

Background information:

## IEEE488 Bus Systems

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### Basics

The IEEE488 standard defines a parallel, 8-bit wide bus which is today used mainly to control measuring devices in laboratory applications.

Meanwhile, companies such as HP and Commodore also promoted the bus as a peripheral interface, for example to connect their printers, plotters and external hard drives. In addition to the name "IEEE488", there exist designations which are in part promoted by other standardizing committees:

HP-IB, GP-IB, IEC 625, as well as DIN IEC 625

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### Topology

A maximum of 15 stations can be connected in parallel to the bus system. The bus uses 25-pin SUB-D connectors (IEC 625) or 24-pin Amphenol connectors (IEEE488), which are generally in turn provide on their back side a 24-pin female for connecting an additional device ("backpack" technique).

The overall length of a bus system can be up to 20m, although the cable distance between any 2 stations must not exceed 2m.

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### Bus control and bus management

The IEEE488 bus is a master/slave system in which a computer generally assumes the so-called controller function and controls access to the bus by the other stations. Before the actual sending of user data, this controller must first address the desired terminal device as a talker or listener, depending on the required data direction.

An exception to master/slave operation is "Listen-only" mode. In this mode, devices such as printers accept all data sent on the bus regardless of addressing. When using a single printer on an oscilloscope, you can for example avoid having to configure the addresses.

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### Bus Signals

All signals on the IEEE488 bus are sent as TTL levels using open collector technique. The 16 lines can be divided into 3 groups:

- Data bus (DI01-DI08)

Depending on the state of the control bus, either user data or address information is sent over the data lines.

- Control bus (ATN, IFC, REN, SRQ, EOI)
  - **ATN** (Attention) is used to distinguish between address information and user data. ATN = "LOW" indicates transmission of an address datum.
  - **IFC** (Interface clear) is activated to initialize all connected devices.
  - **REN** (Remote enable) is used to switch all stations from local to interface operation.
  - **SRQ** (Service Request) represents the interrupt line of the IEEE488 bus. Bus stations can use this to report to the controller that for example data are ready to be picked up.
  - **EOI** (End or identify) must be considered in conjunction with the status of the ATN line: this signal can be used for example to indicate the last byte in a data transmission.
- Handshake bus (DAV, NRFD, NDAC)

These signals are used for flow control in data transmission. Similar to the strobe signal in the Centronics interface, setting the DAV indicates the presence of a valid byte on the data lines. NRFD and NDAC are used by a listener to indicate readiness to receive data and that data have been received respectively.

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### Pin configuration

The IEEE 488 configuration on a 24-pin Amphenol connector is shown in the following table:

Pin	Signal	Pin	Signal
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Pin	Signal		Pin	Signal
1	DI01		13	DI05
2	DI02		14	DI06
3	DI03		15	DI07
4	DI04		16	DIO8
5	EOI		17	REN
6	DAV		18	GND
7	NRFD		19	GND
8	NDAC		20	GND
9	IFC		21	GND
10	SRQ		22	GND
11	ATN		23	GND
12	Shield		24	GND



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