System Test Plan

for the

KNEAD Example System

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DOCUMENT CHANGE HISTORY

The following table is a simple list of released revisions sent for review. Records of reviews and the review artifacts are saved with reviewer information in the The KNEAD Projectartifact repository.

Change Record

Date	Version	Author(s)	Change Reference
25 Feb 2024	P1	Lewis Collier	1st draft version

Each subsequent "section" outlines changes in each release.

Items in this version that are marked with change bars have been modified from the most recent previous version (e.g. P3 changes from P2) or are new as of the current revision. A list of all changed items may be found in the Index section under the heading "All Changes This Version".

Draft P1 Preliminary version of this document.

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CHAPTER 1

Scope

ALL-1.0 ::

If applicable, each section has a summary of data item description (DID) information shown in this font. These are displayed in small capital font and are not part of the formal document. Display of these DID information notes can be turned off for formal releases, but are displayed here for reference.

This document provides the System Test Plan (STP) for the Garden Control System, which is known as GCS. These engineering tests provide the multistage plan for testing of the GCS, which follows Appendix A of DOD-STD-2106 (Navy) [**ref˙DOD˙STD˙2106˙NAVY**].

1.1 Identification

ALL-1.1 :: The Garden Control System is an RP2040 based microcontroller board.

This paragraph shall contain a full identification of the system to which this document applies, including, as applicable, identification number(s), title(s), abbreviation(s), version number(s), and release number(s).

The GCS, described in this document shall be known as GCS version 1.0.

1.2 System Overview

ALL-1.2 :: This paragraph shall briefly state the purpose of the system to which this document applies. It shall describe the general nature of the system; summarize the history of system development, operation, and maintenance; identify the project sponsor, acquirer, user, developer, and support agencies; identify current and planned operating sites; and list other relevant documents.

The Garden Control System will be able to measure moisture levels and control irrigation in raised garden beds. The purpose for GCS is to maintain ideal gardening and growth conditions for fruits, vegetables, and other garden plants throughout a growing season. The goal for GCS is to automate the watering process for DIY gardeners. GCS will monitor temperature, moisture levels, and additionaly environmental factors to determine when to water the plants. Garden Control System is being developed by Zachary Steinberg and sponsored by University of Maryland Graduate Engineering. The operator and maintaner of GCS will also be Zachary Steinberg. The GCS will be operated outside along raised garden beds. GCS is designed to be used by home gardeners. It is not intended for industry. GCS will be controlled by a Raspberry Pi Pico W microcontroller board.

Figure **??** shows the development kit used for the GCS system. This is an image of

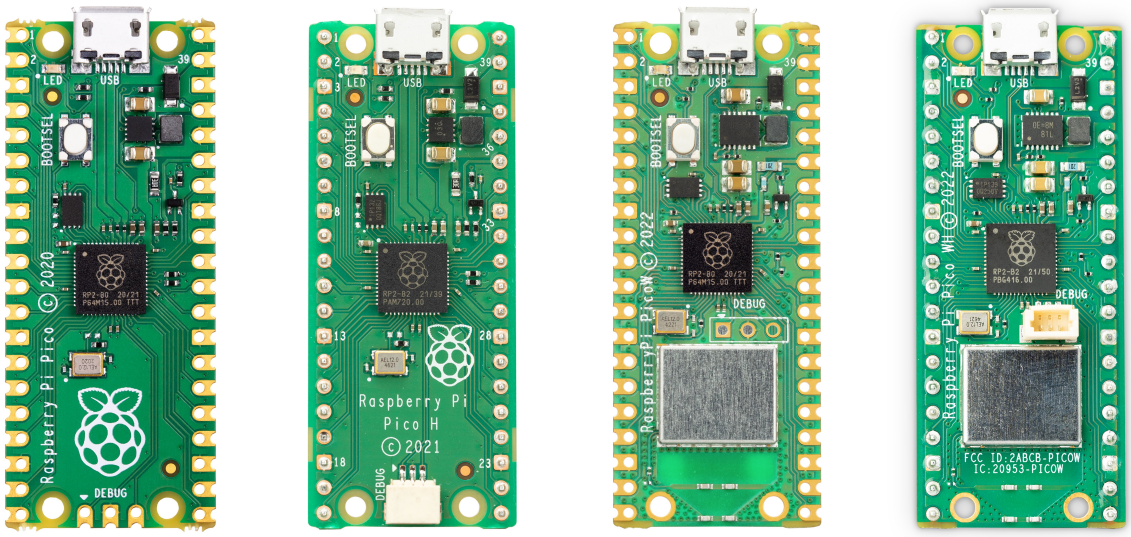

Figure 1: Raspberry Pi Pico W microcontroller board

different versions of the Raspberry Pi Pico microcontroller board. (This is a test image)

1.3 Document Overview

ALL-1.3 :: This paragraph shall summarize the purpose and contents of this document and shall describe any security or privacy considerations associated with its use.

This section provides information about this document's security/privacy considerations, contents, structure, and version information.

1.3.1 Security and Privacy Considerations

This document is not subject to CUI restrictions.

This document format is based upon the guidance in the STP DID [**ref˙STP˙DID**]. The test planning is documented following the guidelines of ISO-12207 (Software Life Cycle Process) [**ref˙ISO˙12207**] and MIL-STD-498 (Software Development and Documentation) [**ref˙MIL˙STD˙498**], from which ISO-12207 originated. This document follows the listed STP sub-section order.

Section 1 provides an overview of the system and this document.

Section 2 lists general and application-specific reference documents as well as glossary terms and acronyms.

Section 3 summarizes the test environment(s).

Section 4 identifies the tests to be performed.

Section 5 outlines the test schedules.

Section 6 provides any applicable requirement traceability.

Section 7 if needed, lists any general notes as may be applicable.

Appendices if needed, provide additional information as may be needed.

1.3.2 Document Version Information

This document was produced in LaTeX and *BibLaTeX/Biber*. The editing and document preparation were performed using MiKTeX version 2.9 with the build option [LaTeX ⇒ PS ⇒ PDF]. The LaTeX*svn-multi* package was used to glean SVN tracking information, when files are stored in an "SVN" version control system. The style `KNEADdocument` was used to provide the LaTeX and *BibLaTeX/Biber* formatting details.

This revision of this document has the following properties:

Tracking Item	**Data**
Repository	`https://svn.riouxsvn.com/kneadlatxinputs/ExampleArtifactFolders/6a%20-%20STP/KNEAD_STP.tex`
Author	
Revision	-2
Rev Date	
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KNEADdocument Version	1.00
KNEADdocument Date	2021/12/05

CHAPTER 2

References

This section provides a list of referenced items for this document.

2.1 Acronyms and Abbreviations

This section defines acronyms and abbreviations used in this and related documents.

Table 1: Acronym Definitions

Acronym	Definition
GCS	Garden Control System
UMD	University of Maryland
MAGE	Maryland Applied Graduate Engineering
ENPM	Engineering Professional Masters
End of acronym definition table	

2.2 Glossary and Definitions

This section defines glossary terms used in this and related documents.

Table 2: Glossary Terms and Definitions

Glossary Term	Definition
Communications	Communication is information transfer, among users or processes, according to agreed conventions.
Customer	The local government project lead who is acting as a general manager for the sponsor to ensure that the contractor team executes the project according to stakeholder goals.
End of glossary terms table	

2.3 Referenced Documents

This section lists the referenced documents for this document. The references are categorized into two categories:

External Documents not directly associated with this project.

Project Documents that are directly associated with this project.

2.3.1 External Documents

2.3.2 Project Specific Documents

CHAPTER 3

Test Environments

STP-3.0.0 :: This section shall be divided into the subsections to describe the system test environments at each intended test site or level. Reference may be made to the Software Development Plan (SDP) for resources that are described here.

This section describes the test environments to be used for testing the system.

3.1 Test Environment One

STP-3.x.0 :: Name of Test Environment – This section shall identify one, or more than one related, test site(s) to be used for the testing, and shall be divided into subsections to describe the test environment at the site(s). If all tests will be conducted at a single site, this section and its subsections shall be presented only once. If multiple test sites provide the same or similar test environments, they may be discussed together. Duplicate information among test site descriptions may be reduced by referencing earlier descriptions. This section shall be divided into the subsections to describe each test environment.

This section identifies and describes the TEone test environment.

3.1.1 Software Items

STP-3.x.1 :: Test Environment Software – This section shall identify by name, number, and version, as applicable, the software items (e.g., operating systems, compilers, communications software, related applications software, databases, input files, code auditors, dynamic path analyzers, test drivers, preprocessors, test data generators, test control software, other special test software, post-processors) necessary to perform the planned testing activities at the test site(s). This section shall describe the purpose of each item, describe its media (tape, disk, etc.), identify those that are expected to be supplied by the site, and identify any classified processing or other security or privacy issues associated with the software items.

The software items needed for the TEone Test Environment are ...TBD....

3.1.2 Hardware and Firmware Items

STP-3.x.2 :: Test Environment Hardware and Firmware – This section shall identify by name, number, and version, as applicable, the computer hardware, interfacing equipment, communications equipment, test data reduction equipment, apparatus such as extra peripherals (tape drives, printers, plotters), test message generators, test timing devices, test event records, etc., and firmware items that will be used in the software test environment at the test site(s). This section shall describe the purpose of each item, state the period of usage and the number of each item needed, identify those that are expected to be supplied by the site, and identify any classified processing or other security or privacy issues associated with the items.

The hardware and firmware items needed for the TEone Test Environment are ...TBD....

3.1.3 Other Materials

STP-3.x.3 :: Test Environment Other Materials – This section shall identify and describe any other materials needed for the testing at the test site(s).

These materials may include manuals, software listings, media containing the software to be tested, media containing data to be used in the tests, sample listings of outputs, and other forms or instructions. This section shall identify those items that are to be delivered to the site and those that are expected to be supplied by the site. The description shall include the type, layout, and quantity of the materials, as applicable. This section shall identify any classified processing or other security or privacy issues associated with the items.

The other materials needed for the TEone Test Environment are ...TBD....

3.1.4 Proprietary Nature

STP-3.x.4 :: Proprietary nature, acquirer's rights, and licensing – This section shall identify the proprietary nature, acquirer's rights, and licensing issues associated with each element of the test environment.

The proprietary nature, acquirer's rights, and licensing issues for the TEone Test Environment are ...TBD....

3.1.5 Installation

STP-3.x.5 :: Installation, testing, and control – This section shall identify the developer's plans for performing each of the following, possibly in conjunction with personnel at the test site(s). This includes planning such as acquiring or developing each element of the test environment, installing and testing each item of the test environment prior to its use, and controlling and maintaining each item of the test environment.

The installation issues for the TEone Test Environment are ...TBD....

3.1.6 Participating Organizations

STP-3.x.6 :: Participating organizations – This section shall identify the organizations that will participate in the testing at the test site(s) and the roles and responsibilities of each.

The participating organizations for the TEone Test Environment are ...TBD....

3.1.7 Personnel

STP-3.x.7 :: Personnel needed– This section shall identify the number, type, and skill level of personnel needed during the test period at the test site(s), the dates and times they will be needed, and any special needs, such as multi-shift operation and retention of key skills to ensure continuity and consistency in extensive test programs.

The personnel planning for the TEone Test Environment is ...TBD....

3.1.8 Orientation Planning

STP-3.x.8 :: Orientation plan – This section shall describe any orientation and training to be given before and during the testing. This information shall be related to the personnel needs given in 3.x.7. This training may include safety, user instruction, operator instruction, maintenance and control group instructions, and orientation briefings to staff personnel. If extensive training is anticipated, a separate plan may be developed and referenced here.

The orientation planning for the TEone Test Environment is ...TBD....

3.1.9 Tests to be Performed

STP-3.x.9 :: Tests Performed – This section shall identify, by referencing section 4, the tests to be performed at the test site(s) / environment.

The tests to be performed for the TEone Test Environment are ...TBD....

3.2 Test Environment Two

STP-3.x.0 :: Name of Test Environment – This section shall identify one, or more than one related, test site(s) to be used for the testing, and shall be divided into subsections to describe the test environment at the site(s). If all tests will be conducted at a single site, this section and its subsections shall be presented only once. If multiple test sites provide the same or similar test environments, they may be discussed together. Duplicate information among test site descriptions may be reduced by referencing earlier descriptions. This section shall be divided into the subsections to describe each test environment.

This section identifies and describes the TEtwo test environment.

3.2.1 Software Items

STP-3.x.1 :: Test Environment Software – This section shall identify by name, number, and version, as applicable, the software items (e.g., operating systems, compilers, communications software, related applications software, databases, input files, code auditors, dynamic path analyzers, test drivers, preprocessors, test data generators, test control software, other special test software, post-processors) necessary to perform the planned testing activities at the test site(s). This section shall describe the purpose of each item, describe its media (tape, disk, etc.), identify those that are expected to be supplied by the site, and identify any classified processing or other security or privacy issues associated with the software items.

The software items needed for the TEtwo Test Environment are ...TBD....

3.2.2 Hardware and Firmware Items

STP-3.x.2 :: Test Environment Hardware and Firmware – This section shall identify by name, number, and version, as applicable, the computer hardware, interfacing equipment, communications equipment, test data reduction equipment, apparatus such as extra peripherals (tape drives, printers, plotters), test message generators, test timing devices, test event records, etc., and firmware items that will be used in the software test environment at the test site(s). This section shall describe the purpose of each item, state the period of usage and the number of each item needed, identify those that are expected to be supplied by the site, and identify any classified processing or other security or privacy issues associated with the items.

The hardware and firmware items needed for the TEtwo Test Environment are ...TBD....

3.2.3 Other Materials

STP-3.x.3 :: Test Environment Other Materials – This section shall identify and describe any other materials needed for the testing at the test site(s). These materials may include manuals, software listings, media containing the software to be tested, media containing data to be used in the tests, sample listings of outputs, and other forms or instructions. This section shall identify those items that are to be delivered to the site and those that are expected to be supplied by the site. The description shall include the type, layout, and quantity of the materials, as applicable. This section shall identify any classified processing or other security or privacy issues associated with the items.

The other materials needed for the TEtwo Test Environment are ...TBD....

3.2.4 Proprietary Nature

STP-3.x.4 :: Proprietary nature, acquirer's rights, and licensing – This section shall identify the proprietary nature, acquirer's rights, and licensing issues associated with each element of the test environment.

The proprietary nature, acquirer's rights, and licensing issues for the TEtwo Test Environment are ...TBD....

3.2.5 Installation

STP-3.x.5 :: Installation, testing, and control – This section shall identify the developer's plans for performing each of the following, possibly in conjunction with personnel at the test site(s). This includes planning such as acquiring or developing each element of the test environment, installing and testing each item of the test environment prior to its use, and controlling and maintaining each item of the test environment.

The installation issues for the TEtwo Test Environment are ...TBD....

3.2.6 Participating Organizations

STP-3.x.6 :: Participating organizations – This section shall identify the organizations that will participate in the testing at the test site(s) and the roles and responsibilities of each.

The participating organizations for the TEtwo Test Environment are ...TBD....

3.2.7 Personnel

STP-3.x.7 :: Personnel needed– This section shall identify the number, type, and skill level of personnel needed during the test period at the test site(s), the dates and times they will be needed, and any special needs, such as multi-shift operation and retention of key skills to ensure continuity and consistency in extensive test programs.

The personnel planning for the TEtwo Test Environment is ...TBD....

3.2.8 Orientation Planning

STP-3.x.8 :: Orientation plan – This section shall describe any orientation and training to be given before and during the testing. This information shall be related to the personnel needs given in 3.x.7. This training may include safety, user instruction, operator instruction, maintenance and control group instructions, and orientation briefings to staff personnel. If extensive training is anticipated, a separate plan may be developed and referenced here.

The orientation planning for the TEtwo Test Environment is ...TBD....

3.2.9 Tests to be Performed

STP-3.x.9 :: Tests Performed – This section shall identify, by referencing section 4, the tests to be performed at the test site(s) / environment.

The tests to be performed for the TEtwo Test Environment are ...TBD....

CHAPTER 4

Test Identifications

STP-4.0.0 :: This section shall be divided into the following paragraphs to identify and describe each test to which this STP applies.

This section defines the test to be conducted for testing the system.

4.1 General Information

STP-4.1.0 :: This section shall shall be divided into subsections as applicable to present general information applicable to the overall testing to be performed. The general information covers areas such as:

Test Levels such as the levels at which testing will be performed, for example, CSCI level or system level, or stages su as defined in [.]

Test Classes such as the types or classes of tests that will be performed (for example, timing tests, erroneous input tests, maximum capacity tests)

General Test Conditions such as conditions that apply to all of the tests or to a group of tests. For example: Each test shall include nominal, maximum, and minimum values;" "each test of type x shall use live data;" "execution size and time shall be measured for each CSCI." Included shall be a statement of the extent of testing to be performed and rationale for the extent selected. The extent of testing shall be expressed as a percentage of some well defined total quantity, such as the number of samples of discrete operating conditions or values, or other sampling approach. Also included shall be the approach to be followed for retesting/regressing testing.

Test Progression such as in case of progressive or cumulative tests, where the planned sequence or progression of tests must be defined.

Data recording, reduction, and analysis shall identify and describe the data recording, reduction, and analysis procedures to be used during and after the tests identified in this STP. These procedures shall include, as applicable, manual, automatic, and semi-automatic techniques for recording test results, manipulating the raw results into a form suitable for evaluation, and retaining the results of data reduction and analysis.

This section provides general and/or common information for all tests.

4.1.1 Test Levels

The section is ...TBD....

4.1.2 Test Classes

The section is ...TBD....

4.1.3 Test Conditions

The section is ...TBD....

4.1.4 Test Progression

The section is ...TBD....

4.1.5 Data recording, reduction, and analysis

The section is ...TBD....

4.2 Planned Tests

STP-4.2.0 :: This section shall be divided into the following subsections to describe the total scope of the planned testing.

A list of tests and brief description are:

Test One test one (§ **??**)

Test Two test two (§ **??**)

4.2.1 Test One

STP-4.2.0 :: This section shall be divided into the following subsections to describe the total scope of the planned testing.

This section defines the plans for the TIDone test.

4.2.1.1 Test Objective

The test objective for TIDone are ...TBD....

4.2.1.2 Test Level

The test level for TIDone is ...TBD....

4.2.1.3 Test Type or Class

The test type or class for TIDone is ...TBD....

4.2.1.4 Qualification Method

The test qualification method for TIDone is ...TBD....

4.2.1.5 Traceability

The test traceability for TIDone is ...TBD....

4.2.1.6 Special Requirements

The test special requirements for TIDone are ...TBD....

4.2.1.7 Data Recoding

The test data recoding for TIDone is ...TBD....

4.2.1.8 Assumptions or Constraints

The test assumptions or constraints for TIDone are ...TBD....

4.2.1.9 Safety, Security, and Privacy

The test safety, security, and privacy for TIDone are ...TBD....

4.2.2 Test Two

STP-4.2.0 :: This section shall be divided into the following subsections to describe the total scope of the planned testing.

This section defines the plans for the TIDtwo test.

4.2.2.1 Test Objective

The test objective for TIDtwo are ...TBD....

4.2.2.2 Test Level

The test level for TIDtwo is ...TBD....

4.2.2.3 Test Type or Class

The test type or class for TIDtwo is ...TBD....

4.2.2.4 Qualification Method

The test qualification method for TIDtwo is ...TBD....

4.2.2.5 Traceability

The test traceability for TIDtwo is ...TBD....

4.2.2.6 Special Requirements

The test special requirements for TIDtwo are ...TBD....

4.2.2.7 Data Recoding

The test data recoding for TIDtwo is ...TBD....

4.2.2.8 Assumptions or Constraints

The test assumptions or constraints for TIDtwo are ...TBD....

4.2.2.9 Safety, Security, and Privacy

The test safety, security, and privacy for TIDtwo are ...TBD....

CHAPTER 5

Schedule

This section provides an overview of the testing schedule.

When the STP is developed, a general time line should be established so general dates should be understood, but exact dates may not be known. Thus, this schedule sets expectations for need-by dates for resources such as laboratories, test ranges, etc.

CHAPTER 6

Traceability

ALL-Traceability :: This section shall traceability between the planned tests and the defining requirements of:

- Each test identified in this plan to the CSCI requirements and, if applicable, software system requirements it addresses. (Alternatively, this traceability may be provided in 4.2.x.y and referenced from this paragraph.), or
- From each CSCI requirement and, if applicable, each software system requirement covered by this test plan to the test(s) that address it. The traceability shall cover the CSCI requirements in all-applicable SRS (s) IRS (s), or, if applicable, the system design requirements in the SSS.

This section provides traceability of the system components and interfaces to the design requirements.

CHAPTER 7

Notes

ALL-Notes :: This section shall contain any general information that aids in understanding this document (e.g., background information, rationale, etc.)

This chapter is ...TBD....

7.1 Note Area 1

ALL-Notes :: This section shall contain any general information that aids in understanding this document (e.g., background information, rationale, etc.)

This section is ...TBD....

7.2 Note Area 2

ALL-Notes :: This section shall contain any general information that aids in understanding this document (e.g., background information, rationale, etc.)

This section is ...TBD....

APPENDIX

Additional Information

This section provides additional information, as necessary, to augment the STP.