Through Arc Seam Tracking (TAST)

Basic Description

The goal of any robotic gas metal arc welding (GMAW) application is to make weld joints repeatable and produce high quality welds. ArcTool application software features many sensing options that can compensate for part miss-location and joint geometry variation. These options include:

- Through Arc Seam Tracking (TAST)
- Adaptive TAST
- Root Pass Memorization (RPM) and Multi Pass Offset (MP)

Through Arc Seam Tracking (TAST) automatically adjusts the robot's vertical and lateral trajectory to compensate for part warping or misplacement. Often used with Touch Sensing to find the start of the weld joint, TAST measures feedback current and adjusts the robot's path to keep the weld in the joint center. TAST can be used on many different joint configurations and material thicknesses. It is a reliable and cost effective way to overcome part variations and produce high quality welds.

Adaptive TAST further enhances robotic seam tracking. It maintains a constant fill for groove weld joints with a varying volume. Changes in the weld current feedback are used to detect the changes in the joint width and dynamically adjust the weld parameters (travel speed, weave amplitude, and weave frequency) as the robot travels along the joint.

Root Pass Memorization (RPM) and **Multi Pass Offset (MP)** work with TAST and Adaptive TAST to provide multiple pass welding capability. RPM stores the TAST positional offset data and the Adaptive TAST weld adjustment values from the tracked root pass.
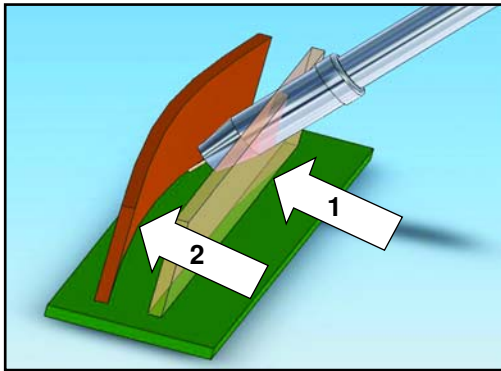

This data can be "played back" on consecutive passes, with the MP offset added to make pre-programmed adjustments in weld length, placement, and torch and work angles.
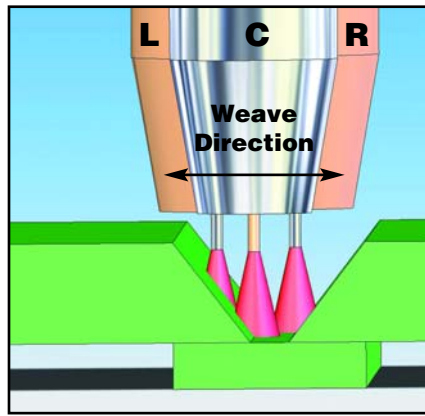
Features and Benefits

- TAST independently controls lateral and vertical compensation.

- Can be used with linear or circular motion.

- Works with all FANUC Robotics' auxiliary axis packages and coordinated motion software.

- As gap condition varies, Adaptive TAST dynamically adjusts weave amplitude, frequency and travel speed.

- Works with RPM to apply changes to consecutive passes.

- Adaptive TAST can be enabled/disabled per individual tracking schedule.

- Automatically adjusts robot path for optimal welding conditions.

- Schedule-based tracking allows user customization per application.

- Super TAST provides diagnostic information to increase tracking speeds on thinner material.

- Works with Touch Sensing to get the correct wire placement at the start of the weld.

- No additional sensing hardware (laser, vision, or PC controllers) required.

- Adaptive TAST compliments standard lateral and vertical tracking.

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TAST Overview

L C R

Weave Direction

Current Feedback (A):

L	C	R
220	180	160

TAST measures welding current at the sides of the joint during weave motion and makes adjustments to the weld path automatically.

1. Original programmed path
2. TAST used to compensate for part warping or inaccurate fixturing.

Programming A Multi-pass Weld

Example 3 Pass Weld

The root pass (1) tracking information is memorized and replayed with a defined offset for the next two passes (2, 3).

Main Teach Pendant Program

```
MAIN

  1:  CALL WELD01(1,0)
  2:  CALL WELD01(2,0)
  3:  CALL WELD01(3,0)
[End]
```

(Pass Number, Weld Direction)

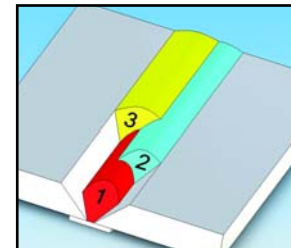### Sub Program Header Information

```
Program\detail
Multi-pass data                          1/7
Program name:  WELD01
Last pass: 0            Status: ********

  1   Number of passes:        3
  2   Weld schedules:          <*DETAIL*>
  3   Weave schedules:         <*DETAIL*>
  4   Multi-pass offsets:      <*DETAIL*>
  5   Run-in schedules:        <*DETAIL*>
  6   Burn back schedules:     <*DETAIL*>
  7   Crater fill schedules:   <*DETAIL*>
```

Multi-Pass Offset Detail Screen

```
Program\detail
Multi-pass offsets          3/3
Pass   X(mm)   Y(mm)   Z(mm)   Wrk(deg)  Trv(deg)
 1      0.0     0.0     0.0      0.0       0.0
 2    -10.0    15.0    12.0    -20.0       5.0
 3    -10.0   -15.0    12.0     20.0       5.0
```

WELD01 Program

```
 1:   R[1]=AR[1]
 2:   R[2]=AR[2]
 3:   IF R[2]=1, JMP LBL[3]
 5:   IF R[1]>1, JMP LBL[2]
 6:
 7:   ! ROOT PASS
 8:   Track TAST[3] RPM[3]
 9:L  PR[3] 20mm/sec FINE
  :   Arc Start[99]
10:   Weave Sine[99]
11:L  P[4] WELD_SPEED FINE
  :   Arc End[99]
12:   Weave End
13:   Track End
14:J  P[5] 10% FINE
15:   END
16:
17:   LBL[2:FORWARD PASSES
18:   MP Offset PR[99]RPM[3]
19:J  PR[3] 10% FINE
  :   Arc Start[99]
20:   Weave Sine[99]
21:L  P[4] WELD_SPEED FINE
  :   Arc End[99]
22:   Weave End
23:   MP Offset End
```

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