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TECHNICAL APPLICATION BRIEF

Using the Resistance Set Feature

GENERAL:
The heat generated in a resistance weld is greatly affected by the electrical resistance of the work piece. Consistent work piece resistance is necessary for achieving repeatable resistance welding results. The Resistance Set feature, which is standard on Unitek Equipment models UB25, DC25 and HF25, can be used to consistently reduce contact resistance prior to the application of the welding current.

BACKGROUND:
In the first stage of a resistance weld, heat is focused at the electrode-to-part and part-to-part contact areas. This is due to the high contact resistance relative to the bulk resistance of the parts. If the contact resistance is too high, electrode sticking and expulsion can occur during welding. Reducing the contact resistance shifts the heat generation from the contact areas to the bulk resistance of the parts.

Contact resistance can be influenced by many factors including part placement, varying part overlap, and part surface conditions. When welding miniature parts, it is not uncommon for contact resistance to vary by as much as 50% due to inconsistent part placement.

The Resistance Set feature uses the first pulse of a dual pulse weld to bring the work piece resistance to a consistent level prior to the welding pulse. The second pulse is then used to weld the parts.

THEORY OF OPERATION:
Resistance Set uses an upslope of power in the first pulse to bring the contact resistance to the same level for each and every part. When an upslope of power is used, both the voltage and the current start out low regardless of the initial work piece resistance. The voltage and current increase as power increases and the contact resistance decreases. When the current reaches a predetermined level, Resistance Set shuts off the first pulse and allows the second pulse to fire.

PROGRAMMING RESISTANCE SET:
Program 6 milliseconds of upslope on the first pulse. Program a power level that is appropriate for the size of the parts to be welded. Different parts will require different power levels to start. Smaller parts will require less power and larger parts will require more power.

If the initial power level for the first pulse is not known, start with a very low setting of 0.100 KW. Use 150 milliseconds of squeeze time and 100 milliseconds of hold time. Do not program weld time or downslope. Program the second pulse for 0 milliseconds (See Figure 1).

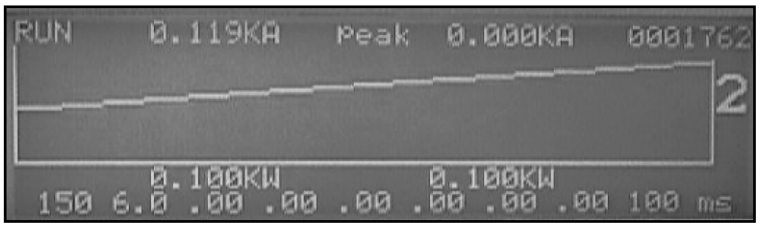

Figure 1: Initial power pulse

Fire the pulse through several sets of parts. Press the “ENERGY” button to view the monitor screens. Look at the resistance, voltage and current graphs. Resistance should start out high and drop down quickly. Voltage and Current should both start out low and increase. If the current does not rise quickly enough, a higher power setting may be required. Return to the RUN screen and adjust the power level up in 0.100 KW steps. Use the monitor screens to determine the proper setting. The resistance should decrease significantly in about 3-4 milliseconds. If the current comes up too fast, the power setting is too high. If the resistance does not decrease significantly, the power setting is too low. Experiment with different power settings until the resistance and current graphs look acceptable and the parts are just starting to stick together (See Figure 2).

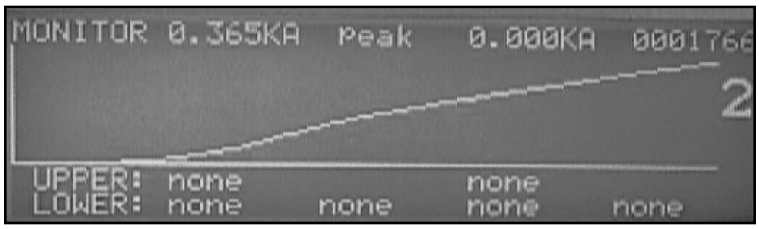

Figure 2: Monitored currant graph

The current limit can now be established. Program the upper current limit to the level that it reaches in about 3-4 milliseconds. This level should be lower than the current level required to stick the parts together. Press the COOL button to program the action for reaching the current limit. Choose "4. APC: STOP PULSE 1/ALLOW PULSE 2" (See Figure 3).

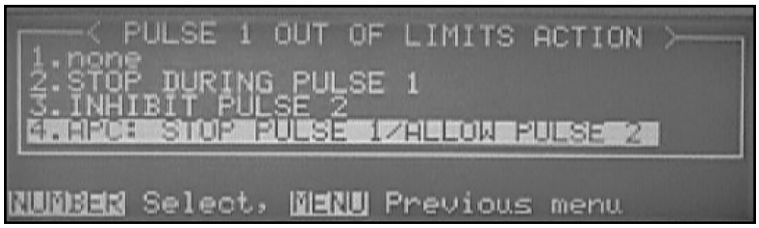

Figure 3: Choose out of limits action

Fire the pulse through several sets of parts. The pulse should terminate in about 3-4 milliseconds for all parts. The resistance graph should show the resistance decreasing to a consistently low level.

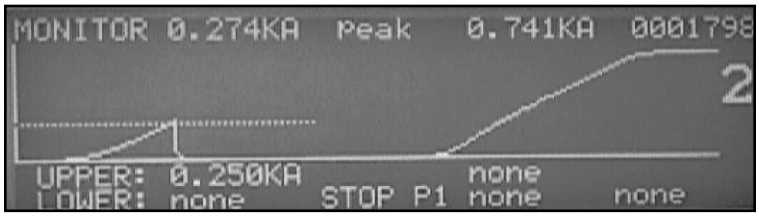

Figure 4: First pulse terminates when current is reaches

Make adjustments to the power setting and current limit as appropriate.

Add 2 milliseconds of cool time. Program the second pulse as normal to do the weld. Add upslope to the second pulse if weld splash occurs. The second pulse can be programmed for constant current, voltage or power based on the part and process challenges of the application.

Make several welds and verify that the first pulse terminates when the current limit is reached (See Figure 4).

SUMMARY:

Resistance Set is easy to program and can greatly reduce the negative affects of varying contact resistance. By bringing the contact resistance to the same low level for each and every part, the Resistance Set feature permits consistent heat generation based on the bulk resistance of the parts. It is especially useful for welding miniature parts where consistent part placement is difficult to achieve.

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