IEEE 488/GPIB BUS INTERFACES

4813

GPIB ⟷ PARALLEL DIGITAL INTERFACE

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

- Provides a user-definable, 128-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 detects input changes.
  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.

- Device configuration, user's IDN message and bus address stored in Flash.
  User can easily set the power-on configuration.

- Lock feature prevents accidental loss or change of user configuration settings.
  Protects your configuration and IDN message.

- Packaged on a 5.5 in x 7 in board with mounting holes.
  Easy installation in host chassis

- Includes a menu-driven configuration program.
  Steps user through configuration choices.

DESCRIPTION

The Model 4813 GPIB <-> Digital Interface Board is an IEEE-488.2/GPIB to digital interface with 128 I/O lines that can be used to easily adapt devices with a large number of digital signals to the IEEE-488/GPIB/HP-IP bus. In a typical application, the 4813 is located inside the device chassis and is powered by the device's +5 volt power. All digital signal connections are on a 150-pin connector at one end of the card. A 26-pin header on the other end of the 4813 contains the GPIB and address switch input signals. It connects to a companion GPIB Connector/Address Switch Board that mounts on the rear panel of the chassis.

The 4813's high-power TTL type signals can easily drive small relays or other logic elements. Applications include controlling switching matrices, displays or large signal arrays.

Versatile Digital Interface

The 4813'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, and handshake modes When done, the setup configuration is saved in the 4813's Flash memory and becomes the new power-on configuration. At power turn-on, the Digital I/O lines are initially tristated and then configured after the 4813 passes its self test. A Stable signal is asserted after the digital I/O lines are configured.

4813 Interface Card

Data Transfer Methods

Data transfer between the GPIB bus and the 4813'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 latch an output value into a specific byte. Data Strobes can be manually generated if needed. Strings of data can be outputted to multiple bytes with a command or transparently. The 4813 converts the data string characters into packed HEX bytes, latches the data in the configured output bytes 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 earlier interfaces. Binary data transfers use the transparent output mode to transfer data bytes directly to the configured output bytes.
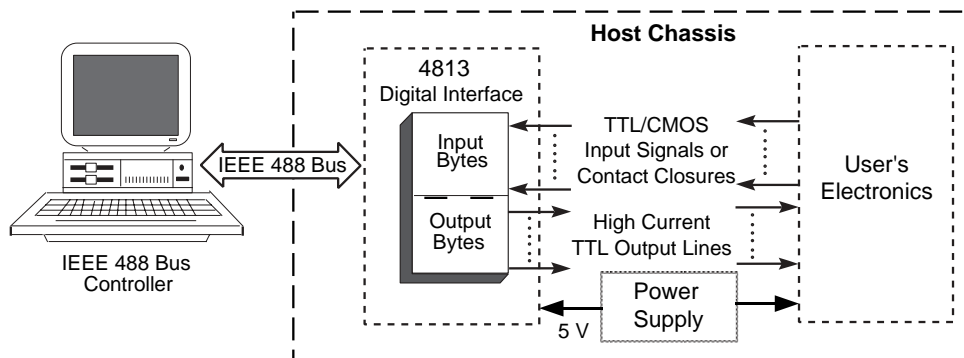

Figure 1 A typical 4813 Application

Reading The Input Signals

Input byte commands read data from a specific byte. Strings of data can be read from multiple bytes with a data transfer command or transparently. For input strings, the 4813 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 input data can be formatted as decimal numbers, as ASCII HEX characters, or into a user selected character set.

Input Signal Monitoring

The 4813 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 4813'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 4813 generates an SRQ to alert the Bus Controller to the event. The user can query the 4813's Questionable Condition Register to determine the input signal states and the Event Register to learn which signal changed state. Application Bulletin 48-18 describes how to configure the 4813's Status Reporting Structure registers and includes a program example.

Configuring the 4813

Figure 2 shows the 4813'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 the talk byte selection)

The SYSTem branch sets the unit's GPIB address and addressing mode. Enabling the external address reads the GPIB address from the rear panel mounted address switch.

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 4813 with the user's own IDN message and to lockout the

4813 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?		BIn?
: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	BOn
:POLarity	0-255	OPn
:STRobe		SP
CALibrate	**Calibrate Configuration**	
:IDN	string (72 char max)	
:DATe	mm/dd/yy	
:DEFault		
:LOCK	1(On)| 0(Off) [0]	

Figure 2   4813 SCPI Command Tree

configuration parameters from being changed by the end user. The DEFault command restores the 4813 to ICS's factory defaults.

4813 Connections

The 4813 has two connectors, one for GPIB signals and the other for the Digital interface. See Figure 3.

Connector J1 is a 150-pin connector (3 rows of 50 pins/row on 0.1 inch centers) with vertical male pins. Mating female connectors are available with solder eyelet, wirewrap or solder pins. When piggybacked on a larger PC board, the 4813 adds less than 0.550 of height to the PC board.

Connector J2 is a 26-pin header that contains the 4813's GPIB bus and external address switch input signals. When the external address mode is enabled, the 4813 uses the address switch signals to read a rocker switch 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 the header on the 4813. The assemblies are available in two layout styles with user specified cable lengths. Refer to the GPIB Connector/Address Switch data sheet for layout styles, mounting dimensions and cable lengths.

GPIB Address Modes

The 4813 has three GPIB address modes: a single primary address, dual primary addresses or a primary address with secondary addresses 0 and 1. The single primary address and the lower address in either dual mode, are used for all commands, queries and for transferring data to and from the digital interface with the data commands. In either dual address mode, the upper GPIB address is used to transparently transfer data between the GPIB bus and the configured bytes in the 4813's digital interface.

Binary Data Transfer

The binary data transfer mode can be used to quickly output large blocks of data to test devices or to load signal generators. The user configures the desired output bytes, sets the listen format to binary and enables either dual address mode. The 4813 is then addressed at its upper GPIB address and the binary data is outputted to the 4813. The 4813 latches each bus character in a separate output byte and then pulses the data strobe when all bytes have been loaded. This sequence repeats until all of the data has been transferred.

4813 Starter Kit

The 4813 Starter Kit includes a 4813 Board, a GPIB Connector/Switch Board Assembly, mating 150-pin connector, a GPIB bus cable, a 488-PCILt or USB GPIB Controller for a Intel type PC, 488.2 Drivers and software. The software package includes a keyboard command line program, a Visual Basic configuration program and sample programs. Order the 4813 Starter Kit as P/N 115146-01 for the 488-PCILt card and P/N 115146-02 for the 488-USB Controller. Limit of one Starter Kit per customer.

OEM Customization

OEM customization can be as simple as presetting the I/O configuration and IDN message prior to shipping or more complex by adding special SCPI commands and functions to the 4813's firmware. Units with custom firmware are identified with a -7 option code and their own program number.
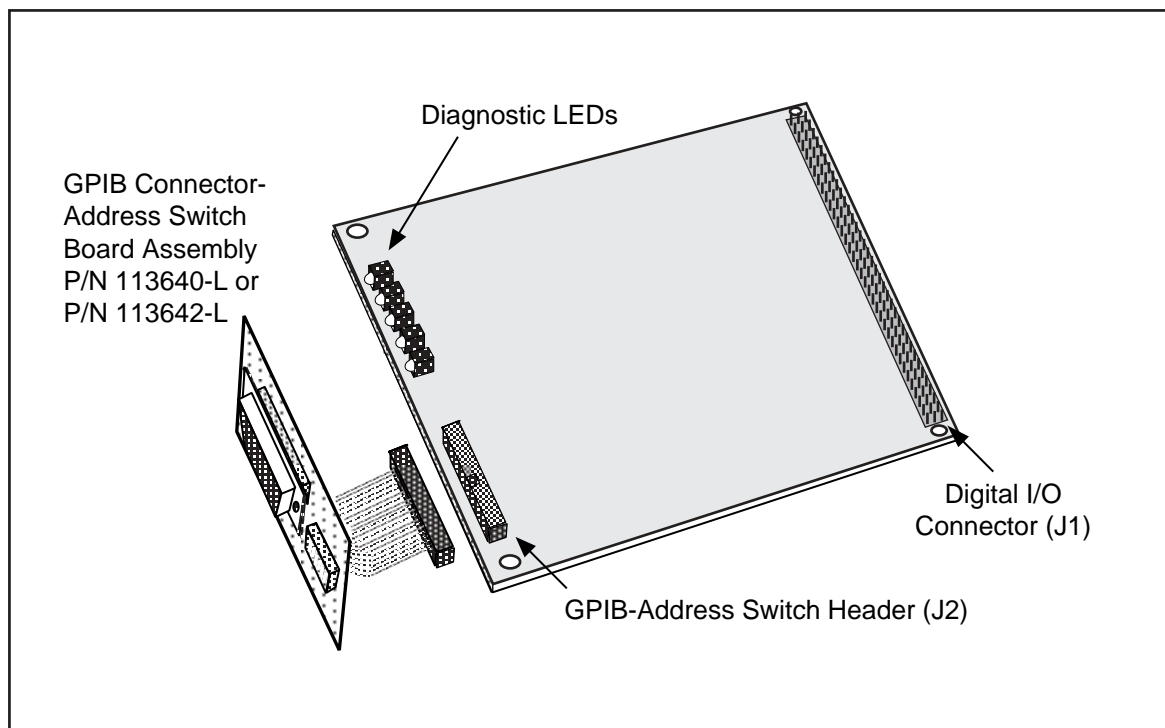

Figure 3   4813 Connection Method

IEEE 488 Bus Interface

The 4813'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

Primary address range: 0-30.
Dual primary addresses or single primary with secondary addresses 0 and 1 for transparent data transfer.

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 if a 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 4813 conforms to SCPI 1994.0 Specification.

Table 2   Programmable Functions

GPIB Bus Address
Address mode
Input Bytes
Input Signal polarity
Input Handshaking
Talk data format
Talk data conversion table
Output Bytes
Output Polarity
Output Handshaking
Listen data format
Control line polarities
SENSe input polarities
SOURce output polarities
STATus register configurations

Reset Inputs

The 4813 is reset by a low going pulse on the External Reset input line or by pressing a miniature push-button on front edge of the 4813's PCB

Signal Characteristics

The 4813's parallel I/O signals have the following electrical characteristics. All time delays listed here are maximums, all pulse widths are minimums.

Inputs 128 Digital I/O , 2 Status and Reset Inputs

Input Logic Levels High = > +2.0 V @ ±10 μA
Low = <0.8 V @ 250 μA
with 33 Kohm pullup to +5 Vdc for sensing contacts.
Max High = 5.5 V

Input Timing External Data Inhibit line SETS within 1 μs 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 4813 has been addressed as a Talker

Output Logic Levels High = >3 V with 3 mA source
High =>2 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 8 ms after receipt of a terminator depending upon transfer method and command.

Data Stb Output pulse width, 2-5 μs.
Trigger Output pulse width, 5 μs
Remote Output level asserted when in the remote state
Reset Output pulse width, 270 μs for when 4813 reset.

Diagnostic Indicators

Six on board LEDs
PWR   On when power applied
RDY   On when self test passed
TALK   On when addressed to talk
LSTN   On when addressed to listen
SRQ   On when asserting SRQ line
ERR   On when ESR error bits set

Physical

Size, L x W x H
7.0 x 5.5 x 0.35 inches
(178 x 140 x 9 mm)

Connector and Headers
GPIB/Addr: 26-pin 3M 2526 male conn.
Digital I/O: 150-pin, 3 row male conn

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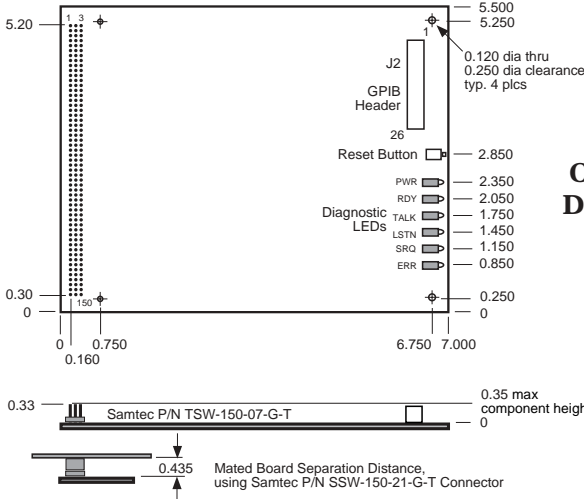Operation   -10° C to +70° C
Storage   -20° C to +85° C

Humidity
0-90% RH without condensation

Power   +5 Vdc @ 400 mA (typical)

Included Accessories

Instruction Manual
Support CD with sample programs

Available Accessories

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.
Mating connector, P/N 902308

4813 Outline Drawing

ORDERING INFORMATION

Part Number

IEEE 488.2 to Parallel Digital Digital Interface Board (Includes Instruction Manual and Configuration Disk)	4813
IEEE 488.2 to Parallel Digital Digital Interface Board (Board only)	115142-01
4813 Starter Package with 4813, 488-PCIlt or 488-USB, Bus Cable, GPIB Conn/Sw Board and mating connector.	115146