Tips for Successful InfraWeld® Integration

INFRAWELD® Quick Start GUIDE

THANK YOU FOR YOUR InfraWeld® PURCHASE!

We appreciate your business and welcome your feedback regarding our equipment and this Quick Start Guide.

KEY POINTS:

Effective integration of this equipment requires a fundamental understanding of the process. Please remember:

- Infrared light energy heats the plastic through radiation (safe radiant energy).
- This is not a laser light source application.
- This is definitely not a hot-air welding process.
- **Weld pressure and sufficient cooling air are very important components in this process.**

TAKE NOTE ALL of You Overly-Quick Starters:

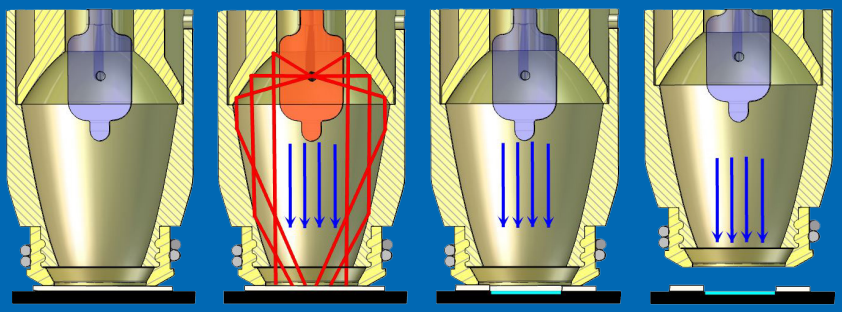
Don't Forget the MANUAL!

This Quick Start Guide provides a condensed overview of our equipment, installation procedures, and application tips. It is not intended to replace the highly detailed equipment manual we provide with every system. Please reference the manual when directed.

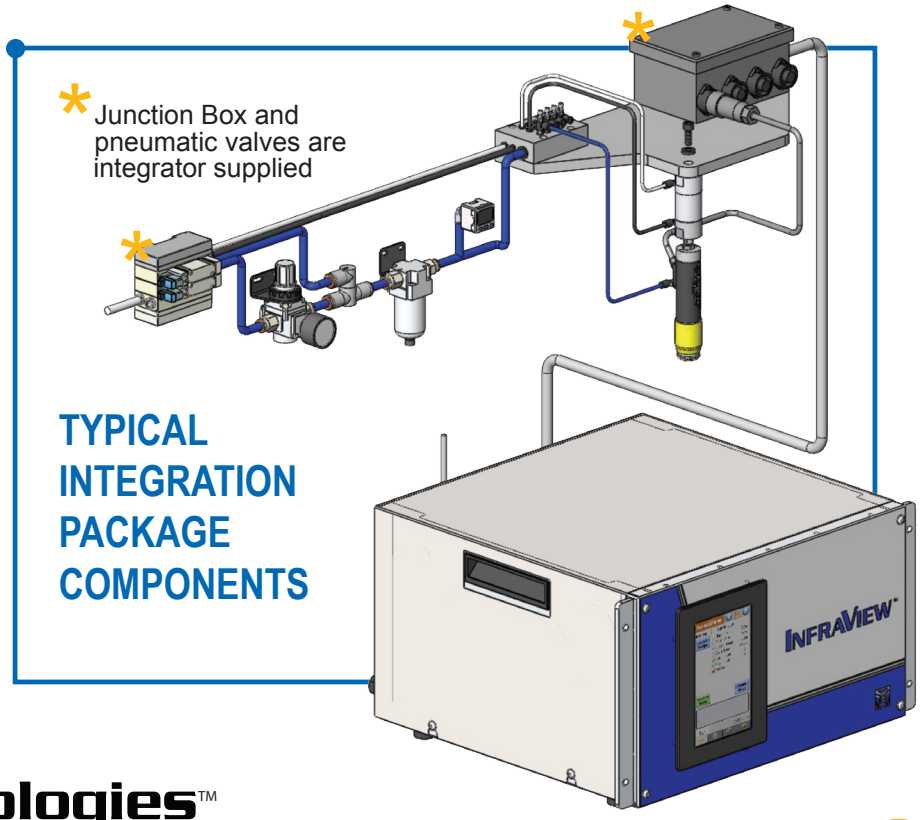
WHAT IS IT?

Derived from the popular InfraStake® technology, the InfraWeld® process applies infrared light energy science to the task of bonding various plastic components, eliminating the need for adhesives or mechanical fasteners. Additional information can be found at extolinc.com.

The InfraWeld® Process:



Blue Lines = Air Flow, Red Lines = Infrared Energy



TYPICAL INTEGRATION PACKAGE COMPONENTS

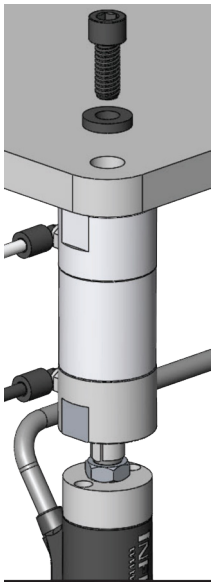
INFRARED Joining Technologies™

Extol, Inc. | 651 Case Karsten Drive | Zeeland, MI 49464 USA
800.324.6205 • 616.748.9955 | sales@extolinc.com | www.extolinc.com

InfraWeld®
Step 1 Mechanical Integration

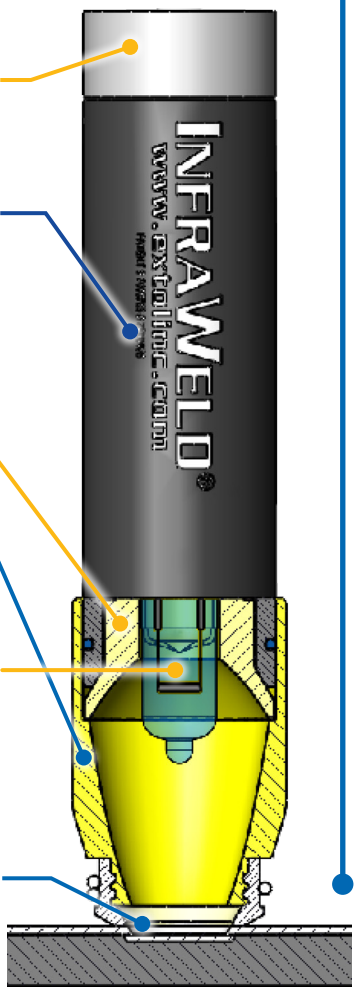
MOUNTING the Modules

- Each InfraWeld module should have a 7/16" (11mm) diameter through-hole in the tooling plate centered over the spot-weld location. This allows for some adjustment of the module position.
- The mounting adapter on the top of the InfraWeld module is tapped for a 5/16"-18 (M8 x 1.25) mounting bolt.
- The bolt should be used with a 5/16" (8mm) hardened washer to mount the InfraWeld module to the tooling plate.
- Wherever possible, allow at least 1/8" (3mm) of clearance around each InfraWeld module for adjustment purposes.
- Once the InfraWeld modules are properly positioned and the machine has produced acceptable parts, the modules can be doweled to the tooling plate if desired.
- Optional mounting adapters are available that allow the X and Y positions of the module to be adjusted independently and precisely.



Module COMPONENTS

- Aluminum **mounting adapter**
- Rugged anodized aluminum **body**
- The **reflector** and the **concentrator** direct infrared energy for precise through-beam welding
- Technical grade halogen **lamp** delivers 'instant-on' infrared energy
- Compliant, flexible **urethane seal** to maintain module pressure



POSITIONING the Modules

- The InfraWeld modules must be mounted perpendicular to the mating part surface so that the entire circumference of the seal makes contact with the part.
- A Z-axis cylinder is used with each module to ensure that there is adequate force clamping the parts together during the InfraWeld cycle.

Procedure:

1) Loosen the 5/16"-18 mounting bolt on top of the tooling plate.
2) Move the InfraWeld module and Z-axis cylinder to the desired location over the mating part.
3) Tighten the mounting bolt to secure the module.

Part FIXTURING

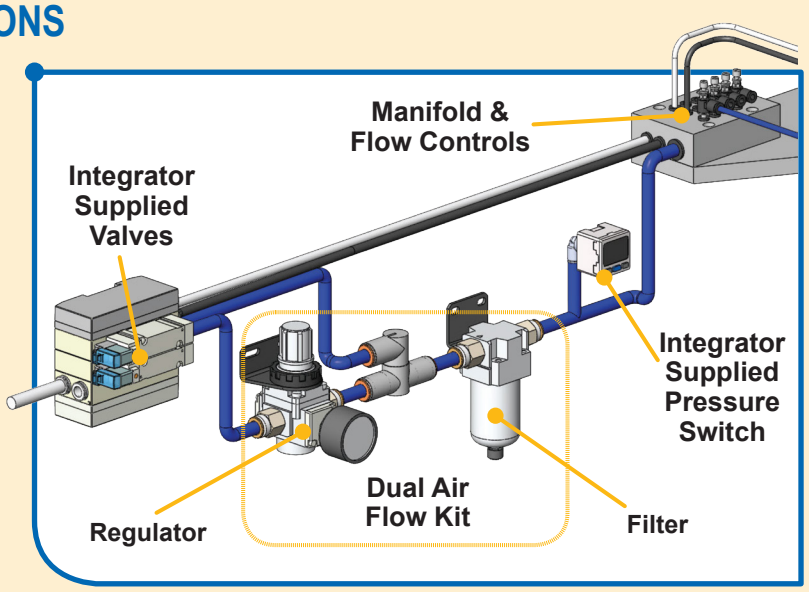
- The part must be fixtured in such a way as to provide support directly beneath each weld location.
- The fixturing must ensure that the parts are in the same location each cycle. If the location of the part varies from one cycle to the next (relative to the InfraWeld module), the process may not be consistent.

TAKE NOTE: **Although InfraWeld modules can be mounted in any orientation, they must be mounted perpendicular to the mating part surface in order to seal properly!**

InfraWeld®
Step ❷ Pneumatic Integration

Pneumatic **COMPONENTS & CONNECTIONS**

- The integrator is responsible for supplying pneumatic valves (double solenoid, open center valves are typical) for the InfraWeld system.
- One valve can be used for all of the Z-axis cylinders, or, if necessary, multiple valves can be used to separate the Z-axis cylinders into groups.
- One valve that can accommodate 90 SCFH per InfraWeld module is required for the cooling air.
- Although a standard filter unit for the main air supply to the machine should be sufficient for the Z-axis cylinders, the InfraWeld module cooling air circuit requires a finer level of filtration provided by the included 0.01 micron filter unit. This filter should be installed between the cooling air valve and the InfraWeld manifold, as shown. If the incoming air supply is oily or dirty, additional filtration may be required.



- Air lines should be color-coded for easy circuit identification.

Z-axis

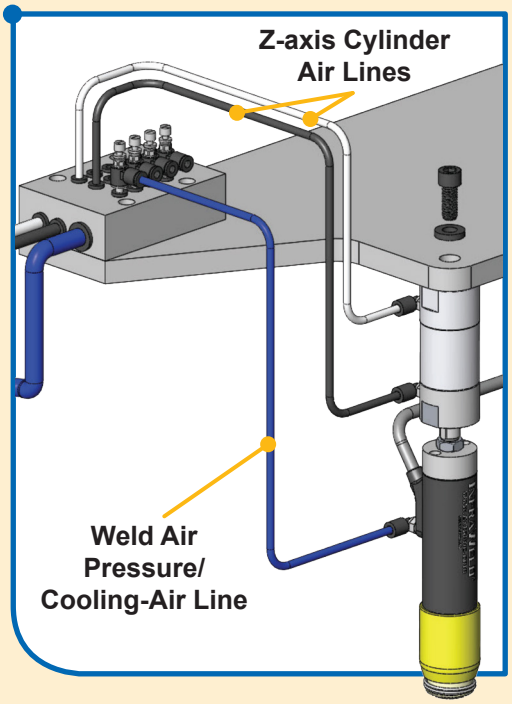
- The InfraWeld manifold has one circuit each for the Z-axis cylinder 'extend' and 'retract' functions. These circuits require 1/4" (or 6mm) tubing to the manifold and 5/32" (or 4mm) tubing to the InfraWeld module. Flow control valves are not required in these circuits.

Cooling Air

- The InfraWeld manifold also has one circuit for cooling air which requires 3/8" (or 10mm) tubing to the manifold and 5/32" (or 4mm) tubing from each flow control valve to the InfraWeld module.
- An electronic regulator, which is typically used to achieve the lower weld pressure and the higher cooling air pressure, is usually set at 20 PSI for the weld pressure and 70 PSI for the cooling air.
- Each InfraWeld module has a flow control in the manifold to set the cooling air flow rate. These may not be necessary if cooling air flow is reasonably balanced without them and if the noise is not objectionable.

TAKE NOTE:

Clean, dry, non-lubricated compressed air is essential to the InfraWeld process.



Setting the **COOLING AIR:**

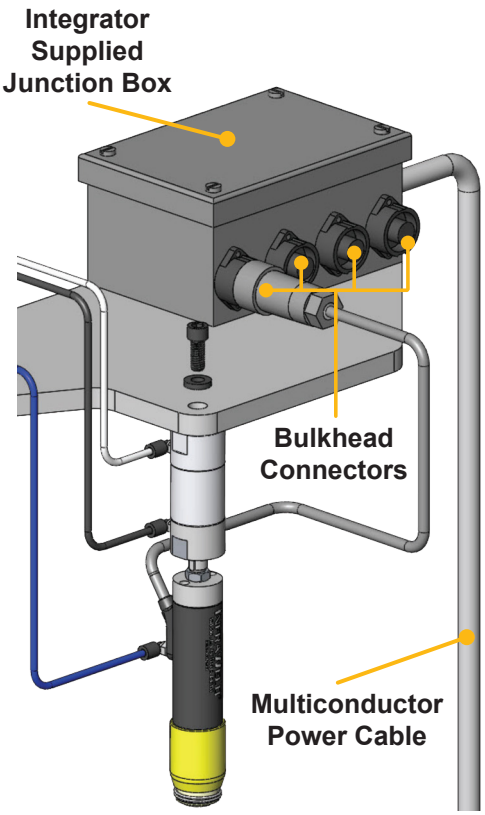
Unless directed otherwise by the Extol Application Report, adjust each flow control to provide 90 SCFH of air flow at the InfraWeld module. Follow these steps:

1. Disconnect the cooling air line at the InfraWeld module and plug it into the union fitting on the 0-100 SCFH flow meter included with the package.
2. Loosen the locking collar on the appropriate flow control at the manifold.
3. Turn on the cooling air and adjust the thumb screw on the flow control until the top of the float reads 90 SCFH on the flow meter.
4. Lock the flow control in place by tightening the locking collar.
5. Repeat the process for each InfraWeld module.

InfraWeld® Step 3 Electrical Integration

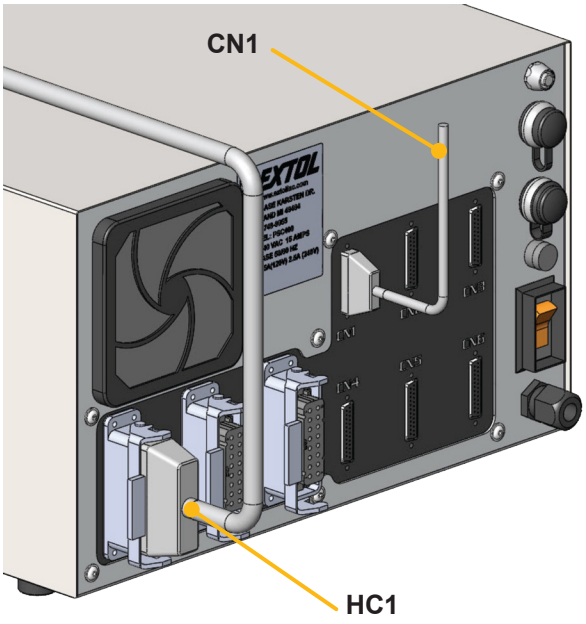
CONNECTIONS

- The integration package contains bulkhead electrical connectors that must be mounted in a junction box or similar structure as shown.
- The 12VDC multiconductor power cable (HC8) plugs into the back of the controller and the non-terminated leads on the other end must be wired to the bulkhead connectors. Depending of the number of InfraWeld modules, the HC8 connector will have 16, 32, or 48 pins.
- Only pins #1 and #2 are used on each bulkhead and in-line connector. The wires within the power cable are used in this manner: wire #1 and #2 are for module #1; wires #3 and #4 are used for module #2, etc. Wiring polarity is universal as the load is a lamp.
- There is at least one 25-pin cable (CN1, CN2, etc.) that plugs into the back of the controller for communication with the machine PLC. The pin-out for this cable is in the documentation manual.
- The controller has either a 100-120VAC or a 200-240VAC input power cable that must be plugged into an appropriate outlet.
- The inputs to the controller are PNP (+24VDC sinking) and the outputs are PNP (+24VDC sourcing).
- The schematics and pin-out diagrams are available in the controller manual.



TAKE NOTE:

Integrators must supply the junction box for the bulkhead connectors.



I/O SEQUENCE
(InfraView™ PSC Models)

1.The machine must move the InfraWeld modules into position above the parts to be welded.

2.The machine PLC must send a Cycle Start signal to the InfraView controller. This signal must be maintained throughout the InfraWeld cycle.

3.The InfraView controller will turn off the Cycle Complete signal (from the previous cycle).

4.The InfraView controller will manage the InfraWeld cycle. The heat and hold times are accessible via the InfraView controller HMI (if purchased).

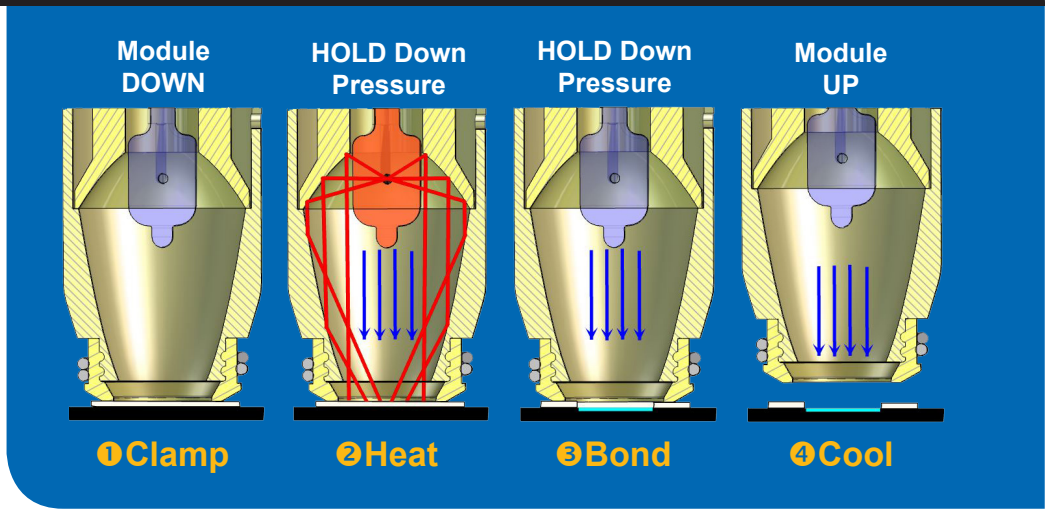
5.The InfraView controller will turn on the Cycle Complete signal (or a fault signal if appropriate).

InfraWeld®

Step ❹ Process Sequence & Settings

Process SEQUENCE

1. The InfraView controller extends the Z-axis cylinder and the InfraWeld module clamps the parts together.
2. The InfraView controller turns on the weld pressure and the lamp (the lamp and the weld pressure stay on for the duration of the heat time).
3. The InfraView controller turns off the lamp at the end of the heat time.
4. The pressurized air presses the molten plastic against the substrate for the duration of the hold time.



Blue Lines = Air Flow, Red Lines = Infrared Energy

5. At the end of the hold time, the InfraView controller turns off the weld pressure and retracts the Z-axis cylinder approximately 1/8" (or 3 mm).
6. The InfraView controller turns on the cooling air and starts the cooling air timer.
7. The cooling air exits the concentrator, blows across the surface of the spot weld, and cools the plastic.
8. At the end of the cooling air time, the machine retracts the InfraWeld module.
9. The cooling air remains on after the end of the cycle for approximately 20 seconds.

   Note: If the next machine cycle starts before the timer expires, the cooling air will stay on. It is not necessary to complete the 20 seconds before starting the next cycle.

Process SETTINGS

- **Application Report:** If sample parts were provided to Extol, an Application Report may be included that lists the appropriate process settings. If parts were not provided, the settings can be established using the following guidelines.
- **Z-Axis Cylinder Pressure:** The Z-axis cylinder pressure determines the clamping force holding the two parts tightly together. Z-Axis cylinders should be regulated to 60 PSI or less.
- **Weld Air Pressure:** This forces the molten plastic together. The weld air pressure should be set at 20 PSI unless otherwise noted.
- **Heat Time**: The amount of time the lamp is on while the plastic is being heated. The appropriate heat time is determined by factors including material properties, color, and translucency (typically 4-6 seconds).
- **Hold Time**: The amount of time that the InfraWeld module remains clamped to the part once it has been heated (typically 8-10 seconds).
- **Cooling Air Flow Rate:** The cooling air flow rate should be set at 75 SCFH per point, unless otherwise noted.
- **Cooling Time**: The amount of time after the hold time that the cooling air is on while the module is positioned 1/8" (or 3 mm) above the spot weld location (typically 8-10 seconds).

INFRAWELD®

Frequently Asked Questions

Q: Should the InfraWeld module make contact with the parts?

A: Yes. The InfraWeld module concentrator clamps the parts together throughout the entire cycle. In order for the pressurized air to drive the molten plastic into the substrate, the flexible tip of the concentrator must make full contact with the upper part.

Q: Should the cooling air be on while the lamp is on?

A: Yes. The cooling air prevents the lamp from overheating, maintains reasonable reflective surface temperatures, and maintains positive pressure inside the module to drive the molten plastic into the substrate.

Q: How often do the reflective surfaces need to be cleaned?

A: A good starting point for a PM schedule for a single-shift, five-day operation would be to inspect the reflectors and concentrators every three weeks. The interval can then be adjusted as necessary.

Q: What should I use to clean the reflective surfaces?

A: Extol offers a cleaning kit that contains Award-Glo polish and a polishing cloth (part # PJ-I-29010). However, any non-abrasive cleaner (e.g. trophy or silver polish) will work as long as it is used with a soft, clean cloth. (Not Scotch-Brite™!)

Q: Why is it important to make sure the InfraWeld modules are perpendicular to the parts being welded?

A: In order for the weld air pressure to press the molten plastic into the substrate material, the concentrator must remain sealed to the mating part surface. The best way to maintain a good seal is to minimize how far the seal on the end of the concentrator has to flex. This is accomplished by positioning the InfraWeld module as close to perpendicular to the part surface as is reasonably possible.

Q: How do I determine the proper heat time?

A:
1. Start by making sure that the InfraWeld module is centered over and is perpendicular to the target weld area and that the cooling air flow rate is set properly.
2. The ideal heat time strikes a balance between too little heat, which doesn't melt the plastic sufficiently and doesn't produce a strong weld, and too much heat, which can degrade the plastic, cause the plastic to smoke, and possibly weaken the weld or mark the A-surface of the part.
3. It's better to start with a heat time that is too low than one that is too high, so start low.
4. As you weld parts, increase the heat time until the molten plastic has visibly bonded to the substrate.
5. Setting the heat time a little longer than the minimum time required to produce a good weld (but still short of the time required to make the part smoke) will allow the InfraWeld process to accommodate some variation in the part size or the part location in the fixture.
   Note: If you send sample parts to Extol, we can test them & provide an Application Report with the appropriate process parameters.

Q: How do I size my pneumatic system properly?

A: Each InfraWeld module will require approximately 75 SCFH for the cooling air and a very small amount of air for the Z-axis cylinder, so the system should be sized for 90 SCFH per point to provide a little extra capacity. The valves, fittings, and line sizes must be sized to maintain 70 psi at the Z-axis cylinders and at the InfraWeld manifold. Supply pressure should typically be at least 10% greater than the pressure at the regulator.

Q: What is the maximum amount of clamping force that should be used?

A: The concentrator seals are rated for a maximum of 50 pounds of clamping force against the part to be welded, but 20 pounds of clamping force is what is recommended.

Q: Can the InfraWeld process be used to attach NVH Pad material to a plastic substrate?

A: Yes it can. By using a different style concentrator without the flexible seal, the InfraWeld process can be used very successfully to attach a variety of polymer-based NVH Pad materials to thermoplastic substrates.

Extol, Inc. | 651 Case Karsten Drive | Zeeland, MI 49464 USA | 800.324.6205 • 616.748.9955 | sales@extolinc.com | www.extolinc.com

SA-D-723-10-01