

Aurora Firmware Guide

Revision 10
July 2018

Revision Status

Revision Number	Date	Description
1	December 2006	Initial issue. Incorporated combined firmware revisions 004, 005 and 007.
2	October 2007	Incorporated combined firmware revision 008.
3	January 2011	Incorporated combined firmware revision 009.
4	October 2011	Incorporated combined firmware revision 011.
5	March 2013	Incorporated combined firmware revision 012.
6	September 2013	Incorporated combined firmware revision 013.
7	November 2014	Incorporated the following firmware updates: V2 SIU firmware revision 002.012, V3 SCU firmware revision 008.000 V3 SIU firmware revisions 003.000 and 003.002. Moved information previously located in the combined firmware revision 013 section to the appropriate component firmware sections.
8	November 2016	Incorporated SCU combined firmware revisions 014, 015 and 016, SIU firmware revisions 003.010, 1.6.0 and 1.3.0, and information about different SIU hardware architectures.
9	November 2017	Incorporated combined firmware revision 017.
10	July 2018	Incorporated combined firmware revision 018.

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Published by:

NDI Europe GmbH
Güttinger Str. 37
78315 Radolfzell, Germany

Telephone: + 49 7732 8234-0
Global: + (800) 634 634 00
Facsimile: + 49 7732 8234-199
Website: www.ndigital.com

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Read Me First!

Read this section before continuing with the rest of the guide.

Warnings



In all NDI documentation, warnings are marked by this symbol. Follow the information in the accompanying paragraph to avoid personal injury.

For a complete list of warnings, refer to the documentation that accompanied your system.

Cautions



In all NDI documentation, cautions are marked with the word "Caution!". Follow the information in the accompanying paragraph to avoid damage to equipment.

For a complete list of cautions, refer to the documentation that accompanied your system.

Contact Information

If you have any questions regarding the content of this guide or the operation of this product, please contact us:



Head Office
Waterloo, ON Canada
☎ +1 (877) 634-6340
✉ info@ndigital.com
🌐 www.ndigital.com

Shelburne, VT USA
☎ +1 (802) 985-1114
✉ info@ndigital.com
🌐 www.ndigital.com

Radolfzell, Germany
☎ +49 7732 8234 0
✉ info@ndieurope.com
🌐 www.ndieurope.com

Hong Kong, China
☎ + (852) 2802-2205
✉ apinfo@ndigital.com
🌐 www.ndigital.cn

Updates

NDI is committed to continuous improvements in the quality and versatility of its software and hardware. To obtain the best results with your NDI system, check the NDI Support Site regularly for update information:

<https://support.ndigital.com>

1 Introduction

This guide provides a reference of the firmware revision history for the Aurora System. It details the history of enhancements and fixes made to the Aurora firmware components.

1.1 API Commands for Firmware Revisions

To check the firmware revision status of the system and its sub-components, use the Application Program Interface (API) commands listed below: For further information on the API, refer to the *“Aurora Application Program Interface Guide.”*

Table 1-1 Firmware Revision Status

Component	API Command
Combined Firmware	VER 5 Aurora V1 and V2: The combined firmware revision is used to specify a package containing both SCU and SIU firmware. These packages are described in "Aurora V1 and V2 Firmware Revision History" on page 10 Aurora V3: Combined firmware revision is used to refer to SCU firmware; the SIU firmware used is independent of the combined firmware revision. Use the GET parameters to query the firmware components separately, as described below.
SCU Firmware	VER 4 or GET with user parameter Features.Firmware.Version
SIU Firmware	GET with user parameter Features.Firmware.Version
API Revision	APIREV

1.2 Compatibility

Aurora V1 and V2

Each combined firmware revision package constitutes a set of firmware versions that have been verified and validated to work together.

Aurora V3

Aurora V3 SIU Hardware Architecture

The Aurora V3 SIU has two distinct hardware architectures requiring distinct firmware:

- Hardware architecture 1: SIUs starting with serial number SIE, SIF or SIG
- Hardware architecture 2: SIUs starting with serial number SIJ or SIK

Table 1-2 shows the revisions of firmware that have been verified and validated to work together.

Table 1-2 Aurora V3 Firmware Compatibility Matrix

	SIU Firmware Hardware Architecture 1			SIU Firmware Hardware Architecture 2		
	003.000	003.002	003.010	1.3.0	1.6.0	1.7.0
Combined firmware rev. 013	X	X				
Combined firmware rev. 014	X	X				
Combined firmware rev. 015	X	X				
Combined firmware rev. 016		X	X	X	X	
Combined firmware rev. 017		X	X	X	X	
Combined firmware rev. 018			X		X	X

2 Aurora V3 System Control Unit Firmware Revision History

This chapter provides a reference of the firmware revision history for the Aurora V3 System Control Unit (SCU). It details the history of enhancements and fixes made to the Aurora firmware components.

For information on the compatibility between various version of firmware when used together, see ["Compatibility" on page 1](#).

Note V3 SCU firmware is compatible only with the Aurora V3 SCU. Aurora V1 and V2 SCUs are not supported.

SCU Combined Firmware Revision 018

The firmware revision of each sub-component that comprises combined firmware revision 018 is shown below:

Table 2-1 Combined Firmware Revision 018

Sub-component	Revision
SCU Firmware	008.500
API Revision	D.002.005

New Features

Support for different flash memory chips Because of backward compatibility reason, downgrade to firmware revision older than combined firmware revision 018 is not supported for board revision number 4.20 or higher.

Sensor information in port handle status Port handle status bits 9 and 10 are used to indicate when the sensor is shorted or the sensor signal is too large.

New TSTART reply option 00 Introducing 00 as the optional default reply option for TSTART for the sake of completeness.

Changes

Selecting communication channels Previously, firmware revisions up to combined firmware revision 017 first check if solely the command (not the argument) is valid before disabling the unused communication channel (e.g. USB or RS-422). Since combined firmware revision 018, receiving a command candidate in space- or colon-style (including valid CRC) is needed for selecting a channel.

Improvement of returning error codes Handling of invalid command arguments has been improved such that with combined firmware revision 018, more consistent error codes will be returned.

Bug Fixes

Hardware selftest Hardware selftest has been improved such that with combined firmware revision 018 no false negative System Control Unit alerts will be set after booting.

SCU Combined Firmware Revision 017

The firmware revision of each sub-component that comprises combined firmware revision 017 is shown below:

Table 2-2 Combined Firmware Revision 017

Sub-component	Revision
SCU Firmware	008.400
API Revision	D.002.004

Bug Fixes

VSIU Packet Sequence Overrun Previously, the VSIU packet sequence counter in the SCU would overflow after several hours of operation. This has been corrected.

VSIU Duplicate Packet Misinterpretation Previously, resending an already processed packet to the SCU would lead to an endless loop of VSIU command packets. This has been corrected.

SCU Combined Firmware Revision 016

The firmware revision of each sub-component that comprises combined firmware revision 016 is shown below:

Table 2-3 Combined Firmware Revision 016

Sub-component	Revision
SCU Firmware	008.300
API Revision	D.002.004

New Features

Support for X2-Generation Field Generators Note: To run an X2-Generation Field Generator, a compatible SIU must be used. Please refer to ["Compatibility" on page 1](#) for reference.

New user parameters The following user parameters have been added:

Table 2-4 New User Parameters

User Parameter Name	Description
Param.Tracking.Frame Sync Source	Sets the source of the frame synchronization.
Param.Tracking.Ext Sync Available	Reports whether an HF signal can be detected on the sync port.
Param.Tracking.Track Frequency	Reports the tracking frame rate.
Param.Tracking.Frame Frequency	Reports the time stamp increase per second.

See the “*Aurora User Guide*” for more information on the synchronization port.

Changes

Port Handle Initialization Behaviour When the PINIT command is issued, all previous settings for that port handle are reset, and related port handles (e.g. for a dual 5DOF configuration) are invalidated.

Bug Fixes

Communication Overrun In SCU firmware revision 008.200, the VSIU packet communication infrequently suffered communication problems when under high system load. These problems were not severe and could be resolved using proper communication timeouts. The root of this problem has been fixed in SCU firmware revision 008.300.

RESET command behaviour Error messages for the RESET command will now be returned at the same baud rate as was used to send the RESET command. The baud rate will only be set back to 9600 baud upon valid RESET. Previously, RESET command always immediately changed the baud rate back to 9600 baud, regardless if the command was using a valid argument or not.

SCU Combined Firmware Revision 015

The firmware revision of each sub-component that comprises combined firmware revision 015 is shown below:

Table 2-5 Combined Firmware Revision 015

Sub-component	Revision
SCU Firmware	008.200
API Revision	D.002.003

New Features

Support for VSIU mode A Virtual Sensor Interface Unit (VSIU) is an SIU which is not physically connected to the Aurora SCU. VSIUs are usually application- and customer-specific devices with special means of system synchronization.

Improved multi-Aurora synchronization

SET command parameter formats The SET command now accepts octal, decimal and hexadecimal number formats for integer parameters. Previously, the SET command only allowed decimal values for integer parameters.

Staging of power ramp-up Powering on of some parts of the SCU are delayed to lower the immediate current draw after switching the Aurora system on.

Support for larger SROMs SROMs are no longer limited to 2 kB.

Bug Fixes

Displayed SIU model string longer The SIU model string displayed via the user parameters was previously cut off after 12 characters. This has been corrected so that the entire model string is displayed.

Command 'RESET 0' sometimes returns ERROR15 This problem was introduced in SCU firmware 008.100 and has been corrected for 008.200.

Unexpected answer after long commands This problem was introduced in SCU firmware revision 008.100 and has been corrected for 008.200. If the command was too long and without the CR acknowledgement, the firmware answered unexpectedly with an error.

SCU Combined Firmware Revision 014

SCU combined firmware revision 014 is customer specific and not described in this guide.

SCU Combined Firmware Revision 013

The firmware revision of each sub-component that comprises combined firmware revision 013 is shown below:

Table 2-6 Combined Firmware Revision 013

Sub-component	Revision
SCU Firmware	008.000
API Revision	D.002.001

New Features

Support of Aurora V3 System Control Unit The Aurora V3 SCU is now supported. (Aurora V1 and V2 SCUs are not supported.)

New Alert for V3 System Control Unit A new V3 SCU alert (hexadecimal value 00000008) reports a processor or logic voltage fault.

New PHINF reply option 0080 A new reply option for PHINF, 0080, returns information on the connected sensors including number, type (5DOF or 6DOF) and physical connection location information.

New error code for BX command A new error code, ERRORC5, will be returned if the BX command is used while the data bits parameter (set using the COMM command) is set to 7 bits.

New user parameters The following user parameters have been added:

Table 2-7 New User Parameters

User Parameter Name	Description
Features.Hardware.Max Ports	Number of physical SIU ports on the SCU.
Features.Hardware.Max Tool Ports	Number of physical tool ports on the SIU.
Info.Path	Physical location of the SIU in the format X.N, where X is the SCU device instance and N is the physical port at the SCU.
Info.Port Handles.i	Reports a list of port handles assigned to physical tool port i at the SIU, for i = 0 to value of Features.Hardware.Max Tool Ports.

Table 2-7 New User Parameters

Info.Status.Port.i	Reports the device instance of the connected SIU at physical port i at the SCU, for i = 0 to value of Features.Hardware.Max Ports.
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Improvements

Field Generator hot-plugging The Field Generator detection has been improved. Previously the FG was not properly detected if the connector was inserted too slowly.

Deprecated Commands

PHINF reply option 0020 has been deprecated. Use PHINF reply option 0080 instead.

VER reply option 8 has been deprecated. To read the firmware version of the SIU, use the GET command to read the value of the user parameter Features.Firmware.Version.

Bug Fixes

Setting GPIO status using a V3 SIU GPIO status may not have been set properly when using a V3 SIU. This bug has existed since combined firmware revision 012 and has now been fixed.

Reporting of GPIO status using PHINF A change in GPIO status may not have been reported with PHINF if the time between two PHINF calls was shorter than 100 ms. This bug has existed since combined firmware revision 012 and has now been fixed.

3 Aurora V3 Sensor Interface Unit Firmware Revision History

This chapter provides a reference of the firmware revision history for the Aurora V3 Sensor Interface Unit (SIU). It details the history of enhancements and fixes made to the Aurora firmware components.

For information on the compatibility between various version of firmware when used together, see ["Compatibility" on page 1](#).

Note V3 SIU firmware is compatible only with Aurora V3 SIUs. Aurora V1 SCUs are not supported.

Aurora V3 SIU Hardware Architecture

The Aurora V3 SIU has two distinct hardware architectures, requiring distinct firmware:

- Hardware architecture 1: SIUs starting with serial number SIE, SIF or SIG
- Hardware architecture 2: SIUs starting with serial number SIJ or SIK

3.1 SIU Hardware Architecture 1 Firmware Revision History

SIUs with hardware architecture 1 have serial numbers starting with SIE, SIF or SIG. This section describes the firmware revisions for SIUs with hardware architecture 1.

SIU Firmware Revision 003.010

New Features

Support for X2 Field Generators

Support 1-wire EEPROMS

Bug Fixes

I2C Initialization •Fixed a bug which could have lead to an incorrect I2C address for port LEDs.

SIU Firmware Revision 003.002

New Features

Front panel LEDs The firmware has been updated to enable the implementation of the LEDs on the front panel of the NDI Aurora V3 SIU. This update has no effect on the LED function of the SIU PCBs.

SIU Firmware Revision 003.000

Supports V3 SIU PCBs.

3.2 SIU Hardware Architecture 2 Firmware Revision History

SIUs with hardware architecture 2 have serial numbers starting with SIJ or SIK. This section describes the firmware revisions for SIUs with hardware architecture 2.

SIU Firmware Revision 1.7.0

New Features

Support for different signal processor

Support for sensor short circuit detection

Bug Fixes

None

SIU Firmware Revision 1.6.0

New Features

Support for X2 Field Generators

Bug Fixes

Logic Programming Fixed a bug which lead to unreliable firmware updates.

I2C Initialization Fixed a bug which could have lead to an incorrect I2C address for port LEDs.

SIU Firmware Revision 1.3.0

Supports V3 SIU PCBs using hardware architecture 2.

4 Aurora V1 and V2 Firmware Revision History

This guide provides a reference of the firmware revision history for the Aurora V1 and V2 Systems. It details the history of enhancements and fixes made to the Aurora firmware components.

Note Combined firmware revision 006 was not released. It was only for NDI internal use. Combined firmware revision 010 is customer specific and not covered in this guide.

SIU Firmware Revision 002.012

V2 SIU firmware revision 002.012 is not part of any combined firmware revision package. It is available from NDI upon request.

Bug Fix

Tool SROMs with 0xE3 in Serial Number Tool SROM devices with a serial number containing 0xE3 could not be read by the Aurora system. This bug existed in all previous versions of SIU firmware and has now been fixed.

Combined Firmware Revision 012

The firmware revision of each sub-component that comprises combined firmware revision 012 is shown below:

Table 4-1 Combined Firmware Revision 012

Sub-component	Revision
SCU Firmware	007.310
V1 SIU Firmware	002.011
V3 SIU Firmware	002.002
API Revision	D.001.008

New Features

Support of V3 SIU The V3 Sensor Interface Unit (SIU) allows multiple tools to connect to a single unit.

Self-Tests and Alerts Alerts are a type of user parameter which describe the status of the various hardware devices in the system.

Configuration Change Bit A configuration change bit has been added to the system status returned with the BX and TX commands. This bit is set when an SIU is added or removed, and is cleared by the API commands PHSR and INIT.

New Commands The following commands have been introduced:

- **DFLT:** Sets user parameters back to factory default values.

- GETINFO: Returns descriptive information about the user parameters.
- SAVE: Saves all non-volatile user parameters that have been changed.
- SET: Sets user parameter values.

For further information, refer to the “*Aurora Application Program Interface Guide.*”

Improvements

User Parameters The user parameters store values for different aspects of the Aurora System. Some user parameters store values for the full system configuration; others store values pertaining to a particular hardware device in the system. Some user parameters are read-only parameters that store useful information about the system; some user parameter values can be changed, to allow you to configure the system. For further information, refer to the “*Aurora Application Program Interface Guide.*” The following user parameters have been added:

Table 4-2 New User Parameters

User Parameter Name	Description
Device.Type.X	Type of device in the system configuration
Device.Instance.X	Instance of this type of device in the system configuration
Features.Firmware.Version	Firmware version programmed into the device
Features.Hardware.Characterization Date	Date of most recent FG characterization
Features.Hardware.Manufacturing Date	Manufacturing date of the device
Features.Hardware.Model	Hardware model string
Features.Hardware.Serial Number	Hardware device serial number
Features.Hardware.Version	Hardware version string
Info.Status.Alerts	System hardware and operating status flags
Info.Status.New Alerts	System hardware and operating status flags
Info.Status.Alerts Overflow	System hardware and operating status flags overflow
Param.User.String	User-defined string (up to 63 chars)
Param.Page.Rev	Revision describing which parameters are saveable
Param.System Beeper	Enables/disables the beeper sequence on system reset
Param.Simulated Alerts	Simulates the 'Info.Status.Alerts' parameter, for testing purposes

Deprecated Commands

DSTART and DSTOP have been deprecated. Use TSTART and TSTOP instead.

GX has been deprecated and removed from the API. Use BX or TX instead.

PSTAT has been deprecated and removed from the API. Use PHSR and PHINF instead.

PVCLR has been deprecated and removed from the API. Use PHF instead.

Bug Fixes

Hardware handshaking for serial communication to the host computer was not properly implemented. This bug existed in all previous versions of firmware and has now been fixed.

Known Issues

Overwriting GPIO Line Direction Using PVWR When the tool definition file for a tool with GPIO lines programmed as output is overwritten using PVWR with a tool definition file with GPIO lines programmed as input, the direction of the lines may not be overwritten.

User Parameters Unavailable During Tracking Mode Not all user parameters for SIU devices are available during tracking. The user parameters which are unavailable for SIU devices during tracking are:

- Features.Hardware.Serial Number
- Features.Hardware.Manufacturing Date
- SIU-1.Features.Firmware Version.

Reporting of GPIO Status Using PHINF A change in GPIO status may not be reported with PHINF if the time between two PHINF calls is shorter than 100 ms.

Setting of GPIO Status Using PSOUT (tracking mode) Updating the GPIO status with PSOUT in tracking mode may occasionally fail, despite a reply of OKAY. To confirm that the GPIO status has been correctly updated, check the GPIO status bits in the replies to the BX or TX command.

Combined Firmware Revision 011

The firmware revision of each sub-component that comprises combined firmware revision 011 is shown below:

Table 4-3 Combined Firmware Revision 011

Sub-component	Revision
SCU Firmware	007.220
SIU Firmware	002.011
API Revision	D.001.007

New Features

Tabletop Field Generator This firmware introduces support for the Tabletop Field Generator (TTFG).

Dome Volume The API command SFLIST now supports the TTFG dome volume. For further information, refer to the SFLIST command in the *“Aurora Application Program Interface Guide.”*

Combined Firmware Revision 010

Combined firmware revision 010 is customer specific and not described in this guide.

Combined Firmware Revision 009

The firmware revision of each sub-component that comprises combined firmware revision 009 is shown below:

Table 4-4 Combined Firmware Revision 009

Sub-component	Revision
SCU Firmware	007.200
SIU Firmware	002.011
API Revision	D.001.006

New Features

Faster Data Acquisition This firmware introduces a mode that allows for faster data acquisition. For further information, refer to the TSTART command in the *“Aurora Application Program Interface Guide.”*

RESET The new API command RESET has been introduced for PC interfaces that do not support a serial break. Soft and hard reset is available depending on SCU hardware. For further information, refer to the RESET command in the *“Aurora Application Program Interface Guide.”*

Improvements

Baud Rates The SCU now supports baud rates as follows:

- 230 kbaud on all SCUs
- 921 kbaud on SCUs that support USB

For further information, refer to the COMM command in the *“Aurora Application Program Interface Guide.”*

Bug Fixes

Status Bit In TX reply the status bit did not change if one tool was removed and another tool added; the number of tools stayed constant. This bug existed in all previous versions of firmware and has now been fixed.

Timeout A timeout occurred in the following situation: enable port, disconnect the SIU connected to that port, TSTART command, TSTOP command. This bug existed in all previous versions of firmware and has now been fixed.

ECHO In ECHO command a colon was not allowed because it had been interpreted as request for checksum. The bug was introduced with the ECHO command combined firmware revision 004 and has now been fixed.

Tool Tracking LED The tool tracking LED sometimes did not show "missing" (flashing) when the tool was out of volume. The bug was introduced with combined firmware revision 008 and has now been fixed.

If tracking is stopped by INIT command the tool tracking LED did not change. This bug existed in all previous versions of firmware and has now been fixed.

Combined Firmware Revision 008

The firmware revision of each sub-component that comprises combined firmware revision 008 is shown below:

Table 4-5 Combined Firmware Revision 008

Sub-component	Revision
SCU Firmware	007.000
SIU Firmware	002.011
API Revision	D.001.005

New Features

Multiple Volume Support The Aurora System now supports multiple measurement volumes. A Field Generator can be programmed with up to four volumes, though only one can be used at a time. (Two volumes are currently available, cube and dome.) Use API command SFLIST 03 to query the Field Generator for volume information, and use API command VSEL to select the required volume.

GET The GET command returns the values of user parameters. The only user parameter values currently available are the timeouts for the API commands.

Syntax GET<SPACE><User Parameter Name><CR>
(only Info.Timeout is currently supported)

Parameters

Parameter	Description
User Parameter Name	A string, identifying the name of the user parameter. May include a trailing wild card character (*). Use GET * to return all user parameter values.

Reply <User Parameter Name>=<value><LF> (repeated for each user parameter name)<CRC16><CR>

Example

Command: GET Info.Timeout.PINIT

Reply: Info.Timeout.PINIT=5<LF>96A7

Indication of Metal Resistance In the reply to the API command SFLIST 03, a previously reserved character is now used to indicate whether or not the Aurora System is metal resistant:

SFLIST 03

Reply Component	Description	
Number of Volumes	1 hexadecimal character	
n th Shape Type	1 hexadecimal character	
	Possible Values:	
	9	cube volume
n th Shape Parameter	A	dome volume
	10 parameters, 7 characters each (a sign, and six digits with an implied decimal in the position XXXX . XX)	
Reserved	1 hexadecimal character	
Metal Resistant	1 hexadecimal character	
	Possible Values:	
	0	no information
	1	metal resistant
	2	not metal resistant

Improvements

Measurement Rate In previous versions of firmware, if a total of six or more sensor coils were simultaneously tracked, the measurement rate dropped from 40 Hz to 20 Hz. All tracking now occurs at 40 Hz, independent of the number of sensor coils.

Note The Aurora System is able to compute new measurement data at a rate of 40 Hz, but the rate at which this data can be extracted from the system depends on factors such as serial baud rate, API command used (BX or TX), and efficiency of software being used.

Bug Fixes

Port Handle Error When SIU Removed If an initialized tool is disconnected from the SIU, the associated port handle is reported as needing to be freed (PHSR 01). However, if the SIU of an initialized tool was disconnected from the SCU, the associated port handle was *not* reported as needing to be freed. This bug existed in all previous versions of firmware and has now been fixed.

SIU Not Recognized If several SIUs, each with a tool connected, were connected to the SCU and the first of these SIUs was disconnected from the SCU and then reconnected, it was possible that this SIU might not be detected. As a consequence, the associated LED on the SCU may not light. This bug existed in all previous versions of firmware and has now been fixed.

Tool Disconnect Error If a tool was disconnected from the SIU at the exact moment its Serial Read Only Memory (SROM) device was being read, an error would occur, causing the Aurora System to no longer respond to the host computer. This bug existed in all previous versions of firmware and has now been fixed.

No Response to TSTART and TSTOP It was possible that the Aurora System would not respond to a TSTART or TSTOP command. This bug existed in all previous versions of firmware and has now been fixed.

Combined Firmware Revision 007

The firmware revision of each sub-component that comprises combined firmware revision 007 is shown below.

Table 4-6 Combined Firmware Revision 007

Sub-component	Revision
SCU Firmware	006.030
SIU Firmware	002.011
API Revision	D.001.004

New Features

Pivot Offset Vector The Aurora System can now apply a previously determined pivot offset vector to a tool with a single sensor coil (5DOF). (The pivot offset is created with NDI 6D Architect software (Version 2.02.09 and above).)

Improvements

Lock-On-Time Overall, the average lock-on-time has been reduced.

SCU Date Format The freeze date for SCU firmware is now presented in ISO 8601 format (yyyy-mm-dd).

Bug Fixes

Incorrect Tool Recognition When the Aurora System was in tracking mode, and tracking a tool, it did not function correctly when the tool was unplugged from the tool port and another tool was plugged into that tool port. The system attempted to track the new tool using the tool definition file from the old tool. This bug was introduced in combined firmware revision 005 and has now been fixed.

Sensor Coil Missing A sensor coil would be incorrectly reported as missing. This happened with the sensor coil located in the measurement volume and parallel to the z-axis of the global coordinate system of the Field Generator. This bug existed in all previous versions of firmware and has now been fixed.

Tracking LED Behaviour The behaviour of the tracking LED of a tool with a single sensor coil was incorrect. The tracking LED flashed while the tool was being tracked, and lit solid when it was out of the measurement volume. This behaviour is the opposite of what it should be. This bug existed in all previous versions of firmware and has now been fixed.

Combined Firmware Revision 006

Combined firmware revision 006 was not released. It was only for NDI internal use.

Combined Firmware Revision 005

The firmware revision of each sub-component that comprises combined firmware revision 005 is shown below.

Table 4-7 Combined Firmware Revision 005

Sub-component	Revision
SCU Firmware	006.010
SIU Firmware	002.011
API Revision	D.001.001

Improvements

Incorrect Sensor Coil Reporting There have been rare occurrences when the position of a sensor coil would be reported incorrectly from the sensor coil's true position (outliers). These occurrences have now been reduced.

Bug Fixes

Out of Volume Bit The 'out of volume' bit was automatically being set when a transformation was reported as missing. This is misleading and has been corrected. This bug existed in all previous versions of firmware.

Intermittently Missing Tools Tools with one or more LED(s) were intermittently reported as missing. This bug existed in all previous versions of firmware and has now been fixed.

Unexpected Tool Behaviour If a tool definition file of a 6DOF tool was loaded to one handle of a dual 5DOF tool, unexpected behaviour was observed. The other handle of the 5DOF tool was left in an undefined state. This bug existed in all previous versions of firmware and has now been fixed.

Incorrect Sensor Coil Positions It was possible that sensor coils, located close to the z-axis of the global coordinate system, could have their positions reported incorrectly (outliers). This bug existed in all previous versions of firmware and has now been fixed.

Incorrect Frame Counter On rare occasions, the frame number counter, reported with a transformation, would sometimes be reported incorrectly. This bug existed in all previous versions of firmware and has now been fixed.

Combined Firmware Revision 004

The firmware revision of each sub-component that comprises combined firmware revision 004 is shown below

Table 4-8 Combined Firmware Revision 004

Sub-component	Revision
SCU Firmware	006.000
SIU Firmware	002.009
API Revision	D.001.001

New Features

Metal Resistance Increased resistance to interference from metal.

Sensor Coil Break Detection If a sensor coil suffers a break in its lead wires - either along the lead wire length, or at its connection points - the system will return a `MISSING` transformation and set a bit to indicate that a break has been detected. This functionality is implemented using the `TX (0x0001)` command. In the `<Port Status>` sub field, the once-reserved bit 8 now represents "sensor coil broken", and will be set if a sensor coil break is detected. Only NDI 6D Architect software (Version 2.02.09 and above) supports sensor break detection.

APIREV The `APIREV` command returns current API revision information.

Syntax `APIREV`

Parameters none

Reply Revision number of the current API, with `<CRC16>`.

Example

Command: `APIREV`

Reply: `D.001.0015314`

ECHO The ECHO command checks the communication path between the host computer and the Aurora System by returning what is sent.

Syntax ECHO<SPACE><Any ASCII characters><CRC16><CR>

Parameters Minimum 4 characters, maximum 198 characters

Reply Exactly what is sent with the command, with <CRC16>.

Example

Command: ECHO Testing!

Reply: Testing!A81C

Improvements

6DOF Tool Tracking Accuracy Improvements to the algorithm have been made which may result in an overall improvement of the 6DOF tool tracking accuracy.

Dual 5DOF Tool Gain Settings Improvements have been made for the support of 5DOF dual sensor coil tools. Independent gain settings are now used for each sensor coil. Independent gain settings allow optimal performance for each sensor coil of a dual sensor coil tool anywhere within the measurement volume.

Missing Frames Reduction Improvements have been made to the firmware which result in an overall reduction of missing frames of data.

5 Abbreviations and Acronyms

The following table provides a listing of the abbreviations and acronyms used in this guide.

Table 5-1 Abbreviations and Acronyms

Abbreviation or Acronym	Meaning
5DOF	Five Degrees of Freedom
6DOF	Six Degrees of Freedom
API	Application Program Interface
GPIO	General Purpose Input/Output
ISO	International Organization for Standardization
LED	Light Emitting Diode
NDI	Northern Digital Inc.
SCU	System Control Unit
SIU	Sensor Interface Unit
SROM	Serial Read Only Memory
V1	<p>First generation Aurora System.</p> <p>FG: Aurora V1 Field Generators (V1 FG) have serial numbers starting with F4, e.g. F4-xxxxx or with FGb, e.g. FGb0-Sxxxxx.</p> <p>SCU: Aurora V1 System Control Units (V1 SCUs) have serial numbers starting with A3 or A4. e.g. A4-xxxxxx.</p> <p>SIU: Aurora V1 Sensor Interface Units (V1 SIU) have serial numbers starting with S4, e.g. S4-xxxxxx. Some older V1 SIUs have only a lot number.</p>
V2	<p>Second generation Aurora System.</p> <p>FG: Aurora V2 Field Generators (V2 FG) have serial numbers starting with FGc, FGd, or FGe e.g. FGc0-Sxxxxx.</p> <p>SCU: Aurora V2 System Control Units (V2 SCUs) have serial numbers starting with SCb or SCe, e.g. SCb2-Sxxxxx.</p> <p>SIU: Aurora V1 SIUs are used with the V2 system.</p>
V3	<p>Third generation Aurora System.</p> <p>FG: Aurora V2 FGs are used with the V3 system.</p> <p>SCU: Aurora V3 System Control Units (V3 SCU) have serial numbers starting with SCd, e.g. SCd0-Sxxxxx.</p> <p>SIU: Aurora V3 Sensor Interface Units (V3 SIU) have serial numbers starting with SIf or SIg, e.g. SIg0-Sxxxxx.</p>
VSIU	Virtual Sensor Interface Unit
TTFG	Tabletop Field Generator