BRANSON

# RADIANCE™

## Laser IRAM Welders

*Closed Loop Control with Digital Signal Processor • Modular/Scalable Architecture*
*Flexible CANopen Control System • Distributed Microprocessor Design*
*Multiple Wavelengths Available • Smart Tool Technology with Tool Maps*
*Discrete I/O Available for Custom Systems*

EMERSON™
Industrial Automation

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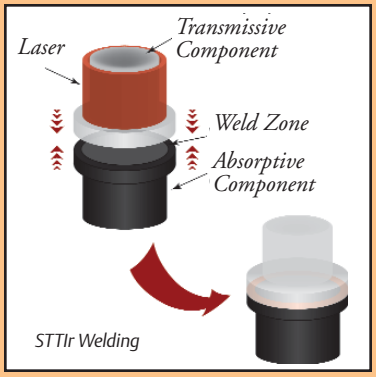
## Our commitment to you

More than sixty years in the plastics joining industry have provided Branson Ultrasonics Corp. with the knowledge and expertise needed to meet the specialized requirements of the markets we serve. In order to provide our customers with the most innovative and cost effective solutions Branson continually explores new methods of joining plastics. Recognizing that laser welding is becoming one of the most anticipated means of joining plastics, Branson proudly introduces the newest additions to our Laser IRAM product line, the ***Radiance 3G and 3I***.

## How does Laser IRAM assembly work?

Branson Laser IRAM assembly systems use a process called Simultaneous Through Transmission Infrared welding (STTIr). The process passes laser radiation through one plastic component (transmissive component), and the energy is absorbed by the mating component (absorptive component). This absorption results in the heating and melting of the interface, and with the application of a controlled clamp force the parts are joined. The major breakthrough in Laser IRAM technology is the ability to illuminate the entire welding surface simultaneously as compared to other techniques that rely on scanning of the weld joint.




## Process advantages and benefits

Laser IRAM has certain clear-cut advantages over other methods for welding plastics:

- **Weld quality** – Since there is no relative motion between the parts, no excitation or vibration, only the weld area is heated and melted, producing parts with excellent cosmetic properties.
- **Minimal flash and no particulate** – Because the process can be easily controlled by varying the power of the laser source, it is possible to accurately control the power dissipation within the weld, resulting in less flash and no particulate.
- **Part design flexibility** – This method allows for 3-D joint configurations.
- **Ability to weld materials that are not easily welded with other joining technologies** – Materials that have been welded successfully to date include acrylonitrile butadiene styrene, acrylics, elastomers, polycarbonate, polypropylene, polystyrene, high-density polyethylene, low-density polyethylene, polyethylene terephtalate glycol, and nylon. This method is also effective with some dissimilar material combinations.
- **Pre-assembled parts can be welded** – For some applications it is critical to allow internal components to be held in place during the welding process without becoming dislodged. This method allows for parts to be placed into the welder in the same position and orientation as the final, assembled position.
- **Fast and flexible** – Ideal for high volume applications; a typical weld cycle time ranges between 1 and 5 seconds.

## Material considerations

As previously discussed, to successfully complete a laser weld, the assembly must consist of one part that transmits the laser light and another part that absorbs the laser light. For transmitting parts, the best welding results are obtained when the material transmission rate is 30% or higher. Some applications have been successfully laser welded with a material transmission rate as low as 18%, but this may result in higher process sensitivity. For absorbing parts, black or darker colored materials (colored with carbon black) are usually very good absorbers. When combined with high transmission rate materials, black or dark colored parts will usually produce the fastest laser welds. Many shades of gray and beige have also been found to be good absorbers.

It is also possible to laser weld two parts that are both laser transmitting. This is accomplished either by adding an absorptive coating at the weld interface or by compounding an absorptive dye into the plastic resin of the absorbing part.

The use of fillers, such as glass fiber, must also be taken into account when designing parts for laser welding. The addition of a filler to a resin generally decreases the transmission rate of the material by diffusing the laser light as it passes through the part. If the filler content is too high and the transmission thickness is excessive, it may not be possible to generate enough heat at the weld interface to create a weld.

## Applications

Applications where Laser IRAM has been used successfully include automotive sensors and control modules, filter assemblies, electronic enclosures, irrigation systems, and medical products.

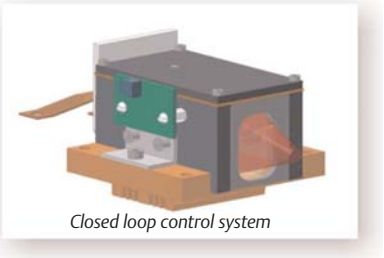
## Radiance features

*Radiance 3G Laser IRAM*

**Unmatched performance and flexibility in a completely modular system approach.** Engineered as a robust, reliable laser joining system based on over 50 years of plastics joining experience, Branson's new Radiance 3G and 3I Laser IRAM systems are designed to provide the ultimate in high-quality, particulate-free welding for a wide range of thermoplastics.

**The core building block of the Radiance IRAM system is the laser bank module.** Each laser bank module contains five high-powered laser diode bars housed in special sealed chambers. Laser bank modules are available with either 808nm or 980nm wavelength diodes so the optimum wavelength can be selected to match the plastics being welded.

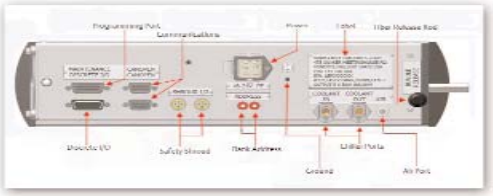
**The Radiance laser bank features a new closed loop control system.** A proprietary optical feedback circuit integrated with a Digital Signal Processor adjusts the laser drive current thousands of times per second to deliver and maintain the commanded laser energy to provide repeatable reliable welds. The Radiance 3G/3I laser bank has internal environmental controls and monitoring. It is light tight with a dual shutter system. The dual shutter system also allows for diode *simmering* between laser welding cycles. The *simmering* function reduces the drive current of the laser diodes below the lasing threshold between cycles instead of turning the laser diode completely off. Each laser bank has five individual outputs rated to deliver 25 Watts of laser energy through a coupled fiber optic bundle for a total output of 125 Watts per laser bank. A new quick-change coupling system allows all five fiber bundles to be coupled or uncoupled at one time.



*Closed loop control system*

**Flexibility and ease of integration is a key principal in the design of the Radiance 3G/3I laser bank.** The Radiance laser bank can be interfaced with the Branson IRAM 50, the Branson Integrator Controller, or used with custom control solutions. When used with custom control solutions the Radiance laser bank can be configured to operate as 1 of 99 laser banks on a

*CANopen* network, or can be operated via discrete I/O. The use of a single power connection and a *CANopen* bus control structure reduces the required wiring and eases installation.



*CANopen bus control structure*

## New Radiance 3G/3I *SmartFiber* optic bundle delivery system.

The *SmartFiber* optic bundle combined with an application-specific custom waveguide is used to deliver the laser energy from the laser bank to the welding workpiece.

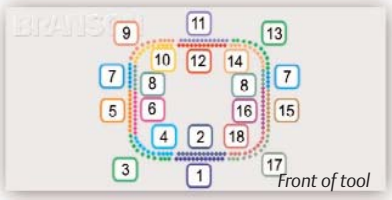
**The Radiance *SmartFiber* optic bundle provides high-efficiency power delivery.** Utilizing *Fused Fiber* bundle technology in conjunction with anti-reflective coatings, provides for optimum coupling efficiency. The smart bundle also has an embedded microchip that communicates the bundle's performance and tooling information to the laser control system allowing the controller to track the fiber bundle regardless of which physical laser channel it is connected to. *SmartFiber* bundles are available in various lengths and output geometries to allow for the best match to an application.

*SmartFiber optic bundles*

**Branson offers two standard models of Radiance IRAM controls: 3G and 3I.** These units include DC laser power supplies, *CANopen* laser bank bus network, 6" LCD touch screen interface, and the ability to control a Branson 2000X Series actuator. The advanced controls include:

- Time and distance welding modes (both collapse and absolute)
- Force measurement
- Process limits with alarms
- Multiple preset memory
- Graphing and weld history data
- Multiple languages

An innovative tool map feature allows for laser parameter control of discrete tooling segments via a graphic representation of the tool. Each laser tool includes a nonvolatile memory device that contains a tool map and the welding parameter presets. When a tool is installed in the welder, the tool map and weld preset data is loaded into the controller. The tool map image can be based on a graphic representation of the part, a CAD drawing image, or a photograph of an actual part.




## Radiance components

**The IRAM 3G is a compact bench-top controller.** It is designed to interface with a single 2000X actuator and up to two Radiance IRAM laser banks capable of delivering up to 250 Watts of laser power. This unit is designed to be operated with an external chiller.

**The IRAM 3I is a free-standing controller.** It is designed to interface with a single 2000X actuator and up to four Radiance IRAM laser banks capable of delivering up to 500 Watts of laser power. This unit features an internal chiller for laser cooling.

**The 2000X actuator offers a precisely-controlled method of delivering the tooling to the workpiece and generating clamp force.** The actuator includes a force transducer and optical linear encoder for accurate distance welding and results reporting. The actuator is available in various stroke lengths and air cylinder sizes so that it can be matched properly to the application. It is available with a standard Ergo base for manual operation or a compact hub mount for use in automation.

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*Branson 3G Controller with Laser Bank and Actuator*

*Branson 3I Controller with Laser Bank and Actuator*

## Specifications

**Branson Radiance 3G/3I Laser Bank:**

| | |
|---|---|
| Wavelength: | 980nm or 808nm |
| Laser Power: | 25 Watts per channel, 125 Watts total |
| Input Power: | 48V DC, 19 Amps, 24V DC, 1 Amp |
| Cooling: | Water/Dow Frost mix @ 18° C and 3 Liters per minute |
| Air: | Clean, dry air @ 420 kPa, 4 LPM |
| Size: | 453mm H x 374mm D x 92 mm W |
| Weight: | Approx. 11 kg |

**Branson 3G Controller:**

| | |
|---|---|
| Input Power: | 200-240V AC, 12 Amps, 50/60 Hz, 3 Phase |
| Air: | Clean, dry air @ 420 kPa and 4 LPM per attached laser bank |
| Size: | 610mm H x 760mm D x 540mm W |
| Weight: | 50 kg |

**Branson 3I Controller:**

| | |
|---|---|
| Input Power: | 208-240V AC, 35 Amps, 50/60 Hz, 3 Phase |
| Air: | Clean, dry air @ 420 kPa and 4 LPM per attached laser bank |
| Size: | 730mm H x 920mm D x 590 mm W |
| Weight: | Approx. 150 kg |

**Branson 2000X Actuator:**

| | |
|---|---|
| Air: | Clean, dry air @690 kPa |

**Branson Ultrasonics Corp.**

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