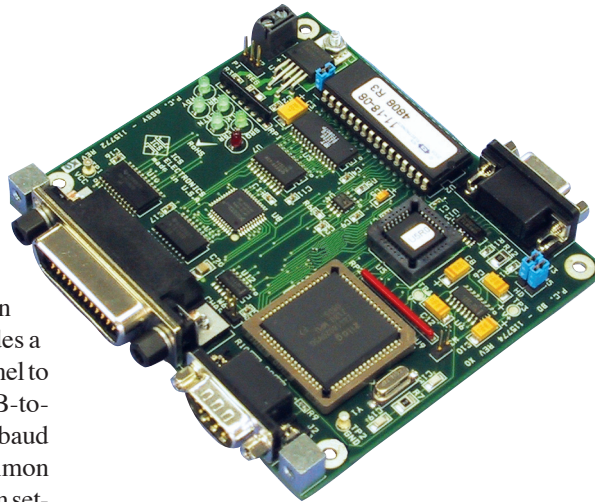# 4808

GPIB<->RS-422/RS-485 INTERFACE BOARD

DESCRIPTION

The Model 4808 GPIB <-> Serial Interface is a small, low cost interface board that interfaces serial devices with RS-422 or RS-485 signals to the GPIB bus. The 4808 provides a smart IEEE-488.2 compliant, GPIB-to-serial interface and includes an RS-232 to RS-485 converter that also provides a serial communications path from the rear panel to the internal serial device. The 4808's GPIB-to-serial data path can be set for any standard baud rate up to 57.6 kbaud and for all of the common asynchronous data formats. All configuration settings are user setable and are saved in the 4808's flash memory. The 4808 is typically mounted to the rear panel of the host chassis so the connectors can protrude through the rear panel or inside the host chassis. An on-card regulator lets the 4808 run on regulated or unregulated DC power.

Typical applications are adding a GPIB interface to a sensor or instrument that has a serial interface or adding an IEEE-488.2 interface to an embedded computer board.

Dual Data Paths

Figure 1 shows the 4808's unique dual data paths. GPIB messages addressed to the 4808 are converted into serial messages and transmitted to the serial device. Responses from the serial 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, the responses are outputted on the GPIB bus when the 4808 is next addressed to talk. Serial messages from the 4808's external serial port are retransmitted by the GPIB-to-serial converter to the internal serial device. The GPIB-to-Serial converter handles the RS-232 to RS-485 conversion task.

4808 Showing Rear Panel Connectors

Multiple Operating Modes

The 4808 has three operating modes to handle virtually any type of a serial device. In all cases, the 4808 passes all GPIB messages onto the serial device except for IEEE-488.2 commands and messages that start with four reserved SCPI keywords which are blocked from the serial device.

The ASYNC mode is for devices like serial transducers that periodically output a serial message. In the ASYNC mode, the 4808 saves the last message and outputs it on the GPIB bus when next asked for serial data.

The STANDARD mode is for the majority of serial devices that receive serial messages from a controller and may return a response to the controller. In the STANDARD mode, the 4808 saves the response and outputs it when addressed to talk.

The SMART mode is for communication with microcontrollers or embedded computers that can control the 4808's IEEE-488.2 interface. In the SMART mode, the 4808 passes GPIB messages to the serial device and receives back a response message for the GPIB Controller or an acknowledgment that the message was received. The 4808 saves the response and outputs it when addressed to talk. The embedded processor can request that the 4808 go to local to enable front panel controls, query the 4808's local/remote status, set/reset bits in the 4808's Status Reporting Structure to generate SRQs, and query/set the 4808's GPIB address.

- **Provides GPIB and RS-232 data interfaces to RS-422 or RS-485 devices.** *Adds a GPIB interface and a RS-232 to RS-485 converter.*

- **Smart firmware passes GPIB data to serial device.** *Does not require escape sequences or a second GPIB address.*

- **Provides all IEEE-488.2 functions and the Status Reporting Structure.** *Easiest way to add IEEE-488.2 capability to any serial device.*

- **User setable IDN message and serial configuration.** *Easy setup with ICS utility programs customizes the 4808 for the end product.*

- **Three operational modes handles any kind of serial device.** *Can be a smart interface or act as the front end for an embedded controller.*

- **Mounts directly to host chassis's rear panel.** *Easy installation eliminates extra cables and reduces cost.*

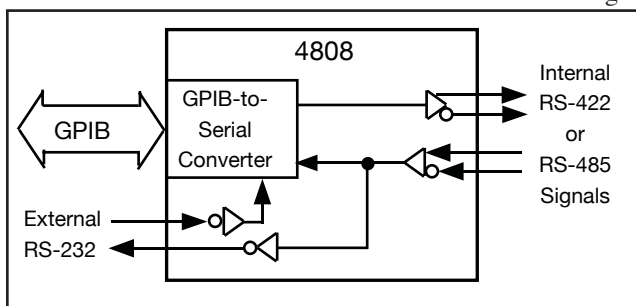- **Runs on 5 to 15 Vdc.** *Uses available DC power.*

☑ RoHS

Figure 1   4808 Data Paths

ICS ELECTRONICS
division of Systems West Inc.

7034 Commerce Circle
Pleasanton, CA 94588
Phone: **925.416.1000**
Fax: **925.416.0105**
Web: **www.icselect.com**

Asynchronous Serial Device Operation - 4808 passes all GPIB messages onto the serial device but blocks all IEEE-488.2 commands and messages that start with the four reserved SCPI keywords from the serial device. Serial device transmits periodic serial messages. 4808 saves only the last message and outputs it in response to the SYSTem:COMMunucate:SERial:RECeive:DATA? or RX? queries. Typical asynchronous devices are transducers or other measuring devices that just output periodic serial messages.
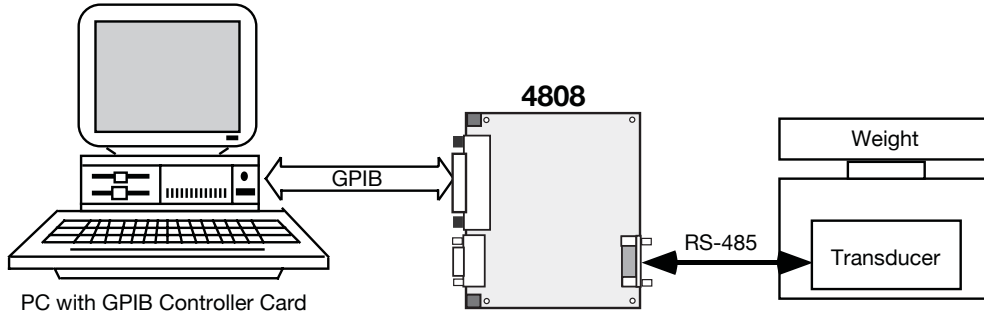

Figure 2(a)   4808 with a Serial Device that sends asynchronous messages

Standard Serial Device Operation - 4808 passes all GPIB messages onto the serial device but blocks all IEEE-488.2 commands and messages that start with the four reserved SCPI keywords from the serial device. The serial device only outputs response messages when queried. The 4808 saves the response messages and outputs them on the GPIB bus when next addressed to talk. This mode handles most serial devices that need a GPIB-to-Serial Interface without any programming modifications.
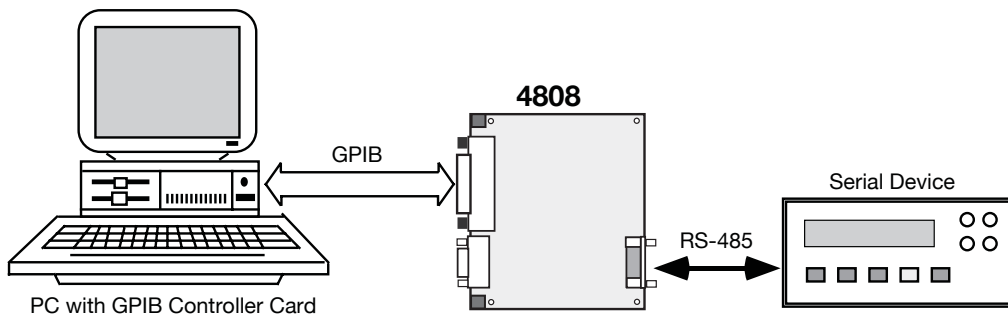

Figure 2(b)   4808 with a Standard Serial Device

Smart Serial Device Operation - 4808 passes all GPIB messages onto the serial device but blocks all messages that start with the four reserved SCPI keywords from the serial device. The 4808 responds to all IEEE-488.2 commands and sends copies of them to the serial device in case it needs to take some additional action. e.g. *RST may be used to reset the system. The serial device must respond to each serial message within a preset timeout period but not to the IEEE-488.2 command copies. The serial device can send responses to the GPIB bus, can pass status information by setting bits in the 4808's 488.2 Status Structure, can set/query the 4808 GPIB address and can query the 4808's Local/Remote state. The serial device can request the 4808 to go to local to enable its' local controls. The 4808 can also notify the serial device whenever its local/remote state changes.
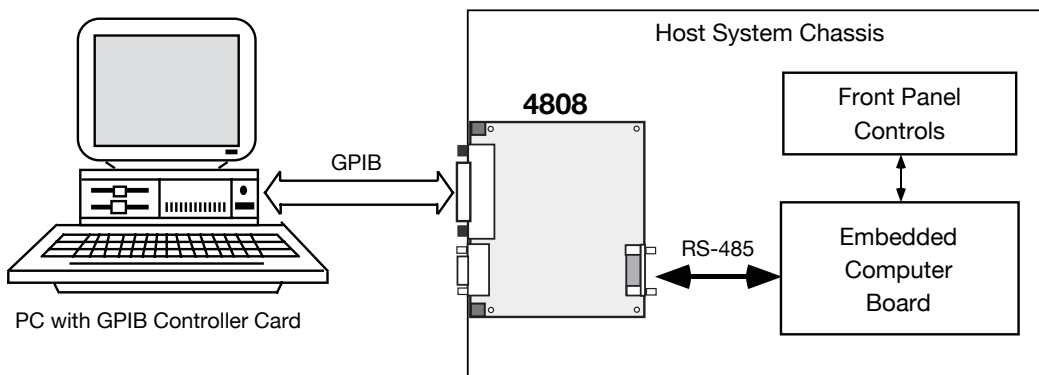

Figure 2(c)   4808 with a Smart Serial Device

Basic Operation

The 4808 GPIB-to-Serial Interface provides a smart data path from the GPIB bus to the serial device that is transparent to most data strings and at the same time provides responses to IEEE-488.2 and SCPI commands and queries for the serial device. The 4808 does this by examining the received GPIB messages and responding to any IEEE-488.2 commands or queries. Next the received GPIB message is checked to see if it is a SCPI command that starts with a reserved keyword. The four reserved SCPI keywords are: SYSTem, STATus, CALibrate and DIAGnostic. Messages containing the reserved words are not blocked if the reserved keywords do not start the data message. All remaining messages are placed in the serial output buffer and transmitted to the serial device.

In the Asynchronous mode, only the last message from the serial device is saved and outputted to the GPIB bus when the 4808 is addressed to talk. This assures that the user gets the latest message. In the Standard mode, any reply is saved and outputted on the GPIB bus when the 4808 is next addressed to talk. If the serial device does not reply within a preset time period, the 4808 assumes that there is no reply and prepares to accept the next GPIB bus message.

Smart Device Operation

The Smart Device mode is similar to the Standard mode but adds a communication capability so the serial device can communicate with the 4808 to modify its operation. The messages in Table 1 let the Smart Serial Device pass device status information to the GPIB Controller by setting or resetting bits in the 4808's Questionable, Operation and ESR registers, query or set the 4808's GPIB address and set the IDN response string. The Smart Device can query the 4808's remote-local status and request that the 4808 go to the local state to enable front panel controls. The 4808 can be set to send the serial device a message whenever it changes the local-remote state.

In the Smart Device mode, the 4808 also sends copies of the IEEE-488.2 commands the serial device in case the serial device needs to respond to the command. Examples are the *RST command which may be used to reset the system or the *OPC command which requests that a bit in the ESR register be set when the pending operation is finished.

When in the Smart device mode, the 4808 expects a reply to all messages sent to the
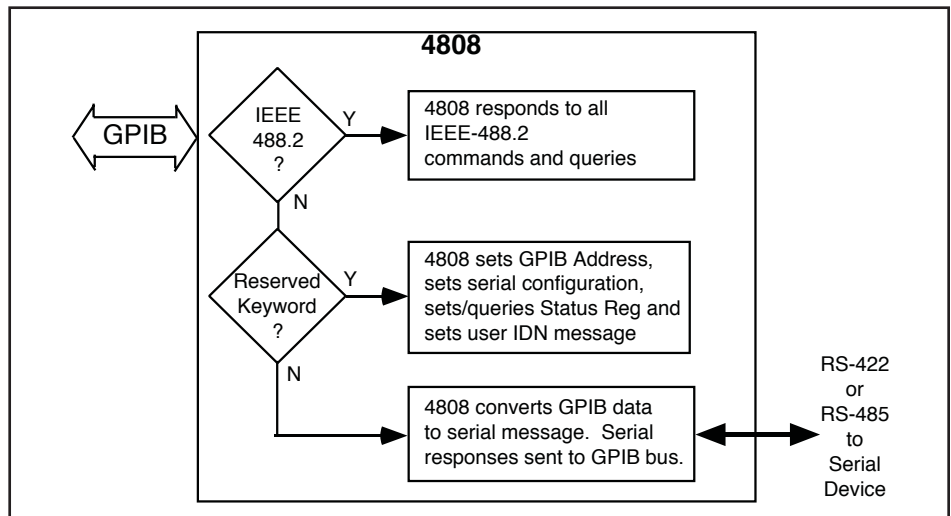

Figure 3   4808 Operation Diagram

Table 1   Smart Device Messages

Message	Meaning
@@@ESR value	Sets bits in the 4808 ESR register. Register reset when read
@@@OPERl value	ORs bits into the 4808 Operational Register.
@@@OPER& value	ANDs value with the Operational Register to reset bits.
@@@QUESl value	ORs bits into the 4808 Questionable Register
@@@QUES& value	ANDs value with the Operation Condition Register to reset bits.
@@@ADDR value	Sets 4808 GPIB address to new value.
@@@ADDR?	Queries current 4808 GPIB address setting.
@@@IDN string	Sets IDN response to user supplied string.
@@@SAV	Saves current configuration in flash. Same as *SAV 0 comd.
@@@REM?	Queries local/remote state. Responses are @@@REM 1 for remote, 0 for local and 3 for remote-local lockout state.
@@@LOC?	Requests 4808 to go to local state. Same replies as for @@@REM?
@@@NOREM	Disables automatic local remote change messages.
@@@LF	Tells 4808 to put a linefeed character in its GPIB buffer
@@@TO nnnn	Extends timeout by *nnnn* times to give the serial device more time to reply to the current query.
@@@OK	Message acknowledgment message. Used by 4808 and Smart device if the message they just received does not have another response.
@@@ERR	4808 received an invalid message.

serial device (except for the copies of the IEEE-488.2 commands). The 4808 also replies to all messages that it receives from the serial device. If a message does not have a response, then the @@@OK acknowledgment message is used as the response.

4808 Configuration

The 4808 is configured by sending it SCPI commands over the GPIB bus. The user can set the 4808's mode, serial baud rate, character format, the device response period and enter a custom IDN message to personalize the 4808 as part of the end product. These settings can be saved in flash memory and locked to prevent changes. The saved settings are recalled at power turn-on as the new default configuration. The unit

must be power cycled to update the serial settings.

The 4808's GPIB address can be set with a SCPI command from the GPIB bus or from the serial device when the 4808 is in the Smart device mode. The 4808's GPIB address setting cannot be locked so the end user can always change it. The GPIB address change takes affect immediately but must be saved if the change is to be permanent. When the Smart device changes the GPIB address, the 4808 performs an automatic save.

Rear Panel Mounting

The 4808 mounts perpendicular to the rear panel so that the GPIB and serial connectors protrude through the rear panel. The 4808 is held against the rear panel by two screws that bolt to mounting blocks on the board and by the four lock studs on the GPIB and Serial connectors. Figure 5 shows the panel cutouts and Figure 6 shows the 4808 board outline dimensions.
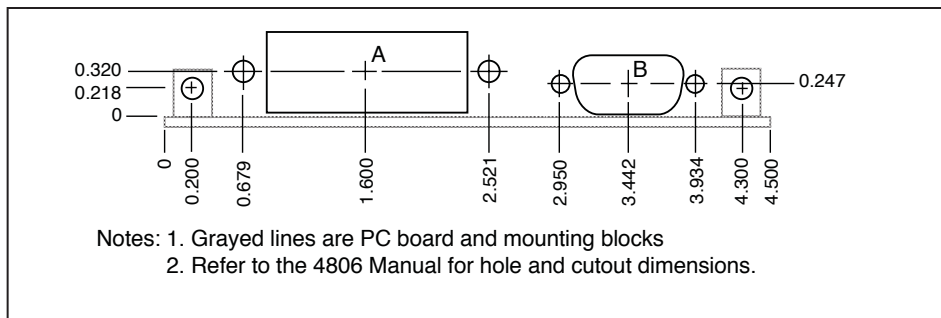
4808 Connections

The end user can connect to either the GPIB Connector (J1) or to the rear panel serial connector (J2). At power turn-on, the 4804 looks for the GPIB bus connection. If it detects a GPIB controller, the GPIB path is enabled and any serial characters received from the rear panel serial connector are ignored. If the GPIB controller was not detected, then the GPIB path is disabled and the 4808 accepts serial characters from the rear panel connector.

Half or Full Duplex Operation

The 4808 internal serial connector has a pair of differential send (SD) and receive (RD) signals for a 4-wire connection to the serial device. On board jumpers connect the two signals together for 2-wire connections. The 4808 ships configured for 4-wire, full-duplex operation.

The 4808 is converted to 2-wire, half-duplex operation by installing the two shorting jumpers (W4 and W5) and moving jumper W6 to the half position to prevent transmitted signals from being echoed back to the rear panel and to the internal logic. The RS485 setting has to be set to On to complete the half-duplex setup.
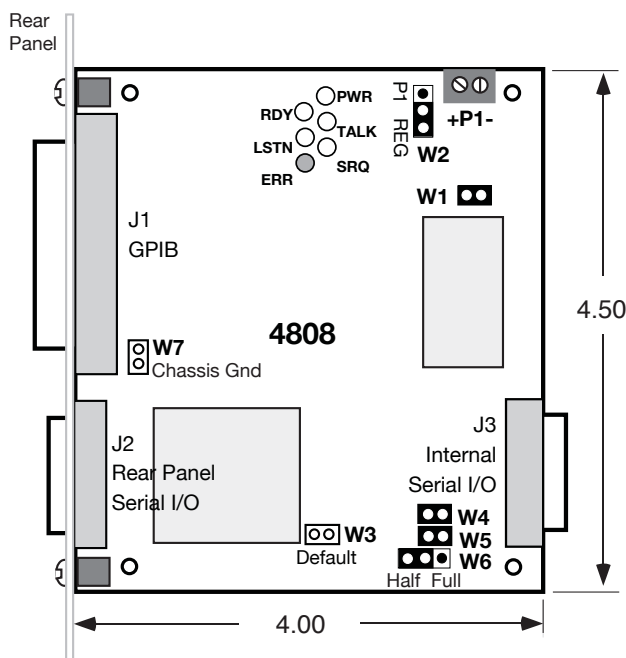

Figure 5   Rear panel Mounting Dimensions

Notes: 1. Grayed lines are PC board and mounting blocks
2. Refer to the 4806 Manual for hole and cutout dimensions.

Figure 6   4808 Outline Dimensions

RS-232 to RS-485 Converter

The 4808 converts the single ended RS-232 signals from the rear panel into differential signals for the internal device. The user's baud rate and signal format must match the 4808's serial settings. Serial characters from the rear panel are received and buffered until the End-of-Message character is received. Then the 4808 outputs the buffered message to the internal serial device. If RS485 is set on, the 4808 enables the transmitter before transmitting the first character and turns the transmitter back off after the last character has been shifted out. If RS485 is set off, the transmitter is always enabled.

Power Connections

The 4808 has a two screw terminal strip for attaching the DC power wires. A low voltage dropout regulator is provided for operating the 4808 from 5.5 to 15 volt DC power. A jumper bypasses the regulator and connects directly to the terminal strip for operation from regulated 5 Vdc power.

IEEE 488 Bus Interface

The 4808'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 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.

Parallel Poll Response

Reports SRV Status in PPR bit

Buffers and message lengths

GPIB Input   256 bytes
Serial Input   256 bytes

488.2 Common Commands

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

Serial Interfaces

Rear Panel Connector

Rear panel serial signals conform to EIA Specifications for RS-232 signals. J2 is a DTE type interface with DTR, CTR and RTS 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#	External J2 (DE-9S) Signals		Internal J3 (DE-9S) Signals
1	DCD	open	RD(B)
2	RxD	←	RD(A
3	TxD	→	SD(A)
4	DTR	←+V	SD(B)
5	Gnd		Gnd
6	DSR	open	
7	RTS	←+V	
8	CTS	←+V	
9	no connection		

Internal Serial Connector

Internal serial signals for connection to the serial device are 4-wire or 2-wire RS-485 signals capable of driving 32 RS-422/RS-485 loads. Rx Differential receiver includes a termination network to hold the signals in a mark state when they are not being driven. 4-wire or 2-wire signal selection set by on card jumpers. Signal transmitter can be set for full or half-duplex operation by a SCPI setup command. The baud rate and data character format settings are the same for both serial connectors. Signal receiver can be always enabled for full-duplex operation disabled when transmitting to block the transmit data from being echoed back.

RS-232 to RS-485 Conversion

Rear panel characters buffered and retransmitted after the EOM character is received if the GPIB path is not enabled. User sets EOM character with a SCPI setup comand. Any serial characters received from the internal serial device are always transmitted to the rear panel connector.

SCPI Commands

The 4808 conforms to the SCPI 1994.0 Specification and uses SCPI commands to set its configuration: The reserved SCPI Keywords are:

SYSTem
STATus
CALibrate
DIAGnostic

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 error 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.
Ext.Serial:	9-pin DE shell male connector with 4-40 lock studs.
Device:	9-pin DE shell female 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 18 Vdc
       240 mA (typ.)

Included Accessories

Instruction Manual
Configuration Disk with sample programs

ORDERING INFORMATION

<div align="right">Part Number</div>

GPIB - Serial Interface Board (includes Manual and Configuration Disk)	4808
GPIB - Serial Interface Board (Board Assembly only)	115772