4819

OEM GPIB<->RS-232 MODBUS INTERFACE

- Uses simple GPIB commands to control RTU Modbus devices
  Relieves user from having to format messages and to do CRC checking.
- Provides GPIB-to-RS-232 and RS-232-to-RS-232 data paths to Modbus device.
  User selects GPIB or RS-232 control of the Modbus device.
- GPIB Interface is IEEE-488.2 Compliant.
  Meets latest GPIB Standards.
- Saves GPIB address, Serial settings and user's IDN message in Flash.
  Personalizes board as part your end product.
- Mounts directly to host chassis's rear panel.
  Easy installation eliminates extra cables and reduces cost.
- Operates on 5 to 12 Volts.
  Runs on any power supply.
- On card status LEDs
  Provides visual indication of unit's operation, address, and selftest status.
- Support includes menu driven configuration programs.
  The easy way to configure the interface or use the programs as examples.

DESCRIPTION

NEW

The Model 4819 GPIB<->Modbus Interface Board has an IEEE 488.2/ GPIB to RS-232 Serial Interface for controlling Modbus slave devices from the GPIB or HP-IB bus. The 4819 lets the user send simple read-write messages over the GPIB bus to control and query slave Modbus devices. The 4819 relieves the user from the Modbus packet formatting and error checking tasks. The 4819 also provides all of the required IEEE-488.2 functions and an expanded IEEE-488.2 Status Reporting Structure to report Modbus communication errors.

Typical applications are adding a GPIB control to a temperature chamber or to a system that has a Modbus RTU interface.

4819 Showing Rear Panel Connectors

Installation

The 4819 is a small PC board that is designed to be mounted directly to the rear panel of the host device. It has two connectors that protrude through the rear panel. The GPIB connector provides user with the GPIB<->Modbus protocol conversion. The RS-232 connector provides the user with a direct connection to the Modbus device's RS-232 signals. An on-card regulator lets the 4819 run on regulated 5 Vdc power or from unregulated 6 to 12 Vdc power.

Dual Data Paths

Figure 1 shows the 4819's dual data paths. GPIB messages addressed to the 4819 are converted into serial packets and ORed with the external serial input to make the RS-232 serial signal to the Modbus device. Responses from the Modbus device go to both the external panel serial port (J2) and to the GPIB's serial input buffer. If the GPIB interface is being used, response data from the Modbus device is outputted on the GPIB bus when the 4819 is next addressed to talk. The 4819's external serial port provides a direct, full-duplex serial connection to the Modbus device.

Operation

The user sends GPIB commands to the 4819 that sets the Modbus device address, specifies the device register to be read or written and the data value. The 4819 converts these commands into the Modbus RTU packet format, adds the CRC checksum and transmits the messages to the Modbus device. Received packets are checked and any query response data is outputted to the GPIB bus when the 4819 is next addressed to talk. Modbus communication faults, exception messages and other errors are reported to the user through a Modbus Error Register in the 4819's Status Structure. The 4819 can be set to generate an SRQ when a Modbus error occurs. Application Note, AB48-25 describes how to use the 4819 to control a Modbus device and includes an example Visual Basic control program.

The External Serial Port can be used for a direct serial connection to the Modbus device or to monitor the 4819's serial messages.

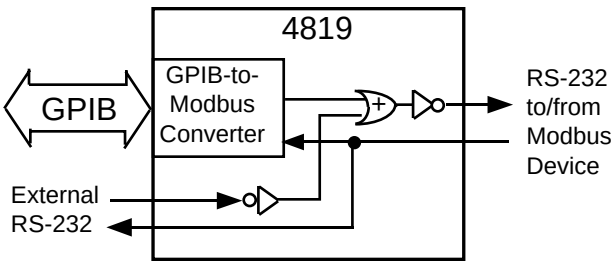

Figure 1 4819 Data Paths

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Configuring

The 4819's serial configuration, IDN message and GPIB address can be set or queried from the GPIB bus with SCPI commands. There are no jumpers or switches to set. The OEM user can enter his own IDN message to personalize the 4819 as part of the end product. All configuration settings are saved in a Flash memory and are automatically recalled when the 4819 is powered-on or reset. All of the settings, except for the GPIB Address, can be locked so they cannot be accidentally changed by the end-user.

4819 Status Reporting Structure

The 4819 has an expanded IEEE-488.2 Status Reporting Structure that includes a Modbus Error Register. Bit 6 of the ESR Register is set whenever anything is saved in the Modbus Error Register. The user can enable SRQ generation by setting the corresponding bits in the ESE, Operational Enable and SRE enable registers so that a true condition will generate a Service Request and assert the SRQ line. When the appropriate enable bits are set, any Modbus error will set the summary ESR bit in the Status Byte and generate an SRQ. The user can then query the Status Byte and the ESR register to learn the source of the SRQ and read the Modbus Error Register. For more information about the IEEE-488.2 Status Structure, refer to Application Bulletin AB48-11.

Diagnostic LEDs

The 4819 has six diagnostic LEDs that show its status. At power turn-on, the 4819 performs a selftest and then blinks its GPIB address before turning on the RDY LED. Any selftest errors are shown by a blinking LED pattern. The LSTN and TALK LEDs light when the 4819 is addressed to Listen or Talk. The ERR LED lights when the 4819 receives a bad GPIB command or detects a Modbus error or timeout.

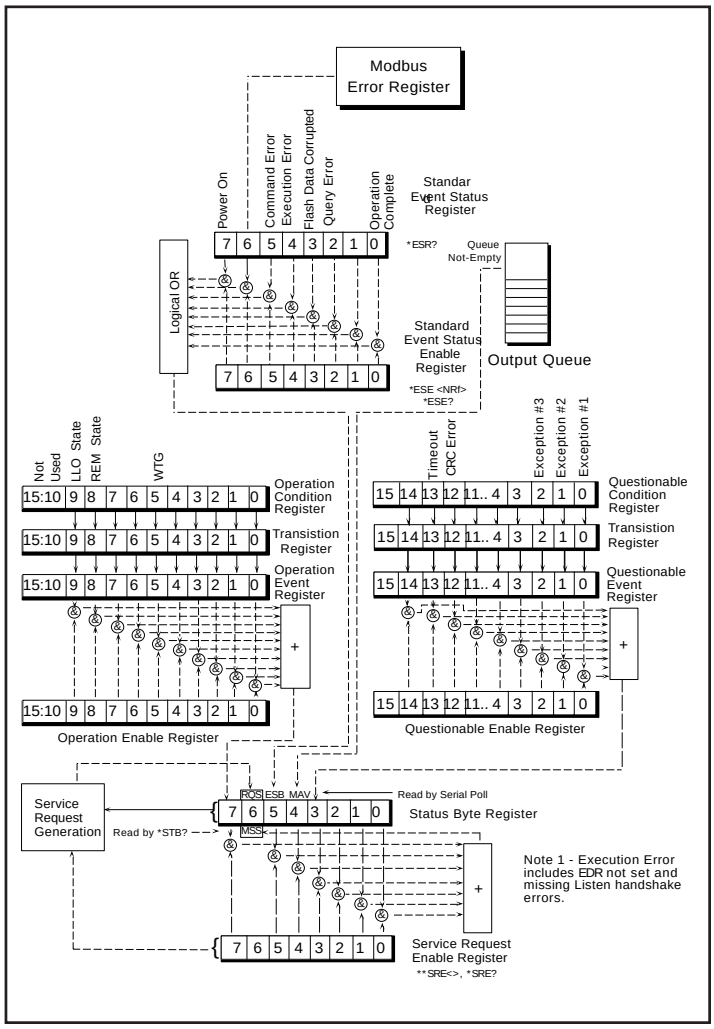


Figure 3 4819 Status Reporting Structure

Temperature Chamber Application - The 4819 automatically responds to all IEEE-488.2 queries and common commands addressed to the chamber. GPIB commands that read from and write data to registers in the Modbus Controller are converted into RTU packets and transmitted to the Modbus Controller. The 4819 handles all of the packet conversion, CRC generation and packet error checking functions. Responses from the Modbus Controller are buffered and outputted to the GPIB controller when the 4819 is next addressed to talk. Any Modbus errors are saved in the Modbus Error Register so they can be read by the GPIB Controller.

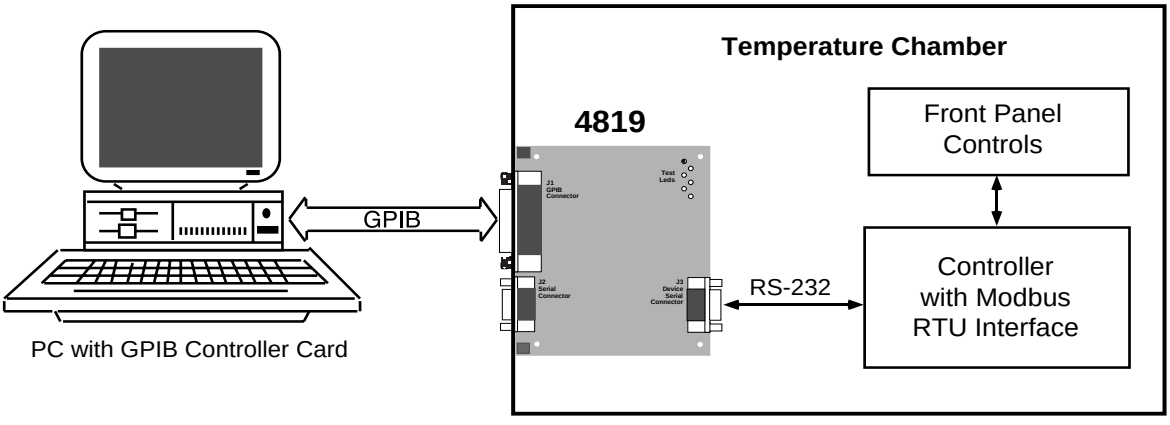


Figure 2 4819 Used in a Temperature Chamber Application

TABLE 1 MODBUS COMMANDS

Syntax	Modbus Code	Meaning
C addr	-	Modbus Address Command. Sets Modbus slave device address for subsequent commands. Value for *addr* is 1 to 255. Default is 1.
L[?] w	0x08	Loopback Command. Writes a 16-bit word, *w*, out to a Modbus device and returns a single response word to the GPIB bus. The question mark is optional. Value for *w* is 0 to 65535.
R[?] reg, num	0x03	Read Register Command. Reads one or multiple Modbus device registers. User specifies starting register *reg* and number of registers to be read *num*. The [?] is an optional symbol so programs like ICS's GPIBKybd program can recognize the comand as a query and automatically read the response. Values for *reg* are 0 to 32767. Values for *num* are 1 to 64. Responses are returned as 16-bit decimal or HEX values separated by commas. Output format selected with the Format command. i.e.. R? 0,1 reads Watlow Model Number. Response is 5270 for Watlow Model F4 R? 0,3 reads three successive registers. Response is 5270,0,123 for the Watlow F4 Controller.
W reg, w	0x06	Write Register Command. Writes a 16-bit value, *w* to a single Modbus device register, *reg*. Values for reg are 0 to 32767. Values for *w* are 0 to 65535. An example is: W 100, 55 writes the decimal value 55 to register 100.
WB reg, num, w(0)..w(n)	0x10	Write Block Command. Writes multiple 16-bit words, *w(i)* to multiple registers. Starting register, *reg*.. Number, *num* specifies how many words are to be written. Values for *reg* are 0 to 32767. Values for *num* are 1 to 64. Values for *w* are 0 to 65535.
D time	-	Timeout Command. Sets timeout value of Modbus response message in milliseconds. Timeout is the total time for the message to be received by the 4899 or 4809. Value for *time* is 1 to 65,535 milliseconds. Default is 100.
D?		Queries the current timeout setting.
E?	-	Read Error Command. Reads and clears the Modbus Error Register and bit 6 in the Event Status Register. Returns a error code whose value is 0 to 255. Current error values are: 0 No errors present 1 Exception Code 1 2 Exception Code 2 3 Exception Code 3 100 CRC Error 101 Timeout Error indicates no charac- ters received in response message. 2nn Partial or corrupted message re ceived. nn is the number of received bytes.

Notes:
1. All values are in decimal. To enter HEX values, the value must be preceded with a #h . i.e. 100 decimal = #h64
2. Response parameter format set by SCPI FORMat command. Default is ASCii

IEEE 488 Bus Interface

The 4819's 488 Bus Interface meets IEEE STD 488.1-1987 and has the following capabilities as a GPIB-to-Serial converter:
SH1, AH1, T5, L3, SR1, PP1, DC1
RL0, DT0, C0 and E1/E2 drivers
Bus drivers incorporate power up/down protection to prevent glitching the bus during power turn-on.

Address Capability
Primary addresses 0-30. Address set by GPIB bus command. Address displayed on LED indicators at power turn-on.

SRQ Generation
SRQs are generated per the IEEE-488.2 specification when the unit is not addressed to talk and an enabled bit in the ESR, Questionable or Conditional register becomes set. ESR bits are:
Modbus Error Register set
Serial Buffer full
Command error
Serial error
Execution error
Query error
Power on

Buffers

GPIB Input	2 Kbytes
GPIB Input	1 Kbytes
Serial Input/Output	256 bytes

488.2 Common Commands
*CLS, *ESE, *ESE?, *ESR?, *IDN?, *OPC, *OPC?, *RST, *SAV, *SRE, *SRE?, *STB, *TST?, AND *WAI.

Serial Interface

Serial signals conform to EIA Specifications for RS-232 signals. J2 is a DTE type interface with DTR and RTS signals pulled to +V. J3 is a DCE type interface with DSR and DCD signals pulled to +V.

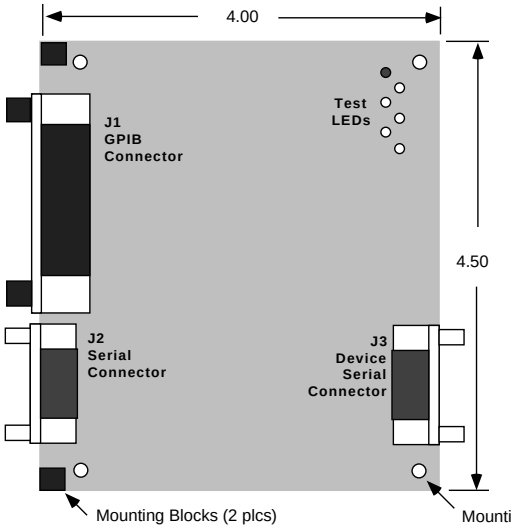
Signals	Txd, Rxd, Gnd
Baud Rates:	300 to 57.6 Kbaud
Data Bits	7 or 8 bits
Parity	Odd, even or none
Stop Bits	1 or 2

Pin#	J2 (DE-9P) Signal	J3 (DE-9S) Signal
1	DCD	DCD →
2	RxD ←	TxD →
3	TxD →	RxD ←
4	DTR →	DTR
5	Gnd	Gnd
6	DSR	DSR →
7	RTS →	⌐
8	CTS	
9	-	-

Notes ← = in, → = out, ⌐ = jumper

SCPI Commands

The 4819 conforms to the SCPI 1995.0 Specification and uses SCPI commands to set its configuration:
Async/Standard/Smart Device Mode
GPIB Bus Address
Baud rate select
7/8 data bits
1/2 stop bits
Odd/even/none parity
User IDN Message



4819 Outline Dimensions

Indicators

Six on board LEDs show selftest diagnostics, GPIB address and status.
PWR - On when power applied
RDY - On when Selftest passed
MTA - On when talk address recognized
MLA - On when listen address recognized
SRQ - On when SRQ generated
ERR - On when ESR register bit set

Physical

Size, L x W x H
101.6 x 114.3 x 17.9 mm
(4.0 x 4.5 x 0.7 inches)

Connectors

GPIB:	24-pin IEEE-488 connector with metric lock studs.
Serial :	9-pin DE shell female connector with 4-40 lock studs.
Device:	9-pin DE shell male connector with 4-40 lock studs.

Construction
Four layer PCB. Connector shells are connected to chassis ground.

Temperature
Operation -10° C to +70° C
Storage -40° C to +85° C

Humidity
0-90% RH without condensation

Power +5 Vdc or 5.5 to 12 Vdc
500 mA (typ.)

Included Accessories

Instruction Manual
Configuration Disk with sample programs

ORDERING INFORMATION

	Part Number
GPIB - Serial Interface Board (includes Manual and Configuration Disk)	4819
GPIB - Serial Interface Board (Board only)	115122