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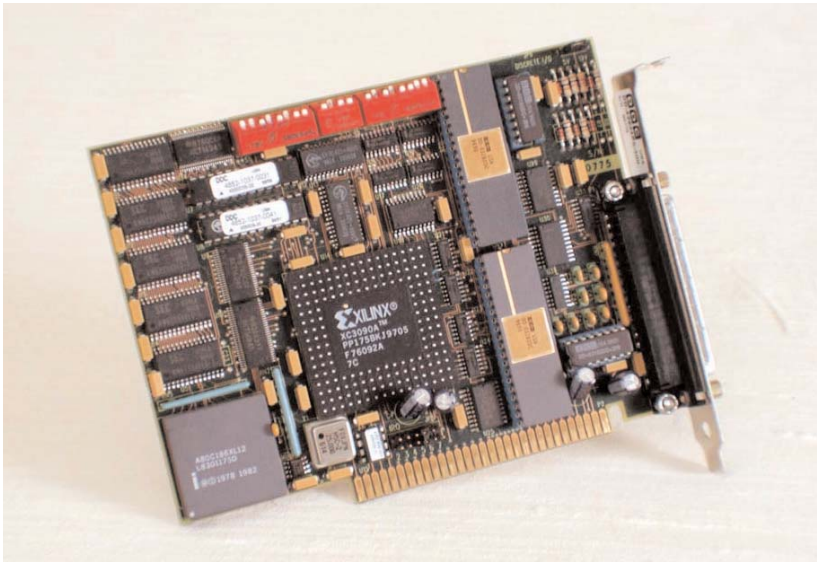
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# DD-429XRP5-300
# ARINC 429
# HALF-SIZE ISA INTERFACE CARD



## DESCRIPTION

The DD-429XRP5-300 is a half-size ISA interface card which provides an intelligent communications link between a host personal computer and an ARINC 429 data bus. It adheres strictly to the ARINC 429 specification by using the DDC chip set (DD-03282). The card also conforms to the Mark 33 Digital Information Transfer System 429-15 specifications and will communicate with the following ARINC specifications: 419, 429, 568, 575, 582, 717 and 724.

The card's small size, along with its memory mapping features, allows for the use of multiple cards in a single PC or portable computer. LRU developers find that these cards provide easy access for simulating and/or testing new systems prior to use with actual flight systems. Avionics maintenance and validation teams can perform end-item testing in the laboratory and, by using portable PCs, can continue testing in an aircraft environment.

The card has an on-board processor, which off-loads much of the low-level data processing from the host PC. The host PC easily transfers data to and from the card through the 16 Kbytes of dual-port RAM. It is fully compatible with the full size DD-429XRP1-300 PC Cards and software packages.

The card also works with DDC's advanced, easy-to-use, DD-42999S0 Commercial Avionics Utilities Software Suite. This optional application software includes an ARINC 429 Data Bus Analyzer, ARINC 615 Data Loader, and ARINC 739 MCDU Simulator.

Make sure the next Card you purchase has...

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## FEATURES

- One or Two Transmit Channels
- Two or Four Receive Channels
- High or Low Speed Data Rates
- On-Board Processor
- 16 Kilobytes Dual Port RAM for Real-Time Data
- 128 Kilobytes Program RAM
- Programmable Time-Stamping Resolution
- FIFO and Scheduled Transmission Methods
- Receive Data Filtering
- Five Discrete Inputs and Five Discrete Outputs
- Configurable PC Memory and I/O Addresses
- Programmable Interrupt Support
- Supports DOS, Windows® 3.X/95/98, Windows NT® and LabVIEW™
- Optional Application Software Available

FOR MORE INFORMATION CONTACT:

Technical Support:
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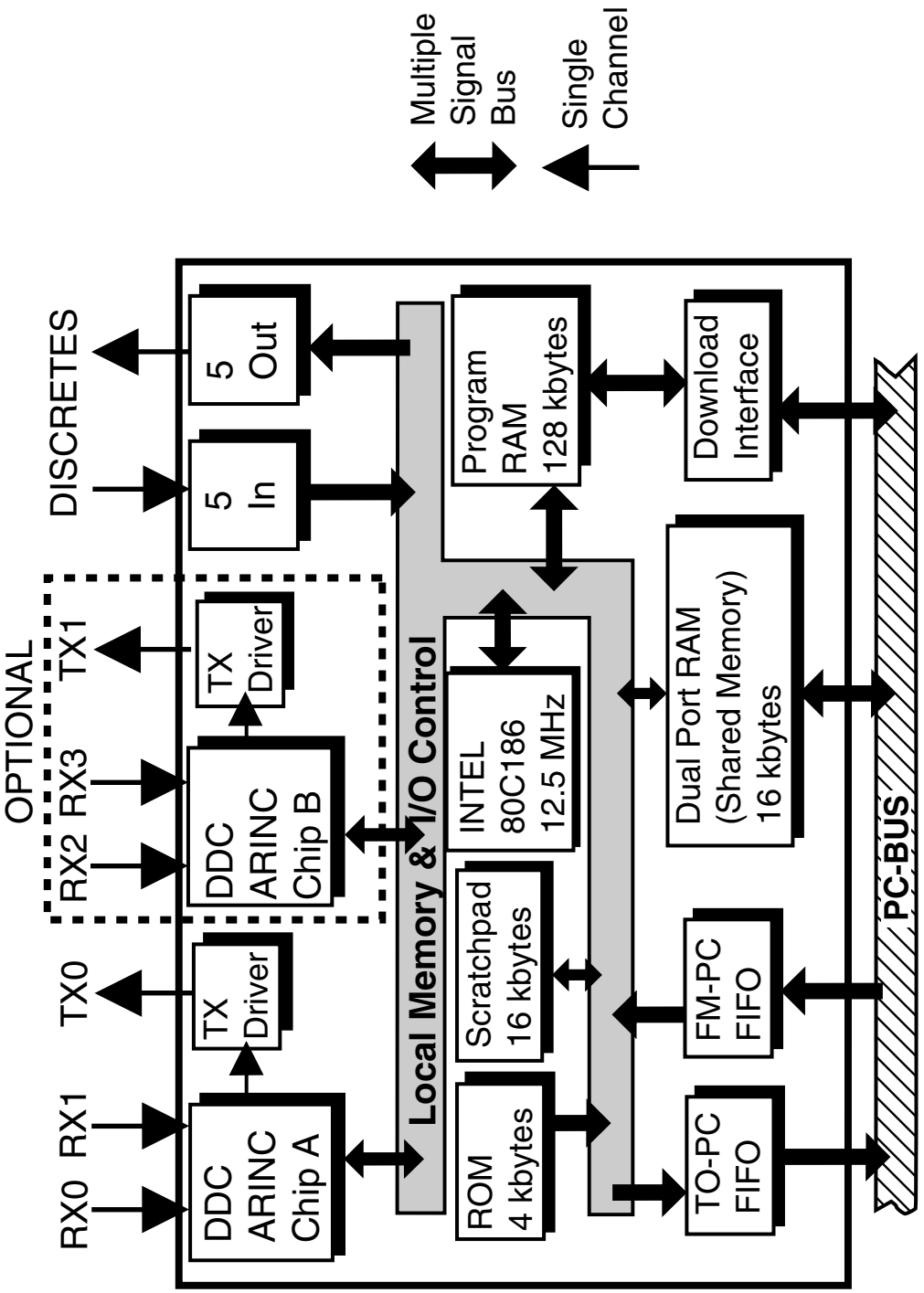



FIGURE 1. DD-429XRP5-300 HALF-CARD FUNCTIONAL BLOCK DIAGRAM



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| TABLE 1. DD-429XRP5-300 GENERAL SPECIFICATIONS | |
|---|---|
| **PARAMETERS** | |
| **ELECTRICAL CHARACTERISTICS** | |
| Operating Voltage : | 5.0 V ± 5% |
| Operating Current : | 350 mA max, one 429 driver<br>450 mA max, two 429 drivers |
| **ENVIRONMENTAL CHARACTERISTICS** | |
| Operating Temperature: | 0° – 50°C at no more than<br>95% relative humidity non-condensing |
| Storage Temperature: | -30° – 50°C at no more than<br>99% relative humidity non-condensing |
| **PHYSICAL CHARACTERISTICS** | |
| Half-Card Size: | 4.2" (10.7 cm) x 6.0" (15.2 cm) |
| I/O Connector: | DB-37 |

## TECHNICAL OVERVIEW

The Half-Card is user-programmable with an Intel 80C186 processor and 128 Kbytes of program RAM (which can be written by the host PC when the 80C186 processor is stopped). There are 4 Kbytes of ROM containing software that boots the on-board processor so that programs can be downloaded. The ROM code also aids in diagnostic testing.

Sixteen Kbytes of dual-port RAM that can be accessed by both the PC and the card's processor are provided. This dual-port RAM is used to reliably transfer data to and from the card. An additional 16 Kbytes of scratchpad memory is allocated for the processor. Command/Response FIFOs communicate commands and responses to and from the card.

## CARD OVERVIEW

The DD-429XRP5-300 card is available with one transmitter and two receivers or two transmitters and four receivers. Each of the transmit and receive channels can be operated at either high or low speed. In addition to the ARINC 429 transmitters and receivers, the card also has five input and five output TTL discretes which provide the capability to control external devices, monitor external events, indicate status, or provide general purpose use.

The DD-42912P5-300 card, with one transmitter and two receivers, is for users looking for a low-cost solution for test environments where few channels are needed. This card can also be upgraded to contain two transmitters and four receivers should additional channels be required.

The DD-42924P5-300 card, with two transmitters and four receivers, has the same features and functionality as the DD-42912P5-300 card.

## I/O ADDRESSING

The DD-429XRP5-300 card has switches that configure the I/O address at which the PC accesses the card. Since the switches allow any legal I/O address to be used, multiple cards can be installed in a single PC. The advanced API (Application Programming Interface) software library supports up to four cards for use in a single system.

## DUAL-PORT MEMORY ADDRESSING

The card has switches that configure the starting address at which the PC accesses the 16 Kbyte dual-port memory window. Valid settings are from A000:0000 to FC00:0000.

## PROGRAM MEMORY ADDRESSING MODES

The host PC can access the program memory through one of two available modes: Two-Page Mode and Eight-Page Mode. Two-Page Mode allows the PC to access a single 64-Kbyte window that can be switched between the first and second "halves" of the total 128-Kbyte program memory. The card has one switch that configures the starting address at which the PC accesses the 64-Kbyte program memory window.

Eight-Page Mode allows the PC to access the program RAM as eight 16-Kbyte pages. Selecting the complete address and current page is done entirely through the card's on-board Program RAM Paging Register.

Valid settings for a program RAM window range from A000:0000 to F000:0000. The program memory window can "overlap" the dual-port memory window, and memory windows of other DD-429XRP5-300 cards in the host PC.

## SCRATCHPAD RAM

The DD-429XRP5-300 card contains an additional 16 Kbytes of byte-wide RAM for data, which is accessible and used only by the 80C186 processor on the card.

## INTERRUPTS

A jumper bank on the card allows selecting which IRQ line the card uses to send interrupts to the PC. The valid settings are IRQ 2 to IRQ 7, or none. In addition, the DDC receive channels can be configured by the on-board software to interrupt the 80C186 processor.

The card is capable of generating interrupts to the host computer. The DLL and driver can generate interrupts in one of two ways:

- A frequency-driven approach, where the PC is interrupted every "X" milliseconds.

- A reception-driven approach, where the PC is interrupted every time an ARINC data word is received by one of a particular set of receivers, e.g., if the set of receivers is R0 & R2, a word received by either R0 or R2 will cause an interrupt to be sent to the PC.



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| TABLE 2. EXAMPLES OF STANDARD LIBRARY FUNCTIONS | |
|---|---|
| • ***Configuration***<br>*Initialize, OpenChannel, SetChannelSpeed, Shutdown*<br>• ***Multiple Card Support Functions***<br>*SetCurrentCard, GetCurrentCard*<br>• ***Transmitting***<br>*Transmit_FIFO, Transmit_FIFO_Block, Kill_Scheduled, Transmit_Scheduled, EnableParityAsData*<br>• ***Receiving***<br>*AddLabel, Receive_Mailbox, Receive_FIFO, Receive_FIFO_Block, Clear_FIFO* | • ***Status Inquiry***<br>*GetChannelStatus, GetChannelSpeed, GetPendingArincWords, GetScheduledLabelValue, GetTimerResolution*<br>• ***Time Calculation***<br>*Get429AbsoluteTime, SetInitialAbsoluteTime, Get429TimeDifference, ZeroCardClock*<br>• ***Interrupts***<br>*EnableGlobalCardToPcInt, ClearPCInterrupt*<br>• ***Also Reading/Writing Discretes, Diagnostics, Message Display, Error Handling & Utility Functions*** |

The programmer can choose which mode to set up a card for; choosing the frequency to interrupt the PC in the frequency-driven case, or the particular set of receivers in the reception-driven case. The card must be correctly enabled and disabled to ensure proper system operation.

The DisableGlobalCardToPcInt API library routine stops the card from generating interrupts to the host computer and restores the previous state of the interrupt that was being used. The EnableGlobalCardToPcInt API library routine will allow the host to set up an interrupt handler routine and define when to interrupt the host.

## DISCRETE I/O

There are two basic commands for handling the card's discrete inputs and outputs. The WriteDiscrete API library routine is used for setting the value of all discrete outputs on the card, and the ReadDiscrete API library routine is used for reading the value of the discrete inputs.

Each card provides five TTL-compatible discrete inputs and five TTL-compatible discrete outputs. The voltage level for the output discretes can be either +5 volts or +12 volts as selected by a jumper on the card. Each output can sink up to 100 mA. Each input discrete accepts any input between +2.5 and +24 volts as a "true" voltage, and - 24.0 to + 0.3 volts as "false." The inputs are CMOS-compatible.

## TIME STAMPING

The DD-429XRP5-300 card has time stamping capability. Each received data word will be time stamped if the user specifies to do so in the OpenChannel API library routine. The time stamping resolution is user programmable with a resolution of 1 to 20 ms.

Each receive channel will buffer two words which can be read by the 80C186 processor. Each transmit channel will buffer eight words which will be transmitted with a 4-bit interword gap when the transmitter is enabled.

Status bits, which can be read by the 80C186 processor, indicate the current status of the receive and transmit buffers.

Received words are automatically checked for parity, which can be set to even or odd. Proper parity (even or odd as specified by the application) is automatically generated for all transmitted words.

## RECEPTION

The DD-429XRP5-300 card has firmware installed that allows the programmer access to the following card features in a simple, easy to understand format:

- "Mailbox" type reception
- FIFO type reception
- Filtering of received data
- Time stamping of received data

The card is capable of receiving data in two modes: FIFO and mailbox.

When FIFO mode is selected through the OpenChannel API library routine, a First-In-First-Out queue is created in Dual-Port RAM, from which the host can read the received ARINC 429 data and time stamps in the exact order in which the words were received.



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When mailbox mode is selected through the OpenChannel API library routine, a Dual-Port RAM "mailbox" is created from which the host can read the most current data for a particular ARINC data word. Using this mode of reception, only the last received value for any label is stored by the DLL and can be requested by the user at any time by using the Receive_Mailbox API library routine. This mode of reception is extremely useful when the user is only concerned with the latest received data. Both FIFO and mailbox modes can be used simultaneously.

## TRANSMISSION

The DD-429XRP5-300 card has firmware installed that allows the programmer access to the following card features in a simple, easy to understand format:

- Queued FIFO transmission to any channel
- Scheduled label/SDI rate transmission to any channel

The scheduled transmission method allows the user to configure the card for automatic data transmission on a particular channel at regular intervals. If scheduled data is to be transmitted, the user must select scheduled mode through the OpenChannel API library routine.

The Transmit_Scheduled API library routine allows the host to define a schedule that will continuously be transmitted by the card. The user can assign a rate associated with each ARINC 32-bit data word. The data will get transmitted at the interval that the user has specified. If the user wishes to distinguish by SDI then the Transmit_Extended_Scheduled API library routine should be used.

The FIFO transmission method allows the user to transmit a series of ARINC data words in sequence.

This card is capable of transmitting data in both FIFO and scheduled modes. When both modes are being used the scheduled data will take priority over the FIFO data. The FIFO data will get transmitted in the gaps between scheduled data transmissions without altering the schedule.

## SELECTABLE OPTIONS

Card jumpers control PC interrupts. Card switches and jumpers control PC memory address and I/O addresses.

## INCLUDED SOFTWARE

### SOFTWARE LIBRARY

The DD-429XRP5-300 card comes with a complete API (Application Programming Interface) software library and drivers for DOS, Windows 3.x/95/98, and Windows NT. LabVIEW library support is also provided with the card for Windows 95/98 and Windows NT. The software is a runtime library that provides the user with a hardware abstraction layer for the card. The library includes routines that dramatically reduce software development time by providing a high-level software interface to the card. The library allows the user to program the card without detailed knowledge of the card's architecture. This software can support operation of up to four cards at the same time.

The software is made up of three parts: (1) The "HEX" file containing the Toolbox executable code that runs on the card and is automatically loaded when the software is initialized; (2) the header files used to develop software for the API software library which contains function prototypes and structure definitions; and (3) the library itself, which is supplied in Microsoft® Visual C™ and as a Windows DLL. The C Libraries have been developed for use with any memory model.

The Windows DLLs are provided as standard software, and are shipped with each card. This includes the Windows 3.x DLL (DD-42991S0-300), the Windows 95/98 DLL (DD-42965S0-300) and the Windows NT DLL and Kernel Driver (DD-42960S0-300).

### DIAGNOSTIC SOFTWARE AND TOOLS

The diagnostic software provided with each DD-429XRP5-300 verifies that the card is installed and operating properly. This is especially beneficial when a unit is first installed, providing verification that the card and PC are communicating, i.e., that the card is configured correctly for a particular PC.

The diagnostic software verifies the operation of the command/response FIFOs, the dual-port RAM, program RAM, the input and output discretes, the PC interrupts, the ARINC receive/transmit hardware, as well as the ARINC transmit drivers.

DDC provides a resource configuration tool which allows the user to easily assign software resources for the card to use. This program provides a graphical user interface to easily assign dual-port RAM, I/O memory, and IRQ resources for the card. The regeditor program is available as a free download on our web site, and works with Windows 95/98 and Windows NT.

## OPTIONAL APPLICATION SOFTWARE

DD-42999S0 - Commercial Avionics Utilities Software Suite
Includes: ARINC 429 Data Bus Analyzer
ARINC 615 Data Loader
ARINC 739 MCDU Simulator

## DOCUMENTATION

Detailed installation instructions and user documentation are provided with all products.

## CUSTOMER SUPPORT

Data Device Corporation is committed to providing unsurpassed customer support. All hardware has a two-year limited warranty. All library and driver updates are available free of charge for the life of the product. This does not include application software.



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## ORDERING INFORMATION

**DD-429XRP5-300 ARINC 429 ISA Interface Card**

**Transmitters, Receivers**
12 = One transmitter, two receivers
24 = Two transmitters, four receivers

**Included Software:**

**DD-42991S0**
API software library and drivers for DOS and Windows 3.x

**DD-42992S0**
Card Diagnostics for DOS and Windows 3.x

**DD-42965S0**
API software library and drivers for Windows 95/98

**DD-42967S0**
LabVIEW software library support for Windows 95/98

**DD-42960S0**
API software library and drivers for Windows NT

**DD-42961S0**
LabVIEW software library support for Windows NT

**regeditor**
Resource configuration set up tool for Windows 95/98 and Windows NT

All of the software listed above is provided free of charge on our web site at www.ddc-web.com

## OPTIONAL APPLICATION SOFTWARE

**DD-42999S0**
Commercial Avionics Utilities Software Suite
Includes: ARINC 429 Data Bus Analyzer
ARINC 615 Data Loader
ARINC 739 MCDU Simulator

These products contain tin-lead solder.

| STANDARD DDC PROCESSING FOR DISCRETE MODULES/PC BOARD ASSEMBLIES | | |
|---|---|---|
| **TEST** | **METHOD(S)** | **CONDITION(S)** |
| INSPECTION/WORKMANSHIP | IPC-A-610 | Class 3 |
| ELECTRICAL TEST | DDC ATP | — |



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**NOTES:**



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