

## 1.0 SCOPE

This specification covers the detail requirements for a high-speed, precision JFET-input operational amplifier.

It is highly recommended that this data sheet be used as a baseline for new military or aerospace spec control drawings.

## 1.2 Part Number. The complete part numbers per Table I of this specification follow:

| <u>Device</u> | <u>Part Number</u> | <u>Package</u> |
|---------------|--------------------|----------------|
| A             | OP-44AJ/883        | J              |
| A             | OP-44AZ/883        | Z              |
| A             | OP-44ARC/883       | RC             |

### 1.2.3 Case Outline.

| <u>Letter</u> | <u>Case Outline (Lead finish per MIL-M-38510)</u> |
|---------------|---------------------------------------------------|
| J             | 8-lead metal can (TO-99)                          |
| Z             | 8-lead ceramic dual-in-line package (CERDIP)      |
| RC            | 20-contact hermetic leadless chip carrier (LCC)   |

## 1.3 Absolute Maximum Ratings. ( $T_A = 25^\circ\text{C}$ , unless otherwise noted)

|                                           |                                             |
|-------------------------------------------|---------------------------------------------|
| Supply Voltage.....                       | $\pm 20\text{V}$                            |
| Power Dissipation.....                    | 500mW                                       |
| Input Voltage (Note 1).....               | $\pm 20\text{V}$                            |
| Differential Input Voltage (Note 1).....  | $\pm 40\text{V}$                            |
| Output Short-Circuit Duration .....       | Indefinite                                  |
| Storage Temperature Range.....            | $-65^\circ\text{C}$ to $+150^\circ\text{C}$ |
| Lead Temperature (Soldering, 60 sec)..... | $+300^\circ\text{C}$                        |
| Operating Temperature Range .....         | $-55^\circ\text{C}$ to $+125^\circ\text{C}$ |

#### NOTES:

- For supply voltages less than  $\pm 20\text{V}$ , the absolute maximum input voltage is equal to the supply voltages.

## 1.5 Thermal Characteristics:

Thermal Resistance, TO-99 (J) package:

|                                                                   |
|-------------------------------------------------------------------|
| Junction-to-Case ( $\theta_{JC}$ ) = $45^\circ\text{C/W MAX}$     |
| Junction-to-Ambient ( $\theta_{JA}$ ) = $150^\circ\text{C/W MAX}$ |

Thermal Resistance, CERDIP (Z) package:

|                                                                   |
|-------------------------------------------------------------------|
| Junction-to-Case ( $\theta_{JC}$ ) = $26^\circ\text{C/W MAX}$     |
| Junction-to-Ambient ( $\theta_{JA}$ ) = $119^\circ\text{C/W MAX}$ |

Thermal Resistance, LCC (RC) package:

|                                                                   |
|-------------------------------------------------------------------|
| Junction-to-Case ( $\theta_{JC}$ ) = $30^\circ\text{C/W MAX}$     |
| Junction-to-Ambient ( $\theta_{JA}$ ) = $120^\circ\text{C/W MAX}$ |

**TABLE 1**

$V_S = \pm 15V$ ;  $R_S = 50\Omega$ ;  $V_{CM} = 0V$ ;  $T_A = T_J = +25^\circ C$  unless otherwise specified.

| Characteristics                              | Symbol     | Special Conditions                                                       | OP-44/883<br>LIMITS A |           | Units            |
|----------------------------------------------|------------|--------------------------------------------------------------------------|-----------------------|-----------|------------------|
|                                              |            |                                                                          | Min                   | Max       |                  |
| Input Offset Voltage                         | $V_{OS}$   |                                                                          | —                     | 1.0       | mV               |
|                                              |            | $-55^\circ C \leq T_A \leq +125^\circ C$                                 | —                     | 2.0       | mV               |
| Input Offset Voltage Temperature Coefficient | $TCV_{OS}$ | $-55^\circ C \leq T_A \leq +125^\circ C$                                 | —                     | 10        | $\mu V/^\circ C$ |
| Input Offset Current                         | $I_{OS}$   |                                                                          | —                     | 40        | pA               |
|                                              |            | $T_A = T_J = +125^\circ C$                                               | —                     | 1         | nA               |
| Input Bias Current                           | $I_B$      |                                                                          | —                     | $\pm 200$ | pA               |
|                                              |            | $T_A = T_J = +125^\circ C$                                               | —                     | $\pm 20$  | nA               |
| Common-Mode Rejection (Note 1)               | CMR        | $V_{CM} = I_{VR} = \pm 11V$                                              | 86                    | —         | dB               |
|                                              |            | $V_{CM} = I_{VR} = \pm 11V$<br>$-55^\circ C \leq T_A \leq +125^\circ C$  | 84                    | —         | dB               |
| Power Supply Rejection Ratio                 | PSRR       | $V_S = \pm 10V$ to $\pm 20V$                                             | —                     | 40        | $\mu V/V$        |
|                                              |            | $V_S = \pm 10V$ to $\pm 20V$<br>$-55^\circ C \leq T_A \leq +125^\circ C$ | —                     | 50        | $\mu V/V$        |
| Output Voltage Swing                         | $V_O$      | $R_L = 1k\Omega$                                                         | $\pm 11.5$            | —         | V                |
|                                              |            | $R_L = 2k\Omega$<br>$-55^\circ C \leq T_A \leq +125^\circ C$             | $\pm 11.0$            | —         | V                |
| Supply Current                               | $I_{SY}$   | $V_O = 0V$ , No Load                                                     | —                     | 7.5       | mA               |
|                                              |            | $V_O = 0V$ , No Load<br>$-55^\circ C \leq T_A \leq +125^\circ C$         | —                     | 7.5       | mA               |
| Short-Circuit Current Limit                  | $I_{SC}$   | Output Shorted to Ground                                                 | $\pm 20$              | $\pm 60$  | mA               |
|                                              |            | Output Shorted to Ground<br>$-55^\circ C \leq T_A \leq +125^\circ C$     | $\pm 8$               | $\pm 60$  | mA               |

TABLE 1 (Continued)

$V_S = \pm 15V$ ;  $R_S = 50\Omega$ ;  $V_{CM} = 0V$ ;  $T_A = T_J = +25^\circ C$  unless otherwise specified.

| OP-44/883                       |             |                                            |           |          |            |
|---------------------------------|-------------|--------------------------------------------|-----------|----------|------------|
| Characteristics                 | Symbol      | Special Conditions                         | LIMITS A  |          | Units      |
|                                 |             |                                            | Min       | Max      |            |
| Slew Rate                       | SR          | $A_{VCL} = +3, R_L = 2k\Omega$             | 100       | —        | V/ $\mu s$ |
|                                 |             | $A_{VCL} = +3, R_L = 2k\Omega$             | 80        | —        | V/ $\mu s$ |
|                                 |             | $-55^{\circ}C \leq T_A \leq +125^{\circ}C$ |           |          |            |
| External $V_{OS}$<br>Trim Range | $V_{OSadj}$ | $R_{POT} = 10k\Omega$                      | $\pm 2.5$ | $\pm 10$ | mV         |
| Large-Signal<br>Voltage Gain    | $A_{VO}$    | $V_O = \pm 10V, T_A = +25^{\circ}C$        |           |          |            |
|                                 |             | $R_L = 10k\Omega$                          | 500       | —        | V/mV       |
|                                 |             | $R_L = 2k\Omega$                           | 200       | —        | V/mV       |
|                                 |             | $R_L = 1k\Omega$                           | 100       | —        | V/mV       |
|                                 |             | $V_O = \pm 10V$                            |           |          |            |
|                                 |             | $-55^{\circ}C \leq T_A \leq +125^{\circ}C$ |           |          |            |
|                                 |             | $R_L = 10k\Omega$                          | 160       | —        | V/mV       |
|                                 |             | $R_L = 2k\Omega$                           | 80        | —        | V/mV       |
| Rise Time (Note 2)              | $t_r$       |                                            | —         | 50       | ns         |
| Overshoot (Note 2)              | OS          |                                            | —         | 40       | %          |

## NOTES:

1. IVR is defined as the  $V_{CM}$  range used for the CMR test.
2. See test conditions and test circuit, Figure 1A and 1B.

**TABLE 2**

**OP-44/883**

**Electrical Test Requirements  
For Class B Devices**

| MIL-STD-883<br>Test Requirements               | Subgroups (see Table 3)   |
|------------------------------------------------|---------------------------|
| Interim Electrical<br>Parameters (pre Burn-In) | 1                         |
| Final Electrical Test<br>Parameters            | 1*, 2, 3, 4, 5, 6, 7, 8   |
| Group A Test Requirements                      | 1, 2, 3, 4, 5, 6, 7, 8, 9 |

\* PDA applies to Subgroup 1 only.  
No other Subgroups are included in PDA.

**TABLE 3**

**Group A Inspection**

$V_S = \pm 15V$ ;  $R_S = 50\Omega$ ;  $V_{CM} = 0V$ ;  $T_A = T_J$  unless otherwise specified.

| Subgroup                           | Symbol                                                                                                                                             | Special Conditions       | OP-44/883<br>LIMITS A |           | Units            |
|------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|-----------------------|-----------|------------------|
|                                    |                                                                                                                                                    |                          | Min                   | Max       |                  |
| Subgroup 1<br>$T_A = +25^\circ C$  | $V_{OS}$                                                                                                                                           |                          | —                     | 1.0       | mV               |
|                                    | $I_B$                                                                                                                                              |                          | —                     | $\pm 200$ | pA               |
|                                    | $I_{OS}$                                                                                                                                           |                          | —                     | 40        | pA               |
|                                    | CMR                                                                                                                                                | $V_{CM} = \pm 11V$       | 86                    | —         | dB               |
|                                    | PSRR                                                                                                                                               | $V_S = \pm 10V, \pm 20V$ | —                     | 40        | $\mu V/V$        |
|                                    | $I_{SC}$                                                                                                                                           | Output Shorted to Ground | $\pm 20$              | $\pm 60$  | mA               |
|                                    | $I_{SY}$                                                                                                                                           | $V_O = 0V$ , No Load     | —                     | 7.5       | mA               |
|                                    | $V_{OSadj}$                                                                                                                                        | $R_{POT} = 10k\Omega$    | $\pm 2.5$             | $\pm 10$  | mV               |
| Subgroup 2<br>$T_A = +125^\circ C$ | $V_{OS}$                                                                                                                                           |                          | —                     | 2.0       | mV               |
|                                    | $TCV_{OS}$                                                                                                                                         |                          | —                     | 10        | $\mu V/^\circ C$ |
|                                    | $I_B$                                                                                                                                              |                          | —                     | $\pm 20$  | nA               |
|                                    | $I_{OS}$                                                                                                                                           |                          | —                     | 1         | nA               |
|                                    | CMR                                                                                                                                                | $V_{CM} = \pm 11V$       | 84                    | —         | dB               |
|                                    | PSRR                                                                                                                                               | $V_S = \pm 10V, \pm 20V$ | —                     | 50        | $\mu V/V$        |
|                                    | $I_{SC}$                                                                                                                                           | Output Shorted to Ground | $\pm 8$               | $\pm 60$  | mA               |
|                                    | $I_{SY}$                                                                                                                                           | $V_O = 0V$ , No Load     | —                     | 7.5       | mA               |
| Subgroup 3<br>$qT_A = -55^\circ C$ | All Tests, Limits and Conditions are the same as for Subgroup 2 with the exclusion of $I_B$ and $I_{OS}$ which are not tested at this temperature. |                          |                       |           |                  |

**TABLE 3****Group A Inspection (Continued)**
 $V_S = \pm 15V$ ;  $R_S = 50\Omega$ ;  $V_{CM} = 0V$ ;  $T_A = T_J$  unless otherwise specified.

| Subgroup                                | Symbol   | Special Conditions                                               | OP-44/883<br>LIMITS A |     | Units      |
|-----------------------------------------|----------|------------------------------------------------------------------|-----------------------|-----|------------|
|                                         |          |                                                                  | Min                   | Max |            |
| Subgroup 4                              | $V_O$    | $R_L = 1k\Omega$                                                 | $\pm 11.5$            | —   | V          |
| $T_A = +25^\circ C$                     | $A_{VO}$ | $V_O = \pm 10V, R_L = 10k\Omega$                                 | 500                   | —   | V/mV       |
|                                         |          | $V_O = \pm 10V, R_L = 2k\Omega$                                  | 200                   | —   | V/mV       |
|                                         |          | $V_O = \pm 10V, R_L = 1k\Omega$                                  | 100                   | —   | V/mV       |
|                                         |          |                                                                  |                       |     |            |
| Subgroup 5                              | $V_O$    | $R_L = 2k\Omega$                                                 | $\pm 11.0$            | —   | V          |
| $T_A = +125^\circ C$                    | $A_{VO}$ | $V_O = \pm 10V, R_L = 10k\Omega$                                 | 160                   | —   | V/mV       |
|                                         |          | $V_O = \pm 10V, R_L = 2k\Omega$                                  | 80                    | —   | V/mV       |
| Subgroup 6<br>$T_A = -55^\circ C$       |          | All Tests, Limits and Conditions are the same as for Subgroup 5. |                       |     |            |
| Subgroup 7<br>$T_A = +25^\circ C$       | SR       | $A_{VCL} = +3, R_L = 2k\Omega$                                   | 100                   | —   | V/ $\mu s$ |
| Subgroup 8<br>$T_A = -55, +125^\circ C$ | SR       | $A_{VCL} = +3, R_L = 2k\Omega$                                   | 80                    | —   | V/ $\mu s$ |
| Subgroup 9<br>$T_A = +25^\circ C$       | $t_r$    | See $t_r$ , OS test circuit,<br>Figure 1A, 1B.                   | —                     | 50  | $\mu s$    |
|                                         | OS       | See $t_r$ , OS test circuit,<br>Figure 1A, 1B.                   | —                     | 40  | %          |

# Rise Time and Overshoot Test Circuit

Figure 1A

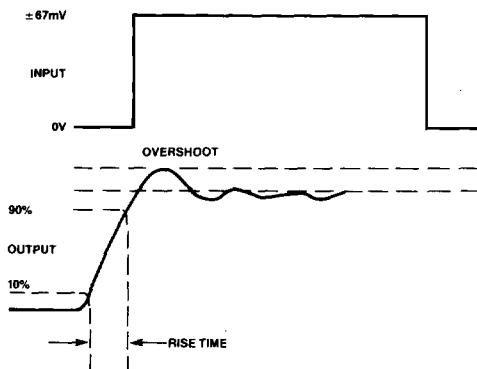
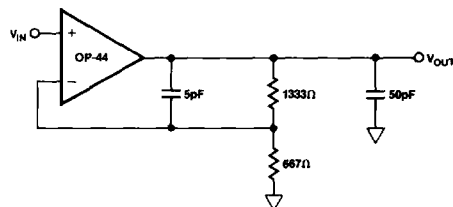
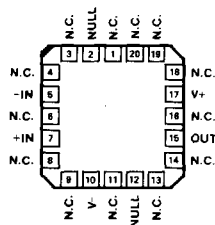
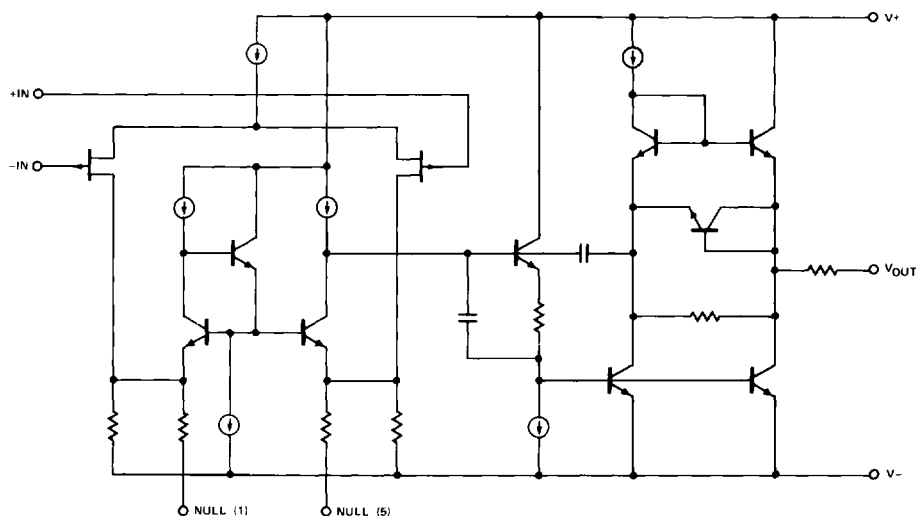


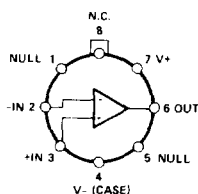
Figure 1B



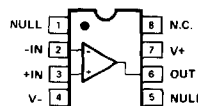
## 3.2.1 Simplified Schematic and Pin Connections.



20-CONTACT HERMETIC LCC  
(RC-Suffix)



TO-99  
(J-Suffix)

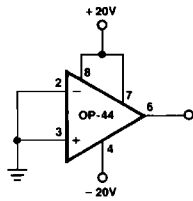


8-PIN HERMETIC DIP  
(Z-Suffix)

# OP-44

**3.2.4 Microcircuit Group Assignment.** This microcircuit is covered by microcircuit group 61.

**4.2 Life Test/Burn-In Circuit.**



**J AND Z PACKAGES**