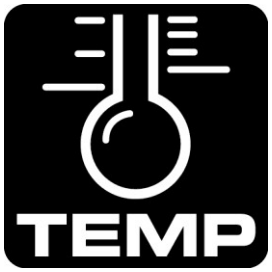
ANT+ Device Profile

Environment



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Revision History

Revision	Effective Date	Description
1.0	August 2012	Approved for release

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1 Overview of ANT+

The ANT+ Managed Network is comprised of a group of devices that use the ANT radio protocol and ANT+ Device Profiles to determine and standardize wireless communication between individual devices. This management of device communication characteristics provides interoperability between devices in the ANT+ network.

Developed specifically for ultra low power applications, the ANT radio protocol provides an optimal balance of RF performance, data throughput and power consumption.

ANT+ Device Profiles have been developed for devices used in personal area networks and can include, but are not limited to, devices that are used in sport, fitness, wellness, and health applications. Wirelessly transferred data that adheres to a given device profile will have the ability to interoperate with different devices from different manufacturers that also adhere to the same standard. Within each device profile, a minimum standard of compliance is defined. Each device adhering to the ANT+ Device Profiles must achieve this minimum standard to ensure interoperability with other devices.

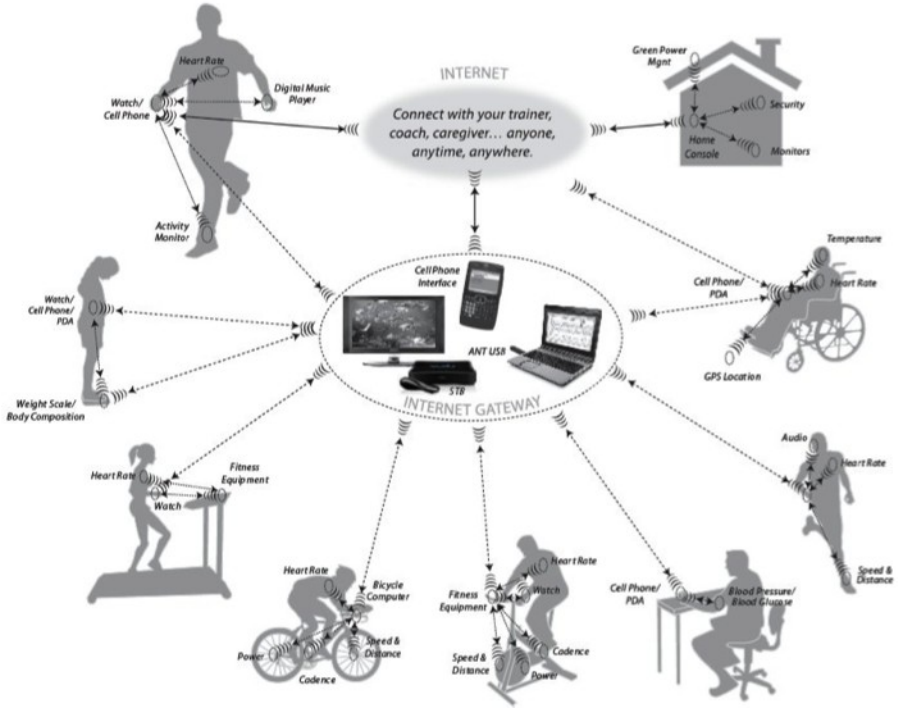

Figure 1-1. ANT+ Device Ecosystem

This document details the wireless communication between devices adhering to this ANT+ Device Profile. The typical use case of the device(s), wireless channel configuration, data format(s), minimum compliance for interoperability, and implementation guidelines are also detailed.

IMPORTANT:

If you have received this document you have agreed to the terms and conditions of the Adopter's Agreement and have downloaded the ANT+ Managed network key. By accepting the Adopter's Agreement and receiving the ANT+ device profiles you agree to:

- **Implement and test your product to this specification in its entirety**
- **To implement only ANT+ defined messages on the ANT+ managed network**

2 Related Documents

Refer to current versions of the listed documents. To ensure you are using the current versions, check the ANT+ website at www.thisisant.com or contact your ANT+ representative.

1. ANT Message Protocol and Usage
2. ANT+ Common Data Pages
3. ANT File Share (ANT-FS) Technical Specification
4. ANT-FS Reference Design User Manual
5. Flexible & Interoperable Data Transfer (FIT) Protocol
6. FIT File Types

4 Overview of Environment Device Use Case

The ANT+ environment sensor is a device that allows a variety of environmental parameters to be measured. Data such as current temperature, and 24 hour highs and/or lows may be transmitted to a collector device for real time display, or stored on the environment sensor for later download to a PC or other collecting device.

Stored data is formatted according to the Flexible and Interoperable Data Transfer (FIT) protocol and as specified in this document. Stored data is transferred in a FIT file using ANT file share (ANT-FS). For more details, refer to the ANT File Share (ANT-FS) Technology and FIT Protocol documents.

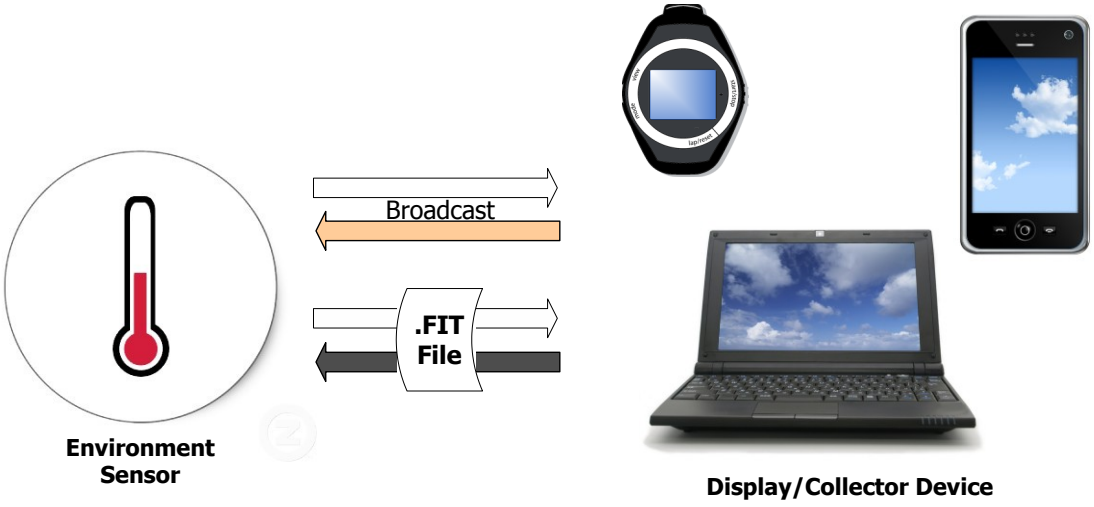

Figure 4-1. ANT+ Environment Sensor Use Case

4.1 Broadcast Use Case

Figure 4-2 below illustrates the typical ANT+ environment sensor broadcast use case. The environment sensor transmits main data pages at a default 0.5Hz or 4Hz rate. Main data pages include general information about the device capabilities, and temperature data. Some device-specific information, such as battery status and manufacturer information, is transmitted at slower rates in the background data pages (i.e. at least once every 129 data pages). The display may also request data pages from the environment sensor. For more details on requesting data pages refer to the ANT+ Common Pages document.

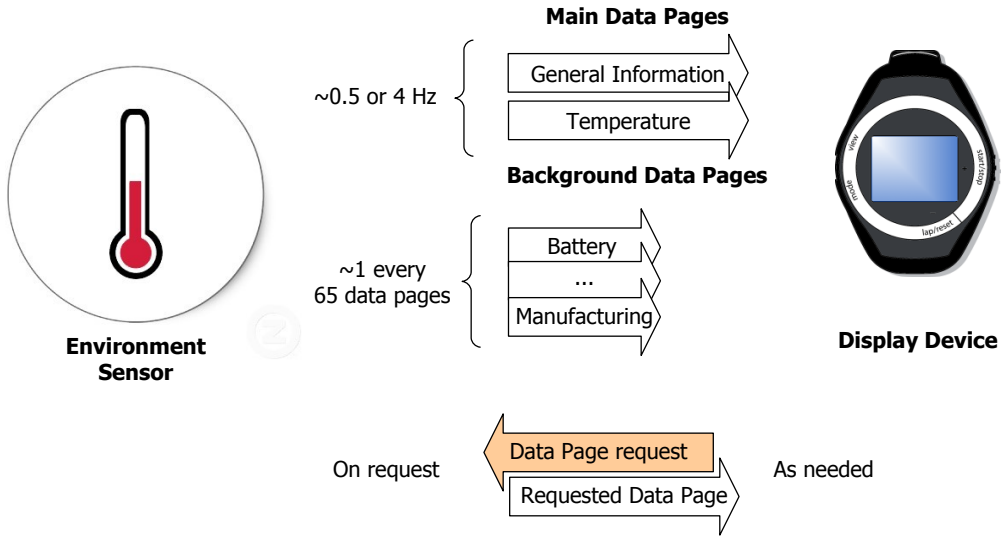

Figure 4-2. Standard Use Case of an ANT+ Environment Sensor and Real Time Display

The environment sensor allows a default transmission rate of 0.5 Hz or 4Hz.

On receiving a request for data from the display:

- **Devices with a default transmission rate of 0.5 Hz:** shall increase its message rate to 4 Hz for a 30 second timeout, after which the sensor shall return to a transmission rate of 0.5 Hz (Figure 4-3). Each time a request message is received from a display, the timeout is reset.
- **Devices with a default transmission rate of 4 Hz:** maintain a 4 Hz transmission rate.

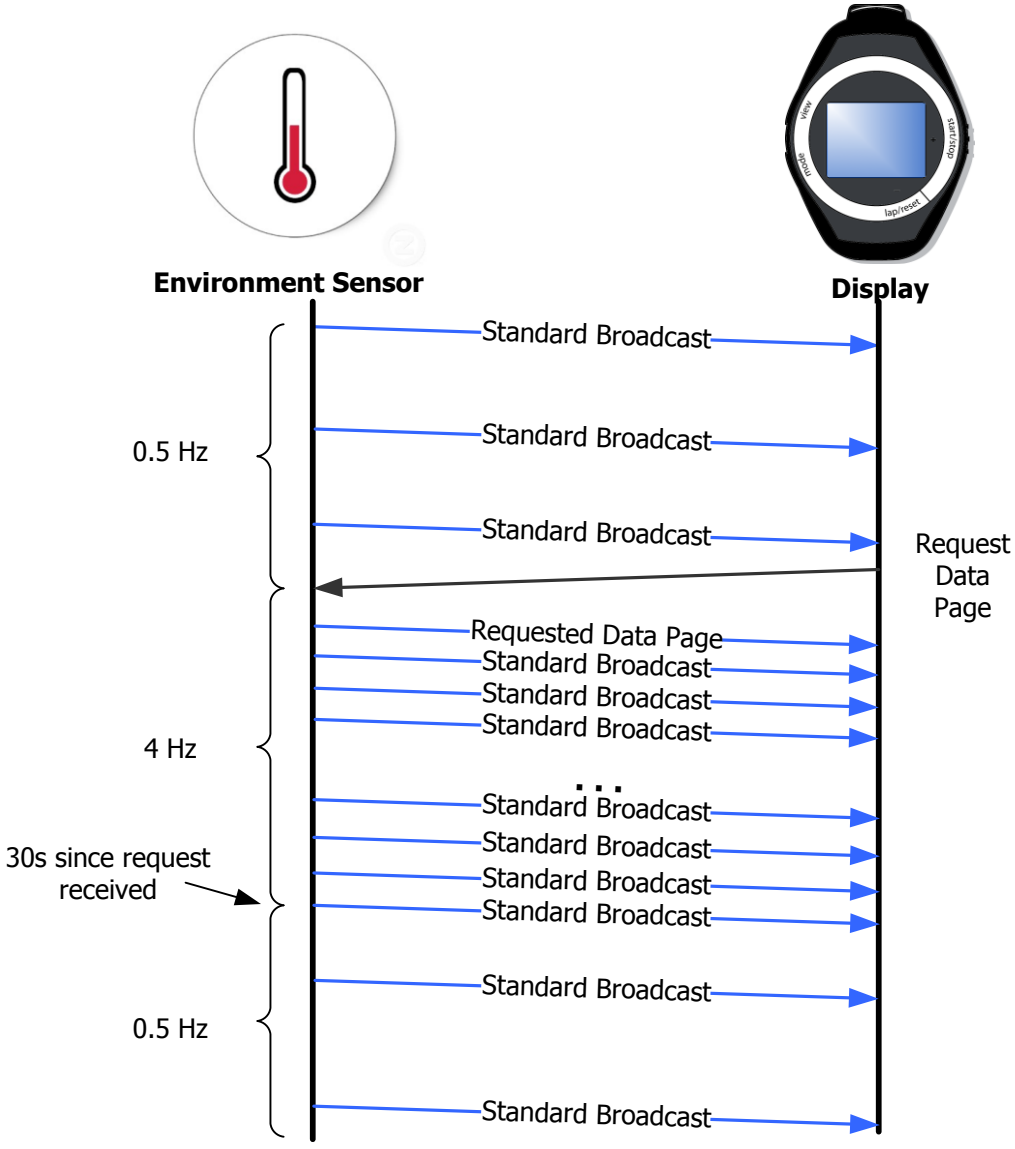

Figure 4-3. ANT+ Environment Sensor 0.5 Hz Default Message Rate Requirements

4.2 Broadcast ANT-FS Use Case

The ANT+ environment sensor may store measurement data for transfer to a collection device (Figure 4-1). The data in the file is formatted according to the Flexible and Interoperable Data Transfer (FIT) protocol and transferred using ANT-FS.

The ANT+ environment device profile supports only broadcast ANT-FS implementations.

In the broadcast ANT-FS use case, the environment device transmits real time data as described in section 4.1. The display/collection device may then initiate an ANT-FS session using the request data page. On receiving the request for ANT-FS session, the sensor shall then behave as an ANT-FS client. Note, if the sensor is broadcasting data at 0.5Hz, the request for ANT-FS is treated the same way as a standard request page; as such, the sensor shall commence beaconing in the link state at 4Hz. As per the ANT-FS Technical Specification, transmission rates in the AUTH and TRANS state are determined by the Host.

Once the ANT-FS session is established, any stored data available may be downloaded from the environment sensor.

The display/collection device may then maintain the ANT-FS session allowing for periodic file transfers of data, or it may disconnect the ANT-FS session, at which point the sensor shall return to the real time data broadcast.

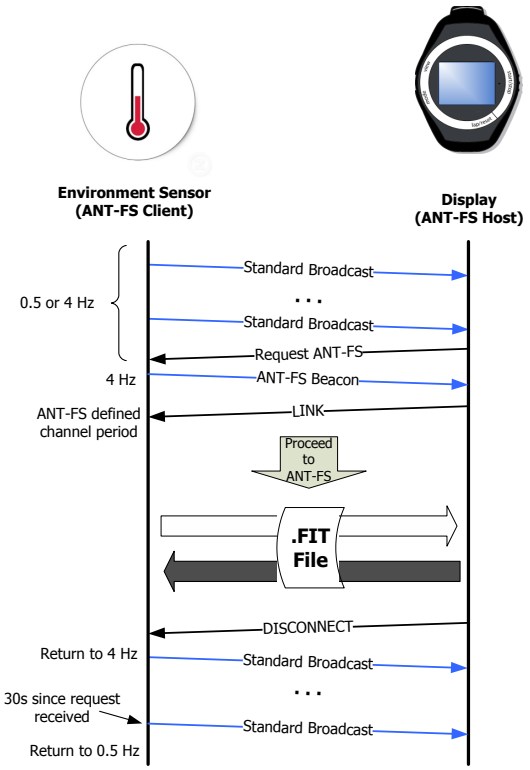

Figure 4-4. Broadcast ANT-FS Use Case of an ANT+ Environment Sensor and Collector Device

5 Channel Configuration

The channel configuration parameters of the environment sensor and all other ANT-enabled devices are defined by the ANT protocol. Refer to the ANT Message Protocol and Usage document for more details.

5.1 Slave Channel Configuration

The device receiving data from an ANT+ environment sensor must configure an ANT channel with its channel parameters set as listed in Table 5-1.

Table 5-1. ANT Channel Configuration for Environment Display (i.e. Slave) Device

Parameter	Value	Comment
Channel Type	Slave (0x00)	The environment sensor is a master device; therefore, the display device must be configured as the slave. Bidirectional communication is required.
Network Key	ANT+ Managed Network Key	The ANT+ Managed Network Key is governed by the ANT+ Managed Network licensing agreement.
RF Channel Frequency	57 (0x39)	RF Channel 57 (2457MHz) is used for the ANT+ environment device
Transmission Type	0 for pairing	The transmission type must be set to 0 for a pairing search. Once the transmission type is learned, the receiving device may remember the type for future searches. To be future compatible, any returned transmission type is valid. Future versions of this spec may allow additional bits to be set in the transmission type.
Device Type	25 (0x19)	25 (0x19) – indicates search for an ANT+ environment device. Please see the ANT Message Protocol and Usage document for more details.
Device Number	1 – 65535 0 for searching	Set the Device Number parameter to zero to allow wildcard matching. Once the device number is learned, the receiving device should remember the number for future searches. Please see the ANT Message Protocol and Usage document for more details.
Channel Period	65535 or 8192 counts	Data is transmitted from the environment device every 8192/32768 seconds (4 Hz) or 65535/32768 seconds (0.5 Hz) and must be received at this rate.
Search Timeout	(recommended = 45 seconds)	The recommended search timeout is set to 45 seconds in the receiver. This allows sufficient time for a 0.5 Hz master to be found. This timeout is implementation specific and can be set by the designer to the appropriate value for the system.

5.1.1 Channel Period

The channel period is set such that the display device shall receive data at the full message rate (4 Hz), or low power 0.5Hz.

5.2 Master Channel Configuration

The ANT+ environment sensor shall establish its ANT channel as shown in Table 5-2.

Table 5-2. ANT Channel Configuration for Environment Sensor (i.e. Master)

Parameter	Value	Comment
Channel Type	Master (0x10)	Within the ANT protocol the master channel (0x10) allows for bi-directional communication channels and utilizes the interference avoidance techniques and other features inherent to the ANT protocol.
Network Key	ANT+ Managed Network Key	The ANT+ Managed Network Key is governed by the ANT+ Managed Network licensing agreement.
RF Channel Frequency	57 (0x39)	RF Channel 57 (2457MHz) is used for the ANT+ environment sensor.
Transmission Type	Bits 0:3 - 5 (0x05)	ANT+ devices will follow the transmission type definition as outlined in the ANT protocol: The lower nibble shall be set to 0x05. The upper nibble may be used to extend the device number
	Bits 4:7 – ext'd device #	
Device Type	25 (0x19)	An environment sensor shall transmit its device type as 0x19. Please see the ANT Message Protocol and Usage document for more details.
Device Number	1-65535	This is a two byte field that allows for unique identification of a given environment sensor. It is imperative that the implementation allow for a unique device number to be assigned to a given device. **NOTE:** The master device number shall not be set to 0x0000.
Channel Period	8192 or 65535 counts	Data is transmitted every 8192/32768 seconds 4Hz) or 65535/32768 seconds (0.5 Hz).

5.2.1 Channel Type

As communication in two directions is required, the channel type is set to bidirectional master (0x10). The bidirectional master channel is also used to enable the interference avoidance features inherent to the ANT protocol.

5.2.2 Device Number

The device number needs to be as unique as possible across production units. An example of achieving this specification is to use the lowest two bytes of the serial number of the device for the device number of the ANT channel parameter; ensure that the device has a set serial number.

The device number of the environment sensor shall not be set to 0x0000. Care should be taken if the device number is derived from the lower 16-bits of a larger serial number. In this case, ensure that serial numbers that are multiples of 0x10000 (65536) are handled correctly such that the device number is not set to 0.

The device number may be extended using the upper nibble of the transmission type. Refer to the ANT Message Protocol and Usage document.

5.2.3 Channel Period

The default channel period may be set at 0.5Hz or 4Hz. On receiving any request message from a display, the environment sensor shall transmit at 4Hz for at least 30 seconds.

6 Message Payload Format

6.1 ANT+ Message Data Formats

All ANT messages have an 8 byte payload. For ANT+ messages, the first byte contains the data page number and the remaining 7 bytes are used for sensor-specific data.

Table 6-1. ANT+ General Message Format

Parameter	Value	Comment
0	Data Page Number	1 Bytes
1-7	Sensor Specific Data	7 Bytes

6.2 Data Page Types

Multiple data pages are supported in the ANT+ environment device profile. These pages are divided into four distinct types of data:

- Main Data Pages: consist of a basic temperature page transmitted by default at 0.5 or 4 Hz.
- Background Data Pages: consist of common pages containing information about the environment sensor, transmitted at a slow interleave rate, or on request from the display.
- Request Data Page: sent from a display to request data and/or an ANT-FS session from the environment sensor.
- ANT-FS Data Pages: data pages allowing File transfer. Transmitted only after an ANT-FS session has been requested

6.2.1 Main Data Pages

There are two main data pages: the general information (page 0) and temperature page (page 1). These are required pages and must be sent from every ANT+ environment device at a minimum rate of 0.5 Hz while in the default state. This is the default data page for the ANT+ environment device.

Other main data pages may be developed in future revisions.

6.2.2 Background Data Pages

Background data pages give background information, such as manufacturer information and battery voltage. All ANT+ environment device background pages defined in this document consist of common pages and must be implemented. These pages shall be interleaved at a rate of 1 per 129 messages, and shall be sent on request.

6.2.3 Request Data Page

The request data page allows the display device to request data, or an ANT-FS session from the environment sensor. The sensor shall be able to respond to requests for data pages; however, requests for ANT-FS are optional.

6.2.4 ANT-FS Data Pages

The ANT+ environment sensor may optionally support ANT-FS. These data pages are sent once an ANT-FS session has been requested by the display.

6.3 Data Page 0 – General Information

Data page 0 is a main data page broadcast from an ANT+ environment device, and provides general information about the device's capabilities. All environment sensors must be able to send this data page interleaved with all supported main data pages at the default transmission rate. All fields in this message shall be set as described in Table 6-2.

Table 6-2. Data Page 0 Format – General Information

Byte	Description	Length	Value	Units	Min/Max
0	Data Page Number	1 Byte	Data Page Number = 0 (0x00)	N/A	N/A
1	Reserved	1 Byte	Set to 0xFF	N/A	N/A
2	Reserved	1 Byte	Set to 0xFF	N/A	N/A
3	Transmission Info	1 Byte	Bit field. Refer to Table 6-3.	N/A	N/A
4	Supported Pages LSB	4 Bytes	Bit Field representing main data pages supported. Bit position refers to page number. Bits 2:31 – Reserved. Set to 0. Bit 1 – Page 1 Support Bit 0 – Page 0 Support	N/A	N/A
5	Supported Pages				
6	Supported Pages				
7	Supported Pages MSB				

6.3.1 Transmission Info

This field provides transmission characteristics of the environment sensor as described in Table 6-3.

Table 6-3. Transmission Info Bit Field Description

Bit	Description	Values
6:7	Reserved	Set to 0.
4:5	Local Time	00 – Local Time not supported
		01 – Local Time Supported, Not Set
		10 - Local Time Supported & Set
		11 - Reserved
2:3	UTC Time	00 – System Time not supported
		01 – UTC Time Supported, Not Set
		10 - UTC Time Supported & Set
		11 - Reserved
0:1	Default Transmission Rate	00 – default transmission rate of 0.5 Hz
		01 - default transmission rate of 4 Hz
		10 – Reserved
		11 – Reserved

6.3.1.1 Local Time and UTC Time

An ANT+ environment sensor may optionally support local time and UTC time. This field is used to determine if local/UTC time is supported on the sensor. Additionally, this field is used to indicate if the local/UTC time on the sensor is currently set.

A display may only set UTC time on the sensor using ANT-FS, specifically the Set Time command pipe.

6.3.1.2 Default Transmission Rate

This field indicates the default transmission rate of the environment sensor.

6.3.2 Supported Pages

The supported pages field indicates the main data pages supported by the ANT+ environment sensor. Support for data page 0 shall always be required, as such; bit 0 shall be set to 1.

Temperature sensors shall set bit 1 to indicate support for main data page 1.

Future revision may allow for other types of data to be transmitted; however, currently no other pages are defined and the remaining bits (2:31) shall be set to 0.

6.4 Data Page 1 – Temperature

Data page 1 is a main data page broadcast from an ANT+ environment device to send temperature information. Currently, all devices must be able to send this page and it shall be sent interleaved with main data page 0 at the default transmission rate. All fields in this message shall be set as described in Table 6-4.

Table 6-4. Data Page 1 Format – Temperature

Byte	Description	Length	Value	Units	Min/Max
0	Data Page Number	1 Byte	Data Page Number = 1 (0x01)	N/A	N/A
1	Reserved	1 Byte	Set to 0xFF	N/A	N/A
2	Event count	1 Byte	increments with each measurement	N/A	N/A
3	24 Hour Low LSB	1.5 Bytes	Signed Integer representing the lowest temperature recorded over the last 24 hours (0x800 invalid)	0.1°C	-204.7 to 204.7
4 (bits 4:7)	24 Hour Low MSN				
4 (bits 0:3)	24 Hour High LSN	1.5 Bytes	Signed Integer representing the highest temperature recorded over the last 24 hours (0x800 invalid)	0.1°C	-204.7 to 204.7
5	24 Hour High MSB				
6	Current Temp LSB	2 Bytes	Signed Integer representing the current Temperature (0x8000 invalid)	0.01°C	-327.67 to 327.67
7	Current Temp MSB				

6.5 Data Pages 2 – 63: Reserved for Future Use

Data pages 2 to 63 are reserved for future data page definitions.

6.6 Required Common Data Pages

Common data pages are pages that can be sent/received from any ANT+ device that has a transmission type indicating it can interpret paginated data. See the ANT+ Common Data Pages document for more details.

6.6.1 Common Page 80 (0x50) – Manufacturer's Identification

Common data page 80 transmits the manufacturer's ID, model number, and hardware revision.

Table 6-5. Common Data Page 80

Byte	Description	Length	Value	Units
0	Data Page Number	1 Byte	0x50 – Common Page 80	N/A
1	Reserved	1 Byte	Value = 0xFF	N/A
2	Reserved	1 Byte	Value = 0xFF	
3	HW Revision	1 Byte	To be set by the manufacturer.	N/A
4	Manufacturer ID LSB	2 Bytes	Contact the ANT+ Alliance for a current list of manufacturing IDs, or to be assigned a manufacturing ID.	N/A
5	Manufacturer ID MSB			
6	Model Number LSB	2 Bytes	To be set by the manufacturer.	N/A
7	Model Number MSB			

For the current list of Manufacturer Identification values, or if you wish to be added to this list, please contact the ANT+ Alliance at antalliance@thisisant.com.

6.6.2 Common Page 81 (0x51) – Product Information

Common data page 81 transmits the device's software revision and its 32-bit serial number.

Table 6-6. Common Data Page 81

Byte	Description	Length	Value	Units
0	Data Page Number	1 Byte	0x51 – Common Page 81	N/A
1	Reserved	1 Byte	Value = 0xFF	N/A
2	Reserved	1 Byte	Value = 0xFF	N/A
3	SW Revision	1 Byte	To be set by the manufacturer.	N/A
4	Serial Number (Bits 0 – 7)	4 Bytes	The lowest 32 bits of the serial number. Value 0xFFFFFFFF to be used for devices without serial numbers.	N/A
5	Serial Number (Bits 8 – 15)			
6	Serial Number (Bits 16 – 23)			
7	Serial Number (Bits 24 – 31)			

6.6.3 Common Page 70 (0x46) – Request Data Page

The request data page allows the ANT+ environment display device to request a specific broadcast data page, or an ANT-FS session (refer section 8), from the environment sensor. For more details refer to the ANT+ Common Pages document.

The request page is sent as an acknowledged message from a display.

The environment sensor must be able to respond to requests for all data pages described in this document. However, other pages may be requested by a display that may not be supported. In these cases, the environment sensor may not respond at all and continue to send data according to this device profile. Any display that plans to use this data page shall handle this "no response" case elegantly. The contents of this data page are detailed in Table 6-7; however for more details on using this page, refer to the ANT+ Common Pages Document.

Table 6-7. Common Data Page 70 Format

Byte	Description	Length	Value	Units
0	Data Page Number	1 Byte	70 (0x46) – Data Page Request	N/A
1	Reserved	1 Byte	Value = 0xFF	N/A
2	Reserved	1 Byte	Value = 0xFF	N/A
3	Descriptor Byte 1	1 Byte	Allows subpages to be requested within the requested data page. Valid Values: 0 – 254 Invalid: 255 (0xFF)	N/A
4	Descriptor Byte 2	1 Byte	Allows subpages to be requested within the requested data page. Valid Values: 0 – 254 Invalid: 255 (0xFF)	N/A
5	Requested Transmission Response	1 Byte	Describes transmission characteristics of the data requested. Bit 0-6: Number of times to transmit requested page. Bit 7: Setting the MSB means the device replies using acknowledged messages if possible. Special Values: 0x80 - Transmit until a successful acknowledge is received. 0x00 – Invalid	N/A
6	Requested Page Number	1 Byte	Page number to transmit.	N/A
7	Command Type	1 Byte	Value = 1 (0x01) for Request Data Page Value = 2 (0x02) for Request ANT-FS session	N/A

6.6.3.1 Descriptor Bytes 1 & 2

The descriptor byte fields are used to describe requested subpages. Currently no subpages are defined within this profile and these bytes shall be set to invalid (0xFF) if requesting a main data page.

6.6.3.2 Requested Transmission Response

When requesting a data page from the sensor device, the **ANT+ display shall only request broadcast message types**. Acknowledged or burst message types shall not be requested.

When requesting an ANT-FS session, the requested transmission response is set to invalid.

6.6.3.3 Requested Page Number

When requesting a data page from the environment sensor, the display uses this field to indicate the page number requested. When requesting an ANT-FS session, this shall be set to 0x43, the ANT-FS beacon page number.

6.6.3.4 Command Type

When requesting a data page from the environment sensor, this field shall be set to 0x01. When requesting an ANT-FS session, this shall be set to 0x02.

6.6.4 Other Common Data Pages

Other common data pages that are listed in the ANT+ Common Data Pages document can be sent from the ANT+ environment sensor. Other common data pages are implemented in the environment sensor at the discretion of the developer.

7 Transmission Requirements

The ANT+ environment sensor shall transmit main data pages by default. Main data pages shall be transmitted at 0.5 or 4 Hz. Each main data page shall be interleaved at least once per 32 channel periods (i.e. once per 8 seconds at 4Hz, once per 64 seconds at 0.5Hz). Note that an ANT+ environment display should handle this latency appropriately.

Background data pages shall be interleaved at least once every 129 channel periods (once per 32 seconds at 4 Hz, or once per 4 minutes at 0.5 Hz).

All data pages shall be transmitted on a display's request.

Currently, only main data pages 0 and 1 are supported. Main data page 0 is a required main data page. The recommended transmission pattern is alternating data pages 0 and 1 by default, with a common page transmitted every 129 messages.

8 File Transfer

The ANT+ Environment Device Profile supports file transfer between the environment sensor and display devices. Data shall be stored on an ANT+ environment device using the Flexible & Interoperable Data Transfer (FIT) Protocol; and transferred between the devices using ANT File Share (ANT-FS).

For more details on the ANT-FS protocol please refer to the ANT-FS Technical Specification and ANT-FS Reference Code User Guide documents.

For more details on the FIT protocol, refer to the Flexible & Interoperable Data Transfer (FIT) Protocol and FIT File Types documents.

8.1 ANT-FS Overview

The **ANT-FS Technical Specification must be implemented in its entirety in order to be compliant with this profile.** This section provides an overview only of how the ANT environment sensor and display devices shall behave as defined by ANT-FS.

The ANT+ environment device profile supports broadcast ANT-FS, which allows an ANT-FS session to occur on an established broadcast channel.

The environment sensor acts as an ANT-FS client, and the display device as an ANT-FS host.

Figure 8-1 provides an example of a broadcast ANT-FS session. A standard environment device channel is established, and data pages transmitted as described in section 6. The display may request an ANT-FS session at any time using common data page 70. On receiving the ANT-FS request, the environment sensor will stop broadcasting data and transmit an ANT-FS link beacon at 4 Hz instead.

Once the display (host) device receives the ANT-FS link beacon, both devices progress through authentication and may transfer files once in the transport state. The display may disconnect from the ANT-FS session after the desired files are transferred, or it may choose to maintain the ANT-FS transport state for periodic file downloads of environment data.

Once the ANT-FS session is completed, the ANT+ environment sensor shall return to standard 4 Hz broadcast mode. After 30 seconds without receiving further commands from the display, the environment sensor shall return to the default 0.5 Hz broadcast mode.

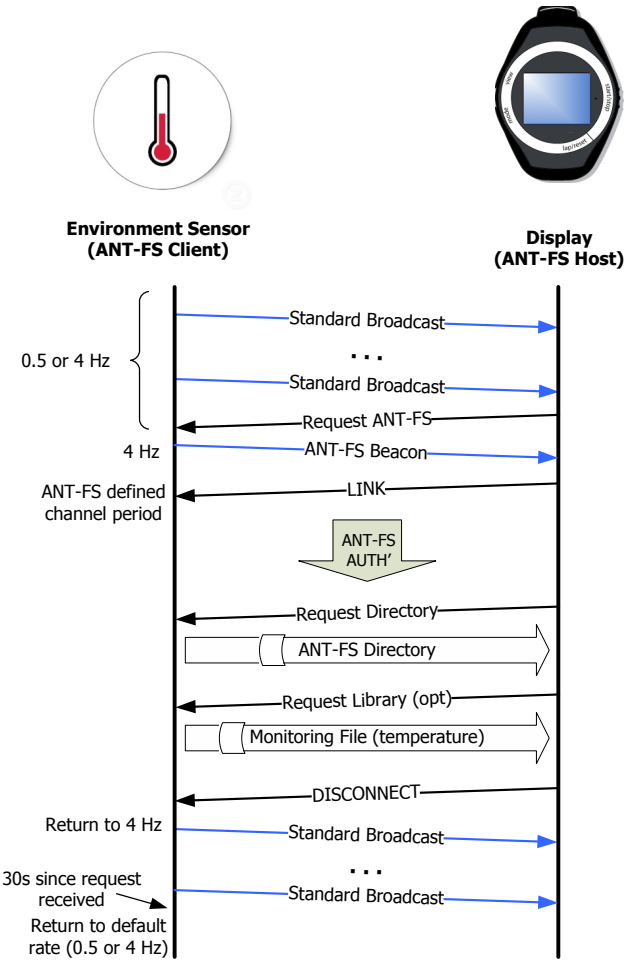

Figure 8-1. ANT+ Environment Sensor Broadcast ANT-FS Overview

8.2 ANT-FS Best Practices

The ANT-FS Technical Specification must be implemented in its entirety in order to be compliant with this profile.

- The display shall request an ANT-FS session when desired:
    - The environment sensor may not support ANT-FS. In this case, the request data page will be ignored. The display shall handle this no response case elegantly.
- On receiving an ANT-FS request the environment sensor shall beacon as an ANT-FS client at 4 Hz, or ignore the request if ANT-FS is not implemented. Note, in the latter case, the environment sensor shall broadcast at 4 Hz for the 30 second timeout.
- When Sending the Link Command, the display device shall specify a new RF channel frequency (mandatory) and may also change the channel period (optional) for subsequent communication.
- Update for authentication method.
- The ANT+ environment sensor shall contain a FIT monitoring file (file subtype temperature).
- Other optional FIT files may also be transferred.
- Appropriate timeouts should be set for the ANT-FS session in case the host or client disappears midsession. This will allow the device to return to real time data broadcast mode.

8.3 FIT Data

The ANT+ Environment Sensor shall store data in a FIT monitoring file, with a file_subtype of 2.

8.3.1 Monitoring FIT File

Data shall be stored on an ANT+ Environment Sensor using the FIT Protocol. Temperature data is stored in a FIT monitoring file. The monitoring file must contain the FIT file_id and monitoring messages as described in the FIT File Types document and outlined in Table 8-1 below.

Table 8-1. Monitoring FIT File Messages and Fields

FIT Message	FIT Fields	Required	Type	Value/Units
file_id	type	Y	file (enum)	Monitoring File = 15
	manufacturer	Y	manufacturer (UINT16)	ANT+ managed. Contact antalliance@thisisant.com for details
	product	Y	UINT16	Managed by manufacturer
	serial_number	Y	UINT32z	Managed by manufacturer
	time_created	Y	date_time (UINT32)	
	number	Y	file_subtype file_duration	File_subtype = 2 (temperature) Refer to Table 8-2
monitoring_info	timestamp	N	date_time	UTC Time
	local_timestamp	N	local_date_time	Local Time
monitoring	timestamp	Y	date_time	Time of measurement recording
	temperature	Y	SINT16	Average Temperate (0.01°C)
	temperature_min	N	SINT16	Minimum Temperature (0.01°C)
	temperature_max	N	SINT16	Maximum Temperature (0.01°C)

As indicated in the "Required" column, not all of the listed fields shall be included in the device file. At a minimum, the following is required:

- file_id message must be included to indicate the file type. All file_id fields are required. The ANT+ environment sensor shall indicate the file contains temperature data by setting the file_subtype to 2. This could also be set to generic if other data is included.
- monitoring message containing temperature data.
- If the monitoring_info message is used, both the timestamp and local_timestamp fields shall be included. This allows for the local time zone offset to be determined (i.e. local offset = local_timestamp - timestamp).

Table 8-2. FIT Monitoring File file_id.number Format

FIT Field	Bits	Description	Value/Units
file_id-file_number	6:15	File_subtype	0: Generic monitoring file 1: Activity monitoring data 2: Temperature data 3: 1023 - Reserved
	0:5	File_duration	0: Generic/All data 1: New data (since last download or power up)

			2: Detailed Daily (24 hours) 3:63 - Reserved

8.3.2 Daily Monitoring FIT File (optional)

Temperature data may optionally also be stored in a FIT daily monitoring file. The daily monitoring file must contain the FIT file_id and daily monitoring messages as described in the FIT File Types document and outlined in

Table 8-3 below.

Table 8-3. Daily Monitoring FIT File Messages and Fields

FIT Message	FIT Fields	Required	Type	Value/Units
file_id	type	Y	file (enum)	Daily monitoring File = 28
	manufacturer	Y	manufacturer (UINT16)	ANT+ managed. Contact antalliance@thisisant.com for details
	product	Y	UINT16	Managed by manufacturer
	serial_number	Y	UINT32z	Managed by manufacturer
	time_created	Y	date_time (UINT32)	
	number	Y	file_subtype file_duration	File_subtype = 2 (temperature) Refer to Table 8-4
monitoring_info	timestamp	N	date_time	UTC Time
	local_timestamp	N	local_date_time	Local Time
monitoring	timestamp	Y	date_time	Time of measurement recording
	temperature	Y	SINT16	Average Temperate (0.01°C)
	temperature_min	N	SINT16	Minimum Temperature (0.01°C)
	temperature_max	N	SINT16	Maximum Temperature (0.01°C)

This file type is very similar to the monitoring file, and the requirements are the same, except that:

- The data shall be recorded at a logging_interval of 24 hours (i.e. daily values).
- The file_id.number structure is similar to that of a monitoring file, however, the file_duration field is as defined in Table 8-4.

Table 8-4. FIT Daily Monitoring File file_id.number Format

FIT Field	Bits	Description	Value / Units
file_id.file_number	6:15	File_subtype	0: Generic Monitoring File 1: Activity Monitoring Data 2: Temperature data 3:1023 – Reserved
	0:5	File_duration	0: Generic/All data

			1: New Data (since last download or power up) 2: monthly 3:63 - Reserved

If the daily monitoring FIT file is used, then it shall be subject to the same field requirements as the monitoring file described in section 8.3.1.

8.3.3 Other FIT Files

Refer to the FIT File Types document for details on other FIT files that may be useful for ANT+ environment device applications.

9 Minimum Requirements

9.1 Broadcast

The ANT+ environment sensor must support real time broadcast of temperature data as outlined in the following sections.

9.1.1 Minimum Transmission Timing Requirements

The ANT+ environment sensor shall transmit at a default rate of 0.5 or 4 Hz. On receiving any data page from a display, the ANT+ environment sensor shall broadcast at 4 Hz for at least 30 seconds. After 30 seconds of not receiving further pages from a display, the environment sensor shall return to its default broadcast rate.

Each main data page shall be interleaved at least once per 32 channel periods (i.e. once per 8 seconds at 4 Hz, once per 64 seconds at 0.5Hz).

Background data page shall be interleaved at least once every 129 channel periods (once per 32 seconds at 4 Hz or once per 4 minutes at 0.5 Hz).

All data pages shall be transmitted on a display's request.

9.1.2 Minimum Data Page Requirements

Table 9-1 summarises the data page requirements of the ANT+ environment sensor.

Table 9-1. Required Data Elements of the ANT+ Environment Sensor

Required Data Page	Transmission Requirements
Data Page 0	At least once every 32 data pages
Data Page 1	At least once every 32 data pages
Data Page 80, 81	Once every 129 data pages or on request

The ANT+ environment display shall be able to interpret these pages and appropriately handle the maximum latency of a single update every 30 seconds.

Additionally, the ANT+ display may support requests for broadcast ANT-FS, which a sensor may not support. In this case, the environment sensor shall ignore the request and the display shall handle this lack of response without adverse effects.

9.2 Minimum File Share Requirements

The ANT+ Environment Sensor may optionally support file transfer. If the sensor does support the storing and transferring of recorded data, the sensor shall comply with the requirements outlined in the following sections.

9.2.1 ANT-FS Minimum Requirements

The ANT+ environment device (sensor or display) that is compliant with this profile shall progress through the ANT-FS states as described in section 8. Furthermore, the **ANT-FS Technical Specification must be implemented in its entirety in order to be compliant with this profile.**

9.2.2 FIT File Requirements

The ANT+ environment device shall support FIT monitoring files. The FIT monitoring files shall contain, at a minimum, the FIT messages and fields outlined in Table 9-2.

Table 9-2. Minimum FIT device File Messages and Fields

FIT Message	FIT Fields	Required	Type	Value/Units
file_id	type	Y	file (enum)	Monitoring File = 15
	manufacturer	Y	manufacturer (UINT16)	ANT+ managed. Contact antalliance@thisisant.com for details
	product	Y	UINT16	Managed by manufacturer
	serial_number	Y	UINT32z	Managed by manufacturer
	time_created	Y	date_time (UINT32)	
	number	Y	file_subtype file_duration	File_subtype = 2 (temperature) Refer to Table 8-2
monitoring	timestamp	Y	date_time	Time of measurement recording
	temperature	Y	SINT16	Average Temperate (0.01°C)

9.2.3 ANT+ Environment Device Interoperability Icon

The ANT+ interoperability icons inform the end user of the product's capabilities. This icon indicates to the user that this specific device will transmit/receive environment information, and that it is interoperable with other devices that carry the same icon.

An ANT+ Environment sensor or display that meets the minimum compliance specifications and has been certified may use the icon shown in Figure 9-1 on packaging, documentation, and marketing material.

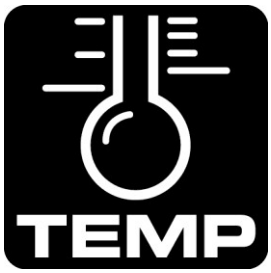

Figure 9-1. ANT+ Environment Device Interoperability Icon