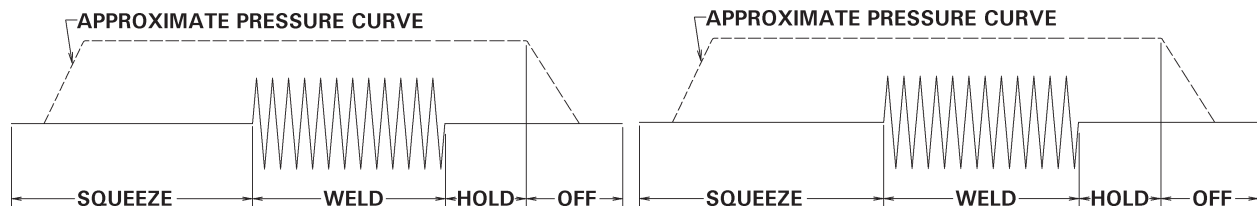


## APPLICATION NOTE 700125C EN1000 PROGRAMMING EXAMPLES

The schedules shown are for demonstration purposes. In order to easily follow visually the schedules as they progress, the individual times in each one have been made longer than they would be for an actual machine operation.

### Example 1: SPOT (REPEAT Mode)

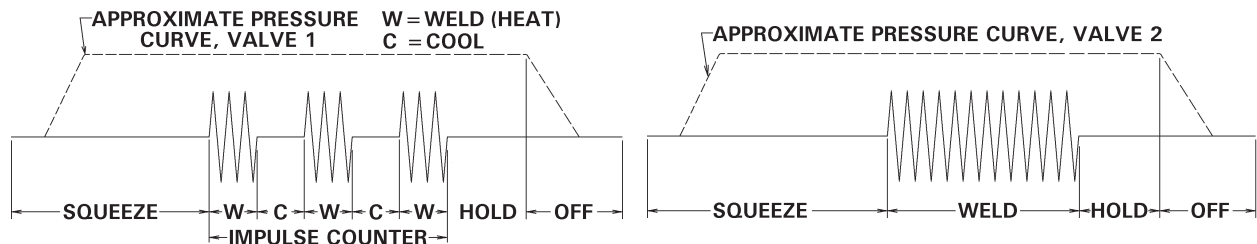
Schedule 00 is a SPOT schedule in the REPEAT mode. Momentary initiation results in one sequence only. If the initiation is held closed, the sequence will continue repeating. Valve 2 output is used.



| SCHEDULE | SQUEEZE | WELD/<br>HEAT | PERCENT<br>CURRENT | HOLD | OFF | IMPULSES | COOL | VALVE<br>MODE | CYCLE<br>MODE | SLOPE<br>MODE | SLOPE<br>COUNT |
|----------|---------|---------------|--------------------|------|-----|----------|------|---------------|---------------|---------------|----------------|
| 00       | 40      | 30            | 60                 | 10   | 15  | 01       | 00   | 02            | 01            | 00            | 00             |

### Example 2: PULSATION & SPOT (SUCCESSIVE Mode)

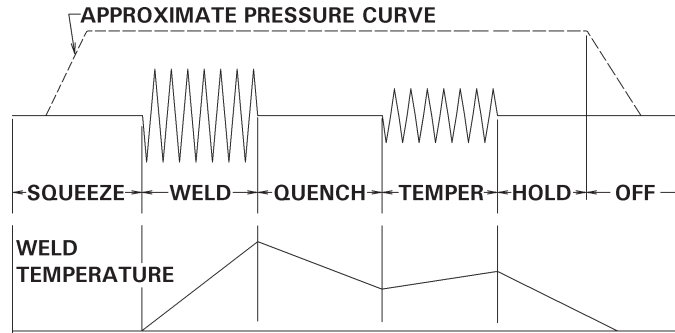
Schedules 01 and 02 are PULSATION and SPOT schedules combined in the SUCCESSIVE mode. Schedule 01 is initiated first. When it is completed, schedule 02 will flash to indicate that it is ready to be initiated. After it is completed, the SCHEDULE display will return to 01. Schedule 01 uses Valve 1, schedule 02 uses Valve 2.



| SCHEDULE | SQUEEZE | WELD/<br>HEAT | PERCENT<br>CURRENT | HOLD | OFF | IMPULSES | COOL | VALVE<br>MODE | CYCLE<br>MODE | SLOPE<br>MODE | SLOPE<br>COUNT |
|----------|---------|---------------|--------------------|------|-----|----------|------|---------------|---------------|---------------|----------------|
| 01       | 20      | 10            | 60                 | 10   | 10  | 03       | 06   | 01            | 03            | 00            | 00             |
| 02       | 25      | 30            | 60                 | 10   | 10  | 01       | 00   | 02            | 00            | 00            | 00             |

### Example 3: QUENCH-TEMPER (CHAINED Mode)

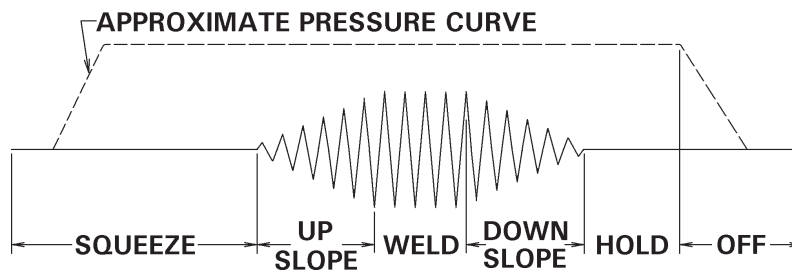
Schedules 03 and 04 are CHAINED together to illustrate QUENCH-TEMPER operation. Schedule 03 performs the SQUEEZE, WELD and QUENCH functions (using HOLD for QUENCH), and schedule 04 performs the TEMPER and HOLD functions (using WELD for TEMPER). Valve 3 output is used. The WELD light gives a visual indication of the relative amplitude and duration of CURRENT during WELD and TEMPER times.



| SCHEDULE | SQUEEZE | WELD/ HEAT | PERCENT CURRENT | HOLD | OFF | IMPULSES | COOL | VALVE MODE | CYCLE MODE | SLOPE MODE | SLOPE COUNT |
|----------|---------|------------|-----------------|------|-----|----------|------|------------|------------|------------|-------------|
| 03       | 40      | 35         | 60              | 35   | 10  | 01       | 00   | 04         | 02         | 00         | 00          |
| 04       | 00      | 30         | 40              | 20   | 10  | 01       | 00   | 04         | 00         | 00         | 00          |

### Example 4: UPSLOPE & DOWNSLOPE (CHAINED Mode)

Schedules 05, 06, 07 and 08 are CHAINED together to illustrate UPSLOPE/DOWNSLOPE operation. Schedule 05 performs the SQUEEZE function and establishes PERCENT CURRENT at which UPSLOPE will begin (bottom current). Schedule 06 performs WELD function and sets UPSLOPE time. Schedule 07 sets DOWNSLOPE time and PERCENT CURRENT it starts from. Schedule 08 establishes PERCENT CURRENT at which DOWNSLOPE will end, and performs HOLD function. The number in the SCHEDULE display will change as the sequence progresses from one schedule to the next. Valve 1 output is used for this example.



| SCHEDULE | SQUEEZE | WELD/ HEAT | PERCENT CURRENT | HOLD | OFF | IMPULSES | COOL | VALVE MODE | CYCLE MODE | SLOPE MODE | SLOPE COUNT |
|----------|---------|------------|-----------------|------|-----|----------|------|------------|------------|------------|-------------|
| 05       | 40      | 00         | 10              | 00   | 00  | 01       | 00   | 01         | 02         | 00         | 00          |
| 06       | 00      | 20         | 60              | 00   | 00  | 01       | 00   | 01         | 02         | 01         | 20          |
| 07       | 00      | 00         | 60              | 00   | 00  | 01       | 00   | 01         | 02         | 02         | 22          |
| 08       | 00      | 00         | 05              | 20   | 10  | 01       | 00   | 01         | 00         | 00         | 00          |

### Example 5: FORGE DELAY (CHAINED Mode)

The forging process is most often used when working with hard-to-weld materials such as aluminum. The weld is usually started at one force, followed by the application of a higher force during weld or hold time. This action may refine the weld zone, and provide a more homogeneous weld nugget. Timing of the application of forging force is critical. If applied too soon, the welding current may be insufficient for the higher force. If applied too late, the weld will have solidified and the forging force will do no good.

FORGE DELAY is defined as the delay from the beginning of the weld to the activation of the forging solenoid valve. To accomplish a FORGE DELAY operation, it is necessary to CHAIN together two or more schedules as outlined below.

1. Program the first schedule with the amount of WELD time desired before the activation of the forging valve. Use any one of the three solenoid valve outputs.
2. For FORGE during WELD, program the second schedule with remaining WELD time and program an unused valve output. This second valve output activates the forging valve.

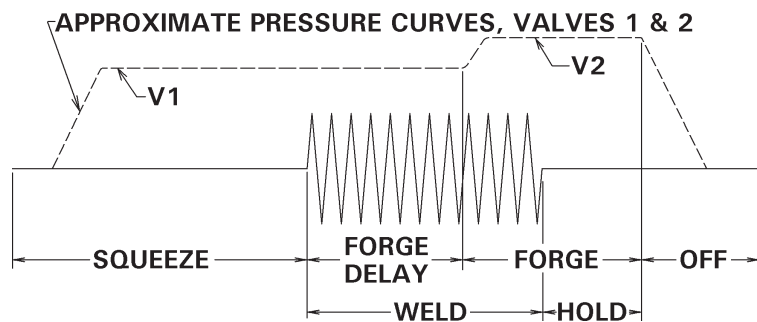
**NOTICE**

For continuous CURRENT from the first schedule to the second schedule, do not program any HOLD time into the first schedule or SQUEEZE time into the second schedule.

3. For FORGE after WELD, program the number of cycles of time between WELD time and the activation of the forge valve into HOLD time of the first schedule or into SQUEEZE time of the second schedule.

| SCHEDULE | SQUEEZE | WELD/HEAT | PERCENT CURRENT | HOLD | OFF | IMPULSES | COOL | VALVE MODE | CYCLE MODE | SLOPE MODE | SLOPE COUNT |
|----------|---------|-----------|-----------------|------|-----|----------|------|------------|------------|------------|-------------|
| 00       | xx      | xx        | xx              | 00   | 00  | 01       | 00   | 02         | 02         | 00         | 00          |
| 01       | 00      | xx        | xx              | xx   | 00  | 01       | 00   | 06         | 00         | 00         | 00          |

In the next example, Valve 1 will be the standard valve and Valve 2 will be the forging valve. The total WELD time is 15 cycles at 95 PERCENT CURRENT with the forging valve activated after 10 cycles.



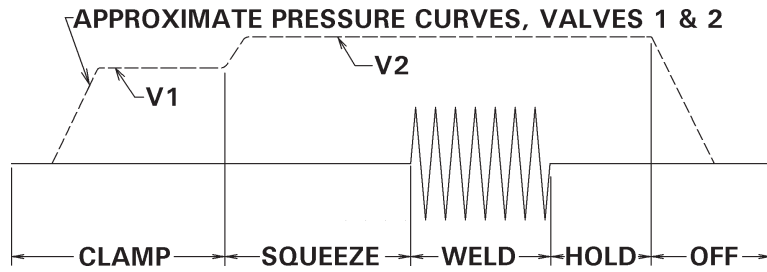
For FORGE during WELD, it is possible to select a PERCENT CURRENT for the second schedule different from that of the first schedule.

| SCHEDULE | SQUEEZE | WELD/HEAT | PERCENT CURRENT | HOLD | OFF | IMPULSES | COOL | VALVE MODE | CYCLE MODE | SLOPE MODE | SLOPE COUNT |
|----------|---------|-----------|-----------------|------|-----|----------|------|------------|------------|------------|-------------|
| 00       | 20      | 10        | 95              | 00   | 00  | 01       | 00   | 01         | 02         | 00         | 00          |
| 01       | 00      | 05        | 95              | 20   | 00  | 01       | 00   | 03         | 00         | 00         | 00          |

Other combinations of weld schedules may be combined to create other forging schedules. For example, it would be possible to use UPSLOPE in the first sequence and PULSATION in the second sequence.

### Example 6: BUTT WELD (CHAINED Mode)

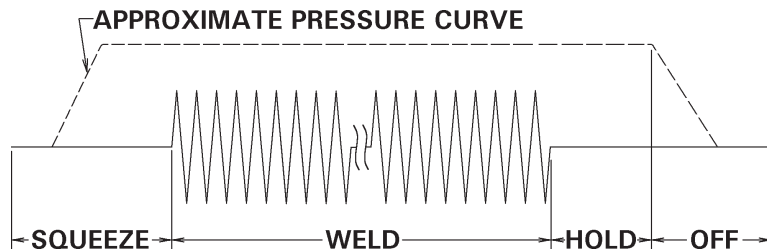
Schedules 11 and 12 are CHAINED together to perform a BUTT welding sequence. Schedule 11 contains only SQUEEZE time with Valve 1 output, and is used as the CLAMP function. Schedule 12 follows the CLAMP function with a normal SQUEEZE, WELD, HOLD sequence with Valve 2 output. Both valve outputs turn off at the end of HOLD time.



| SCHEDULE | SQUEEZE | WELD/ HEAT | PERCENT CURRENT | HOLD | OFF | IMPULSES | COOL | VALVE MODE | CYCLE MODE | SLOPE MODE | SLOPE COUNT |
|----------|---------|------------|-----------------|------|-----|----------|------|------------|------------|------------|-------------|
| 11       | 20      | 00         | 00              | 00   | 00  | 01       | 00   | 01         | 02         | 00         | 00          |
| 12       | 20      | 10         | 50              | 10   | 10  | 01       | 00   | 03         | 00         | 00         | 00          |

### Example 7: CONTINUOUS SEAM

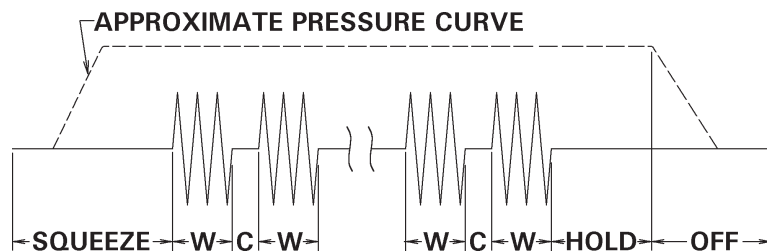
Schedule 13 is a CONTINUOUS SEAM mode. The control is switched to the SEAM mode by programming the EXTENDED FUNCTION **S.E.** to **01**. Welding current starts when the initiation contact is closed, and stays on as long as it is held closed.



| SCHEDULE | SQUEEZE | WELD/ HEAT | PERCENT CURRENT | HOLD | OFF | IMPULSES | COOL | VALVE MODE | CYCLE MODE | SLOPE MODE | SLOPE COUNT |
|----------|---------|------------|-----------------|------|-----|----------|------|------------|------------|------------|-------------|
| 13       | 10      | 01         | 40              | 10   | 10  | 01       | 00   | 01         | 00         | 00         | 00          |

### Example 8: INTERMITTENT SEAM

Schedule 14 is an INTERMITTENT SEAM mode. INTERMITTENT operation is accomplished by programming a value other than **00** for COOL into the schedule. To switch the control back to the SPOT mode, program the EXTENDED FUNCTION **S.E.** to **00**.



| SCHEDULE | SQUEEZE | WELD/ HEAT | PERCENT CURRENT | HOLD | OFF | IMPULSES | COOL | VALVE MODE | CYCLE MODE | SLOPE MODE | SLOPE COUNT |
|----------|---------|------------|-----------------|------|-----|----------|------|------------|------------|------------|-------------|
| 14       | 10      | 20         | 40              | 10   | 10  | 01       | 05   | 01         | 00         | 00         | 00          |