



**RTI-1265/1266/1267**

**FEATURES**

**RTI-1265 Analog Input Board**

- 12-Bit A/D Resolution
- High Input Channel Expansion Capacity (Up to 64 Analog Inputs)
- Acquisition Rates up to 19kHz
- Wide Range of Interface Panels
- Compatible with Analog Devices 5B Series Signal Conditioning Modules

**RTI-1266 Analog Input and Output Board**

- Same Features as RTI-1265 Plus:
- 12-Bit D/A Resolution
- On-Board Dedicated Microprocessor
- High Output Channel Expansion Capacity (Up to 16 Analog Outputs)

**RTI-1267 Digital Input and Output Board**

- 24 Digital I/O Points (Three 8-Bit Ports)
- Compatible with Solid-State Relays

**SOFTWARE**

Completely Compatible With MS-DOS-Based Drivers and Application Software Which Support the

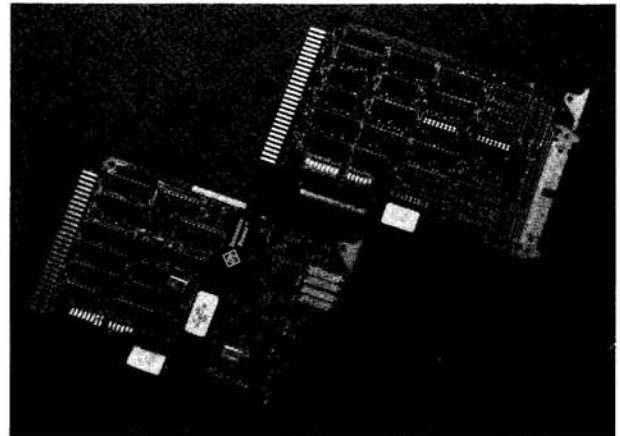
- RTI-820 Analog and Digital I/O Board
- MS-DOS Drivers - Model No. AC1527-A
- Reduces Software Development Time
- Callable Routines for Analog and Digital I/O
- Supports Popular DOS-Based Languages
- Microsoft Compiled and Interpreted BASIC
- Microsoft QuickBASIC, C, Pascal, FORTRAN and Macro Assembler
- Borland TURBO Pascal

Test Program to Verify All I/O Functionality  
Menu-Driven Configuration and Calibration Routines

- Menu-Driven Application Software Packages
- Eliminates Programming
- Variety of Text and Graphic Displays
- Fully Supports RTI-1265/1266/1267, External Analog and Digital I/O Panels and 5B Series of Signal Conditioners

**GENERAL**

- I/O or Memory Mapped
- Compatible with all CPUs on STD Bus
- Tested up to the 8088 5MHz Spec (No Wait States)



**GENERAL DESCRIPTION**

The RTI-1265, RTI-1266 and RTI-1267, new members of the RTI® family of analog and digital I/O boards, provide high density, modular analog inputs and outputs and digital I/O for all STD Bus compatible systems. When used with "IBM PC\* Compatible" CPUs and the MS-DOS operating system, they can be used with a wide array of application software written for the IBM environment. These boards utilize a modular architecture, providing the basic functionality on-board while supporting external panels for signal conditioning and isolation for a variety of sensor and signal types.

Model	Description	Channel Capacity		
		Analog Inputs	Analog Outputs	Digital I/O
<b>BOARDS</b>				
RTI-1265	Modular Analog Input	64	0	0
RTI-1266	Modular Analog I/O	64	16	0
RTI-1267	Digital I/O	0	0	24
<b>EXTERNAL PANELS</b>				
STB-HL02	High Level Analog I/O	16	4	0
STB-TC	Low Level Analog Input	16	0	0
STB-HLI	High Level Isolated Analog Input	8	0	0
STB-TCI	Low Level Isolated Analog Input	8	0	0
SB02	Signal Conditioning Backplane	16 Total I/O		
DB-24	Quad Solid-State Relay Backplane	0	0	24
AC1585-1	Screw Termination Panel (TTL Level)	0	0	24

Table 1.

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\*IBM PC is a trademark of International Business Machines Corp.

# SPECIFICATIONS (typical @ +25°C and +5V dc)

<p>ANALOG INPUT (RTI-1265/1266) Number of Analog Input Channels</p> <p>Input Resolution A/D Converter Time System Throughput Accuracy</p>	<p>Up to 64 (Dependent on Interface Panel Used) Supports Up to 4 Signal Conditioning Panels in Any Combination</p> <p>12-bit (4096 Counts) 30<math>\mu</math>S Typical 19kHz Maximum 0.025% (<math>\pm</math> 1LSB)</p>
<p>ANALOG OUTPUT (RTI-1266 Only) Number of Analog Output Channels</p> <p>Output Resolution Update Rates Accuracy</p>	<p>Up to 16 (Dependent on Interface Panel Used) Supports Up to 4 Signal Conditioning Panels in Any Combination</p> <p>12-bit (4096 Counts) 400Hz Each Channel 0.025% (<math>\pm</math> 1LSB)</p>
<p>DIGITAL I/O (RTI-1267 Only) Number of Channels Signal Levels</p> <p>Outputs:</p> <p>Inputs:</p>	<p>24 (Software Selectable in Groups of 8 as Input or Output) Inverted TTL (Compatible with Solid-State Relays)</p> <p><math>V_{ol} = 0.4V</math> Maximum <math>I_{ol} = 24mA</math> Maximum <math>I_{IH} = 20\mu A</math> Maximum <math>I_{IL} = -0.8mA</math> Maximum</p>
<p>SYSTEM CONFIGURATION Compatibility</p> <p>Bus Resource Utilization Data Acquisition Mode Base Address Selection</p> <p>Expansion Options Software Compatibility</p>	<p>Meets All Electrical and Mechanical STD Bus Specifications, Tested to the 8088 5MHz Spec (No Wait States) Occupies One STD Bus Slot per RTI Series Board Polled Status DIP Switch Selectable I/O or Memory Mapped 12 Consecutive Bytes (RTI-1265/1266) 4 Consecutive Bytes (RTI-1267) MEMEX and IOEXP Fully Supported, Jumper Selectable Emulates an RTI-820 When Used With IBM PC Compatible CPUs</p>
<p>PHYSICAL/ENVIRONMENTAL Operating Temperature Range Storage Temperature Range Relative Humidity</p> <p>POWER CONSUMPTION</p> <p>RTI-1265</p> <p>RTI-1266</p> <p>RTI-1267</p> <p>+5V Power Available on Analog I/O Connector (RTI-1265/1266) +5V Power Available on Digital I/O Connector (RTI-1267)</p>	<p>0 to +70°C -25°C to +85°C Up to 90% (Noncondensing)</p> <p>+5V @ 130mA +12V @ 12mA -12V @ 26mA +5V @ 200mA +12V @ 20mA -12V @ 30mA +5V @ 215mA</p> <p>Up to 0.8 Amps (Fused) Up to 0.5 Amps (Fused)</p>

The RTI-1266 provides analog input and output capability with A/D and D/A resolution of 12-bits. Using up to 4 external signal conditioning panels, a maximum of 64 analog inputs and 16 analog outputs can be addressed from a single STD Bus slot. The RTI-1265 provides the same capability but is limited to analog inputs only. These boards, in conjunction with the external panels, provide a modular method of interfacing a large number of analog I/O points, via many signal conditioning options, to any STD Bus system.

The RTI-1267 provides 24 digital I/O points as three 8-bit ports, each configurable as input or output via software. These points are TTL level signals and via a DB-24 and solid-state relay modules can be used to connect to higher level voltage signals.

Five different analog I/O panels are available for use with the RTI-1265/1266. Up to four of these panels in any combination can be used at one time via daisy chaining of ribbon cables (CAB-01). All of these panels provide screw terminations for sensor inputs and outputs and can be powered either through the 5 volt power on the board or via an external 5 volt supply. All panels are built on standoffs so that they can stand alone or be surface or rack mounted (rack mount kits are available). Exposed circuitry on the panels can be covered with the CV-01 cover option.

The high level voltage panel (STB-HL02) provides 16 high level (voltage) single-ended analog inputs and 4 analog outputs and open positions for user installed attenuators, filters or current shunts. The thermocouple panel (STB-TC) provides screw terminations for 16 low level (mV) differential analog inputs or 15 thermocouples with cold junction compensation. The isolated high level panel (STB-HLI) provides 8 high level (voltage) isolated inputs, and the isolated thermocouple panel (STB-TCI) provides 8 low level (mV) or thermocouple inputs plus cold junction compensation while providing  $\pm 750V$  rms of isolation.

The 5B Series interface panel (5B02) provides 16 galvanically isolated analog I/O channels using the 5B Series signal conditioning modules. The 5B modules provide for direct connection to volts, millivolts, current input and output, strain gages, thermocouples and RTDs at up to  $\pm 240V$  rms input protection and 2000 volts peak isolation. If isolation is not required, the high level voltage and thermocouple panels provide an economical solution for signal termination.

The 24 channels of digital I/O connect via a ribbon cable to either a nonisolated panel (AC1585-1) for TTL level I/O or to an isolated digital I/O backplane (DB-24) for high level digital I/O.

#### **ANALOG I/O (RTI-1265/1266)**

The RTI-1266 contains one 12-bit A/D converter and one 12-bit D/A converter (the RTI-1265 has no D/A converter) that provide one channel of analog input and one channel of analog output respectively. Multiple channels are accommodated with the interface panels by multiplexing several input and output channels into the single I/O lines of the board through the J1 connector. The multiplexing functions on the interface panels are controlled by the channel select lines on the analog I/O connector. Six lines are supplied for inputs and four for outputs to provide for a maximum of 64 analog inputs and 16 analog outputs into a single RTI-1266 board.

Analog output (RTI-1266 only) is implemented with a single D/A converter coupled with an on-board slave microprocessor. The microprocessor's principle task is to periodically update all active output lines by storing the output data in RAM memory and controlling the D/A refresh rate. Individual sample-and-hold amplifiers (SHAs) will hold each output signal constant until the microprocessor updates the value, which occurs about once every two milliseconds. A timer inside the slave microprocessor will insure that each D/A channel is periodically refreshed. In this manner, one D/A converter is able to serve multiple analog output channels.

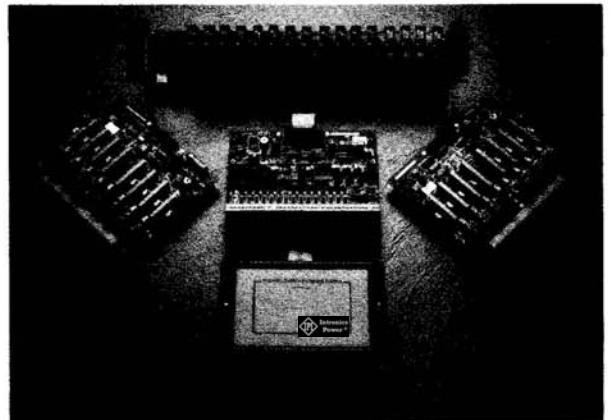
#### **DIGITAL I/O (RTI-1267 ONLY)**

The RTI-1267 has three 8-bit digital I/O ports, each of which may be configured as either an input or output port. All digital I/O channels are inverse TTL level signals and are compatible with industry standard solid-state relay subsystems such as the Analog Devices DB-24, 24-channel isolated digital I/O backplane. The DB-24 panel uses up to six plug-in quad modules (four channels each) to provide optically isolated digital I/O. If isolation is not required, the AC1585-1 screw termination panel is available for direct connections to the RTI-1267 board.

#### **POWERING THE PANELS**

All of the signal conditioning panels are powered by +5 volts. It may be necessary to power the panels from an external source, depending on the configuration used. The RTI-1265/1266 provides 0.8 amps of fused power on the +5V pin of the analog I/O connector for powering panels. When the total power required by the external panels and modules exceeds this 0.8 amps provided, an external +5V power source should be used (see technical data on the panels and modules for power consumption information). When using the 5B Series of signal conditioning modules an external 5V supply is always required.

Similarly, the RTI-1267 provides 0.5 amps of fused power on the +5V pin of the digital I/O connector for powering the solid-state relay backplane.



*Analog Devices Family of Signal Conditioning Panels*

## SOFTWARE SUPPORT

Analog Devices offers three levels of software support for use with the RTI-1265/1266/1267 family of boards. At the lowest level, they may be programmed through assembly language via the I/O memory map. All support documentation needed to program at this level is supplied in the user's manuals.

A higher level programming option for users of IBM PC compatible systems is the MS DOS based I/O driver package, model number AC1527-A. The AC1527-A Driver package consists of language libraries, a sample program which tests all I/O functions on the boards and board library. Each language library consists of a language binding and system routines. Bindings handle the different parameter-passing conventions used by the languages and set up calls to the board library. System routines are hardware independent and include initializing the system data, delaying program execution and clearing logical channel definition.

The board library contains the low level subroutines that perform the setup and I/O functions.

Other features included are: menu-driven configuration program, error-handling routines and menu-driven calibration software. Languages supported include: Microsoft's Compiled and Interpreted BASIC, Microsoft's QuickBasic, C, Pascal, FORTRAN, and Macro Assembler, and Borland International's TURBO Pascal.

The following is a list of subroutines in the AC1527-A Driver package that support the RTI-1265, RTI-1266, RTI-1267 boards. The functions supported include initialization, analog I/O, digital I/O, delay execution and clear logical channel routines.

### Analog I/O

AIN	Reads a single value from an analog input channel.
AING	Reads multiple values from a group of analog input channels.
AOT	Sets an analog output channel to a specified value.

### Digital I/O

DIN	Reads an 8-bit value from a specified digital port.
DINB	Reads a single bit from a specified digital port.
DOT	Sets an 8-bit value on a specified digital port.
DOTB	Sets a single bit on a specified digital port.
DOTR	Reads back the 8-bit value set on a specified digital output port.

### Delay Execution

DELAY	Delays execution of the program for a specified period.
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### Initialization

INITIALIZE	Clears all previously defined logical channels and initializes global variables used by the I/O routines. Clears the channel sequence list (specified for AING operations).
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### Clear Logical Channel

CLCHAN	Clears the definition for a previously defined logical channels and removes entries from the channel sequence list (specified for AING operations). The logical channel may subsequently be redefined.
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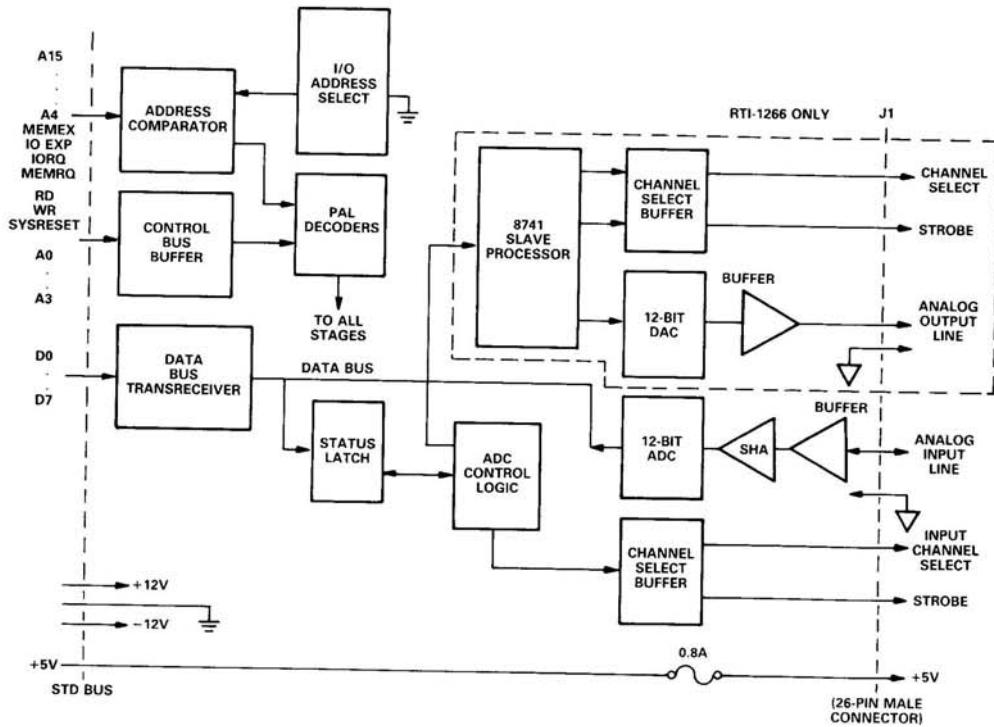
### SAMPLE PROGRAM

The following is a fragment of a Microsoft C program that reads an analog input value from an RTI-1266 board using the AC1527-A Driver package. It consists of an initialization routine and the AIN setup and I/O function call (note that the analog input call is "AIN820," making reference to the IBM PC Bus product with the same functionality).

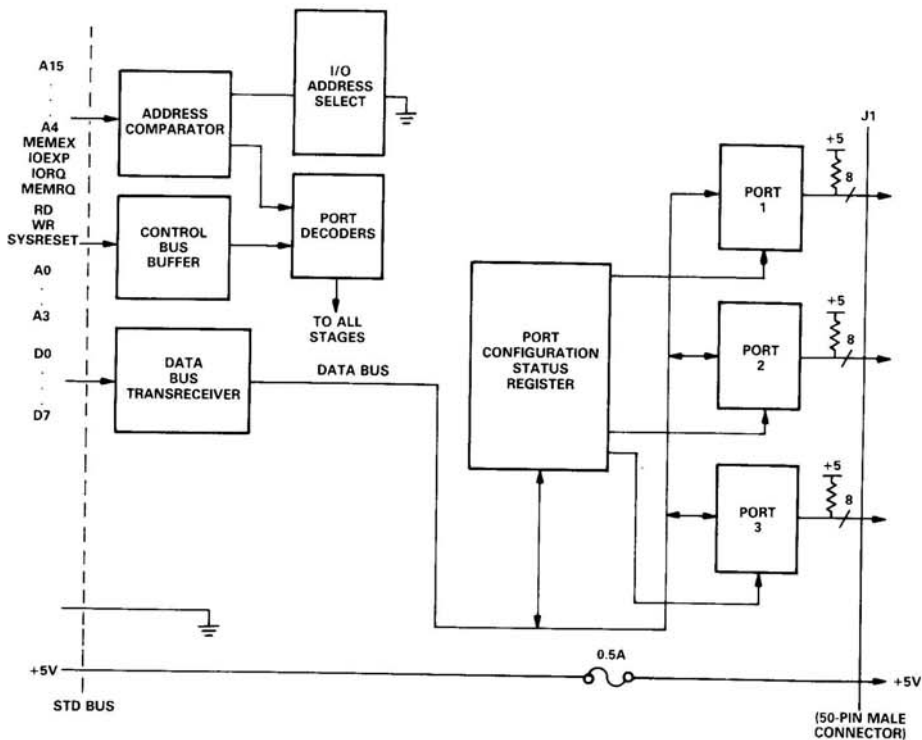
```
{ INITIALIZE(&erstat);
  if(erstat) printf ("\n\tINITIALIZE error: %2d\n",erstat);
  else {
    lchan = 5;
    board = 3;
    pchan = 1;
    AIN820(lchan,board,pchan,&erstat);
    if(erstat) printf ("\n\tAIN setup error: %2d\n",erstat);
    else {
      value = AIN(lchan,&erstat);
      if(erstat) printf ("\n\tAIN error: %2d\n",erstat);
      else printf ("\n\tAIN value: %5d\n",value);
    }
  }
}
```

### APPLICATION SOFTWARE

The third level of software support available for the RTI-1265/1266/1267 is application software. Packages written for the IBM PC family of computers that include support for the Analog Devices RTI-820 are compatible with the RTI-1265/1266/1267. Compatible application packages include Intellution's THE FIX, Quinn Curtis' Control EG, Laboratory Technologies' LABTECH NOTEBOOK and LT/CONTROL.



RTI-1265/1266 Block Diagram



RTI-1267 Block Diagram



*Analog Devices RTI-1265/1266/1267 Series STD Bus I/O Boards Are Compatible with Signal Conditioning Panels and IBM PC Application Software.*