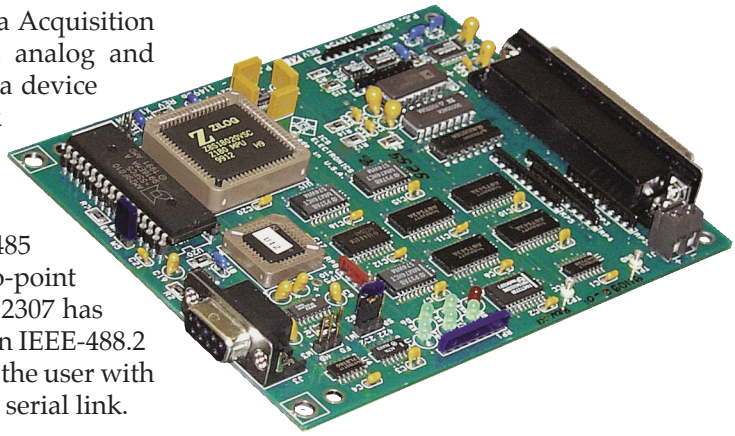
2307
SERIAL DATA ACQUISITION AND CONTROL

- Combines analog I/O, digital I/O, relay drivers and temperature readings in one board.
  Versatile serial control board handles many applications.
- User selectable RS-232 or RS-422/RS-485 interface.
  Flexible serial interface supports point-to-point and network connections.
- Uses SCPI commands and IEEE-488.2 status reporting structure.
  Provides GPIB functionality over a serial link.
- Optional packet protocol adds checksum protection to each message.
  Added protection against erroneous messages.
- Rugged metal shell connectors provide secure connections.
  Suitable for portable or airborne applications.
- Support includes a menu driven configuration program, Visual Basic and LabView programs.
  Easy to use, easy to program.
- Companion Terminal Board simplifies test connections.
  Saves connection time.

DESCRIPTION

The Model 2307 Serial Data Acquisition and Control Board provides analog and digital signals for controlling a device and the capability to read back analog voltages, digital signals and temperatures. The 2307's serial interface has selectable RS-232, RS-422 or RS-485 signals and supports point-to-point or network connections. The 2307 has a SCPI command parser and an IEEE-488.2 Status Structure so it provides the user with true GPIB functionality over a serial link.



2307 Data Acquisition and Control Board

The 2307 is fabricated on a small 4.5 in x 5.5 in board with metal shell connectors. In a typical application, the 2307 is located inside the host device and is powered by the device's +5 volt power supply. The 2307 is designed so that it can be mounted against the rear panel of the host chassis or on any panel or other surface. Analog, digital and thermocouple connections are made to a 62-pin data connector on the 2307.

The serial settings and all of the I/O configuration settings can be changed with SCPI commands and are saved in the 2307's internal flash memory.

Temperature Measurements

The 2307 has four thermocouple inputs for reading temperatures in the host chassis. The 2307's on card compensation circuit accepts J type thermocouples and provides calibrated readings from -100 to + 400 °C with a resolution of 0.1 °C. Not installed on 2307-TC boards.

Analog I/O

The 2307 has six single ended analog inputs with programmable unipolar and bipolar input ranges. The ranges are 0 to + 5, 0 to +10, -5 to +5 and -10 to +10 Vdc. Resolution is 1 parts in 12 bits. Inputs are digital filtered to reduce measurement noise. The 2307's four analog outputs have a fixed 0 to + 5 Vdc output range with a resolution of 1 part in 10 bits.

Digital I/O

The 2307 has 32 digital I/O lines that can be configured as inputs or outputs in 8 bit byte increments. When used as outputs the lines are latched and can sink 48 mA or source 24 mA. As inputs the lines have pullup resistors so they can sense TTL, CMOS or contact closure inputs.

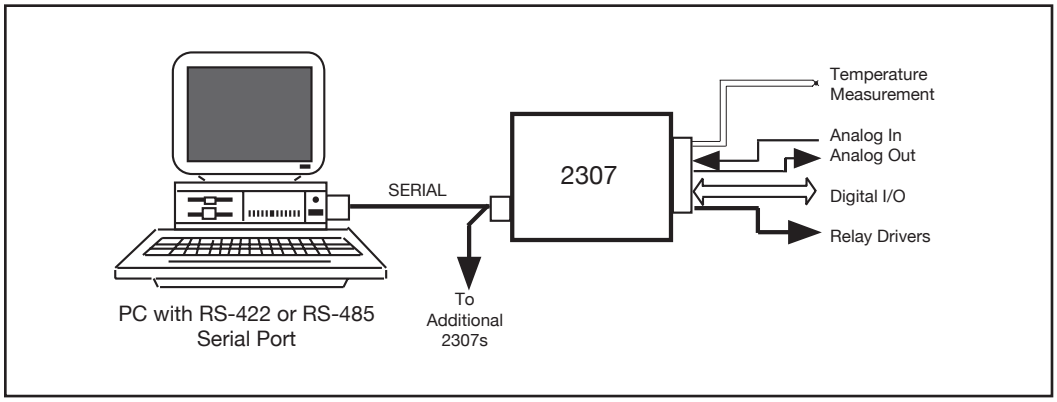


Figure 1 A Typical 2307 Application

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Relay Drivers

The 2307 has 6 relay driver outputs that can sink up to 300 mA to operate external relays, solenoids or other devices.

Signal Connections

The 2307 uses metal shell connectors with mechanical locking studs to assure trouble free connections in vibration prone installations. The 2307's rugged construction makes it suitable for ground, portable or even airborne applications.

2307 Configuration Features

If the 2307 is being used in a product or in test chassis, the user can set the 2307's IDN message to personalize the 2307 as part of the end product or to identify the test chassis. The IDN message, the serial settings, the I/O signal configuration and settings are saved in the 2307's nonvolatile Flash memory. The saved settings are recalled as the default settings at power turn-on. A lock command and write jumper protect the configuration settings from being accidentally changed by the end user.

SCPI Command Parser

The Model 2307 includes a SCPI command parser, an IEEE-488.2 STD status structure and also responds to all of the required 488.2 common commands. The 2307's parser lets the user program with the SCPI commands (Standard Commands for Programmable Instruments) shown in Table 1 or use short form commands.

Table 1 shows the 2307's SCPI command tree. The SYSTem command group sets the 2307's serial interface parameters and enables serial address detection for network connections.

2307 SCPI COMMAND TREE

SYSTem	**Serial Configuration**
:COMM	
:SERial	
:BAUD	<numeric> [9600]
:BITS	7 I 8
:PARITY	ODD I EVEN I NONE
:SBITs	1 I 2
:NETwork	0 I 1
:ADDRess	0-15
:PROTocal	0 I 1
:ERRor?	
:VERSion?	(1996.0)
STATus	
:OPERation	
:CONDition?	
:ENABle	<numeric>
:QUEStionable	**Digital Inputs**
:CONDition?	
:ENABle	<numeric>
:PTRansistion	<numeric>
:NTRansistion	<numeric>
CONFigure	**Data Strings**
[:DIGital]	
:INPut	<channel list>
:POLarity	boolean
:OUTput	<channel list>
:POLarity	boolean
FORMat	**Data Format**
[:DATA]	
:TALK	
:LISTen	
SOURce	**Outputs**
:VOLTage	**Analog**
[:LEVel]	
[:IMMediate]	
[:AMPLitude]	<numeric>
:TRIGgered	
[:AMPlitude]	<numeric>
:LIMit	
[:AMPlitude]	<numeric>
:OFFset	
[:AMPlitude]	<numeric>
:RANGe	<numeric>
:SLOPe	
[:AMPlitude]	<numeric>
[:DIGital]	**Port Outputs**
:DATA	
[:VALue]	0-255
:PORTn	0-255
:POLarity	0-255
ROUTe	**Relay Driver Outputs**
:CLOSe	<channel list>
:STATe?	
:OPEN	<channel list>
:ALL	

2307 SCPI COMMAND TREE Cont'd

MEASure	**Analog Inputs**
:VOLTage?	
[:DC]	<channel list>
:RANGe	<numeric>
:POLarity	<numeric>
:AVERage	<numeric>
:TEMPerature	<channel list>
SENSe	**Digital inputs**
[:DIGital]	
:DATA	
[:VALue]?	
:PORT	<channel list>
:PORTn?	
:POLarity	<numeric>
CALibrate	**Calibrate**
:MEASURE	
:GAIN	<numeric>
:NGAIN	<numeric>
:OFFset	<numeric>
:IDN	<string>
:FAULT	0 I 1

STATus group commands can sense digital input changes through the Questionable Status Register.

CONFigure commands group multiple bytes together as inputs or outputs so they can pass data as strings. Unconfigured bytes can be directly read or written to with the byte oriented commands.

FORMat commands set the data format used for transferring data as strings.

SOURce command group controls the analog input and digital output functions. Digital outputs can be set by direct writes to a specific port or by strings of data written to the configured output ports.

ROUTe commands set and clear the relay driver outputs.

MEASure command group sets the input ranges and reads the analog and temperature input values.

SENSe group controls the digital input functions. Digital inputs can be read directly from a specific port or as a data string from the configured input ports.

CALibrate group saves the calibration values in Flash and has a default command to restore the factory settings.

Serial Interfaces

The 2307 provides RS-232 and RS-422/RS-485 signals on it's 9-pin serial connector. Signal selection is made by jumpers on the 2307. The RS-232 interface is a full-duplex, three wire interface. The RS-422/RS-485 interface is a four wire interface with TX and RX signal pairs. The transmitter can be set for full or half duplex operation. RS-485 network connections are made by externally jumpering the TX and RX signal pairs.

Networking Capabilities

The 2307 can be operated on a RS-422 or RS-485 network by prefixing messages to the 2307 with a two character address sequence. The 2307's serial address detection capability lets the user control up to sixteen 2307s on a single network. When address recognition is enabled, the 2307 looks for presence of the STX character followed by its own address before acting upon the remainder of the attached command string. The address is saved in the 2307's Flash memory. A separate command lets the user enable or disable the address sequence.

Packet Protocol

The 2307 also supports message packets that include a checksum for added message security in noisy environments. Each received message is verified against the checksum before being executed. Valid messages are responded to with a response or an acknowledgment message. Invalid messages are responded to with a command error message. The message syntax is:

STX Addr Comd...ETX Checksum

The packet protocol requires the use of an address for the 2307 even when the 2307 is being used on a point-to-point connection. A separate command lets the user enable or disable the packet protocol.

Physical Description

The 2307 is packaged on a small 4.5 inch x 5.5 inch PC board. Maximum component height is 0.5 inches. The 2307 can be mounted against a panel or on a larger PC board. It has mounting blocks so it can also be attached directly to a rear panel. The Serial I/O connector (J3) is a DE-9S with lock studs. All of the analog and digital signals are connected through J2 which is a DC-62S high density connector with lock studs. 5 volt regulated power is connected to the 2307 via the screw terminal block, J1.

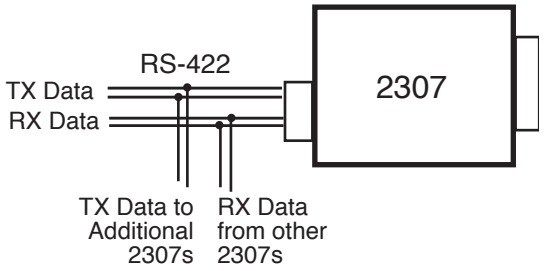


Figure 2 RS-422 Connections

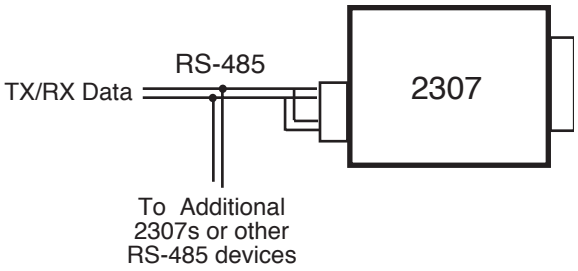
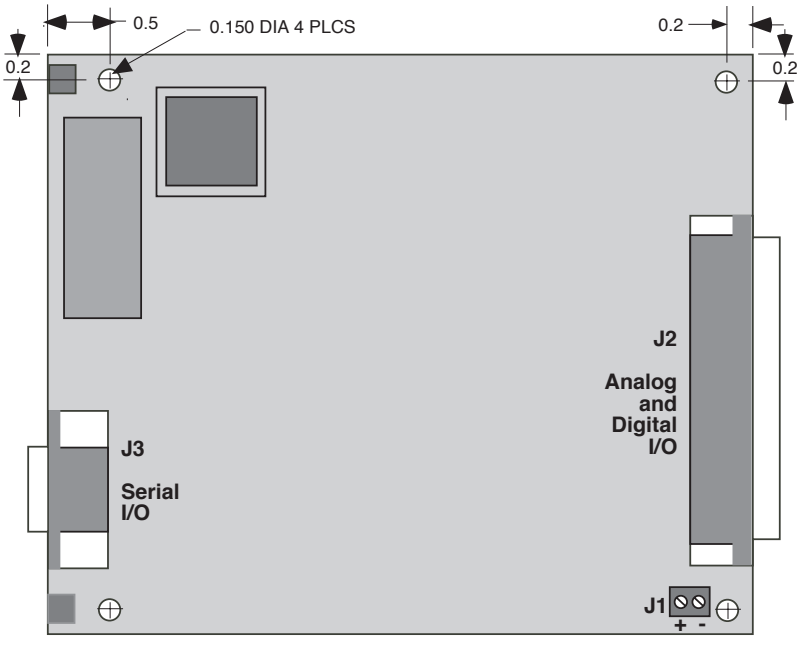


Figure 3 RS-485 Connections



Note - All dimensions are in inches

Figure 4 2307 Board layout

Serial Interface and Commands

Provides RS-232 and RS-422/RS-485 asynchronous serial interfaces. Signal type selected by jumpers on the board.

RS-232 Interface
- Signals: AB, BA and BB
- Mode: Full Duplex

RS-422/RS-485 Signals
- Signals: TX/RX pairs
- Mode: Half duplex with or without network address detection

Data Rates and Formats
- Baud Rate: 300 to 115.2 Kbaud
- Data bits: 7 or 8
- Stop bits : 1 or 2
- Parity: Odd, Even or None

Command Sets
SCPI and short form commands listed in Table 1 plus the following IEEE 488.2 Common Commands:
*CLS, *ESE, *ESE?, *ESR?, *IDN?, *OPC, *OPC?, *PSC, *PSC?, *RCL, *RST, *SAV, *SRE, *SRE?, *TRG, *TST, and *WAI.

Table 1 Programmable Functions

Baud Rate, Serial Format
Enable Network Addressing
Set Network Address
IDN Message
String input (Talk) bytes
Input data polarity
Input data format
Input data conversion
Input control signal polarities
String output (Listen) bytes
Output polarity
Output data Format
488.2 Status Enable Registers
Byte out polarities
Byte in polarities
Output Driver Settings
Read Temperature 1:4
Read Analog Inputs 1:6
Set analog Outputs 1:4

Digital I/O

32 lines configurable as input or outputs in 8-bit byte increments.

Input Logic Levels	High = > +2.4 V Low = <0.5 V 33 Kohm pullup to +5 Vdc for normally open contacts.
Output Logic Levels	High = >3 V, 3 mA source High = >2 V, 24 mA source Low = 0.0 to +0.8 Vdc, 48 mA sink

Analog Inputs

6 single ended inputs with programmable ranges.

Ranges	±10, ±5, 0 to +5, 0 to + 10Vdc
Resolution	1 part in 12 bits
Accuracy	4 bits
Offset	5 bits (Zero and endpoints)
Scaling	Offset and gain
Scan Rate	50 samples/sec
Averaging	1 to 100 samples
Response	8.5 ms after terminator

Analog Outputs

4 outputs with common ground.

Vout	0 to 4.99 Vdc (Limited to Vcc-30 mV)
Resolution	1 part in 10 bits (4.88 mV)
Accuracy	2 bits (Non-linearity)
Offset	4 bits (Zero and endpoint)
Load	5 kohms maximum
Scaling	Offset and Gain
Update	8 ms after terminator

Driver Outputs

6 open collector relay drivers

Imax	300 mA
Vmax	48 Vdc
Response	2 ms after terminator

Temperature Measurements

Four type J thermocouple inputs

Range:	-100 to + 400 °C
Resolution	0.1 °C
Accuracy	±2 °C exclusive of thermocouple error
Filter	1 to 100 samples

Diagnostic Indicators

Six on board LEDs: PWR, RDY, MTA, MLA, SRQ and ERR.

Physical

Size, L x W x H
139.7 x 114.3 x 12.7 mm
(5.5 x 4.5 x 0.5 inches)

Connectors and Headers
- GPIB: 26-pin (2 row x 13 pin) header
- Data: 62-pin DC shell female connector
- Power: 2 screw terminals

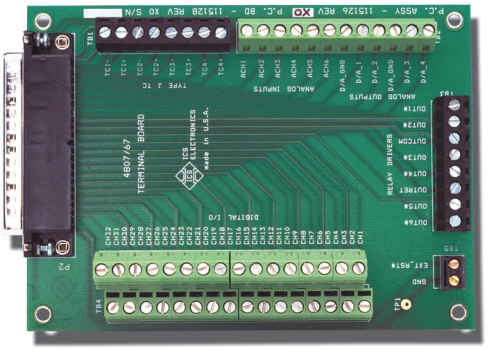
Temperature
- Operation -10° C to +70° C
- Storage -20° C to +85° C

Humidity
0-90% RH, no condensation

Power
+5 ± 0.2 Vdc@ 400 mA (typ)

Included Accessories

Instruction Manual
Support CD with configuration programs and sample Visual Basic program.
62-pin mating connector and hood



48x7/23x7 Terminal Board Assembly

ORDERING INFORMATION

	Part Number
Serial Data Acquisition and Control Board (Includes Instruction Manual and Support CD)	2307
Serial Data Acquisition and Control Board, board only	114952
Serial Data Acquisition and Control Board without thermocouple inputs (Includes Instruction Manual and Support CD)	2307-TC
48x7/23x7 Terminal Board Assembly	115124