

# IEEE 488/GPIB BUS INTERFACES

## 4863 GPIB ↔ PARALLEL DIGITAL INTERFACE

### DESCRIPTION

The 4863 is an IEEE-488/GPIB/HP-IB to Digital Interface that provides 48 programmable digital lines that can be configured as inputs or outputs in eight bit bytes. Each data line has a pullup resistor for sensing contact closures or TTL/CMOS inputs. As outputs, each line is latched and can source 24 mA or sink up to 48 mA. The 4863 can also be configured to monitor up to 15 input lines for changes. Applications include interfacing devices with parallel digital signals to the GPIB bus, controlling discrete devices from the GPIB bus, monitoring digital signals for changes and outputting blocks of data.

The Model 4863 is a member of ICS's Minibox™ interface family. All Minibox™ interfaces are IEEE 488.2 compatible, use SCPI commands for ease of programming and are packaged in a CE compliant metal case that is less than 1.6 inches (39 mm) high. Rack mounting kits are available for mounting one or two Model 4863s in a single 1U high space.

### Versatile Digital Interface

The 4863's digital interface is configured 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, connect bytes into strings, set data polarity, data format, and handshake modes. The user can set the output lines to his desired values and save the current configuration in the 4863's Flash memory. The saved configuration becomes the new power-on configuration. At power turn-on, the Digital I/O lines are initially tristated and then set to the saved configuration. A Stable signal is asserted after the digital I/O lines are configured to enable external logic or relays.



4863 Parallel Interface

### Data Transfer Methods

Data transfer between the computer and the 4863's digital interface can be by individual bits, by bytes or as strings of data values to multiple bytes as shown in Figure 2.

- Bit commands set or reset specific bits in a byte or query a bit's status.
- Byte commands set all 8 bits in a specific byte or read data from a byte.
- String transfer commands send strings of data characters to one or more output bytes to make a multi-byte output word or read a string of data from one or more input bytes. The user designates these bytes as inputs or outputs when he configures the board.

In the Single Address Mode, the user can set the 4863's configuration and transfer data as described above. In the Dual Address Mode, the lower address behaves like the Single Address Mode. The upper address transparently passes strings of data to the output bytes or reads data from input bytes. The data is sent or read without having to parse any commands, eliminating the parsing time and speeding up the data transfer. When the binary data format is used, the 4863 can output data at rates > 50 Kbytes/sec.

### Reading Input Signals

Input byte commands read data from a specific bit, byte or from multiple bytes as shown in Figure 2. When inputting data as strings with a data transfer command or transparently, the 4863 reads the bytes that have been previously configured as inputs, converts the data to the selected output format (decimal, ASCII HEX or user character set), and output it as a string of characters on the GPIB bus. Data can be inputted with or without handshaking.

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 4863 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.*
- Device configuration and bus address stored in Flash. *Saves your setup values.*
- IEEE-488.2 compatible unit uses SCPI commands and Short Form commands. *Includes latest GPIB program advances.*
- Packaged in small 1U high metal case. *Smaller size with EMI/RFI protection.*
- Includes a menu-driven configuration program. *Steps user through configuration choices.*

CE Approved

RoHS



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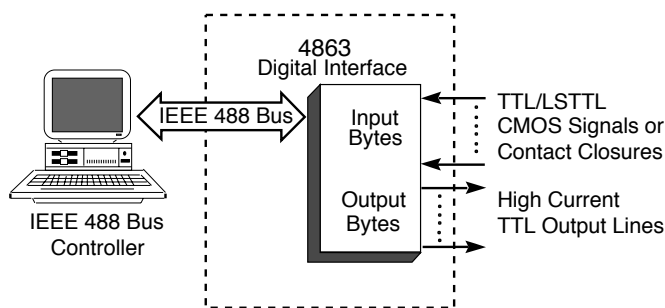
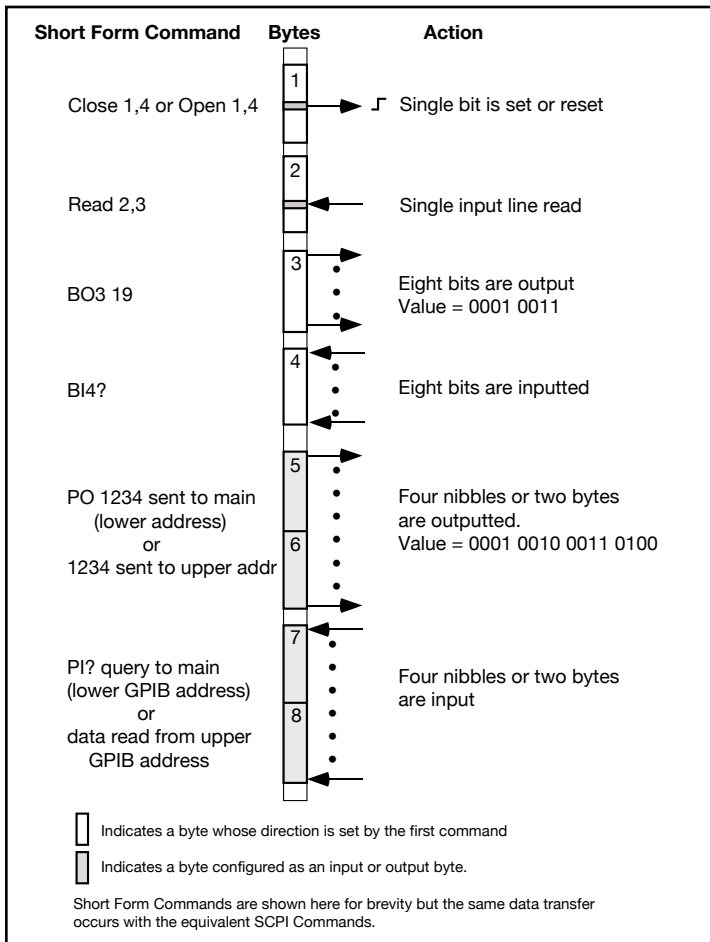


Figure 1 4863 Block Diagram

## 4863: Application



**Figure 2 Digital Interface Transfer Methods**

### Input Signal Monitoring

The 4863 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 4863'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 4863 generates an SRQ to alert the Bus Controller to the event. Application Bulletin 48-18 describes how to configure the 4863's Status Reporting Structure registers and includes a program example.

### Configuring the 4863

Figure 3 shows the 4863'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 CALibrate branch provides a way to customize the 4863 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. All configuration settings can be saved with the \*SAV 0 command and become the new power turn-on default settings.

### 4833 Compatibility

The 4863's transparent data transfer mode and short form configuration commands are similar to ICS's Model 4833 GPIB

## 4863 SCPI COMMAND TREE

SCPI Commands	Short Form Commands
<b>SYSTem</b>	
:COMM	
:GPIB	
:ADDRESS	<numeric>
:EXT	
:MODE	SINGle   DUAL   SEC
:ERRor?	
:VERSion?	
<b>CONFigure</b>	
[:DIGital]	
:INPut	<channel list>
:POLarity	0   1
:HANDshake	<boolean>
:OUTput	<channel list>
:POLarity	0   1
:HANDshake	<boolean>
:CLEar	0   1
:EDR	0   1
:INHibit	0   1
:REMote	0   1
:RESet	0   1
:STRobe	0   1
:TRIGger	0   1
:ASTATus	0   1
:BSTATus	0   1
<b>FORmat</b>	
:TALK	<ASCIi   Hex   HEXL   Table>
:TRANSLation	<16 char string>
:LISTen	<ASCIi   Hex   HEXL   BIN   4833>
<b>SENSe</b>	
:BIT?	byte,bit
:READ?	byte
[:DIGital]	
:DATA	
[[:VALue]?	
:PORT?	number or <channel list>
:PORTn?	
:POLarity?	
:RESet:EDR	
<b>ROUTe</b>	
:CLOSE	byte,bit
:OPEN	byte,bit
:RESEt	byte
<b>[SOURce]</b>	
[[:DIGital]	
:DATA	
[[:VALue]	0-255
:PORTn	0-255
:POLarity	0-255
:STRobe	
<b>CALibrate</b>	
:IDN	Calibrate Configuration
:DATE	string (72 char max)
:DEFault	mm/dd/yy
:LOCK	1(On)   0(Off) [0]

**Figure 3 4863 SCPI Command Tree**

to Parallel Interfaces. Users familiar with the Model 4833 will be able to use many of the same commands and command syntax when configuring the 4863's interface.

**Digital IO Connections**

All of the 4863's Digital I/O signals are on a 62-pin connector on the rear panel of the 4863. There are several ways to connect to the 4863:

The user can solder wires to the mating connector that is supplied with each 4863. The connector accepts 24 to 28 AWG wire sizes.

The user can purchase a five foot long, open-end cable (P/N 114508) and connect a connector to the open end or solder the cable wires directly to his PC board or devices.

The user can purchase a Digital I/O extension cable with male connectors that provides a pin-to-pin extension of the 4863's Digital I/O signals. Mount a female connector (P/N 902268) on the user's PC board to complete the signal connection.

See page 4 for a graphical list of the 4863's connection options.

**OEM Board Version**

The 4863 is also available as a board version for OEM applications. Board versions are designed to be mounted in the host's chassis and are powered from the host's 12 to 32 volt power supply. The boards are available with GPIB and Serial interface configurations listed in Table 1. On the OEM boards, the interface headers are mounted vertically to minimize the board footprint. The Digital I/O connector is the same right angle 62-pin connector with lock studs supplied on the 4863 boxed units. A mating connector and hood is included with OEM board.

**GPIB Address**

Standard 4863's store their GPIB address in Flash memory and use a SCPI command to change it. On OEM boards, extra digital input lines are provided to input the GPIB address from an external address switch at power turn-on. The SCPI external address enable setting selects which address is used at power turn-on.

**GPIB Header**

On OEM boards, the 4863's GPIB connector is replaced with a 26-pin vertical header for remoting the GPIB bus and address switch signals to the rear panel. The 26 pin header mates with a flat ribbon cable from ICS's GPIB Connector/Address switch assemblies. These compact, business card size assemblies provide a convenient way to mount a GPIB Connector and an address switch on the rear panel.

**RS-232/RS-485 Interfaces**

OEM board versions are available with an optional RS-232/RS-485 serial interface. The serial interface operates at rates up to 115,200 baud. The serial interface provides all of the functionality of the GPIB interface but allows for control of the 4863 by any PC's COM port or by an RS-485 network. Up to sixteen 4863s can be placed on a single RS-485 network. The 4863s are addressed by a two character address sequence that precedes the actual command. When the OEM board has both interfaces, the unit defaults to the serial interface until the GPIB interface enters the Remote state.

**LED Header**

An 8 pin header on the OEM boards allows easy extension of the 4863's LEDs to the user's front panel.

**OEM Customization**

The 4863's firmware allows the user to store an IDN message and other setup parameters in the 4863's Flash memory. This effectively integrates the board into the user's system and makes the 4863 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 OEM Starter Kit provides the OEM designer with everything needed to install and test a 4863 OEM Board. The kit includes a 114515 OEM Board with GPIB and Serial interfaces, a GPIB Connector/Switch Board Assembly, a GPIB bus cable, a serial cable, a 488-USB2 GPIB Controller module, GPIB Drivers and software. The software package includes ICS's GPIBkybd program, a Visual Basic control program and 4863 sample LabView programs. Order the 4863 OEM Starter Kit as P/N 114499. Limit is one to a customer.

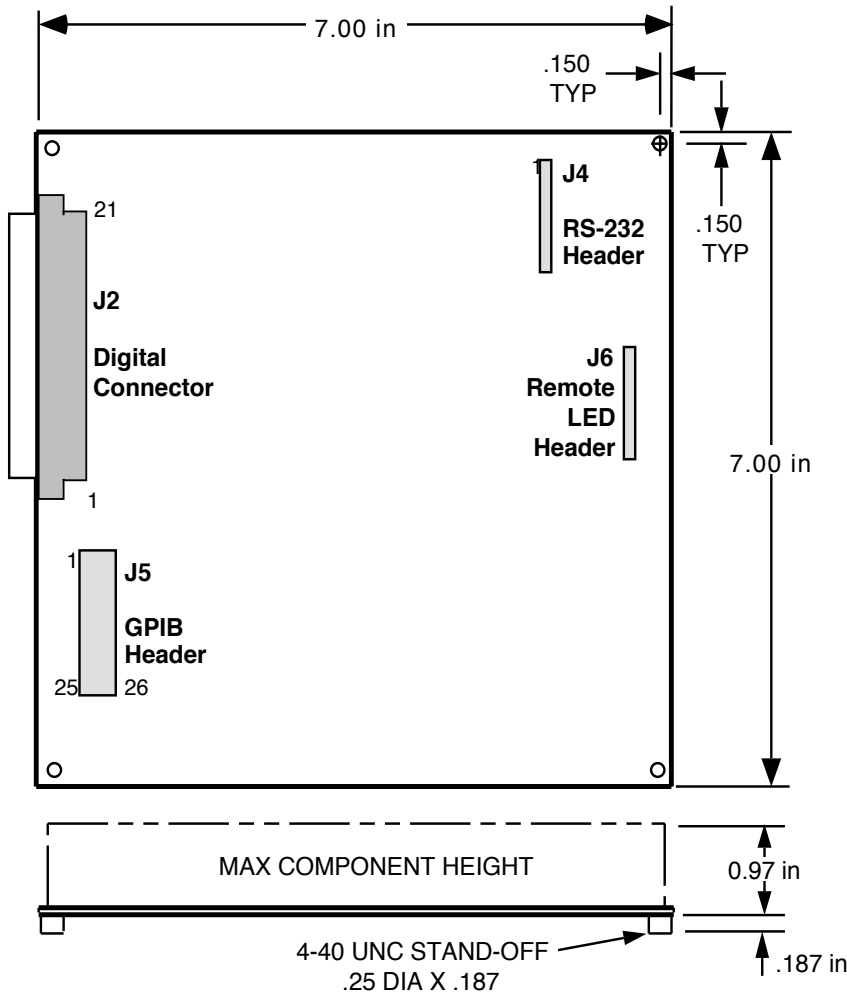


Figure 4 4863 OEM Board Dimensions

Select the 4863 and then pick your accessory items.

<b>Part Selection</b>	<b>Qty</b>	<b>Part Number</b>
Standard 4863 Minibox with 48 I/O lines. Includes a 62-pin mating connector and hood	(1)	4863
<div style="display: flex; align-items: center;"> <div style="border-left: 1px solid black; border-right: 1px solid black; border-bottom: 1px solid black; width: 100px; height: 100px; margin-right: 10px;"></div> <div> <p>Select an extra mating digital I/O connector, 62-pin male - solder eyelet (1) 902270</p> <p style="margin-left: 100px;">hood (1) 902105</p> </div> </div>		
<div style="display: flex; align-items: center;"> <div style="border-left: 1px solid black; border-right: 1px solid black; border-bottom: 1px solid black; width: 100px; height: 100px; margin-right: 10px;"></div> <div> <p>Select an Open end, 62 conductor, 28 AWG wire cable assembly, 5 feet long (1) 114508</p> <p style="text-align: center;"> </p> <p style="text-align: center;">or</p> <p style="text-align: center;"> </p> <p>Select the Digital Extension Cable, pin-to-pin connections, male connectors (1) 114714-003 (Note 1)</p> <p style="text-align: center;"> </p> <p style="text-align: center;">(Dash number is cable length in feet)</p> <p style="text-align: center;">and</p> <p style="text-align: center;"> </p> <p>Select mating female connector with right angle PCB tails (1) 902268</p> </div> </div>		
4863 OEM board with 48 I/O lines. Includes a 62-pin mating connector and hood		
GPIB Interface only	(1)	114514
GPIB and Serial Interfaces	(1)	114515
<div style="display: flex; align-items: center;"> <div style="border-left: 1px solid black; border-right: 1px solid black; border-bottom: 1px solid black; width: 100px; height: 100px; margin-right: 10px;"></div> <div> <p>Select a GPIB Connector/Address Switch Assembly - Horizontal style (1) 113640-L (Note 2)</p> <p style="margin-left: 100px;">Vertical style (1) 113642-L (Note 2)</p> </div> </div>		
<div style="display: flex; align-items: center;"> <div style="border-left: 1px solid black; border-right: 1px solid black; border-bottom: 1px solid black; width: 100px; height: 100px; margin-right: 10px;"></div> <div> <p>Select an extra mating digital I/O connector, 62-pin male - solder eyelet (1) 902270</p> <p style="margin-left: 100px;">hood (1) 902105</p> </div> </div>		
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Notes:

1. The dash number is the cable length in feet.
2. -L is the cable length in cm. You can order any length from 10 to 90 cm. Standard stocked lengths are: 30, 45, 60 and 90 cm. Select an appropriate length as it is best to not have extra cable coiled up in the chassis to minimize EMI pickup. See the GPIB Connector/Address Switch Assembly data sheet for more details.

**TABLE 1 OEM BOARD CONFIGURATIONS**

Part Number	Interfaces		
	GPIB	RS-232	RS-485
114514	Yes	No	No
114515	Yes	Yes	Yes
114711	No	Yes	Yes

OEM 4863 Boards include Instruction Manual, Support CD, mating digital I/O connector and hood. GPIB Connector/Switch Assemblies and cables are ordered separately.

## 4863: Specifications

### IEEE 488 Bus Interface

The 4863'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 4863 conforms to SCPI 1995.0 Specification.

**Table 2 Programmable Functions**

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

### Signal Characteristics

The 4863's parallel I/O signals have the following electrical characteristics. All time delays listed here are maximums, all pulse widths are minimums.

Lines 48 Digital I/O plus  
2 Status Inputs  
Input High => +2.0 V @ ±10 μA  
Logic Low = <0.8 V @ 250 μA  
Levels with 33 Kohm pullup to +5 Vdc for sensing contacts.  
Max High = 5.5 V

Input External Data Inhibit line  
Timing 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 4863 has been addressed as a Talker

Output High => 3 V with 3 mA source  
Logic High => 2 V with 24 mA source  
Levels Low = 0.0 to +0.55 Vdc, 48 mA sink

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

**Data Stb** Output pulse width, 5 μs  
**Trigger** Output pulse width, 5 μs  
**Clear** Output pulse width, 5 μs  
**Reset** Output pulse width, 40 μs for \*RST command and true during 4863 reset time (70 ms)

### Controls and Indicators

**POWER** Front-panel switch  
LEDs  
PWR Indicates power on  
RDY Unit has passed self test  
TALK Unit is addressed to talk  
LSTN Unit is addressed to listen  
SRQ Unit is asserting SRQ  
ERR Unit has detected a command error

### Physical

**Size** W x H x D  
7.29 x 1.52 x 7.45 inches  
(1185.2 x 38.6 x 189.2 mm)

**Weight** 3 lbs (1.4 kg)

### Temperature

-10°C to +55°C Operating  
-40°C to +70°C Storage

**Humidity** 0-90% RH no condensation

**RFI/EMI** CE Certified

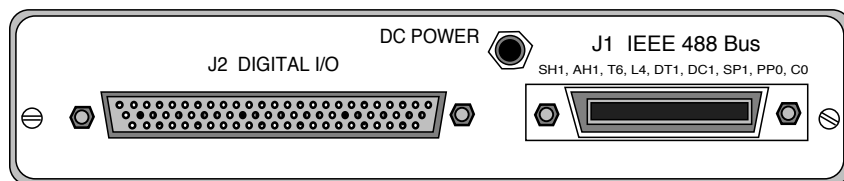
### Connectors and Headers

IEEE bus: Std 24-pin metal shell w/ metric studs  
I/O: 62-pin female, metal DC shell connector with lock studs  
Serial: 10-pin male header  
LEDs: 8-pin male header

**Power** 9 to 32 Vdc @ 3 VA

### Included Accessories

Instruction Manual  
Mating Connector and Hood  
CD-ROM with GPIB Keyboard Controller program and Configuration Utility.  
UL/CSA/VDE approved AC power Adapters provided for:  
US 115±10% Vac, 60 Hz (std, no dash)  
-U Universal 100-230 Vac, 50/60 Hz with plugs for Australia, China, Europe, Japan, UK and US.



**Figure 5 4863 Rear Panel**

## ORDERING INFORMATION

	Part Number
IEEE 488 Bus Parallel Digital Interface with 115 VAC adapter	4863
IEEE 488 Bus Parallel Digital Interface with 100-230 VAC adapter.	4863-U
IEEE 488 Bus Parallel Digital Interface Starter Kit	114499
OEM IEEE 488 Bus to Parallel Digital Interface Boards (adapter not included)	See Table 1