



# CH1816 Data Access Arrangement (DAA) Direct Connect Telephone Line Interface

T-75-37-05

## INTRODUCTION

The Cermetek CH1816 DAA module provides complete DAA (Data Access Arrangement) for direct connection to telephone lines. This device meets or exceeds FCC requirements under Part 68 for direct connection to the telephone line for specified surge, hazardous voltage and leakage, therefore making it easily FCC Part 68 registerable. This minimizes costs and delays associated with Part 68 testing and registration.

The user will be required to submit his ultimate design to the FCC for approval. See Design Considerations for specifics. Cermetek can assist with the registration.

This product is packaged in a module (1.25" x 1.0" x 0.5") making it easy to integrate into new designs. The product can be mounted directly on a Printed Wiring Board (PWB) or it can be socketed. It requires only 1.25 square inches of board space. Connection is made through pins on 0.10 inch centers. The telephone line connection is made through a user supplied RJ-11C or equivalent jack.

## PRINCIPLES OF OPERATION

### Hook Switch Control

In the Public Switched Telephone Network (PSTN) the wires from a telephone to the phone company's central office (CO) is referred to as the local loop. Drawing current from the local loop signals the central office that the telephone is Off Hook, that is, either answering a call or preparing to place a call. In the CH1816 this function is controlled by the OFFHK signal. When this input is LOW, the DAA is On Hook indicating to the central office it is ready to receive calls. When OFFHK is HIGH, the DAA is Off Hook indicating to the central office it is using the line. The DAA can pulse dial by toggling the OFFHK input.

### Ring Detection

The central office signals an incoming call by placing a ring signal on the local loop. The DAA monitors the loop for this signal. The Ring indication output, RI, is normally HIGH. When ringing appears, RI is set LOW during the typically 2 second ring period and is restored to HIGH for the typically 4 seconds between rings. The ring detection circuit is designed to prevent false indications due to noise or pulse dialing on the line.

### Transmit Signal

Audio signals destined for the phone line are called transmit audio. These signals are applied between the XMIT pin and signal ground. See Electrical Specifications for signal levels.

### Receive Path

The signal presented at the RCV pin comes from the 2-wire to

## Cermetek CH1816 DAA Feature Set:

- Pin compatible with XE0002 and DS6112: Form, Fit, Function
- FCC Part 68 registerable
- Complete DAA function
- Hook switch control
- Ring detection
- Pulse dial capability
- Small size 1.25" x 1.0" x 0.5"
- Occupies only 1.25 square inches of board space
- Low power consumption and  $\pm 5$  volt operation
- 1500 volt isolation
- 800 volt surge protection
- Built-in hybrid (2-wire to 4-wire conversion)
- Ringer equivalence of 0.2A

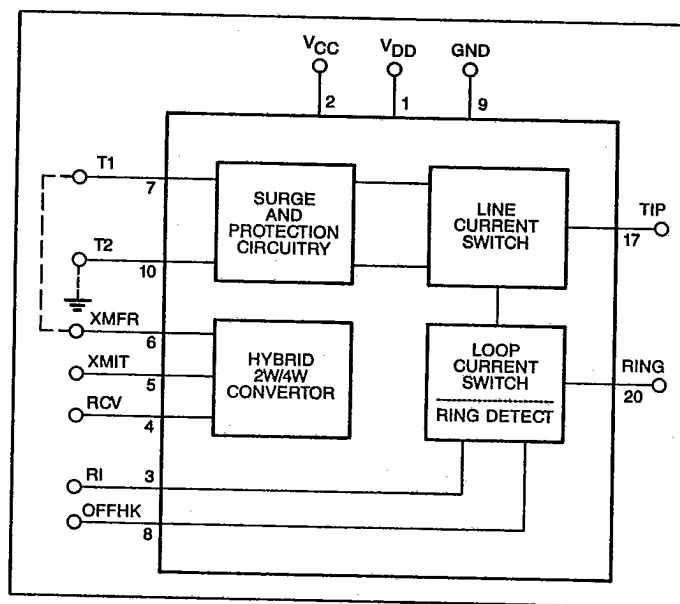


Figure 1. CH1816 DAA Block Diagram

4-wire converter. The output of the 2-wire to 4-wire converter is connected to RCV. The level of the signal at RCV will be the same as that of the received signal on the phone line.

### 2-wire to 4-wire Converter (Hybrid)

This functional block has two functions: 1) It applies the XMIT signal to the phone line, 2) It subtracts this signal from the total signal on the phone line to produce the received signal. The accuracy of this subtraction process depends on how closely the impedance of the phone line matches 600 ohms. Generally a small amount of the XMIT signal will appear at RCV. The ratio of the XMIT signal applied to the signal returned is called trans-hybrid

rejection. For a phone line impedance of 600 ohms  $\pm 30\%$ , the hybrid will yield a rejection of at least 10 dB.

The CH1816 is configured to allow the use of an external 2-wire to 4-wire converter when required by design constraints. In this case XMIT (Pin 5) and T1 (Pin 7) are connected together and to the 2-wire side of the external hybrid (See Block Diagram). The 2-wire side of the external hybrid should have an impedance of 536 ohms to create an impedance of 600 ohms toward the phone line.

The 2-wire to 4-wire converter may be bypassed when it is not required by connecting directly to the T1 and T2 inputs.

Using an external hybrid or bypassing the built-in hybrid will not interfere with the Ring Detect function.

## DESIGN CONSIDERATIONS

The CH1816 DAA includes circuits that couple the modem signals to the phone line and provides FCC required isolation and protection. The FCC registration process by the host product can be minimized provided that the following guidelines are followed.

- 1) The mounting of the DAA in the final assembly must be made so that it is isolated from exposure to any hazardous voltages within the assembly. Adequate separation and restraint of cables and cords must be provided.
- 2) Connection to the phone line should be made through a standard RJ-11C jack or equivalent.
- 3) Circuit board traces from the DAA's TIP and RING pins **must** exceed 0.1 inch spacing to one another and 0.2 inches spacing from all other traces or other conducting material. Traces should have a nominal width of 0.020 inches or greater.
- 4) RING and TIP traces should be as short as possible and should be oriented to prevent coupling from other signals on the host circuit card.

- 5) The DAA Module is a sensitive subsystem that should be treated as any other integrated component. Pay special attention to the power supply to the DAA. The device handles signals in the millivolt range. Even though it is designed to handle noise in the power supply, steps should be taken to assure the noise level does not exceed 50 mV peak-to-peak.
- 6) For voice and data calls, Part 68 rules require silence on the phone line for at least 2 seconds after a data call has been completed to allow central offices to exchange billing information and specifies the transmit level must not exceed  $-9$  dBm. The FCC rules also require that for voice calls the final system meet the requirements of Part 68 for Out-of-Band Energy, and DTMF Transmit Levels. Because the CH1816 already meets FCC requirements for Part 68 registration for High Voltage Isolation and Surge Protection, the certification of the product is normally a simple process that often can be completed directly with the FCC. If desired, independent testing labs are available that can test the system and submit the required paperwork to the FCC for approval. Cermetek can assist with the registration.

- 7) The CH1816 DAA meets or exceeds the hazardous voltage, surge and leakage requirements of the FCC. For applications that connect to Canadian phone lines, governed by the DOC (Department of Communications), a higher level of transient protection is required, thereby making the two resistors and one varistor circuit shown below, mandatory. Adding these three devices will not affect FCC registration.

For applications that potentially will be connected to either U.S. or Canadian phone lines, it is recommended that this additional transient protection be designed in from the very start, since the incremental cost is low.

Components L1, L2, C1, C2 are optional and serve two purposes. First, they restrict high frequency signals from reaching the phone line and thereby add EMI protection. Second, they protect against externally generated RFI from degrading the modem's ability to operate on proper carrier signals. Adding these devices will not affect FCC or DOC registration.

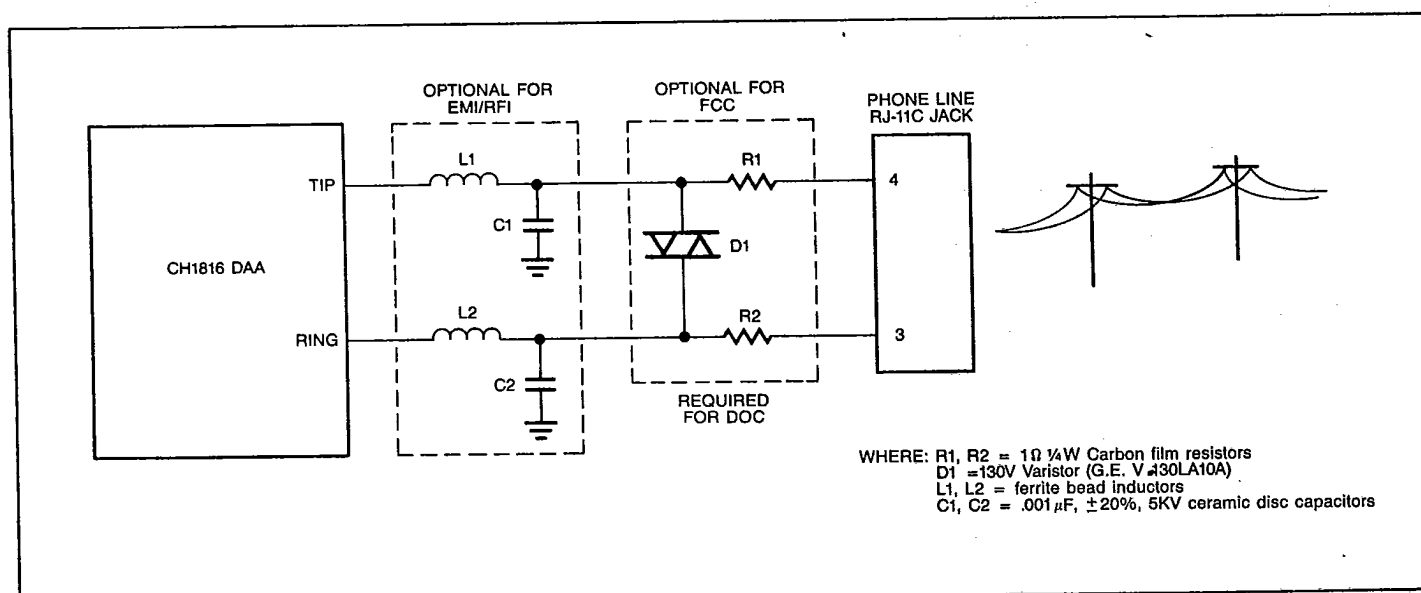


Figure 2. Phone Line Interface

## CH1816 DAA

## Electrical Specifications

 $V_{CC} = +5V \pm 5\%$ ,  $V_{DD} = -5V \pm 5\%$ ,  $T_A = 0^\circ \text{ to } 70^\circ \text{ C}$ 

Parameter	Conditions	Min	Typ	Max	Units
Supply Current			20	30	mA
Transmission Gain	Gain between transmit input and telephone line at 1800 Hz with 600 ohm termination	-0.5	0	+0.5	dB
Receive Gain	Gain between telephone line and receive output at 1800 Hz with 600 ohm termination	-0.5	0	+0.5	dB
Telephone Line Input Impedance	at 1800 Hz	540	600	660	Ohms
Coupler Match Impedance	Output impedance of external circuitry when T1 driven directly to provide 600 ohm phone line impedance match	531	536	541	Ohms
Trans-Hybrid Loss	Attenuation between the transmitter input and receiver output at 1 kHz with 600 ohm termination	10	18		dB
Attenuation	Receive and Transmit attenuation at 300 Hz with 600 ohm termination		0.8	3	dB
Transmit Input Impedance	at 1800 Hz	8	10	12	KOhm
Receive Output Impedance	at 1800 Hz		10	100	Ohm
Ring Detect Sensitivity	AC voltage between Tip & Ring	38			Vrms
Hook Switch Control Voltage	High (off hook) Low (on hook)	2.0	3.0 0.5	0.8	Volts Volts
Hook Switch Control Current			0.5	1.0	mA

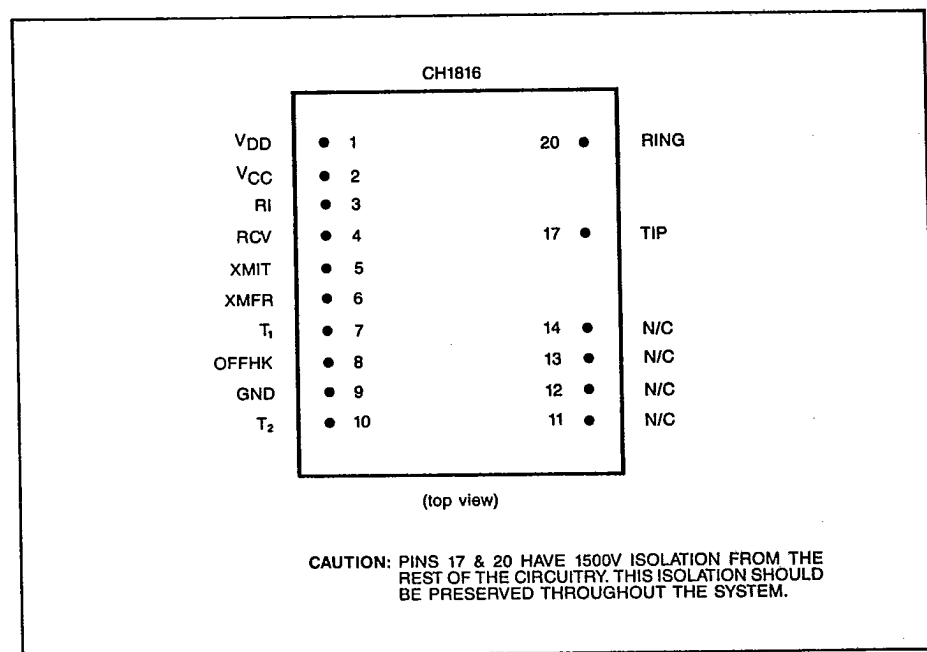


Figure 3. Pin Connections

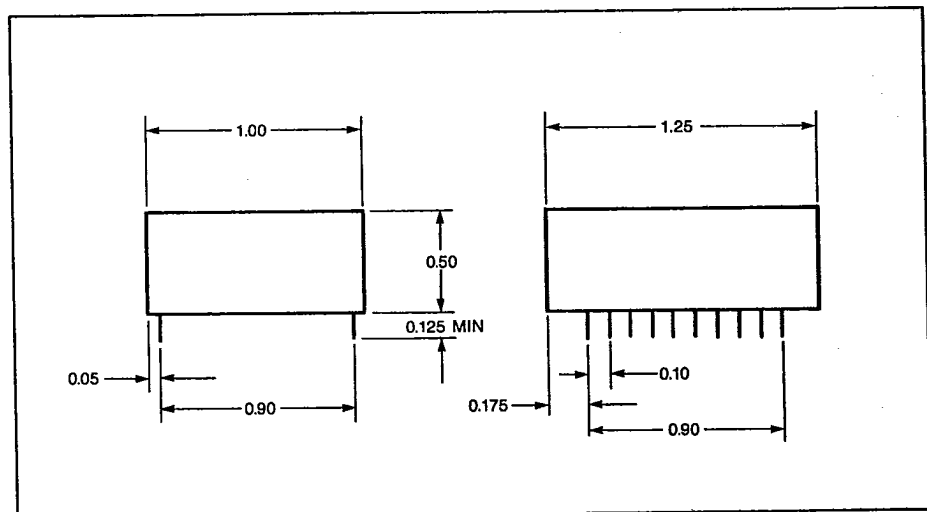


Figure 4. Mechanical Specifications

