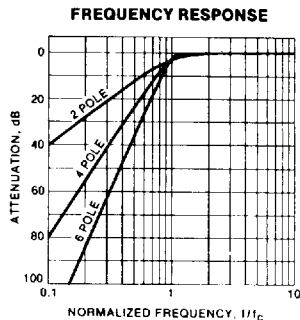



**FREQUENCY DEVICES INC**
*T.64.05*
**FEATURES**

- Ready-To-Use Component
- Socket Or Solder-In Installation
- Corner Frequencies From 0.001Hz to 20kHz
- Corner Frequency Stability  $\pm 0.05\%/^{\circ}\text{C}$
- 50  $\mu\text{V}$  Noise Level

**APPLICATIONS**

- Band Limiting
- Tone Control
- Noise Reduction
- Test Equipment
- Interference Elimination
- Broadcast Signal Conditioning
- Biomedical Instrumentation


**DESCRIPTION**

The fixed frequency filter is the most effective and economical way to fill filter applications in the production of analog and digital systems, communications and control equipment. The fixed frequency filter provides guaranteed performance with a single plug-in or solder-in installation step. Costly design, assembly, tuning and testing steps are avoided. Modern computer controlled manufacturing techniques give you custom performance with off-the-shelf delivery and low cost.

Frequency Devices' line of high performance fixed frequency highpass active filters offers to the electronics, data processing, communications and control systems industries many proven, standard, off-the-shelf designs to satisfy the requirements of a wide range of fixed frequency, highpass applications.

Standard frequency response characteristics include 2-, 4-, and 6-pole Butterworth and Tchebyscheff functions. The Butterworth response provides a maximally flat gain response in the passband. Attenuation is 3dB at  $f_c$  and rolls off at 6dB per octave per pole below  $f_c$ . The step response displays moderate undershoot which increases with the number of poles,  $N$ . An excellent choice for general purpose filter applications, the Butterworth is particularly useful where passband gain accuracy is important. The Tchebyscheff response achieves a sharp frequency cutoff at the expense of allowing ripple in the passband. Tchebyscheff filters are specified by the amount of passband gain variation and the cutoff frequency. FDI's Tchebyscheffs are normalized to 3dB attenuation at  $f_c$  and unity gain in the passband. Tchebyscheffs are used where rolloff rate is important and passband gain variations are of secondary consideration.

The large number of available standard models provides for corner frequencies from 0.001Hz to 20kHz. The corner frequency is specified in a simple code added to the basic model number to form a complete part number. Each unit is factory pretuned to the specified corner frequency within its corner frequency range. It is especially important to note that all models are complete high performance active filters which require no external components. The use of these high performance, fixed frequency highpass active filters allows the system designer to think at the system level, saving time and money by eliminating component-level problems.

Frequency Devices Incorporated  
25 Locust Street  
Haverhill, Massachusetts  
01832

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


**FREQUENCY DEVICES INC**

LINE	3dB CORNER FREQUENCY			POLES	OUTPUT OFFSET DRIFT ± μV/°C	IMPEDANCES		CURRENTS	
	RANGE (HERTZ)	TOL	DRIFT %/°C			INPUT Ω MIN	SOURCE <sup>2</sup> Ω MAX	INPUT BIAS	SUPPLY ± mA
1	0.001-0.01	± 3%	± 0.05	2	50	1M	20k	0	8
2	0.001-0.1	± 3%	± 0.05	4	50	300k	6k	0	12
3	0.01-0.1	± 3%	± 0.05	2	30	300k	6k	0	8
4	0.1-1	± 3%	± 0.05	2	25	30k	600	0	4
5	0.1-1	± 3%	± 0.05	4	25	30k	600	0	8
6	1-10	± 2%	± 0.05	2	25	30k	600	0	4
7	1-10	± 2%	± 0.05	4	25	30k	600	0	8
8	1-100	± 2%	± 0.05	6	25	30k	600	0	12
9	10-20k	± 2%	± 0.05	2	20	30k	600	0	4
10	10-20k	± 2%	± 0.05	4	20	30k	600	0	8
11	100-20k	± 2%	± 0.05	6	20	30k	600	0	12

**SPECIFICATIONS COMMON TO ALL MODELS<sup>1</sup>**
**PASSBAND GAIN**

Non-Inverting 0 ± 0.02dB

**INPUT**

Voltage Range ± 10V

 Maximum Safe Voltage ± V<sub>S</sub>
**OUTPUT**

Resistance 1Ω

Full Power Response 50kHz

Rated Output at 2mA ± 10V

Offset Voltage ± 5mV

 Noise<sup>3</sup> 50 μV RMS

Offset Zero Adjustment All Models

Ground Short Protected All Models

**POWER SUPPLY (± V<sub>S</sub>)**

Rated Voltage ± 15V dc

Operating Range ± 5 to ± 18V dc

**TEMPERATURE RANGE**

Operating 0°C to 70°C

Storage - 25°C to + 85°C

**NOTES:**

 1) Typical at 25°C and V<sub>S</sub> = ± 15V dc.

 2) Maximum allowable series input resistor to maintain f<sub>c</sub> accuracy.

3) Noise, dc to 50kHz, excluding dc offset, input grounded.

Specifications are subject to change without notice.



LINE	PACKAGE DATA				MODEL NUMBER	
	CASE	TERMINAL DIAGRAM	PAGE	SOCKET	BUTTERWORTH	TCHEBYSCHIEFF
1	C-3	C-05	10	S1002	751H2B-f	751H2Yr-f
2	C-3	C-05	10	S1002	753H4B-f	753H4Yr-f
3	R-3	R-01	11	S1002	701H2B-f	701H2Yr-f
4	R-3	R-01	11	S1002	708H2B-f	708H2Yr-f
5	R-3	R-01	11	S1002	709H4B-f	709H4Yr-f
6	L-2	L-01	11	S1001	710H2B-f	710H2Yr-f
7	R-3	R-01	11	S1002	711H4B-f	711H4Yr-f
8	R-3	R-01	11	S1002	723H6B-f	-----
9	L-2	L-01	11	S1001	712H2B-f	712H2Yr-f
10	L-2	L-01	11	S1001	713H4B-f	713H4Yr-f
11	L-2	L-01	11	S1001	724H6B-f	-----

**ORDERING GUIDE** All of the basic model numbers are listed in these tables. In each case a corner frequency code must be added to complete the part number. For Tchebyscheff models a passband ripple code is also required.

**PASSBAND RIPPLE** for Tchebyscheff models is designated by adding one of these codes directly onto the basic model number:

RIPPLE	CODE(r)
0.2dB	A2W
0.5dB	A5W
1 dB	1W

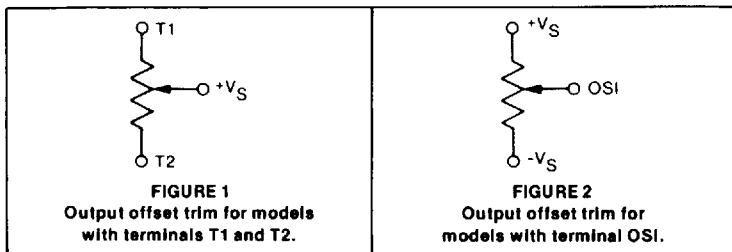
EXAMPLE
751H2YA2W-f
751H2YA5W-f
751H2Y1W-f

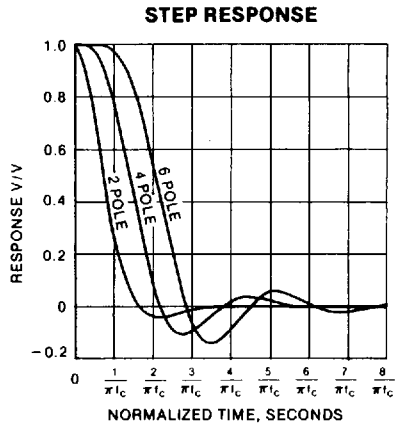
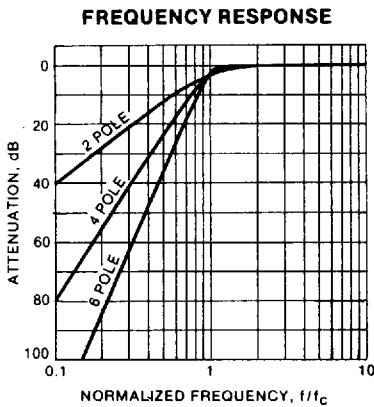
**CORNER FREQUENCY** is designated in Hertz using either a letter A instead of a decimal point or a letter K instead of a thousands comma:

FREQUENCY	CODE(f)	EXAMPLE
0.00123Hz	A00123	751H2B-A00123
12.3 Hz	12A3	723H6B-12A3
12.3 kHz	12K3	712H2YA5W-12K3

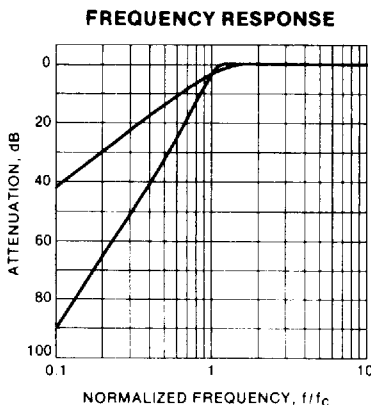
### OUTPUT OFFSET VOLTAGE ADJUSTMENT

The output offset voltage of all Frequency Devices' fixed frequency high-pass active filters is within  $0 \pm 5\text{mVdc}$  at rated power supply voltage and temperature. The OPTIONAL adjustment circuits shown in Figures 1 and 2 below can be used to zero the offset voltage if necessary. Use the circuit shown in Figure 1 for all models that have terminals T1 and T2. Use the circuit of Figure 2 for all models that have terminal OSI.

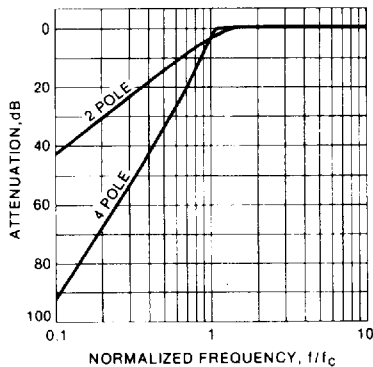
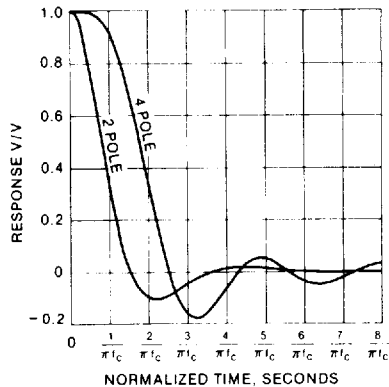



**FREQUENCY DEVICES INC**

**NORMALIZED FREQUENCY RESPONSE TABLE**

$f/f_c$	2 POLE		4 POLE		6 POLE	
	A (dB)	$\psi$ (°)	A (dB)	$\psi$ (°)	A (dB)	$\psi$ (°)
0.00	$\infty$	0.0	$\infty$	0.0	$\infty$	0.0
0.10	40.00	171.9	80.00	345.0	120.00	517.8
0.20	27.97	163.6	55.92	329.9	83.88	495.5
0.30	20.95	155.0	41.83	314.5	62.75	472.8
0.40	16.03	146.0	31.84	298.6	47.75	449.6
0.50	12.30	136.7	24.10	282.0	36.12	425.5
0.60	9.40	127.0	17.82	264.3	26.63	400.0
0.65	8.20	122.1	15.10	254.9	22.48	386.6
0.70	7.13	117.3	12.64	245.1	18.65	372.5
0.75	6.19	112.4	10.41	234.8	15.13	357.6
0.80	5.37	107.7	8.43	224.1	11.92	341.8
0.85	4.65	103.0	6.69	213.1	9.05	324.8
0.90	4.02	98.5	5.22	201.9	6.57	306.9
0.95	3.48	94.2	3.99	190.8	4.55	288.4
1.00	3.01	90.0	3.01	180.0	3.01	270.0
1.10	2.26	82.3	1.66	160.1	1.20	236.4
1.20	1.71	75.5	0.91	143.2	0.46	209.4
1.30	1.30	69.4	0.50	129.2	0.18	188.3
1.40	1.00	64.1	0.28	117.8	0.08	171.6
1.50	0.78	59.5	0.17	108.3	0.03	158.0
2.00	0.26	43.3	0.02	78.0	0.00	114.5
2.50	0.11	34.0	0.00	61.4	0.00	90.4
3.00	0.05	27.9	0.00	50.7	0.00	74.8
3.50	0.03	23.7	0.00	43.3	0.00	63.9
4.00	0.02	20.7	0.00	37.8	0.00	55.8
5.00	0.01	16.4	0.00	30.1	0.00	44.5
6.00	0.00	13.8	0.00	25.1	0.00	37.0
7.00	0.00	11.7	0.00	21.4	0.00	31.7
8.00	0.00	10.2	0.00	18.8	0.00	27.7
9.00	0.00	9.0	0.00	16.7	0.00	24.6
10.00	0.00	8.1	0.00	15.0	0.00	22.2


**FREQUENCY DEVICES INC**

**NORMALIZED FREQUENCY RESPONSE TABLE**

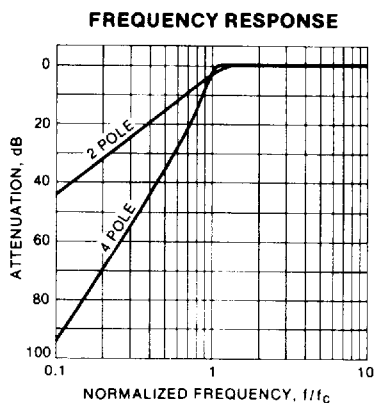
$f/f_c$	2 POLE		4 POLE	
	A (dB)	$\psi$ (°)	A (dB)	$\psi$ (°)
0.00	$\infty$	0.0	$\infty$	0.0
0.10	41.81	173.5	89.78	352.4
0.20	29.73	166.9	65.50	344.7
0.30	22.63	159.9	51.08	336.7
0.40	17.58	152.6	40.60	328.2
0.50	13.67	144.7	32.20	318.9
0.60	10.53	136.3	25.02	308.4
0.65	9.91	131.8	21.74	302.5
0.70	7.98	127.3	18.61	296.0
0.75	6.89	122.7	15.60	288.6
0.80	5.91	118.0	12.71	280.2
0.85	5.04	113.4	9.94	270.5
0.90	4.27	108.7	7.34	259.1
0.95	3.60	104.1	4.98	245.8
1.00	3.01	99.5	3.01	230.7
1.10	2.06	90.9	0.59	199.0
1.20	1.37	83.0	-0.14	172.3
1.30	0.88	75.9	-0.18	152.9
1.40	0.53	69.6	-0.10	138.7
1.50	0.29	64.1	-0.03	127.7
2.00	-0.16	45.2	-0.07	93.2
2.50	-0.20	34.8	-0.17	73.4
3.00	-0.17	28.3	-0.20	60.4
3.50	-0.14	23.9	-0.19	51.2
4.00	-0.12	20.7	-0.17	44.5
5.00	-0.08	16.4	-0.13	35.2
6.00	-0.06	13.5	-0.10	29.2
7.00	-0.04	11.6	-0.08	24.9
8.00	-0.03	10.1	-0.06	21.7
9.00	-0.03	8.9	-0.05	19.3
10.00	-0.02	8.0	-0.04	17.3


**FREQUENCY DEVICES INC**
**FREQUENCY RESPONSE**

**STEP RESPONSE**

**NORMALIZED FREQUENCY RESPONSE TABLE**

$f/f_c$	2 POLE		4 POLE	
	A (dB)	$\psi$ (°)	A (dB)	$\psi$ (°)
0.00	$\infty$	0.0	$\infty$	0.0
0.10	42.79	174.3	91.87	353.8
0.20	30.69	168.5	67.57	347.4
0.30	23.56	162.5	53.11	340.8
0.40	18.45	156.0	42.58	333.8
0.50	14.46	149.0	34.09	326.1
0.60	11.21	141.4	26.80	317.4
0.65	9.80	137.3	23.44	312.4
0.70	8.51	133.1	20.21	306.9
0.75	7.34	128.8	17.08	300.6
0.80	6.28	124.3	14.02	293.3
0.85	5.32	119.7	11.03	284.6
0.90	4.45	115.1	8.13	274.0
0.95	3.69	110.4	5.40	261.0
1.00	3.01	105.7	3.01	245.3
1.10	1.91	96.6	0.09	209.2
1.20	1.10	88.0	-0.50	178.9
1.30	0.53	80.2	-0.31	158.4
1.40	0.14	73.2	-0.11	144.1
1.50	-0.12	67.0	-0.01	133.2
2.00	-0.50	46.1	-0.25	98.2
2.50	-0.44	35.0	-0.46	76.9
3.00	-0.35	28.2	-0.50	62.7
3.50	-0.28	23.7	-0.46	52.8
4.00	-0.22	20.4	-0.40	45.5
5.00	-0.15	16.1	-0.30	35.7
6.00	-0.10	13.3	-0.22	29.4
7.00	-0.08	11.3	-0.17	25.0
8.00	-0.06	9.9	-0.13	21.8
9.00	-0.05	8.7	-0.11	19.3
10.00	-0.04	7.9	-0.09	17.3

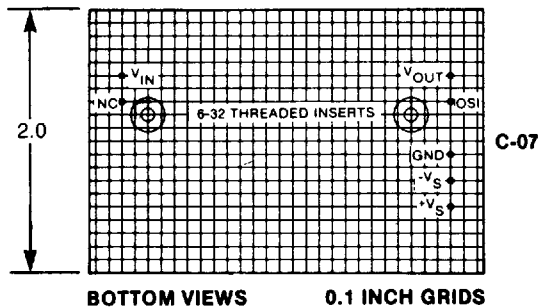
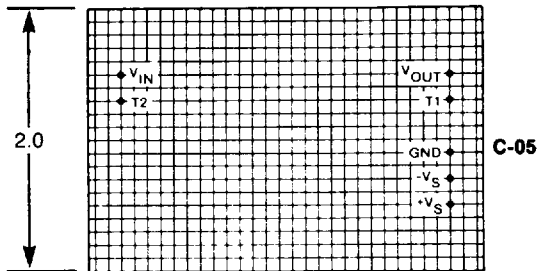
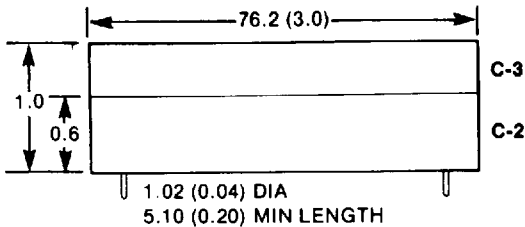


## FREQUENCY DEVICES INC



NORMALIZED FREQUENCY RESPONSE TABLE

$1/f_c$	2 POLE		4 POLE	
	A (dB)	$\psi(^{\circ})$	A (dB)	$\psi(^{\circ})$
0.00	$\infty$	0.0	$\infty$	0.0
0.10	43.79	175.2	93.61	354.9
0.20	31.67	170.2	69.29	349.7
0.30	24.51	165.0	54.81	344.3
0.40	19.36	159.5	44.24	338.5
0.50	15.30	153.4	35.71	332.2
0.60	11.94	146.7	28.33	324.9
0.65	10.47	143.1	24.93	320.8
0.70	9.11	139.3	21.63	316.1
0.75	7.86	135.4	18.41	310.9
0.80	6.70	131.2	15.23	304.6
0.85	5.64	126.8	12.07	297.1
0.90	4.67	122.3	8.93	287.7
0.95	3.80	117.7	5.85	275.5
1.00	3.01	113.0	3.01	259.6
1.10	1.71	103.4	-0.55	218.8
1.20	0.73	94.1	-0.92	184.3
1.30	0.04	85.3	-0.43	163.1
1.40	-0.42	77.4	-0.11	149.2
1.50	-0.71	70.3	-0.00	138.7
2.00	-0.98	46.8	-0.56	103.6
2.50	-0.78	34.7	-0.95	80.4
3.00	-0.59	27.7	-0.99	64.6
3.50	-0.45	23.1	-0.89	53.6
4.00	-0.36	19.8	-0.76	45.8
5.00	-0.23	15.5	-0.55	35.5
6.00	-0.16	12.8	-0.41	29.0
7.00	-0.12	10.9	-0.31	24.6
8.00	-0.09	9.5	-0.24	21.3
9.00	-0.07	8.4	-0.19	18.8
10.00	-0.06	7.5	-0.16	16.9

**FREQUENCY DEVICES INC**
**DIMENSIONS IN MM(Inches)**

**TERMINAL KEY**

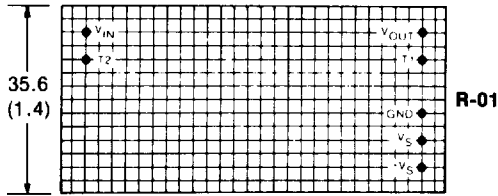
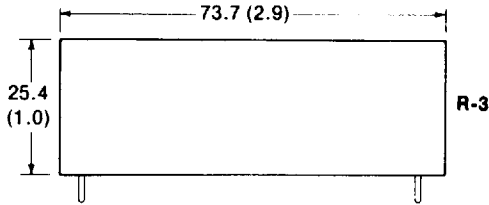
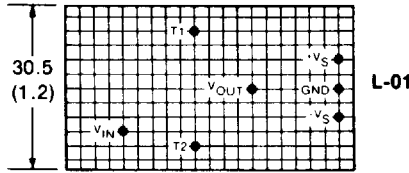
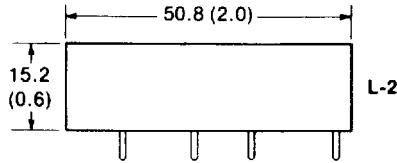
V <sub>IN</sub>	Signal Input
V <sub>OUT</sub>	Signal Output
T <sub>1</sub> , T <sub>2</sub> , OSI	Offset Trim
NC	No Connection
+V <sub>S</sub>	Supply Voltage, Positive
GND	Ground, Supply Common
-V <sub>S</sub>	Supply Voltage, Negative



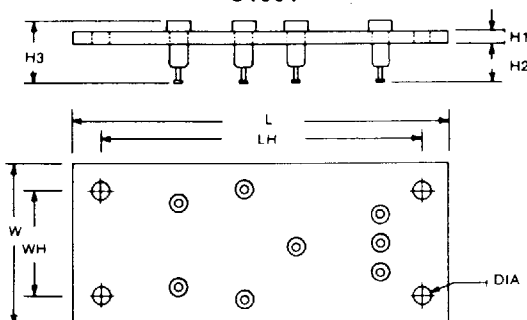


## FREQUENCY DEVICES INC

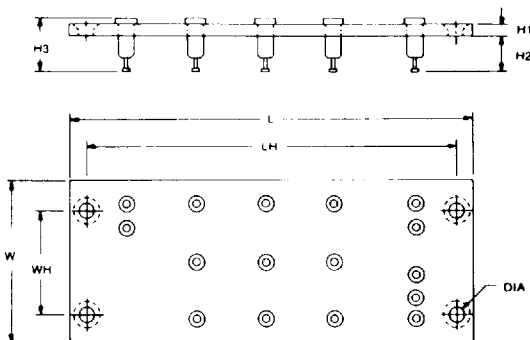
## DIMENSIONS IN MM (inches)



BOTTOM VIEWS 0.1 INCH GRIDS


**FREQUENCY DEVICES INC**
**S1001**


DIMENSION	MILLIMETERS	INCHES
L	71	2.8
LH	61	2.4
W	30	1.2
WH	20	0.8
H1	2.3	0.09
H2	7.9	0.31
H3	12	0.47
DIA	3.5	0.14

**S1002**


DIMENSION	MILLIMETERS	INCHES
L	89	3.5
LH	81	3.2
W	36	1.4
WH	23	0.9
H1	2.3	0.09
H2	7.9	0.31
H3	12	0.47
DIA	3.5	0.14


**FREQUENCY DEVICES INC**
**HOW TO ORDER**

All of the basic fixed frequency highpass active filter model numbers are listed in the Available Models and Specifications Table. In each case a simple corner frequency code must be added to complete the part number. For Tchebyscheff models a passband ripple code is also required.

**PASSBAND RIPPLE** for Tchebyscheff models is designated by adding one of these codes directly onto the basic model number:

RIPPLE	CODE(r)	EXAMPLE
0.2dB	A2W	751H2YA2W-f
0.5dB	A5W	751H2YA5W-f
1dB	1W	751H2Y1W-f

**CORNER FREQUENCY** is designated in Hertz using either a letter A instead of a decimal point or a letter K instead of a thousands comma:

FREQUENCY	CODE(f)	EXAMPLE
0.00123Hz	A00123	751H2B-A00123
12.3Hz	12A3	723H6B-12A3
12.3kHz	12K3	712H2YA5W-12K3

Installation sockets are ordered simply by listing as a separate line item on your P.O.