure B.1 PC HMI



B.2 PC HMI Installation

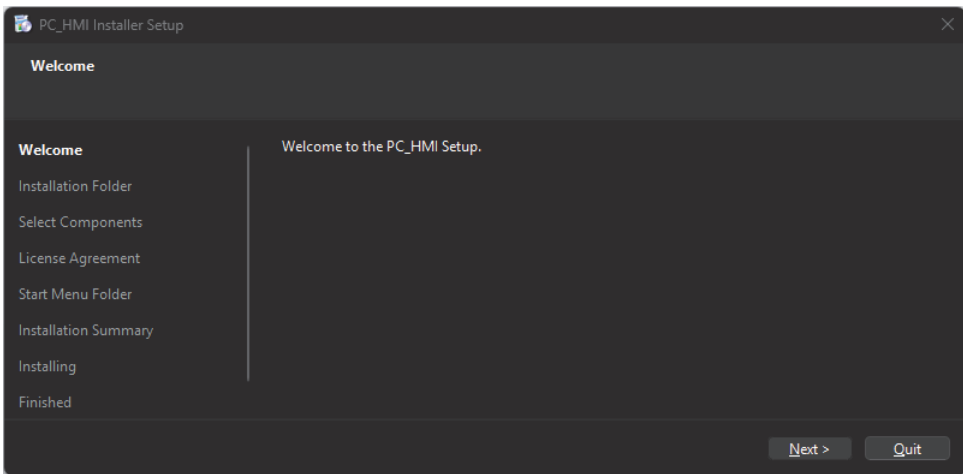
B.2.1 Before You Begin

Verify that:

- The PC HMI installation package has been downloaded from the Emerson website.
- The computer is running Windows 11.
- You have authorization to install software on the computer.

B.2.2 Install the PC HMI Application

Table B.1 Install the PC HMI Application

Step	Instructions
1	Download the PC HMI installation package from the Emerson website.
2	Open the installation executable (.exe) file. Follow the installation wizard instructions. 
3	Select the installation folder. NOTE It is recommended to use the default installation directory.
4	Accept the license agreement.
5	Select whether to create application shortcuts.
6	Review the installation summary.
7	Wait for the installation to complete.
8	After installation, the PC HMI application icon is available from the Windows Desktop and Start Menu. 

B.3 **Configure the PC Network Connection**

The Polaris system is configured with a default IP address of 192.168.1.100.

To communicate with the welder, configure the network adapter on the Windows computer with a compatible IP address on the same subnet.

Example:

Table B.2 IP Setup

Device	IP Address
Polaris Welder	192.168.1.100
PC HMI Computer	192.168.1.101

B.4 Connect to a Welder

Table B.3 Connect to a Welder

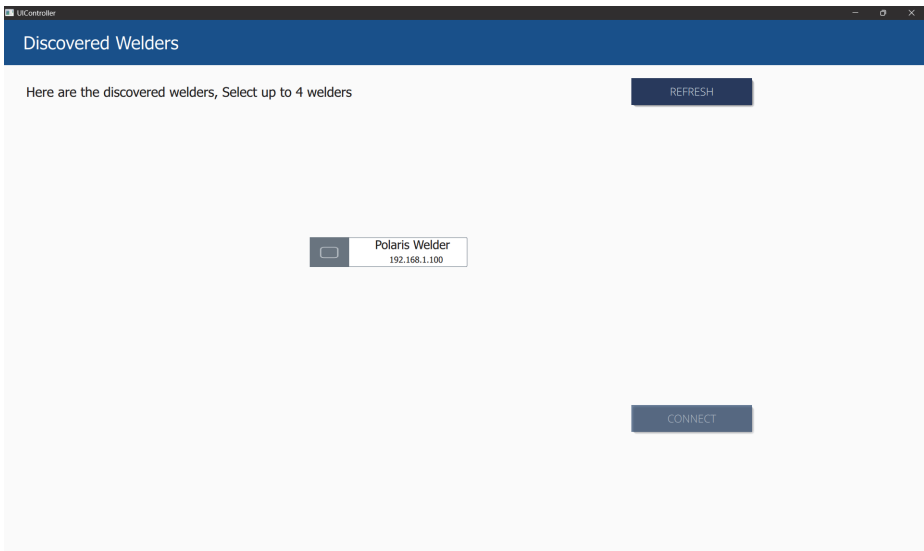
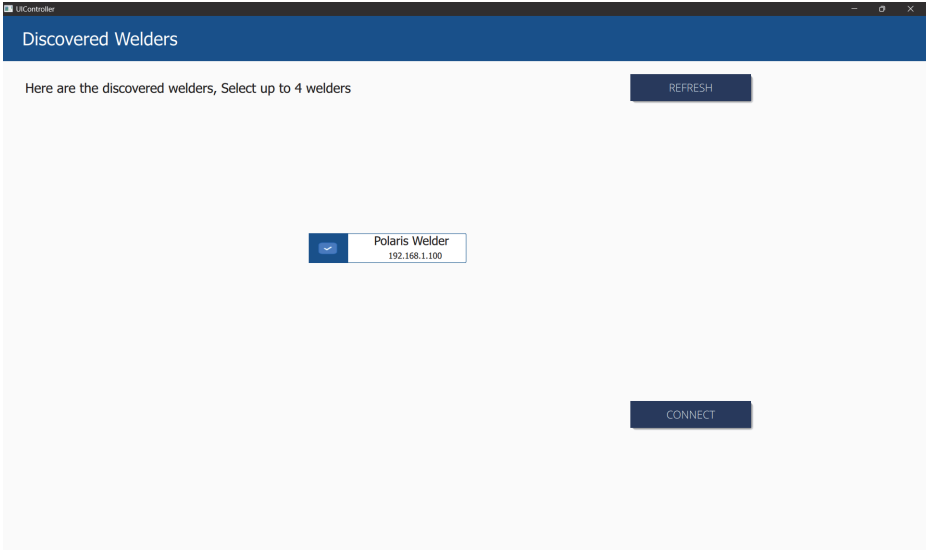
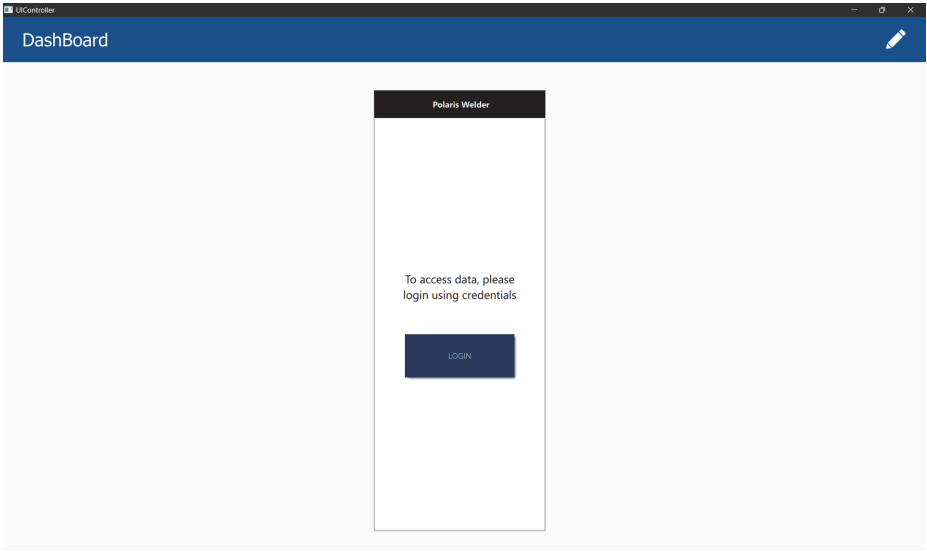
Step	Instructions
1	Open the PC HMI application. The Discovering Welders screen appears while the application searches for available Polaris welders on the network. 
2	Review the list of detected welders. The list displays: • Welder name • IP address 

Table B.3 Connect to a Welder

Step	Instructions
3	Select one or more welders. Up to four welders can be selected at the same time. Click Connect. 
4	The selected welders appear in separate columns on the PC HMI dashboard. Log in to each welder using the credentials configured on that specific system. 

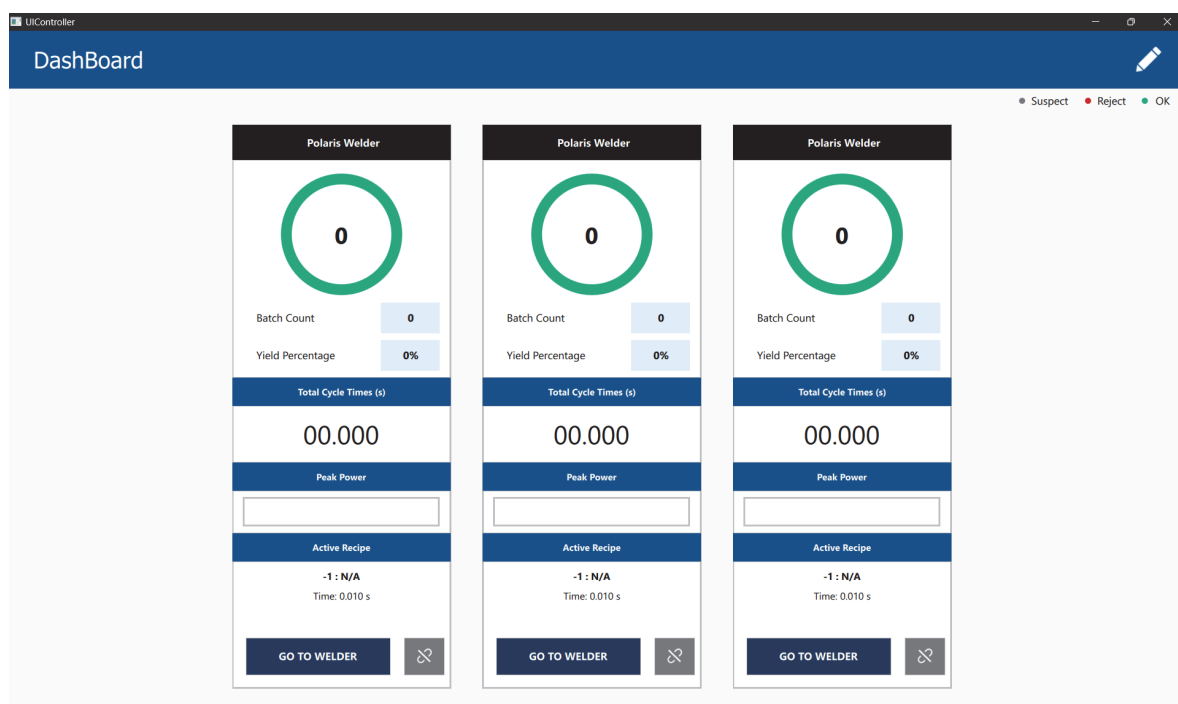
B.5 Monitor Multiple Welders

The PC HMI dashboard can display up to four welders simultaneously. Each welder is displayed in a separate column containing key production information, including:

- Batch count
- Yield percentage
- Total cycle time
- Peak power
- Active recipe

This view allows users to monitor production activity across multiple systems from a single location.

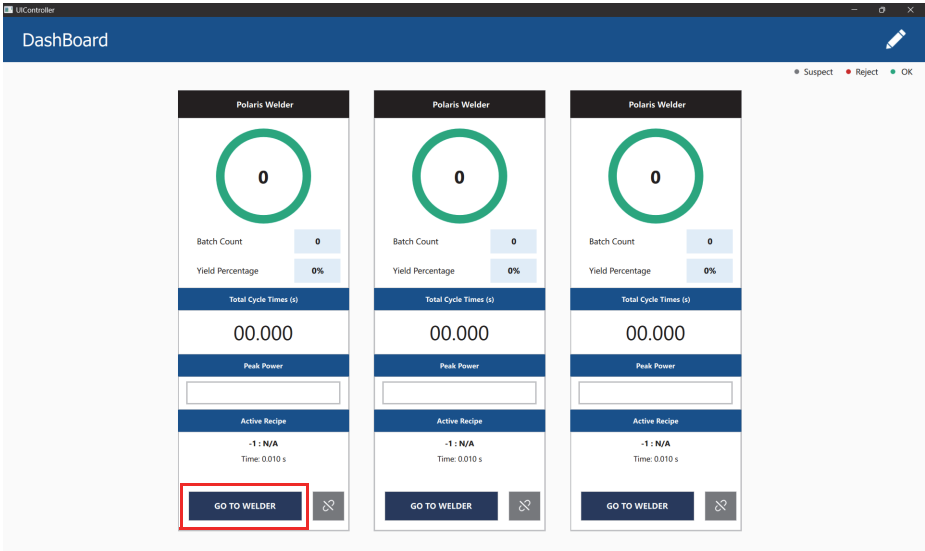
Figure B.2 Monitor Multiple Welders



B.6 Access the Full Welder HMI

The PC HMI provides the same screens, menus, and functionality available on the local welder HMI. To access the complete HMI interface of a connected welder:

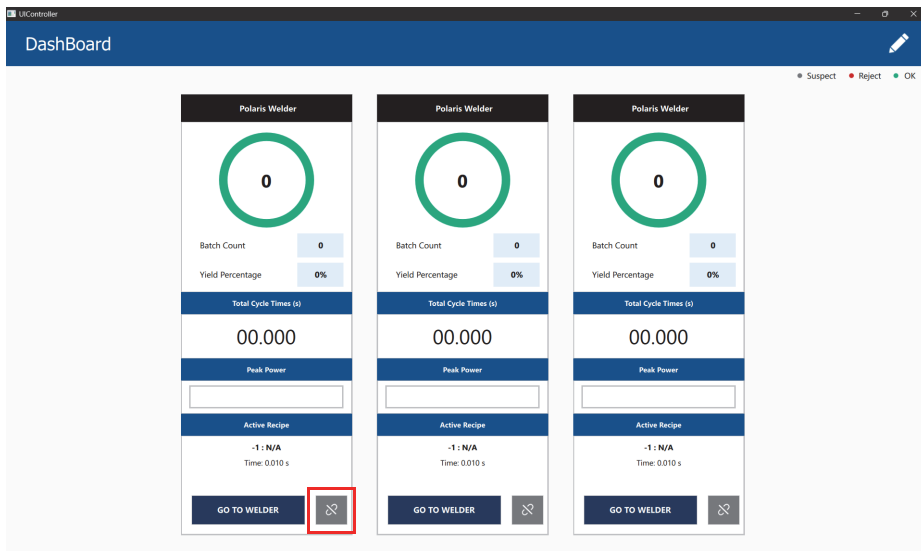
Table B.4 Access the Full Welder HMI

Step	Instructions
1	Locate the desired welder column on the dashboard.
2	Click Go to Welder. 
3	The full Polaris HMI for the selected welder is displayed on the computer.

B.7 Disconnect a Welder

To remove a welder from the PC HMI dashboard:

Table B.5 Disconnect a Welder

Step	Instructions
1	Locate the desired welder column on the dashboard.
2	Click the Disconnect icon.  The screenshot shows a window titled 'Dashboard' with a legend for 'Suspect' (yellow), 'Reject' (red), and 'OK' (green). It displays three identical welder columns for 'Polaris Welder'. Each column has a large green circle with '0' inside, representing the status. Below this are fields for 'Batch Count' (0), 'Yield Percentage' (0%), 'Total Cycle Times (s)' (00.000), 'Peak Power' (empty), and 'Active Recipe' (-1 : N/A, Time: 0.010 s). At the bottom of each column is a 'GO TO WELDER' button and a Disconnect icon (a square with a diagonal line). The Disconnect icon in the first column is highlighted with a red box.
3	The selected welder is disconnected from the PC HMI application and removed from the dashboard view. Other connected welders remain active.

[This page intentionally left blank]

Appendix C: System Automation

C.1 Polaris Automation Assembly Manual 234

C.1 Polaris Automation Assembly Manual

	⚠WARNING
	Crushing Hazard The ultrasonic welder is equipped with palm buttons for initiating operation and an emergency stop (E-Stop) button for operator safety. If alternative start or E-Stop controls are used as part of an automated system, improper integration or use may result in hazardous conditions leading to serious injury or equipment damage. • Before implementing any alternate control methods, the customer must sign a Branson Product Liability Agreement. • Use only manufacturer-approved control configurations. • Ensure all start and Emergency Stop functions are properly integrated and verified before operation. • Failure to comply with this requirement may result in unsafe operation and void applicable liability protections.
	NOTE
	See document BU-4001430 - POLARIS AUTOMATION - ASSEMBLY MANUAL for more information.

Appendix D: LDAP

D.1	Purpose	236
D.2	Scope	237
D.3	Installation Procedure for Microsoft Active Directory LDAP Server.....	238
D.4	LDAP Configuration for the OpenLDAP Server	246
D.5	LDAP Setup Block Diagram.....	257
D.6	Preconditions.....	258
D.7	LDAP Server Configuration via HMI.....	259
D.8	LDAP Client Certificate Upload	260
D.9	LDAP Server Configuration and Secure TLS Connection.....	262
D.10	Responsibilities	265
D.11	Login Credential Requirements.....	266
D.12	Troubleshooting	267

D.1 Purpose

The purpose of this section is to describe the procedures for installing, configuring, and validating Microsoft Active Directory on the Windows platform and OpenLDAP on the Linux platform.

This document provides guidance for deploying a secure and scalable Active Directory and OpenLDAP infrastructure integrated with LDAP and Certificate Authority (CA) services, while ensuring adherence to industry best practices for identity management, access control, and data protection.

It also provides step-by-step instructions for the consistent and secure deployment of LDAP services used for authentication, directory services, and certificate management integration.

In addition, this document provides guidance for configuring and managing LDAP parameters, including the host name, port number, security settings, and authentication details through the HMI interface, enabling successful communication between the LDAP client and the LDAP server.

D.2 Scope

This document defines the activities required for the deployment, configuration, and validation of the LDAP infrastructure, including:

- Domain Controller (DC) setup
- LDAP server configuration
- Certificate Authority (CA) setup
- System testing and validation

D.3 Installation Procedure for Microsoft Active Directory LDAP Server

This section describes the following procedures:

- Domain Controller (DC) setup
- LDAP configuration
- Certificate Authority (CA) setup

Table D.1 Installation Procedure for Microsoft Active Directory LDAP Server

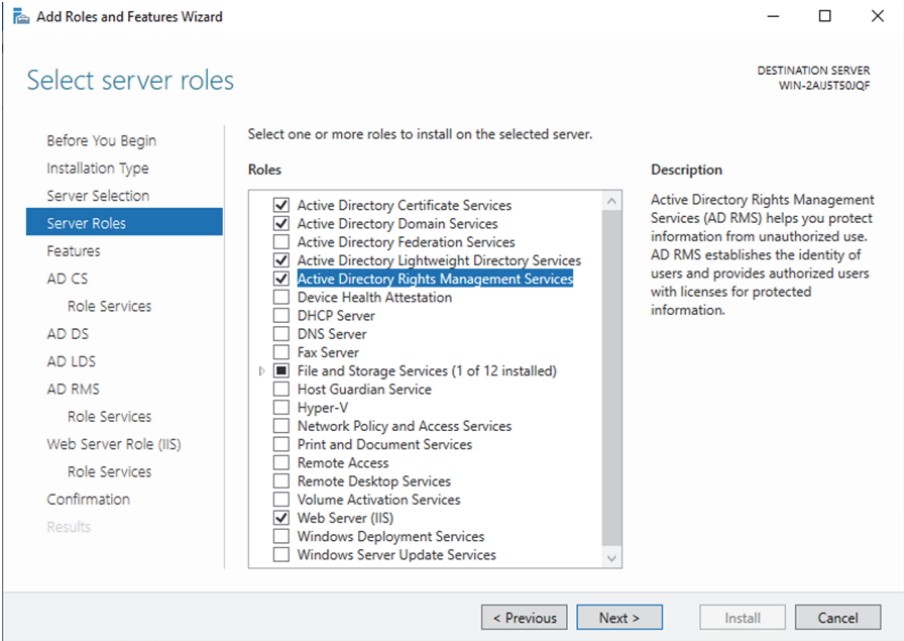
Step	Action
1	Select the required server roles shown in the following screenshot. • Active Directory Certificate Services • Active Directory Domain Services • Active Directory Lightweight Directory Services • Active Directory Right Management Services • File and Storage Services • Web Server 

Table D.1 Installation Procedure for Microsoft Active Directory LDAP Server

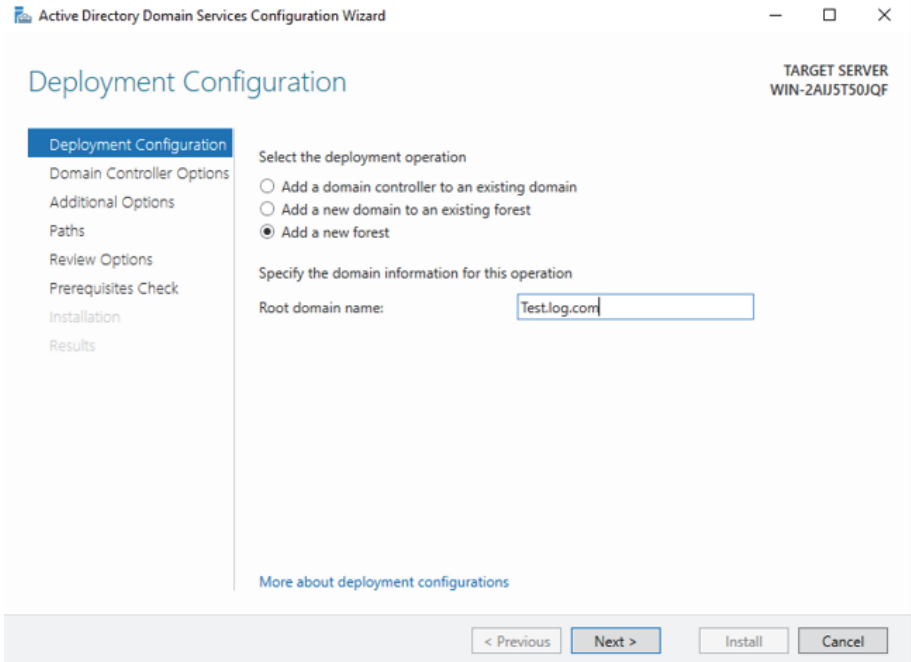
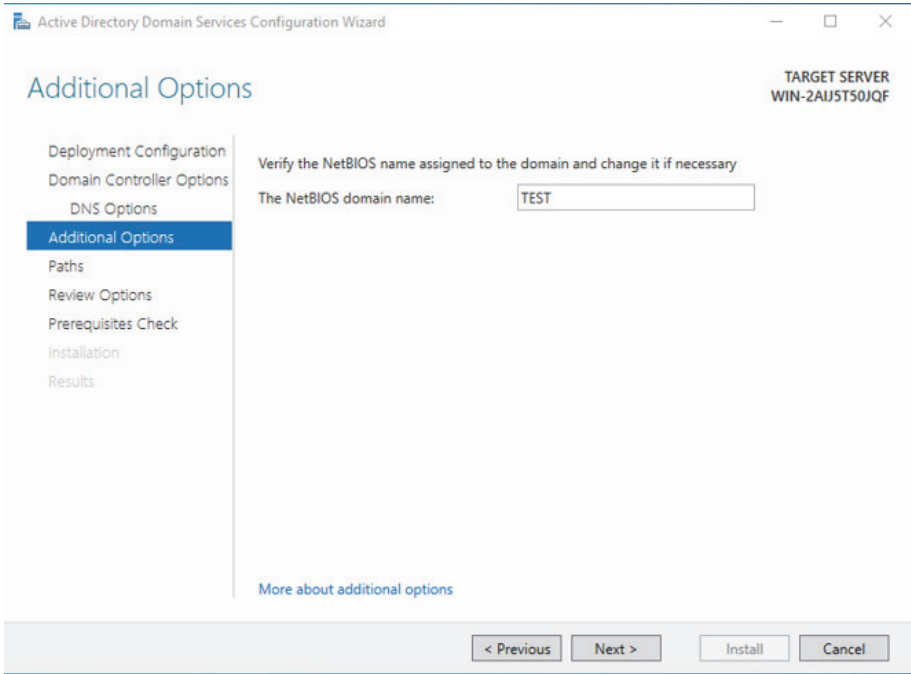
Step	Action
2	Under <i>Active Directory Domain Services (AD DS)</i>, select the options shown below:  

Table D.1 Installation Procedure for Microsoft Active Directory LDAP Server

Step	Action
3	Under <i>Active Directory Certificate Services (AD CS)</i>, select the required options, as shown in the screenshot below: • Certification Authority • Certificate Enrollment Policy Web Service • Certificate Enrollment Web Service • Certification Authority Web Enrollment • Network Device Enrollment Service Add Roles and Features Wizard Select role services DESTINATION SERVER WIN-2AUJ5T50JQF Before You Begin Installation Type Server Selection Server Roles Features AD CS Role Services AD DS AD LDS AD RMS Role Services Web Server Role (IIS) Role Services Confirmation Results Select the role services to install for Active Directory Certificate Services Role services ☒ Certification Authority ☒ Certificate Enrollment Policy Web Service ☒ Certificate Enrollment Web Service ☒ Certification Authority Web Enrollment ☒ Network Device Enrollment Service ☐ Online Responder Description Certification Authority Web Enrollment provides a simple Web interface that allows users to perform tasks such as request and renew certificates, retrieve certificate revocation lists (CRLs), and enroll for smart card certificates. < Previous Next > Install Cancel AD CS Configuration Role Services DESTINATION SERVER WIN-2AUJ5T50JQF.plan.log.com Credentials Role Services Setup Type CA Type Private Key Cryptography CA Name Validity Period Certificate Database Confirmation Progress Results Select Role Services to configure ☒ Certification Authority ☒ Certification Authority Web Enrollment ☐ Online Responder ☐ Network Device Enrollment Service ☐ Certificate Enrollment Web Service ☐ Certificate Enrollment Policy Web Service More about AD CS Server Roles < Previous Next > Configure Cancel

Table D.1 Installation Procedure for Microsoft Active Directory LDAP Server

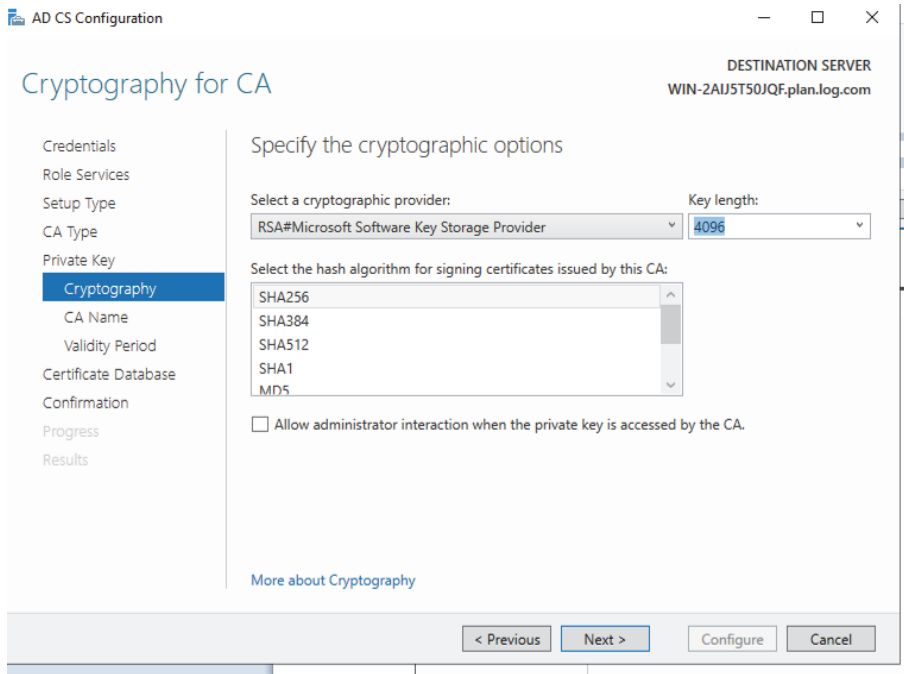
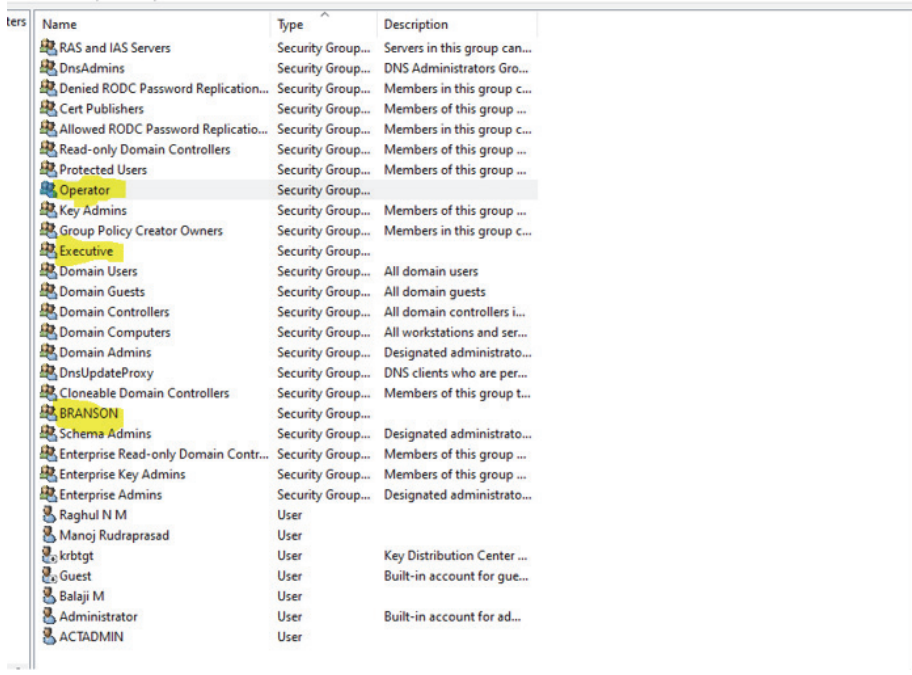
Step	Action
4	
5	After the domain has been created, configure the following Active Directory groups using the Active Directory Users and Computers (dsa.msc) console. 

Table D.1 Installation Procedure for Microsoft Active Directory LDAP Server

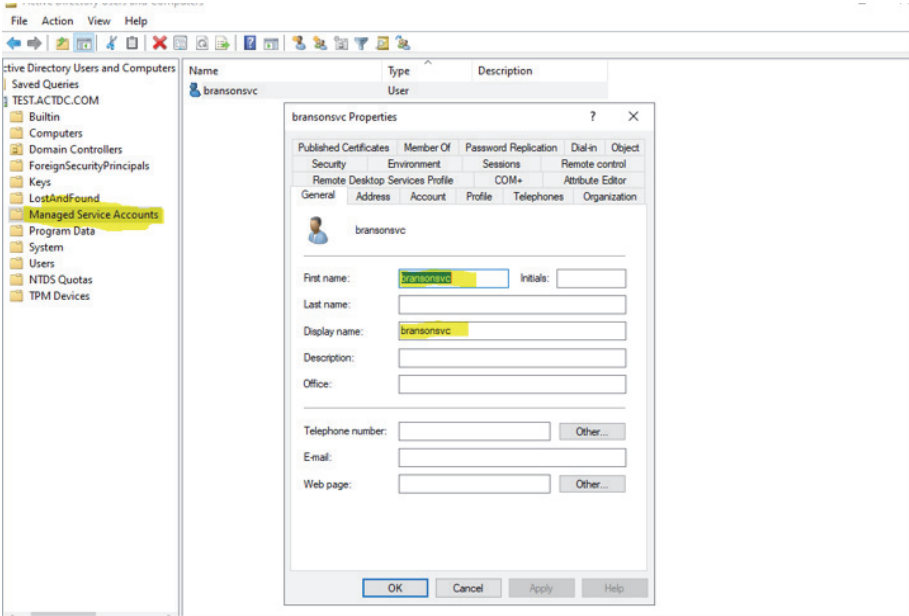
Step	Action
6	Create a dedicated service account for group management and grant it full administrative privileges to manage users and groups. 
7	To harden the server, import the provided Group Policy Objects (GPOs) using the Group Policy Management Console (GPMC).

Table D.1 Installation Procedure for Microsoft Active Directory LDAP Server

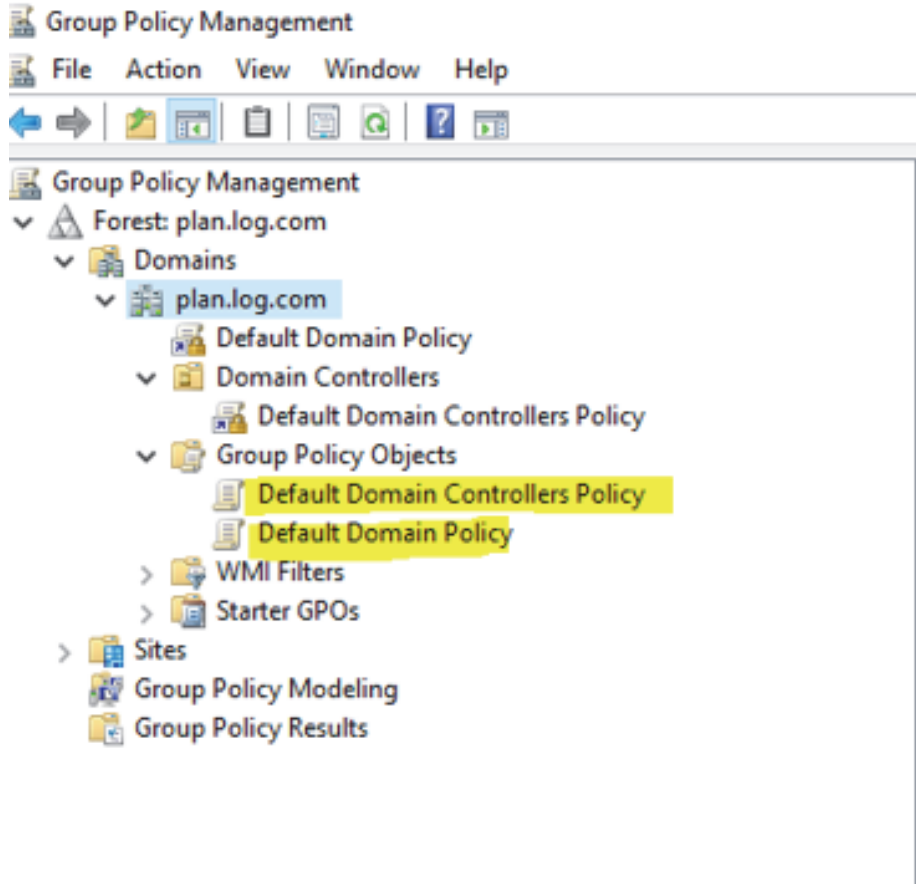
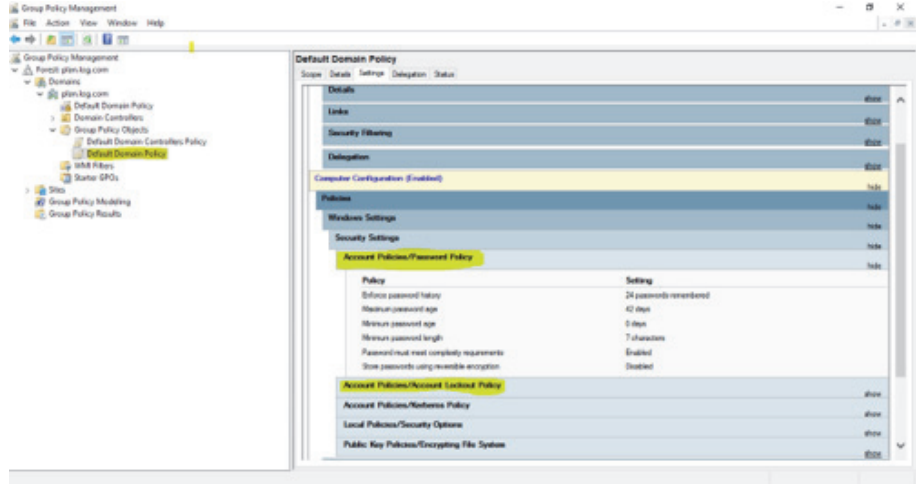
Step	Action
8	After importing the Group Policy Objects (GPOs), configure the password policies using the Group Policy Management Console (GPMC).  

Table D.1 Installation Procedure for Microsoft Active Directory LDAP Server

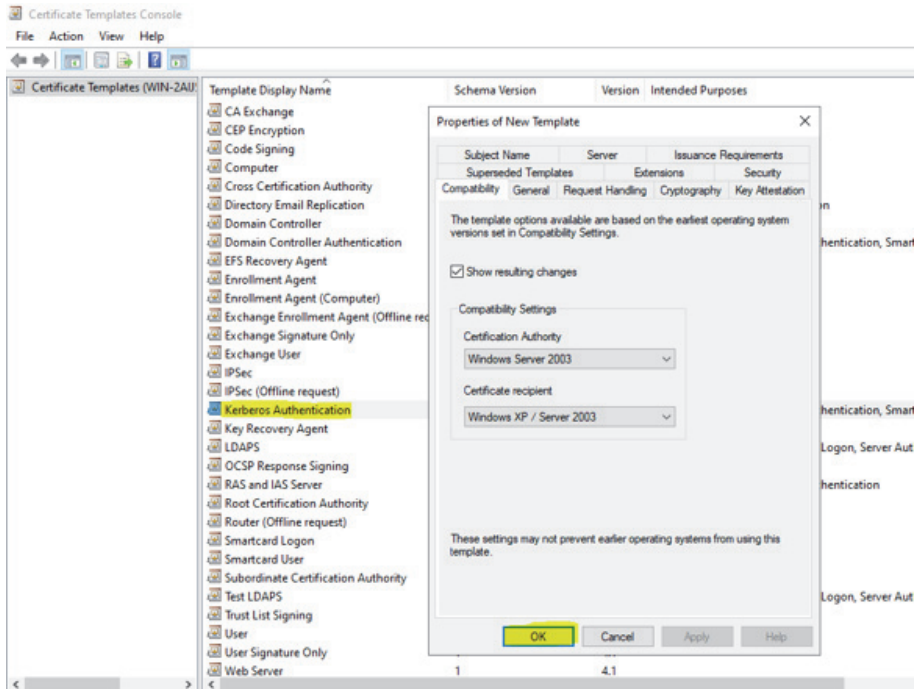
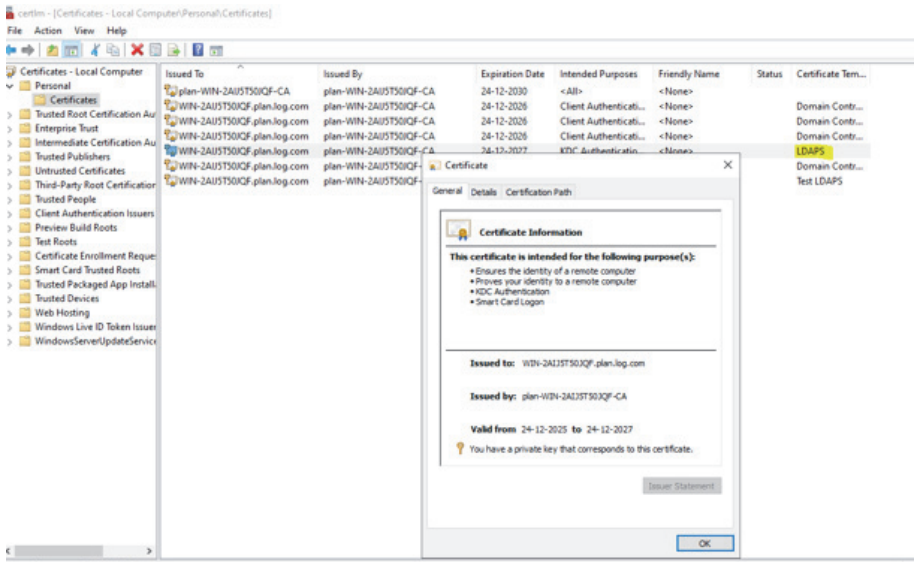
Step	Action
9	Navigate to the Certificate Templates console and duplicate the Kerberos Authentication certificate template to enable LDAP connections over TLS. 
10	Verify that the duplicated certificate has been successfully enrolled on the Domain Controller. 

Table D.1 Installation Procedure for Microsoft Active Directory LDAP Server

Step	Action
11	Test LDAP connectivity over TLS using the following procedure: • Launch the ldp.exe utility. • Click Connect, and then enter the server host name (for example, serverhostname.test.domain.com). • After the connection is established, bind to the server using the service account credentials (bransonsvc). • After a successful bind operation, enable TLS and review the connection logs to verify successful communication.

D.4 LDAP Configuration for the OpenLDAP Server

D.4.1 Install and Enable the Password Policy

Table D.2 Install and Enable the Password Policy

Step	Action
1	Run the following command to enable the password policy module: <pre>sudo ldapadd -Y EXTERNAL -H ldapi:/// <<EOF dn: cn=module{0},cn=config changetype: modify add: olcModuleLoad olcModuleLoad: ppolicy.la EOF</pre> Expected output: • SASL/EXTERNAL authentication started • SASL username: gidNumber=0+uidNumber=0,cn=peercred,cn=external,cn=auth
2	Run the following command to add the password policy overlay: <pre>sudo ldapadd -Y EXTERNAL -H ldapi:/// <<EOF dn: olcOverlay=ppolicy,olcDatabase={1}mdb,cn=config objectClass: olcOverlayConfig objectClass: olcPPolicyConfig olcOverlay: ppolicy olcPPolicyDefault: cn=default,ou=policies,dc=example,dc=com olcPPolicyUseLockout: TRUE EOF</pre> Expected output: • SASL/EXTERNAL authentication started • SASL username: gidNumber=0+uidNumber=0,cn=peercred,cn=external,cn=auth
3	Check the status of the LDAP server by running the following command: <pre>sudo systemctl status slapd</pre> Expected output: • The service status is displayed as Active (running).
4	Restart the LDAP server by running the following command: <pre>sudo systemctl restart slapd</pre>
5	Create a directory to store the OpenLDAP server TLS files by running the following command: <pre>sudo mkdir -p /etc/ldap/tls</pre>
6	Create the password policy entry by creating an LDIF file with the following command: <pre>sudo nano /etc/ldap/tls/ppolicy.ldif</pre>

Table D.2 Install and Enable the Password Policy

Step	Action
7	Update the LDIF file with the following contents, and then save the file: <pre>dn: ou=policies,dc=example,dc=com objectClass: organizationalUnit ou: policies dn: cn=default,ou=policies,dc=example,dc=com objectClass: person objectClass: pwdPolicy cn: default sn: default pwdAttribute: userPassword pwdMaxAge: 3600 pwdExpireWarning: 600 pwdInHistory: 5 pwdCheckQuality: 1 pwdMinLength: 8 pwdMaxFailure: 5 pwdLockout: TRUE pwdLockoutDuration: 600 pwdFailureCountInterval: 300 pwdMustChange: TRUE pwdAllowUserChange: TRUE pwdGraceAuthNLimit: 0 pwdSafeModify: TRUE</pre>
8	Run the following command to apply the password policy: <pre>sudo ldapadd -x -D cn=admin,dc=example,dc=com -W -f /etc/ldap/tls/ppolicy.ldif</pre> When prompted, enter the LDAP administrator password. If the operation completes successfully, output similar to the following is displayed: <pre>adding new entry "cn=default,ou=policies,dc=example,dc=com"</pre>

D.4.2 Create Organizational Units (Users and Groups)

Table D.3 Create Organizational Units (Users and Groups)

Step	Action
1	Create a new LDIF file for the organizational units by running the following command: <pre>sudo nano /etc/ldap/tls/base.ldif</pre>
2	Update the LDIF file with the following contents, and then save the file: <pre>dn: ou=users,dc=example,dc=com objectClass: organizationalUnit ou: users dn: ou=groups,dc=example,dc=com objectClass: organizationalUnit ou: groups</pre>
3	Run the following command to apply the configuration: <pre>sudo ldapadd -x -D cn=admin,dc=example,dc=com -W -f /etc/ldap/tls/base.ldif</pre> Expected output: • Adding new entry “ou=users,dc=example,dc=com” • Adding new entry “ou=groups,dc=example,dc=com”
4	Add LDAP users. Create an LDIF file for the LDAP users by running the following command: <pre>sudo nano /etc/ldap/tls/users.ldif</pre> Add the following entries to the LDIF file, and then save the file: <pre>dn: uid=john,ou=users,dc=example,dc=com objectClass: inetOrgPerson objectClass: organizationalPerson objectClass: person objectClass: top cn: John Doe sn: Doe uid: john userPassword: welcome!234 title: Supervisor dn: uid=alice,ou=users,dc=example,dc=com objectClass: inetOrgPerson objectClass: organizationalPerson objectClass: person objectClass: top cn: Alice Smith sn: Smith uid: alice userPassword: welcome@2345 title: Executive</pre>
5	To add new users, insert the user entries at the beginning of the /etc/ldap/tls/users.ldif file.

Table D.3 Create Organizational Units (Users and Groups)

Step	Action
6	Run the following command to add the LDAP users: <pre>sudo ldapadd -x -D cn=admin,dc=example,dc=com -W -f /etc/ldap/tls/users.ldif</pre> Expected output: • Adding new entry “uid=john,ou=users,dc=example,dc=com” • Adding new entry “uid=alice,ou=users,dc=example,dc=com”

D.4.3 Apply the Password Policy to Previously Added Users

Table D.4 Apply the Password Policy to Previously Added Users

Step	Action
1	Create an LDIF file for the password policy assignment by running the following command: <code>sudo nano /etc/ldap/tls/user_ppolicy.ldif</code>
2	Update the LDIF file with the following contents, and then save the file: <code>dn: uid=john,ou=users,dc=example,dc=com</code> <code>changetype: modify</code> <code>add: pwdPolicySubentry</code> <code>pwdPolicySubentry: cn=default,ou=policies,dc=example,dc=com</code> <code>dn: uid=alice,ou=users,dc=example,dc=com</code> <code>changetype: modify</code> <code>add: pwdPolicySubentry</code> <code>pwdPolicySubentry: cn=default,ou=policies,dc=example,dc=com</code>
3	Run the following command to apply the password policy to the previously added users: <code>sudo ldapmodify -x -D cn=admin,dc=example,dc=com -W -f /etc/ldap/tls/user_ppolicy.ldif</code> Expected output: • Modifying entry “uid=john,ou=users,dc=example,dc=com” • Modifying entry “uid=alice,ou=users,dc=example,dc=com”
4	Verify user authentication by running the following command: <code>ldapwhoami -x -D uid=john,ou=users,dc=example,dc=com -W</code> Expected output: • When prompted, enter the LDAP user password. If authentication is successful, output similar to the following is displayed: <code>dn:uid=john,ou=users,dc=example,dc=com</code>

D.4.4 Update User Details in the LDIF File (Optional)

Table D.5 Update User Details in the LDIF File (Optional)

Step	Action
1	Open the LDIF file used for user modifications, remove the existing contents, update the required user attributes, and then save the file: <code>sudo nano /etc/ldap/tls/modify_user.ldif</code>
2	To add or modify attributes for an existing user, update the LDIF file using the format shown below. For example, to add the title attribute for the user alice, enter the following content: dn: uid=alice,ou=users,dc=example,dc=com changetype: modify add: title title: Supervisor
3	After saving the LDIF file, apply the changes by running the following command: <code>sudo ldapmodify -x -D cn=admin,dc=branson,dc=com -W -f /etc/ldap/tls/modify_user.ldif</code>

D.4.5 Delete a User from the OpenLDAP Server (Optional)

Table D.6 Delete a User from the OpenLDAP Server (Optional)

Step	Action
1	To delete a user from the OpenLDAP server, run the following command: <code>sudo ldapdelete -x -D cn=admin,dc=example,dc=com -W "uid=alice,ou=users,dc=example,dc=com"</code>

D.4.6 Changing a User Password in OpenLDAP (Optional)

Table D.7 Changing a User Password in OpenLDAP (Optional)

Step	Action
1	To change the password of an existing user in OpenLDAP, run the following command: <code>sudo ldapasswd -x -D "cn=admin,dc=example,dc=com" -W -S "uid=alice,ou=users,dc=example,dc=com"</code>

D.4.7 Change the Password Expiration Period in OpenLDAP (Optional)

If a password policy already exists and you want to change the password expiration period (for example, from 90 days to 60 days), follow the steps below.

Table D.8 Change the Password Expiration Period in OpenLDAP (Optional)

Step	Action
1	Create a new LDIF file by running the following command: sudo nano /etc/ldap/tls/update-ppolicy.ldif
2	Add the following contents to the LDIF file, and then save the file: dn: cn=default,ou=policies,dc=example,dc=com changetype: modify replace: pwdMaxAge pwdMaxAge: 5184000 NOTE 5184000 seconds corresponds to 60 days.
3	Run the following command to apply the updated password policy: ldapmodify -x -D "cn=admin,dc=example,dc=com" -W -f /etc/ldap/tls/update-ppolicy.ldif

D.4.8 Generate a Self-Signed Certificate and CA Certificate Using OpenSSL

Table D.9 Generate a Self-Signed Certificate and CA Certificate Using OpenSSL

Step	Action
1	Use the following directory to store TLS-related files: /etc/ldap/tls
2	Generate the private key by running the following OpenSSL command: sudo openssl genrsa -out /etc/ldap/tls/ldap_server_key.key 2048
3	Generate a Certificate Signing Request (CSR) by running the following OpenSSL command: udo openssl req -new \ -key /etc/ldap/tls/ldap_server_key.key \ -out /etc/ldap/tls/ldap_server_csr.csr When prompted, enter the certificate details. Example values are shown below: Country Name (2 letter code) IN State or Province Name (full name) [Some-State]: KA Locality Name (eg, city) []: Bengaluru Organization Name (eg, company) [Internet Widgits Pty Ltd]: XYZ Organizational Unit Name (eg, section) []: ABC Common Name (e.g. server FQDN or YOUR name) []: ldap.example.com Email Address []: example@gmail.com
4	Generate a self-signed certificate by running the following OpenSSL command: sudo openssl x509 -req -days 365 \ -in /etc/ldap/tls/ldap_server_csr.csr \ -signkey /etc/ldap/tls/ldap_server_key.key \ -out /etc/ldap/tls/ldap_server_cert.crt
5	Generate a Certificate Authority (CA) certificate by running the following OpenSSL command: sudo openssl req -new -x509 -days 365 \ -key /etc/ldap/tls/ldap_server_key.key \ -out /etc/ldap/tls/ldap_server_ca.crt When prompted, enter the CA certificate details. Example values are shown below: Country Name (2 letter code) []: IN State or Province Name (full name) [Some-State]: KA Locality Name (eg, city) []: Bengaluru Organization Name (eg, company) [Internet Widgits Pty Ltd]: XYZ Organizational Unit Name (eg, section) []: ABC Common Name (e.g. server FQDN or YOUR name) []: ldap.example.com Email Address []: example@gmail.com
6	Run the following command to convert the ldap_server_cert.crt certificate to PEM format for use by the LDAP client application: sudo openssl x509 -in /etc/ldap/tls/ldap_server_cert.crt \ -out /etc/ldap/tls/ldap_server_cert.pem

Table D.9 Generate a Self-Signed Certificate and CA Certificate Using OpenSSL

Step	Action
7	Grant the OpenLDAP service access to the TLS files by configuring the correct ownership and permissions. Run the following command to assign ownership of the TLS files to the openldap user and group: <pre>sudo chown openldap:openldap /etc/ldap/tls/*</pre> Run the following commands to configure secure permissions for the TLS files: <pre>sudo chmod 600 /etc/ldap/tls/ldap_server_key.key sudo chmod 644 /etc/ldap/tls/ldap_server_cert.crt sudo chmod 644 /etc/ldap/tls/ldap_server_ca.crt</pre>
8	Create an LDIF file for the TLS configuration by running the following command: <pre>sudo nano /etc/ldap/tls/enable_tls.ldif</pre>
9	Add the following contents to the LDIF file, and then save the file: <pre>dn: cn=config changetype: modify add: olcTLSCertificateFile olcTLSCertificateFile: /etc/ldap/tls/ldap_server_cert.crt - add: olcTLSCertificateKeyFile olcTLSCertificateKeyFile: /etc/ldap/tls/ldap_server_key.key - add: olcTLSCACertificateFile olcTLSCACertificateFile: /etc/ldap/tls/ldap_server_ca.crt</pre>
10	Run the following command to apply the TLS configuration: <pre>sudo ldapmodify -Y EXTERNAL -H ldapi:/// -f /etc/ldap/tls/enable_tls.ldif</pre> Expected output: • SASL/EXTERNAL authentication started • SASL username: gidNumber=0+uidNumber=0,cn=peercred,cn=external,cn=auth • SASL SSF: 0 • modifying entry “cn=config”
11	Run the following command to restart the OpenLDAP server: <pre>sudo systemctl restart slapd</pre>

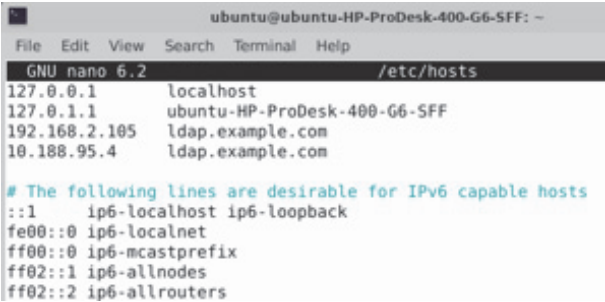
D.4.9 Install the Certificate in the System Trust Store

Table D.10 Install the Certificate in the System Trust Store

Step	Action
1	Run the following commands to add the certificate to the system trust store: <pre>sudo cp /etc/ldap/tls/ldap_server_cert.crt \ /usr/local/share/ca-certificates/ldap_server_cert.crt</pre> sudo update-ca-certificates

D.4.10 Map an IP Address to an FQDN in Ubuntu

Table D.11 Map an IP Address to an FQDN in Ubuntu

Step	Action
1	Run the following command to open the hosts file located at /etc/hosts: <pre>sudo nano /etc/host</pre>
2	Run the following command to assign a static IP address to the Ubuntu system: <pre>sudo ifconfig ens33 192.168.2.105 netmask 255.255.255.0 broadcast 192.168.2.255</pre>
3	Update the /etc/hosts file to map the server IP address to its Fully Qualified Domain Name (FQDN). 192.168.2.105 ldap.example.com In this example: • Server IP address: 192.168.2.105 • FQDN: ldap.example.com  <pre>ubuntu@ubuntu-HP-ProDesk-400-G6-SFF: ~ File Edit View Search Terminal Help GNU nano 6.2 /etc/hosts 127.0.0.1 localhost 127.0.1.1 ubuntu-HP-ProDesk-400-G6-SFF 192.168.2.105 ldap.example.com 10.188.95.4 ldap.example.com # The following lines are desirable for IPv6 capable hosts ::1 ip6-localhost ip6-loopback fe00::0 ip6-localnet ff00::0 ip6-mcastprefix ff02::1 ip6-allnodes ff02::2 ip6-allrouters</pre>

D.4.11 Test the TLS Connection

Table D.12 Test the TLS Connection

Step	Action
1	Run the following OpenSSL command to test the LDAP TLS connection: <pre>sudo openssl s_client -starttls ldap -connect ldap.example.com:389</pre> Expected output: The command displays the LDAP server certificate information, including the certificate subject, issuer, validity dates, and TLS session details. A successful connection typically ends with output similar to: • Verify return code: 0 (OK)
2	Run the following command to perform an LDAP search over a TLS-secured connection: <pre>sudo ldapsearch -H ldap://ldap.example.com -ZZ -x \ -D "cn=admin,dc=example,dc=com" -W \ -b "dc=example,dc=com"</pre>

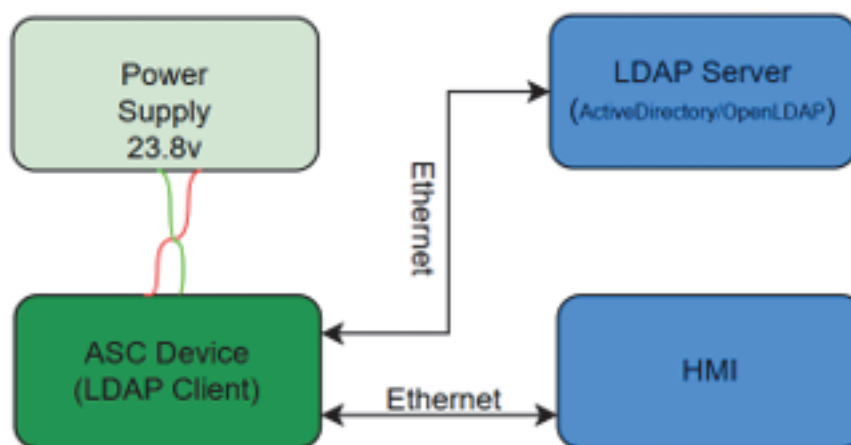
D.4.12 Enable LDAP Ports

Table D.13 Enable LDAP Ports

Step	Action
1	Run the following command to verify that the required LDAP ports are allowed through the firewall: <pre>sudo ufw status</pre> Expected output: • 389/tcp ALLOW Anywhere • 636/tcp ALLOW Anywhere
2	If the firewall status is inactive or the required ports are not allowed, run the following commands to enable the firewall and allow LDAP traffic: <pre>sudo ufw enable sudo ufw allow 389/tcp sudo ufw allow 636/tcp</pre>
3	After applying the firewall rules, verify the configuration by running: <pre>udo ufw status</pre>

D.5 LDAP Setup Block Diagram

Figure D.1 LDAP Setup Block Diagram



LDAP Server: Supports Microsoft Active Directory on the Windows platform and OpenLDAP on the Linux platform.

LDAP Client: The Advanced Supervisory Controller (ASC) acts as an LDAP client. LDAP configuration parameters are configured through the HMI interface.

D.6 Preconditions

Before performing the LDAP configuration procedures described in this section, ensure that the following preconditions are met:

Verify network connectivity between the server and client:

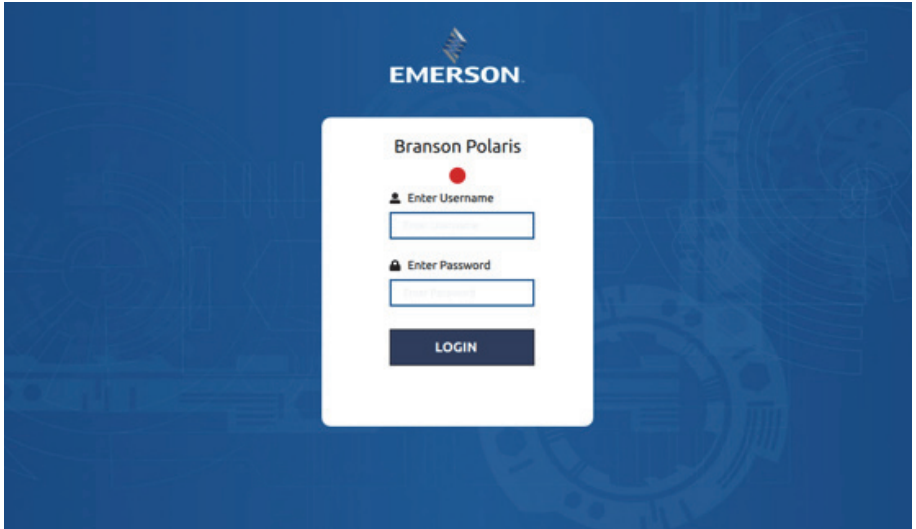
- Both the LDAP server and the LDAP client must have an active network connection. Verify connectivity by pinging the ASC device from the LDAP server.

Verify the OpenLDAP server network configuration:

- If the LDAP server is OpenLDAP, ensure that a static IP address is configured on the server. Also verify that the required LDAP ports (389 for LDAP and 636 for LDAPS) are open and accessible.

D.7 LDAP Server Configuration via HMI

Table D.14 LDAP Server Configuration via HMI

Step	Action
1	Disconnect the network connection to the Active Directory or OpenLDAP server.
2	On the HMI login page, the LDAP connection status should be displayed as Inactive (red icon). 
3	Log in to the HMI using the default local user credentials.
4	Default local database credentials: • Username: Admin • Password: 123456Aa#

D.8 LDAP Client Certificate Upload

Table D.15 LDAP Client Certificate Upload

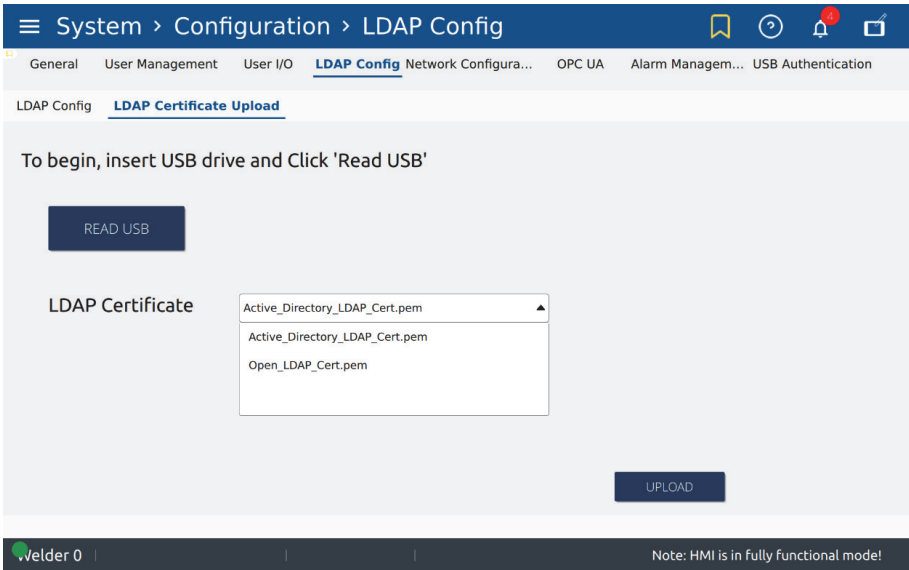
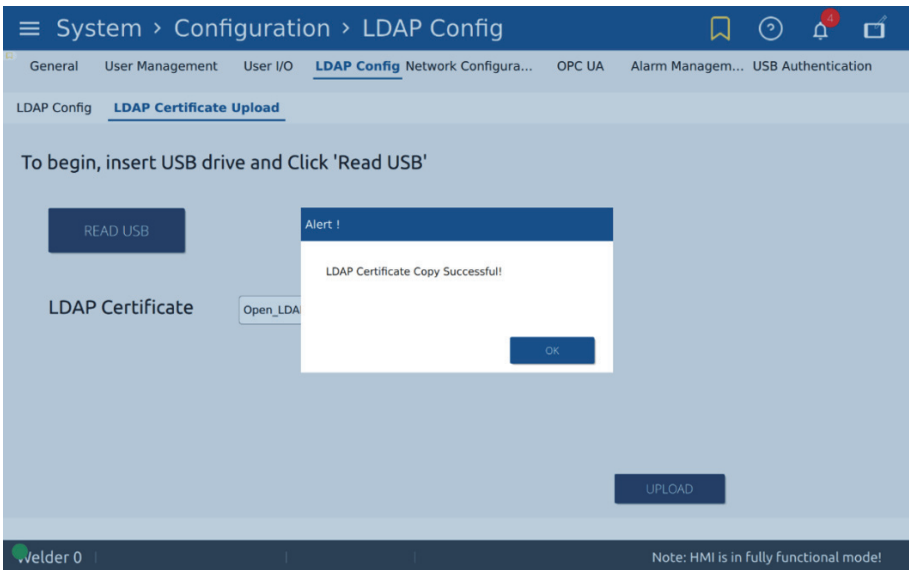
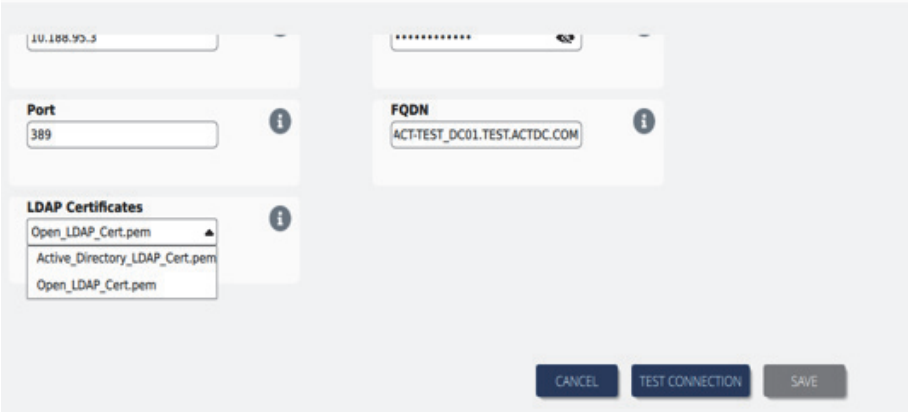
Step	Action
1	Register the USB device. See section 5.10.8 USB Authentication for more information.
2	Navigate to System > Configuration > LDAP Config > LDAP Certificates Upload. Click Read USB to read the certificates from the USB device.
3	Select the LDAP certificate (Open_LDAP_Cert.pem for an OpenLDAP server or Active_Directory_LDAP_Cert.pem for an Active Directory server) from the USB device, and then click Upload to copy the certificate to the Polaris system. 
4	Click Upload. After the upload is complete, a pop-up window should appear with the message: "LDAP Certificate Copy Successful!". 

Table D.15 LDAP Client Certificate Upload

Step	Action
5	To verify that the certificate copy was successful, navigate to System > Configuration > LDAP Config > LDAP Configuration. In the LDAP Certificates tab, confirm that the certificates copied from the USB device are displayed. 

D.9 LDAP Server Configuration and Secure TLS Connection

D.9.1 LDAP Server Configuration

Navigate to System > Configuration > LDAP Config. Enter the Active Directory or OpenLDAP server configuration parameters listed in the table below into the LDAP Config page.

Table D.16 LDAP Server Configuration

Parameter	Active Directory Configuration	OpenLDAP Configuration
BASEDN	CN=USERS,DC=TEST,DC=ACTDC,DC=COM	ou=users,dc=example,dc=com
Host	10.188.95.3	10.188.95.4
Port	389	389
Manager DN	CN=bransonsvc,CN=Managed Service	cn=admin,dc=example,dc=com
Manager DN Password	Welcome@9876	welcome@1234
FQDN	ACT-TEST_DC01.TEST.ACTDC.COM	ldap.example.com
LDAP Certificates	Select the Active Directory CA certificate provided by Organization's LDAP Server administrator for establishing the LDAP connection.	Select the OpenLDAP Self signed Certificate provided by Organization's LDAP Server administrator for establishing the LDAP connection

D.9.2 Purpose of LDAP Certificates

LDAP certificates are used to:

- Secure data transmitted between the LDAP client and the LDAP server through encryption.
- Authenticate the identity of the LDAP server.
- Protect sensitive information from unauthorized access.
- Help ensure the integrity and confidentiality of LDAP communications.

D.9.3 When LDAP Certificates Are Required

LDAP certificates are required in the following situations:

- LDAP over SSL/TLS is enabled. By default, TLS is enabled on the LDAP client.
- Secure authentication is required by organizational security policies.
- Encrypted communication between the LDAP client and the LDAP server is required.
- The identity of the LDAP server must be verified before establishing a connection.

D.9.4 Certificate Type

The LDAP client supports the following certificate format:

- Certificate format: X.509
- File type: PEM (.pem)

D.9.5 LDAP Certificate Selection and Installation

Table D.17 LDAP Certificate Selection and Installation

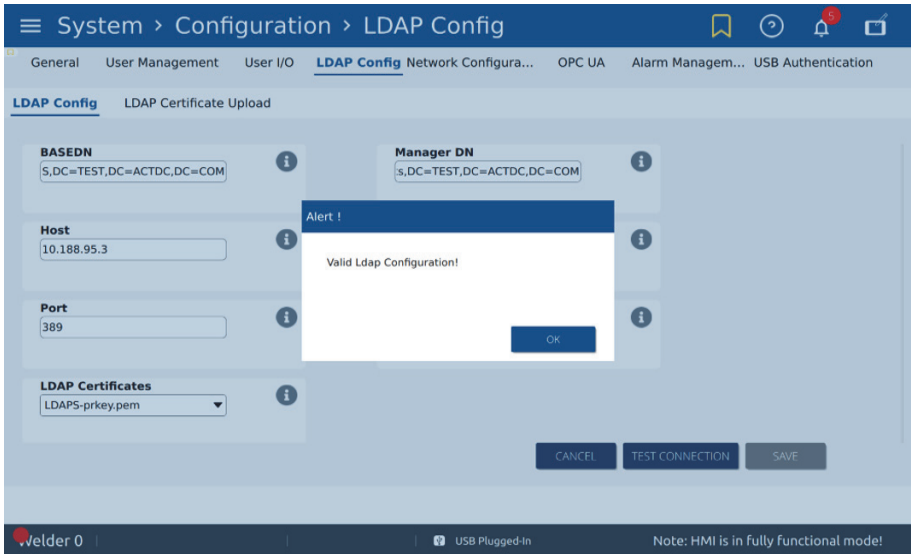
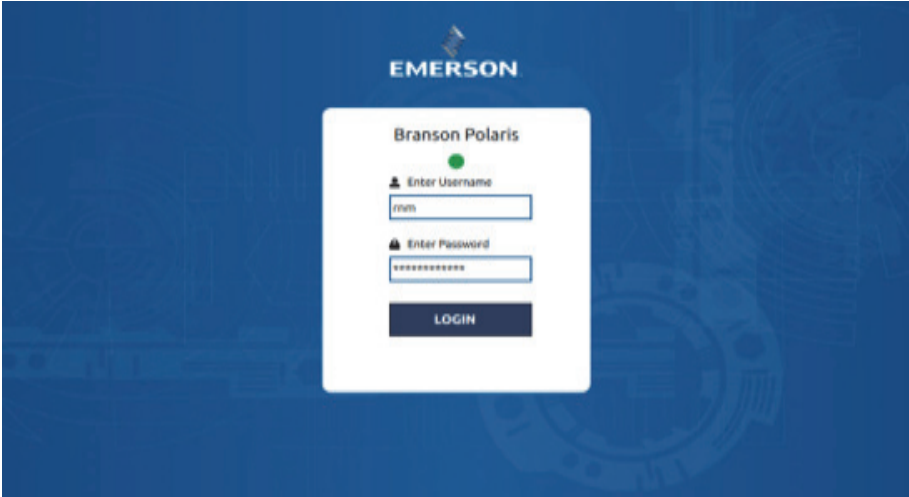
Step	Action
1	In the LDAP Certificates field, click the drop-down list and select the appropriate certificate for the LDAP server being used (Active Directory or OpenLDAP). 
2	After updating the LDAP server configuration (OpenLDAP or Active Directory), save the configuration changes.
3	Reconnect the Ethernet connection between the LDAP server and the LDAP client (ASC device).
4	Click Test Connection. A pop-up window appears displaying the LDAP configuration status. If the configuration is valid, the message "Valid LDAP Configuration!" is displayed. Save the configuration changes. This confirms that communication between the LDAP server and the LDAP client (ASC device) has been successfully established. 

Table D.17 LDAP Certificate Selection and Installation

Step	Action
5	When a connection is established, the LDAP server certificate is validated against the configured trusted certificate to verify the server's identity. If certificate validation fails, the LDAP client rejects the connection and secure communication cannot be established.
6	Log out of the local user account. Return to the login screen and verify that the LDAP server status is displayed as Active (green icon), indicating a successful connection to the LDAP server. 
7	Log in using a valid LDAP user account. If the LDAP configuration is correct, the user is authenticated successfully and granted access to the system.

D.10 Responsibilities

D.10.1 LDAP Server Administrator

The LDAP Server Administrator is responsible for:

- Providing and maintaining the LDAP server configuration.
- Providing the LDAP server certificate required for secure communication.
- Monitoring certificate validity and ensuring certificates are renewed before expiration.

D.10.2 Branson Field Engineer

The Branson Field Engineer is responsible for:

- Installing and configuring the provided LDAP certificate.
- Verifying secure communication between the LDAP client and the LDAP server.
- Identifying, documenting, and reporting certificate-related issues.

D.11 Login Credential Requirements

Username

- Maximum length: 15 characters

Password

- Length must be between 8 and 20 characters.
- Must contain at least:
- One uppercase letter
- One lowercase letter
- One numeric character
- One special character
- Passwords are case-sensitive

D.12 Troubleshooting

D.12.1 Certificate Validation Error

If a certificate validation error occurs, verify the following:

- Monitor certificate expiration dates to prevent authentication failures caused by expired certificates.
- Verify that the certificate is in .pem format.
- Ensure that the certificate provided by the end user is selected in the LDAP configuration.
- Verify that the date and time on the ASC device are set correctly. Incorrect date or time settings can cause certificate validation failures.

D.12.2 LDAP Server Configuration

- Verify that the LDAP server configuration on the LDAP Config page matches the server-side configuration.
- Confirm that all LDAP parameters, including the host name, port number, security settings, and authentication credentials, are configured correctly.

D.12.3 Network Connectivity

- Before establishing an LDAP connection, ping the ASC device from the LDAP server to verify network connectivity.
- Ensure that the ASC device responds successfully to the ping request.
- Verify that the required LDAP ports (389 and 636) are open and accessible between the LDAP server and the ASC device.

[This page intentionally left blank]

Appendix E: OPC UA

E.1	Purpose	270
E.2	Prerequisites	271
E.3	OPC UA Server HMI Settings.....	272
E.4	Prosys OPC UA Browser	277

E.1 Purpose

This section provides guidance for establishing and verifying OPC UA client-server communication. It describes the prerequisites, software requirements, and connection procedures required to configure communication between an OPC UA server and an OPC UA client. The objective is to ensure successful setup and verification of OPC UA communication.

E.2 Prerequisites

E.2.1 Software Requirements

E.2.1.1 OPC UA Client Application

OPC UA Client X509 Certificate.

E.2.1.2 Connectivity

The OPC UA Server provides secure and reliable communication between OPC UA clients and the Polaris system using the OPC Unified Architecture (OPC UA) protocol.

E.3 OPC UA Server HMI Settings

E.3.1 Enable/Disable OPC UA Security

OPC UA security helps protect communication between the server and client by ensuring authentication, message integrity, and data encryption. Users can enable or disable this feature through the HMI.

E.3.1.1 Disable Security

Communication occurs without encryption or client authentication. Any OPC UA client can connect to the server when this option is selected. Use this mode only in trusted network environments.

- **Security Mode:** None

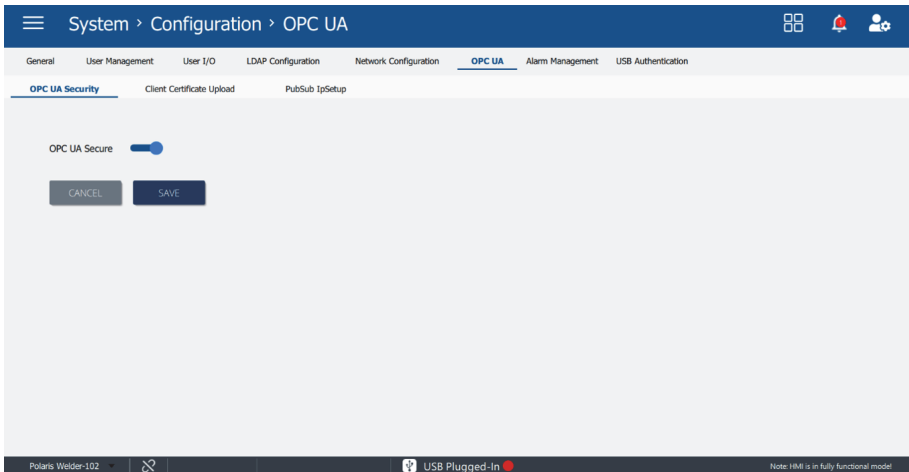
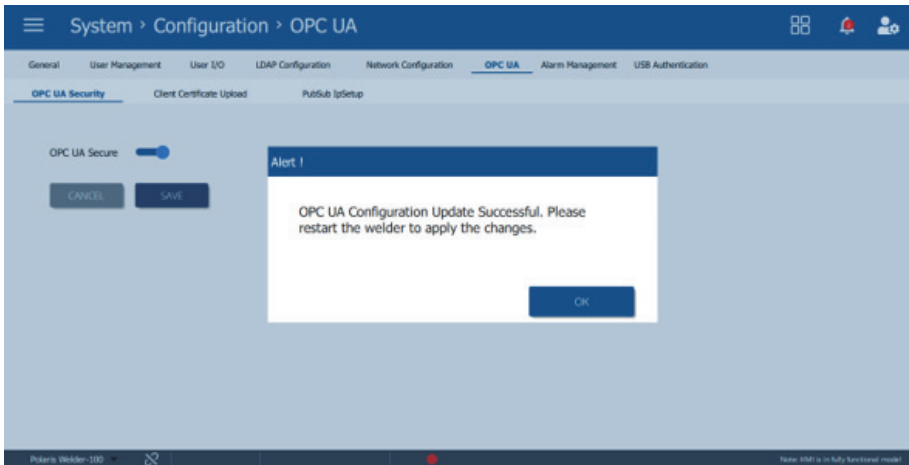
E.3.1.2 Enable Security

Communication is secured through the use of certificates, security modes, and security policies to authenticate the client and protect data exchanged between the client and server.

- **Security Certificate:** Server verifies the identity of the OPC UA client.
- **Security Modes:**
 - Sign:** Ensures message authenticity and integrity.
 - Sign and Encrypt:** Ensures message authenticity, integrity, and confidentiality through encryption.
 - Security Policies:** Specifies the type of encryption that the clients may select as endpoints for message exchange.
 - Supported Encryption:** Basic 256, Basic 128Rsa15, TLS Basic 256Sha256, Aes128-Sha256-RsaOaep.

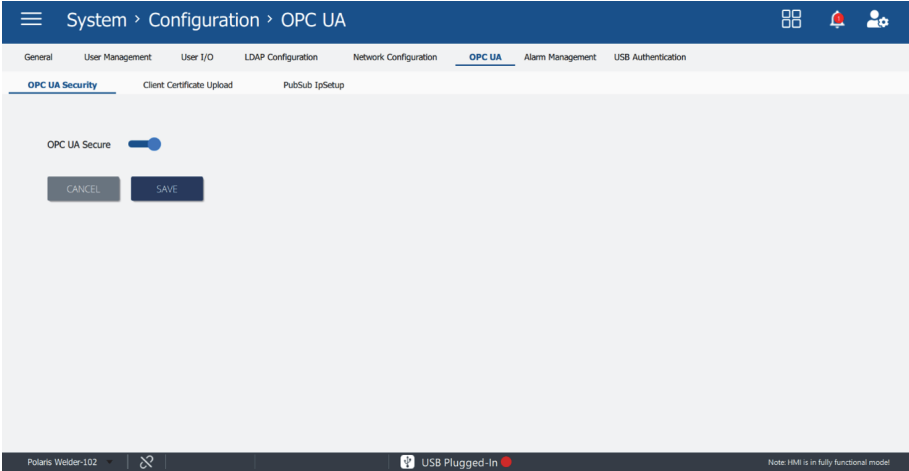
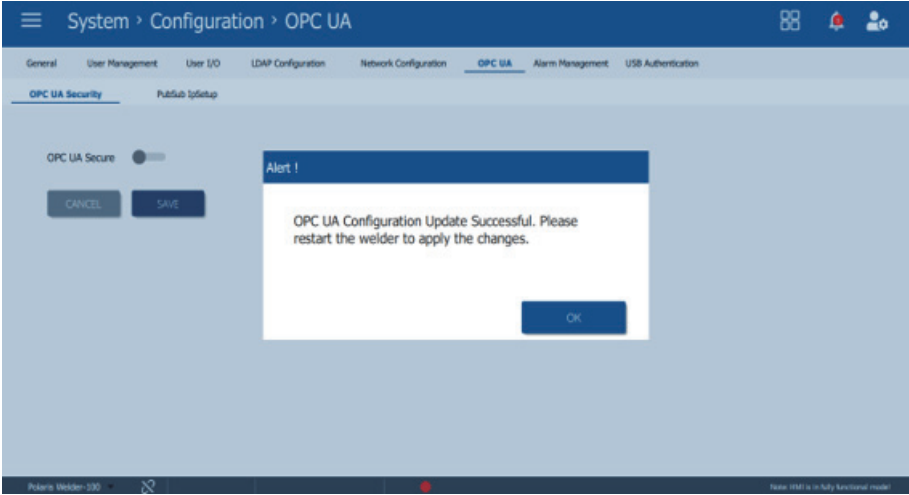
E.3.2 Enable OPC UA Security from the HMI

Table E.1 Enable OPC UA Security from the HMI

Step	Action
1	To enable OPC UA security from the HMI, navigate to <i>System > Configuration > OPC UA > OPC UA Security</i> .
2	Enable the OPC UA Secure toggle. 
3	Save the configuration. Upon successful completion, the HMI displays the following message: <i>OPC UA Configuration Update Successful. Please restart the welder to apply the changes.</i> 

E.3.3 Disable OPC UA Security from the HMI

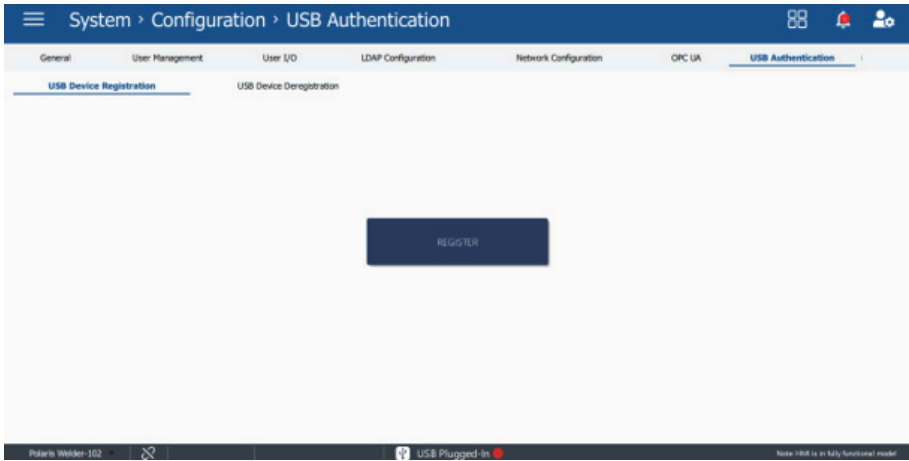
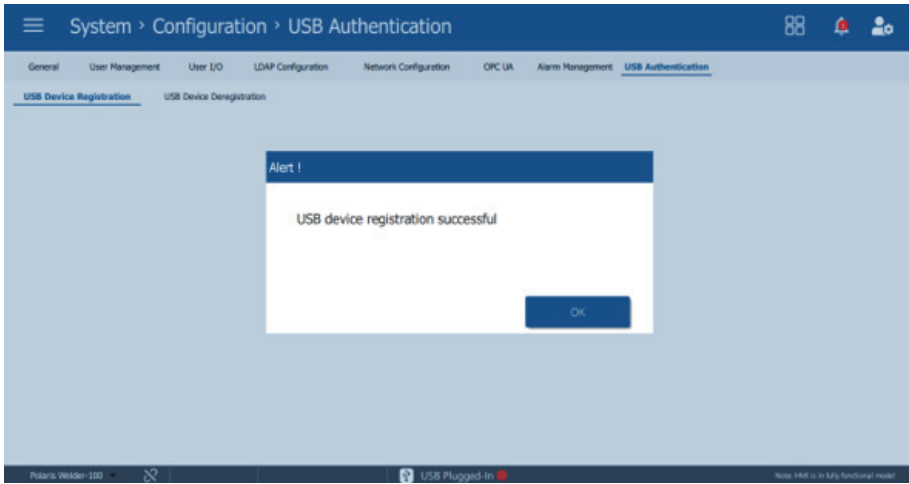
Table E.2 Disable OPC UA Security from the HMI

Step	Action
1	To disable OPC UA security from the HMI, navigate to <i>System > Configuration > OPC UA > OPC UA Security</i> .
2	Disable the OPC UA Secure toggle. 
3	Save the configuration. Upon successful completion, the HMI displays the following message: <i>OPC UA Configuration Update Successful. Please restart the welder to apply the changes.</i> 

E.3.4 USB Device Registration

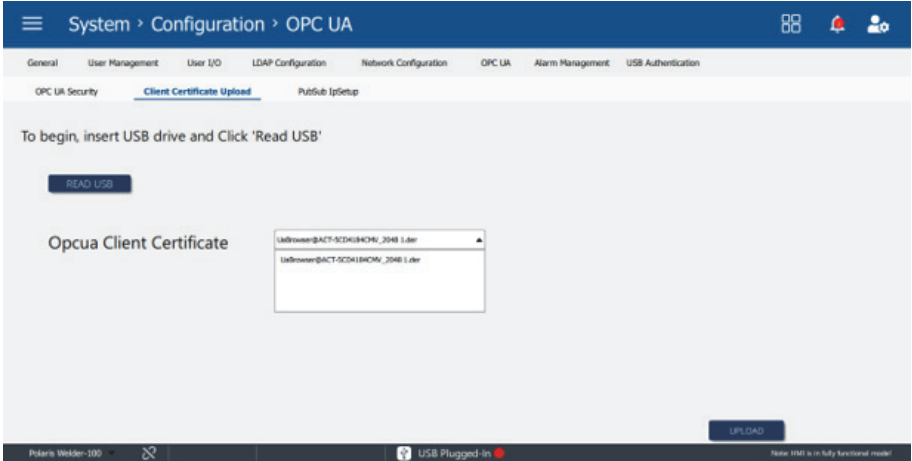
NOTE	
	See section 5.10.8 USB Authentication for more information.

Table E.3 USB Device Registration

Step	Action
1	To register a USB device, insert an unregistered USB device into the Polaris system.
2	Upon insertion, the HMI displays the message <i>Unregistered USB device connected</i> .
3	Navigate to <i>System > Configuration > USB Authentication</i>, and then select <i>Register</i>. 
4	Upon successful registration, the HMI displays the following message: <i>USB device registration successful</i> 

E.3.5 Client Certificate Upload

Table E.4 Client Certificate Upload

Step	Action
1	Copy the client certificate to a USB device. - The client certificate is located at: C:\Users\OPC UA Client\PKI\CA\private - Copy the required .der certificate file to the USB device. - Insert the USB device into the Polaris system.
2	To upload a client certificate from a USB device to the Polaris system OPC UA trust list, navigate to <i>System > Configuration > OPC UA > Client Certificate Upload</i>.
3	Press <i>Read USB</i>. The OPC UA Client Certificate section lists the client certificates detected on the USB device. 
4	Select the desired certificate and click Upload to copy it to the Polaris system. Upon successful upload, the HMI displays the following message: <i>OPC UA client certificate copied successfully</i> 

E.4 Prosys OPC UA Browser

NOTE	
	The example above demonstrates the use of the Prosys OPC UA Browser as the OPC UA client. End users may also use other compatible third-party OPC UA clients, such as OPC UA Expert.

E.4.1 Communication Establishment Using Prosys OPC UA Browser

Table E.5 Communication Establishment Using Prosys OPC UA Browser

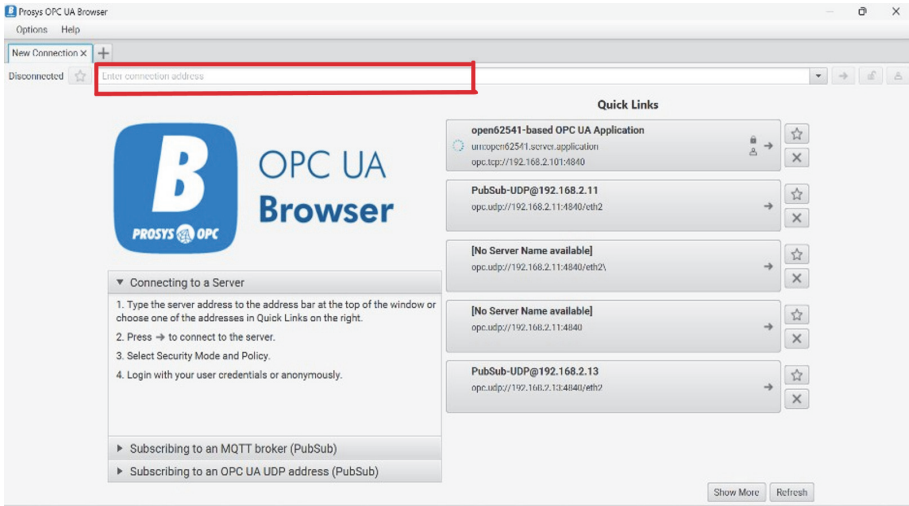
Step	Action
1	Open the Prosys OPC UA Browser application on your PC.
2	Select <i>New Connection</i> . If no existing connection is available, click the <i>Add (+)</i> icon to create a new connection.
3	In the <i>Enter Connection Address</i> field at the top of the window, enter the server address using the following format: <i>opc.tcp://<server_ip>:<port></i> Example: <i>opc.tcp://192.168.2.101:4840</i> Press <i>Enter</i> to establish the connection. 

Table E.5 Communication Establishment Using Prosys OPC UA Browser

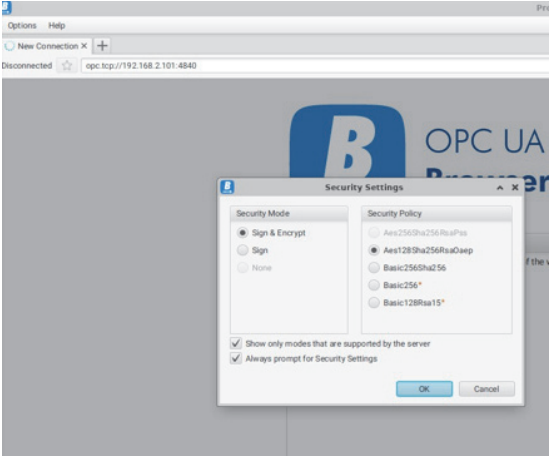
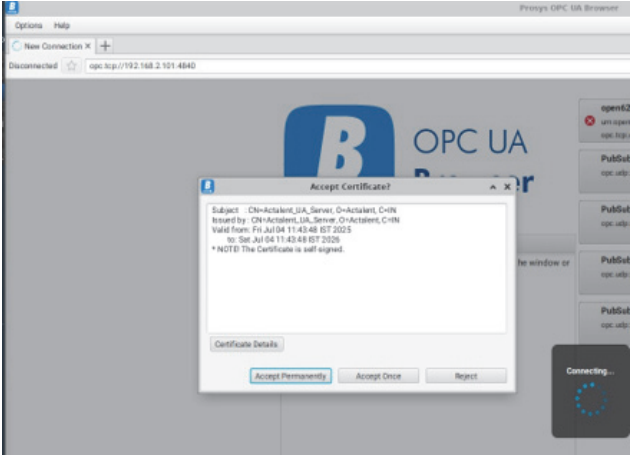
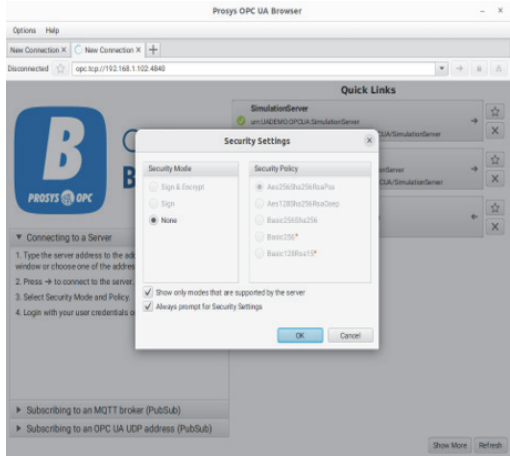
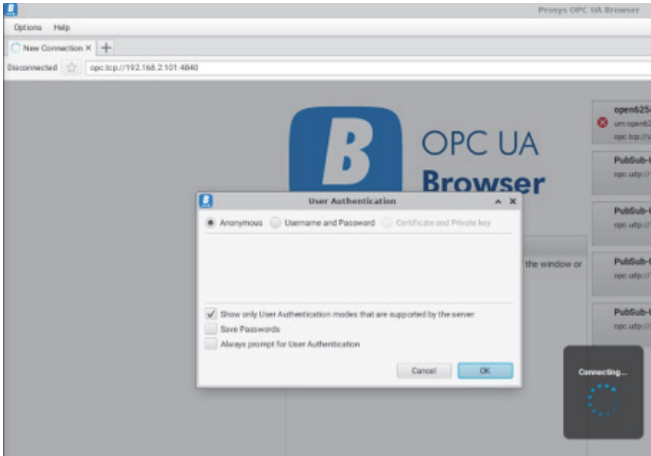
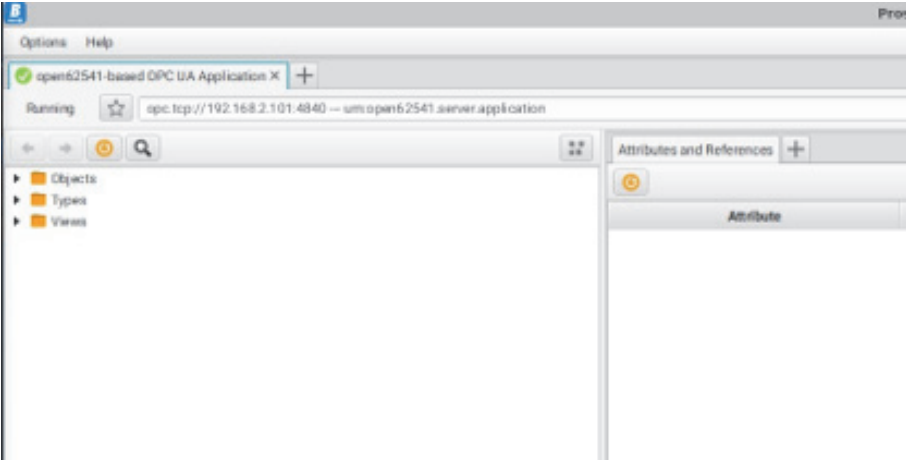
Step	Action
4	If OPC UA security is enabled on the HMI: The <i>Security Settings</i> window is displayed. Select a security mode (<i>Sign & Encrypt</i> or <i>Sign</i>) and the appropriate <i>Security Policy</i>, then click OK. 
5	The <i>Accept Certificate?</i> window is displayed. To trust the OPC UA server certificate, select Accept Permanently or Accept Once. 

Table E.5 Communication Establishment Using Prosys OPC UA Browser

Step	Action
6	If OPC UA security is disabled on the HMI: The <i>Security Settings</i> window is displayed. Select <i>None</i> as the security mode, and then click OK to continue. 
7	The <i>User Authentication</i> window is displayed. Select <i>Anonymous</i>, and then click OK. 
8	Upon successful connection, a new window opens displaying the <i>Objects</i> node. 

E.4.2 Reading OPC UA Data

Table E.6 Reading OPC UA Data

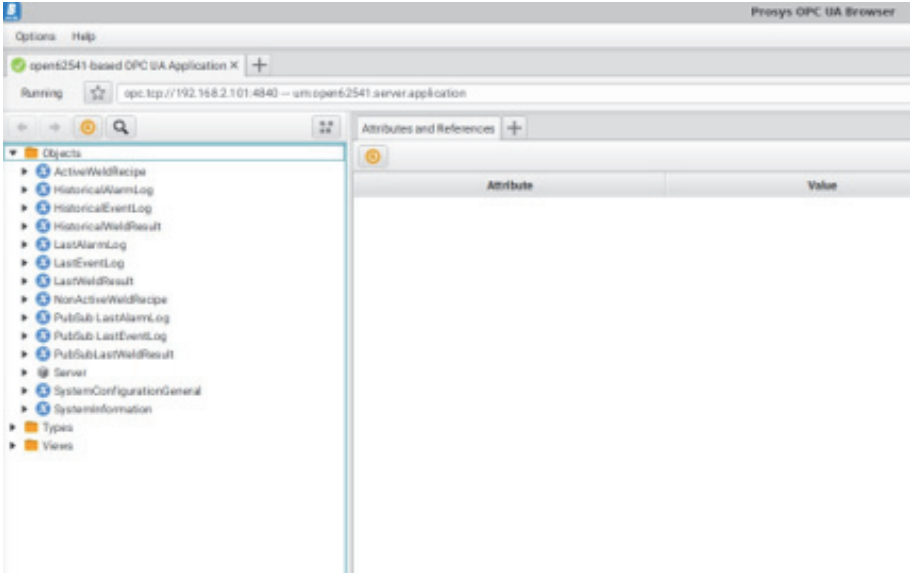
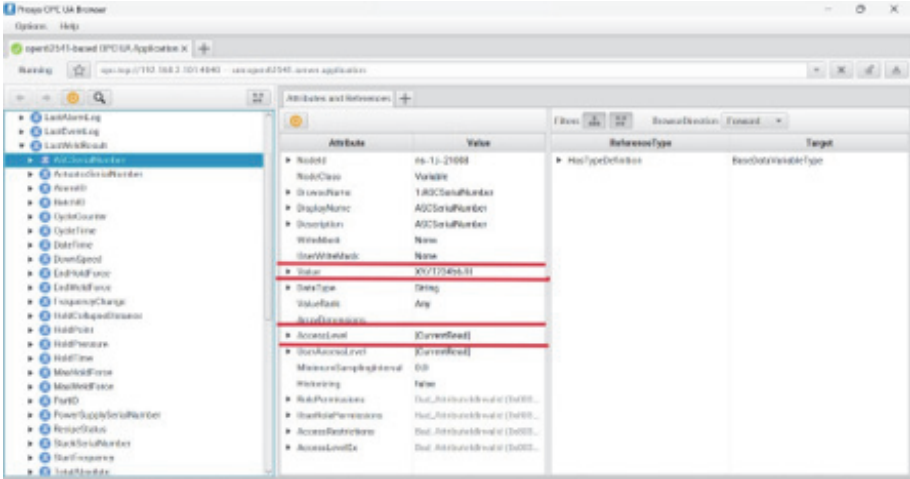
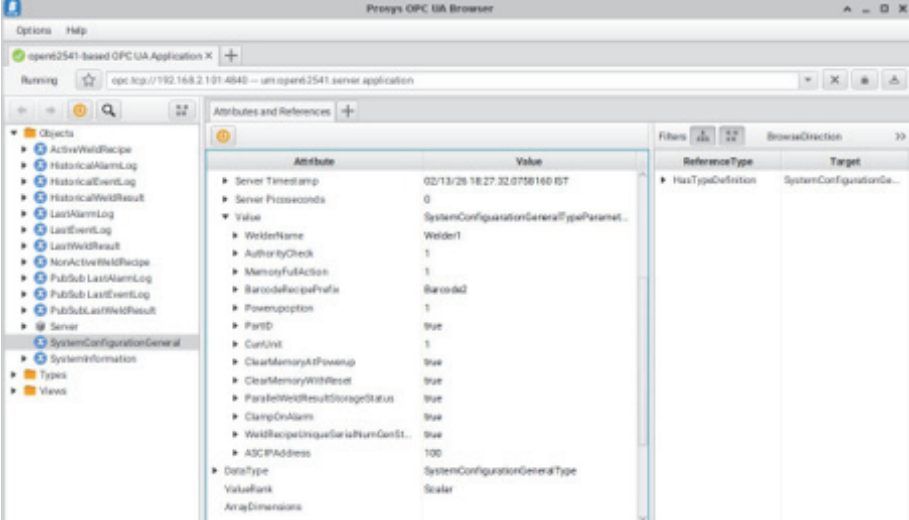
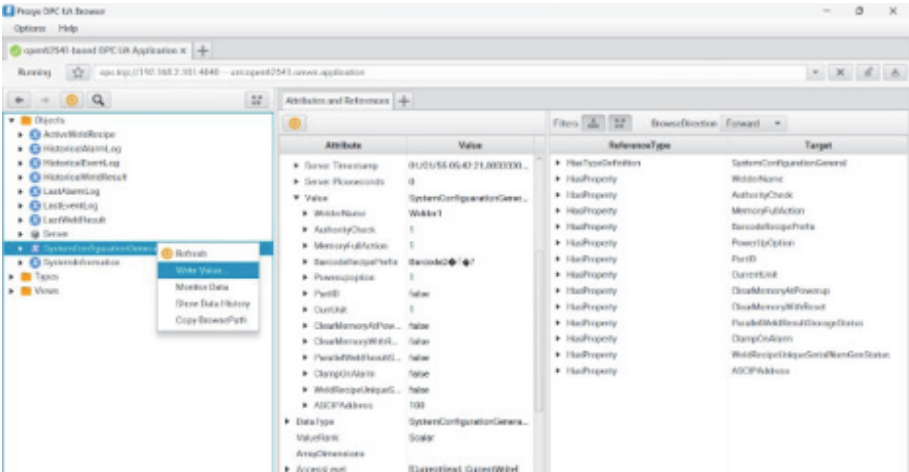
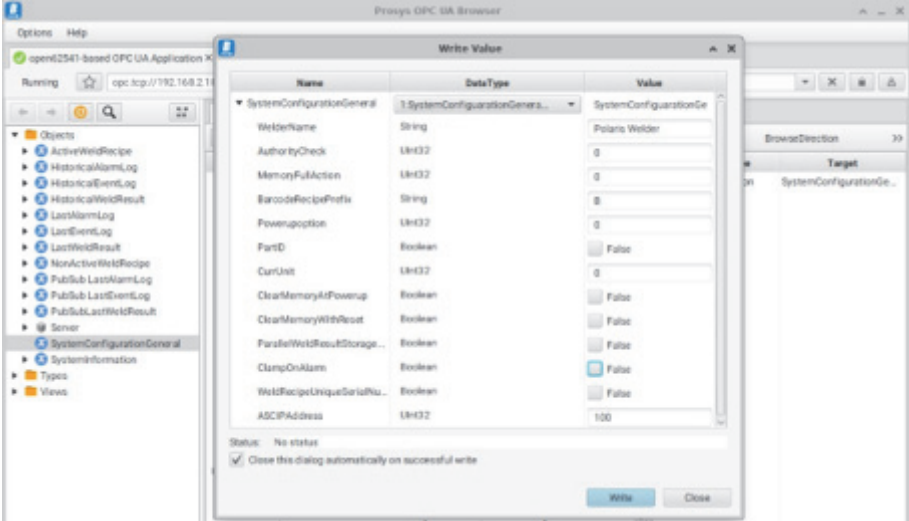
Step	Action
1	Expand the <i>Objects</i> node, and then expand the desired object node (for example, <i>LastWeldResult</i>). The available variable nodes are displayed, starting with <i>ASCSerialNumber</i>. 
2	Double-click a variable node (for example, <i>ASCSerialNumber</i>) to display its details, including the <i>Value</i>, in the <i>Attributes</i> window. 
3	To read a custom data type variable, click its parent variable node (for example, <i>SystemConfigurationGeneral</i>) to display the data structure and its associated variables.

Table E.6 Reading OPC UA Data

Step	Action
4	In the <i>Attributes</i> window, click the <i>Value</i> drop-down arrow to expand the data structure. Then expand the nested <i>Value</i> field to display the values of the custom data type members. 

E.4.3 Writing OPC UA Data

Table E.7 Writing OPC UA Data

Step	Action
1	To write values to a custom data type node, right-click the parent variable node that has both Read and Write access (for example, <i>SystemConfigurationGeneral</i>), and then select <i>Write Value</i> from the context menu.  The screenshot shows the Prosys OPC UA Browser interface. On the left, a tree view displays the OPC UA namespace hierarchy. The 'SystemConfigurationGeneral' node is selected, and a right-click context menu is open, showing options like 'Write Value', 'Monitor Data', 'Show Data History', and 'Copy Browser Path'. The main pane on the right displays the 'Attributes and References' for the selected node, showing various attributes like 'Server Timestamp', 'Server ProcessName', and 'Value'.
2	Modify the desired values in <i>SystemConfigurationGeneral</i>, and then click Write to save and apply the changes.  The screenshot shows the 'Write Value' dialog box in the Prosys OPC UA Browser. The dialog has a table with columns 'Name', 'Data Type', and 'Value'. It lists various attributes of the 'SystemConfigurationGeneral' node, such as 'WelderName', 'AuthorityCheck', 'MemoryFullAction', 'BarcodeRecipePrefix', 'PowerupOption', 'PartID', 'CurUnit', 'ClearMemoryAtPowerup', 'ClearMemoryWithReset', 'PurgeWeldResultStorage...', 'ClampOnAlarm', 'WeldRecipeUniqueSerialNo...', and 'ASCPAddress'. Each attribute has a corresponding input field for its value. The 'Write' button is at the bottom right of the dialog.

Appendix F: Industrial Ethernet

F.1	EtherNet/IP.....	284
F.2	PROFINET	285

F.1 EtherNet/IP

	NOTICE
	See document BU-4001427 - POLARIS ETHERNET/IP - USER GUIDE for more information.

F.2 PROFINET

	NOTICE
	See document BU-4001429 - POLARIS PROFINET - USER GUIDE for more information.

[This page intentionally left blank]

Appendix G: Third-Party Software and Open Source Software Notices

G.1	Third Party Software and Open Source Software Notice	288
-----	--	-----

G.1 Third Party Software and Open Source Software Notice

The product contains certain third party (including “open source”) software components. Emerson makes those components available to you under the terms and conditions of the third party license agreements governing the respective components. The copyright statements and licenses presented herein apply to the indicated third party components.

For a third party component that you receive from Emerson in binary form, which is licensed under an open source license giving you the right to receive the source code for that binary, you may submit a written request for a copy of the source code to:

Associate General Counsel
1100 W. Louis Henna Blvd.
Round Rock, TX 78681 USA

Your request should include:

- (i) the name of the component or the binary file for which you are requesting the source code,
- (ii) the name and version number of the Emerson product containing the component/binary,
- (iii) the date you purchased the Emerson product,
- (iv) your name,
- (v) your company's name,
- (vi) your mailing and email addresses, and
- (vii) a telephone number.

Copyright 2026

[Polaris Platform: 1.7_BinaryScans]

Phase: DEVELOPMENT

Distribution: EXTERNAL

Notices Report Content

- * License Data
- * License Text

Components:

cJSON v1.7.14: <https://github.com/DaveGamble/cJSON> : MIT License
GNU Compiler Collection 8.3.0: <http://gcc.gnu.org/> : BSD 4-clause “Original” or “Old” License
libpdf-2.2.1 2.4.2: <http://www.libharu.org/> : zlib License
LLVM - Low Level Virtual Machine 11.1.0-rc1: <https://www.llvm.org/> : Apache License v2.0 with LLVM Exceptions
OpenLDAP 2.4.47: <http://www.openldap.org/> : Open LDAP Public License v2.8
OpenSSL 1.1.1k: <https://www.openssl.org/> : (SSLeay License - standalone AND OpenSSL License)
OpenSSL 3.0.13: <https://www.openssl.org/> : Apache License 2.0

Licenses:

Apache License 2.0

(OpenSSL 3.0.13, LLVM)

Apache License

Version 2.0, January 2004

=====

<http://www.apache.org/licenses/>

TERMS AND CONDITIONS FOR USE, REPRODUCTION, AND DISTRIBUTION

1. Definitions.

“License” shall mean the terms and conditions for use, reproduction, and distribution as defined by Sections 1 through 9 of this document.

“Licensor” shall mean the copyright owner or entity authorized by the copyright owner that is granting the License.

“Legal Entity” shall mean the union of the acting entity and all other entities that control, are controlled by, or are under common control with that entity. For the purposes of this definition, “control” means (i) the power, direct or indirect, to cause the direction or management of such entity, whether by contract or otherwise, or (ii) ownership of fifty percent (50%) or more of the outstanding shares, or (iii) beneficial ownership of such entity.

“You” (or “Your”) shall mean an individual or Legal Entity exercising permissions granted by this License.

“Source” form shall mean the preferred form for making modifications, including but not limited to software source code, documentation source, and configuration files.

“Object” form shall mean any form resulting from mechanical transformation or translation of a Source form, including but not limited to compiled object code, generated documentation, and conversions to other media types.

“Work” shall mean the work of authorship, whether in Source or Object form, made available under the License, as indicated by a copyright notice that is included in or attached to the work (an example is provided in the Appendix below).

“Derivative Works” shall mean any work, whether in Source or Object form, that is based on (or derived from) the Work and for which the editorial revisions, annotations, elaborations, or other modifications represent, as a whole, an original work of authorship. For the purposes of this License, Derivative Works shall not include works that remain separable from, or merely link (or bind by name) to the interfaces of, the Work and Derivative Works thereof.

“Contribution” shall mean any work of authorship, including the original version of the Work and any modifications or additions to that Work or Derivative Works thereof, that is intentionally submitted to Licensor for inclusion in the Work by the copyright owner or by an individual or Legal Entity authorized to submit on behalf of the copyright owner. For the purposes of this definition, “submitted” means any form of electronic, verbal, or written communication sent to the Licensor or its representatives, including but not limited to communication on electronic mailing lists, source code control systems, and issue tracking systems that are managed by, or on behalf of, the Licensor for the purpose of discussing and improving the Work, but excluding communication that is conspicuously marked or otherwise designated in writing by the copyright owner as “Not a Contribution.”

“Contributor” shall mean Licensor and any individual or Legal Entity on behalf of whom a Contribution has been received by Licensor and subsequently incorporated within the Work.

2. Grant of Copyright License. Subject to the terms and conditions of this License, each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable copyright license to reproduce, prepare Derivative Works of, publicly display, publicly perform, sublicense, and distribute the Work and such Derivative Works in Source or Object form.

3. Grant of Patent License. Subject to the terms and conditions of this License, each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable (except as stated in this section) patent license to make, have made, use, offer to sell, sell, import, and otherwise transfer the Work, where such license applies only to those patent claims licensable by such Contributor that are necessarily infringed by their Contribution(s) alone or by combination of their Contribution(s) with the Work to which such Contribution(s) was submitted. If You institute patent litigation against any entity (including a cross-claim or counterclaim in a lawsuit) alleging that the Work or a Contribution incorporated within the Work constitutes direct or contributory patent infringement, then any patent licenses granted to You under this License for that Work shall terminate as of the date such litigation is filed.

4. Redistribution. You may reproduce and distribute copies of the Work or Derivative Works thereof in any medium, with or without modifications, and in Source or Object form, provided that You meet the following conditions:

- a. You must give any other recipients of the Work or Derivative Works a copy of this License; and

- b. You must cause any modified files to carry prominent notices stating that You changed the files; and
- c. You must retain, in the Source form of any Derivative Works that You distribute, all copyright, patent, trademark, and attribution notices from the Source form of the Work, excluding those notices that do not pertain to any part of the Derivative Works; and
- d. If the Work includes a “NOTICE” text file as part of its distribution, then any Derivative Works that You distribute must include a readable copy of the attribution notices contained within such NOTICE file, excluding those notices that do not pertain to any part of the Derivative Works, in at least one of the following places: within a NOTICE text file distributed as part of the Derivative Works; within the Source form or documentation, if provided along with the Derivative Works; or, within a display generated by the Derivative Works, if and wherever such third-party notices normally appear. The contents of the NOTICE file are for informational purposes only and do not modify the License. You may add Your own attribution notices within Derivative Works that You distribute, alongside or as an addendum to the NOTICE text from the Work, provided that such additional attribution notices cannot be construed as modifying the License.

You may add Your own copyright statement to Your modifications and may provide additional or different license terms and conditions for use, reproduction, or distribution of Your modifications, or for any such Derivative Works as a whole, provided Your use, reproduction, and distribution of the Work otherwise complies with the conditions stated in this License.

5. **Submission of Contributions.** Unless You explicitly state otherwise, any Contribution intentionally submitted for inclusion in the Work by You to the Licensor shall be under the terms and conditions of this License, without any additional terms or conditions. Notwithstanding the above, nothing herein shall supersede or modify the terms of any separate license agreement you may have executed with Licensor regarding such Contributions.

6. **Trademarks.** This License does not grant permission to use the trade names, trademarks, service marks, or product names of the Licensor, except as required for reasonable and customary use in describing the origin of the Work and reproducing the content of the NOTICE file.

7. **Disclaimer of Warranty.** Unless required by applicable law or agreed to in writing, Licensor provides the Work (and each Contributor provides its Contributions) on an “AS IS” BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied, including, without limitation, any warranties or conditions of TITLE, NON-INFRINGEMENT, MERCHANTABILITY, or FITNESS FOR A PARTICULAR PURPOSE. You are solely responsible for determining the appropriateness of using or redistributing the Work and assume any risks associated with Your exercise of permissions under this License.

8. **Limitation of Liability.** In no event and under no legal theory, whether in tort (including negligence), contract, or otherwise, unless required by applicable law (such as deliberate and grossly negligent acts) or agreed to in writing, shall any Contributor be liable to You for damages, including any direct, indirect, special, incidental, or consequential damages of any character arising as a result of this License or out of the use or inability to use the Work (including but not limited to damages for loss of goodwill, work stoppage, computer failure or malfunction, or any and all other commercial damages or losses), even if such Contributor has been advised of the possibility of such damages.

9. **Accepting Warranty or Additional Liability.** While redistributing the Work or Derivative Works thereof, You may choose to offer, and charge a fee for, acceptance of support, warranty, indemnity, or other liability obligations and/or rights consistent with this License. However, in accepting such obligations, You may act only on Your own behalf and on Your sole responsibility, not on behalf of any other Contributor, and only if You agree to indemnify, defend, and hold each Contributor harmless for any liability incurred by, or claims asserted against, such Contributor by reason of your accepting any such warranty or additional liability.

END OF TERMS AND CONDITIONS

APPENDIX: How to apply the Apache License to your work

To apply the Apache License to your work, attach the following boilerplate notice, with the fields enclosed by brackets “[]” replaced with your own identifying information. (Don't include the brackets!) The text should be enclosed in the appropriate comment syntax for the file format. We also recommend that a file or class name and description of purpose be included on the same “printed page” as the copyright notice for easier identification within third-party archives.

Copyright [yyyy] [name of copyright owner] Licensed under the Apache License, Version 2.0 (the "License"); you may not use this file except in compliance with the License. You may obtain a copy of the License at <http://www.apache.org/licenses/LICENSE-2.0> Unless required by applicable law or agreed to in writing, software distributed under the License is distributed on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language governing permissions and limitations under the License.

---- LLVM Exceptions to the Apache 2.0 License ----

As an exception, if, as a result of your compiling your source code, portions of this Software are embedded into an Object form of such source code, you may redistribute such embedded portions in such Object form without complying with the conditions of Sections 4(a), 4(b) and 4(d) of the License.

In addition, if you combine or link compiled forms of this Software with software that is licensed under the GPLv2 ("Combined Software") and if a court of competent jurisdiction determines that the patent provision (Section 3), the indemnity provision (Section 9) or other Section of the License conflicts with the conditions of the GPLv2, you may retroactively and prospectively choose to deem waived or otherwise exclude such Section(s) of the License, but only in their entirety and only with respect to the Combined

Software.

BSD 4-clause "Original" or "Old" License (GNU Compiler Collection 8.3.0)

All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
3. All advertising materials mentioning features or use of this software must display the following acknowledgment:
This product includes software developed by the University of California, Berkeley and its contributors.
4. Neither the name of the University nor the names of its contributors may be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE REGENTS AND CONTRIBUTORS ``AS IS'' AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE

ARE DISCLAIMED. IN NO EVENT SHALL THE REGENTS OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT

LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE

MIT License

(cJSON v1.7.14)

Copyright (c) 2009-2017 Dave Gamble and cJSON contributors

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE

Open LDAP Public License v2.8

(OpenLDAP 2.4.47)

The OpenLDAP Public License

=====

Version 2.8, 17 August 2003

Redistribution and use of this software and associated documentation ("Software"), with or without modification, are permitted provided that the following conditions are met:

1. Redistributions in source form must retain copyright statements and notices,
2. Redistributions in binary form must reproduce applicable copyright statements and notices, this list of conditions, and the following disclaimer in the documentation and/or other materials provided with the distribution, and
3. Redistributions must contain a verbatim copy of this document.

The OpenLDAP Foundation may revise this license from time to time. Each revision is distinguished by a version number. You may use this Software under terms of this license revision or under the terms of any subsequent revision of the license.

THIS SOFTWARE IS PROVIDED BY THE OPENLDAP FOUNDATION AND ITS CONTRIBUTORS "AS IS" AND ANY EXPRESSED OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE OPENLDAP FOUNDATION, ITS CONTRIBUTORS, OR THE AUTHOR(S) OR OWNER(S) OF THE SOFTWARE BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

The names of the authors and copyright holders must not be used in advertising or otherwise to promote the sale, use or other dealing in this Software without specific, written prior permission. Title to copyright in this Software shall at all times remain with copyright holders.

OpenLDAP is a registered trademark of the OpenLDAP Foundation.

Copyright 1999-2003 The OpenLDAP Foundation, Redwood City, California, USA. All Rights Reserved. Permission to copy and distribute verbatim copies of this document is granted.

© Copyright 2004, OpenLDAP Foundation, info@OpenLDAP.org

\$OpenLDAP: www/pages/software/release/license.wml,v 1.6 2000/08/23 19:44:27 kurt

Exp \$

OpenSSL License

(OpenSSL 1.1.1k)

OpenSSL Project License

=====

OpenSSL License

=====

Copyright (c) 1998-2001 The OpenSSL Project. All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
3. All advertising materials mentioning features or use of this software must display the following acknowledgment: "This product includes software developed by the OpenSSL Project for use in the OpenSSL Toolkit. (<http://www.openssl.org/>)"
4. The names "OpenSSL Toolkit" and "OpenSSL Project" must not be used to endorse or promote products derived from this software without prior written permission. For written permission, please contact openssl-core@openssl.org.
5. Products derived from this software may not be called "OpenSSL" nor may "OpenSSL" appear in their names without prior written permission of the OpenSSL Project.
6. Redistributions of any form whatsoever must retain the following acknowledgment:
"This product includes software developed by the OpenSSL Project for use in the OpenSSL Toolkit (<http://www.openssl.org/>)"

THIS SOFTWARE IS PROVIDED BY THE OpenSSL PROJECT ``AS IS" AND ANY EXPRESSED OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE OpenSSL PROJECT OR ITS CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

=====

This product includes cryptographic software written by Eric Young
(eay@cryptsoft.com). This product includes software written by Tim Hudson
(tjh@cryptsoft.com).

SSLeay License - standalone

(OpenSSL 1.1.1k)

SSLeay License

=====

Copyright (C) 1995-1998 Eric Young (eay@cryptsoft.com) All rights reserved.

This package is an SSL implementation written by Eric Young (eay@cryptsoft.com). The implementation was written so as to conform with Netscapes SSL. This library is free for commercial and non-commercial use as long as the following conditions are adhered to. The following conditions apply to all code found in this distribution, be it the RC4, RSA, lhash, DES, etc., code; not just the SSL code. The SSL documentation included with this distribution is covered by the same copyright terms except that the holder is Tim Hudson (tjh@cryptsoft.com).

Copyright remains Eric Young's, and as such any Copyright notices in the code are not to be removed. If this package is used in a product, Eric Young should be given attribution as the author of the parts of the library used. This can be in the form of a textual message at program startup or

in documentation (online or textual) provided with the package. Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

1. Redistributions of source code must retain the copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
3. All advertising materials mentioning features or use of this software must display the following acknowledgment: "This product includes cryptographic software written by Eric Young (eay@cryptsoft.com)". The word 'cryptographic' can be left out if the routines from the library being used are not cryptographic related :-).
4. If you include any Windows specific code (or a derivative thereof) from the apps directory (application code) you must include an acknowledgement: "This product includes software written by Tim Hudson (tjh@cryptsoft.com)"

THIS SOFTWARE IS PROVIDED BY ERIC YOUNG ``AS IS'' AND ANY EXPRESS OR IMPLIED

WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE AUTHOR OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE. The license and distribution terms for any publically available version or derivative of this code cannot be changed. i.e. this code cannot simply be copied and put under another distribution license [including the GNU

Public License.

zlib License

(libhpdf-2.2.1 2.4.2)

The zlib/libpng License

=====

Copyright (c) <year> <copyright holders>

This software is provided 'as-is', without any express or implied warranty. In no event will the authors be held liable for any damages arising from the use of this software.

Permission is granted to anyone to use this software for any purpose, including commercial applications, and to alter it and redistribute it freely, subject to the following restrictions:

1. The origin of this software must not be misrepresented; you must not claim that you wrote the original software. If you use this software in a product, an acknowledgment in the product documentation would be appreciated but is not required.
2. Altered source versions must be plainly marked as such, and must not be misrepresented as being the original software.
3. This notice may not be removed or altered from any source distribution.

[This page intentionally left blank]

