

- 1.1 Scope.** This specification covers the detail requirements for an ultra-precision 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 1 of this specification follow:

<u>Device</u>	<u>Part Number</u>	<u>Package</u>
A	OP-177AZ/883	Z
B	OP-177BZ/883	Z
B	OP-177BRC/883	RC

- 1.2.3 Case Outline.**

<u>Letter</u>	<u>Case Outline</u> (Lead finish per MIL-M-38510)
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 .....	$\pm 22\text{V}$
Internal Power Dissipation .....	500MW
Differential Input Voltage .....	$\pm 30\text{V}$
Input Voltage (Note 1) .....	$\pm 22\text{V}$
Output Short-Circuit Duration .....	Indefinite
Storage Temperature .....	$-65^\circ\text{C}$ to $+150^\circ\text{C}$
Lead Temperature (soldering, 60 sec) .....	$+300^\circ\text{C}$
Operating Temperature Range .....	$-55^\circ\text{C}$ to $+125^\circ\text{C}$
DICE Junction Temperature ( $T_J$ ) .....	$+150^\circ\text{C}$

**NOTES:**

1. For supply voltages less than  $\pm 22\text{V}$ , the absolute maximum input voltage is equal to the supply voltages.

- 1.5 Thermal Characteristics:**

Thermal Resistance, CERDIP (Z) package:

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

Thermal Resistance, LCC (RC) package:

$$\begin{aligned} \text{Junction-to-Case } (\theta_{JC}) &= 35^\circ\text{C/W MAX} \\ \text{Junction-to-Ambient } (\theta_{JA}) &= 110^\circ\text{C/W MAX} \end{aligned}$$

**TABLE 1**

$V_S = +15V$ ;  $R_S = 500\Omega$ ;  $T_A = +25^\circ C$  unless otherwise specified.

Characteristic	Symbol	Special Conditions	OP-177/883				Units
			LIMITS A		LIMITS B		
			Min	Max	Min	Max	
Input Offset Voltage	$V_{OS}$	$-55^\circ C \leq T_A \leq +125^\circ C$	--	10	--	25	$\mu V$
			--	20	--	55	
Average Offset Voltage Drift	$TCV_{OS}$	$-55^\circ C \leq T_A \leq +125^\circ C$	--	0.1	--	0.3	$\mu V/^\circ C$
Input Offset Current	$I_{OS}$	$-55^\circ C \leq T_A \leq +125^\circ C$	--	1.0	--	1.5	nA
			--	1.5	--	2.0	
Input Bias Current	$I_B$	$-55^\circ C \leq T_A \leq +125^\circ C$	-0.2	1.5	-0.2	2.0	nA
			-0.2	4.0	-0.2	4.0	
Output Voltage Swing	$V_O$	$R_L = \geq 10k\Omega$	$\pm 13.5$	--	$\pm 13.5$	--	V
		$R_L = \geq 2k\Omega$	$\pm 12.5$	--	$\pm 12.5$	--	
		$R_L = \geq 1k\Omega$	$\pm 12.0$	--	$\pm 12.0$	--	
		$R_L = \geq 2k\Omega$	$\pm 12.0$	--	$\pm 12.0$	--	
		$-55^\circ C \leq T_A \leq +125^\circ C$					
Supply Current	$I_{SY}$	No Load	--	2.0	--	2.0	mA
		No Load, $V_S = \pm 3V$	--	0.75	--	0.75	
Power Dissipation	$P_d$	No Load	--	60	--	60	mW
		No Load	--	75	--	75	
		$-55^\circ C \leq T_A \leq +125^\circ C$ No Load, $V_S = \pm 3V$	--	4.5	--	4.5	mW
Slew Rate	SR	$R_L = \geq 2k\Omega$ , $C_L = 50pF$	0.1	--	0.1	--	V/ $\mu s$

**TABLE 1**

$V_S = +15V$ ;  $R_S = 500\Omega$ ;  $T_A = +25^\circ C$  unless otherwise specified.

Characteristic	Symbol	Special Conditions	OP-177/883				Units
			LIMITS A		LIMITS B		
			Min	Max	Min	Max	
Common-Mode Rejection	CMR	$V_{CM} = IVR = \pm 13V$	130	--	130	--	dB
		$V_{CM} = IVR = \pm 13V$	120	--	120	--	
		$-55^\circ C \leq T_A \leq +125^\circ C$					
Input Voltage Range (Note 1)	IVR		$\pm 13$	--	$\pm 13$	--	V
		$-55^\circ C \leq T_A \leq +125^\circ C$	$\pm 13$	--	$\pm 13$	--	
Power Supply Rejection Ratio	PSRR	$V_S = \pm 3V$ to $\pm 18V$	120	--	115	--	dB
		$V_S = \pm 3V$ to $\pm 18V$	120	--	110	--	
		$-55^\circ C \leq T_A \leq +125^\circ C$					
Input Noise Voltage (Note 2)	$e_n$	$f_O = 1Hz$ to $100Hz$	--	150	--	150	$nV_{RMS}$
Input Noise Current (Note 2)	$i_n$	$f_O = 1Hz$ to $100Hz$	--	8	--	8	$pA_{RMS}$
Open Loop Voltage Gain	$A_{VO}$	$R_L \geq 2k\Omega$ , $V_O = \pm 10V$	5000	--	5000	--	V/mV
		$R_L \geq 2k\Omega$ , $V_O = \pm 10V$	2000	--	2000	--	
		$-55^\circ C \leq T_A \leq +125^\circ C$					
Small-Signal Bandwidth	BW	$A_{VCL} = +1$	0.4	--	0.4	--	MHz
Input Offset Adjustment	$V_{OSadj+}$	$R_P = 20k\Omega$	0.5	--	0.5	--	mV
	$V_{OSadj-}$	$R_P = 20k\Omega$	--	-0.5	--	-0.5	

**TABLE 1**

$V_S = +15V$ ;  $R_S = 500\Omega$ ;  $T_A = +25^\circ C$  unless otherwise specified.

Characteristic	Symbol	Special Conditions	OP-177/883				Units
			LIMITS A		LIMITS B		
			Min	Max	Min	Max	
Output Short Circuit	$I_{SC}^+$		--	65	--	65	mA
	$I_{SC}^-$		-65	--	-65	--	

**NOTES:**

1. IVR is defined as the  $V_{CM}$  range used for the CMR test.
2. This parameter is 100% tested.

**TABLE 2**

OP-177/883

**Electrical Test Requirements  
For Class B Devices**

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

- \* PDA applies to Subgroup 1 only.  
No other Subgroups are included in PDA.  
 $V_{OS}$  is excluded from PDA calculation.

**TABLE 3**

**Group A Inspection**

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

Characteristic Symbol	Special Conditions	OP-177/883				Units
		Limits A		Limits B		
		MIN	MAX	MIN	MAX	
<b>Subgroup 1.</b> $T_A = +25^\circ C$	$I_{OS}$	--	1.0	--	1.5	nA
	$I_B$	-0.2	1.5	-0.2	2.0	nA
CMR	$V_{CM} = \pm 13V$	130	--	130	--	dB
PSRR	$V_S = \pm 3V$ to $\pm 18V$	120	--	115	--	dB
$A_{VO}$	$R_L = 2k\Omega$ , $V_O = \pm 10V$	5000	--	5000	--	V/mV
$V_O$	$R_L \geq 10k\Omega$	$\pm 13.5$	--	$\pm 13.5$	--	V
	$R_L \geq 2k\Omega$	$\pm 12.5$	--	$\pm 12.5$	--	
	$R_L \geq 1k\Omega$	$\pm 12.0$	--	$\pm 12.0$	--	
$P_d$	No Load	--	60	--	60	mW
	No Load, $V_S = \pm 3V$	--	4.5	--	4.5	
$V_{OS}^{adj+}$	$R_p = 20k\Omega$	0.5	--	0.5	--	mV
$V_{OS}^{adj-}$	$R_p = 20k\Omega$	--	-0.5	--	-0.5	mV
$I_{SC}^+$		--	65	--	65	mA
$I_{SC}^-$		-65	--	-65	--	mA

**TABLE 3**

**Group A Inspection**

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

Characteristic Symbol	Special Conditions	OP-177/883				Units
		Limits A		Limits B		
		MIN	MAX	MIN	MAX	
<b>Subgroup 2.</b> $T_A = +125^\circ C$	$I_{OS}$	--	1.5	--	2.0	nA
	$I_B$	-0.2	4.0	-0.2	4.0	nA
	CMR $V_{CM} = \pm 13V$	120	--	120	--	dB
	PSRR $V_S = \pm 3V$ to $\pm 18V$	120	--	110	--	dB
	$A_{VO}$ $R_L \geq 2k\Omega$ , $V_O = \pm 10V$	2000	--	2000	--	V/mV
	$V_O$ $R_L \geq 2k\Omega$	$\pm 12$	--	$\pm 12$	--	V
	$P_d$ No Load	--	75	--	75	mW
<b>Subgroup 3.</b> $T_A = -55^\circ C$	All Tests, Limits and Conditions are the same as Subgroup 2.					
<b>Subgroup 4.</b> $T_A = +25^\circ C$	$V_{OS}$	--	10	--	25	$\mu V$
<b>Subgroup 5.</b> $T_A = +125^\circ C$	$V_{OS}$	--	20	--	55	$\mu V$
<b>Subgroup 6.</b> $T_A = -55^\circ C$	$V_{OS}$	--	20	--	55	$\mu V$

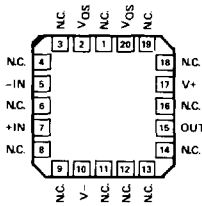
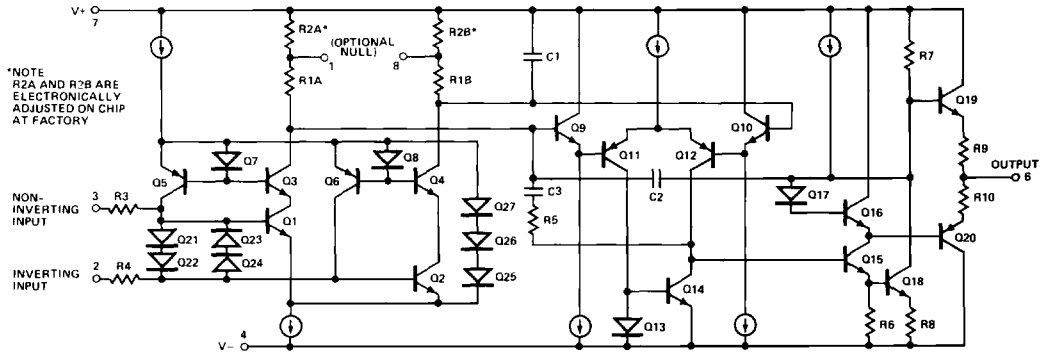
**TABLE 3**

**Group A Inspection**

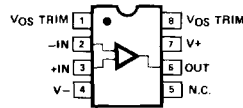
$V_S = \pm 15V$ ;  $R_S = 50\Omega$ ;  $V_{CM} = 0V$ ;  $T_A = T_J$  unless otherwise specified.

Characteristic Symbol	Special Conditions	OP-177/883				Units
		Limits A		Limits B		
		MIN	MAX	MIN	MAX	
Subgroup 7. $T_A = +25^\circ C$	BW $A_{VCL} = +1$	0.4	--	0.4	--	MHz
	SR $R_L = 2k\Omega$ , $C_L = 50pF$	0.1	--	0.1	--	V/ $\mu s$
Subgroup 8. $-55^\circ C \leq T_A \leq +125^\circ C$	$TCV_{OS}$	--	0.1	--	0.3	$\mu V/^\circ C$

## 3.2.1 Simplified Schematic and Pin Connections



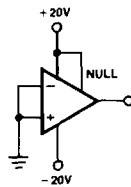
**LCC**  
(RC-Suffix)



**8-PIN  
HERMETIC DIP**  
(Z-Suffix)

**3.2.4 Microcircuit Group Assignment.** This microcircuit is covered by microcircuit group 49.

## 4.2 Life Test/Burn-In Circuit



**Z PACKAGE**