INFICON

Operating Manual

FFS232

FabGuard® Factory Switch

Table of Contents

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3 Declaration of Conformity

INFICON

This is to certify that this equipment, designed and manufactured by:

**INFICON Inc.
Two Technology Place
East Syracuse, NY 13057
USA**

meets the essential safety requirements of the European Union and is placed on the market accordingly. It has been constructed in accordance with good engineering practice in safety matters in force in the Community and does not endanger the safety of persons, domestic animals or property when properly installed and maintained and used in applications for which it was made.

Equipment Description:	FFS 232 – FabGuard Factory Switch
Applicable Directives:	73/23/EEC as amended by 93/68/EEC
	89/336/EEC as amended by 93/68/EEC
Applicable Standards:	EN 61010-1:1993/A2: 1995
	EN 61326-1:2000, Class A, Emissions per Table 3;
	Immunity per Table A.1 (Industrial)
CE Implementation Date:	September 9, 2002
Authorized Representative:	Gary W. Lewis
	Vice President - Quality Assurance
	INFICON Inc.

ANY QUESTIONS RELATIVE TO THIS DECLARATION OR TO THE SAFETY OF INFICON'S PRODUCTS SHOULD BE DIRECTED, IN WRITING, TO THE QUALITY ASSURANCE DEPARTMENT AT THE ABOVE ADDRESS.

09/09/02

4 Safety Information

All work described in this document may only be carried out by persons who have suitable technical training and the necessary experience or who have been instructed by the end user of the product.

4.1 Safety Precautions When Using Instrument

Misuse of the instrument can damage the instrument and may cause bodily harm. The safety messages in this document are provided to protect the user, as well as to optimize instrument performance. Before operating the instrument, the user must read and understand all safety messages and take adequate precautions to mitigate hazards or equipment damage.

4.2 General Safety Instructions

⚠ CAUTION

The product is not for use in a manner not specified by the manufacturer. If the product is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

⚠ CAUTION

The product is part of the end user's application. Fire protection features should be provided by the end user.

⚠ CAUTION

When installing the product, make sure it is properly secured in case of a seismic event.

⚠ CAUTION

Only trained personnel may perform service actions on the product.

4.3 Definition of Safety and Informational Messages

When using this document, please pay attention to the safety and informational messages found throughout. For the purposes of this manual, they are defined as follows:

⚠ **DANGER**

This type of message indicates a hazardous situation that will result in death or serious injury if proper precautions are not taken.

⚠ **WARNING**

This type of message indicates a hazardous situation that could result in death or serious injury if proper precautions are not taken.

⚠ **WARNING**

This type of message indicates that dangerous electrical voltages are present that could result in personal injury if proper precautions are not taken.

⚠ **WARNING**

This type of message indicates that high temperatures are present that could result in personal injury if proper precautions are not taken.

⚠ **WARNING**

This type of message warns against actions that could cause extensive equipment and/or environmental damage.

⚠ **CAUTION**

This type of message indicates a hazardous situation that could result in minor or moderate injury if proper precautions are not taken.

⚠ **CAUTION**

This type of message cautions against actions that may cause an instrument malfunction, minor equipment damage, and/or the loss of data.

NOTICE

This type of message indicates information that is considered important but is not related to any type of hazard.

ⓘ This type of message indicates information that is considered important but is not related to any type of hazard.

4.4 Liability and Warranty

INFICON assumes no liability and the warranty becomes null and void if the custodian or third parties:

- disregard the information in this document

- use the product in a non-conforming manner

- make any kind of changes (modifications, alterations, etc.) to the product

- use the product with accessories not listed in the corresponding product documentation

The custodian assumes the responsibility in conjunction with the process media used.

4.5 Training

For the optimal use of this product, INFICON offers application, operation, and maintenance courses. Your INFICON partner would be glad to provide the information.

5 Service and Technical Support

5.1 How to Contact Customer Support

Worldwide customer support information is available under **Contact** at www.inficon.com:

- Sales and Customer Service
- Technical Support
- Repair Service

When reporting an issue with your instrument, please have the following information readily available:

- the instrument part number(s) and serial number(s)
- a description of the problem
- an explanation of any corrective action already attempted
- the exact wording of any error messages

For technical support, visit www.inficon.com and select **Contact >> Service & Support**. Select your region and product to obtain support contact information. To submit a repair request in North America, fill out a Service Request form at https://service.inficon.com/.

5.2 Returning an Instrument to INFICON

Do not return any component of your instrument to INFICON without first obtaining a Return Material Authorization (RMA) number from a Customer Support Representative. To obtain an RMA, fill out and submit a Service Request form (refer to How to Contact Customer Support [▶ 11]). Service Request forms must be approved by INFICON before an RMA number is issued.

If you deliver a package to INFICON without an RMA number, your package will be held and you will be contacted. This will result in delays in servicing your instrument.

Prior to being given an RMA number, you may be required to complete a Declaration of Contamination (DOC) form if your instrument has been exposed to certain materials. DOC forms must be approved by INFICON before an RMA number is issued. INFICON may require that the instrument be sent to a designated decontamination facility, not to the factory.

6 Getting Started

6.1 Introduction

The FabGuard® Factory Switch (FFS) is placed between the FabGuard computer and the Host and Equipment computers.

The FFS provides a safeguard in case of FabGuard software or FabGuard computer failure. The Host computer is connected to one COM port on the FabGuard computer and the Equipment computer is connected to another COM port on the FabGuard computer. In the event of a FabGuard failure, the Host and Equipment computers are connected directly together.

The Host and Equipment computers communicate with each other using the Semiconductor Equipment Communication Standard (SECS) via an RS232-C serial connection.

FabGuard software is compatible with a PC running Windows® 7 or newer.

6.2 Classification and Agency Approvals

Classification: Equipment for measurement, control, and laboratory use

Agency approvals: CE certified (for additional details, refer to Declaration of Conformity [▶ 7]).

> ⚠ **CAUTION**
>
> **Any changes or modifications made to the FFS232 by the end user, without the written approval of INFICON, could void the user's FCC granted authority to operate this equipment.**

> ⚠ **CAUTION**
>
> **This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the Operating Manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.**

> ⚠ **CAUTION**
>
> **This product is not for use in a manner not specified in the Operating Manual or in writing from INFICON.**

6.3 Physical Specifications

6.3.1 Physical Dimensions

133.35 mm L × 128.27 mm W × 39.88 mm H (5.25 in. L × 5.05 in. W × 1.57 in. H)

6.3.2 Weight

0.28 kg (0.62 lb.)

6.3.3 Mounting

No restrictions.

6.4 Technical Specifications

6.4.1 Electrical Power Requirements

Power supply	15 V (DC) ± 10% @ 1 W
Type	External
Connector	080 pin Switchcraft mate RAPC722
Polarity	Polarity independent

6.4.2 Communication Ports

Quantity	4
Baud rate	38.4 kb max
Connections	9-pin D-sub
Cable length (max)	15.24 m (50 ft.)

6.4.2.1 FabGuard Host

Name	FabGuard Interface HOST
Connector	9-pin D-sub female
Cable	Straight
Triggered connection	FACTORY HOST
Untriggered connection	OPEN

6.4.2.2 FabGuard Equipment

Name	FabGuard Interface EQUIP
Connector	9-pin D-sub male
Cable	Null modem
Triggered connection	FACTORY EQUIPMENT
Untriggered connection	OPEN

6.4.2.3 Factory Host

Name	Factory Interface HOST
Connector	9-pin D-sub male
Cable	Null modem
Triggered connection	FABGUARD HOST
Untriggered connection	FACTORY EQUIPMENT

6.4.2.4 Factory Equipment

Name	Factory Interface EQUIP
Connector	9-pin D-sub female
Cable	Straight
Triggered connection	FABGUARD EQUIPMENT
Untriggered connection	FACTORY HOST

6.4.3 Switch

Type	2 DPDT 5V relays (form C)
Rating	0.3 A @ 60 V (DC) resistive 0.5 A @ 120 V (AC) resistive
Dielectric strength	500 V (AC) between open contacts 1000 V (AC) otherwise
Time values	Operate 6 ms, release 3 ms, bounce 4 ms
Contact	Stationary: Gold-overlay AgPd Moveable: AgPd

6.4.4 Trigger Definition

Port	FabGuard Equip
Pin	Pin 8 on FabGuard Equip
Source	RTS line
Sensing	Edge - positive or negative edge
Max. interval	3 s
Min. interval	10 ms
Noise discrimination	Min. pulse width of 4 ms
EIA levels max.	±25 V
EIA levels min.	±3 V
Reference	FabGuard Equip port Pin 5

6.4.5 Timeout

Default	3.300 s
Configure	Yes (see Timeout DIP Switch Settings [▷ 16], DIP On = 1)
Min. time	0.2 s
Max. time	9.8 s

6.4.6 Protection

Transient	Yes (all sampled lines)
Overvoltage protection	330 Ω (±5 V)
Load capacitance	<100 pF
Reference	Chassis

6.4.7 Switch Logic

Power up state	Off (untriggered bypass state)
Power up delay	200 ms
Power up to state change	Max. 3.5 ms, min. 200 ms

6.4.8 Switch Time

Bypass to triggered	Min. 30 ms, max. 3 s
Triggered to bypass	Min. 3.3 s, max. 3.5 s
Power fail triggered to bypass	Min. 30 ms

6.4.9 Enclosure

Type	Plastic ABS, EMI coating, brushed Al end panels
Color	Black

6.4.10 Indicators

Quantity	4
Active functions	System operating, triggered, factory host activity, factory equip activity

6.4.11 RS232 PC Interface

See Timeout DIP Switch Settings [▷ 16], DIP On = 1

6.4.12 Environmental Requirements

As per EN 61010 / CP QA0035 (INFICON)

Temperature range	0–50°C
Pollution	Degree 2
Installation	Degree 3
Susceptibility	Degree 2 ESD

6.4.13 PC Interface Connections

Pin	Function
2	PC receive
3	PC transmit
5	GND
7	RTS (FabGuard Equipment Port Pin 8)

6.4.14 Timeout DIP Switch Settings

DIP Setting	Timeout	DIP Setting	Timeout
XX 00 0000	200	XX 01 0000	2700
XX 00 0001	400	XX 01 0001	2800
XX 00 0010	600	XX 01 0010	2900
XX 00 0011	800	XX 01 0011	3000
XX 00 0100	1000	XX 01 0100	3100
XX 00 0101	1200	XX 01 0101	3200
XX 00 0110	1400	XX 01 0110	3300
XX 00 0111	1600	XX 01 0111	3400
XX 00 1000	1800	XX 01 1000	3500
XX 00 1001	2000	XX 01 1001	3600
XX 00 1010	2100	XX 01 1010	3700
XX 00 1011	2200	XX 01 1011	3800
XX 00 1100	2300	XX 01 1100	3900
XX 00 1101	2400	XX 01 1101	4000
XX 00 1110	2500	XX 01 1110	4100
XX 00 1111	2600	XX 01 1111	4200

DIP Setting	Timeout	DIP Setting	Timeout
XX 10 0000	4300	XX 11 0000	6800
XX 10 0001	4400	XX 11 0001	7000
XX 10 0010	4500	XX 11 0010	7200
XX 10 0011	4600	XX 11 0011	7400
XX 10 0100	4700	XX 11 0100	7600
XX 10 0101	4800	XX 11 0101	7800

DIP Setting	Timeout	DIP Setting	Timeout
XX 10 0110	4900	XX 11 0110	8000
XX 10 0111	5000	XX 11 0111	8200
XX 10 1000	5200	XX 11 1000	8400
XX 10 1001	5400	XX 11 1001	8600
XX 10 1010	5600	XX 11 1010	8800
XX 10 1011	5800	XX 11 1011	9000
XX 10 1100	6000	XX 11 1100	9200
XX 10 1101	6200	XX 11 1101	9400
XX 10 1110	6400	XX 11 1110	9600
XX 10 1111	6600	XX 11 1111	9800

6.5 Installation

Installation should be performed when the Host computer and the Equipment computer are not sending SECS messages to each other, or when their user gives permission to briefly interrupt these messages.

Referring to the diagram, make the cable connections in the order given in the procedure below. These instructions assume the Host to the Equipment SECS port has been connected. If it is not connected, the SECS passthrough between the FabGuard computer and the FFS is not necessary.
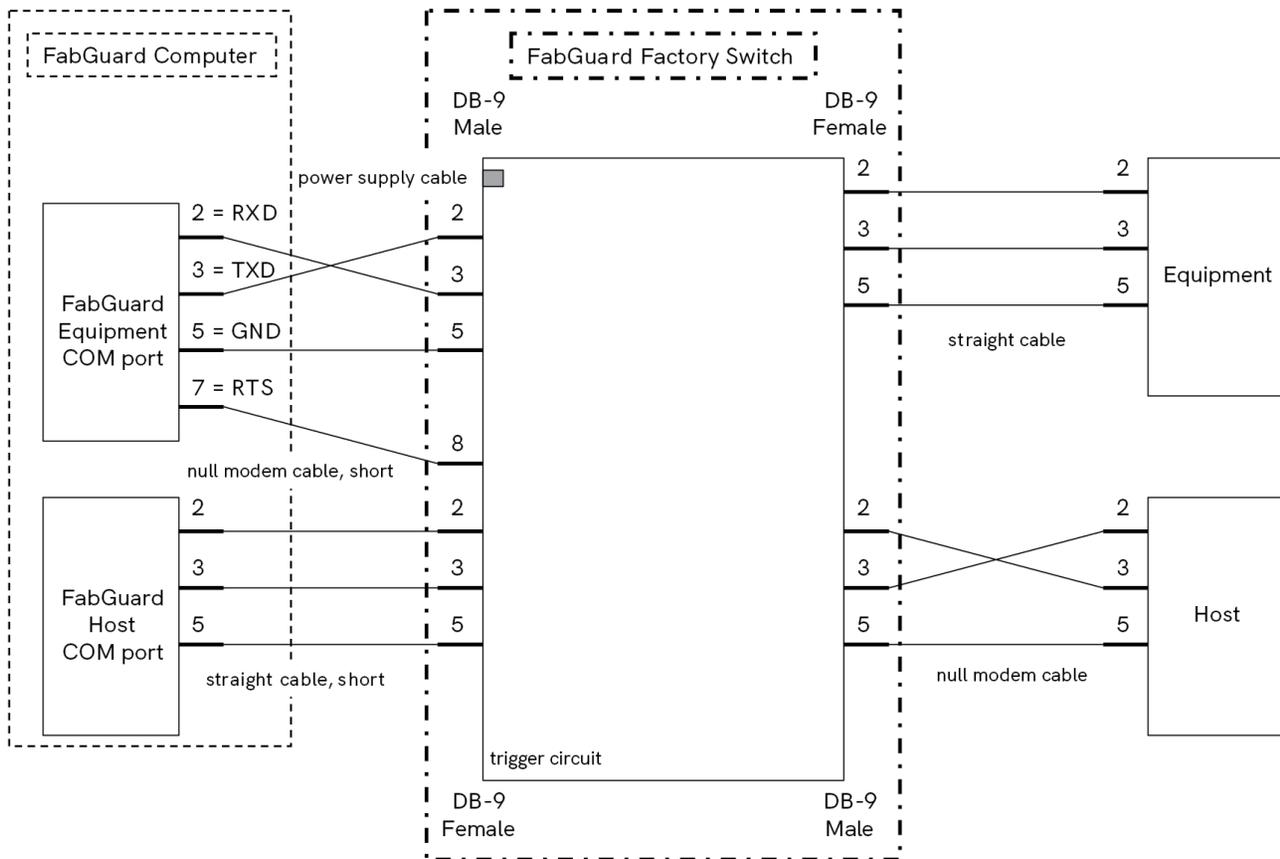
NOTICE

Perform steps 1 and 2 quickly, to minimize the interruption of SECS messages between the Host and the Equipment.

    1   At the tool, unplug the SECS cable from the Host. Plug this cable into the FabGuard Factory switch, as shown in the diagram. It may be necessary to use a DB-25 to DB-9 adapter or a gender changer. A null modem adapter should never be necessary.

    2   Connect a straight RS232 cable (supplied by INFICON) from the FabGuard Factory switch to the Equipment, as shown in the diagram. A standard Transpector RS232 cable of the appropriate length can be used. Do not use a cable that is much longer than necessary.

    3   Connect a short straight RS232 cable (IPN 600-1179-P1—standard 1 m cable supplied by INFICON) from the FabGuard Host COM port to the FabGuard Factory switch, as shown in diagram.

    4   Connect a short null modem RS232 cable (IPN 600-1151-P1—standard 1 m cable supplied by INFICON) from the FabGuard Equipment COM port to the FabGuard Factory switch, as shown in diagram.

    5   Plug in the FabGuard Factory switch's power supply. Use cable ties to secure the power supply connector and cord to the FabGuard Factory switch.

    6   In FabGuard, set the SECS bypass type to Serial FabGuard Factory switch, make sure the other SECS settings are correct, and start SECS.

7 Theory of Operation

The FFS232 acts as a bypass switch, shown in the diagrams below. In the diagrams, the physical FFS232 is bordered by dash-dot lines. The FFS232 has four DB-9 connectors, two male and two female.

If FabGuard is operating correctly, FabGuard will send trigger pulses to the FFS232 and the FFS232 will connect the Host and Equipment to two different COM ports on the FabGuard computer, as shown in the Triggered State diagram. This situation is the normal condition, where all SECS communication goes through FabGuard.

Triggered State
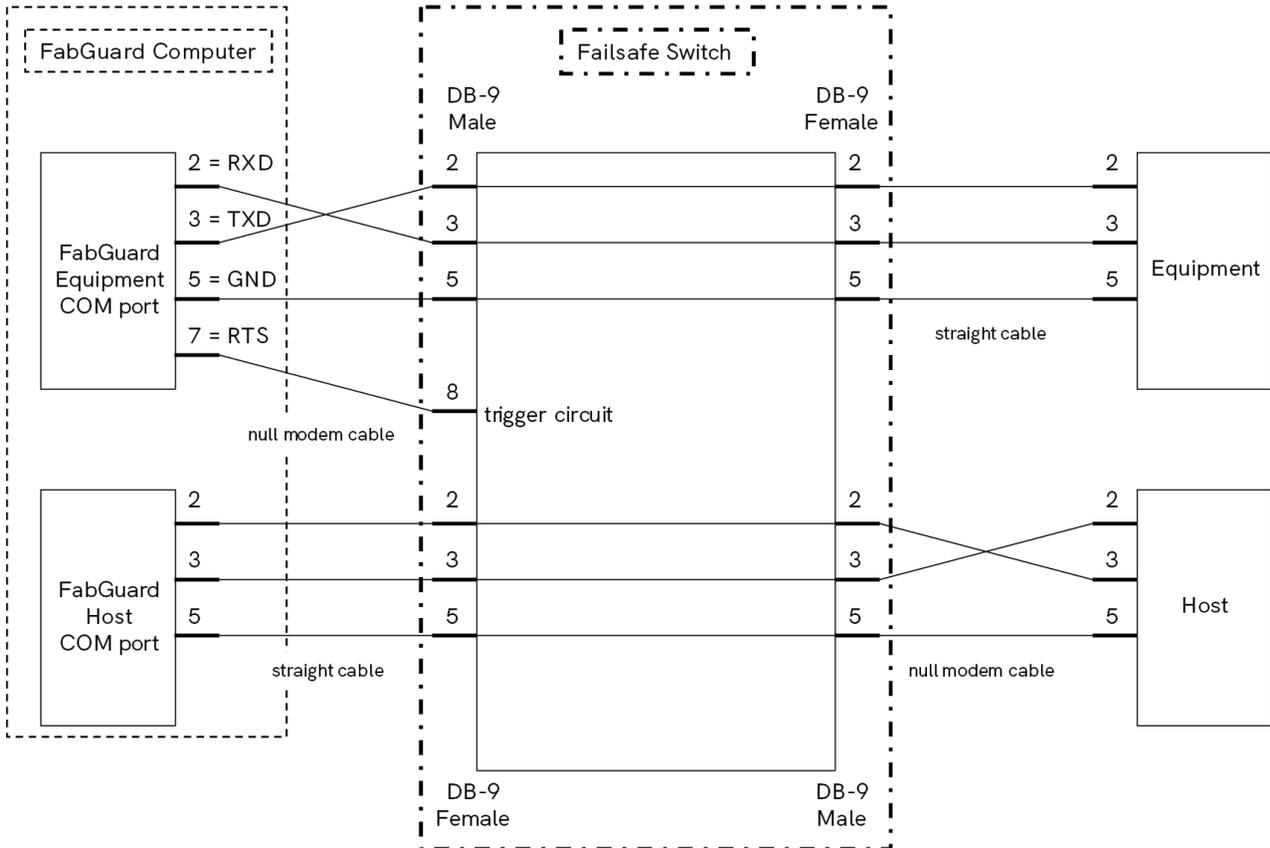
If FabGuard fails, it will stop sending trigger pulses to the FFS232 and the FFS232 will connect the Host and Equipment directly together, as shown in the Not-Triggered State diagram.

Not-Triggered State
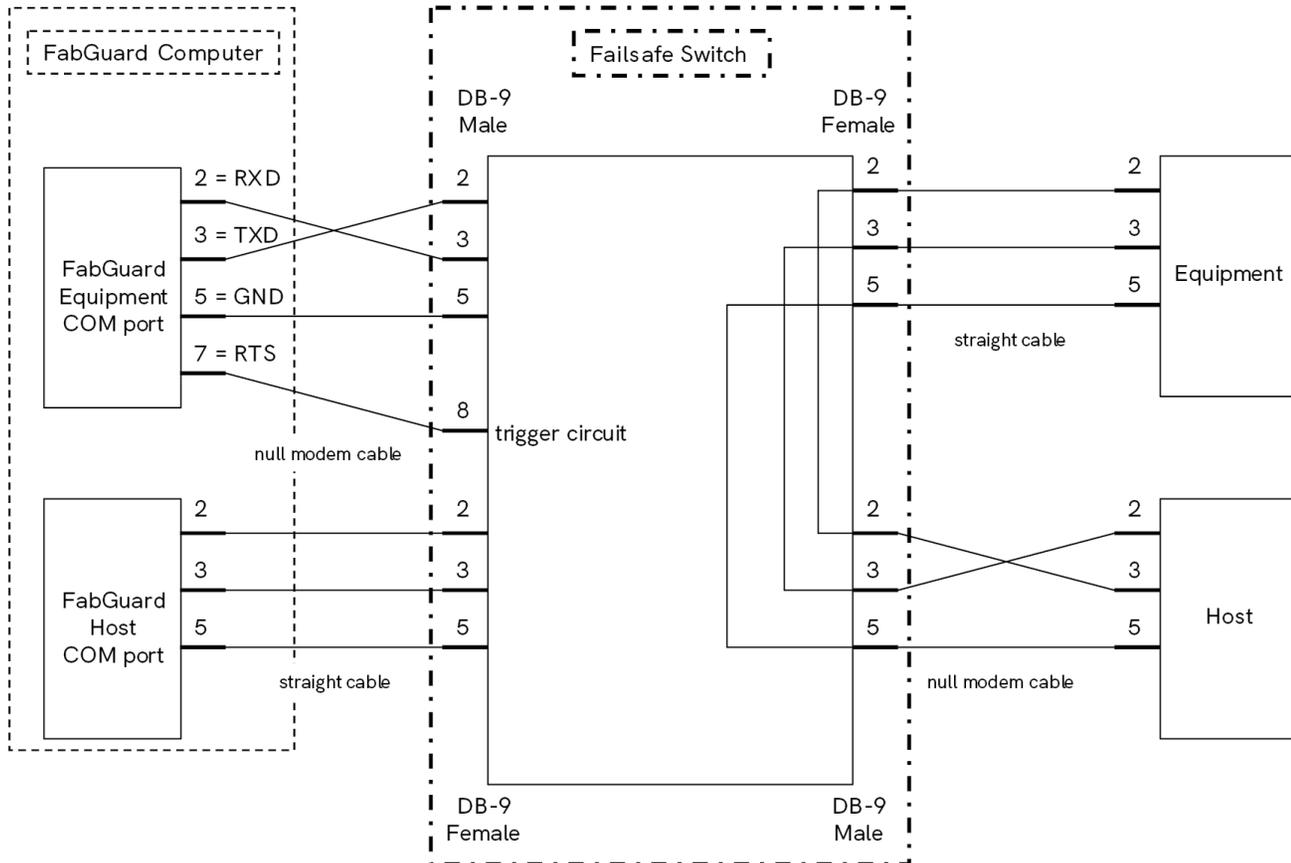
The Host and Equipment communicate with each other using SECS via an RS232-C Serial connection. FabGuard software uses SECS to communicate with the Host and/or the Equipment.

SECS uses only three of the nine pins in a DB-9 connector. SECS uses pins 2 (RXD), 3 (TXD), and 5 (GND). Pins 2 and 3 are for receive and transmit; pin 5 is ground. The pins that are not used for SECS are available for other purposes. FabGuard uses pin 7 (RTS) on its Equipment COM port as the trigger signal for the FFS232 bypass switch. Since FabGuard's Equipment COM port is connected to the FFS232 bypass switch by a null modem cable, the FFS232 bypass switch will receive the trigger signal on pin 8.

FabGuard is considered OK if it changes the voltage on the trigger line from high-to-low-to-high or low-to-high-to-low in less than 3 seconds. If the FFS232 receives either of these voltage changes more often than once every 3 seconds, the FFS232 will change to—or remain in—the Triggered State. If the FFS232 does not receive either of these voltage changes within 3 seconds, the switch will change to—or remain in—the Not-Triggered State.

Voltage levels for each of the RS232 lines with respect to ground (pin 5) are −3 V (DC) to −25 V (DC) for low and +3 V (DC) to +25 V (DC) for high.

The trigger circuit is fast enough that the high and low levels need to be maintained for no more than 10 milliseconds (0.010 second). Also, in the Triggered State the high or low levels might be maintained for up to just less than 3 seconds. Therefore, the trigger circuit bandwidth is DC to 10 KHz.

The switching mechanism has very low resistance contacts, therefore the FFS232 introduces very little voltage drop in the RS232 signals. Mechanical relays are used.

The bit rate for SECS is 38,400 bits per second or slower. All circuits in the FFS232 connecting pins 2, 3, and 5 support this bit rate, in both the Triggered State and the Not-Triggered State.

The power supply input voltage range is 90 V (AC) to 240 V (AC) at 50 Hz to 60 Hz. If the power supply is disconnected, the FFS232 will change to, and remain in, the Not-Triggered State.

8 Troubleshooting

8.1 Introduction

The simple design of the FFS232 makes it a highly reliable product. Any user-correctable faults are most likely attributed to inadequate cable attachment or lack of power to the FFS232.

8.2 Diagnosing Problems

8.2.1 CPU Light Does Not Illuminate

The CPU indicator light is connected to a power monitor chip within the FFS232. If the light does not illuminate, make sure that the power connector is securely inserted into the FFS232. If this does not cause the light to illuminate, make sure the external power supply is plugged into the appropriate AC power source and that there is power at the source.

8.2.2 Active Light Does Not Illuminate

The FFS232 monitors the RTS line from the FabGuard EQUIP port. If the RTS line does not change state within a predefined period, the FFS232 times out, and the switch opens. If the Active indicator light on the FabGuard interface side of the FFS232 does not illuminate, check that the RTS line is toggling, and that it is at a rate slower than 10 msec. The FFS232 samples the RTS line and requires that the line maintain a constant state to reject noise.

8.2.3 Activity Indicators on the Factory Side Do Not Flash

The activity indicator lights reflect state transitions on the RS232 TX lines. They do not reflect the actual data being transmitted, only that the TX lines are changing states. If no indicator activity is observed, ensure that the appropriate cables are attached to the FFS232 port, that the cables are attached to the appropriate communication equipment, and that the communication equipment is transmitting data.

8.3 Factory Defaults

The default DIP switch setting starting with position 1 is 01101000. This will provide a watchdog time period of 3.3 seconds. It is not recommended that these positions be altered from the default.

9 Replacement Parts

Part Number	Description
600-1179-P1	1 m RS232-C cable
600-1151-P1	Null modem RS232-C cable
033-0098	Power supply 90–264 V (AC) 15 V/0.4 A

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