

The documentation and process conversion measures necessary to comply with this document shall be completed by 10 January 2024.

INCH-POUND

MIL-PRF-19500/436B  
W/AMENDMENT 1  
10 October 2023  
SUPERSEDING  
MIL-PRF-19500/436B  
11 May 2018

## PERFORMANCE SPECIFICATION SHEET

SEMICONDUCTOR DEVICE, DIODE, SILICON, VOLTAGE-VARIABLE CAPACITOR  
TYPES 1N5461B THROUGH 1N5476B, AND 1N5461C THROUGH 1N5476C  
JAN, JANTX, AND JANTXV

This specification is approved for use by all Departments  
and Agencies of the Department of Defense.

The requirements for acquiring the product described herein shall consist of  
this specification sheet and [MIL-PRF-19500](#).

### 1. SCOPE

1.1 Scope. This specification covers the performance requirements for a silicon, voltage-variable-capacitor diode. Three levels of product assurance (JAN, JANTX, and JANTXV) are provided for each device type.

1.2 Package outlines. The device package outlines are as follows: similar to DO-7 in accordance with figure 1 for all encapsulated device types.

### 1.3 Ratings and characteristics.

| P <sub>T</sub> 1/ |     | V <sub>RM(wkg)</sub> | BV<br>I <sub>R</sub> = 10 $\mu$ A dc | C<br>V <sub>R</sub> = 4 V dc<br>f = 1 MHz | Capacitance<br>ratio            | Q<br>V <sub>R</sub> = 4 V dc<br>f = 50 MHz |
|-------------------|-----|----------------------|--------------------------------------|-------------------------------------------|---------------------------------|--------------------------------------------|
|                   | mW  | V(pk)                | V dc                                 | pF                                        |                                 |                                            |
| Min               | --- | ---                  | 30                                   | (See <a href="#">table II</a> )           | (See <a href="#">table II</a> ) | (See <a href="#">table II</a> )            |
| Max               | 400 | 30                   | ---                                  | (See <a href="#">table II</a> )           | ---                             | ---                                        |

1/ Derate linearly 2.67 mW/°C above 25°C.

OPERATING AMBIENT TEMPERATURE: -65°C TO +175°C  
STORAGE TEMPERATURE: -65°C TO +200°C

\* Comments, suggestions, or questions on this document should be addressed to DLA Land and Maritime, ATTN: VAC, P.O. Box 3990, Columbus, OH 43218-3990, or emailed to [Semiconductor@dla.mil](mailto:Semiconductor@dla.mil). Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at <https://assist.dla.mil/>.

AMSC N/A

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1.4 Part or Identifying Number (PIN). The PIN is in accordance with [MIL-PRF-19500](#), and as specified herein. See 6.4 for PIN construction example and [6.5](#) for a list of available PINs.

1.4.1 JAN certification mark and quality level for encapsulated devices. The quality level designators for encapsulated devices that are applicable for this specification sheet from the lowest to the highest level are as follows: "JAN", "JANTX" and "JANTXV".

1.4.2 Device type. The designation system for the device types of voltage-variable-capacitor diodes covered by this specification sheet are as follows.

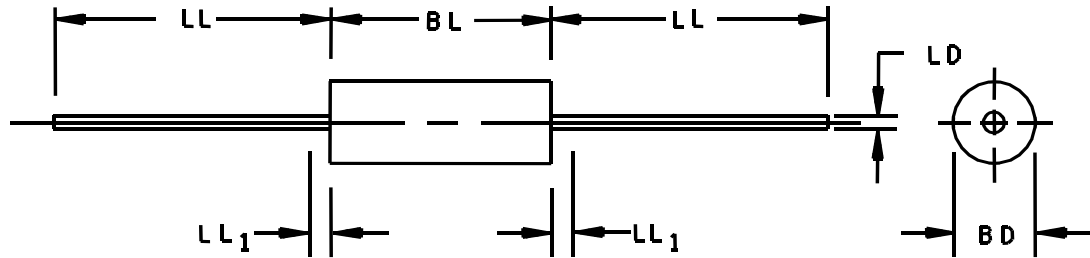
1.4.2.1 First number and first letter symbols. The diodes of this specification sheet use the first number and letter symbols "1N".

1.4.2.2 Second number symbols. The second number symbols for the diodes covered by this specification sheet are as follows: "5461", "5462", "5463", "5464", "5465", "5466", "5467", "5468", "5469", "5470", "5471", "5472", "5473", "5474", "5475", and "5476".

1.4.2.3 Suffix letters. The suffix letter "B" indicates that the voltage-variable-capacitor diode has electrical characteristics as specified in [table II](#). The suffix letter "C" indicates devices with a smaller range of capacitance than the "B" suffix versions as specified in [table II](#).

1.4.3 Lead finish. The lead finishes applicable to this specification sheet are listed on [QPDSIS-19500](#).

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| Ltr | Dimensions |      |       |       | Notes |
|-----|------------|------|-------|-------|-------|
|     | in         | in   | mm    | mm    |       |
|     | Min        | Max  | Min   | Max   |       |
| LD  | .018       | .022 | 0.46  | 0.56  |       |
| BD  | .078       | .107 | 1.98  | 2.72  | 3     |
| BL  | .195       | .300 | 4.95  | 7.62  | 3     |
| LL  | 1.00       | 1.50 | 25.40 | 38.10 |       |
| LL1 | ---        | .050 | ---   | 1.27  | 4     |

NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Package contour optional within BD and length BL. Heat slugs, if any, shall be included within this cylinder but shall not be subject to minimum limit of BD.
4. Within this zone lead, diameter may vary to allow for lead finishes and irregularities other than heat slugs.

FIGURE 1. Physical dimensions

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## 2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3 and 4 of this specification, whether or not they are listed.

### 2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

#### DEPARTMENT OF DEFENSE SPECIFICATIONS

**MIL-PRF-19500** - Semiconductor Devices, General Specification for.

#### DEPARTMENT OF DEFENSE STANDARDS

**MIL-STD-750** - Test Methods for Semiconductor Devices.

\* (Copies of these documents are available online at <https://quicksearch.dla.mil>).

2.3 Order of precedence. Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

## 3. REQUIREMENTS

3.1 General. The individual item requirements shall be as specified in **MIL-PRF-19500** and as modified herein.

3.2 Qualification. Devices furnished under this specification shall be products that are manufactured by a manufacturer authorized by the qualifying activity for listing on the applicable qualified manufacturer's list (**QML-19500**) before contract award (see 4.2 and 6.4).

3.3 Abbreviations, symbols, and definitions. Abbreviations, symbols, and definitions used herein shall be as specified in **MIL-PRF-19500**.

Q.....Quality factor (ratio of reactance to effective resistance)  
TCC .....Temperature coefficient of capacitance.

3.4 Interface and physical dimensions. Interface and physical dimensions shall be as specified in **MIL-PRF-19500**, and on **figure 1** (similar to DO-7) herein.

3.4.1 Lead finish. Lead finish shall be solderable in accordance with **MIL-STD-750** and **MIL-PRF-19500**, and herein. Lead finish may be specified in the contract (see 6.2), without affecting the qualified product status of the device or applicable JAN marking.

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3.5 Polarity. The polarity shall be indicated with a contrasting color band to denote the cathode end.

3.6 Electrical performance characteristics. Unless otherwise specified herein, the electrical performance characteristics are as specified in 1.3 and table I.

3.7 Electrical test requirements. The electrical test requirements shall be the subgroups specified in table I herein.

3.8 Qualification. Devices furnished under this specification shall be products that are authorized by the qualifying activity for listing on the applicable qualified products list before contract award (see 4.2 and 6.4 ).

#### 4. VERIFICATION

4.1 Classification of Inspections. The inspection requirements specified herein are classified as follows:

- a. Qualification inspection (see 4.2).
- b. Screening (see 4.3)
- c. Conformance inspection (see 4.4).

4.2 Qualification inspection. Qualification inspection shall be in accordance with MIL-PRF-19500.

4.2.1 Inspection lot. Inspection lot shall be defined in MIL-PRF-19500, except that the lot accumulation period requirements shall be 6 months in lieu of 6 weeks.

\* 4.3 Screening (JANTX and JANTXV levels only). Screening shall be in accordance with MIL-PRF-19500 (table E-IV), and as specified herein. The following measurements shall be made in accordance with table I herein. Devices that exceed the limits of table I herein shall not be acceptable.

| Screen | Measurements for<br>JANTX, JANTXV levels                                                                       |
|--------|----------------------------------------------------------------------------------------------------------------|
| 2      | $T_A = +200^{\circ}\text{C}$ , 48 hours                                                                        |
| 10     | Not applicable                                                                                                 |
| 11     | $I_{R_i}$                                                                                                      |
| 12     | See 4.3.1                                                                                                      |
| 13     | Subgroup 2 of table I herein;<br>$\Delta I_R = 100$ percent of initial value or 10 nA dc whichever is greater. |

4.3.1 High temperature reverse bias (HTRB). HTRB conditions are as follows:  $T_A = 150^{\circ}\text{C}$ ,  $V_R = 25$  V dc,  $t = 96$  hours.

4.4 Conformance inspection. Conformance inspection shall be in accordance with MIL-PRF-19500, and as specified herein.

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4.4.2 Group B inspection. Group B inspection shall be conducted in accordance with the conditions specified for subgroup testing in table E-VIB (JAN, JANTX, and JANTXV) of MIL-PRF-19500, and as follows.

| <u>Subgroup</u> | <u>Method</u> | <u>Condition</u>                                                                                                  |
|-----------------|---------------|-------------------------------------------------------------------------------------------------------------------|
| B2              | 1051          | $t_{\text{high}} = 175^{\circ}\text{C}$ ; 10 cycles                                                               |
| B3              | 1027          | $V_R = 25 \text{ V dc}$ , $T_A = 150^{\circ}\text{C}$ , $t = 500 \text{ hrs.}$                                    |
| B6              | 1032          | $t = 1000 \text{ hrs.}$                                                                                           |
| B7              | ----          | $T_A = -65^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ , $V_R = 4 \text{ V dc}$ , $n = 22$ , $c = 0$ ; (see 4.4.4). |

4.4.3 Group C inspection. Group C inspection shall be conducted in accordance with the conditions specified for subgroup testing in table E-VII of MIL-PRF-19500, and as follows.

| <u>Subgroup</u> | <u>Method</u> | <u>Condition</u>                                                                                              |
|-----------------|---------------|---------------------------------------------------------------------------------------------------------------|
| C2              | 2036          | Terminal strength: test condition A; 4 lbs, $t = 15 \text{ sec.}$<br>Lead fatigue, test cond. E.              |
| C6              | 1027          | $V_R = 25 \text{ V dc}$ , $T_A = 150^{\circ}\text{C}$ , $t = 500 \text{ hrs}$ , $T_A = 200^{\circ}\text{F}$ . |

4.4.4 Temperature coefficient of capacitance. Throughout the temperature range specified the capacitance shall not change by more than .04 %/ $^{\circ}\text{C}$  relative to the capacitance value measured at  $T_A = 25^{\circ}\text{C}$ . The temperature coefficient of capacitance may be computed by the following formula:

$$TC_C = \frac{C_T (+85^{\circ}\text{C}) - C_T (-65^{\circ}\text{C})}{85 + 65} \times \frac{10^2}{C_T (25^{\circ}\text{C})}$$

(Accuracy is limited by the  $C_T$  measurement to  $\pm 0.1 \text{ pF.}$ )

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TABLE I. Group A inspection.

| Inspection <u>1/</u>             | MIL-STD-750 |                                                                                      | Symbol   | Limits             | Limits            | Unit             |
|----------------------------------|-------------|--------------------------------------------------------------------------------------|----------|--------------------|-------------------|------------------|
|                                  | Method      | Conditions                                                                           |          | Min                | Max               |                  |
| <u>Subgroup 1</u>                |             |                                                                                      |          |                    |                   |                  |
| Visual and mechanical inspection | 2071        |                                                                                      |          |                    |                   |                  |
| <u>Subgroup 2</u>                |             |                                                                                      |          |                    |                   |                  |
| Breakdown voltage                | 4021        | $I_R = 10 \mu\text{A dc}$                                                            | $BV_R$   | 30                 | ---               | V dc             |
| Reverse current                  | 4016        | Condition A or B;<br>DC method; $V_R = 25 \text{ V dc}$                              | $I_{R1}$ | ---                | 20                | nA dc            |
| <u>Subgroup 3</u>                |             |                                                                                      |          |                    |                   |                  |
| Reverse current                  | 4016        | Condition A or B;<br>DC method; $V_R = 25 \text{ V dc}$<br>$T_A = 150^\circ\text{C}$ | $I_{R2}$ | ---                | 20                | $\mu\text{A dc}$ |
| <u>Subgroup 4</u>                |             |                                                                                      |          |                    |                   |                  |
| Capacitance                      | 4001        | $V_R = 4 \text{ V dc}$ ; $f = 1 \text{ MHz}$                                         | C        | Col. 3<br>table II | Col 4<br>table II | pF               |
| Capacitance ratio                | 4001        | $V_R = 2 \text{ V dc}$ to $V_R = 30 \text{ V dc}$ ;<br>$f = 1 \text{ MHz}$           | ---      | Col 5<br>table II  | Col 6<br>table II | ---              |
| Quality factor                   | 4036        | $V_R = 4 \text{ V dc}$ ;<br>$f = 50 \text{ MHz}$                                     | Q        | Col 7<br>table II  | ---               | ---              |

1/ For sampling plan, see MIL-PRF-19500.

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TABLE II.

| Col. 1  | Col. 2                                | Col. 3                                | Col. 4                                | Col. 5                                                                         | Col. 6                                                                         | Col. 7                                              |
|---------|---------------------------------------|---------------------------------------|---------------------------------------|--------------------------------------------------------------------------------|--------------------------------------------------------------------------------|-----------------------------------------------------|
| Type    | Capacitance<br>$V_R = 4 \text{ V dc}$ | Capacitance<br>$V_R = 4 \text{ V dc}$ | Capacitance<br>$V_R = 4 \text{ V dc}$ | Capacitance ratio<br>from $V_R = 2 \text{ V dc}$<br>to $V_R = 30 \text{ V dc}$ | Capacitance ratio<br>from $V_R = 2 \text{ V dc}$<br>to $V_R = 30 \text{ V dc}$ | Q<br>$V_R = 4 \text{ V dc}$<br>$f = 50 \text{ MHz}$ |
|         | Nom.                                  | Min                                   | Max                                   | Min                                                                            | Max                                                                            | Min                                                 |
|         | pF                                    | pF                                    | pF                                    |                                                                                |                                                                                |                                                     |
| 1N5461B | 6.8                                   | 6.46                                  | 7.14                                  | 2.7                                                                            | 3.1                                                                            | 600                                                 |
| 1N5462B | 8.2                                   | 7.79                                  | 8.61                                  | 2.8                                                                            | 3.1                                                                            | 600                                                 |
| 1N5463B | 10.0                                  | 9.5                                   | 10.5                                  | 2.8                                                                            | 3.1                                                                            | 550                                                 |
| 1N5464B | 12.0                                  | 11.4                                  | 12.6                                  | 2.8                                                                            | 3.1                                                                            | 550                                                 |
| 1N5465B | 15.0                                  | 14.25                                 | 15.75                                 | 2.8                                                                            | 3.1                                                                            | 550                                                 |
| 1N5466B | 18.0                                  | 17.1                                  | 18.9                                  | 2.9                                                                            | 3.1                                                                            | 500                                                 |
| 1N5467B | 20.0                                  | 19.0                                  | 21.0                                  | 2.9                                                                            | 3.1                                                                            | 500                                                 |
| 1N5468B | 22.0                                  | 20.9                                  | 23.1                                  | 2.9                                                                            | 3.2                                                                            | 500                                                 |
| 1N5469B | 27.0                                  | 25.65                                 | 28.35                                 | 2.9                                                                            | 3.2                                                                            | 500                                                 |
| 1N5470B | 33.0                                  | 31.35                                 | 34.65                                 | 2.9                                                                            | 3.2                                                                            | 500                                                 |
| 1N5471B | 39.0                                  | 37.05                                 | 40.95                                 | 2.9                                                                            | 3.2                                                                            | 450                                                 |
| 1N5472B | 47.0                                  | 44.65                                 | 49.35                                 | 2.9                                                                            | 3.2                                                                            | 400                                                 |
| 1N5473B | 56.0                                  | 53.2                                  | 58.8                                  | 2.9                                                                            | 3.3                                                                            | 300                                                 |
| 1N5474B | 68.0                                  | 64.6                                  | 71.4                                  | 2.9                                                                            | 3.3                                                                            | 250                                                 |
| 1N5475B | 82.0                                  | 77.9                                  | 86.1                                  | 2.9                                                                            | 3.3                                                                            | 225                                                 |
| 1N5476B | 100.0                                 | 95.0                                  | 105.0                                 | 2.9                                                                            | 3.3                                                                            | 200                                                 |
| 1N5461C | 6.8                                   | 6.66                                  | 6.94                                  | 2.7                                                                            | 3.1                                                                            | 600                                                 |
| 1N5462C | 8.2                                   | 8.04                                  | 8.36                                  | 2.8                                                                            | 3.1                                                                            | 600                                                 |
| 1N5463C | 10.0                                  | 9.8                                   | 10.2                                  | 2.8                                                                            | 3.1                                                                            | 550                                                 |
| 1N5464C | 12.0                                  | 11.76                                 | 12.24                                 | 2.8                                                                            | 3.1                                                                            | 550                                                 |
| 1N5465C | 15.0                                  | 14.7                                  | 15.3                                  | 2.8                                                                            | 3.1                                                                            | 550                                                 |
| 1N5466C | 18.0                                  | 17.64                                 | 18.36                                 | 2.9                                                                            | 3.1                                                                            | 500                                                 |
| 1N5467C | 20.0                                  | 19.60                                 | 20.4                                  | 2.9                                                                            | 3.1                                                                            | 500                                                 |
| 1N5468C | 22.0                                  | 21.56                                 | 22.44                                 | 2.9                                                                            | 3.2                                                                            | 500                                                 |
| 1N5469C | 27.0                                  | 26.46                                 | 27.54                                 | 2.9                                                                            | 3.2                                                                            | 500                                                 |
| 1N5470C | 33.0                                  | 32.34                                 | 33.66                                 | 2.9                                                                            | 3.2                                                                            | 500                                                 |
| 1N5471C | 39.0                                  | 38.22                                 | 39.78                                 | 2.9                                                                            | 3.2                                                                            | 450                                                 |
| 1N5472C | 47.0                                  | 46.06                                 | 47.94                                 | 2.9                                                                            | 3.2                                                                            | 400                                                 |
| 1N5473C | 56.0                                  | 54.88                                 | 57.12                                 | 2.9                                                                            | 3.3                                                                            | 300                                                 |
| 1N5474C | 68.0                                  | 66.64                                 | 69.36                                 | 2.9                                                                            | 3.3                                                                            | 250                                                 |
| 1N5475C | 82.0                                  | 80.36                                 | 83.64                                 | 2.9                                                                            | 3.3                                                                            | 225                                                 |
| 1N5476C | 100.0                                 | 98.0                                  | 102.00                                | 2.9                                                                            | 3.3                                                                            | 200                                                 |

## 5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the Military Service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

## 6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory. The notes specified in MIL-PRF-19500 are applicable to this specification.)

6.1 Intended use. Semiconductors conforming to this specification are intended for original equipment design applications and logistic support of existing equipment.

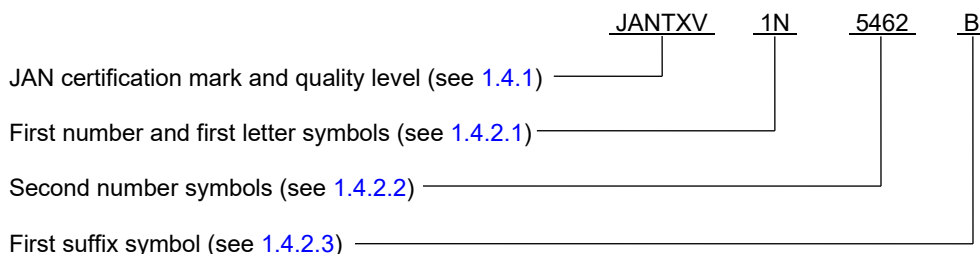
6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. Packaging requirements (see 5.1).
- c. Lead finish (see 3.4.1).
- d. The complete PIN, see 1.4 and 6.5.

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Manufacturers List (QPDSIS-19500) whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from DLA Land and Maritime, ATTN: VQE, P.O. Box 3990, Columbus, OH 43218-3990 or e-mail [vqe.chief@dla.mil](mailto:vqe.chief@dla.mil). An online listing of products qualified to this specification may be found in the Qualified Products Database (QPD) at <https://assist.dla.mil/>.

6.4 PIN construction example.

6.4.1 Encapsulated devices The PINs for encapsulated devices are constructed using the following form.



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6.5 List of PINs.

6.5.1 List of PINs for encapsulated devices. The following is a list of possible PINs for encapsulated devices available on this specification sheet for the "B" suffix. Replace "B" with "C" for "C" suffix part numbers.

| PINs for devices of the base quality level | PINs for devices of the "TX" quality level | PINs for devices of the "TXV" quality level |
|--------------------------------------------|--------------------------------------------|---------------------------------------------|
| JAN1N5461B                                 | JANTX1N5461B                               | JANTXV1N5461B                               |
| JAN1N5462B                                 | JANTX1N5462B                               | JANTXV1N5462B                               |
| JAN1N5463B                                 | JANTX1N5463B                               | JANTXV1N5463B                               |
| JAN1N5464B                                 | JANTX1N5464B                               | JANTXV1N5464B                               |
| JAN1N5465B                                 | JANTX1N5465B                               | JANTXV1N5465B                               |
| JAN1N5466B                                 | JANTX1N5466B                               | JANTXV1N5466B                               |
| JAN1N5467B                                 | JANTX1N5467B                               | JANTXV1N5467B                               |
| JAN1N5468B                                 | JANTX1N5468B                               | JANTXV1N5468B                               |
| JAN1N5469B                                 | JANTX1N5469B                               | JANTXV1N5469B                               |
| JAN1N5470B                                 | JANTX1N5470B                               | JANTXV1N5470B                               |
| JAN1N5471B                                 | JANTX1N5471B                               | JANTXV1N5471B                               |
| JAN1N5472B                                 | JANTX1N5472B                               | JANTXV1N5472B                               |
| JAN1N5473B                                 | JANTX1N5473B                               | JANTXV1N5473B                               |
| JAN1N5474B                                 | JANTX1N5474B                               | JANTXV1N5474B                               |
| JAN1N5475B                                 | JANTX1N5475B                               | JANTXV1N5475B                               |
| JAN1N5476B                                 | JANTX1N5476B                               | JANTXV1N5476B                               |

\* 6.6 Amendment notations. The margins of this specification are marked with asterisks to indicate modifications generated by this amendment. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

Custodians:  
Air Force - 85  
DLA - CC

Preparing activity:  
DLA - CC

(Project 5961-2023-076)

Review activity:  
Air Force - 19

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