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# Optimizing Biomedical Engineering Test Equipment Inspection Frequencies

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*Abstract*— **This report presents an analysis conducted by the Island Health Biomedical Engineering Department, focusing on the optimization of inspection frequencies for biomedical engineering test equipment. The study, spanning eight months, included 164 assets across ten subcategories, utilizing data extracted from the TMS Computerized Maintenance Management System and inspection certificates.**

**The standard annual inspection frequency was examined and specific inspection intervals, ranging from one to four years, are recommended for each subcategory based on observed trends. Data challenges, especially in acquiring inspection certificates emphasize the critical need for enhanced collaboration with vendors to ensure accurate and comprehensive data records.**

**Recommendations include addressing data gaps for complete evaluations and suggesting pilot studies for subcategories with limited data. The report concludes with a detailed set of recommendations for each subcategory, providing a technical framework for updating inspection frequencies within Island Health and other Health Authorities in BC. Continuous updates are emphasized to align with evolving requirements and adhere to clinical engineering best practices.**

*Keywords*— **Biomedical Engineering, Clinical Engineering, Test Equipment, Inspection Frequency, Calibration**

## I. Introduction

Biomedical engineering departments utilize various testing equipment to ensure that medical devices function as intended. This testing equipment is mandated to undergo periodic Preventative Maintenance (PM) to ensure the equipment is operating within specifications. Test equipment manufacturers recommend this inspection annually, maintaining a consistent inspection frequency across all biomedical testing equipment. Based on user experience and anecdotal evidence in biomedical engineering departments, the need for an annual frequency may vary, given that the inspection frequency could be contingent upon the specific requirements of the device.

To validate the biomedical engineering test equipment inspection frequency requirements, a review was conducted, based on the Island Health Biomedical Engineering Department's experience and data. The objective was to verify and establish updated inspection frequencies that accurately reflect the specific calibration requirements of each device.

## II. Methods

The study utilized TMS, the Computerized Maintenance Management System (CMMS) developed by Accruent and used by Island Health Biomedical Engineering and other Health Authorities in BC [1]. TMS is used provincially for biomedical operations, which include asset management, work order management, and PM scheduling.

Within TMS, the inspection history of the biomedical test equipment was obtained by collecting the performance verification certificates of each asset. These certificates are attached to the asset within TMS after being inspected by a third-party organization. However, not all certificates included inspection results, leading to notable gaps in data. The missing certificates from 2018 to the present, for all facilities, were obtained and reviewed to determine if calibration was required.

The metrology used in the certificates to define the equipment's condition was adapted from Fluke Biomedical [2]. The condition was classified into one of the two categories below and used for data analysis.

1. "Unit verified to meet specifications" – This applies if the device was verified to meet specifications; it did not require adjustments to be within specifications.
2. "Unit calibrated to meet specifications" – This applies if the unit was calibrated to meet specifications; it required adjustment to be within specification.

The calibration history for each asset was collected and consolidated with the history previously obtained from TMS. The assets were organized by model, and the models were further organized by subcategory, based on the UMDNS classification [3]. The history was analyzed for each asset, and a recommended inspection frequency was determined.

The study spanned over eight months due to the difficulty of data collection which included obtaining inspection certificates.

## III. Results

This section outlines the study findings and presents inspection frequency recommendations for each subcategory. A summarized overview of these recommendations can be found in Appendix A, while supporting data and complete analysis are provided in Appendix B.

The inspection history of the subcategory 11-489 Testers, Electrosurgical Unit included 8 out of the 10 active assets within Island Health. Out of these 8 assets, a total of 20 inspection records were obtained, and only 1 inspection required calibration. Further analysis revealed that 50% of these assets have gone beyond 4 consecutive years without calibration. While 37.5% of the assets are inspected frequently and have not gone longer than 2 years without being inspected, the remaining are inspected closer to a 2-year interval. Consequently, a recommended inspection interval of 2 years is proposed and outlined in Table 1 in Appendix A. This recommendation is verified by the fact that half of the devices have demonstrated a prolonged period without requiring calibration, instilling confidence that this subcategory does not require annual calibration.

The analysis conducted for the subcategory 11-399 Testers, Electrical Safety, included inspection records for 34 assets corresponding to the current 34 active assets in Island Health. Subsequent analysis of the data revealed 2 trends, resulting in the organization of models into 2 groups. The first group includes models 232D, 505PRO, DALE 601, and ESA 180, with a total of 31 inspection records. Of these inspection records, 80.6% required calibration adjustments. The average inspection interval of these records is approximately 2 years and thus this indicated that the inspection frequency needs to be more frequent. The recommended inspection frequency for these devices is 1 year. The second group includes the remaining models, ESA 609, ESA 612, LKG610, ULT 800, VPAD-ES, and Mestester1000. A total of 48 inspection records were identified, 6 of which were initial inspections and 3 indicated the need for calibration adjustments. This corresponds to 7% of all inspection reports requiring calibration. Over 50% of these devices have gone over 3 consecutive years without requiring calibration. Consequently, these findings suggest that the inspection interval for this group may be increased, and thus, the recommended inspection frequency for these devices is set at 2 years. The recommendations for the two groups are outlined in Table 2 in Appendix A.

The analysis conducted for the subcategory 17-711 Pressure Meters, Digital, involved an assessment of 41 of the total 58 active assets within Island Health. A total of 81 inspection records were obtained, and 2 trends were observed within this subcategory. The first group of 25 assets, includes models 4078, 4080, 4071, 4081, and 4088, which are flow module units from TSI. A separate investigation into these devices found that these devices are susceptible to sensor contamination causing significant reading drifts and potential implications [4]. Consequently, the findings of this separate investigation recommended an annual inspection, which has been incorporated into this analysis. For these devices, as well as models DPM 2 PLUS, DIGIMANO, Trucal, and Universal, the inspection records reveal 2 initial inspection calibrations and 18 records indicating the need for calibration, resulting in a calibration occurrence of 38%. This also supports the need to maintain the annual inspection frequency. The second group, consisting of models DPIII, DPM 2350, DPM-2100, PTS 2000, and 207, includes 16 assets with 33 inspection records. One of these records was an incoming inspection calibration, while another indicated the need for calibration, corresponding to a calibration occurrence of 3%. Overall, 37.5% of these devices have surpassed 3 consecutive years without requiring calibration, suggesting that the inspection frequency for this group may be extended to 2 years. The detailed inspection frequency recommendations for this subcategory are summarized in Table 3 in Appendix A.

The analysis of subcategory 111-27 Testers, Defibrillator, included the inspection history of 15 assets, 13 active units within Island Health, and 2 retired assets. A review of 25 inspection records revealed one specific model that frequently requires calibration, facilitating the categorization of the models into two groups. The IMPULSE 400 inspection reports consistently revealed requirement for calibration. As a result, it is recommended to conduct annual inspections for these devices. Further review of this subcategory revealed an asset, with over 25 years in service with 1 inspection record. This asset, model QED 6, is also recommended to have annual inspections due to its age and limited data. For the remaining models, Impulse 7000DP, Phase 3, DA2006P, and DPM 2350, 20 inspection records were obtained, with 100% of these reports indicating no calibrations were required. Moreover, 60% of these assets exceeded four years without calibration. Consequently, based on the supporting data, the recommended inspection frequency for these devices is 3 years. However, the variability of inspection intervals ranges from 2 to 4 years and thus a preliminary frequency of 2 years is suggested as a pilot study. This is to verify all assets have the capability to remain within specification during this longer interval. Table 4 in Appendix A defines the recommended inspection frequencies for this subcategory.

The inspection analysis of subcategory 27-040 Electrical Multimeters comprised of 44 assets from 11 models, all currently active within Island Health. In total, 89 inspection records were reviewed, revealing that 2 models, U1253B and 179, exhibited an extended history and a greater potential for an increased inspection frequency than the other models. Consequently, the subcategory was organized into 2 groups.

For these 2 models, a total of 37 records were reviewed, all of which required no calibration adjustments, including the initial inspection. Additionally, 79% of these assets had a recommended frequency of 4 years, supported by the absence of calibration needs for over 4 consecutive years. However, a few devices had a recommended frequency of 2 years. Considering the variability in inspection intervals, a preliminary frequency of 2 years is proposed as a pilot study. This initiative aims to confirm that all assets can consistently meet specifications before implementing this extended interval. For the remaining models, 52 records were reviewed, and no calibrations were indicated on the reports. Although 47% of these assets demonstrated the capability to surpass 4 consecutive years without calibration, the recommended inspection intervals ranged from 1 to 4 years. Thus, a frequency of 2 years is recommended, aligning with the average recommended inspection frequency of 2.6 years. The detailed recommendations for the two groups of electrical multimeters are presented in Table 5 in Appendix A.

The inspection history for subcategory BE-636 Testers, Thermometry included 7 out of the 17 active assets within Island Health. A total of 19 inspection records were obtained, five reports were identified as incoming calibrations, and the remaining reports did not indicate calibrations were required. Notably, 57% of these devices have exceeded 5 consecutive years without needing calibration and the data for these devices supports an inspection frequency of 4 years. The remaining 43% of the assets only have an inspection frequency recommendation of 2 to 3 years due to the lack of information available. The variability of recommended inspection intervals promoted a recommended preliminary frequency of 2 years for verification as noted in Table 6, Appendix A.

The review of the subcategory 17-721 Testers, External Cardiac Pacemaker includes the inspection history of 2 out of the 4 active assets within Island Health. Obtaining 5 inspection records for these assets, it was revealed that 20% of the records indicated a calibration requirement. Even with the inclusion of this calibration, both devices demonstrated a capability to exceed 4 consecutive years without requiring further calibration. In addition to this, the inspection records show these devices are inspected on average every 3 years. Consequently, this data supports a recommended inspection frequency of 2 years, as outlined in Table 7, Appendix A.

The analysis of the subcategory BE-519 Testers, Infusion Pump, consisted of two assets, one active asset within Island Health and one retired asset. A review of the 3 inspection records for these devices revealed that all inspections did not require calibration. The active asset, model IDAPLUS, has gone over 5 consecutive years without requiring a calibration. While calibrations are typically not required for these devices, the limited number of inspection reports available necessitates a lower recommended inspection frequency of 2 years. Table 8 in Appendix A provides the recommended frequency for the active asset and the retired asset if in the future similar models are put back in service.

The inspection history of subcategory 32-674 Testers, Radiographic System, Quality Assurance, included data available from 6 of 12 active assets in Island Health, along with the history of 3 retired assets. An analysis of 11 inspection records for this subcategory revealed that 100% of the records did not require calibration. Although 1 of the active assets is recorded to have successfully exceeded 3 consecutive years without requiring calibration, 9 assets have limited data to support this. Consequently, the data available does not justify a longer inspection frequency and as a result, annual inspection is recommended. The recommendation for this subcategory is outlined in Table 9, in Appendix A.

The subcategory BE-519 Testers, Probe, Ultrasonic, relied on the inspection history of 2 assets out of the 4 currently active within Island Health. The analysis of the available data revealed that the 2 records obtained for this subcategory did not require calibration. However, due to the restricted number of records available, an inspection frequency of 1 year is recommended, as presented in Table 10 Appendix A.

For a summary of the recommended inspection frequencies, please refer to Table 11 in Appendix A. This table provides a comprehensive overview for a clear understanding of the proposed inspection intervals specific for each biomedical test equipment subcategory.

## IV. Discussion

A review of biomedical engineering test equipment was conducted, targeting a total of 164 assets across 10 subcategories. It is important to acknowledge that a portion of the subcategories lacked complete inspection records for all active assets. Gaps in the data limited the recommendations that could be made for inspection frequencies, leading to a more conservative recommendation. These missing records indicate the need for a more thorough data collection process from third-party vendors to ensure a more accurate representation of each subcategory. The percentage of active assets included in the study is presented in Table 12 in Appendix A.

As observed in Table 12, of the 10 subcategories within the study, 4 presented challenges due to limited data available. The analysis for the subcategory BE-636 Testers, Thermometry, is primarily based on reports for a single model, which is only 41% of the current assets within Island Health.

The absence of records for other models within the subcategory introduces uncertainty, making it difficult to confidently recommend a higher frequency for the entire subcategory. Thus, the recommendation is only for this model and further analysis will need to be conducted for the other models. Similarly, the 17-721 Testers, External Cardiac Pacemaker, 50% of assets lack inspection reports, and the limited available data poses challenges in forming recommendations. The subcategory 32-674 Testers, Radiographic System, Quality Assurance, faces the same data gap of 50% of active assets, and the existing data is relatively limited, impacting the overall confidence in setting precise inspection intervals. The same holds for BE-519 Testers, Probe, Ultrasonic, with 50% of assets missing inspection records, leading to a restricted dataset for informed frequency recommendations.

Despite this, recommendations were made with the information available, and pilot studies were suggested to consider any variable data. In the case of limited data, a more conservative recommendation was suggested to ensure all equipment stayed within specification. Subcategories that were well represented by the number of assets used and inspection reports for each asset include: 11-489 Testers, Electrosurgical Unit; 11-399 Testers, Electrical Safety; 17-711 Pressure Meters, Digital; 111-27 Testers, Defibrillator; 27-040 Electrical Multimeters; and BE-519 Testers, Infusion Pump. These subcategories were represented by a majority of active assets and had multiple inspection records per asset. Overall, this structured approach to reviewing and validating biomedical engineering test equipment has shown that the inspection frequency is specific to the device, and an annual inspection frequency is not required across all biomedical engineering test equipment.

## V. Conclusion and Recommendations

A review was conducted to determine optimal inspection frequencies for biomedical engineering test equipment. Based on the experience and data of Island Health's Biomedical Engineering Department, information was gathered from the TMS CMMS, and performance verification certificates were obtained from Getinge, a major service provider to Island Health. The analysis aimed to assess and establish updated inspection frequencies that accurately reflect the specific calibration requirements of each device.

The results, presented in Appendix A, Tables 1 through 11, offer an overview of the recommended inspection frequency for the biomedical engineering test equipment subcategories. For subcategories with limited data, such as 111-27 Testers, Defibrillator, BE-636 Testers, Thermometry, and 27-040 Electrical Multimeters, pilot studies are recommended. These pilot studies will provide valuable insights into the feasibility and effectiveness of proposed inspection frequency changes before a longer interval is implemented. The data used for the analysis, supporting the recommended inspection frequencies are presented in Appendix B, Tables 13 through 22.

The study encountered challenges, particularly in data collection, with difficulties in obtaining inspection certificates. This emphasizes the importance of future collaborations with service providers to provide comprehensive data records. Table 12 in Appendix A provides an overview of the percentage of assets included in the study. Addressing the identified data gaps is essential for enhancing the credibility and applicability of proposed changes to inspection intervals. Collaborating with these providers will ensure regular collection of inspection records and will contribute significantly to future evaluations.

These recommendations may serve as an initial guide to update inspection frequencies within Island Health and other Health Authorities in BC. Regularly updating this study as future inspection reports become available ensures that the calibration frequencies remain aligned with the latest requirements and clinical engineering best practices.

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## Conflict of Interest

The authors declare that they have no conflict of interest.

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# Appendix

## *A. Recommended Inspection Frequencies by Subcategory*

The results, presented in Tables 1 through 10, provide an overview of the recommended inspection frequency for the subcategories of biomedical engineering test equipment. Each table includes the model and sample size to enhance understanding of the accuracy of the recommendation and the study.

Table 1 Recommended Frequency - 11-489 Testers, Electrosurgical Unit

| Model | Sample Size | Recommended Inspection Frequency |
|---|---|---|
| 454A | 2 | 2 |
| ESU 2400 | 1 | |
| QAESII | 2 | |
| RF303 | 1 | |
| VPAD-RF | 2 | |

Table 2 Recommended Frequency - 11-399 Testers, Electrical Safety

| Model | Sample Size | Recommended Inspection Frequency |
|---|---|---|
| 232D | 2 | 1 |
| 505PRO | 1 | |
| DALE 601 | 2 | |
| ESA 180 | 7 | |
| ESA 609 | 3 | 2 |
| ESA 612 | 12 | |
| LKG610 | 1 | |
| MEDTESTER1000 | 1 | |
| ULT 800 | 1 | |
| VPAD-ES RUGGED | 4 | |

Table 3 Recommended Frequency - 17-711 Pressure Meters, Digital

| Model | Sample Size | Recommended Inspection Frequency |
|---|---|---|
| 4078 | 1 | 1 |
| 4080 | 2 | |
| 4081 | 2 | |
| 4088 | 5 | |
| 4071 (A/B) | 3 | |
| DPM 2 PLUS | 4 | |
| DIGIMANO | 3 | |
| Trucal | 2 | |
| DPI705 | 1 | 2 |
| DPIII | 1 | |
| DPM 2350 | 4 | |
| DPM-2100 | 3 | |
| PTS 2000 | 2 | |
| 207 | 5 | |

Table 4 Recommended Frequency - 111-27 Testers, Defibrillator

| Model | Sample Size | Recommended Inspection Frequency |
|---|---|---|
| IMPULSE 4000 | 2 | 1 |
| QED 6 | 1 | |
| IMPULSE 7000DP | 9 | 3 (Pilot of 2) |
| PHASE 3 | 1 | |
| DPM 2350 | 1 | |
| DA2006P | 1 | |

Table 5 Recommended Frequency - 27-040 Electrical Multimeters

| Model | Sample Size | Recommended Inspection Frequency |
|---|---|---|
| 1587 | 1 | 2 |
| 79SERIESII | 3 | |
| 87 V | 15 | |
| SC5 | 1 | |
| 287 | 2 | |
| 115 | 4 | |
| 233 | 1 | |
| 289 | 2 | |
| 83V | 1 | |
| U1253B | 6 | 3 (Pilot of 2) |
| 179 | 8 | |

Table 6 Recommended Frequency - BE-636 Testers, Thermometry

| Model | Sample Size | Recommended Inspection Frequency |
|---|---|---|
| 9600 PLUS | 7 | 4 (Pilot of 2) |

Table 7 Recommended Frequency - 17-721 Testers, External Cardiac Pacemaker

| Model | Sample Size | Recommended Inspection Frequency |
|---|---|---|
| SIGMAPACE1000 | 2 | 2 |

Table 8 Recommended Frequency - BE-519 Testers, Infusion Pump

| Model | Sample Size | Recommended Inspection Frequency |
|---|---|---|
| 2000 INFUTEST 2000 | 1 | 2 |
| IDA4PLUS | 1 | |

Table 9 Recommended Frequency - 32-674 Testers, Radiographic System, Quality Assurance

| Model | Sample Size | Recommended Inspection Frequency |
|---|---|---|
| PIRANHA657 | 9 | 1 |

Table 10 Recommended Frequency - BE-519 Testers, Probe, Ultrasonic

| Model | Sample Size | Recommended Inspection Frequency |
|---|---|---|
| ULT2010 | 2 | 1 |

Table 11 provides a summary of the recommendations presented in Tables 1 through 10.

Table 21 Recommended Inspection Frequency Summary

| Biomedical Engineering Test Equipment | Recommended Inspection Frequency (Years) |
|---|---|
| BE-519 Testers, Probe, Ultrasonic | 1 |
| 32-674 Testers, Radiographic System, Quality Assurance | 1 |
| 11-399 Testers, Electrical Safety | 1-2 |
| 17-711 Pressure Meters, Digital | 1-2 |
| 111-27 Testers, Defibrillator | 1-2 |
| BE-519 Testers, Infusion Pump | 2 |
| 11-489 Testers, Electrosurgical Unit | 2 |
| 17-721 Testers, External Cardiac Pacemaker | 2 |
| BE-636 Testers, Thermometry | 2 |
| 27-040 Electrical Multimeters | 2 |

Table 12 presents the percentage of assets included in the study out of the current active assets within Island Health.

Table 32 Percentage of Active Assets Included within the Study

| Biomedical Engineering Test Equipment Subcategory | Percentage of Active Assets Included in the Study |
|---|---|
| 11-489 Testers, Electrosurgical Unit | 80% |
| 11-399 Testers, Electrical Safety | 100% |
| 17-711 Pressure Meters, Digital | 71% |
| 111-27 Testers, Defibrillator | 100% |
| 27-040 Electrical Multimeters | 100% |
| BE-636 Testers, Thermometry | 41% |
| 17-721 Testers, External Cardiac Pacemaker | 50% |
| BE-519 Testers, Infusion Pump | 100% |
| 32-674 Testers, Radiographic System, Quality Assurance | 50% |
| BE-519 Testers, Probe, Ultrasonic | 50% |

*B. Analysis of Inspection Frequencies*

The results of the analysis are listed in Tables 13 through 22 with the device's subcategory listed at the top of each table. The assets within each subcategory are organized by model, presented in the first column, with the asset number in the second column, and the acceptance date extracted from TMS in the third column. The next section details the inspection history of each asset, where each date corresponds to an inspection, and the color indicates the result of the inspection. If an asset, upon inspection, did not require calibration, the cell is highlighted green. In instances where the asset was found out of specification, and required calibration, the cell is a pale yellow. If the inspection findings were missing, indicated by a pale red color and a diagonal line through the cell, that inspection data point is not used in the analysis.

The following section calculates the days between each inspection, starting with the acceptance date and the first inspection date. If two inspections were five or more years apart, it was identified as an outlier, and in such cases, this date was excluded from the recommended inspection interval. The acceptance date was often treated as an outlier, as many devices were accepted more than 5 years before the first recorded inspection certificate.

The next section calculates the consecutive duration the asset went without requiring calibration, based on the days between inspections, presenting this information in both days and years. The average inspection interval is provided beside this to offer an overview of the current frequency at which the device is inspected, shown in both days and years.

Utilizing these data points, a recommended inspection frequency was calculated. Additional corresponding justification for each specific asset was added. The average of the recommended inspection frequency is then calculated at the bottom of the table, and a final recommendation is made for the specific subcategory. If data showed that the sub-category of test equipment have high variability in calibration intervals, a preliminary frequency may be suggested, in pilot studies. More data on the calibration for that sub-category is required in the next long interval, to verify all assets are able to remain calibrated during the longer interval. The recommendation for each subcategory is discussed in the body of the report, in the results section.

Table 43 11-489 Testers, Electrosurgical Unit Analysis Table 5 Font sizes and styles

**11-489 Testers, Electrosurgical Unit**

| Model | Asset | Accepted Date | Inspection Date and Status | | | | | Days Between Inspection | | | | Consecutive Duration Without Calibration | | Average Inspection Interval | | Recommended Inspection Frequency | Justification |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | Days | Years | Days | Years | | |
| QAESII | 53917 | 26-Jan-03 | 26-Aug-13 | 22-Mar-18 | 18-Mar-20 | 5-May-22 | | outlier | 1669 | 727 | 778 | - | - | 1058 | 2.9 | 1 | Requires calibration at approximately 2 year intervals. |
| | 81039 | 12-Apr-13 | 1-Jul-13 | 27-Mar-15 | 27-Mar-18 | 27-Mar-20 | | n/a | n/a | 1096 | 731 | 1827 | 5.0 | 914 | 2.5 | 2 | Calibration not required at approximately 2 year intervals. |
| VPAD-RF | 103053 | 14-Feb-20 | 13-Aug-20 | 18-May-22 | | | | 181 | 643 | | | 824 | 2.3 | 412 | 1.1 | 2 | Calibration not required at approximately 2 year intervals. |
| | 103660 | 12-Jan-18 | 26-Sep-18 | 23-Oct-19 | 18-May-22 | | | 257 | 392 | 938 | | 1587 | 4.3 | 529 | 1.4 | 4 | Calibration not required for over 4 years. |
| ESU 2400 | 83784 | 28-Apr-14 | 20-Sep-15 | 22-Mar-18 | 18-Mar-20 | 5-May-22 | | n/a | 914 | 727 | 778 | 2419 | 6.6 | 806 | 2.2 | 4 | Calibration not required at approximately 2 year intervals. |
| 454A | 96529 | 1-Apr-09 | 12-Aug-20 | 12-May-22 | | | | outlier | 638 | | | - | - | 638 | 1.7 | 1 | Calibration interval has not exceeded 2 years. |
| | 4504 | 16-Apr-97 | 17-Jan-13 | 2-Jun-16 | 27-Mar-18 | 24-Mar-20 | | outlier | 1232 | 663 | 728 | 2623 | 7.2 | 874 | 2.4 | 4 | Calibration not required for over 4 years. |
| RF303 | 90803 | 17-Sep-15 | 12-Aug-20 | 12-May-22 | | | | 1791 | 638 | | | - | - | 1215 | 3.3 | 3 | Calibration not required at approximately 2 year intervals. |

| | |
|---|---|
| Average Recommended Inspection Frequency: | 2.6 |
| **Recommended Inspection Frequency:** | **2 Years** |

Table 64 11-399 Testers, Electrical Safety Analysis

**11-399 Testers, Electrical Safety**

| Model | Asset | Accepted Date | Inspection Date and Status | Days Between Inspection | Consecutive Duration Without Calibration | | Average Inspection Interval | | Recommended Inspection Frequency | Justification |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Days | Years | Days | Years | | |
| 232D | 75091 | 1-Mar-05 | 13-Aug-20 12-May-22 | outlier 637 | - | - | 637 | 1.7 | 1 | Requires calibration at approximately 2 year intervals. |
| | 75127 | 1-Mar-04 | 13-Aug-20 12-May-22 23-Nov-22 | outlier 637 195 | - | - | 416 | 1.1 | 1 | Requires calibration at approximately 2 year intervals. |
| 505PRO | 56275 | 22-Mar-06 | 23-Mar-18 16-Mar-20 3-May-22 | outlier 724 778 | - | - | 751 | 2.1 | 1 | Requires calibration at approximately 2 year intervals. |
| DALE 601 | 81381 | 19-Jan-14 | 26-Mar-18 18-May-22 | 1527 1514 | - | - | 1521 | 4.2 | 1 | Requires calibration at approximately 2 year intervals. |
| | 69296 | 26-Sep-08 | ~~16-Nov-13~~ 18-May-22 | n/a | - | - | 0 | 0.0 | 1 | Insufficient information to recommend a longer interval. |
| ESA 180 | 17449 | 20-Mar-02 | 21-Mar-18 16-Mar-20 2-May-22 | outlier 726 777 | - | - | 752 | 2.1 | 1 | Requires calibration at approximately 2 year intervals. |
| | 52080 | 2-Apr-03 | 21-Mar-18 17-Mar-20 2-May-22 | outlier 727 776 | - | - | 752 | 2.1 | 1 | Requires calibration at approximately 2 year intervals. |
| | 73676 | 21-Mar-12 | 8-Mar-16 20-Mar-18 18-Mar-20 2-May-22 | 1448 742 729 775 | - | - | 924 | 2.5 | 1 | Requires calibration at approximately 2 year intervals. |
| | 79590 | 29-Feb-12 | 19-Sep-17 19-Mar-18 16-Mar-20 2-May-22 | outlier 181 728 777 | - | - | 562 | 1.5 | 1 | Requires calibration at approximately 2 year intervals. |
| | 82648 | 5-Jul-13 | ~~3-Feb-16~~ 26-Jan-18 13-Aug-20 16-May-22 | n/a 723 930 641 | - | - | 765 | 2.1 | 1 | Requires calibration at approximately 2 year intervals. |
| | 82887 | 5-Jul-13 | ~~3-Feb-16~~ 13-Aug-20 12-May-22 | n/a 1653 637 | - | - | 1145 | 3.1 | 1 | Requires calibration at approximately 2 year intervals. |
| | 93041 | 3-Jun-13 | ~~4-Feb-16~~ 12-May-22 | n/a outlier | - | - | 0 | 0.0 | 1 | Insufficient information to recommend a longer interval. |

| | |
|---|---|
| Average Recommended Inspection Frequency: | 1.0 |
| **Recommended Inspection Frequency:** | **1 Year** |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| ESA 609 | 98885 | 18-Aug-17 | 13-Aug-20 12-May-22 | 1091 637 | 1728 | 4.7 | 864 | 2.4 | 3 | Calibration not required for over 4 years. |
| | 98886 | 18-Aug-17 | 12-May-22 | 1728 | - | - | 1728 | 4.7 | 2 | Nearly an outlier with a substantial gap between calibrations. |
| | 98887 | 18-Aug-17 | 13-Aug-20 12-May-22 | 1091 637 | 1728 | 4.7 | 864 | 2.4 | 3 | Calibration not required for over 4 years. |
| ESA 612 | 105989 | 14-Aug-18 | 29-Jun-18 18-Mar-20 2-May-22 | initial 628 775 | 1403 | 3.8 | 702 | 1.9 | 3 | Calibration not required for over 3 years. |
| | 113204 | 20-Jan-20 | 21-Dec-19 2-May-22 | initial 863 | - | - | 863 | 2.4 | 2 | Calibration not required since initial calibration. |
| | 114474 | 20-Apr-22 | 13-Apr-22 | initial | - | - | 0 | 0.0 | 1 | Insufficient information to recommend a longer interval. |
| | 116044 | 23-Sep-20 | 3-Aug-20 3-May-22 | initial 638 | - | - | 638 | 1.7 | 2 | Calibration not required since initial calibration. |
| | 116596 | 22-Feb-23 | 12-Dec-22 | initial | - | - | 0 | 0.0 | 1 | Insufficient information to recommend a longer interval. |
| | 80437 | 15-Feb-13 | 27-Mar-18 25-Mar-20 10-May-22 | outlier 729 776 | 1505 | 4.1 | 753 | 2.1 | 4 | Calibration not required for over 4 years. |
| | 80972 | 15-Feb-13 | ~~3-Feb-15~~ 28-Sep-18 25-Mar-20 9-May-22 | n/a 1333 544 775 | 2652 | 7.3 | 884 | 2.4 | 4 | Calibration not required for over 4 years. |
| | 81357 | 12-Jun-13 | ~~22-Jun-16~~ 26-Mar-18 25-Mar-20 9-May-22 | n/a 642 730 775 | 2147 | 5.9 | 716 | 2.0 | 4 | Calibration not required for over 4 years. |
| | 83518 | 2-Feb-14 | 21-Nov-16 3-Feb-17 19-Mar-18 19-Mar-20 3-May-22 | 1023 74 409 731 775 | 1915 | 5.2 | 821 | 2.2 | 3 | Calibration not required for over 4 years, with an anomaly at 74 days. |
| | 83606 | 2-Feb-14 | 7-Nov-16 19-Mar-18 18-Mar-20 3-May-22 | 1009 497 730 776 | 2003 | 5.5 | 753 | 2.1 | 4 | Calibration not required for over 4 years. |
| | 96531 | 12-Jun-15 | 13-Aug-20 12-May-22 | outlier 637 | - | - | 637 | 1.7 | 1 | Calibration interval has not exceeded 2 years. |
| | 105718 | 3-Apr-18 | 7-Mar-18 16-Mar-20 2-May-22 | initial 740 777 | 1517 | 4.2 | 759 | 2.1 | 4 | Calibration not required since initial calibration. |
| LKG610 | 106316 | 14-Jan-19 | ~~2-Jan-19~~ 2-May-22 | initial 1216 | | | 1216 | 3.3 | 3 | Calibration not required since initial calibration. |
| ULT 800 | 90859 | 10-May-15 | 16-May-22 | outlier | | | 0 | 0.0 | 1 | Insufficient information to recommend a longer interval. |
| VPAD-ES RUGGED | 103052 | 1-Nov-18 | 13-Aug-20 18-May-22 | 651 643 | 1294 | 3.5 | 647 | 1.8 | 2 | Calibration not required for over 3 years. |
| | 103659 | 31-Aug-17 | ~~7-Sep-18~~ 12-Aug-20 19-May-22 | n/a 1077 645 | 1722 | 4.7 | 861 | 2.4 | 3 | Calibration not required for over 4 years. |
| | 103662 | 31-Aug-17 | ~~25-Sep-18~~ 13-Aug-20 19-May-22 | initial 1078 644 | 1722 | 4.7 | 861 | 2.4 | 3 | Calibration not required for over 4 years. |
| | 103053 | 1-Oct-17 | 18-May-22 | 1690 | - | - | 1690 | 4.6 | 1 | Nearly an outlier with a substantial gap between calibrations. |
| MEDTESTER1000 | 68982 | 5-Jun-09 | ~~26-Jun-09~~ ~~31-Oct-13~~ 13-Aug-20 12-May-22 | initial n/a outlier 637 | - | - | 637 | 1.7 | 1 | Calibration interval has not exceeded 2 years. |

| | |
|---|---|
| Average Recommended Inspection Frequency: | 2.5 |
| **Recommended Inspection Frequency:** | **2 Years** |

Table 75 17-711 Pressure Meters, Digital Analysis

**17-711 Pressure Meters, Digital**

| Model | Asset | Accepted Date | Inspection Date and Status | Days Between Inspection | Consecutive Duration Without Calibration | | Average Inspection Interval | | Recommended Inspection Frequency | Justification |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Days | Years | Days | Years | | |
| 4078 | 73292 | 18-Apr-12 | 18-Feb-16 | n/a | - | - | 0 | 0.0 | 1 | These devices have a history of drifting and require annual calibration. |
| | 50921 | 3-Jun-03 | 7-May-12 \| 10-May-16 \| 22-Sep-17 | outlier \| 1464 \| 500 | 1964 | 5.4 | 982 | 2.7 | 1 | These devices have a history of drifting and require annual calibration. |
| 4080 | 58670 | 13-Nov-05 | 14-Aug-20 \| 12-May-22 | outlier \| 636 | - | - | 636 | 1.7 | 1 | These devices have a history of drifting and require annual calibration. |
| | 57791 | 15-Jul-04 | 22-Mar-19 \| 11-Jun-20 \| 21-Apr-22 \| 17-May-22 | outlier \| 447 \| 679 \| 26 | - | - | 384 | 1.1 | 1 | These devices have a history of drifting and require annual calibration. |
| 4071 (A/B) | 92734 | 15-Mar-16 | 6-May-16 \| 21-Sep-17 | n/a \| n/a | - | - | 0 | 0.0 | 1 | These devices have a history of drifting and require annual calibration. |
| | 92733 | 25-Apr-16 | 29-Feb-16 \| 5-Jul-18 | initial \| 857 | - | - | 857 | 2.3 | 1 | These devices have a history of drifting and require annual calibration. |
| | 95496 | 15-Mar-16 | 6-May-16 \| 21-Sep-17 | initial \| 503 | - | - | 503 | 1.4 | 1 | These devices have a history of drifting and require annual calibration. |
| | 97570 | 17-Mar-17 | 9-Jan-17 \| 15-Jul-18 | initial \| 552 | - | - | 552 | 1.5 | 1 | These devices have a history of drifting and require annual calibration. |
| 4081 | 112390 | 17-Dec-21 | 1-Dec-21 | initial | - | - | 0 | 0.0 | 1 | These devices have a history of drifting and require annual calibration. |
| | 115101 | 29-Nov-21 | 12-May-22 \| 23-Aug-23 | 164 \| 468 | - | - | 316 | 0.9 | 1 | These devices have a history of drifting and require annual calibration. |
| 4088 | 58225 | 1-Dec-07 | 9-Sep-08 \| 23-May-18 \| 12-May-22 \| 23-Aug-23 | 283 \| outlier \| 1450 \| 468 | - | - | 734 | 2.0 | 1 | These devices have a history of drifting and require annual calibration. |
| | 93384 | 9-Sep-16 | 23-Apr-18 \| 6-Jun-21 | 591 \| 1140 | 1731 | 4.7 | 866 | 2.4 | 1 | These devices have a history of drifting and require annual calibration. |
| | 104003 | 30-Sep-20 | 19-Oct-20 \| 14-Jun-22 | initial \| 603 | - | - | 603 | 1.7 | 1 | These devices have a history of drifting and require annual calibration. |
| | 97154 | 23-Dec-16 | 21-Mar-17 \| 16-Mar-18 \| 27-Jul-23 | 88 \| 360 \| outlier | - | - | 224 | 0.6 | 1 | These devices have a history of drifting and require annual calibration. |
| | 115100 | 29-Nov-21 | 12-May-22 \| 23-Aug-23 | 164 \| 468 | - | - | 316 | 0.9 | 1 | These devices have a history of drifting and require annual calibration. |
| DPM 2 PLUS | 115125 | 30-Mar-22 | 12-May-22 | initial | - | - | 0 | 0.0 | 1 | Insufficient information to recommend a longer interval. |
| | 103050 | 24-Feb-09 | 13-Aug-20 \| 17-May-22 | outlier \| 642 | - | - | 642 | 1.8 | 2 | Calibration interval has not exceeded 2 years. |
| | 74405 | 14-Apr-21 | 23-Mar-18 \| 17-Mar-20 \| 3-May-22 | outlier \| 725 \| 777 | - | - | 751 | 2.1 | 1 | Requires calibration at approximately 2 year intervals. |
| | 53548 | 19-Apr-03 | 21-Mar-18 \| 17-Mar-20 \| 3-May-22 | outlier \| n/a \| 777 | - | - | 777 | 2.1 | 2 | Requires calibration at approximately 2 year intervals. |
| DIGIMANO | 93329 | 27-Oct-15 | 28-Sep-15 \| 6-Mar-17 \| 25-Sep-18 \| 18-Mar-20 \| 5-May-22 | initial \| 525 \| 568 \| 540 \| 778 | - | - | 603 | 1.7 | 1 | Requires calibration at approximately 2 year intervals. |
| | 113206 | 23-Jan-20 | 6-Jan-20 \| 2-May-22 | initial \| 847 | - | - | 847 | 2.3 | 2 | Calibration not required since initial calibration. |
| | 96104 | 9-Sep-16 | 26-Aug-16 \| 1-Dec-17 \| 19-Mar-18 \| 19-Mar-20 \| 10-Aug-22 | initial \| 462 \| 108 \| 731 \| n/a | - | - | 434 | 1.2 | 1 | Requires calibration at approximately 2 year intervals. |
| TruCal | 74406 | 3-Apr-99 | 3-May-22 | outlier | - | - | 0 | 0.0 | 1 | Insufficient information to recommend a longer interval. |
| | 50560 | No Data | 10-May-22 | n/a | - | - | 0 | 0.0 | 1 | Insufficient information to recommend a longer interval. |
| UNIVERSAL | 82649 | 1-Aug-94 | 14-Aug-20 | outlier | - | - | 0 | 0.0 | 1 | Insufficient information to recommend a longer interval. |

| | |
|---|---|
| Average Recommended Inspection Frequency: | 1.3 |
| **Recommended Inspection Frequency:** | **1 Year** |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| DPM 2350 | 103049 | 1-Sep-18 | 13-Aug-20 \| 17-May-22 | 712 \| 642 | 1354 | 3.7 | 677 | 1.9 | 2 | Calibration not required at approximately 2 year intervals. |
| | 104160 | 16-Mar-18 | 14-Aug-20 \| 19-May-22 | 882 \| 643 | 1525 | 4.2 | 763 | 2.1 | 2 | Calibration not required at approximately 2 year intervals. |
| | 116668 | 3-Feb-23 | 15-Mar-23 | initial | - | - | 0 | 0.0 | 1 | Not enough information. |
| DPMIII | 4645 | 15-Nov-97 | 26-Mar-18 \| 10-May-22 | outlier \| 1506 | - | - | 1506 | 4.1 | 1 | Requires calibration at approximately 2 year intervals. |
| | 1570 | 25-Nov-90 | 18-Jun-09 \| 22-Jun-16 \| 26-Mar-18 \| 10-May-22 | outlier \| outlier \| n/a \| 1506 | - | - | 1506 | 4.1 | 2 | Calibration not required at approximately 2 year intervals. |
| | 58670 | 13-Nov-05 | 12-May-22 | outlier | - | - | 0 | 0.0 | 1 | Insufficient information to recommend a longer interval. |
| | 58674 | 13-Nov-04 | 12-May-22 | outlier | - | - | 0 | 0.0 | 1 | Insufficient information to recommend a longer interval. |
| PTS 2000 | 67578 | 22-Feb-06 | 4-Mar-08 \| 30-Jan-09 \| 3-May-11 \| 3-Sep-14 \| 16-Mar-18 \| 5-May-21 \| 2-Nov-22 | n/a \| n/a \| n/a \| 1219 \| n/a \| n/a \| n/a | - | - | 1219 | 3.3 | 1 | Insufficient information to recommend a longer interval. |
| | 17760 | 4-Jul-02 | 30-Nov-05 \| 22-Jan-09 \| 15-Jun-12 \| 7-Mar-18 \| 30-Jun-21 \| 10-Jan-23 | n/a \| n/a \| 1240 \| outlier \| n/a \| 559 | - | - | 900 | 2.5 | 3 | Calibration not required at approximately 3 year intervals. |
| | 50880 | 3-Apr-03 | 17-Jan-13 \| 26-May-15 \| 16-Mar-16 \| 2-Aug-17 \| 18-Mar-19 \| 7-Apr-20 \| 26-Apr-22 | n/a \| n/a \| 295 \| n/a \| 593 \| 386 \| 749 | 1728 | 4.7 | 750 | 2.1 | 4 | Calibration not required for over 4 years. |
| | 80889 | 3-Nov-12 | 5-Sep-12 \| 4-Nov-13 \| 30-Apr-14 \| 12-May-22 | n/a \| 425 \| 177 \| outlier | 602 | 1.6 | 301 | 0.8 | 2 | Calibration not required at approximately 2 year intervals. |
| | 52763 | 14-Apr-05 | 12-Mar-10 \| 25-Nov-13 \| 24-May-17 \| 12-May-22 | n/a \| 1354 \| 1276 \| 1814 | 4444 | 12.2 | 1481 | 4.1 | 4 | Calibration not required for over 4 years. |
| DPM-2100 | 97571 | 17-Mar-17 | 26-Mar-18 \| 25-Mar-20 \| 10-May-22 | 374 \| 730 \| 776 | 1880 | 5.2 | 627 | 1.7 | 4 | Calibration not required for over 4 years. |
| | 90853 | 15-Apr-15 | 10-Aug-20 | outlier | - | - | 0 | 0.0 | 1 | Insufficient information to recommend a longer interval. |
| 207 | 84568 | 8-Dec-14 | 14-Aug-20 \| 19-May-22 | outlier \| 643 | - | - | 643 | 1.8 | 2 | Calibration not required at approximately 2 year intervals. |
| DPI705 | 98530 | 16-Dec-16 | 14-Aug-20 \| 12-May-22 | 1337 \| 636 | 1973 | 5.4 | 987 | 2.7 | 2 | Calibration not required at approximately 2 year intervals. |

| | |
|---|---|
| Average Recommended Inspection Frequency: | 2.1 |
| **Recommended Inspection Frequency:** | **2 Years** |

Table 86 27-040 Electrical Multimeters

**27-040 Electrical Multimeters**

| Model | Asset | Accepted Date | Inspection Date and Status | | | Days Between Inspection | | | Consecutive Duration Without Calibration | | Average Inspection Interval | | Recommended Inspection Frequency | Justification |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Days | Years | Days | Years | | |
| 1587 | 91300 | 4-May-15 | 22-Mar-18 | 10-May-22 | | 1053 | 1510 | | 2563 | 7.0 | 1282 | 3.5 | 4 | Calibration not required for over 4 years. |
| 79SERIESII | 83784 | 28-Apr-14 | 22-Mar-18 | 25-Mar-20 | | 1424 | 734 | | 2158 | 5.9 | 1079 | 3.0 | 4 | Calibration not required for over 4 years. |
| | 2064V | 2-Oct-91 | 10-May-22 | | | outlier | | | - | - | 0 | 0.0 | 1 | Insufficient information to recommend a longer interval. |
| | 95484 | 18-Feb-20 | 10-May-22 | | | 812 | | | 812 | 2.2 | 812 | 2.2 | 2 | Calibration not required at approximately 2 year intervals. |
| 289 | 103373 | 25-Jan-22 | 13-Aug-20 | | | initial | | | - | - | 0 | 0.0 | 1 | Insufficient information to recommend a longer interval. |
| | 81807 | 30-Aug-13 | 23-Mar-18 | 25-Mar-20 | | 1666 | 733 | | 2399 | 6.6 | 1200 | 3.3 | 3 | Calibration not required at approximately 2 year intervals. |
| 287 | 103372 | 25-Jan-22 | 13-Aug-20 | 17-May-22 | | initial | 642 | | 642 | 1.8 | 642 | 1.8 | 1 | Calibration not required at approximately 2 year intervals. |
| | 104196 | 9-Aug-17 | 13-Aug-20 | 19-May-22 | | 1100 | 644 | | 1744 | 4.8 | 872 | 2.4 | 4 | Calibration not required for over 4 years. |
| 83V | 82313 | 24-Sep-13 | 23-Mar-18 | 25-Mar-20 | | 1641 | 733 | | 2374 | 6.5 | 1187 | 3.3 | 2 | Calibration not required at approximately 2 year intervals. |
| 87 V | 57316 | 6-Nov-08 | 22-Mar-18 | 10-May-22 | | outlier | 1510 | | 1510 | 4.1 | 1510 | 4.1 | 4 | Calibration not required for over 4 years. |
| | 80178 | 15-Nov-12 | 22-Mar-18 | 10-May-22 | | outlier | 1510 | | 1510 | 4.1 | 1510 | 4.1 | 4 | Calibration not required for over 4 years. |
| | 85582 | 15-Jan-15 | 22-Mar-18 | 10-May-22 | | 1162 | 1510 | | 2672 | 7.3 | 1336 | 3.7 | 4 | Calibration not required for over 4 years. |
| | 98312 | 18-Feb-20 | 22-Mar-18 | 10-May-22 | | initial | 1510 | | 1510 | 4.1 | 1510 | 4.1 | 4 | Calibration not required for over 4 years. |
| | 15333 | 22-Dec-97 | 23-Mar-18 | 25-Mar-20 | 6-May-22 | outlier | 733 | 772 | 1505 | 4.1 | 733 | 2.0 | 4 | Calibration not required for over 4 years. |
| | 77915 | 12-Sep-13 | 25-Mar-20 | 6-May-22 | | outlier | 772 | | 772 | 2.1 | 772 | 2.1 | 2 | Calibration not required for over 2 years. |
| | 82293 | 12-Sep-13 | 23-Mar-18 | 25-Mar-20 | 6-May-22 | 1653 | 733 | 772 | 3158 | 8.7 | 1193 | 3.3 | 4 | Calibration not required for over 4 years. |
| | 17435 | 21-Feb-02 | 25-Mar-20 | 6-May-22 | | outlier | 772 | | 772 | 2.1 | 772 | 2.1 | 2 | Calibration not required for over 2 years. |
| | 74499 | 1-Apr-00 | 23-Mar-18 | 6-May-22 | | outlier | 1505 | | 1505 | 4.1 | 1505 | 4.1 | 4 | Calibration not required for over 4 years. |
| | 17434 | 21-Feb-02 | 6-May-22 | | | outlier | | | - | - | 0 | 0.0 | 1 | Insufficient information to recommend a longer interval. |
| | 82307 | 23-Sep-13 | 23-Mar-18 | 25-Mar-20 | 6-May-22 | 1642 | 733 | 772 | 3147 | 8.6 | 1188 | 3.3 | 4 | Calibration not required for over 4 years. |
| | 105904 | 25-Jun-18 | 6-May-22 | | | 1411 | | | 1411 | 3.9 | 1411 | 3.9 | 2 | Calibration not required at approximately 2 year intervals. |
| | 106250 | 9-Sep-20 | 6-May-22 | | | 604 | | | 604 | 1.7 | 604 | 1.7 | 2 | Calibration not required at approximately 2 year intervals. |
| | 73771 | 1-Jan-03 | 25-Mar-20 | 6-May-22 | | outlier | 772 | | 772 | 2.1 | 772 | 2.1 | 2 | Calibration not required for over 2 years. |
| | 93373 | 20-Jul-17 | 6-May-22 | | | 1751 | | | 1751 | 4.8 | 1751 | 4.8 | 2 | Calibration not required at approximately 2 year intervals. |
| SC5 | 83841 | 28-Aug-14 | 22-Mar-18 | | | 1302 | | | 1302 | 3.6 | 1302 | 3.6 | 2 | Calibration not required at approximately 2 year intervals. |
| 115 | 98209 | n/a | 22-Mar-18 | 25-Mar-20 | | n/a | 734 | | 734 | 2.0 | 734 | 2.0 | 2 | Calibration not required for 2 years. |
| | 37490034WS | 9-Aug-17 | 13-Aug-20 | | | 1100 | | | 1100 | 3.0 | 1100 | 3.0 | 2 | Calibration not required for over 2 years. |
| | 37490035WS | 8-Sep-17 | 13-Aug-20 | | | 1070 | | | 1070 | 2.9 | 1070 | 2.9 | 2 | Calibration not required for over 2 years. |
| | 103371 | 25-Jan-22 | 17-May-22 | | | 112 | | | 112 | 0.3 | 112 | 0.3 | 1 | Insufficient information to recommend a longer interval. |
| 233 | 98315 | 1-Jan-14 | 25-Mar-20 | 10-May-22 | | outlier | 776 | | 776 | 2.1 | 776 | 2.1 | 2 | Calibration not required at approximately 2 year intervals. |
| | | | | | | | | | | | Average Recommended Inspection Frequency: | | 2.6 | |
| | | | | | | | | | | | **Recommended Inspection Frequency:** | | **2 Years** | |
| U1253B | 105715 | 3-Apr-18 | 23-Mar-18 | 25-Mar-20 | 10-May-22 | initial | 733 | 776 | 1509 | 4.1 | 733 | 2.0 | 4 | Calibration not required for over 4 years. |
| | 77980 | 11-Sep-14 | 23-Mar-18 | 25-Mar-20 | 10-May-22 | 1289 | 733 | 776 | 2798 | 7.7 | 1011 | 2.8 | 4 | Calibration not required for over 4 years. |
| | 78232 | 19-Nov-13 | 23-Mar-18 | 10-May-22 | | 1585 | 1509 | | 3094 | 8.5 | 1547 | 4.2 | 4 | Calibration not required for over 4 years. |
| | 78237 | 19-Nov-13 | 23-Mar-18 | 25-Mar-20 | 10-May-22 | 1585 | 733 | 776 | 3094 | 8.5 | 1159 | 3.2 | 4 | Calibration not required for over 4 years. |
| | 78241 | 19-Nov-13 | 23-Mar-18 | 25-Mar-20 | 10-May-22 | 1585 | 733 | 776 | 3094 | 8.5 | 1159 | 3.2 | 4 | Calibration not required for over 4 years. |
| | 77795 | 19-Nov-13 | 23-Mar-18 | 25-Mar-20 | | 1585 | 733 | | 2318 | 6.4 | 1159 | 3.2 | 3 | Calibration not required for over 4 years. |
| 179 | 50500 | 25-Sep-02 | 22-Mar-18 | 23-Mar-20 | 10-May-22 | outlier | 732 | 778 | 1510 | 4.1 | 732 | 2.0 | 4 | Calibration not required for over 4 years. |
| | 68667 | 1-Jan-05 | 22-Mar-18 | 23-Mar-20 | 10-May-22 | outlier | 732 | 778 | 1510 | 4.1 | 732 | 2.0 | 4 | Calibration not required for over 4 years. |
| | 68668 | 1-Jan-05 | 22-Mar-18 | 10-May-22 | | outlier | 1510 | | 1510 | 4.1 | 1510 | 4.1 | 4 | Calibration not required for over 4 years. |
| | 71358 | 27-Oct-10 | 22-Mar-18 | 23-Mar-20 | 10-May-22 | outlier | 732 | 778 | 1510 | 4.1 | 732 | 2.0 | 4 | Calibration not required for over 4 years. |
| | 80208 | n/a | 22-Mar-18 | 25-Mar-20 | 10-May-22 | n/a | 734 | 776 | 1510 | 4.1 | 734 | 2.0 | 4 | Calibration not required for over 4 years. |
| | 98313 | 18-Dec-20 | 22-Mar-18 | 23-Mar-20 | 10-May-22 | initial | 732 | 778 | 1510 | 4.1 | 732 | 2.0 | 4 | Calibration not required for over 4 years. |
| | 103370 | 25-Jan-22 | 13-Aug-20 | 17-May-22 | | initial | 642 | | 642 | 1.8 | 642 | 1.8 | 2 | Calibration not required at approximately 2 year intervals. |
| | 103371 | 25-Jan-22 | 13-Aug-20 | 17-May-22 | | initial | 642 | | 642 | 1.8 | 642 | 1.8 | 2 | Calibration not required at approximately 2 year intervals. |
| | | | | | | | | | | | Average Recommended Inspection Frequency: | | 3.6 | |
| | | | | | | | | | | | **Recommended Inspection Frequency:** | | **3 Years** | |
| | | | | | | | | | | | **Recommended Pilot Frequency of 2 Years** | | | |

Table 97 111-27 Testers, Defibrillator Analysis

## 111-27 Testers, Defibrillator

| Model | Asset | Accepted Date | Inspection Date and Status | Days Between Inspection | Consecutive Duration Without Calibration | | Average Inspection Interval | | Recommended Inspection Frequency | Justification |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Days | Years | Days | Years | | |
| IMPULSE 4000 | 56378 | 20-Sep-06 | 10-Apr-15 10-Jul-17 19-Mar-18 16-Mar-20 4-May-22 | n/a n/a 252 728 779 | - | - | 586 | 1.6 | 1 | Requires calibration at approximately 2 year intervals. |
| | 14521 | 18-Feb-95 | 19-Mar-18 | outlier | - | - | 0 | 0.0 | 1 | Insufficient information, and annual calibration is recommended for devices over 20 years old. |
| QED 6 | 4496 | 12-Apr-97 | 27-Mar-18 25-Mar-20 | n/a 729 | - | - | 729 | 2.0 | 1 | Insufficient information, and annual calibration is recommended for devices over 20 years old. |

| | |
|---|---|
| Average Recommended Inspection Frequency: | 1.0 |
| **Recommended Inspection Frequency:** | **1 Year** |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| IMPULSE 7000DP | 102877 | 23-Oct-17 | 14-Aug-20 18-May-22 | 1026 642 | 1668 | 4.6 | 834 | 2.3 | 4 | Calibration not required for over 4 years. |
| | 101537 | 20-Mar-08 | 28-Jun-17 14-Aug-20 18-May-22 | n/a 1143 642 | 1785 | 4.9 | 893 | 2.4 | 4 | Calibration not required for over 4 years. |
| | 104593 | 23-Oct-18 | 10-Aug-20 12-May-22 | 657 640 | 1297 | 3.6 | 649 | 1.8 | 3 | Calibration not required at approximately 3 year intervals. |
| | 105741 | 06-Apr-18 | 16-Mar-20 4-May-22 | 710 779 | 1489 | 4.1 | 745 | 2.0 | 4 | Calibration not required for over 4 years. |
| | 105742 | 06-Apr-18 | 12-Mar-18 18-Mar-20 4-May-22 | n/a 737 777 | 1514 | 4.1 | 757 | 2.1 | 4 | Calibration not required for over 4 years. |
| | 74985 | 05-Aug-11 | 13-Jul-11 5-Nov-13 2-Apr-16 13-Jul-17 12-May-22 | n/a n/a n/a n/a 1764 | - | - | 1764 | 4.8 | 2 | Insufficient information to recommend a longer interval. |
| | 98340 | 16-Apr-18 | 25-Mar-20 10-May-22 | 709 776 | 1485 | 4.1 | 743 | 2.0 | 4 | Calibration not required for over 4 years. |
| | 99368 | 10-Oct-18 | 21-Jul-18 10-Aug-20 12-May-22 | n/a 751 640 | 1391 | 3.8 | 696 | 1.9 | 3 | Calibration not required for over 3 years. |
| | 98879 | 28-Sep-17 | 10-Aug-20 12-May-22 | 1047 640 | 1687 | 4.6 | 844 | 2.3 | 4 | Calibration not required for over 4 years. |
| PHASE 3 | 76354 | 02-Jun-17 | 12-May-22 | 1805 | - | - | 1805 | 4.9 | 2 | Calibration not required at approximately 2 year intervals. |
| DA2006P | 66127 | 01-Oct-10 | 14-Aug-20 18-May-22 | outlier 642 | - | - | 642 | 1.8 | 2 | Calibration not required at approximately 2 year intervals. |
| DPM 2350 | 103049 | 09-Jan-18 | 18-May-22 | 1590 | - | - | 1590 | 4.4 | 2 | Calibration not required at approximately 2 year intervals. |

| | |
|---|---|
| Average Recommended Inspection Frequency: | 3.2 |
| **Recommended Inspection Frequency:** | **3 Years** |

**Recommended Pilot Frequency of 2 Years**

Table 108 BE-636 Testers, Thermometry

**BE-636 Testers, Thermometry**

| Model | Asset | Accepted Date | Inspection Date and Status | Days Between Inspection | Consecutive Duration Without Calibration | | Average Calibration Interval | | Recommended Inspection Frequency | Justification |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Days | Years | Days | Years | | |
| 9600 PLUS | 99386 | 30-Oct-18 | 16-May-22 | 1294 | - | - | 1294 | 3.5 | 3 | Calibration not required for over 3 years. |
| | 112753 | 15-Aug-19 | 18-Jun-19 27-Jun-22 | initial 1105 | - | - | 1105 | 3.0 | 3 | Calibration not required for 3 years. |
| | 93096 | 19-Nov-15 | 25-Sep-15 23-Mar-18 19-Mar-20 6-May-22 | initial 910 727 778 | 2415 | 6.6 | 805 | 2.2 | 4 | Calibration not required since initial calibration. |
| | 93097 | 19-Nov-15 | 25-Sep-15 23-Mar-18 19-Mar-20 6-May-22 | initial 910 727 778 | 2415 | 6.6 | 805 | 2.2 | 4 | Calibration not required since initial calibration. |
| | 76801 | 04-Nov-10 | 4-Nov-10 25-Feb-13 23-Mar-18 13-Mar-20 8-Jun-23 | initial n/a outlier 721 1182 | 1903 | 5.2 | 952 | 2.6 | 4 | Calibration not required at approximately 2 year intervals. |
| | 77786 | 04-Nov-10 | 29-Oct-10 12-Aug-13 23-Mar-18 6-May-22 | initial n/a 1684 1505 | 3189 | 8.7 | 1594.5 | 4.4 | 4 | Calibration not required at approximately 2 year intervals. |
| | 113574 | 27-Jun-19 | 16-May-22 | 1054 | - | - | 1054 | 2.9 | 2 | Calibration not required at approximately 2 year intervals. |

| | |
|---|---|
| Average Recommended Inspection Frequency: | 3.4 |
| **Recommended Inspection Frequency:** | **4 Years** |

**Recommended Pilot Frequency of 2 Years**

Table 19 17-721 Testers, External Cardiac Pacemaker

**17-721 Testers, External Cardiac Pacemaker**

| Model | Asset | Accepted Date | Inspection Date and Status | Days Between Inspection | Consecutive Duration Without Calibration | | Average Inspection Interval | | Recommended Inspection Frequency | Justification |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Days | Years | Days | Years | | |
| SIGMAPACE1000 | 91908 | 15-Sep-15 | 12-Aug-20 12-May-22 | 1793 638 | 2431 | 6.7 | 1216 | 3.3 | 3 | Calibration not required at approximately 2 year intervals. |
| | 74379 | 9-Nov-11 | 8-Jul-14 21-Mar-18 19-Mar-20 6-May-22 | n/a 1352 729 778 | 1507 | 4.1 | 953 | 2.6 | 1 | Requires calibration at the occasional 2 year interval. |

| | |
|---|---|
| Average Recommended Inspection Frequency: | 2.0 |
| **Recommended Inspection Frequency:** | **2 Years** |

Table 20 BE-519 Testers, Infusion Pump

**BE-519 Testers, Infusion Pump**

| Model | Asset | Accepted Date | Inspection Date and Status | Days Between Inspection | Consecutive Duration Without Calibration | | Average Inspection Interval | | Recommended Inspection Frequency | Justification |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Days | Years | Days | Years | | |
| 2000 INFUTEST 2000 | 70485 | 18-Jun-04 | 27-Mar-18 | outlier | - | - | 0 | 0.0 | 1 | Insufficient information to recommend a longer interval. |
| IDA4PLUS | 80877 | 14-Mar-13 | 19-Mar-13 21-Apr-17 11-Aug-20 16-May-22 | initial n/a 1208 643 | 1851 | 5.1 | 926 | 2.5 | 3 | Calibration not required at approximately 2 year intervals. |

| | |
|---|---|
| Average Recommended Inspection Frequency: | 2 |
| **Recommended Inspection Frequency:** | **2 Years** |

Table 21 32-674 Testers, Radiographic System, Quality Assurance

## 32-674 Testers, Radiographic System, Quality Assurance

| Model | Asset | Accepted Date | Inspection Date and Status | Days Between Inspection | Consecutive Duration Without Calibration | | Average Inspection Interval | | Recommended Inspection Frequency | Justification |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Days | Years | Days | Years | | |
| PIRANHA657 | 68977 | 19-Jun-09 | 15-Mar-11 ~~9-Dec-15~~ 20-Apr-17 24-Jun-19 | 634 n/a 498 795 | 1293 | 3.5 | 642 | 1.8 | 3 | Calibration not required for over 3 years. |
| | 97760 | 31-Mar-08 | ~~23-Apr-15~~ 17-May-17 ~~7-Apr-20~~ | n/a 755 n/a | - | - | 755 | 2.1 | 1 | Insufficient information to recommend a longer interval. |
| | 80749 | 30-Sep-10 | ~~1-Nov-12~~ ~~28-Jun-21~~ | n/a n/a | - | - | 0 | 0.0 | 1 | Insufficient information to recommend a longer interval. |
| | 96523 | 31-Dec-05 | 17-May-22 | outlier | - | - | 0 | 0.0 | 1 | Insufficient information to recommend a longer interval. |
| | 93040 | 4-Apr-94 | 17-May-22 | outlier | - | - | 0 | 0.0 | 1 | Insufficient information to recommend a longer interval. |
| | 98805 | 15-Jan-18 | 17-May-22 | 1583 | - | - | 1583 | 4.3 | 1 | Insufficient information to recommend a longer interval. |
| | 98684 | 27-Feb-17 | 17-May-22 | outlier | - | - | 0 | 0.0 | 1 | Insufficient information to recommend a longer interval. |
| | 98685 | 27-Feb-17 | 17-May-22 | outlier | - | - | 0 | 0.0 | 1 | Insufficient information to recommend a longer interval. |
| | 103657 | 5-Jan-18 | 18-May-22 | 1594 | - | - | 1594 | 4.4 | 1 | Insufficient information to recommend a longer interval. |
| | 95707 | 21-Oct-10 | 18-May-22 | outlier | - | - | 0 | 0.0 | 1 | Insufficient information to recommend a longer interval. |

| | |
|---|---|
| Average Recommeneded Inspection Frequency: | 1.2 |
| **Recommended Inspection Frequency:** | **1 Year** |

Table 22 BE-519 Testers, Probe, Ultrasonic

## BE-519 Testers, Probe, Ultrasonic

| Model | Asset | Accepted Date | Inspection Date and Status | Days Between Inspection | Consecutive Duration Without Calibration | | Average Inspection Interval | | Recommended Inspection Frequency | Justification |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Days | Years | Days | Years | | |
| ULT2010 | 105740 | 6-Apr-18 | ~~7-Mar-18~~ 3-Dec-21 | initial 1367 | - | - | 1367 | 3.7 | 1 | Insufficient information to recommend a longer interval. |
| | e81841 | 24-Oct-13 | ~~1-Oct-13~~ 3-Nov-21 | initial outlier | - | - | 0 | 0.0 | 1 | Insufficient information to recommend a longer interval. |

| | |
|---|---|
| Average Recommended Inspection Frequency: | 1.0 |
| **Recommended Inspection Frequency:** | **1 Year** |