

488-SERIAL

Serial-to-GPIB Controller and Interface Module

- 3 Serial to GPIB conversion modes in one small module. *Improved flexibility*
- S-Mode uses serial commands to control multiple GPIB devices. *Makes any serial source a 488.2 GPIB Controller.*
- New command complete prompts return command and error status to user. *A real serial protocol for controlling GPIB devices prevents command overruns.*
- C-Mode sends serial commands to and reads responses from a GPIB device. *Limited control of a single GPIB device.*
- G-Mode adds a GPIB interface to any device with a serial port. *Transparent data transfer.*
- Supports RS-232, RS-422 and RS-485 signals. *Versatile serial interface includes Xon/Xoff and hardware handshaking.*
- Easy configuration from the serial port or GPIB bus. *Use any controller.*

 *RoHS Compliant*



7034 Commerce Circle
Pleasanton, CA 94588
Phone: 925.416.1000
Fax: 925.416.0105
Web: www.icselect.com

DESCRIPTION

ICS's 488-SERIAL module provides three Serial to GPIB functions for controlling GPIB devices and interfacing serial devices with the GPIB bus. The 488-SERIAL is a full featured, serial to GPIB controller that can control multiple GPIB devices or it can be used as a simple transparent controller for a single GPIB instrument. The 488-SERIAL can also be used as a GPIB to serial interface for devices with RS-232, RS-422 or RS-485 signals.

The 488-SERIAL combines the best features of our 4895 Serial to GPIB Controller and our 4894B GPIB to Serial Interface in one small module. The 488-SERIAL is the only serial to GPIB Controller that includes features like Command Complete Prompts, optional Error Reporting, and the ability to be configured from its GPIB or Serial port.

When operating in the S-Mode, Command Complete prompts provide a real serial protocol for controlling GPIB devices from a serial source and prevent losing commands by overrunning the 488-SERIAL's parser. When Error Reporting is enabled, the user gets immediate feedback of any command errors and GPIB device problems. This allows the application program or user to take corrective action when the error occurs instead of waiting for a problem to develop later on.

Applications include controlling GPIB devices from a PLC or from an embedded computer, remotely controlling GPIB devices over a long cable or adding a GPIB interface to a serial device or to an instrument with an embedded computer board. The 488-SERIAL is available as an enclosed module as shown above or as two different OEM boards for inclusion in an instrument.



488-SERIAL GPIB Controller Module

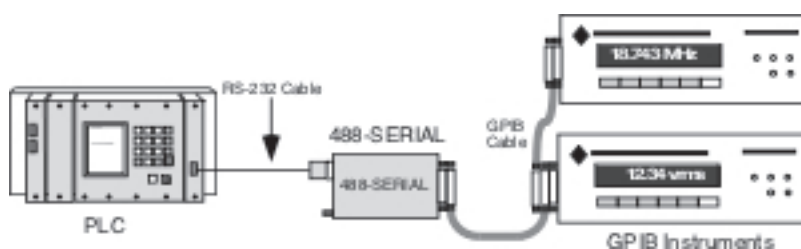
S-Mode

S-Mode provides any computer or processor with a serial port the ability to operate as a full featured, IEEE-488.2 compatible GPIB Controller. Using ICS's Basic like commands or the NI CT command, the user has complete control of the GPIB bus and all attached devices. The 488-SERIAL can execute all GPIB commands except for Parallel Poll and Pass Control.

Command complete prompts keep the application from sending commands before the prior command has been executed and keep the application in sync with the 488-SERIAL module and the GPIB devices it is controlling. The optional error reporting feature adds the 488-SERIAL's current ESR register value to the prompt so that the application can be immediately alerted to a device response failure, command errors or SRQ line asserted. The 488-SERIAL prompts overcome the lack of feedback in earlier serial to GPIB Controllers. Prompts can be turned off to run an existing 4895 program.

In the S-Mode, the 488-SERIAL module can be configured from the serial port using SCPI commands. The 488-SERIAL operates

like a 488.2 device and responds to all of the 488.2 Common Commands. Configuration changes can be saved and become active when the module is power cycled.



Controlling GPIB Instruments from a PLC

488-SERIAL APPLICATIONS

The 488-SERIAL uses the Commands listed in Table 1 to control GPIB devices. These are the same commands used by ICS's 4895 Serial to GPIB Controller, making migration to the 488-SERIAL module an easy task. The 488-SERIAL can also accept the NI CT commands to control GPIB devices.

The 488-SERIAL also includes the IEEE 488.2 Controller protocols such as FINDLSTN, ALLSPOLL and RESET. FINDLSTN generates a list of all devices on the bus with listener capability. The 488-SERIAL saves the list for use when executing the ALLSPOLL and RESET commands.

C-Mode

In C-Mode, the 488-SERIAL module transparently transfers data to and from a single GPIB device. When the 488-SERIAL receives a serial message, it addresses the GPIB device to listen and passes the message to the device. The device is then addressed to talk and any response or data is transmitted back to the serial host. The C-Mode cannot send IEEE-488.1 GPIB commands to the device but it can send IEEE-488.2 Common Commands to the device to accomplish similar actions.

G-Mode

In the G-Mode, the 488-SERIAL module operates as a GPIB interface for a device with a serial port. It transparently passes GPIB messages to the serial device when addressed to listen and outputs device responses on the GPIB bus when addressed to talk. There are no character, message length or time restrictions on the data transfer. Messages exceeding the 488-SERIAL's buffer size are handshaked and processed in buffer size blocks. When transferring data in the G-Mode, the 488-SERIAL operates as a IEEE-488.1 interface only and the serial device is responsible for all command and query responses.

The 488-SERIAL automatically switches to operate G-Mode if it detects that it is connected to a GPIB Controller at power turn-on or when reset. When put into the Command sub-mode, the 488-SERIAL can be configured with the same SCPI Commands as in S-Mode to query or change the 488-SERIAL's configuration. After saving any configuration changes, the user can return to the transparent data mode by power cycling the module or with the SCPI SYST:OPER DATA command. In the Command sub-mode, the 488-SERIAL operates as an IEEE-488.2 compliant device.

New S-Mode Command Complete Prompts

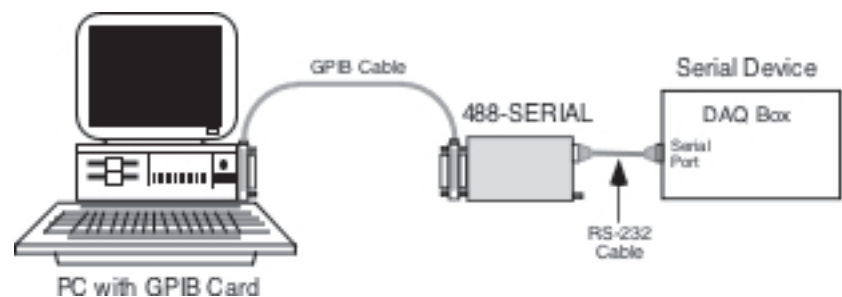
In older serial to GPIB Controllers, a command is transmitted serially to the Controller without any feedback to the user. The only hint of a problem is the later failure of the Controller to return a response from an instrument for from itself. A typical command sequence might be:

Output 04; FREQ:GEN 25200
Output 04; OUT:ENAB 1

The user has to hope that all went well and that he did not overrun the controller's parser. The Command Complete prompts prevent command overrun with the following sequence:

TABLE 1 SERIAL-GPIB COMMAND SET

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]<nl>	Outputs binary data to listed devices. <CR> can be a semicolon.
OUTPUT [A-list] <CR> [data]<nl>	Outputs ASCII data to the listed devices.
OUTPUT <CR> [data] <nl>	Outputs ASCII data to all listeners.
REMOTE <nl>	Set REN.
REMOTE [A-list] <nl>	Set REN and address listed devices.
SEND <string> <nl>	Outputs user specified commands.
SPOLL [A-list] <nl>	Serial poll listed devices.
STATUS [c] [n] [s] <nl>	Sets/queries 4895 status.
TIMEOUT <nl>	Query current timeout values.
TIMEOUT [IO time, SP time]	Set data transfer and serial poll timeouts.
TRIGGER <nl>	Send GET.
TRIGGER [A-list] <nl>	Send GET msg to listed devices.
@@@	Resets 4895.
<u>BUFFER COMMANDS</u>	
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.
<u>488.2 PROTOCOLS</u>	
ALLSPOLL <nl>	Serial polls all devices in FINDLSTN list.
FINDLSTN <nl>	Executes find listener routine
LSTNLIST <nl>	Returns list of listeners found by FINDLSTN command.
RESET	Resets system and all devices in FINDLSTN list.



Adding a GPIB interface to a Serial Device

Output 04; **FREQ:GEN 252000**

>

Output 04; **OUT:ENAB 1**

>

Enabling Error Reporting provides the user with feedback about each command as it is executed by displaying the decimal value of the 488-SERIAL's ESR Register.

Output 04; **FREQ:GEN 252000**

0>

Output 04; **OUT:ENAB 1**

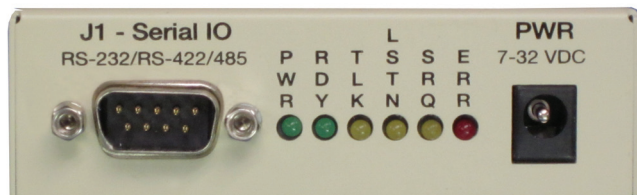
32>

A value of 0 indicates the command was successfully executed. A non-zero value indicates a problem with the command or its execution by the instrument. The 488-SERIAL's ESR Register includes GPIB Bus timeout and SRQ detected in addition to the usual 488.2 errors. In the above example, 32 indicates a command syntax error because 'Output' was misspelled. The ESR Register bits are listed below.

488-SERIAL ESR Register Bits

Bit	Bit Weight	Event	Description
7	128	PON	The Power-on event occurs at power turn-on and can be used to signal a power off-on occurred.
6	64	SRQ	GPIB SRQ line asserted. (S-Mode only)
5	32	Cmd	Command Error. Command not executed due to bad or invalid command, spelling or syntax.
4	16	Exc	Execution Error. Values out of range etc. Command not executed.
3	8	Memory	Setup variable data corrupted.
2	4	Query	Query error, data not read or read attempt with no data present.
1	2	Timeout	GPIB Bus timeout. (S-Mode only)
0	1	OPC	Operation Complete. Operation Complete has no meaning in the 488-SERIAL.

Receiving a prompt with an error value instead of receiving nothing allows the application to continue without hanging up the 488-SERIAL module when an error occurs. The application can recover from these errors without a human having to power cycle everything. This feedback provides a true command protocol for controlling GPIB devices from a serial source and avoids lost commands and program hangups.



488-SERIAL Serial Port and LEDs

488-SERIAL - 4895 Differences

The 488-SERIAL has the following differences from ICS's Model 4895 Serial to GPIB Controller to improve its performance when used in the S-Mode.

1. Power turn-on message defaults to the 488-SERIAL's IDN message.
2. EOL and CADDR values are saved which simplifies the power turn-on sequence. The CADDR value is now separate from the 488-SERIAL's own GPIB address value used in G-Mode.
3. Optional prompts after every message provide command synchronization and prevent overrun problems.
4. Optional ESR value with prompts alerts the user to command or device problems to prevent program hangups.
5. Fully configurable from the Serial port. 488-SERIAL commands and queries can be interspersed with command for GPIB instruments.
6. Extended baud rates up to 115,200 baud.

User configuration settings let the user change the Power turn-on message and turn off the prompts so an existing 4895 program will run the 488-SERIAL module.

488-SERIAL - 4894B Differences

There are no functional differences between a 488-SERIAL Module and an ICS Model 4894B. The 488-SERIAL's G-Mode operates the same as the G-Mode in a 4894B. The 488-SERIAL's C-Mode is the same as the 4894B's S-Mode. The 488-SERIAL has smaller buffers than does the 4894B and is not intended to be used to buffer large amounts of data for a serial device. Messages larger than the 488-SERIAL's buffer size are handled by hardware handshaking or by the Xon/Xoff flow control protocol.

Hardware

The 488-SERIAL Controller-Interface Module is available in the small metal enclosure shown above or in two types of OEM boards. The standard module has a female GPIB connector at one end and a 9-pin serial connector, diagnostic LEDs and power receptacle at the other end. Baud rates can be as high as 115,200 baud and the serial data flow can be controlled with hardware handshaking or with the Xon/Xoff protocol. Internal jumpers select RS-232 or two or four-wire RS-422/RS-485 signals. The LEDs provide module status and show you SRQ line and Error conditions.

The metal enclosure can be panel mounted, can sit on rubber feet or can be DIN rail mounted. The 488-SERIAL module includes a clip for a 35 mm DIN rail.

Diagnostic LEDs

The 488-SERIAL module has a full set of Diagnostic LEDs on the serial port end of the module. PWR and RDY are on after the unit has passed its self-test. TLK and LSTN show its GPIB bus state. SRQ lights when the SRQ line is asserted. ERR comes on when the 488-SERIAL has a problem with a command or when there is GPIB device response error.

488-SERIAL APPLICATIONS

488-SERIAL OEM Boards

The 488-SERIAL is available in two PCB assembly versions. One board is same PCB assembly used in the 488-SERIAL module. It has right angle GPIB and Serial connectors and is intended to be mounted perpendicular to the rear panel of the host chassis so the GPIB Connector can protrude thru the rear panel. It can also be mounted on a panel elsewhere in the chassis and with a flat ribbon cable to a GPIB connector on the rear panel.

The second version is a PC board assembly that is intended to be mounted parallel to the rear panel of the host chassis. It has its GPIB Connector on the circuit side of the OEM Board. When mounted against the rear panel of the host chassis, the GPIB connector protrudes thru the rear panel. Both OEM boards include metric lockstuds for the GPIB connector.

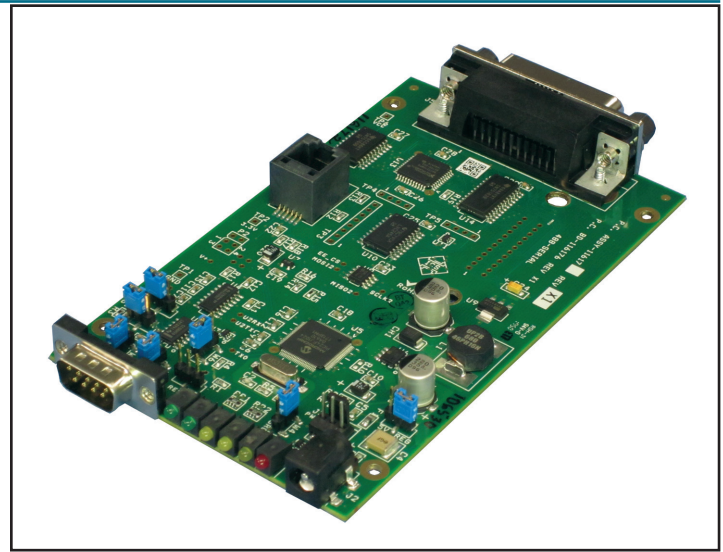
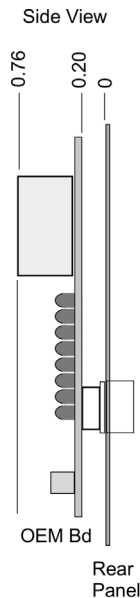
The standard board has four mounting holes like those shown in the mounting diagram in the lower right side of this page. Use 0.125 inch or longer 4-40 threaded standoffs to mount the board to a panel. Use the GPIB Connector cutout in Note 1 if the GPIB connector is to protrude thru the rear panel.

The parallel mount Board has two 0.156 x 4-40 threaded standoffs that support the GPIB connector. The metric lockstuds are applied from outside the chassis and screw into the threaded standoffs to hold the board and GPIB connector firmly against the rear panel. The rear panel then supports the weight of the mating GPIB cable. The board has four 0.128 diameter holes for mount the board. Use 0.2 inch long standoffs to hold the board to the rear panel.

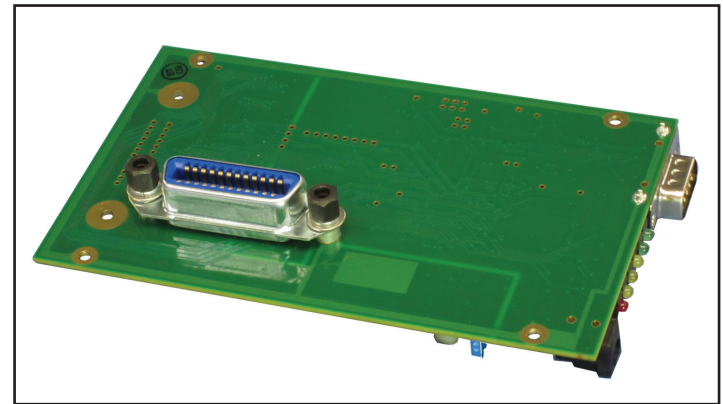
DC Power Options

The 488-SERIAL Module accepts 7 to 32 Vdc power. A universal 115/230 VAC to DC power supply is included with each module.

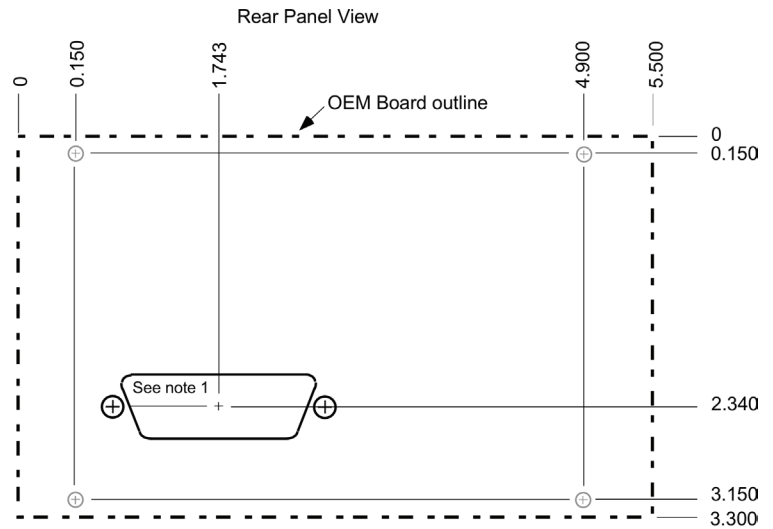
The OEM boards can be powered by regulated 5 Vdc or by 7 to 32 unregulated Vdc power. Power can be inputted on pin 9 of the serial connector or by plugging into the power jack. Jumpers on the board let the user select the power input source and bypass the internal regulator to use 5 Vdc power.



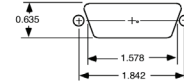
Standard 488-SERIAL OEM Board



Parallel Mount 488-SERIAL OEM Board
GPIB Connector side



- NOTES: 1. Cutout for Amphenol 57-20240-14 GPIB Connector.
2. ⊕ hole dia is 0.128 in, 4 plcs.
3. Allow 0.76 inch clearance behind Rear Panel for the board and components.



Rear Panel Mounting Layout for parallel Mounted Board

488-SERIAL Specifications

IEEE 488 Bus Interface

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

S Mode:

SH1, AH1, T6, L4, SR0, DT0, PP0, DC0, RL0, C1-C4 and C25 and E1/E2 drivers.

G Mode:

SH1, AH1, T6, L4, SR1, PP0, DC1, RL0, DT0, C0 and E1/E2 drivers.

C Mode:

SH1, AH1, T8 L4, SR0, DT0, PP0 DC0, RL0, C1-C3 and C27, and E1/E2 drivers.

Bus drivers incorporate powerup/down protection to prevent sending invalid data to the bus.

Address Capability

S-Mode: Addresses all 31 primary and 961 secondary addresses

G and C Modes: Primary addresses 0-30

488.2 Compliance

S and 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

Data buffers four total
GPIB IO 4,000 bytes
Serial IO 4,000 bytes

Programs 19 Buffers @ 512 bytes each

S-Mode Commands

Executes all commands and 488.2 Protocols listed in Table 1 and emulates all serial commands used in NI-CT S mode except for IBCL function. Handles binary and ASCII device messages.

G-Mode

Transparently passes binary and ASCII device messages to/from the device and GPIB bus

C-Mode

Transparently passes ASCII device messages to/from the device and the GPIB bus.

SCPI Compliance

Meets SCPI 1994.0

Serial Interface

Provides RS-232C single ended and two and four-wire RS-485 (RS-422) differential signals on a single DE-9S FEMale connector

Baud Rates

300, 600, 1.2K, 1.8K, 2.4K, 4.8K, 7.2K, 9.6K, 14.4K, 19.2K, 38.4K, 57.6K and 115.2K 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
Xon/Xoff handshake enabled or disabled by a separate command

TABLE 2 RS-232C SIGNALS

Pin #	Signal
1	-
2	Received Data input
3	Transmit Data output
4	-
5	Ground
6	-
7	Request-to-Send input
8	Clear-to-Send output
9	DC Power Input

TABLE 3 RS-424/485 SIGNALS

Pin #	Signal
1	TX/RX- or RX-
2	TX/RX- or RX-
3	TX-
4	TX+
5	Ground
6	-
7	-
8	-
9	DC Power Input

Physical

Module

3.3 in x 5.5 in x 1.0 in
(8.38 cm x 13.97 cm x 2.54 cm)

OEM Boards

3.3 in x 5.5 in x 1.0 in
(8.38 cm x 13.97 cm x 2.54 cm)

Indicators

PWR, RDY, TALK, LSTN, SR and ERR LEDs

Construction

RoHS Compliant, FR-4 PCB

Temperature

Operating -10 °C to +65 °C
Storage -40 °C to +70 °C

Humidity

5-95% RH non-condensing

Shock/Vibration

Normal handling

Connectors

GPIB GPIB 24 pin female with metric studs.

Serial

DE-9S with lockstuds

Power

Power Jack, 2mm ctr pin
Friction Lock header
AMP P/N 64716-3

Power

Module 7-32 Vdc, .2 VA
OEM Board 5±0.2 Vdc at 300 mA or
7-32 Vdc at 0.2 VA

Included Accessories (Module only)

Instruction Manual with complete programming instructions and command definitions.

UL/CSA/VDE approved 115/230 Vac to 12 Vdc
Power Adapter with Universal plugs for US, UK, Europe, Australia/China and Japan.

DIN Clip and mounting screws.

ORDERING INFORMATION

488-SERIAL Module with Power Adapter, Manual and Support CD

488-SERIAL OEM Board, Standard Board

488-SERIAL OEM Board, Parallel Mount with GPIB connector on circuit-side

Part Number

488-SERIAL

116172

116173