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OPERATING MANUAL

I/O SIGNAL CONDITIONER



⚠CAUTION:

THIS PRODUCT DOES NOT PROVIDE GALVANIC ISOLATION. DO NOT ATTEMPT USE OF THIS PRODUCT WHERE COMMON MODE VOLTAGES EXIST BETWEEN INPUTS, OUTPUTS, POWER SUPPLY, OR THE SERIAL COMMUNICATIONS TERMINALS.

TABLE OF CONTENTS

(a)	UNPACKING THE I/O SIGNAL CONDITIONER.....	1
	a.1 Inspect Package for External Damage.....	1
	a.2 Unpack the Signal Conditioner.....	1
	a.3 Returning Merchandise for Repair.....	1
(b)	DESCRIPTION.....	2
(c)	FEATURES.....	2
(d)	SPECIFICATIONS.....	2
	d.1 General Attributes.....	2
	d.2 CE Compliance.....	3
(e)	ELECTRICAL CONNECTIONS.....	3
	e.1 Connector Pin Assignments.....	3
	e.2 Jumper Assignments.....	4
(f)	PROGRAMMING.....	4
(g)	CALIBRATION PROCEDURES.....	5
	g.1 Equipment Required for Calibration.....	5
	g.2 Calibration.....	5
(h)	SELECTING THE MODE OF OPERATION.....	6
(i)	COMMANDS.....	6
(j)	TROUBLESHOOTING GUIDE.....	9
(k)	TECHNICAL ASSISTANCE.....	9
APPENDIX 1 COMPONENT DIAGRAM		
APPENDIX 2 DIMENSIONS		
APPENDIX 3 CONNECTION DIAGRAM FOR RS232 and RS485		
APPENDIX 4 WARRANTY		

(a) UNPACKING THE I/O SIGNAL CONDITIONER

a.1 Inspect Package for External Damage

Your I/O Signal Conditioner was carefully packed in a sturdy cardboard carton, with anti-static cushioning materials to withstand shipping shock. Upon receipt, inspect the package for possible external damage. In case of external damage to the package contact the shipping company immediately.

a.2 Unpack the I/O Signal Conditioner

Open the carton carefully from the top and inspect for any sign of concealed shipping damage. In addition to contacting the shipping carrier please forward a copy of any damage report to your distributor or Aalborg directly.

When unpacking the instrument please make sure that you have all the items indicated on the Packing List. Please report any shortages promptly.

a.3 Returning Merchandise for Repair

Please contact the customer service representative of your distributor or Aalborg if you purchased your I/O directly, and request a **Return Authorization Number (RAN)**. **Equipment returned without an RAN will not be accepted.** Aalborg reserves the right to charge a fee to the customer for equipment returned under warranty claims if the instruments are tested to be free from warrantied defects.

Shipping charges are borne by the customer. Items returned "collect" will not be accepted!

It is mandatory that any equipment returned for servicing be purged and neutralized of any dangerous contents including but not limited to toxic, bacterially infectious, corrosive or radioactive substances. No work shall be performed on a returned product unless the customer submits a fully executed, signed SAFETY CERTIFICATE. Please request form from the Service Manager.

(b) DESCRIPTION

This Signal Conditioner allows analog voltage levels to be set and read via its RS-232 serial port. Commands are provided to perform various functions: an analog output, read an analog input, verify the communications link, programming, and enter calibration mode.

(c) FEATURES

The I/O is capable of operating in a voltage output mode or a current output mode. When operating in the voltage mode the analog input and output range is 0.00 to 5.00 volts. In the current mode the analog input and output range is 4.00 to 20.0 milliamps. See Selecting the Operating Mode.

(d) SPECIFICATIONS

d.1 General Attributes

INPUT AND OUTPUT ANALOG RANGE: 0 - 5 Vdc or 4 - 20 mA, jumpers selectable.

INPUT OVERVOLTAGE/OVERCORRECT PROTECTION: 15 Vdc, 50 mA.

MINIMUM OUTPUT VOLTAGE COMPLIANCE IN 4-20 mA MODE: 8 Vdc.

MAXIMUM INPUT VOLTAGE DROP IN 4-20 mA MODE: 5 Vdc.

POWER SUPPLY REQUIREMENTS: 10 to 30 Vdc, less than 0.75 watts (OPTIONAL).

OPERATING TEMPERATURE RANGE: 0 °C to 70 °C.

ALTITUDE: to 10,000 feet.

DIGITAL VOLTAGE STANDARD: RS-232 or RS-485 (not galvanically isolated).

COMMUNICATIONS PARAMETERS: 8 bits, one stop bit no parity (N,8,1).

RS-232 COMMON MODE CAPABILITY: ± 10 volts.

RESOLUTION: 10 bits (0.1%).

DATA FORMAT: ASCII.

DATA TRANSFER RATE: 300 baud to 9600 baud.

MODULE CONNECTION METHOD: Pinch Type terminals.

d.2 CE Compliance

Any model **I/O** Signal Conditioner bearing a CE marking on it, is in compliance with the below stated test standards currently accepted.

EMC Compliance with 89/336/EEC as amended;
Emission Standard: EN 55011:1991, Group 1, Class B
Immunity Standard: EN 55082 1:1992
Environmental (per IEC 664): Installation Level II; Pollution Degree II

(e) ELECTRICAL CONNECTIONS

e.1 Connector Pin Assignments

All connections are made at connector J1. This is a pinch type connector. Insert a small flat blade screwdriver into the slot along the top of J1 and press down. This will cause the pinch clamp to open allowing the stripped wire to be inserted. Remove the screwdriver and the connection is made.

- Pin 1 - Analog input from sensor IN+
- Pin 2 - Analog input from sensor IN-
- Pin 3 - Analog output to sensor OUT+
- Pin 4 - Analog output to sensor OUT-
- Pin 5 - Data output from module TX (-)
- Pin 6 - Data input to module RX (+)
- Pin 7 - Power supply input to module 10VDC - 30VDC
- Pin 8 - Power supply return (GND)



CAUTION: Exceeding the following voltages will cause device failure and/or hazardous conditions to exist.

Terminal Number	Maximum Voltage VDC)	Mode
1	15	voltage input
1	10	current input
3	(see note)	voltage output
3	(see note)	current output
5	(see note)	RS-232
5	15	RS-485
6	15	RS-232
6	15	RS-485
7	33	all



Note: The applicable terminals are utilized as outputs. Do not apply any external voltage or current sources to these terminals.



CAUTION: Make sure power is OFF when connecting or disconnecting any cables in the system.

The power input is protected by a 1A re-settable fuse. If a shorting condition or polarity reversal occurs, the fuse will cut power to the flow transducer circuit. Disconnect the power to the unit, remove the faulty condition, and reconnect the power. The fuse will reset once the faulty condition has been removed.

e.2 Jumper Assignments

JP1 - Program mode jumper
Pins 1 and 2 select Run mode
Pins 2 and 3 select Program mode

JP3 - Input mode jumper
Pins 1 and 2 select 0 - 5VDC mode (factory default)
Pins 2 and three select 4 - 20 mA mode

JP2, JP4, JP5 - Output mode jumpers
Pins 1 and 2 select 0 - 5VDC mode (factory default)
Pins 2 and 3 select 4 - 20mA mode



CAUTION: Improper setting of jumpers may result in incorrect operation of the unit and could cause damage to the connected equipment.

(f) PROGRAMMING

Programming the module allows the user to set the communications baud rate, module address and, whether to use error checking. Note that the address is included only for compatibility with the RS-485 version of this unit.



Note: All I/O conditioners are programmed on the factory by default settings: address 1, baud rate 9600, and error checking OFF.

Connect a dumb terminal or PC running a communications program, such as Procomm, to the unit.

RS232 APPLICATION:

Connect the unit TX line to the terminal RX line, connect the unit RX line to the terminal TX line. Connect the I/O GND (pin 8) to SG Terminal.

RS485 APPLICATION:

Make sure RS485 Terminal Equipment (RS-485 to RS232 Converter) is configured for bidirectional Multi drops Two-Wire Half-Duplex operation (TX+ is connected to RX+ and TX- is connected to RX-). Connect the unit TX(-) line (pin 5) to the terminal TX- line, connect the unit RX+ line (pin 6) to the terminal TX+ line. Connect the **I/O** GND (pin 8) to terminal GND (if applicable).

To program the module remove power from the unit and install the shorting plug on jumper JP1 between pins 2 and 3.

Apply power to the unit and follow the on screen instructions. When programming is completed turn the unit off, place the shorting plug on jumper JP1 on pins 1 and 2 to return the module to run mode, the new settings will take affect when the unit is powered on. The initial power on defaults are 9600 baud, 8 data bits, 1 stop bit, no parity, error checking off, address 0.

(g) CALIBRATION PROCEDURE

g.1 Equipment Required for Calibration

You will need a 3-1/2 digit DMM set to the selected analog output range (see Selecting Operating Mode), a power supply and, a dumb terminal or PC running a communications program, such as Procomm.



Note: All **I/O** conditioners are calibrated on the factory for 0 - 5V mode. Usually it is not necessary to calibrate unit, unless 4 to 20 mA mode is required.

g.2 Calibration

Connect the dumb terminal or PC.

RS232 APPLICATION: Connect the unit TX line to the terminal RX line, connect the unit RX line to the terminal TX line. Connect the **I/O** GND (pin 8) to the SG line terminal.

RS485 APPLICATION: Make sure RS485 Terminal Equipment (RS-485 to RS232 Converter) is configured for bidirectional Multi drops Two-Wire Half-Duplex operation (TX+ is connected to RX+ and TX- is connected to RX-). Connect the unit TX(-) line (pin 5) to the terminal TX- line, connect the unit RX+ line (pin 6) to the terminal TX+ line. Connect the **I/O** GND (pin 8) to terminal GND (if applicable).

Apply power to the **I/O**, issue the calibrate command and follow the on screen instructions. See Host C command for format.

(h) SELECTING THE MODE OF OPERATION

Before operating in the desired mode the **I/O** has to be calibrated in the same mode.

To set the unit to operate in 0 - 5V mode install shorting plugs between pins 1 and 2 on JP2, JP3, JP4 and, JP5. If 4 - 20mA current mode is desired install the shorting plugs between pins 2 and 3 on JP2, JP3, JP4 and, JP5. See Jumper Definitions for more detail.

(i) COMMANDS

The following is a list of the valid commands, command format and, unit response.

Host Command format:

	>	address command X X X X crc CR
Where:	>	message start character
		Address unit address is any single printable ASCII
		command character one of the commands from below
X X X X		optional four ASCII characters, used by the unit to set the analog output
crc		optional error checking characters, the crc is composed of two ASCII characters
CR		ASCII carriage return character

There are no spaces in the transmitted command, spaces are inserted here only to make the command easier to read. If a crc is not used it is not sent in the command line. Commands sent by the host are preceded with a start character symbol, >. All commands are terminated with a CR. If data bytes are not required by the command they are not included in the command line.

I/O Module Response format:

	#	X X X X X crc CR
Where:	#	message start character
		command one of the commands listed below
		X X X X X up to five ASCII characters, used to report the analog input of the unit back to the host
		optional error checking characters, the crc is composed of two ASCII characters
		ASCII carriage return character

There are no spaces in the transmitted response, spaces are inserted here only to

make the response easier to read. If a crc is not required it is not sent in the response line. Responses sent by the **I/O** Module are preceded with a start character symbol, #. All responses are terminated with a CR. Only the number of data bytes required by the response are sent. Leading zeroes are stripped.

Host S Command:

S or s - This command queries the **I/O** Module for its communication status. If the communications line is intact the **I/O** Module responds to the host with an "OK".

An example of a valid command to a unit with address M:

> M S crc CR

> M s crc CR

The reply format is:

#OK crc CR

If the command is not recognized, the **I/O** Module responds with "Bad Command".

An example of an invalid command:

> M x crc CR

The reply format is:

#Bad Command crc CR

If the command is not received no response is sent.

Host T Command:

T or t - This command tells the **I/O** Module to transmit its current reading. Up to five ASCII characters are sent by the **I/O** Module. The returned data is in millivolts if the module is operating in a 0 - 5V mode. If the module is operating in a 4 - 20mA mode the data is in microamps.

An example of a valid command to a unit with address 5:

> 5 T crc CR

> 5 t crc CR

The reply format is:

#1000 crc CR which corresponds to 1000 mV
or

#19500 crc CR which corresponds to 19500uA

If the command is not recognized "Bad Command" is returned.

An example of an invalid command to a unit with address 5:

> 5 x crc CR

The reply format is:

#Bad Command crc CR

If the command is not received no response is sent. The module returns the analog input data if the command was received and understood.

Host R Command:

R or r - This command tells the **I/O** Module to receive a new set point. Four characters must be sent and one of these characters is always a decimal point. If the set point does not fill all four characters trailing zeroes are added. A crc is added if error checking is enabled, otherwise it is not sent. If the command is not recognized "Bad Command" is returned.

An example of a valid command to a unit with address >:

>> R 1.00 crc CR

>> r 1.00 crc CR

An example of an invalid command to a unit with address r:

> r W 1.00 crc CR

The reply format is:

#Bad Command crc CR

If the command is not received no response is sent. The module sends "OK" if the command was received and understood.

The reply format is:

#OK crc CR

Host C Command:

C or c - This command tells the **I/O** Module to enter calibration mode. Calibration instructions are sent to the terminal display. See **Calibrating the I/O Module** for calibration procedure. If the command is received and understood the unit enters calibration mode.

An example of a valid command to a unit with address @:

> @C crc CR

> @c crc CR

If the command is not recognized "Bad Command" is returned.

An example of an invalid command to a unit with address @:

> @q crc CR

The reply format is:

#Bad Command crc CR

Host G Command:

G or g - This command tells the **I/O** Module to accept a global command. This is included for compatibility with the RS-485 version of this unit. The syntax is the same as the R command except the address is 0 and no response is sent by the module.

An example of a valid command is:

> 0 G crc CR

> 0 g c crc CR

(j) TROUBLE SHOOTING

Your **I/O** Signal Conditioner was thoroughly checked at numerous quality control points during and after manufacturing and assembly operations. It was calibrated in accordance to conditions for a given.

It was carefully packed to prevent damage during shipment. Should you feel that the instrument is not functioning properly please check for the following common conditions first:

Are all cables connected correctly?

Is the power supply correctly selected according to requirements?
When several meters are used a power supply with appropriate current rating should be selected.

Were the connector pinouts matched properly?
When interchanging with other manufacturers' equipment, cables and connectors must be carefully wired for correct.

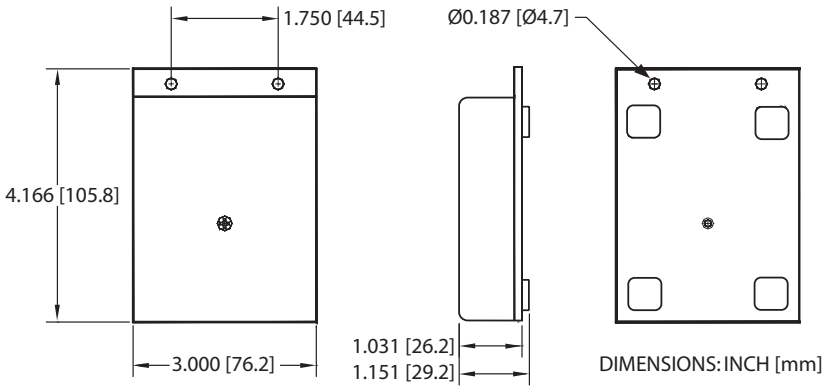
For best results it is recommended that instruments are returned to the factory for servicing. See section a.3 for return procedures.



CAUTION: Use of the **I/O** Signal Conditioner in a manner other than that specified in this manual or in writing from Aalborg, may impair the protection provided by the equipment.

APPENDIX 2

Dimensions



I/O Signal Conditioner

NOTE: Aalborg® reserves the right to change designs and dimensions at its sole discretion at any time without notice. For certified dimensions please contact Aalborg®.

APPENDIX 3

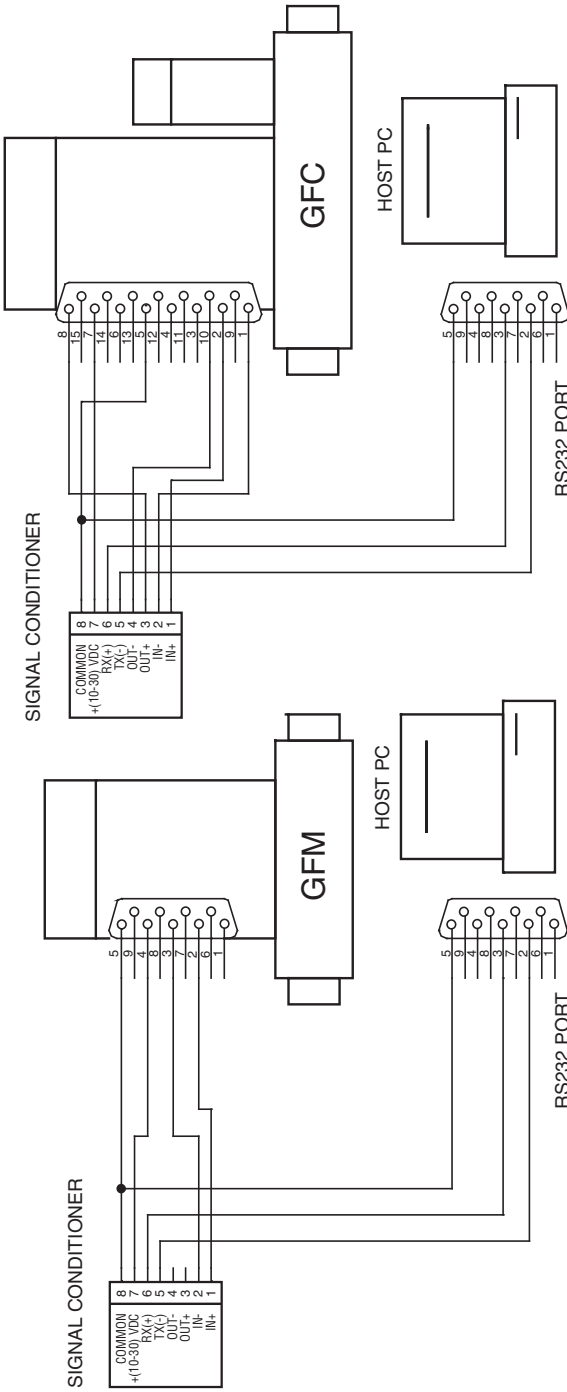


Fig. 1 Connection diagram GFM to I/O232

Fig. 2 Connection diagram GFC to I/O232

APPENDIX 4

Warranty

Aalborg electronics products are warranted against defects in parts and workmanship for a period of one year from the date of purchase. Proper product selection is the responsibility of the customer. It is deemed the responsibility of the customer that only operators with at least basic knowledge of the equipment and its limitations are permitted to control and operate the equipment covered by this warranty. Anything to the contrary will automatically void the liability of Aalborg and the provisions of this warranty. Defective products will be repaired or replaced solely at the discretion of Aalborg at no charge.

Shipping charges are borne by the customer.

This warranty is void if the equipment is damaged by accident or misuse, or has been repaired or modified by anyone other than Aalborg or factory authorized service facility. This warranty defines the obligation of Aalborg and no other warranties expressed or implied are recognized.

Note: Follow Return Procedures In Section a.3.