

# Deburring Framework

SFMG 386 Product Requirements document

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## **Introduction**

This document is presenting the framework for a deburring system. This framework will deburr material from target geometries utilizing machining.

## **Intended use**

This framework is targeted at machinists and manufacturing companies. Burrs are created during machining operations. This framework will guide the deburring operation occurring in the post machining phase.

## **Associated PC Software**

RoboDK - make and simulate robot

SolidWorks - used a telephone case as the object to deburr

## **Associated Hardware**

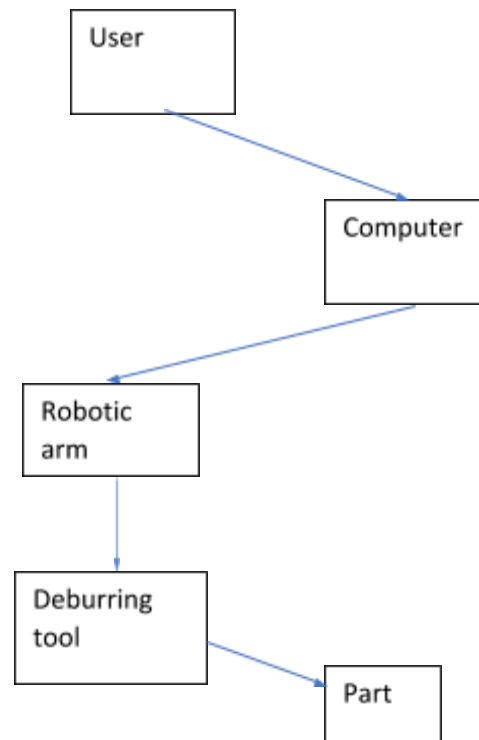
Omron Adept Viper 650

Deburring tool

## System Architecture



## Hardware Architecture



## Codes

.PROGRAM telephone()

; Program generated by RoboDK v4.2.3 for Adept Viper s650 on 18/05/2020 15:12:46

; Using nominal kinematics.

BASE 0,0,0,0

SPEED 1000.0, 100 MMPS ALWAYS

TOOL TRANS(32.000,0.000,260.000,0.000,39.000,0.000)

; Show Spindle

MOVE TRANS(597.701,12.138,211.533,164.480,152.683,162.643)

MOVES TRANS(553.483,24.418,122.685,164.480,152.683,162.643)

SPEED 50.0, 100 MMPS ALWAYS

MOVES TRANS(553.928,22.549,122.205,161.158,151.987,158.867)

MOVES TRANS(554.458,20.764,121.568,156.051,150.815,153.036)

MOVES TRANS(554.588,20.380,121.406,152.919,149.790,149.389)

MOVES TRANS(555.214,18.756,120.619,149.711,148.370,145.550)

MOVES TRANS(555.924,17.271,119.732,146.249,146.864,141.412)

MOVES TRANS(556.734,15.947,118.777,143.912,145.923,138.653)

MOVES TRANS(557.137,15.409,118.336,142.868,145.586,137.454)

MOVES TRANS(557.972,14.506,117.504,142.545,145.634,137.136)

MOVES TRANS(558.850,13.812,116.742,142.463,145.931,137.152)

MOVES TRANS(559.036,13.695,116.596,142.488,146.322,137.309)

MOVES TRANS(559.846,13.291,116.008,142.412,146.978,137.445)

MOVES TRANS(560.676,13.045,115.492,142.204,147.747,137.477)

MOVES TRANS(560.932,13.002,115.350,141.799,148.383,137.259)

MOVES TRANS(561.661,12.959,114.987,141.070,149.045,136.713)

MOVES TRANS(562.084,12.988,114.804,139.991,149.726,135.816)

MOVES TRANS(562.744,13.116,114.564,138.636,150.295,134.610)

MOVES TRANS(563.074,13.219,114.464,137.250,150.707,133.334)  
MOVES TRANS(563.493,13.388,114.359,135.918,151.000,132.086)  
MOVES TRANS(563.798,13.539,114.299,134.620,151.208,130.854)  
MOVES TRANS(564.100,13.716,114.253,133.396,151.355,129.685)  
MOVES TRANS(564.403,13.918,114.222,132.119,151.464,128.461)  
MOVES TRANS(564.753,14.188,114.206,130.807,151.540,127.200)  
MOVES TRANS(565.083,14.479,114.211,129.326,151.585,125.775)  
MOVES TRANS(565.758,15.198,114.288,127.936,151.701,124.463)  
MOVES TRANS(565.911,15.387,114.319,127.161,151.834,123.751)  
MOVES TRANS(566.651,16.451,114.536,127.241,152.330,123.950)  
MOVES TRANS(567.331,17.690,114.828,128.319,153.582,125.289)  
MOVES TRANS(567.731,18.559,115.030,130.996,155.190,128.271)  
MOVES TRANS(568.438,20.415,115.420,136.156,157.440,133.875)  
MOVES TRANS(569.032,22.410,115.744,145.053,160.321,143.418)  
MOVES TRANS(569.561,24.721,115.960,157.696,162.828,156.763)  
MOVES TRANS(569.946,26.937,116.018,170.226,164.279,169.853)  
MOVES TRANS(570.236,29.231,115.987,178.163,164.869,178.097)  
MOVES TRANS(570.431,31.611,115.926,-179.278,165.146,-179.253)  
MOVES TRANS(570.517,33.740,115.897,-179.707,165.279,-179.697)  
MOVES TRANS(570.493,36.854,115.905,179.387,165.298,179.366)  
MOVES TRANS(570.290,39.959,115.974,-179.046,165.253,-179.014)  
MOVES TRANS(569.905,43.063,116.033,-170.591,164.987,-170.264)  
MOVES TRANS(569.474,45.433,115.972,-159.043,163.946,-158.270)  
MOVES TRANS(569.273,46.343,115.906,-148.934,162.493,-147.720)  
MOVES TRANS(568.712,48.455,115.647,-139.153,160.289,-137.435)  
MOVES TRANS(568.016,50.478,115.280,-131.862,157.410,-129.601)  
MOVES TRANS(567.184,52.332,114.875,-128.412,154.977,-125.698)

MOVES TRANS(566.969,52.736,114.783,-127.126,153.635,-124.148)  
MOVES TRANS(566.207,53.954,114.520,-127.027,152.828,-123.863)  
MOVES TRANS(565.432,54.909,114.369,-128.454,152.092,-125.060)  
MOVES TRANS(564.760,55.547,114.335,-130.401,151.694,-126.845)  
MOVES TRANS(564.397,55.827,114.350,-132.030,151.459,-128.373)  
MOVES TRANS(564.029,56.071,114.389,-133.507,151.265,-129.771)  
MOVES TRANS(563.601,56.304,114.462,-134.974,151.018,-131.153)  
MOVES TRANS(563.286,56.445,114.532,-136.225,150.751,-132.323)  
MOVES TRANS(562.966,56.562,114.619,-137.303,150.467,-133.319)  
MOVES TRANS(562.639,56.655,114.721,-138.136,150.207,-134.081)  
MOVES TRANS(562.543,56.678,114.754,-138.939,149.900,-134.802)  
MOVES TRANS(561.892,56.775,115.006,-140.114,149.311,-135.819)  
MOVES TRANS(561.219,56.775,115.320,-141.304,148.461,-136.776)  
MOVES TRANS(560.460,56.436,115.824,-141.991,147.524,-137.187)  
MOVES TRANS(559.714,56.180,116.308,-142.239,146.650,-137.161)  
MOVES TRANS(558.804,55.669,116.998,-142.360,146.000,-137.070)  
MOVES TRANS(558.033,55.044,117.673,-142.578,145.693,-137.191)  
MOVES TRANS(557.362,54.334,118.332,-143.282,145.791,-137.953)  
MOVES TRANS(556.591,53.285,119.171,-144.919,146.389,-139.859)  
MOVES TRANS(555.890,52.067,119.997,-146.839,147.337,-142.184)  
MOVES TRANS(555.630,51.543,120.310,-149.177,148.332,-144.968)  
MOVES TRANS(554.972,50.003,121.114,-152.950,149.631,-149.382)  
MOVES TRANS(554.401,48.349,121.801,-158.047,151.208,-155.301)  
MOVES TRANS(553.908,46.586,122.356,-163.519,152.532,-161.559)  
MOVES TRANS(553.649,45.484,122.618,-168.760,153.446,-167.475)  
MOVES TRANS(553.270,43.562,122.944,-173.918,154.046,-173.242)  
MOVES TRANS(552.965,41.550,123.150,-177.996,154.394,-177.778)

MOVES TRANS(552.737,39.451,123.267,-179.914,154.521,-179.905)

MOVES TRANS(552.627,37.931,123.316,179.779,154.559,179.756)

MOVES TRANS(552.538,34.920,123.355,179.992,154.559,179.991)

MOVES TRANS(552.621,31.902,123.318,-179.944,154.542,-179.938)

MOVES TRANS(552.869,28.972,123.200,178.527,154.529,178.368)

MOVES TRANS(553.188,26.659,122.991,174.119,154.397,173.484)

MOVES TRANS(553.603,24.456,122.631,171.207,154.226,170.253)

SPEED 1000.0, 100 MMPS ALWAYS

MOVES TRANS(596.574,17.809,212.682,171.207,154.226,170.253)

.END

.PROGRAM Path2()

; Program generated by RoboDK v4.2.3 for Adept Viper s650 on 18/05/2020 15:16:34

; Using nominal kinematics.

BASE 0,0,0,0

SPEED 1000.0, 100 MMPS ALWAYS

TOOL TRANS(32.000,0.000,260.000,0.000,39.000,0.000)

; Show Spindle

MOVE TRANS(615.221,53.512,224.346,-23.044,165.718,-23.699)

MOVES TRANS(637.923,43.856,127.437,-23.044,165.718,-23.699)

SPEED 50.0, 100 MMPS ALWAYS

MOVES TRANS(638.111,45.334,127.334,-27.347,165.337,-28.129)

MOVES TRANS(638.158,46.589,127.168,-35.668,164.178,-36.723)

MOVES TRANS(638.084,48.086,126.867,-43.173,162.447,-44.537)

MOVES TRANS(637.869,49.558,126.459,-48.875,160.527,-50.539)

MOVES TRANS(637.601,50.677,126.072,-52.784,158.659,-54.724)

MOVES TRANS(637.131,52.033,125.509,-55.683,156.756,-57.905)

MOVES TRANS(636.522,53.277,124.890,-57.743,155.252,-60.180)



MOVES TRANS(636.234,53.741,124.632,-58.656,154.431,-61.214)  
MOVES TRANS(635.496,54.693,124.052,-58.748,153.986,-61.393)  
MOVES TRANS(634.670,55.466,123.517,-58.284,153.871,-60.977)  
MOVES TRANS(633.999,55.928,123.150,-57.395,154.044,-60.095)  
MOVES TRANS(633.132,56.349,122.750,-56.248,154.369,-58.932)  
MOVES TRANS(633.004,56.397,122.697,-55.475,154.603,-58.142)  
MOVES TRANS(632.170,56.621,122.386,-54.777,154.842,-57.420)  
MOVES TRANS(631.314,56.706,122.120,-53.654,155.231,-56.253)  
MOVES TRANS(630.654,56.676,121.950,-52.852,155.538,-55.409)  
MOVES TRANS(630.323,56.630,121.875,-52.406,155.693,-54.943)  
MOVES TRANS(629.558,56.440,121.732,-52.044,155.803,-54.568)  
MOVES TRANS(628.799,56.129,121.631,-51.749,155.912,-54.256)  
MOVES TRANS(628.691,56.074,121.621,-51.579,155.945,-54.084)  
MOVES TRANS(627.940,55.611,121.574,-51.286,155.943,-53.798)  
MOVES TRANS(627.212,55.003,121.581,-50.869,155.958,-53.387)  
MOVES TRANS(627.083,54.877,121.588,-50.277,155.992,-52.801)  
MOVES TRANS(626.348,54.021,121.668,-48.863,156.162,-51.376)  
MOVES TRANS(625.704,53.028,121.802,-46.475,156.604,-48.922)  
MOVES TRANS(625.298,52.227,121.921,-42.029,157.557,-44.280)  
MOVES TRANS(624.781,50.895,122.123,-36.516,158.638,-38.485)  
MOVES TRANS(624.404,49.468,122.334,-31.222,159.528,-32.903)  
MOVES TRANS(624.213,48.322,122.496,-25.475,160.349,-26.835)  
MOVES TRANS(624.092,46.668,122.715,-20.141,160.899,-21.212)  
MOVES TRANS(624.150,45.000,122.922,-15.060,161.309,-15.858)  
MOVES TRANS(624.311,43.779,123.076,-11.511,161.456,-12.123)  
MOVES TRANS(624.666,42.274,123.287,-9.568,161.477,-10.081)  
MOVES TRANS(625.175,40.891,123.526,-8.649,161.432,-9.116)

MOVES TRANS(625.405,40.405,123.626,-8.710,161.292,-9.188)  
MOVES TRANS(626.040,39.330,123.892,-9.283,161.188,-9.797)  
MOVES TRANS(626.777,38.407,124.190,-10.010,161.046,-10.572)  
MOVES TRANS(627.467,37.753,124.463,-10.780,160.954,-11.388)  
MOVES TRANS(628.300,37.170,124.784,-11.308,160.910,-11.948)  
MOVES TRANS(629.088,36.785,125.078,-11.666,160.907,-12.325)  
MOVES TRANS(629.975,36.517,125.398,-11.830,160.957,-12.494)  
MOVES TRANS(630.138,36.485,125.455,-11.749,161.080,-12.399)  
MOVES TRANS(630.987,36.405,125.747,-11.649,161.198,-12.286)  
MOVES TRANS(631.686,36.443,125.977,-11.549,161.345,-12.171)  
MOVES TRANS(631.850,36.465,126.030,-11.384,161.547,-11.984)  
MOVES TRANS(632.299,36.554,126.171,-11.217,161.807,-11.791)  
MOVES TRANS(633.125,36.823,126.421,-10.754,162.146,-11.285)  
MOVES TRANS(633.941,37.238,126.654,-10.585,162.450,-11.090)  
MOVES TRANS(634.083,37.327,126.693,-9.786,162.966,-10.225)  
MOVES TRANS(634.898,37.946,126.908,-9.395,163.373,-9.797)  
MOVES TRANS(635.642,38.703,127.090,-8.943,163.842,-9.304)  
MOVES TRANS(635.948,39.084,127.161,-8.622,164.503,-8.942)  
MOVES TRANS(636.614,40.101,127.304,-9.605,164.955,-9.939)  
MOVES TRANS(637.167,41.240,127.404,-12.055,165.481,-12.441)  
MOVES TRANS(637.590,42.440,127.452,-16.961,165.772,-17.466)  
MOVES TRANS(637.923,43.856,127.437,-23.836,165.596,-24.520)  
MOVES TRANS(637.943,45.342,127.294,-32.297,164.906,-33.212)  
MOVES TRANS(637.988,46.581,127.130,-40.440,163.550,-41.626)  
MOVES TRANS(637.912,48.060,126.833,-46.931,161.859,-48.385)  
MOVES TRANS(637.694,49.513,126.431,-52.238,159.919,-53.963)  
MOVES TRANS(637.425,50.616,126.050,-55.662,157.919,-57.665)

MOVES TRANS(636.955,51.951,125.496,-57.531,156.373,-59.759)  
MOVES TRANS(636.348,53.173,124.889,-58.661,155.039,-61.098)  
MOVES TRANS(636.062,53.627,124.636,-58.329,154.307,-60.930)  
MOVES TRANS(635.332,54.555,124.068,-57.777,154.065,-60.455)  
MOVES TRANS(634.522,55.303,123.546,-56.562,154.111,-59.287)  
MOVES TRANS(633.867,55.746,123.190,-55.944,154.227,-58.672)  
MOVES TRANS(633.027,56.146,122.802,-54.589,154.632,-57.283)  
MOVES TRANS(632.904,56.190,122.751,-54.051,154.911,-56.705)  
MOVES TRANS(632.102,56.398,122.451,-53.152,155.258,-55.761)  
MOVES TRANS(631.285,56.474,122.197,-52.561,155.527,-55.129)  
MOVES TRANS(630.657,56.441,122.035,-52.146,155.749,-54.678)  
MOVES TRANS(630.342,56.395,121.964,-51.952,155.834,-54.471)  
MOVES TRANS(629.617,56.212,121.829,-51.752,155.918,-54.259)  
MOVES TRANS(628.895,55.914,121.733,-51.596,155.953,-54.099)  
MOVES TRANS(628.792,55.861,121.723,-51.341,155.955,-53.850)  
MOVES TRANS(628.076,55.418,121.679,-51.485,155.954,-53.990)  
MOVES TRANS(627.377,54.835,121.685,-51.064,155.957,-53.579)  
SPEED 1000.0, 100 MMPS ALWAYS  
MOVES TRANS(601.773,86.526,213.010,-51.064,155.957,-53.579)  
.END

.PROGRAM Path3()

; Program generated by RoboDK v4.2.3 for Adept Viper s650 on 18/05/2020 15:16:48

; Using nominal kinematics.

BASE 0,0,0,0

SPEED 1000.0, 100 MMPS ALWAYS

TOOL TRANS(32.000,0.000,260.000,0.000,39.000,0.000)

; Show Spindle

MOVE TRANS(530.532,1.666,150.110,34.546,112.022,81.426)

MOVES TRANS(606.890,54.236,112.614,34.546,112.022,61.426)

SPEED 50.0, 100 MMPS ALWAYS

MOVES TRANS(609.221,48.567,116.075,17.019,136.536,22.867)

MOVES TRANS(609.099,47.936,116.141,-22.422,154.944,-24.488)

MOVES TRANS(608.796,46.894,116.186,-19.995,155.777,-21.752)

MOVES TRANS(608.381,45.927,116.149,-17.707,156.403,-19.209)

MOVES TRANS(608.082,45.396,116.091,-16.157,156.964,-17.475)

MOVES TRANS(607.550,44.660,115.959,-15.115,157.658,-16.279)

MOVES TRANS(606.958,44.054,115.790,-14.867,158.096,-15.967)

MOVES TRANS(606.871,43.980,115.764,-14.901,158.510,-15.960)

MOVES TRANS(606.258,43.544,115.578,-15.133,159.231,-16.131)

MOVES TRANS(605.626,43.235,115.382,-15.944,159.972,-16.913)

MOVES TRANS(605.292,43.121,115.279,-16.998,160.634,-17.954)

MOVES TRANS(604.719,43.000,115.103,-17.846,161.247,-18.778)

MOVES TRANS(604.641,42.991,115.079,-18.671,161.821,-19.578)

MOVES TRANS(603.998,42.974,114.885,-19.767,162.498,-20.647)

MOVES TRANS(603.766,42.996,114.816,-21.272,163.265,-22.124)

MOVES TRANS(603.113,43.136,114.623,-22.994,164.097,-23.809)

MOVES TRANS(602.767,43.262,114.521,-24.434,164.858,-25.206)

MOVES TRANS(602.430,43.420,114.422,-26.788,165.595,-27.531)

MOVES TRANS(601.790,43.834,114.233,-30.077,166.482,-30.780)

MOVES TRANS(601.276,44.296,114.076,-34.239,167.307,-34.901)

MOVES TRANS(600.673,45.038,113.873,-39.963,167.827,-40.606)

MOVES TRANS(600.128,46.000,113.647,-46.431,167.759,-47.088)

MOVES TRANS(599.713,47.092,113.404,-52.421,166.976,-53.140)

MOVES TRANS(599.437,48.283,113.130,-56.253,165.923,-57.055)  
MOVES TRANS(599.378,48.686,113.033,-58.682,164.896,-59.569)  
MOVES TRANS(599.298,49.995,112.705,-60.976,163.470,-61.990)  
MOVES TRANS(599.383,51.303,112.355,-62.778,162.143,-63.912)  
MOVES TRANS(599.413,51.515,112.297,-63.373,161.180,-64.613)  
MOVES TRANS(599.655,52.654,111.978,-63.279,160.017,-64.681)  
MOVES TRANS(600.021,53.701,111.688,-62.816,159.073,-64.373)  
MOVES TRANS(600.482,54.598,111.462,-61.231,158.723,-62.904)  
MOVES TRANS(600.970,55.289,111.323,-58.667,158.714,-60.435)  
MOVES TRANS(601.497,55.847,111.252,-55.456,158.763,-57.313)  
MOVES TRANS(602.013,56.259,111.241,-52.429,158.721,-54.365)  
MOVES TRANS(602.273,56.426,111.254,-50.234,158.601,-52.231)  
MOVES TRANS(602.560,56.583,111.281,-48.447,158.430,-50.501)  
MOVES TRANS(602.860,56.718,111.322,-46.718,158.196,-48.834)  
MOVES TRANS(603.146,56.821,111.372,-45.149,157.914,-47.330)  
MOVES TRANS(603.434,56.902,111.433,-43.431,157.504,-45.697)  
MOVES TRANS(604.015,56.997,111.586,-41.797,156.978,-44.168)  
MOVES TRANS(604.178,57.008,111.636,-40.559,156.431,-43.038)  
MOVES TRANS(604.790,56.989,111.848,-39.321,155.649,-41.958)  
MOVES TRANS(605.469,56.855,112.133,-38.289,154.626,-41.145)  
MOVES TRANS(606.127,56.601,112.461,-37.800,153.827,-40.837)  
MOVES TRANS(606.210,56.560,112.506,-37.542,153.029,-40.770)  
MOVES TRANS(606.922,56.105,112.935,-37.221,152.178,-40.660)  
MOVES TRANS(607.603,55.462,113.430,-36.720,151.569,-40.305)  
MOVES TRANS(608.196,54.660,113.951,-36.307,151.289,-39.955)  
MOVES TRANS(608.678,53.716,114.474,-35.112,151.223,-38.736)  
MOVES TRANS(608.798,53.412,114.625,-33.724,151.629,-37.186)

```
MOVES TRANS(609.119,52.315,115.106,-32.161,151.976,-35.462)
MOVES TRANS(609.302,51.158,115.511,-30.147,152.568,-33.199)
MOVES TRANS(609.326,50.870,115.597,-30.188,152.571,-33.242)
MOVES TRANS(609.339,49.714,115.883,-28.516,153.075,-31.357)
SPEED 1000.0, 100 MMPS ALWAYS
MOVES TRANS(569.549,71.332,205.043,-28.516,153.075,-31.357)
.END
```

```
.PROGRAM Path4()
```

```
; Program generated by RoboDK v4.2.3 for Adept Viper s650 on 18/05/2020 15:17:05
```

```
; Using nominal kinematics.
```

```
BASE 0,0,0,0
```

```
SPEED 1000.0, 100 MMPS ALWAYS
```

```
TOOL TRANS(32.000,0.000,260.000,0.000,39.000,0.000)
```

```
; Show Spindle
```

```
MOVE TRANS(593.249,24.578,218.161,7.925,161.406,8.356)
```

```
MOVES TRANS(624.831,28.974,123.381,7.925,161.406,8.356)
```

```
SPEED 50.0, 100 MMPS ALWAYS
```

```
MOVES TRANS(624.831,28.974,123.381,7.685,161.440,8.101)
```

```
MOVES TRANS(624.890,29.135,123.408,7.437,161.459,7.839)
```

```
MOVES TRANS(625.405,30.308,123.631,7.840,161.424,8.265)
```

```
MOVES TRANS(626.036,31.361,123.891,8.645,161.333,9.117)
```

```
MOVES TRANS(626.337,31.769,124.014,9.507,161.229,10.030)
```

```
MOVES TRANS(627.058,32.566,124.303,10.441,161.120,11.020)
```

```
MOVES TRANS(627.858,33.226,124.616,11.042,160.990,11.662)
```

```
MOVES TRANS(628.067,33.366,124.696,11.402,160.919,12.046)
```

```
MOVES TRANS(628.895,33.810,125.008,11.726,160.888,12.390)
```

MOVES TRANS(629.742,34.100,125.316,11.830,160.885,12.499)  
MOVES TRANS(629.870,34.130,125.361,11.770,160.932,12.432)  
MOVES TRANS(630.724,34.252,125.658,11.742,161.050,12.395)  
MOVES TRANS(631.490,34.241,125.914,11.616,161.203,12.251)  
MOVES TRANS(631.565,34.234,125.938,11.371,161.310,11.986)  
MOVES TRANS(631.849,34.197,126.030,10.951,161.494,11.532)  
MOVES TRANS(632.713,33.987,126.299,10.236,161.903,10.756)  
MOVES TRANS(633.600,33.608,126.559,9.476,162.481,9.928)  
MOVES TRANS(634.441,33.074,126.790,8.781,163.108,9.170)  
MOVES TRANS(635.133,32.482,126.968,8.034,163.791,8.362)  
MOVES TRANS(635.901,31.615,127.151,7.243,164.521,7.513)  
MOVES TRANS(636.575,30.598,127.299,6.955,164.996,7.198)  
MOVES TRANS(636.777,30.227,127.340,7.181,165.386,7.418)  
MOVES TRANS(637.338,28.939,127.441,8.669,165.863,8.935)  
MOVES TRANS(637.753,27.543,127.482,12.085,166.120,12.437)  
MOVES TRANS(637.944,26.575,127.469,17.253,166.122,17.739)  
MOVES TRANS(638.107,25.063,127.377,25.066,165.722,25.763)  
MOVES TRANS(638.122,23.547,127.184,33.532,164.728,54.487)  
MOVES TRANS(638.056,22.591,127.004,38.970,163.574,60.143)  
MOVES TRANS(637.997,22.083,126.890,37.723,161.400,59.220)  
MOVES TRANS(637.834,21.102,126.631,42.441,160.299,64.166)  
MOVES TRANS(637.472,19.687,126.167,51.730,159.648,73.512)  
MOVES TRANS(637.086,18.631,125.747,54.688,157.848,76.732)  
MOVES TRANS(636.528,17.484,125.211,56.572,156.215,78.867)  
MOVES TRANS(635.866,16.474,124.659,57.151,154.978,79.669)  
MOVES TRANS(635.098,15.611,124.115,56.995,154.399,79.639)  
MOVES TRANS(634.925,15.451,124.004,56.469,154.274,79.163)

MOVES TRANS(634.133,14.845,123.549,55.407,154.398,78.120)  
MOVES TRANS(633.191,14.354,123.099,54.230,154.698,76.923)  
MOVES TRANS(632.385,14.097,122.778,53.248,155.062,75.896)  
MOVES TRANS(631.585,13.974,122.510,52.570,155.341,75.178)  
MOVES TRANS(631.123,13.959,122.376,52.038,155.574,74.610)  
MOVES TRANS(630.333,14.030,122.180,51.490,155.806,74.027)  
MOVES TRANS(629.566,14.216,122.030,51.181,155.907,73.704)  
MOVES TRANS(629.444,14.257,122.010,51.025,155.953,73.541)  
MOVES TRANS(629.039,14.415,121.951,50.773,156.051,73.274)  
MOVES TRANS(628.262,14.827,121.873,50.430,156.132,72.921)  
MOVES TRANS(627.907,15.066,121.855,49.947,156.234,72.426)  
MOVES TRANS(627.111,15.746,121.856,48.939,156.467,71.386)  
MOVES TRANS(626.378,16.585,121.915,47.619,156.689,70.036)  
MOVES TRANS(626.283,16.713,121.928,46.094,157.042,68.450)  
MOVES TRANS(625.579,17.839,122.054,43.061,157.735,65.279)  
MOVES TRANS(624.994,19.120,122.213,39.107,158.413,61.160)  
MOVES TRANS(624.769,19.750,122.292,35.230,159.017,57.102)  
MOVES TRANS(624.360,21.310,122.484,29.962,159.740,51.570)  
MOVES TRANS(624.125,22.946,122.674,23.437,160.437,24.705)  
MOVES TRANS(624.065,24.465,122.837,17.210,160.928,18.146)  
MOVES TRANS(624.163,26.045,123.003,14.283,161.095,15.061)  
SPEED 1000.0, 100 MMPS ALWAYS  
MOVES TRANS(592.766,18.052,217.609,14.283,161.095,15.061)

.END

.PROGRAM Path5()

; Program generated by RoboDK v4.2.3 for Adept Viper s650 on 18/05/2020 15:17:24



; Using nominal kinematics.

BASE 0,0,0,0

SPEED 1000.0, 100 MMPS ALWAYS

TOOL TRANS(32.000,0.000,260.000,0.000,39.000,0.000)

; Show Spindle

MOVE TRANS(581.513,35.906,212.990,2.275,162.539,2.385)

MOVES TRANS(611.495,37.097,117.597,2.275,162.539,2.385)

SPEED 50.0, 100 MMPS ALWAYS

MOVES TRANS(611.106,36.007,117.462,1.243,162.624,1.303)

MOVES TRANS(611.091,34.837,117.456,-1.416,162.630,-1.484)

MOVES TRANS(611.229,33.664,117.511,-3.953,162.336,-4.148)

MOVES TRANS(611.510,32.568,117.624,-5.835,161.930,-6.135)

MOVES TRANS(611.849,31.716,117.762,-7.277,161.362,-7.675)

MOVES TRANS(612.345,30.832,117.967,-8.409,160.709,-8.902)

MOVES TRANS(612.818,30.211,118.163,-8.987,159.911,-9.559)

MOVES TRANS(613.453,29.590,118.427,-9.177,159.090,-9.812)

MOVES TRANS(614.102,29.135,118.700,-8.865,158.375,-9.525)

MOVES TRANS(614.792,28.809,118.993,-8.788,157.698,-9.486)

MOVES TRANS(614.887,28.775,119.034,-8.094,157.030,-8.781)

MOVES TRANS(615.575,28.603,119.331,-7.787,156.565,-8.477)

MOVES TRANS(616.287,28.552,119.642,-7.291,155.943,-7.976)

MOVES TRANS(616.538,28.565,119.753,-6.608,155.426,-7.259)

MOVES TRANS(617.238,28.684,120.063,-6.192,155.033,-6.825)

MOVES TRANS(617.933,28.930,120.374,-5.645,154.613,-6.244)

MOVES TRANS(618.285,29.109,120.532,-5.128,154.297,-5.688)

MOVES TRANS(618.933,29.548,120.824,-4.758,154.092,-5.287)

MOVES TRANS(619.543,30.118,121.098,-4.319,153.883,-4.808)

MOVES TRANS(619.635,30.220,121.139,-3.764,153.749,-4.196)  
MOVES TRANS(620.194,30.965,121.388,-3.245,153.676,-3.620)  
MOVES TRANS(620.668,31.837,121.599,-2.541,153.575,-2.837)  
MOVES TRANS(620.865,32.311,121.686,-1.769,153.562,-1.975)  
MOVES TRANS(621.178,33.359,121.825,-1.214,153.547,-1.356)  
MOVES TRANS(621.355,34.468,121.903,-0.550,153.537,-0.614)  
MOVES TRANS(621.370,34.636,121.910,0.102,153.563,0.114)  
MOVES TRANS(621.381,35.804,121.914,0.740,153.572,0.827)  
MOVES TRANS(621.240,36.957,121.852,1.564,153.609,1.746)  
MOVES TRANS(620.983,37.962,121.738,2.338,153.652,2.609)  
MOVES TRANS(620.580,38.958,121.559,3.029,153.725,3.378)  
MOVES TRANS(620.157,39.703,121.370,3.630,153.846,4.043)  
MOVES TRANS(619.574,40.463,121.108,4.121,154.037,4.582)  
MOVES TRANS(619.000,41.014,120.848,4.569,154.339,5.067)  
MOVES TRANS(618.320,41.488,120.540,5.005,154.749,5.530)  
MOVES TRANS(617.612,41.818,120.220,5.381,155.130,5.927)  
MOVES TRANS(616.894,42.009,119.898,5.650,155.427,6.208)  
MOVES TRANS(616.802,42.023,119.857,5.898,155.775,6.463)  
MOVES TRANS(616.763,42.029,119.840,6.165,156.166,6.735)  
MOVES TRANS(616.060,42.064,119.530,6.505,156.618,7.082)  
MOVES TRANS(615.350,41.973,119.222,6.803,157.251,7.371)  
MOVES TRANS(615.075,41.903,119.104,7.219,157.927,7.784)  
MOVES TRANS(614.403,41.642,118.818,7.540,158.467,8.098)  
MOVES TRANS(613.752,41.256,118.546,7.540,159.057,8.067)  
MOVES TRANS(613.664,41.192,118.509,7.776,159.713,8.283)  
MOVES TRANS(613.047,40.650,118.254,7.455,160.231,7.917)  
MOVES TRANS(612.483,39.978,118.022,6.955,160.891,7.357)

```
MOVES TRANS(612.125,39.423,117.875,6.050,161.504,6.377)
MOVES TRANS(611.680,38.507,117.693,5.001,161.937,5.259)
MOVES TRANS(611.352,37.503,117.560,4.769,162.053,5.012)
MOVES TRANS(611.270,37.151,117.527,3.615,162.375,3.793)
SPEED 1000.0, 100 MMPS ALWAYS
MOVES TRANS(581.052,35.242,212.833,3.615,162.375,3.793)
.END
```

```
.PROGRAM Path6()
```

```
; Program generated by RoboDK v4.2.3 for Adept Viper s650 on 18/05/2020 15:18:20
```

```
; Using nominal kinematics.
```

```
BASE 0,0,0,0
```

```
SPEED 1000.0, 100 MMPS ALWAYS
```

```
TOOL TRANS(32.000,0.000,260.000,0.000,39.000,0.000)
```

```
; Show Spindle
```

```
MOVE TRANS(581.792,15.929,211.575,33.895,170.285,34.279)
```

```
MOVES TRANS(595.799,25.340,113.010,33.895,170.285,34.279)
```

```
SPEED 50.0, 100 MMPS ALWAYS
```

```
MOVES TRANS(596.211,24.786,113.015,36.459,170.468,36.840)
```

```
MOVES TRANS(596.724,23.869,112.985,40.729,169.065,41.249)
```

```
MOVES TRANS(597.056,23.045,112.918,43.087,166.178,43.928)
```

```
MOVES TRANS(597.366,21.913,112.766,46.261,164.065,47.381)
```

```
MOVES TRANS(597.539,20.751,112.539,50.221,162.383,51.567)
```

```
MOVES TRANS(597.577,19.513,112.220,53.637,160.598,55.222)
```

```
MOVES TRANS(597.466,18.286,111.824,56.364,159.213,58.118)
```

```
MOVES TRANS(597.430,18.065,111.744,59.089,158.329,60.907)
```

```
MOVES TRANS(597.155,16.925,111.286,60.639,157.152,62.596)
```

MOVES TRANS(596.748,15.888,110.804,61.580,156.120,63.673)  
MOVES TRANS(596.481,15.387,110.549,64.223,155.672,66.249)  
MOVES TRANS(595.942,14.614,110.127,66.119,155.498,68.057)  
MOVES TRANS(595.288,13.949,109.730,66.711,155.637,68.589)  
MOVES TRANS(594.713,13.535,109.458,67.384,156.044,69.159)  
MOVES TRANS(594.054,13.207,109.215,67.364,156.959,69.007)  
MOVES TRANS(593.492,13.033,109.059,65.555,159.223,66.975)  
MOVES TRANS(592.927,12.946,108.945,68.217,159.124,69.525)  
MOVES TRANS(592.650,12.934,108.904,72.935,156.820,74.241)  
MOVES TRANS(592.376,12.942,108.874,74.277,156.250,75.551)  
MOVES TRANS(592.106,12.969,108.854,75.135,156.507,76.319)  
MOVES TRANS(591.741,13.036,108.843,76.288,158.346,77.223)  
MOVES TRANS(591.454,13.115,108.848,77.848,159.168,78.621)  
MOVES TRANS(591.174,13.215,108.864,79.245,157.842,80.023)  
MOVES TRANS(590.638,13.474,108.932,80.554,156.822,81.304)  
MOVES TRANS(590.325,13.671,108.996,81.803,156.167,82.494)  
MOVES TRANS(589.740,14.148,109.173,83.139,155.776,83.738)  
MOVES TRANS(589.475,14.421,109.283,84.535,155.605,85.021)  
MOVES TRANS(588.894,15.183,109.607,87.799,156.055,87.989)  
MOVES TRANS(588.402,16.100,110.007,90.468,156.552,90.429)  
MOVES TRANS(588.348,16.223,110.060,90.346,156.867,90.318)  
MOVES TRANS(587.958,17.375,110.546,91.182,158.130,91.097)  
MOVES TRANS(587.719,18.616,111.023,92.889,159.962,92.714)  
MOVES TRANS(587.657,19.265,111.250,88.020,161.734,88.120)  
MOVES TRANS(587.650,20.493,111.634,87.328,163.898,87.432)  
MOVES TRANS(587.784,21.702,111.951,95.272,166.197,95.121)  
MOVES TRANS(587.971,22.561,112.139,91.410,168.759,91.383)

MOVES TRANS(588.321,23.609,112.326,88.480,171.041,88.499)  
MOVES TRANS(588.790,24.566,112.458,95.033,172.269,94.988)  
MOVES TRANS(588.869,24.698,112.474,97.024,172.892,96.971)  
MOVES TRANS(589.388,25.414,112.551,76.676,175.195,76.721)  
MOVES TRANS(589.959,25.993,112.608,40.984,176.171,41.047)  
MOVES TRANS(590.037,26.058,112.615,44.058,176.393,44.115)  
MOVES TRANS(590.613,26.462,112.657,44.485,176.333,44.544)  
MOVES TRANS(591.210,26.750,112.697,37.505,176.345,37.561)  
MOVES TRANS(591.300,26.783,112.703,35.278,176.056,35.342)  
MOVES TRANS(591.911,26.944,112.743,28.026,175.916,28.086)  
MOVES TRANS(592.516,27.000,112.784,26.213,175.671,26.278)  
MOVES TRANS(592.520,27.000,112.784,24.237,175.387,24.307)  
MOVES TRANS(592.723,26.995,112.798,23.277,175.159,23.351)  
MOVES TRANS(593.358,26.909,112.845,21.725,174.893,21.804)  
MOVES TRANS(593.689,26.819,112.870,25.461,173.999,25.584)  
MOVES TRANS(594.013,26.699,112.894,20.617,174.591,20.701)  
MOVES TRANS(594.656,26.360,112.943,28.391,173.175,28.562)  
SPEED 1000.0, 100 MMPS ALWAYS  
MOVES TRANS(584.202,20.710,212.234,28.391,173.175,8.562)  
.END

.PROGRAM Path7()

; Program generated by RoboDK v4.2.3 for Adept Viper s650 on 18/05/2020 15:18:34

; Using nominal kinematics.

BASE 0,0,0,0

SPEED 1000.0, 100 MMPS ALWAYS

TOOL TRANS(32.000,0.000,260.000,0.000,39.000,0.000)

; Show Spindle

MOVE TRANS(595.489,69.753,209.324,-109.444,166.697,-108.960)

MOVES TRANS(587.829,48.055,112.007,-109.444,166.697,-108.960)

SPEED 50.0, 100 MMPS ALWAYS

MOVES TRANS(588.135,46.892,112.243,-109.358,167.403,-108.926)

MOVES TRANS(588.178,46.769,112.264,-110.421,168.490,-110.043)

MOVES TRANS(588.604,45.771,112.416,-111.515,169.673,-111.198)

MOVES TRANS(589.140,44.900,112.519,-109.640,171.120,-109.422)

MOVES TRANS(589.561,44.391,112.571,-105.243,172.080,-105.105)

MOVES TRANS(590.173,43.834,112.625,-98.328,172.728,-98.262)

MOVES TRANS(590.723,43.476,112.665,-88.665,173.135,-88.675)

MOVES TRANS(591.351,43.200,112.706,-79.655,173.314,-79.724)

MOVES TRANS(591.469,43.161,112.714,-72.855,173.245,-72.967)

MOVES TRANS(592.078,43.030,112.754,-65.418,172.937,-65.583)

MOVES TRANS(592.581,43.000,112.788,-58.458,172.630,-58.670)

MOVES TRANS(592.704,43.004,112.797,-54.750,172.385,-54.989)

MOVES TRANS(592.997,43.028,112.818,-50.635,172.017,-50.908)

MOVES TRANS(593.609,43.156,112.863,-44.918,171.382,-45.243)

MOVES TRANS(594.219,43.394,112.910,-40.920,170.671,-41.297)

MOVES TRANS(594.311,43.440,112.917,-38.537,170.196,-38.949)

MOVES TRANS(594.918,43.821,112.961,-36.053,169.599,-36.505)

MOVES TRANS(595.498,44.329,112.997,-34.626,168.680,-35.154)

MOVES TRANS(595.835,44.703,113.011,-34.403,167.886,-35.007)

MOVES TRANS(596.139,45.106,113.016,-35.097,167.242,-35.774)

MOVES TRANS(596.638,45.955,112.995,-36.889,166.233,-37.694)

MOVES TRANS(596.969,46.714,112.942,-39.611,164.892,-40.604)

MOVES TRANS(597.300,47.794,112.812,-42.713,163.362,-43.935)

MOVES TRANS(597.505,48.931,112.608,-44.933,161.789,-46.405)  
MOVES TRANS(597.555,49.450,112.493,-46.862,160.552,-48.537)  
MOVES TRANS(597.569,50.675,112.165,-49.205,159.190,-51.106)  
MOVES TRANS(597.439,51.885,111.763,-51.139,157.849,-53.266)  
MOVES TRANS(597.346,52.358,111.583,-52.569,156.883,-54.857)  
MOVES TRANS(597.014,53.485,111.103,-53.999,156.103,-56.404)  
MOVES TRANS(596.546,54.501,110.608,-55.354,155.739,-57.788)  
MOVES TRANS(596.490,54.597,110.558,-55.972,155.790,-58.374)  
MOVES TRANS(595.934,55.395,110.122,-56.516,156.191,-58.818)  
MOVES TRANS(595.297,56.043,109.735,-57.619,156.897,-59.745)  
MOVES TRANS(594.846,56.381,109.516,-58.889,157.721,-60.819)  
MOVES TRANS(594.211,56.727,109.267,-60.509,158.556,-62.237)  
MOVES TRANS(593.818,56.877,109.144,-62.552,159.318,-64.083)  
MOVES TRANS(593.230,57.018,109.001,-64.942,159.942,-66.290)  
MOVES TRANS(592.927,57.054,108.945,-67.083,160.319,-68.294)  
MOVES TRANS(592.713,57.065,108.913,-69.117,160.593,-70.209)  
MOVES TRANS(592.234,57.046,108.862,-71.765,160.804,-72.716)  
MOVES TRANS(591.964,57.009,108.848,-74.290,160.873,-75.118)  
MOVES TRANS(591.695,56.953,108.843,-76.472,160.857,-77.195)  
MOVES TRANS(591.424,56.876,108.849,-78.289,160.777,-78.925)  
MOVES TRANS(591.339,56.847,108.853,-80.291,160.649,-80.830)  
MOVES TRANS(590.802,56.616,108.906,-83.610,160.273,-83.982)  
MOVES TRANS(590.276,56.295,109.008,-87.377,159.569,-87.542)  
MOVES TRANS(589.742,55.853,109.173,-90.573,158.732,-90.534)  
MOVES TRANS(589.211,55.265,109.414,-93.170,157.935,-92.939)  
MOVES TRANS(588.682,54.462,109.761,-95.257,157.478,-94.858)  
MOVES TRANS(588.242,53.516,110.173,-97.042,157.711,-96.521)

MOVES TRANS(587.915,52.455,110.615,-98.981,158.442,-98.362)

MOVES TRANS(587.866,52.240,110.700,-100.226,159.370,-99.583)

MOVES TRANS(587.675,50.977,111.167,-101.629,160.892,-101.005)

MOVES TRANS(587.642,49.689,111.581,-103.021,161.874,-102.395)

SPEED 1000.0, 100 MMPS ALWAYS

MOVES TRANS(594.651,79.999,206.618,-103.021,161.874,-102.395)

.END