

Request #: HUTRR113  
Title: Additional Sensor Usages for Multi-Person Detection  
Spec Release: 1.4  
Requester: Sergii Liashenko  
Company: Microsoft

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Current Status: **Approved**  
Priority: Normal  
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Required Voter: Intel Corporation  
Required Voter: HP  
Required Voter: Dell Inc  
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Voting Begins: 20<sup>th</sup> November 2023  
Voting Ends: 27<sup>th</sup> November 2023  
Voting Result: 5-0

**Summary:**

Add new Usages to the Sensors Page (0x20) to support Human Presence Detection sensors with Multi-Person Detection capability.

**Background/Scenario:**

Human-Presence sensors detect the presence of humans in the sensor's field of view. With advancements in Presence Sensing technologies, new capabilities are introduced in Human-Presence sensors, such as tracking the presence of more than one person simultaneously and providing detailed information about each detected person (e.g., position, head orientation, attention, etc.). This information allows for enabling various new experiences in the host OS, e.g., preventing on-lookers from reading the screen.

**Proposal:**

Add new Sensor Page Usages for data fields related to Multi-Person detection.

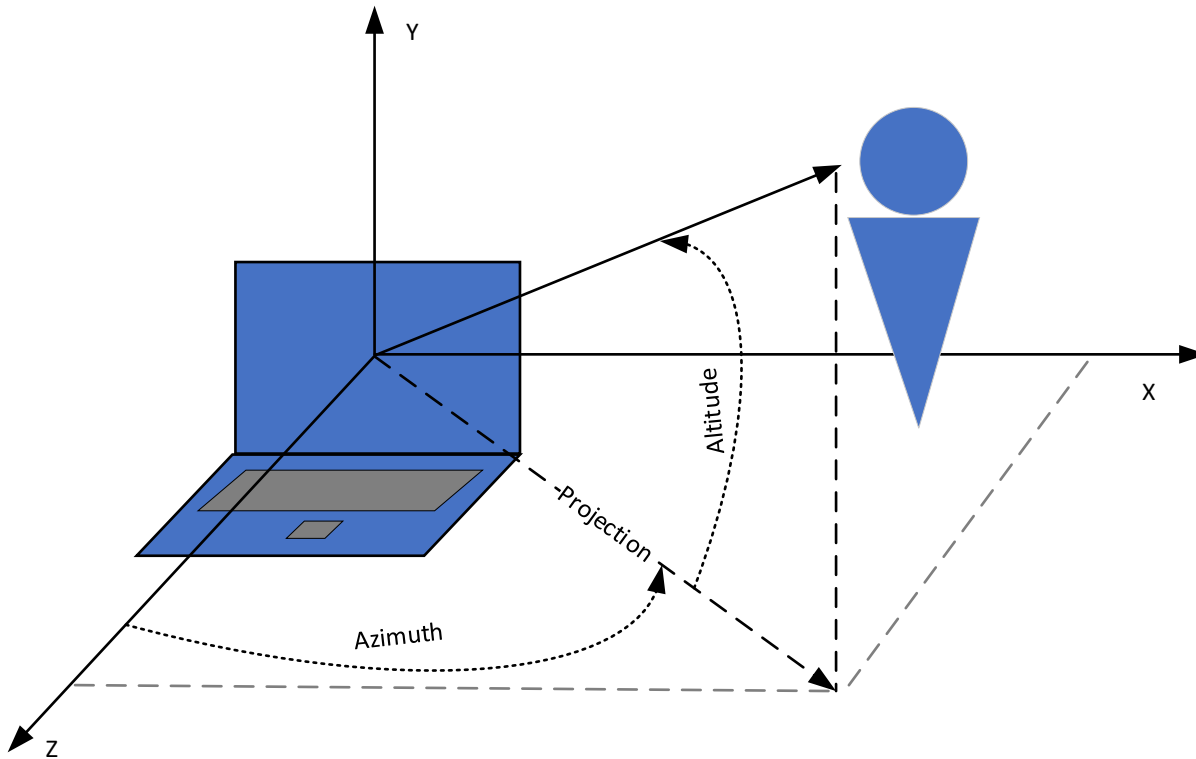
Add to Table 23.1: Sensors Page

Usage Id	Usage Name	Usage Type
0x04BE	Data Field: Human Head Azimuth	SV
0x04BF	Data Field: Human Head Altitude	SV
0x04C0	Data Field: Human Head Roll	SV
0x04C1	Data Field: Human Head Pitch	SV
0x04C2	Data Field: Human Head Yaw	SV
0x04C3	Data Field: Human Correlation Id	SV

Add to Table 23.6 Biometric Sensor Field Usages

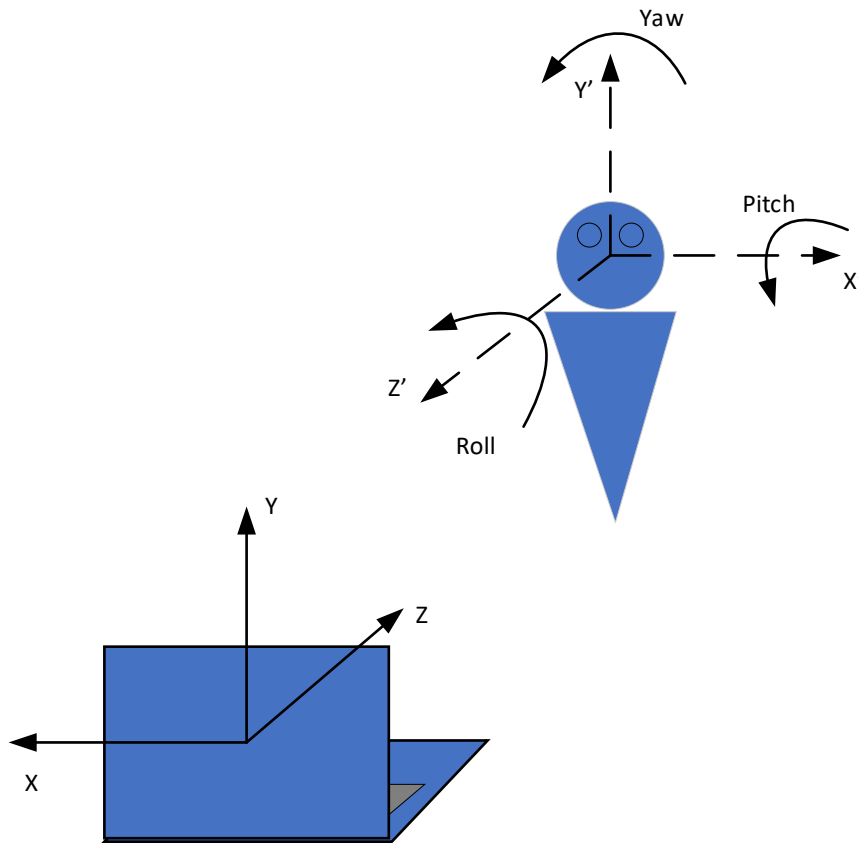
Usage Name	Usage Type	Description
Data Field: Human Head Azimuth	SV	Indicates the azimuth angle in degrees at which a person's head is located relative to the device.
Data Field: Human Head Altitude	SV	Indicates the altitude angle in degrees at which a person's head is located relative to the device.
Data Field: Human Head Roll	SV	Indicates the Roll angle of a person's head in degrees relative to the device.
Data Field: Human Head Pitch	SV	Indicates the Pitch angle of a person's head in degrees relative to the device.
Data Field: Human Head Yaw	SV	Indicates the Yaw angle of a person's head in degrees relative to the device.
Data Field: Human Correlation Id	SV	Indicates a non-persistent correlation identifier of a person within the current session. The session is implementation specific, e.g., it may be the sensor's current active power state cycle. The purpose of this identifier is to distinguish people from one another as they move within the sensor's field of view.

Head position parameters:



- The head position is specified as Azimuth and Altitude angles.
- Azimuth is the angle between Z axis and XZ-projection of the vector pointing from the device to the center of the person's face. Range  $[-90, 90]$ . The angle value is positive in the counterclockwise rotation around Y axis.
- Altitude is the angle between the vector pointing from the device to the center of the person's face and its XZ-projection. Range  $[-90, 90]$ . Positive values specify an angle toward the positive Y axis.
- The conventions for X, Y, Z axes and rotation angles are aligned with conventions used for Motion and Orientation sensors, which are based on W3C Device Orientation Draft Specification. The reason W3C spec is used is to simplify exposing Sensors API to W3C in future, to be consumed in Progressive Web Apps and other web applications.
- Axes start at the center of the device's screen.
- The center of the person's face is considered a point between the eyes.
- The X axis is in the plane of the device's screen and is positive towards the right hand side of the screen from the perspective of a user facing the device.
- The Y axis is in the plane of the screen is positive towards the top of the screen.
- The Z is perpendicular to the screen, positive toward a user facing the device.
- Axes are fixed relative to the device and don't change with the device's rotation.
- For non screen-based devices the axes are defined relative to the devices' front panel.

Head orientation parameters:



- The head orientation is specified in intrinsic Tait-Bryan angles applied in Roll, Pitch, Yaw order.
- Roll is the counterclockwise rotation of the person's head around  $Z'$  axis, in degrees. Range  $[0, 360)$ . In the zero position the  $Z'$  axis is parallel to the device's  $Z$  axis and points from the center of the person's face towards the device.
- Pitch is the counterclockwise rotation of the person's head around  $X'$  axis, in degrees. Range  $[-180, 180)$ . In the zero position the  $X'$  axis is parallel to the device's  $X$  axis and points from the center of the person's face rightwards from the device's perspective.
- Yaw is the counterclockwise rotation of the person's head around  $Y'$  axis, in degrees. Range  $[-90, 90)$ . In the zero position the  $Y'$  axis is parallel to the device's  $Y$  axis and points from the center of the person's face upwards.

## Sample Descriptor .wara:

The sample HID Report Descriptor below defines:

- A Feature Report containing thresholds.
- An Input Report containing multi-person data for up to three persons.
- Each person's data is defined in a separate Ordinal-Instance logical collection.
- Each person's data contains: proximity, head azimuth, head altitude, head pitch, head roll, head yaw, correlation id.
- NullState is supported for each data field, so that empty ordinal instances can be filled with null values when less than three persons were detected.

```
[[usagePage]]
```

```
id = 0x20
```

```
name = 'Sensors'
```

```
[[usagePage.usage]]
```

```
id = 0x04BE
```

```
name = 'Data Field: Human Head Azimuth'
```

```
types = ['SV']
```

```
[[usagePage.usage]]
```

```
id = 0x04BF
```

```
name = 'Data Field: Human Head Altitude'
```

```
types = ['SV']
```

```
[[usagePage.usage]]
```

```
id = 0x04C0
```

```
name = 'Data Field: Human Head Roll'
```

```
types = ['SV']
```

```
[[usagePage.usage]]
```

```
id = 0x04C1
```

```
name = 'Data Field: Human Head Pitch'
```

```
types = ['SV']
```

```
[[usagePage.usage]]
```

```
id = 0x04C2
```

```
name = 'Data Field: Human Head Yaw'
```

```
types = ['SV']
```

```
[[usagePage.usage]]
```

```
id = 0x04C3
```

```
name = 'Data Field: Human Correlation Id'
```

```
types = ['SV']
```

```
[[applicationCollection]]
```

```
usage = ['Sensors', 'Sensor']
```

```
[[applicationCollection.featureReport]]
```

```
[[applicationCollection.featureReport.physicalCollection]]
```

```
usage = ['Sensors', 'Biometric: Human Presence']
```

```
[[applicationCollection.featureReport.physicalCollection.variableItem]]
```

```
usageTransform = ['Sensors', 'Data Field: Human Proximity Range', 'Modifier: Threshold Low']
```

```
logicalValueRange = [0, 65534]
```

```
[[applicationCollection.featureReport.physicalCollection.variableItem]]
```

```
usageTransform = ['Sensors', 'Data Field: Human Head Azimuth', 'Modifier: Change Sensitivity Absolute']
```

```
logicalValueRange = [-90, 90]
```

```
[[applicationCollection.featureReport.physicalCollection.variableItem]]
```

```
usageTransform = ['Sensors', 'Data Field: Human Head Altitude', 'Modifier: Change Sensitivity Absolute']
```

```
logicalValueRange = [-90, 90]
```

```
[[applicationCollection.featureReport.physicalCollection.variableItem]]
usageTransform = ['Sensors', 'Data Field: Human Head Roll', 'Modifier: Change Sensitivity Absolute']
logicalValueRange = [0, 360]
```

```
[[applicationCollection.featureReport.physicalCollection.variableItem]]
usageTransform = ['Sensors', 'Data Field: Human Head Pitch', 'Modifier: Change Sensitivity Absolute']
logicalValueRange = [-180, 180]
```

```
[[applicationCollection.featureReport.physicalCollection.variableItem]]
usageTransform = ['Sensors', 'Data Field: Human Head Yaw', 'Modifier: Change Sensitivity Absolute']
logicalValueRange = [-90, 90]
```

```
[[applicationCollection.inputReport]]
```

```
[[applicationCollection.inputReport.physicalCollection]]
usage = ['Sensors', 'Biometric: Human Presence']
```

```
[[applicationCollection.inputReport.physicalCollection.logicalCollection]]
usage = ['Ordinal', 'Instance 1']
```

```
[[applicationCollection.inputReport.physicalCollection.logicalCollection.variableItem]]
usage = ['Sensors', 'Data Field: Human Proximity Range']
logicalValueRange = [0, 65534]
reportFlags = ['NullState']
```

```
[[applicationCollection.inputReport.physicalCollection.logicalCollection.variableItem]]
usage = ['Sensors', 'Data Field: Human Head Azimuth']
logicalValueRange = [-90, 90]
reportFlags = ['NullState']
```

```
[[applicationCollection.inputReport.physicalCollection.logicalCollection.variableItem]]
usage = ['Sensors', 'Data Field: Human Head Altitude']
logicalValueRange = [-90, 90]
reportFlags = ['NullState']
```

```
[[applicationCollection.inputReport.physicalCollection.logicalCollection.variableItem]]
usage = ['Sensors', 'Data Field: Human Head Roll']
logicalValueRange = [0, 360]
reportFlags = ['NullState']
```

```
[[applicationCollection.inputReport.physicalCollection.logicalCollection.variableItem]]
usage = ['Sensors', 'Data Field: Human Head Pitch']
logicalValueRange = [-180, 180]
reportFlags = ['NullState']
```

```
[[applicationCollection.inputReport.physicalCollection.logicalCollection.variableItem]]
usage = ['Sensors', 'Data Field: Human Head Yaw']
logicalValueRange = [-90, 90]
reportFlags = ['NullState']
```

```
[[applicationCollection.inputReport.physicalCollection.logicalCollection.variableItem]]
usage = ['Sensors', 'Data Field: Human Correlation Id']
logicalValueRange = [0, 65534]
reportFlags = ['NullState']
```

```
[[applicationCollection.inputReport.physicalCollection.logicalCollection]]
usage = ['Ordinal', 'Instance 2']
```

```
[[applicationCollection.inputReport.physicalCollection.logicalCollection.variableItem]]
usage = ['Sensors', 'Data Field: Human Proximity Range']
logicalValueRange = [0, 65534]
reportFlags = ['NullState']
```

```
[[applicationCollection.inputReport.physicalCollection.logicalCollection.variableItem]]
usage = ['Sensors', 'Data Field: Human Head Azimuth']
logicalValueRange = [-90, 90]
reportFlags = ['NullState']
```

```
[[applicationCollection.inputReport.physicalCollection.logicalCollection.variableItem]]
usage = ['Sensors', 'Data Field: Human Head Altitude']
logicalValueRange = [-90, 90]
```

```
reportFlags = ['NullState']

[[applicationCollection.inputReport.physicalCollection.logicalCollection.variableItem]]
usage = ['Sensors', 'Data Field: Human Head Roll']
logicalValueRange = [0, 360]
reportFlags = ['NullState']

[[applicationCollection.inputReport.physicalCollection.logicalCollection.variableItem]]
usage = ['Sensors', 'Data Field: Human Head Pitch']
logicalValueRange = [-180, 180]
reportFlags = ['NullState']

[[applicationCollection.inputReport.physicalCollection.logicalCollection.variableItem]]
usage = ['Sensors', 'Data Field: Human Head Yaw']
logicalValueRange = [-90, 90]
reportFlags = ['NullState']

[[applicationCollection.inputReport.physicalCollection.logicalCollection.variableItem]]
usage = ['Sensors', 'Data Field: Human Correlation Id']
logicalValueRange = [0, 65534]
reportFlags = ['NullState']

[[applicationCollection.inputReport.physicalCollection.logicalCollection]]
usage = ['Ordinal', 'Instance 3']

[[applicationCollection.inputReport.physicalCollection.logicalCollection.variableItem]]
usage = ['Sensors', 'Data Field: Human Proximity Range']
logicalValueRange = [0, 65534]
reportFlags = ['NullState']

[[applicationCollection.inputReport.physicalCollection.logicalCollection.variableItem]]
usage = ['Sensors', 'Data Field: Human Head Azimuth']
logicalValueRange = [-90, 90]
reportFlags = ['NullState']

[[applicationCollection.inputReport.physicalCollection.logicalCollection.variableItem]]
usage = ['Sensors', 'Data Field: Human Head Altitude']
logicalValueRange = [-90, 90]
reportFlags = ['NullState']

[[applicationCollection.inputReport.physicalCollection.logicalCollection.variableItem]]
usage = ['Sensors', 'Data Field: Human Head Roll']
logicalValueRange = [0, 360]
reportFlags = ['NullState']

[[applicationCollection.inputReport.physicalCollection.logicalCollection.variableItem]]
usage = ['Sensors', 'Data Field: Human Head Pitch']
logicalValueRange = [-180, 180]
reportFlags = ['NullState']

[[applicationCollection.inputReport.physicalCollection.logicalCollection.variableItem]]
usage = ['Sensors', 'Data Field: Human Head Yaw']
logicalValueRange = [-90, 90]
reportFlags = ['NullState']

[[applicationCollection.inputReport.physicalCollection.logicalCollection.variableItem]]
usage = ['Sensors', 'Data Field: Human Correlation Id']
logicalValueRange = [0, 65534]
reportFlags = ['NullState']
```

## Sample Descriptor:

```
0x05, 0x20, // UsagePage(Sensors[0x0020])
0x09, 0x01, // UsageId(Sensor[0x0001])
0xA1, 0x01, // Collection(Application)
0x85, 0x01, // ReportId(1)
0x09, 0x11, // UsageId(Biometric: Human Presence[0x0011])
0xA1, 0x00, // Collection(Physical)
0x0A, 0xB2, 0x74, // UsageId(Data Field: Human Proximity Range || (Modifier: Threshold
Low)[0x74B2])
0x15, 0x00, // LogicalMinimum(0)
0x27, 0xFE, 0xFF, 0x00, 0x00, // LogicalMaximum(65,534)
0x95, 0x01, // ReportCount(1)
0x75, 0x10, // ReportSize(16)
0xB1, 0x02, // Feature(Data, Variable, Absolute, NoWrap, Linear, PreferredState,
NonnullPosition, NonVolatile, BitField)
0x0A, 0xBE, 0x14, // UsageId(Data Field: Human Head Azimuth || (Modifier: Change
Sensitivity Absolute)[0x14BE])
0x0A, 0xBF, 0x14, // UsageId(Data Field: Human Head Altitude || (Modifier: Change
Sensitivity Absolute)[0x14BF])
0x15, 0xA6, // LogicalMinimum(-90)
0x25, 0x5A, // LogicalMaximum(90)
0x95, 0x02, // ReportCount(2)
0x75, 0x08, // ReportSize(8)
0xB1, 0x02, // Feature(Data, Variable, Absolute, NoWrap, Linear, PreferredState,
NonnullPosition, NonVolatile, BitField)
0x0A, 0xC0, 0x14, // UsageId(Data Field: Human Head Roll || (Modifier: Change
Sensitivity Absolute)[0x14C0])
0x15, 0x00, // LogicalMinimum(0)
0x26, 0x68, 0x01, // LogicalMaximum(360)
0x95, 0x01, // ReportCount(1)
0x75, 0x09, // ReportSize(9)
0xB1, 0x02, // Feature(Data, Variable, Absolute, NoWrap, Linear, PreferredState,
NonnullPosition, NonVolatile, BitField)
0x0A, 0xC1, 0x14, // UsageId(Data Field: Human Head Pitch || (Modifier: Change
Sensitivity Absolute)[0x14C1])
0x16, 0x4C, 0xFF, // LogicalMinimum(-180)
0x26, 0xB4, 0x00, // LogicalMaximum(180)
0xB1, 0x02, // Feature(Data, Variable, Absolute, NoWrap, Linear, PreferredState,
NonnullPosition, NonVolatile, BitField)
0x0A, 0xC2, 0x14, // UsageId(Data Field: Human Head Yaw || (Modifier: Change
Sensitivity Absolute)[0x14C2])
0x15, 0xA6, // LogicalMinimum(-90)
0x25, 0x5A, // LogicalMaximum(90)
0x75, 0x08, // ReportSize(8)
0xB1, 0x02, // Feature(Data, Variable, Absolute, NoWrap, Linear, PreferredState,
NonnullPosition, NonVolatile, BitField)
0xC0, // EndCollection()
0x75, 0x06, // ReportSize(6)
0xB1, 0x03, // Feature(Constant, Variable, Absolute, NoWrap, Linear, PreferredState,
NonnullPosition, NonVolatile, BitField)
0x09, 0x11, // UsageId(Biometric: Human Presence[0x0011])
0xA1, 0x00, // Collection(Physical)
0x05, 0x0A, // UsagePage(Ordinal[0x000A])
0x09, 0x01, // UsageId(Instance 1[0x0001])
0xA1, 0x02, // Collection(Logical)
0x05, 0x20, // UsagePage(Sensors[0x0020])
0x0A, 0xB2, 0x04, // UsageId(Data Field: Human Proximity Range[0x04B2])
0x15, 0x00, // LogicalMinimum(0)
0x27, 0xFE, 0xFF, 0x00, 0x00, // LogicalMaximum(65,534)
0x75, 0x10, // ReportSize(16)
0x81, 0x42, // Input(Data, Variable, Absolute, NoWrap, Linear,
PreferredState, NullState, BitField)
0x0A, 0xBE, 0x04, // UsageId(Data Field: Human Head Azimuth[0x04BE])
```



```

0x0A, 0xBF, 0x04, // UsageId(Data Field: Human Head Altitude[0x04BF])
0x15, 0xA6, // LogicalMinimum(-90)
0x25, 0x5A, // LogicalMaximum(90)
0x95, 0x02, // ReportCount(2)
0x75, 0x08, // ReportSize(8)
0x81, 0x42, // Input(Data, Variable, Absolute, Nowrap, Linear,
PreferredState, NullState, BitField)
0x0A, 0xC0, 0x04, // UsageId(Data Field: Human Head Roll[0x04C0])
0x15, 0x00, // LogicalMinimum(0)
0x26, 0x68, 0x01, // LogicalMaximum(360)
0x95, 0x01, // ReportCount(1)
0x75, 0x09, // ReportSize(9)
0x81, 0x42, // Input(Data, Variable, Absolute, Nowrap, Linear,
PreferredState, NullState, BitField)
0x0A, 0xC1, 0x04, // UsageId(Data Field: Human Head Pitch[0x04C1])
0x16, 0x4C, 0xFF, // LogicalMinimum(-180)
0x26, 0xB4, 0x00, // LogicalMaximum(180)
0x81, 0x42, // Input(Data, Variable, Absolute, Nowrap, Linear,
PreferredState, NullState, BitField)
0x0A, 0xC2, 0x04, // UsageId(Data Field: Human Head Yaw[0x04C2])
0x15, 0xA6, // LogicalMinimum(-90)
0x25, 0x5A, // LogicalMaximum(90)
0x75, 0x08, // ReportSize(8)
0x81, 0x42, // Input(Data, Variable, Absolute, Nowrap, Linear,
PreferredState, NullState, BitField)
0x0A, 0xC3, 0x04, // UsageId(Data Field: Human Correlation Id[0x04C3])
0x15, 0x00, // LogicalMinimum(0)
0x27, 0xFE, 0xFF, 0x00, 0x00, // LogicalMaximum(65,534)
0x75, 0x10, // ReportSize(16)
0x81, 0x42, // Input(Data, Variable, Absolute, Nowrap, Linear,
PreferredState, NullState, BitField)
0xC0, // EndCollection()
0x05, 0x0A, // UsagePage(Ordinal[0x000A])
0x09, 0x02, // UsageId(Instance 2[0x0002])
0xA1, 0x02, // Collection(Logical)
0x05, 0x20, // UsagePage(Sensors[0x0020])
0x0A, 0xB2, 0x04, // UsageId(Data Field: Human Proximity Range[0x04B2])
0x81, 0x42, // Input(Data, Variable, Absolute, Nowrap, Linear,
PreferredState, NullState, BitField)
0x0A, 0xBE, 0x04, // UsageId(Data Field: Human Head Azimuth[0x04BE])
0x0A, 0xBF, 0x04, // UsageId(Data Field: Human Head Altitude[0x04BF])
0x15, 0xA6, // LogicalMinimum(-90)
0x25, 0x5A, // LogicalMaximum(90)
0x95, 0x02, // ReportCount(2)
0x75, 0x08, // ReportSize(8)
0x81, 0x42, // Input(Data, Variable, Absolute, Nowrap, Linear,
PreferredState, NullState, BitField)
0x0A, 0xC0, 0x04, // UsageId(Data Field: Human Head Roll[0x04C0])
0x15, 0x00, // LogicalMinimum(0)
0x26, 0x68, 0x01, // LogicalMaximum(360)
0x95, 0x01, // ReportCount(1)
0x75, 0x09, // ReportSize(9)
0x81, 0x42, // Input(Data, Variable, Absolute, Nowrap, Linear,
PreferredState, NullState, BitField)
0x0A, 0xC1, 0x04, // UsageId(Data Field: Human Head Pitch[0x04C1])
0x16, 0x4C, 0xFF, // LogicalMinimum(-180)
0x26, 0xB4, 0x00, // LogicalMaximum(180)
0x81, 0x42, // Input(Data, Variable, Absolute, Nowrap, Linear,
PreferredState, NullState, BitField)
0x0A, 0xC2, 0x04, // UsageId(Data Field: Human Head Yaw[0x04C2])
0x15, 0xA6, // LogicalMinimum(-90)
0x25, 0x5A, // LogicalMaximum(90)
0x75, 0x08, // ReportSize(8)

```

```

0x81, 0x42, // Input(Data, Variable, Absolute, Nowrap, Linear,
PreferredState, NullState, BitField)
0x0A, 0xC3, 0x04, // UsageId(Data Field: Human Correlation Id[0x04C3])
0x15, 0x00, // LogicalMinimum(0)
0x27, 0xFE, 0xFF, 0x00, 0x00, // LogicalMaximum(65,534)
0x75, 0x10, // ReportSize(16)
0x81, 0x42, // Input(Data, Variable, Absolute, Nowrap, Linear,
PreferredState, NullState, BitField)
0xC0, // EndCollection()
0x05, 0x0A, // UsagePage(Ordinal[0x000A])
0x09, 0x03, // UsageId(Instance 3[0x0003])
0xA1, 0x02, // Collection(Logical)
0x05, 0x20, // UsagePage(Sensors[0x0020])
0x0A, 0xB2, 0x04, // UsageId(Data Field: Human Proximity Range[0x04B2])
0x81, 0x42, // Input(Data, Variable, Absolute, Nowrap, Linear,
PreferredState, NullState, BitField)
0x0A, 0xBE, 0x04, // UsageId(Data Field: Human Head Azimuth[0x04BE])
0x0A, 0xBF, 0x04, // UsageId(Data Field: Human Head Altitude[0x04BF])
0x15, 0xA6, // LogicalMinimum(-90)
0x25, 0x5A, // LogicalMaximum(90)
0x95, 0x02, // ReportCount(2)
0x75, 0x08, // ReportSize(8)
0x81, 0x42, // Input(Data, Variable, Absolute, Nowrap, Linear,
PreferredState, NullState, BitField)
0x0A, 0xC0, 0x04, // UsageId(Data Field: Human Head Roll[0x04C0])
0x15, 0x00, // LogicalMinimum(0)
0x26, 0x68, 0x01, // LogicalMaximum(360)
0x95, 0x01, // ReportCount(1)
0x75, 0x09, // ReportSize(9)
0x81, 0x42, // Input(Data, Variable, Absolute, Nowrap, Linear,
PreferredState, NullState, BitField)
0x0A, 0xC1, 0x04, // UsageId(Data Field: Human Head Pitch[0x04C1])
0x16, 0x4C, 0xFF, // LogicalMinimum(-180)
0x26, 0xB4, 0x00, // LogicalMaximum(180)
0x81, 0x42, // Input(Data, Variable, Absolute, Nowrap, Linear,
PreferredState, NullState, BitField)
0x0A, 0xC2, 0x04, // UsageId(Data Field: Human Head Yaw[0x04C2])
0x15, 0xA6, // LogicalMinimum(-90)
0x25, 0x5A, // LogicalMaximum(90)
0x75, 0x08, // ReportSize(8)
0x81, 0x42, // Input(Data, Variable, Absolute, Nowrap, Linear,
PreferredState, NullState, BitField)
0x0A, 0xC3, 0x04, // UsageId(Data Field: Human Correlation Id[0x04C3])
0x15, 0x00, // LogicalMinimum(0)
0x27, 0xFE, 0xFF, 0x00, 0x00, // LogicalMaximum(65,534)
0x75, 0x10, // ReportSize(16)
0x81, 0x42, // Input(Data, Variable, Absolute, Nowrap, Linear,
PreferredState, NullState, BitField)
0xC0, // EndCollection()
0xC0, // EndCollection()
0x75, 0x02, // ReportSize(2)
0x81, 0x03, // Input(Constant, Variable, Absolute, Nowrap, Linear, PreferredState,
NonnullPosition, BitField)
0xC0, // EndCollection()

```