

# LightWELD – Fanuc CRX Co Robot System

There is a co robot solution that can be added to the IPG LightWELD hand held laser welders. This system is completely retrofittable to any LightWELD system, or added new. The system has been developed to allow fast change over from hand held laser welding to co robot laser welding in under 5 minutes. This allows best case manufacturing decisions to be made – hand held where it makes sense or co robot or both. The Fanuc CRX has a unique Timeline – Icon programming system. LightBOT programming icons – supplied by Serra Laser – IPGs Fanuc integrator and partner - have been developed to make programming easy to do and understand by the LightWELD welder. Wire Feed Option includes modification of the wire feeder supplied by IPG and Fanuc Control Card for Wire Feed Control. **Install Included**



## 3 Models Are Available

### FANUC CRX 10iA

MAX REACH – 49 INCHES

PAYLOAD – 22 LBS

PRICE - \$69,750

Includes IPG co robot kit and

Serra LightBOT Icon Set

Wire Feeder OPTION (\$4000)

---

### FANUC CRX 10iAL

MAX REACH – 55 INCHES

PAYLOAD – 22 LBS

PRICE - \$75,750

Includes IPG co robot kit and

Serra LightBOT Icon Set

Wire Feeder OPTION (\$4000)

---

### FANUC CRX 25iA

MAX REACH – 74 INCHES

PAYLOAD – 55 LBS

PRICE - \$89,750

Includes IPG co robot kit and

Serra LightBOT Icon Set

Wire Feeder OPTION (\$4000)





The IPG co robot gun holder uses the standard LightWELD GUN to allow safe control by the Fanuc CRX controller.



**IPG Supplied Co Robot Parts** – IPG supplies several critical parts of the co robot interface. Software upgrade to allow co robot control, LightWELD gun holder, LightWELD switch box, and LightWELD TCP calibration tools are supplied by IPG Photonics. This does not include the LightBOT icon set which is used by the Fanuc CRX timeline method of programming. These LightBOT icon set is supplied and developed by Serra Laser Center – IPG partner in developing the co robot solution for the LightWELD. Serra Laser also supplies the wire feed modification needed for wire speed control.



### IPG LightWELD Kit

Included in this kit are

1. Gun Holder – The gun holder is designed to allow co robot operation only when the gun is in the LightWELD gun holder. Very well made and adaptable to Fanuc co robots.
2. Co Robot Switch Box – Switch box uses a toggle switch between hand held and co robot welding
3. Calibration tools – IPG supplies a tool center point calibration nozzle and block to make easy setting of tool center point on the Fanuc Co Robot.
4. Velcro Straps – Helps organize the LightWELD cabling
5. IPG Co Robot SW upgrade – Opens the LightWELD to co robot control



**IPG LightWELD Gun Holder** – This has been specially developed by IPG for co robots. A concern on adapting the LightWELD System was inadvertent firing of the gun by the robot controller. A protocol has been established where the LightWELD can only be fired when the LightWELD gun is secured in the co robot gun holder – and the co robot switch box toggle switch in the co robot position. The gun holder holds both triggers closed and only in this position can it be fired from the Fanuc Controller. Gun can be secured in the gun holder in a few seconds and requires no tools to do it.



**IPG Co Robot TCP Calibration Tools**



**Velcro Straps Help Organize Co Robot Cabling**



# LightBOT™ Programming Icons for Fanuc CRX

The LightBOT Programming Icons, developed by Serra Laser, allow the Fanuc CRX to control the LightWELD system in a manner that is the same way a welder would control the LightWELD when welding by hand. This allows quick adaption by welder as co robot LightWELDing uses the existing IPG Presets and User Presets - Controls the Wire Speed - Power - Wobble Width - Wobble Frequency - which are controlled by the LightBOT Icon Set. The CRX uses the Fanuc CRX Timeline Programming and can be programmed offline.

This is a screen shot of the Fanuc CRX control table with LightBOT Icon Set from Serra Laser Center.





**WELD PROGRAM ICONS** – This section is where the welder selects the IPG Preset or User Preset Welding Conditions (just like hand laser welding) using the IPG Welding Condition Chart. Multiple

preset welding conditions can be selected, up to 5 total. This allows the LightBOT to change welding conditions on the fly or allows multiple welding set ups within the same program – such as tack welds, IPG Presets, User Presets, or Cleaning Presets. Within each Icon a different power, wobble width, or wobble frequency can be selected to further fine tune the co robot welding program. The welder does not have to change these manually at the LightWELD – the Fanuc CRX will change them on the fly. Each Weld Program – WP1, WP2, WP3 for example can recall completely different presets. This allows changing the weld program by swiping up different icons onto the Fanuc CRX timeline.

The screenshot shows the 'iRProgrammer' application window titled 'LIGHTBOT\_DEMO'. The interface is for configuring a weld program. At the top, there are five tabs labeled WP1 through WP5. The main title is 'LightBOT / Weld Program Config'. Below this, there are five tabs for WP1 through WP5, with WP1 selected. The configuration for 'Weld Program 1' is shown. It includes a 'Program Character' section with buttons for X (User), A, C, E (selected), F, H, J, L, P, U, and Y. The 'Program Index' section has buttons for 0 through 7, with 2 selected. There are three checked options: 'Override power', 'Override wobble frequency', and 'Override wobble length'. The 'Power' section shows a text input with '290' and 'watts', and buttons for -100, -10, 10, and 100. A note states: 'NOTE: The LightWELD will round up or down to the nearest 10W increment.' The 'Wobble Frequency' section shows a text input with '5' and '%', and buttons for -10, -1, 1, and 10. At the bottom, there are buttons for 'Play' and 'Robot Operation'.



**Laser On Icon** – The laser on Icon turns on the laser beam for welding. From this Icon Gas Pre-Flow can be set for shield gas control, and Power Ramp Up can be set. When wire welding speed of the wire can also be set. This sequence is the same as pulling Trigger one and Trigger two when Hand LightWelding, with the addition that the wire speed can also be set. No need to input a wire feed speed at the wire feeder screen.

The screenshot shows the iRProgrammer software interface. At the top, the window title is "iRProgrammer" and the application name is "LIGHTBOT\_DEMO". The interface includes a menu icon, a "100% AUTO" status indicator, and navigation icons. Below this is a timeline with various icons, including a blue "Laser On" icon. The "Details" tab is selected, showing the "Laser On" configuration screen. This screen has four sections: "Gas Pre-Flow" with a text input field containing "1000" and buttons for "-1000", "-100", "100", and "1000"; "Power Ramp-Up" with a text input field containing "350" and buttons for "-1000", "-100", "100", and "1000"; a checked checkbox for "Use Wire Feeder"; and "Wire Speed" with a text input field containing "50" and buttons for "-10", "-1", "1", and "10". At the bottom, there are "Play" and "Robot Operation" buttons.



**Laser Off** icon turns the laser beam off. Ramp down can be set to control heat input into a part which might be needed at the end of a weld. Wire speed ramp down can also be set to allow further control. This is the same as releasing the triggers when hand LightWELDing

The screenshot shows the iRProgrammer software interface for a 'LIGHTBOT\_DEMO' project. The top bar includes a menu icon, the project name 'LIGHTBOT\_DEMO', a zoom level of '100%', and an 'AUTO' button. Below the top bar is a timeline with various icons, including a 'Laser Off' icon (a red prohibition sign over a laser beam) which is highlighted with a blue background and a circled '2'. The interface is divided into 'Programming' and 'Details' tabs, with 'Details' currently selected. The 'Laser Off' configuration panel shows two sections: 'Ramp Down' with a text input field containing '1500' and a 'ms' unit, and 'Wire Speed Ramp Down' with a text input field containing '400' and a 'ms' unit. Both sections have four buttons for selecting ramp down values: '-1000', '-100', '100', and '1000'. At the bottom of the interface, there are 'Play' and 'Robot Operation' buttons.





**Wire Speed Setting Icon.** Wire speed can be set in multiple ways, such as thru the Program Set Icon or the Wire Speed Icons. Multiple Wire Speed Icons can be set up, which might be useful in case some parts of a program use different wire welding speeds – allowing the flexibility to use different wire speeds on different parts of a weldment. This might be done to fill a bigger weld gap for example.

## Wire Speed Presets

### Wire Speed 1

<input type="text" value="3"/>	cm/min	<input type="button" value="-10"/>	<input type="button" value="-1"/>	<input type="button" value="1"/>	<input type="button" value="10"/>
--------------------------------	--------	------------------------------------	-----------------------------------	----------------------------------	-----------------------------------

### Wire Speed 2

<input type="text" value="3"/>	cm/min	<input type="button" value="-10"/>	<input type="button" value="-1"/>	<input type="button" value="1"/>	<input type="button" value="10"/>
--------------------------------	--------	------------------------------------	-----------------------------------	----------------------------------	-----------------------------------

### Wire Speed 3

<input type="text" value="3"/>	cm/min	<input type="button" value="-10"/>	<input type="button" value="-1"/>	<input type="button" value="1"/>	<input type="button" value="10"/>
--------------------------------	--------	------------------------------------	-----------------------------------	----------------------------------	-----------------------------------

### Wire Speed 4

<input type="text" value="3"/>	cm/min	<input type="button" value="-10"/>	<input type="button" value="-1"/>	<input type="button" value="1"/>	<input type="button" value="10"/>
--------------------------------	--------	------------------------------------	-----------------------------------	----------------------------------	-----------------------------------

### Wire Speed 5

<input type="text" value="3"/>	cm/min	<input type="button" value="-10"/>	<input type="button" value="-1"/>	<input type="button" value="1"/>	<input type="button" value="10"/>
--------------------------------	--------	------------------------------------	-----------------------------------	----------------------------------	-----------------------------------



**The Set Power Icon** is the same as changing the power on the power knob when Hand Light Welding. This can be convenient for adjusting the penetration depth on a weldment.

Power can be changed mid weld. This allows fine tuning of the power setting at the end of a weld for example, where heat control might be needed. For a weldment with different material types of thicknesses control of the power – penetration – can be quite useful to allow successful co robot use.

The screenshot shows the iRProgrammer software interface. At the top, there is a blue header bar with the text 'iRProgrammer' and 'LIGHTBOT\_DEMO'. Below this is a toolbar with various icons, including a lightning bolt icon. The main area is divided into two tabs: 'Programming' and 'Details'. The 'Details' tab is active, showing the 'Set Power' screen. In this screen, there is a 'Power' section with a text input field containing the number '750' and the unit 'watts'. To the right of the input field are four buttons labeled '-100', '-10', '10', and '100'. Below the input field, there is a note: 'NOTE: The LightWELD will round up or down to the nearest 10W increment.' At the bottom of the interface, there are two buttons: 'Play' and 'Robot Operation'.



**Wobble Length Icon** is the same control as the bottom knob on the LightWELD system. It has two different modes of working depending on if a IPG preset is being used – in this case its an adjustment of a percentage + or – 50% of the IPG Preset – or if a User Preset it is an adjustment of the width of the wobble in mm. This might be used to widen a weld on an outside corner or to have deeper penetration on a weld by making it narrower.

The screenshot shows the iRProgrammer software interface. At the top, there's a title bar with "iRProgrammer" and window controls. Below that, a menu bar shows "LIGHTBOT\_DEMO" and a "100% AUTO" indicator. The main workspace displays a sequence of icons for a program, with the "Wobble Length" icon (a sine wave) highlighted in blue. Below the workspace, there are two tabs: "Programming" and "Details". The "Details" tab is active, showing the "Wobble Length" control panel. This panel includes a section for "User or Factory Preset" with a dropdown menu currently set to "User". Below this, there's a text box with the value "3.34" and the unit "mm". To the right of the text box are four buttons labeled "-1", "-0.1", "0.1", and "1". At the bottom of the interface, there are two main buttons: "Play" and "Robot Operation".



**Wobble Frequency Icon.** This is the same as the 2<sup>nd</sup> knob from the bottom on the hand held LightWELD system. When using in conjunction with the IPG Preset this sets the frequency as a percentage of the preset, + or – 50%. When used with a user preset it adjusts the frequency in HZ per second. This might be used to adjust the look of a zig zag weld for example.

The screenshot shows the iRProgrammer software interface. At the top, the window title is "iRProgrammer" and the program name is "LIGHTBOT\_DEMO". The interface includes a toolbar with various icons, one of which is the Wobble Frequency icon (a blue square with a white wavy line). Below the toolbar, there are two tabs: "Programming" and "Details". The "Details" tab is active, showing the "Wobble Frequency" settings. The settings include a section for "User or Factory Preset" with two buttons: "User" (selected) and "Factory". Below this, there is a "Wobble Frequency" input field with the value "290" and a unit "Hz". To the right of the input field are four buttons: "-10", "-1", "1", and "10". At the bottom of the interface, there are two buttons: "Play" and "Robot Operation".



**Laser Cleaning Icon** allows the LightWELD Cleaning function to be easily set by material type and intensity – without changing or setting the Weld Program. Laser Cleaning can also be used for part stenciling allows part numbers or other items to be “stenciled” onto a part.

The screenshot displays the iRProgrammer software interface. At the top, the window title is 'iRProgrammer' and the application name is 'LIGHTBOT\_DEMO'. The interface includes a toolbar with various icons, including a blue starburst icon representing the Laser Cleaning function. Below the toolbar, there are two tabs: 'Programming' and 'Details'. The 'Details' tab is selected, showing the 'Laser Cleaning' configuration screen. The configuration includes the following settings:

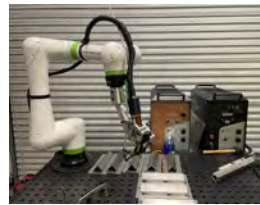
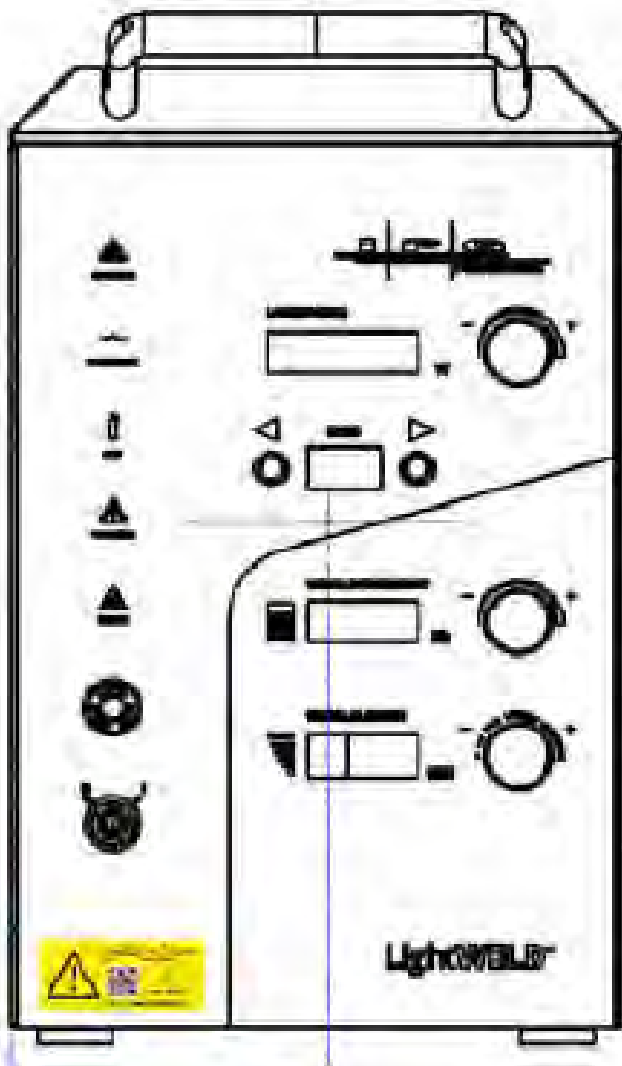
- LightWELD Model:** XC
- NOTE:** You can change your LightWELD model on the LightBOT configuration screen.
- Metal:** Stainless Steel (dropdown menu)
- Intensity:** Low (dropdown menu)
- Override power**
- Power:** 150 watts (input field) with buttons for -100, -10, 10, and 100.
- NOTE:** The LightWELD will round up or down to the nearest 10W increment.
- Override wobble length**
- Wobble Length:** 7.5 mm (input field) with buttons for -1, -0.1, 0.1, and 1.

At the bottom of the interface, there are two buttons: 'Play' and 'Robot Operation'.

# LightWELD Manual Operation

=

# LightBOT™ FANUC CRX Co Robot Icons



Set Power Icon does the same Function as Power Knob on LightWELD



Weld Program Icons 1 - 5 allow multiple IPG Presets and User Preset Welding Conditions to be called



Wobble Frequency Icons do the same Function as Wobble Frequency Knob on LightWELD



Wobble Length Icons do the same Function as Wobble Length Knob on the LightWELD

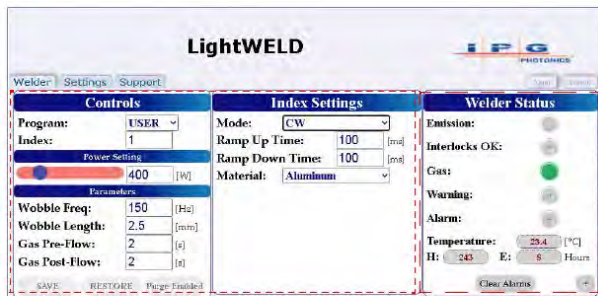
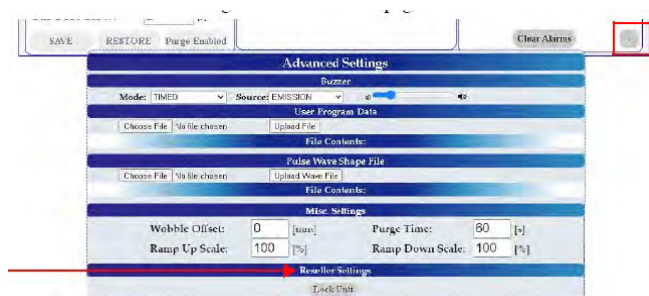
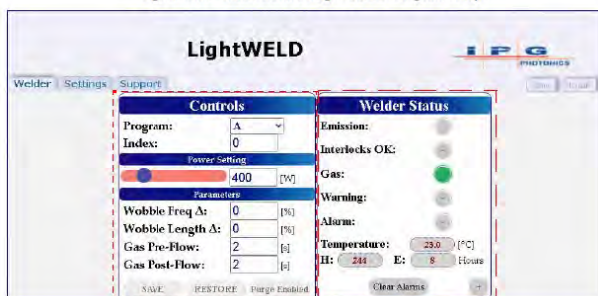


Figure 9-14. Laser Welder Page - Preset Program Recipe

The LightWELD Interface is available directly from the Fanuc CRX Tablet. This allows the welder to alter IPG Preset Welding Conditions from the Fanuc tablet and also to develop and change IPG User Presets . There is no need to plug in a separate computer to do this.

The Fanuc Tablet displays the IPG Welder Status indicators and alarms, making it easy for the welder to troubleshoot problems.

This includes the Advanced Setting Page where advanced settings such as buzzer control, Pulse Wave Shapes, and Wobble Alignment can be done.



# LightBOT™ Icon Set for Fanuc CRX to IPG LightWELD Co Robot Timeline Programming

