

# Software User's Guide for the **Core Flight System SP0-VxWorks6.9 Platform Support Package**

---

Engineering Directorate  
Software, Robotics, and Simulation Division

## Availability:

NASA & NASA contractor employees as required

May 2022  
Baseline



National Aeronautics and  
Space Administration  
**Lyndon B. Johnson Space Center**  
Houston, Texas

|   |   |              |
|---|---|--------------|
| Johnson Space Center<br>Engineering Directorate | Title: Software User's Guide for the Core Flight System SP0-VxWorks6.9 Platform Support Package |              |
|   | Doc. No. N/A  | Baseline     |
|   | Date: May 2022  | Page 2 of 13 |

## Change Record

| <i>Revision</i> | <i>Date</i> | <i>Originator</i> | <i>Description</i> |
|-----------------|-------------|-------------------|--------------------|
| N/A             | Oct 2021    | Tam Ngo           | Initial draft      |
| N/A             | May 2022    | Tam Ngo           | Baseline           |
|                 |             |                   |                    |
|                 |             |                   |                    |
|                 |             |                   |                    |

**Verify that this is the correct version before use**

|   |   |              |
|---|---|--------------|
| Johnson Space Center<br>Engineering Directorate | Title: Software User's Guide for the Core Flight System SP0-VxWorks6.9 Platform Support Package |              |
|   | Doc. No. N/A  | Baseline     |
|   | Date: May 2022  | Page 3 of 13 |

## Table of Contents

|           |   |           |
|-----------|---|-----------|
| <b>1</b>  | <b>INTRODUCTION.....</b>                              | <b>5</b>  |
| 1.1       | SCOPE .....   | 5         |
| 1.2       | PURPOSE .....   | 5         |
| 1.3       | AUDIENCE.....   | 5         |
| 1.4       | DOCUMENT STATUS AND SCHEDULE .....                    | 5         |
| <b>2</b>  | <b>RELATED DOCUMENTATION .....</b>                    | <b>5</b>  |
| 2.1       | APPLICABLE DOCUMENTS.....                             | 5         |
| 2.2       | REFERENCE DOCUMENTS .....                             | 5         |
| <b>3</b>  | <b>OVERVIEW .....</b>                                 | <b>6</b>  |
| <b>4</b>  | <b>INSTALLATION.....</b>                              | <b>6</b>  |
| <b>5</b>  | <b>BUILD.....</b>                                     | <b>6</b>  |
| <b>6</b>  | <b>CONFIGURATION.....</b>                             | <b>6</b>  |
| <b>7</b>  | <b>APPLICATION PROGRAMMING INTERFACES .....</b>       | <b>6</b>  |
| 7.1       | COMMON APIs .....                                     | 7         |
| 7.2       | STARTUP APIs .....                                    | 7         |
| 7.3       | FLASH APIs.....                                       | 7         |
| 7.4       | EXCEPTION STORAGE APIs.....                           | 7         |
| 7.5       | MEMORY APIs.....                                      | 7         |
| 7.6       | MEMORY SCRUBBING APIs .....                           | 7         |
| 7.7       | MODULE APIs .....                                     | 7         |
| 7.8       | SP0 INFO APIs.....                                    | 7         |
| 7.9       | NTP TIME SYNCHRONIZATION APIs .....                   | 7         |
| <b>8</b>  | <b>ASSUMPTIONS, DEPENDENCIES AND CONSTRAINTS.....</b> | <b>8</b>  |
| 8.1       | ASSUMPTIONS .....                                     | 8         |
| 8.2       | DEPENDENCIES .....                                    | 8         |
| 8.3       | CONSTRAINTS .....                                     | 8         |
| <b>9</b>  | <b>LIMITATIONS AND WARNINGS.....</b>                  | <b>8</b>  |
| 9.1       | LIMITATIONS.....                                      | 8         |
| 9.2       | WARNINGS.....   | 8         |
| <b>10</b> | <b>KNOWN PROBLEMS .....</b>                           | <b>8</b>  |
| <b>11</b> | <b>TROUBLESHOOT.....</b>                              | <b>8</b>  |
| 11.1      | VERIFYING SUCCESSFUL STARTUP .....                    | 9         |
| <b>12</b> | <b>APPENDICES .....</b>                               | <b>11</b> |
| 12.1      | ABBREVIATIONS AND ACRONYMS .....                      | 11        |
| 12.2      | DEFINITION OF TERMS .....                             | 12        |
| <b>13</b> | <b>NOTES.....</b>                                     | <b>13</b> |

Verify that this is the correct version before use

|   |   |              |
|---|---|--------------|
| Johnson Space Center<br>Engineering Directorate | Title: Software User's Guide for the Core Flight System SP0-VxWorks6.9 Platform Support Package |              |
|   | Doc. No. N/A  | Baseline     |
|   | Date: May 2022  | Page 4 of 13 |

## List of Tables

|   |   |
|---|---|
| Table 2-1: Applicable Documents .....   | 5 |
| Table 2-2: Reference Documents.....   | 6 |
| Table 7-1: <a href="#">SP0-VxWorks6.9 PSP Common APIs</a> .....                   | 7 |
| Table 7-2: <a href="#">SP0-VxWorks6.9 PSP Startup APIs</a> .....                  | 7 |
| Table 7-3: <a href="#">SP0-VxWorks6.9 PSP FLASH APIs</a> .....                    | 7 |
| Table 7-4: <a href="#">SP0-VxWorks6.9 PSP Exception Storage APIs</a> .....        | 7 |
| Table 7-5: <a href="#">SP0-VxWorks6.9 PSP Memory APIs</a> .....                   | 7 |
| Table 7-6: <a href="#">SP0-VxWorks6.9 PSP Memory Scrubbing APIs</a> .....         | 7 |
| Table 7-7: <a href="#">SP0-VxWorks6.9 PSP Module APIs</a> .....                   | 7 |
| Table 7-8: <a href="#">SP0-VxWorks6.9 PSP SP0 APIs</a> .....                      | 7 |
| Table 7-9: <a href="#">SP0-VxWorks6.9 PSP NTP Time Synchronization APIs</a> ..... | 8 |

**Verify that this is the correct version before use**

|   |   |              |
|---|---|--------------|
| Johnson Space Center<br>Engineering Directorate | Title: Software User's Guide for the Core Flight System SP0-VxWorks6.9 Platform Support Package |              |
|   | Doc. No. N/A  | Baseline     |
|   | Date: May 2022  | Page 5 of 13 |

## 1 INTRODUCTION

### 1.1 Scope

This Software User's Guide is for the Core Flight System (cFS) SP0-VxWorks6.9 Platform Support Package (PSP). From here on, the software product will be referred to as the SP0-VxWorks6.9 PSP.

### 1.2 Purpose

This document describes how to install, configure, build, execute and troubleshoot the SP0-VxWorks6.9 PSP within the context of a cFS-based software system. The software was developed specifically as a software component of a cFS system, and hence, can only be built and executed within the cFS development and run-time environments. For additional information on cFE/cFS software framework, see documentation building and running included with the cFE software release. A copy can be obtained at <https://github.com/nasa/cfe>.

### 1.3 Audience

The intended audience of this document are the cFS software developers. It is assumed that the developers are familiar with the general infrastructure of the cFS and its ecosystem as well as the general build and run of cFS applications and libraries. New cFS developers can start with CFS-101 as the initial cFS training. A copy can be obtained at <https://github.com/nasa/cfs-101>.

Note that this is NOT the Software User's Guide for the Crew and Ground to command and control the target system. That shall be a separate document to be produced by the users for their mission or project.

### 1.4 Document Status and Schedule

This Software User's Guide is part of the documentation that comes with the software release of the SP0-VxWorks6.9 PSP.

## 2 RELATED DOCUMENTATION

### 2.1 Applicable Documents

The following documents, of the exact issue and revision shown, form a part of this Software User's Guide to the extent specified herein.

**Table 2-1: Applicable Documents**

| <i>Document Number</i> | <i>Document Title</i>  | <i>Revision / Release Date</i> |
|------------------------|--|--------------------------------|
| NPR 7150.2             | NASA Software Engineering Procedural Requirements            | Rev C / Aug 2019               |
| EA-WI-025              | GFE Flight Project Software and Firmware Development         | Rev D / Sep 2013               |
| GP-10021               | Core Flight Software Certification Software Development Plan | Baseline / May 2020            |

### 2.2 Reference Documents

The following documents are reference documents utilized in the development of this Software User's Guide. These documents do not form a part of this document and are not controlled by their reference herein.

**Verify that this is the correct version before use**

|   |   |              |
|---|---|--------------|
| Johnson Space Center<br>Engineering Directorate | Title: Software User's Guide for the Core Flight System SP0-VxWorks6.9 Platform Support Package |              |
|   | Doc. No. N/A  | Baseline     |
|   | Date: May 2022  | Page 6 of 13 |

**Table 2-2: Reference Documents**

| <i>Document Number</i> | <i>Document Title</i>                       | <i>Revision / Release Date</i> |
|------------------------|---|--------------------------------|
| GSFC 582-2008-012      | cFS Deployment Guide                        | Rel. 3.0 / Sep 2014            |
| GSFC 582-2007-001      | cFE Application User's Guide                | Rel. 5.4 / Sep 2014            |
| GSFC 582-2007-00       | OSAL Configuration Guide                    | Rel. 4.2.1 / Aug 2016          |
| N/A                    | SP0-VxWorks6.9 PSP Software Design Document | Baseline / May 2022            |

### 3 OVERVIEW

The SP0-VxWorks6.9 PSP is an abstraction layer of the processor's Board Support Package (BSP), similar to how the OSAL is the abstraction layer of the Operating System. A PSP provides a common set of Application Programming Interfaces (APIs) that can be used by the cFE, the OSAL and any cFS application/library.

The SP0-VxWorks6.9 PSP is implemented specifically for the AiTech SP0-S processor running VxWorks v6.9 operating system.

### 4 INSTALLATION

The SP0-VxWorks6.9 PSP requires no custom installation. It is packaged for distribution and installation just like any other PSP product, along with all the necessary documentation and artifacts. To install the SP0-VxWorks6.9 in a typical cFS workspace layout, the users can add its source code to the "*psp*" directory. See <https://github.com/nasa/cfs> for a recommended cFS workspace layout.

Note that the users can opt to customize their own cFS workspace layout. When that is the case, the users' custom installation process supersedes the cFS default installation process.

### 5 BUILD

The SP0-VxWorks6.9 PSP requires no custom build. Adding the SP0-VxWorks6.9 PSP to the build is the same as adding any typical PSP implementation to an existing cFS build. See cFS Deployment Guide for information on cFS build process with CMake.

Note that if the users opt to use their own workspace layout, the users need to update the the cFS build steps to accommodate that custom workspace layout. When that is the case, the users' build process supersedes the cFS default build process.

The SP0-VxWorks6.9 PSP is developed to build, load and executed out-of-box with its default configurations.

### 6 CONFIGURATION

The SP0-VxWorks6.9 PSP can be configured for a project. To customize the configuration parameters, edit the C header file, "*psp/fsw/sp0-vxworks6.9/inc/cfe\_psp\_config.h*".

### 7 APPLICATION PROGRAMMING INTERFACES

**Verify that this is the correct version before use**

|   |   |              |
|---|---|--------------|
| Johnson Space Center<br>Engineering Directorate | Title: Software User's Guide for the Core Flight System SP0-VxWorks6.9 Platform Support Package |              |
|   | Doc. No. N/A  | Baseline     |
|   | Date: May 2022  | Page 7 of 13 |

This section includes the nine groups of SP0-VxWorks6.9 PSP APIs.

## 7.1 Common APIs

**Table 7-1** lists the SP0-VxWorks6.9 PSP APIs associated with common APIs for a cFE PSP.

**Table 7-1:** [SP0-VxWorks6.9 PSP Common APIs](#)

## 7.2 Startup APIs

**Table 7-2** lists the SP0-VxWorks6.9 PSP APIs associated with PSP startup.

**Table 7-2:** [SP0-VxWorks6.9 PSP Startup APIs](#)

## 7.3 FLASH APIs

**Table 7-3** lists the SP0-VxWorks6.9 PSP APIs associated with FLASH-related IO.

**Table 7-3:** [SP0-VxWorks6.9 PSP FLASH APIs](#)

## 7.4 Exception Storage APIs

**Table 7-4** lists the SP0-VxWorks6.9 PSP APIs associated with exception storage.

**Table 7-4:** [SP0-VxWorks6.9 PSP Exception Storage APIs](#)

## 7.5 Memory APIs

**Table 7-5** lists the SP0-VxWorks6.9 PSP APIs associated with memory.

**Table 7-5:** [SP0-VxWorks6.9 PSP Memory APIs](#)

## 7.6 Memory Scrubbing APIs

**Table 7-6** lists the SP0-VxWorks6.9 PSP APIs associated with memory scrubbing.

**Table 7-6:** [SP0-VxWorks6.9 PSP Memory Scrubbing APIs](#)

## 7.7 Module APIs

**Table 7.7** lists the SP0-VxWorks6.9 PSP APIs associated with module.

**Table 7-7:** [SP0-VxWorks6.9 PSP Module APIs](#)

## 7.8 SP0 Info APIs

**Table 7-8** lists the SP0-VxWorks6.9 PSP APIs associated with SP0 statistical data.

**Table 7-8:** [SP0-VxWorks6.9 PSP SP0 APIs](#)

## 7.9 NTP Time Synchronization APIs

**Table 7-9** lists the SP0-VxWorks6.9 PSP APIs associated with NTP time synchronization.

**Verify that this is the correct version before use**

|   |   |              |
|---|---|--------------|
| Johnson Space Center<br>Engineering Directorate | Title: Software User's Guide for the Core Flight System SP0-VxWorks6.9 Platform Support Package |              |
|   | Doc. No. N/A  | Baseline     |
|   | Date: May 2022  | Page 8 of 13 |

**Table 7-9: [SP0-VxWorks6.9 PSP NTP Time Synchronization APIs](#)**

## 8 ASSUMPTIONS, DEPENDENCIES AND CONSTRAINTS

### 8.1 Assumptions

- The SP0-VxWorks6.9 PSP contains the implementation of the common PSP APIs, as well as the additional custom APIs that are specific to the SP0 processor. The custom APIs are dictated by the software system's requirements, and hence, will vary from PSP to PSP.
- The SP0-VxWorks6.9 PSP's platform-specific configuration parameters are defined in the header file, *psp/fsw/sp0-vxworks6.9/inc/cfe\_psp\_config.h*.
- Aitech Bootloader seems to delete the Reserved Memory after reboot. Since Reserved Memory will get erased at each reboot, Critical Data Storage (CDS), Reset Memory, Volatile Disk Memory, and User Reserved Memory are synchronized on FLASH memory.
  - The Reserved Memory on RAM is the Gold copy.
  - The Reserved Memory sections on FLASH are used to recover data after a PROCESSOR reset. A POWERON reset will result in each Reserved Memory section being erased.
  - There is no process by which a user can disable a Reserved Memory section.

### 8.2 Dependencies

- The SP0-VxWorks6.9 PSP is dependent on the Wind River development tools (cross compiler, loader, etc.) for the VxWorks v6.9 operating system for the PowerPC processor family.

### 8.3 Constraints

- The SP0-VxWorks6.9 PSP is developed specifically for cFS, and hence, can only be used within the cFS development and run-time environments. For additional information on cFS, see documentation included with the cFE software release.

## 9 LIMITATIONS AND WARNINGS

### 9.1 Limitations

- The SP0 exception handling is currently defaulted to the Kernel's default exception handling.
- Direct Memory Access (DMA) is not yet supported.
- When running the SP0-VxWorks6.9 PSP's unit tests on the SP0 platform, the SPE-based functions are currently stubbed out due to issues with the Wind River's code coverage tool.

### 9.2 Warnings

None.

## 10 KNOWN PROBLEMS

The SP0-VxWorks6.9 PSP's known problems and known changes are documented in the SP0-VxWorks6.9 PSP's Version Description Document (VDD), which is also included in an SP0-VxWorks6.9 PSP software release.

## 11 TROUBLESHOOT

**Verify that this is the correct version before use**



|   |   |              |
|---|---|--------------|
| Johnson Space Center<br>Engineering Directorate | Title: Software User's Guide for the Core Flight System SP0-VxWorks6.9 Platform Support Package |              |
|   | Doc. No. N/A  | Baseline     |
|   | Date: May 2022  | Page 9 of 13 |

## 11.1 Verifying successful startup

When the SP0-VxWorks6.9 PSP is successfully loaded and executed by the cFE Executive service, look for outputs similar to those below from the FSW execution output. Note that

- the expected outputs might not immediately follow one another; and
- the actual timestamps or will not be the same as the ones listed below; and
- certain values relating to kernel configurations, such as memory addresses could be different.

```
. . .
CFE_PSP_Main()
. . .
CFE_PSP: Set up VxWorks timebase, 50000000 ticks/sec, OS_time_t ratio=1/5
CFE_PSP: Using DIRECT memory mapped EEPROM implementation
CFE_PSP: Using DIRECT memory mapped RAM implementation
CFE_PSP: Using DIRECT memory mapped PORT implementation
PSP SP0: Collecting Data
PSP MEMORY: SetupReservedMemoryMap Info:
  RESET:      Block Ptr: 0x3ffce090   Block Size: 0x000264e8
  CDS:   Block Ptr: 0x3fbe0000   Block Size: 0x00020000
  VoDi:  Block Ptr: 0x3fc00000   Block Size: 0x00200000
  UsRe:  Block Ptr: 0x3fa00000   Block Size: 0x00100000
PSP NTP SYNC: Task Initialized
PSP: Reset Register = 08
PSP: POWERON Reset: Power Switch ON.
CFE_PSP: Clearing Processor Reserved Memory.
PSP MEM SCRUB: Starting Active Memory Scrubbing
PSP: Setting system tasks' priorities for 10 tasks.
PSP: Setting tLogTask priority from 0 to 0
PSP: Setting tShell0 priority from 0 to 201
PSP: Setting tWdbTask priority from 0 to 203
PSP: Setting tVxdbgTask priority from 0 to 200
PSP: Setting tNet0 priority from 0 to 25
PSP: Setting ipftps priority from 0 to 202
PSP: Setting ipcom_syslogd priority from 0 to 205
PSP: Setting ipcom_telnetd priority from 0 to 204
PSP: Could not find task ipcom_egd
PSP: Setting FTCMP00 priority from 0 to 253
PSP: At least one vxWorks task priority set failed. System may have degraded
performance.
PSP: PROCESSOR rst Source = 0x8 = (RESET_SRC_POR) Safe mode = 0, sbc = LOCAL, reason =
0, cause = 0x00000000
PSP: POST Test - PASSED - Marching Address Test(L) .
PSP: POST Test - Not Run - Marching Address Test(W) .
PSP: POST Test - Not Run - Marching Address Test(B) .
PSP: POST Test - Not Run - Walk a Bit Test(L) .
PSP: POST Test - Not Run - Walk a Bit Test(W) .
PSP: POST Test - Not Run - Walk a Bit Test(B) .
PSP: POST Test - PASSED - Refresh Test(L) .
PSP: POST Test - Not Run - Refresh Test(W) .
PSP: POST Test - Not Run - Refresh Test(B) .
PSP: POST Test - PASSED - Random Data Test(L) .
PSP: POST Test - Not Run - Random Data Test(W) .
PSP: POST Test - Not Run - Random Data Test(B) .
PSP: POST Test - PASSED - Clear Memory Test(L) .
```

**Verify that this is the correct version before use**

|   |   |               |
|---|---|---------------|
| Johnson Space Center<br>Engineering Directorate | Title: Software User's Guide for the Core Flight System SP0-VxWorks6.9 Platform Support Package |               |
|   | Doc. No. N/A  | Baseline      |
|   | Date: May 2022  | Page 10 of 13 |

```

PSP: POST Test - Not Run - Clear Memory Test(W).
PSP: POST Test - Not Run - Clear Memory Test(B).
PSP: POST Test - Not Run - N/D Marching Bit Test(L).
PSP: POST Test - Not Run - N/D Marching Bit Test(W).
PSP: POST Test - Not Run - N/D Marching Bit Test(B).
PSP: POST Test - PASSED - ECC Read Test on SDRAM .
PSP: POST Test - Not Run - Boot Flash Fail Over.
PSP: POST Test - PASSED - EEPROM CRC Test .
PSP: POST Test - PASSED - User Flash CRC Test .
PSP: POST Test - Not Run - User Flash Retention Test.
PSP: POST Test - PASSED - CPU Test .
PSP: POST Test - Not Run - L1 Cache Test.
PSP: POST Test - Not Run - L2 Cache Test.
PSP: POST Test - PASSED - PCI Bridge Test .
PSP: POST Test - PASSED - cPCI Bridge Test .
PSP: POST Test - Not Run - Watchdog Reset Test.
PSP: POST Test - PASSED - Interrupt Test .
PSP: POST Test - PASSED - Timer Test .
PSP: POST Test - Not Run - Serial I/O External Loopback Test.
PSP: POST Test - PASSED - Memory Interface Test .
PSP: POST Test - Not Run - Combined Timer Test.
PSP: POST Test - PASSED - ECC Error Injection Test .
PSP: POST Test - PASSED - Serial I/O Internal Loopback Test - UART .
PSP: POST Test - Not Run - Watchdog Timer Test.
PSP: POST Test - Not Run - FPGA Watchdog Reset Test.
PSP: POST Test - PASSED - FPGA Watchdog Timer Test .
. . .
PSP: PSP Application Startup Complete
. . .
PSP EXC: Attached cFE Exception Handler.
PSP SetDefaultExceptionEnvironment not implemented
PSP NTP SYNC: CFE TIME Service is ready - Starting NTP Sync
. . .

```

**Verify that this is the correct version before use**

|   |   |               |
|---|---|---------------|
| Johnson Space Center<br>Engineering Directorate | Title: Software User's Guide for the Core Flight System SP0-VxWorks6.9 Platform Support Package |               |
|   | Doc. No. N/A  | Baseline      |
|   | Date: May 2022  | Page 11 of 13 |

## 12 APPENDICES

### 12.1 Abbreviations and Acronyms

| Term  | Definition  |
|-------|---|
| API   | Application Programming Interface                 |
| BSP   | Board Support Package                             |
| CCDD  | CFS Command and Data Dictionary tool              |
| CCSDS | Consultative Committee for Space Data Systems     |
| cFE   | Core Flight Executive                             |
| cFS   | Core Flight System                                |
| CI    | Command Ingest cFS application                    |
| COTS  | Commercial Off-the-Shelf                          |
| CSC   | Computer Software Component                       |
| CSCI  | Computer Software Configuration Item              |
| CSU   | Computer Software Unit                            |
| EA    | JSC Engineering Directorate Organization Code     |
| ES    | cFE Executive Services                            |
| EVS   | cFE Event Services                                |
| GFE   | Government Furnished Equipment                    |
| GSFC  | Goddard Space Flight Center                       |
| HK    | Housekeeping cFS application                      |
| JSC   | Johnson Space Center                              |
| MDT   | Message Definition Table (for SCH_TT application) |
| MID   | Message Identifier                                |
| NASA  | National Aeronautics and Space Administration     |
| NPR   | NASA Procedural Requirements                      |
| OS    | Operating System                                  |
| OSAL  | Operating System Abstraction Layer                |
| PSP   | Platform Support Package                          |
| SB    | cFE Software Bus                                  |
| SBNg  | Software Bus Network for Gateway cFS application  |

**Verify that this is the correct version before use**

|   |   |               |
|---|---|---------------|
| Johnson Space Center<br>Engineering Directorate | Title: Software User's Guide for the Core Flight System SP0-VxWorks6.9 Platform Support Package |               |
|   | Doc. No. N/A  | Baseline      |
|   | Date: May 2022  | Page 12 of 13 |

| Term    | Definition   |
|---------|--|
| SCH     | Scheduler cFS application                          |
| SCH_TT  | Time-Triggered Ethernet Scheduler cFS application  |
| SDD     | Software Detailed Design                           |
| SDT     | Schedule Definition Table (for SCH_TT application) |
| SRS     | Software Requirements Specification                |
| TBD     | To Be Determined                                   |
| TDM     | Time-Division Multiplexer                          |
| TO      | Telemetry Output cFS application                   |
| TTE     | Time-Triggered Ethernet                            |
| TTE ES  | Time-Triggered Ethernet End System                 |
| TTE_LIB | Time-Triggered Ethernet cFS Library                |
| TTE_MGR | Time-Triggered Ethernet Manager cFS application    |
| VDD     | Version Description Document                       |

## 12.2 Definition of Terms

None.

**Verify that this is the correct version before use**

|   |  |               |
|---|--|---------------|
| <b>Johnson Space Center<br/>Engineering Directorate</b> | <b>Title: Software User's Guide for the Core Flight System SP0-VxWorks6.9 Platform Support Package</b> |               |
|   | Doc. No. N/A   | Baseline      |
|   | Date: May 2022   | Page 13 of 13 |

## 13 NOTES

None.

**Verify that this is the correct version before use**