

IEEE 488/GPIB BUS INTERFACES

4803

GPIB ↔ PARALLEL DIGITAL INTERFACE

Description

The Model 4803 GPIB <-> Digital Interface Board is an IEEE-488.2/GPIB to digital interface with 40 I/O lines that can be used to easily adapt devices with digital signals to the IEEE-488/GPIB/HP-IP bus. In a typical application, the 4803 is located inside the device and is powered by the device's +5 volt power supply. All signal connections can be made with plug-in flat ribbon cables that directly connect to the GPIB and digital headers on the 4803. When used with the companion GPIB Connector/Address Switch Board, the 4803 becomes a quick and easy way to add an IEEE-488.2 interface to most digital devices.



4803 Interface Card and Cable Assembly

A flexible interface between the IEEE 488 Bus and devices with digital signals.

- Provides a user-definable, 40-line parallel interface with bit, byte, string and binary data transfer capabilities. *Fully configurable to the user's needs by bus commands.*
- Signal monitor feature allows the 4803 to detect signal changes on 15 inputs. *Relieves controller of time consuming polling function.*
- High-current drivers and input pullup resistors. *Drives more devices, longer lines and inputs CMOS signals or switch contacts.*
- IEEE-488.2 compatible unit uses SCPI commands and Short Form commands. *Includes latest GPIB program advances*
- Device configuration, user's IDN message and bus address stored in Flash. *Stored setup eliminates program initialization statements.*
- Lock feature prevents accidental loss or change of user configuration. *Protects your configuration and IDN message.*
- Includes a menu-driven configuration program. *Steps user through configuration choices.*

The 4803 includes a complete manual and a configuration disk with sample programs. A Starter kit is available that has everything a non-GPIB user needs to install a 4803 in his chassis and control it from the GPIB bus.

Versatile Digital Interface

The 4803's digital interface can be configured to match the user's electronics with commands from the GPIB Bus. The configuration commands permit the user to designate the data lines as inputs and/or outputs in 8-bit byte increments, to connect the bytes into strings, set data polarity, data format, handshake modes and data format. When done, the setup configuration is saved in the 4803's Flash memory and becomes the new power-on configuration. At power turn-on, the Stable output signal goes true after the Digital I/O lines have been configured to avoid glitching sensitive devices like relays.

4803's digital interface can be to or from specific bytes or as strings of values to or from one or more bytes. String transfers can be done with data transfer commands or transparently without commands. Binary output mode transfers data at rates > 50 Kbytes/sec. New bit operation commands set/reset specific bits in a byte and query a bit's status.

Outputting Data

Output byte commands specify a specific byte and the output data value(s). Data strobes are manually generated if needed. When outputting data as strings, the 4803 converts the string of characters into packed HEX bytes, places the data in the configured output latches and generates a data strobe pulse to update the external device. The data strings can be a series of decimal values, ACSII HEX characters, or the 30-3F HEX characters used in ICS's 4823 series interfaces. Binary data transfers use the transparent output mode to transfer GPIB bus data bytes directly to the configured output bytes at rates > 50 Kbytes/sec.

Data Transfer Methods

Data transfer between the GPIB bus and the

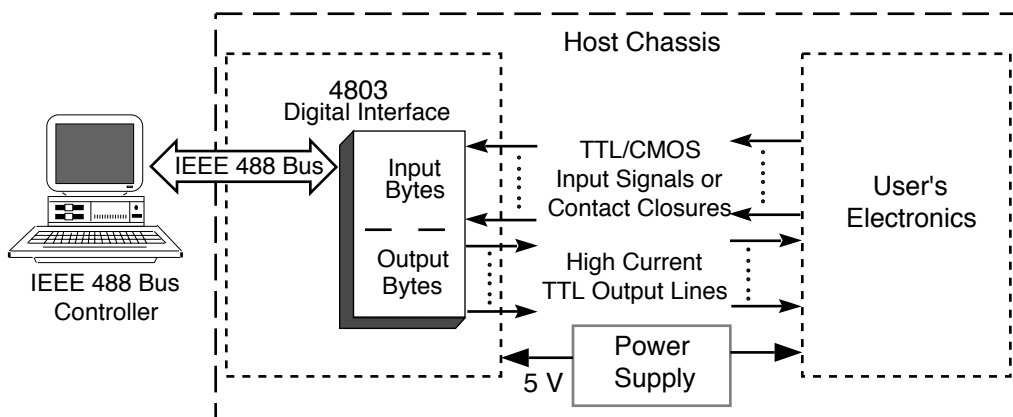


Figure 1 A typical 4803 Application



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4803: APPLICATION

Reading Input Signals

Input byte commands read data from a specific byte. When inputting data as strings with a data transfer command or transparently, the 4803 reads the configured input bytes, converts the data to the selected output format, and outputs it as a string of characters. Data can be inputted with or without handshaking. The parallel input data can be formatted as decimal numbers, as ASCII HEX characters, or into a user selected character set.

Input Signal Monitoring

The 4803 can monitor up to fifteen of the digital inputs for signal changes and generate an SRQ to notify the Bus Controller when changes occur. Monitoring is done by setting the 4803's Questionable Transition register to detect positive and/or negative signal transitions and enabling bits in the Questionable Event register. When the enabled bit(s) are detected, the 4803 generates an SRQ to alert the Bus Controller to the event. Application Bulletin 48-18 describes how to configure the 4803's Status Reporting Structure registers and includes a program example.

Configuring the 4803

Figure 2 shows the 4803's configuration and data transfer commands as a SCPI Command Tree. Each SCPI command has a corresponding Short Form command for quick programming. Most of the functions can also be queried to verify the command setting. (i.e. N? reads back talk byte selection)

The SYSTem branch sets the unit's GPIB address and addressing mode. The external address is for OEM boards.

The CONFigure branch assigns the bytes for string data transfer and sets their data polarity and handshaking. The CONFigure branch also sets the control signal polarities.

The FORMat branch sets the data conversion method and the characters in the user's Talk conversion table.

The SENSE branch gives the user a way to read digital data from a single byte or from the configured input bytes. When reading data from a specific byte, input data polarity can be assigned on a bit-by-bit basis.

The SOURce branch provides a way to write values to a byte or to the configured output bytes. When data is outputted to a specific byte, output data polarity can be assigned on a bit-by-bit basis.

The STATus branch (not shown) is used to setup and query the Operational and Questionable registers so that changes in the digital inputs or status inputs can be used to generate 488 Service Requests (SRQs). The Questionable registers can be used to monitor and query the first 15 digital I/O lines. The Operational registers can be used to examine or monitor the two external Status inputs.

The CALibrate branch provides a way to customize the 4803 with the user's own IDN message and to lockout the configuration parameters from being changed by the end user. The DEFault command restores the factory settings.

4803 SCPI COMMAND TREE

SCPI Commands		Short Form Cmds
SYSTem		
GPIB Settings		
:COMM		
:GPIB		
:ADDRESS	<numeric>	
:EXT		
:MODE	SINGLE DUAL SEC	
:ERRor?		
:VERSion?		
CONFigure		
Configure I/O		
[:DIGital]		
:INPut	<channel list>	N
:POLarity	0 1	TPn
:HANDshake	<boolean>	TBn
:OUTPut	<channel list>	LN
:POLarity	0 1	LPn
:HANDshake	<boolean>	LH
:CLEar	0 1	C
:EDR	0 1	E
:INHibit		0 1 I
:REMote	0 1	R
:RESet	0 1	X
:STRobe	0 1	S
:TRIGger	0 1	TR
:ASTatus	0 1	A
:BSTatus	0 1	B
FORMat		
:TALK	<ASCIi Hex HEXL Table>	
:TRANslation	<16 char string>	V
:LISTen	<ASCIi Hex HEXL BIN 4833>	
ROUTe		
Bit Commands		
:CLOSE	byte, bit	CLOSE
:OPEN	byte, bit	OPEN
:RESET	byte	BRESET
SENSe		
Input Data		
[:DIGital]		
:DATA		
:[VALue]?		PI?
:PORT?	number or <channel list>	BI?
:PORTn?		BlIn?
:POLarity?		
IPn		
:RESet:EDR		
ER		
:BIT?	0-1	READ?
:BYTe?	0-255	BREAD?
[SOURce]		
Output Data		
[:DIGital]		
:DATA		
:[VALue]	0-255	PO
:PORTn	0-255	BOOn
:POLarity	0-255	OPn
:STRobe		SP
CALibrate		
Calibrate Configuration		
:IDN	string (72 char max)	
:DATE	mm/dd/yy	
:DEFault		
:LOCK		1(On)

Figure 2 4803 SCPI Command Tree

The 4803 has three vertical connectors which accept flat ribbon cable connectors. Two of the connectors contain the GPIB signals. The 4803 only requires that one of the GPIB connectors be used to connect it to the GPIB bus. The unused connector can be left open. The third connector is a DIN connector with the digital I/O signals. Figure 3 shows some of the connection possibilities.

Connector J1 is a 24-pin connector that is designed for direct connection to a GPIB bus connector. Use a flat ribbon cable like ICS's P/N 114439-L that has a 24-pin plug on one end and a GPIB connector on the other end. (L is the cable length in cm) Punch a 'D' hole on the rear panel with two mounting holes. Use the metric lock studs supplied with the cable to mount the GPIB connector on the rear panel of the chassis.

Connector J2 is a 26-pin connector that contains the address switch input signals as well as the GPIB bus signals. When the external address function is enabled, the 4803 uses these signals to set the GPIB address at power-on time. Connector J2 mates with ICS's GPIB Connector/Address Switch Board Assemblies. The Connector/Address Switch Assemblies are small, business card size PC assemblies that mount a GPIB connector and an 8-bit Address rocker switch to the rear panel of a chassis. They have a flat ribbon cable which plugs into J2. The assemblies are available in two layout styles. Refer to the GPIB Connector/Address Switch data sheet for the GPIB Connector/Address Switch styles, mounting dimensions and cable lengths.

Connector J3 is a 96-pin female DIN

connector with male pins that uses rows A and C for the 4803 digital I/O signals and power. Mating DIN connectors have solder eyelet, wirewrap or solder pins or use ICS's rainbow ribbon cable assembly. 4803 boards are also available with a male DIN connector mounted on the circuit side so the board can be piggybacked on a larger PCB assembly.

GPIB Address Modes

The 4803 has three GPIB address modes: a single primary address, dual primary addresses or a primary address with two secondary addresses. In dual mode, the lower GPIB address is used for all commands, queries and for transferring data to/from the digital interface with the data commands. The upper GPIB address disables the 4803's parser and is used to transparently transfer data between the GPIB bus and the 4803's digital interface.

Binary Data Transfer

The binary data transfer mode can be used to quickly output large blocks of data. The user configures the desired bytes as outputs, sets the listen format to binary and enables either dual address mode. The 4803 is then addressed at its upper GPIB address and the binary data is outputted to the 4803. The 4803 places each bus character in a separate output byte and then pulses the data strobe. This sequence repeats until all of the data has been transferred.

OEM Customization

The 4803's firmware allows the user to store an IDN message and other setup parameters in the 4803's Flash memory. This effectively integrates the board into the user's system and makes the 4803 appear as part of the OEM's product. A lock function hides the setup variables from the end user and prevents accidental changes to the setup.

Starter Kit

The 4803 Starter Kit provides the OEM designer with everything needed to install and test a 4803 Board. The Starter Kit includes a 4803 Board, a GPIB Connector/Switch Board Assembly, the open-end ribbon cable, a GPIB bus cable, a 488-USB GPIB Controller or a 488-PCILt GPIB PCI card, ICS's 488.2 Drivers and software. The software package includes a keyboard command line program, a Visual Basic configuration program and example programs. Limit of one Starter Kit per customer.

4803 SDK Kit

The 4803SDK kit provides everything a user needs to write custom 4803 programs. The kit contains the IAR 'C' language compiler, spy debugger, ICS's SDK library disk, manual and spare flash chips. ICS's library disk contains the SCPI parser files, 'C' routines, make files and example 4803 files. Refer to the separate 4803SDK data sheet for more information about the SDK package.

4803 Relay Driver Board

The 4803DVR Board expands the 4803's drive outputs by providing forty 300 mA relay drivers with convenient screw terminals. A 4803 with J3 mounted on the circuit side piggybacks on the 4803DVR board to make a compact assembly. The 4803DVR board can be configured for all outputs or for 8 or 16 digital inputs. The 4803DVR Board is powered by the relay power supply and supplies 5 Vdc power to the 4803.

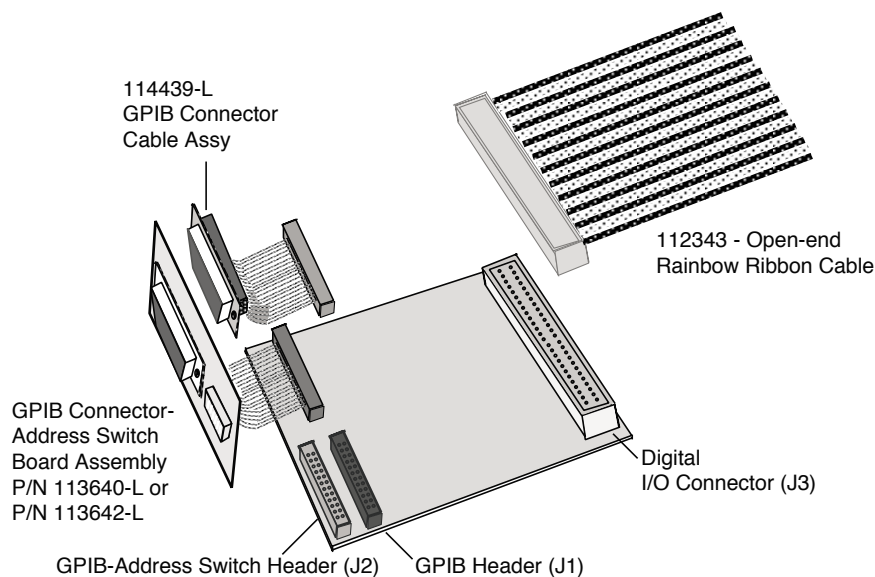


Figure 3 4803 Connection Methods

4803: SPECIFICATIONS

IEEE 488 Bus Interface

The 4803's 488 Bus interface meets IEEE STD 488.1-1987 and has the following capabilities:

SH1, AH1, T6, L4, SR1, PP0, DC1, RL0, DT1, C0 and E2 drivers.

Address Capability

Dual primary addresses or single primary with secondary addresses 00 and 01. Primary address range: 0-30.

SRQ Generation

SRQs are generated if the unit is not a talker, if SRQs are enabled and if an Enabled Event Status Register bit or an monitored digital input change occurs. Digital inputs monitored by the Questionable registers.

488.2 Common Commands

*CLS, *ESE, *ESE?, *ESR?, *IDN?, *OPC, *OPC?, *RCL, *RST, *SAV, *SRE, *SRE?, *STB, TST? and *WAI

SCPI Commands

Used to set and query all programmable functions. The 4803 conforms to SCPI 1994.0 Specification.

Signal Characteristics

The 4803's parallel I/O signals have the following electrical characteristics. All time delays listed here are maximums, all pulse widths are minimums.

Inputs 40 Digital I/O ,
2 Status and Reset Inputs
Input High = $> +2.0\text{ V}$ @ $\pm 10\text{ }\mu\text{A}$
Max High = 5.5 V
Logic Levels Low = $< 0.8\text{ V}$ @ $250\text{ }\mu\text{A}$
with 33 Kohm pullup to +5 Vdc for sensing contacts.

Input Timing External Data Inhibit line
SETS within $1\text{ }\mu\text{s}$ of the active edge of the EDR Input signal and resets after data is loaded. Data loading time for 6 BCD/HEX characters is 0.15 ms (typ.) after the 4803 has been addressed as a Talker

Output Logic Levels High = $> 3\text{ V}$ with 3 mA source
High $\Rightarrow > 2\text{ V}$ with 24 mA source
Low = 0.0 to +0.55 Vdc, 48 mA sink

Output Timing Data is transferred to the output 0.6 to 5.3 ms after receipt of a terminator depending upon transfer method.

Data Stb Output pulse width, $5\text{ }\mu\text{s}$
Trigger Output pulse width, $5\text{ }\mu\text{s}$
Remote Output level asserted when in the remote state
Reset Output pulse width, $40\text{ }\mu\text{s}$ for *RST command and true during 4803 reset time (70 ms)
Stable Output level asserted when Digital I/O lines have been configured.

Diagnostic Indicators

Six on board LEDs with drive signals on the DIN connector for remote LEDs

PWR, RDY, TALK, LSTN, SRQ and ERR

Physical

Size, L x W x H
139.7 x 114.3 x 14.3 mm
(5.5 x 4.5 x 0.562 inches)

Connectors and Headers

GPIB: 24-pin 3M 2524 male conn.
 GPIB/Addr: 26-pin 3M 2526 male conn.
 Digital I/O: 96-pin, 3 row male DIN conn using rows A & C.

Temperature

Operation -10° C to $+70^{\circ}\text{ C}$
Storage -20° C to $+85^{\circ}\text{ C}$

Humidity

0-90% RH without condensation

Power

+5 Vdc @ 400 mA (typical)

Included Accessories

Instruction Manual

Configuration Disk with sample programs

Available Accessories

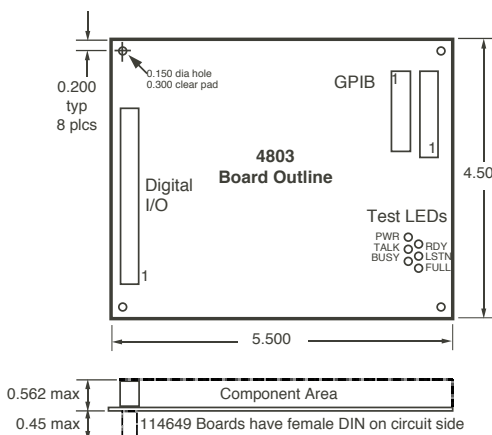
GPIB flat ribbon cable 90 cm max.,
P/N 114439-90.

GPIB Connector/Addr Sw Assy with flat ribbon cable, 90 cm max., P/N 113640-90 or 113642-90. See GPIB Conn/Sw data sheet.

Open-end rainbow ribbon cable, 5 ft,
P/N 112343

Mating DIN Connectors:

P/N 902023 Dolder Eyelet
P/N 902066 Wirewrap
P/N 902067 Dip Solder
P/N 902124 Flat ribbon Cable



4803 Outline Drawing

ORDERING INFORMATION

	Part Number
IEEE 488.2 to Parallel Digital Interface Board (Includes Instruction Manual and Configuration Disk)	4803
IEEE 488.2 to Parallel Digital Interface Board (Board only)	114642
4803 Starter Package with 4803, 488-PCILt card, Bus Cable, GPIB Connector/Switch Bd, and Connectors	114646-01
4803 Starter Package with 4803, 488-USB Controller, Bus Cable, GPIB Connector/Switch Bd, and Connectors	114646-02
4803 with connector on circuit side (Includes Instruction Manual and Configuration Disk)	114648
4803 with connector on circuit side (Board only)	114649
GPIB Connector/Address Switch Assemblies	see separate data sheet
GPIB Flat Ribbon Cables	see separate data sheet
Open-end Rainbow colored flat ribbon cable, 5 feet long	112343