Welder Programming

To adjust welding parameters:
1. Power up machine
   a. “Power On” LED will illuminate
   b. Dual Blinking dots indicates Run Mode (machine will weld with previously input weld settings).

   Rotate knob to select schedule 0 through 9, and operate welder using a foot switch.

   PROGRAMMING

   1. Rotate the control know and select the schedule to be programmed
   2. Quickly depress Programming Dial once
   3. Control goes into Select Mode, and the “squeeze time” LED will illuminate.
   4. Turn Programming Dial to select between:
      Squeeze Time
      Impulses
      Cool Time
      Heat Time
      Heat Percent
      Hold Time
      Off Time
   5. Once the selected parameter is highlighted with an LED, push Programming Dial
      Again. “Pr”, followed by “- -” will be displayed on the readout for a second indicating programming mode
      and ready to change the parameter.
   6. Adjust variable to desired setting by turning the Programming Dial.
   7. When adjusted, press the Programming Dial to save parameters.
      All LEDS will flash once and the controller will be back in run mode.
   8. Repeat steps outlined above until all of your parameters are set.
   9. To program the Repeat function, in run mode, depress and hold the Programming Dial until it reads “rP” or
      “no”. Once the programming dial is released, the display will toggle between “rP” and no”. Press the dial again
      while the display indicates “rP”. Hold the dial until the two decimal dot’s turn on. This indicates that the
      schedule has been setup for a repeat function. The controller returns to run mode.

   Power limits:
The controller can be set to limit the heat percentage. Make sure the controller is off, and then power on while
   depressing the dial knob. The controller LED “squeeze Time” will toggle between flashing (3 times) and off.
   Release the dial knob while the led is flashing.
   The display will start at 50 and increment to 99, then restart at 00. Depress the dial knob at the desired power
   value.
   This value will be the top limit used in heat percent regardless of the schedules programmed - For instance, if
   the limit is set at 60%, and a user schedule is set for 90%, the power output will be 60%. This function is particularly
   helpful when the user has low incoming AC power capacity.

   Load Defaults for every schedule
   Make sure the controller is off, and then power on while depressing the dial knob. The controller LED “squeeze
   Time” will toggle between flashing and off. Release the dial knob while the led is not flashing. This will load
   defaults into every schedule.

   Factory Voltage Sense record
   Depress FS2 then power on - This will cause the system to record the 120VAC input voltage and store it for
   future reference. A 15% raise in AC voltage will cause the display to flash the top left segment of the display indicating
   high voltage. Flashing indicates that either the transformer supplying AC volts to the weld controller is applying too much
   voltage. Or the main incoming voltage has increased significantly. Before performing this action, make sure that the AC input
   Voltage is measured to be 120VAC. If the top left segment is on permanent, the AC voltage is within range, but has increased
   In the past. This is a record of past line voltage.
High Voltage Indicator. Top left Segment is flashing

The controller will continue to operate but is indicating that the AC input voltage has exceeded 120 volts AC by more than 15% [138 VAC]. The indicator will continue to flash even after reapplication of power.

Persistent issues require a service technician to resolve the voltage issues.
## Weld Definitions and Weld Setting Recommendations

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cool Time (cycles)</td>
<td>Cool Time is only used when Impulses is set to 2 or more. Cool time is the amount of time that the weld &quot;cools&quot; in between Impulse welds. If there is a value in Cool Time but Impulses are set to 1, the Cool Time will be ignored. Set Cool Time to 20 cycles or more and then decrease it to improve overall welding time.</td>
</tr>
<tr>
<td>Cycles</td>
<td>Cycles are a measurement of time. One cycle is equal to 1/60th of a second. There are 60 cycles in one second. Cycles are to milliseconds what inches are to millimeters.</td>
</tr>
<tr>
<td>Heat Percent (%)</td>
<td>Heat Percent is the percentage of output of the capacity of the welder. 99 represents 99%, or the maximum capacity of the resistance welder. Start your weld schedule with a low percent (5% or less), and increase your schedule at 5% increments.</td>
</tr>
<tr>
<td>Heat Time (cycles)</td>
<td>Heat Time is the amount of time that the welder will provide current to the weld. Start with a heat time of 5 cycles and work your way up from there.</td>
</tr>
<tr>
<td>Hold Time (cycles)</td>
<td>Hold Time represents the time the weld tips stay together after the weld time is complete. In effect, it acts like a forge and allows the weld to cool. Start with a Hold Time of 20 cycles and experiment from there.</td>
</tr>
<tr>
<td>Impulses</td>
<td>One Impulse is defined as one complete welding sequence of one weld. Usually set to 1. If welding heavier gauge material, the number of Impulses can be increased to provide double (2 Impulses), triple (3 Impulses), or more (4 and up to 99) multipliers of the weld energy. Use the Cool Time to set the amount of time in between Impulses. Impulses differ from Repeat (see Repeat definition for details).</td>
</tr>
<tr>
<td>Off Time (cycles)</td>
<td>Off Time is only utilized when the Repeat function is turned on. The Off Time is the amount of time the welder will wait in between welds. If there is a value in Off Time but Repeat is set to &quot;no&quot;, the Off Time will be ignored.</td>
</tr>
<tr>
<td>Rapid Fire</td>
<td>Rapid Fire welding (also known as &quot;Stitch Welding&quot;) is when the Repeat function is utilized to weld many welds together in rapid succession (possible to weld up to 60 or 100 welds per minute). Often the welds are &quot;layered&quot; on top of one another, allowing a skilled operator to create a hermetic seal. Note: a special type of welding machine is required for this operation, and not all welding machines can be retro-fit.</td>
</tr>
<tr>
<td>Repeat</td>
<td>Repeat is a function that allows an operator to press and hold the footswitch closed while the welder performs multiple welds in a row. This is helpful if welding Rapid Fire, or if placing multiple welds near one another. Repeat differs from Impulses in that the welding tips will open and close in between welds, and that the welder will Repeat for as long as the footswitch is depressed. Use the Off Time to adjust the time in between welds.</td>
</tr>
<tr>
<td>Squeeze Time (cycles)</td>
<td>The amount of time it takes for the weld tips to hit the parts and build pressure. The time starts from the moment the footswitch is activated. When the time elapses, the Heat Time (and corresponding Heat Percent setting) will initiate. Start with a long squeeze time (60 cycles or more) and work your way down to minimize the overall welding time.</td>
</tr>
</tbody>
</table>
Wiring detail for 3 position foot switch and 120VAC Valves
Wiring detail for SCR and Transformer Temp Switches
Measured Linearity

Power[49] = 1295
Power[48] = 1303
Power[47] = 1310
Power[46] = 1310
Power[45] = 1310
Power[44] = 1328
Power[43] = 1345
Power[42] = 1358
Power[41] = 1370
Power[40] = 1375
Power[39] = 1380
Power[38] = 1393
Power[37] = 1405
Power[36] = 1415
Power[35] = 1425
Power[34] = 1438
Power[33] = 1450
Power[32] = 1458
Power[31] = 1465
Power[30] = 1473
Power[29] = 1480
Power[28] = 1495
Power[27] = 1510
Power[26] = 1520
Power[25] = 1530
Power[24] = 1543
Power[23] = 1555
Power[22] = 1570
Power[21] = 1585
Power[20] = 1593
Power[19] = 1600
Power[18] = 1615
Power[17] = 1630
Power[16] = 1645
Power[15] = 1660
Power[14] = 1675
Power[13] = 1690
Power[12] = 1705
Power[10] = 1730
Power[9] = 1734
Power[8] = 1740
Power[7] = 1745
Power[6] = 1750
Power[5] = 1755
Power[4] = 1760
Power[3] = 1765
Power[2] = 1770
Power[1] = 1785
Power[0] = 1881
Table: Gain Count Degrees Radians Sine Averages Normalized
1 1 0.1 0.001744 0.001744 0.043983 8.21
80 114 11.4 0.196367 0.195758 0.043473 8.19 powered 99

Figure 6: Linear RPM Output Using Micro-control of TRIAC Phase Angle

Smart Control of Phase Angle for Linear RPM Control

Normalized RPM and Phase Angle

Normalized Speed Adjustment
PANEL CUT OUT
Welding Cheat Sheet

Squeeze Time.
Time to allow pressure buildup on the part

Impulses
Quantity of “Heat Time” applications

Cool Time
Time in between impulses with no current

Heat Time
Number of cycles providing current

Heat Percent
Current value obtained by firing angle

Hold Time
Pressure time, before release, after weld is complete

Off time
Used in repeat mode only. Dwell time before next weld occurs
Manufacturing Test Verifications
Serial Example (Build date-Test Date) 123014-012616

Serial Number _________________________

1. Reset unit – Program button on at power up. Release while Squeeze LED is off.

2. Max setting @ 90% - Reset with Squeeze LED flashing

3. AC Volts record at 125V – use FS2 then Powerup

4. Check both limits work (Therm and aux input)

5. Check for 128Amps with Schedule R1 set at (default)
   Heat 20
   Cool 0
   Impulses 2
   Heat Time 99
   Hold 30
   Off Time 10

6. Plastic washer on mount nut located at limit sw area