



# PRELIMINARY DATA SHEET MODEM FILTER SET

## CH1710/20/30/40-01 212 TYPE 1200/300 bps MODEM FILTER SET

### FEATURES

- Bell 212 compatible realization with compromise line equalization (amplitude and group delay).
- No external components.
- $0 \pm 1.5$  dB gain at center frequency.
- 100 k $\Omega$  typical input impedance.
- $\pm 5$  V to  $\pm 18$  V power supply range.
- Compatible with 300 bps Bell (103/113) operation in low speed mode.
- 75 dB dynamic range in 3 kHz bandwidth.
- Compact design occupies less than 5 sq. inches of board space.
- 45 dBm receiver sensitivity.
- Low sensitivity of amplitude and delay responses to temperature and power supply variations.
- Out of band signal rejection in conformance with FCC, part 68.

### GENERAL DESCRIPTION

The CH1710/20/30/40-01 series is a family of 1200/300 bps filters designed for use in 212-type data sets. The CH1710-01 and CH1730-01 are ten pole delay equalizers and the CH1720-01 and CH1740-01 are ten pole bandpass filters. The CH1710-01 and CH1720-01 operate together as a low band receive/transmit filter and the CH1730-01 and CH1740-01 as a high band receiver/transmit filter for 212 modem applications.

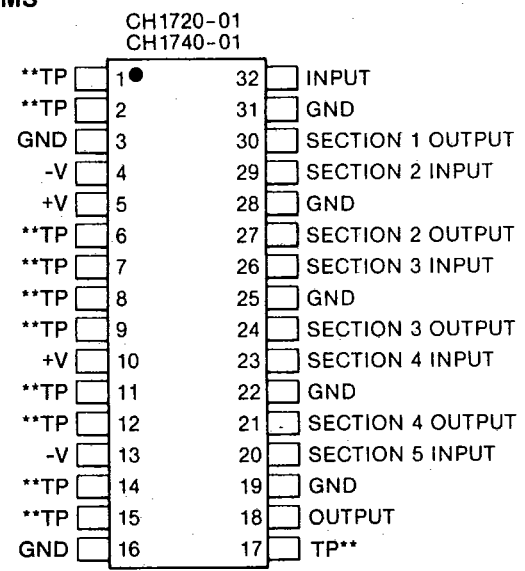
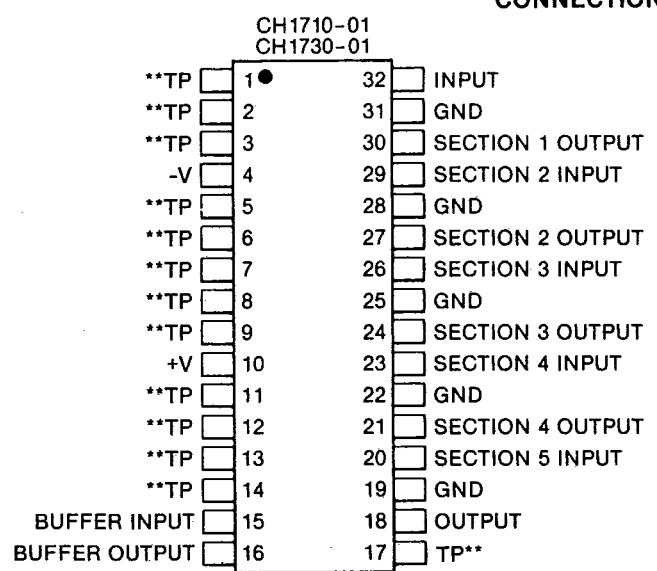
All are thick film hybrids and are packaged in 32-pin dual in-line ceramic packages.

The envelope delay response of each delay equalizer is parabolic in shape and provides compensation for filter and line delay distortions to improve data quality.

The CH1710-01 and CH1730-01 have an extra operational amplifier, which is available as an input buffer.

The ten pole delay equalizers (the CH1710-01 and CH1730-01) are to be placed first in the cascade as to present a low driving impedance to the filters.

### CONNECTION DIAGRAMS



\*\*TP denotes factory test point. Leave unconnected to any other component used, or ground, power supply.

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# ABSOLUTE MAXIMUM RATINGS

Supply Voltage:  $\pm 18$  Volts DC

Operating Temperature Range:  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$

Input Signal Voltage Swing:  $\pm 17$  V<sub>p.p</sub>

## ELECTRICAL CHARACTERISTICS (at $V_S = \pm 12$ V and $25^{\circ}\text{C}$ unless specified otherwise)

Parameter	Symbol	Conditions	Tandem Connection						
			CH1710-01/1720-01			CH1730-01/1740-01			
			Min.	Typ.	Max.	Min.	Typ.	Max.	Units
Center Frequency	f <sub>C</sub>			1200			2400		Hz
Bandwidth	BW	750 ≤ f ≤ 1650 Hz (CH1710-01/20-01)		900					Hz
		1950 ≤ 2850 Hz (CH1730-01/40-01)				900			Hz
Passband Ripple (within Bandwidth)	ΔA	750 ≤ f ≤ 1650 Hz (CH1710-01/20-01)			±1.5				dB
		1950 ≤ f ≤ 2850 Hz (CH1730-01/40-01)						±1.5	dB
Voltage Gain	A <sub>V</sub>	V <sub>IN</sub> = 775 mV <sub>rms</sub> f = 1200 Hz (CH1710-01/20-01)	-2.0	0	+2.0				dB
		f = 2400 Hz (CH1730-01/40-01)				-3.5	-1.5	+5	dB
Input Impedance	Z <sub>IN</sub>	f = 1 kHz	60	100		60	100		kΩ
Output Impedance	Z <sub>O</sub>				10			10	Ω
Adjacent Channel Attenuation	A <sub>R</sub>	f = 1200 ± 300 Hz (CH1730-01/40-01)				55			dB
		f = 2400 ± 300 Hz (CH1710-01/20-01)	55						dB
Output Voltage Swing producing –60 dB of THD at ±12V V <sub>S</sub>	E <sub>O</sub>	f = 1200 Hz (CH1710-01/20-01)		6					V <sub>rms</sub>
		f = 2800 Hz (CH1730-01/40-01) 1200 & 2800 Hz are Max. gain frequencies R <sub>L</sub> = 1 kΩ					6		V <sub>rms</sub>
Output Noise Level, (Buffer Input Grounded)	E <sub>N</sub>	R <sub>L</sub> = 1 kΩ; AC component only		0.7			0.7		mV <sub>rms</sub>
DC Output Offset Voltage	V <sub>OS</sub>	In tandem connection; on the output of CH1720-01/40-01		+10			+10		mV
Power Supply Voltage	V <sub>S</sub>		±5	±12	±18	±5	±12	±18	V
Power Supply Current	I <sub>S</sub>	V <sub>S</sub> = ±12V, V <sub>IN</sub> = 2.2V <sub>P.P</sub> Current in tandem connection		23			23		mA
Power Consumption	P <sub>C</sub>	Over the power supply Consumption Range	220	560	900	220	560	900	mW

## FUNCTIONAL DESCRIPTION

When used as the transmit filter, the CH1710-01/20-01 tandem is switched after the PSK (1200bps operation) or FSK (300bps operation) modulator and in front of the telephone line interface circuit. When used as the receive filter, the CH1710-01/20-01 is switched after the telephone line interface circuit and in front of the PSK or FSK demodulator. The CH1730-01/40-01 circuit is used the same way when transmitting or receiving in the high frequency band.

Compromise delay and amplitude equalization are based on Bell telephone line characteristics. Low intersymbol interference is thus attainable over more than 90% of dialed or leased connections. The CH1720-01, CH1740-01 shape the signal in passband ( $f_C \pm 600$  Hz, where  $f_C = 1200$  Hz for the

CH1720-01 & 2400 Hz for the CH1740-01) and attenuate the adjacent channel band.  $2400 \pm 600$  Hz and  $1200 \pm 600$  Hz is the attenuation band for the CH1720-01 and CH1740-01 filters respectively. The filters will also attenuate the out-of-passband spectral components to satisfy the FCC, part 68 requirements. The dynamic range and adjacent channel rejection capabilities of the complete modem are essentially determined by the filters. Spectrally weighted, the adjacent channel attenuation is in excess of 60 dB. This allows it to realize -45dBm receiver sensitivity. The nominal input level into the filter sets is 0dBm. The delay equalizers have flat amplitude over the 0-50kHz frequency band.

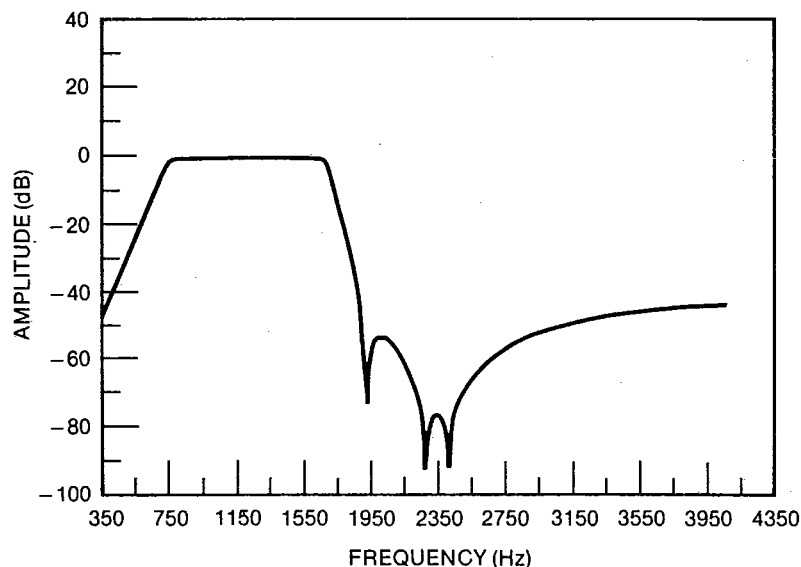


Figure 1. Typical Response of Lowband 212 Filter (CH1710-01 & CH1720-01, Tandem)

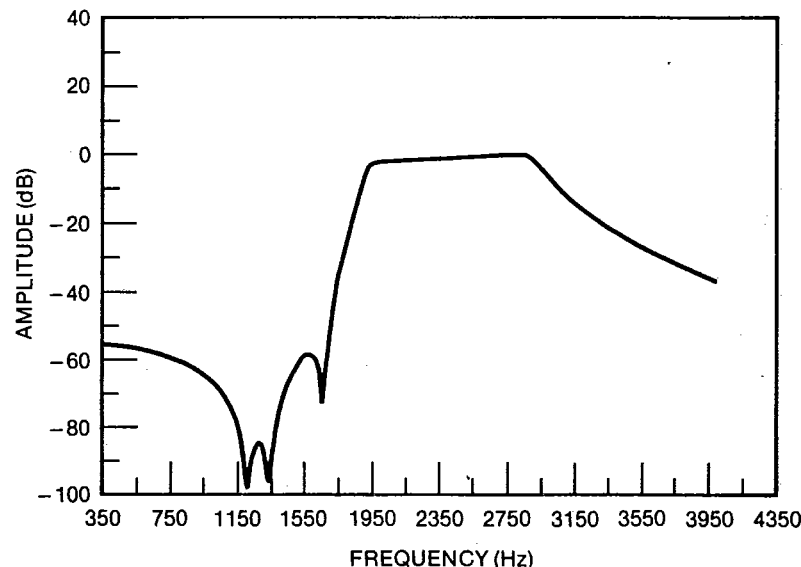
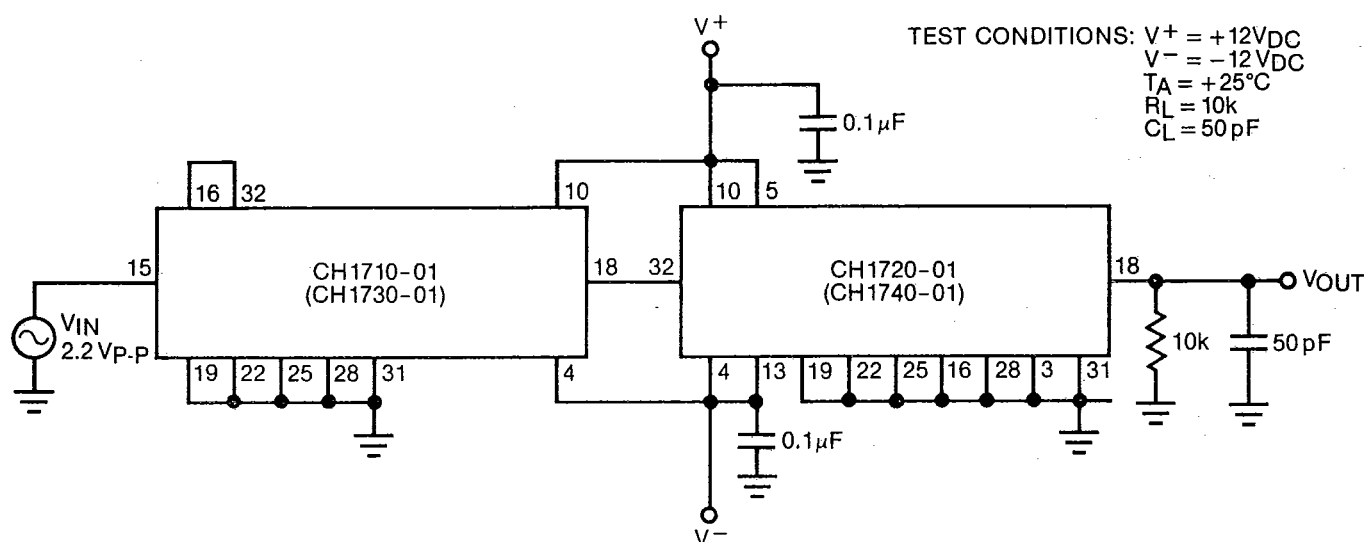


Figure 2. Typical Response of Highband 212 Filter (CH1730-01 & CH1740-01, Tandem)

RECOMMENDED TEST CIRCUIT



PACKAGE DIMENSIONS (INCHES)

