APPENDIX D
In-Built Geometric Entities Used in Chapter 7

This appendix describes the in-built geometric entity types that were used in the Knowledge-Based software system reported in Chapter 7. A brief description of each entity type is given, followed by the EXPRESS definition of its constituent sub-members.

D.1 POINT

This is the most basic geometric entity type, containing merely the 3 Cartesian co-ordinates of a point.

```
ENTITY point;
x : REAL;
y : REAL;
z : REAL;
END_ENTITY;
```

D.2 POLY_LOOP

This defines a closed loop of POINT instances.

```
ENTITY poly_loop;
polygon : BAG OF point;
END_ENTITY;
```

D.3 FACE_BOUND

This defines one boundary (internal or external) of a FACE and consists of a reference to a planar POLY_LOOP and a BOOLEAN value indicating the orientation of that POLY_LOOP with respect to the FACE that it forms a boundary of. The orientation must be specified since individual POLY_LOOP instances can be used to define more than one FACE, e.g. the POLY_LOOP forming the inner bound (cut-out) of a face could also form the outer bound (perimeter) of a different (but co-planar) face.

```
ENTITY face_bound;
orientation : BOOLEAN;
bound : poly_loop;
END_ENTITY;
```

D.4 FACE

This defines a bounded surface by a collection of references to unique FACE_BOUND instances. The first FACE_BOUND in the collection defines the outer bound or perimeter of the FACE. Any later FACE_BOUND instances designate interior bounds (i.e. cut-outs or holes) in the FACE.

It is important to note that the geometric modeler requires the oriented exterior bound to be of the opposite sense the oriented interior bounds. In other words, while looping around the POINT instances referenced by each FACE_BOUND belonging to a FACE, *and* doing so in the direction determined by the respective ‘orientation’ field, the direction of the loop must be opposite that of the outer loop.

```
ENTITY face;
bounds : BAG OF UNIQUE face_bound.
END_ENTITY;
```