VAR robtarget newTarget\_1;

VAR robtarget newTarget\_2;

VAR robtarget newTarget\_3;

VAR robtarget newTarget\_4;

VAR robtarget newTarget\_5;

VAR robtarget FrontEdgeWithOffset;

VAR robtarget FrontEdgeWithOffsetPlus25;

VAR robtarget LeftEdgeWithOffset;

VAR robtarget LeftEdgeWithOffsetPlus220;

VAR robtarget HoleFirstPointWithOffset;

VAR robtarget HoleSecondPointWithOffset;

VAR robtarget HoleThirdPointWithOffset;

VAR robtarget CentrePointWithOffset;

!!different constants

CONST speeddata Fast\_Speed := v1000;

CONST speeddata Slow\_Speed := v200;

CONST speeddata Very\_Slow\_Speed := v50;

CONST num Circle\_Diameter := 25;

CONST num HeightOfSuspensionElement := 448;

CONST num Distance\_LaserSensor\_Gripper := 97;

!!different variables

VAR num DistanceHole\_FirstPt\_SecondPt;

VAR num DistanceHole\_SecondPt\_ThirdPt;

VAR num Distance\_LaserSensor\_Underbody;

VAR num Distance\_Gripper\_Underbody;

VAR intnum SensedPoint\_Z;

PROC initABB()

!!initialise the robot

MoveJ RelTool(Home,0,0,0\Rz:=180),Fast\_Speed,fine,tool0\WObj:=wobj0;

WaitTime 0.5;

SetDO DO\_ActivateGripper,0;

SetDO DO\_Open0Close1Gripper,0;

SetDO DO\_ActivateLaserSensor,0;

ENDPROC

PROC ScanForFrontEdge()

!!Find the front edge of the car underbody

FrontEdgeWithOffset := [[0,0,0],[0,0,0,0],[0,0,0,0],[0,0,0,0,0,0]];

SetDO DO\_ActivateLaserSensor,0;

WaitTime 0.1;

MoveJ startScan,Fast\_Speed,fine,tooldata\_LaserSensor\WObj:=wobj0;

WaitRob \InPos;

SetDO DO\_ActivateLaserSensor,1;

WaitTime 0.1;

newTarget\_1 := startScan;

newTarget\_1.trans.y := startScan.trans.y + 10;

MoveL newTarget\_1,Fast\_Speed,fine,tooldata\_LaserSensor\WObj:=wobj0;

WaitRob \InPos;

WHILE TRUE DO

IF SensorOut = 1 THEN

newTarget\_1 := newTarget\_1;

newTarget\_1.trans.y := newTarget\_1.trans.y - 1;

MoveL newTarget\_1,Fast\_Speed,fine,tooldata\_LaserSensor\WObj:=wobj0;

IF SensorOut = 0 THEN

newTarget\_1 := newTarget\_1;

newTarget\_1.trans.y := newTarget\_1.trans.y + 0.1;

MoveL newTarget\_1,Fast\_Speed,fine,tooldata\_LaserSensor\WObj:=wobj0;

WaitRob \InPos;

FrontEdgeWithOffset := CRobT();

SetDO DO\_ActivateLaserSensor,0;

WaitTime 0.5;

FrontEdgeWithOffsetPlus25 := FrontEdgeWithOffset;

FrontEdgeWithOffsetPlus25.trans.y := FrontEdgeWithOffset.trans.y + 25;

RETURN;

ENDIF

ELSE

newTarget\_1 := newTarget\_1;

newTarget\_1.trans.y := newTarget\_1.trans.y + 10;

MoveL newTarget\_1,Fast\_Speed,fine,tooldata\_LaserSensor\WObj:=wobj0;

ENDIF

ENDWHILE

ENDPROC

PROC ScanForLeftEdge()

!!Find the left edge of the car underbody

LeftEdgeWithOffset := [[0,0,0],[0,0,0,0],[0,0,0,0],[0,0,0,0,0,0]];

MoveL FrontEdgeWithOffsetPlus25,Fast\_Speed,fine,tooldata\_LaserSensor\WObj:=wobj0;

WaitRob \InPos;

SetDO DO\_ActivateLaserSensor,1;

WaitTime 0.5;

newTarget\_2 := FrontEdgeWithOffsetPlus25;

newTarget\_2.trans.x := FrontEdgeWithOffsetPlus25.trans.x - 10;

MoveL newTarget\_2,Fast\_Speed,fine,tooldata\_LaserSensor\WObj:=wobj0;

WHILE TRUE DO

IF SensorOut = 0 THEN

newTarget\_2 := newTarget\_2;

newTarget\_2.trans.x := newTarget\_2.trans.x + 1;

MoveL newTarget\_2,Fast\_Speed,fine,tooldata\_LaserSensor\WObj:=wobj0;

IF SensorOut = 1 THEN

newTarget\_2 := newTarget\_2;

newTarget\_2.trans.x := newTarget\_2.trans.x - 0.1;

MoveL newTarget\_2,Fast\_Speed,fine,tooldata\_LaserSensor\WObj:=wobj0;

WaitRob \InPos;

LeftEdgeWithOffset := CRobT();

SetDO DO\_ActivateLaserSensor,0;

WaitTime 1;

RETURN;

ENDIF

ELSE

newTarget\_2 := newTarget\_2;

newTarget\_2.trans.x := newTarget\_2.trans.x - 10;

MoveL newTarget\_2,Fast\_Speed,fine,tooldata\_LaserSensor\WObj:=wobj0;

ENDIF

ENDWHILE

ENDPROC

PROC FindFirstPointOfHole()

!!Find the first point in the hole

HoleFirstPointWithOffset := [[0,0,0],[0,0,0,0],[0,0,0,0],[0,0,0,0,0,0]];

LeftEdgeWithOffsetPlus220 := LeftEdgeWithOffset;

LeftEdgeWithOffsetPlus220.trans.x := LeftEdgeWithOffset.trans.x + 220;

MoveL LeftEdgeWithOffsetPlus220,Fast\_Speed,fine,tooldata\_LaserSensor\WObj:=wobj0;

WaitRob \InPos;

SetDO DO\_ActivateLaserSensor,1;

WaitTime 0.5;

newTarget\_3 := LeftEdgeWithOffsetPlus220;

newTarget\_3.trans.y := LeftEdgeWithOffsetPlus220.trans.y + 1;

MoveL newTarget\_3,Slow\_Speed,fine,tooldata\_LaserSensor\WObj:=wobj0;

WHILE TRUE DO

IF SensorOut = 0 THEN

newTarget\_3 := newTarget\_3;

newTarget\_3.trans.y := newTarget\_3.trans.y - 0.1;

MoveL newTarget\_3,Slow\_Speed,fine,tooldata\_LaserSensor\WObj:=wobj0;

IF SensorOut = 1 THEN

newTarget\_3 := newTarget\_3;

newTarget\_3.trans.y := newTarget\_3.trans.y + 0.01;

MoveL newTarget\_3,Slow\_Speed,fine,tooldata\_LaserSensor\WObj:=wobj0;

WaitRob \InPos;

HoleFirstPointWithOffset := CRobT();

SetDO DO\_ActivateLaserSensor,0;

WaitTime 0.5;

WaitRob \InPos;

SensedPoint\_Z := SensedPoint;

Distance\_LaserSensor\_Underbody := HoleFirstPointWithOffset.trans.z - SensedPoint\_Z\*1000;

Distance\_Gripper\_Underbody := Distance\_LaserSensor\_Underbody - Distance\_LaserSensor\_Gripper;

RETURN;

ENDIF

ELSE

newTarget\_3 := newTarget\_3;

newTarget\_3.trans.y := newTarget\_3.trans.y + 1;

MoveL newTarget\_3,Slow\_Speed,fine,tooldata\_LaserSensor\WObj:=wobj0;

ENDIF

ENDWHILE

ENDPROC

PROC FindSecondPointOfHole()

!!Find the second point in the hole

SetDO DO\_ActivateLaserSensor,1;

WaitTime 0.5;

HoleSecondPointWithOffset := [[0,0,0],[0,0,0,0],[0,0,0,0],[0,0,0,0,0,0]];

newTarget\_4 := HoleFirstPointWithOffset;

newTarget\_4.trans.y := HoleFirstPointWithOffset.trans.y + 5;

MoveL newTarget\_4,Very\_Slow\_Speed,fine,tooldata\_LaserSensor\WObj:=wobj0;

WaitRob \InPos;

WHILE TRUE DO

IF SensorOut = 1 THEN

newTarget\_4 := newTarget\_4;

newTarget\_4.trans.y := newTarget\_4.trans.y - 0.1;

MoveL newTarget\_4,Very\_Slow\_Speed,fine,tooldata\_LaserSensor\WObj:=wobj0;

IF SensorOut = 0 THEN

newTarget\_4 := newTarget\_4;

newTarget\_4.trans.y := newTarget\_4.trans.y + 0.01;

MoveL newTarget\_4,Very\_Slow\_Speed,fine,tooldata\_LaserSensor\WObj:=wobj0;

WaitRob \InPos;

HoleSecondPointWithOffset := CRobT();

SetDO DO\_ActivateLaserSensor,0;

WaitTime 0.5;

RETURN;

ENDIF

ELSE

newTarget\_4 := newTarget\_4;

newTarget\_4.trans.y := newTarget\_4.trans.y + 1;

MoveL newTarget\_4,Very\_Slow\_Speed,fine,tooldata\_LaserSensor\WObj:=wobj0;

ENDIF

ENDWHILE

ENDPROC

PROC FindThirdPointOfHole()

!!Find the third point in the hole

SetDO DO\_ActivateLaserSensor,1;

WaitTime 0.5;

HoleThirdPointWithOffset := [[0,0,0],[0,0,0,0],[0,0,0,0],[0,0,0,0,0,0]];

newTarget\_5 := HoleSecondPointWithOffset;

newTarget\_5.trans.x := HoleSecondPointWithOffset.trans.x + 5;

MoveL newTarget\_5,Very\_Slow\_Speed,fine,tooldata\_LaserSensor\WObj:=wobj0;

WaitRob \InPos;

WHILE TRUE DO

IF SensorOut = 1 THEN

newTarget\_5 := newTarget\_5;

newTarget\_5.trans.x := newTarget\_5.trans.x - 0.1;

MoveL newTarget\_5,Very\_Slow\_Speed,fine,tooldata\_LaserSensor\WObj:=wobj0;

IF SensorOut = 0 THEN

newTarget\_5 := newTarget\_5;

newTarget\_5.trans.x := newTarget\_5.trans.x + 0.01;

MoveL newTarget\_5,Very\_Slow\_Speed,fine,tooldata\_LaserSensor\WObj:=wobj0;

WaitRob \InPos;

HoleThirdPointWithOffset := CRobT();

WaitTime 0.5;

SetDO DO\_ActivateLaserSensor,0;

WaitTime 0.5;

RETURN;

ENDIF

ELSE

newTarget\_5 := newTarget\_5;

newTarget\_5.trans.x := newTarget\_5.trans.x + 1;

MoveL newTarget\_5,Very\_Slow\_Speed,fine,tooldata\_LaserSensor\WObj:=wobj0;

ENDIF

ENDWHILE

ENDPROC

PROC CalculateCentre()

!!Calculate centre of the hole

CentrePointWithOffset := [[0,0,0],[0,0,0,0],[0,0,0,0],[0,0,0,0,0,0]];

DistanceHole\_FirstPt\_SecondPt := HoleSecondPointWithOffset.trans.y - HoleFirstPointWithOffset.trans.y;

DistanceHole\_SecondPt\_ThirdPt := HoleThirdPointWithOffset.trans.x - HoleSecondPointWithOffset.trans.x;

CentrePointWithOffset := HoleFirstPointWithOffset;

CentrePointWithOffset.trans.x := HoleFirstPointWithOffset.trans.x + (DistanceHole\_FirstPt\_SecondPt/2);

CentrePointWithOffset.trans.y := HoleFirstPointWithOffset.trans.y + (DistanceHole\_SecondPt\_ThirdPt/2);

CentrePointWithOffset.trans.z := HoleFirstPointWithOffset.trans.z + (HeightOfSuspensionElement-Distance\_Gripper\_Underbody);

MoveJ CentrePointWithOffset,Very\_Slow\_Speed,fine,tooldata\_LaserSensor\WObj:=wobj0;

WaitRob \InPos;

WaitTime 0.5;

ENDPROC

PROC GetAndPlaceSuspensionElement()

!! get the suspension element

SetDO DO\_ActivateGripper,1;

WaitTime 0.5;

SetDO DO\_Open0Close1Gripper,0;

WaitTime 0.5;

MoveJ getAbove\_1,Fast\_Speed,fine,tooldata\_Gripper\WObj:=wobj0;

MoveL Offs(getAbove\_1,0,0,-200),Fast\_Speed,fine,tooldata\_Gripper\WObj:=wobj0;

MoveL getSuspension\_1,Slow\_Speed,fine,tooldata\_Gripper\WObj:=wobj0;

WaitRob \InPos;

SetDO DO\_Open0Close1Gripper,1;

WaitTime 1;

MoveL getAbove\_1,Fast\_Speed,fine,tooldata\_Gripper\WObj:=wobj0;

!!Place the gripper in the hole

MoveJ HelpTarget,Slow\_Speed,fine,tooldata\_Gripper\WObj:=wobj0;

MoveJ CentrePointWithOffset,Slow\_Speed,fine,tooldata\_Gripper\WObj:=wobj0;

WaitRob \InPos;

WaitTime 0.5;

MoveL Offs(CentrePointWithOffset,0,0,-275),Very\_Slow\_Speed,fine,tooldata\_Gripper\WObj:=wobj0;

WaitRob \InPos;

WaitTime 0.5;

SetDO DO\_Open0Close1Gripper,0;

WaitTime 0.5;

SetDO DO\_ActivateGripper,0;

MoveL CentrePointWithOffset,Slow\_Speed,fine,tooldata\_Gripper\WObj:=wobj0;

ENDPROC

PROC main()

initABB;

WaitRob \InPos;

ScanForFrontEdge;

WaitRob \InPos;

ScanForLeftEdge;

WaitRob \InPos;

FindFirstPointOfHole;

WaitRob \InPos;

FindSecondPointOfHole;

WaitRob \InPos;

FindThirdPointOfHole;

WaitRob \InPos;

CalculateCentre;

WaitRob \InPos;

GetAndPlaceSuspensionElement;

WaitRob \InPos;

ENDPROC

PROC Start\_Weld()

TempTarget\_1:=WeldPoint;

TempTarget\_1.trans.x:=TempTarget\_1.trans.x+x1;

MoveL TempTarget\_1,Very\_Slow\_Speed,fine,Tooldata\_WeldGun\WObj:=wobj0;

WaitRob\InPos;

TempTarget\_1.trans.z:=TempTarget\_1.trans.z+2;

MoveL TempTarget\_1,Slow\_Speed,fine,Tooldata\_WeldGun\WObj:=wobj0;

WaitRob\InPos;

TempTarget\_1.trans.x :=TempTarget\_1.trans.x+x2;

MoveL TempTarget\_1,Slow\_Speed,fine,Tooldata\_WeldGun\WObj:=wobj0;

WaitRob\InPos;

TempTarget\_1.trans.z:=TempTarget\_1.trans.z-2;

MoveL TempTarget\_1,Slow\_Speed,fine,Tooldata\_WeldGun\WObj:=wobj0;

WaitRob\InPos;

TempTarget\_1.trans.x:=TempTarget\_1.trans.x+x3;

MoveL TempTarget\_1,Very\_Slow\_Speed,fine,Tooldata\_WeldGun\WObj:=wobj0;

WaitRob\InPos;

TempTarget\_1.trans.z:=TempTarget\_1.trans.z+2;

MoveL TempTarget\_1,Slow\_Speed,fine,Tooldata\_WeldGun\WObj:=wobj0;

WaitRob\InPos;

TempTarget\_1.trans.x:=TempTarget\_1.trans.x+x2;

MoveL TempTarget\_1,Very\_Slow\_Speed,fine,Tooldata\_WeldGun\WObj:=wobj0;

WaitRob\InPos;

TempTarget\_1.trans.z:=TempTarget\_1.trans.z-2;

MoveL TempTarget\_1,Slow\_Speed,fine,Tooldata\_WeldGun\WObj:=wobj0;

WaitRob\InPos;

TempTarget\_1.trans.x := TempTarget\_1.trans.x+x1;

MoveL TempTarget\_1,Very\_Slow\_Speed,fine,Tooldata\_WeldGun\WObj:=wobj0;

WaitRob\InPos;

ENDPROC