# 605 RS232 Adapter and GSIOC Protocol User's Guide

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# 605 RS232 Adapter and GSIOC Protocol User's Guide

 February 2003

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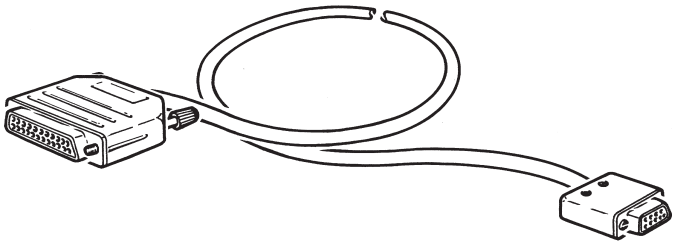
# Introduction 1

An interface is required to connect Gilson equipment to a controlling computer such as an IBM PC. The Gilson Model 605 RS232 Adapter provides an interface between an RS232 computer output and the Gilson Serial Input/Output Channel (GSIOC). It functions as a modem by converting EIA RS232 signals into RS422/RS485 signals, as defined by GSIOC.

Two GSIOC modules can be connected to the computer using a Model 605 RS232 Adapter. In this case, each module must have a different GSIOC identification number.

With reference to the figure below, the interface is housed in a small metallized plastic case that terminates with a 25-pin D female connector (RS232). The 9-pin D female connector (GSIOC) is joined to the interface by a 1.5 meter low voltage computer cable.



# Introduction 1

# Installation 2

This chapter describes how to connect the GSIOC cable.

## Computer Equipped with 25-pin Male RS232 Socket

When connecting to one Gilson instrument:

1. Connect the 25-pin (female) connector of the Model 605 to the 25-pin (male) RS-232 output of the computer.
2. Connect the 9-pin (female) connector of the Model 605 to the 9-pin (male) GSIOC socket on the Gilson instrument

When connecting to two GSIOC instruments a GSIOC Cable is also required (see page 18):

1. Connect the 25-pin (female) connector of the Model 605 to the 25-pin (male) RS-232 output of the computer.
2. Connect the 9-pin (female) connector of the Model 605 to the 9-pin (male) connector of the GSIOC cable.
3. Connect the first 9-pin (female) connector of the GSIOC cable to the 9-pin (male) GSIOC socket on one of the Gilson instruments.
4. Connect the second 9-pin (female) connector of the GSIOC cable to the 9-pin (male) GSIOC socket on the other Gilson instrument.

## Computer Equipped with 9-pin Male RS232 Socket

When connecting a Model 605 to an IBM PC (or equivalent) having a 9-pin RS-232 output, a 9-pin D (female) to 25 pin D (male) converter is required. Connect the converter as follows:

1. Connect the 9-pin (female) end of the converter to the 9-pin (male) RS 232 socket on the IBM PC; tighten the clamping screws.
2. Connect the 25-pin (female) end of the Model 605 to the 25-pin (male) connector on the converter; tighten the clamping screws.
3. Connect the 9-pin (female) connector of the Model 605 to the 9-pin (male) GSIOC socket on the Gilson instrument, or to the GSIOC cable if two Gilson instruments are to be connected (see above).

# Installation 2

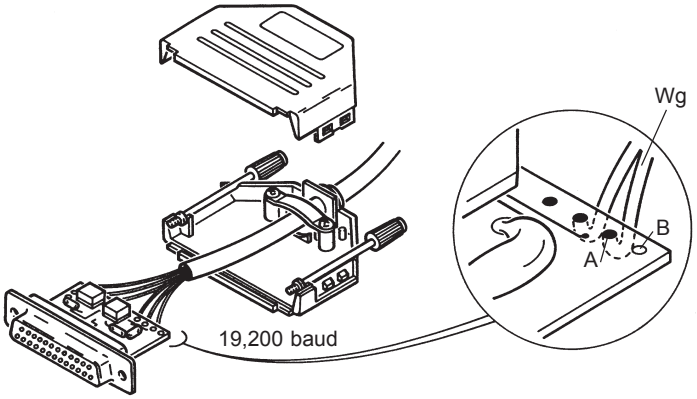
# Changing the Baud Rate 3

You require the following tools:

- a small flat bladed screw driver
- a small cross headed screw driver
- a suitable soldering iron.

## Procedure

- Carefully pry apart the two halves of the metallized plastic cover, by inserting a small flat bladed screw-driver beneath one of the catches at the side of the cover.
- Unscrew the cable clamp so as the cable comes lose.
- Disengage the socket and its circuit board from the cover.
- The Model 605 is provided under two versions, either with 9,600 or 19,200 baud rate. Depending on the model that you have, to change the baud rate: With reference the figure below, find wire **Wg** on the circuit board. Unsolder this wire from hole **A** (19,200 baud) and solder it into hole **B** (9,600 baud), or vice versa.



- Put the circuit board back into the metallized cover. The conductive outer sleeve should come in contact with the cover, and extend to beneath the cable clamp.
- Make sure that the conductive outer sleeve of the cable is held against the cover by the cable clamp and then tighten the cable clamp screws.
- Gently press together the two halves of the plastic cover until the side catches click into place.

# Changing the Baud Rate 3

# Operation 4

One or two GSIOC modules can be fully controlled by the computer through the Model 605 Adapter. You can write your own programs, according to the GSIOC protocol described in the next Section, or use the 706 Gilson Software package.

## 706 GSIOC Driver

This software provides machine code drivers for the following programming languages:

- IBM BasicA or Microsoft GW-BASIC
- Borland Turbo Pascal
- Microsoft Pascal and Microsoft C.

It also includes a GSIOC test program for demonstration and familiarization with the GSIOC protocol.

# GSIOC Protocol 5

The Gilson Serial Input/Output Channel (GSIOC) is a bi-directional communications channel that can link the master module with up to 64 slave devices (in the case of the Model 605, only two slave devices may be linked). The master communicates with one slave at a time. The slave is identified by a unique unit code, usually designated as Unit ID 0 through 63. When the master identifies a slave, it connects to the channel as the previous slave disconnects.

There are two command types that a master sends to a slave device: buffered and immediate.

The slave executes buffered commands as background processes. Immediate commands have a higher priority; the slave device interrupts the execution of a buffered command to execute an immediate command. Immediate commands, unlike buffered commands, allow the slaves to send data to the master. Therefore, status requests from the master must be immediate commands.

GSIOC consists of three differential signal pairs: the master data pair, the slave data pair, and the clock pair. Differential signals are used to eliminate ground loops in the system.

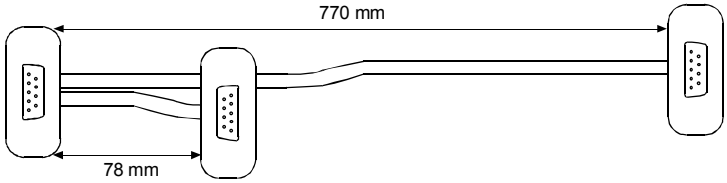
A multi-drop protocol allows the easy addition of more slaves into the system by permitting the cabling to be connected as a daisy-chain.

## Physical Level

GSIOC permits the daisy-chaining of multiple slave units. Connections are made with 9-pin D connectors on all master units, slave modules, and cabling.

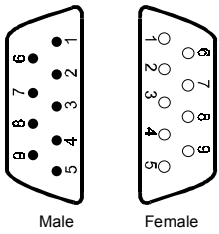
### GSIOC Control Cable

The control cable contains one male and one female connector at the master end, and one female connector at the slave end.




### GSIOC Pin Functions

The GSIOC cable has nine wires connecting corresponding pins. The pin-out and pin functions are shown in the figure below.




| | |
|---|---|
| ¤ 1 reserved | ¤ 6 reserved |
| ¤ 2 - data from slave | ¤ 7 + data from slave |
| ¤ 3 - data from master | ¤ 8 + data from master |
| ¤ 4 - clock from master | ¤ 9 + clock from master |
| ¤ 5 reserved | |

## Electrical Level

The signals on the GSIOC are differential and are compatible with RS422 and RS485 specifications. The channel master drives both the master data pair and the clock pair.
Each slave drives the slave pair only when it is selected. All slaves must be capable of deselecting from the channel on command.

Although the GSIOC is differential, the common mode voltage between slaves and masters should be less than 15V. The ground connection is not implemented in every GSIOC device, so they must be grounded locally. This ensures compliance with the common mode specification.

Normally, no more than 32 slaves may be connected to GSIOC in one system. In the case of 605, only 2 slaves may be connected. Total length of the GSIOC cabling should be less than fifty meters.

Receivers should meet or exceed the loading capability of an RS485 differential receiver.

Drivers should meet or exceed the driving capability of an RS422 differential transmitter.

# Character Level and Format

## Level

Because the GSIOC is a multi-drop channel with the ability to have several slave units connected at the same time, GSIOC reserves some of the possible characters for channel control.

## Format

| Bit | Function |
|---|---|
| s | start bit |
| 0 | value 1 |
| 1 | value 2 |
| 2 | value 4 |
| 3 | value 8 |
| 4 | value 16 |
| 5 | value 32 |
| 6 | value 64 |
| 7 | address flag if high |
| p | parity (even) |
| s | stop (optional) |

All traffic on the GSIOC is asynchronous, eight bit, even parity (see below). Any parity error can be corrected by reconnecting and restarting the message.

## GSIOC Baud Rates

The clock runs at sixteen times the desired baud rate. The baud rate may range from 600 to 19200. The discrete frequencies are 600, 1200, 2400, 4800, 9600 and 19200.

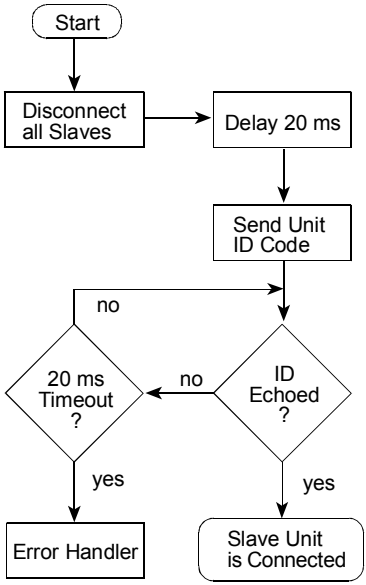
The Model 605 is provided under two references:

- for reference 360784 the baud rate is set to 9,600,
- for reference 360784192 the baud rate is set to 19,200.

## Disconnect/Connect Sequence

To connect to a specific slave, the controller must first disconnect from the slave currently selected. This is done by sending the disconnect code 255 (FF hexadecimal). The master unit must then wait twenty milliseconds to allow any active slaves to turn off their drivers. Finally, the master sends the desired slave's unit identification code (Unit ID). Unit ID codes are eight bit bytes with the most significant bit set (add 128 to the unit number).

The slave that recognises the Unit ID as its own, connects its transmitter to the slave data channel and echoes the Unit ID. Any slave device that does not recognise the Unit ID disconnects. Active slave devices must echo their ID code within twenty milliseconds of receiving it. The controller may assume a slave is unavailable if no Unit ID echo is received within that time. After connection, a slave stays connected until the dis-connect code of the Unit ID of a different slave is received.

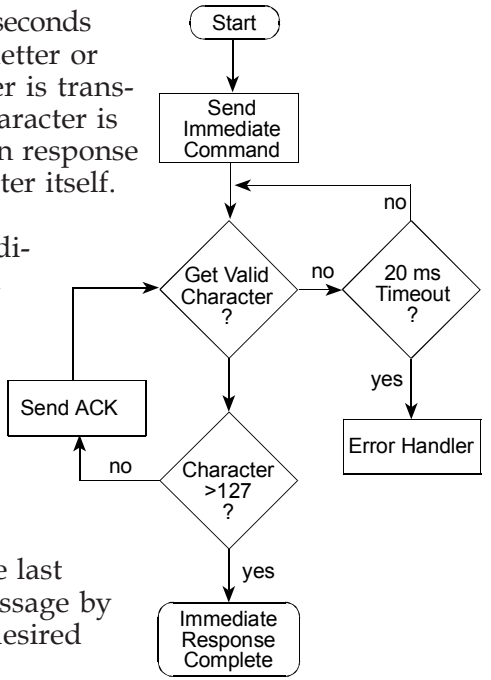


## Immediate Command Protocol

Immediate commands are high priority single letter commands. Any valid data character except a line-feed (OA hexadecimal), a carriage-return (OD hexadecimal), a pound-sign (23 hexadecimal) or a NAK (15 hexadecimal) may be used as an immediate command. Immediate commands return messages of one or more characters. Each character of the response must be sent by the active slave unit within twenty milliseconds after the command letter or prompting character is transmitted. The first character is sent to the master in response to the command letter itself.

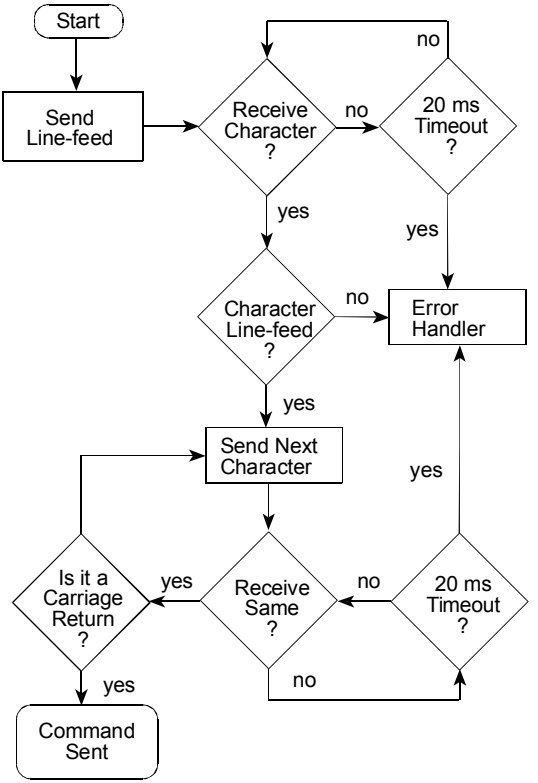
The master gets additional characters in response to sending an ACK (6 hexadecimal) to the slave. This is repeated until the last character is detected.

The slave marks the last character in the message by adding 128 to the desired last data character.



## Buffered Command Protocol

Buffered commands are lower priority commands that may have to wait for a prior process to complete before they can be executed. All buffered commands consist of an ASCII string preceded by a line-feed and followed by a carriage-return. The selected slave unit holds off the start of a buffered command by echoing the initial line-feed with a pound-sign (23 hexadecimal).



The master then retries sending the line-feed until either the slave echoes a line-feed or the master abandons the command. After the slave echoes the line-feed, all following characters are accepted and echoed on the first try. The slave must always send the pound-sign or the next character within twenty milliseconds.

## Program Example

The following program example, written in Basic, is a simple test of GSIOC for a system master. The program is not guaranteed to run on any computer. It is extremely inefficient with time, because it always times out on every transfer. The serial port is fictitious, but you probably need to use a similar low level interface, because many software packages restrict character data to seven bits.

This example does not show any mode changes, which may be required by particular GSIOC devices before they respond to a particular buffered or immediate command. These mode changes are done with normal commands, and are documented in their respective manuals.

```
100     REM
110     REM Example GSIOC system master program
120     IO_DATA=0F456H:REM serial data port
130     IO_COMMAND=0F457H:REM command/status port
140     REM
150     REM use 8-bit, even parity, 19200 baud
160     POKE IO_COMMAND, 75H:command byte
170     REM
180     REM put all slaves off-line
190     POKE IO_DATA, 255
200     FOR I=1 TO 200:NEXT I;REM wait 20 ms
210     REM
220     REM put unit #5 on-line
230     POKE IO_DATA, (128+5):REM
240     REM wait for response
250     FOR I=1 TO 200:NEXT I
260     REM check response
270     IF PEEK (IO_DATA)<>(80H OR 5) THEN 1000
400     REM
410     REM send buffered “A” command
420     POKE IO_DATA, 10:REM line feed=10
430     FOR I=1 TO 200:NEXT I
440     IF PEEK (IO_DATA)=# THEN 410
450     IF PEEK (IO_DATA)<>10 THEN100
460     POKE IO_DATA, ASC (“A”)
470     FOR I=1 TO 200:NEXT I
480     IF (PEEK (IO_DATA)<>ASC (“A”)) THEN 1000
490     POKE IO_DATA, 13:REM return=13
500     FOR I=1 TO 200:NEXT I
510     IF (PEEK (IO_DATA)<>13) THEN 1000
600     REM
610     REM send immediate “B” command
620     POKE IO_DATA, ASC (“B”)
700     REM
710     REM receive message response
720     PRINT:REM new line on consul output
730     FOR I=1 TO 200:NEXT I
750     PRINT CHR$ (PEEK (IO_DATA) AND 7FH);
760     POKE IO_DATA, 6:REM ACK=6
770     IF (PEEK (IO_DATA)>127) THEN 800
780     GOTO 730
800     END
1000    REM
1010    REM error routine
1020    END:REM you could send NAK and try again
```

# GSIOC Protocol 5

# Technical Data 6

Gilson's Model 605 RS232 to GSIOC Adapter conforms to the following norms.

EEC directive 89/336/EEC for electromagnetic compatibility:

Standard EN50081-1 for emission,
Standard EN50082-1 for immunity.

# Electrical

## Computer Connector

This connector is a 25-pin D female (data input is pin 2; output is pin 3), compatible with Electronic Industries Association (EIA) requirements for Data Communication Equipment (DCE).

## GSIOC Connector

The Model 605 is compatible with EIA requirements for RS-422 and RS-485 signal levels. The GSIOC connector is a 9-pin D female; **this connector should not be connected to the 9-pin male socket on a computer.** The communications protocol and connector pinout are defined by GSIOC technical specifications. One or two slaves can be driven by a Model 605.

## Bauds Rate

The Model 605 is provided under two references:

- Reference 360784 is factory set to operate at 9,600 bits/seconds. The Baud rate can be modified to 19,200 bits/second (see chapter 3).
- Reference 360784192 is factory set to operate at 19,200 bits/seconds. The Baud rate can be modified to 9,600 bits/second (see chapter 3).

## Power

The Model 605 is powered directly by the computer via the RS-232 output, through the DCD (pin 8) or DTR (pin 20) signals (or both); at least one being at the 'ON' level.

# Environment

## Dimensions

25-pin Connector:
L x W x H = 45 x 52 x 15 millimeters.

## Weight

50 grams

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