

PERFORMANCE SPECIFICATION  
SIGNAL CONDITIONER

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Contents

1.0	DESCRIPTION .....	2
1.1	KEY FEATURES .....	2
2.0	ELECTRICAL CHARACTERISTICS: INPUTS .....	3
2.1	PIEZO-ELECTRIC (PE).....	3
2.2	ISOTRON (ICP COMPATIBLE).....	3
2.3	CALIBRATION.....	3
3.1	AC VOLTAGE OUTPUT .....	4
3.2	DC VOLTAGE OUTPUT .....	4
3.3	SERVO VOLTAGE OUTPUT .....	4
4.0	TRANSFER CHARACTERISTICS .....	5
4.1	AC & DC OUTPUTS .....	5
4.2	SERVO OUTPUT .....	6
4.3	PROGRAMMABLE FILTER .....	6
4.5	PROGRAMABLE INTEGRATOR .....	7
4.6	OUTCAL 2% ACCURACY AT 170 HZ FULL-SCALE OUTPUT.....	8
4.7	EXTCAL 2% ACCURACY AT 1.0 KHZ FULL-SCALE OUTPUT.....	8
5.0	POWER REQUIREMENT .....	9
5.1	VOLTAGE AND CURRENT REQUIREMENTS .....	9
5.2	POWER DISSIPATION .....	9
5.3	ISOLATION .....	9
6.0	PHYSICAL CHARACTERISTICS.....	9
6.1	DIMENSIONS AND WEIGHT .....	9
6.2	REAR CONNECTORS .....	10
7.0	ENVIRONMENTAL CHARACTERISTICS .....	10
7.1	TEMPERATURE .....	10
7.2	HUMIDITY .....	10
7.3	VIBRATION .....	10
7.4	SHOCK.....	10
7.5	COMPLIANCE .....	10
8.0	FIGURES.....	11
8.1	INTEGRATOR FREQUENCY RESPONSE .....	11
8.2	AMPLIFIER BLOCK DIAGRAM .....	15
8.3	FRONT AND REAR PANEL.....	16
8.4	ENCLOSURE OUTLINE DRAWING .....	18
9.0	ACCESSORIES.....	21

## 1.0 DESCRIPTION

The ENDEVCO Model 2775C is a low noise signal conditioner designed for use with piezoelectric accelerometers, ISOTRON (ICP compatible) accelerometers, and remote charge converters.

The unit provides three standard outputs: an AC output voltage proportional to Charge input, with max.  $\pm 40$  mA current output to drive large capacitive loads; a DC output voltage of 10 Vdc Full-Scale for driving X-Y plotters or strip chart recorders, etc; and a SERVO output. The AC and DC outputs have a maximum gain of 10,000, the SERVO output has a fixed mV/pC output with a maximum gain of 1,000.

The ENDEVCO Model 2775C Signal Conditioner accepts either Piezo-electric or Isotron type transducers. The PE/IEPE input has a wide full scale range, from 0.01 to 100k EU. A selectable 4.3mA or 9.2mA constant current is provided at the IEPE input for Isotron type transducers or Remote Charge Converter preamplifiers.

The Model 2775C includes a 2-pole, programmable filter that can be configured as either a low-pass, high-pass or band pass type. Corner frequencies are selected via internal DIP switches and filter type is selected from the front panel. Also included is a programmable integrator that provides velocity and displacement outputs. Integrator frequencies are selected via internal DIP switches and velocity or displacement output is selected from the front panel.

The ENDEVCO Model 2775C can be manually programmed from the front panel (Figure 8.3.1), remotely controlled through a standard RS-232 serial interface, or controlled through a 10/100 Ethernet interface. This unit is powered by an external 12 VDC, 1.0 Amp power adapter. Up to six (6) Model 2775C units can be installed in a 19" rack using ENDEVCO Model 4948A. Figure 8.2 shows a detailed circuit block diagram for the card. Figure 8.4 shows an outline drawing. All specifications are typical and measured at room temperature (+22°C to +28°C) unless otherwise noted.

### 1.1 KEY FEATURES

- PE, ISOTRON, and RCC inputs
- AC, DC, SERVO outputs
- 120 kHz Bandwidth (-3dB corner)
- Programmable HP, LP, BP filter
- Programmable Integration with selectable velocity or displacement outputs
- Fault indicator for open/short at the Isotron input.
- Gain range from 0 to 10,000
- 10/100 Ethernet Interface
- RS-232 Serial Interface

## 2.0 ELECTRICAL CHARACTERISTICS: INPUTS

### 2.1 PIEZO-ELECTRIC (PE)

High impedance, single-ended with one side connected to signal ground.

- 2.1.1 Maximum Charge Input < 100,000 pC
- 2.1.2 Source Resistance > 10 Mohms
- 2.1.3 Source Capacitance < 30000 Pf

### 2.2 ISOTRON (ICP COMPATIBLE)

Piezoelectric with internal electronics, single-ended with one side connected to signal ground, supplying constant current in a two-wire system.

- 2.2.1 Constant Excitation Current 4.3mA or 9.2mA  
Selected from the front panel
- 2.2.2 Accuracy  $\pm 0.5$  mA
- 2.2.3 Compliance Voltage < 22 Vdc
- 2.2.4 Maximum Input Voltage < 22 V (AC + DC Components)
- 2.2.5 Input Impedance 100 Mohms, 33000 Pf

### 2.3 CALIBRATION

Single ended with one side connected to ground. This mode is selected from the front panel.

- 2.3.1 Input Impedance 100K ohms
- 2.3.2 Frequency Response  $\pm 5\%$  at 2.0 Hz ( $\pm 25\%$  corner accuracy) to  $\pm 5\%$  at 50 kHz, referenced to 1 kHz.
- 2.3.3 Common Mode Rejection Minimum -60 dB from 10 Hz to 1000 Hz.

### 3.0 Electrical Characteristics: Outputs

#### 3.1 AC VOLTAGE OUTPUT

Single ended with one side connected to ground. Signal proportional to input.

- 3.1.1 Minimum Linear Output 10 Vpk
- 3.1.2 Maximum Current 40 mA
- 3.1.3 Operation up to typical 10 17F load. The frequency response is a function of both cable capacitance load and the signal peak at output:

$$F_{max} = \frac{109(10)}{2\pi CoV}$$

Where:

- Fmax= Maximum frequency in Hz
- Co = Cable capacitance in picofarads (Output Load)
- V = peak output (Maximum 10Vpk)
- Io= 40mA

- 3.1.4 DC Offset 20 mV maximum
- 3.1.5 Protection Short circuit protected

#### 3.2 DC VOLTAGE OUTPUT

Single ended with one side connected to ground. DC output (signal proportional to input) or% FS DC output. Internal switch (SW13 at 3 position) sets for% DC FS Output.

- 3.2.1 Minimum Linear Output 10 Vdc
- 3.2.2 Maximum Current Output 20 mA
- 3.2.2 DC Offset 30 mV/dc maximum with gain <1,000
- 3.2.3 Protection Short circuit protected

#### 3.3 SERVO VOLTAGE OUTPUT

Single ended with one side connected to ground. Signal proportional to input.

3.3.1	Output Sensitivity	Front panel selectable 0.1 mV/EU, 1.0 mV/EU, 10 mV/EU, or 100 mV/EU
3.3.2	Minimum Linear Output	10Vpk
3.3.3	Maximum Current Output	30 mA
3.3.4	DC Offset	20 mV maximum
3.3.5	Protection	Short Circuit

#### 4.0 TRANSFER CHARACTERISTICS

##### 4.1 AC & DC OUTPUTS

4.1.1	Gain Range	Programmable from 0 to 10,000
4.1.2	Resolution	0.0025, 0 < gain < 10 0.025, 10 < gain < 100 0.25, 100 < gain < 1000 2.5, 1000 < gain < 10,000
4.1.3	Gain Accuracy	±0.5% for AC Output and ±1.0% for DC Output at 1 kHz after calibration, filters disabled.  ±0.1% of full scale, best fit straight line at 1 kHz.
4.1.4	Linearity	
4.1.5	Broadband Frequency Response for AC & DC Outputs	
4.1.5.1	Magnitude Frequency Response	±5% at 0.5 Hz ±25% (HPF sets 0.5 Hz, -3dB @ 0.16 Hz), or ±5% at 2.0 Hz ± 25% (for HPF sets at 2 Hz, -3dB @ 0.66 Hz) to ±5% at 50 kHz, referenced to 1 kHz.
4.1.6	Residual Noise for AC Output	
		Noise specification valid for the following conditions: (a) Internal filter disabled (b) Isolation in GND (off) (c) HP Filter at 2.0 Hz unless otherwise noted (d) External 1 poles LPF at 30 KHz
4.1.6.1	Piezo-Electric Noise	0.01pC-RMS plus 0.0015 pC-RMS per 1000 pF of source capacitance referred to input (RTI), or 1 mV RMS referred to output (RTO), whichever is greater.
4.1.6.2	Low Frequency Piezo-Electric Noise	Max. 15 mVpk-pk RTO for 100 mV/pC gain with 0.5 Hz HPF.

4.1.6.3 Isotron

10  $\mu$ V-RMS referred to input (RTI), or 1 mV-RMS referred to output (RTO), whichever is greater. Input shunted with 249 Ohms (4.3 mA excitation).

4.2 SERVO OUTPUT

- 4.2.1 Gain Range Programmable from 0 to 10,000
- 4.2.2 Resolution 0.0025, 0 < gain < 10  
0.025, 10 < gain < 100  
0.25, 100 < gain < 1000
- 4.2.3 Gain Accuracy  $\pm 0.5\%$  at 1 kHz after calibration, filters disabled
- 4.2.4 Linearity  $\pm 0.1\%$  of full scale, best fit straight line at 1 kHz

4.2.5 Broadband Frequency Response for Servo Output

- 4.2.5.1 Magnitude Frequency Response
  - $\pm 5\%$  at 0.5 Hz  $\pm 25\%$  (HPF sets 0.5 Hz, -3dB @ 0.16 Hz), or  $\pm 5\%$  at 2.0 Hz  $\pm 25\%$  (for HPF sets at 2 Hz, -3dB @ 0.66 Hz) to  $\pm 5\%$  at 50 kHz, referenced to 1 kHz.

4.2.6 Residual Noise for AC Output

Noise specification valid for the following conditions:

- (a) Internal filter disabled
- (b) Isolation in GND (off)
- (c) HP Filter at 2.0 Hz unless otherwise noted
- (d) External 1 poles LPF at 30 KHz

4.2.6.1 Piezo-Electric Noise

0.01 pC-RMS plus 0.0015 pC-RMS per 1000 pF of source capacitance referred to input (RTI), or 1 mV RMS referred to output (RTO), whichever is greater.

4.2.6.2 Low frequency Piezo-Electric Noise

Max. 15 mVpk-pk RTO for 100 mV/pC gain with 0.5 Hz HPF.

4.2.6.3 Isotron

10  $\mu$ V-RMS referred to input (RTI), or 1 mV-RMS referred to output (RTO), whichever is greater. Input shunted with 249 Ohms (4.3 mA excitation).

4.3 PROGRAMMABLE FILTER

The programmable filter is comprised of a 2-pole HP Butterworth filter stage, followed by a 2-pole LP Butterworth filter stage. Corner frequencies for both filters are selected via DIP switches SW7 - SW12 located inside the enclosure (Refer to IM2775C for DIP switch

location and settings). By combining these two stages, HP, LP, and BP filter functions can be realized. All three filter types are user selectable from the front panel.

4.4.1	Gain	1.0 ±0.5%
4.4.2	Frequency Response	
4.4.3	Gain at Corner Frequency	0.95 ±0.5%
4.4.4	Fixed Corner Frequencies	
4.4.4.1	HP Frequency (-5% Corner, +12 dB per octave)	
		2.0 Hz
		10 Hz
4.4.5	LP Frequency (-5% Corner, -12 dB per octave)	
		100 Hz
		200 Hz
		500 Hz
		1K Hz
		2K Hz
		5K Hz
		10K Hz

#### 4.5 PROGRAMMABLE INTEGRATOR

Two integrator functions are available (5.0 Hz and 10 Hz) and selectable via DIP switches SW1 - SW6 located inside the enclosure (Refer to IM2775C for DIP switch location and settings). Each integrator has two modes of operation: 1) Acceleration to Velocity, or 2) Acceleration to Displacement. These two modes are user selectable from the front panel.

4.5.1	Gain	
4.5.1.1	Acceleration to Velocity Mode	61.42/f ±1.5%
4.5.1.2	Acceleration to Displacement Mode	19566/f <sup>2</sup> ±2.5%
4.5.2	Frequency Response	
4.5.2.1	Gain at HP 10 Hz filter corner`	
4.5.2.1.1	Acceleration to Velocity Mode	61.42/f ±.2 dB, -0.5dB
4.5.3	Acceleration to Displacement Mode	195.7+0.2dB,-0.7dB
4.5.3.1	Gain at HP 5 Hz filter corner	
4.5.3.1.1	Acceleration to Velocity Mode	12.3 +0.2dB, -0.5dB
4.5.3.1.2	Acceleration to Displacement Mode	782.6 +0.2dB, -0.7dB
4.5.3	Phase Response	





5.0 POWER REQUIREMENT

5.1 VOLTAGE AND CURRENT REQUIREMENTS 12 VDC (+/- 1V)@ 500 Ma

5.2 POWER DISSIPATION 1.2W typical (100 mA@ 12 VDC)

5.3 ISOLATION

5.3.1 Input to output Signal Grounds Isolated

5.3.2 Input to output Case Ground Isolated

5.3.3 Output Signal Ground to Case Ground No isolation as default  
(internal switch S14 at 1 position)

6.0 PHYSICAL CHARACTERISTICS

6.1 DIMENSIONS AND WEIGHT

6.1.1 Dimensions 5.0" X 2.78" X 13"

6.1.2 Weight 1.9 lbs typical

6.1.3 Case Material Aluminum

6.2 REAR CONNECTORS

- 6.2.1 Sensor Input BNC
- 6.2.2 ExtCal Input BNC
- 6.2.3 AC Output BNC
- 6.2.4 DC Output BNC
- 6.2.5 SERVO Output BNC
- 6.2.6 Power Input DC: Circular EIAJ-1 Jack (Center Positive)
- 6.2.7 RS-232 RJ-11 Jack (see Fig. 8.3.3)  
Pin 1: Analog Ground  
Pin 2: TX (connects to RX in computer)  
Pin 3: Not Used  
Pin 4: RX (connects to TX in computer)  
Pin 5: Digital Ground  
Pin 6: Digital Ground
- 6.2.8 10/100 Ethernet Standard RJ-45 Jack

7.0 ENVIRONMENTAL CHARACTERISTICS

7.1 TEMPERATURE

- 7.1.1 Operating Temperature 32°F to 122°F (0°C to 50°C)
- 7.1.2 Storage Temperature -40°F to 185°F (-40°C to 85°C)

7.2 HUMIDITY 0 % to 90 % non condensing

7.3 VIBRATION 5g pk level with frequency sweep from 5 Hz to 2000 Hz on 3 planes (X, Y and Z).

7.4 SHOCK The negative and positive Sawtooth signal with 20 gpk amplitude and 11 ms pulse width are used for shock test on 3 planes (X, Y and Z).

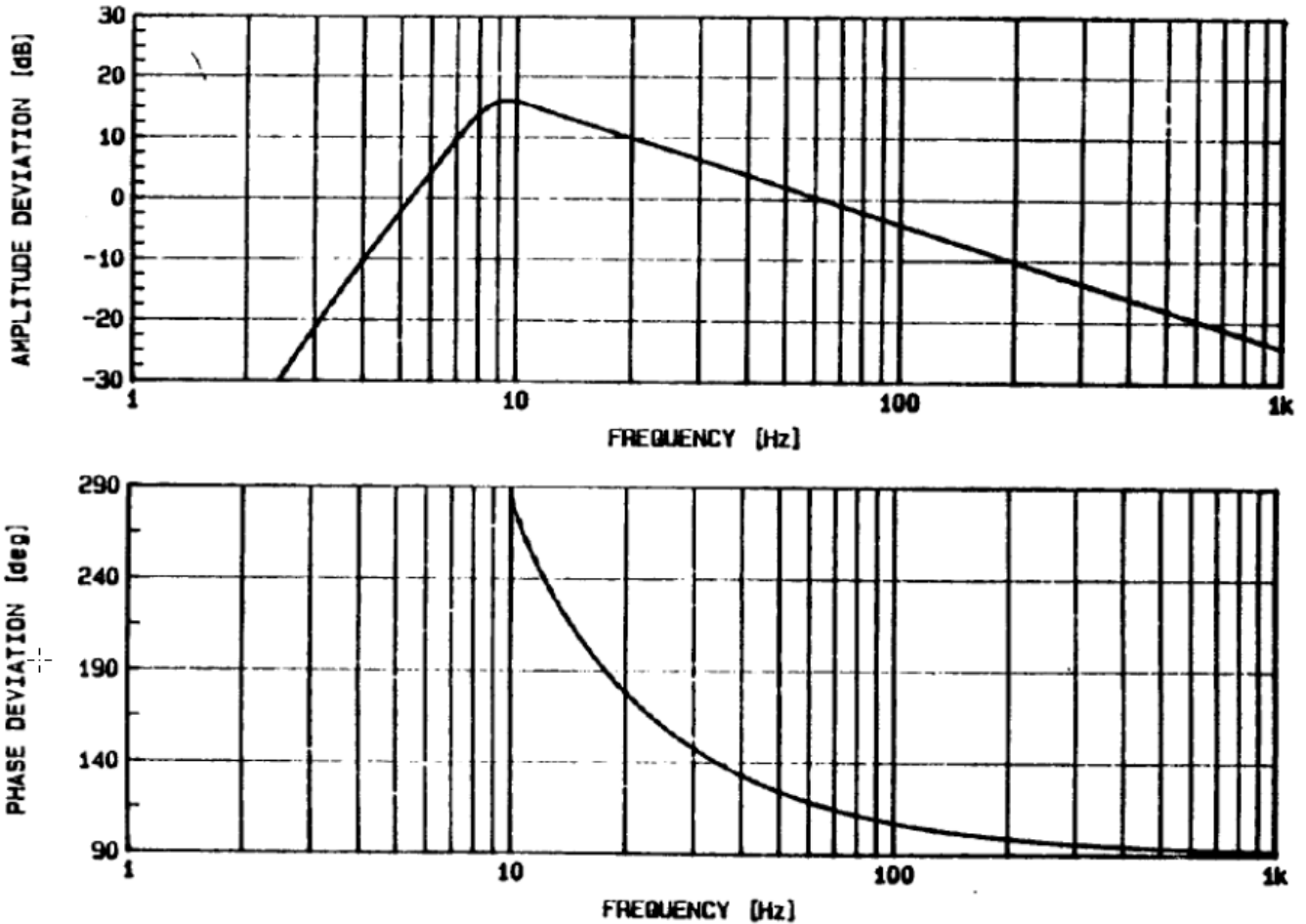
7.5 COMPLIANCE Industrial CE standard class A.

8.0 FIGURES

8.1 INTEGRATOR FREQUENCY RESPONSE

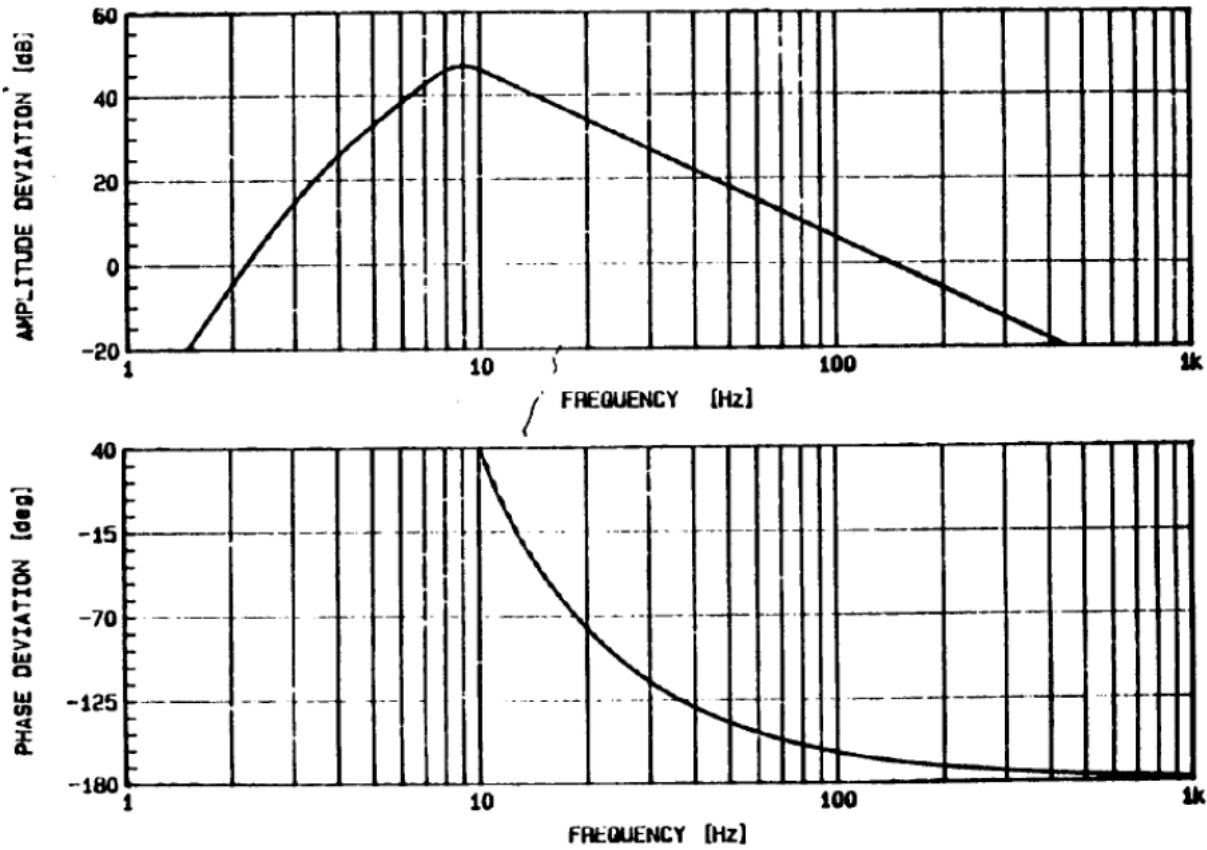
8.1.1 Typical Phase/Frequency Response for Acceleration to Velocity Mode, 10Hz.

**A/V with 4 pole 10 Hz FILTER**



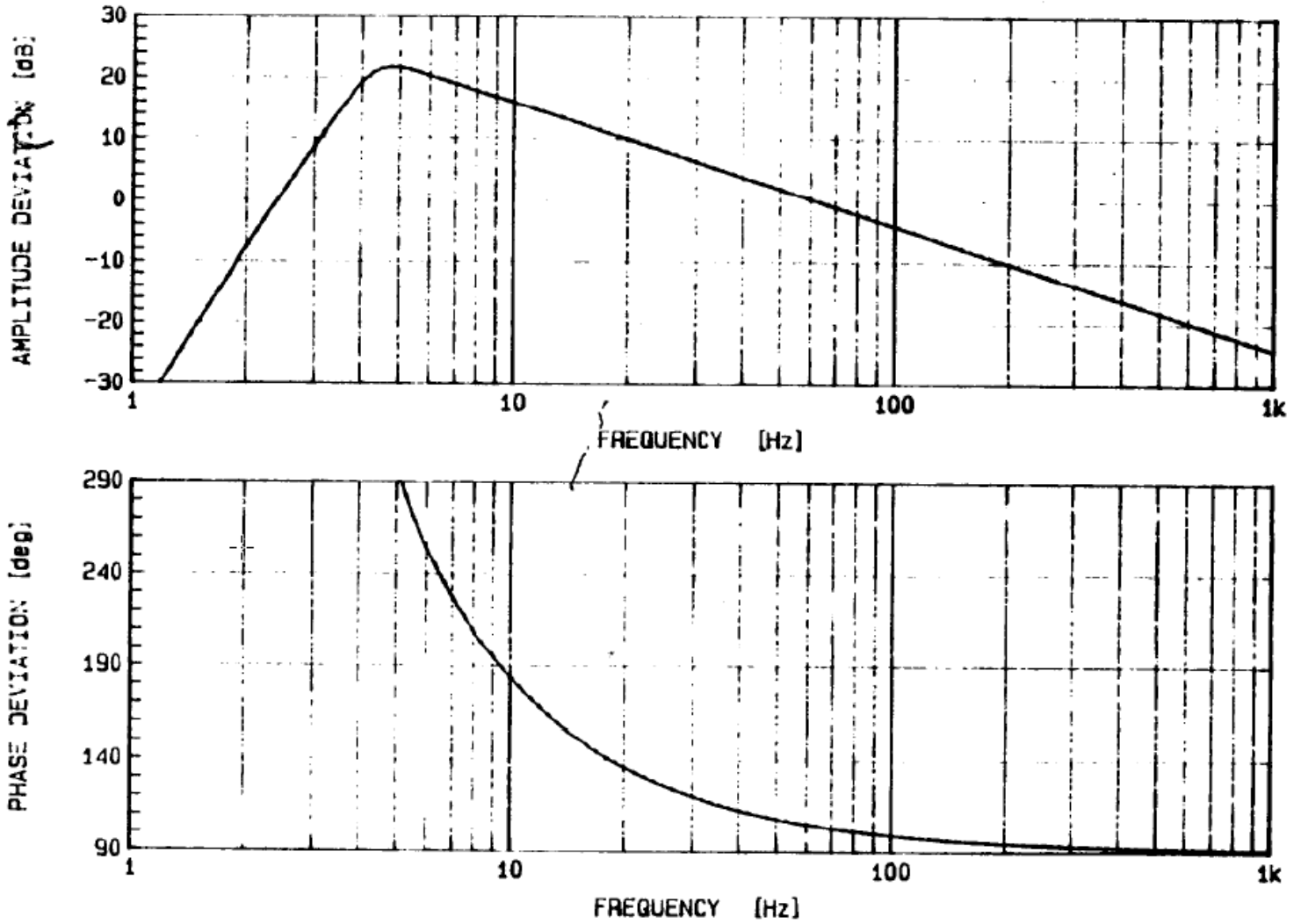
8.1.2 Typical Phase/Frequency Response for Acceleration to Displacement Mode, 10 Hz.

**A/D with 4 pole 10 Hz HP FILTER**



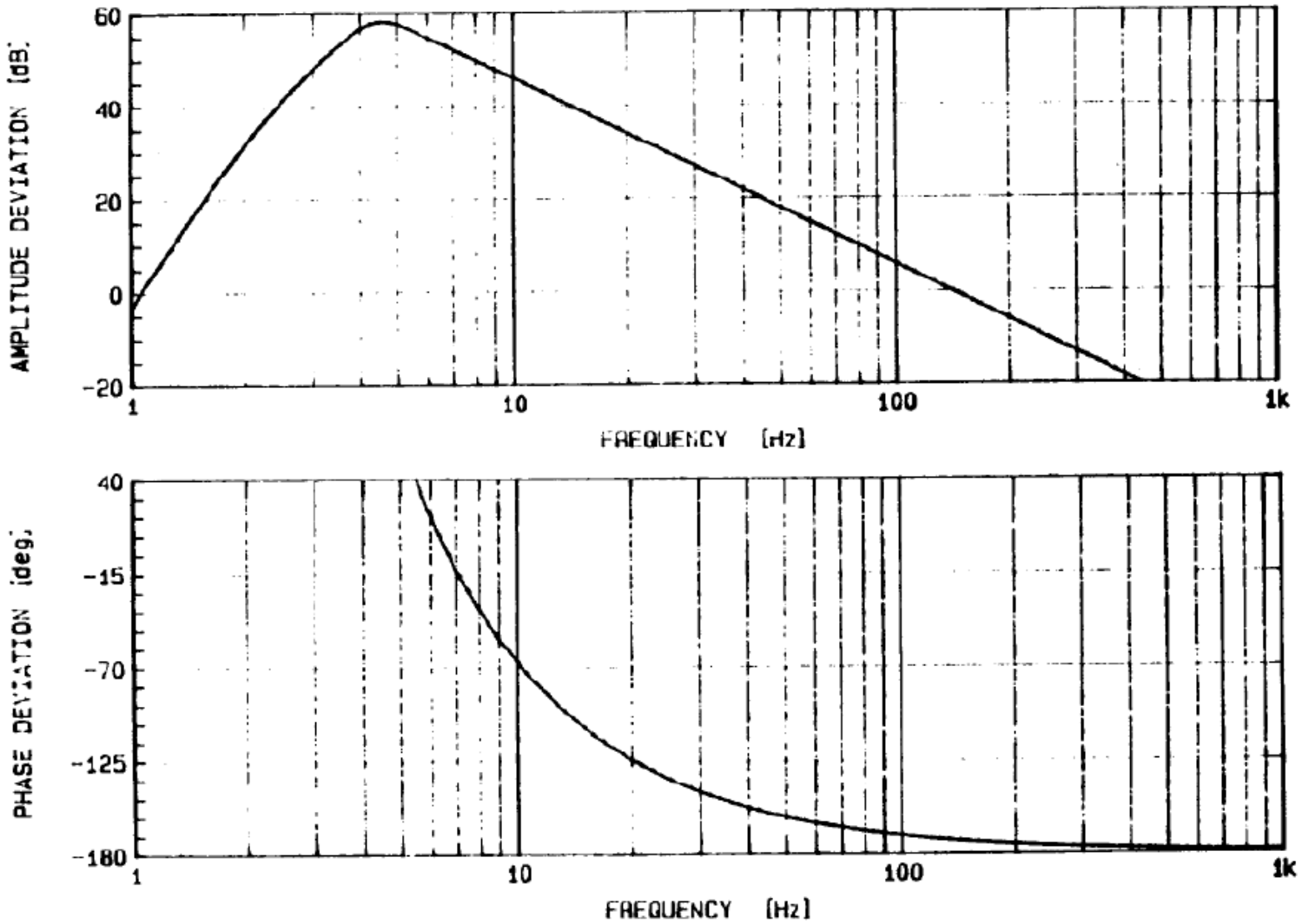
8.1.3 Typical Phase/Frequency Response for  
Acceleration to Velocity Mode, 5 Hz.

A/V with 4 pole 5 Hz FILTER

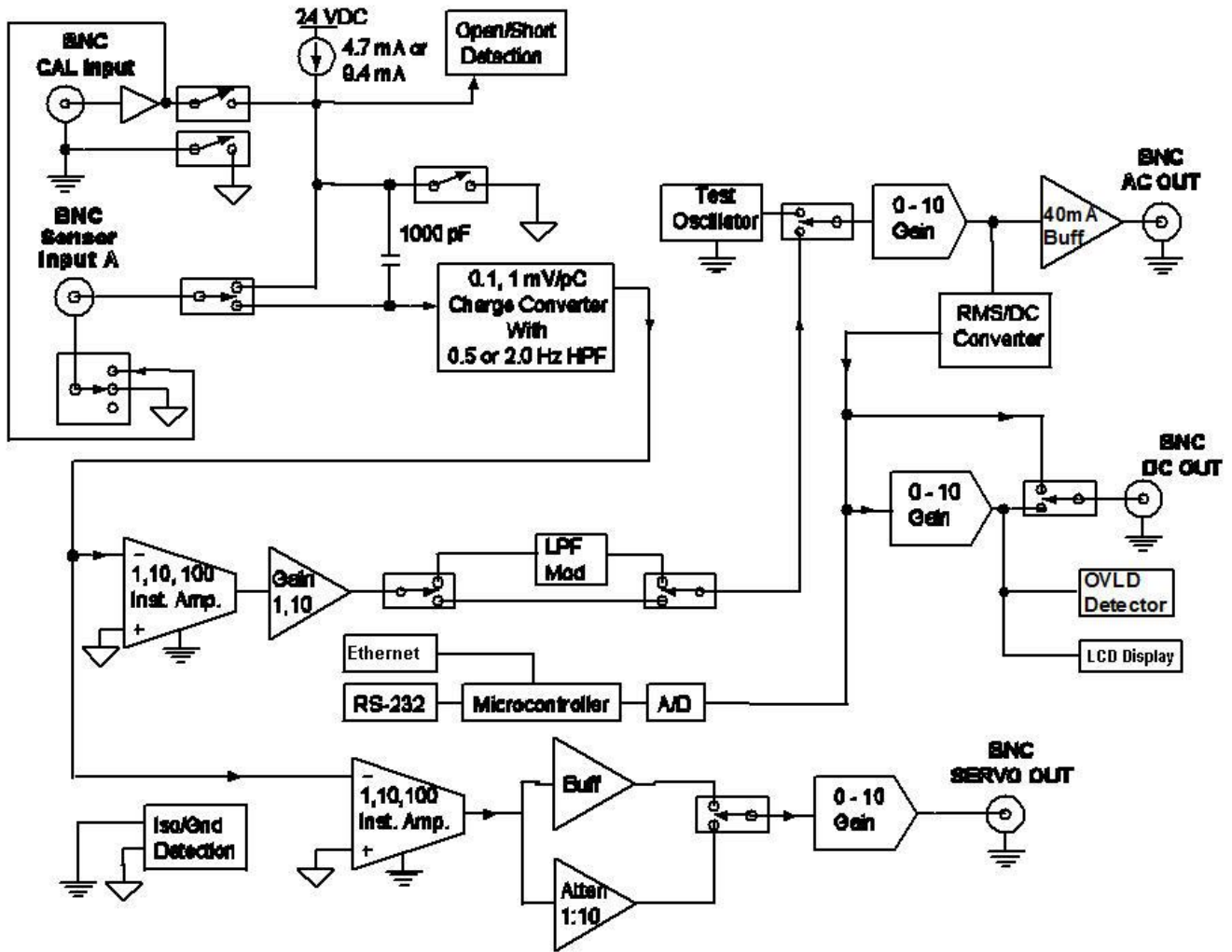


8.1.4 Typical Phase/Frequency Response for Acceleration to Displacement Mode, 5 Hz.

A/D with 4 pole 5 Hz FILTER

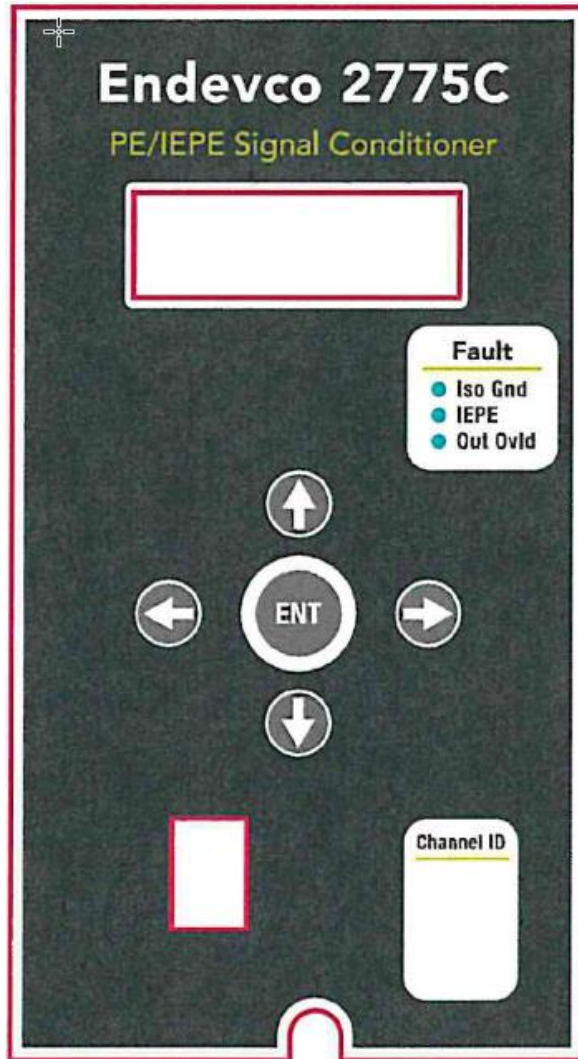


8.2 AMPLIFIER BLOCK DIAGRAM



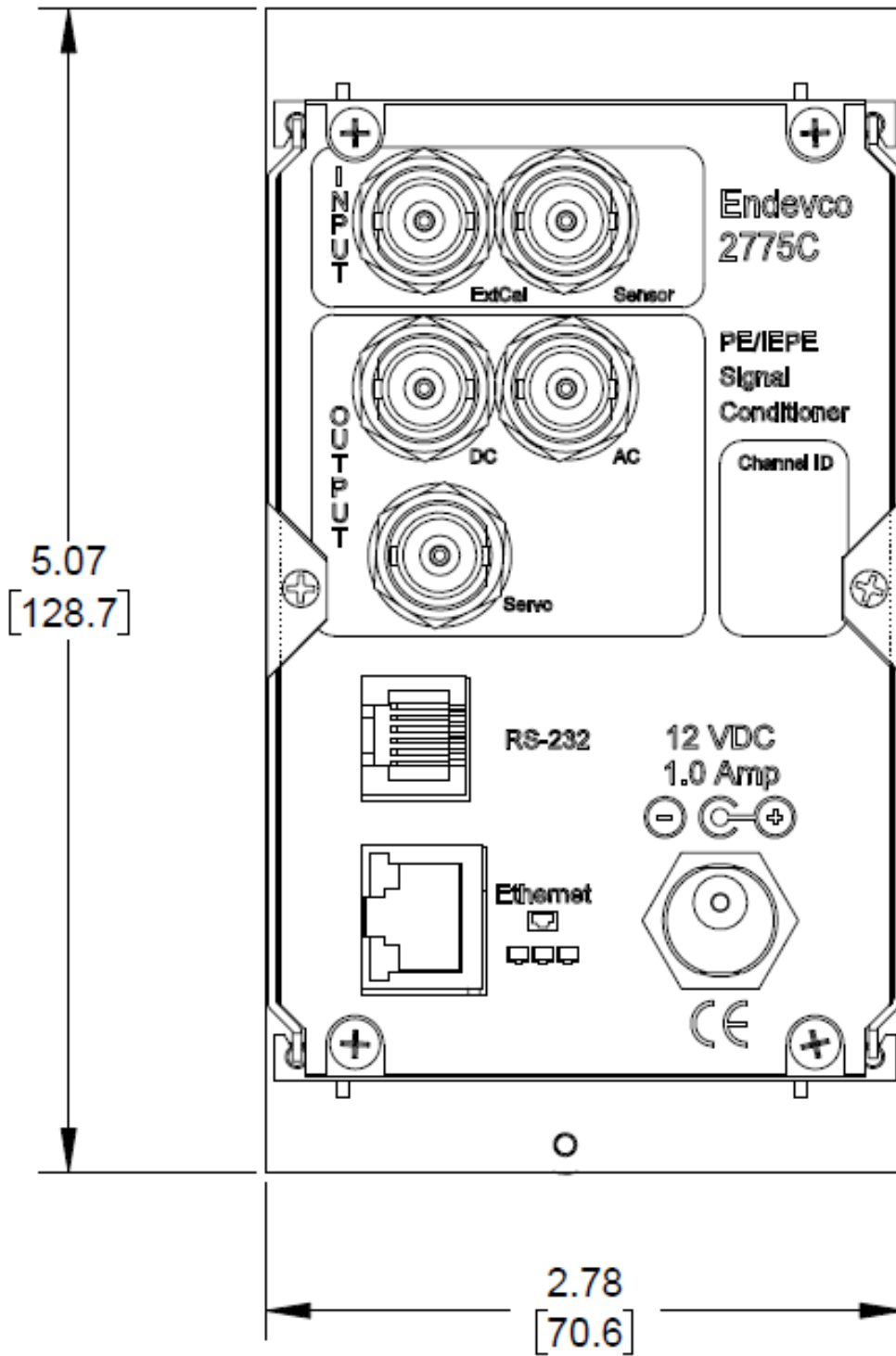
### 8.3 FRONT AND REAR PANEL

#### 8.3.1 Front Panel

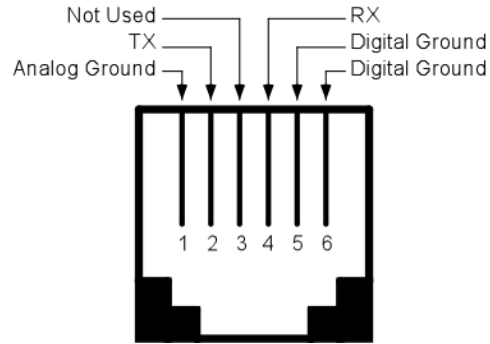




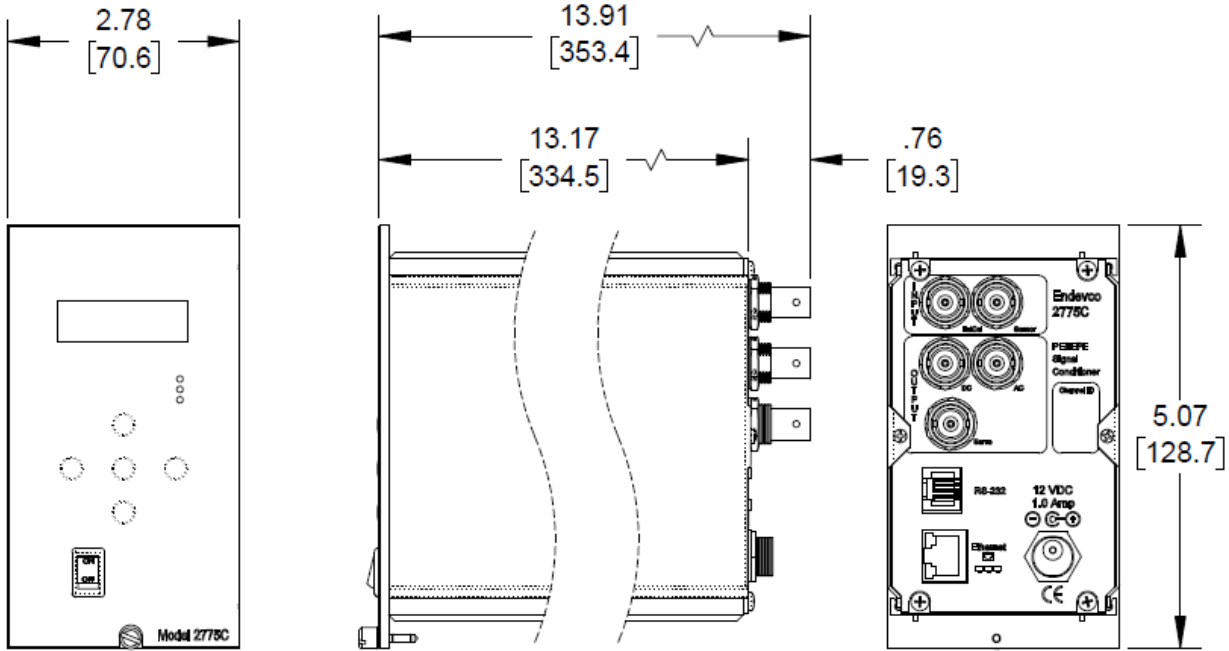
8.3.2 Rear Panel



### 8.3.3 RJ-11 Modular Jack, Front View



### 8.4 ENCLOSURE OUTLINE DRAWING



STANDARD TOLERANCE  
INCHES [MILLIMETERS]  
.XX = ± .02 [X = ± .5]  
.XXX = ± .010 [XX = ± .25]

SOL

**9.0 ACCESSORIES**

Description	Part Number	Qty
Power Adapter, 12 VDC @2.0 Amps	100-17355-60	1
Cable, Ethernet CAT5 Shielded 6 ft	EDVEW1368	1
Rack	4948A	Optional