FREQUENCY DEVICES

790 SERIES MATCHED, LOW POWER & ECONOMY LOWPASS ACTIVE FILTERS

FREQUENCY DEVICES INC

FEATURES

- **2-, 4-, 6- & 8-Pole Lowpass Butterworth & Bessel Models... with the following choices:**
- **Matched Gain and Phase (Models 790-791)**
- **General Purpose/Low Cost (Models 792-795)**
- **Low Power Consumption (Models 796-797)**

APPLICATIONS

- **Precision Multi-Channel A/D Pre-Filter (Models 790-791)**
- **Instrumentation including: Medical, Scientific, Production Test**
- **Process Measurement and Control Systems**
- **Battery-Powered Applications (Models 796-797)**

GENERAL DESCRIPTION

Frequency Devices' next-generation **790 Series** are fixed-frequency lowpass active filters that meet a wide variety of price/performance requirements. Expanded to 64 basic models, this family offers the user 2-, 4-, 6- or 8-pole Butterworth or Bessel transfer characteristics factory-tuned to user-specified frequencies from 100Hz to 50kHz.

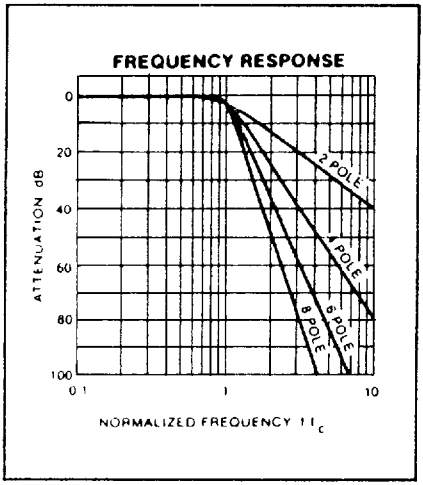
All **790 Series** models are low profile, fully finished active filter components that are factory-trimmed and pre-tuned; each includes terminals for external offset trimming.

GAIN- AND PHASE-MATCHED to theoretical by precise tuning, **790** and **791 Models** are ideal for critical multi-channel data acquisition pre-filtering. Across the information band, gain and phase accuracies to ± 0.1dB and ± 0.5 degree are standard.

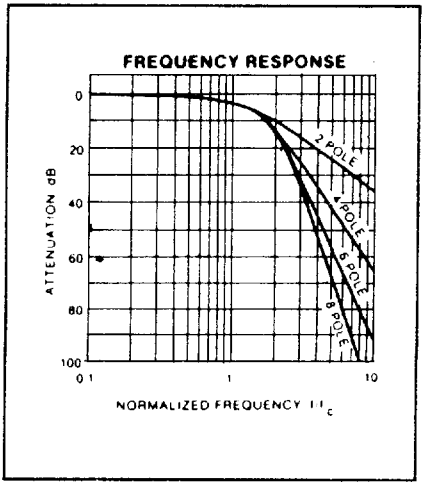
ECONOMICAL AND COST EFFECTIVE, the **792/3/4/5 Models** offer 32 basic active filter models. Optional 3 or 5% corner frequency accuracy plus a 2mV or 10mV output offset provide further economy for the user.

LOW POWER CONSUMPTION (down to 15μW) ideally suits **796** and **797 Models for** many types of battery-powered applications.

BUTTERWORTH RESPONSE



BESSEL RESPONSE



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FREQUENCY DEVICES

790 SERIES COMMON SPECIFICATIONS

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SPECIFICATIONS COMMON TO ALL 790 SERIES MODELS

Parameters	Conditions	Min	Typ	Max	Units
Passband Characteristics					
Voltage Gain (Nov-inv.)	at dc	−0.04	−0.02	0	dB
Range of fc[1]					Hz
790 – 795	−3dB	100	—	50,000	Hz
796 – 797	−3dB	100	—	20,000	Hz
Attenuation	Nominal	See Note 3.			
Input					
Impedance		10	—	—	kΩ
Linear Voltage Range	Vs = ±15Vdc	±10	—	—	V
Safe Input Voltage		—	—	±Vs	V
Output[2]					
Impedance			1		Ω
Rated Load Current					
790 – 795	Vs = ±15Vdc	—	—	±10	mA
796 – 797	Vs = ±15Vdc	—	—	±1	mA
Linear Voltage Range	Vs = ±15Vdc	±10	—	—	V
Offset Voltage	Vin = 0	See Table 1, next page.			
Noise					
RMS (5Hz to 50kHz)	Nominal	—	50	—	μV RMS
Power Supply					
Operating Voltage		±5	±15	±18	V
Quiescent Current		See Table 1, next page.			
Temperature					
Operating Range	Nominal	0	—	70	°C
Storage Range	Non-op.	−25	—	85	°C
Package Styles		See Table 1 and PACKAGE AND PIN-OUT Section.			

Notes:
1) The user may specify any frequency in the range shown to within three digits of accuracy.
2) Short circuit protected to ground.
3) See Table 2 and the THEORETICAL BUTTERWORTH AND BESSEL RESPONSE sections further on.

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TABLE 1. 790 SERIES POWER REQUIREMENTS, OFFSET AND CASE STYLES

POLES	2-Pole		4-Pole		6-Pole		8-Pole	
Power Requirements								
MODELS	**Typ (mA)**	**Max (mA)**	**Typ (mA)**	**Max (mA)**	**Typ (mA)**	**Max (mA)**	**Typ (mA)**	**Max (mA)**
790-795	2	4	4	7	8	14	9	18
796-797	0.2	0.25	0.6	0.75	0.8	1.0	1.0	1.25
Offset Voltage (mV)								
790-793	±2	±5	±2	±5	±2	±5	±2	±5
794-795	±10	±25	±10	±25	±10	±25	±10	±25
796-797	±2	±5	±2	±5	±2	±5	±2	±5
Case Styles (See PACKAGE AND PIN-OUT DATA Section)								
790-797	P-1		N-1		K-1		G-1	
Socket Style								
790-797	S1015		S1014		S1013		S1006	

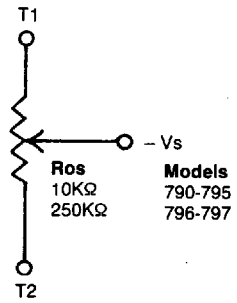

Figure 1.

The output offset voltage of any 790 Series model is trimmable to zero by means of the circuit of Fig. 1. The Ros potentiometer should be a carbon composition, cermet or metal film device. Do not use a wire wound potentiometer as its reactance may degrade filter performance.

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FREQUENCY DEVICES

790 SERIES
RESPONSE CHARACTERISTICS

FREQUENCY DEVICES INC

Table 2. RESPONSE CHARACTERISTICS FOR ALL 790 SERIES MODELS

Parameters	Conditions	2&4-Pole Models Max	6-Pole Models Max	8-Pole Models Max	Units
Passband Characteristics					
Fc Tolerance[1]					
791 Models	at fc	±1	±1	±1	%
792 & 794	at fc	±3	±3	±3	%
793 & 795	at fc	±5	±5	±5	%
796 Models	at fc	±1	±1	±1	%
797 Models	at fc	±3	±3	±3	%
Conformance to Theoretical[1,2]		Typ/Max	Typ/Max	Typ/Max	
Gain					
790 Models	0 to 0.8fc	±0.05/0.1	±0.05/0.1	±0.05/0.1	dB
	0.8fc to fc	±0.05/0.1	±0.1/0.2	±0.15/0.3	dB
791 Models	0 to 0.8fc	±0.1/0.2	±0.1/0.2	±0.1/0.2	dB
	0.8fc to fc	±0.1/0.2	±0.2/0.4	±0.3/0.6	dB
Phase					
790 Models	0 to fc	±0.3/0.5	±0.3/0.5	±0.3/0.5	Deg.
791 Models	0 to fc	±0.6/1	±0.6/1	±0.6/1	Deg.
Stopband Reference Attenuation Point			**See Note 2**		

Notes: 1) Source impedance should not exceed 10 Ohms to avoid gain and/or frequency deviation.

2) See the THEORETICAL BUTTERWORTH AND BESSEL RESPONSE sections further on for amplitude, phase and transient curves and data.

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FREQUENCY DEVICES

790 SERIES THEORETICAL BESSEL RESPONSE

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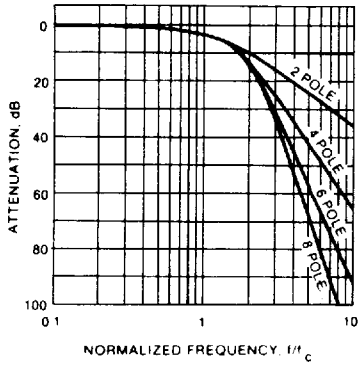

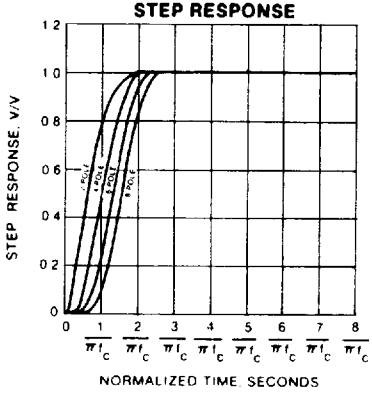

NORMALIZED FREQUENCY RESPONSE TABLE

f/f_c	2 POLE		4 POLE		6 POLE		8 POLE	
	A(dB)	ψ(°)	A(dB)	ψ(°)	A(dB)	ψ(°)	A(dB)	ψ(°)
0.00	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0
0.10	0.03	-7.8	0.03	-12.1	0.03	-15.5	0.03	-18.2
0.20	0.11	-15.6	0.11	-24.2	0.12	-31.0	0.12	-36.4
0.30	0.25	-23.4	0.25	-36.3	0.26	-46.5	0.26	-54.7
0.40	0.45	-31.2	0.45	-48.4	0.46	-62.0	0.47	-72.9
0.50	0.71	-38.3	0.71	-60.6	0.73	-77.4	0.74	-91.1
0.60	1.04	-46.4	1.02	-72.7	1.05	-92.9	1.06	-109.3
0.65	1.24	-50.1	1.21	-78.7	1.24	-100.7	1.25	-118.4
0.70	1.44	-53.8	1.41	-84.8	1.44	-108.4	1.45	-127.5
0.75	1.67	-57.4	1.63	-90.8	1.66	-116.2	1.67	-136.6
0.80	1.91	-61.0	1.86	-96.8	1.89	-123.9	1.91	-145.7
0.85	2.16	-64.4	2.12	-102.9	2.15	-131.7	2.16	-154.9
0.90	2.43	-67.8	2.40	-108.9	2.42	-139.4	2.42	-164.0
0.95	2.72	-71.1	2.69	-114.9	2.70	-147.1	2.71	-173.1
1.00	3.01	-74.3	3.01	-120.8	3.01	-154.9	3.01	-182.2
1.10	3.63	-80.4	3.71	-132.6	3.68	-170.4	3.67	-200.4
1.20	4.28	-86.1	4.51	-144.2	4.44	-185.8	4.40	-218.6
1.30	4.96	-91.4	5.39	-155.5	5.29	-201.2	5.20	-236.8
1.40	5.66	-96.3	6.37	-166.4	6.23	-216.5	6.10	-255.0
1.50	6.36	-100.8	7.42	-176.7	7.29	-231.5	7.08	-273.2
2.00	9.82	-118.4	13.41	-219.4	14.17	-300.2	13.68	-361.9
2.50	12.96	-130.1	19.43	-247.8	22.54	-350.7	23.08	-436.4
3.00	15.74	-138.2	25.09	-267.3	30.70	-384.7	33.38	-489.2
3.50	18.19	-144.0	30.04	-281.0	38.08	-408.4	42.85	-525.4
4.00	20.36	-148.5	34.43	-291.2	44.68	-425.8	51.81	-551.8
5.00	24.07	-154.8	41.92	-305.2	55.93	-449.5	66.80	-587.3
6.00	27.15	-159.0	48.12	-314.5	65.25	-465.0	79.22	-610.2
7.00	29.77	-162.0	53.40	-321.1	73.17	-475.9	89.80	-626.3
8.00	32.06	-164.2	57.99	-326.0	80.07	-484.0	98.99	-638.2
9.00	34.08	-166.0	62.05	-329.8	86.16	-490.3	107.12	-647.4
10.00	35.89	-167.4	65.68	-332.8	91.62	-495.3	114.40	-654.8

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790 SERIES THEORETICAL BUTTERWORTH RESPONSE

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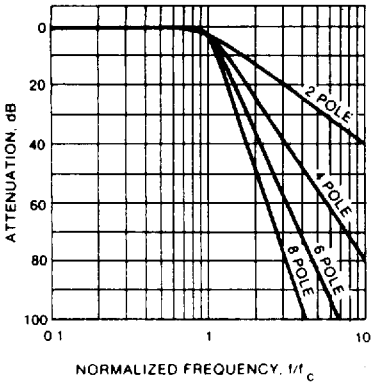
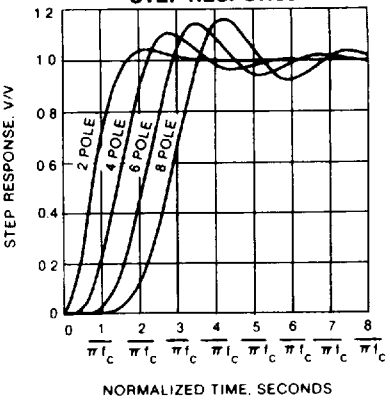
FREQUENCY RESPONSE



STEP RESPONSE



NORMALIZED FREQUENCY RESPONSE TABLE

f/f c	2 POLE		4 POLE		6 POLE		8 POLE	
	A(dB)	ψ(°)	A(dB)	ψ(°)	A(dB)	ψ(°)	A(dB)	ψ(°)
0.00	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0
0.10	0.00	-8.1	0.00	-15.0	0.00	-22.0	0.00	-29.4
0.20	0.01	-16.4	0.00	-30.1	0.00	-44.5	0.00	-59.0
0.30	0.04	-25.0	0.00	-45.5	0.00	-67.2	0.00	-89.1
0.40	0.11	-34.0	0.00	-61.4	0.00	-90.4	0.00	-119.8
0.50	0.26	-43.3	0.02	-78.0	0.00	-114.5	0.00	-151.7
0.60	0.53	-53.0	0.07	-95.7	0.01	-140.0	0.00	-185.0
0.65	0.71	-57.9	0.14	-105.1	0.02	-153.4	0.00	-202.6
0.70	0.93	-62.7	0.24	-114.9	0.06	-167.5	0.01	-220.9
0.75	1.19	-67.6	0.41	-125.2	0.14	-182.4	0.04	-240.2
0.80	1.49	-72.3	0.67	-135.9	0.29	-198.2	0.12	-260.8
0.85	1.82	-77.0	1.05	-146.9	0.58	-215.2	0.31	-283.2
0.90	2.19	-81.5	1.55	-158.1	1.08	-233.1	0.74	-307.4
0.95	2.59	-85.8	2.21	-169.2	1.88	-251.6	1.59	-333.5
1.00	3.01	-90.0	3.01	-180.0	3.01	-270.0	3.01	-360.0
1.10	3.92	-97.7	4.97	-199.9	6.17	-303.6	7.48	-407.9
1.20	4.88	-104.5	7.24	-216.8	9.96	-330.6	12.90	-444.5
1.30	5.86	-110.6	9.62	-230.8	13.86	-351.7	18.30	-472.1
1.40	6.85	-115.9	11.98	242.2	17.61	-368.4	23.40	-493.7
1.50	7.83	-120.5	14.25	-251.7	21.16	-382.0	28.18	-511.4
2.00	12.30	-136.7	24.10	-282.0	36.12	-425.5	48.16	-568.3
2.50	16.03	-146.0	31.84	-298.6	47.75	-449.6	63.67	-600.2
3.00	19.14	-152.1	38.17	-309.3	57.25	-465.2	76.34	-620.8
3.50	21.79	-156.3	43.53	-316.7	65.29	-476.1	87.05	-635.3
4.00	24.10	-159.3	48.16	-322.2	72.25	-484.2	96.33	-646.0
5.00	27.97	-163.6	55.92	-329.9	83.88	-495.5	111.84	-661.0
6.00	31.13	-166.4	62.25	-334.9	93.38	-503.0	124.50	-670.9
7.00	33.81	-168.3	67.61	-338.6	101.41	-508.3	135.22	-677.9
8.00	36.12	-169.8	72.25	-341.2	108.37	-512.3	144.49	-683.2
9.00	38.17	-171.0	76.34	-343.3	114.51	-515.4	152.68	-687.3
10.00	40.00	-171.9	80.00	-345.0	120.00	-517.8	160.00	-690.6

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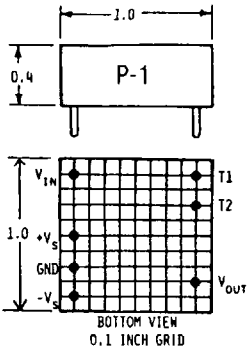
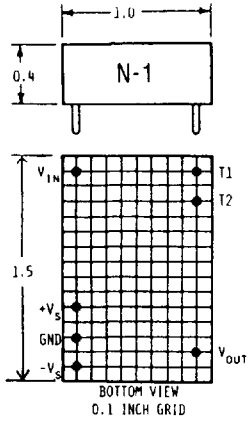
2 POLE MODELS



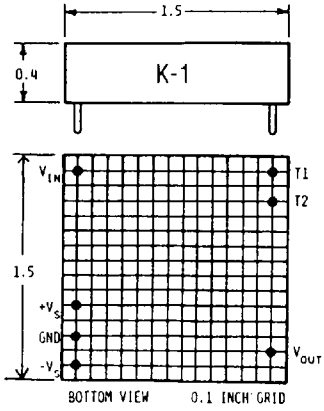
Use S1015 Socket

4 POLE MODELS



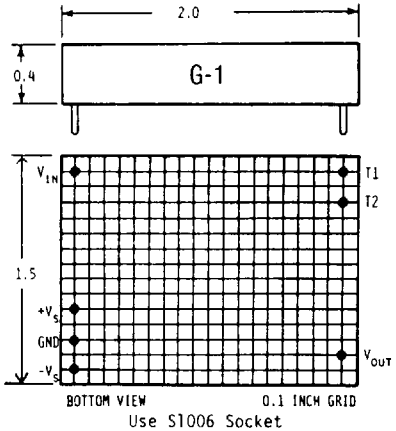
Use S1014 Socket

6 POLE MODELS



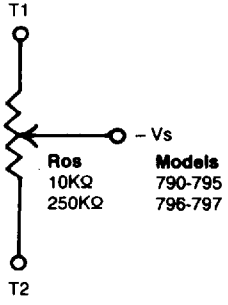
Use S1013 Socket

8 POLE MODELS



Use S1006 Socket

TERMINAL KEY	
V_{in}	Signal Input
V_{out}	Signal Output
T1, T2	Offset Trim
$+V_s$	Power Supply Voltage, Positive
GND	Ground
$-V_s$	Power Supply Voltage, Negative



Ros	Models
10KΩ	790-795
250KΩ	796-797

Figure 1.

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FREQUENCY DEVICES INC

HOW TO ORDER

The KEY SPECIFICATION SELECTION GUIDE below displays the key specifications that separate basic **790 Series** models from one another. Each of the sixteen basic models combines a unique set of gain, phase and corner frequency tolerances, operating frequencies, transfer characteristics, DC offset and power consumption.

Knowing his system requirements for active filter performance, the user can select from the GUIDE the **790 Series** model that fits his needs.

The user must specify the number of poles and the desired corner frequency. This is easily achieved by modifying the model number listed in the GUIDE in the following ways:

a) Replace the "*" designator in the model number with a 2, 4, 6, or 8 for the number of poles.

b) Replace the "fc" suffix in the model number with a simple corner frequency code.

The code specifies the corner frequency in Hertz (Hz), and substitutes the letter **k** for the thousand's comma. The example below illustrates the simplicity of the method:

Example: The model number 793LT-B-12k3 designates an 8-pole Bessel filter with a ± 5% (max) corner frequency tolerance and a ± 2mV (typ) output offset. The corner frequency is 12,300 Hz (12.3kHz).

Mating sockets are described in PACKAGE AND PIN-OUT DATA. To order, list each as separate purchase order line items.

KEY SPECIFICATION SELECTION GUIDE

RESPONSE		Fc TOLERANCE	OUTPUT OFFSET	Fc
BUTTERWORTH	BESSEL	(%. max)	(mV. typ)	RANGE
790BT – * – fc	790LT – * – fc	See Table 2	2	100Hz-50kHz
791BT – * – fc	791LT – * – fc	See Table 2	2	100Hz-50kHz
792BT – * – fc	792LT – * – fc	3	2	100Hz-50kHz
793BT – * – fc	793LT – * – fc	5	2	100Hz-50kHz
794BT – * – fc	794LT – * – fc	3	10	100Hz-50kHz
795BT – * – fc	795LT – * – fc	5	10	100Hz-50kHz
796BT – * – fc	796LT – * – fc	1	2	100Hz-20kHz
797BT – * – fc	797LT – * – fc	3	2	100Hz-20kHz

*** Insert number of poles (2, 4, 6, 8).**

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