FREQUENCY DEVICES™

780 / 781 SERIES
BAND-REJECT / BANDPASS ACTIVE FILTERS

FREQUENCY DEVICES INC T-64-05

FEATURES

- Simultaneous Bandpass & Band-Reject Outputs.
- Two Auxiliary Outputs: Lowpass and Highpass.
- Notch Depth Independent of Tuning Component Match; 50dB Min a Q = 2, Trims to 60 to 80dB.
- Adjustable Q (0.5 to 100).
- Fine Frequency Adjust, ±5%, All Models.
- Low Profile, 10.2mm (0.4").
- Passband Gain 0dB.
- 780 Series: 1000:1 Resistive Tuning Range.
- 781 Series: Factory Pretuned f_0.

APPLICATIONS

- Comb Filtering
- Control Systems
- Biomedical Research
- Interference Control
- Automotive Engineering
- Test Equipment
- Communications
- Distortion Testing
- THD Testing

DESCRIPTION

Frequency Devices' 780/781 Series band-reject and bandpass active filters use a unique, patented design concept that makes the band-rejection notch depth and the bandpass gain independent of the external tuning component match. Each unit provides simultaneous band-reject, bandpass, lowpass and highpass outputs. All outputs are continuously available at separate terminals.

All models of the 780/781 Series feature a fine frequency trim capability with a ±5% adjustment range. The filter Q is factory set at 2, but can be adjusted from 0.5 to 100 by a single external resistor. The notch depth of the band-reject response can be trimmed to 60 to 80dB with an external potentiometer. The full power response of all 780/781 models extends to 100kHz.

780RT MODELS

In addition to the features listed above, the center/corner frequency of the 780 models is resistive tuneable over a 1000:1 frequency range. Discrete frequency tuning is achieved by connecting 2-equal resistors having the nearest standard 1% value to

$$R(k\Omega) = 2\left[\frac{f_{max}}{f_0} - 1\right] \quad \text{Eq. 1.1}$$

Continuously adjustable frequency tuning can be achieved with an external dual potentiometer. In either case a 50dB (Q = 2) notch can easily be maintained over the 1000:1 tuning range. Three models cover the frequency spectrum from 0.2Hz to 20kHz in overlapping 3-decade frequency ranges. (See the Available Models Table.)

781R1Q2-f MODELS

The 781 Series provides all of the features described above in a factory-pretuned, ready to use filter. The desired center/corner frequency, between 0.2Hz and 20kHz, is simply specified on the purchase order.

Frequency Devices Incorporated
25 Locust Street
Haverhill, Massachusetts 01832
(508) 374-0761
FAX (508) 521-1839

OPERATING CHARACTERISTICS[1]

CENTER FREQUENCY	Tolerance[2]	±2%
	Stability[3]	0.01% / °C
NOTCH ATTENUATION	Typical	50 - 60 dB
	Trimmable	to 60 - 80 dB
SELECTIVITY (Q)	Preset	2
	Adjustable	0.5 to 100
INPUT	Impedance	20 kΩ
	Linear Voltage Range	±10V
	Maximum Safe Voltage	$\pm V_S$
OUTPUT	Noise[4]	50 μV RMS
	Resistance	1Ω
	Full Power Response	100 kHz
	Small Signal Response	500 kHz
	Linear Voltage Range at ±5 mA	±10 V
	Ground Short Protected	All Models
PASSBAND GAIN	Band-Reject (inv)	0±0.1 dB
	Bandpass (inv)	0±0.1 dB
POWER SUPPLY [$\pm V_s$]	Rated Voltage	±15 VDC
	Operating Range	±5 to ±18 VDC
	Maximum Safe Voltage	±18 VDC
	Quiescent Current	±8 mA
TEMPERATURE	Operating Range	0 to +70°C
	Storage Range	-25 to +85°C

NOTES
1 Typical at 25°C, V_S = ±15 VDC, and Q = 2.
2 Tuning with the closest standard 1% resistor value.
3 Tuning with 50ppm / °C resistors.
4 With input grounded, DC to 500kHz excluding DC offset.

Specifications Subject To Change Without Notice.

AVAILABLE MODELS

TUNING RANGE f_o, f_c, HERTZ		CASE	NOTCH DEPTH, dB			MODEL NUMBER
			MIN [Q = 2]	TRIMMABLE RANGE		
f_{min}	f_{max}			MIN	MAX	
RESISTIVE TUNEABLE[1]						
0.2	200	G-2	50	60	80	780RT-1
2	2k	G-1	50	60	80	780RT-2
20	20k	G-1	50	60	80	780RT-3
FIXED FREQUENCY[1]						
0.2	20k	G-1	50	60	80	781R1Q2-f

1. All models have a ±5% fine frequency trim capability.

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HOW TO ORDER

780/781 SERIES FILTERS

Order 780 Series Resistive Tuneable filters simply by listing the full model number from the Available Models table on your P.O.

When ordering a factory-pretuned 781R1Q2-f filter, the desired center/corner frequency is added, in the form of a simple code, to the basic model number to form a complete part number. The frequency code is formed simply by writing the desired frequency in Hertz using a letter A instead of a decimal point or a letter K instead of a thousands comma. For example, 1,250Hz is coded as 1K25, and the complete part number would be 781R1Q2-1K25. Some frequencies, like 750Hz, can be correctly coded either with a K (K750) or with an A (750A).

MODEL S1006 PLUG-IN SOCKETS

Order Model S1006 plug-in sockets for the 780/781 Series filters by listing as a separate line item on your P.O.

780 SERIES TUNING RESISTOR SETS

To order tuning resistor sets for the 780 Series resistive tuneable filters, state the complete model number of the filter and then list either the center/corner frequencies (in Hertz) or the resistor values (in ohms) required using an A instead of a decimal point or a K instead of a thousands comma. For Example:

Tuning Resistor Sets for Model 780RT-3

f = 75A	(75 Hertz)
R = 536K	(536 K Ω)

When frequency is specified, the tuning resistor value is calculated using Equation 1.1 and the closest standard 1% value is selected.

INSTALLATION NOTES

As is the case with most electronic components, the performance of the 780/781 Series may be influenced by external stray capacitive coupling, wiring inductance and capacitance, and capacitive loading of the outputs. To minimize these effects the following precautions should be followed:

1 When the desired center/corner frequency falls in the overlapping region of two models, select the model with the lower f_{max}. This keeps the tuning resistors smaller. In addition, the internal capacitors of the lower frequency models are larger and, therefore, the external capacitive coupling has less effect.

2 Lead lengths at terminals T1, T2, and ΔQ should be kept very short. Potentiometers and/or resistors attached to these points should be non-inductive, have a low terminal capacitance, and should be located as close to the filter as possible. Avoid using shielded cable at these terminals. If shielded cable is necessary, ground the shield at the input power supply common at the module (GND).

3 Large capacitive loads may cause the filter to oscillate. Isolate capacitive loads in excess of 100pF with a resistor of 470 Ω or more in series with the outputs. For large capacitive loads such as long shielded lines, or where the filter formed by the series resistor and the capacitive load has a breakpoint too close to the center/corner frequency of the filter, use a buffer amplifier stage to isolate the load capacitance. When driving output coaxial cable, ground the shield at the input common.

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780 SERIES FREQUENCY TUNING

The center/corner frequency of the 780 Series Resistive Tuneable filters is determined by the value of two equal external tuning resistors. The value is calculated with Equation 1.1, repeated here:

$$R(K\Omega) = 2[(f_{max}/f_o) - 1] \qquad \text{Eq. 1.1}$$

where f_{max} is the upper frequency limit of the 780 model used. See the Available Models table on page 2. The connections are shown in Figure 4.1A below.

The accuracy and stability of the center/corner frequency are determined by the properties of the tuning resistors. Use 1%, 50ppm/°C tuning resistors to obtain the accuracy and stability specified in the Operating Characteristics table. To obtain the full high performance of the 780 Series filters, the tuning resistors must also be non-inductive over the frequency range from DC to 100 f_{max}. Metal film type resistors for any center/corner frequencies within the tuning range of the 780 model you are using may be ordered from FDI. See the How To Order instructions on page 3.

The principal PATENTED feature of the 780/781 Series design is that the notch depth and bandpass gain are insensitive to the accuracy and match of the tuning resistors. Therefore, a dual-gang potentiometer may be used to provide continuously adjustable frequency tuning. The connections are shown in Figure 4.1B. A 2 megohm log taper potentiometer will cover the entire 1000:1 tuning range. For greater tuning resolution use a smaller ganged potentiometer connected in series with two fixed resistors.

780/781 SERIES ±5% FINE FREQUENCY TUNING

The connection of a non-inductive potentiometer as shown below in Figure 4.1C provides a ±5% center/corner frequency adjustment for all 780/781 Series filters.

780/781 SERIES PRECISION FREQUENCY CALIBRATION

Precision center/corner frequency calibration of 780/781 Series filters in high Q applications may be accomplished by temporarily running the filter as an oscillator in the circuit of Figure 4.2 below. The fine tuning potentiometer is adjusted to set the frequency of oscillation exactly to the desired center/corner frequency.

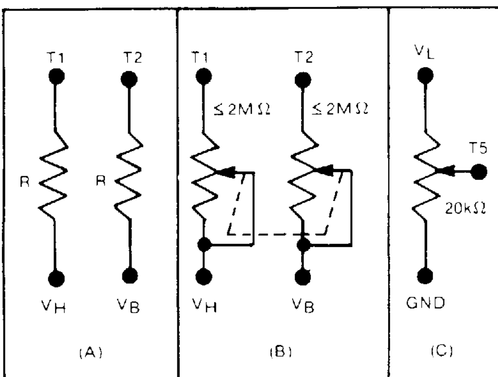

FIGURE 4.1
780 Series Frequency Tuning (A & B)
780/781 Series Fine Tuning(C)

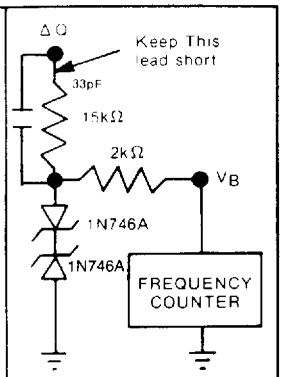

FIGURE 4.2
Precision Frequency Calibration

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25 Locust Street
Haverhill, Massachusetts 01832
(508) 374-0761
FAX
(508) 521-1839

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780/781 SERIES NOTCH DEPTH AND Q

The notch depth and Q of the 780/781 Series filters are factory pretrimmed to 50dB min and 2. All 780 Series filters are shipped ready to tune and use. All 781 Series filters are shipped pretuned and ready to use. With the possible exception of fine frequency trimming, no further adjustments are needed.

The 780/781 Series filters use a unique, PATENTED design which permits adjustment of both the Q of the poles and the Q_z of the zeros to maximize the notch depth. The Q adjustment is independent of f_0 but it does influence the notch depth and bandpass gain at f_0. If your application requires a Q other than 2 or the maximum attainable notch depth, use the OPTIONAL notch trim and Q adjustment procedures detailed below.

780 SERIES OPTIONAL NOTCH TRIM

For a given Q the notch depth may be increased from -50 to -60 to -80dB with two external non-inductive potentiometers (Figure 5.1). If the full 1000:1 frequency range is used, perform the V_L-T4 trim at f_{max}, and the V_B-T3 trim at 0.01 f_{max}. For narrower ranges, perform the trims at the limits of the range of interest. For a very narrow range (20% or less) only one trim is needed and either trim may be used. The V_L-T4 trim is usually not necessary for Model 780RT-1.

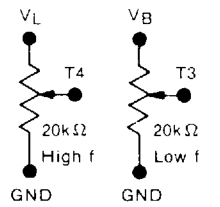

FIGURE 5.1
780 Series Notch Trim

781 SERIES OPTIONAL NOTCH TRIM

For a given Q the notch depth is maximized with an external non-inductive potentiometer (Figure 5.2).

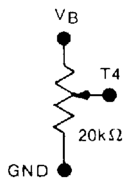

FIGURE 5.2
781 Series Notch Trim

780/781 SERIES NOTCH TRIM PROCEDURE

When an external oscillator is used to trim the notch depth, the fundamental component of the test signal at f_0 is attenuated by the notch, but the harmonics are passed and appear in the output signal. The presence of these harmonics makes it difficult to measure the amplitude of the fundamental at the output with ordinary wideband voltmeters. If a low distortion source and/or a narrowband tuned voltmeter (spectrum analyzer) are not available, the notch depth can be easily trimmed, as explained in this example, by increasing the Q of the filter temporarily while the notch trim is performed:

If notch depth of 70dB is required at Q = 2, but the distortion of the test signal is 0.5% (-46dB), set the Q to 50 by temporarily connecting a 309 ohm resistor from ΔQ to GND. Trim the notch to 42dB and then remove the 309 ohm resistor. The notch at Q = 2 will be greater than the notch set at Q = 50 by the ratio of the Q's, in this example 50/28dB. The resulting notch depth at Q = 2 will, therefore, be 42dB plus 28dB, or 70dB.

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The filter Q of the 780/781 Series filters may be adjusted to any value between 0.5 and 100 by connecting either a single external 20kΩ potentiometer or a single fixed resistor as shown in Figure 6.1. The potentiometer provides continuous adjustment of Q over the entire 0.5 to 100 range. R4 provides fixed values of Q between 0.5 and 2, and R5 provides fixed Q values between 2 and 100. The values of R4 and R5 are given by equations 6.1 and 6.2. Use the standard 1% resistor value closest to the calculated value. Some typical Q resistor values are listed in Table 6.1.

$$R4(k\Omega) = 15[(2Q-1)/(2-Q)] \qquad 0.5 \leq Q < 2 \qquad \text{(Eq. 6.1)}$$

$$R5(k\Omega) = 15/(Q-2) \qquad 2 < Q \leq 100 \qquad \text{(Eq. 6.2)}$$

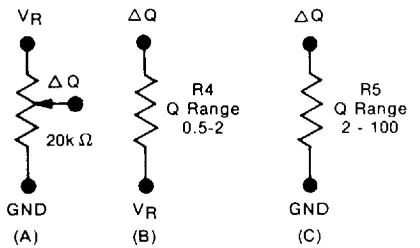

FIGURE 6.1
780/781 Series Q Adjustment

TABLE 6.1 Q Resistor Values

Q	R4 (Ω)	R5 (Ω)
0.5	0	—
1	15k	—
2	—	—
5	—	5k
10	—	1.87k
20	—	825
50	—	309
100	—	154

781 SERIES DC OFFSET ADJUSTMENT

The 780 Series filters do not have a dc offset adjustment capability.

For all 781 Series filters, the dc offset of either the bandpass output or the band-reject output may be trimmed to zero with an external 20kΩ potentiometer as shown in Figure 6.2. When the offset of one of the outputs is trimmed to zero the other will not necessarily be zero.

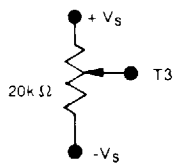

FIGURE 6.2
781 Series
Offset Trim

Frequency Devices Incorporated
25 Locust Street
Haverhill, Massachusetts 01832
(508) 374-0761
FAX
(508) 521-1839

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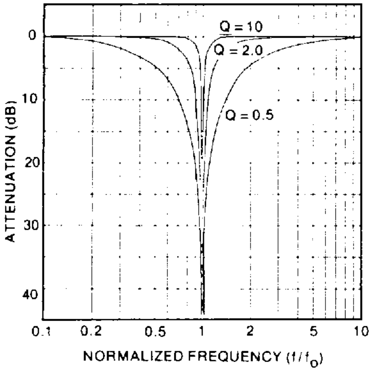
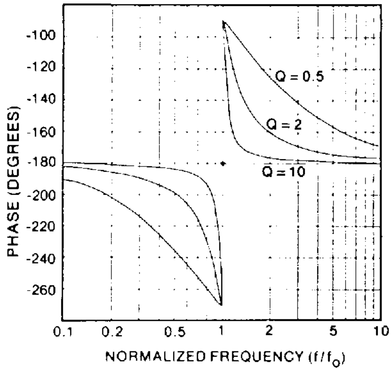
THEORETICAL BAND-REJECT FREQUENCY RESPONSE





THEORETICAL BAND-REJECT RESPONSE TABLE

Attenuation and Phase vs. Normalized frequency, Q from 1 to 50.

f/f_c	Q = 1		Q = 2		Q = 5		Q = 10		Q = 20		Q = 50	
	A[dB]	Ψ[°]	A[dB]	Ψ[°]	A[dB]	Ψ[°]	A[dB]	Ψ[°]	A[dB]	Ψ[°]	A[dB]	Ψ[°]
0.1000	0.0	-185.8	0.0	-182.9	0.0	-181.2	0.0	-180.6	0.0	-180.3	0.0	-180.1
0.2000	0.2	-191.8	0.1	-185.9	0.0	-182.4	0.0	-181.2	0.0	-180.6	0.0	-180.2
0.3000	0.5	-198.2	0.1	-189.4	0.0	-183.8	0.0	-181.9	0.0	-180.9	0.0	-180.4
0.5000	1.6	-213.7	0.5	-198.4	0.1	-187.6	0.0	-183.9	0.0	-181.9	0.0	-180.8
0.7000	4.6	-233.9	1.7	-214.5	0.3	-195.4	0.1	-187.8	0.0	-183.9	0.0	-181.6
0.8000	7.7	-245.8	3.5	-228.0	0.8	-204.0	0.2	-192.5	0.1	-186.3	0.0	-182.5
0.9000	13.7	-258.1	8.2	-247.1	2.8	-223.5	0.9	-205.3	0.2	-193.3	0.0	-185.4
0.9200									0.4	-196.7	0.1	-186.8
0.9300					4.6	-234.0	1.7	-214.5				
0.9400									0.7	-202.0	0.1	-189.2
0.9500					6.8	-242.8	2.9	-224.3				
0.9600	21.8	-265.3										
0.9700			18.3	-263.1	10.7	-253.1	5.7	-238.6	2.2	-219.4	0.4	-198.2
0.9850									5.7	-238.8	1.6	-213.5
0.9900	33.9	-268.8			20.0	-264.3						
0.9950			34.0	-268.9			20.0	-264.3	14.1	-258.7	7.0	-243.4
0.9980					34.0	-268.9			22.0	-265.4		
0.9990							34.0	268.9			20.0	-264.3
0.9996									35.9	-269.1		
0.9998											34.0	-268.9
1.0000	∞	-180.0	∞	-180.0	∞	-180.0	∞	-180.0	∞	-180.0	∞	-180.0
1.0002											34.0	-91.1
1.0004									35.9	-90.9		
1.0010							34.0	-91.1			20.1	-95.7
1.0020					34.0	-91.1			22.0	-94.6		
1.0050			34.0	-91.1			20.1	-95.7	14.2	-101.3	7.0	-116.5
1.0100	34.0	-91.1			20.1	-95.7						
1.0150									5.8	-120.8	1.6	-146.1
1.0300			18.6	-96.7	11.0	-106.5	5.9	-120.6	2.3	-139.8	0.5	-161.3
1.0400	22.1	-94.5										
1.0500					7.2	-116.0	3.1	-134.3				
1.0600									0.7	-156.8	0.1	-170.3
1.0700					5.0	-124.1	1.9	-143.6				
1.0800									0.4	-162.0	0.1	-172.6
1.1000	14.5	-100.8	9.0	-110.9	3.2	-133.7	1.0	-152.4	0.3	-165.3	0.1	-174.0
1.2000	9.3	-110.1	4.6	-126.3	1.1	-151.4	0.3	-164.7	0.1	-172.2	0.0	-176.9
1.4000	5.0	-124.4	1.9	-143.9	0.4	-163.7	0.1	-171.7	0.0	-175.8	0.0	-178.3
1.7000	2.6	-138.0	0.8	-155.8					0.0	-177.4	0.0	-179.0
2.0000	1.6	-146.3	0.5	-161.6	0.1	-172.4	0.0	-176.2	0.0	-178.1	0.0	-179.2
3.0000	0.6	-159.4	0.2	-169.4	0.0	-175.7	0.0	-177.9	0.0	-178.9	0.0	-179.6
5.0000	0.2	-168.2	0.1	-174.1	0.0	-177.6	0.0	-178.8	0.0	-179.4	0.0	-179.8
10.0000	0.0	-174.2	0.0	-177.1	0.0	-178.8	0.0	-179.4	0.0	-179.7	0.0	-179.9

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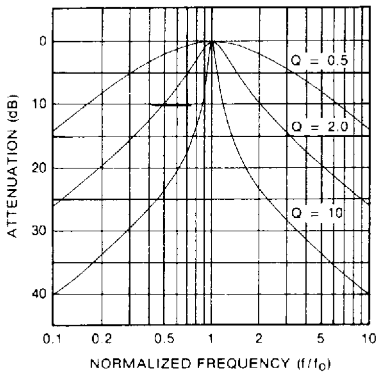
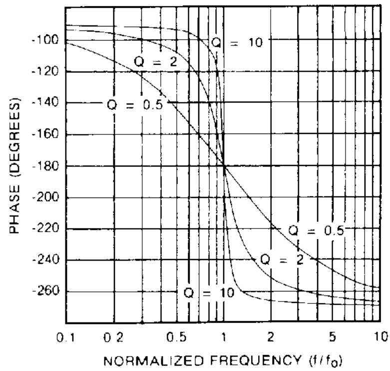
THEORETICAL BANDPASS FREQUENCY RESPONSE





THEORETICAL BANDPASS RESPONSE TABLE

Attenuation and Phase vs. Normalized frequency, Q from 1 to 50.

f/f_c	Q = 1		Q = 2		Q = 5		Q = 10		Q = 20		Q = 50	
	A[dB]	Ψ[°]	A[dB]	Ψ[°]	A[dB]	Ψ[°]	A[dB]	Ψ[°]	A[dB]	Ψ[°]	A[dB]	Ψ[°]
0.1000	20.0	-95.8	25.9	-92.9	33.9	-91.2	39.9	-90.6	45.9	-90.3	53.9	-90.1
0.2000	13.8	-101.8	19.7	-95.9	27.6	-92.4	33.6	-91.2	39.7	-90.6	47.6	-90.2
0.3000	10.1	-108.2	15.8	-99.4	23.6	-93.8	29.6	-91.9	35.7	-90.9	43.6	-90.4
0.5000	5.1	-123.7	10.0	-108.4	17.6	-97.6	23.5	-93.8	29.6	-91.9	37.5	-90.8
0.7000	1.9	-143.9	5.0	-124.5	11.5	-105.4	17.3	-97.8	23.3	-93.9	31.2	-91.6
0.8000	0.8	-155.8	2.6	-138.0	7.8	-114.0	13.3	-102.5	19.1	-96.3	27.1	-92.5
0.9000	0.2	-168.1	0.7	-157.1	3.3	-133.5	7.4	-115.3	12.8	-103.3	20.5	-95.4
0.9200									10.9	-106.7	18.5	-96.8
0.9300					1.8	-144.0	4.9	-124.5				
0.9400									8.5	-112.0	16.0	-99.2
0.9500					1.0	-152.8	3.1	-134.3				
0.9600	0.0	-175.3										
0.9700			0.0	-173.1	0.4	-163.1	1.4	-148.6	4.0	-129.4	10.1	-108.2
0.9850									1.4	-148.8	5.2	-123.5
0.9900	0.0	-178.8			0.0	-174.3						
0.9950			0.0	-178.9			0.0	-174.3	0.1	-168.7	1.0	-153.4
0.9980					0.0	-178.9			0.0	-175.4		
0.9990							0.0	-178.9			0.0	-174.3
0.9996									0.0	-179.1		
0.9998											0.0	-178.9
1.0000	0.0	-180.0	0.0	-180.0	0.0	-180.0	0.0	-180.0	0.0	-180.0	0.0	-180.0
1.0002											0.0	-181.1
1.0004									0.0	-180.9		
1.0010							0.0	-181.1			0.0	-185.7
1.0020					0.0	-181.1			0.0	-184.6		
1.0050			0.0	-181.1			0.0	-185.7	0.1	-191.3	1.0	-206.5
1.0100	0.0	-181.1			0.0	-185.7						
1.0150									1.3	-210.8	5.1	-236.1
1.0300			0.0	-186.7	0.4	-196.5	1.3	-210.6	3.8	-229.8	9.9	-251.3
1.0400	0.0	-184.5										
1.0500					0.9	-206.0	2.9	-224.3				
1.0600									8.1	-246.8	15.4	-260.3
1.0700					1.6	-214.1	4.5	-233.6				
1.0800									10.2	-252.0	17.8	-262.6
1.1000	0.2	-190.8	0.6	-200.9	2.8	-223.7	6.7	-242.4	11.9	-255.3	19.6	-264.0
1.2000	0.6	-200.1	1.9	-216.3	6.4	-241.4	11.6	-254.7	17.4	-262.2	25.3	-266.9
1.4000	1.7	-214.4	4.6	-253.9	11.1	-253.7	16.8	-261.7	22.8	-265.8	30.7	-268.3
1.7000	3.5	-228.0	7.7	-245.8					27.0	-267.4	34.9	-269.0
2.0000	5.1	-236.3	10.0	-251.6	17.6	-262.4	23.5	-266.2	30.0	-268.1	37.5	-269.2
3.0000	9.1	-249.4	14.7	-259.4	22.5	-265.7	28.5	-267.9	34.6	-268.9	42.5	-269.6
5.0000	13.8	-258.2	19.7	-264.1	27.6	-267.6	33.6	-268.8	39.7	-269.4	47.6	-269.8
10.0000	20.0	-264.2	25.9	-267.1	33.9	-268.8	39.9	-269.4	45.9	-269.7	53.9	-269.9

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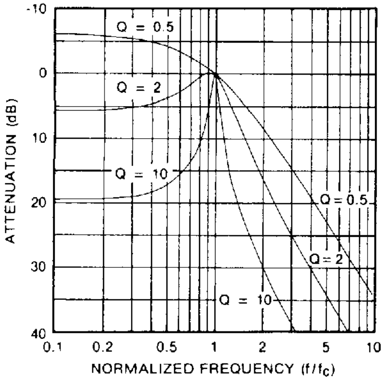
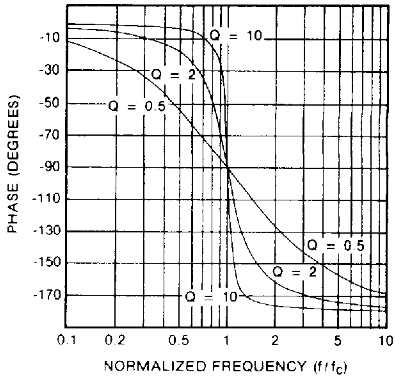
(508) 374-0761
FAX (508) 521-1839

THEORETICAL LOWPASS FREQUENCY RESPONSE





THEORETICAL LOWPASS RESPONSE TABLE

Attenuation and Phase vs. Normalized Frequency, Q from 1 to 50.

f/f_o	Q = 1		Q = 2		Q = 5		Q = 10		Q = 20		Q = 50	
	A[dB]	Ψ[°]	A[dB]	Ψ[°]	A[dB]	Ψ[°]	A[dB]	Ψ[°]	A[dB]	Ψ[°]	A[dB]	Ψ[°]
0.1000	0.0	-5.8	5.9	-2.9	13.9	-1.2	19.9	-0.6	25.9	-0.3	33.9	-0.1
0.2000	-0.2	-11.8	5.7	-5.9	13.6	-2.4	19.7	-1.2	25.7	-0.6	33.6	-0.2
0.3000	-0.4	-18.2	5.3	-9.4	13.2	-3.8	19.2	-1.9	25.2	-0.9	33.2	-0.4
0.5000	-0.9	-33.7	4.0	-18.4	11.6	-7.6	17.5	-3.8	23.5	-1.9	31.5	-0.8
0.7000	-1.3	-53.9	1.9	-34.5	8.5	-15.4	14.2	-7.8	20.2	-3.9	28.1	-1.6
0.8000	-1.1	-65.8	0.6	-48.0	5.9	-24.0	11.3	-12.5	17.2	-6.3	25.1	-2.5
0.9000	-0.7	-78.1	-0.2	-67.1	2.3	-43.5	6.5	-25.3	11.8	-13.3	19.6	-5.4
0.9200									10.1	-16.7	17.8	-6.8
0.9300					1.2	-54.0	4.3	-34.5				
0.9400									8.0	-22.0	15.4	-9.2
0.9500					0.6	-62.8	2.7	-44.3				
0.9600	-0.3	-85.3										
0.9700			-0.1	-83.1	0.1	-73.1	1.1	-58.6	3.7	-39.4	9.9	-18.2
0.9850									1.2	-58.8	5.0	-33.5
0.9900	-0.1	-88.8			0.0	-84.3						
0.9950			0.0	-88.9			0.0	-84.3	0.1	-78.7	0.9	-63.4
0.9980					0.0	-88.9			0.0	-85.4		
0.9990							0.0	-88.9			0.0	-84.3
0.9996									0.0	-89.1		
0.9998											0.0	-88.9
1.0000	0.0	-90.0	0.0	-90.0	0.0	-90.0	0.0	-90.0	0.0	-90.0	0.0	-90.0
1.0002											0.0	-91.1
1.0004									0.0	-90.0		
1.0010							0.0	-91.1			0.1	-95.7
1.0020					0.0	-91.1			0.1	-94.6		
1.0050			0.1	-91.1			0.1	-95.7	0.2	-101.3	1.0	-116.5
1.0100	0.1	-91.1			0.1	-95.7						
1.0150									1.5	-120.8	5.2	-146.1
1.0300			0.3	-96.7	0.6	-106.5	1.6	-120.6	4.1	-139.8	10.1	-161.3
1.0400	0.4	-94.5										
1.0500					1.4	-116.0	3.3	-134.3				
1.0600									8.6	-156.8	16.0	-170.3
1.0700					2.2	-124.1	5.1	-143.6				
1.0800									10.9	-162.0	18.5	-172.6
1.1000	1.0	-100.8	1.4	-110.9	3.6	-133.7	7.5	-152.4	12.8	-165.3	20.5	-174.0
1.2000	2.1	-110.1	3.5	-126.3	8.0	-151.4	13.2	-164.7	19.0	-172.2	26.9	-176.9
1.4000	4.6	-124.4	7.5	-143.9	14.0	-163.7	19.7	-171.7	25.7	-175.8	33.6	-178.3
1.7000	8.1	-138.0	12.4	-155.8					31.6	-177.4	39.5	-179.0
2.0000	11.1	-146.3	16.0	-161.6	23.6	-172.4	29.6	-176.2	35.6	-178.1	43.5	-179.2
3.0000	18.6	-159.4	24.2	-169.4	32.1	-175.7	38.1	-177.9	44.0	-178.9	52.0	-179.6
5.0000	27.8	-168.2	33.7	-174.1	41.6	-177.6	47.6	-178.8	53.6	-179.4	61.6	-179.8
10.0000	40.0	-174.2	45.9	-177.1	53.9	-178.8	59.9	-179.4	65.9	-179.7	73.9	-179.9

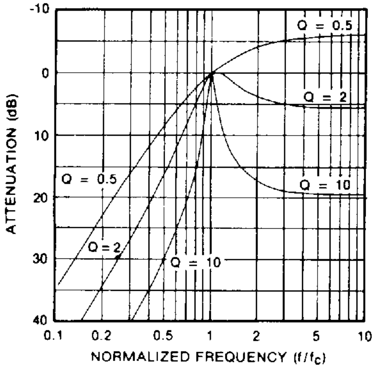
Frequency Devices Incorporated
25 Locust Street
Haverhill, Massachusetts 01832
(508) 374-0761
FAX (508) 521-1839

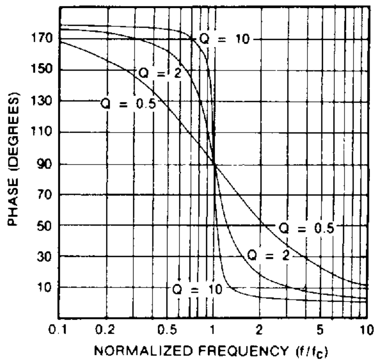
FREQUENCY DEVICES

780 / 781 SERIES BAND-REJECT / BANDPASS ACTIVE FILTERS

57E D 3731130 0002221 826 FRE

THEORETICAL HIGHPASS FREQUENCY RESPONSE





THEORETICAL HIGHPASS RESPONSE TABLE

Attenuation and Phase vs. Normalized Frequency, Q from 1 to 50.

f/f_c	Q = 1		Q = 2		Q = 5		Q = 10		Q = 20		Q = 50	
	A[dB]	Ψ[°]	A[dB]	Ψ[°]	A[dB]	Ψ[°]	A[dB]	Ψ[°]	A[dB]	Ψ[°]	A[dB]	Ψ[°]
0.1000	40.0	174.2	45.9	177.1	53.9	178.8	59.9	179.4	65.9	179.7	73.9	179.9
0.2000	27.8	168.2	33.7	174.1	41.6	177.6	47.6	178.8	53.6	179.4	61.6	179.8
0.3000	20.5	161.8	26.2	170.6	34.1	176.2	40.1	178.1	46.1	179.1	54.1	179.6
0.5000	11.1	146.3	16.0	161.6	23.6	172.4	29.6	176.2	35.6	178.1	43.5	179.2
0.7000	5.0	126.1	8.0	145.5	14.6	164.6	20.4	172.2	26.4	176.1	34.3	178.4
0.8000	2.7	114.2	4.5	132.0	9.8	156.0	15.2	167.5	21.1	173.7	29.0	177.5
0.9000	1.1	101.9	1.6	112.9	4.2	136.5	8.3	154.7	13.7	166.7	21.4	174.6
0.9200									11.6	163.3	19.2	173.2
0.9300					2.5	126.0	5.6	145.5				
0.9400									9.0	158.0	16.5	170.8
0.9500					1.5	117.2	3.6	135.7				
0.9600	0.4	94.7										
0.9700			0.3	96.9	0.7	106.9	1.6	121.4	4.2	140.6	10.4	161.8
0.9850									1.5	121.2	5.3	146.5
0.9900	0.1	91.2			0.1	95.7						
0.9950			0.1	91.1			0.1	95.7	0.2	101.3	1.0	116.6
0.9980					0.0	91.1			0.1	94.6		
0.9990							0.0	91.1			0.1	95.7
0.9996									0.0	90.9		
0.9998											0.0	91.1
1.0000	0.0	90.0	0.0	90.0	0.0	90.0	0.0	90.0	0.0	90.0	0.0	90.0
1.0002											0.0	88.9
1.0004									0.0	89.1		
1.0010							0.0	88.9			0.0	84.3
1.0020					0.0	88.9			0.0	85.4		
1.0050			0.0	88.9			0.0	84.3	0.1	78.7	0.9	63.5
1.0100	-0.1	88.9			0.0	84.3						
1.0150									1.2	59.2	5.0	33.9
1.0300			-0.2	83.3	0.1	73.5	1.0	59.4	3.5	40.2	9.6	18.7
1.0400	-0.3	85.5										
1.0500					0.5	64.0	2.5	45.7				
1.0600									7.6	23.2	14.9	9.7
1.0700					1.0	55.9	3.9	36.4				
1.0800									9.5	18.0	17.1	7.4
1.1000	-0.7	79.2	-0.2	69.1	2.0	46.3	5.8	27.6	11.1	14.7	18.8	6.0
1.2000	-1.0	69.9	0.3	53.7	4.8	28.6	10.0	15.3	15.8	7.8	23.7	3.1
1.4000	-1.3	55.6	1.7	36.1	8.1	16.3	13.9	8.3	19.8	4.2	27.8	1.7
1.7000	-1.1	42.0	3.1	24.2					22.3	2.6	30.3	1.0
2.0000	-0.9	33.7	4.0	18.4	11.6	7.6	17.5	3.8	23.5	1.9	31.5	0.8
3.0000	-0.5	20.6	5.2	10.6	13.0	4.3	19.0	2.1	25.0	1.1	53.0	0.4
5.0000	-0.2	11.8	5.7	5.9	13.6	2.4	19.7	1.2	25.7	0.6	33.6	0.2
10.0000	0.0	5.8	5.9	2.9	13.9	1.2	19.9	0.6	25.9	0.3	33.9	0.1

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Frequency Devices Incorporated
25 Locust Street
Haverhill, Massachusetts 01832
(508) 374-0761
FAX
(508) 521-1839

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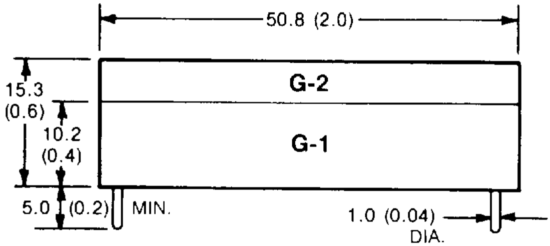
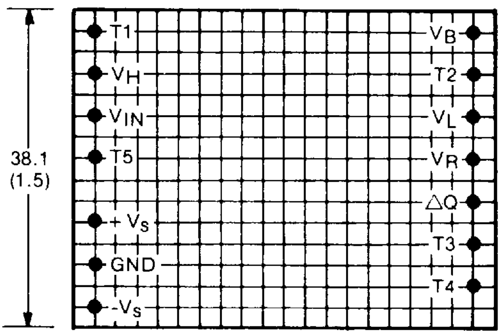
DIMENSIONS

IN MM (INCHES)





BOTTOM VIEW 0.1 INCH GRID

TERMINAL KEY

T1	Frequency Tune, 780 Series
V_H	Highpass Output
V_{IN}	Signal Input
T5	Frequency Fine Tune
$+V_S$	Supply Voltage, Positive
GND	Ground, Common
$-V_S$	Supply Voltage, Negative
V_B	Bandpass Output
T2	Frequency Tune, 780 Series
V_L	Lowpass Output
V_R	Band-Reject Output
ΔQ	Q Adjustment
T3	Band-Reject Notch Trim
T4	Band-Reject Notch Trim

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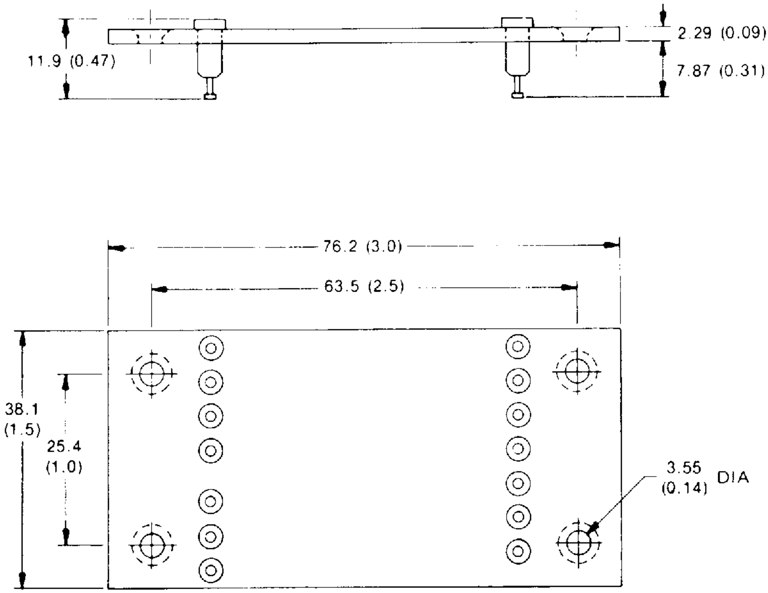
FREQUENCY DEVICES INC

SOCKET S1006

DIMENSIONS IN MM (INCHES)



Frequency Devices Incorporated
25 Locust Street
Haverhill, Massachusetts 01832
(508) 374-0761
FAX
(508) 521-1839