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506C System Interface User's Guide

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February 2004

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Declaration of Conformity

Application of Council Directives:

89/336/EEC, 73/23/EEC

Standards to which Conformity is Declared:

EN61326, EN61000-3-3, EN61000-3-2, EN61010-1

Manufacturer's Name ..... Gilson, Inc.

Manufacturer's Address ..... 3000 W. Beltline Highway
Middleton, WI 53562

EC Office Address ..... Gilson S.A.S.
19 Avenue des Entrepreneurs, B.P. 145
F-95400 Villiers-le-Bel, France

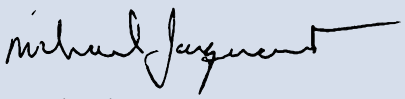
Type of Equipment ..... Laboratory Equipment

Model. ..... **506C System Interface**

Beginning with Serial Number: **369A6PA001**

Month and Year of Manufacture: **January 1996**

I, the undersigned, hereby declare that the equipment specified above conforms to the above Directives and Standards.



Place: Middleton, WI (USA)
Issue Date: January 1996

Michael Jacquart
Senior Vice President
Corporate Technology Development

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Introduction 1

The Gilson 506C System Interface connects your computer to many instruments made by Gilson. It permits bi-directional communication by interconverting the RS-232 signal levels used by computers and the RS-422/485 signal levels required by the Gilson Serial Input/ Output Channel (GSIOC).

The system interface also provides four contact inputs and six contact outputs that allow your computer to control instruments not equipped for GSIOC operation. The state of the contacts can be read or changed using appropriate software (such as Gilson control software).

The system interface incorporates four analog data inputs that can be read by the computer via the GSIOC . Using these data inputs, your computer can read the signal from any detector or monitor that provides a –100 mV to +1.0 V analog input.

The system interface includes a socket for installing the security key required to operate most Gilson software products.

As explained below and in the *GSIOC Technical Manual* (part number LT2181) available from Gilson, the 506C generally operates as the master device on the GSIOC. However, the unit can also be a GSIOC slave unit to provide additional contacts when needed.

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Unpacking

Unpack the system interface and its accessories carefully from the carton.

Cross-check the contents against the equipment checklist shown below to verify that all parts are included and are undamaged.

Do this now, even if the system interface will not be used immediately. Many carriers must receive concealed damaged claims within seven days of delivery.

Please retain all packing material so the unit may be shipped safely, if necessary.

The carton contains:

- RS-232 cable
- wall transformer – 12V DC, 500 mA (the transformer you receive is designed to accept the input voltage specified in your order)
- GSIOC cable

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Customer Service

Gilson, Inc. and its worldwide network of authorized representatives provide customers with four basic types of assistance: sales, technical, applications and instrument repair.

If you need assistance, please contact your Gilson representative, or if you are in the United States, contact the Gilson Customer Service Department.

Phone: 800-445-7661 or 608-836-1551
Fax: 608-831-4451
Email: service@gilson.com
Web: www.gilson.com

To help us serve you quickly and efficiently, please refer to **Before calling us** on page 5-4.

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Technical Specifications

Please be aware of the following before connecting the system interface.

Warning: Changes or modifications to the system interface not expressly approved by Gilson could void the factory-authorized warranty.

The system interface has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC commercial environment. The system interface generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this device in a residential area is likely to cause harmful interference; in which case, the user will be required to correct the interference at the user's own expense.

Shielded cables must be used with the system interface to ensure compliance with the Class A FCC limits.

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Technical Specification	*Definition*
Contact control	8-pin barrier strip connector for four differential analog inputs from a Gilson or non-Gilson instrument. Input impedance: More than 47K ohms Input voltage range: -100mV to +1.0V Input resolution: 10 µV (17-bit equivalent resolution) 8-pin terminal block connector includes four switch-closure compatible TTL input pairs (1K ohm ground isolation). 60W, 125V A power rating. Maximum switching voltage: 250V AC. **Note**: For your safety, do not switch voltages higher than 30V even though the output contacts are rated for high voltage. 12-pin terminal block connector includes six isolated relay output contact pairs
Environmental conditions	Indoor use Altitude: up to 2000 m Temperature range: 5–40°C Air pressure: 75–105 kPa Pollution degree: 1 or 2, in accordance with IEC 66 Humidity: Maximum relative humidity 80% for temperatures up to 31°C, decreasing linearly to 50% relative humidity at 40°C
Key	Socket for the electronic key supplied with most Gilson software products.
Manufacturing standards	Meets applicable Safety and EMC certification standards; UL and CE certified.
Physical space requirement	19.3 x 12.7 x 3.8 cm (7.6 x 5.0 x 1.5 in)
Power requirements	+12V DC at 500 mA supplied via a 2.1 mm ID power plug. Center contact is positive.
Weight	0.56 kg (1.25 lbs)

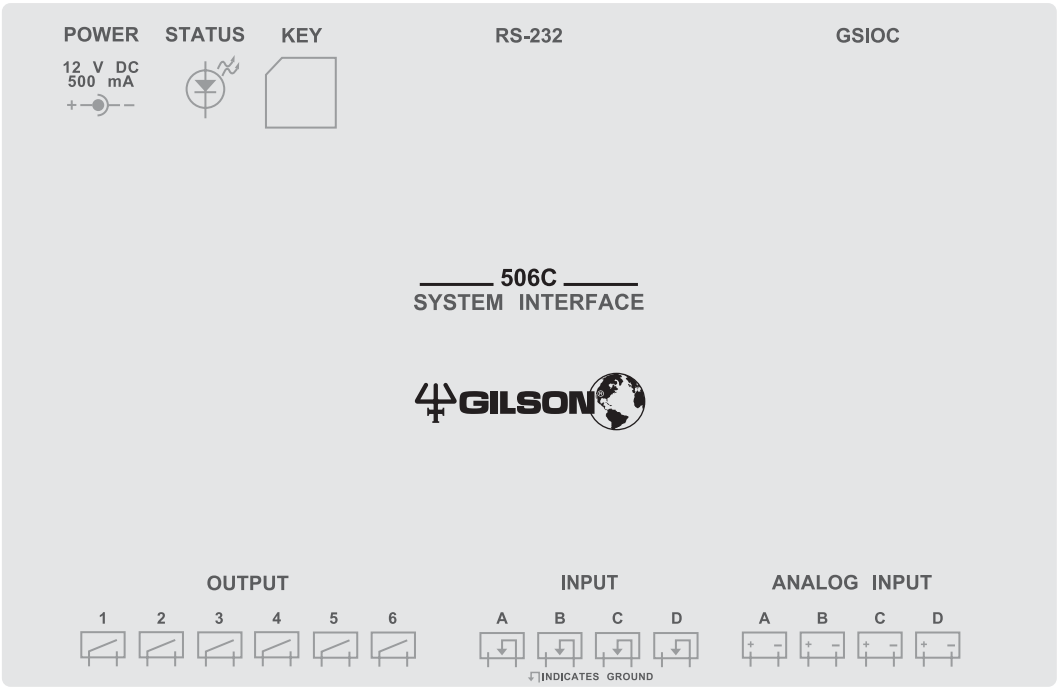
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Installation 2

The 506C System Interface Module is pre-configured as an RS-232-to-GSIOC interface (i.e., as a master device). Follow these instructions to set up the system interface for use as the GSIOC master device.

If you will use your system interface as an additional contact I/O module (i.e., as a GSIOC slave device), re-configure the unit as described in *Appendix A*.

Turn off and unplug all computers and instruments before making the connections described in this section.



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Making Connections

Connect the RS-232 Cable

Locate the RS-232 cable provided with the system interface. It has a large D connector at each end.

Attach the male end of the RS-232 cable to the 506C RS-232 input. Tighten the retaining screws.

Connect the female end of the RS-232 cable to the computer's RS-232 serial communications port. That port is a male 25-pin D connector. *Do not mistake it for the female 25-pin D connector of the parallel printer port!* Again tighten the retaining screws.

Note: If the RS-232 serial communications port of your computer is a male 9-pin D connector, you must obtain a 9-to-25 pin serial cable. This cable is available from Gilson or most computer stores.

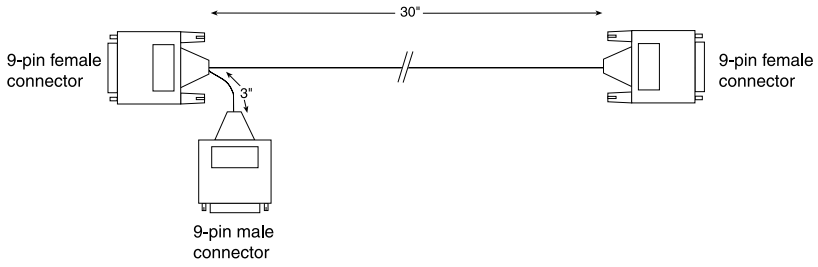
Attach the 9-pin connector of the serial cable to the computer's RS-232 port; then attach the 25-pin connector to the RS-232 input of the 506C.

To construct your own cable, see ***Appendix B*** for the 506C RS-232 pinout diagram.

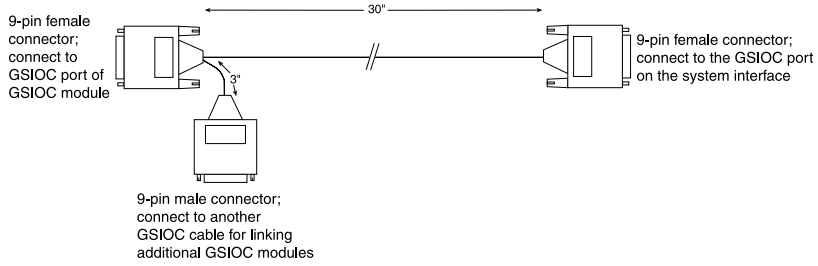
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Connect the GSIOC Cable

Use a GSIOC cable to connect the system interface to the Gilson device you wish to control. A GSIOC cable has two 9-pin female connectors and one male connector.



Refer to the diagram below to connect the 506C to another Gilson device using a GSIOC cable.



With additional GSIOC cables, you can connect as many as 32 slave devices. To connect additional GSIOC cables, connect the male connector to the next cable's female connector (use the female connector that's not joined to the male connector). Then connect the remaining female connector to the GSIOC port of the device.

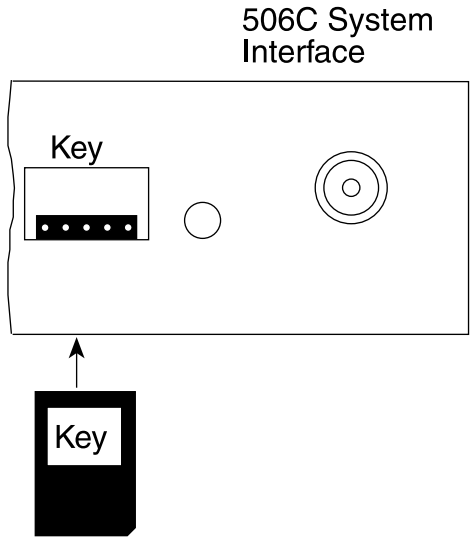
Cables should be arranged in a linear fashion. Any "Y-branching" from the main GSIOC cable may increase noise.

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Install the Security Key

If you have Gilson key-protected software installed on your computer, insert the security key into the Key port on the 506C System Interface. The security key is supplied with the Gilson software.

Note: The system interface requires that the Gilson device driver be installed on the computer. Gilson device drivers are installed with all Gilson control software packages.



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Connect the I/O Contacts

Contact inputs

The input barrier strip has 8 connections. All of the inputs are paired, and each pair includes a GROUND reference (⏚).

Contact input pairs are labeled A, B, C, and D.

Gilson control software packages can determine the state of any input (connected/disconnected) via the GSIOC. A contact is connected if it has a short across the input or is held low by a TTL output or other active device.

Never connect voltages higher than 5V DC to an input. When using TTL signals, be sure to match GROUND connections.

Contact outputs

The output barrier strip has 12 contacts. All of the connections are paired, isolated-relay contact closures.

Contact output pairs are labeled 1, 2, 3, 4, 5, and 6.

As described in ***Section 3***, your control software can connect and disconnect these output pairs to control peripheral devices.

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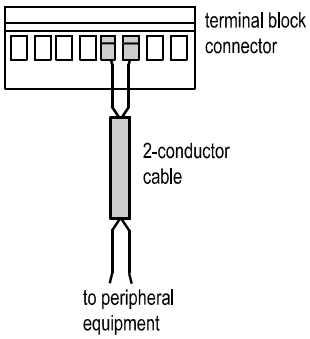
Items you'll need

To make connections to the input and output barrier strips, you'll need:

- 2-conductor interconnect cable (22-30 gauge for each wire)
- wire installation stripper
- small-blade screwdriver

You can purchase a 6-foot piece of suitable cable (part number 709910206) or a package of five cables with identification markers (part number 36078155) from Gilson.

Making connections



To prepare for each connection, cut the 2-conductor cable into pieces of appropriate length. Then strip about 1 cm of insulation from each end.

Insert each wire into the appropriate slot on the terminal block connector. Push each wire all the way in. Then tighten its corresponding pin screw. (The pins labeled (⏚) refer to GROUND.)

Note: Be sure to maintain the correct orientation of the terminal block connector relative to its port.

Attach all wires before joining the terminal block connectors to their appropriate ports on the 506C.

Connect the terminal block connector with the wires facing down and the pin screws facing away from the 506C. This prevents spillage from dripping onto the contacts.

Push the terminal block connector as far as it will go. It is designed to fit snugly into the port.

Connect the opposite ends of these wires to the appropriate peripheral equipment. Be sure to match GROUND connections when using signals not generated by contacts. Good practice dictates labeling the ends of the wire appropriately.

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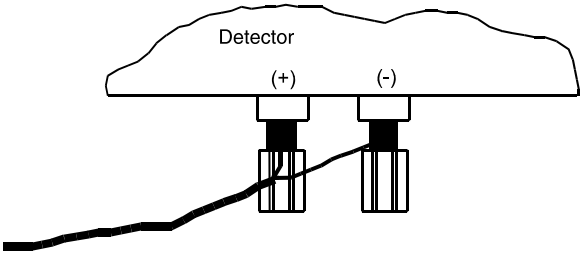
Connect the Analog Inputs

When you connect a detector to one or more of the analog inputs, the 506C can function as a data acquisition device. Data from the detector(s) are digitized and may be sent to your control software via the computer.

Each of the four analog inputs accepts a detector signal from –100 mV to +1.0 V.

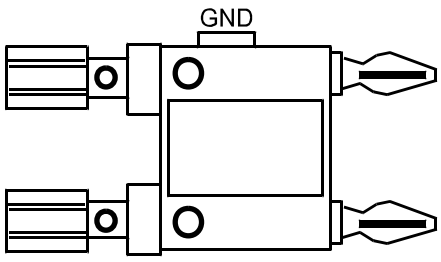
Most detectors have one of two types of output connectors. Using the accompanying figures, determine which output connectors are used on your detector(s).

One type of detector has screwable binding posts built into the rear panel of the detector. To connect the system interface to these outputs, attach the "+" wire to the "+" post on the detector and "-" wire to the "-" post. Tighten the posts securely.



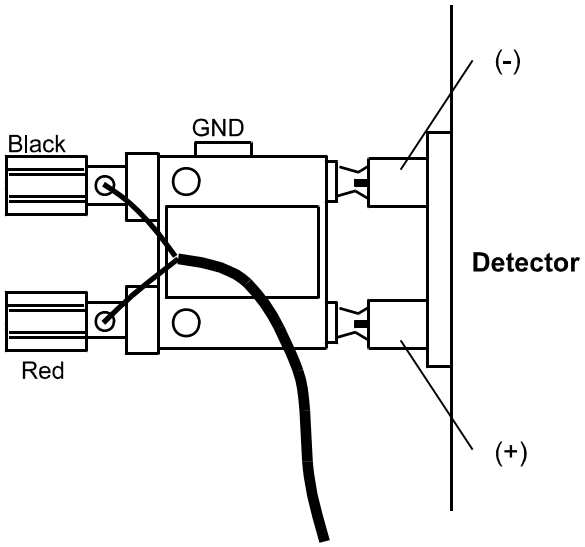
To analog input A, B, C, or D
of the system interface

The other type of connector, like the one on a Gilson detector, has fixed binding receptacles. To connect this type of detector to the system interface, you'll need a Pomona Cable Adapter (part number 6374022611) that looks like this.



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Make the connections to your system interface as shown below. Be sure to attach "+" to "+" and "-" to "-".



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Attach the Power Connector

After you've made all the necessary connections, attach the power connector to the POWER input of the system interface and the transformer to a wall outlet. Since the system interface is designed to be left on at all times (especially for cold room use), it does not have a power switch. If you prefer to have a power switch, a switched power outlet strip is recommended.

The Status light indicates that power is being supplied to the unit. It also flashes to indicate the current baud rate. ***Section 5, Troubleshooting*** describes how to evaluate the Status light. ***Appendix A*** describes how to set the baud rate.

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Operation 3

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Master Mode

This mode provides RS-232-to-GSIOC interface and contact control from the computer. As a master device, the 506C System Interface has GSIOC unit ID 63 regardless of the internal unit ID switch setting.

Gilson control software packages let you issue GSIOC commands that:

- read or activate the input/output contacts
- read the analog data inputs
- communicate with any GSIOC slave device connected to the system interface.

See ***Appendix C*** for a list of GSIOC commands.

If you write your own software to control this or other Gilson modules, you'll need:

- 706 Device Driver Software
- GSIOC Technical Manual (part number LT2181)
- A programming language such as Borland Turbo Pascal, Microsoft Visual Basic or Microsoft C++
- A list of GSIOC commands for the instrument you wish to control. Each instrument's *User's Guide* includes a list of valid commands.

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Slave Mode

This alternate mode is useful when you want the contact-control capability of the 506C System Interface but do not need RS-232-to-GSIOC conversion.

To use the system interface in slave mode, you'll have to change its master/slave termination jumpers and assign a new unit ID number. Do not use ID number 63 in slave mode. See *Appendix A*.

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Maintenance 4

The 506C System Interface should not require maintenance. The best precautions for continued operation are to avoid spilling liquids on the connectors and to avoid mechanical strain on the wire connections.

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Troubleshooting 5

When using the 506C System Interface with Gilson-supplied accessories, computers and application software, troubleshooting is simple. Most problems are due to improper connections and installation.

You can directly activate the contact outputs from Gilson software to verify their operation.

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Status Light

The Status light on the 506C System Interface serves several purposes and is a useful troubleshooting tool.

If the light is off, either the power is not being sent to the system interface or the processor may be damaged. Reset the machine by removing and replacing the power connector. If the light remains off, contact the Gilson Customer Service Department or your local Gilson representative for repair information.

If the light is steadily lit, the processor may be improperly initialized. Reset the machine by removing and replacing the power connector. If the light remains steadily lit, contact the Gilson Customer Service Department or your local Gilson representative for repair information.

If the light flashes, the system interface is operating normally. The rate of flashing indicates the current baud rate setting as outlined below.

Flashing rate	**Baud rate**
1 flash/second (1Hz)	19200
1 flash/2 seconds (0.5 Hz)	9600
1 flash/4 seconds (0.25 Hz)	any other setting

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Troubleshooting Chart

No response to RS-232 input

- There is no DC power connection at power input. If the Status light is off, check that transformer is plugged into an outlet.
- RS-232 connections are not correct. Check for proper cable and connectors.
- Check RS-232 port of computer for proper operation with other RS-232 devices.
- Baud rate may be incorrect. Check Status light as described on page 5-2.

GSIOC slave devices do not respond to commands

- Check GSIOC cable connections.
- Check slave device GSIOC unit ID numbers and baud rate switches as described in ***Appendix A***.
- Baud rate may be incorrect. Check Status light as described on page 5-2.

Unit does not respond to inputs

- Input must be a switch closure or a TTL-compatible, low level signal (0V) for activation. The polarity of the signal must also be correct.

Relay outputs will not activate; inputs are OK

- Check DC voltage from the wall transformer. Voltage must be at least 11V for proper relay activation.

Cannot locate security key in the 506C

- Make sure that the security key is installed in the Key port of the 506C.

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Repair and Return Policies

Before Calling Us

Gilson Customer Service personnel will be able to serve you more efficiently if you have the following information:

- the serial number and model number of the equipment involved
- the installation procedure you used
- list of concise symptoms
- list of operating procedures and conditions you were using when the problem arose
- list of other devices connected to the 506C and a description of those connections
- list of other electrical connections in the room

Warranty Repair

Units covered under warranty will be repaired and returned to you at no charge. If you have any questions about applicability, please contact the Gilson Customer Service Department or your authorized representative.

Non-Warranty Repair

For out-of-warranty repairs, contact your local Gilson representative or the Gilson Customer Service Department. A Customer Service representative will discuss service options with you and can assist in making arrangements to return the equipment, if necessary.

Rebuilt Exchange

For some units, rebuilt exchange components are available. Contact the Gilson Customer Service Department for details.

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Return Procedure

In the United States, contact the Gilson Customer Service Department to obtain authorization before returning any Gilson equipment. To return a piece of equipment :

- Carefully pack the unit to prevent damage in transit. Check with Gilson regarding proper method of shipment. No responsibility is assumed by Gilson for damage caused by improperly packaged instruments. Indicate the authorization on the carton and on the packing slip.

- Always insure for the replacement value of the unit.

- Include a description of symptoms, your name, address, phone number and purchase order to cover repair costs, return and shipping charges, if your institution requires it. Ship to:

  Gilson, Inc.
  Attention: Customer Service
  (indicate the authorization here)
  3000 W. Beltline Highway
  Middleton, WI 53562-0027

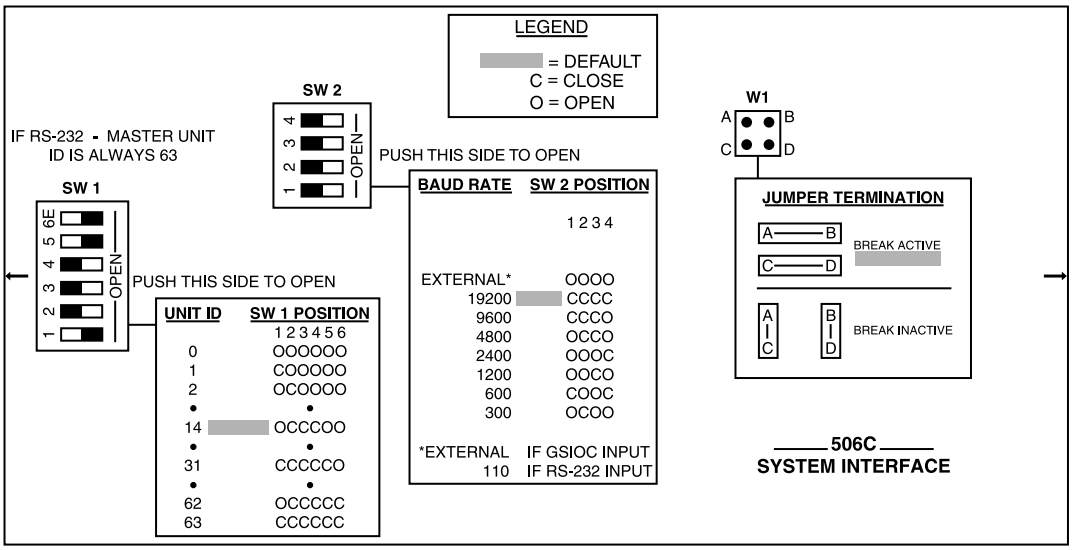
Outside the United States, contact your Gilson representative for return procedures.

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Switches and Jumper Settings A

This section provides information and settings for the two PC board switches and the jumpers that configure the baud rate, unit ID and master/slave configuration. The printed circuit board can be accessed by removing the top cover of the system interface.

Note: When you remove the top cover of the system interface, turn it over. You'll see a label (illustrated below) that details the same information given in this section.



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Baud Rate Selection

Baud Rate	Switch SW2 Position			
	1	2	3	4
External	O	O	O	O
300	O	C	O	O
600	C	O	O	C
1200	O	O	C	O
1800	C	O	C	O
2400	O	O	O	C
4800	O	C	C	O
9600	C	C	C	O
19200*	C	C	C	C

O=Open C=Closed

*Factory default

Choose External if the rate of transmission is clocked outside the 506C. Also note the following:

- If external is selected and the 506C is connected to the controlling device via the RS-232 input, the baud rate is 110.

- If external is selected and the 506C is connected to the controlling device via the GSIOC input, the baud rate is that of the controlling device.

See ***Section 5, Troubleshooting*** for a discussion of the 506C Status light which flashes to indicate the current baud rate. You can use the Status light to determine if you have correctly set the baud rate to 9600 or 19200.

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Unit ID Selection

Unit ID	Switch SW1 Position					
	1	2	3	4	5	6
0	O	O	O	O	O	O
1	C	O	O	O	O	O
2	O	C	O	O	O	O
3	C	C	O	O	O	O
4	O	O	C	O	O	O
5	C	O	C	O	O	O
:						
14*	O	C	C	C	O	O
15	C	C	C	C	O	O
:						
31	C	C	C	C	C	O
:						
62	O	C	C	C	C	C
63**	C	C	C	C	C	C

O=Open C=Closed

* The 506C is shipped with unit ID set to 14 for slave operation when not connected to an RS-232 cable.

** The unit ID of 506C master device is 63, regardless of the switch SW1 setting, when connected to an RS-232 cable.

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Jumper Table

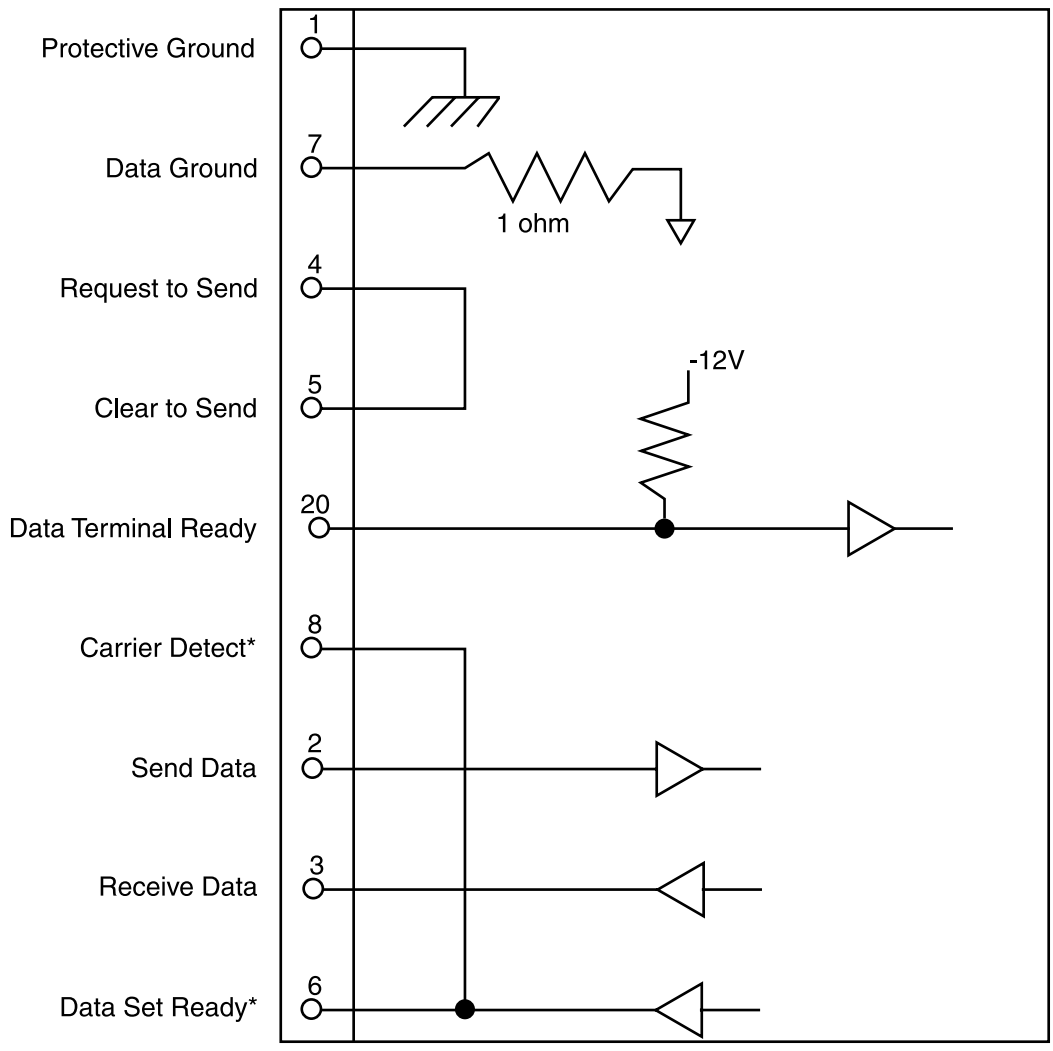
Consult the *GSIOC Technical Manual* for a description of termination conditions.

Termination Condition	Jumper Setting
RS-232 Control (Master, Break Active)	A-B, C-D*
RS-232 Control (Master, Break Inactive)	A-C, B-D
GSIOC Control (Slave)	Disconnect jumpers**

* Factory default
** Disconnected minijumps can be stored on one post.

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506C to RS-232 Connector Pinout B



*Driven true to +9V

25-pin Female D-Connector (DCE)

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GSIOC Commands C

The Gilson Serial Input Output Channel (GSIOC) is an asynchronous serial communications interface that enhances the power of your Gilson instruments.

It incorporates a standard EIA RS-422/485 interface and allows up to 32 slave devices to be controlled from a single master in a multi-drop configuration.

Each instrument is identified by a unique number which must be known to the instrument and to the computer. The default unit ID of the 506C System Interface is 14. When connected to an RS-232 cable (i.e., when operating as the master device) the default unit ID is 63, regardless of the internal switch setting.

Using the computer and software, you:

- specify the device that you want to control
- issue commands that set operating parameters, control operation, or request information from that instrument.

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GSIOC Commands

There are two kinds of commands that you can issue from your system controller to the 506C.

- **Buffered commands** send instructions to the 506C. These commands are executed one at a time.

- **Immediate commands** request status information from the 506C. These commands are executed immediately, temporarily interrupting other commands in progress.

The *GSIOC Technical Manual* includes a complete description of the GSIOC protocol.

FIFO Commands

Using GSIOC commands, your system controller can request compressed data that is stored in the 506C FIFO memory buffers. These commands are useful to programmers who want to capture data for analysis. The FIFO commands are listed after the GSIOC commands.

To interpret the FIFO data, consult the *506C Technical Manual*'s (part number LT3645CCD) discussion of the data compression format.

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GSIOC Command List

GSIOC Immediate Commands

'C' = connect 'D'= disconnect

A contact is connected if it has a short across the input or is held low by a TTL or other device.

%	Identifies the selected module. Returns character string: '506CVx.y', where x and y represent the software version.
?	Requests the status of the group of six contact outputs. Returns '123456' where each digit is either 'C' or 'D'. **Example**: 'CCDDDD' indicates that outputs 1 and 2 are connected and that outputs 3, 4, 5, and 6 are disconnected.
$	Power reset.
*	Requests the status of the group of four contact inputs. Returns 'ABCD' where each letter is either 'C' or 'D'. **Example**: 'CCCD' indicates that inputs A, B, and C are connected, and input D is disconnected.
A	Requests status of contact input A. Returns 'C' if connected, 'D' if disconnected.
B	Requests status of contact input B. Returns 'C' if connected, 'D' if disconnected.
C	Requests status of contact input C. Returns 'C' if connected, 'D' if disconnected.

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D	Requests status of contact input D. Returns 'C' if connected, 'D' if disconnected.
V	Reads analog input A voltage. Returns the voltage in the format 'XXX.XX mV'.
W	Reads analog input B voltage. Returns the voltage in the format 'XXX.XX mV'.
X	Reads analog input C voltage. Returns the voltage in the format 'XXX.XX mV'.
Y	Reads analog input D voltage. Returns the voltage in the format 'XXX.XX mV'.

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GSIOC Buffered Commands

'C' = connect 'D' = disconnect 'X' = no charge

A contact is connected if it has a short across the input or is held low by a TTL output or other active device.

Cn..n Connects output(s) specified by n..n, where n is any subset of 1, 2, 3, 4, 5, 6.

Examples: Sending 'C2' connects output 2. Sending 'C63' connects outputs 3 and 6.

Dn..n Disconnects output(s) specified by n..n, where n is any subset of 1, 2, 3, 4, 5, 6.

Examples: Sending 'D6' disconnects output 6. Sending 'D25' disconnects outputs 2 and 5.

O123456 Sets the six contact outputs. For 123456, indicate either 'C', 'D' or 'X'. Note that the first character of this command is the letter O, not the number 0.

Example: Sending 'ODDDDDD' disconnects all contact outputs.

Pnt Pulses a contact output where n is 1, 2, 3, 4, 5, or 6 and t is the pulse duration, measured in tenths of seconds ranging from 0 to 99. If not specified, the default is 1.

Example: Sending 'P410' pulses output 4 for 1 second.

Za..a Zeroes the offset of the analog inputs specified by a..a, where a is any subset of A, B, C, D. The analog input should be shorted or disconnected when this command is sent.

Example: Sending 'ZAD' zeroes analog inputs A and D.

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FIFO Command List

To interpret the FIFO data, consult the *506C Technical Manual*'s (part number LT3645CCD) discussion of the data compression format.

FIFO Immediate Commands

0 Reads data from FIFO 0 (analog input A).

1 Reads data from FIFO 1 (analog input B).

2 Reads data from FIFO 2 (analog input C).

3 Reads data from FIFO 3 (analog input D).

9 Reads contact input event FIFO.

Whenever the status of a contact input changes, the state of all four contacts and the time since the previous change are recorded in the event FIFO.

Returns 'Xttttt' where X describes the state of the four contact inputs and ttttt is the time since the last change, expressed as a hexadecimal number. To determine the time in seconds, convert the hexadecimal value to a decimal number, then divide by 100. ttttt is 000000 if the queue is empty.

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Use the following chart to evaluate the state of the four contact inputs at time tttttt.

'C'= connect 'D' = disconnect

A contact is connected if it has a short across the input or is held low by a TTL output or other active device.

State of Inputs				
X	A	B	C	D
@	D	D	D	D
A	C	D	D	D
B	D	C	D	D
C	C	C	D	D
D	D	D	C	D
E	C	D	C	D
F	D	C	C	D
G	C	C	C	D
H	D	D	D	C
I	C	D	D	C
J	D	C	D	C
K	C	C	D	C
L	D	D	C	C
M	C	D	C	C
N	D	C	C	C
O	C	C	C	C

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FIFO Buffered Commands

To interpret the FIFO data, consult the *506C Technical Manual*'s (part number LT3645CCD) discussion of the data compression format.

0xxxx	Clears FIFO 0 and sets sampling rate. For xxxx indicate the sampler rate in units of 0.01 Hz. FIFO 0 contains data for analog input A.
1xxxx	Clears FIFO 1 and sets sampling rate. For xxxx indicate the sampler rate in units of 0.01 Hz. FIFO 0 contains data for analog input B.
2xxxx	Clears FIFO 2 and sets sampling rate. For xxxx indicate the sampler rate in units of 0.01 Hz. FIFO 0 contains data for analog input C.
3xxxx	Clears FIFO 3 and sets sampling rate. For xxxx indicate the sampler rate in units of 0.01 Hz. FIFO 0 contains data for analog input D.
9	Clears the contact event FIFO and resets the contact input event timer.

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