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ARINC 429 PC Interface Cards

Half Size Cards

"The industry standard ARINC 429 test tool..."

- 1 or 2 transmit channels
- 2 or 4 receive channels
- High or Low speed
- On-board Intel 80C186 microprocessor (12.5 MHz)
- 16 KBytes Dual-Port RAM
- 5 In / 5 Out TTL discretes
- Configurable PC Memory and I/O Addresses
- Programmable Interrupts to the PC

Description

The PAC-429 Half-Card is a half size (IBM/AT Type, ISA/EISA compatible) PC Interface card which provides an intelligent communications link between a host personal computer and an ARINC 429 Data Bus. The half-card adheres strictly to the ARINC 429 specification by using the Harris Chip Set.

The PAC-429 Half-Card conforms to the Mark 33 Digital Information Transfer System 429-14 specifications and will communicate with the following ARINC specifications: 419, 429, 568, 575, 582, 717, 724.

The half-card's size, along with its advanced memory mapping features, allows more cards in a single PC as well as easy installation into a laptop computer.

LRU developers find that PAC-429 Half-Cards provide easy access for simulating and 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 or rack-mount PCs, they can continue testing in an actual aircraft environment.

The PAC-429 Half-Card has an on-board Intel 80C186 processor, which off-loads much of the low-level data processing from the host PC.

The host PC easily transfers ARINC 429 receive and transmit data to and from the card through the 16 KBytes of on-board dual-port RAM.

The PAC-429 Half-Cards are available with 1, or 2 transmitters and 2 or 4 receivers, all of which can be operated at either high or low speed.

The half-cards are fully compatible with the full size PAC-429 PC Cards and software packages.

Card Models

PAC-429C-1x2/H

The PAC-429 1x2 card supports one transmitter and two receiver channels. This card is designed to support users looking for a low-cost solution for test environments where few channels are needed. The 1x2 half-card can also be upgraded to a 2x4, should additional channels be required.

PAC-429C-2x4/H

The PAC-429 2x4 card supports two transmitter and four receiver channels. Except for the additional channels, this card has the same features and functionality as the PAC-429 1x2 half-card.

Card Features

I/O Addressing

The PAC-429 Half-Card has two switches that configure the I/O address at which the PC accesses the half-card. Since the switches allow any legal I/O address to be used, an unlimited number of cards can be placed in a single PC.

Dual-Port Memory Addressing

The half-card has two 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 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 half-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 memory window is from A000:0000 to F000:0000. The program memory window can "overlap" the dual-port memory window, and memory windows of other PAC-429 Cards in the system.

Scratchpad RAM

The PAC-429 Half-Card contains 16 KBytes of byte-wide RAM for data, which is accessible only by the 80C186 processor on the card.

Interrupts

There is a jumper bank on the half-card that selects which IRQ line the card uses to send interrupts to the PC. The valid settings are IRQ 2, IRQ 3, ... , IRQ 7, or none. In addition, the Harris receive channels can be configured by the on-board software to interrupt the 80C186 processor.

Discretes

Each PAC-429 Half-Card provides 5 TTL compatible discrete inputs and 5 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 of current.

Each input discrete accepts any input between 2.5 and 24 volts as a "true" voltage, and -24.0 to 0.3 volts as ÒfalseÓ. The inputs are CMOS compatible.

ROM Features

The software in ROM, which starts executing when the PC is first powered up, responds to a number of commands that are placed in the FROM-PC FIFO.

The ROM commands include the following built-in-test functions: generate a PC interrupt, fill dual-port with decrementing values, fill the first page of program RAM with NOPs, turn on all the discrete outputs, and loop FROM-PC FIFO to TO-PC FIFO.

In addition, there are commands that cause the half-card to jump to a certain address and begin executing, which are used by software developers to run newly loaded programs.
ARINC 429 Interface

Each receiver channel will buffer two words which can be read by the 80C186 processor. Each transmitter channel will buffer eight words which will be transmitted with the minimum 4 bit 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 expected 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.

Any receiver or transmitter can be either high or low speed. On the receive channels, data can be filtered by the hardware based on the SDI (bits 9 and 10).

Included Software

Programmer's Toolbox

The Programmer's Toolbox is a library of driver functions included with all PAC-429 PC Half-Cards that allows a user to develop PC software without knowledge of the half-cardÕs architecture, and will support up to 4 half-cards simultaneously. The Toolbox is made up of three parts: (1) the "HEX" file that contains the toolbox executable code that runs on the card and is automatically loaded when the user software is initialized, (2) the header files used to develop software for the toolbox which contain function prototypes and structure definitions, and (3) the library itself which can be supplied in a Microsoft "C", a Borland "C", or as a Windows DLL. The "C" Libraries have been developed for use with any memory model.

The Toolbox supports two modes of transmission: Scheduled, and FIFO (First-In-First-Out queue). The Scheduled transmission allows the user to configure the card to automatically transmit labels on a particular channel at regular intervals. The FIFO transmission allows the user to transmit a series of words in sequence. FIFO and Scheduled transmissions can be intermixed on a single channel.

The Toolbox supports two modes of reception: Mailbox and FIFO. The Mailbox reception allows the user to retrieve the "latest" copy of data received on a particular label. This mode would be used when the user is only interested in the most recently received data. The FIFO reception allows the user to dequeue words in the same sequence as they were received on the channel. The words placed in the receive FIFO can be filtered by their label and time stamped.

The Toolbox also supports the input and output discretes on the half-card by allowing the userÕs software to request the current state of the input discretes, and change the state of the output discretes.

Examples of Standard Toolbox Functions:

Configuration
Initialize, OpenChannel, SetChannelSpeed, Shutdown

Multiple Card Support Functions
SetCurrentCard, GetCurrentCard

Transmitting
Transmit_FIFO, Transmit_FIFO_Block, Kill_Scheduled,

Transmit_Scheduled, EnableParityAsData

Receiving
AddLabel, Receive_Mailbox, Receive_FIFO,
Receive_FIFO_Block, Clear_FIFO

Status Inquiry
GetChannelStatus, GetChannelSpeed, GetPendingArincWords,
GetScheduledLabelValue, GetTimerResolution

Time Calculation
Get429AbsoluteTime, SetInitialAbsoluteTime,
Get429TimeDifference, ZeroCardClock

Interrupts
EnableGlobalCardToPcInt, ClearPCInterrupt

Also Reading/Writing Discretes, Diagnostics, Message
Display, Error Handling & Utility Functions

Diagnostic Software

The diagnostic software provided with each PAC-429 Half-Card verifies that the half-card is installed and operating properly. This is useful when a half-card is first installed, in order to verify 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 and program RAM, the input and output discretes, the PC interrupts, the ARINC receive/transmit hardware, as well as the ARINC transmit drivers.

Optional ARINC 429 Software

Data Bus Analyzer (PAC-429S-DBA)
 - menu driven, easy access to data analysis of ARINC 429 bus traffic. Features include filtering, and triggering with real-time raw data conversion in user definable engineering units.

Protocol Interface Tester (PAC-429S-PIT)
 - allows development of high level scripts to transmit ARINC 429 data on multiple High or Low speed transmit channels simultaneously. This software can transmit data based on the contents of received data, therefore simulating complex ARINC 429 protocol scenarios.

ARINC 615 Data Loader Simulator (PAC-429S-DLS)
- performs all functional requirements of a portable or airborne ARINC 615 (603) data loader.

Williamsburg Protocol (PAC-429S-WPS)
- monitors and simulates the protocol used for file transfer of binary or character oriented file data between airborne systems such as ACARS.

Other LRU simulation software is also available such as: 739 MCDU Simulator or MCDU/IDU Monitor, Boeing 747-400 CMC, Flight Simulator, & 740 Printer Simulator.

Technical Overview

The half-card is user programmable with an Intel 80C186 processor and 128 KBytes of program memory (which can be written by the host PC when the 80C186 processor is stopped). There are 4 KBytes of ROM that contain software that "boots" the card so programs can be downloaded. The ROM code also aids in diagnostic testing.

There are 16 KBytes of dual-port RAM that can be accessed by both the PC and the card's 80C186 processor. This dual-port RAM is used to transfer ARINC 429 receive and transmit data to and from the card. There are 16 KBytes of additional scratchpad memory allocated for the processor. Two on-board 512 Byte FIFOs communicate commands and responses to and from the half-card.

The PAC-429 Half-Card is configurable from 1TX / 2RX to 2TX / 4RX and all transmitters and receivers can be operated at either high or low speed. In addition to the ARINC 429 transmitters and receivers, the half-card has 5 input and 5 output TTL discretes which provide the capability to control external devices or indicate external events.

Specifications

Physical Characteristics:

Half-Card Size: 4.2" x 6.0" (AT Size)

I/O Connector: DB-37

Environment:

Operating Temperature: 0 Đ 50 ° C at no more than 95% relative humidity non-condensing.

Storage Temperature: -30 Đ 50 ° C at no more than 99% relative humidity non-condensing

Electrical:

Operating Voltage: 5.0 v ± 5%

Operating Current: 350 mA max, one 429 driver 450 mA max, two 429 drivers

Selectable Options:

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

Documentation:

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

Support:

PAC is committed to providing unsurpassed customer support. All hardware has a one year limited warranty and software has a 90 day limited warranty. For this warranty period, all software updates are free. Extended warranties are available

for all products. Should the need arise for product repair, our goal is to have you back on-line within 48 hours for domestic companies, and 96 hours for international firms.

Pacific Avionics is continually updating and developing new hardware and software products. Please call for the latest product information.

Ordering Guide

Model Number	Description
PAC-429C-1x2/H.	.429 PC Interface Half Card with 1 TX and 2 RX
PAC-429C-2x4/H.	.429 PC Interface Half Card with 2 TX and 4 RX

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