



Operator's Manual

WELD SEQUENCER[®]



Register your machine:

www.lincolnelectric.com/register

Authorized Service and Distributor Locator:

www.lincolnelectric.com/locator

Save for future reference

Date Purchased

Code: (ex: 10859)

Serial: (ex: U1060512345)

Need Help? Call 1.888.935.3877

to talk to a Service Representative

Hours of Operation:

8:00 AM to 6:00 PM (ET) Mon. thru Fri.

After hours?

Use "Ask the Experts" at lincolnelectric.com
A Lincoln Service Representative will contact you
no later than the following business day.

For Service outside the USA:

Email: globalservice@lincolnelectric.com

THANK YOU FOR SELECTING A QUALITY PRODUCT BY LINCOLN ELECTRIC.

PLEASE EXAMINE CARTON AND EQUIPMENT FOR DAMAGE IMMEDIATELY

When this equipment is shipped, title passes to the purchaser upon receipt by the carrier. Consequently, claims for material damaged in shipment must be made by the purchaser against the transportation company at the time the shipment is received.

SAFETY DEPENDS ON YOU

Lincoln arc welding and cutting equipment is designed and built with safety in mind. However, your overall safety can be increased by proper installation ... and thoughtful operation on your part. **DO NOT INSTALL, OPERATE OR REPAIR THIS EQUIPMENT WITHOUT READING THIS MANUAL AND THE SAFETY PRECAUTIONS CONTAINED THROUGHOUT.** And, most importantly, think before you act and be careful.

WARNING

This statement appears where the information must be followed exactly to avoid serious personal injury or loss of life.

CAUTION

This statement appears where the information must be followed to avoid minor personal injury or damage to this equipment.



KEEP YOUR HEAD OUT OF THE FUMES.

DON'T get too close to the arc. Use corrective lenses if necessary to stay a reasonable distance away from the arc.

READ and obey the Safety Data Sheet (SDS) and the warning label that appears on all containers of welding materials.

USE ENOUGH VENTILATION or exhaust at the arc, or both, to keep the fumes and gases from your breathing zone and the general area.

IN A LARGE ROOM OR OUTDOORS, natural ventilation may be adequate if you keep your head out of the fumes (See below).

USE NATURAL DRAFTS or fans to keep the fumes away from your face.

If you develop unusual symptoms, see your supervisor. Perhaps the welding atmosphere and ventilation system should be checked.



WEAR CORRECT EYE, EAR & BODY PROTECTION

PROTECT your eyes and face with welding helmet properly fitted and with proper grade of filter plate (See ANSI Z49.1).

PROTECT your body from welding spatter and arc flash with protective clothing including woolen clothing, flame-proof apron and gloves, leather leggings, and high boots.

PROTECT others from splatter, flash, and glare with protective screens or barriers.

IN SOME AREAS, protection from noise may be appropriate.

BE SURE protective equipment is in good condition.

Also, wear safety glasses in work area **AT ALL TIMES.**



SPECIAL SITUATIONS

DO NOT WELD OR CUT containers or materials which previously had been in contact with hazardous substances unless they are properly cleaned. This is extremely dangerous.

DO NOT WELD OR CUT painted or plated parts unless special precautions with ventilation have been taken. They can release highly toxic fumes or gases.

Additional precautionary measures

PROTECT compressed gas cylinders from excessive heat, mechanical shocks, and arcs; fasten cylinders so they cannot fall.

BE SURE cylinders are never grounded or part of an electrical circuit.

REMOVE all potential fire hazards from welding area.

ALWAYS HAVE FIRE FIGHTING EQUIPMENT READY FOR IMMEDIATE USE AND KNOW HOW TO USE IT.



SECTION A: WARNINGS



CALIFORNIA PROPOSITION 65 WARNINGS



WARNING: Breathing diesel engine exhaust exposes you to chemicals known to the State of California to cause cancer and birth defects, or other reproductive harm.

- Always start and operate the engine in a well-ventilated area.
- If in an exposed area, vent the exhaust to the outside.
- Do not modify or tamper with the exhaust system.
- Do not idle the engine except as necessary.

For more information go to www.P65warnings.ca.gov/diesel

WARNING: This product, when used for welding or cutting, produces fumes or gases which contain chemicals known to the State of California to cause birth defects and, in some cases, cancer. (California Health & Safety Code § 25249.5 *et seq.*)



WARNING: Cancer and Reproductive Harm
www.P65warnings.ca.gov

ARC WELDING CAN BE HAZARDOUS. PROTECT YOURSELF AND OTHERS FROM POSSIBLE SERIOUS INJURY OR DEATH. KEEP CHILDREN AWAY. PACEMAKER WEARERS SHOULD CONSULT WITH THEIR DOCTOR BEFORE OPERATING.

Read and understand the following safety highlights. For additional safety information, it is strongly recommended that you purchase a copy of "Safety in Welding & Cutting - ANSI Standard Z49.1" from the American Welding Society, P.O. Box 351040, Miami, Florida 33135 or CSA Standard W117.2. A Free copy of "Arc Welding Safety" booklet E205 is available from the Lincoln Electric Company, 22801 St. Clair Avenue, Cleveland, Ohio 44117-1199.

BE SURE THAT ALL INSTALLATION, OPERATION, MAINTENANCE AND REPAIR PROCEDURES ARE PERFORMED ONLY BY QUALIFIED INDIVIDUALS.



FOR ENGINE POWERED EQUIPMENT.

- Turn the engine off before troubleshooting and maintenance work unless the maintenance work requires it to be running.
- Operate engines in open, well-ventilated areas or vent the engine exhaust fumes outdoors.
- Do not add the fuel near an open flame welding arc or when the engine is running. Stop the engine and allow it to cool before refueling to prevent spilled fuel from vaporizing on contact



with hot engine parts and igniting. Do not spill fuel when filling tank. If fuel is spilled, wipe it up and do not start engine until fumes have been eliminated.

- Keep all equipment safety guards, covers and devices in position and in good repair. Keep hands, hair, clothing and tools away from V-belts, gears, fans and all other moving parts when starting, operating or repairing equipment.
- In some cases it may be necessary to remove safety guards to perform required maintenance. Remove guards only when necessary and replace them when the maintenance requiring their removal is complete. Always use the greatest care when working near moving parts.
- Do not put your hands near the engine fan. Do not attempt to override the governor or idler by pushing on the throttle control rods while the engine is running.
- To prevent accidentally starting gasoline engines while turning the engine or welding generator during maintenance work, disconnect the spark plug wires, distributor cap or magneto wire as appropriate.
- To avoid scalding, do not remove the radiator pressure cap when the engine is hot.
- Using a generator indoors CAN KILL YOU IN MINUTES.
- Generator exhaust contains carbon monoxide. This is a poison you cannot see or smell.
- NEVER use inside a home or garage, EVEN IF doors and windows are open.
- Only use OUTSIDE and far away from windows, doors and vents.
- Avoid other generator hazards. READ MANUAL BEFORE USE.



ELECTRIC AND MAGNETIC FIELDS MAY BE DANGEROUS



- Electric current flowing through any conductor causes localized Electric and Magnetic Fields (EMF). Welding current creates EMF fields around welding cables and welding machines
- EMF fields may interfere with some pacemakers, and welders having a pacemaker should consult their physician before welding.
- Exposure to EMF fields in welding may have other health effects which are now not known.
- All welders should use the following procedures in order to minimize exposure to EMF fields from the welding circuit:
 - Route the electrode and work cables together - Secure them with tape when possible.
 - Never coil the electrode lead around your body.
 - Do not place your body between the electrode and work cables. If the electrode cable is on your right side, the work cable should also be on your right side.
 - Connect the work cable to the workpiece as close as possible to the area being welded.
 - Do not work next to welding power source.



ELECTRIC SHOCK CAN KILL.



- 3.a. The electrode and work (or ground) circuits are electrically “hot” when the welder is on. Do not touch these “hot” parts with your bare skin or wet clothing. Wear dry, hole-free gloves to insulate hands.
- 3.b. Insulate yourself from work and ground using dry insulation. Make certain the insulation is large enough to cover your full area of physical contact with work and ground.

In addition to the normal safety precautions, if welding must be performed under electrically hazardous conditions (in damp locations or while wearing wet clothing; on metal structures such as floors, gratings or scaffolds; when in cramped positions such as sitting, kneeling or lying, if there is a high risk of unavoidable or accidental contact with the workpiece or ground) use the following equipment:

- Semiautomatic DC Constant Voltage (Wire) Welder.
 - DC Manual (Stick) Welder.
 - AC Welder with Reduced Voltage Control.
- 3.c. In semiautomatic or automatic wire welding, the electrode, electrode reel, welding head, nozzle or semiautomatic welding gun are also electrically “hot”.
 - 3.d. Always be sure the work cable makes a good electrical connection with the metal being welded. The connection should be as close as possible to the area being welded.
 - 3.e. Ground the work or metal to be welded to a good electrical (earth) ground.
 - 3.f. Maintain the electrode holder, work clamp, welding cable and welding machine in good, safe operating condition. Replace damaged insulation.
 - 3.g. Never dip the electrode in water for cooling.
 - 3.h. Never simultaneously touch electrically “hot” parts of electrode holders connected to two welders because voltage between the two can be the total of the open circuit voltage of both welders.
 - 3.i. When working above floor level, use a safety belt to protect yourself from a fall should you get a shock.
 - 3.j. Also see Items 6.c. and 8.



ARC RAYS CAN BURN.



- 4.a. Use a shield with the proper filter and cover plates to protect your eyes from sparks and the rays of the arc when welding or observing open arc welding. Headshield and filter lens should conform to ANSI Z87.1 standards.
- 4.b. Use suitable clothing made from durable flame-resistant material to protect your skin and that of your helpers from the arc rays.
- 4.c. Protect other nearby personnel with suitable, non-flammable screening and/or warn them not to watch the arc nor expose themselves to the arc rays or to hot spatter or metal.



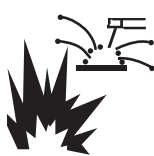
FUMES AND GASES CAN BE DANGEROUS.



- 5.a. Welding may produce fumes and gases hazardous to health. Avoid breathing these fumes and gases. When welding, keep your head out of the fume. Use enough ventilation and/or exhaust at the arc to keep fumes and gases away from the breathing zone. **When welding hardfacing (see instructions on container or SDS) or on lead or cadmium plated steel and other metals or coatings which produce highly toxic fumes, keep exposure as low as possible and within applicable OSHA PEL and ACGIH TLV limits using local exhaust or mechanical ventilation unless exposure assessments indicate otherwise. In confined spaces or in some circumstances, outdoors, a respirator may also be required. Additional precautions are also required when welding on galvanized steel.**
- 5.b. The operation of welding fume control equipment is affected by various factors including proper use and positioning of the equipment, maintenance of the equipment and the specific welding procedure and application involved. Worker exposure level should be checked upon installation and periodically thereafter to be certain it is within applicable OSHA PEL and ACGIH TLV limits.
- 5.c. Do not weld in locations near chlorinated hydrocarbon vapors coming from degreasing, cleaning or spraying operations. The heat and rays of the arc can react with solvent vapors to form phosgene, a highly toxic gas, and other irritating products.
- 5.d. Shielding gases used for arc welding can displace air and cause injury or death. Always use enough ventilation, especially in confined areas, to insure breathing air is safe.
- 5.e. Read and understand the manufacturer’s instructions for this equipment and the consumables to be used, including the Safety Data Sheet (SDS) and follow your employer’s safety practices. SDS forms are available from your welding distributor or from the manufacturer.
- 5.f. Also see item 1.b.




WELDING AND CUTTING SPARKS CAN CAUSE FIRE OR EXPLOSION.



- 6.a. Remove fire hazards from the welding area. If this is not possible, cover them to prevent the welding sparks from starting a fire. Remember that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas. Avoid welding near hydraulic lines. Have a fire extinguisher readily available.
- 6.b. Where compressed gases are to be used at the job site, special precautions should be used to prevent hazardous situations. Refer to "Safety in Welding and Cutting" (ANSI Standard Z49.1) and the operating information for the equipment being used.
- 6.c. When not welding, make certain no part of the electrode circuit is touching the work or ground. Accidental contact can cause overheating and create a fire hazard.
- 6.d. Do not heat, cut or weld tanks, drums or containers until the proper steps have been taken to insure that such procedures will not cause flammable or toxic vapors from substances inside. They can cause an explosion even though they have been "cleaned". For information, purchase "Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping That Have Held Hazardous Substances", AWS F4.1 from the American Welding Society (see address above).
- 6.e. Vent hollow castings or containers before heating, cutting or welding. They may explode.
- 6.f. Sparks and spatter are thrown from the welding arc. Wear oil free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes and a cap over your hair. Wear ear plugs when welding out of position or in confined places. Always wear safety glasses with side shields when in a welding area.
- 6.g. Connect the work cable to the work as close to the welding area as practical. Work cables connected to the building framework or other locations away from the welding area increase the possibility of the welding current passing through lifting chains, crane cables or other alternate circuits. This can create fire hazards or overheat lifting chains or cables until they fail.
- 6.h. Also see item 1.c.
- 6.i. Read and follow NFPA 51B "Standard for Fire Prevention During Welding, Cutting and Other Hot Work", available from NFPA, 1 Batterymarch Park, PO box 9101, Quincy, MA 022690-9101.
- 6.j. Do not use a welding power source for pipe thawing.



CYLINDER MAY EXPLODE IF DAMAGED.

- 7.a. Use only compressed gas cylinders containing the correct shielding gas for the process used and properly operating regulators designed for the gas and pressure used. All hoses, fittings, etc. should be suitable for the application and maintained in good condition. 
- 7.b. Always keep cylinders in an upright position securely chained to an undercarriage or fixed support.
- 7.c. Cylinders should be located:
 - Away from areas where they may be struck or subjected to physical damage.
 - A safe distance from arc welding or cutting operations and any other source of heat, sparks, or flame.
- 7.d. Never allow the electrode, electrode holder or any other electrically "hot" parts to touch a cylinder.
- 7.e. Keep your head and face away from the cylinder valve outlet when opening the cylinder valve.
- 7.f. Valve protection caps should always be in place and hand tight except when the cylinder is in use or connected for use.
- 7.g. Read and follow the instructions on compressed gas cylinders, associated equipment, and CGA publication P-1, "Precautions for Safe Handling of Compressed Gases in Cylinders," available from the Compressed Gas Association, 14501 George Carter Way Chantilly, VA 20151.



FOR ELECTRICALLY POWERED EQUIPMENT.



- 8.a. Turn off input power using the disconnect switch at the fuse box before working on the equipment.
- 8.b. Install equipment in accordance with the U.S. National Electrical Code, all local codes and the manufacturer's recommendations.
- 8.c. Ground the equipment in accordance with the U.S. National Electrical Code and the manufacturer's recommendations.

Refer to
<http://www.lincolnelectric.com/safety>
for additional safety information.

Table of Contents

Preface

Typographical Conventions Used	1
Notes, Warnings, and Tips.....	2

Revision History

General Information

Introduction.....	1.1
Typical Setup.....	1.1
Single Computer Running the Weld Sequencer System	1.1
Multiple Computers Running the Weld Sequencer System	1.2
System Hardware Requirements.....	1.3
Compatible Equipment	1.3

Installing the Weld Sequencer Software

Overview.....	2.1
Stand-Alone Single-Computer Installation.....	2.1
Multiple Computer Installations with a Shared Server.....	2.1
Uninstalling the Weld Sequencer database	2.2
Installing Microsoft .NET Framework 4.7.2.....	2.2
Installing Microsoft Edge Webview2 Runtime	2.3
Installing Weld Sequencer Toolkit	2.4
Installing the Weld Sequencer Toolkit.....	2.4
Folders Created During Installation.....	2.5
Installing Weld Sequencer Updates.....	2.6
Installing/Configuring Microsoft SQL Server	2.6
Enterprise Configuration	2.6
Stand-Alone Installation	2.6
Activating the Software	2.7
Updating the Welding Power Source Firmware	2.9
Connecting to the Welding Power Source.....	2.11
Connect to the Welding Power Source	2.12
Disconnecting from the Welding Power Source.....	2.13
Finding the IP Address of a Welder	2.13
Creating Multiple Instances of Weld Sequencer	2.14

Setting Up the System

User Accounts	3.1
Overview	3.1
User Roles.....	3.2

Creating User Accounts.....	3.2
Editing and Deleting User Accounts.....	3.3
RFID and Barcode Scanners.....	3.4
Weld Sequence Editor	
Overview.....	4.1
Top Toolbar	4.2
File Actions.....	4.2
Edit	4.4
Connections	4.4
Maintenance.....	4.4
Properties.....	4.4
Tools	4.5
Layout	4.5
Settings – Preferences.....	4.5
Zoom Options.....	4.6
Work Area	4.7
Status Bar.....	4.7
Sequence Functions	4.8
Part Lookup Table.....	4.8
Editing a Part Number Entry.....	4.9
Deleting a Part Number Entry.....	4.9
Sequence-Level Properties	
Global Properties.....	5.1
Weld Record Logging	5.8
Opening Tab-Delimited Sequence Reports	5.16
Weld Procedures Library.....	5.17
Adding a Weld Procedure to the Library	5.19
Adding a Weld Procedure to the Database	5.20
User Limits	5.21
Editing a Weld Procedure in the Library.....	5.21
Deleting a Weld Procedure from the Library.....	5.22
Copying Weld Procedures.....	5.22
Weld Validations Library	5.23
Adding Weld Validations to the Library.....	5.23
Adding a Weld Validation to the Database	5.26
Editing a Weld Validation in the Library	5.27
Deleting a Weld Validation from the Library.....	5.27
Copying Weld Validations	5.28
Report Analysis Tool.....	5.28
Analysis Parameters	5.34
Select Calculated Data to Include in the Weld Sequence File	5.35

Sequence Functions

Planning Your Weld Sequence	6.1
Steps in a Weld Sequence	6.2
Inserting/Deleting a Step.....	6.2
Step Properties	6.3
Adding Functions to the Weld Sequence	6.4
Connecting and Validating Functions	6.5
Connecting Functions.....	6.5
Conditional Connectors	6.5
Start and End Functions	6.6
Start.....	6.6
End	6.7
Alert	6.8
Consumable Weight.....	6.9
Decision	6.11
Display HTML.....	6.12
Display Picture	6.13
Display Video	6.16
Field Entry	6.17
Field Appender	6.20
Goto Step Function	6.22
Approval.....	6.22
Review	6.24
Review Function.....	6.25
Review Function Exit Conditions	6.26
Welding Functions	6.27
Weld Function	6.28
Weld Accumulator Function.....	6.29
Weld Open Function	6.31
Weld Procedures Tab.....	6.33
Weld Validation Tab	6.34
Using Weld Profiles to Validate Welds	6.35
Connecting a Welding Function	6.36
Resuming a Welding Function	6.37
Weld Function Icons	6.37
Weldset Software	6.38
Database Functions.....	6.39
Work Item Create Functions	6.40
Work Item Lookup Functions	6.45
Programmable Logic Controller (PLC) Functions	6.49
PLC Field Entry	6.50
PLC Tag Read.....	6.51

PLC Tag Write 6.53
Power Lift HZA Function 6.55
Connecting Weld Sequencer to the PLC 6.56
Weld Sequencer to PLC Interface Example 6.56

Weld Sequencer

Overview 7.1
Load and Run a Weld Sequence File 7.1
Part Lookup 7.2
Weld Sequencer 7.3
Goto Step 7.7
Preferences 7.7
Locking a Welding Power Source 7.10
Weld Sequencer and PLCs 7.10
 Connecting to the PLC 7.11
 Disconnecting the PLC 7.11
 PLC Connection Properties 7.12
 Automatically Launch a Weld Sequence Based on a PLC Tag 7.12

Enterprise Configuration

Microsoft SQL Server Installation Details A.1
Creating a Named Instance A.2
Adding the Database to the Instance A.5
Connecting Computers to the Database A.8
 Modifying the Connection File A.9
 Install the Connection File on Client Computers A.11

Tips and Helpful Hints

Two-Step Process for Creating a Weld Sequence B.1
Create a Sequence File from Excel B.1
Using PowerPoint to Create Images B.4
Keyboard Shortcuts B.5
Loading a Weld Sequence File by Command Line B.6
Ignoring Short Welds in a Weld Sequence B.7

Troubleshooting

Cannot Connect to a Power Source C.1
 User Has Incorrect User Role C.1
 IP Address or Other Ethernet Settings on the Welding Power Source Are Invalid C.1
 Ethernet Settings Seem Valid but Still Cannot Connect C.2
Weld Sequencer Cannot Create a Database C.3

Frequently Asked Questions

Installation D.1
 How big will the Weld Sequencer database get? D.1

Do I have to name the Microsoft SQL Server instance "LEWS100"?..... D.1
Enterprise Configuration..... D.1
Can I use an existing named instance?..... D.1
Do I need to include the instance name in the connection string? D.1
Why won't the computer connect to my network resources? D.1

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Preface

Typographical Conventions Used

Before using this guide, it is important to understand the typographical conventions used to identify and describe information.

Cross-References

Cross-references to chapters, sections, page numbers, headings, etc. are shown in an *italic typeface*.
e.g., Refer to *Text You Type Using the Keyboard* on page 1.

Text You Type Using the Keyboard

Text that you type using the keyboard is shown in a `Courier` typeface.
e.g., Type John Smith in the *Name* field.

Keys You Press and Buttons You Click

Keys that you press on the keyboard and buttons/icons that you click with the mouse are shown in a **bold sans-serif typeface**.

e.g., Press **Enter**.

e.g., Click **OK** to continue.

Menus You Select

Menus and the selections you make from the menus are shown in a **bold sans-serif typeface**.

e.g., Select **Start > Control Panel** from the main computer menu.

e.g., Select **Tools > Options** from the menu.

Dialog Box, Application Window Titles, and Field Names

The titles of dialog boxes and application windows are shown in *italics*. Field names and selections made from drop-down menus, etc. are also shown in *italics*.

e.g., *The Print Preview window opens.*

e.g., *Select All Shifts from the drop-down list.*

Notes, Warnings, and Tips

Notes, stops and tips appear throughout the manual. They provide additional information that is important for you to know about the topic.

STOP | You should definitely read the information in a stop table. It could help you prevent a situation from which you cannot recover.

NOTE | A note is an important piece of information.

TIP | A tip table helps you with some interesting or useful information about using the program.

Revision History

Date	Change Description
April 2022 V1.16	<ul style="list-style-type: none"> ▪ Added compatibility with the Power Wave® 300C. ▪ Updated the “Display HTML” function to be compatible with modern browsers. ▪ When editing Weld Procedure Properties, and not connected to a Power Wave®, the Automatic checkboxes will be displayed. ▪ Added Alert messages to the sequence report. ▪ Added the ability to hide functions in the Review page. ▪ Made changes to require an Administrator to perform database updates. ▪ Added Summary and Function details to a Sequence Report saved in the database. ▪ Added the ability to prevent Assembly Listing information being sent to CheckPoint™. ▪ Fixed an issue where the Display Picture consumed increasing amounts of memory. ▪ Fixed an issue where the trigger mode could change from 4-Step to 2-Step when changing to a Weld Function with a different Weld Procedure. ▪ Fixed an issue where the Editor would allow a Weld Procedure to have both a Spot Timer and 4-Step trigger mode selected. ▪ Fixed an issue where certain Weld Records from Generation 2 Power Wave® Welding Power Sources were not saved.
February 2021 V1.15	<ul style="list-style-type: none"> ▪ Made changes in the editor to improve the look and feel when adding elements to the sequence. ▪ Improved the cut and paste functionality in the editor for individual and grouped items. ▪ Added the ability to enable the supported User Limits in each Weld Procedure. ▪ Added the ability for each user to personalize and override Weld Procedure parameters. ▪ The four Database functions have new names. <ul style="list-style-type: none"> ○ “Work Item Create” is now “Create Record” ○ “Work Item Lookup” is now “Select Record” ○ “Work Item Field Create” is now “Save Field” ○ “Work Item Field Lookup” is now “Verify Field” ▪ PLC Function Renamed: <ul style="list-style-type: none"> ○ “Vizient Positioner” is now “Power Lift HZA” ▪ Added the ability to compare a Verify Field (Work Item Field Lookup) entry to a predefined string value. ▪ Added the ability to compare a Verify Field (Work Item Field Lookup) entry to

Date	Change Description
	<p>the record's User Name.</p> <ul style="list-style-type: none"> ▪ Added the capability for a Field Entry function to load a Work Item ID value. ▪ Added the Weld Mode and Weld Identifier to the Sequence Reports. ▪ Weld Records saved in the database will include the Power Source ID. ▪ Weld Reports differentiate Manual Welds performed when the sequence is not running compared to when the sequence is running and control switches to Manual mode. ▪ When Sequence Reports are enabled, the Deposition value will use the decimal point character required by Excel regardless of which language is selected the in Weld Sequencer Preferences. ▪ When Excel Sequence Reports are enabled, clicking the Weld Record links will navigate to the correct Weld Number in the weld detail section. ▪ When welding in Manual Mode for longer than the defined timeout period, the weld will continue until the operator releases the trigger, the Weld Sequencer will then exit Manual Mode. ▪ When the Manual welding option is disabled, the sequence will not go into Manual Mode with four trigger-pulls. ▪ Fixed an issue where Manual Mode could be enabled during an Approval function by logging out of then back in to the application. ▪ Alert Table Deposition values will be metric values when the Weld Sequencer Preferences are Metric System Units. ▪ Added a Continue feature in the Weld Open and Weld Accumulator functions. When the Arc Time, or Deposition, for the weld function is between the minimum and maximum limits, the operator can choose to make additional welds in this block or continue to the next block in the sequence. ▪ The Weld Sequencer will display an error and the sequence will end if one of the Weld functions has an exit connector pointing back to itself. ▪ In the Editor Create New Sequence wizard, the name of the sound file will be displayed after it has been selected using the Browse option. ▪ When the sequence is paused for a Review action, the login button is disabled. ▪ A Review function will include failed Display Picture blocks where they can be marked as passed. ▪ Weld Sequencer menu shortcut keys are available for each language. ▪ Fixed an issue where a double trigger-pull would advance the sequence to the next step when Navigation for the step is disabled. ▪ Adjusted the timing of the reset communication when the Power Supply Auto Lockout feature is enabled to avoid unintended lockouts. ▪ The process for accessing license and application files has been simplified. ▪ Added a button to display the status of the installed license. ▪ Added a checkbox in the Weld Procedure edit screen to indicate if the Weld Procedure is stored in the database or the sequence file. ▪ Added a maximum value limit to the PLC Tag Read Timeout value.

Date	Change Description
September 2019 V1.14	<ul style="list-style-type: none"> ▪ Modified the Weld Sequencer application to address a possible issue with exhausting Windows User Objects. ▪ Translated the application and instruction manual (V1.13 manual, 02/19) into Spanish, Portuguese, German, French, Simplified Chinese, and Russian. ▪ In the Weld Sequence Editor, the step size will automatically adjust to fit the size of the items being pasted. ▪ When creating a sequence from a Microsoft Excel spreadsheet, added the capability to include an Approval block in each step of the predefined layout. ▪ Double-clicking on a file with a .wsf extension will automatically open the Editor and load the file. ▪ In the Weld Open function the default value for the Maximum Number of Welds is changed from 0 to 1. ▪ Added the ability to enter Consumable Lot information for Power Supplies using Dual Head Wire Feeders. ▪ Improved response time after a Power Supply failed to connect. ▪ Changed the Cycle Timer to pause when the user is not logged in to the Sequencer. ▪ Increased the communication timeout threshold between the Power Supply and the host computer. ▪ The Power Supply Auto Lockout menu item will always be visible. ▪ The Review Function column widths have been adjusted to allow longer description messages to be visible. ▪ Made the font in the Alert Table adjustable by using the Function Information Font selector in the Preferences screen. ▪ The Alert Table will display properly when a language other than English is selected. ▪ Added a message when the user attempts to log in and the database is offline. ▪ Changed the button focus and Enter key behavior to prevent the sequence from aborting when the Enter key is pressed during a step with Navigation Disabled and the Wait for Continue Action deselected. ▪ Power Cycling will not allow a locked Power Source to be used for welding. ▪ The PLC Connect menu selection will stay enabled after an unsuccessful connection attempt. ▪ Changing the Weld Procedure during the sequence will prevent the Power Supply settings from reverting to a Factory Reset condition.

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General Information

Introduction

Weld Sequencer is a technology from Lincoln Electric designed to control every aspect of the assembly sequence for complex, multi-step welded assembly work. Weld Sequencer benefits include:

- Increased productivity
- No compromises on weld procedures
- Detection of missed welds
- Logging and validation of all steps
- Real-time QA feedback
- Quick operator training
- Improved data integrity

Using the Weld Sequencer software, work instructions become a controlled sequence of events, including the instructions, pictures, audio files, traceability and weld validations involved in completing the assembly. The flowchart-type editor allows Weld Engineers to design a weld sequence that controls every aspect of the welding operation including (but not limited to) enabling and disabling the power source; requiring user login; validating welds performed; and ensuring traceability data is entered as required. Weld Operators have a simple, easy-to-use and intuitive interface on the production floor to run the weld sequence file.

Typical Setup

Weld Sequencer is a flexible tool that can meet the needs of many companies. You can install the software based on your company's needs. If you plan to both create and run the weld sequence files on the same computer, you can install Weld Sequencer as a stand-alone system, where you do not involve a common network server.

If your plan is to have two or more computers on the production floor running weld sequence files created by Weld Engineers on their office computers, the computers will need to share that data on a common network server and use the Enterprise Configuration for the Weld Sequencer.

Single Computer Running the Weld Sequencer System

With a stand-alone installation of the system, you typically have a computer station on the production floor near to the Welding Power Source that connects to it. You install all of the software needed for the system on that one computer and run both Weld Sequence Editor and Weld Sequencer from this computer. You will also have a single local instance of Microsoft SQL Server installed.

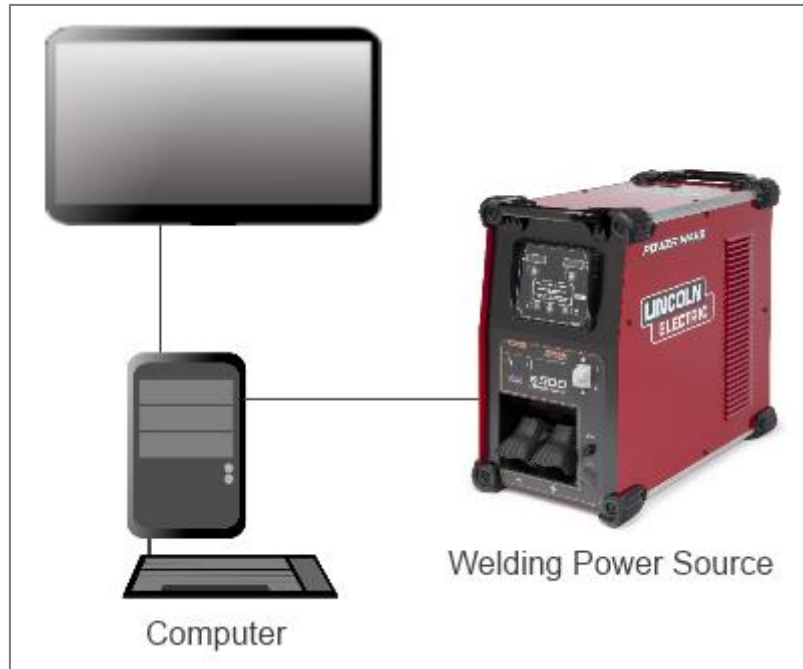


Figure 1.1 Single Computer

Multiple Computers Running the Weld Sequencer System

With an Enterprise Configuration of the Weld Sequencer system, you typically have a computer station on the production floor for each work cell running the weld sequence files. You also have Weld Engineers with computers they will use to create weld sequence files. Since all of these computers must share data to function effectively, you may also have a common network with a shared folder for data storage.

You would also install Microsoft SQL Server on one of your networked servers. You install the Weld Sequencer Toolkit on all of the computers and link them to the common SQL Server database.

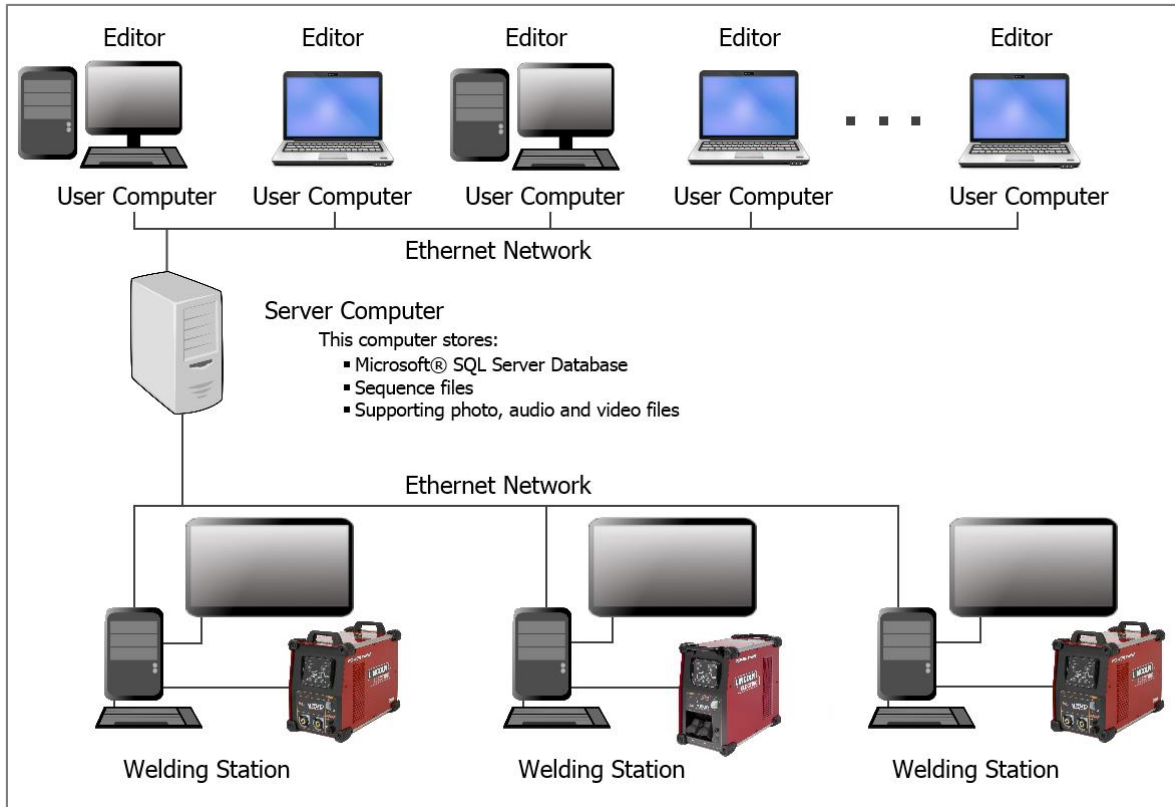


Figure 1.2 Example of a Typical Setup

System Hardware Requirements

The computers running the Weld Sequencer system need to meet the following minimum computer hardware requirements:

- Operating System: Windows 7 or 10
- Processor (minimum recommended): Dual core, 2 GHz
- RAM (minimum recommended): 2 GB
- Disk Space (minimum): 4 GB
- Ethernet Network Type: IEEE 802.3 compliant
- Network Architecture: Common subnet for PC and power source

Compatible Equipment

You may use the Weld Sequencer system with some second-generation and most third-generation Lincoln Electric Power Wave® Welding Power Sources. This list includes, but is not limited to:

- Power Wave® 355M
- Power Wave® 455M
- Power Wave® 655R
- Power Wave® i400

- Power Wave® C300
- Power Wave® C300 CE
- Power Wave® S350
- Power Wave® S500
- Power Wave® S700
- Power Wave® 300C

NOTE | Stick/TIG user interfaces are not supported.

The following wire feeders are compatible with the Weld Sequencer system, with more to come in the future:

- Power Feed® 10M Single/Dual/Bench/Boom
with required Dual Procedure/Memory Panel (K2360-1)
- Power Feed® 25M
- Power Feed® 84

Weld Sequencer supports the following Programmable Logic Controllers (PLCs), with more to come in the future:

- Allen-Bradley Logix5000 Controller Family

Installing the Weld Sequencer Software

The installation of the Weld Sequencer software depends on the way your company wants to use the system. If you have a single computer that will both create and run weld sequence files, you only have a single installation to consider. If you have multiple computers, you will need access to a central server for data storage and install software on all computers. Please see page 1.1 for information on the typical setup of the Weld Sequencer system.

In all cases, before you begin the installation process, be sure of the following:

- All computers meet the requirements on page 1.3.
- You have all installation files on hand or access to the Internet in order to download them.
- You have read through these instructions in their entirety. Be sure you fully understand how to install the software for your company's setup.
- You have administrative access to the computer(s) on which you will install the system.

TIP | Be sure to allow yourself about 30 minutes to install the Weld Sequencer applications.

Overview

Since the installation varies depending on whether you want to use a single computer to run the Weld Sequencer system or you will have multiple computers running the software, the following is the order of installation for both scenarios.

Stand-Alone Single-Computer Installation

1. Install .NET Framework 4.7.2 (or higher) on computer (page 2.2). Skip if already installed.
2. Install Microsoft Webview2 on computer (page 2.3). Skip if already installed.
3. Install the Weld Sequencer Toolkit on computer (page 2.4).
4. Install Microsoft SQL Server Express (page 2.6).
5. Activate software on computer (page 2.7).
6. Update the Welding Power Source firmware (page 2.9).

Multiple Computer Installations with a Shared Server

1. Install .NET Framework 4.7.2 (or higher) on each computer station (page 2.2). Skip if already installed.
2. Install Microsoft Webview2 on computer (page 2.3). Skip if already installed.
3. Install the Weld Sequencer Toolkit on each computer station (page 2.4).
4. Activate software on each computer station (page 2.7).
5. Update the Welding Power Source firmware for each Welding Power Source (page 2.9).
6. Configure Microsoft SQL Server and connect client computers to the databases (Appendix A). If you are a new user to an existing Enterprise Configuration of the Weld Sequencer system, contact your local database administrator or IT department for assistance connecting to the database.

Uninstalling the Weld Sequencer database

If you need to remove the Weld Sequencer database:

Procedure	Details
1. Log in to the computer as a user with administrative privileges.	Contact your IT department if you do not have administrator privileges.
2. Run the WeldSequencer_SQLUninstall.bat file found in the <i>C:\Program Files (x86)\Lincoln Electric\Weld Sequencer Tool Kit\Weld Sequencer Set-up Tools</i> directory.	The database files will be removed without user input.
3. A SQL Server Instance Uninstaller window will pop up. Click the Remove button.	
4. On the dialog box, make sure the LEWS100 instance is selected in the dropdown box then press Next .	
5. Select the Database Engine Services checkbox below LEWS100 and press Next .	A summary box will display the items that are selected for removal.
6. Review the summary of items to be removed and click the Remove button. The SQL instance removal process will begin.	The removal process typically takes several minutes to complete.
7. Click Finish when the uninstaller is complete.	

Installing Microsoft .NET Framework 4.7.2

The Weld Sequencer system requires Microsoft .NET Framework 4.7.2 or higher on each of the computers running the application and automatically guides you to the website to download the installer. To verify your version or to verify if you have .NET Framework installed, open your computer *Control Panel* and open *Programs and Features*. Microsoft .NET Framework should appear in your list, along with the version.

NOTE | If you already have .NET Framework 4.7.2 or higher installed on the computer, you can skip this step and continue with the Microsoft Edge Webview2 Runtime (page 2.3)

NOTE | Please allow about 10 minutes for the .NET Framework installation (from download to installation), depending on your Internet speed.

To install .NET Framework 4.7.2:

Procedure	Details
1. Log in to the computer as a user with administrative privileges.	Contact your IT department if you do not have administrator privileges.

Procedure	Details
2. Visit the Microsoft .NET Framework 4.7.2 web page: https://dotnet.microsoft.com/download/dotnet-framework/thank-you/net472-offline-installer	
3. Click the Accept and Download button.	
4. Double-click the downloaded file.	
5. Click Run if prompted with a security warning.	The End User License Agreement displays.
6. Read & accept the license agreement and then click Install .	
7. Click Finish when the installation is complete.	
8. Repeat on each computer that will run the Weld Sequencer system.	This includes all computers on the production floor that will run weld sequence files and any computers that will be used to create weld sequence files.

Installing Microsoft Edge Webview2 Runtime

The Weld Sequencer system requires Microsoft Edge Webview2 Runtime on each of the computers running the application and automatically guides you to the website to download the installer. To verify your version or to verify if you have Webview2 installed, open your computer *Control Panel* and open *Programs and Features*. *Microsoft Edge Webview2 Runtime* should appear in your list, along with the version.

NOTE | If you already have the Microsoft Edge Webview2 Runtime installed on the computer, you can skip this step and continue with the Weld Sequencer Toolkit installation (page 2.4).

NOTE | Please allow about 10 minutes for the Webview2 Runtime installation (from download to installation), depending on your Internet speed.

To install Webview2 Runtime:

Procedure	Details
1. Log in to the computer as a user with administrative privileges.	Contact your IT department if you do not have administrator privileges.
2. Visit the Microsoft Webview2 web page: https://developer.microsoft.com/en-us/microsoft-edge/webview2/#download-section	

Procedure	Details
3. Click the x64 Download button.	
4. Read & accept the license agreement and then click Accept and Download	The End User License Agreement displays.
5. Click Run if prompted with a security warning.	
6. Read & accept the license agreement and then click Install .	
7. Click Close when the installation is complete.	
8. Repeat on each computer that will run the Weld Sequencer system.	This includes all computers on the production floor that will run weld sequence files and any computers that will be used to create weld sequence files.

Installing Weld Sequencer Toolkit

On all computers that will use the Weld Sequencer system (including a single-computer installation), you need to make sure you have .NET Framework 4.7.2 (or higher) installed (page 2.2). Once you have it installed, you can install the Weld Sequencer Toolkit.

NOTE | You cannot install the Weld Sequencer Toolkit on a drive or in a directory that is compressed. See page C.3 for troubleshooting details.

Installing the Weld Sequencer Toolkit

To install the Weld Sequencer Toolkit:

Procedure	Details
1. Log in to the computer as a user with administrative privileges.	Contact your IT department if you do not have administrator privileges.
2. Download the Weld Sequencer Tool Kit.	
3. Double-click <i>WeldSequencerToolkit.exe</i> .	
4. On the <i>Welcome</i> screen, click Next .	The <i>License Agreement</i> screen displays.
5. Read & accept the license agreement and then click Next .	The <i>Choose Install Location</i> screen displays.
6. Leave the default in the <i>Destination Folder</i> field and click Install .	The installation begins. NOTE If you do not have .NET Framework 4.7.2 (or higher) installed, the installation launches the .NET web site automatically and cancels the install. Please see page 2.2 for more information.

Procedure	Details
7. Click Finish when the installation is complete.	
8. Restart your computer if prompted.	You now need to install or configure Microsoft SQL Server (page 2.6).

Folders Created During Installation

The installation creates the *Weld Sequencer Files* directory on the root directory of the computer (typically the C:\ directory). Within the *Weld Sequencer Files* directory are the following folders:

- **Database:** The *Database* folder stores the original Microsoft SQL Server database files installed with the stand-alone Weld Sequencer system database. You should not store any other files in this folder.
- **Key:** Each computer running the Weld Sequencer must have a unique License Key File. Once all components of the installation are complete, you need to activate the software on each computer using the License Key File provided to you by Lincoln Electric for that computer. Save that file in this directory.
- **Logs:** Anytime either application encounters an error, the system creates a log file with programming details. Lincoln Electric support may request this file when attempting to troubleshoot an issue. Weld Sequencer also saves Sequence Reports in this folder.

TIP | Weld Sequencer retains log files for 90 days.

- **Sequences:** By default, the system saves any weld sequence files you created with the Weld Sequence Editor in this directory. The Weld Sequencer also looks in this directory, by default, to find the weld sequence files available for it to launch and run.

You can change the default location under the *Preferences* in either application (page 4.5 for the Weld Sequence Editor and page 7.7 for Weld Sequencer); however, you must remember that all files related to the weld sequence file are stored in the directory specified here (e.g., sequence file, audio files, image files). If you change this directory without moving the related files, you will break links to those files in the weld sequence files, and the operator or Weld Engineer will have problems opening and/or running the file.

NOTE | In an Enterprise Configuration where the computers creating the weld sequence files are different from the computers running the files, the weld sequence files should be moved to a central location on your company's network when completed.

NOTE | If the sequence file format was updated. Older sequence files will automatically convert and re-save when they are opened for editing or running in the Weld Sequencer. The original file will be renamed with a ".bak" extension.

- **Settings:** The Weld Sequence Editor and the Weld Sequencer both create settings files for the workstation preferences established in that application. The system saves those settings files in this directory.

We recommend that you do not modify these folders or the files within them unless directed to do so by Lincoln Electric support.

Installing Weld Sequencer Updates

An updated version of the Weld Sequencer may have additional features that require an update to the database schema. To update the database, a Weld Sequencer Administrator must log into the Weld Sequencer Editor and authorize the update.

Previous Weld Sequencer versions will no longer function after the database schema is updated. All computers running Weld Sequencer and connecting to the same database will need to install and use this new Weld Sequencer version. Do not authorize the database update unless all computers running Weld Sequencer will be updated to this new version.

TIP | The update screen has an option to automatically backup the database before the update is performed.

Installing/Configuring Microsoft SQL Server

The Weld Sequencer system requires Microsoft SQL Server in order to share data efficiently. How you install Microsoft SQL Server depends whether you will be running multiple Weld Sequencer installations or if you have a limited number of (or just one) stand-alone systems.

Enterprise Configuration

If you will be using an Enterprise Configuration where a common SQL Server will be utilized for multiple installations, you'll need to create a new SQL Server instance (or use an existing instance), add the Weld Sequencer databases to that instance, and connect the client computers.

STOP | See Appendix A for detailed Enterprise Configuration instructions. Do not attempt an Enterprise Configuration unless you are experienced with Microsoft SQL Server or you can contact your IT department for assistance.

NOTE | If you are a new user to an existing Weld Sequencer system, your IT department may have already created a procedure and/or an installation package to help connect you to the system.

Stand-Alone Installation

In a situation where you want to run a limited number of (or just one) Weld Sequencer installation, the stand-alone installation is the best option. For this installation method, Microsoft SQL Server Express needs to be downloaded from the internet using the following instructions. If you have trouble locating the SQL Server Installer file online, your IT department may be able to help you.

NOTE | Microsoft SQL Server installation packages must be downloaded separately for new installations.

To install Microsoft SQL Server on a stand-alone computer:

Procedure	Details
1. Log in to the computer as a user with administrative privileges.	Contact your IT department if you do not have administrator privileges.
2. Download the latest Microsoft SQL Server Express installer (or other installation packages if required) from: https://www.microsoft.com/en-us/sql-server/sql-server-editions-express	Downloading the file may take several minutes. If your Internet browser asks for a location to save the downloaded file, make sure you save it in your Downloads folder. The file must be in this location for the installation process to continue.
3. Select All Programs > Lincoln Electric > Weld Sequencer Toolkit > Weld Sequencer Setup Tools > Weld Sequencer SQL Express Install from the Windows Start menu.	<p>NOTE At times, the installation may pause for a few seconds. This is normal and expected.</p> <p>Once the installation is complete, a command window displays and informs you that the database was created successfully.</p>
4. Press any key on your keyboard to complete the installation.	
5. Restart your computer to finish the installation.	The SQL Server installation is now complete; proceed to Activating the Software (page 2.7).

Activating the Software

Once all components of the installation are complete, you need to activate the software on each computer. Each computer running the software must have a unique License Key File for the appropriate software (i.e., Weld Sequence Editor and Weld Sequencer). For example, if you have one (1) Weld Engineer creating weld sequence files from the desktop computer in his or her office and five (5) computers on your production floor running weld sequence files, you need six (6) License Key Files.

After purchasing a license for the Weld Sequencer software an email is sent containing an Entitlement Certificate. Follow the link in the email to activate and manage the entitlement.

When using a license that has an expiration date (typically 1 year after creation), the Weld Sequencer Editor and Weld Sequencer will provide reminders as you get closer to expiration. Notices will be provided at various intervals starting when less than 90 days are remaining.


NOTE | If the computer will only be running Weld Sequencer Editor, be sure to request an “Editor Only” license. You will receive a

License Key File only coded for that application at no cost.

NOTE | If you need to make a connection between a PLC and the Weld Sequencer and/or you need to run multiple instances, be sure to add this request to the *Special Installation Notes* section of the Request Form. The key file contains important information that enables these features.

To activate the software:

Procedure	Details
Request License Key File	
<p>1. Order the Weld Sequencer software licenses from Lincoln Electric.</p>	<p>Available options:</p> <ul style="list-style-type: none"> ▪ <i>90-Day Evaluation License</i>: If a trial license is needed, we can manually generate this for you. Please reach out to your local Lincoln representative to request one. ▪ <i>Purchased License on PO#</i>: If a PO is received with a Weld Sequencer part number, an email will be sent to the contact on file with license activation instructions. <p>1. <i>Free Editor License</i>: If an editor only license is needed, we can manually generate this for you. Please reach out to your local Lincoln representative to request one.</p>
<p>2. Follow the link in the Entitlement email message to activate the Software License.</p>	<p>This email will be sent to the contact(s) address(es) provided in the order for the software license.</p>
<p>3. Select the Software License and click the <i>Activate</i> button.</p>	
<p>4. Enter the <i>Computer Name/Identification</i> in the External ID box.</p>	<p>This is a computer name, asset number, or other identifying information used to associate this license with a specific computer.</p>
<p>5. Enter the <i>License Serial Number</i>.</p>	<p>Launch the Weld Sequencer application on the appropriate computer. Since a License Key File does not exist yet, the application displays a message, along with the <i>License Serial Number</i> of that computer.</p> <div style="border: 1px solid gray; padding: 5px; margin-top: 10px;"> <p style="font-size: small; margin: 0;">License Key file was not found</p> <div style="border: 1px solid gray; padding: 2px; margin: 5px 0;"> <p style="font-size: x-small; margin: 0;">License Serial Number</p> <input style="width: 100%; border: none;" type="text" value="PDX1200ZDHEW85"/> </div> <div style="text-align: right; margin: 5px 0;"> <input style="border: 1px solid gray; padding: 2px 5px;" type="button" value="Close"/> </div> </div>


Procedure	Details
6. Click the Activate button.	
7. The License File is sent to the <i>Primary Contact</i> as an attachment in an email message.	
Install the License Key File	
8. Once you receive the License File, extract the lservrc file from the zip file and copy this lservrc file to the following directory on that computer: <i>C:\Weld Sequencer Files\Key</i>	STOP Each License Key File is specific to each computer. Be sure to copy the file to the correct computer.
9. Verify the License Key File has now activated the Weld Sequencer application(s) on that computer.	Select All Programs > Lincoln Electric > Weld Sequencer Toolkit > Weld Sequence Editor from the computer's Windows menu. OR Select All Programs > Lincoln Electric > Weld Sequencer Toolkit > Weld Sequencer from the computer's Windows menu.
10. Press the  icon in the Weld Sequencer application(s) <i>to see the activated license information for that computer.</i>	Information is shown for the license(s) enabled on that computer, this includes the dates when the license was enabled and when it will expire.

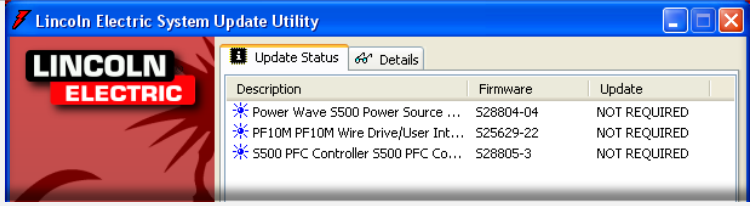
Updating the Welding Power Source Firmware

“Firmware” is the memory and programming code within the Welding Power Source that is the control program for the machine. Making sure you have the latest firmware ensures that you have the latest features available for the power source, including the most recent version of the CheckPoint™ software.

To install the latest firmware:

Procedure	Details
1. Log in to the computer as a user with administrative privileges.	Contact your IT department if you do not have administrator privileges.
2. Open your browser and go to www.powerwavesoftware.com .	The <i>Login</i> page displays.

Procedure	Details
<p>3. Enter your user name and password in the <i>Email</i> and <i>Password</i> fields and click Sign In.</p> <p>OR</p> <p>Click the <i>Register Today</i> link to create an account.</p>	<p>If you are creating a new account, follow the onscreen instructions and return to this step when finished.</p> <p>Once you log in, the system displays the <i>Power Wave Resource Center</i>.</p>
<p>4. In the <i>Quick Links</i> section, click the <i>Power Wave</i>[®], <i>Power Feed</i>[®]/<i>MAXsa</i>[®] <i>Software</i> link.</p>	<p>The system displays a page containing the Download Power Wave[®] Bundle-FREE button.</p> <div data-bbox="751 646 1357 705" style="text-align: center;">  </div> <p style="text-align: center; font-size: small;">File Size: 11.1 MB / Last Updated: 08-20-12</p>
<p>5. Click the Download Power Wave[®] Bundle-FREE button to run the update.</p>	<p>NOTE Depending on your Windows version, you may have to click Run or Allow to permit your system to launch the file.</p> <p>The system opens the <i>Lincoln Electric System Update Utility</i> window where you tell the utility how to find the Welding Power Source you want to update.</p>
<p>6. Choose the Connect through Ethernet option and enter the IP address of the Welding Power Source you want to update.</p>	<p>TIP If there is an IP address already displayed, it is the IP address of the last Welding Power Source that was connected. Be sure you enter the correct address for the current Welding Power Source you want to update.</p> <p>You can enter the IP address for the Welding Power Source in one of two ways:</p> <ul style="list-style-type: none"> ▪ Type the specific IP address into the <i>I know the IP address of the welder</i> field. ▪ Choosing the <i>I do not know the IP address of the welder</i> option. The update utility scans your network and displays a list of Welding Power Source IP addresses on the same subnet. <p>NOTE If this Welding Power Source has older firmware, the IP address will not show up using this method.</p> <p>TIP If you run into a problem, please refer to the <i>Troubleshooting</i> section (Appendix A).</p>
<p>7. Click the Connect button once you have entered the IP address for the power source you are updating.</p>	<p>The software scans the Welding Power Source to verify if the firmware currently on the machine is up to date.</p>

Procedure	Details
	
<p>8. If the firmware is not up to date, you must click Continue to update the Welding Power Source.</p>	<p>The system proceeds with the update.</p> <p>If the firmware is already up to date, you will receive the message <i>Update not required</i> and you can click Exit to close the window.</p>
<p>9. Exit the program once the firmware has finished updating.</p>	
<p>10. Repeat steps 4 through 9 for each power source you need to update.</p>	

Connecting to the Welding Power Source

The final step in configuring the Weld Sequencer system is setting the communication from Weld Sequencer applications to a specific Welding Power Source. In each application, you need to log into the application in order to configure the connection to the Welding Power Source.

The Weld Sequencer applications automatically attempt to connect to the last IP address they connected to. This is also true if you have multiple instances of either application on one computer (page 2.14).

NOTE | Only a user with the *Administrator* user role associated with their account can log in and change the connected Welding Power Source in either application. See page 3.2 for details on user roles.

NOTE | The Welding Power Source must have a static IP address to use the Weld Sequencer software.

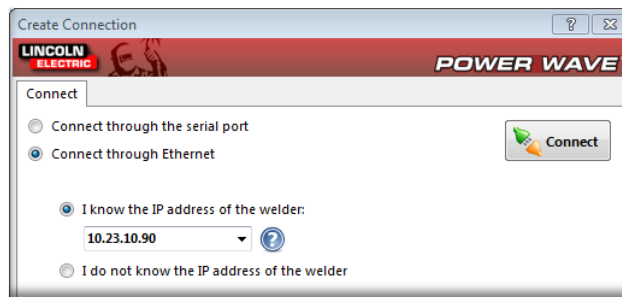


Figure 2.1 Connection Window


Connect to the Welding Power Source

In order for Weld Engineers to load weld procedures in the Weld Sequence Editor and for Weld Operators to be able to load weld sequence files or use the Part Lookup table in Weld Sequencer, you need to connect the Weld Sequence Editor and the Weld Sequencer to a Welding Power Source.

NOTE | You must be a user with the *Administrator* role associated with your account. See page 3.2 for details on user roles.

If you need to connect multiple Welding Power Sources to a single installation of Weld Sequencer out on the production floor (e.g., one computer kiosk controls two Welding Power Sources), you can create an application shortcut for each Welding Power Source and then connect each instance of the application to the appropriate Welding Power Source. See page 2.14 for details on creating multiple instances of Weld Sequencer.

To connect to the Welding Power Source for the first time or to change connection:

Procedure	Details
<p>1. Select All Programs > Lincoln Electric > Weld Sequencer Toolkit > Weld Sequence Editor from the computer's Windows menu.</p> <p>OR</p> <p>Select All Programs > Lincoln Electric > Weld Sequencer Toolkit > Weld Sequencer from the computer's Windows menu.</p>	
<p>2. Click the Login button in Weld Sequence Editor and enter your administrator credentials.</p> <p>OR</p> <p>Click the Login button  in Weld Sequencer and enter your administrator credentials.</p>	
<p>3. In Weld Sequence Editor, click the PS Connect button in the top toolbar.</p> <p>OR</p> <p>In Weld Sequencer, select File > Power Supply Connect from the main menu.</p>	The <i>Create Connection</i> window opens (Figure 2.1).
<p>4. Choose the <i>Connect through Ethernet</i> option.</p>	
<p>5. Choose <i>I know the IP address of the welder</i></p>	An IP address is a numeric identifier for a device on a

Procedure	Details
<p>(if you know the network address) and type the IP address in the text field.</p> <p>Or if you don't know the IP address:</p> <p>Choose <i>I do not know the IP address of the welder</i> if you need to scan the network to find the welder's address. See page 2.13 for more information on finding the IP address.</p>	<p>network, similar to a phone number, and is composed of four numbers (each ranging from 0 to 255). All devices that participate on the network must each have a unique IP address.</p> <p>For example, <i>10.23.10.90</i> is a valid IP address.</p> <p>NOTE If there is an IP address already displayed in the text field, it is the IP address of the last Welding Power Source that was connected. Be sure you enter the correct address Welding Power Source to which you want to connect.</p> <p>NOTE The Welding Power Source must have a static IP address to use the Weld Sequencer software.</p>
<p>6. Click the Connect button.</p>	<p>The system attempts to connect to the Welding Power Source. If the Weld Sequence Editor or Weld Sequencer cannot connect to the Welding Power Source, there may be a couple of solutions you can try. Please refer to Appendix A for more information.</p> <p>NOTE The connection to the Welding Power Source will use UDP.</p>
<p>7. Click the Logout button.</p>	

Disconnecting from the Welding Power Source

There may be times when you need to disconnect the Welding Power Source from the Weld Sequencer software. You can do this easily from the main menu: **File > Power Source Disconnect**.

NOTE | You must be a user with the *Administrator* role associated with your account. See page 3.2 for details on user roles.

Weld Sequencer disconnects from the Welding Power Source and erases the power source's IP address from the connection memory.

Finding the IP Address of a Welder

If you don't know the IP address of a Welding Power Source or if you are having trouble connecting when you enter a specific IP address, you can have Weld Sequencer scan your network for welders. When you choose the *I do not know the IP address of the welder* option on the *Connect* window, the system automatically begins scanning your network for power sources. Once it completes the scan, Weld Sequencer displays the results in the list, along with the model name and machine name.

Simply click on each Welding Power Source in the list until you see the green status light on the Welding Power Source you want start to blink rapidly. Click **Connect**. See Appendix A for common reasons you may experience problems connecting to the power source.

NOTE | The Welding Power Source must be on the same subnet as the

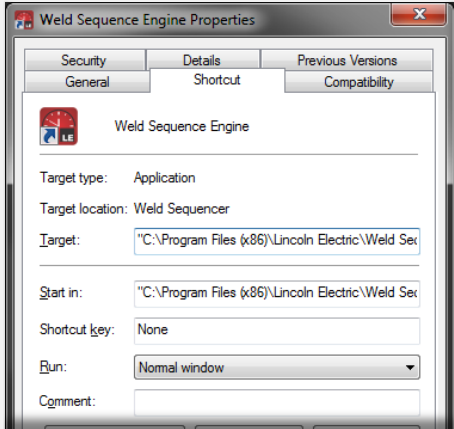
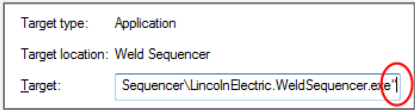
Weld Sequencer computer in order to retrieve the IP address when using this option.

Creating Multiple Instances of Weld Sequencer

The standard installation process creates a single **Weld Sequencer** shortcut on the Desktop that uses the default instance settings. If you have multiple Welding Power Sources that you need to connect to the same computer and that need to use the same Weld Sequencer software on the production floor, you need a Weld Sequencer desktop shortcut for each Welding Power Source.

Each of the Weld Sequencer shortcuts will launch a different instance of the application, and each instance will remember the connection information for its connected Welding Power Source.

To create and configure an additional Desktop shortcut for each Welding Power Source:

Procedure	Details
1. Right-click the default Weld Sequencer shortcut and select Copy from the pop-up menu.	
2. Right-click on the Desktop of the computer and select Paste from the pop-up menu.	
3. Right-click the new shortcut and select Rename from the pop-up menu.	
4. Enter a unique name for this shortcut and click OK .	For example, <i>Weld Sequencer System 2</i> .
5. Right-click the new shortcut and select Properties from the pop-up menu.	The <i>Properties</i> window opens. 
6. Click on the <i>Target</i> field and place your cursor at the end of the existing text in the field.	
7. Add the following text: -s system2 or, -settings system2	Be sure to add a space after the existing text and then begin typing.

Procedure	Details
	<div data-bbox="917 247 1328 352" style="border: 1px solid black; padding: 5px;"> Target type: Application Target location: Weld Sequencer Target: "C:\LincolnElectric\WeldSequencer.exe" -s system2 </div> <p data-bbox="800 380 1433 478">TIP Instead of <code>system2</code>, you can use any text you want (e.g., <code>welder2</code>). Just be sure that the name does not include spaces or special characters.</p>
<p data-bbox="180 510 589 541">8. Click OK to save your changes.</p>	
<p data-bbox="180 573 760 636">9. Repeat steps 1 through 8 for each additional Welding Power Source.</p>	<p data-bbox="800 579 1442 678">STOP Be sure to provide a unique name in step 7 for each shortcut (e.g., <code>system2</code>, <code>system3</code>, <code>system4</code>).</p> <p data-bbox="800 705 1373 804">Once you have created the additional shortcuts, return to page 2.11 for details on connecting the Welding Power Source.</p>

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Setting Up the System

Before Weld Operators can begin using Weld Sequencer, you need to create user accounts and connect the Weld Sequencer to the Welding Power Source.

User Accounts

Once you have Weld Sequencer installed, you need to create user accounts for each Weld Operator, Weld Engineer and Quality Manager, as well as any other individual who needs to use the Weld Sequencer software.

Overview

You can access the user accounts under the **User Maintenance** button in the Weld Sequence Editor (see page 3.2 for more details). When you create or edit a user account, there are several fields you have available. Table 3.1 explains these fields in more detail.

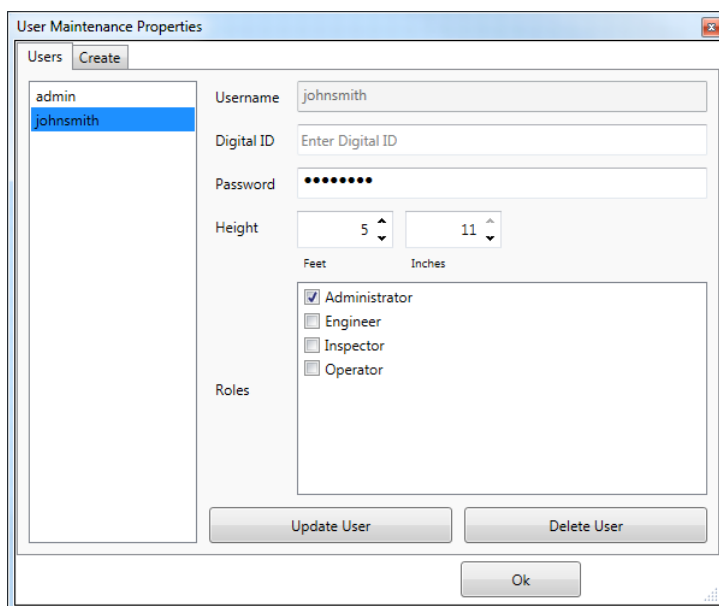


Figure 3.1 User Maintenance Properties Window

Table 3.1 Fields on the User Maintenance Properties Window

Field	Description
User Name	Enter the text the person will use as a user name to log in to the Weld Sequence Editor or the Weld Sequencer.
Digital ID	The <i>Digital ID</i> allows the system to log users in through RFID or barcode scanners. The information is sent electronically and logs the user in automatically. This field must be blank or it must contain at least four characters to be considered a valid <i>Digital ID</i> . TIP Every <i>Digital ID</i> across your system must be unique (i.e., no duplicates).

Field	Description
<i>Password</i>	Enter the characters this user should use as a password to log in to the Weld Sequencer and/or into User Maintenance and Part Maintenance.
<i>Height</i>	Enter the height of the user. This is used for automatic ergonomic positioning of a fixture when the Power Lift HZA function is used. See page 6.55 for details.
<i>Roles</i>	Place a check mark next to the appropriate role for this user. See page 3.2 for details.

User Roles

You define user permissions in Weld Sequencer by assigning a User Role (Figure 3.1 on page 3.1) to the user account. These permissions allow (or don't allow) users to access certain areas of the software. Currently, the following actions are restricted by the user's role:

- Connecting Weld Sequence Editor and Weld Sequencer to a Welding Power Source or PLC.
- Locking a Welding Power Source by enabling the Auto Lockout feature.
- Creating and maintaining user accounts.
- Creating and maintaining the Part Lookup table.

NOTE | Weld Sequencer stores the user name as the *Operator ID* in the Welding Power Source.

Table 3.2 Permissions Available with Each Role

Permission	Administrator	Operator	Inspector	Engineer
Connecting the Welding Power Source	✓			✓
Enabling Power Source Auto Lockout	✓			✓
Connecting the PLC	✓			✓
User Maintenance	✓			
Part Lookup Table Maintenance	✓			✓
Loading and Running Weld Sequences	✓	✓	✓	✓
Database Schema Updates	✓			

Creating User Accounts

You must create a user account for any person who needs to log in to the Weld Sequencer. This includes (but is not limited to) Weld Operators, Weld Engineers and Quality Managers. You also need to create a user account for any person who needs to be able to add other user accounts to the system (e.g., a foreman who needs to add Weld Operators to the system).

When Weld Sequencer was first installed, a default administrative account was created for you. When you log in, use `admin` for the user name and `password` for the password.

STOP | After you log in for the first time, you should change this to a secure password. Alternatively, you can create a new administrator account and delete the pre-installed one.

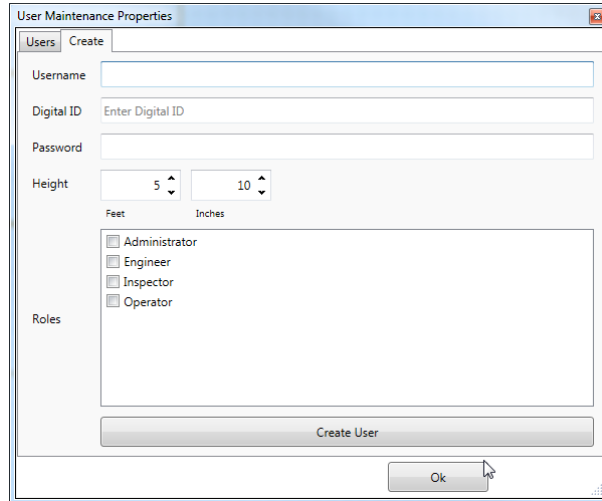


Figure 3.2 Creating a User Account

To create a new user account:

Procedure	Details
1. Launch the Weld Sequence Editor.	
2. Click the Login button.	The Weld Sequence Editor prompts you for a user name and password.
3. Enter your user credentials and click OK .	NOTE You must be an Administrator user to access User Maintenance .
4. Click User Maintenance in the top toolbar.	The <i>User Maintenance Properties</i> window opens (Figure 3.1 on page 3.1).
5. Click the Create tab.	See Figure 3.2.
6. Enter the details of the user’s account.	See Table 3.1 on page 3.1 for details on these fields.
7. Place a check mark next to the appropriate role for this user.	See Table 3.2 on page 3.2 for user privileges.
8. Click the Create User button.	The system adds the new user account to the Users tab.

Editing and Deleting User Accounts

Once you have user accounts created in the system, there may be times when you need to edit the details of those accounts or remove the account entirely. Perhaps you need to change the password on an account for that user. You can do so easily.

To update a user account simply highlight the account on the **Users** tab, make your changes and click the **Update User** button. You can click the **Delete User** button to remove a user account from Weld Sequencer. See Figure 3.1 on page 3.1.

NOTE | You cannot delete the “admin” user account.

RFID and Barcode Scanners

If your company uses RFID or barcode scanners to enter data into Weld Sequencer (e.g., logging in or entering part numbers), you need to make sure that you configure the scanner properly. For use with Weld Sequencer, you only need to make sure you enable the Line Feed/Carriage Return setting for entering data.

Enabling the Line Feed/Carriage Return setting means that when someone scans an RFID or barcode, the scanner also sends along data that acts like they pressed the **Enter** key on the keyboard or clicked **OK** in Weld Sequencer. Refer to the manufacturer’s documentation for your scanner for instructions on configuring this setting.

Weld Sequence Editor

Overview

The Weld Sequence Editor is where the Weld Engineer creates the weld sequence file. The weld sequence for the engineer is in the form of a flowchart. The flowchart shows the building blocks and details of the welding operation. Weld Sequence Editor is similar to many popular flowchart software packages, with drag-and-drop functions and connectors, and is flexible enough to meet the needs of most assembly operations.

TIP | Contact Lincoln Electric Weld Sequencer support for any questions about using Weld Sequencer with your assemblies: softwaresupport@lincolnelectric.com.

The Weld Sequencer Editor application stores each weld sequence that you create as a file on a computer. You can store unfinished files locally on the Weld Engineer's computer; however, we recommend that you share the finished weld sequence file on a central server computer. This allows the computers on the production floor to access any weld sequence files they need to load.

TIP | Weld Sequencer automatically saves your open file every five minutes (with the file extension *.wsfautosave*).

Weld sequence files are not interchangeable between a Power Wave® 300C and other supported Power Wave® models that use a Power Feed® 10M or Power Feed® 84 wire feeder. You must create your weld sequence file specifically for the Power Wave® system you intend to use when running the sequence.

In comparison to a system that uses a Power Feed® 10M or Power Feed® 84 wire feeder, a Power Wave® 300C uses different formats for Weld Procedures and User Interface controls. By connecting to a Power Wave® system before creating your weld sequence file, the Weld Sequence Editor will automatically detect the system type and display the correct data entry options for your targeted Power Wave®.

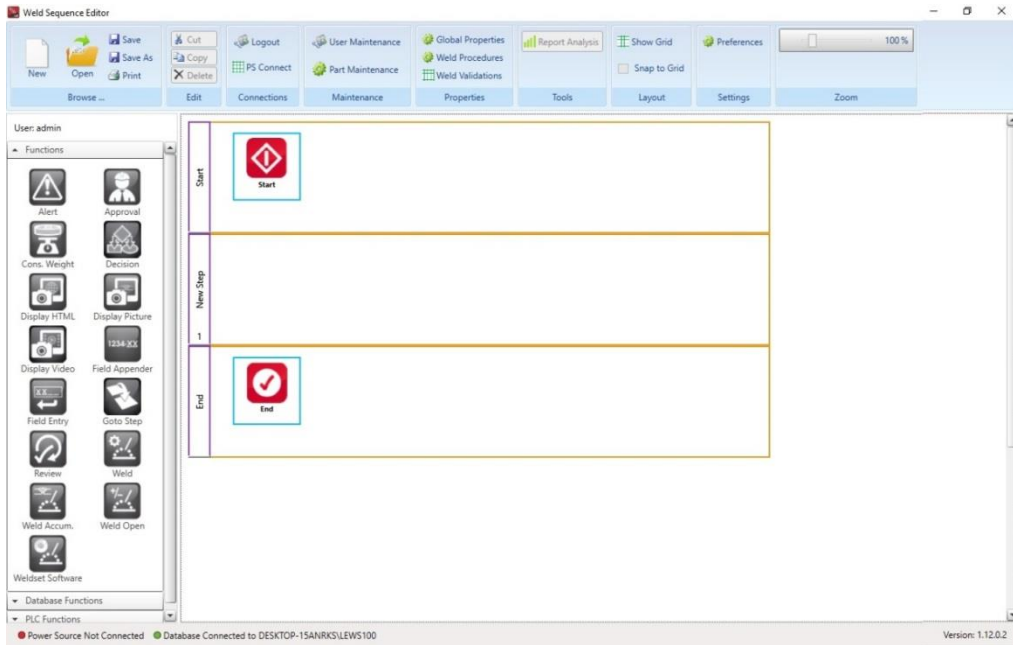


Figure 4.1 Weld Sequence Editor

Top Toolbar

The top toolbar is divided into sections with related actions grouped together. From here, you can create a new weld sequence file, open an existing one to edit, establish properties for the current weld sequence file, maintain user accounts and change your grid options.

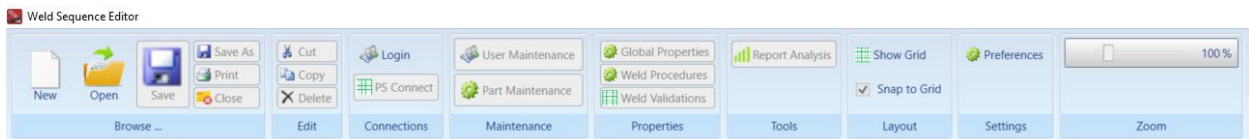


Figure 4.2 Top Toolbar

File Actions

From the *Browse* section of the top toolbar, you can perform a number of actions on the weld sequence file.

Creating a New Weld Sequence File

STOP | When creating a new Weld sequence file, the supported system type (Power Wave 300C or Power Feed 10M / 84) must be determined. Connect to your intended Power Source system type, with the Weld sequence file open, to complete the configuration of the Weld Sequence file.

To create a new weld sequence file, click the **New** button. You can then pick from several templates that help create the new sequence file quickly. The templates contain different functions for each Step and the ability to enter the number of Steps you want to create. Some templates also collect additional information for default messages, sound files, or other properties which are copied into the

functions of all the Steps. Each template provides a short description of the functions and connectors it will insert on each Step; refer to the section on Sequence Functions for the capabilities of each function.

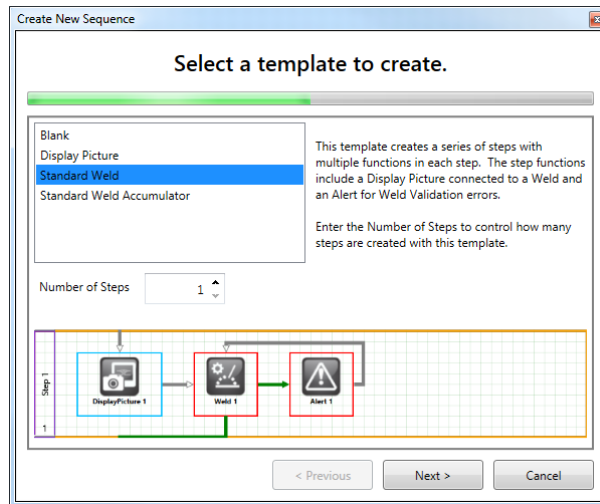


Figure 4.3 New Weld Sequence Templates

Opening an Existing Weld Sequence File

If you want to edit an existing weld sequence file, click the **Open** button.

Saving a Weld Sequence File

You can also save the file you currently have open with either the **Save** or **Save As** button. The **Save** button saves the current file under the same name. Clicking the **Save As** button allows you save a new copy of the file with a different name or in a new location.

When you save a weld sequence file, the software performs a Weld Sequence Review (Figure 4.4). This Weld Sequence Review lists common problems that you should fix before attempting to run the sequence file (e.g., missing PLC Tags; empty descriptions or titles; missing connectors to and from functions; unused Weld Procedures or Weld Validations; or incomplete or incorrect validation rules).

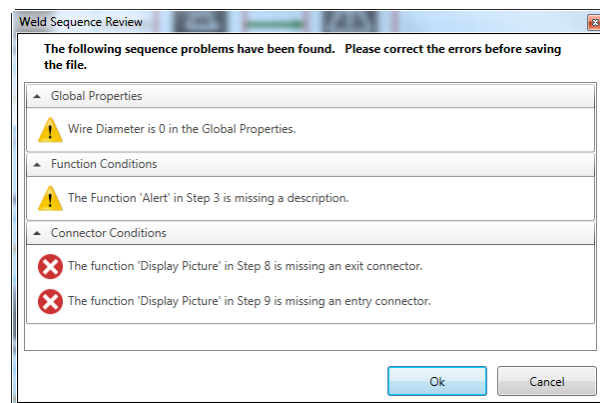




Figure 4.4 Automatic Weld Sequence Review

Weld Sequencer divides the issues into two categories: Warnings  and Errors . Before you run the sequence, be sure to correct any issues flagged as Errors or serious welding issues could occur.

You can click **OK** to save the file despite issues being present, or you can click **Cancel** to go back and make the corrections before you save the file.

Printing a Weld Sequence File

If you would like to check your weld sequence so you can update the file or you want to create a hard copy of the steps in the sequence, you can click the **Print** button on the top toolbar to send the file to your printer.

Close the Weld Sequence File

If you would like to cancel your changes to the weld sequence file without saving, press the **Close** button.

Edit

While working with the functions in your sequence, you can use the *Edit* options in the top toolbar to cut or copy functions from one step and paste them into another step. You can also delete functions if necessary.

TIP | To Paste, click your cursor in the location where you want to paste the function(s) and press the Ctrl+ V key combination on your keyboard. This provides a precise location for the pasted functions and eliminates any guesswork that could produce an error.

TIP | To select a group of functions, click and drag the cursor around the functions to create a selection area.

Connections

The *Connections* section of the top toolbar provides you with the ability to log in and connect to a Welding Power Source. It also allows you to log in if you need to access the **User Maintenance** (see page 3.1) and **Part Maintenance** (see page 4.8). For more details on connecting to a power source, please see page 2.11.

Maintenance

In order to activate the options in the Maintenance section, you need to log in as a user with the Administrator role associated with their user account. Once you log in, you can add, edit or delete users under **User Maintenance** (page 3.1) and add, edit or delete entries from your Part Lookup table using **Part Maintenance** (page 4.8).

Properties

The *Properties* section of the top toolbar applies to the open weld sequence file. These options allow you to establish various settings specifically for the weld sequence file you are editing.

- *Global Properties* (page 5.1): *Global Properties* are settings you establish for the entire weld sequence and include options such as the type of wire feeder, quick trigger options and options for locking the User Interface.
- *Weld Procedures* (page 5.8): *Weld Procedures* is a library of weld procedures that you can call for the welding functions in this weld sequence. This allows you to set the parameters for each type of weld.
- *Weld Validations* (page 5.22): *Weld Validations* in the top toolbar allows you to create a library of conditions for passing a weld that you can use within this sequence. If the weld does not meet these conditions, the weld fails validation and you can tell Weld Sequencer what to do.

Tools

The Report Analysis Wizard allows you to load all Sequence Reports made using the open weld sequence file and add valuable data to the sequence. Sequence Reports contain all raw data captured while welding with the weld sequence file and provides you with complete views of how a part was created. See page 5.28 for more details on the Report Analysis Wizard.

Layout

The grid in the Weld Sequence Editor helps you align your functions and groups of functions in an orderly manner. The grid looks just like graph paper and can help you organize your weld sequence in a way that makes it easier for you to navigate and edit. Simply click the **Show Grid** button in the top toolbar to display the alignment grid in the background. Click the **Snap to Grid** button to force the functions you add or move to “snap” to the nearest gridline. This helps you keep your functions aligned automatically.

Settings – Preferences

Weld Sequence Editor has a few workstation preferences you can set; Table 4.1 explains these fields in more detail. The Weld Sequencer also has a separate set of workspace preferences you can set for the Weld Operators (page 7.7).

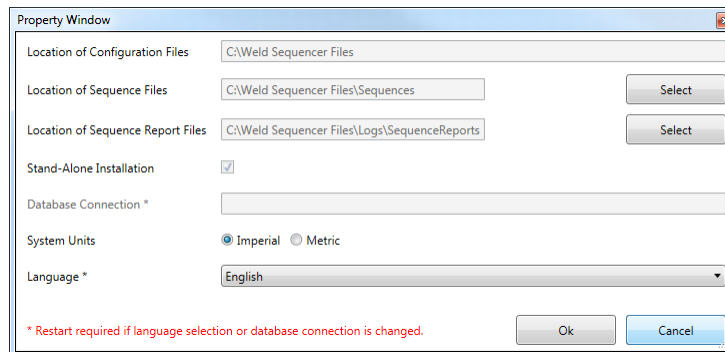


Figure 4.5 Weld Sequence Editor Preferences

Table 4.1 Preferences Available in Weld Sequence Editor

Field	Description
<i>Location of Configuration Files</i>	This field displays the directory where the Weld Sequence Editor can find the files necessary to run the application, from program files to the default location for saving weld sequence files.

Field	Description
<i>Location of Sequence Files</i>	<p>The <i>Location of Sequence Files</i> is where the Weld Sequence Editor stores all the weld sequence files you create, along with any accompanying files like images and sounds. By default, the location is the <i>C:\Weld Sequencer Files\Sequences</i> directory on this workstation. You can use the Select button to change the location; however, remember that you could have image and/or sound files linked to various functions of the sequence. If you move the weld sequence file without moving these external files, you will break the links and the weld sequence file will no longer function properly.</p> <p>TIP A great practice to get into: store your weld sequence file and the image/sound files together in a specific folder for a given part. If you move or copy the folder, the associated image/sound files will stay together and prevent broken links.</p>
<i>Location of Sequence Report Files</i>	<p>This location is where Weld Sequencer finds the Sequence Reports generated by Welding Power Source on the production floor that use the weld sequences. This is especially helpful if all reports are saved to a common location (e.g., a network drive).</p>
<i>Stand-Alone Installation</i>	<p>This option allows you to choose a default Stand-Alone Installation where the required database is installed on the same computer. Refer to Installing/Configuring Microsoft SQL Server on page 2.6 for more information on the installation options. Uncheck this option and enter the Database Connection string (below) if you are using the Enterprise Configuration.</p> <p>NOTE You must log in as an administrator user in order to modify this setting.</p>
<i>Database Connection</i>	<p>This is the Database Connection string for Enterprise Configurations. See Appendix A for detailed Enterprise Configuration instructions. You must restart the Weld Sequence Editor to utilize changes to the connection string.</p> <p>NOTE You must log in as an administrator user in order to modify this setting.</p>
<i>System Units</i>	<p>You can choose to display the units within the Weld Sequence Editor as <i>Imperial</i> or <i>Metric</i> units.</p>
<i>Language</i>	<p>Click on the dropdown arrow to select from the available languages. You must restart the Weld Sequence Editor if a different language is selected.</p>

Zoom Options

Depending on the complexity of your weld sequence, it could turn into a large workflow document where much of your weld sequence is hidden from your view. The zoom bar allows you to navigate your document easily. Use the Zoom Bar at the top of the window to zoom out to see your whole document, click on a function near where you want to be, and then slide the zoom bar back to 100% to begin editing in a normal zoom.

Work Area

The main open area in the *Weld Sequence Editor* window (Figure 4.6) is where you build your weld sequence. You can drag-and-drop functions into this Work Area, rearrange them, group them, add properties, and more. You can use the scroll bar to navigate the weld sequence.

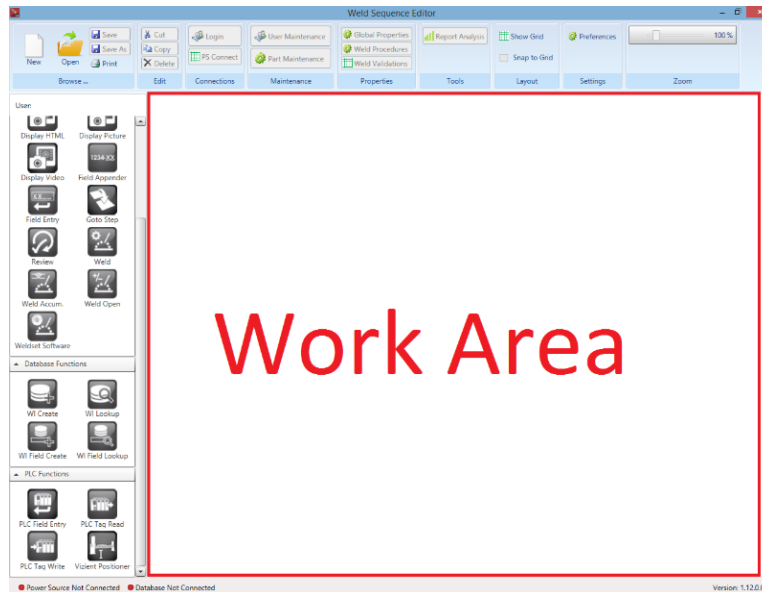


Figure 4.6 Work Area

Status Bar

At the bottom of the window, Weld Sequence Editor displays several bits of information for you.

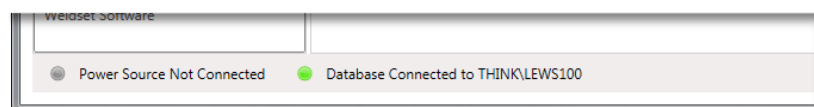


Figure 4.7 Status Bar in Weld Sequence Editor

- **Welding Power Source Connection:** If you have connected to a Welding Power Source, the system displays the IP address of that power source on the left.
- **Database Connection:** Next to the Welding Power Source connection, the system displays the Weld Sequencer database that you are currently connected to. This is especially helpful for an Enterprise Configuration.
- **PLC Connection (Weld Sequencer only):** Next to the *Database Connection* information, Weld Sequencer displays whether you are currently connected to a programmable logic controller (PLC) device.
- **Version Number:** At the far right is the software version number. This is helpful if you need to provide the support team with your current version.

Sequence Functions

On the left of the Weld Sequence Editor window, you have access to the tools you need to create your weld sequence—the Sequence Functions. These functions are the building blocks of the welding operation. You add functions to the weld sequence that controls every aspect of the Welding Power Source and the welds the operator creates. These functions help you define a consistent and repeatable process for the Weld Operator. Chapter 6 explains each of these functions in detail and how to use them in your sequence.

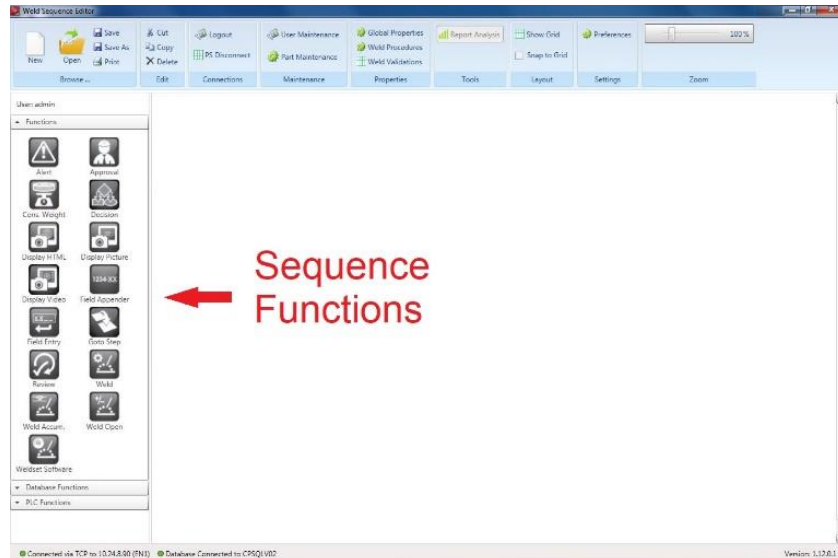


Figure 4.8 Sequence Functions

Part Lookup Table

If you want to load weld sequence files based on part numbers, the Part Lookup table is a simple association between your part number and the weld sequence file that is used to weld it. Weld Operators access this table from the Weld Sequencer under **File > Part Lookup** in the main menu (page 7.2). When the Weld Operator enters the part number, Weld Sequencer loads the weld sequence file you associated with the part number and launches it.

NOTE | If you want any Weld Sequencer on any computer to look up a part number and then launch the correct weld sequence file, you need to save the weld sequence files (and all supporting image or sound files) in a central network folder that all computers can access.

TIP | There is a workstation preference that prompts for a part number as soon as the user logs in to the Weld Sequencer Engine. See page 7.7 for more details.

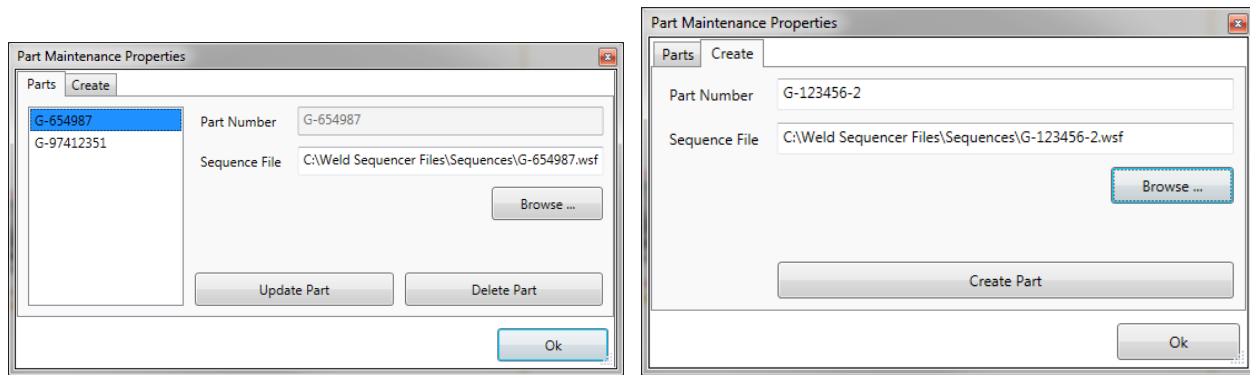


Figure 4.9 Part Maintenance Properties

To add to your Part Lookup table:

Procedure	Details
1. Launch the Weld Sequence Editor.	
2. Click the Login button.	The Weld Sequence Editor prompts you for a user name and password.
3. Enter your user credentials and click Login .	The username is shown above the Functions List. NOTE You must log in as an administrator user in order to add, edit or delete part number entries.
4. Click Part Maintenance in the top toolbar.	The <i>Part Maintenance Properties</i> window opens (Figure 4.9).
5. Click the Create tab.	
6. Enter the part number in the <i>Part Number</i> field.	Remember, this is the number that the Weld Operator will type when prompted in the Weld Sequencer.
7. Click the Browse button next to the <i>Sequence File</i> field and select the file you want to associate with this part number entry.	
8. Click the Create Part button.	

Editing a Part Number Entry

If you need to associate a part number with a different weld sequence file, you can highlight the part number, click the **Browse** button and associate a new file. Click the **Update Part** button to save your change (Figure 4.9).

Deleting a Part Number Entry

If you need to remove a part number entry from the Part Lookup table, simply highlight the part and click the **Delete Part** button (Figure 4.9).

STOP | Once you click the Delete Part button, the entry is removed. If you delete the entry by mistake, you will need to add it again.

Sequence-Level Properties

The overall properties of the weld sequence and the weld sequence file also allow you to ensure a consistent semi-automatic welding program.

Global Properties

The Global Properties are settings you establish for the entire weld sequence file. These properties help you set up the Welding Power Source to meet the needs of the welds within the sequence. When the Weld Operator launches the weld sequence file and begins the weld sequence, Weld Sequencer can prevent outside control of the Welding Power Source. All control occurs from the weld sequence file. See Table 5.1 for details on each parameter on this window.

The Global Properties screens display the parameters specific to the connected Power Wave® type. If the Power Wave® type is undetected, User Interface Controls and features that may not be supported are not shown.

NOTE | Any settings under Global Properties will overwrite the current settings of the Welding Power Source.

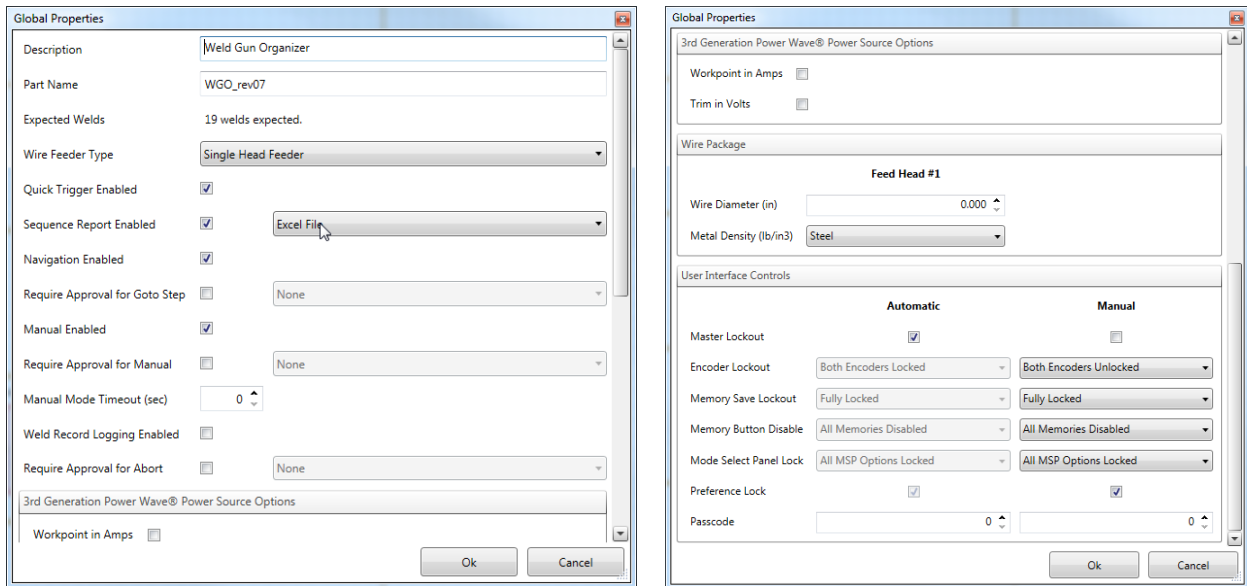


Figure 5.1 Global Properties for Weld Sequence and Power Feed 10M or Power Feed 84

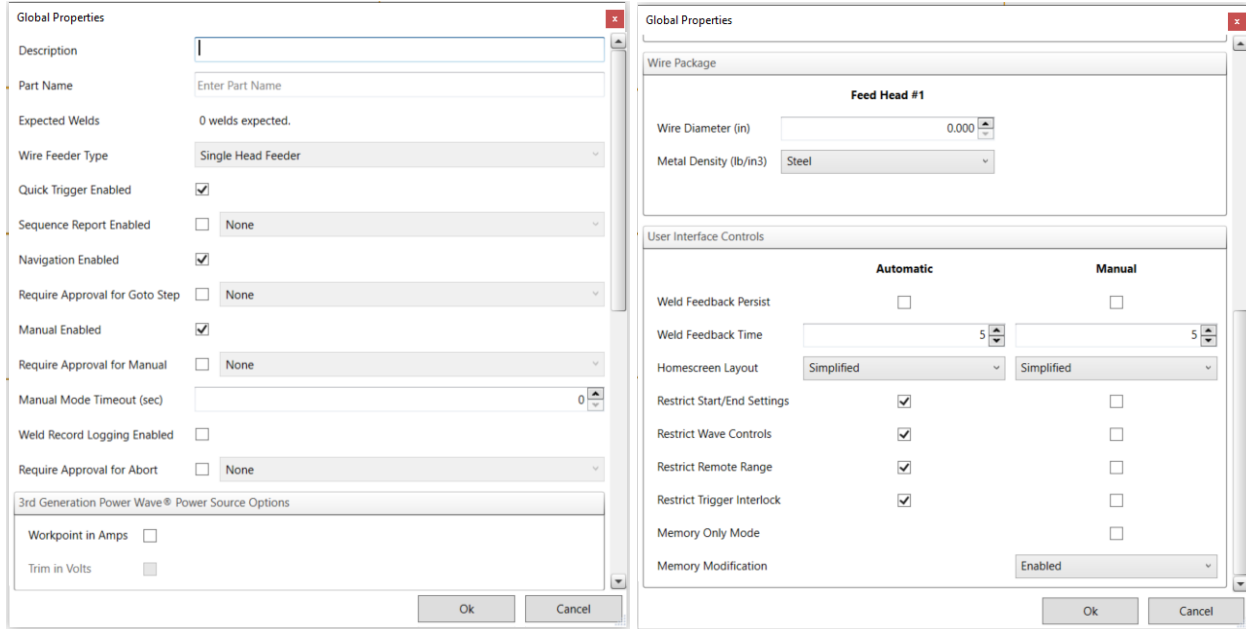


Figure 5.2 Global Properties for Weld Sequence and Power Wave® 300C

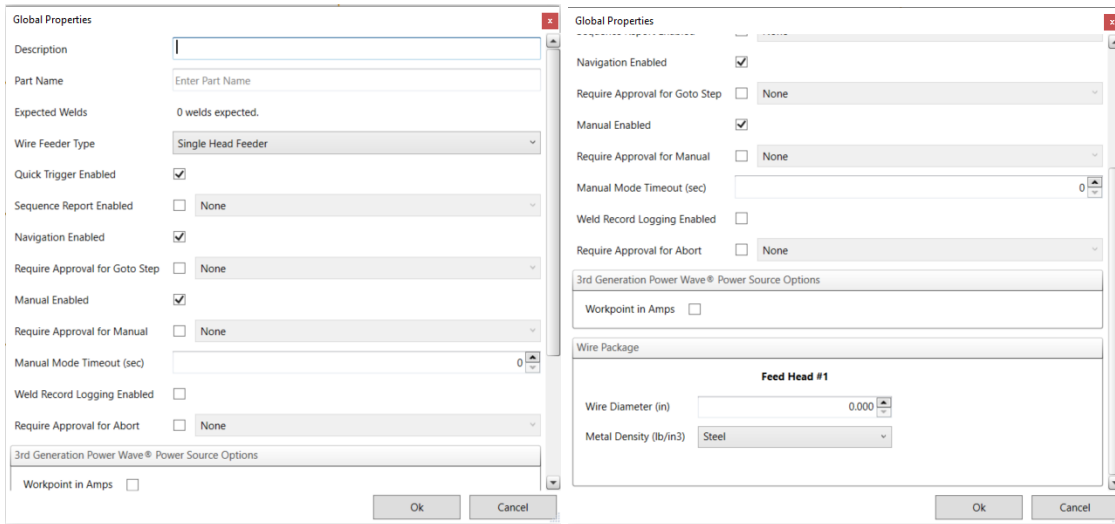










Figure 5.3 Global Properties for Weld Sequence and Undetected Power Wave® Type

Table 5.1 Global Properties Available for a Weld Sequence File

Field	Description
General Properties	
<i>Description</i>	The <i>Description</i> field is the title of the entire weld sequence file. This text appears in the list of files that the Weld Operator can load. See page 7.1 for details on loading weld sequence files in the Weld Sequencer.

Field	Description
<p><i>Part Name</i></p>	<p>The text that you enter in the <i>Part Name</i> field is the text that displays in the <i>Assembly Name</i> column in CheckPoint™. This helps you identify one part of the assembly from another one for reporting purposes. All weld sequences that use this part name will be grouped together in CheckPoint™.</p> <p>Weld Sequencer also uses the <i>Part Name</i> when locating the appropriate Sequence Report files for analysis with the Report Analysis Wizard (page 5.28).</p> <p>NOTE Typically, the <i>Part Name</i> is the same text you have for the part number; however, they are different fields and different data in the system.</p>
<p><i>Expected Welds</i></p>	<p>This field automatically calculates the total number of welds you expect the Weld Operator to have performed by the end of the weld sequence. If this number of welds is not reached or is exceeded, Weld Sequencer identifies the sequence as containing errors.</p> <p>NOTE When the sequence contains <i>Weld Open</i> or <i>Weld Accumulator</i> functions, the <i>Expected Welds</i> field displays the number in the <i>Minimum Number of Welds</i> field of the function.</p>
<p><i>Wire Feeder Type</i></p>	<p>If you have a weld sequence that requires a Dual Head wire feeder, select <i>Dual Head Feeder</i> from the <i>Wire Feeder Type</i> drop-down. This adds an additional set of procedure options to the <i>Weld</i> functions so you can specify which torch you want to use for the weld. See page 5.8 for details on establishing weld procedures per feed head and page 6.33 for selecting procedures for the feed head per weld. This also adds a second Wire Package configuration for properly tracking the wire used on each feed head.</p>
<p><i>Quick Trigger Enabled</i></p>	<p>Place a check mark in the <i>Quick Trigger Enabled</i> checkbox to allow the Weld Operator to navigate the weld sequence (i.e., Previous, Next and Enter) using the trigger on the welding torch instead of the keyboard.</p> <ul style="list-style-type: none"> ▪ Two quick trigger pulls simulate pressing the Enter key, as well as clicking the Next button . Two quick trigger pulls also simulate clicking the Continue button in the case of the <i>Review</i> function or activating the Start button when waiting to start a sequence. If you activate the Continue button for a <i>Display Picture</i>, <i>Display HTML</i> or <i>Display Video</i> function, two quick trigger pulls also simulate clicking this Continue button. ▪ Three quick trigger pulls simulate clicking the Previous button . ▪ Four quick trigger pulls simulate clicking the Manual  and Automatic  toggle button.
<p><i>Sequence Report Enabled</i></p>	<p>The Weld Sequencer can automatically export a file listing the details of the finished weld sequence and all of the welds created each time a Weld Operator completes it, including welds made in Manual mode. Weld records contain information such as weld duration, start delay, wire density, deposition and WeldScore®.</p> <p>Simply place a check mark in the <i>Sequence Report Enabled</i> checkbox and select the format from drop-down:</p>

Field	Description
	<ul style="list-style-type: none"> ▪ <i>Tab-Delimited File</i>: Weld Sequencer creates a simple text file that separates each piece of data for the weld record with a tab character. ▪ <i>Microsoft Excel</i>: Weld Sequencer creates a Microsoft® Excel spreadsheet file that contains a row for each weld record and column for each piece of weld record data. <p>Weld Sequencer stores this file under <i>C:\Weld Sequencer Files\Logs\ SequenceReports</i>. The software also automatically creates XML files for each Sequence Report that you can find under <i>C:\Weld Sequencer Files\Logs\SequenceReports\XML</i>. You will need these XML files to use the Report Analysis tool.</p> <p>NOTE You need to generate Sequence Reports if you want to use the Report Analysis tool. See page 5.28 for details on the Report Analysis tool.</p>
<i>Navigation Enabled</i>	<p>The Weld Sequencer has Previous  and Next buttons  that allow the Weld Operator to navigate through the weld sequence, even if the sequence step is not complete. The <i>Navigation Enabled</i> checkbox allows you to control whether or not the operator is allowed to navigate the sequence with these buttons.</p> <p>To prevent the user from advancing or going back before the end of the sequence step, remove the check mark from this checkbox.</p> <p>NOTE This option also includes the File > Goto Step feature in the menu of Weld Sequencer.</p> <p>NOTE You can disable Navigation on specific Steps. In the Editor, double-click on the left side Step name label to configure this feature. When disabled, the Weld Sequencer will not allow the user to Navigate away from the Step. This is very useful for Steps that contain PLC Functions, and Navigation needs to be disabled, but Navigation is desired for the remainder of the sequence. The background of the left side Step name will change to grey when this option is used.</p>
<i>Require Approval for Goto Step</i>	<p>Place a check mark in this option to specify that a user associated with the selected user role must log in to allow the Weld Operator to use the File > Goto Step feature during an active sequence.</p>
<i>Manual Enabled</i>	<p>If you want to prevent the Weld Operator from going into Manual mode during the weld sequence, simply remove the check mark from the <i>Manual Enabled</i> checkbox. When a Weld Operator runs the sequence, they will not be able to use the Manual button  in the Weld Sequencer. They will be restricted to the functions in the sequence.</p>
<i>Require Approval for Manual</i>	<p>Place a check mark in this option to specify that a user associated with the selected user role must log in to allow the Weld Operator to use <i>Manual</i> mode during an active sequence.</p> <p>When the Weld Operator (or other user) clicks the Manual button  in the Weld Sequencer, Weld Sequencer requires someone with the specified user role to log in to release the Welding Power Source into manual mode.</p>

Field	Description
<i>Manual Mode Timeout</i>	Use this option to set a timeout value for Manual Mode. Setting this timeout value (in seconds) will limit use of Manual Mode to this period of time when the sequence is running. After the timeout expires, the Weld Sequencer will return to Automatic Mode. A timeout value of zero will disable this feature. This Global Property allows customization of the timeout within every sequence file.
<i>Weld Record Logging Enabled</i>	Place a check mark in this option to activate Weld Record Logging in a weld sequence file. For every weld completed by the Welding Power Source, Weld Sequencer creates a new database entry. This is not a replacement for Production Monitoring or CheckPoint™ data. Weld Sequencer saves the same Weld Record information in the Weld Sequencer database. See page 5.8 for more details about Weld Record Logging. STOP Using this option increases the size of the database. Each weld record is approximately 1600 bytes. NOTE Weld Record Logging is most useful for those advanced users who need to use raw data and have some SQL Server experience.
<i>Require Approval for Abort</i>	Place a check mark in this option to specify the user role allowed to abort a sequence or close the Weld Sequence while a sequence is active. When the Weld Sequence encounters an abort situation or the Weld Operator (or other user) attempts to close the weld sequence before it is complete, Weld Sequencer requires someone with the specified user role to log in to approve the action.
3rd Generation Power Wave® Power Source Options	
<i>Workpoint in Amps</i>	Place a check mark in this option to base the output level on Amps instead of wire feed speed for this weld sequence. If you are connected to a welding power source and this property differs from the power source's configuration, Weld Sequence Editor displays a message.
<i>Trim in Volts</i>	Place a check mark in this option to set the output level based on voltage instead of a unitless control (trim) for this weld sequence. If you are connected to a welding power source and this property differs from the power source's configuration, Weld Sequence Editor displays a message. This feature is only available on a Power Wave® with a Power Feed 10M or Power Feed 84. The <i>Trim in Volts</i> option is not available when connected to a Power Wave® 300C or when the Power Wave® type is undetected.
Wire Package	
<i>Wire Diameter and Metal Density</i>	In the <i>Wire Diameter</i> field, enter the diameter of wire used for the welds in this weld sequence. From the <i>Metal Density</i> drop-down, select the density of the metal from which the wire is composed. If none of the available options apply to the wire loaded into the wire feeder, select <i>User Defined Density</i> from the drop-down and enter the density value in the text field that appears. If a <i>Dual Head Feeder</i> is used, configuration options for each feed head will be shown. When the Weld Operator loads this weld sequence file, Weld Sequencer changes the

Field	Description
	<i>Wire Package</i> information on the Welding Power Source to match the information you entered here.
Power Feed 10M and Power Feed 84 User Interface Controls	
<i>Automatic and Manual</i>	The <i>Automatic</i> and <i>Manual</i> columns let you control the User Interface lockout when the weld sequence is in <i>Automatic</i> mode and when the Weld Operator puts the sequence into <i>Manual</i> mode. Simply select the appropriate lockout preferences in each column.
<i>Master Lockout</i>	<p>The <i>Master Lockout</i> checkbox allows you to lock all user interface controls for this weld sequence, preventing the operator from making any changes.</p> <p>The <i>Master Lockout</i> checkbox should not be checked if the <i>Save User Preferences</i> feature is being used.</p> <p><i>Master Lockout</i> takes precedence over the <i>Encoder Lockout</i>, <i>MemorySave Lockout</i>, <i>Memory Button Disable</i>, <i>Mode Select Panel Lockout</i> and <i>Preference Lock</i> options.</p>
<i>Encoder Lockout</i>	<p>The <i>Encoder Lockout</i> drop-down allows you to lock one or both of the upper knobs (encoders) on the Welding Power Source for this weld sequence, preventing the operator from changing wire feed speed, amps, volts or trim. The function of each upper knob depends on the selected weld mode. When a constant current weld mode is selected (e.g., Stick, TIG, Gouge), the upper right knob will always function as an on/off switch.</p> <p>In order to adjust and <i>Save User Preferences</i>, the Encoders should be unlocked to allow the operator to adjust the allowed parameters.</p> <p>Select the appropriate lockout option, setting the options for both <i>Automatic</i> and <i>Manual</i> operation of the weld sequence.</p>
<i>MemorySave Lockout</i>	<p>The <i>MemorySave Lockout</i> allows you to control whether the operator can overwrite the memories on the Welding Power Source with new data.</p> <ul style="list-style-type: none"> ▪ <i>Unlocked</i>: When you select <i>Unlocked</i>, the operator can save memories and reconfigure limits set on the machine. ▪ <i>Fully Locked</i>: Fully Locked prevents the memories from being changed and prohibits reconfiguration of limits on the machine. Do not choose this setting when enabling the <i>Save User Preferences</i> feature. ▪ <i>Allow Saving Within Limits</i>:
<i>Memory Button Disable</i>	<p>If you want to enable/disable a specific memory button on the User Interface, you can select the memory button from the <i>Memory Button Disabled</i> drop-down (or enable/disable ALL memories).</p> <p>When a memory is disabled, you cannot restore Weld Procedures from or save Weld Procedures to that memory.</p> <p>If using the <i>Save User Preferences</i> feature, Memories 1 and 2 (at a minimum) have to be enabled.</p> <p>NOTE In multi-head systems, this parameter disables the same memory buttons on</p>

Field	Description
	both feed heads.
<i>Mode Select Panel Lock</i>	<p>The Mode Select Panel Lock allows you to select between several Mode Select Panel lockout preferences. This helps you control the selections the Weld Operator may make on the Welding Power Source.</p> <ul style="list-style-type: none"> ▪ <i>All MSP Options Unlocked:</i> All adjustable parameters on the Mode Select Panel are unlocked. ▪ <i>All MSP Options Locked:</i> All knobs and buttons on the Mode Select Panel are locked. ▪ <i>Start & End Options Locked:</i> The Start and End parameters on the Mode Select Panel are locked; all others are unlocked. ▪ <i>Weld Mode Option Locked:</i> The Weld Operator cannot change the Weld Mode from the Mode Select Panel; all other Mode Select Panel settings are unlocked. ▪ <i>Wave Control Options Locked:</i> The Wave Control parameters on the Mode Select Panel are locked; all others are unlocked. ▪ <i>Start, End & Wave Options Locked:</i> The Start, End and Wave Control parameters on the Mode Select Panel are locked; all others are unlocked. ▪ <i>Start, End & Mode Options Locked:</i> The Start, End and Weld Mode Select parameters on the Mode Select Panel are locked; all others are unlocked.
<i>Preference Lock</i>	<p>With the <i>Preference Lock</i> checkbox, you can control whether the Weld Operator can modify the setup parameters on the Welding Power Source with or without a passcode.</p> <ul style="list-style-type: none"> ▪ Unchecked: The operator does not need to enter the passcode to change any setup menu parameter, even if the passcode is non-zero. ▪ Checked: The operator must enter the passcode (if the passcode is non-zero) in order to change any setup menu parameters.
<i>Passcode</i>	<p>Creating a passcode allows you to prevent unauthorized changes to the equipment for this weld sequence. The default passcode is zero, which allows full access. A non-zero passcode will prevent unauthorized:</p> <ul style="list-style-type: none"> ▪ changes to memory limits ▪ saving to memory (if <i>Memory Save Lockout</i> is disabled) ▪ changes to setup parameters (if the <i>Preference Lock</i> checkbox is unchecked) <p>Valid passcode entries are from 0 to 9998.</p>
Power Wave® 300C User Interface Controls	
<i>Weld Feedback Persist</i>	Enable the Power Wave® User Interface to display values from the last weld after completion.
<i>Weld Feedback Time</i>	The amount of time the values from the last weld are displayed on the User Interface.
<i>Homescreen</i>	You can control whether the Power Wave® User Interface displays a <i>Simplified</i> or

Field	Description
<i>Layout</i>	<i>Advanced layout.</i>
<i>Restrict Start/End Settings</i>	Restrict use of the Start and End parameters on the Power Wave® User Interface.
<i>Restrict Wave Controls</i>	Restrict use of the Wave Control parameters on the Power Wave® User Interface.
<i>Restrict Remote Range</i>	Restrict the ability to make adjustments using a Remote Pot.
<i>Restrict Trigger Interlock</i>	Restrict the ability to switch between 2-Step and 4-Step.
<i>Memory Only Mode</i>	Choose whether the operator is limited to settings saved in memory when welding in manual mode.
<i>Memory Modification</i>	Choose whether the operator can save changes to memory.

Weld Record Logging

A weld record is a string of data from the Welding Power Source. This data contains the details of an individual weld, from the arc start time to the WeldScore™ of the weld. The welding power source gathers this data and then transmits it to the Lincoln Electric software connected to the power source.

The Weld Record Logging feature in Weld Sequencer receives the same weld record data that the Welding Power Source sends to CheckPoint™ and stores it in the Weld Sequencer database. In addition, the database records includes sequence-specific welding information such as the sequence file name, number of welds and whether the weld validation passed or failed.

Each time the sequence runs the Weld Record Logging feature stores summary information from the sequence, information on every Function in the sequence and the weld Record.

Since Weld Sequencer saves the weld record to the Weld Sequencer database, you can search the database for related welds on a variety of parameters. For example, John at Advanced Manufacturing searches the database for all welds made using a specific weld sequence file and reviews each of the weld records. He can also search the database for those weld records related to a specific part serial number.

Table 5.2 explains the database tables in more detail.

STOP | Remember: Using this option increases the size of the database. Each weld record is approximately 1600 bytes.

TIP | Weld Record Logging is also good if you want to keep data locally (perhaps there is no Internet connection)

Table 5.2 Data Available in the Database Tables

Column	Description
Data Available in the Weld Records Table	
<i>WeldRecordId</i>	This column displays the unique database identifier for this weld record in Weld Sequencer database. This is different from the <i>WeldId</i> column, which is the identifier used by the Welding Power Source.
<i>PC_CreatedOnUTC</i>	This is the time from the computer running the Weld Sequencer and the weld sequence file, which could be different from the computer running the Weld Sequencer database.
<i>SequenceFile</i>	This is simply the file name for the weld sequence file used when creating this weld record. All functions and weld validations used for this weld record are included in the file listed here.
<i>PartName</i>	This column displays the assembly name associated with this weld. You can find this information in the <i>Part Name</i> field of the weld sequence under <i>Global Properties</i> (page 5.1).
<i>FunctionType</i>	This column displays the type of sequence function that determined the parameters of this weld: <i>Welding</i> , <i>Weld Accumulator</i> or <i>Weld Open</i> .
<i>FunctionName</i>	This column displays the description of the function from the <i>Name</i> field of the <i>Properties</i> window. For example, Figure 6.11 on page 6.8.
<i>ValidationPassed</i>	This column indicates if the validations that were set on the Weld Validations tab of the welding function passed.
<i>PowerSourceStartOfWeld</i>	This is the start time for this specific weld on the Welding Power Source.
<i>IsPowerSourceTimeUTC</i>	This column displays whether the time stamp of the power source at the beginning of the weld is in UTC format.
<i>ArcTime</i>	The time displayed in this column is the length of time it took to create the individual weld.
<i>WeldProfile</i>	This is the Weld Profile used for creating this individual weld. In the weld sequence, you can find this in the <i>Weld Profile</i> field of the welding function's properties.
<i>CausedLatchedFault</i>	This column indicates if this weld went outside the limits set by the Weld Profile for the weld, which faulted the power source and caused it to stop welding immediately. This is also known as a "Fault System" event. The Weld Operator would have been able to make adjustments and begin welding again.
<i>CausedFault</i>	This column indicates if a fault occurred as a result of this weld.

Column	Description
<i>CausedLatchedAlarm</i>	This column indicates if a weld went outside the limits set by the Weld Profile and caused the power source to enter into a faulted state (also known as a “Alarm Latch” event). In order for the power source to continue welding, the Weld Operator would have had to clear the fault.
<i>CausedAlarm</i>	This column indicates if an alarm was issued for an event that occurred while making this weld.
<i>ArcTimeExceededHigh</i>	This column indicates if the duration of the weld went above the high end of the time limit that was set in the Weld Profile used to make the weld.
<i>ArcTimeExceededLow</i>	This column indicates if the duration of the weld went below the low end of the time limit that was set in the Weld Profile used to make the weld.
<i>IsShortWeld</i>	This column indicates if the duration of the weld less than the Start plus End delay times set in the Weld Profile used to make the weld.
<i>ArcTimeOutOfLimits</i>	This column indicates if the arc time for the weld went outside the high or low <i>Weld duration limit</i> set in the Weld Profile used to make the weld.
<i>WeldScoreExceededLow</i>	This column indicates if the WeldScore® of the weld went below the WeldScore® limit that was set in the Weld Profile used to make the weld.
<i>WireSpeedExceededHigh</i>	This column displays whether the wire feed speed went above the wire feed speed limit set in the Weld Profile that was used to make the weld.
<i>WireSpeedExceededLow</i>	This column displays whether the wire feed speed went below the wire feed speed limit set in the Weld Profile that was used to make this weld.
<i>VoltageExceededHigh</i>	This column displays whether the arc voltage went above the high end of the arc voltage limit set in the Weld Profile that was used to make this weld.
<i>VoltageExceededLow</i>	This column displays whether the arc voltage went below the low end of the arc voltage limit set in the Weld Profile that was used to make this weld.
<i>CurrentExceededHigh</i>	This column displays whether the current went above the high end of the arc current limit set in the Weld Profile that was used to make this weld.
<i>CurrentExceededLow</i>	This column displays whether the current went below the low end of the arc current limit set in the Weld Profile that was used to make this weld.
<i>CurrentAverage</i>	Hundreds of times per second, the Welding Power Source takes a measurement of the arc current while the welder is active for this weld (minus the Start and End delays). When the weld is complete, the power source averages those measurements together. The <i>CurrentAverage</i> column displays that average arc current value for this weld.
<i>CurrentMax</i>	The <i>CurrentMax</i> column displays the highest arc current measurement taken by the Welding Power Source throughout the duration of this weld (minus the Start and End delays).

Column	Description
<i>CurrentMin</i>	The <i>CurrentMin</i> column displays the lowest arc current measurement taken by the Welding Power Source throughout the duration of this weld (minus the Start and End delays).
<i>CurrentPercentHigh</i>	This value is the percentage of measurements taken during the weld (minus the Start and End delays) that were above the high end of the arc current limit set in the Weld Profile that was used to make this weld.
<i>CurrentPercentLow</i>	This value is the percentage of measurements taken during the weld (minus the Start and End delays) that were below the low end of the arc current limit set in the Weld Profile that was used to make this weld.
<i>CurrentHighLimit</i>	This column displays the high end of the arc current limit that was set in the Weld Profile used to make the weld.
<i>CurrentLowLimit</i>	This column displays the low end of the arc current limit that was set in the Weld Profile used to make the weld.
<i>VoltageAverage</i>	Hundreds of times per second, the Welding Power Source takes a measurement of the arc voltage while the welder is active for this weld (minus the Start and End delays). When the weld is complete, the power source averages those measurements together. The <i>VoltageAverage</i> column displays that average arc voltage value for this weld.
<i>VoltageMax</i>	The <i>VoltageMax</i> field displays the highest arc voltage measurement taken by the Welding Power Source throughout the duration of this weld (minus the Start and End delays).
<i>VoltageMin</i>	The <i>VoltageMin</i> field displays the lowest arc voltage measurement taken by the Welding Power Source throughout the duration of this weld (minus the Start and End delays).
<i>VoltagePercentHigh</i>	This value is the percentage of measurements taken during the weld (minus the Start and End delays) that were above the high end of the arc voltage limit set in the Weld Profile that was used to make this weld.
<i>VoltagePercentLow</i>	This value is the percentage of measurements taken during the weld (minus the Start and End delays) that were below the low end of the arc voltage limit set in the Weld Profile that was used to make this weld.
<i>VoltageHighLimit</i>	This column displays the high end of the arc voltage limit that was set in the Weld Profile used to make the weld.
<i>VoltageLowLimit</i>	This column displays the low end of the arc voltage limit that was set in the Weld Profile used to make the weld.

Column	Description
<i>WireSpeedAverage</i>	Hundreds of times per second, the Welding Power Source takes a measurement of the speed at which the wire is put into the weld (minus the Start and End delays). When the weld is complete, the power source averages those measurements together. The <i>WireSpeedAverage</i> column displays that average wire feed speed value for this weld.
<i>WireSpeedMax</i>	The <i>WireSpeedMax</i> column is the highest wire feed speed measurement taken by the Welding Power Source throughout the duration of this weld (minus the Start and End delays).
<i>WireSpeedMin</i>	The <i>WireSpeedMin</i> field displays the lowest wire feed speed measurement taken by the Welding Power Source throughout the duration of this weld (minus the Start and End delays).
<i>WireSpeedPercentHigh</i>	This value is the percentage of measurements taken during the weld (minus the Start and End delays) that were above the wire feed speed limit set in the Weld Profile that was used to make this weld.
<i>WireSpeedPercentLow</i>	This value is the percentage of measurements taken during the weld (minus the Start and End delays) that were below the wire feed speed limit set in the Weld Profile that was used to make this weld.
<i>WireSpeedHighLimit</i>	The <i>WireSpeedHighLimit</i> column simply displays the high end of the wire feed speed limit that was set in the Weld Profile used for the weld.
<i>WireSpeedLowLimit</i>	The <i>WireSpeedLowLimit</i> column simply displays the low end of the wire feed speed limit that was set in the Weld Profile used for the weld.
<i>WeldScoreAverage</i>	The <i>WeldScoreAverage</i> column displays the average score for this weld. Every quarter of a second, the Welding Power Source compares the performance of the weld against the trained weld for the Weld Profile being used. When the weld is complete, the power source averages those measurements together for an average WeldScore® value. For more details on WeldScore®, please refer to the <i>Power Wave® Manager User Manual</i> (IM8002).
<i>WeldScoreMax</i>	The <i>WeldScoreMax</i> column is the highest WeldScore® measurement calculated by the Welding Power Source throughout the duration of this weld (minus the Start and End delays).
<i>WeldScoreMin</i>	The <i>WeldScoreMin</i> column displays the lowest WeldScore® measurement taken by the Welding Power Source throughout the duration of this weld (minus the Start and End delays).
<i>WeldScorePercentLow</i>	This value is the percentage of measurements taken during the weld (minus the Start and End delays) that were below the WeldScore® limit set in the Weld Profile that was used to make this weld.

Column	Description
<i>WeldScoreLowLimit</i>	This column displays the WeldScore® limit that was set in the Weld Profile used to make this weld.
<i>ArcTimeMaxLimit</i>	This column displays the high end of the time limit that was set in the Weld Profile used to make the weld.
<i>ArcTimeMinLimit</i>	This column displays the low end of the time limit that was set in the Weld Profile used to make the weld.
<i>StartDelay</i>	This is the amount of delay that was used for the beginning of this weld. The <i>Start delay</i> is an option set in the Weld Profile and is the amount of time (in seconds) that the power source will wait, directly after the start of a weld, until the limits entered for the Weld Profile begin to be applied. This option is necessary because the start of a weld is often unpredictable and may fall out of limits easily. For more in-depth details on Start Delay, please refer to the <i>Power Wave® Manager User Manual (IM8002)</i> .
<i>EndDelay</i>	This is the amount of delay used at the end of this weld. The <i>End delay</i> is an option set in the Weld Profile and is the amount of time (in seconds) directly before the end of a weld that the power source stops applying the limits entered for the Weld Profile. This option is necessary because, at the end of a weld, the set points for the Welding Power Source are often different than the rest of the weld (e.g., if the Power Wave® is in a burn-back state). For more in-depth details on End Delay, please refer to the <i>Power Wave® Manager User Manual (IM8002)</i> .
<i>SerialNumber</i>	The <i>Serial Number</i> column is the part serial number associated with this weld and entered with either a <i>Field Entry</i> function or a <i>PLC Field Entry</i> function.
<i>OperatorId</i>	This is the username of the person who was logged into Weld Sequencer during the creation of this weld.
<i>ConsumableLot</i>	The <i>Consumable Lot</i> is the consumable lot code that was entered with either a <i>Field Entry</i> function or a <i>PLC Field Entry</i> function.
<i>WeldId</i>	This column displays the identifier used by the Welding Power Source for this weld record. This is different from the <i>WeldRecordId</i> column, which is the database identifier for this weld record in the Weld Sequencer database.
<i>ConsumableDensity</i>	The <i>ConsumableDensity</i> column displays the density of the metal used for this individual weld. The system uses the wire density in its calculation of how much material was deposited for this weld.
<i>WireDiameter</i>	The <i>WireDiameter</i> column displays the diameter of the wire used for this individual weld. The system uses the wire diameter in its calculation of how much material was deposited for this weld.

Column	Description
<i>TrueEnergy</i>	<p>This column displays the True Energy™ calculated for this weld using the following equation:</p> $True\ Energy\ [J] = \frac{1}{n} \sum_{i=1}^n (v_i * i_i * t_i)$ <p>If the Welding Power Source that made the weld had older firmware and did not support the True Energy™ calculation, this column displays a 0.</p>
<i>Deposition</i>	The <i>Deposition</i> shows how much material was deposited during the weld, normalized to pounds per hour.
<i>PowerSourceName</i>	<p>This column displays the name of the Welding Power Source that was set by the user. Please refer to the Power Wave® Manager User Manual (IM8002) for information on setting this name.</p> <p>NOTE The power source name can be changed by the user. This value can be blank or may be the same for multiple power sources.</p>
<i>PowerSourceDeviceID</i>	This column shows a unique identifier for the Welding Power Source that made the weld. This value was assigned to the power source during its manufacture and cannot be changed.
<i>WeldMode</i>	This column shows the Weld Mode selected when this weld was made.
Data Available in the Weld Record Summary Table	
<i>WeldRecordSummaryId</i>	This field displays the unique database identifier for this weld summary in the Weld Sequencer database.
<i>Welder</i>	The name of the Power Wave® that was used during the weld sequence.
<i>PartName</i>	The text that was entered in the Part Name field in General Properties.
<i>CycleTime</i>	The total elapsed time to run the weld sequence.
<i>Arctime</i>	The total time for all welds made during the weld sequence.
<i>CompletedWelds</i>	The number of welds made during the weld sequence.
<i>ExpectedWelds</i>	The number of welds expected for the entire weld sequence.
<i>FeedHead1_WireDiameterter</i>	The WireDiameter field is the diameter of the wire used for this weld sequence. The system uses the wire diameter in its calculation of how much material was deposited for this weld sequence.
<i>FeedHead1_WireDensity</i>	The WireDensity field is the density of the metal used for this weld sequence. The system uses the wire density in its calculation of how much material was deposited for this weld sequence.
<i>FeedHead2_WireDiameterter</i>	The WireDiameter field is the diameter of the wire used for this weld sequence. The system uses the wire diameter in its calculation of how much material was deposited for this weld sequence.

Column	Description
<i>FeedHead2_WireDensity</i>	The WireDensity field is the density of the metal used for this weld sequence. The system uses the wire density in its calculation of how much material was deposited for this weld sequence.
<i>TotalDeposition</i>	The deposition field shows how much material was deposited during the weld sequence, normalized to pounds per hour.
<i>OperatorId</i>	This is the username of the person who was logged into Weld Sequencer during the weld sequence.
<i>PartSerialNumber</i>	The Serial Number is the part serial number associated with this weld and entered with either a Field Entry function or a PLC Field Entry function.
<i>ConsumableLot</i>	The Consumable Lot is the consumable lot code that was entered with either a Field Entry function or a PLC Field Entry function.
<i>CycleStartTime</i>	This is the start time from the computer running the Weld Sequencer and the weld sequence file, which could be different from the computer running the WeldSequencer database.
<i>CycleEndTime</i>	This is the end time from the computer running the Weld Sequencer and the weld sequence file, which could be different from the computer running the WeldSequencer database.
Data Available in the <i>Weld Record Functions</i> Table	
<i>WeldRecordFunctionsId</i>	This field displays the unique database identifier for this weld function list in Weld Sequencer database.
<i>WeldRecordSummaryId</i>	This field displays the unique database identifier for this weld summary in Weld Sequencer database
<i>WeldRecordId</i>	This column displays the unique database identifier for this weld record in Weld Sequencer database. This is different from the <i>WeldId</i> column, which is the identifier used by the Welding Power Source.
<i>StepNumber</i>	This is the number of the step that contains this function. This number is in the lower area of the vertical bar in the Weld Sequencer Editor.
<i>FunctionType</i>	Identifies the type of function.
<i>FunctionName</i>	This is the name assigned to the function.
<i>WeldId</i>	This field displays the identifier used by the Welding Power Source for this weld. This is different from the <i>WeldRecordId</i> column, which is the database identifier for this weld record in the Weld Sequencer database.
<i>Status</i>	This indicates whether the function initially passed or failed validation.
<i>FinalStatus</i>	This indicates whether the function passed or failed validation at the completion of the weld sequence. The <i>Review</i> function may be used to change the status after visual inspection.

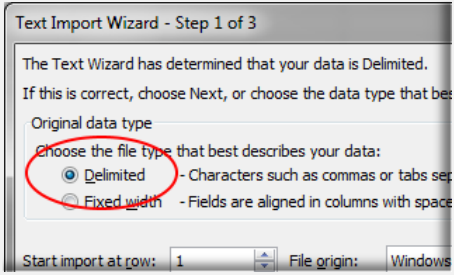
Column	Description
<i>ExecutionTime</i>	This is the amount of time used for the function to complete.
<i>ExpectedTime</i>	This is the estimated time entered into the function.
<i>ManualTime</i>	This is the amount of time where control was switched to Manual Mode.
<i>Miscellaneous</i>	This is a text field used to store messages. For an <i>Alert</i> function, the validation results will be stored.
<i>FunctionId</i>	This field is a system generated identifier provided for each function.

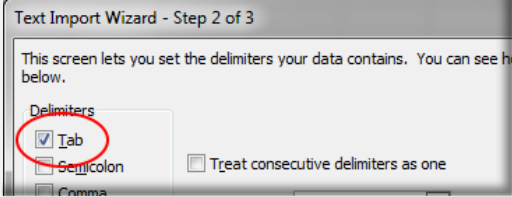
Opening Tab-Delimited Sequence Reports

Tab-delimited Sequence Report files are special text files where each piece of data in each of the weld records is separated by a tab character. Once you have the Sequence Report file, you can use it a variety of ways. One of the common ways to open the file is to open it in Microsoft® Excel.

NOTE | Depending how you open this file, the formatting may look strange.

To import a Sequence Report into Microsoft® Excel:

Procedure	Details
1. Open Microsoft® Excel.	
2. Select File > Open from the main menu.	
3. Navigate to <i>C:\Weld Sequencer Files\Logs\ SequenceReports</i> .	
4. Select your report file and click Open .	<p>The <i>Text Import Wizard</i> in Microsoft® Excel should open.</p> 
5. Verify you have <i>Delimited</i> chosen under <i>Original data type</i> and click Next .	

Procedure	Details
<p>6. On Step 2 of the <i>Text Import Wizard</i>, verify there is a check mark next to <i>Tab</i> in the <i>Delimiters</i> section.</p>	<p>Weld Sequencer exports Sequence Reports as tab-delimited files (as of 9/29/14). If you have a different delimiter, choose the appropriate option.</p> 
<p>7. Click Next.</p>	
<p>8. On Step 3 of the <i>Text Import Wizard</i>, click Finish.</p>	<p>Microsoft® Excel opens the file with data separated into columns based on the delimiter.</p>

Weld Procedures Library

The **Weld Procedures** in the top toolbar is a library of procedures that you can call from the welding functions in this weld sequence. This allows you to set the parameters for each type of weld (i.e., what will be used for Procedure A and Procedure B on each weld). When you change a parameter in the library, any function using that type of weld automatically begins using the new parameter.

When the Weld Operator launches Weld Sequencer, the application saves the weld procedures currently found on the connected Welding Power Source. Once the operator closes the application, Weld Sequencer reloads those weld procedures back to the Welding Power Source. This allows the power source to retain its original procedures and prevents customized procedures from a sequence file to remain active in the Welding Power Source.

NOTE | There is an exception, however. If parameter P.16 (Push-Pull Gun Knob Behavior) is set to either “Gun Pot Enabled” or “Gun Pot Proc A” on the wire feeder, this setting overrides the defined wire feed speed from the weld procedure. Please refer to the appropriate Operator Manual for your Welding Power Source or wire feeder for more information on using this parameter.

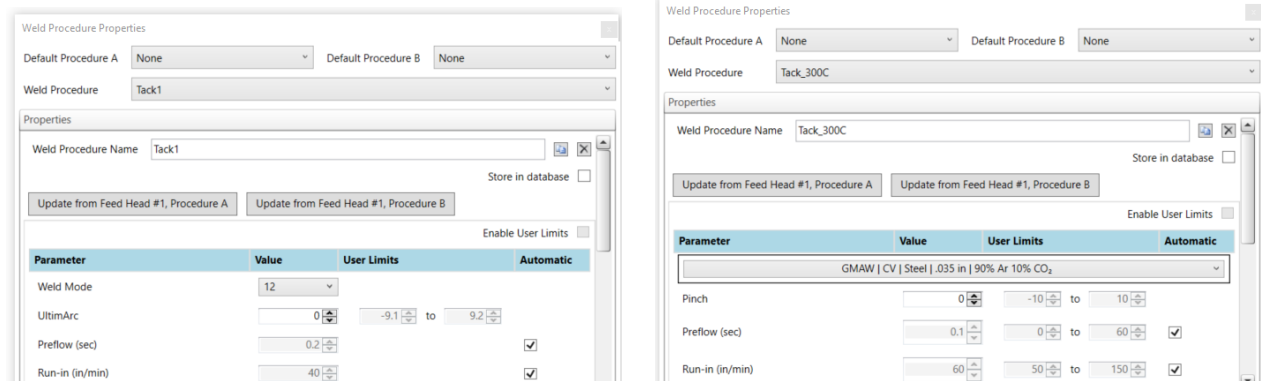




Figure 5.4 Weld Procedures Library

For existing weld procedures in a sequence, you can click the appropriate **Update from Feed Head** button (Figure 5.4) to replace all of the parameters with those from the connected power source.

Older Weld Sequence files may have weld procedures that do not have parameter limits. When this condition exists, a warning icon  displays next to the *Weld Mode* field. You can click the **Refresh** button to load the parameter limits from the connected power source.

NOTE | If a weld procedure uses a *Weld Mode* that does not exist in the connected power source, a warning icon  appears next to the *Weld Mode* field. Hover your mouse over the icon to display an explanation.

You can also set the defaults for Procedure A and Procedure B to help you quickly build your weld sequence. If you have a sequence where the majority of the welds use the same procedure, you can use the *Default Procedure A* and *Default Procedure B* drop-downs at the top of the window to automatically pre-populate the **Weld Procedures** tab on every welding function you add.

STOP | You must connect to the **Welding Power Source** in order to load the weld parameters into the weld sequence file.

STOP | Weld Sequencer automatically connects to the last **Welding Power Source** connected. Before editing the weld parameters, be sure you are connected to the correct **Welding Power Source**.

NOTE | For details on the specific parameters available, please refer to the appropriate **Operator Manual** for your **Welding Power Source** or wire feeder.

TIP | If you have a **Dual Head** feeder for this weld sequence, you will have two sets of default drop-downs—one set for each feed head.

Adding a Weld Procedure to the Library

In order to add a Weld Procedure for a type of weld, you need to connect to the appropriate Welding Power Source to be used with the weld sequence file and load the available parameters into the file. You can then create the set of procedures you need for the welding functions in your sequence. (See page 5.20 for information on saving Weld Procedures to the database instead of saving in the sequence file.)

NOTE | If the Workpoint and Trim units differ from those established in the Global Properties for this weld sequence, Weld Sequence Editor displays a warning message.

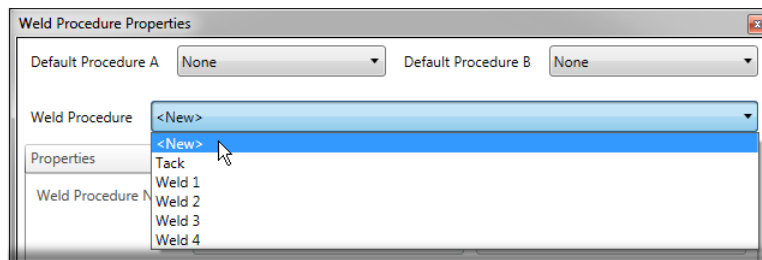
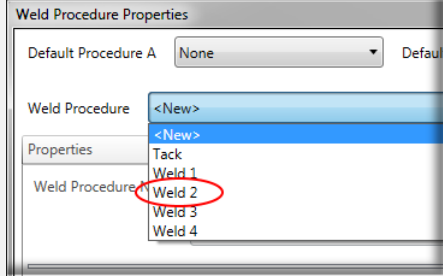


Figure 5.5 Adding a Weld Procedure

To add a procedure to the Weld Procedures library:

Procedure	Details
1. Launch the Weld Sequence Editor and load your weld sequence file.	
2. Log in to Weld Sequence Editor.	
3. Click the PS Connect button and connect to the Welding Power Source.	See page 2.11 for more in-depth information.
4. Click the Weld Procedures button in the top toolbar.	
5. Select <New> from the <i>Weld Procedure</i> drop-down if not already selected.	See Figure 5.5.
6. Enter a name for the type of weld in the <i>Weld Procedure Name</i> field.	
7. Click the Load from Feed Head #1, Procedure A or Load from Feed Head #1, Procedure B button to load this weld procedure from the appropriate procedure group on the wire feeder.	Weld Sequence Editor reads the available parameters from this procedure group. TIP If you have a Dual Head feeder, there are two buttons for each feed head.

Procedure	Details
<p>8. Click OK.</p>	<p>Weld Sequence Editor adds a new entry to the <i>Weld Procedure</i> drop-down.</p>  <p>TIP You can add multiple weld procedures in one sitting; however, be sure you click OK when finished to save your changes.</p>

Adding a Weld Procedure to the Database

You also have the option of saving a Weld Procedure to a common database so that multiple weld sequence files can use the same weld procedure. This allows you to create the weld procedure once, assign the weld procedure to functions in multiple files, and then only update the procedure once. When you update the weld procedure from within any of the sequence files, every weld sequence that uses that procedure will always use the latest parameters.

STOP | Use caution when making changes to or deleting Weld Procedures saved in the database. Any weld sequence file that uses the procedure will be impacted.

Saving a Weld Procedure to the common database is simple:

1. Create your weld procedure (page 5.19) and be sure to save it.
2. Edit the *Weld Procedure Name* field and enclose the name in square brackets (Figure 5.6).
3. Save the Weld Procedure.

The brackets tell Weld Sequence Editor to save the weld procedure to the database so you can pull it from the database for other weld sequence files. When you select the weld procedure on a function (page 6.33), the drop-down contains all weld procedures created for the individual sequence file and all weld procedures saved in the database (enclosed in square brackets).

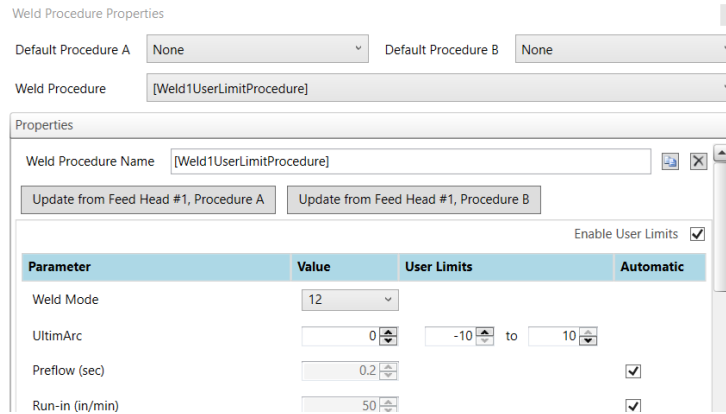


Figure 5.6 Weld Procedure Saved in the Database

NOTE | Each computer using Weld Sequencer out on the shop floor must have access to the database when using this feature.


User Limits

The *Save User Preferences* feature allows a Weld Operator to adjust and save their preferred settings for each Weld Procedure. The Weld Engineer enables this feature by checking the *Enable User Limits* checkbox and choosing the range for each parameter in the Weld Procedure.

NOTE | The Weld Procedure must be stored in the database when using *User Preferences* and *User Limits*.

Editing a Weld Procedure in the Library

When you need to edit welding parameters in a procedure, you do not need to connect to the Welding Power Source to make your changes. You can make your changes, and once the Weld Operator loads the weld sequence file, Weld Sequencer updates the Welding Power Source before welding begins. Once you make your changes to the procedure in the Weld Sequence Editor, any function using that type of weld reflects the change.

TIP | If a Weld Procedure uses a weld mode that does not exist on the connected power source, a warning icon  appears next to the *Weld Mode* field. Hover your mouse over the icon for an explanation of the error.


If you want to update the weld procedure to match the procedure on the connected Welding Power Source, simply click the **Refresh** button. The Weld Sequence Editor clears the current parameters and replaces them with the values from the Welding Power Source.

Procedure	Details
<ol style="list-style-type: none"> 1. Launch the Weld Sequence Editor and load 	

Procedure	Details
your weld sequence file.	
2. Click the Weld Procedures button in the top toolbar.	
3. From the <i>Weld Procedure</i> drop-down, select the type of weld you want to edit.	
4. Make the changes you need to make.	
5. Click OK .	Weld Sequencer updates the parameters and all the functions using this weld procedure automatically begin to use the new parameters.


Deleting a Weld Procedure from the Library

When you need to remove a weld procedure from a weld sequence, you do not need to connect to the Welding Power Source to make your changes. Once you make your changes to the procedure in the Weld Sequence Editor, any function using that type of weld reflects the change.

Procedure	Details
1. Launch the Weld Sequence Editor and load your weld sequence file.	
2. Click the Weld Procedures button in the top toolbar.	
3. From the <i>Weld Procedure</i> drop-down, select the procedure you want to remove.	
4. Click the Delete icon  next to the <i>Weld Procedure Name</i> field.	
5. Click OK to commit your changes.	Weld Sequence Editor removes the weld procedure from the weld sequence file.

Copying Weld Procedures

When you need to copy a Weld Procedure while building a weld sequence, follow these steps.

Procedure	Details
1. Launch the Weld Sequence Editor and load your weld sequence file.	
2. Click the Weld Procedures button in the top toolbar.	
3. From the <i>Weld Procedure</i> drop-down, select the procedure you want to copy.	
4. Click the Copy icon  next to the <i>Weld</i>	A copy of the <i>Weld Procedure</i> is created and “- Copy” is added to the <i>Weld Procedure Name</i> field.

Procedure	Details
<i>Procedure Name</i> field.	You can rename this to anything you want.
5. Click OK to commit your changes.	

Weld Validations Library

You create all of the validations needed in this weld sequence under **Weld Validations** in the top toolbar. Once you create your “library” of welding requirements, you can select them on the **Weld Validation** tab of each welding function.

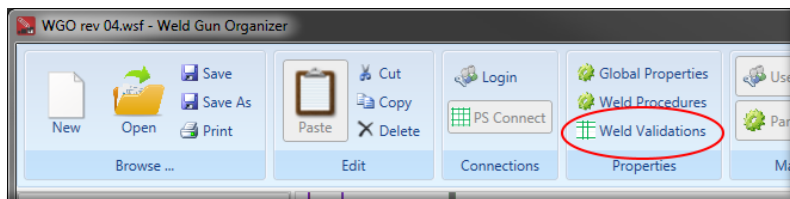


Figure 5.7 Weld Validations

Adding Weld Validations to the Library

You can validate a weld based directly on the properties of the weld record or based on the limits from the Weld Profile used for the weld. These validations instruct the sequence what to do next based on average values from the weld record or properties of Weld Profile events.

- The validation using the weld record compares the values directly from the weld record (e.g., deposition, duration, short weld alert) and does not involve the limits from the Weld Profile.
- Validating based on Weld Profile limits compares the average values in the weld record to the limits set in the Weld Profile, which you can set on the **Properties** tab of the welding function.

To create validation rules, select *<New>* from the *Select Weld Validation* drop-down; enter a name for the validation in the *Weld Validation Rule* field; and select the appropriate property from the *Property Name* drop-down. Use the *Operation* and *Value* fields to set the condition for passing the weld. Table 5.3 explains each of the options in the *Property Name* drop-down in detail. Be sure to click **OK** to commit your changes.

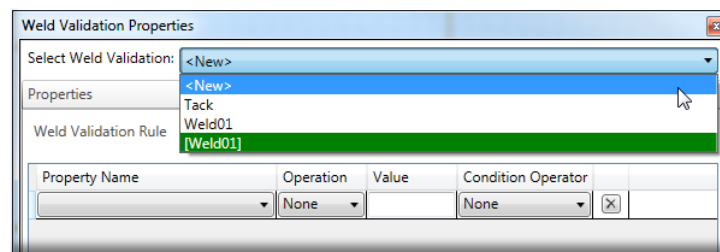


Figure 5.8 Adding a Validation

The *Condition Operator* drop-down allows you to add more than one validation for the weld. Select *AND* from the drop-down to tell the weld sequence that the weld must meet both conditions.

TIP | Be sure that you have *None* selected in the *Condition Operator*

drop-down on the last condition of the rule. Otherwise, the sequence errors out for the Weld Operator.

For example, John at Advanced Manufacturing has several tack welds in his weld sequence. He wants each of those welds to meet certain qualities before the Weld Operator can continue and to ensure the welds are consistent. Therefore, he created a “Tack” validation rule where the duration must be greater than one second but less than two seconds: *Duration* >= 1 AND *Duration* <= 2. These are John’s “good” conditions.

Table 5.3 Validation Properties Available in the Property Name Drop-down

Property Name	Description
(WR = Weld Record property; WP = Weld Profile property)	
<i>Current Alert</i>	(WP) This option allows you to validate the weld based on whether the arc current went above the maximum OR below the minimum limit set in the Weld Profile that was used to make this weld.
<i>Current Average</i>	(WR) Hundreds of times per second, the Welding Power Source takes a measurement of the arc current while the welder is active for this weld (minus the Start and End delays). When the weld is complete, the power source averages those measurements together. The <i>Current Average</i> property allows you to set the validation of the weld based on the average arc current value for this weld.
<i>Current Exceeded High Limit</i>	(WP) This option allows you to validate the weld based on whether the current went above the high end of the arc current limit set in the Weld Profile that was used to make this weld.
<i>Current Exceeded Low Limit</i>	(WP) This option allows you to validate the weld based on whether the current went below the low end of the arc current limit set in the Weld Profile that was used to make this weld.
<i>Current Maximum</i>	(WR) The <i>Current Maximum</i> option allows you to validate a weld based the highest arc current measurement taken by the Welding Power Source throughout the duration of the weld (minus the Start and End delays).
<i>Current Minimum</i>	(WR) The <i>Current Minimum</i> option allows you to validate a weld based on the lowest arc current measurement taken by the Welding Power Source throughout the duration of the weld (minus the Start and End delays).
<i>Deposition</i>	(WR) The <i>Deposition</i> option allows you validate a weld based on the total amount of material deposited during the welds (in lbs.) in the function. This is extremely useful with the Weld Accumulator function (page 6.29).
<i>Duration</i>	(WR) The <i>Weld Duration</i> displays the length of time (in seconds) from the time listed in the <i>Start of Weld</i> field to the time the Welding Power Source stopped welding.
<i>Short Weld Alert</i>	(WP) You can validate a weld based on whether it is a short weld (i.e., Welds with a duration less than the sum of the Start Delaytime plus the End Delaytime) as defined in the Weld Profile.
<i>Time Exceeded High Limit</i>	(WP) This option allows you to validate the weld based on whether the duration went above the time limit set in the Weld Profile that was used to make this weld.

Property Name	Description
<i>Time Exceeded Low Limit</i>	(WP) This option allows you to validate the weld based on whether the duration was below the time limit set in the Weld Profile that was used to make this weld.
<i>True Energy</i>	(WR) True Energy™ is a Lincoln Electric technology that uses the digital control system embedded in each Power Wave® power source to measure and calculate the instantaneous amount of energy put into a weld. The <i>True Energy</i> option allows you to set the validation of the weld based on the average True Energy™ put into this weld.
<i>Voltage Alert</i>	(WP) This option allows you to validate the weld based on whether the arc voltage went above the maximum OR below the minimum limit set in the Weld Profile that was used to make this weld.
<i>Voltage Average</i>	(WR) Hundreds of times per second, the Welding Power Source takes a measurement of the arc voltage while the welder is active for this weld (minus the Start and End delays). When the weld is complete, the power source averages those measurements together. The <i>Voltage Average</i> option allows you to set the validation of the weld based on the average arc voltage value for this weld.
<i>Voltage Exceeded High Limit</i>	(WP) This option allows you to validate the weld based on whether the arc voltage went above the high end of the arc voltage limit set in the Weld Profile that was used to make this weld.
<i>Voltage Exceeded Low Limit</i>	(WP) This option allows you to validate the weld based on whether the arc voltage went below the low end of the arc voltage limit set in the Weld Profile that was used to make this weld.
<i>Voltage Maximum</i>	(WR) The <i>Voltage Maximum</i> field allows you to validate a weld based on the highest arc voltage measurement taken by the Welding Power Source throughout the duration of this weld (minus the Start and End delays).
<i>Voltage Minimum</i>	(WR) The <i>Voltage Minimum</i> option allows you to validate a weld based on the lowest arc voltage measurement taken by the Welding Power Source throughout the duration of this weld (minus the Start and End delays).
<i>WeldScore Average</i>	(WR) Every quarter of a second, the Welding Power Source compares the performance of the weld against the trained weld for the Weld Profile being used. When the weld is complete, the power source averages those measurements together for an average WeldScore® value. The <i>WeldScore Average</i> option allows you to validate the welding function based on the average WeldScore® for the weld.
<i>WeldScore Low Alert</i>	(WP) In each Welding Power Source, you can have the power source issue an alert if the WeldScore® goes below a certain score. You can validate the weld on whether or not an alert was issued. For example, if a WeldScore Low alert was issued for the weld(s) performed in the weld function, you can forward the sequence to an <i>Alert</i> function or an <i>Approval</i> function to address the potential quality issue. If no alert was issued, the weld

Property Name	Description
	sequence can go on to the next function in the sequence.
<i>WeldScore Maximum</i>	(WR) The <i>WeldScore Maximum</i> option allows you to validate the weld(s) based on whether the maximum WeldScore® on the weld performed is above, below or equal to the number you specify here.
<i>WeldScore Minimum</i>	(WR) The <i>WeldScore Minimum</i> option allows you to validate the weld(s) based on whether the minimum WeldScore® on the weld performed is above, below or equal to the number you specify here.
<i>Wire Feed Speed Alert</i>	(WP) This option allows you to validate the weld based on whether the wire feed speed went above the maximum OR below the minimum limit set in the Weld Profile that was used to make this weld.
<i>Wire Feed Speed Average</i>	(WR) Hundreds of times per second, the Welding Power Source takes a measurement of the speed at which the wire is put into the weld (minus the Start and End delays). When the weld is complete, the power source averages those measurements together. The <i>Wire Feed Speed Average</i> option allows you to validate the weld based on the average wire feed speed value for the weld.
<i>Wire Feed Speed Exceeded High Limit</i>	(WP) This option allows you to validate the weld based on whether the wire feed speed went above the wire feed speed limit set in the Weld Profile that was used to make this weld.
<i>Wire Feed Speed Exceeded Low Limit</i>	(WP) This option allows you to validate the weld based on whether the wire feed speed went below the wire feed speed limit set in the Weld Profile that was used to make this weld.
<i>Wire Feed Speed Maximum</i>	(WR) The <i>Wire Feed Speed Maximum</i> option allows you to validate a weld based on the highest wire feed speed measurement taken by the Welding Power Source throughout the duration of the weld (minus the Start and End delays).
<i>Wire Feed Speed Minimum</i>	(WR) The <i>Wire Feed Speed Minimum</i> option allows you to validate a weld based on the lowest wire feed speed measurement taken by the Welding Power Source throughout the duration of the weld (minus the Start and End delays).

Adding a Weld Validation to the Database

You can save a Weld Validation to a common database so that multiple weld sequence files can use the same Weld Validation. This allows you to create the Weld Validation once, assign the Weld Validation to functions in multiple files, and then only update the Validation once. When you update the Weld Validation from within any of the sequence files, every weld sequence that uses that Validation will always use the latest parameters.

STOP | Use caution when making changes to or deleting Weld Validations saved in the database. Any weld sequence file that uses the Validation will be affected.

Saving a Weld Validation to the common database:

1. Create your Weld Validation (page 5.19) and be sure to save it.
2. Edit the *Weld Validation Name* field and click the *Store in database* checkbox to enclose the name in square brackets (Figure 5.9).
3. Save the Weld Validation.

The brackets tell Weld Sequence Editor to save the weld Validation to the database so you can pull it from the database for other weld sequence files. When you select the weld Validation on a function (page 6.33), the drop-down contains all Weld Validations created for the individual sequence file and all Weld Validations saved in the database (enclosed in square brackets)

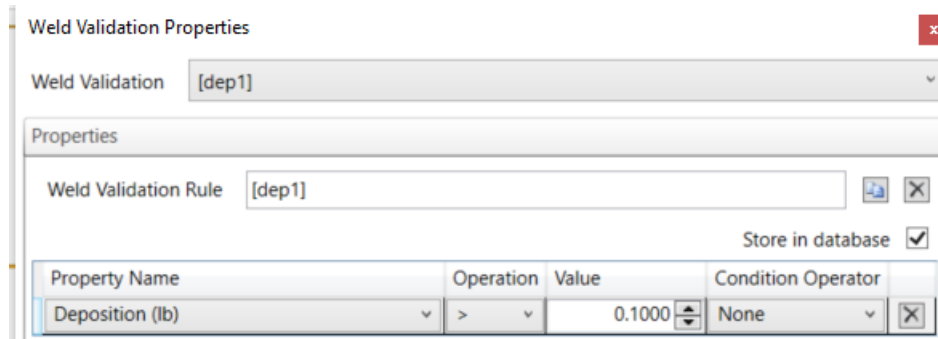


Figure 5.9 Weld Validation Saved in the Database

NOTE | Each computer using Weld Sequencer out on the shop floor must have access to the database when using this feature.

Editing a Weld Validation in the Library

To edit a validation rule, simply click the **Weld Validations** button in the top toolbar, select the appropriate entry from the drop-down and make your changes. Be sure to click the **OK** button to commit your changes.

TIP | If you want to edit multiple entries in one sitting, simply select each entry and edit. Then you can click OK once to commit all of the changes you made and close the window.

NOTE | Weld Validations added to the library from the Sequence Report Analysis tool use the naming convention "FunctionName X.Y" where FunctionName equals the function name; X equals the step number (found in the lower left corner of the vertical title bar); and Y equals the consecutive function for the step (starting at 0).

Deleting a Weld Validation from the Library


To remove a validation rule from the sequence, click the **Weld Validations** button in the top toolbar; select the entry you want to remove; and click the **Delete** icon  next to the *Weld Validation Rule* field. Be sure to click the **OK** button to commit your changes.

STOP | If you delete a validation rule that is currently in use by a weld

in the sequence, Weld Sequencer Editor automatically removes the selection from the welding function(s).

Copying Weld Validations

When you need to copy a Weld Validation while building a weld sequence, follow these steps.

Procedure	Details
1. Launch the Weld Sequence Editor and load your weld sequence file.	
2. Click the Weld Validations button in the top toolbar.	
3. From the <i>Weld Validation</i> drop-down, select the validation you want to copy.	
4. Click the Copy icon  next to the <i>Weld Validation Rule</i> field.	A copy of the <i>Weld Validation</i> is created and “-Copy” is added to the <i>Weld Validation Rule</i> field. You can rename this to anything you want.
5. Click OK to commit your changes.	

Report Analysis Tool

On page B.1, we explained the Two-Step Process for creating a weld sequence file. First, you build the skeleton of the sequence with all of the sequence functions you want to use and connect the functions to each other. Second, you add all the weld validations you want to use. It’s this second part that is time-consuming. The Report Analysis tool, however, can do it for you automatically.

NOTE | The weld record data saved in the report(s) use the active Weld Profile to omit starting and ending data. You must correctly configure the Weld Profile *Start* and *End* delays BEFORE collecting and analyzing the Report data.

When using average data for quick welds (approximately less than 5 seconds), the *Start* and *End* delays can have a significant impact on the analysis process and will not reflect an accurate reading for the steady state welding conditions. (For in-depth details on Weld Profiles, please refer to the *Power Wave® Manager User Manual (IM8002)*.)

NOTE | You must have already generated a series of Sequence Reports to use the Report Analysis tool.

After loading the XML Sequence Report files, the Report Analysis Wizard provides an automated analysis of the report files to create weld validations. A Sequence Report contains all raw data captured while welding with the weld sequence file and gives you a complete view of how a part was created.

When you create tab-delimited text files or Microsoft® Excel files for your Sequence Reports, Weld Sequencer also automatically creates an XML file for each report. **You need these XML files to use with Report Analysis.** The Report Analysis tool should find the XML files automatically for you, but you can generally find them in the following location if necessary:
 C:\Weld Sequencer Files\Logs\SequenceReports\XML.

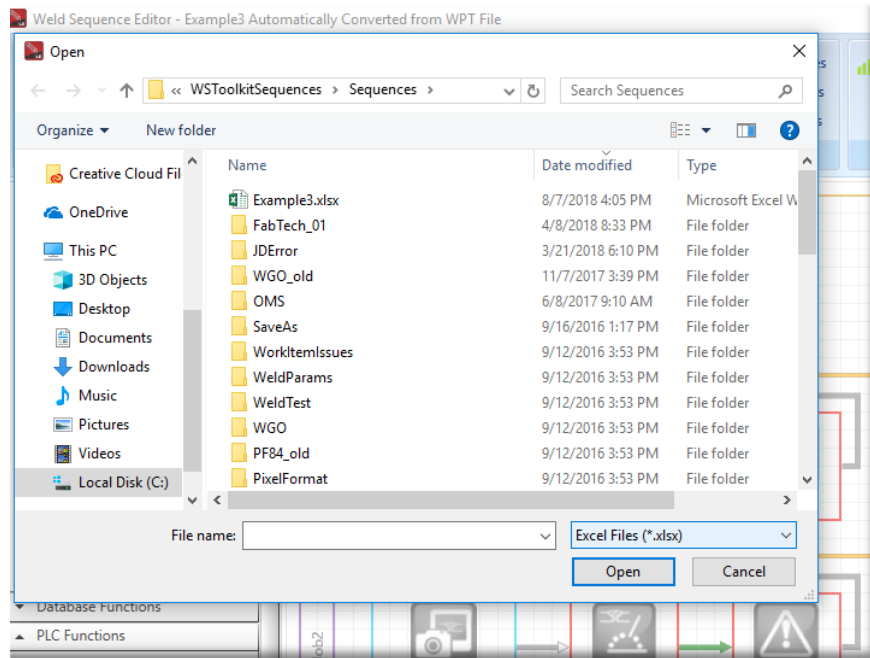
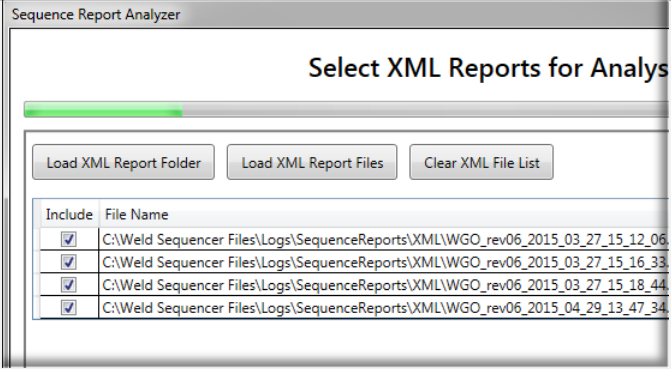
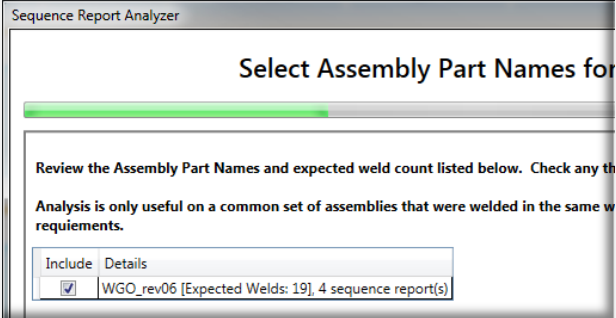


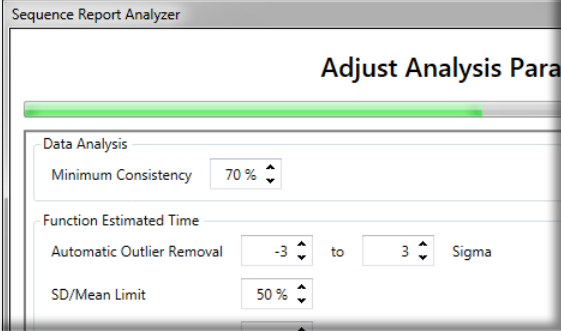
Figure 5.10 Create Microsoft® Excel Files

In order to use the Report Analysis Tool, you must have the weld sequence file you want to edit open in the Weld Sequence Editor. The intention of this tool is to modify your skeleton sequence. The Sequence Reports that you want to analyze must match this open file.

NOTE | You must have a weld sequence file open in Weld Sequence Editor to enable the Report Analysis button in the top toolbar.

Procedure	Details
Load Sequence Reports	
1. Open Weld Sequence Editor.	
2. Open the weld sequence file you want to edit.	
3. Click the Report Analysis button in the top toolbar.	The <i>Sequence Report Analyzer</i> window opens.

Procedure	Details
	
<p>4. Click either the Load XML Report Folder or Load XML Report Files button.</p>	<p>The Load XML Report Folder button allows you to load an entire folder of XML Sequence Reports.</p> <p>The Load XML Report Files button allows you to load specific individual XML file(s) from within a folder.</p> <p>TIP Weld Sequencer automatically sorts through the XML files and knows which files go with your open weld sequence file, as well as those report files that are empty of completed steps, executed functions or automatic welds. You will confirm the reports you want to use in a later step.</p>
<p>5. Repeat step 4 until satisfied that you have loaded all your XML report files.</p>	<p>You may have multiple Sequence Reports saved from several welding stations running the same weld sequence file.</p> <p>NOTE The list of XML files continues to build as you add more and more reports.</p>
<p>6. Click Next.</p>	<p>The <i>Select Assembly Part Names for Analysis</i> window displays.</p> 
<h3>Select Assembly Part Names for Analysis</h3>	
<p>7. Review the set(s) of Sequence Reports automatically selected by the Report Analysis tool.</p>	<p>The system compares the <i>Part Name</i> (under <i>Global Properties</i>) of the currently open weld sequence file to the Part Name in each Sequence Report.</p> <p>The Report Analysis tool automatically places a check mark next to the group(s) of files it determines are a match.</p>
<p>8. Place a check mark next</p>	<p>This can happen if the <i>Part Name</i> of the Sequence Report does not</p>

Procedure	Details
to any additional set(s) of reports you want to include.	match the open weld sequence file, but the Sequence Report still represents valid examples for analysis.
<p>9. Click Next.</p>	<p>The <i>Adjust Analysis Parameters</i> window displays.</p> 
Adjust Analysis Parameters	
<p>10. In the <i>Data Analysis</i> section, set the <i>Minimum Consistency</i> percentage.</p>	<p>The <i>Minimum Consistency</i> percentage represents the percentage of repeated Sequence Report parameter values where the data is consistent.</p> <p>For example, if you have this value set at 70%, then at least 70% of the parameter values contained in the Sequence Reports must be the same value to be automatically included for analysis.</p>
<p>11. In the <i>Function Estimated Time</i> section, set the parameters for the <i>Estimated Time</i> in the dataset.</p>	<p>The Report Analysis tool uses these parameters to limit the dataset to the data you consider valuable when calculating the final <i>Estimated Time</i> for each function.</p> <p>Table 5.4 on page 5.35 explains the parameters in detail.</p> <p>The Report Analysis tool reviews and creates the <i>Estimated Time</i> for the following functions:</p> <ul style="list-style-type: none"> ▪ <i>Display HTML</i> (only if there is a check mark next to <i>Wait for Continue Action</i>) ▪ <i>Display Picture</i> (only if there is a check mark next to <i>Wait for Continue Action</i>) ▪ <i>Field Entry</i> ▪ <i>Review</i> ▪ <i>Weld</i> ▪ <i>Weld Accumulator</i> ▪ <i>Weld Open</i> ▪ <i>PLC Field Entry</i> ▪ <i>PLC Tag Read</i> ▪ <i>PLC Tag Write</i>

Procedure	Details
<p>12. In the <i>Function Weld Parameters</i> section, set the parameters for the welding data in the dataset.</p>	<p>The Report Analysis tool uses these values to limit the dataset to the data you consider valuable when calculating the final welding parameters for each function.</p> <p>Table 5.4 on page 5.35 explains the parameters in detail.</p> <p>The Report Analysis tool reviews and creates the following parameter values from the following functions:</p> <ul style="list-style-type: none"> ▪ <i>Weld Accumulator: Minimum Number of Welds and Accumulate Minimum/Maximum values</i> ▪ <i>Weld Open: Minimum Number of Welds and Maximum Number of Welds</i>
<p>13. In the <i>Weld Validations for Arc Time and Deposition</i> section, set the parameters for the arc time and deposition in the dataset.</p>	<p>The Report Analysis tool uses these parameters to limit the dataset to the data you consider valuable when calculating the final values for each function.</p> <p>Table 5.4 on page 5.35 explains the parameters in detail.</p>
<p>14. In the <i>Weld Validations for Other Parameters</i> section, set the parameters for the remaining data in the dataset.</p>	<p>The Report Analysis tool uses these values to limit the dataset to the data you consider valuable when calculating the remaining welding parameters for each function.</p> <p>Table 5.4 on page 5.35 explains the parameters in detail.</p> <p>The Report Analysis tool also reviews and creates the following parameter values from the welding functions:</p> <ul style="list-style-type: none"> ▪ <i>Arc Voltage</i> ▪ <i>Arc Amperage</i> ▪ <i>Wire Feed Speed</i> ▪ <i>Deposition</i> ▪ <i>True Energy™</i> ▪ <i>WeldScore®</i>
<p>15. Click Next.</p>	<p>The Report Analysis Tool calculates your parameters using the contents of all report files you selected.</p>
<h3>Select Reports for Analysis</h3>	
<p>16. Verify the reports you want to use for the final analysis.</p>	<p>The Report Analysis Tool automatically groups together similar reports and selects the reports that fall above your <i>Minimum Consistency Percentage</i> for the following:</p> <ul style="list-style-type: none"> ▪ <i>Highest Completed Step</i>: This is the highest step number completed in the weld sequence files and the percentage of reports that reached that number. ▪ <i>Executed Functions</i>: This is the number of functions that were

Procedure	Details
	<p>performed in the weld sequence files and the percentage of reports that reached that number.</p> <ul style="list-style-type: none"> ▪ <i>Automatic Welds</i>: This is the number of welds performed in <i>Automatic</i> mode in the weld sequence files and the percentage of reports that reached that number.
<p>17. Place a check mark next to any additional set(s) of reports you want to include.</p>	<p>The Sequence Reports may not match your <i>Minimum Consistency</i> requirements, but you know they represent valid examples for analysis.</p>
<p>18. Click Next.</p>	<p>The Report Analysis tool performs statistical analysis of the all the reports you included.</p> <p>First, the tool removes any data points that fall outside the standard deviation limits, specified by the <i>Automatic Outlier Removal</i> field for the parameters. Next, the tool uses your <i>SD/Mean Limit</i> parameters on the remaining data to determine if they are consistent. Finally, the Report Analysis tool uses the <i>Prediction Range</i> calculate the minimum and maximum recommended values.</p>
<h3>Select Calculated Data to Include in the Weld Sequence File</h3>	
<p>19. On the Function Data tab, place a check mark next to each <i>Parameter</i> you want to add to the indicated function.</p>	<p>The Report Analysis tool automatically places a check mark next to each item that meets your <i>SD/Mean Limit</i> percentage. Table 5.5 on page 5.36 explains each column in this section in more detail.</p> <p>You can use the Uncheck All and Check All buttons to select parameters in bulk.</p>
<p>20. On the Weld Validation Data tab, place a check mark next to each <i>Weld Validation</i> you want to add to the indicated function.</p>	<p>The Report Analysis tool automatically places a check mark next to each item that meets your <i>SD/Mean Limit</i> percentage. Table 5.5 on page 5.36 explains each column in this section in more detail.</p> <p>You can use the Uncheck & Hide buttons and the Show buttons to select validations in bulk.</p>
<p>21. Click Apply Changes to make the selected changes to the open weld sequence file.</p>	<p>The Report Analyzer Tool updates the appropriate function parameter values, creates new weld validations and selects the new weld validations in the welding functions.</p> <p>NOTE Weld Validations created by the Sequence Report Analysis tool use the naming convention “FunctionName X.Y” where <i>FunctionName</i> equals the function name, X equals the step number (found in the lower left corner of the vertical title bar), and Y equals the consecutive function for the step (starting at 0).</p>
<h3>Summary of Changes</h3>	
<p>22. Review the list of changes that were made to your</p>	

Procedure	Details
weld sequence file.	
23. Click OK .	

Analysis Parameters

The analysis parameters in the Report Analysis tool allow you to control which data from within the Sequence Report files to use for calculating a recommended function parameter values and recommended weld validations. You can remove invalid data and narrow down to just good solid weld data.

TIP | This window remembers your choices and displays them the next time you use the Report Analysis tool.

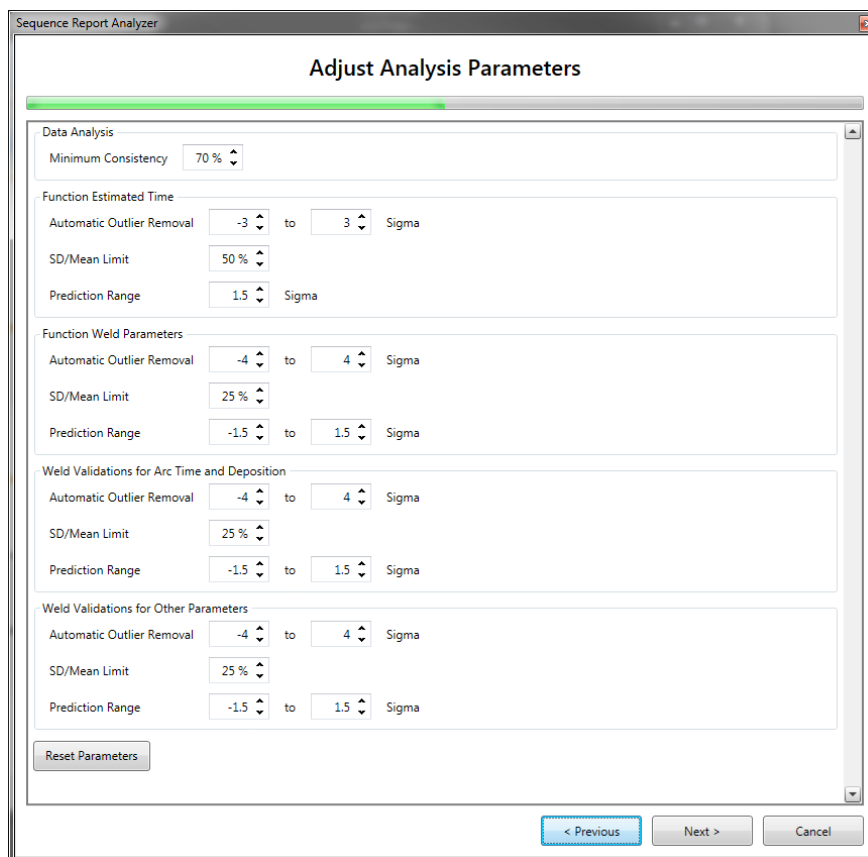


Figure 5.11 Analysis Parameters

TIP | Different sets of analysis parameters are provided for *Estimated Time*, *Function Weld Parameters*, *Weld Validations for Arc Time and Deposition*, and *Weld Validations for Other Parameters* so you can set individual preferences for each type of parameter.

TIP | Click the **Reset Parameters** button to revert to the original

default settings.

Table 5.4 Parameters Available for the Report Analysis Tool

Field	Description
<i>Minimum Consistency</i>	The <i>Minimum Consistency</i> percentage represents the percentage of repeated Sequence Report parameter values where the data is consistent.
<i>Automatic Outlier Removal</i>	The Report Analysis tool loads all the data from the selected Sequence Reports and calculates statistics from the entire dataset. The tool then removes any data points that fall outside the standard deviation limits, specified by the upper and lower <i>Automatic Outlier Removal</i> limits. The <i>Samples</i> column (Table 5.5 on page 5.36) in the final results indicates how many data points were used in the final statistics in the form of <i>X of Y</i> . If <i>X</i> is less than <i>Y</i> , some of the data points (the outliers) were removed based on these <i>Automatic Outlier Removal</i> limits.
<i>SD/Mean Limit</i>	The <i>SD/Mean Limit</i> field is the maximum limit for considering the data useful or consistent. If the analysis produces an <i>SD/Mean</i> (or <i>Coefficient of Variation</i>) value that is less than this limit, the Report Analysis tool automatically selects the data in the final step of the analysis.
<i>Prediction Range</i>	Enter the limit range you want the Report Analysis tool to implement when it calculates its recommendations. It does so in terms of standard deviation (SD or Sigma). The Report Analysis tool uses this <i>Prediction Range</i> value to provide a reliable “buffer” on either end of the average value. See Table 5.5 on page 5.36 for more details on how the Report Analysis tool uses the <i>Prediction Range</i> to calculate the <i>Low Limit</i> and <i>High Limit</i> .

Select Calculated Data to Include in the Weld Sequence File

Once the Report Analysis tool combs the Sequence Report files, it compiles the data into a usable format and displays the results on the screen. From this information, you make a determination whether the system should make changes to your open weld sequence file. Table 5.5 explains the columns available in more detail.

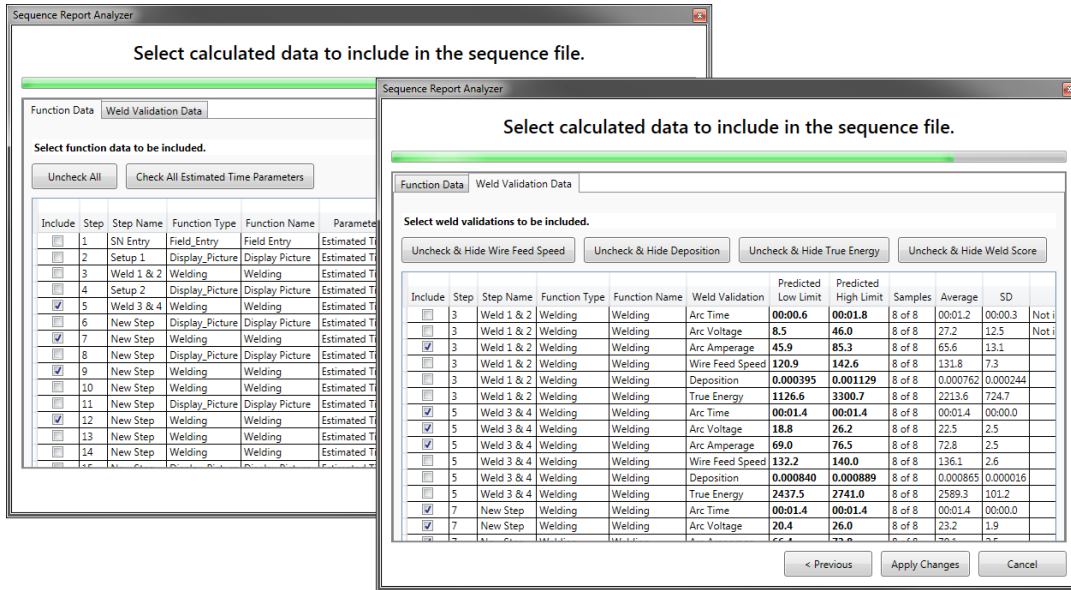


Figure 5.2 Data to Include in the Weld Sequence File

Table 5.5 Columns for Calculated Data

Field	Description
<i>Include</i>	Place a check mark in this option to add this data or validation to the open weld sequence file. The Report Analysis tool automatically selects those rows that best match the parameters you have established based on the <i>SD/Mean Limit</i> (Coefficient of Variation); however, you can choose not to include those and include others.
<i>Step</i>	This is the step number displayed in the weld sequence. You can find that number in the step's title bar. <div style="text-align: center;"> </div>
<i>Step Name</i>	This is the name of the step displayed in the weld sequence. You can find that name in the step's title bar. <div style="text-align: center;"> </div>
<i>Function Type</i>	This column displays the type of sequence function from which this data was collected (e.g., a <i>Display Picture</i> function, a <i>Review</i> function or a <i>Welding</i> Function).
<i>Function Name</i>	This column displays the description of the function from the <i>Name</i> field of the <i>Properties</i> window. <div style="text-align: center;"> </div>

Field	Description
<i>Parameter</i>	In the <i>Select function data to be included</i> section, the <i>Parameter</i> column displays the data represented by the row (e.g., <i>Estimated Time</i> or <i>Minimum Number of Welds</i>). The <i>Parameter</i> column only appears on the Function Data tab.
<i>Weld Validation</i>	In the <i>Select weld validations to be included</i> section, the <i>Weld Validation</i> column indicates the calculated Weld Validation parameter represented by this column. This is the <i>Property</i> that the Report Analysis tool will use in the weld validation if selected. The <i>Weld Validation</i> column only appears on the Weld Validation Data tab.
<i>Predicted Low Limit</i>	Based on the <i>Average</i> and <i>SD</i> columns calculated from the Sequence Reports (and taking into account the <i>Prediction Range</i> you set earlier), the <i>Predicted Low Limit</i> column displays the recommended value from the Report Analysis. The <i>Predicted Low Limit</i> uses the following equation: $\text{Average} + [(\text{Low Value for Prediction Range}) * \text{SD}]$ STOP This is the change that will be made to your weld sequence for this item when you click Apply Changes. TIP The <i>Predicted Low Limit</i> column does not apply to some parameters like the <i>Estimated Time</i> parameter.
<i>Predicted High Limit</i>	Based on the <i>Average</i> and <i>SD</i> columns calculated from the Sequence Reports (and taking into account the <i>Prediction Range</i> you set earlier), the <i>Predicted High Limit</i> column displays the recommended value from the Report Analysis. The <i>Predicted High Limit</i> uses the following equation: $\text{Average} + [(\text{High Value for Prediction Range}) * \text{SD}]$ STOP This is the change that will be made to your weld sequence for this item when you click Apply Changes. TIP The <i>Predicted High Limit</i> column does not apply to the <i>WeldScore</i>[®] parameter.
<i>Samples</i>	The <i>Samples</i> column displays the number of data points that were used to determine the <i>Predicted Low Limit</i> and <i>Predicted High Limit</i> values. If an outlier was discovered during the analysis, this column indicates that. For example, the <i>Samples</i> column could display <i>3 of 4</i> . This means that one of the data points was removed due to the inconsistency of the data, based on the analysis parameters you set.
<i>Average</i>	The <i>Average</i> column displays the average value across the data points used.
<i>SD</i>	The <i>SD</i> column represents the standard deviation of the data for this property across the data points used for this analysis.
<i>Comments</i>	The Report Analysis tool adds any additional information in this column.

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Sequence Functions

On the left of the Weld Sequence Editor window, you have access to the tools you need to create your weld sequence—the Sequence Functions. Sequence Functions are the building blocks of the welding operation. You add functions to the weld sequence that controls every aspect of the Welding Power Source and the welds the operator creates. These functions help you define a consistent and repeatable process for the Weld Operator. Each step that you create is actually a group of functions in the Weld Sequence Editor.

TIP | As the Weld Sequencer application matures, more functions will become available.

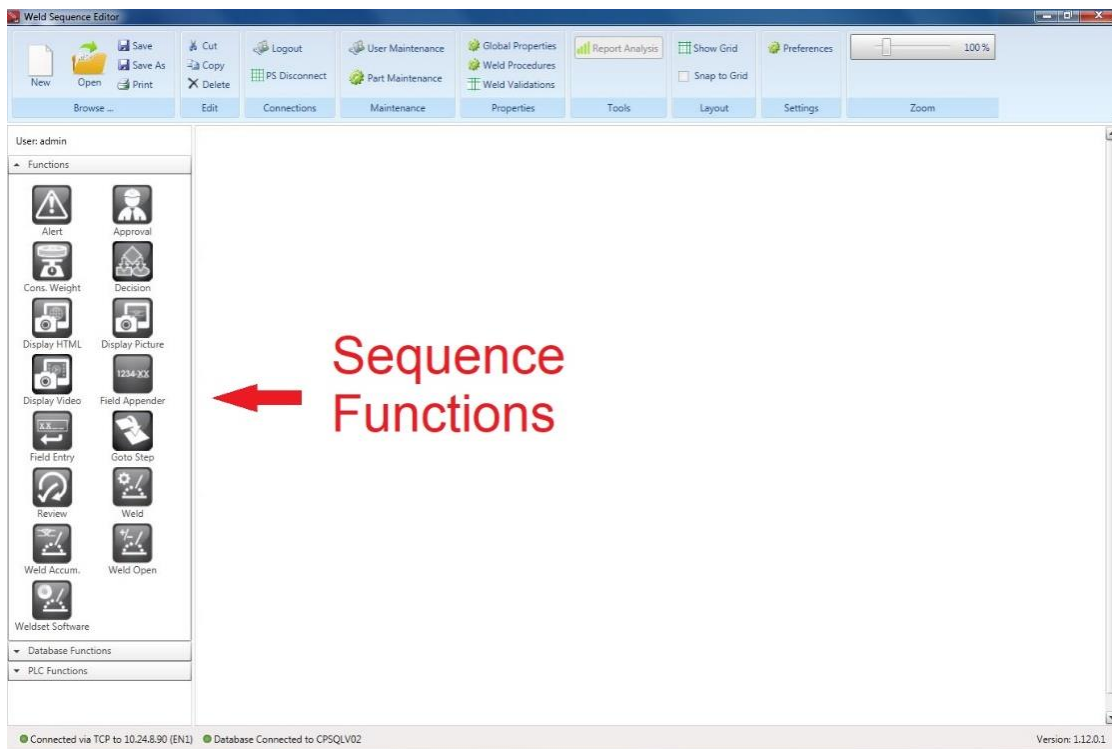


Figure 6.1 Sequence Functions

Planning Your Weld Sequence

Before you begin creating your weld sequence file, it is a good idea to think through the sequence first and make sure you have any work instructions you may need and/or a clear idea of the welding requirements and parameters you need for the welds the operator needs to perform.

TIP | Sketching out the flowchart using the function names and their parameters before you begin could make it quick and easy to build the weld sequence file in the software.

Steps in a Weld Sequence

Every time the Weld Operator clicks **Next** (or completes the welds in the step) in the Weld Sequencer, they move forward to a new step. Each step could contain multiple instructions and series of functions, depending on the needs of the welds. You create each step of the weld sequence in the Weld Sequence Editor (Figure 5.6).

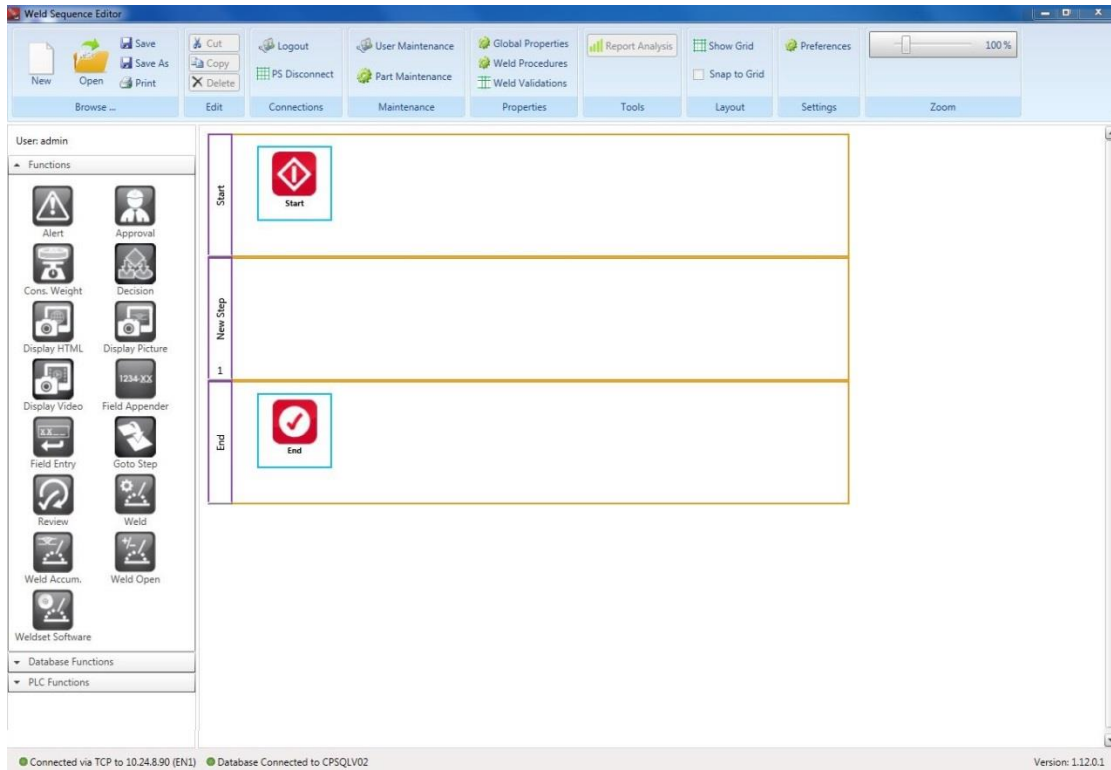


Figure 6.2 New Blank Weld Sequence File

When you create a new weld sequence file (i.e., click **New** in the top toolbar), Weld Sequencer automatically adds at least three steps for you:

- **Start:** The *Start* step contains the *Start* function (page 6.1) and is where you can indicate if you want to perform a restore on the Welding Power Source.
- **Steps:** These are the steps in your weld sequence. You can edit the steps (including renaming them) and you can insert additional steps above or below as needed for your sequence.
- **End:** The *End* step contains the *End* function (page 6.1) and is where you can choose to display a summary of the performance on the weld sequence after the Weld Operator completes it.

Inserting/Deleting a Step

Creating a step in Weld Sequence Editor is simple. Right-click the left title area of any step already displayed in your Work Area and select one of the **Insert** options from the pop-up menu (Figure 6.3).

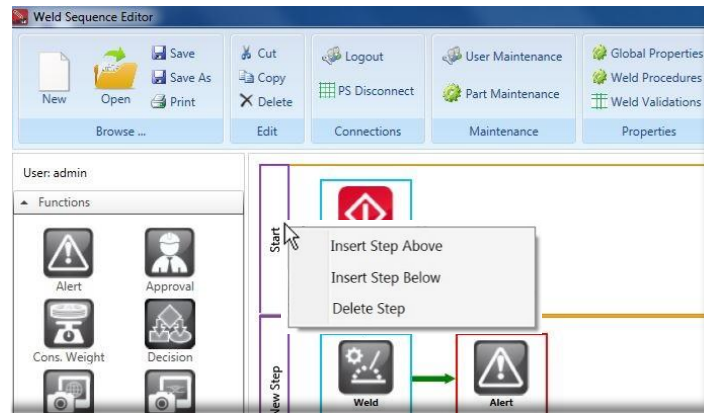


Figure 6.3 Inserting a Step

You can insert a step above or below the current one. Once you insert the step, you can drag-and-drop any function(s) you want to add to the step.

Step Properties

Weld Sequencer allows you to rename each step in the editor so you can easily tell your steps apart. This is especially useful in the larger weld sequences that contain a large number of steps. You can also disable navigation specifically for this step. This is extremely useful when navigation generally needed but it must be disabled for a critical step that cannot be skipped. Steps involving PLC communications typically use this option to temporarily disable navigation. Refer to the Global Properties section on page 5.1 for more navigation options.

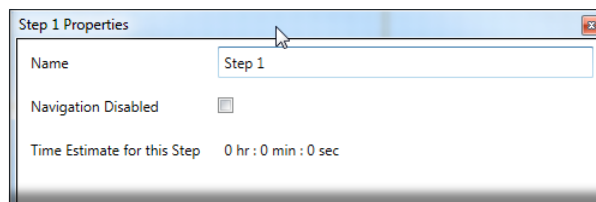


Figure 6.4 Step Properties

To access the properties for any step, simply double-click the left title area of the step. The *Properties* window opens (Figure 6.4), Table 6.1 explains these fields in more detail.

Table 6.1 Fields on the Step Properties Window

Field	Description
<i>Name</i>	Enter text in this field that helps you to distinguish this step from all the others in your weld sequence. For example, you can create a step called “Setup” and another called “Tack Welds”. Your “Review” step could contain an <i>Approval</i> function and the <i>Review</i> function.
<i>Navigation Disabled</i>	This option will disable Navigation on this Step. When disabled, the Weld Sequencer will not allow the user to Navigate away from the Step. This is very useful for Steps that contain PLC Functions, and Navigation needs to be disabled, but Navigation is desired for the remainder of the sequence steps. The background of the left side Step name will change to grey and highlight when this option is used.

Field	Description
<i>Estimated Time</i>	<p>Weld Sequencer totals up all the estimated times you enter for each of the functions within the step and displays that total here. If you need to change the estimated time, you should adjust the time on the appropriate function(s). Weld Sequencer uses the total time for each step when it displays the <i>Cycle Status</i> and <i>Step Status</i> progress bars (Figure 7.2 on page 7.4).</p> <p>TIP The Step Status ¹⁻²⁻³ bar in Weld Sequencer turns yellow when the Weld Operator reaches 85% of the time you enter here. See Table 7.1 on page 7.4 for details on the Weld Sequencer display.</p>

Adding Functions to the Weld Sequence

Adding functions to your weld sequence is simple. Find the function you want to add from the list on the left. Drag-and-drop that function into the appropriate step. Double-click the function to open the *Properties* window and configure the function as needed. Each function has different properties, and you can find information on each function starting on page 6.6.

STOP | You MUST have a “First Function” identified in each step. If you have a function at the beginning of the step without a blue border, right-click the function and select Make First Function from the pop-up menu.

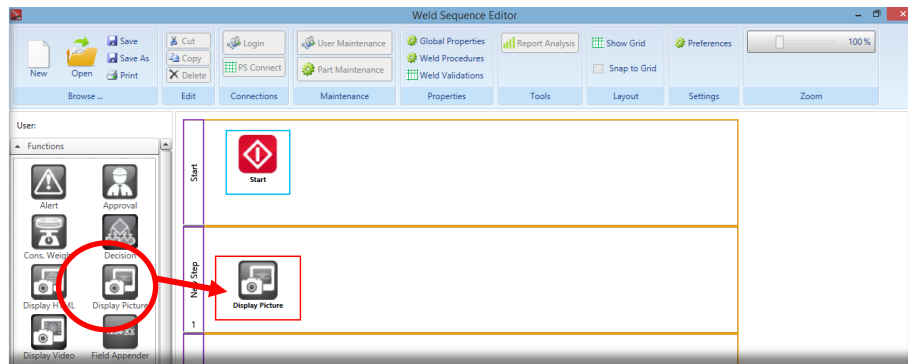


Figure 6.5 Adding a Function to the Sequence

When you drag-and-drop the first function into a step, Weld Sequencer automatically turns the border of the function to blue and tags that function as the starting point in that step so the previous step knows which function to run first. If you need to identify a different function, simply right-click the function and select **Make First Function** from the pop-up menu.

TIP | Be sure your function is fully within the orange boundary. This ensures Weld Sequencer can detect the function as part of the correct step.

Connecting and Validating Functions

In order for Weld Sequencer to move in a path from the *Start* function to the *End* function and all the functions in between, you need to connect each function to the next one, always moving forward. When possible, you need to also add conditions for possible outcomes to the function (e.g., what should Weld Sequencer do when welds do not pass validation or the user credentials for an *Approval* function are incorrect).

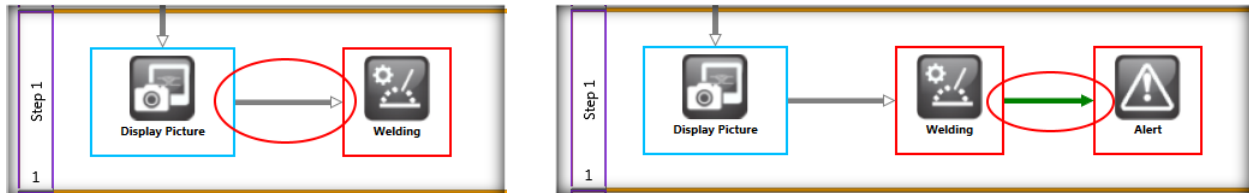


Figure 6.6 Basic Connector and Conditional Connector

Connecting Functions

To connect a function to another function, simply hover your mouse over one of the handles until the cursor changes to a crosshair, click and drag a line to the function you want to occur next and release it. Once you release the connector, it turns into an arrow that indicates the direction in which the weld sequence will run from function to function. The connector essentially becomes “glued” to each function and remains glued until you delete the connector or function(s).

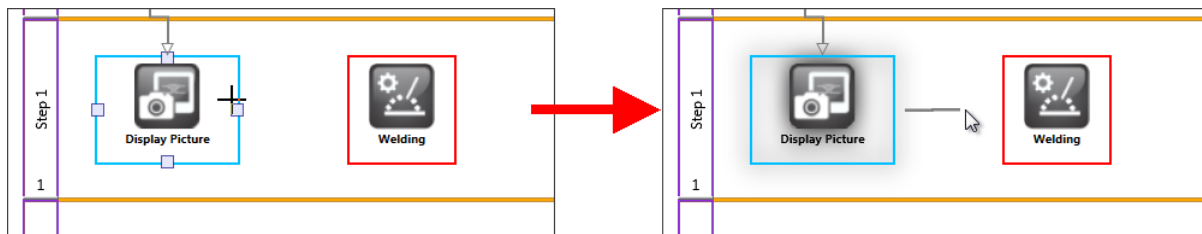


Figure 6.7 Connecting Functions

Conditional Connectors

There are some functions that provide you with the option to validate the outcome of the function based on conditions you can set (e.g., *Weld* functions and the *Approval* function). Weld Sequencer automatically detects the decision-making capabilities for the function. If you have the option to validate the function, the connector changes to green (Figure 6.8). Double-click the connector to configure the validation settings for that function.

TIP | Hover your mouse over a conditional connector between two functions, to display the current validation rules.

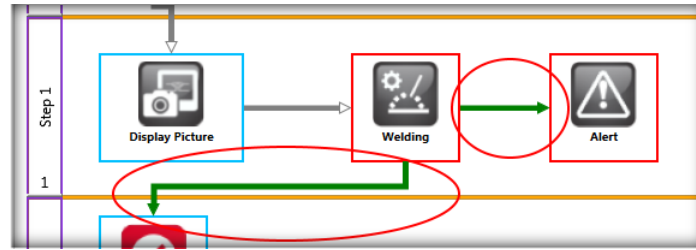


Figure 6.8 Green Validation Connector

For more information on the validation for specific functions, refer to the following sections:

- *Approval* function (page 6.22)
- Welding functions (page 6.33)
- Database functions (page 6.39)
- PLC functions (page 6.49)

Start and End Functions

Every weld sequence file launched by a Weld Operator must have a *Start* function and an *End* function. When you click the **New** button in the top toolbar, Weld Sequence Editor adds them to the sequence automatically to help you out (Figure 5.6 on page 6.2).

Start



The *Start* function gives the Weld Sequencer a defined beginning and dictates if you want to perform a restore on the Welding Power Source that runs the weld sequence file before the rest of the sequence gets under way.

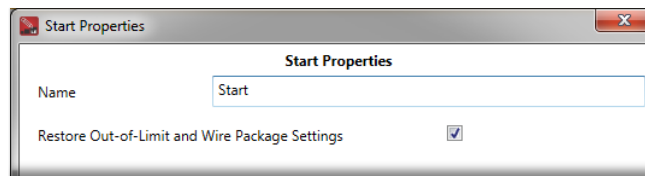




Figure 6.9 Start Function in the Editor

Table 6.2 Properties Available for the Start Function

Field	Description
<i>Name</i>	You can add a description for this function that appears on the function's icon in the Weld Sequence Editor. This helps you easily identify the function within the step.
<i>Restore Out-of-Limit and Wire Package Settings</i>	Place a check mark next to this option to change the Welding Power Source to match the <i>Wire Package</i> settings from <i>Global Properties</i> on the weld sequence file. Once the Weld Operator loads the weld sequence file and clicks the Start button  , the <i>Wire Package</i> settings on the Welding Power Source change to match these settings.

End



Every weld sequence must have an end. The *End* function indicates to the Welding Power Source that there are no more functions to come in this weld sequence. It displays a summary to the Weld Operator (Figure 6.10); the Cycle Timer  stops; and the Weld Operator can quickly launch into the loaded weld sequence again for the next assembly. Table 6.3 explains the properties available on the *End* function. (See page 7.3 for more details on the right information panel in Figure 6.10.)

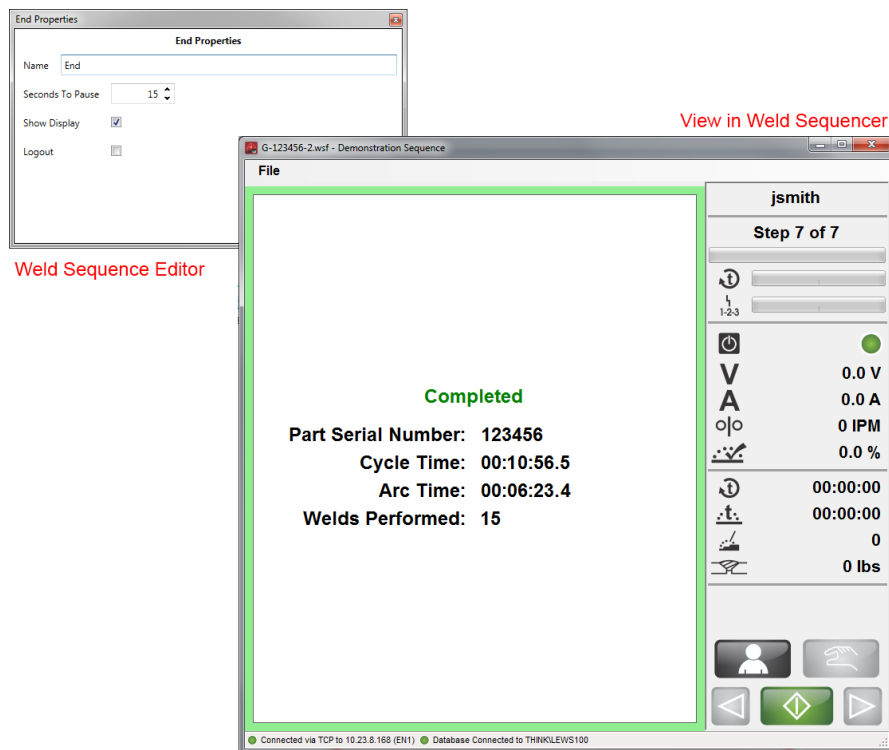


Figure 6.10 End Function

Table 6.3 Properties Available for the End Function

Field	Description
<i>Name</i>	You can add a description for this function that appears on the function’s icon in the Weld Sequence Editor. This helps you easily identify the function within the step.
<i>Seconds To Pause</i>	For use with the <i>Auto Restart</i> preference in the Weld Sequencer workstation preferences (page 7.7), the <i>Seconds To Pause</i> field allows you to set a delay time before the sequence automatically begins again. The Cycle Time stops when the sequence stops, but you can have the sequence pause for any length of time (in seconds) before the <i>Auto Restart</i> activates. The system does not include the pause time in the Cycle Time. TIP If you have a check mark in the <i>Show Display</i> option in conjunction with a value in the <i>Seconds To Pause</i> field, the sequence displays the performance summary information during this pause time.
<i>Show Display</i>	Place a check mark in this checkbox to display the performance summary for the sequence (Figure 6.10) to the Weld Operator in the Weld Sequencer. If you do not want or need to display this information to the operator, remove the check mark.

Field	Description
<i>Logout</i>	Place a check mark in the <i>Logout</i> checkbox if you would like Weld Sequencer to automatically log the user out of the application at the end of the weld sequence.

Alert



The *Alert* function allows you to communicate with the Weld Operator. This is a simple message that displays on the screen along with a **Continue** button and prevents the Weld Operator from proceeding until they acknowledge the message. The system also displays additional information based on validations that caused the *Alert* to display. There are many uses for the *Alert* function, including providing important information or instruction. Table 6.4 explains the properties available for the *Alert* function.

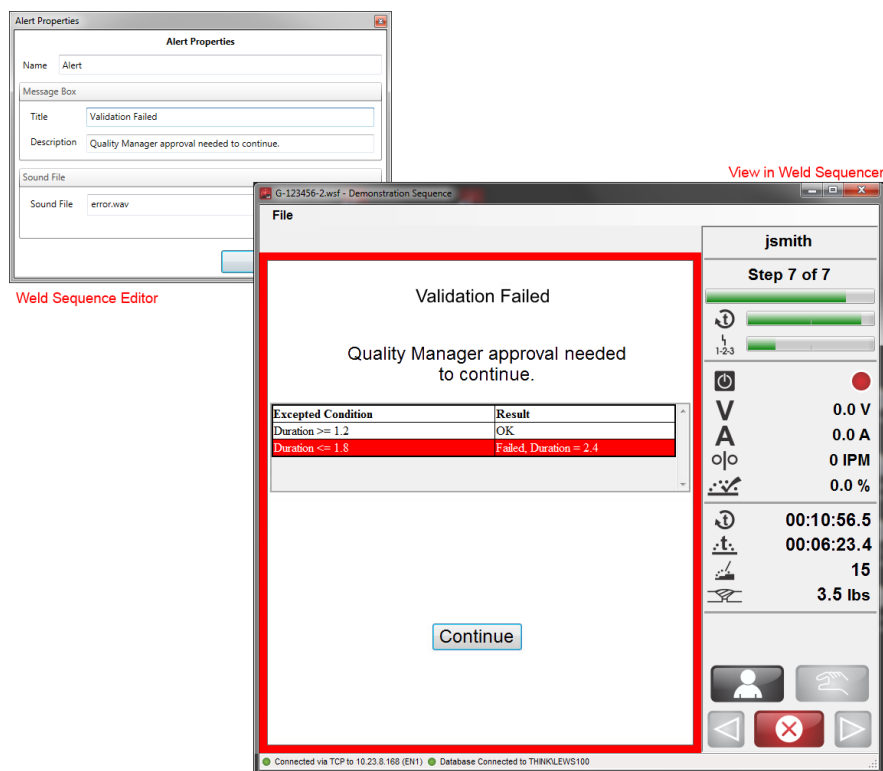


Figure 6.11 Alert Function

For example, after each welding function on a tricky assembly, John at Advanced Manufacturing added an *Alert* function to the weld sequence that displays an alert in Weld Sequencer if the weld exceeds the duration limits set on the weld. The *Alert* informs the Weld Operator that they must obtain a quality inspection before they can continue welding, as well as which validations failed. In Figure 6.11, the Weld Operator performed one weld. The validation on the weld was that it needed to be greater than or equal to 1.2 seconds, and the weld had to be less than or equal to 1.8 seconds.

The *Alert* displayed because the weld performed by the operator failed validation. The weld failed because the duration was 2.4 seconds (longer than 1.8 seconds). Weld Sequencer highlights the failures in red. The weld passed the first validation because it was longer than 1.2 seconds.

TIP | If there had been four welds the operator needed to perform, and the duration on each of the welds was too short, there would be four sets of notifications.

Once the Weld Operator clicks **Continue** on the alert in Weld Sequencer, John has the sequence display the *Approval* function (page 6.22), requiring a Quality Manager to sign in to unlock the sequence and allow the operator to continue.

Table 6.4 Properties Available for the Alert Function

Field	Description
<i>Name</i>	You can add a description for this function that appears on the function's icon in the Weld Sequence Editor. This helps you easily identify the function within the step.
<i>Message Box</i>	<p>The text in the <i>Title</i> field and the <i>Description</i> field comprise the alert message that appears on the screen for the Weld Operator.</p> <ul style="list-style-type: none"> ▪ <i>Title</i>: The text in the <i>Title</i> field appears first in the alert message for the Weld Operator. See Figure 6.11. ▪ <i>Description</i>: The text in the <i>Description</i> field appears after the text from the <i>Title</i> field. This is the specific information you want to communicate to the Weld Operator.
<i>Sound File</i>	<p>The <i>Sound File</i> field allows you to play a sound when the weld sequence reaches this alert. This helps you get the attention of the Weld Operator so they look at the computer screen. Click the Browse button and navigate to the sound file you want to use.</p> <p>STOP Be sure that the computer running the Weld Sequencer has access to the location of this sound file. If it does not, the sound file will not play for the Weld Operator. Also, be sure that the computer has speakers that are loud enough for the Weld Operator to hear over the noise in the production area.</p> <p>TIP You can drag-and-drop a sound file from outside the Weld Sequence Editor application, right onto the <i>Alert</i> function. Be sure that you have already added the function to the sequence and that you have saved the weld sequence file before you drag-and-drop.</p>

Consumable Weight



Before a welding job begins, you want to make sure that there is currently enough consumable loaded for the wire feeder, to complete the job. This will help prevent the Weld Operator from stopping in the middle of the weld sequence to load the wire feeder.

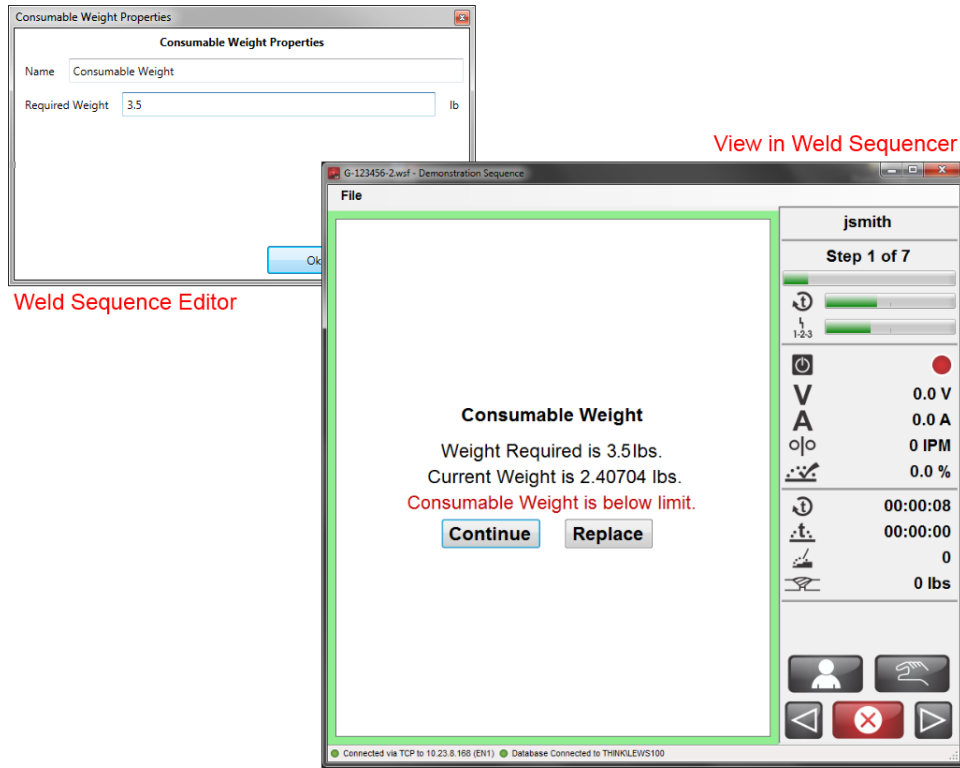


Figure 6.12 Consumable Weight Function

When you add the *Consumable Weight* function to the weld sequence, Weld Sequencer displays a message to the Weld Operator listing the consumable weight required for the job and the weight currently loaded (Figure 6.12). The message gives the Weld Operator the option to replenish the consumable now or to click continue without replacing.

NOTE | If the user clicks the Previous  or Next  buttons instead of the Continue button, Weld Sequencer flags the sequence with an error.

Table 6.5 Properties Available for the Consumable Weight Function

Field	Description
<i>Name</i>	You can add a description for this function that appears on the function’s icon in the Weld Sequence Editor. This helps you easily identify the function within the step.
<i>Required Weight</i>	Enter the amount of consumable needed to complete the weld sequence in its entirety. The system checks this requirement with the amount currently loaded for the Welding Power Source. If the amount required is more than what is available on the power source, this function provides the Weld Operator with the ability to continue with the amount currently loaded or to replace the consumable (Figure 6.12).
<i>Hide in Review Function</i>	You can select this option to hide information about this function and not show it in the Review Function list. If a sequence error occurs during this function, it will still be shown in the Review Function list.

Decision



The *Decision* function allows you to forward the weld sequence based on one of the available properties on the connector from the function, in addition to any available conditions you used when exiting the previous function. Table 6.6 explains the options available on the conditional connector from the *Decision* function.

For example, John at Advanced Manufacturing wants a quality manager to approve the welding if the Weld Operator makes any welds in Manual mode. If there aren't any manual welds, he wants to allow the welder to continue seamlessly.

In Figure 6.14, John added two functions after his welding function: *Decision* and *Approval*. He connected the *Welding* function to the *Decision* function. Then he connected the *Decision* function to the *Approval* function. On this connector, he set the property to *Manual Weld Count > 0*. If there are any welds made in manual mode, the weld sequence will display the *Approval* function. He also added a connector from the *Decision* function to the next step in the case where there are no manual welds: *Manual Weld Count = 0*.

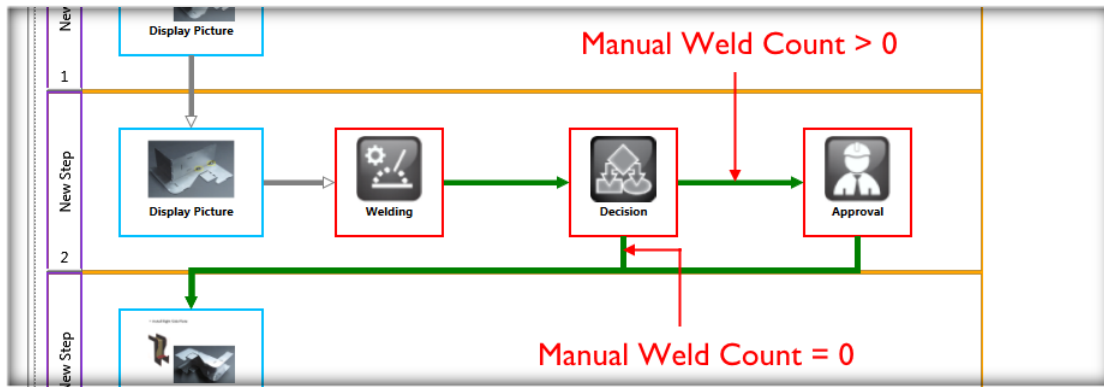


Figure 6.13 Example Use of Decision Function

NOTE | Remember: You must set an exit connector for each condition (e.g., one for a *True* result and one for a *False* result).

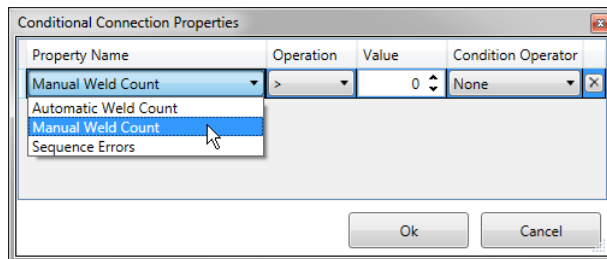


Figure 6.14 Decision Function Connector

Table 6.6 Properties Available for the Decision Function Conditional Connector

Property	Description
<i>Automatic Weld Count</i>	The <i>Automatic Weld Count</i> property allows you to run specific functions based on the number of welds performed in Automatic mode. See Automatic mode on page 7.6.

Property	Description
<i>Manual Weld Count</i>	The <i>Manual Weld Count</i> property allows you to run specific functions based on the number of welds performed in Manual mode. Read more about Manual mode on page 7.6.
<i>Sequence Errors</i>	If you want to perform a specific function when sequence errors occur, you can use the <i>Decision</i> function to direct the weld sequence.
<i>Hide in Review Function</i>	You can select this option to hide information about this function and not show it in the Review Function list. If a sequence error occurs during this function, it will still be shown in the Review Function list.

Display HTML



If you need to show the Weld Operator a web page, whether internal or external, the *Display HTML* function allows you to display that page during the weld sequence. The only difference between the *Display Picture* function (page 6.13) and the *Display HTML* function is that instead of specifying an image path, you specify a URL path.

STOP | When you use the *Display HTML* function, the computer running Weld Sequencer must have access to that file's location on the network or on the Internet. It cannot display the file if it cannot access it.

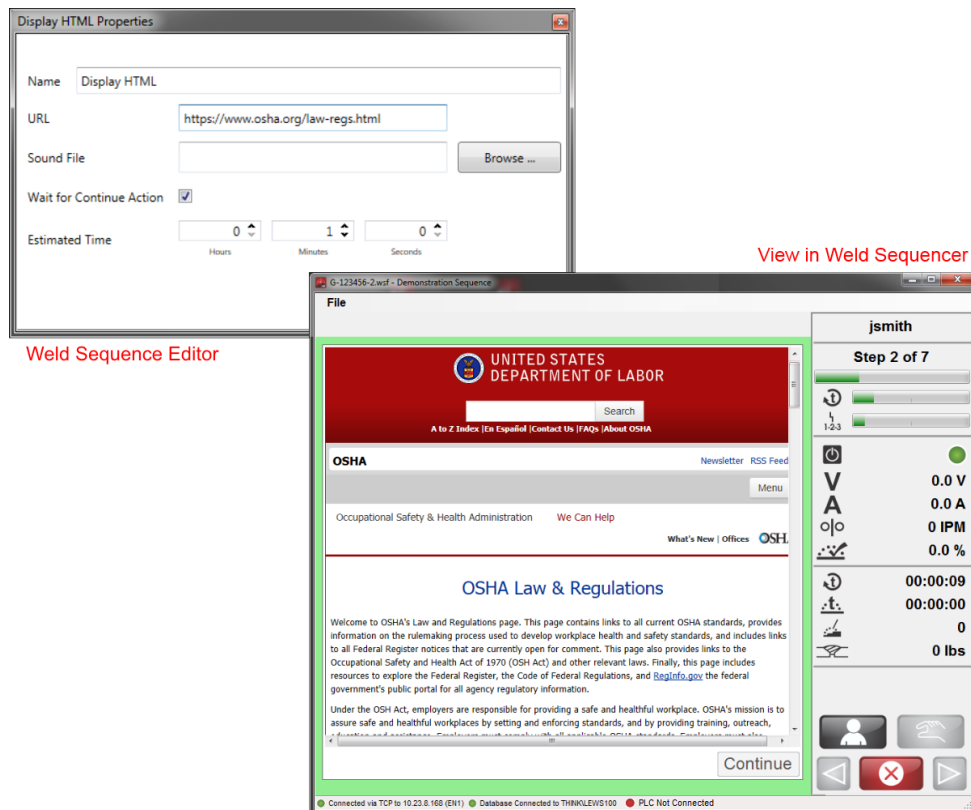


Figure 6.15 Display HTML

In the *URL* field, simply type the URL address of the HTML you want to display. Be sure to have all characters in the address correct, including “https” versus “http” if applicable. If in doubt about the correct format for the file’s location, contact your local IT department.

Here are a few examples:

<https://www.osha.org/law-regs.html>

<http://www.oursite.com/example.html>

Display Picture



One of the most useful features of Weld Sequencer is the ability to show a Weld Operator an example of each weld you want them to make (Figure 6.16). This can help them place the welds on the assembly consistently and in the proper order. You can insert the *Display Picture* function before each welding function and show the progression of welds with each new picture. You could also use the *Display Picture* function in a variety of other ways. You can display any standard image format, as well as play audio files with the image. Table 6.7 explains the properties for the *Display Picture* function.

TIP | In the Weld Sequence Editor, right-click the *Display Picture* function in your sequence (e.g., Figure 6.13 on page 6.11) and select Show Image from the pop-up menu to see a preview of the image file attached to the function.

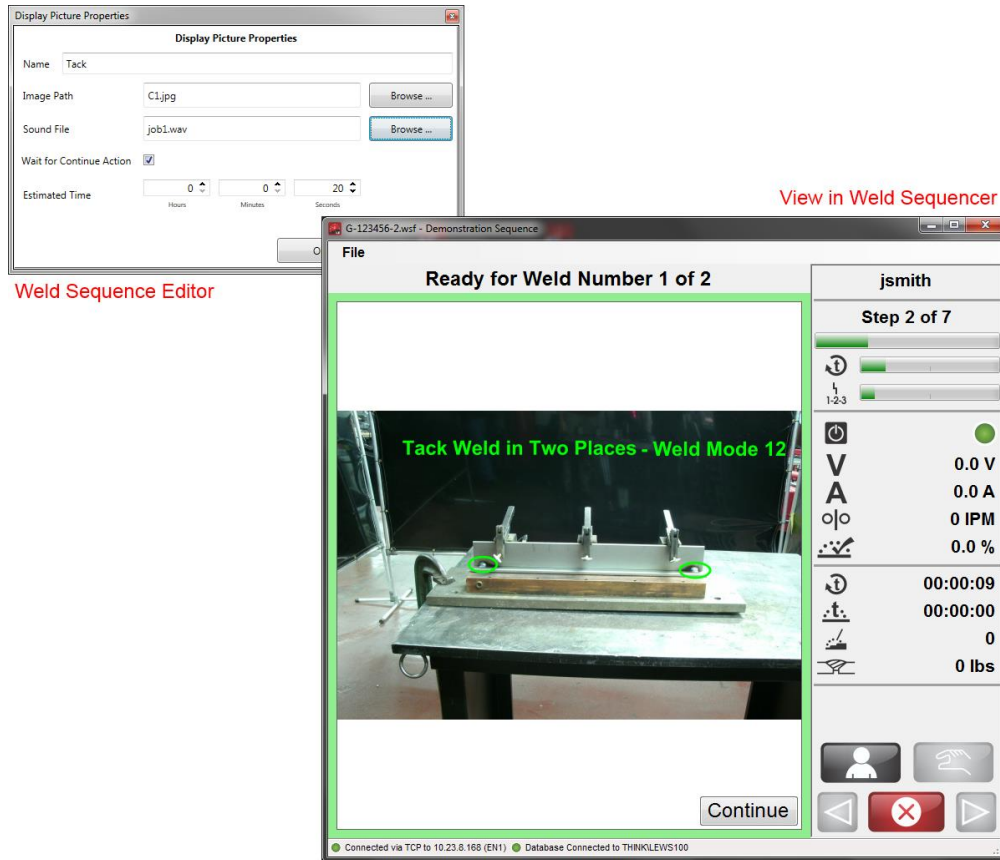





Figure 6.16 Display Picture Function

For example, John at Advanced Manufacturing inserted a *Display Picture* function before the “Tack Welds” *Weld* function to show a picture of where to place the two tack welds (Figure 6.16). On all pictures in the sequence, he circled the welds on the current step and added text on the expected length of the weld, as well as the Weld Mode being used.

STOP | When you use the *Display Picture* function, the computer running Weld Sequencer must have access to that file’s location on the network. It cannot display the file if it cannot access it. This is a great reason to have a common server folder for your Weld Sequencer files.

Table 6.7 Properties Available for the Display Picture Function

Field	Description
<i>Name</i>	You can add a description for this function that appears on the function’s icon in the Weld Sequence Editor. This helps you easily identify the function within the step.
<i>Image Path</i>	Click the Browse button to navigate to the image file you want to display when Weld Sequencer reaches this function in the sequence. Remember, the computer running the weld sequence file on the production floor must have access to this image file over your network. You can use the following types of files: *.png, *.jpg or *.gif. TIP You can drag-and-drop an image file from outside the Weld Sequence Editor application, right onto the <i>Display Picture</i> function. Be sure that you have already

Field	Description
	added the function to the sequence.
<i>Sound File</i>	<p>If you would like to play a sound file when the sequence displays the picture to the Weld Operator, click the Browse button and navigate to the sound file. You can use this sound file to get the attention of the Weld Operator so they look at the computer screen, or to offer a brief explanation of the welds to be performed.</p> <p>STOP Be sure that the computer running the Weld Sequencer has access to the location of this sound file. If it does not, the sound file will not play for the Weld Operator. Also, be sure that the computer has speakers that are loud enough for the Weld Operator to hear over the noise in the production area.</p> <p>TIP You can drag-and-drop a sound file from outside the Weld Sequence Editor application, right onto the <i>Display Picture</i> function. Be sure that you have already added the function to the sequence.</p>
<i>Hide in Review Function</i>	<p>You can select this option to hide information about this function and not show it in the Review Function list. If a sequence error occurs during this function, it will still be shown in the Review Function list.</p>
<i>Wait for Continue Action</i>	<p>If you need to make sure that a Weld Operator looks at the picture you have displayed (e.g., a setup picture or a safety reminder to wear their safety glasses), you might want to give them time to acknowledge they have seen the image, to put on their safety glasses, or to set up the part.</p> <p>When you place a check mark next to <i>Wait for Continue Action</i>, Weld Sequencer keeps the display active until the operator clicks the Continue button (or uses two quick trigger pulls), rather than allowing Weld Sequencer to advance automatically.</p> <p>STOP If the user clicks the Previous  or Next  buttons instead of the Continue button, Weld Sequencer flags the sequence with an error.</p> <p>TIP There is no Continue button unless you use the <i>Wait for Continue Action</i> button. Weld Sequencer adds the Continue button to the display for the Weld Operator with this option.</p>
<i>Seconds To Pause or Estimated Time</i>	<p>The <i>Seconds To Pause</i> field allows you to set a delay time before executing the next function in the sequence. This field is useful if you need to show a progression of images before the welding function begins.</p> <p>If you place a check mark in the <i>Wait for Continue Action</i> checkbox, this field changes to <i>Estimated Time</i>, which is how long you think it should take for someone to review and acknowledge the displayed image. Weld Sequencer uses this time in the Cycle Status so be sure to provide ample time for a person to review and understand the picture and then to acknowledge the picture.</p> <p>TIP The Cycle Status  bar in Weld Sequencer turns yellow when the Weld Operator reaches 85% of the estimated time you enter here. This alerts the operator that time is running out. See Table 7.1 on page 7.4 for details on the Weld Sequencer display.</p>

Display Video



There are some welding operations that are easier to explain by demonstrating the process, rather than displaying a series of pictures. The *Display Video* function is similar to a *Display Picture* function except you can launch a video instead of displaying a static image during the weld sequence.

STOP | When you use the *Display Video* function, the computer running Weld Sequencer must have access to that file's location on the network or on the Internet. It cannot run the file if it cannot access it.

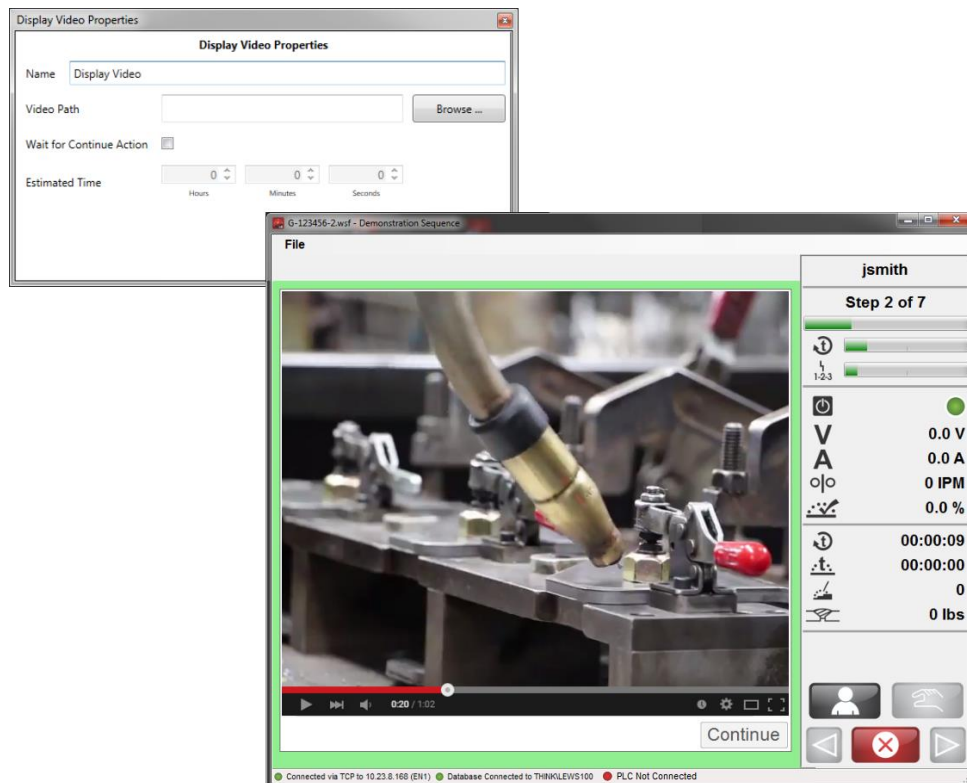





Figure 6.17 Display Video Function

Table 6.8 Properties Available for the Display Video Function

Field	Description
<i>Name</i>	You can add a description for this function that appears on the function's icon in the Weld Sequence Editor. This helps you easily identify the function within the step.
<i>Video Path</i>	Click the Browse button to navigate to the video file you want to play when Weld Sequencer reaches this function in the sequence. Remember, the computer running the weld sequence file on the production floor must have access to this video file over your network. You use the following types of files: *.avi, *.asf, *.wma, *.wmv, and *.wm.
<i>Hide in Review</i>	You can select this option to hide information about this function and not show it in the Review Function list. If a sequence error occurs during this function, it will still be shown in

Field	Description
<i>Function</i>	the Review Function list.
<i>Wait for Continue Action</i>	<p>If you want to provide the Weld Operator enough time to view the video and even replay it when necessary, you can use the <i>Wait for Continue Action</i> option. When you place a check mark next to <i>Wait for Continue Action</i>, Weld Sequencer loops the video until the operator clicks the Continue button (or uses the trigger options to advance), rather than allowing Weld Sequencer to advance automatically.</p> <p>STOP If the user clicks the Previous  or Next  buttons instead of the Continue button, Weld Sequencer flags the sequence with an error.</p> <p>NOTE Remember to enter an <i>Estimated Time</i> if you choose this option.</p> <p>TIP There is no Continue button unless you use the <i>Wait for Continue Action</i> button. Weld Sequencer adds the Continue button to the display for the Weld Operator with this option.</p>
<i>Estimated Time</i>	<p>Weld Sequencer enables the <i>Estimated Time</i> fields when you place a check mark in the <i>Wait for Continue Action</i> option.</p> <p>The <i>Estimated Time</i> field is how long you think it should take for someone to view this video and click the Continue button. Weld Sequencer uses this time in the Cycle Status (Table 7.1 on page 7.4) so be sure to provide ample time for a person to watch the entire video (replay it if necessary) and click the Continue button.</p> <p>TIP The Cycle Status  bar in Weld Sequencer turns yellow when the Weld Operator reaches 85% of the time you enter here. This alerts the operator that time is running out. See Table 7.1 on page 7.4 for details on the Weld Sequencer display.</p>

Field Entry



To help increase the traceability of your parts and welds, you can insert the *Field Entry* function into your weld sequence anywhere you need to capture one of two IDs: Consumable Lot and Part Serial Number. When you use the *Field Entry* function, Weld Sequencer displays an input screen to the Weld Operator (Figure 6.18), and you can configure the text on the input screen to meet your needs.

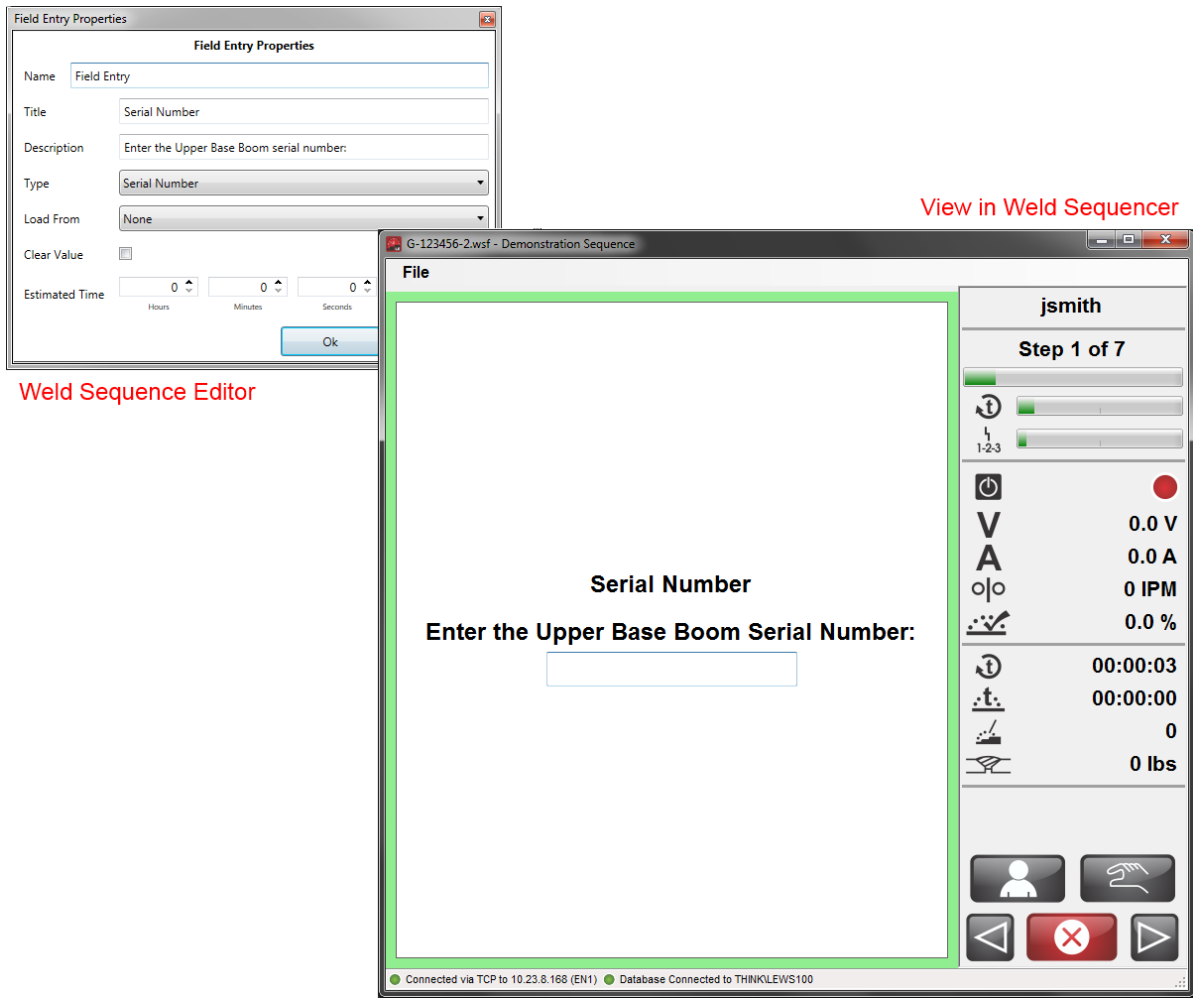


Figure 6.18 Field Entry Function

The Weld Operator must enter the requested information (Figure 6.18) and press **Enter**, or the software flags the sequence with an error. Weld Sequencer adds the entered information to the Welding Power Source for increased traceability.


NOTE | Weld Sequencer clears the part serial number at the end of the sequencer to ensure the software does not use an old or “left over” serial number for new sequences (new parts).

TIP | You can use the *Field Appender* function (page 6.20) to attach an additional identifier to the end of the ID number to increase the granularity of the part’s traceability.

Table 6.9 Properties Available for the Field Entry Function

Field	Description
Name	You can add a description for this function that appears on the function’s icon in the Weld Sequence Editor. This helps you easily identify the function within the step.

Field	Description
<i>Title</i>	<p>The text that you enter in the <i>Title</i> field displays in the Weld Sequencer first on the screen when the Weld Operator reaches this function (e.g., “Serial Number” in Figure 6.18).</p> <p>NOTE When you use the <i>Clear Value</i> option, this field is disabled since there is no display to the Weld Operator in Weld Sequencer.</p>
<i>Description</i>	<p>The text you enter in the <i>Description</i> field displays in the Weld Sequencer after the text from the <i>Title</i> field (e.g., “Enter the Upper Base Boom Serial Number:” text in Figure 6.18).</p> <p>NOTE When you use the <i>Clear Value</i> option, this field is disabled since there is no display to the Weld Operator in Weld Sequencer.</p>
<i>Type</i>	<p>Weld Sequencer needs to know which number you are asking the Weld Operator to enter in order to save the number properly. From the <i>Type</i> drop-down, select which ID number this function represents: Consumable Lot Code or the Part Serial Number. You will see this number in reports in CheckPoint™.</p>
<i>Wire Feeder</i>	<p>If you have a weld sequence that requires a Dual Head wire feeder, select which wire feeder this function represents.</p>
<i>Load From</i>	<p>You use the <i>Load From</i> field in conjunction with the <i>Create Record</i> or the <i>Select Record</i> functions (page 6.39). The <i>Load From</i> field allows you to pull data from the Work Item table in the Weld Sequencer database that was created with the <i>Database</i> functions. The <i>Field Entry</i> function then sends that data to the Welding Power Source as the type you specify in the <i>Type</i> field. Simply select the column in the <i>Load From</i> drop-down from which you would like to pull data.</p> <p>For example, John at Advanced Manufacturing has a weld sequence file for a vehicle that consists of several sub-assemblies with their own serial numbers. John wants the operator to scan in the vehicle serial number and each of the serial numbers for the sub-assemblies to build that record in the Weld Sequencer database. He has used a <i>Create Record</i> function in the sequence to create this record. (See page 6.39 for more details on using <i>Database</i> functions.)</p> <p>Now, rather than using the <i>Field Entry</i> function to request the Weld Operator to enter the vehicle’s serial number a second time to send the data to CheckPoint™, John just wants to pull the number already entered and pass it to CheckPoint™.</p> <p>So, since the vehicle’s record is currently active, John selects <i>Field 1</i> from the <i>Load From</i> drop-down since <i>Field 1</i> contains the vehicle serial number he wants to use as the serial number for the welds.</p> <p>NOTE When you use the <i>Load From</i> option, Weld Sequencer does NOT display an entry field to the Weld Operator.</p>
<i>Clear Value</i>	<p>The <i>Clear Value</i> checkbox allows you to create a function that clears the existing Consumable Lot Code or Part Serial Number currently entered on the Welding Power Source. This is especially helpful to add at the end of a weld sequence so future weld records from this Welding Power Source do not contain any “leftover” values.</p> <p>NOTE When you use the <i>Clear Value</i> checkbox, the Weld Operator does not see a</p>

Field	Description
	<p>display in the Weld Sequencer. The activity occurs behind the scenes.</p> <p>Place a check mark in the <i>Clear Value</i> checkbox and select the field you want to clear from the <i>Type</i> drop-down. When the Weld Operator runs this weld sequence file and reaches this function, the sequence removes the selected data.</p>
<i>Hide in Review Function</i>	You can select this option to hide information about this function and not show it in the Review Function list. If a sequence error occurs during this function, it will still be shown in the Review Function list.
<i>Estimated Time</i>	<p>The <i>Estimated Time</i> field is how long you think it should take for someone to find the appropriate ID and enter it into Weld Sequencer. Weld Sequencer uses this time in the Cycle Status (Table 7.1 on page 7.4) so be sure to provide ample time for a person to locate the consumable lot code or part serial number and come back to the computer to enter the data.</p> <p>TIP The Cycle Status  bar in Weld Sequencer turns yellow when the Weld Operator reaches 85% of the time you enter here. This alerts the operator that time is running out. See Table 7.1 on page 7.4 for details on the Weld Sequencer display.</p>

Field Appender



You can use the *Field Appender* function to add an identifier to the consumable lot code or part serial number to help you identify individual welds. Many companies have a single part serial number for all pieces of a part for example. The *Field Appender* allows you to label the specific welds for increased traceability. The appended text becomes part of the *Consumable Lot* and *Part SN* fields in CheckPoint™.

TIP | You can use this function in conjunction with the *Field Entry* function as well (page 6.16) and add identifiers to the data entered by the Weld Operator.

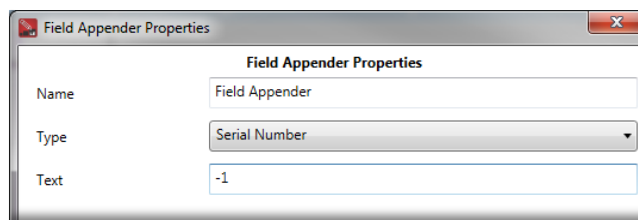


Figure 6.19 Field Appender Properties

NOTE | The *Field Appender* remains in effect until you use another *Field Appender* function to change it or the sequence ends, whichever comes first.

For example, in Figure 6.20, John at Advanced Manufacturing has created a weld sequence file for an engine cradle that includes 14 different welds. There is one part serial number for the engine cradle; however, John wants to be able to identify every one of those welds individually.

John has already added the *Field Entry* function at the beginning of the sequence to prompt the Weld Operator for the part serial number in Weld Sequencer. Before the *Weld* function of each weld in Weld Sequence Editor, he includes the *Field Appender* function and tells the system to add specific text to the end of the part serial number that was entered by the Weld Operator:

- Before the *Weld* function for the first weld, John adds the *Field Appender* function and types a hyphen “-” and a “1” in the *Text* property: -1
- He adds a *Field Appender* function before the *Weld* function for the second weld and types a hyphen “-” and a “2” in the *Text* property: -2
- And so on for all 14 welds, changing the numbers accordingly.

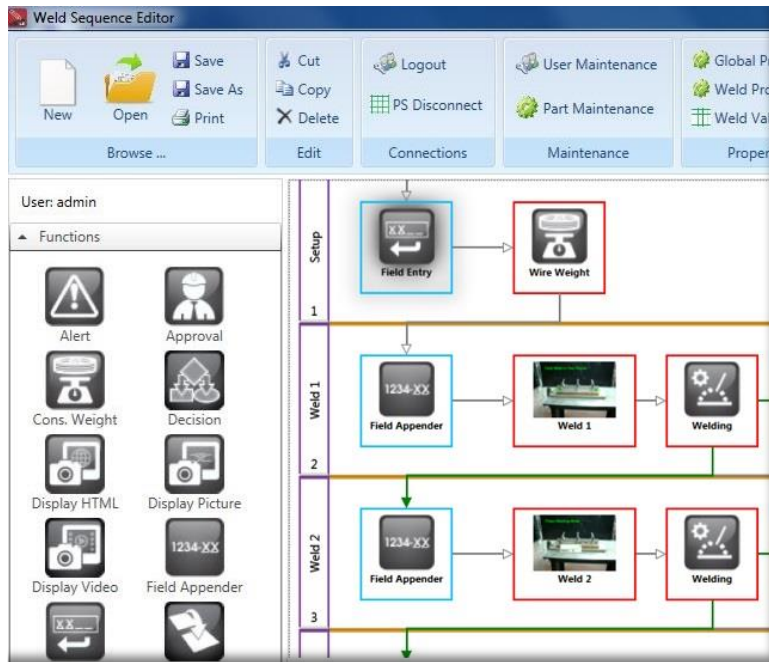


Figure 6.20 Example of Using Field Appender Function

Table 6.10 Properties Available for the Field Appender Function

Field	Description
<i>Name</i>	You can add a description for this function that appears on the function’s icon in the Weld Sequence Editor. This helps you easily identify the function within the step.
<i>Type</i>	Weld Sequencer needs to know to which number you want to append the text you enter in the <i>Text</i> field. From the <i>Type</i> drop-down, select the data you want to append.
<i>Wire Feeder</i>	If you have a weld sequence that requires a Dual Head wire feeder, select which wire feeder this function represents.
<i>Text</i>	Enter the letters, numbers or special characters (either a hyphen or an underscore) that you want the system to tack on to the end of the ID number selected in the <i>Type</i> field. For example, John at Advanced Manufacturing wants to add a dash (-) and a 1 after the part serial number for the first weld in the sequence. Before the first <i>Weld</i> function, he inserts the <i>Field Appender</i> function and types the following in the <i>Text</i> field: -1

Field	Description
<i>Hide in Review Function</i>	You can select this option to hide information about this function and not show it in the Review Function list. If a sequence error occurs during this function, it will still be shown in the Review Function list.

Goto Step Function



For large sequences with a large number of steps and the need to jump to a distant step, the *Goto Step* function allows you to go directly to that later step without a long connector. You can identify the target step using the unique step name.

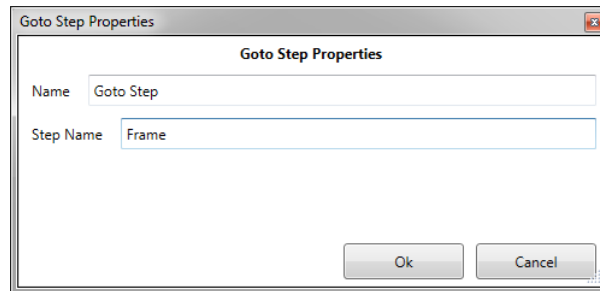


Figure 6.21 Goto Step Function

Table 6.11 Properties Available for the Goto Step Function

Field	Description
<i>Name</i>	You can add a description for this function that appears on the function's icon in the Weld Sequence Editor. This helps you easily identify the function within the step.
<i>Step Name</i>	Enter the name of the step to which you want the sequence to jump. This step name should be unique across the weld sequence. If the step name you use is not unique, Weld Sequencer jumps to the first instance of that step name. For example, if you have multiple steps with the default step name "New Step", Weld Sequencer uses the first step with that name. NOTE Be sure to use the step name. The <i>Goto Step</i> function does not recognize the step number.
<i>Hide in Review Function</i>	You can select this option to hide information about this function and not show it in the Review Function list. If a sequence error occurs during this function, it will still be shown in the Review Function list.

If approval is required for the Goto Step option, select the level of approval from the Global Properties window. Refer to Chapter 5 *Global Properties*.

Approval




With the *Approval* function, you can specify the type of User Role that is required to login at this point in your weld sequence before the weld sequence can go any farther. Weld Sequencer disables all navigation buttons (i.e., **Previous**, **Next**, **Goto Step**, etc.) until a user logs in. You can use the function to incorporate a quality check or manager approval into your weld sequence.

Sequencer does not have the Administrator role, John still wants Weld Sequencer to display the *Review* function, but he doesn't want that user to change any of the statuses.

On the connector to the first *Review* function in Weld Sequence Editor (the one for the Quality Manager where there is a check mark next to *Allow Editing*), he selected *Correct User Role = True*. On the connector to the second *Review* function (with no check mark next to *Allow Editing*), he selected *Correct User Role = False*. (See page 6.24 for details on the *Review* function and the *Allow Editing* checkbox.)

Table 6.12 Properties Available for the Approval Function

Field	Description
<i>Name</i>	You can add a description for this function that appears on the function's icon in the Weld Sequence Editor. This helps you easily identify the function within the step.
<i>Description</i>	<p>The text you enter in the <i>Description</i> field appears in the Weld Sequencer with the user name and password fields for the login. You can use this text to help guide your Weld Operator with what to do next.</p> <p>For example, once all the welds in the sequence are complete, John at Advanced Manufacturing wants their Quality Control Manager to log in to Weld Sequencer and review any welds that didn't pass validation during the sequence. In Weld Sequence Editor, John enters the following text in the <i>Description</i> field for the function: <code>Contact a Quality Control Manager to log in and review.</code></p>
<i>Role</i>	<p>Select the user role for the type of user you want to login. Only a user with the selected user role on their user account can log in at this step of the weld sequence. See page 3.1 for more details on user roles and accounts.</p> <p>TIP When an approver user logs in to the <i>Approval</i> function, Weld Sequencer records that username in the Sequence Reports.</p>
<i>Hide in Review Function</i>	You can select this option to hide information about this function and not show it in the Review Function list. If a sequence error occurs during this function, it will still be shown in the Review Function list.
<i>Estimated Time</i>	<p>The <i>Estimated Time</i> field is how long you think it should take for someone to log in with their username and password. Weld Sequencer uses this time in the Cycle Status (Table 7.1 on page 7.4) so be sure to provide ample time for the appropriate personnel to be located and then log in, if different from the Weld Operator.</p> <p>TIP The Cycle Status  bar in Weld Sequencer turns yellow when the Weld Operator reaches 85% of the time you enter here. This alerts the operator that time is running out. See Table 7.1 on page 7.4 for details on the Weld Sequencer display.</p>

Review



The *Review* function is a Quality Control measure. It displays a list of all the steps in the weld sequence up until the point of the *Review* function and whether they passed or failed validation. Typically, you add this to the end of the weld sequence. You also have the option to set up a conditional exit out of the *Review* function based on whether or not there were any errors during the sequence.

NOTE | If the user clicks the Previous ◀ or Next ▶ buttons instead of the Continue button, Weld Sequencer flags the sequence with an error.

Review Function

Once a Weld Operator completes the weld sequence, you can display the *Review* function so either the Weld Operator or a manager can review the validation on all steps in a sequence. They can review any welds that failed and either approve them or deal with them appropriately. To change the status of a step, the user simply selects *Pass* or *Fail* from the drop-down. Some functions are hidden from the Review list as they relate to running the sequence and not actual welding (e.g., the Display Picture function, the Alert function, or the option to hide the function has been selected). Table 6.13 explains the properties available for the *Review* function.

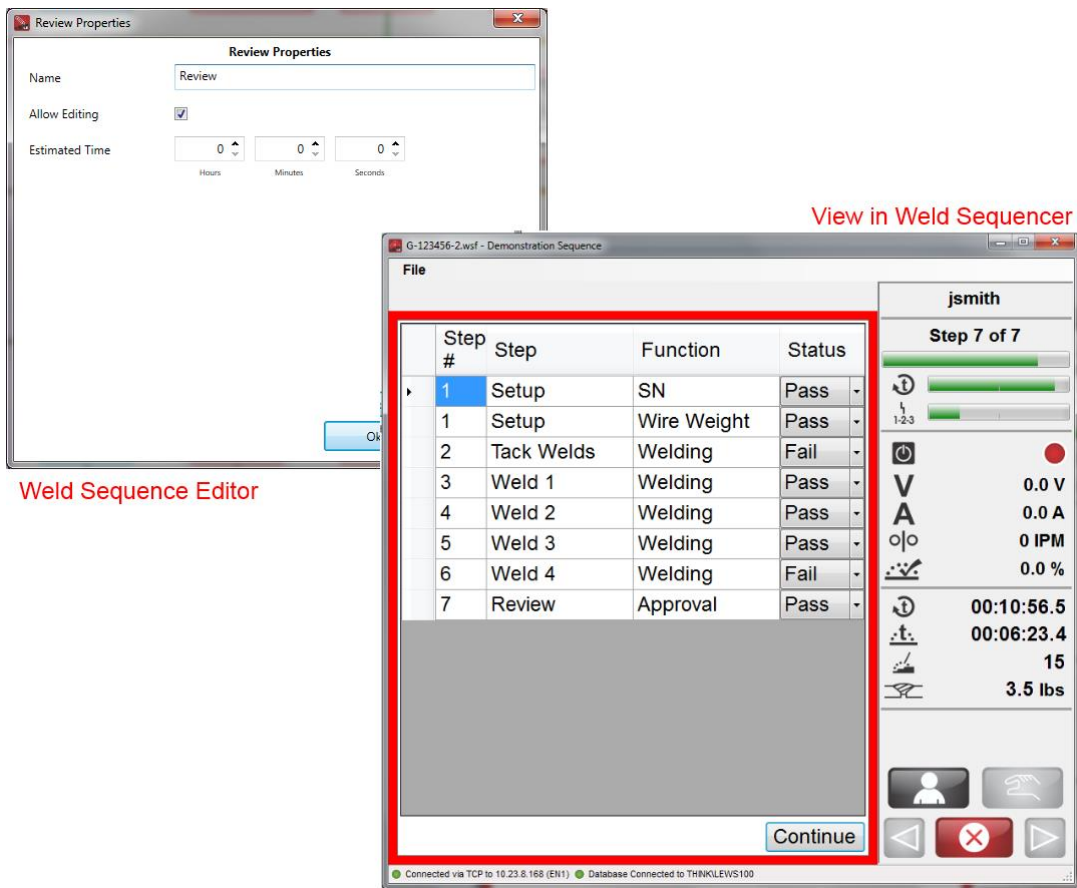



Figure 6.24 Review Function

TIP | See page 5.3 for details on how to set up the torch trigger to work as the Continue button on the *Review* function.

TIP | For more stringent quality control measures, you can implement this function along with the *Approval* function to force a manager to log in and review the welds produced using this weld sequence before the Weld Operator can continue.

Table 6.13 Properties Available for the Review Function

Field	Description
<i>Name</i>	You can add a description for this function that appears on the function's icon in the Weld Sequence Editor. This helps you easily identify the function within the step.
<i>Allow Editing</i>	<p>The <i>Allow Editing</i> checkbox allows you to choose whether or not you want to allow the current user to change the <i>Status</i> drop-down on the steps. This is especially helpful if you simply want to display a read-only review step.</p> <p>If you decide to use the <i>Review</i> function in conjunction with the <i>Approval</i> function, you can choose to display the read-only version for a user without the appropriate user role and an editable version for the correct user (Figure 6.23 on page 6.23).</p>
<i>Hide in Review Function</i>	You can select this option to hide information about this function and not show it in the Review Function list. If a sequence error occurs during this function, it will still be shown in the Review Function list.
<i>Estimated Time</i>	<p>The <i>Estimated Time</i> field is how long you think it should take for someone to complete the review process on this weld sequence. Weld Sequencer uses this time in the Cycle Status (Table 7.1 on page 7.4) so be sure to provide ample time for a person to read through each failed step and verify the quality of the assembly.</p> <p>TIP The Cycle Status  bar in Weld Sequencer turns yellow when the Weld Operator reaches 85% of the time you enter here. This alerts the operator that time is running out. See Table 7.1 on page 7.4 for details on the Weld Sequencer display.</p>

Review Function Exit Conditions

When you connect the *Review* function to the next function in the sequence, the connector turns green. This indicates that you made a decision based on whether or not there were any errors during the sequence.

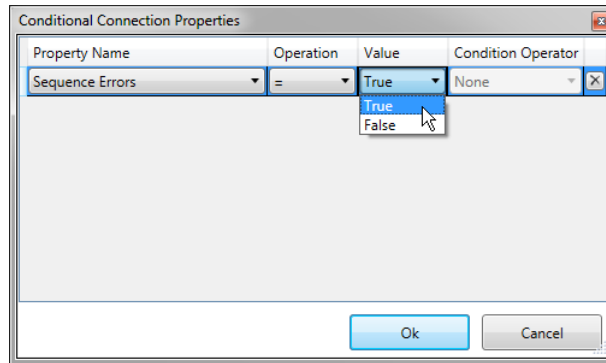


Figure 6.25 Connector Options on the Review Function

When you double-click the green connector, you can make the following conditions using the drop-downs on the *Conditional Connection Properties* window (Figure 5.6):

- *Sequence Errors = True* means that if there are sequence errors (steps that display the word “Fail” on the *Review* display), this is the route the sequence should take.
- *Sequence Errors = False* means that if there are no sequence errors (all steps display the word “Pass” on the *Review* display), this is the route the sequence should take.

For example, John at Advanced Manufacturing added a *Review* function for the Weld Operator at the end of the sequence. He added the *Sequence Error* conditions to the green connectors so that:

- If there were sequence errors (i.e., *Sequence Errors = True*), the sequence would display an *Approval* function that requires a Quality Manager to come over, discuss the problems with the Weld Operator and then log in to allow the Weld Operator to continue.
- If there were no sequence errors (i.e., *Sequence Errors = False*), the sequence simply skips the *Approval* function and allows the Weld Operator to continue to finish the sequence.

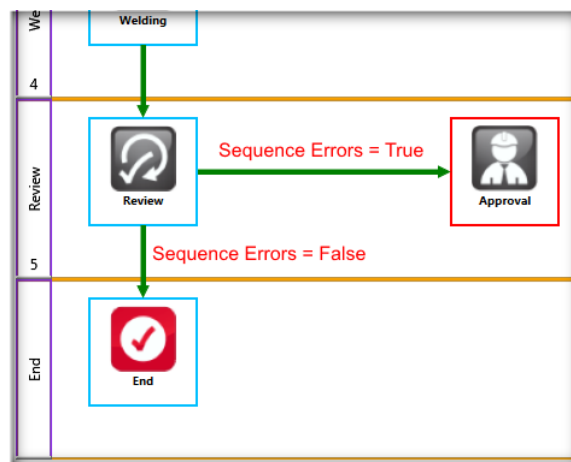


Figure 6.26 Example Use of Review Exit Conditions

Welding Functions

The heart of a weld sequence is, of course, the welding. With the welding functions, you dictate how many welds to perform, which Weld Profile to use, how to validate the welds and which weld procedures to use.

There are several functions available for welding that you can insert into your sequence, depending on the needs of your weld operation:

- *Weld* (page 6.28): The standard *Weld* function is a standard specification for the welds in a specific step of the weld sequence. There are a strict number of welds the Weld Operator must perform, with no variance allowed in the number of welds performed.
- *Weld Accumulator* (page 6.29): The *Weld Accumulator* function provides flexibility in the number of welds that can be made in order to complete the operation (e.g., to accommodate various experience levels of Weld Operators).
- *Weld Open* (page 6.31): The *Weld Open* function accommodates variable parts and non-standard welds (such as welding over a gap in a part) in the weld sequence where it is difficult to predict the number of welds needed to perform the weld. You do, however, need to define the minimum and maximum number of welds.

TIP | If a weld sequence has the User Limits feature enabled, the weld operator can adjust the settings on the power source before making a weld. After adjusting the settings, please wait 10 seconds before completing the weld to allow the weld operator's settings to be saved.

Weld Function



When you have a specific number of welds that must be performed, where the Weld Operator cannot make any more or any fewer welds, you can use the Weld function to dictate the precise number of welds the Weld Operator must perform. The system tracks welds by counting the arc starts and stops. If the Weld Operator does not perform the specified number of welds, the sequence is flagged with an error. See page 6.34 for details on validating welds within the function and page 6.33 for details on specifying procedures for the feed head(s).

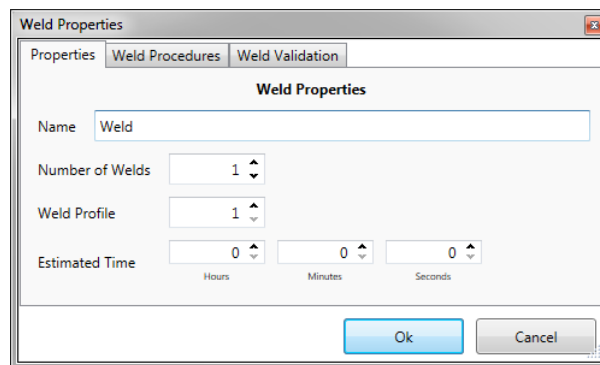



Figure 6.27 Weld Function Properties

To add welds to your weld sequence, drag-and-drop the *Weld function* to your weld sequence, enter the number of welds and other properties (Table 6.14); select the weld procedures (page 6.33); and select the validation properties (page 6.34).

Table 6.14 Properties Available for the Weld Function

Field	Description
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Field	Description
<i>Name</i>	You can add a description for this function that appears on the function's icon in the Weld Sequence Editor. This helps you easily identify the function within the step.
<i>Number of Welds</i>	Enter the number of welds you need to perform with this function. This is the number of arc starts that Weld Sequencer must sense before continuing to the next function. See page 6.33 for details on adding validation to your <i>Weld</i> function. NOTE Remember, if you use multiple welds with the same <i>Weld</i> function, all settings and the Weld Profile are used for all welds. For example, if you need two welds with different characteristics, you need to add two separate <i>Weld</i> functions to your sequence.
<i>Weld Profile</i>	Enter the number for the Weld Profile you want the Welding Power Source to use for all of the welds in this function. This Weld Profile determines the welding limits for the welds. For in-depth details on Weld Profiles, please refer to the <i>Power Wave® Manager User Manual</i> (IM8002). STOP Be sure that the Weld Profile on the Welding Power Source contains the settings you want to use for this weld. For example, each Welding Power Source has a Weld Profile 4; however, the profile limits set on each machine's Profile 4 could be different. TIP You can use the <i>Weld Profiles</i> field to ignore short welds. See page B.7 for more information.
<i>Hide in Review Function</i>	You can select this option to hide information about this function and not show it in the Review Function list. If a sequence error occurs during this function, it will still be shown in the Review Function list.
<i>Estimated Time</i>	The <i>Estimated Time</i> field is how long you think it should take for someone to complete all the welds you have listed in this function. Weld Sequencer uses this time in the Cycle Status (Table 7.1 on page 7.4) so be sure to provide ample time for a person to make the weld(s), reposition the part if needed and carry out other behaviors that go into making the weld(s). STOP The <i>Estimated Time</i> is NOT ONLY arc-on time. It also includes non-welding time involved in completing the welds. TIP The Cycle Status  bar in Weld Sequencer turns yellow when the Weld Operator reaches 85% of the time you enter here. This alerts the operator that time is running out. See Table 7.1 on page 7.4 for details on the Weld Sequencer display.

Weld Accumulator Function



If you have a weld operation that requires a little flexibility in the number of welds (or arc starts) that can be made in order to complete the operation, the *Weld Accumulator* function provides that flexibility. For example, those weld operations that an experienced welder can complete with a single weld, but a new welder may take two or three welds (e.g., welding around a circle), you can insert the *Weld Accumulator* function into your weld sequence.

Figure 6.28 Weld Accumulator Function

With the flexibility of the *Weld Accumulator* function, you end the function based on the *Minimum Number of Welds*, *Minimum Deposition* and *Maximum Deposition* fields. These are the total amounts for the entire function. You VALIDATE those welds by the choice(s) you make on the **Weld Validation** tab and on the connectors you add to the next function in the sequence.


For example, Ron at Advanced Manufacturing has been welding for 20 years. He's a very competent and experienced welder. David, on the other hand, has only been welding for a few months and isn't quite as skilled.

The weld operation they each need to accomplish is a circular weld with a minimum of two welds and a minimum deposition of 0.15 lbs. (but a maximum of 0.20 lbs.). At Ron's skill level, he can perform this weld operation in two welds, meeting the weld quantity and deposition requirements. David, however, needs the flexibility to complete that weld operation in more welds.

Since the wire deposition on David's second weld is still below the minimum set in the weld sequence, he is allowed to continue without flagging the step with an error and finish the weld operation with a third weld that brings the total deposition above the minimum (and of course, below the maximum).

Table 6.15 Properties Available for the Weld Accumulator Function

Field	Description
<i>Name</i>	You can add a description for this function that appears on the function's icon in the Weld Sequence Editor. This helps you easily identify the function within the step.
<i>Minimum Number of Welds</i>	Enter the minimum number of total welds that it takes to complete this welding operation. Weld Sequencer uses this field, along with the <i>Minimum Deposition</i> and <i>Maximum Deposition</i> fields, to determine when to exit the function. If a Weld Operator attempts to advance to the next step without making at least this many welds, Weld Sequencer displays a red border and flags the step with an error. In the <i>Review</i> function, this step would show as failed.
<i>Accumulate From</i>	You can choose to determine weld accumulation by <i>Deposition</i> or by <i>Arc Time</i> . The <i>Minimum</i> and <i>Maximum</i> fields allow you to specify the acceptable upper and lower limits for: <ul style="list-style-type: none"> ▪ <i>Deposition</i>: The total amount of material it takes to complete this welding

Field	Description
	<p>operation. Or,</p> <ul style="list-style-type: none"> ▪ <i>Arc Time</i>: The total amount of arc time it takes to complete this welding operation. <p>This helps to determine when the function ends, in conjunction with the <i>Minimum Number of Welds</i> field.</p> <p>For example, in Figure 6.28, if David at Advanced Manufacturing completed three welds (which was above the defined <i>Minimum Number of Welds</i>) and the total amount of material he deposited for the welds was above the amount defined in the <i>Minimum Deposition</i> field, the function would be completed and the next function would start to execute.</p>
<i>Weld Profile</i>	<p>Enter the number for the Weld Profile you want the Welding Power Source to use for all of the welds in this function. This Weld Profile determines the welding limits for the welds. For in-depth details on Weld Profiles, please refer to the <i>Power Wave® Manager User Manual</i> (IM8002).</p> <p>STOP Be sure that the Weld Profile listed on the Welding Power Source contains the settings you want to use for this weld. For example, each Welding Power Source has a Weld Profile 1; however, the profile limits set on each machine's Profile 1 could be different.</p>
<i>Enable Continue Action</i>	<p>Enabling this option controls the completion of the function by displaying a <i>Continue</i> button instead of exiting the function after the <i>Minimum Number of Welds</i> and the <i>Minimum Accumulation</i> have been met. Additional welds can be made until the <i>Maximum Accumulation</i> is reached or the operator <i>Continues</i> to the next function.</p>
<i>Hide in Review Function</i>	<p>You can select this option to hide information about this function and not show it in the Review Function list. If a sequence error occurs during this function, it will still be shown in the Review Function list.</p>
<i>Estimated Time</i>	<p>The <i>Estimated Time</i> field is how long you think it should take for someone to complete all the welds you have listed in this function. Weld Sequencer uses this time in the Cycle Status (Table 7.1 on page 7.4) so be sure to provide ample time for a person to make the weld(s), reposition the part if needed and carry out other behaviors that go into making the weld(s).</p> <p>STOP The <i>Estimated Time</i> is NOT ONLY arc-on time. It also includes non-welding time involved in completing the welds.</p> <p>TIP The Cycle Status  bar in Weld Sequencer turns yellow when the Weld Operator reaches 85% of the time you enter here. This alerts the operator that time is running out. See Table 7.1 on page 7.4 for details on the Weld Sequencer display.</p>

Weld Open Function



When you need to include a welding function that accommodates variable parts and non-standard welds (such as welding over a gap in a part), you can use the *Weld Open* function. The *Weld Open* function allows the Weld Operator to make necessary adjustments to complete the weld(s). Those welds must be within the minimum and maximum range that was set for the welding operation. Table 6.16

explains the properties for the *Weld Open* function in more detail. See page 6.33 for details on validating welds within the function and page 6.33 for details on specifying procedures for the feed head(s).

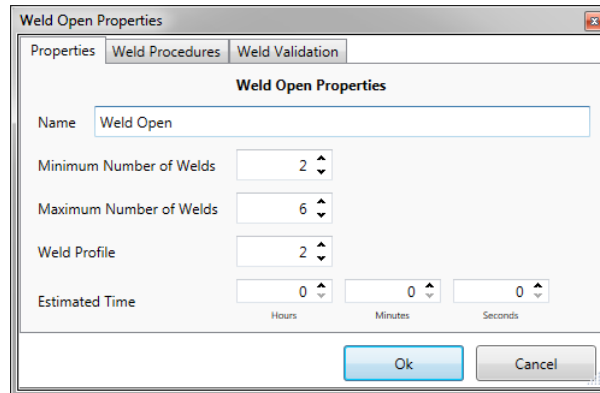



Figure 6.29 Weld Open Properties

Once a Weld Operator completes the welding operation, and as long as the number of welds made falls within the minimum and maximum range, the operator will be able to advance to the next step without flagging the sequence with an error. However, if the welds do go outside the limits set by the Weld Engineer, Weld Sequencer will flag the step with an error (turning the border red) when the Weld Operator attempts to advance to the next step.

For example, Ron at Advanced Manufacturing needs to weld over a gap in his assembly. John, the Weld Engineer, added a *Weld Open* function to the weld sequence in Weld Sequence Editor to allow the Weld Operator some freedom to weld as needed to cover the gap appropriately, with a limit of two to six welds.

Table 6.16 Properties Available for the Weld Open Function

Field	Description
<i>Name</i>	You can add a description for this function that appears on the function's icon in the Weld Sequence Editor. This helps you easily identify the function within the step.
<i>Minimum Number of Welds</i>	Enter the minimum number of welds that it takes to complete this welding operation. If a Weld Operator attempts to advance to the next step without making at least this many welds, Weld Sequencer displays a red border and flags the sequence as having errors. In the <i>Review</i> function, this step would show as failed.
<i>Maximum Number of Welds</i>	Enter the maximum number of welds that it takes to complete this welding operation. Once the Weld Operator makes the maximum number of welds, Weld Sequencer automatically advances to the next function.
<i>Weld Profile</i>	Enter the number for the Weld Profile you want the Welding Power Source to use for all of the welds in this function. This Weld Profile determines the welding limits for the welds. For in-depth details on Weld Profiles, please refer to the <i>Power Wave® Manager User Manual</i> (IM8002). STOP Be sure that the Weld Profile on the Welding Power Source contains the settings you want to use for this weld. For example, each Welding Power Source has a Weld Profile 1; however, the profile limits set on each machine's Profile 1 could be different.

Field	Description
<i>Hide in Review Function</i>	You can select this option to hide information about this function and not show it in the Review Function list. If a sequence error occurs during this function, it will still be shown in the Review Function list.
<i>Estimated Time</i>	<p>The <i>Estimated Time</i> field is how long you think it should take for someone to complete this Weld Open function. Weld Sequencer uses this time in the Cycle Status (Table 7.1 on page 7.4) so be sure to provide ample time for a person to make the weld(s), reposition the part if needed and carry out other behaviors that go into making the weld(s).</p> <p>STOP The <i>Estimated Time</i> is NOT ONLY arc-on time. It also includes non-welding time involved in completing the welds.</p> <p>TIP The Cycle Status  bar in Weld Sequencer turns yellow when the Weld Operator reaches 85% of the time you enter here. This alerts the operator that time is running out. See Table 7.1 on page 7.4 for details on the Weld Sequencer display.</p>

Weld Procedures Tab

With any of the welding functions, you use the **Weld Procedures** tab to specify which procedures the Welding Power Source should use for the welds in this function. Once you enter the number of welds you want to make on the **Properties** tab of the function, Weld Sequencer activates the drop-downs on the **Weld Procedures** tab, and you can select the appropriate weld procedure for the weld and indicate which feed head should be enabled for this weld. You can select a Procedure A and a Procedure B for each feed head. See page 5.17 for details on adding weld procedures to the weld procedure library so it appears in this drop-down.

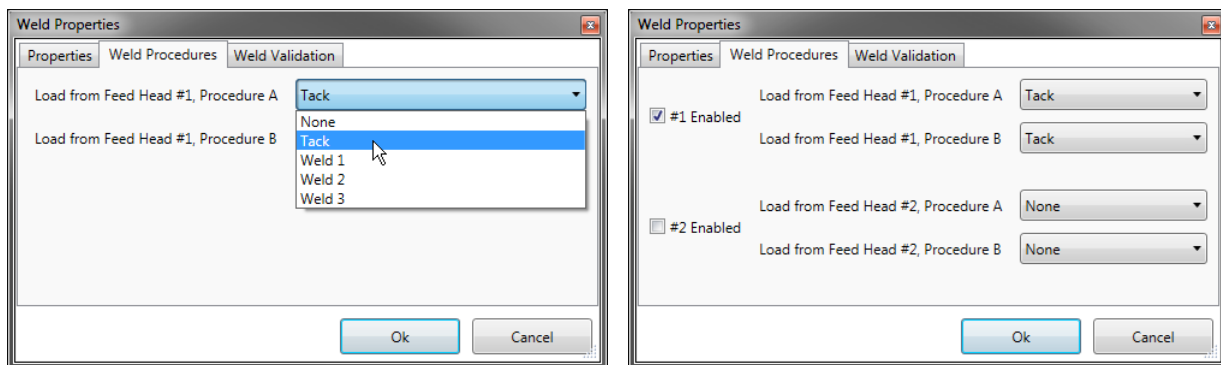


Figure 6.30 Weld Procedures for Single and Dual Head Feeders

TIP | To enable this sequence for a Dual Head feeder system, select the appropriate *Wire Feeder Type* under Global Properties (page 5.1). Enabling a Dual Head feeder displays another set of *Procedure* drop-downs so you can enable the correct feed head(s) for the weld.

Weld Validation Tab

Validations allow you to set conditions for passing a weld (i.e., the “good” conditions). If the weld does not meet these conditions, the weld fails validation and you can tell Weld Sequencer what to do next (e.g., display an alert or require a Quality Manager’s approval). You do all this using the **Weld Validations** in the top toolbar (which is unique to each weld sequence) and selecting the appropriate entry from the **Weld Validation** tab of the welding function. See page 5.22 for details on the sequence’s library of Weld Validations.

In order to validate a welding function, you use both the **Weld Validation** tab on the function and the function connectors. On the **Weld Validation** tab (Figure 6.31), simply select which validation you want to use for the welds in this function. Remember: The validation parameters indicate what properties must be met in order for the function to pass and move the sequence forward (i.e., the “good” condition). The function connectors tell Weld Sequencer which function to run when the validation passes and which function to run when the validation fails. See page 6.36 for details on connecting functions.

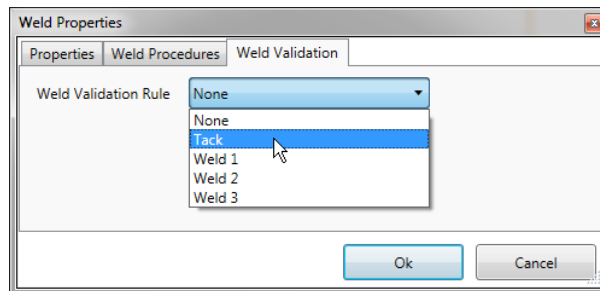


Figure 6.31 Weld Validation Tab

For example, John at Advanced Manufacturing has a *Weld* function in his *TackWelds* step. He created a validation rule for the *Tack* weld where he set the following parameters: *Duration* >= 1 AND *Duration* <= 2. Now he is ready to use that rule for a weld. He simply selects the *Tack* entry from the *Weld Validation Rule* drop-down on the **Weld Validation** tab of the *Weld* function (Figure 6.31).

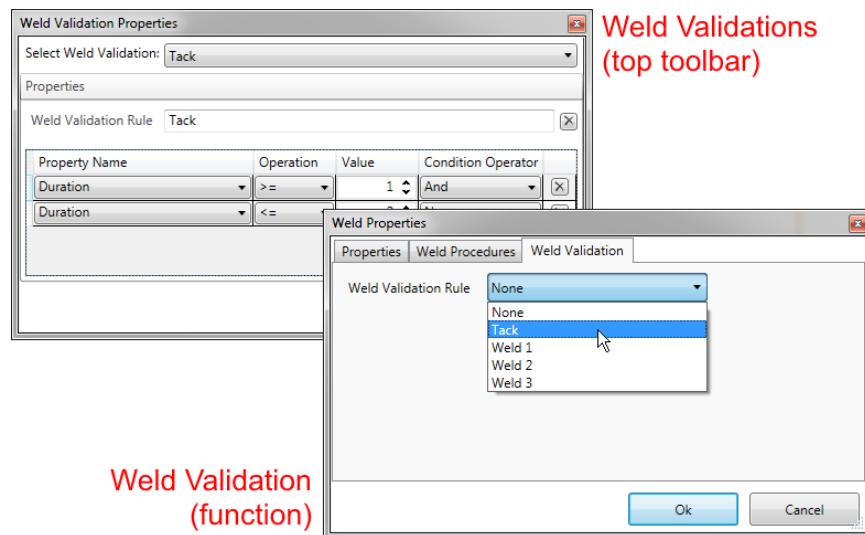


Figure 6.32 Weld Validations and the Weld Validation Tab of Welding Function

Using Weld Profiles to Validate Welds

Weld Profiles can help you validate welds and make sure that any welds you want the operator to perform are consistent across multiple parts. Profiles can cause alerts to occur when welding goes outside any limits you set in the profile. The availability of these alerts provides you with a great way to validate any welds in the sequence. If the welding operation causes an alert based on the Weld Profile being used, Weld Sequencer can perform any number of actions for you, including preventing the operation from moving forward.

TIP | The *Power Wave® Manager User Manual (IM8002)* explains **Weld Profiles in great detail.**

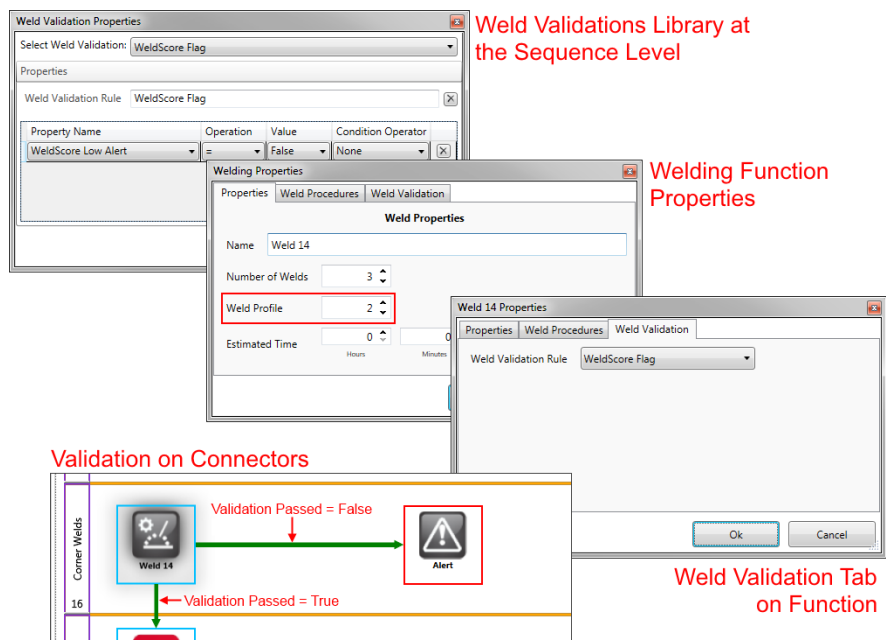


Figure 6.33 Using Weld Profiles to Validate Welds

For example, John at Advanced Manufacturing wants to use Weld Profiles for the welds in his sequence. In his Weld Profiles, the WeldScore® is set a little differently depending on the needs of the welds that will use that profile. No matter what the WeldScore® limit is for each profile, they each create an alert in the power source if welding goes below the limit. John is going to use the existence of that alert to validate the welding functions.

He created a welding validation on the sequence that indicated that the “good condition” is no WeldScore® alert when the Weld Operator completes the operation. Once he has this validation created, he can now use this validation on any of the welds that use any Weld Profile.

If the WeldScore® on any of the welding functions goes below whatever limit is chosen for whatever Weld Profile is listed on the welding function, John can use the connectors to direct the path of the sequence (e.g., to an *Alert* function if there is a WeldScore® alert issued or on to the next function if there is no alert issued).

TIP | See page B.7 for a helpful way to use a Weld Profile to ignore short welds in your welding operation.

Connecting a Welding Function

When you add validations to a welding function, you need to connect that function to the next sequence function you want the sequence to run if the validation you set fails (e.g., an *Approval* function) AND to the function you want the sequence to run if the validation passes (e.g., the next welding function). You must add a connector to address all possible values for the *PropertyName* you select. See Figure 6.23 on page 6.23.

TIP | The connector turns green if there are validation options available for the function.

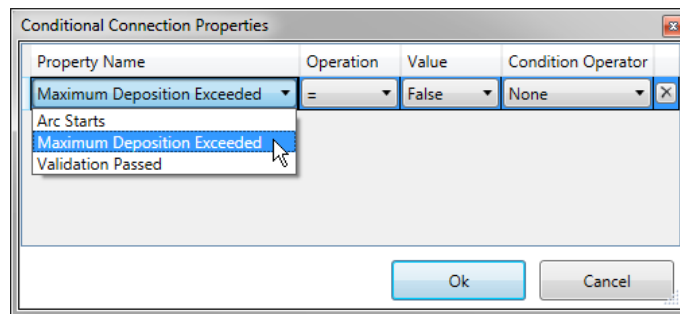


Figure 6.34 Connector Properties

The validations on the connector are simple. You have a choice between *Arc Starts*, *Maximum Deposition Exceeded* or *Validation Passed*.

- *Arc Starts*: The *Arc Starts* (i.e., number of welds) property allows you to move to another function based on a comparison to the number of arc starts that occurred in the welding function (e.g., *Arc Starts* \geq 2).
- *Maximum Deposition Exceeded*: Available only with the Weld Accumulator function, this property allows you to indicate which path Weld Sequencer should take if the total amount of material used by the Weld Operator went over the amount you specified as the top limit on the **Properties** tab within the accumulator function.
- *Validation Passed*: This property tells the weld sequence which path to take from the welding function based on the parameters on the **Weld Validation** tab.
 - *Validation Passed* = *True* means that if the validation you set on the **Weld Validation** tab within the welding function passes, this is the route the sequence should take.
 - *Validation Passed* = *False* means that if the validation you set on the **Weld Validation** tab within the welding function fails, this is the route the sequence should take.

In our example on page 6.34, John at Advanced Manufacturing set his validations for the *Weld* function in the Weld Sequence Editor based on the WeldScore[®] being above 90%. He added an *Approval* function next to the *Weld* function. He dragged a connector from the *Weld* function to the *Approval* function and double-clicked the connector. This is the path John wants Weld Sequencer to take if the WeldScore[®] is 90% or lower. So, he selects *Validation Passed* from the *PropertyName* drop-down and selected *False* from the *Value* drop-down. He did the same with the connector he dragged from the *Weld* function to the next *Weld* function in his sequence, but he selected *True* from the *Value* drop-down instead so the weld sequence would take this path if the WeldScore[®] was above 90%.

Resuming a Welding Function

If a weld fails validation in one of the welding functions (i.e., *Weld*, *Weld Accumulator* and *Weld Open*), a Weld Engineer typically takes the weld sequence to an *Alert* function or an *Approval* function or handles it some other way. If a connector comes back to the welding function, Weld Sequencer picks up where the operator left off, ready for the next weld.

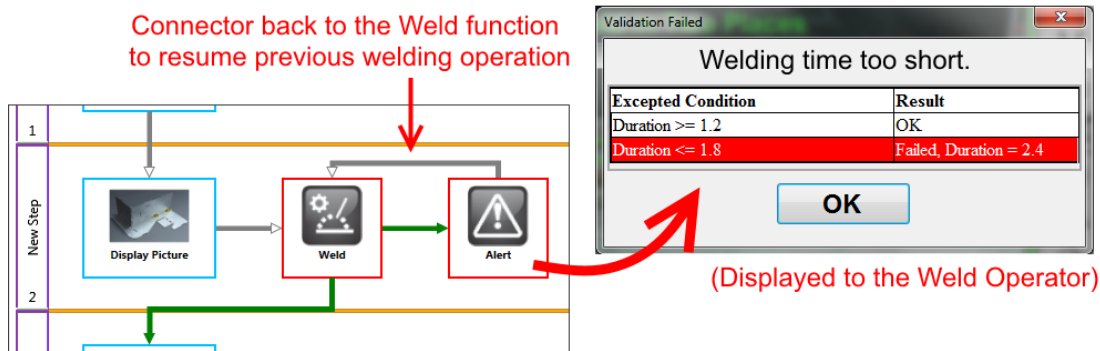


Figure 6.35 Best Practices with an Alert Function

For example, John at Advanced Manufacturing created a step in his weld sequence that contains a *Display Picture* function, a *Weld* function (with four welds) and an *Alert* function (to handle failed welds). He then drew a connector from the *Alert* function back to the *Weld* function (NOT to the next function of the next step).

When Ron down on the floor reached this part of the welding operation, his third weld failed validation. The weld sequence exited the welding function after the failed weld and displayed the alert for Ron (Figure 5.6). He acknowledged the message with two quick trigger pulls on his torch. The sequence went back to the welding function and picked up where Ron left off. However, Ron needed to make a correction in the failed weld. So, he switched into Manual mode with four quick trigger pulls and corrected the failed weld. He switched back into Automatic mode with four quick trigger pulls and continued the sequence with the final weld in the function.

Weld Function Icons

The welding function, ignore weld (optional), and spot timer (optional) icons are displayed on the top status bar to help the Weld Operator understand the requirements and conditions for the welding activity. The welding function icon lets the Weld Operator know if this is a *Weld* function, *Weld Accumulator* function, or a *Weld Open* function.

To the right of the welding function icon, an optional icon for the ignore weld time will be shown if the active Weld Profile is using this capability. Welds with a duration less than this value (in seconds) will be completely ignored. This is typically used to allow small tack welds, or to ignore accidental arc starts, without counting the weld against the requirements of the welding function.

If any of the Weld Procedures defined by the welding function are using Spot Timer functionality, another optional icon will be displayed along with the spot time (in seconds). This informs the Weld Operator that welding will stop automatically at the end of the spot time period.

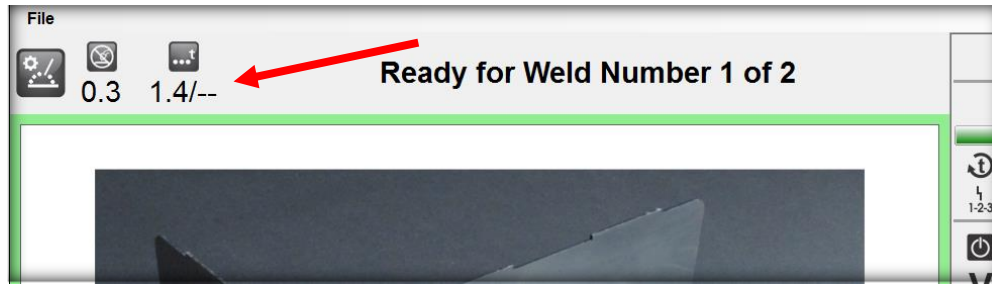


Figure 6.36 Weld Function Icons

Weldset Software



Use the *Weldset Software* function when you need to verify whether the connected Welding Power Source contains a special Weld Set (i.e., a specific library of Weld Modes on the machine). If you require a special weld set, you want to make sure the Welding Power Source that runs your weld sequence contains the appropriate welding software revision before the Weld Operator begins welding. When Weld Sequencer encounters this function, it checks the Welding Power Source for you and verifies the weld set.

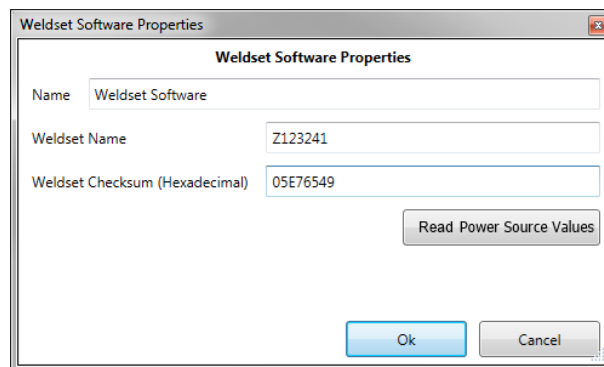


Figure 6.37 Weld Set Software Function Properties

If the Welding Power Source does not contain the weld set software revision you indicate in the function, Weld Sequencer displays an error and stops the weld sequence. This prevents a Weld Operator from attempting to execute a sequence on a power source with “wrong” or “unverified” welding software.

TIP | To read the values from the power source you have currently connected to the Weld Sequence Editor, simply click the Read Power Source Values button.

You can also find the weld set information for a Welding Power Source using Power Wave® Manager. Connect to the power source (page 2.11) and select System Status > Module Information. In the *Basic Information* section, you’ll see the *Weld Set Version* in the format: name (checksum).

Table 6.17 Properties Available for the Weld Set Software Function

Attribute	Description
-----------	-------------

Attribute	Description
<i>Name</i>	You can add a description for this function that appears on the function's icon in the Weld Sequence Editor. This helps you easily identify the function within the step.
<i>Weldset Name</i>	Enter the name of the weld set that must be on the Welding Power Source for this weld sequence. When the weld sequence finds the weld set's name, it then verifies the checksum.
<i>Checksum</i>	Enter the required checksum value for the weld set. If the checksum you list here does not match the checksum on the Welding Power Source for this weld set, Weld Sequencer displays an error and stops the sequence.
<i>Hide in Review Function</i>	You can select this option to hide information about this function and not show it in the Review Function list. If a sequence error occurs during this function, it will still be shown in the Review Function list.

Database Functions

The *Database* functions allow you to create and/or interact with the Work Item table in the Weld Sequencer database.

STOP | These functions make changes to a table in the Microsoft® SQL Server database. Only those users who are familiar with maintaining a SQL Server database should use these functions.

There are two sets of functions that work with this table:

- *Create Record* functions allow you to add records to the Work Item table in the Weld Sequencer database and help you increase the traceability of assemblies and subassemblies.

For example, John at Advanced Manufacturing needs to track the welds that go into making a vehicle. The vehicle has a serial number and each of the sub-assemblies has a serial number. John needs to be able to put those together. So, he has a weld sequence with the *Create Record* and *Save Field* functions to create a "work order".

- *Verify Field* functions allow you to look up data from a table and use it in your weld sequence (even if the data was not created with the *Create Record* functions).

For example, John at Advanced Manufacturing has assemblies that require the Weld Operator to use specific materials for the welds. He wants the operator to verify the material on the Welding Power Source and if what the operator enters does not match what John has in the table, John can make the weld sequence stop and inform the operator that the material is not correct. This helps him prevent unacceptable welds before the Weld Operator gets too far.

NOTE | Work Items are up to you. You can use them for tracking assemblies and sub-assemblies. You can also use them to create material lists for an assembly. Contact Lincoln Electric Weld Sequencer support for additional assistance: softwaresupport@lincolnelectric.com.

Work Item Create Functions

The *Create Record* and *Save Field* functions work together to build the records in the Work Item table. These functions allow you to prompt the Weld Operator (or other personnel) for data that Weld Sequencer saves into the database table.

- *Create Record* function: Use this function to prompt the Weld Operator for a unique identifier for the record. Weld Sequencer creates the row in the Work Item table and identifies the row by whatever text the operator enters (e.g., vehicle serial number or work order number). See page 6.41 for more details on this function.
- *Save Field* function: This function prompts the Weld Operator for data to add to the columns of the active record (e.g., columns for the cab, frame, bucket and other sub-assemblies of a loader vehicle). See page 6.42 for more details on this function.

TIP | When the operator creates a new record, that record remains active until the sequence changes it or the application closes.

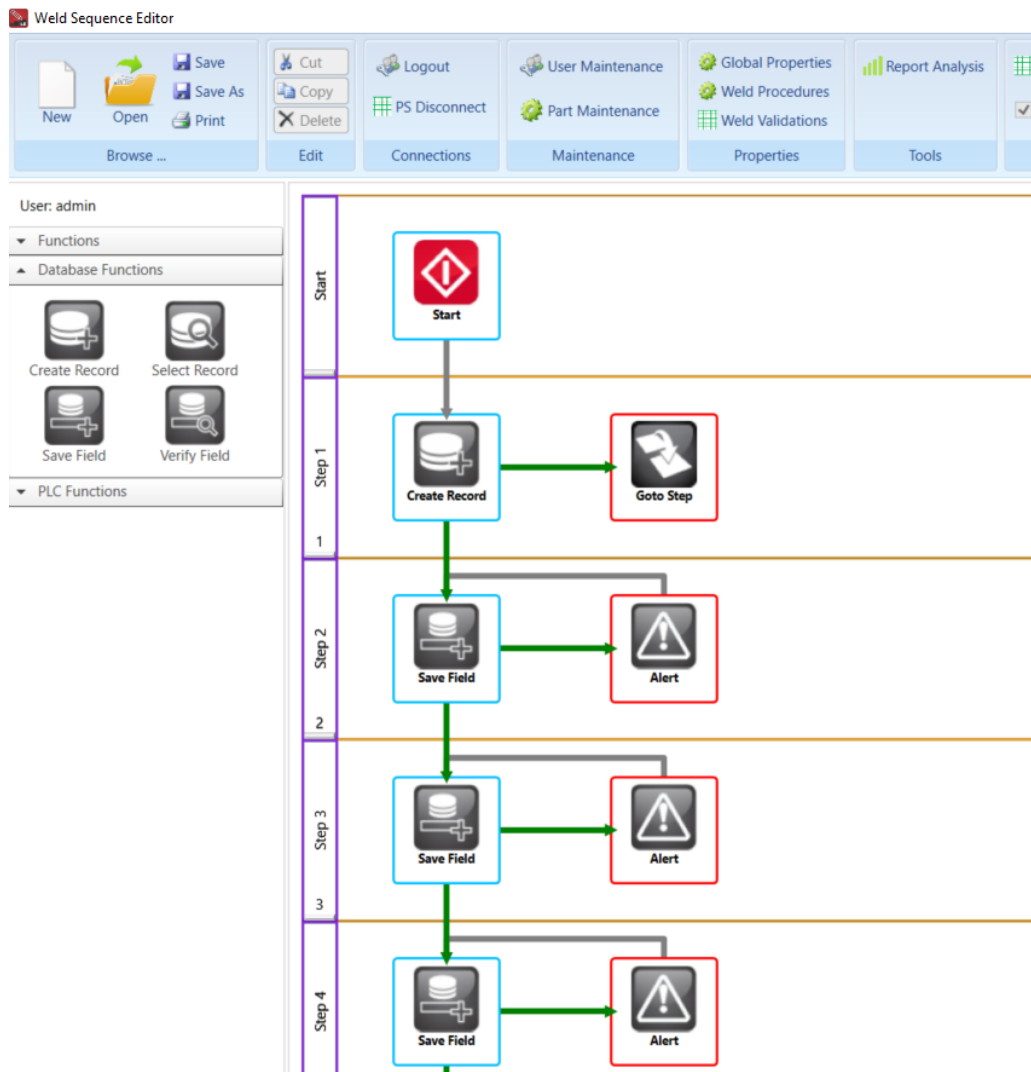


Figure 6.38 Create Record Functions

Create Record



The *Create Record* function displays an entry field in Weld Sequencer (Figure 6.39). When the Weld Operator (or other personnel) enters the data, the function verifies if that entry already exists in the table and, if it doesn't exist, the system creates a new row in the database and uses that data as the unique identifier for the record and keeps the record as the currently active record. Table 6.18 on page 6.42 explains the fields on the *Properties* window in more detail.

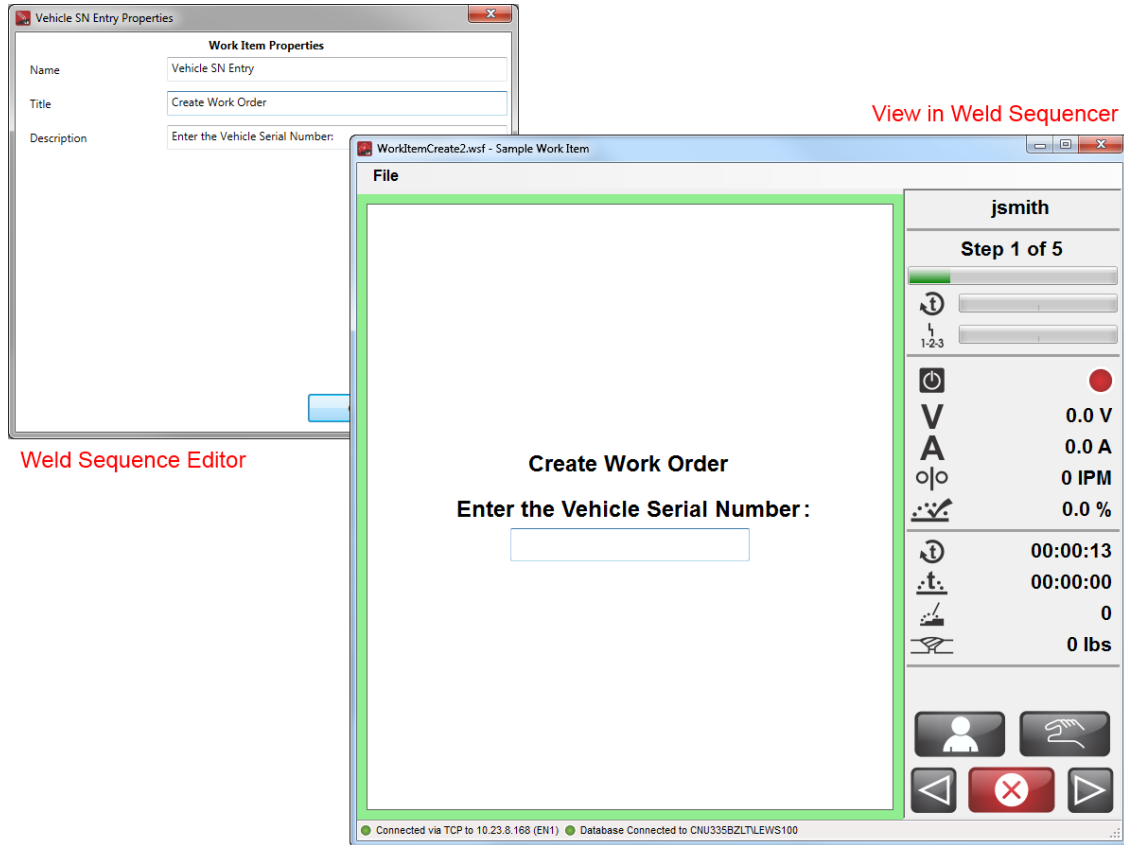


Figure 6.39 Create Record Function

The validation on the connector from this sequence function is simple: *Item is New = True* or *False*. Since we want to create a new entry for a new record and we don't want to recreate a record when it already exists, this validation is important to maintain the integrity of the database. You need to tell Weld Sequencer what sequence function to run next if the entry is new and which one to run when it is not. (See page 6.5 for more details on connecting and validating functions.)

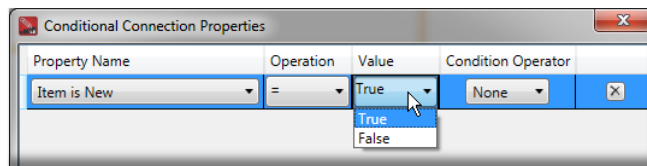


Figure 6.40 Validation on Create Record Function

Table 6.18 Properties Available for the Create Record Function

Field	Description
<i>Name</i>	You can add a description for this function that appears on the function's icon in the Weld Sequence Editor. This helps you easily identify the function within the step.
<i>Title</i>	The text that you enter in the <i>Title</i> field displays in the Weld Sequencer first on the screen when the Weld Operator reaches this function (e.g., "Create Work Order" in Figure 6.39).
<i>Description</i>	The text you enter in the <i>Description</i> field displays in the Weld Sequencer after the text from the <i>Title</i> field (e.g., "Enter the Vehicle Serial Number:" text in Figure 6.39).
<i>Hide in Review Function</i>	You can select this option to hide information about this function and not show it in the Review Function list. If a sequence error occurs during this function, it will still be shown in the Review Function list.

Save Field



Now that you have a record created in the Work Item table, you need to add data to the columns in that table so the Weld Operator can enter data into that column (Figure 6.41). To add to a column for the record, you need to add the *Save Field* function to a new step in the sequence and tell the sequence which column in the table you want to use for this bit of data, using the *Type* drop-down. Table 6.19 on page 6.44 explains the fields on the *Properties* window in more detail.

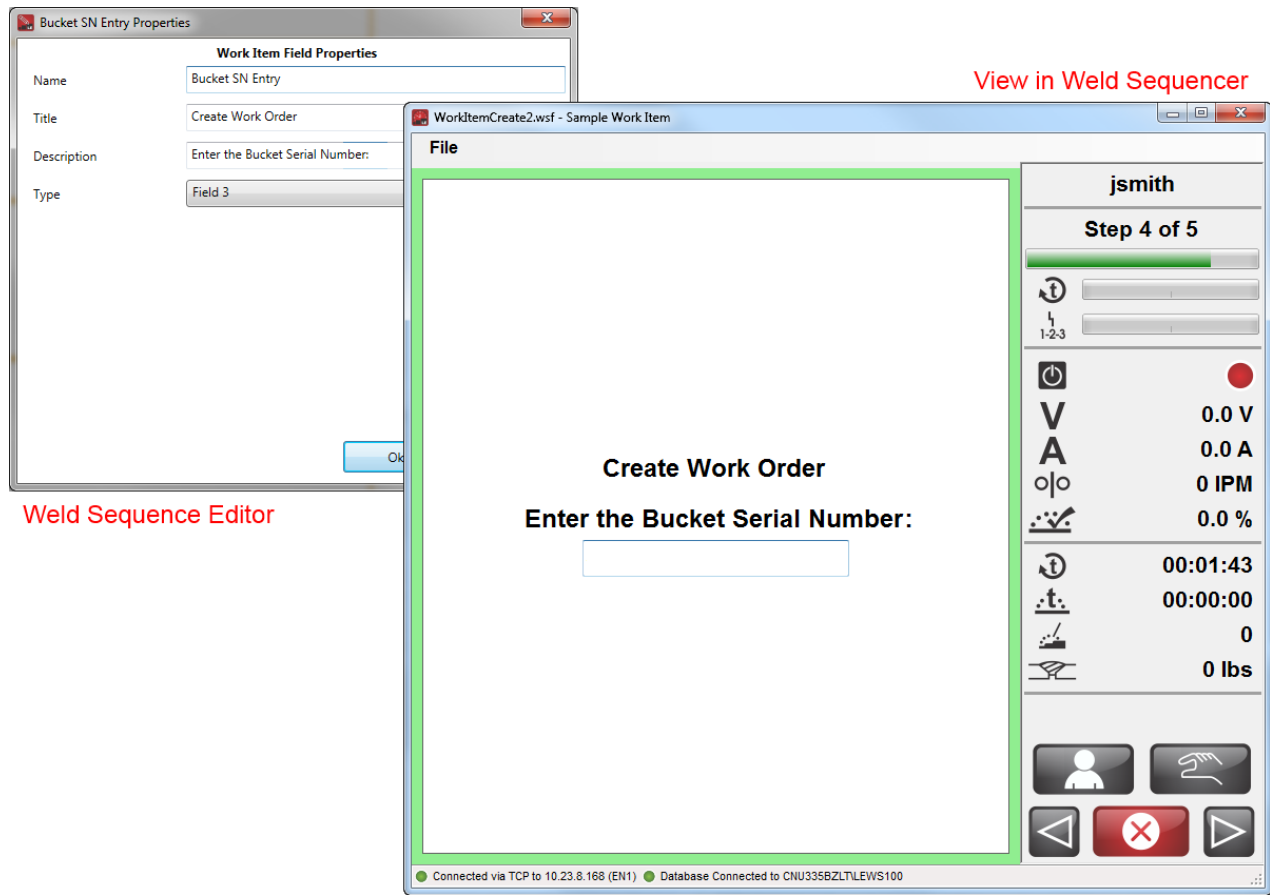


Figure 6.41 Save Field Functions

NOTE | You need to add the *Save Field* function for each column you want in the record.

For example, if you want the vehicle’s record to contain the serial number for the cab, the frame and the bucket, you would have three *Save Field* functions in your weld sequence (Figure 6.38 on page 6.41).

The validation on this function is simple, too: *Field is Valid = True or False*. When the Weld Operator enters data for this function, the system checks if the indicated column is empty for this record.

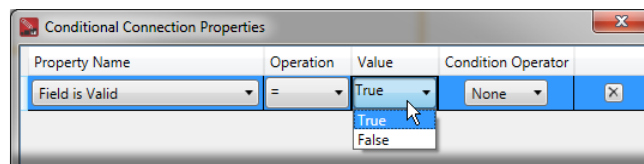
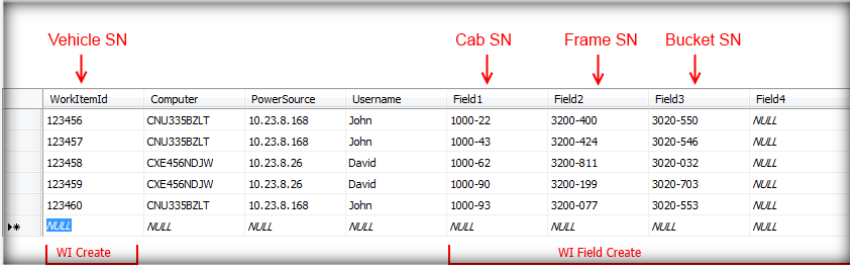


Figure 6.42 Validation on Save Field Function in Weld Sequence Editor

If the column is empty, the system considers this a valid entry and adds the serial number to the column. With a valid entry, the weld sequence continues to the function you have connected with the validation *Field is Valid = True*.

If the column is not empty, Weld Sequencer follows the path you established with the validation *Field is Valid = False*. Typically, this is an *Alert* function communicating with the Weld Operator.

Table 6.19 Properties Available for the Save Field Function

Field	Description
<i>Name</i>	You can add a description for this function that appears on the function's icon in the Weld Sequence Editor. This helps you easily identify the function within the step.
<i>Title</i>	The text that you enter in the <i>Title</i> field displays in the Weld Sequencer first on the screen when the Weld Operator reaches this function (e.g., "Create Work Order" in Figure 6.41).
<i>Description</i>	The text you enter in the <i>Description</i> field displays in the Weld Sequencer after the text from the <i>Title</i> field (e.g., "Enter the Bucket Serial Number:" text in Figure 6.41).
<i>Type</i>	<p>The <i>Type</i> field is how you identify in which column of the active work item record you want to store the data entered by the Weld Operator. Simply select the appropriate column from the drop-down. Here's an example of the table in the database:</p>  <p>NOTE Be sure the <i>Type</i> drop-down on each of the <i>Save Field</i> functions in your sequence is a different selection (e.g., Field 1, Field 2, Field 3, etc.).</p> <p>TIP Weld Sequencer automatically records the Computer Name, User name and IP address of the Welding Power Source that creates the record in the Work Item table.</p>
<i>Hide in Review Function</i>	You can select this option to hide information about this function and not show it in the Review Function list. If a sequence error occurs during this function, it will still be shown in the Review Function list.

Example

John at Advanced Manufacturing has a weld sequence file created that will help his personnel create the work order needed to build a vehicle from its sub-assemblies. In Figure 6.38 on page 6.41, he used the *Create Record* function and multiple *Save Field* functions.

When the Weld Operator runs this weld sequence file in the Weld Sequencer, they will enter the vehicle's serial number (*Create Record* function labeled *Vehicle SN Entry* in Figure 6.38). If that number is not yet in the database, John makes Weld Sequencer display an alert that a new record was created and then move to the next step. If it is already in the database, the system automatically displays the next step, with the entered serial number as the active record.

The next step is to enter the serial number of the first sub-assembly (*Save Field* function labeled *Cab SN Entry* in Figure 6.38). When the operator enters the serial number for the cab, the system checks if that column is empty for this vehicle's record. If it is empty, this is considered a valid entry and the system adds the serial number to the column and moves to the next step. If that column is not empty,

John has Weld Sequencer display an alert that the entry was not valid and allows the operator to enter the information again.

This continues for the frame and the bucket.

Work Item Lookup Functions

If your IT team has imported data into the Work Item table for you or if you have created records in this table using the *Work Item Create* functions, you can look up data from the table and use them to make decisions in your weld sequence. The *Select Records* functions help you do this.

- *Select Record* function: This function prompts the Weld Operator for the unique identifier on the record they want to look up and, if found, keeps that record active for the remainder of the sequence. See page 6.46 for more details on this function.
- *Verify Field* function: This function prompts the Weld Operator for information in the active record (found using the *Select Record* function). This function allows you to verify information in the table and act on it. See page 6.47 for more details on this function.

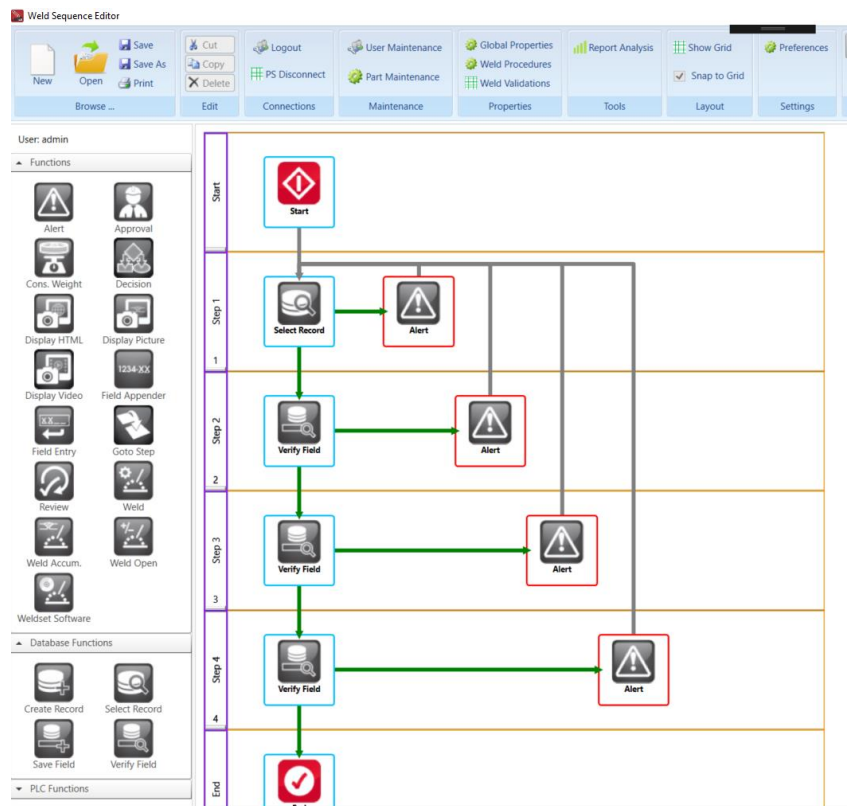


Figure 6.43 Select Record Functions

For example, John at Advanced Manufacturing has assemblies that require the Weld Operator to use specific materials for the welds. He wants the operator to verify the material on the Welding Power Source and if the material entered does not match what is in the table, he can stop the weld sequence and inform the operator that the material is not correct. This helps him prevent unacceptable welds before the Weld Operator gets too far.

Select Record



The *Select Record* function displays an entry field in Weld Sequencer (Figure 6.42) and prompts the Weld Operator (or other personnel) for the information needed to look up the record in the Work Item table (e.g., the vehicle serial number or work order number). When the operator enters that data in Weld Sequencer, the function looks for that record in the Work Item table and reacts based on the validation you establish on the connector. (Table 6.20 explains the fields on the *Properties* window in more detail.)

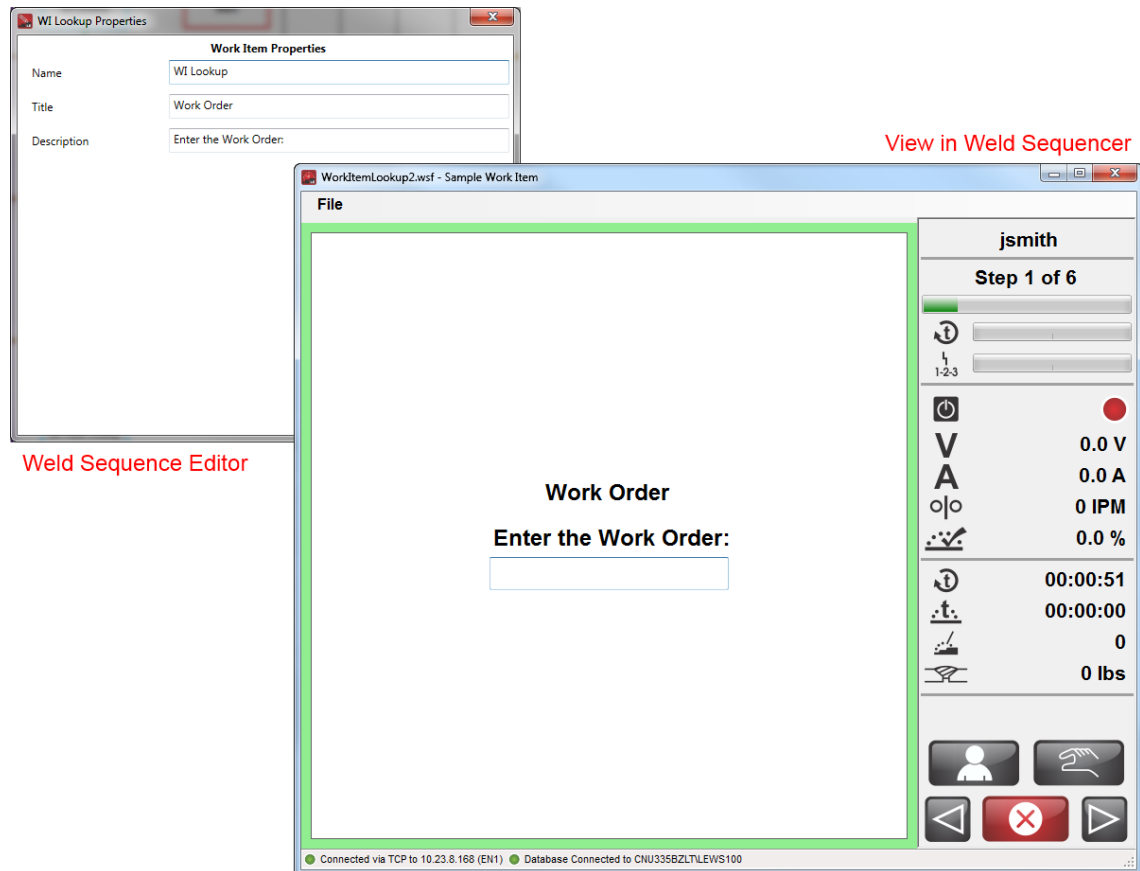


Figure 6.44 Select Record Function

The validation for the *Select Record* function is simple: *Item was Found = True* or *False* (Figure 6.45). If the system finds a record matching the text entered by the Weld Operator (or other personnel) in Weld Sequencer, the sequence follows the path you've laid out for it based on the validation *Item was Found = True* and maintains the record as the currently active record. If it doesn't find a matching entry, Weld Sequencer takes the path you have indicated with the validation *Item was Found = False*.

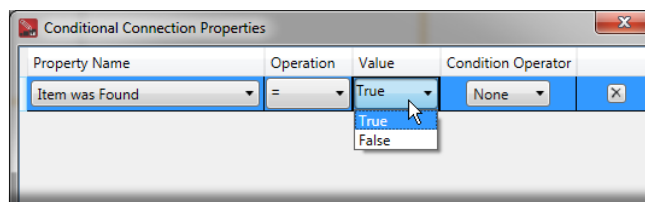


Figure 6.45 Validation on the Select Record Function

Table 6.20 Properties Available for Select Record Function

Field	Description
<i>Name</i>	You can add a description for this function that appears on the function’s icon in the Weld Sequence Editor. This helps you easily identify the function within the step.
<i>Title</i>	The text that you enter in the <i>Title</i> field displays in the Weld Sequencer first on the screen when the Weld Operator reaches this function (e.g., “WorkOrder” in Figure 6.44).
<i>Description</i>	The text you enter in the <i>Description</i> field displays in the Weld Sequencer after the text from the <i>Title</i> field (e.g., “Enter the Work Order:” text in Figure 6.44).
<i>Hide in Review Function</i>	You can select this option to hide information about this function and not show it in the Review Function list. If a sequence error occurs during this function, it will still be shown in the Review Function list.

Verify Field



The *Verify Field* function allows you to verify information that appears in the columns of the record found when the Weld Operator entered data in the *Select Record* function (e.g., various materials listed for the record). When the function runs in Weld Sequencer, the system displays a prompt for the Weld Operator (or other personnel) to enter text in a field. Table 6.21 explains the fields on the *Properties* window in more detail.

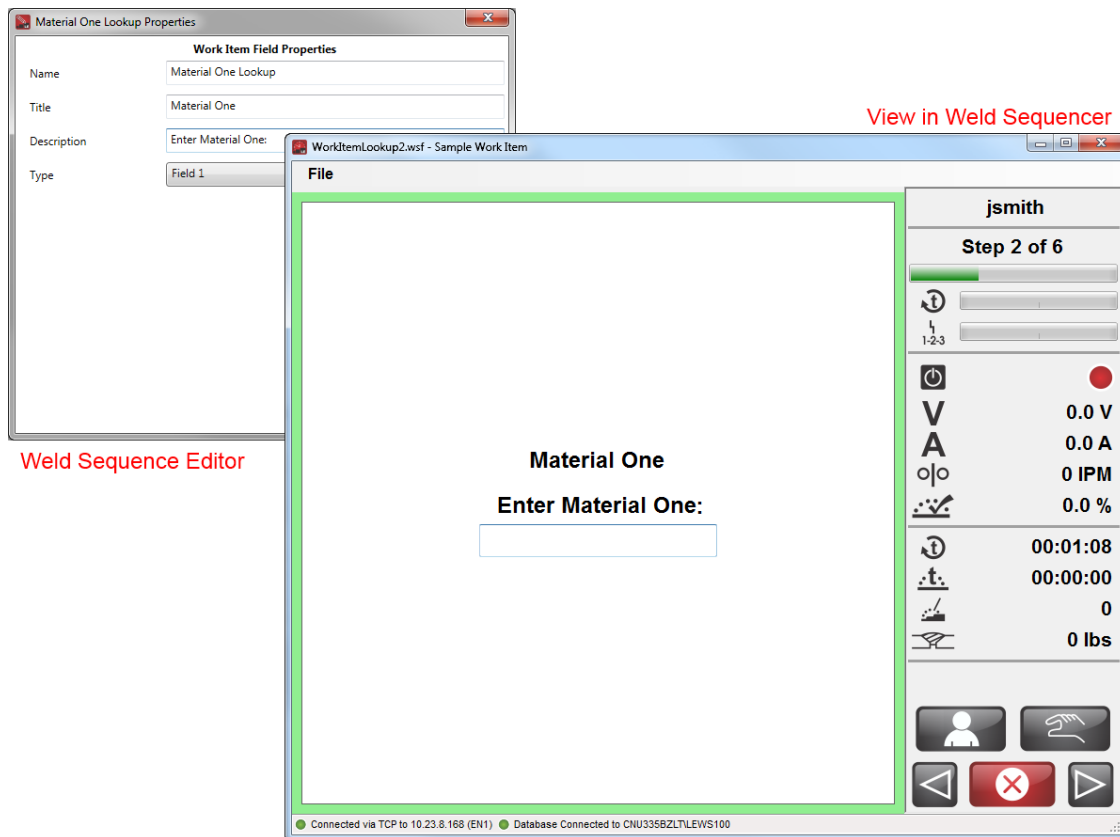


Figure 6.46 Verify Field Function

The validation on this function is simple: *Field Matches = True or False*. When the Weld Operator enters data for this function, the system checks if the text entered matches the text in the appropriate column of this record in the Work Item table.

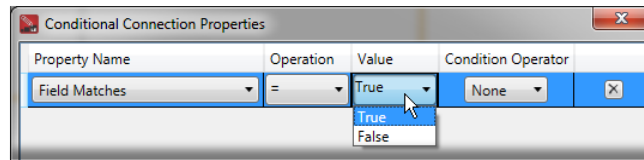


Figure 6.47 Validation on Verify Field Function

If the text matches the data in the indicated column of the record, the system considers this a valid entry, and the weld sequence continues to the function you have connected with the validation *Field Matches = True*.

If the text entered does not match the data in the column indicated in the function, Weld Sequencer follows the path you established with the validation *Field Matches = False*. Typically, this is an *Alert* function communicating with the Weld Operator.

Table 6.21 Properties Available for the Verify Field Function

Field	Description
<i>Name</i>	You can add a description for this function that appears on the function’s icon in the Weld Sequence Editor. This helps you easily identify the function within the step.
<i>Title</i>	The text that you enter in the <i>Title</i> field displays in the Weld Sequencer first on the screen when the Weld Operator reaches this function (e.g., “Material One” in Figure 6.46).
<i>Description</i>	The text you enter in the <i>Description</i> field displays in the Weld Sequencer after the text from the <i>Title</i> field (e.g., “Enter Material One:” text in Figure 6.46).
<i>Type</i>	<p>The <i>Type</i> field is how you identify in which column of the active work item record you want to search for the data entered by the Weld Operator. Simply select the appropriate column from the drop-down. Here’s an example of the table in the database:</p>
<i>Hide in Review Function</i>	You can select this option to hide information about this function and not show it in the Review Function list. If a sequence error occurs during this function, it will still be shown in the Review Function list.

Example

John at Advanced Manufacturing wants to make sure that specific materials are loaded for the Welding Power Source before the Weld Operator can begin welding. His IT team imported a materials list into the Work Item table for him with the columns containing Work Order, Material One, Material Two and Filler Material. In Figure 6.43 on page 6.45, he used the *Select Record* function and multiple *Verify Field* functions to work with the data.

When the Weld Operator runs this weld sequence file in Weld Sequencer, they will enter the work order number (*Select Record* function labeled *Order Lookup* in Figure 6.43 on page 6.45). If Weld Sequencer finds this record in the table, John has the sequence move to the next step, with the entered work order as the active record. If Weld Sequencer could not find the work order number, John has the sequence display an *Alert* function.

The next step is to enter the first material for the work order (*Verify Field* function labeled *Material One Lookup* in Figure 6.43 on page 6.45). When the operator enters the material, the system checks if that text is a match for the data in Material One's column of the work order record. If it is a match, this is considered a valid entry, and John has the sequence move to the next step. If the text does not match the data in the column, John has the sequence display an *Alert* function.

This continues for Material Two and the Filler Material. Once all the lookup fields pass validation, John allows the Weld Operator to begin the welding steps of the sequence.

Programmable Logic Controller (PLC) Functions

The Programmable Logic Controller (PLC) functions allow you to incorporate the use of PLC-controlled automation, sensors and actuators into the weld sequence. You can read information from your PLC-controlled equipment and bring it into Weld Sequencer, and you can send information out from Weld Sequencer to the PLC. See Page 6.56 for a detailed example for using *PLC Tag Read* and *PLC Tag Write* functions.

Weld Sequencer establishes a point-to-point connection to the PLC using TCP/IP protocol, and each request sent to the PLC is a self-contained transaction. The *Guideline for Using the Weld Sequencer PLC Interface* document provides in-depth details and discussions on the PLC interface.

For example, Weld Sequencer can read PLC tag values to determine:

- Preheat and interpass temperature
- Assembly position from automatic positioners
- Clamp position (open or closed)
- Part presence

Weld Sequencer can write tag values to PLCs such as those that run the following:

- Turn on a stack light or other type of status indicator
- Signify the end of a welding cycle
- Enable fixture motion

STOP | When referencing PLC tags in the Weld Sequence editor, you must enter the precise name of the PLC I/O or memory tag. Typically, you can export the tags to a comma-separated value

(CSV) file using software provided by the manufacturer of your PLC. Refer to the manufacturer's documentation for details.

PLC Field Entry




Similar to the standard *Field Entry* function (page 6.16), the *PLC Field Entry* function allows Weld Sequencer to retrieve a specific tag from the PLC and use that string as the part serial number or consumable lot code. This helps streamline the weld sequence.

Figure 6.48 PLC Field Entry Function

NOTE | Weld Sequencer clears the part serial number at the end of the sequence to ensure the software does not use an old or “left over” serial number for new sequences (new parts).

Table 6.22 Properties Available for the PLC Field Entry Function

Field	Description
<i>Name</i>	You can add a description for this function that appears on the function's icon in the Weld Sequence Editor. This helps you easily identify the function within the step.
<i>Tag Name</i>	The tag's name is dependent on the PLC to which the sequence needs to connect and identifies the information to read. Be sure the name you type matches the format and syntax required by the manufacturer of the PLC.
<i>Tag Type</i>	<p>From the <i>Tag Type</i> drop-down, select the kind of data the tag contains. For example, if the data is a string, you would select <i>String</i> from the drop-down. Generally, you can set this drop-down to <i>Auto</i> and allow Weld Sequencer to select the best method for reading the tag value specified in the <i>Tag Name</i> field.</p> <p>In some cases, however, it may be necessary to select the precise data type of the element specified in the <i>Tag Name</i> field (e.g., when accessing user-defined data type (UDT) element).</p> <p>NOTE When referencing PLC tags in the Weld Sequence Editor, refer to the manufacturer's documentation if you need to determine the correct data type for the tag.</p>
<i>Type</i>	Weld Sequencer needs to know which number you are retrieving from the PLC in order to save the number properly. From the <i>Type</i> drop-down, select which ID number this function represents: <i>Consumable Lot</i> or the <i>Serial Number</i> . You will see this number in reports in CheckPoint™.

Field	Description
<i>Hide in Review Function</i>	You can select this option to hide information about this function and not show it in the Review Function list. If a sequence error occurs during this function, it will still be shown in the Review Function list.
<i>Estimated Time</i>	The <i>Estimated Time</i> field is how long you think it should take for the operation represented by this function. Weld Sequencer uses this time in the Cycle Status (Table 7.1 on page 7.4) so be sure to provide ample time to complete the operation. TIP The Cycle Status  bar in Weld Sequencer turns yellow when the Weld Operator reaches 85% of the time you enter here. This alerts the operator that time is running out.

PLC Tag Read



The *PLC Tag Read* function allows you to pull data from your PLC into Weld Sequencer and determine what to do next in the sequence. For example, if the PLC for a fixture clamp returns the correct value indicating it is closed, you can tell Weld Sequencer to move to the next function. If the value returned is different from the closed tag, you can tell the sequencer to follow a different path.

In the *PLC Read Properties* window, you tell Weld Sequencer which tag you want it to read and the optional value you expect that tag to contain. You can also set the amount of time the system waits for the Expected Value. Your PLC manufacturer’s documentation should provide you with information for creating and configuring tags. Table 6.23 explains each field in detail.

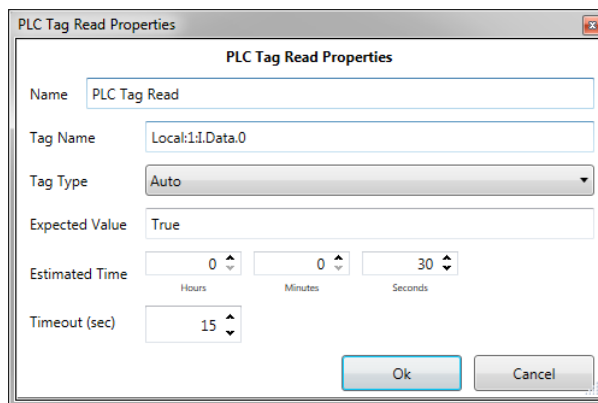



Figure 6.49 PLC Tag Read Function

Table 6.23 Properties Available for the PLC Tag Read Function

Field	Description
<i>Name</i>	You can add a description for this function that appears on the function’s icon in the Weld Sequence Editor. This helps you easily identify the function within the step.
<i>Tag Name</i>	The tag’s name is dependent on the PLC to which the sequence needs to connect and identifies the information to read. Be sure the name you type matches the format and syntax required by the manufacturer of the PLC.
<i>Tag Type</i>	From the <i>Tag Type</i> drop-down, select the kind of data the tag contains. For example, if the data is a string, you would select <i>String</i> from the drop-down. Generally, you can set this

Field	Description
	<p>drop-down to <i>Auto</i> and allow Weld Sequencer to select the best method for reading the tag value specified in the <i>Tag Name</i> field.</p> <p>In some cases, however, it may be necessary to select the precise data type of the element specified in the <i>Tag Name</i> field (e.g., when accessing user-defined data type (UDT) element).</p> <p>NOTE When referencing PLC tags in the Weld Sequence Editor, refer to the manufacturer’s documentation if you need to determine the correct data type for the tag.</p>
<i>Expected Value</i>	<p>Enter the value you expect to appear in the tag’s data when Weld Sequencer retrieves it. You have the option on the conditional connector from the <i>PLC Tag Read</i> function to specify how Weld Sequencer behaves based on this value. You can read the value one time and exit this function (set <i>Timeout</i> to zero) or you can periodically read the value and watch for a specific value over a period of time (the <i>Timeout</i> time).</p>
<i>Hide in Review Function</i>	<p>You can select this option to hide information about this function and not show it in the Review Function list. If a sequence error occurs during this function, it will still be shown in the Review Function list.</p>
<i>Estimated Time</i>	<p>The <i>Estimated Time</i> field is how long you think it should take for the operation represented by this function. Weld Sequencer uses this time in the Cycle Status (Table 7.1 on page 7.4) so be sure to provide ample time to complete the operation.</p> <p>TIP The Cycle Status  bar in Weld Sequencer turns yellow when the Weld Operator reaches 85% of the time you enter here. This alerts the operator that time is running out.</p>
<i>Timeout</i>	<p>In the <i>Timeout</i> field, enter the number of seconds Weld Sequencer should monitor the tag value with periodic read operations and then process one of the conditional connectors. The periodic read timing is set with the <i>PLC Settings</i> in Weld Sequencer (page 7.10).</p> <p>If the <i>Timeout</i> period expires, the function will end and the exit connectors for the function will be processed. In this case, a default connector (with no rules) or a conditional connector with <i>Timeout Occurred = True</i> would be taken.</p> <p>If you enter a value of 0 in the <i>Timeout</i> field, the <i>PLC Tag Read</i> function performs a single read and then compares the value it receives to the <i>Expected Value</i> and processes the exit connectors for the function. At least two exit connectors should always be used in this case:</p> <ul style="list-style-type: none"> ▪ one for the <i>Matches Expected Value</i> (True or False) result or for the <i>Compare Acquired Value</i> ▪ and second default connector (with no rules) to handle all other results. In the case of a PLC communication problem that does not allow the single read operation to complete successfully, another connector can be added to handle this condition.

When you add a *PLC Tag Read* function, you need to connect that function to the next one. The connector for a *PLC Tag Read* function is conditional. It’s based on either the value you entered in the *Expected Value* field, a comparison to conditional connector values, or whether the number of seconds in the *Timeout* field have elapsed. Table 6.24 explains the properties in more detail.

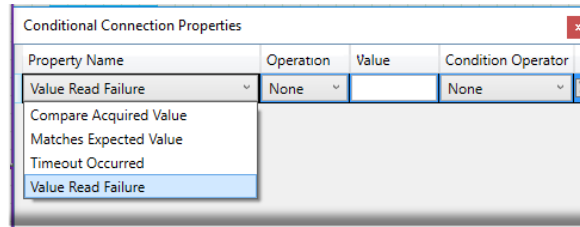


Figure 6.50 Connector Properties

Table 6.24 Available Properties for the PLC Tag Read Connector

Field	Description
<i>Compare Acquired Value</i>	This property tells the weld sequence which path to take from the <i>PLC Tag Read</i> function based on a comparison of values. Weld Sequencer can compare the value it receives from the PLC to the value you enter in the <i>Value</i> field here on the connector. If you use this property, the function reads the acquired value, compares it to the value you enter here and determines if the connector route should be taken.
<i>Matches Expected Value</i>	This property tells the weld sequence which path to take from the <i>PLC Tag Read</i> function based on whether Weld Sequencer received the text you entered in the <i>Expected Value</i> field on the <i>PLC Tag Read</i> function. <ul style="list-style-type: none"> ▪ <i>Matches Expected Value = True</i> means if the text received from the PLC message matches the text you entered in the <i>Expected Value</i> field, this is the route the sequence should take. ▪ <i>Matches Expected Value = False</i> means if the text received from the PLC message DOES NOT match the text you entered in the <i>Expected Value</i> field, this is the route the sequence should take.
<i>Timeout Occurred</i>	Rather than matching the <i>Expected Value</i> , you can define the path of the sequence based on whether the number of seconds you defined in the <i>Timeout</i> field have passed. <ul style="list-style-type: none"> ▪ <i>Timeout Occurred = True</i> means that the time elapsed before the <i>Expected Value</i> or a valid Conditional Connector executes.
<i>Value Read Failure</i>	The path of the sequence can be determined based on the readQuality from the PLC. The PLC read values are GOOD, INACTIVE UNCERTAIN and BAD.

PLC Tag Write



The *PLC Tag Write* function allows you to send information to the PLC-controlled device from Weld Sequencer. For example, when the sequence begins, you can activate a stack light to inform passers-by that welding is in progress and then turn it off again afterward. Table 6.25 explains the properties for the *PLC Tag Write* function in more detail.

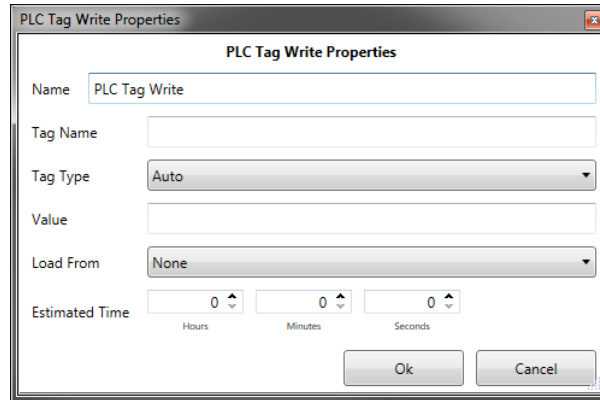



Figure 6.51 PLC Tag Write Function

NOTE | You cannot configure the connector coming from a *PLC Tag Write* function. If the tag write fails, a sequence error occurs.

Table 6.25 Properties Available for the PLC Tag Write Function

Field	Description
<i>Name</i>	You can add a description for this function that appears on the function's icon in the Weld Sequence Editor. This helps you easily identify the function within the step.
<i>Tag Name</i>	The tag's name is dependent on the PLC to which the sequence needs to connect and identifies where the information will be written. Be sure the name you type matches the format and syntax required by the manufacturer of the PLC.
<i>Tag Type</i>	<p>From the <i>Tag Type</i> drop-down, select the kind of data the tag contains. For example, if the data is a string, you would select <i>String</i> from the drop-down. Generally, you can set this drop-down to <i>Auto</i> and allow Weld Sequencer to select the best method for sending the tag value specified in the <i>Tag Name</i> field.</p> <p>In some cases, however, it may be necessary to select the precise data type of the element specified in the <i>Tag Name</i> field (e.g., when accessing user-defined data type (UDT) element).</p> <p>NOTE When referencing PLC tags in the Weld Sequence Editor, refer to the manufacturer's documentation if you need to determine the correct data type for the tag.</p>
<i>Value</i>	Enter the value you want Weld Sequencer to send to the PLC.
<i>Load From</i>	You use the <i>Load From</i> field in conjunction with the <i>Create Record</i> or the <i>Select Record</i> functions (page 6.39). The <i>Load From</i> field allows you to pull data from the Work Item table in the Weld Sequencer database that was created with the <i>Database</i> functions. You can then pass this information to the PLC. Simply select the column from which you would like to pull data.
<i>Hide in Review Function</i>	You can select this option to hide information about this function and not show it in the Review Function list. If a sequence error occurs during this function, it will still be shown in the Review Function list.
<i>Estimated Time</i>	The <i>Estimated Time</i> field is how long you think it should take for the operation represented by this function. Weld Sequencer uses this time in the Cycle Status (Table 7.1 on page 7.4)

Field	Description
	<p>so be sure to provide ample time to complete the operation.</p> <p>TIP The Cycle Status  bar in Weld Sequencer turns yellow when the Weld Operator reaches 85% of the time you enter here. This alerts the operator that time is running out.</p>

Power Lift HZA Function



This function enables PLC control of the Power Lift HZA Positioner; it provides all the required PLC interactions for positioning to a new height and rotation angle. You can preprogram the positioner height and rotation angle in order to automatically move the part into the optimal position for welding. In addition, the height can automatically adjust to the height of the Weld Operator providing an ergonomic position for making quality welds. Table 6.26 explains the properties for the *Power Lift HZA* function in more detail.

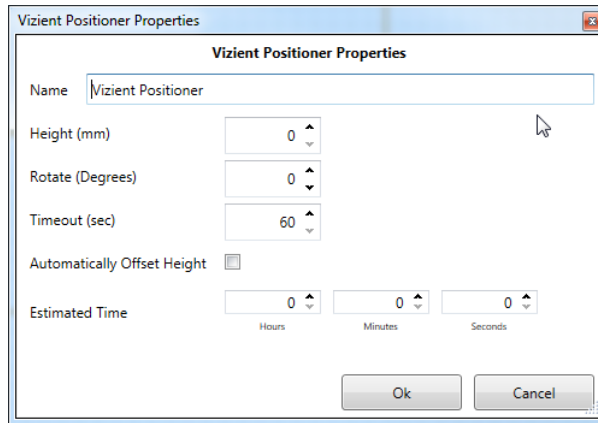



Figure 6.52 Power Lift HZA Function

Table 6.26 Properties Available for the Power Lift HZA Function

Field	Description
<i>Name</i>	You can add a description for this function that appears on the function’s icon in the Weld Sequence Editor. This helps you easily identify the function within the step.
<i>Height</i>	Enter the desired height of the Power Lift HZA positioner. Once motion is enabled on the positioner, it will move the part/fixture to this height.
<i>Rotate</i>	Enter the desired rotation angle of the Power Lift HZA positioner. Once motion is enabled on the positioner, it will rotate the part/fixture to this angle.
<i>Timeout</i>	<p>In the <i>Timeout</i> field, enter the number of seconds Weld Sequencer should wait for the positioner to move to the new height and rotation angle. Motion will not begin until the Weld Operator enables motion with safety switches. A conditional connector using the <i>Position Completed</i> property can be used to recognize when this function completes successfully.</p> <p>If the <i>Timeout</i> period expires (minimum value is 60 seconds), the function will end and the exit connectors for the function will be processed. In this case, a default connector (with no rules) or a conditional connector with <i>Timeout Occurred = True</i> would be taken.</p>

Field	Description
	At least two exit connectors should always be used with this function: <ul style="list-style-type: none"> ▪ one for the Position Completed condition ▪ and a second Timeout Occurred condition or a default connector (with no rules) to handle all other results.
<i>Automatically Offset Height</i>	Using 5 foot 10 inches as the default height of an operator, when this option is used, the positioner will automatically offset the desired height by comparing this to the height of the Weld Operator who is running the Weld Sequencer. For example, if the Weld Operator is 6 foot tall, the desired height would be automatically increased by 2 inches. See page 3.1 for details on entering the height of each user.
<i>Hide in Review Function</i>	You can select this option to hide information about this function and not show it in the Review Function list. If a sequence error occurs during this function, it will still be shown in the Review Function list.
<i>Estimated Time</i>	The <i>Estimated Time</i> field is how long you think it should take for the operation represented by this function. Weld Sequencer uses this time in the Cycle Status (Table 7.1 on page 7.4) so be sure to provide ample time to complete the operation. <p>TIP The Cycle Status  bar in Weld Sequencer turns yellow when the Weld Operator reaches 85% of the time you enter here. This alerts the operator that time is running out.</p>

Connecting Weld Sequencer to the PLC

If you have a sequence that contains *PLC Tag Read* and *PLC Tag Write* functions, you need to remember to configure the Weld Sequencer computer on the production floor to connect to the PLC. See page 7.10 for details.

Weld Sequencer to PLC Interface Example

The following example shows how you can use the *PLC Tag Read* and *PLC Tag Write* functions on a welding fixture that has part present sensing and clamps controlled by a PLC. For more in-depth information about using PLCs with Weld Sequencer, refer to the *Guideline for Using the Weld Sequencer PLC Interface* document.

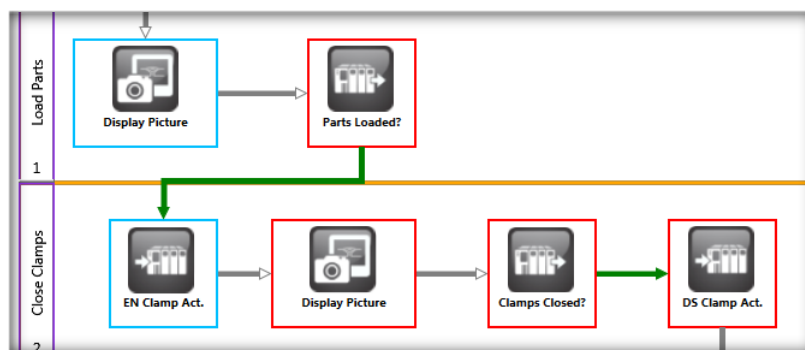


Figure 6.53 PLC Example

In the *Load Parts* step, Weld Sequencer displays a picture indicating the part locations that the operator needs to load. The *PLC Tag Read* function labeled *Parts Loaded?* executes. This function simply reads the “part present” sensor input from the PLC. The function waits for the part present sensor to send the *Expected Value* of *True*. Once it does, the sequence continues.

In the *Close Clamps* step, John created an enable and confirmation control pattern. The Weld Sequencer sends a tag to the PLC with the *PLC Tag Write* function labeled *EN Clamp Act*. This tag enables the clamp close operation from the Weld Sequencer point of view. The PLC itself specifies other conditions that have to be met before the clamps will move. As soon as the *EN Clamp Act*. function sends the memory tag; Weld Sequencer displays a picture indicating to the operator that it is time to close the clamps. The operator moves clear of the fixture and initiates closing the clamps by using standard operator controls. The PLC energizes the clamping actuators only if all conditions for safe operation have been met.

Once Weld Sequencer displays the picture to the operator, the next function is a *PLC Read Tag* labeled *Clamps Closed?*. This function provides you with a way to get confirmation that the clamps are closed as expected. The *Clamps Closed?* function waits for the *Expected Value* for the “clamps closed” tag to return as *True* (based on the *Group Update Rate* in the PLC Settings). Once it does, the sequence continues.

Next, the Weld Sequencer executes a *PLC Tag Write* function labeled *DS Clamp Act*. This function clears the PLC memory tag that was set by the *EN Clamp Act*. function. In the PLC, this disables clamp operation from the Weld Sequencer point of view in preparation for opening the clamps at the end of the sequence. The PLC logic, of course, maintains the current clamp position with the appropriate clamping pressure, etc. as needed as long as conditions require it. The step completes as soon as the PLC memory tag is clear.

Next are the welding functions and a final Review step, which performs another set of *PLC Tag Read* and *PLC Tag Write* functions to open the clamps.

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Weld Sequencer

Overview

Once the Weld Engineer(s) create a weld sequence file to help when performing semi-automatic welding operations, Weld Operators can run those files on the Weld Sequencer computer. These weld sequence files help Weld Operators perform weld operations in a consistent and repeatable way. Once the Weld Operator loads the weld sequence file, they simply begin welding. The weld sequence file takes care of the settings on the Welding Power Source for each weld.

STOP | Once you connect to the Welding Power Source, Weld Sequencer disables the power source anytime the application starts. The Weld Operator must log in to the application to enable the power source. From that point, the sequence can determine if the User Interface is locked or unlocked. See page 5.1 for information on Global Properties.

NOTE | If your company uses bar code scanners to enter data into Weld Sequencer (e.g., logging in or entering part numbers), you need to make sure that you configure the scanner properly (page 3.4).




Load and Run a Weld Sequence File

When you are ready to begin using weld sequence files to weld, you can simply log in and launch the weld sequence file. Various settings are available for each instance of the Weld Sequencer application to reflect the needs of the operators (page 7.7).

TIP | You can also set up the application shortcut to launch a specific weld sequence file automatically (page B.6).

The general workflow for running a weld sequence file:

Procedure	Details
1. Launch Weld Sequencer.	Weld Sequencer automatically connects to the last Welding Power Source connected and displays the <i>Login</i> window.
2. Enter your user name and password.	Weld Sequencer uses these credentials as the Operator ID for each weld performed.
3. Select File > Load Sequence from the main menu.	The <i>Please select a file</i> window opens.

Procedure	Details
4. Double-click the appropriate weld sequence file from the list to launch it or click Browse to find the file.	TIP If you have the <i>Auto Start</i> preference for this instance of the Weld Sequencer enabled, the weld sequence begins automatically.
5. Click the Start button  .	The Cycle Time  starts.
6. Follow the steps in the sequence.	If you execute the sequence properly, it ends automatically, and the Cycle Time  stops. TIP If you have the <i>Auto Restart</i> preference for this instance of the Weld Sequencer enabled, the weld sequence file resets itself, begins again automatically and resets the Cycle Time.

Part Lookup

The *Part Lookup* table provides an easy way to load the appropriate weld sequence file based on a part number. The *Part Lookup* table uses the part number database. In the part number database is a simple association between your part numbers and the file name of the weld sequence file that goes along with each one. Once the Weld Operator enters the part number, Weld Sequencer looks it up in the part number database and then, if it's a valid part number, automatically loads the correct weld sequence file for the operator.

NOTE | Weld Engineers create the Part Lookup table in the Weld Sequence Editor (page 4.8).

TIP | Weld Sequencer can monitor a PLC tag and automatically perform a Part Lookup based on the value of that tag. Please see page 7.12 for details.

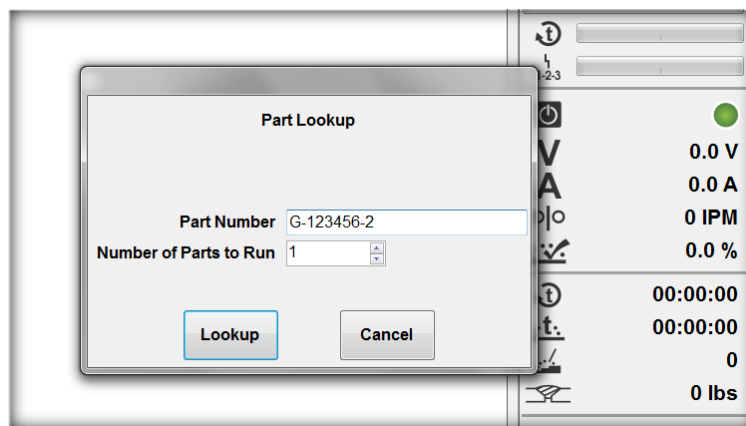


Figure 7.1 Part Lookup

TIP | Under **File > Preferences**, users have the option to automatically display a prompt for the **Part Lookup** as soon as they log in. See page 7.7 for more details on workstation preferences.

The Weld Operator also has the option to run the same sequence a specified number of times. When running a sequence based on Part Lookup, the Weld Operator can enter a number in the *Number of Parts to Run* field (Figure 7.1).

When the quantity is more than one, the status panel on the right side of the screen will show *Part X of Y*, where X is the number of the part you are actively running and Y is the total number of parts to run. If the *Automatically Request New Part Number* option is enabled under **File > Preferences**, Weld Sequencer only displays the *Part Lookup* window again after all parts (Y) have been completed.

To load a weld sequence file in Weld Sequencer with this Part Lookup functionality:

Procedure	Details
1. Launch the Weld Sequencer.	The <i>Login</i> window displays.
2. Enter your user name and password.	
3. Select File > Part Lookup from the main menu.	
4. Enter the part number (and quantity if applicable) and click Lookup .	Weld Sequencer locates the part number in the database and loads the file associated with that part number.

Weld Sequencer

The Weld Sequencer runs the weld sequence file created by the Weld Engineer. Each step can contain a variety of displays, weld procedures and/or audio files to guide the Weld Operator through complex welding operations, from simple tack welds to critical welds. These helps ensure consistency when welding the same assembly over and over.

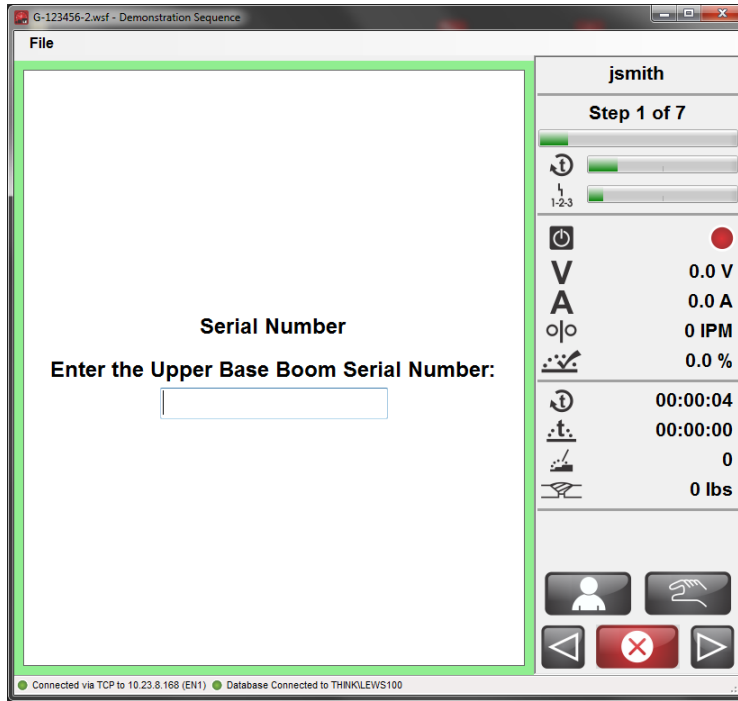


















Figure 7.2 Weld Sequencer
















The right side of the Weld Sequencer displays the status of the sequence/steps and the details of the welding currently in progress. When the Weld Operator starts the sequence, the Cycle Time  begins and the Cycle Status bar  begins to track the Weld Operator’s progress through the timeline of the sequence. The rest of the fields in this information panel reflect the weld currently in progress. Table 7.1 explains each of these fields and the buttons in more detail.


TIP | The Cycle Status  and Step Status  bars turn yellow when you reach 85% of the time estimated for completion of the cycle or step.

Table 7.1 Fields Displayed on the Weld Sequencer

Field	Description
<p><i>Cycle Status</i></p> 	<p>The <i>Cycle Status</i> bar displays the Weld Operator’s progress in the current weld sequence. Each step in a weld sequence has an estimated time for completion. As the weld sequence progresses, each new step adds a new time target to the <i>Cycle Status</i> progress bar. The middle point of the progress bar is always the next time target for the weld sequence and is the aggregated totals from each step’s estimate.</p> <p>For example, Ron at Advanced Manufacturing clicked Start for his weld sequence. Several things occurred at once:</p> <ul style="list-style-type: none"> ▪ The <i>Step</i> progress at the top of the panel showed <i>Step 1 of 28</i>. ▪ The <i>Cycle Time</i>  began, which is a timer for the entire sequence. ▪ The <i>Cycle Status</i> bar  began inching toward the first-time target for the weld sequence, which is 30 seconds in our example.

Field	Description
	<ul style="list-style-type: none"> The <i>Step Status</i> bar  began inching toward the time target for this step, which is 30 seconds in our example. <p>As Ron begins welding for his first step, the <i>Cycle Status</i> bar is the same as the <i>Step Status</i> bar. As he closes in on that tick mark in the middle, he completes the current step and advances to the next step. Several things occur:</p> <ul style="list-style-type: none"> The <i>Cycle Status</i> bar  adds the next time target, adjusts the progress bar, and begins inching toward the new target for the sequence, which is 1:30 in our example. The <i>Step Status</i> bar  resets and begins inching toward the time target for the new step, which is 1:00 in our example. <p>TIP A great rule of thumb is: Progress displayed on the left of the tick mark on the progress bar is within the time estimate. Progress displayed on the right side of the tick mark on the progress bar means the timing has exceeded the time estimate.</p>
<p><i>Step Status</i></p> 	<p>The <i>Step Status</i> bar displays the Weld Operator's progress in the current step of the weld sequence. Each step in a weld sequence has an estimated time for completion and is represented by the target in the middle of the progress bar. If the time spent on the step exceeds the estimated time, the progress bar passes the target and turns red.</p> <p>TIP A great rule of thumb: Progress displayed on the left of the tick mark is within the time estimate. Progress displayed on the right side of the tick mark means the timing has exceeded the time estimate.</p>
<p><i>Power Source</i></p> 	<p>The <i>Power Source</i> field displays the current status of the Welding Power Source.</p> <ul style="list-style-type: none"> Disabled : This means that the power source is disabled, the Weld Operator cannot weld, and the torch trigger does not do anything when pulled. Enabled : This means that the power source is enabled and the Weld Operator can perform welds established in the welding function(s) of a sequence.
<p><i>Volts, Amps, WFS, and WeldScore®</i></p> 	<p>Mainly for a Quality Manager walking by, these fields display a live update of the volts, amps, wire feed speed and WeldScore® occurring with the weld currently in progress. Once the Weld Operator stops welding, the display resets to zero. This is the same information displayed on the wire feeder.</p>
<p><i>Cycle Time</i></p> 	<p>The <i>Cycle Time</i> field is the actual time for the weld sequence currently in progress and begins when the Weld Operator clicks the Start button . It stops when the user reaches the end of the sequence, they click the Abort button , or if the weld sequence aborts for any reason. The time disappears when the sequence stops.</p>

Field	Description
	<p>TIP If you need to keep the Cycle Time on the screen after the sequence ends, place a check mark next to the <i>Display Summary</i> checkbox on the <i>End</i> function (page 6.7).</p> <p>NOTE If the user logs out of the sequence the Cycle Timer will not advance until a user logs back in.</p>
<p>Arc Time</p> 	<p>This is the amount of arc time spent on the welds performed in the weld sequence so far. This field resets to zero when the weld sequence ends.</p>
<p>Weld Count</p> 	<p>This is the number of welds completed so far in the weld sequence, and the <i>Wire Deposited</i> field reflects the deposition for those welds. This field resets to zero when the weld sequence ends.</p>
<p>Wire Deposited</p> 	<p>The <i>Wire Deposited</i> field displays the amount of wire that has been deposited on the welds performed in the weld sequence so far. This field resets to zero when the weld sequence ends.</p>
<p>Login/Logout</p> 	<p>Click the Login button  to enter your user name and password. The user name entered becomes the Operator ID associated with the welds performed during the weld sequence.</p>
<p>Start/Abort</p> 	<p>The Start/Abort button controls the weld sequence. Once the Weld Operator is ready to begin welding with the sequence, they click the Start button. The Cycle Time for the sequence begins and doesn't stop until the sequence ends.</p> <p>TIP If you have the <i>Auto Start</i> preference enabled for this instance of the Weld Sequencer, the weld sequence begins automatically when you load the weld sequence file. It can also start automatically if you have <i>Auto Restart</i> enabled.</p>
<p>Previous/Next</p> 	<p>Click the Next button  to move the sequence forward to the following step in the weld sequence. Use the Previous button  to reverse the sequence and go back to the preceding step.</p> <p>STOP If you click Next  and skip a required function in the current step, Weld Sequencer turns the border of the weld sequence to red and flags the sequence with errors.</p> <p>NOTE If you click the Manual button  to put the weld sequence into Manual mode, Weld Sequencer disables the Previous and Next buttons until you click Automatic .</p>
<p>Manual/Automatic</p> 	<p>If the Weld Operator needs to release the lock on the Welding Power Source and free the machine from the sequence to make welds that are not defined in the weld sequence, they can click the Manual button . This allows the Weld Operator to change the settings on the Welding Power Source if necessary. Click Automatic  to pick up the sequence again and allow the weld sequence to control the</p>

Field	Description
	<p>machine.</p> <p>NOTE When the Weld Operator clicks the Manual button  and makes a weld, Weld Sequencer turns the border of the weld sequence to red and flags the sequence with errors.</p> <p>NOTE A Global Property for each sequence file provides the ability to set a timeout value for Manual Mode. Setting this timeout value (in seconds) limits the use of Manual Mode to this period of time when the sequence is running. After the timeout expires, the Weld Sequencer will return to Automatic Mode.</p> <p>NOTE A Preference for Manual Mode Timeout allows anyone with a User Role of Weld Sequencer Administrator or Engineer to change this value. This timeout value is used when the Weld Sequencer is idle or during execution of all sequences that don't have their own timeout value.</p> <p>NOTE Any welds made during Manual mode still count toward your sequence totals, but they count as errors.</p>

Goto Step

If your weld sequence unexpectedly aborted or you suffered any other type of “restart” on the sequence while you were working it, the **Goto Step** feature allows you to jump directly to (or near to) the step you were on when you're back up and running.

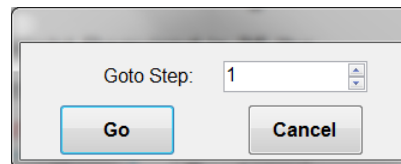


Figure 7.3 Goto Step

Simply select **File > Goto Step** from the main menu in the Weld Sequencer Engine. Enter the number of the step you want to execute and click **Go**.

NOTE | When you use the Goto Step feature, Weld Sequencer flags the sequence as containing errors since the weld sequence was not performed intact from start to finish.

Preferences

Each computer that runs the Weld Sequencer has workstation preferences that a Weld Sequencer Administrator can set. They include the location of weld sequence files to the style and size of the text for the application. You can also choose to have the weld sequence start or restart automatically for you.

Table 7.2 explains each preference in more detail.

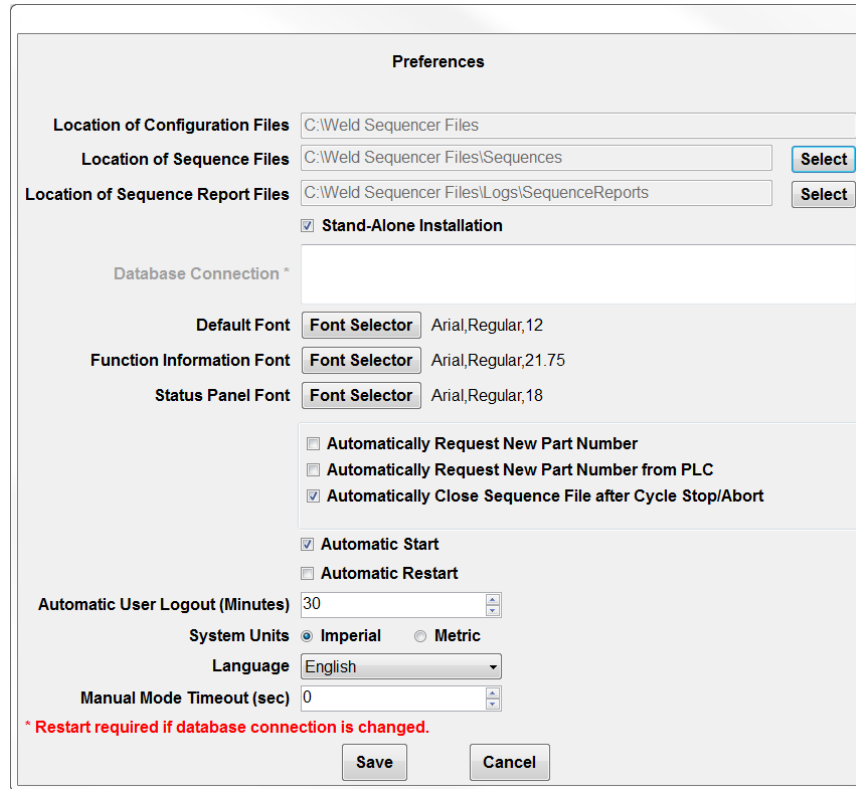


Figure 7.4 Weld Sequencer Preferences

NOTE | If you have multiple instances of Weld Sequencer (see page 2.14) on the same computer, each instance can have its own preferences.

NOTE | Login is possible only with a database connection.

Table 7.2 Preferences Available in Weld Sequencer

Field	Description
<i>Location of Configuration Files</i>	The <i>Location of Configuration Files</i> field displays the directory where the Weld Sequencer can find the files necessary to run the application, from program files to the default location for retrieving weld sequence files.
<i>Location of Sequence Files</i>	This is the location where the Weld Sequencer should look for weld sequence files, along with any accompanying files like images and sounds. By default, the location is the C:\Weld Sequencer Files\Sequences folder.
<i>Location of Sequence Report Files</i>	This location is where Weld Sequencer finds the Sequence Reports generated by Welding Power Source on the production floor that use the weld sequences. This is especially helpful if all reports are saved to a common location (e.g., a network drive).
<i>Stand-Alone Installation</i>	This option allows you to choose a default Stand-Alone Installation where the required database is installed on the same computer. Refer to

Field	Description
	Installing/Configuring Microsoft SQL Server on page 2.6 for more information on the installation options. Uncheck this option and enter the Database Connection string (below) if you are using the Enterprise Configuration. NOTE You must log in as an administrator user in order to modify this setting.
<i>Database Connection</i>	This is the Database Connection string for Enterprise Configurations. See Appendix A for detailed Enterprise Configuration instructions. You must restart the Weld Sequencer to utilize changes to the connection string. NOTE You must log in as an administrator user in order to modify this setting.
<i>Default Font</i>	The <i>Default Font</i> field sets the style and size of the text for the main menu and the text on other pop-up windows. This is especially useful when you need to increase the readability on a distant monitor.
<i>Function Information Font</i>	This field sets the style and size of the text on each of the steps in the display area of the weld sequences run on this computer. This is especially useful when you need to increase the readability on a distant monitor.
<i>Status Panel Font</i>	The <i>Status Panel Font</i> field controls the style and size of the text for the panel on the right of the main display area of the Weld Sequencer (Figure 7.2 on page 7.4). This is especially useful when you need to increase the readability on a distant monitor.
<i>Automatically Request New Part Number</i>	If you want Weld Sequencer to automatically prompt users of this machine for a part number when they log in and after they complete a sequence, you can place a check mark next to this preference. As soon as the user logs in and after they complete a sequence, Weld Sequencer displays the <i>Part Lookup</i> window (Figure 7.1 on page 7.2).
<i>Automatically Request New Part Number from PLC</i>	If you want Weld Sequencer to automatically monitor for a specific tag from the connected PLC, place a check mark next to this preference. This tag provides the part number to Weld Sequencer.
<i>Automatically Close Sequence File after Cycle Stop/Abort</i>	If you want the Weld Sequencer to automatically close the sequence file after the end of a weld sequence (so it is no longer available to start another weld sequence), place a check mark next to this preference. The user (or PLC) will be required to load a new sequence file before starting another weld sequence.
<i>Automatic Start</i>	If you want Weld Sequencer to start running the weld sequence and start the Cycle Time automatically when you load the weld sequence file, place a check mark next to <i>Automatic Start</i> . This preference is typically unchecked.
<i>Automatic Restart</i>	If you want Weld Sequencer to start the loaded weld sequence file again automatically once you complete it, place a check mark next to the <i>Automatic Restart</i> option.
<i>Automatic User Logout</i>	If Weld Sequencer has no activity for the amount of time entered (in minutes), the system automatically logs the user out.

Field	Description
<i>System Units</i>	You can choose to display the units within the Weld Sequencer as <i>Imperial</i> or <i>Metric</i> units.
<i>Language</i>	Click on the dropdown arrow to select from the available languages. You must restart the Weld Sequencer if a different language is selected.
<i>Manual Mode Timeout</i>	Anyone with a User Role of Weld Sequencer Administrator or Engineer can change this value. This timeout value is used when the Weld Sequencer is not actively running a sequence file or when a sequence file is executing but it doesn't have a timeout value of its own. The timeout value limits the use of Manual Mode; after this amount of time, the Weld Sequencer will automatically exit Manual Mode. If a weld is in progress when the timeout occurs, Weld Sequencer will exit Manual Mode after the trigger is released.

Locking a Welding Power Source

You can now lock (or disable) a Welding Power Source when the Weld Sequencer is not connected. This prevents operators from using the Welding Power Source unless the Weld Sequencer is running and communicating with the power source.

NOTE | Only user accounts with the role of *Administrator* or *Engineer* can enable or disable this feature.

To enable (or disable) the Welding Power Source unless connected to Weld Sequencer:

Procedure	Details
1. On the computer connected to the Welding Power Source, open Weld Sequencer and log in.	Remember: Only user accounts with the role of <i>Administrator</i> or <i>Engineer</i> can enable or disable this feature.
2. Connect to the Welding Power Source.	
3. Select File > Power Supply Auto Lockout Enable from the main menu.	The system remembers this setting, and the Welding Power Source will only function if the Weld Sequencer software is communicating with the machine. To turn the feature off, select Power Supply Auto Lockout Disable from the menu.

Weld Sequencer and PLCs

If you have a weld sequence file that contains *PLC Tag Read* and *PLC Tag Write* functions, you need to physically connect the PLC and the Weld Sequencer computer on the production floor. Then you need to establish the appropriate settings in Weld Sequencer and connect the software to the PLC. Once connected, Weld Sequencer monitors the Ethernet/IP connection and the PLC controller mode continuously. You can see the status of the connection in the status bar of the Weld Sequencer.

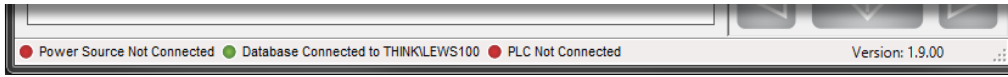


Figure 7.5 Status Bar Showing PLC Connection Status

NOTE | You must be a user with the *Administrator* role associated with your account. See page 3.2 for details on user roles.

Connecting to the PLC

After you connect the PLC to the Weld Sequencer computer, you need to establish the connection between the PLC and the Weld Sequencer software.

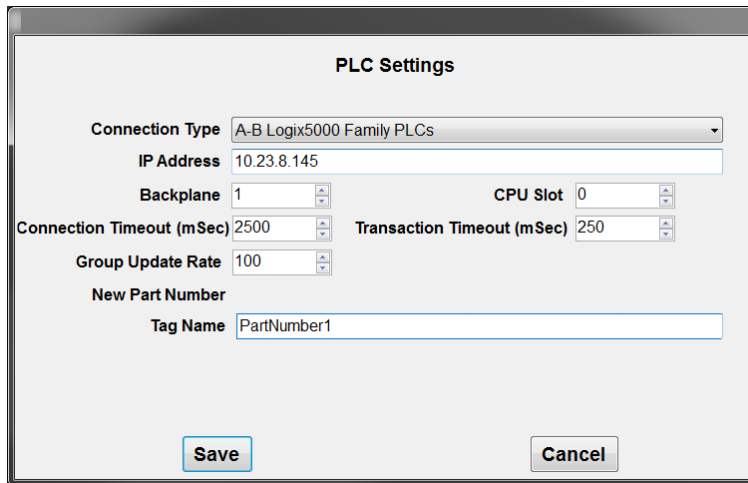



Figure 7.6 PLC Settings

To connect to the PLC:

Procedure	Details
1. Select All Programs > Lincoln Electric > Weld Sequencer Toolkit > Weld Sequencer from the computer’s Windows menu.	
2. Click the Login button  and enter your administrator credentials.	
3. Select File > PLC Connect from the main menu.	The <i>PLC Settings</i> window opens (Figure 7.6).
4. Complete the fields for the PLC to which you want to connect.	See Table 7.3 for in-depth details on each of these fields.
5. Click the OK button.	
6. Click the Logout button.	

Disconnecting the PLC

To disconnect the PLC from the Weld Sequencer, simply select **File > PLC Disconnect** from the main menu.

PLC Connection Properties

For details on the actual data that you need to include in each of these fields, refer to the manufacturer’s documentation for your PLC and consult your IT department if necessary.

Table 7.3 Fields on the PLC Settings Window

Field	Description
<i>Connection Type</i>	Select the appropriate type of PLC from the drop-down.
<i>IP Address</i>	This is the IP address assigned to the Ethernet bridge module in the PLC backplane.
<i>Backplane</i>	This is the port number in the Ethernet bridge module of the backplane connection. It is almost always “1”.
<i>CPU Slot</i>	This is the slot number of the target PLC in the PLC backplane. This is typically “0” (the leftmost slot).
<i>Connection Timeout</i>	This is the amount of time you want Weld Sequencer to wait (in milliseconds) before dropping the Ethernet/IP connection.
<i>Transaction Timeout</i>	This is the amount of time you want to pass (in milliseconds) before Weld Sequencer should consider a communication from a <i>PLC Tag Read</i> or <i>PLC Tag Write</i> to have failed due to a bad connection.
<i>Group Update Rate</i>	This is the polling rate you want Weld Sequencer to use when a <i>PLC Tag Read</i> function is waiting for the data in the <i>Expected Value</i> field (page 6.52) to be received from the PLC.
<i>New Part Number Tag Name</i>	This is the tag that you want Weld Sequencer to monitor from the PLC. The tag from the PLC contains the part number used to automatically look up the weld sequence (page 4.8).

Automatically Launch a Weld Sequence Based on a PLC Tag

Weld Sequencer provides you with the ability to monitor a tag sent from the PLC that contains the part number. When the system detects the tag name you enter in the PLC Settings window, it attempts to find a part number match in the database. If the system finds a match with a valid part number, Weld Sequencer launches the associated weld sequence file, just like with a part lookup.

TIP | If there is a check mark in the *Automatic Start* checkbox, the sequence automatically begins as soon as it launches.

To establish this functionality:

- Set up your PLC with a tag using a string value that sends the part number to Weld Sequencer.
- Create the part in the part database (page 4.8).
- On the workstation preferences, place a check mark in the *Automatically Request New Part Number from PLC* option (Figure 7.4 on page 7.8).

- In the *New Part Number Tag Name* field on the *PLC Settings* window (Figure 7.6 on page 7.11), add the PLC tag that you want to monitor for a part number. This tag must be a string.

When the Weld Operator (or other user) opens Weld Sequencer and saves the tag name in the *PLC Settings*, Weld Sequencer begins to monitor the PLC for tag changes, loads the next sequence accordingly, and clears the value in the tag (to prevent recycling of the same part number). After the weld sequence completes, the Weld Sequencer will again start monitoring the PLC for tag changes and continue loading the next sequence to execute.

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Enterprise Configuration

Microsoft SQL Server Installation Details

For a situation where you already have SQL Server installed for an Enterprise Configuration, you may want to customize the installation to meet your unique requirements. This section walks you through the various installation settings and SQL scripts that are necessary to create an Enterprise Configuration of the Weld Sequencer Database.

STOP | Do not attempt an Enterprise Configuration unless you are experienced with Microsoft SQL Server or you can contact your IT department for assistance.

STOP | This section of the manual refers only to Enterprise Configuration. For a stand-alone installation, please see page 2.1.

TIP | If you need assistance with the Enterprise Configuration, please contact Lincoln Electronic Weld Sequencer support at softwaresupport@lincolnelectric.com.

This section assumes you have familiarity with the following Microsoft SQL Utilities and bases any instructions on SQL Server 2019. Use these instructions as a guide for any other version of SQL Server you may have installed.

- SQL Server Installation Center
- SQL Server Configuration Manager
- SQL Server Management Studio

All of these utilities were installed when you installed SQL Server.

NOTE | This section does not cover the details of the initial installation of Microsoft SQL Server and presumes you are working with an existing default server instance and that you have experience with Microsoft SQL Server.

With the default SQL Server installation, you only need to create a named SQL Server Instance for the Weld Sequencer and add the Weld Sequencer database to it. You can perform both of these steps manually using the SQL Server tools (listed above) distributed with Microsoft SQL Server.

Weld Sequencer Toolkit components used in this process:

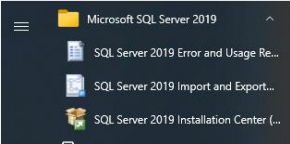
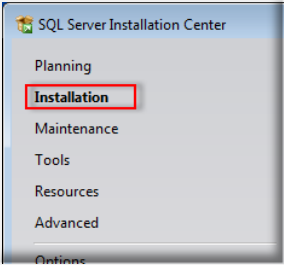
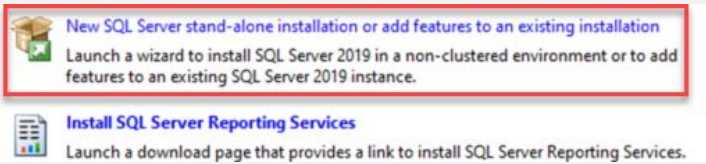
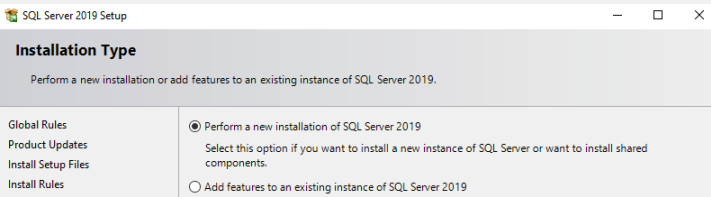
- SQL script to create Weld Sequencer database: *WeldSequencer_Install.sql*
- Connection String: *local.connectionString.config*

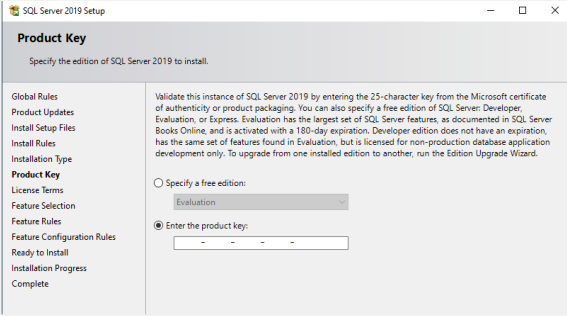
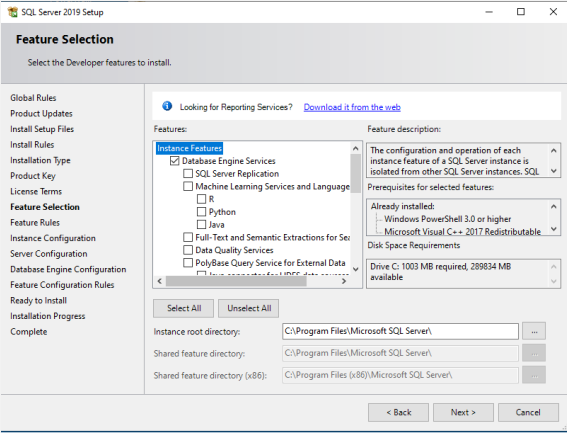
Creating a Named Instance

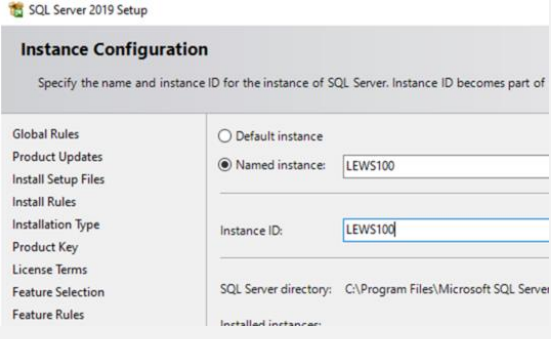
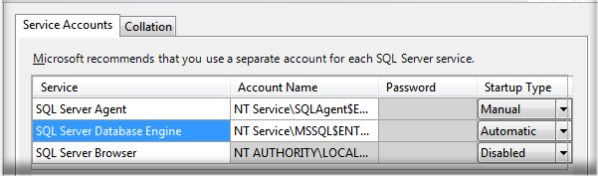
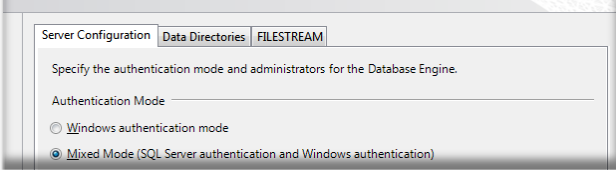
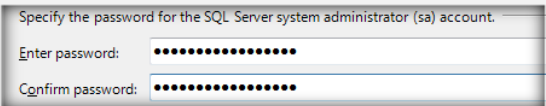
You create a Weld Sequencer SQL Server instance like any other SQL Server named instance through the SQL Server Installation Center. For an Enterprise Configuration, you create this instance manually on a database server.

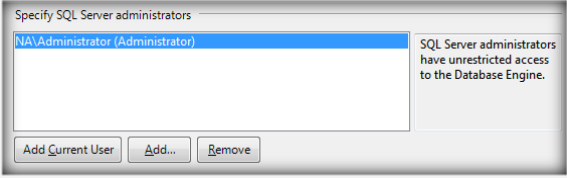
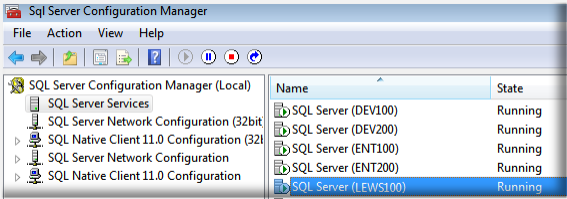
STOP | You can add the database to an existing instance if you prefer. Be sure you know the name of the instance and whether it supports Mixed Mode or Windows Authentication. Skip to page A.5 for detailed instructions.

To create a new instance:

Procedure	Details
<p>1. Launch the SQL Server Installation Center.</p>	
<p>2. In the <i>SQL Server Installation Center</i> window, click the <i>Installation</i> link on the left.</p>	
<p>3. On the right side, click the <i>New SQL Server stand-alone installation or add features to an existing installation</i> link.</p>	
<p>4. If prompted, insert the SQL Server 2019 installation media or navigate to the setup file on your computer system.</p>	
<p>5. On the first <i>Setup Support Rules</i> screen, click OK.</p>	<p>If necessary, address any issues that appear and begin again.</p>
<p>6. If prompted with an <i>Installation Type</i> step, choose <i>Perform a new installation of SQL Server 2019</i> and click Next.</p>	

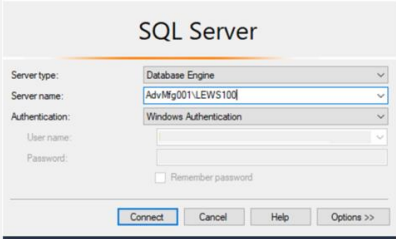
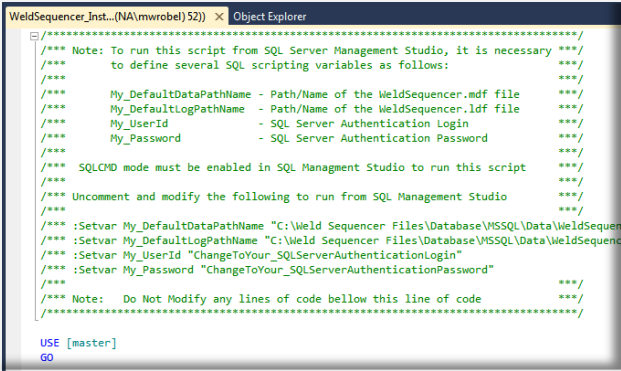
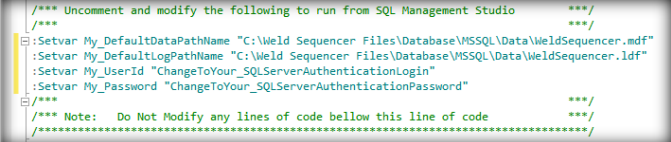
Procedure	Details
<p>7. On the <i>Product Key</i> screen, enter the product key if not defaulted and click Next.</p>	
<p>8. You must read & accept the license agreement and click Next.</p>	
<p>9. On the <i>Product Updates</i> screen, click Next.</p>	
<p>10. On the <i>Install Setup Files</i> screen, click Install.</p>	
<p>11. On the <i>Install Rules</i> screen, solve any issues displayed and click Next.</p>	
<p>12. On the second <i>Setup Support Rules</i> screen, click Next.</p>	
<p>13. On the <i>Setup Roles</i> screen, choose <i>SQL Server Feature Installation</i>.</p>	<p>This is a recommendation. Make the choice appropriate for your setup.</p>
<p>14. On the <i>Feature Selection</i> screen, be sure to select <i>Database Engine Services</i> and <i>Management Tools</i>.</p>	
<p>15. Click Next.</p>	<p>Add any other features you require for your system.</p>
<p>16. On the <i>Feature Rules</i> screen, solve any issues and click Next.</p>	

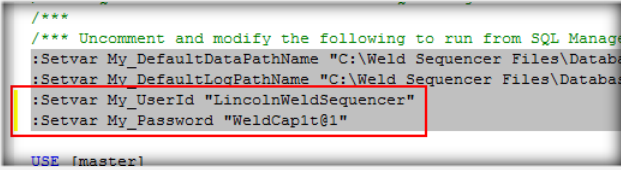
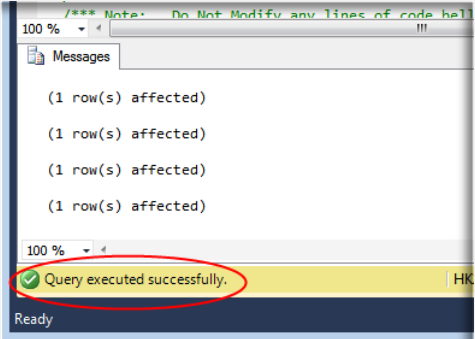
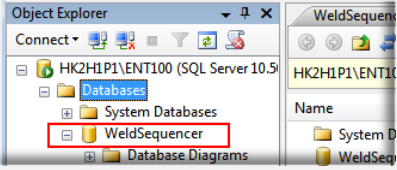
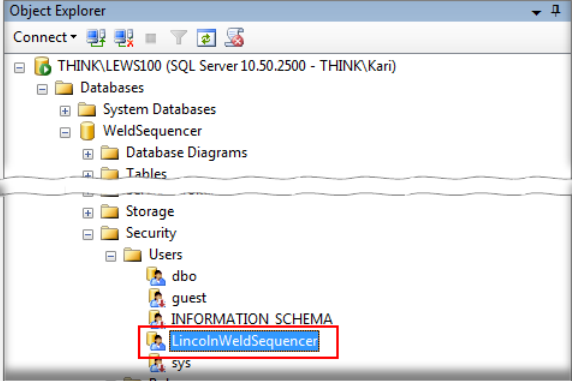
Procedure	Details
<p>17. On the <i>Instance Configuration</i> screen, choose <i>Named instance</i>.</p>	
<p>18. Enter the standard <i>LEWS100</i> in the <i>Named instance</i> and <i>Instance ID</i> fields.</p>	<p>NOTE If you choose not to use <i>LEWS100</i> as the instance name, make note of the instance name you choose. You will need this information later.</p>
<p>19. Leave the <i>Instance root directory</i> field at its default value.</p>	<p>Typically, this value is <i>C:\Program Files\Microsoft SQL Server</i>. Other pre-existing installed instances are allowed. You can change the <i>Instance root directory</i> field without affecting Weld Sequencer operation.</p>
<p>20. Click Next.</p>	
<p>21. On the <i>Disk Space Requirements</i> screen, click Next.</p>	
<p>22. On the <i>Server Configuration</i> screen, provide a specific <i>Account Name</i>, <i>Password</i>, and <i>Startup type</i> as required for your system.</p>	 <p>No settings specific to Weld Sequencer are necessary for any of the other settings on this screen.</p>
<p>23. Click Next.</p>	
<p>24. On the <i>Database Engine Configuration</i> screen, choose either <i>Windows authentication mode</i> or <i>Mixed Mode</i>.</p>	
<p>25. If you chose <i>Windows authentication mode</i>, skip to step 27. If you chose <i>Mixed Mode</i>, continue with step 26.</p>	
<p>26. In the <i>Enter password</i> field, enter a strong password and confirm it with the next field.</p>	

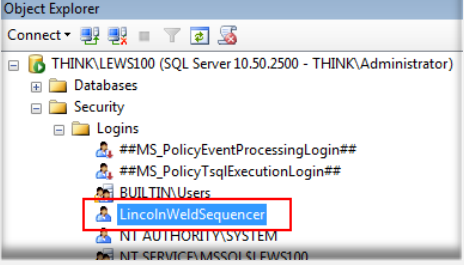
Procedure	Details
	This is your system administrator (“sa”) password and must be a strong password. Type one that contains both letters and numbers.
27. In the <i>Specify SQL Server Administrators</i> section, click the Add button and add any administrators if necessary for your organization.	
28. Click Next .	
29. On the <i>Error and Usage Report Reporting</i> screen, leave the boxes unchecked and click Next .	
30. On the <i>Installation Rules</i> screen, address any errors and click Next .	
31. On the <i>Ready to Install</i> screen, click Install .	
32. When the installation finishes, click Next .	
33. On the <i>Complete</i> screen, click Close .	<p>Your instance name and passwords for future reference:</p> <p>Named Instance: _____</p> <p>SA Password: _____</p> <p><input type="checkbox"/> Windows Authentication Mode</p> <p><input type="checkbox"/> Mixed Mode:</p> <p>SQL Server Authentication Login _____</p> <p>SQL Server Authentication Password _____</p>
34. Open the SQL Server Management Studio and verify the new SQL Server instance was created and that it is running.	

Adding the Database to the Instance

Now that you have the Weld Sequencer instance created on the server machine, you need to add the Weld Sequencer database to that instance.

Procedure	Details
<p>1. Using SQL Server Management Studio, connect to the server instance.</p>	
<p>2. In the <i>SQL Server Management Studio</i> window, select File > Open > File from the main menu.</p>	
<p>3. Navigate to <i>C:\Program Files (x86)\Lincoln Electric\Weld Sequencer Tool Kit\Weld Sequencer Set-up Tools\WeldSequencer_Install.sql</i>.</p>	<p>TIP If you need to remove the Weld Sequencer database, you can use the <i>WeldSequencer_Uninstall.sql</i> file (instructions provided in the file).</p>
<p>4. Click Open.</p>	<p>The SQL script file opens. The block of comment text at the beginning of the file also provides instructions.</p> 
<p>5. Uncomment the four <i>:Setvar</i> lines of code.</p>	<p>STOP Do not modify any lines of code below the block of commented text.</p> 
<p>6. Select Query > SQLCMD Mode from the main menu.</p>	<p>With the <i>:Setvar</i> statements uncommented, you must set the query to run in SQLCMD mode. This will change the background color of the <i>:Setvar</i> lines.</p>
<p>7. Leave the default paths for the two databases (<i>:Setvar My_DefaultDataPathName</i> and <i>:Setvar My_DefaultLogPathName</i>).</p>	<p>NOTE The installation uses the default <i>C:\Weld Sequencer Files\Database\MSSQL\Data\</i> path as a convenient location for the <i>WeldSequencer.mdf</i> and <i>WeldSequencer.ldf</i> files, but this path is not referenced by the Weld Sequencer applications themselves. If you need to create the databases in another folder, replace</p>

Procedure	Details
	<p>C:\Weld Sequencer Files\Database\MSSQL\Data\ with the path you want to use.</p>
<p>8. If you chose <i>Mixed Mode</i> for your Authentication Mode, enter the default <i>LincolnWeldSequencer</i> between the quotes for <code>:Setvar My_UserId</code> and <code>WeldCap1t@1</code> between the quotes for <code>:Setvar My_Password</code></p>	 <p>For <i>Mixed Mode</i>, if you created a new user name and password for the database, enter those credentials.</p> <p>Leave the default text if using <i>Windows authentication mode</i>.</p>
<p>9. Click Execute after making changes.</p>	<p>The script creates the necessary files for you in the locations you specified.</p>
<p>10. Review the Messages tab and verify the script executed correctly</p>	
<p>11. Right-click <i>Databases</i> in the folder tree and select Refresh from the pop-up menu.</p>	
<p>12. Verify the <i>WeldSequencer</i> database entry now exists.</p>	
<p>13. Verify the <i>LincolnWeldSequencer</i> user was created within that database.</p>	

Procedure	Details
<p>14. Verify the <i>LincolnWeldSequencer</i> login was created (or the user name you created if different from the default).</p>	<p>TIP If the SQL server instance uses <i>Windows authentication mode</i> only, you can delete this user.</p>  <p>TIP If the SQL Server instance uses <i>Windows authentication mode</i> only, you can delete this login.</p> <p>You have successfully added the database to the instance. Now you need to configure each client computer so it can connect to the database.</p>

Connecting Computers to the Database

Each client computer that needs to use the Enterprise Configuration must be set up to connect to the database. To reference the SQL Server database, you need to modify the connection string application files on the client computers to reference the SQL Server instance and to specify a SQL Server Authentication login and password that the applications can use to access the database.

A Weld Sequencer Administrator can edit the database connection method and connection string (separately for the Editor and the Engine) with the Preferences menu.

STOP | This section of the manual refers only to Enterprise Configuration. For a stand-alone installation, please see page 2.1.

NOTE | Only users with administrative privileges can make changes within the *C:\Program Files* directory. Contact your IT department if you do not have administrator privileges.

NOTE | If the database is not connected, anyone can change the connection method and strings settings in the Preferences menu (without login because login is not possible without a database connection).

Weld Sequencer Toolkit installs two configuration files with the Weld Sequencer applications. These configuration files identify the SQL Server that the applications should use and what access credentials they should use (i.e., user name and password) for the Weld Sequencer database.

The two files have the same file name *local.ConnectionStrings.config*, and you can find them on each workstation in the following default folders:

On a 32-bit computer:

- C:\Program Files\Lincoln Electric\Weld Sequencer Tool Kit\Weld Sequence Editor\
- C:\Program Files\Lincoln Electric\Weld Sequencer Tool Kit\Weld Sequencer

On a 64-bit computer:

- C:\Program Files (x86)\Lincoln Electric\Weld Sequencer Tool Kit\Weld Sequence Editor\
- C:\Program Files (x86)\Lincoln Electric\Weld Sequencer Tool Kit\Weld Sequencer

NOTE | If you chose a different directory during installation, you can find the configuration files in that location. See Figure 7.4.

Modifying the Connection File

To configure the files:

Procedure	Details
1. Open a simple text-editing program (such as Notepad or Notepad++).	
2. In Notepad, select File > Open from the main menu.	
3. Select <i>All files</i> in the drop-down next to the <i>File name</i> field.	
4. Navigate to C:\Program Files\Lincoln Electric\Weld Sequencer Tool Kit\Weld Sequence Editor\ (or the appropriate path as discussed on page A.9).	
5. Select <i>local.ConnectionStrings.config</i> and click Open .	<p>The file also contains instructions in the comment text. Those comments contain the following text for Mixed Mode authentication:</p> <pre><add name="LincolnConnection" connectionString="Server=MySQLServer; Initial Catalog=WeldSequencer; User Id=LincolnWeldSequencer; Password=MyPassword;" providerName="System.Data.SqlClient"/></pre> <p>and the following for Windows Authentication mode:</p> <pre><add name="LincolnConnection" connectionString="Server=MySQLServer; Initial Catalog=WeldSequencer; Trusted_Connection=True;" providerName="System.Data.SqlClient"/></pre>
6. Copy the appropriate text and paste it between <code><connectionStrings></code> and <code></connectionStrings></code> .	<p>So, the text should look like this for <i>Mixed Mode</i>:</p> <pre><connectionStrings> <add name="LincolnConnection" connectionString="Server=MySQLServer; Initial Catalog=WeldSequencer; User</pre>

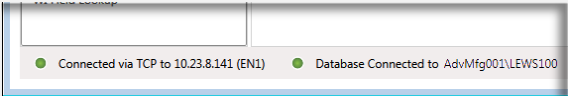
Procedure	Details
	<pre>Id=LincolnWeldSequencer; Password=MyPassword;" providerName="System.Data.SqlClient"/> </connectionStrings></pre> <p>and like this for <i>Windows Authentication Mode</i>:</p> <pre><connectionStrings> <add name="LincolnConnection" connectionString="Server=MySQLServer; Initial Catalog=WeldSequencer; Trusted_Connection=True;" providerName="System.Data.SqlClient"/> </connectionStrings></pre>
<p>7. Replace <code>MySQLServer</code> with the name of the SQL Server and, if necessary, the instance name.</p>	<p>Examples:</p> <pre>AdvMfg001\LEWS100 ADVSQLV03</pre> <p>TIP Refer to page D.1 for some more information on this connection string.</p>
<p>8. If you chose <i>Mixed Mode</i> authentication, continue with step 9. If you chose Windows authentication mode, skip to step 11.</p>	
<p>9. Replace <code>LincolnWeldSequencer</code> with the user name for the SQL Server database.</p>	<p>For example: <code>WeldSeqUser</code></p> <p>NOTE A “Trusted Connection” SQL login user must have the “db_owner” SQL security rights.</p>
<p>10. Replace <code>MyPassword</code> with the password for the SQL Server database.</p>	<p>For example: <code>WeldCaplt@1</code></p>
<p>11. Save the file.</p>	<p>Aside from the block of comment text, the contents of our example would look like this for <i>Mixed Mode</i>:</p> <pre><connectionStrings> <add name="LincolnConnection" connectionString="Server= AdvMfg001\LEWS100; Initial Catalog=WeldSequencer; User Id= WeldSeqUser; Password= WeldCaplt@1;" providerName="System.Data.SqlClient"/> </connectionStrings></pre> <p>or like this for <i>Windows authentication mode</i>:</p> <pre><connectionStrings> <add name="LincolnConnection" connectionString="Server= AdvMfg001\LEWS100; Initial Catalog=WeldSequencer; Trusted_Connection=True;" providerName="System.Data.SqlClient"/> </connectionStrings></pre>

Install the Connection File on Client Computers

In the following steps, you copy your modified *local.connectionString.config* file and replace the existing file that is distributed with the Weld Sequencer Editor and Weld Sequencer applications.

TIP | Alternatively, you can rename the original installed *local.connectionString.config* file to *local.connectionStrings_asInstalled.config* instead of replacing the file. This would allow you to keep the original file for future reference.

TIP | If you will add new computers to the system in the future, you could create a common configuration file for your Enterprise Configuration and possibly package it up (e.g., with InstallShield or a self-extracting ZIP file) to distribute to those new users in the future after installing the Weld Sequencer Toolkit.

Procedure	Details
1. Copy the <i>local.connectionString.config</i> file that you edited.	
2. Paste and replace the file into <i>C:\Program Files\Lincoln Electric\Weld Sequencer Toolkit\Weld Sequence Editor</i> (or the appropriate path as discussed on page A.9).	
3. Paste and replace the file into <i>C:\Program Files\Lincoln Electric\Weld Sequencer Toolkit\Weld Sequencer</i> (or the appropriate path as discussed on page A.9).	
4. Test the database connections by launching the Weld Sequence Editor and Weld Sequencer applications.	<p>A green indicator next to the name of the database in the status bar (at the bottom) of each application indicates that the database connection was successful.</p> 
5. Repeat steps 1 through 4 for each workstation or client computer.	This includes all computers that will build weld sequence files and all computers that will run weld sequence files.

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Tips and Helpful Hints

Two-Step Process for Creating a Weld Sequence

Creating a weld sequence is quite simple with the Weld Sequence Editor. If you break up your process into a couple of steps, you can avoid being overwhelmed by all the little details that go into creating a great sequence.

- **Step 1: Get the basics down first.**
When you begin creating a sequence, your first step is to create most of the steps you will need and provide a basic connection between the functions. This helps you make sure you have all the welds in place. Run the weld sequence file in Weld Sequencer to make sure the order of your sequence is correct and the flow of your sequence is correct. You want to make sure you have the correct pictures displaying when they are supposed to and the welding functions are in the correct order.
- **Step 2: Refine the functions and incorporate your validations.**
Once you are confident you have all the functions in the correct order, you can begin refining and adding parameters and conditions to the sequence functions.
 - Run the weld sequence file, make any adjustments needed, and start collecting production data. Use the Sequence Reports feature to create a file after welding with the weld sequence file. You can analyze these reports manually, or you can use the Report Analysis tool (page 5.28) to add parameters and weld validations automatically.
 - Use the production data to "finalize" the sequence: enter estimated times for each function, add weld validations for each welding operation to improve the sequencer control and quality.
 - Ask the Weld Operator for feedback and ways to improve the weld sequence. Possibly re-order some of the steps to improve cycle time or to make it easier for the operator.

TIP | You can use the Report Analysis Wizard to help you with Step 2. See page 5.28 for in-depth details.

Create a Sequence File from Excel

You can automatically create a new weld sequence file based on the contents of an Excel spreadsheet. The new weld sequence is made from a Microsoft Excel spreadsheet with a predefined layout. An example Excel file with this predefined layout is provided with the software installation; the file can be found in the *Weld Sequencer Files* folder.

NOTE | Each row in the Excel file will be converted to a Weld Sequencer Step using the Weld Accumulator function.

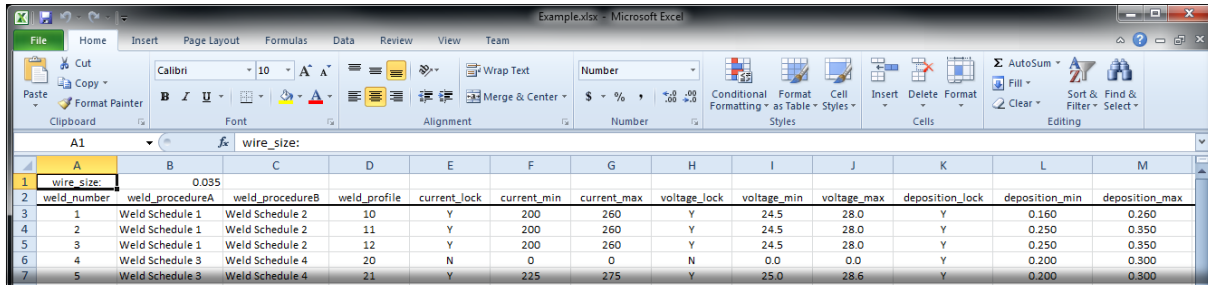


Figure B.1 Example Microsoft Excel Spreadsheet

Excel Rows	Details
1	Column B contains the size of the wire used for the weld sequence.
2	These are the column headers to help explain the required information in the following rows. Do not modify these column headers; use the example Excel file found in the <i>Weld Sequencer Files</i> folder.
3, 4, 5, ...	Each additional row defines a Step to create with a Weld Accumulator function. Do not include any additional data or additional rows of information beyond the Steps you expect to create in the new Weld Sequencer file.

Column	Details
A <i>weld_number</i>	This number is the step number of the weld in the weld sequence.
B <i>weld_procedureA</i>	This is the name of the first weld procedure associated with the weld. This weld procedure will be loaded from the database; make sure you have the specified weld procedure saved in the database.
C <i>weld_procedureB</i>	This is the name of the second weld procedure associated with the weld. This weld procedure will be loaded from the database; make sure you have the specified weld procedure saved in the database.
D <i>weld_profile</i>	The weld profile to use during welding.
E <i>current_lock</i>	Enter a “Y” for yes and “N” for no to control if a weld current validation is used for this step. The minimum and maximum values can be zero if this option is not used.
F <i>current_min</i>	Enter the low current alarm limit for this step.
G <i>current_max</i>	Enter the high current alarm limit for this step.
H <i>voltage_lock</i>	Enter a “Y” for yes and “N” for no to control if a weld voltage validation is used for this step. The minimum and maximum values can be zero if this option is not used.
I <i>voltage_min</i>	Enter the low voltage alarm limit for this step.

Column	Details
J <i>voltage_max</i>	Enter the high voltage alarm limit for this step.
K <i>deposition_lock</i>	Enter a “Y” for yes and “N” for no to control if a weld deposition validation is used for this step. The minimum and maximum values can be zero if this option is not used.
L <i>deposition_min</i>	Enter the low deposition alarm limit for this step.
M <i>deposition_max</i>	Enter the high deposition alarm limit for this step.
N <i>duration_lock</i>	Enter a “Y” for yes and “N” for no to control if a weld duration validation is used for this step. The minimum and maximum values can be zero if this option is not used.
O <i>duration_min</i>	Enter the low duration alarm limit for this step.
P <i>duration_max</i>	Enter the high duration alarm limit for this step.
Q <i>image_file</i>	Enter the file name and extension for the image to display during this step.
R <i>approval</i>	Enter a “Y” for yes and “N” for no to control if an Approval function is used for this step.

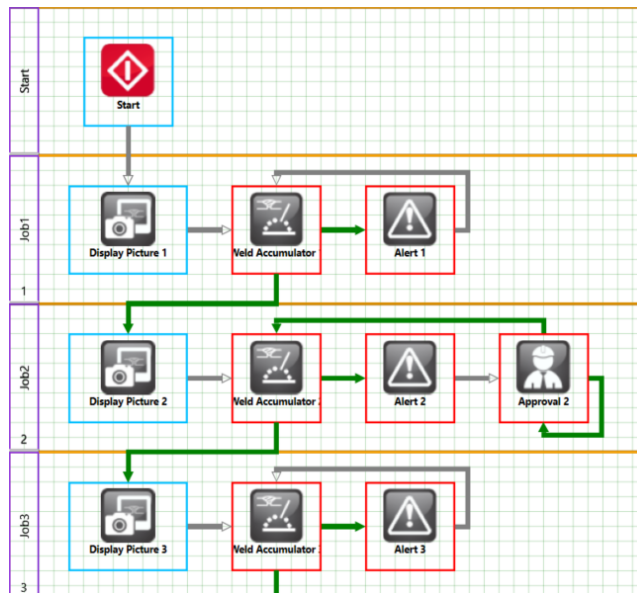


Figure B.2 Example Weld Sequence Created from an Excel Spreadsheet

To create a new weld sequence file based on the contents of an Excel spreadsheet:

Procedure	Details
1. Open the Weld Sequence Editor	If the Weld Sequence Editor is already open, save any open weld sequences. Opening the Excel file will overwrite the open file.

Procedure	Details
2. Search for and select the Excel file	Set the file search filter on the browser to All Files or files with an .xlsx extension.
3. Click OPEN on the Browser.	The information from the Excel file is automatically converted to a sequence file and shown in the Editor workspace.
4. Verify the weld sequence file.	Follow the tips from the <i>Two-Step Process for Creating a Weld Sequence</i>.
5. Save the weld sequence file.	

Using PowerPoint to Create Images

You've taken great pictures of the welds you want to display in Weld Sequencer. You want to add text to the photos and circle different parts of the pictures for different parts of the sequence, but you do not have an image-editing software. Good news. You can use Microsoft® PowerPoint to create images.

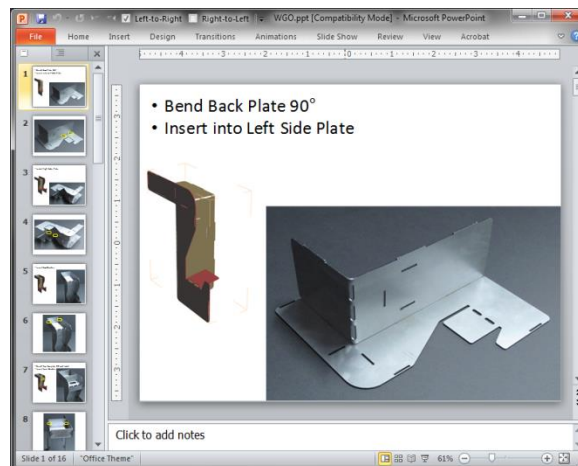
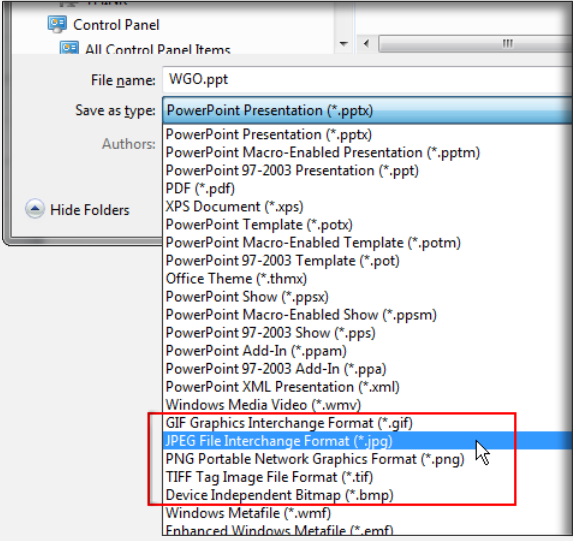
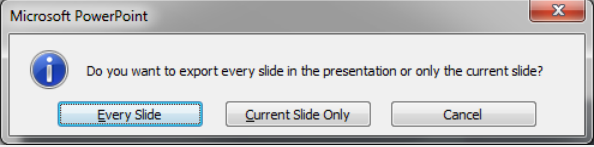


Figure B.3 Example Image While in PowerPoint

Simply make slides with your pictures and add some bullets. You can highlight where the operator should make the welds. The possibilities are endless. Once you finish, you can save the presentation as image files and load them into the *Display Picture* function.

To create an image using Microsoft® PowerPoint:

Procedure	Details
1. Open Microsoft® PowerPoint.	
2. Create one slide for each <i>Display Picture</i> function you want the Weld Operator to see.	Refer to Figure B.3. TIP Save your PowerPoint presentation as you normally would. This allows you to make changes easily in the future.
3. To save as an image, select File > Save As	

Procedure	Details
<p>from the main menu in PowerPoint.</p>	
<p>4. Navigate to the location where you want to save the images for this sequence.</p>	<p>TIP To make it easy on yourself, save the image files in the weld sequence file's location so you do not have to move them later.</p>
<p>5. From the <i>Save as type</i> field, select the image file format you prefer (e.g., JPG or PNG) and click Save.</p>	
<p>6. If you have multiple slides, PowerPoint will ask you if you want to export all of them or just the current slide. Click the appropriate button.</p>	 <p>Microsoft® PowerPoint saves each slide as an individual image, and you can now add them to your <i>Display Picture</i> functions.</p>

Keyboard Shortcuts

Weld Sequencer includes keyboard shortcuts to help you quickly perform certain tasks. You can access the **File** menu using the **Alt F** key combination. You can then press the following key on the keyboard to access the indicated menu item:

- **s** for **Load Sequence**
- **n** for **Part Number Lookup**
- **t** for **Consumable Lot**
- **g** for **Goto Step**
- **c** for **Power Supply Connect**
- **L** for **PLC Connect**
- **p** for **Preferences**
- **x** for **Exit**

Loading a Weld Sequence File by Command Line

To load a specific weld sequence file automatically when the Weld Operator launches the application, you can add the following text to the command line of the application shortcut. You need to know the location and file name for the weld sequence file. You can add either of the following commands to the shortcut:

- -l [filename]
- -load [filename]

TIP | If *Automatic Start* is enabled under **File > Preferences**, the sequence will also start automatically.

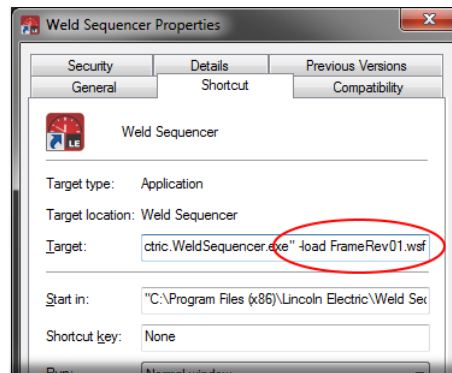


Figure B.4 Loading a Sequence by Command Line

To load a weld sequence file by command line:

Procedure	Details
1. Right-click the Weld Sequencer shortcut and select Properties from the pop-up menu.	The <i>Properties</i> window opens (Figure B.4).
2. Click on the <i>Target</i> field and place your cursor at the end of the existing text in the field.	
3. Type a space after the existing text.	
4. Type either <code>-l</code> or <code>-load</code> , followed by the filename you want to load automatically.	<p>For example:</p> <p>TIP If your filename contains spaces, be sure to enclose the filename with quotes. For example, you would type <i>Frame Weld Sequence.wsf</i> as <code>"Frame Weld Sequence.wsf"</code>.</p>
5. Click OK to save your changes.	

Ignoring Short Welds in a Weld Sequence

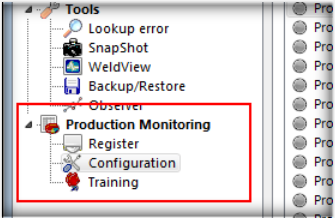
There may be times when you want to allow the Weld Operator to create short welds during a welding operation, but you do not want to define functions in the weld sequence for them. These are short welds that you do not need to have recorded and tracked with the CheckPoint™ software nor do you need to specify detailed welding information for the operator in the sequence. You also do not want these welds to produce an alert or error in the sequence.

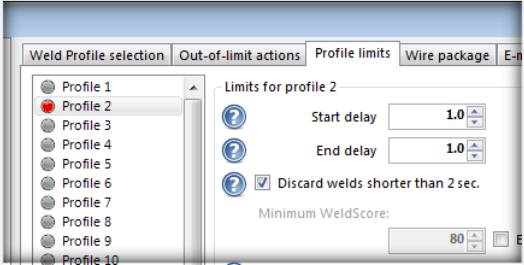
If you are not already using a specific Weld Profile for the welding function, you can use the Weld Profile feature to ignore these short welds without recognizing them and without creating individual functions for them.

NOTE | This is a special configuration and requires the use of the Weld Profile in Power Wave® Manager.

NOTE | Not all short welds need to be ignored. If you have short welds that need to be validated, simply create a function for the welds and do not use this special Weld Profile.

To create a special Weld Profile to ignore short welds:

Procedure	Details
<p>1. Decide on the maximum length of arc time that defines the short weld.</p>	<p>For example, you could say a short weld is less than two seconds of arc time, and you want to ignore all small welds like this.</p> <p>You need to configure a Weld Profile to ignore these short welds.</p>
<p>Configure Special Weld Profile</p>	
<p>2. Launch the Power Wave® Manager software.</p>	
<p>3. Connect to the Welding Power Source.</p>	
<p>4. Select Production Monitoring > Configuration from the navigation tree.</p>	

Procedure	Details
5. Click the Profile Limits tab.	
6. Click the Weld Profile you want to configure.	<p>STOP Profile 1 is the default profile for all welding functions in the Weld Sequencer. You need to pick a different Weld Profile for this special configuration.</p> <p>NOTE You will need to configure each Welding Power Source that will run the weld sequence file. Power Wave® Manager saves the configuration to the power source. The Backup and Restore feature in Power Wave® Manager can help you easily copy this configuration to a different Welding Power Source. See the <i>Power Wave® Manager User Manual (IM8002)</i> for details.</p>
7. Adjust the <i>Start delay</i> and the <i>End delay</i> fields to equal the maximum length of arc time you determined in step 1.	<p>In our example:</p> <p><i>Start Delay</i> = 1</p> <p><i>End Delay</i> = 1</p> <p>Total 2</p>
8. Place a check mark next to the <i>Discard welds shorter than X sec</i> option.	<p>Where x should match your maximum length of arc time.</p>
9. Click Apply Settings .	<p>In our example, when you use Weld Profile 2, the Welding Power Source ignores any welds less than two seconds.</p>
10. Repeat steps 3 through 9 for each Welding Power Source that will use the weld sequence file.	<p>You can use the Backup and Restore feature in Power Wave® Manager to simply copy your configuration if you have multiple machines to set up. See the <i>Power Wave® Manager User Manual (IM8002)</i> for details.</p> <p>Now you need to configure the welding function in the Weld Sequence Editor to use your new Weld Profile.</p>
Configure Welding Function	
11. Launch Weld Sequence Editor.	
12. Open your weld sequence file.	

Procedure	Details
13. Double-click on the welding function(s) where the short welds normally occur.	
14. Enter the profile number in the <i>Weld Profile</i> field.	
15. Click OK .	Since you configured the Weld Profile to discard any welds shorter than the time you specified, the Welding Power Source does not create a weld record for these short welds. Therefore, there is no data to send to Weld Sequencer and no welds to recognize.

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Troubleshooting

Sometimes, when working with a software program or installing software, you need a little extra information to help troubleshoot and solve the problem. There are some common minor issues you might be able to fix without a call to support.

NOTE | If you continue to have trouble, please contact your local IT department or Lincoln Electric Weld Sequencer support: softwaresupport@lincolnelectric.com.

Cannot Connect to a Power Source

There are multiple reasons you may not be able to access the connection window, connect to the IP address of a power source or why the IP address may not show up in the list of addresses. Here are some possibilities.

User Has Incorrect User Role

Only users with the *Administrator* role associated with their account can change the Welding Power Source connected to an instance of the Weld Sequencer software. See page 3.1 for details on user accounts.

IP Address or Other Ethernet Settings on the Welding Power Source Are Invalid

To correct this issue, you need to connect directly to the Welding Power Source through a temporary connection and change the permanent Ethernet settings.

Procedure	Details
1. Contact your local IT department for the correct Ethernet settings for the Welding Power Source.	
2. Temporarily disconnect the Welding Power Source from the network.	
3. Plug an Ethernet cable into the computer running Power Wave® Manager.	
4. Plug the other end of the Ethernet cable into the Welding Power Source.	Microsoft Windows assigns a temporary IP address to the computer and the Welding Power Source so they can communicate.
5. Launch Power Wave® Manager.	
6. On the Connect tab, choose <i>I do not know the IP address of the welder</i> .	
7. Click the Refresh List button.	Only one IP address should appear.

Procedure	Details
8. Select the welder and click Connect .	When you select the power source, the green status light on the machine should begin to blink. The system automatically takes you to the System status section in Power Wave® Manager.
9. Click Ethernet in the navigation tree.	
10. Edit the Ethernet settings to those provided by your IT department.	Refer to the <i>Power Wave® Manager User Manual</i> (IM8002) for more details on Ethernet settings.
11. Click Apply Settings .	The Welding Power Source resets and accepts its new network settings.
12. Unplug the Ethernet cable from the Welding Power Source.	
13. Reconnect the Welding Power Source to the plant network again.	The new settings should take effect.

Ethernet Settings Seem Valid but Still Cannot Connect

If you have checked the Ethernet settings, and they are valid, use the following information to verify communications and physical connections:

- Check the physical network connections to the computer and the power source. Check for a solid green or yellow light near each Ethernet jack. If you see a light, the physical connections are probably not the issue.
- Cycle the power to the Welding Power Source (off then back on). The power source could still have a residual network connection in its memory under some circumstances.

If you continue to have trouble connecting, verify the following:

- Do you have multiple Ethernet adapters enabled? This could cause issues. Verify that the Ethernet communications are going through a single adapter. To do this, temporarily disable any additional adapters.
- If you are using an Ethernet cable connection, try to temporarily disable any wireless communication on the computer. This could help the computer to directly connect to the Welding Power Source through the cable without interference.
- If the computer is running some type of security software or firewall, this may block the IP address of the Welding Power Source. Check with your local IT department.

Weld Sequencer Cannot Create a Database

If you receive a message that Weld Sequencer cannot create a database, the culprit could be that the directories involved in the installation are compressed. If this happens, the folder names appear blue in the file explorer (Figure C.1). If they are compressed, you just need to fix it and try the installation again.

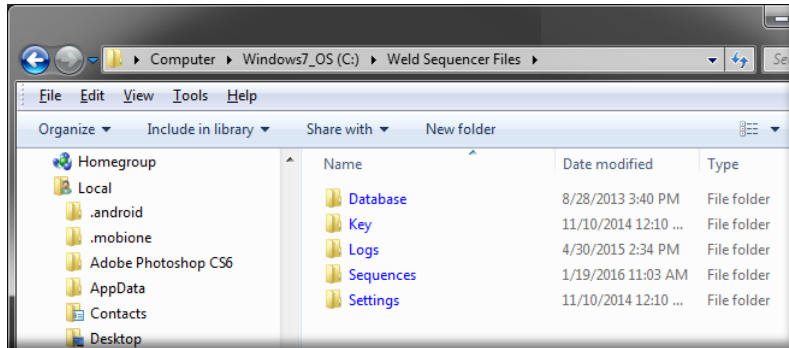
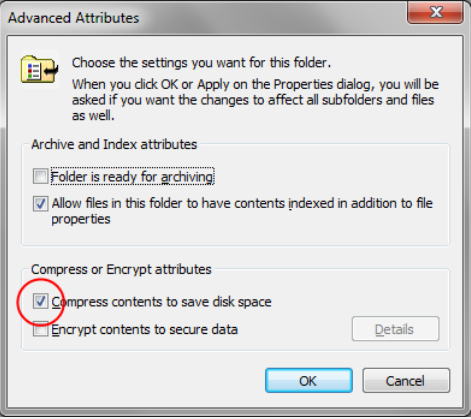


Figure C.1 Compressed Files/Folders

To decompress a file or a folder:

Procedure	Details
<p>1. Right-click the file or folder and select Properties from the pop-up menu.</p>	<p>The screenshot shows a File Explorer window with a context menu open over the 'Sequences' folder. The 'Properties' option at the bottom of the menu is highlighted by the mouse cursor.</p>
<p>2. On the General tab, click the Advanced button.</p>	<p>The screenshot shows the 'Weld Sequencer Files Properties' dialog box. The 'General' tab is selected. Under 'Attributes', the 'Advanced...' button is circled in red.</p>

Procedure	Details
<p>3. Remove the check mark from the <i>Compress contents to save disk space</i> checkbox.</p>	
<p>4. Click OK.</p>	<p>This decompresses the file or folder. Try your installation again.</p>

Frequently Asked Questions

The *Frequently Asked Questions* list is a compilation of questions posed by users of the software and the answers generally provided. Over time, the list will continue to grow and provide useful information requested often by our users.

Installation

How big will the Weld Sequencer database get?

There is minimal growth once you install and create the Weld Sequencer database. Weld Sequencer saves only a small amount of data to the database. The initial size of the database is approximately 334 MB. Enabling Weld Record Logging in a weld sequence file increases the size of the database. Each weld record is approximately 1600 bytes.

Do I have to name the Microsoft SQL Server instance “LEWS100”?

No. You can name the Microsoft SQL Server instance whatever you need to name it. We provide “LEWS100” in these instructions and elsewhere as a suggestion for those who need a basic installation, as well as for illustration purposes. Just be sure to record and keep track of the name you use if it is different.

Enterprise Configuration

Can I use an existing named instance?

Yes. If you have an existing Microsoft SQL Server installation with an existing instance you would like to use, you can simply add the Weld Sequencer database to that instance. Appendix A provides Enterprise Configuration information. Please refer to page A.5 for more detailed information on adding to an existing instance.

Do I need to include the instance name in the connection string?

Whether or not to include the instance name in the connection string depends on your needs and how the server is set up to resolve the connection. The format of the *ConnectionString* property in the *local.ConnectionStrings.config* files follows the standard format for SQL Server connection strings and the standard rules for parsing connection strings. If you have unique needs, you have the flexibility to use advanced connection string syntax if you choose. The Weld Sequence Editor and Weld Sequencer applications simply use the unmodified string when making the connection.

Why won't the computer connect to my network resources?

If you have a connection issue but the connection string files have been edited correctly, try using the fully qualified domain names when referencing the network resource. In our example in step 7 on page A.10, John at Advanced Manufacturing would change `ADVSQLV03` to `ADVSQLV03.us.corp.am` in the connection string file to fully resolve the name for his network. This made it easier for Weld Sequencer to find the resource. How you resolve the name depends on the domain set up on your company's network.

WARNING	<ul style="list-style-type: none"> ● Do not touch electrically live parts or electrode with skin or wet clothing. ● Insulate yourself from work and ground. 	<ul style="list-style-type: none"> ● Keep flammable materials away. 	<ul style="list-style-type: none"> ● Wear eye, ear and body protection.
Spanish AVISO DE PRECAUCION	<ul style="list-style-type: none"> ● No toque las partes o los electrodos bajo carga con la piel o ropa mojada. ● Aíslese del trabajo y de la tierra. 	<ul style="list-style-type: none"> ● Mantenga el material combustible fuera del área de trabajo. 	<ul style="list-style-type: none"> ● Protéjase los ojos, los oídos y el cuerpo.
French ATTENTION	<ul style="list-style-type: none"> ● Ne laissez ni la peau ni des vêtements mouillés entrer en contact avec des pièces sous tension. ● Isolez-vous du travail et de la terre. 	<ul style="list-style-type: none"> ● Gardez à l'écart de tout matériel inflammable. 	<ul style="list-style-type: none"> ● Protégez vos yeux, vos oreilles et votre corps.
German WARNUNG	<ul style="list-style-type: none"> ● Berühren Sie keine stromführenden Teile oder Elektroden mit Ihrem Körper oder feuchter Kleidung! ● Isolieren Sie sich von den Elektroden und dem Erdboden! 	<ul style="list-style-type: none"> ● Entfernen Sie brennbares Material! 	<ul style="list-style-type: none"> ● Tragen Sie Augen-, Ohren- und Körperschutz!
Portuguese ATENÇÃO	<ul style="list-style-type: none"> ● Não toque partes elétricas e electrodos com a pele ou roupa molhada. ● Isole-se da peça e terra. 	<ul style="list-style-type: none"> ● Mantenha inflamáveis bem guardados. 	<ul style="list-style-type: none"> ● Use proteção para a vista, ouvido e corpo.
Japanese 注意事項	<ul style="list-style-type: none"> ● 通電中の電気部品、又は溶材にヒフやぬれた布で触れないこと。 ● 施工物やアースから身体が絶縁されている様にして下さい。 	<ul style="list-style-type: none"> ● 燃えやすいものの側での溶接作業は絶対にしてはなりません。 	<ul style="list-style-type: none"> ● 目、耳及び身体に保護具をして下さい。
Chinese 警告	<ul style="list-style-type: none"> ● 皮肤或湿衣物切勿接触带电部件及焊条。 ● 使你自已与地面和工件绝缘。 	<ul style="list-style-type: none"> ● 把一切易燃物品移离工作场所。 	<ul style="list-style-type: none"> ● 佩戴眼、耳及身体劳动保护用具。
Korean 위험	<ul style="list-style-type: none"> ● 전도체나 용접봉을 젖은 헝겍 또는 피부로 절대 접촉치 마십시오. ● 모재와 접지를 접촉치 마십시오. 	<ul style="list-style-type: none"> ● 인화성 물질을 접근시키지 마십시오. 	<ul style="list-style-type: none"> ● 눈, 귀와 몸에 보호장구를 착용하십시오.
Arabic تحذير	<ul style="list-style-type: none"> ● لا تلمس الاجزاء التي يسري فيها التيار الكهربائي أو الألكترود بجسدك أو بالملابس المبللة بالماء. ● ضع عازلا على جسمك خلال العمل. 	<ul style="list-style-type: none"> ● ضع المواد القابلة للاشتعال في مكان بعيد. 	<ul style="list-style-type: none"> ● ضع أدوات وملابس واقية على عينيك وأذنيك وجسمك.

READ AND UNDERSTAND THE MANUFACTURER'S INSTRUCTION FOR THIS EQUIPMENT AND THE CONSUMABLES TO BE USED AND FOLLOW YOUR EMPLOYER'S SAFETY PRACTICES.

SE RECOMIENDA LEER Y ENTENDER LAS INSTRUCCIONES DEL FABRICANTE PARA EL USO DE ESTE EQUIPO Y LOS CONSUMIBLES QUE VA A UTILIZAR, SIGA LAS MEDIDAS DE SEGURIDAD DE SU SUPERVISOR.

LISEZ ET COMPRENEZ LES INSTRUCTIONS DU FABRICANT EN CE QUI REGARDE CET EQUIPMENT ET LES PRODUITS A ETRE EMPLOYES ET SUIVEZ LES PROCEDURES DE SECURITE DE VOTRE EMPLOYEUR.

LESEN SIE UND BEFOLGEN SIE DIE BETRIEBSANLEITUNG DER ANLAGE UND DEN ELEKTRODENEINSATZ DES HERSTELLERS. DIE UNFALLVERHÜTUNGSVORSCHRIFTEN DES ARBEITGEBERS SIND EBENFALLS ZU BEACHTEN.

			
<ul style="list-style-type: none"> ● Keep your head out of fumes. ● Use ventilation or exhaust to remove fumes from breathing zone. 	<ul style="list-style-type: none"> ● Turn power off before servicing. 	<ul style="list-style-type: none"> ● Do not operate with panel open or guards off. 	WARNING
<ul style="list-style-type: none"> ● Los humos fuera de la zona de respiración. ● Mantenga la cabeza fuera de los humos. Utilice ventilación o aspiración para gases. 	<ul style="list-style-type: none"> ● Desconectar el cable de alimentación de poder de la máquina antes de iniciar cualquier servicio. 	<ul style="list-style-type: none"> ● No operar con panel abierto o guardas quitadas. 	Spanish AVISO DE PRECAUCION
<ul style="list-style-type: none"> ● Gardez la tête à l'écart des fumées. ● Utilisez un ventilateur ou un aspirateur pour ôter les fumées des zones de travail. 	<ul style="list-style-type: none"> ● Débranchez le courant avant l'entretien. 	<ul style="list-style-type: none"> ● N'opérez pas avec les panneaux ouverts ou avec les dispositifs de protection enlevés. 	French ATTENTION
<ul style="list-style-type: none"> ● Vermeiden Sie das Einatmen von Schweißrauch! ● Sorgen Sie für gute Be- und Entlüftung des Arbeitsplatzes! 	<ul style="list-style-type: none"> ● Strom vor Wartungsarbeiten abschalten! (Netzstrom völlig öffnen; Maschine anhalten!) 	<ul style="list-style-type: none"> ● Anlage nie ohne Schutzgehäuse oder Innenschutzverkleidung in Betrieb setzen! 	German WARNUNG
<ul style="list-style-type: none"> ● Mantenha seu rosto da fumaça. ● Use ventilação e exaustão para remover fumo da zona respiratória. 	<ul style="list-style-type: none"> ● Não opere com as tampas removidas. ● Desligue a corrente antes de fazer serviço. ● Não toque as partes elétricas nuas. 	<ul style="list-style-type: none"> ● Mantenha-se afastado das partes moventes. ● Não opere com os painéis abertos ou guardas removidas. 	Portuguese ATENÇÃO
<ul style="list-style-type: none"> ● ヒュームから頭を離すようにして下さい。 ● 換気や排煙に十分留意して下さい。 	<ul style="list-style-type: none"> ● メンテナンス・サービスに取りかかる際には、まず電源スイッチを必ず切ってください。 	<ul style="list-style-type: none"> ● パネルやカバーを取り外したままで機械操作をしないで下さい。 	Japanese 注意事項
<ul style="list-style-type: none"> ● 頭部遠離煙霧。 ● 在呼吸區使用通風或排風器除煙。 	<ul style="list-style-type: none"> ● 維修前切斷電源。 	<ul style="list-style-type: none"> ● 儀表板打開或沒有安全罩時不準作業。 	Chinese 警告
<ul style="list-style-type: none"> ● 얼굴로부터 용접가스를 멀리하십시오. ● 호흡지역으로부터 용접가스를 제거하기 위해 가스제거기나 통풍기를 사용하십시오. 	<ul style="list-style-type: none"> ● 보수전에 전원을 차단하십시오. 	<ul style="list-style-type: none"> ● 관널이 열린 상태로 작동치 마십시오. 	Korean 위험
<ul style="list-style-type: none"> ● ابعد رأسك بعيداً عن الدخان. ● استعمل التهوية أو جهاز ضغط الدخان للخارج لكي تبعد الدخان عن المنطقة التي تتنفس فيها. 	<ul style="list-style-type: none"> ● أقطع التيار الكهربائي قبل القيام بأية صيانة. 	<ul style="list-style-type: none"> ● لا تشغيل هذا الجهاز اذا كانت الاغطية الحديدية الواقية ليست عليه. 	Arabic تحذير

LEIA E COMPREENDA AS INSTRUÇÕES DO FABRICANTE PARA ESTE EQUIPAMENTO E AS PARTES DE USO, E SIGA AS PRÁTICAS DE SEGURANÇA DO EMPREGADOR.

使う機械や溶材のメーカーの指示書をよく読み、まず理解して下さい。そして貴社の安全規定に従って下さい。

請詳細閱讀並理解製造廠提供的說明以及應該使用的銀焊材料，並請遵守貴方的有關勞動保護規定。

이 제품에 동봉된 작업지침서를 숙지하시고 귀사의 작업자 안전수칙을 준수하시기 바랍니다.

اقرأ بتمعن وافهم تعليمات المصنع المنتج لهذه المعدات والمواد قبل استعمالها واتبع تعليمات الوقاية لصاحب العمل.

CUSTOMER ASSISTANCE POLICY

The business of Lincoln Electric is manufacturing and selling high quality welding equipment, automated welding systems, consumables, and cutting equipment. Our challenge is to meet the needs of our customers, who are experts in their fields, and to exceed their expectations. On occasion, purchasers may ask Lincoln Electric for information or technical information about their use of our products. Our employees respond to inquiries to the best of their ability based on information and specifications provided to them by the customers and the knowledge they may have concerning the application. Our employees, however, are not in a position to verify the information provided or to evaluate the engineering requirements for the particular weldment, or to provide engineering advice in relation to a specific situation or application. Accordingly, Lincoln Electric does not warrant or guarantee or assume any liability with respect to such information or communications. Moreover, the provision of such information or technical information does not create, expand, or alter any warranty on our products. Any express or implied warranty that might arise from the information or technical information, including any implied warranty of merchantability or any warranty of fitness for any customers' particular purpose or any other equivalent or similar warranty is specifically disclaimed.

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WELD FUME CONTROL EQUIPMENT

The operation of welding fume control equipment is affected by various factors including proper use and positioning of the equipment, maintenance of the equipment and the specific welding procedure and application involved. Worker exposure level should be checked upon installation and periodically thereafter to be certain it is within applicable OSHA PEL and ACGIH TLV limits.



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