ROBOTICS

Application manual

Lincoln ArcLink Interface and Weld Editor

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Application manual

Lincoln ArcLink Interface and Weld Editor

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Revision: G

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Original instructions.

Table of contents

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Overview of this manual

About this manual

This manual describes the options *Lincoln ArcLink Interface* and *Weld Editor* and contains instructions to configure it.

Who should read this manual?

This manual is intended for:

- Personnel responsible for installations and configurations of fieldbus hardware/software
- Personnel responsible for I/O system configuration
- System integrators

Prerequisites

The reader should have the required knowledge of:

- Mechanical installation work
- Electrical installation work
- System parameter configuration

Trademarks

Power Wave is a trademark of Lincoln Electric.

Limitations

The Lincoln ArcLink Interface supports the following Lincoln Welding Equipment:

- Power Weave R450
- Power Weave E500

References

References	Document ID
Operating manual - RobotStudio	*3HAC032104-001*
Application manual - Arc and Arc Sensor	*3HAC050988-001*
Technical reference manual - RAPID Instructions, Functions and Data types	*3HAC050917-001*
Technical reference manual - RAPID Overview	*3HAC050947-001*

Revisions

Revision	Description
-	New manual
A	Released with RobotWare 6.0.
B	Released with RobotWare 6.01. • Corrections and updates throughout the manual.

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Revision	Description
C	Released with RobotWare 6.02. • The ArcLink Interface is connected to the LAN2 port on the IRC5 controller. • Minor corrections.
D	Released with RobotWare 6.05. • Added section *Setting the IP address and port number of the welder on page 43*. • Minor corrections.
E	Released with RobotWare 6.08. • Corrections in information about options, see *Software on page 23*.
F	Released with RobotWare 6.10.01. • Information added regarding MultiMove systems in section *ArcLink setup on page 17*.
G	Released with Add-In Version: 1.02.00. • Limitations added in section *Limitations on page 7*.

Product documentation

Categories for user documentation from ABB Robotics

The user documentation from ABB Robotics is divided into a number of categories. This listing is based on the type of information in the documents, regardless of whether the products are standard or optional.

Tip

All documents can be found via myABB Business Portal, *www.abb.com/myABB*.

Product manuals

Manipulators, controllers, DressPack/SpotPack, and most other hardware is delivered with a **Product manual** that generally contains:

- Safety information.
- Installation and commissioning (descriptions of mechanical installation or electrical connections).
- Maintenance (descriptions of all required preventive maintenance procedures including intervals and expected life time of parts).
- Repair (descriptions of all recommended repair procedures including spare parts).
- Calibration.
- Decommissioning.
- Reference information (safety standards, unit conversions, screw joints, lists of tools).
- Spare parts list with corresponding figures (or references to separate spare parts lists).
- References to circuit diagrams.

Technical reference manuals

The technical reference manuals describe reference information for robotics products, for example lubrication, the RAPID language, and system parameters.

Application manuals

Specific applications (for example software or hardware options) are described in **Application manuals**. An application manual can describe one or several applications.

An application manual generally contains information about:

- The purpose of the application (what it does and when it is useful).
- What is included (for example cables, I/O boards, RAPID instructions, system parameters, software).
- How to install included or required hardware.
- How to use the application.
- Examples of how to use the application.

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Operating manuals

The operating manuals describe hands-on handling of the products. The manuals are aimed at those having first-hand operational contact with the product, that is production cell operators, programmers, and troubleshooters.

Safety

Safety regulations

Before beginning mechanical and/or electrical installations, ensure you are familiar with the safety information in the product manuals for the robot.

The integrator of the robot system is responsible for the safety of the robot system.

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1 Overview of ArcLink

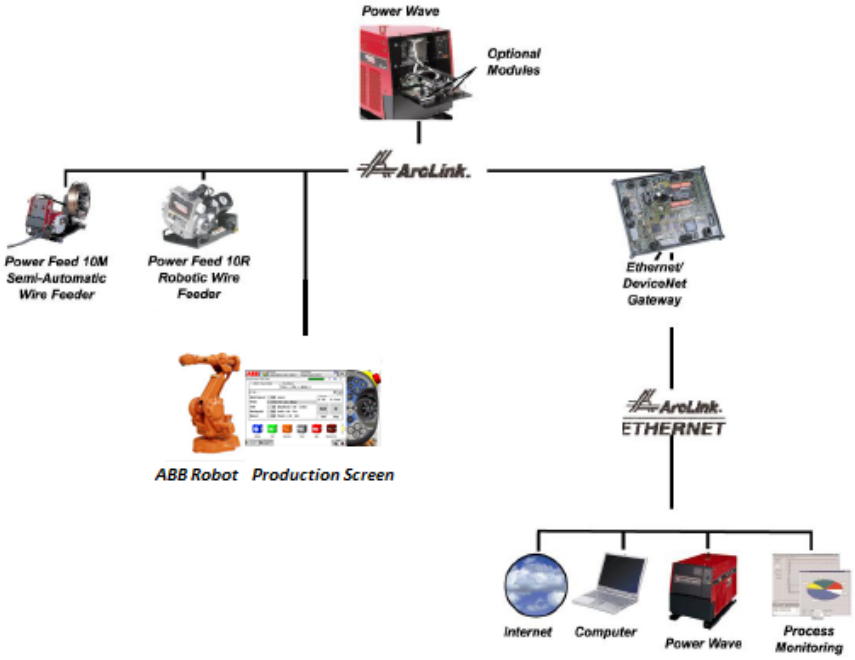
Introduction

ArcLink is a digital communications system that is used in the Power Wave Welding Systems from Lincoln Electric.

ArcLink is specially designed for the arc welding environment and is the best method to communicate to cell components such as semiautomatic wire feeders or robots. ArcLink is simply the way each piece "talks" to each other in a Power Wave system. The Power Wave Welding Systems also provide "gateways" to allow other digital networks such as Ethernet to connect to the ArcLink system.

ArcLink integrates all welding components for seamless, time-critical data transfer. The strength of ArcLink lies in the ability to communicate with each system component in a pre-defined welding language. ArcLink brings modularity to welding systems and provides a single, intelligent connection between all modules.

ArcLink also allows for networking capabilities through gateways (such as Ethernet) to allow simultaneous monitoring of multiple welding cells, which establishes a means for developing supervisory or monitoring tools.



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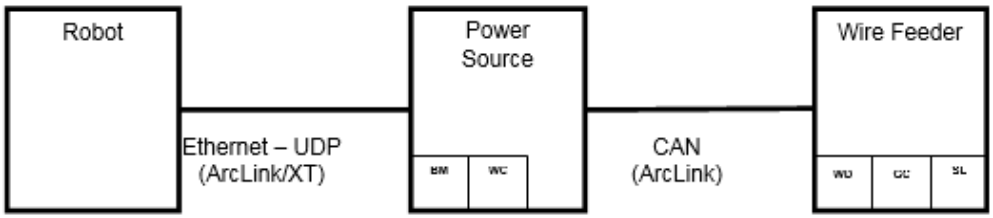
An ArcLink bus can consist of a CAN and Ethernet bus together; some nodes on CAN and others on Ethernet as in the figure below. ArcLink/XT adds Ethernet capability to the ArcLink CAN bus.



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Working principle

ArcLink uses peer-to-peer, event-driven messaging, which broadcasts on an “as-needed” basis.

Peer-to-peer messaging frees space on the data highway, reducing message traffic. Because ArcLink logic is based on a Controller Area Network (CANIIB) standard; it inherits the benefits of priority-based, deterministic messaging and noise immunity. This means that critical messages are guaranteed to reach their destination with minimum delay, even in the presence of electrical noise.

Features

Feature	Description
File transfer	Weld files can be saved, shared, or modified.
Data acquisition	Weld data is collected and stored for Production Monitoring purposes.
Advanced diagnostics	ArcLink provides the capability to monitor component failures system wide.
Ease of installation	ArcLink uses one control cable for communications, component power, and electrode voltage sensing connections. ArcLink is used in the control cable connection between the weld power source and the wire feeder. It provides flexibility of physical configuration so that any component may be connected to any other component in the system. ArcLink/XT uses one Ethernet cable for communication between the robot controller and weld power source.

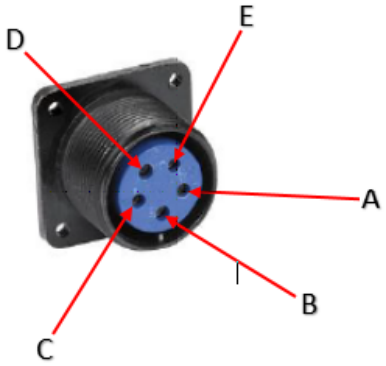
2 Installation and setup

2.1 Hardware

2.1.1 ArcLink specifications

Description

- 5-conductor SO-type control cable with 5-pin connectors for all interconnections
- Isolated 40 VDC power supply
- Multiple-sourced transceiver
- Data rate of 125-500K baud



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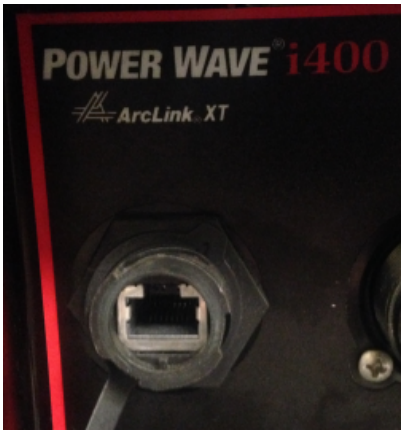
A	Leads A and B are dedicated to communications. They carry CANIIB messages between welding systems components.
B	
C	Lead C serves as the voltage sensory lead. Lincoln Electric digital welding machines supply this lead within the ArcLink cable. Certain applications may require an additional voltage sense lead.
D	Leads D and E are dedicated power leads supplying 40 VDC, enough power to run the wire feeder drive motor. This eliminates the need for a separate wire feeder power cable.
E	

2.1.2 ArcLink/XT

Description

ArcLink/XT is an Ethernet digital communications system used in Lincoln Electric's Power Wave welding systems. It is used to connect between the robot and weld power source. The figure below shows the front panel Ethernet connector on a Power Wave welding system.



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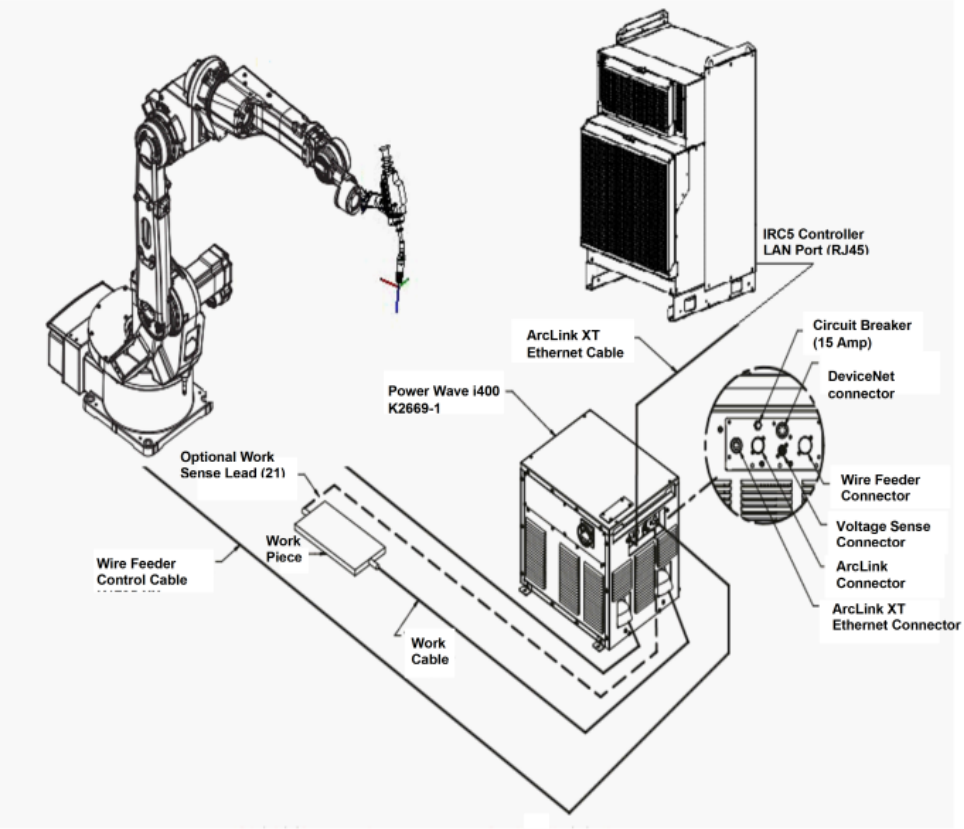
2.1.3 ArcLink setup

Description

ArcLink/XT is a single cable interface between the Power Wave and the IRC5 controller. It is connected to the 5-pin connector port on the Power Wave panel and uses a regular RJ45 connector that connects directly, or via a switch, to the LAN2 port on the IRC5 controller.

Overview

The following figure illustrates an overview of the ArcLink setup.



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Setup with MultiMove systems

The RobotWare Arc functionality for MultiMove systems is similar to the functionality in single arc welding systems. Up to four welding robots are programmed in separate tasks running independent or synchronized. The user interface provides the possibility to select an active welding robot for the functions to operate on.

For more information about the MultiMove setup, see *Application manual - Arc and Arc Sensor*.

2.1.4 Power Wave

Description

The Power Wave welding systems are extensively used in robotic arc welding applications. They are provided with a number of PC tools, ranging from diagnostics to advanced production monitoring.

In addition to this, Power Wave uses ArcLink, a digital communications system that was specially designed for the arc welding environment.

The Power Wave welding systems also provide "gateways" to allow other digital networks such as DeviceNet and Ethernet to connect to the ArcLink system.

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2.1.5 Power Wave Manager

Description

Power Wave Manager is an application that allows you to configure and manage a multitude of settings and configuration options within the full range of Lincoln Electric's Power Wave line of welding machines. It also provides in-depth diagnostics of the machine's hardware and firmware to help identify and eliminate any issues with welding or configuration.

System requirements

Minimum hardware requirements:

- 256 MB system RAM.
- 1.0 GHz processor speed.
- 1024×768 display resolution.
- 50 MB free disk space.
- Connection to a Lincoln Electric Power Wave or compatible machine through an Ethernet network or serial (RS-232) cable.

Power Wave Manager runs under the Microsoft .NET Framework. Therefore, it may be run within any of the following versions of Microsoft Windows:

- Windows 7
- Windows Vista
- Windows XP Service Pack 2
- Windows 2000 Service Pack 4
- Windows 98 Second Edition

The user must be logged on as an administrator to the PC.

Compatible equipment

The Lincoln ArcLink Interface may be used with any generation 3 welding machine in Lincoln Electric's Power Wave family that utilizes the digital controls platform. This list includes, but is not limited to, the following units:

Power Wave i400

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Power Wave S350

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Power Wave R350

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2.1.5 Power Wave Manager
Continued

Power Wave S500

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Power Wave R500

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Power Wave S700

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Establishing a connection

The Power Wave Welding Power Source must be connected to a PC before using the Power Wave Manager software.

For assistance with connecting to your welding machine, see the *Help Me Connect* guide that is included with the Power Wave Utilities installation. The guide can be downloaded from *http://powerwavesoftware.com*.

By default, Lincoln Power Wave power sources ship from the factory as a DHCP client. The recommended method to connect to the IRC5 controller is using fixed IP addresses.

The robot LAN2 ethernet port must be used to connect to the Lincoln welder. The robot LAN2 ethernet port is set up with an IP address of *192.168.125.1*. Choose a compatible IP address for the Lincoln welder in the range of *192.168.125.150* to *192.168.125.199*, for example *192.168.125.150*.

To set the Lincoln IP address, use the Power Wave Manager. Connect an Ethernet cable between your PC and the Lincoln welder, and then start the Power Wave Manager.

When Power Wave Manager is started, a list of categorized configuration sections is shown to the left. These sections are:

- **Connection**
- **System Status**
- **Power Source Settings**
- **Network Settings**
- **Feeder settings**
- **Tools**
- **Production Monitoring**

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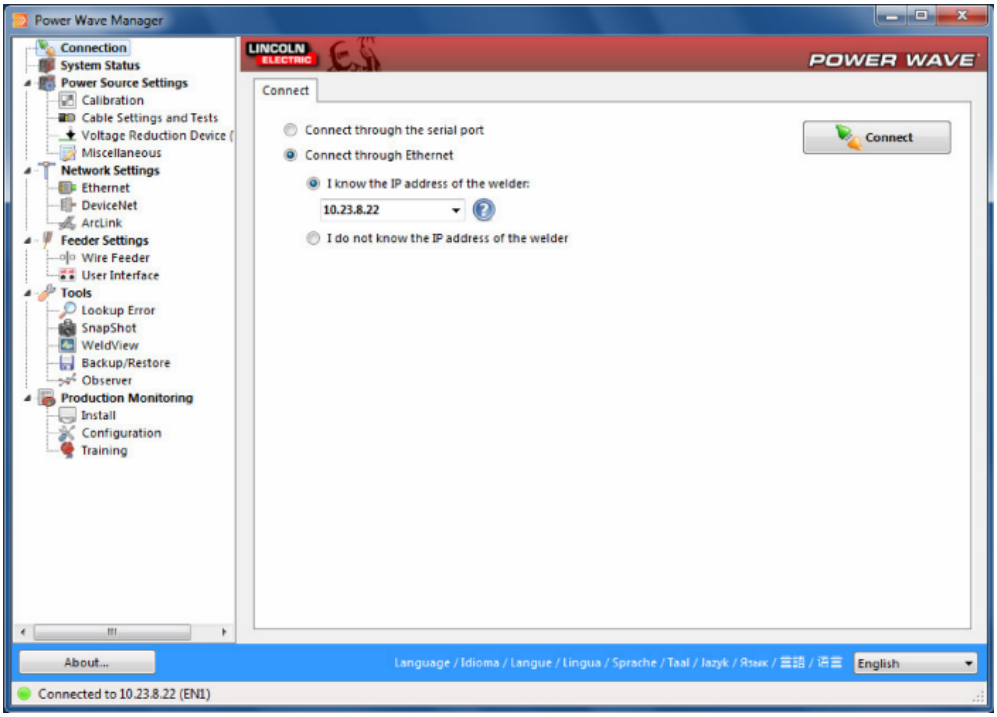
By default, Power Wave Manager starts up in the **Connection** section, since a connection is required for accessing most of the other sections, except Lookup Error and WeldView.



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Use the **Power Wave Manager** to set the welder IP address.

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2.1.5 Power Wave Manager
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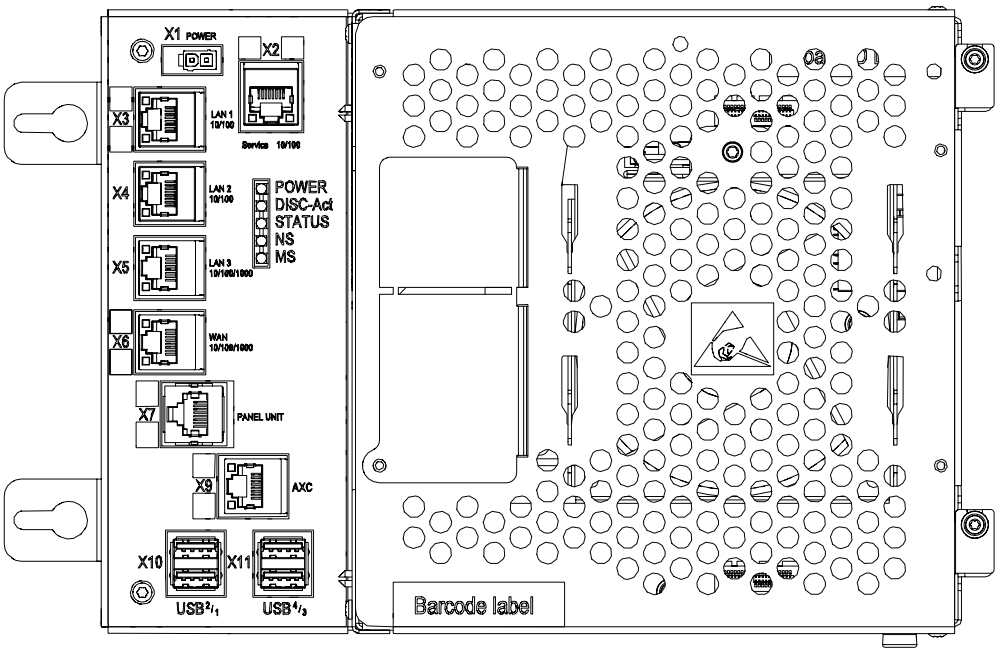
Connecting to the IRC5 controller

Connect an Ethernet cable between the robot controller LAN2 port and the Lincoln welder Ethernet port.

The following illustration shows an overview of the computer unit.



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X5	LAN2

By default, the IP address of the welder in the robot system is set to *0.0.0.0* in the system parameters. When connecting the welder to the IRC5 controller the robot will automatically read the welder IP address and store it in the system parameters (topic Process).

For more information, see *Setting the IP address and port number of the welder on page 43*.

Tip

If you are connecting a robot that was previously connected to a different Lincoln power source, set the system parameter Welder IP address to *0.0.0.0*. Then when you connect the welder to the IRC5 robot controller the robot will automatically read the welder IP address and store it in the system parameters.

2.2 Software

System prerequisites

- IRC5 robot controller with main computer DSQC1000 or newer
- RobotWare 6.0 or higher with the following options:
  - *[616-1] PC Interface* (this is necessary for *Socket Messaging*)
  - *[617-1] FlexPendant Interface*
  - *[812-1] Production Manager* (optional)
  - *[637-1] Production Screen*
  - *[633-1] RobotWare Arc*

Software download and installation

In *Installation Manager*, make sure to select *RW Add-In loaded Welder* under *Options*, *Arc*.

See also *The Lincoln RobotStudio Add-In on page 37*.

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3 Weld Editor Interface

Overview

The graphical user interface for the FlexPendant is called the *Weld Editor Interface*. The information is presented in widgets, which are small applications available when starting the application *Production Screen* on the FlexPendant.

The Weld Editor Interface consists of tabs where the user can process and modify information such as:

- Ignition parameters
- Heat parameters
- Weld parameters
- End parameters

Unlike the regular data editor, it combines seam data and weld data for intuitive process setup and allows them to be modified at the same time.

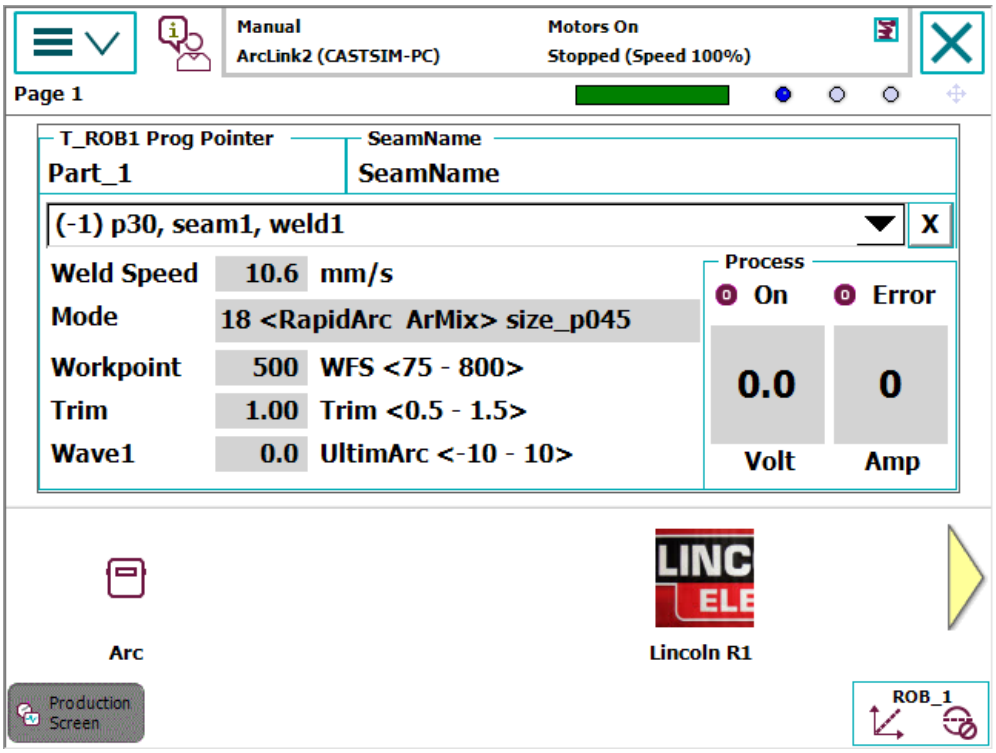
The Weld Editor also validates the data based on information from the welder.

The data to edit can be selected either by moving the program pointer to a weld instruction or by using the last weld and seam data.

Widget screens

The widget screens provide live weld process information during welding. They provide information from both welder and robot program execution.

Use the back/forward arrow buttons or the dots in the upper right corner to move between widgets.



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The widgets show the following the live weld process information:

- Weld speed
- Mode
- IPM
- Workpoint
- Wave1
- Voltage
- Current
- Welding status
- Error status

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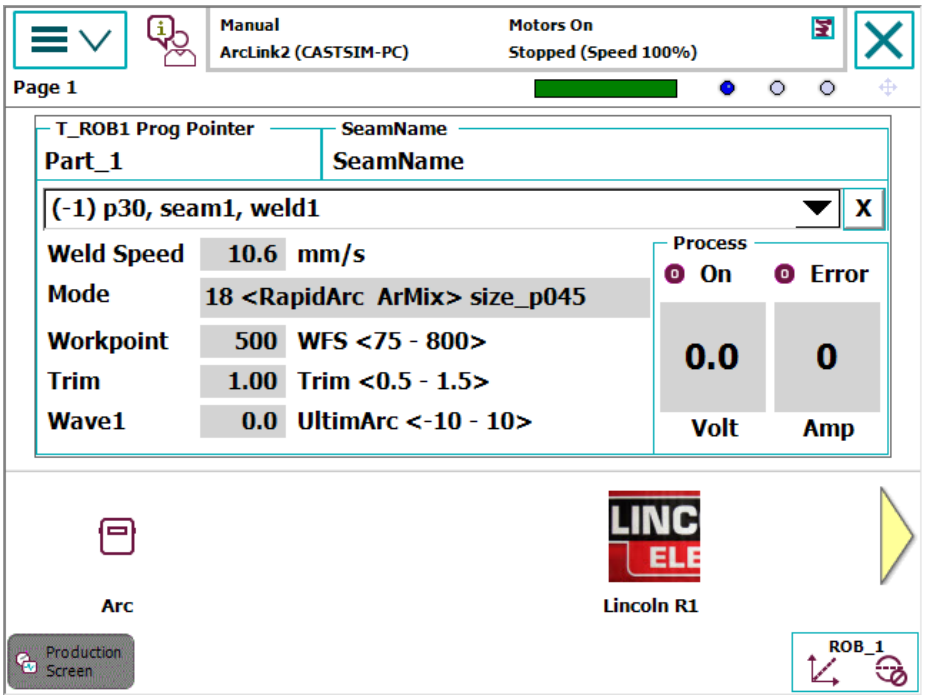
Starting the Weld Editor Interface

1 On the FlexPendant, tap the **ABB** menu and then tap **Production Screen**.

2 Tap **Lincoln R1** to start the Weld Editor widget.



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3 Tap **Production Screen** to close the window and return to the previous window.

4 Tap **Refresh** to refresh and show the updated values.

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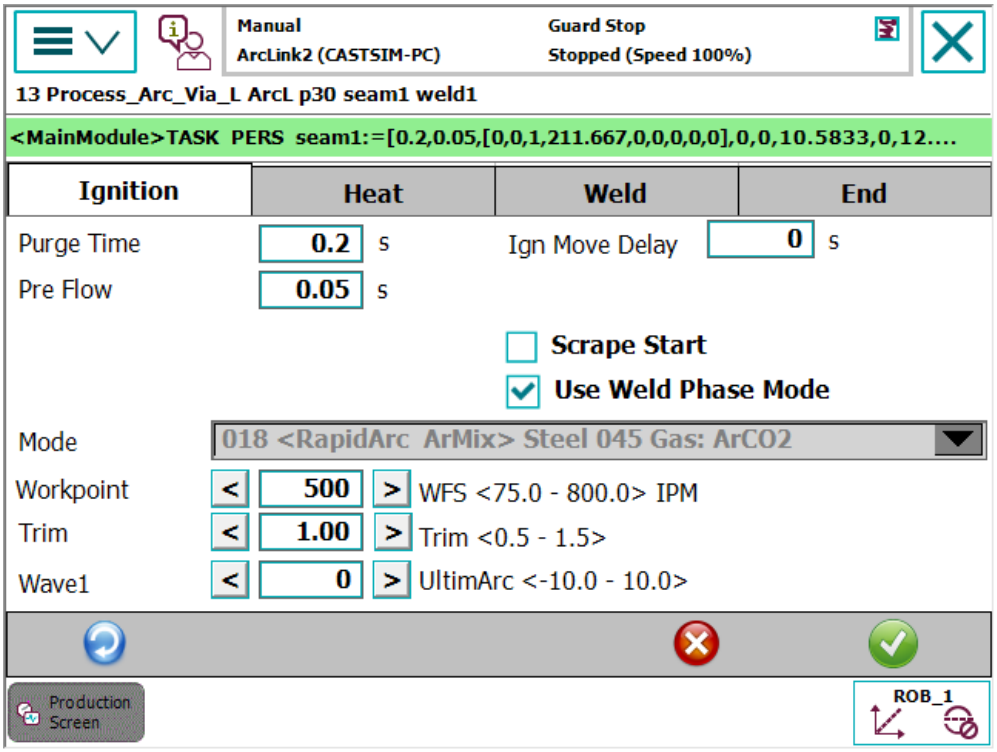
Ignition parameters

Tap the **Ignition** tab to view or modify the ignition phase parameters.

> **Note**
>
> The ignition phase parameters can only be modified in manual mode.

> **Tip**
>
> To copy the current weld phase mode settings, toggle **Use Weld Phase Mode** off, on, and then off again.



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Button	Description
Refresh	The blue refresh button is used to return to the Weld Phase tab.
Confirm	The green check button is used to confirm any changes made.
Cancel	The red cancel button is used to cancel any changes made and return to the previous values.

Parameter	Description
seamdata	`seamdata` is used to control the start and end of the weld. `seamdata` is also used if the process is restarted after a welding operation has been interrupted.
Purge Time	The time (in seconds) it takes to fill the gas lines and the welding gun with protective gas, also called "gas purging".
Pre Flow Time	The time (in seconds) it takes to pre-flow the weld object with protective gas, also called "gas pre-flow".

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Parameter	Description
Ign Move Delay	The delay (in seconds) from the time the arc is considered stable at ignition until the heat phase is started.
Scrape Start	The type of scrape used at the weld start. Scrape type at restart will not be affected. It will always be *Weaving scrape*. • Not selected – No scrape at weld start • Selected – *Weaving scrape*
Use Weld Phase Mode	Not selected – Select weld parameters during ignition phase manually Selected – Use the parameters from the **Weld** tab. This is the default mode.
Mode	Mode defines the shape and characteristics of the weld. The characteristics of a mode generally implement the process: GMAW, SMAW, SAW, GTAW, FCAW, etc. Also known as a schedule.
Workpoint	WorkPoint sets the wire feed speed reference for the weld. Limits are defined by the selected mode
Trim	Trim defines the arc length. Trim is adjustable from 0.5 to 1.50 in synergic pulse modes. **Note** If using a CV (Constant Voltage) mode like the example above, the limit range is mode specific and is set in volts instead of a multiplier.
Wave1	Wave is the apparent inductance or "pinch" control for CV welding, and wave shape control for pulse welding. Increasing it gives a hotter, crisper arc. Decreasing it gives a colder, softer arc.

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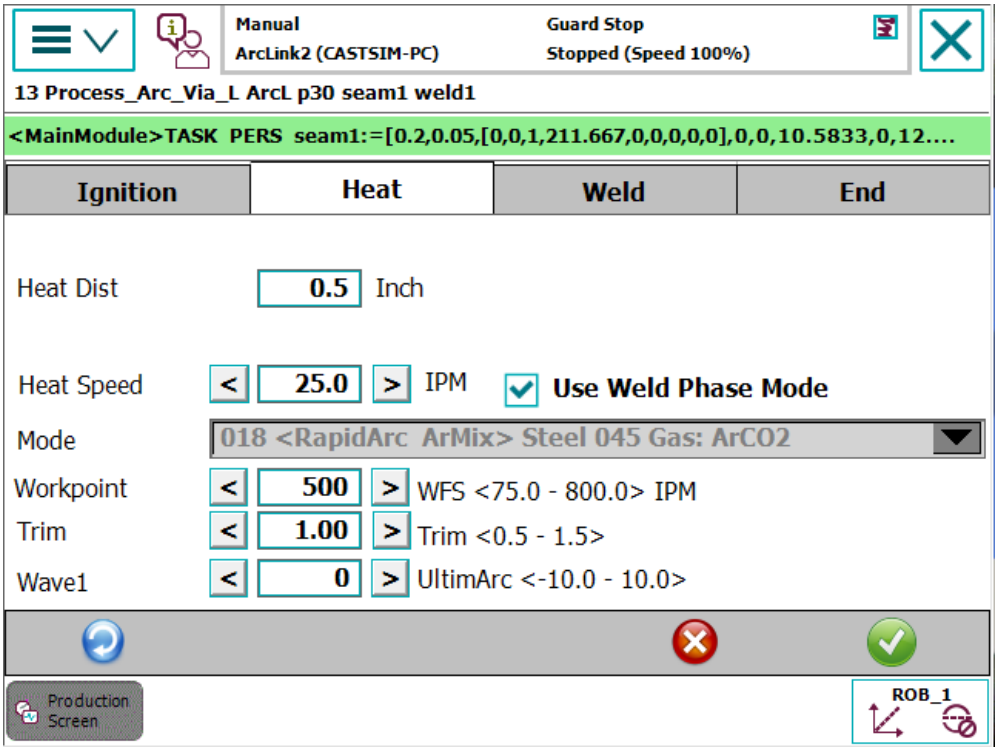
Continued

Heat parameters

Tap the **Heat** tab to view or modify heat phase parameters.

> **Note**
>
> The heat phase parameters can only be modified in manual mode.

> **Tip**
>
> To copy the current weld phase mode settings, toggle **Use Weld Phase Mode** off, on, and then off again.



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Button	Description
Refresh	The blue refresh button is used to return to the Weld Phase tab.
Confirm	The green check button is used to confirm any changes made.
Cancel	The red cancel button is used to cancel any changes made and return to the previous values.

Parameter	Description
Heat Dist	The distance during which the heat data is active at the start of the weld.
Heat Speed	The welding speed during the heat phase at the start of the weld phase.

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Continued

Parameter	Description
Use Weld Phase Mode	• Not selected – Select weld parameters during the heat phase manually. • Selected – Use the parameters from the **Weld** tab. This is the default mode.
Mode	Mode defines the shape and characteristics of the weld. The characteristics of a mode generally implement the process: GMAW, SMAW, SAW, GTAW, FCAW, etc. Also known as a schedule.
Workpoint	WorkPoint sets the wire feed speed reference at the start of the weld phase. Limits are defined by the selected mode.
Trim	Trim defines the arc length. Trim is adjustable from 0.5 to 1.50 in synergic pulse modes.  **Note** If using a CV (Constant Voltage) mode like the example above, the limit range is mode specific and is set in volts instead of a multiplier.
Wave1	Wave is the apparent inductance or "pinch" control for CV welding, and wave shape control for pulse welding. Increasing it gives a hotter, crisper arc. Decreasing it gives a colder, softer arc.

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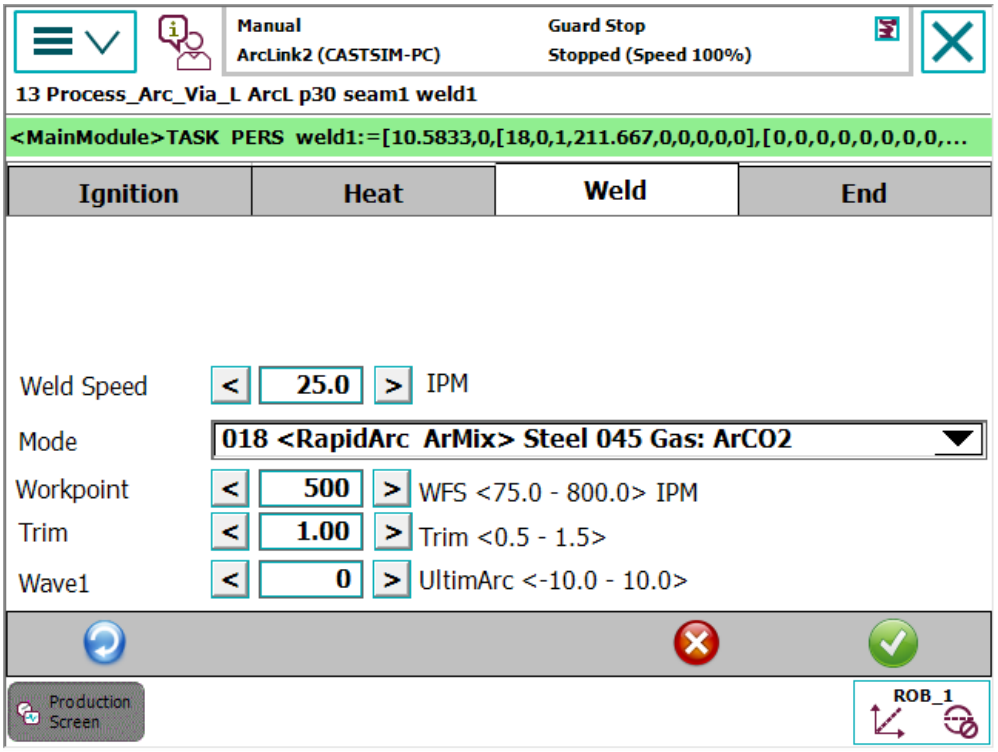
Weld parameters

Tap the **Weld** tab to view or modify the weld parameters.

> **Note**
>
> The weld parameters can only be modified in manual or tune mode while the arc is established.



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Button	Description
Refresh	The blue refresh button is used to return to the Weld Phase tab.
Confirm	The green check button is used to confirm any changes made.
Cancel	The red cancel button is used to cancel any changes made and return to the previous values.

Parameter	Description
welddata	The `welddata` parameters control the weld during the weld phase, which is as long as the arc is established.
Weld Speed	The speed of the TCP of the welding torch during the weld instruction.
Mode	Mode defines the shape and characteristics of the weld. The characteristics of a mode generally implement the process: GMAW, SMAW, SAW, GTAW, FCAW, etc. Also known as a schedule.
Workpoint	WorkPoint sets the wire feed speed reference for the weld phase. Limits are defined by the selected mode.

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Continued

Parameter	Description
Trim	Trim defines the arc length. Trim is adjustable from 0.5 to 1.50 in synergic pulse modes. **Note** If using a CV (Constant Voltage) mode like the example above, the limit range is mode specific and is set in volts instead of a multiplier.
Wave1	Wave is the apparent inductance or "pinch" control for CV welding, and wave shape control for pulse welding. Increasing it gives a hotter, crisper arc. Decreasing it gives a colder, softer arc.

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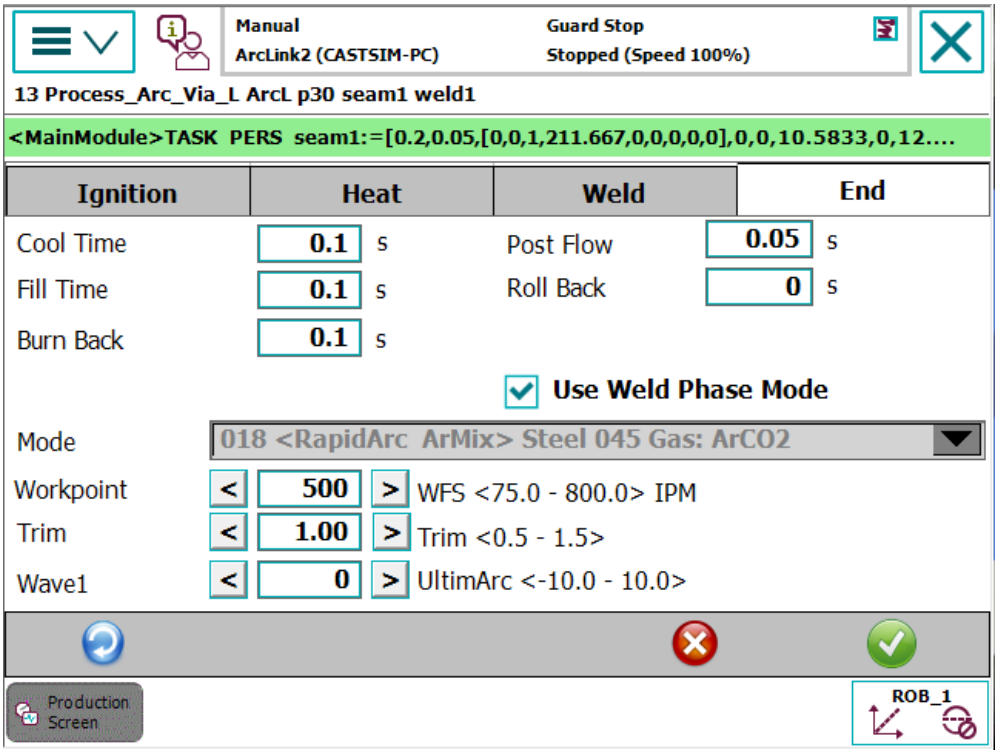
Continued

End parameters

Tap the **End** tab to view or modify the end phase parameters.

> **Note**
>
> The end phase parameters can only be modified in manual mode.

> **Tip**
>
> To copy the current weld phase mode settings, toggle **Use Weld Phase Mode** off, on, and then off again.



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Button	Description
Refresh	The blue refresh button is used to return to the Weld Phase tab.
Confirm	The green check button is used to confirm any changes made.
Cancel	The red cancel button is used to cancel any changes made and return to the previous values.

Parameter	Description
seamdata	`seamdata` is used to control the start and end of the weld. `seamdata` is also used if the process is restarted after a welding operation has been interrupted.
Cool Time	The time (in seconds) during which the process is stopped, allowing the weld to cool before other end activities such as crater fill and burn back take place.
Fill Time	The crater-filling time (in seconds) at the end phase of the weld.

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Parameter	Description
Burn Back	The time (in seconds) during which the weld electrode is burnt back when electrode feeding has stopped.
Post Flow	The time (in seconds) for purging with protective gas after the end of the process.
Use Weld Phase Mode	• Not selected – Select weld parameters during the ignition phase manually. • Selected – Use the parameters from the **Weld** tab. This is the default mode.
Mode	Mode defines the shape and characteristics of the weld. The characteristics of a mode generally implement the process: GMAW, SMAW, SAW, GTAW, FCAW, etc. Also known as a schedule.
Workpoint	WorkPoint sets the wire feed speed reference for the end phase of the weld. Limits are defined by the selected mode.
Trim	Trim defines the arc length. Trim is adjustable from 0.5 to 1.50 in synergic pulse modes.  **Note** If using a CV (Constant Voltage) mode like the example above, the limit range is mode specific and is set in volts instead of a multiplier.
Wave1	Wave is the apparent inductance or "pinch" control for CV welding, and wave shape control for pulse welding. Increasing it gives a hotter, crisper arc. Decreasing it gives a colder, softer arc.

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4 The Lincoln RobotStudio Add-In

4.1 Introduction

About RobotStudio

Lincoln RobotStudio Add-In is a PC application for modeling, offline programming, and simulation of robot cells. It can be downloaded from the *ABB RobotApps™ web site* under the Add-In tab.

For information on how to install and operate RobotStudio, see *Operating manual - RobotStudio*.

Installing the Lincoln Add-In

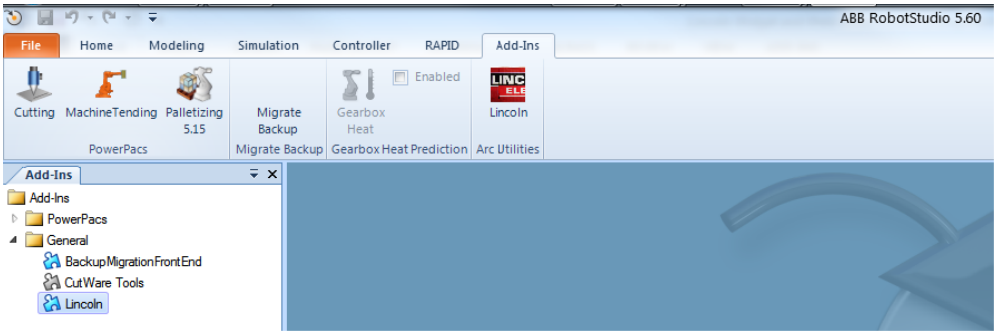
The Lincoln RobotStudio Add-In does not require a RobotStudio license.

To install the Lincoln Add-In, double click the file *LincolnArcLinkXTSetup.exe* and follow the instructions. In RobotStudio, the Add-In will be available in the Add-Ins tab.

4.2 Overview of the Lincoln Add-In

General

This section describes the available configuration options for the Lincoln Add-In used in ArcLink setup.



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Note

The Lincoln add-in is used to select the weld modes to be used in the robot from among the many weld modes available in the welder. This simplifies choosing weld modes for the user and allows engineering staff to select only the weld modes they want the user to use.

Note

Make sure that any optional weld modules such as the Lincoln STT Module or the Lincoln Advanced Welding module is installed before running the Lincoln Add-In to configure the weld modes.

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xx1500000710

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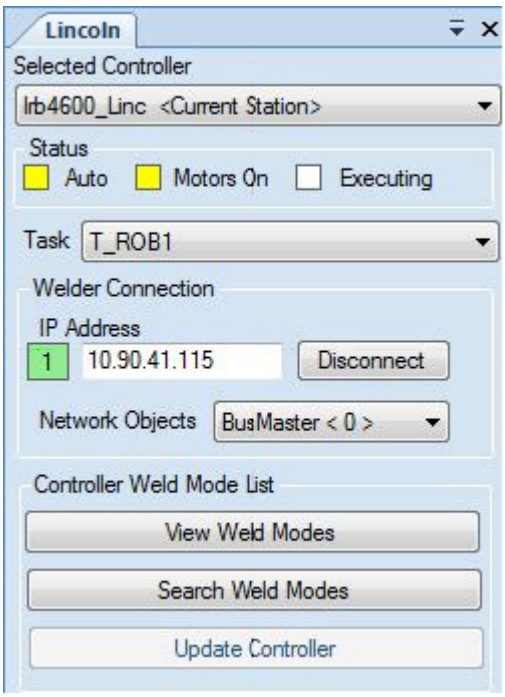
The Lincoln Add-In consists of a list of controllers and its tasks in drop-down menus. The status of the controller is displayed in the status section.



xx1400002237

The controller is connected to the designated IP address of the welder and the status of the connection is displayed. Green indicates a correct connection.

Network objects

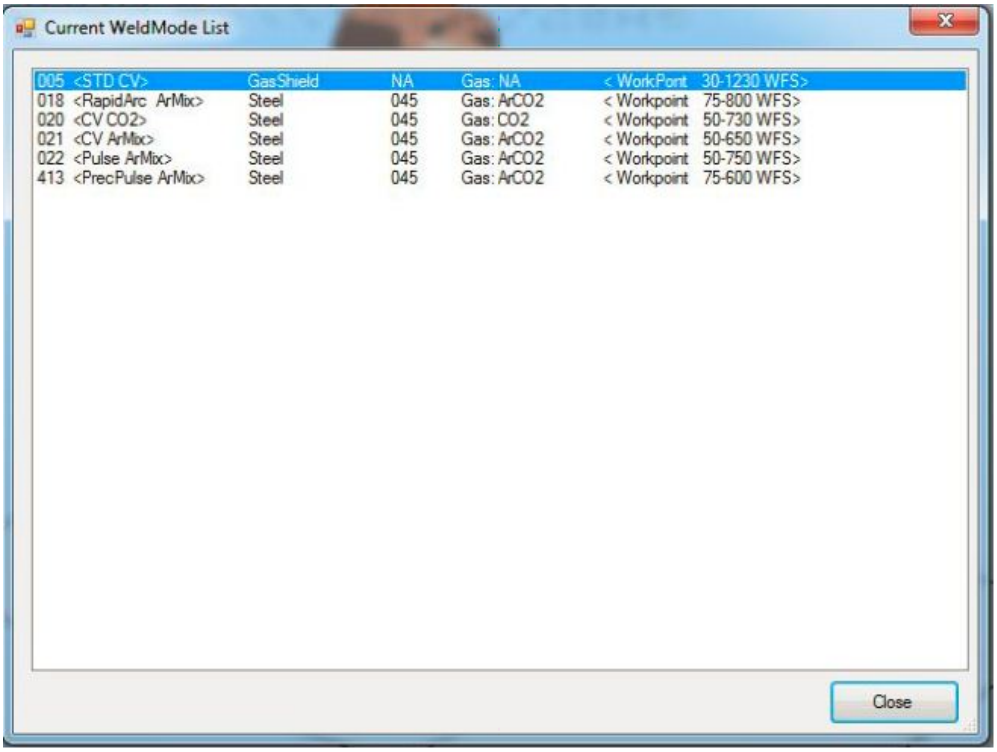
Presents a list of equipment connected to the welder equipment network.

Continues on next page

Controller Weld Mode List

Presents a list of available weld modes in the controller.

The weld modes currently configured in the robot controller are displayed by clicking on the View Weld Modes button.



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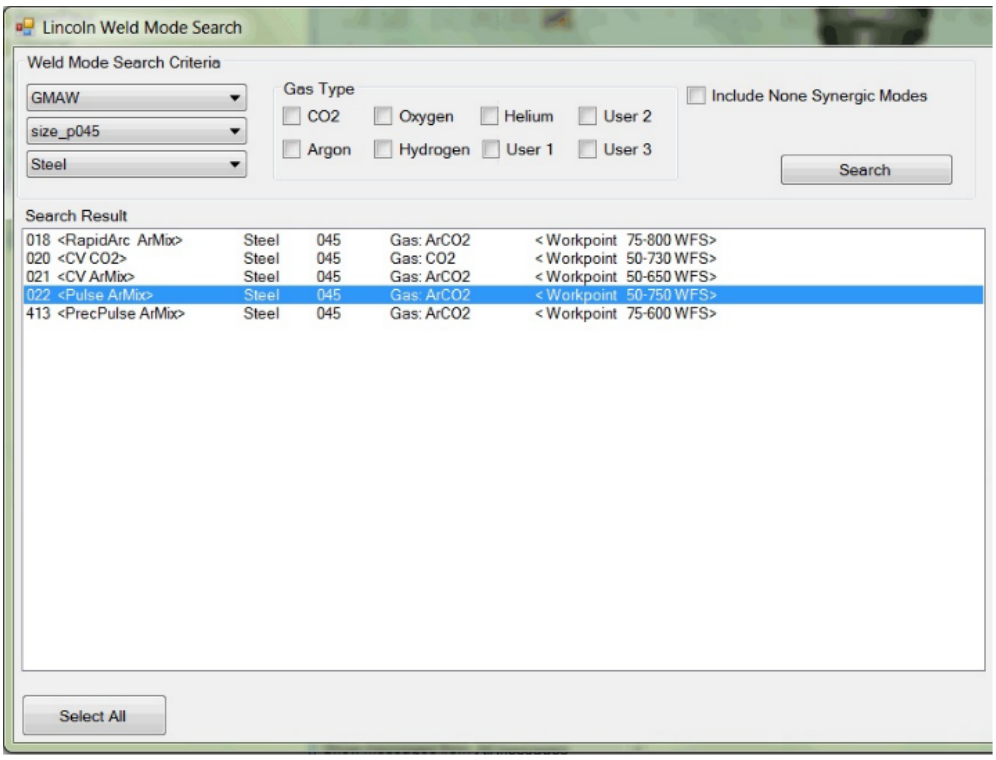
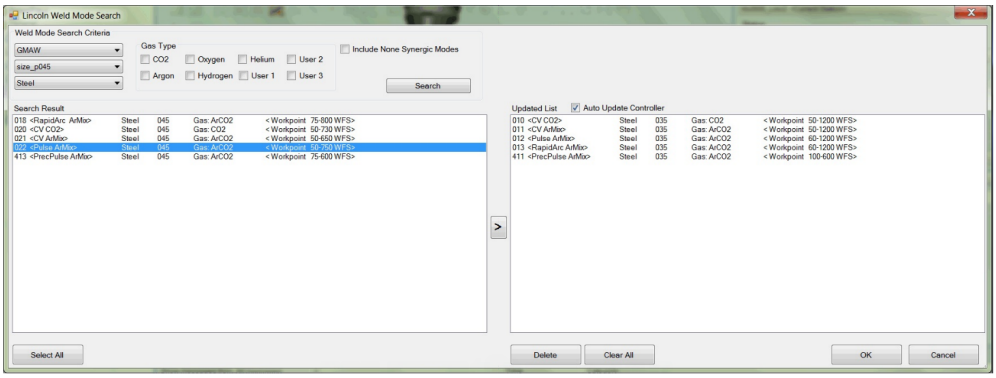
Search Weld Modes

Clicking the **Search Weld Modes** button lists the weld modes available in the welder. Search the weld modes matching the search parameters by selecting the type of weld, material being welded, and the thickness of the weld wire and gas type.



xx1400002239



xx1400002240

Auto Update Controller

If the **Auto Update Controller** check box is selected, then the weld mode list is updated immediately in the robot controller. Add weld modes from the welder on the left to the robot controller on the right by clicking the arrow button.

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Update Controller

This button is enabled when **Auto Update Controller** checkbox is not selected during updating weld modes in Lincoln weld mode search window. After updating the weld mode list on the robot controller click **Update Controller** to make sure that the updated weld mode lists are configured on the robot controller.

When the robot controller is updated with weld modes two files will be created in the following locations:

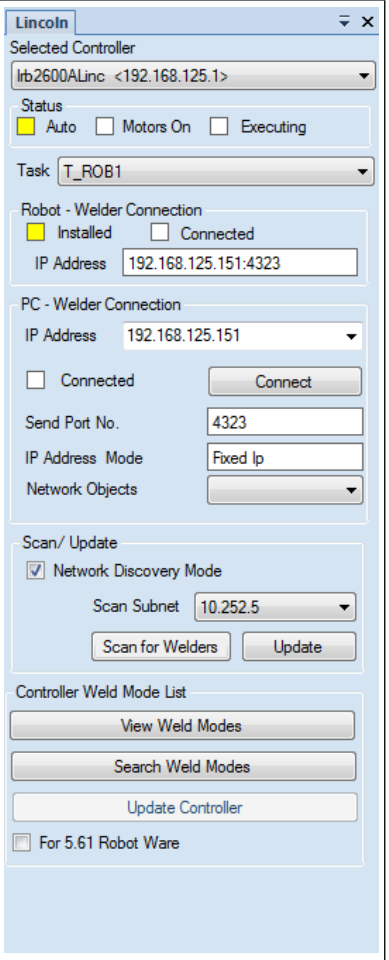
File	Location
`LincolnModes.sys`	*<HOME>\Arc\LincolnData\T_ROB1*
`T_ROB1_LincolnModes.xml`	*<HOME>\Arc\LincolnData*

Once the robot controller is updated with new weld modes the controller must be restarted to reflect the changes and work with the updated weld modes with the robot controller and welder.

Continues on next page

Setting the IP address and port number of the welder

Use the following procedure to set the IP address and port number of the welder:

	Action	Note
1	Connect the welder to LAN 2. The factory setting for the welder is to have DHCP activated. The robot will assign an IP address to the welder.	
2	Select TASK on the Add-In form.	 xx1700000287
3	On the Lincoln Add-Ins form, select Network Discovery Mode. This will make the robot print out the IP for the welders that are found on the network and populate a drop down on the Add-Ins form. If there is more than one welder connected, turn on one welder at the time in order to connect the welder to the correct task.	
4	Select IP address from the drop down-list and connect to the welder.	
5	Press the update button on the form.	
6	Turn off Network Discovery Mode.	
7	Restart the controller.	
8	If there are more than one welder connected, turn on the other welder and repeat from step 2.	

For more information, see *Connecting to the IRC5 controller on page 22*.

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