IEEE 488/GPIB CONTROL

4895

SERIAL ⟷ GPIB BUS CONTROLLER

- Adds full GPIB Bus controller capability to any computer with an RS-232/RS-422 or RS-485 port.
  Easiest way to add GPIB bus control capability.
- Automatic DMA provides high speed GPIB data transfer >600 K bytes/sec.
  Fast GPIB ⟷ Serial buffer.
- Uses HP BASIC style commands on the serial interface to control the bus.
  The worlds most familiar GPIB/HP-IB control language.
- Program storage space in RAM and E²ROM
  Use program space to off load the computer and serial link.
- Includes IEEE 488.2 command protocols.
  Provides latest GPIB bus functions.
- Reverse G mode converts the 4895 into a GPIB ⟷ Serial interface.
  Two functions in one unit.
- New 1 U high, metal box design has CE approval
  Small size with full EMI/RFI protection.

CE Approved

DESCRIPTION

The 4895 adds a complete IEEE 488 Bus Controller capability to any PC or computer with a RS-232/RS-422 or RS-485 interface. By connecting to your computer's serial COM port, the 4895 enables any computer to control IEEE 488/GPIB or HP-IB bus instruments at distances up to hundreds of feet from the computer. The 4895 accepts high level, BASIC like commands over the serial interface to control and operate GPIB devices. Response data from the GPIB devices is inputted into a 192 Kbyte buffer and then returned over the serial link to the host computer.

4895 Serial to GPIB Controller

Unique Features

The 4895 includes a number of features that increase its usefulness and distinguish it from the competition. The 4895 provides the user with multiple buffers for program storage. The user can down load GPIB command programs to the 4895 for later execution much like subroutines. The stored programs can be used for any repeated task - from device initialization to a complete test. Program space is also provided in nonvolatile E²ROM for permanent program storage.

Data from GPIB devices is quickly inputted into a 192 Kbyte buffer at handshake rates up to 400,000 bytes/sec and transmitted back to the serial host at the serial line rate.

The 4895 is the first stand-alone GPIB controller that incorporates the new IEEE 488.2 protocols and SCPI commands. Incorporating the 488.2 protocols such as FINDLSTN and ALLSPOLL give the 4895 more control over the bus devices and lets the user execute complex protocols with a single command.

The 4895 uses SCPI commands on the GPIB bus or ASCII letter commands on the serial link to set its operational modes and serial link parameters. The user no longer needs to open the box to change or check a switch setting.

New short form commands speed up execution of the five most frequently used GPIB commands to minimize program time.

GPIB to Serial Interface Mode

When used as a GPIB to Serial Interface (G-mode), the 4895 becomes a full 488.2 compatible GPIB interface for any device with a serial interface. This function can be used to connect devices with RS-232 or RS-485 interfaces to the GPIB bus and at the same time provide them with a full IEEE 488.2 compliant interface.

The 4895 uses automatic DMA GPIB transfers to achieve GPIB handshake rates >600,000 bytes/second. This transfer rate and the 4895's large data buffer minimizes bus transfer time and off loads the host computer when outputting data to serial devices.

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The primary use of the 4895 is to add a GPIB Bus Controller capability to any computer that has a serial interface as shown in Figure 1. Because the connection to the computer is done with a serial link, the 4895 can be located next to the computer or up to hundreds of feet away from the computer. RS-232 is specified for distances of 50 feet but can successfully operate over longer distances of 100-200 feet with reduced baud rates. Adding an RS-232 to RS-485 converter to the computer creates RS-485 differential signals which can extend the data transmission distances up to 10,000 feet with greatly improved noise immunity. The 4895 can be set for operation with either RS-232 or RS-485 signals.

Figure 2 shows that by adding modems between the 4895 and the computer, the 4895 can be used to control instruments at a remote site over the dial-up phone system. Current modems now provide inexpensive 9600, 19,200 and 38,400 baud links over dial up phone lines. Most of these newer modems include internal error correction which guarantees error free data.

Figure 3 shows the 4895's operation in the G Mode where it becomes an IEEE 488.2 interface for a serial device. In the G Mode, the 4895's configuration (baud rate, data dits etc.) is controlled by commands received on its GPIB interface. Data is transferred transparently from the GPIB bus to the serial port when the 4895 is addressed as a listener and from the serial port to the GPIB bus when the 4895 is addressed as a talker. The 4895's IEEE-488.2 Status Reporting Structure can be used to notify the user when the 4895 has data in its serial receive buffer.

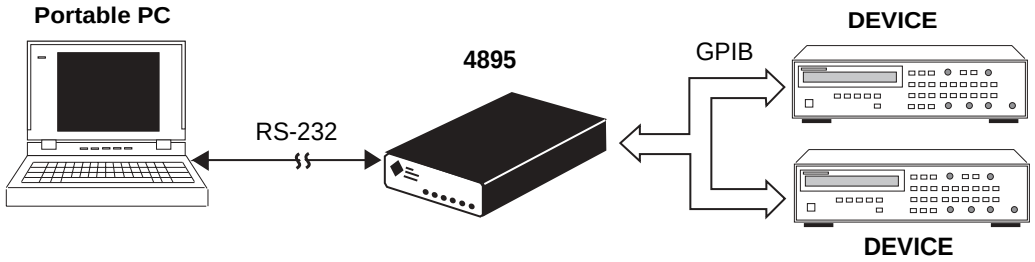

Figure 1 Connecting the 4895 to any computer's com port adds full GPIB capability to the computer. The 4895 is an easy way to interface a notebook computer with the GPIB bus.

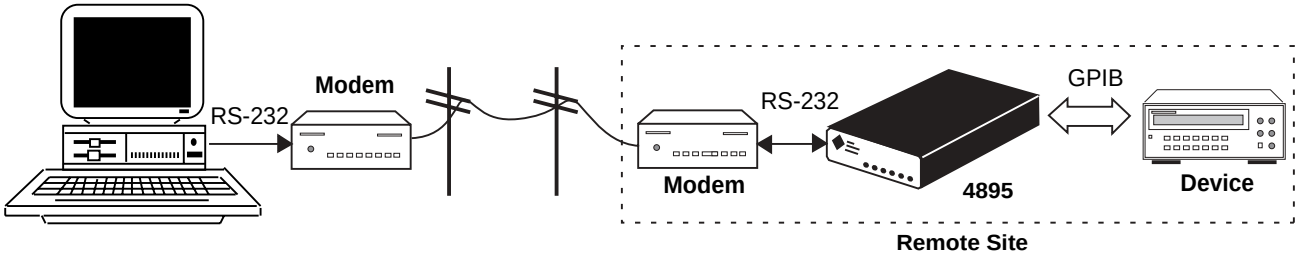

Figure 2 By adding modems, the computer can use the phone line to communicate with the 4895 and control devices at the remote site.

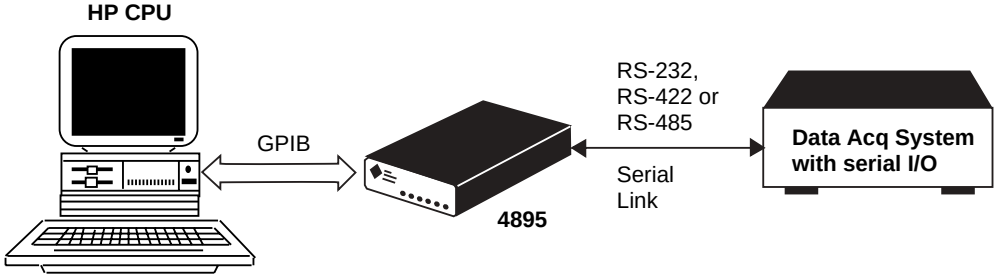

Figure 3 By controlling the 4895 from the GPIB/HP-IB bus, the 4895 becomes a IEEE 488.2 interface for a Serial Device.

4895 BASIC Command Set

4895 Commands are ASCII strings that the user outputs from his program using any program language or operating system. A 4895 command string has two parts: the first is the 4895's own command and the second is any data that the 4895 is to pass onto the GPIB device. The 4895's commands are similar to Hewlett-Packard's Rocky Mountain Basic HP-IB commands. This command set is very familiar to a majority of older GPIB/HP-IB programmers and its simplicity minimizes learning time for new users. The following is a typical 4895 command sequence for querying a device:

```
Output 04; *IDN?      'sends *IDN? query to device 4
Enter 04              'reads device response
```

The Table on the right lists the full 4895 command set.

System Response Times

Command response time is a function of the serial baud rate, length of the command string and the GPIB device's handshake timing. The 4895's firmware has been enhanced to reduce command parsing delays and to minimize command execution times. Typical command execution time is 2 to 5 milliseconds. Short form commands are available for the more frequently used 4895 commands to reduce the serial transmission time. Refer to Application Note AB48-17 for more information about calculation and reducing system response times.

488.2 Controller Commands

The 4895 includes the new IEEE 488.2 Controller commands such as FINDLSTN, ALLSPOLL and RESET. FINDLSTN generates a list of all devices on the bus with listener capability. The 4895 reports and saves the list for use when executing the ALLSPOLL and RESET commands.

Serial Interface

The 4895's serial interface provides the user with a choice of RS-232 or RS-422/RS-485 signals in the same unit. Hardware handshaking and X-on/X-off protocol may be used to control the serial data flow. Baud rate is adjustable from 300 to 38.4 Kbaud. The RS-485 selection provides automatic half-duplex operation.

Internal Programmability

The 4895's operational modes and serial interface functions are all programmed over the GPIB bus using SCPI commands to set, query and store the configuration settings. All configuration changes are made with out having to remove the cover or look up switch setting tables. A menu driven, PC compatible program is included with each unit to walk the first time user through the configuration procedure. The 4895 also responds to the CONFIG command on the serial interface to set the 4895's serial parameters and GPIB address.

G Mode Capabilities

Figure 3 shows the 4895 being used in the G Mode where it is controlled from the GPIB bus. In the G Mode, the 4895 operates as a IEEE 488.1 or 488.2 bus device and can be used to interface any device with a serial interface such as printer, modem, terminal, etc. to the GPIB bus. Data transfer between the GPIB bus and the serial interface is totally transparent in G Mode. GPIB data is transferred to a 220 Kbyte buffer by a high-speed DMA transfer process. The stored data is then outputted at the slower serial data rate. Incoming serial data is stored in a 32 Kbyte buffer.

TABLE 1 GPIB CONTROLLER COMMANDS

Command	Function
ABORT <nl>	Assert IFC then take control
BUSTAT [s] <nl>	Query bus control signal status
CADDR <dev> <nl>	Changes 4895's GPIB address
CLEAR <nl>	Send DC
CLEAR [A-list] <nl>	Send SDC to listed devices
CONFIG [parm-list] <nl>	Sets/queries 4895's settings
ENTER <dev> <nl>	Read data from device
ENTERB <dev> <nl>	Read binary data from device
EOI [0:1] <nl>	Enable/Disable EOI on last byte
EOL [[R] [x] [B] eoschar]	Set/query end-of-msg character
EOL D <nl>	Disable EOS mode
GTS <nl>	Puts 4895 in standby mode
LLOCKOUT <nl>	Sends LLO to bus
LOCAL <nl>	Remove REN
LOCAL [A-list] <nl>	Send GTL to listed devices
MSG <string> <nl>	Sends string to serial host
ONSRQ [n] <nl>	Execute commands in buffer n as a SRQ service routine
OUTPUT [count] [A-list] <CR> [data]	Output ASCII or binary data to listed devices. <CR> can be <:>
OUTPUT [A-list] <CR> [data]	
OUTPUT <CR> [data] <nl>	
PASSCONTROL <addrs> <nl>	Pass control to device
PPOLL <nl>	Conducts a parallel poll
PPOLLC <list [addrs, bit, pol]> <nl>	Configure listed devices for parallel poll
PPOLLU <nl>	Unconfigure parallel poll all devices
PPOLLU [A-list] <nl>	Unconfigure parallel poll listed devices
REMOTE <nl>	Set REN
REMOTE [A-list] <nl>	Set REN and address listed listeners
SEND <string> <nl>	Outputs userspecified commands
SPOLL [A-list] <nl>	Serial poll listed devices
STATUS [c] [n] [s] <nl>	Sets/queries 4895 status
TIMEOUT <nl>	Query current timeout value
TIMEOUT [IO time, SP time] <nl>	Set data transfer and serial poll timeouts
TRIGGER <nl>	Send GET
TRIGGER [A-list] <nl>	Send GET msg to listed devices
@@@	Resets 4895
BUFFER COMMANDS	
END <nl>	Stops storing function
LIST n <nl>	Lists program sequence in buffer n
RUN n <nl>	Executes command sequence in buffer n
STORE n <nl>	Starts storing commands into buffer n
488.2 PROTOCOLS	
ALLSPOLL <nl>	Serial polls all devices in FINDLSTN list.
FINDLSTN <nl>	Executes find listener routine
LSTNLIST <nl>	Queries list of listeners found by FINDLSTN command
RESET	Resets system and all devices in FINDLSTN list

IEEE 488 Bus Interface

The 4895's 488 Bus interface meets IEEE STD 488.1-1987 and has the following capabilities:

S Mode (Serial Link Controlling):
SH1, AH1, T6, L4, SR1, DT0, PP1, DC0, RL0, C1-C4 and C9

G Mode (GPIB Bus Port Controlling):
SH1, AH1, T6, L3, SR1, PP0, DC1, RL0, DT0, C0 and E1/E2 drivers.
Bus drivers incorporate powerup/down protection to prevent sending invalid data to the bus.

Address Capability

Addresses all 31 primary and 961 secondary addresses (S mode)
Uses Primary addresses 0-30 for self

488.2 Compliance

G Mode: Responds to common commands: *CLS, *ESE, *ESE?, *ESR?, *IDN?, *OPC, *OPC?, *RCL, *RST, *SAV, *SRE, *SRE?, *STB, *TST?, and *WAI
S Mode: Executes RESET, ALLSPOLL, and FINDLSTN

Buffers

G Mode	GPIB input	220,000 bytes
	Serial input	32,000 bytes
S Mode	Serial input	4,000 bytes
	GPIB input	192,000 bytes
	Program	19 @ 512 bytes each

NI Emulation

Emulates all serial commands used in NI-CT S mode except for IBCL function. Emulates NI-CV G mode.

SCPI Compliance

Meets SCPI 1995.0

Serial Interface

Provides RS-232C single ended or RS-485 (RS-422) differential signals on a DB-25S connector, see Tables 2 and 3. Pin assignments conform to EIA RS-530 specification and are pin compatible with most RS-232 devices. The 4895 is a DTE serial device.

Baud Rates

300, 600, 1.2K, 2.4K, 4.8K, 9.6K, 19.2K and 38.4K baud

Data Character Formats

Data bits	7 or 8 bits
Parity	odd, even or none
Stop bits	1 or 2

Data Transfer Protocols

Hardware handshake always enabled
X-on /X-off handshake enabled or disabled by a separate command

TABLE 2 RS-232C SIGNALS

Pin #	Signal
1	Shield
2	Transmit Data
3	Received Data
4	Request-to-Send
5	Clear-to-Send
7	Ground
8	Signal Detected
20	Data Terminal Rdy

TABLE 3 RS-424/485 SIGNALS

Pin #	Signal
1	Shield
2/14	Send Data
3/16	Received Data
4/19	Request-to-Send
5/13	Clear-to-Send
8/10	Signal Detected
20/23	Data Terminal Rdy

Front Panel Indicators

PWR	Indicates power on
RDY	Unit has passed self test
TALK	Unit has recognized its Talk Address
LSTN	Unit has recognized its Listen address
SRQ	Unit sensed SRQ active
ATN	Unit sensed ATN asserted

Physical

Size
7.45" L x 5.57" W x 1.52" H
(18.92 cm L x 14.15 cm W x 3.86 cm H)

Weight 1.6 lbs. (0.73 kg.) plus adapter

Temperature
Operating -10° C to +55° C
Storage -20° C to + 70° C

Humidity 0-90% RH non- condensing

Shock/Vibration Normal handling

Construction All metal case

Power 9 to 32 Vdc @ 3.5 VA

Included Accessories

Instruction Manual
3.5 in Configuration Program Disk
PC serial cable, 25-pin Connector
UL/CSA/VDE approved AC power Adapters provided for:
US - 115±10% Vac, 60 Hz (std)
Europe - 230±10% Vac, 50/60 Hz
UK - 230±10% Vac, 60 Hz
Japan - 100±10% Vac, 50/60 Hz

ORDERING INFORMATION

	Part Number
Serial - GPIB Controller with 115 VAC adapter and serial PC cable	4895
Serial - GPIB Controller with 230 VAC adapter and serial cable	(Specify plug style) -E (Europe), -B (UK), -A (Australia)
GPIB Accessary Cables	See separate data sheet
Rack Mounting Kits (holds one or two units)	Single - 114210, Dual - 114211