UNITROL INSTABRAZE
Product Overview

Unitrol's Instabraze System is the marriage between Closed Loop Microcomputer technology and Resistance Brazing (also known as "Electro brazing").

Resistance Brazing is the most efficient method of bringing ferrous or no-ferrous metals up to brazing temperatures. Electrical current is passed directly through the parent metals. This heats only the area necessary resulting in minimal heat damage to the rest of the assembly.

SOME TYPICAL APPLICATIONS

- **Tube to Tube**
- **Tube to Bracket**
- **Spark Plug HOTLOCK**
- **Tube to Fitting**
- **Flange to Tube**
- **Carbide Saw Blade Inserts**
- **Motor Stator and Rotor**
- **Relay and Circuit Breaker contacts**
- **Transformer Lead Brazing**
- **Solidification of Braded Cable Ends**
- **Continuous heating of Roll Formed Tubing**
- **Heat Treating of wire and spring steel**

INSTABRAZE ADDS TRUE CONTROL TO RESISTANCE BRAZING

The major drawback in the past of Resistance Brazing has been that, to ensure joint strength during production runs, the amount of current had to be set significantly above that which was needed, and the heat conduction time was set longer than required. This reduced production rates and overheated the components being joined.

Unitrol hs developed a Microcomputer Control that reacts to the temperature of the parts being brazed. This **closed loop** control has allowed users to reduce the time per part by 50% or more over non-controlled resistance brazing, and 90% or more over non-resistance brazing methods (ie. flame, induction, etc.). Most importantly, brazed parts produced with the **INSTABRAZE** process are consistent in joint strength and physical attributes.

INSTABRAZE RETROFITS TO EXISTING EQUIPMENT

For companies that already have a Resistance Brazing system, this Unitrol **SOLUTION** system replaces the existing welding control in less than one day's installation time. Allow a few hours to become familiar with the accuracy and repeatability of this closed loop digital control, and the next step is **Controlled Quality Production.**

UNITROL WILL DESIGN OR ASSIST WITH NEW APPLICATIONS

Unitrol Electronics can provide Engineering Services as well as lab R&D services to find the most economical means of Resistance Brazing your products. Please contact us with drawings, samples, or just questions.

Unitrol's **INSTABRAZE** is available in two different processes: **TEMPERATURE FEEDBACK** and **RIBBON BREAK.** Both have been developed to provide closed loop feedback systems for production Resistance Brazing.

UNITROL INSTABRAZE
Technical Description
Temperature Feedback Method using Infrared instruments

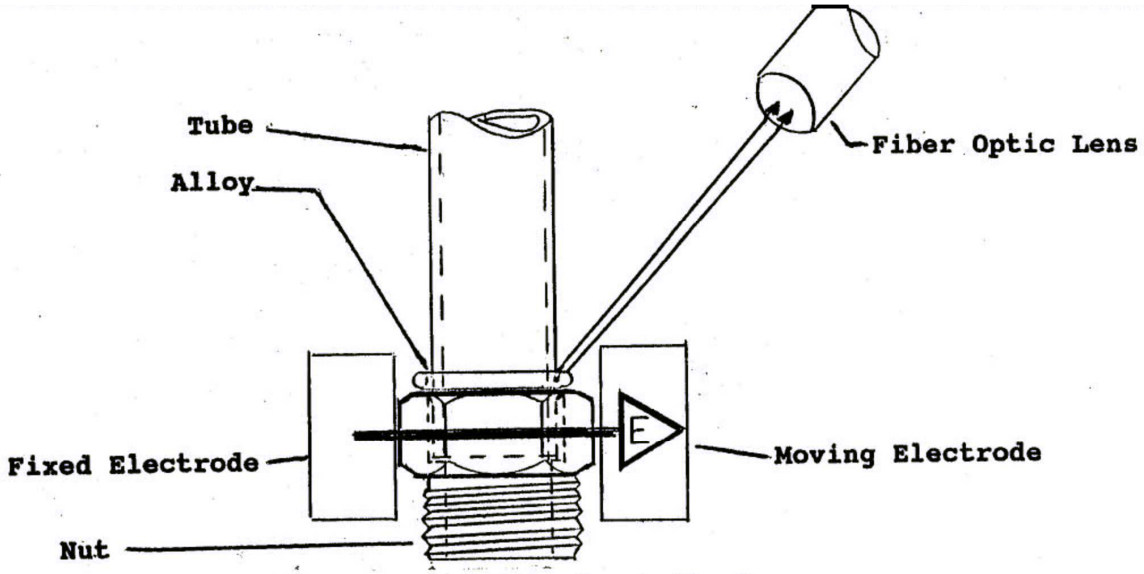


Figure A. Typical System

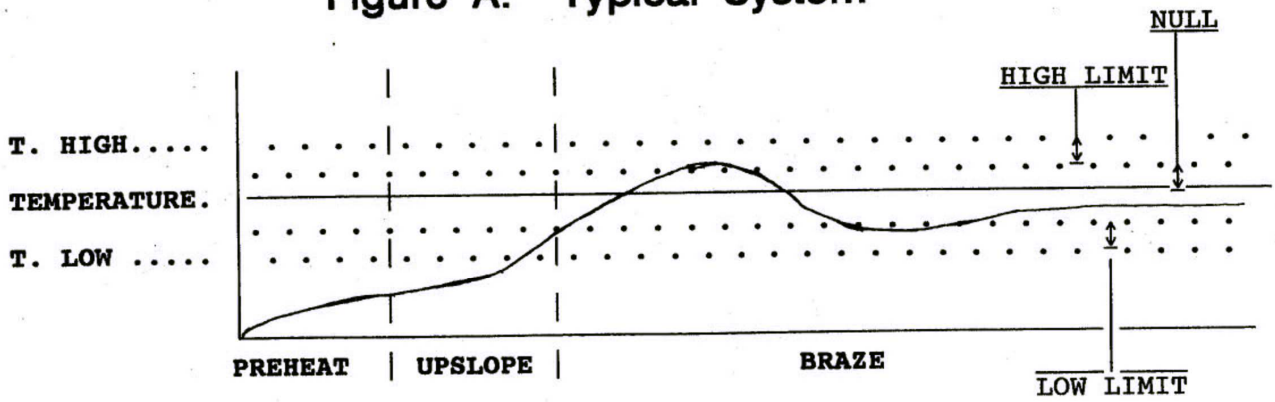


Figure B. Temperature Sequence

JOINING OF TYPICAL PART

Figure A shows the INSTABRAZE process being used on a tube to nut application. This is an **indirect** heating sequence. Current **E** passes from one side of the nut to the other through two molybdenum or tungsten electrodes.

The sequence is as follows:

1. The nut is placed between two electrodes which are then closed by an air cylinder.
2. A preform ring with flux is placed on the tube end. Note that a braze alloy/flux paste can also be used in this application.
3. The tube is pushed down into the counterbored hole of the nut.

4. The Unitrol SOLUTION control starts electrical current (E) flowing on a controlled ramp **across** the nut. Other techniques pass the current across the joint.
5. While parts are being heated, the SOLUTION control continuously monitors and displays **surface temperature** of the part being joined. This temperature is being read using a high-speed infrared thermometer connected directly to the Unitrol SOLUTION control. The target size of the temperature being read is approximately .040" diameter.
6. As shown in Figure B, the control first PREHEATS the part and then ramps current (UPSLOPE) while continuously checking the temperature as read from the infrared temperature instrument. When the keypad-selected temperature has been reached, the SOLUTION control steps into the BRAZE portion of the program by dynamically shifting electrical power to maintain the selected temperature.
7. After the selected number of BRAZE cycles have been completed, the control checks to be sure that the temperature is within the selected range. If it is out of the range, a tone is sounded, the display will shown the problem, and a fault relay contact closes. If a communication option has been installed on the control, this fault can be exported out using RS-232 or RS-485 to document the problem. At the same time, the part is clamped between the electrodes and requires operator input to release it.
8. If the part passes the temperature test, the electrodes are opened after a delay time that allows the joint transition to the solidus state. Alternately, the system can wait until temperature drops below a set point before release.

AVAILABLE VARIATIONS

A. **TEMPERATURE FEEDBACK ANNEALING:** This can be used on single parts or continuous components (tube mills, automatic spring machines, etc.).

B. **SOLIDIFY STRANDED WIRE:** Hand-loaded or automatic continuous process

C. **SOFT or HARD SOLDERING:** This process uses temperature instruments that can work with 400ºF – 900ºF temperatures for very precise soldering

D. **FUSING COPPER LAMINATIONS:** Long sequences using graphite or other high-resistance electrodes uses the temperature feedback system to bring a large mass up to temperature and hold it there for any desired time.

UNITROL INSTABRAZE
TECHNICAL DESCRIPTION

Ribbon Break Method

This method is used when the filler metal is in a continuous ribbon form (strip or coil). A typical braze joint takes between ¼ second on small parts to as long as 60 seconds on components with greater mass. A typical sequence with the parts held as shown in Figure A uses the electrical sequence as shown in Figure B.

FIGURE A. TYPICAL EQUIPMENT

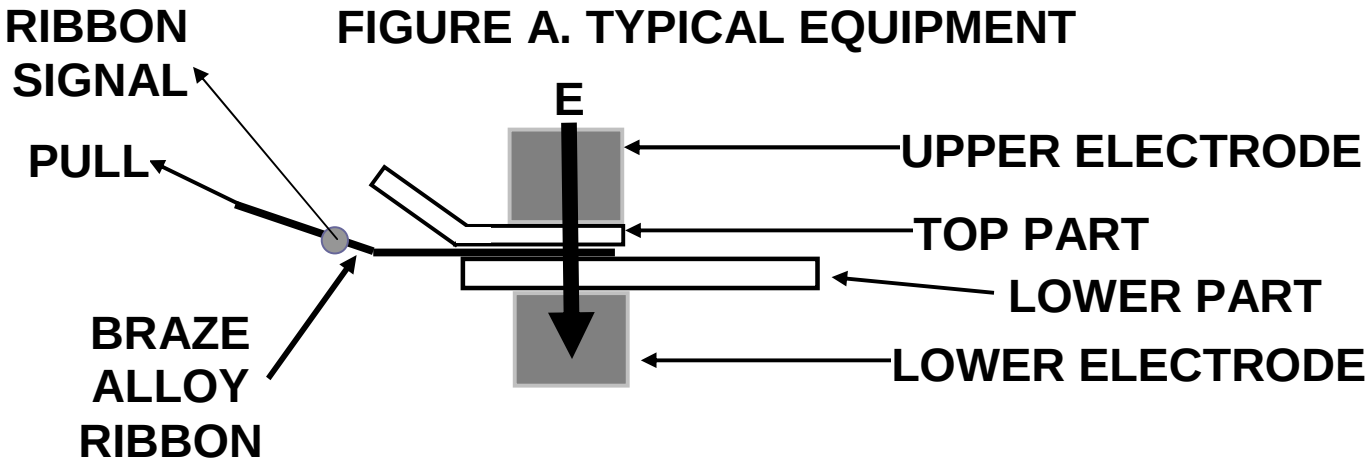
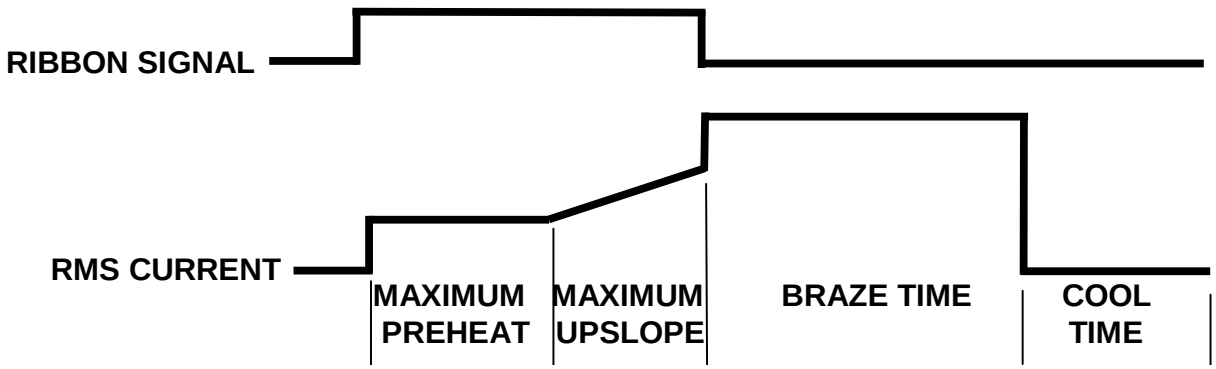


FIGURE B. ELECTRICAL SEQUENCE



1. The brazing alloy ribbon is place between the two parts being joined (FIGURE A).
2. The upper electrode moves down to clamp the parts and the alloy ribbon.
3. Current (E) passes through this “sandwich” and starts heating the parts and the braze alloy.
    a. QC Note: if the control does not sense that the braze ribbon is connected (no RIBBON SIGNAL), no heat will be conducted, the electrodes will open, and the control will display the fault. The electrodes will stay closed until the initiation has been closed to release the part.
4. When the braze alloy heats to a liquid state, the force pulling the ribbon separates the rest of the braze alloy ribbon from the part.
5. A sensing wire on the roll of braze alloy (RIBBON SIGNAL) connect to the SOLUTION control and tells it that the braze alloy ribbon has separated from the sandwich.
6. The control immediately moves to the BRAZE portion and skips remaining PREHEAT or UPSLOPE time.
    a. QC NOTE: If the control runs out of PREHEAT and UPSLOPE time, a fault will be displayed and the electrodes will stay closed until the initiation switch has been closed.
7. After the preset BRAZE TIME, heat is turned OFF and the part cools (COOL TIME). At the end of COOL TIME, the electrodes automatically open to release the part.