

# cd4 - 392

As most quadro-enthusiasts will know, an integrated demodulator for CD-4 has been available in the retail trade for several months now: the CD4-392.

In this article, we are pleased to present all relevant information concerning pinning and specifications. A practical circuit using this IC is included.

We received this article one day before going to press, so we are presenting it as received from JVC — with their original drawings.

—Ed.

At present in Japan 8 record companies are releasing CD-4 discs on 31 labels and 750 albums are available. People throughout Japan are enjoying a wide variety of music from CD-4 records.

In America, 350 CD-4 albums are available on 13 labels including those of the RCA and WEA groups. Recently the A & M label with its excellent reputation in the field of popular music has joined the CD-4 family. We expect that the number of CD-4 releases will grow in the future. Supporting this, CD-4 playback equipment has been greatly improved by the enhancement of the fidelity of pickup cartridges and demodulators. Initially CD-4 playback equipment was designed for incorporation in big console-type stereo systems; now the ground-work for its incorporation in component systems has been completed. The introduction of a low-priced demodulator will make available high performance playback equipment in a price range which will make it more popular. This has been achieved after a year of cooperation between JVC, the inventor of the CD-4 system, and Signetics, one of the world's leaders in linear IC technology.

The CD4-392 single monolithic IC has two basic functions, a carrier recovery system and an audio processing system. This monolithic IC's parameters are sufficient to allow the user flexibility in the design of either high performance or minimum cost demodulators.

## Features of the CD4-392 IC chip

The CD4-392 IC chip developed for CD-4 playback offers the following advantages.

1. Versatility and wide range of applications. The CD4-392 IC can be used in a number of design configurations, either low-priced for consumer use or high-priced for professional applications. This IC is designed to be adaptable to newer methods of carrier recovery which may be introduced in the future.
2. Automatic compensation for carrier dropout. CD-4 demodulators using

<b>Matrix &amp; audio amplifiers</b>	
THD ( $V_O = 1.5\text{ V}$ )	
RMS)	: < .05%
Equiv. input noise voltage	: < $2\text{ }\mu\text{V}$
Gain balance	: < 0.2 dB
Output swing	: > 3 V RMS

## Carrier recovery system

Sensitivity (30 dB quieting 3% deviation)	: < $200\text{ }\mu\text{V}$
Distortion ( $\pm 20\%$ deviation)	: < 0.2%
S/N ( $V_{\text{carrier}} = 20\text{ mV}$ , $\pm 20\%$ dev)	: > 70 dB
PLL freq. drift with temp	: < $200\text{ ppm}/^\circ\text{C}$

Table 1. Typical CD-4 Demodulator Performance ( $V_{CC} = 12\text{ V}$ ).

CD4-392 ICs can be designed to compensate automatically for unexpected carrier dropout and for other undesirable input conditions. The carrier level is also automatically adjusted for cartridge output levels from 1 to 7 millivolts.

3. High performance combined with economy. The performance of a typical CD-4 demodulator is shown in table 1.

Each block on the integrated circuit is designed for lower noise and distortion and wider dynamic range than previous circuits; this was considered essential if the degree of demodulator performance demanded today was to be realized. Inputs and outputs of the circuit blocks are designed to have high and low impedances respectively. Gain, balance and signal level at all block terminals have been established so that external components such as filters and equalizing networks can be simplified. The CD4-392 IC is of the standard 16-pin configuration and two are required for a complete demodulator. The pin configuration is shown in figure 1.

## Description of the IC

Figure 2 is a block diagram. The single monolithic chip contains two basic systems, a carrier recovery system and an audio processing system. The carrier recovery system consists of a limiter amplifier, a PLL and a synchronous detector. The PLL includes a phase detector, lock range tracer, VCO (voltage controlled oscillator) and audio amplifier. The audio processing system consists of an automatic noise reduction system (ANRS), its driving amplifier and a matrix circuit. A regulator provides stabilized power for the IC. Lock range characteristics of the PLL are shown in figure 3. These are extremely wide, the DC lock range characteristic being some 20 dB wider than the AC characteristic. Such a wide range is unusual in PLL systems and allows correct synchronization with any input con-

## NEW CD-4 MODULATION SYSTEM MARK-III

