



# TC-5922BP Pneumatic Shield Box

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User Manual

R20200211

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# Table of Contents

Table of Contents .....	iii
Revision History .....	v
WARRANTY .....	vi
Safety Considerations .....	vii
Safety Symbols and Terms .....	viii

## **PART 1. Getting Started ..... 1**

<b>1. Introduction and Specifications .....</b>	<b>2</b>
1.1 Introduction .....	2
1.2 Specifications .....	2
1.3 Initial Inspection .....	3
1.4 Operating Environment .....	4
1.5 TESCOM Sales and Service Office .....	4

## **PART 2. Hardware Overview ..... 5**

<b>2. Hardware Description .....</b>	<b>6</b>
2.1 Outside .....	6
2.2 Inside .....	7
2.3 Control Box .....	8
2.4 Dimensions .....	10
<b>3. Optional Panels &amp; Fixtures .....</b>	<b>12</b>
3.1 I/O Interface Panels .....	12
3.2 Fixtures .....	15

## **PART 3. Putting into Operation ..... 16**

<b>4. Setup and Operation .....</b>	<b>17</b>
4.1 Exterior and Accessory Inspection .....	17
4.2 Setting Up .....	18
4.3 Operating with Fixture .....	24
4.4 Operating without Fixture .....	27

<b>5. Remote Operation Using RS-232C</b> .....	<b>28</b>
5.1 RS-232C Cable Connection .....	28
5.2 RS-232C Port Setting .....	29
5.3 RS-232C Command Protocol .....	29
5.4 Control with Terminal Application on PC .....	30
5.5 RS-232C Command List .....	32
5.6 RS-232C Commands in Detail .....	34

## **PART 4. Maintenance** .....

<b>6. Maintenance</b> .....	<b>44</b>
6.1 Maintenance .....	44
6.2 Performance Test .....	45
<b>7. Expendables and Accessories</b> .....	<b>49</b>
7.1 Expendables and Accessories .....	49
<b>8. Check List for Common Problems</b> .....	<b>51</b>

## Revision History

### Revision Record

Revision	Description	Date
v1.0	Initial Draft	2020-02-12
v1.1	Contents Revised	2020-02-17
v1.2	Terminology Revised	2020-02-18

# WARRANTY

TESCOM guarantees that this product will be free from defects in materials and workmanship for one year from the date of shipment. During the warranty period, TESCOm will, at its discretion, either repair or replace defective products.

For the warranty service, customer must notify TESCOm of the defect before the expiration of the warranty period and make suitable arrangements for the performance of service. Customer shall be responsible for packaging and shipping the defective product to TESCOm or to a service center designated by TESCOm. Customer shall pay for shipping charges as well as any other charges incurred outside of Korea. TESCOm shall pay shipping charge to return the product to the customer.

This warranty does not apply to [Expendables and Accessories](#) and any failure or damage caused by improper use or unauthorized service. In such cases, TESCOm may refuse to offer any service under the warranty.

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## LIMITATION OF WARRANTY

The foregoing warranty shall not apply to defects resulted from software (user interface) supplied by the customer or any third party, unauthorized modification or misuse, accident or abnormal condition of operation. Also, Tescom does NOT warrant certain parts which are considered expendable such as gaskets, gas springs, handle assemblies, accessories, antennas, I/O interfaces, modules and fixtures.

TESCOM's responsibility to repair or replace defective products is the sole and exclusive remedy provided to the customer for breach of this warranty. TESCOm will not be liable for any indirect, extraordinary, incidental, or consequential damages, despite any advance notice of the possibility of such damages.

# Safety Considerations

Review the following safety precautions to avoid personal injury, damage to this product or any product connected.

**Do not disassemble any part unless listed replaceable in this manual**

**Do not operate in wet/damp conditions**

To avoid injury or fire hazard, do not operate this product in wet or damp conditions.

**Do not operate in explosive atmosphere**

To avoid injury or fire hazard, do not operate this product in an explosive atmosphere.

**Do not operate with suspected failures**

If there is any damage to this product, have it inspected by qualified service personnel

**Provide proper ventilation**

To prevent product overheating, provide proper ventilation.

**Install and operate in an appropriate environment**

Refrain from using this equipment in a place subject to intense vibration, direct sunlight, or uneven ground. Also, use it where the temperature is between 0 °C to 50 °C and relative humidity is less than 85%.

# Safety Symbols and Terms





Various symbols are used in this manual and on the product itself to ensure correct usage, to prevent danger to the user and others, and to prevent property damage. The meanings of these symbols are described below. It is important that you read these descriptions thoroughly and fully understand its context.

## Safety Terms

**WARNING:** Identifies conditions or practices that could result in injury or loss of life.

**CAUTION:** Identifies conditions or practices that could result in damage to the product or other property.

**Symbols:** The following symbols may appear in this manual or on the product.

Symbol	Meaning
	<input checked="" type="checkbox"/> <b>Crush hazard</b> Moving part can cause serious injury. Must not operate Shield Box when unauthorized person is in proximity.
	Indicates a potentially hazardous situation which, if not avoided, could result in serious injury and/or equipment damage.
	Indicates a potentially hazardous situation which, if not avoided, may result in a minor or moderate injury and/or equipment damage. It may also be used to alert against unsafe practices.
	Indicates necessary information or useful information for operation and maintenance.



# **PART 1.**

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## **Getting Started**

# 1. Introduction and Specifications

## 1.1 Introduction

Shield Box is an equipment that shields wireless products from RF interference which flows in by radiation or through I/O cables while running tests.

Shield Box is highly effective in shielding as well as being small and sturdy. Therefore, it offers efficient and economical testing solutions for mass production, service, and development.

### Key Features

- High durability and reliable RF-shielding
- Pneumatic operation of lid and connector movements
- EMI filters on all data and power line
- Suitable for various testing needs
- Red and green LED indicators to visualize test results
- Remote control by RS-232C

## 1.2 Specifications

### Mechanical Specifications

Standard RF Connector		Two(2) N(f) outside and SMA(f) inside
Input Voltage		24 VDC
Power Consumption		Max 1.5 W
Remote Control		RS-232C, 3 wire, DB9(s)
Air Connector	Main Connector	6 mm OD hose, one-touch push-on fitting
	Fixture Control Connector	4 mm OD hose, one-touch push-on fitting
	Input Air Pressure	5 to 10 bar

Dimensions	Inside	296(W) x 435(D) x 238(H) mm
	Outside	417(W) x 601(D) x 332(H) mm, lid closed, 623(H) mm, lid open
Weight		Approx. 27 kg
*Packing	Size	560(W) x 820(D) x 480(H) mm
	Weight	Approx. 33 kg
*The size and/or weight of a package may vary depending on how the product is packed.		

## Typical RF Shielding

- The shielding effectiveness below is measured with blank panels.
- Other I/O interface panels may cause different results.

Frequency	Shielding Effectiveness (dB)
100 to 2000 MHz	> 70 dB
2000 to 3000 MHz	> 70 dB
3000 to 6000 MHz	> 60 dB

## 1.3 Initial Inspection

When the Shield Box is delivered, inspect the package and its content as follows:

- 1 Check for any damage that could have occurred during the shipment.
- 2 Verify that you have received the accessories supplied with the Shield Box and its options, which are listed in [4.1 Exterior and Accessory Inspection](#)
- 3 Referring to [3. Optional Panels & Fixtures](#), check optional panels and see if they are in place as you ordered.



In case of any abnormality, do not install nor operate the product for your own safety. Please contact TESCOM immediately.

## 1.4 Operating Environment

Refrain from using this equipment in a place subject to intense vibration, direct sunlight, or uneven ground. Also, use it where the temperature is between 0 °C to 50 °C and relative humidity is less than 85%.



If Shield Box is supposed to be idle for a long time, pack it securely and store it in a dry place at room temperature.

## 1.5 TESCOM Sales and Service Office

If you have any difficulty with the product, call or write to our Technical Support specialists at:

### **NOTICE**

TESCOM Company Limited # 927 Unitechvil, 142, Ilsan-ro, Ilsandong-gu, Goyang-si,  
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FAX: 82-31-920-6607  
Email: [support@tescom.org](mailto:support@tescom.org)  
Website: <http://en.tescom.co.kr>

## **PART 2.**

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# **Hardware Overview**

## 2. Hardware Description

### 2.1 Outside

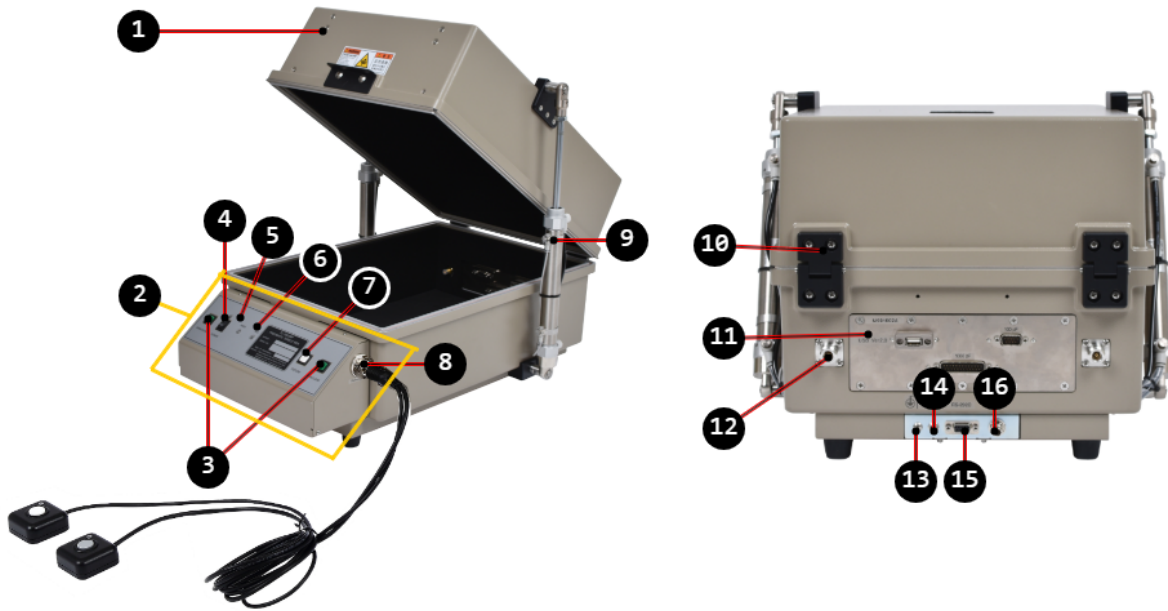


Figure 2-1 TC-5922BP Outside Components

Table 2-1 TC-5922BP Outside Components

No.	명칭	No.	명칭
①	Lid	⑨	Air cylinder
②	Control box	⑩	Hinge
③	Open/close button	⑪	I/O interface panel
④	Power on/off switch	⑫	RF connector (N(f) outside and SMA(f) inside)
⑤	PASS LED (Green)	⑬	Ground connection
⑥	FAIL LED (Red)	⑭	Power input
⑦	Fixture operation button	⑮	RS-232C connector
⑧	Remote control switch connector	⑯	Compressed air inlet

## 2.2 Inside

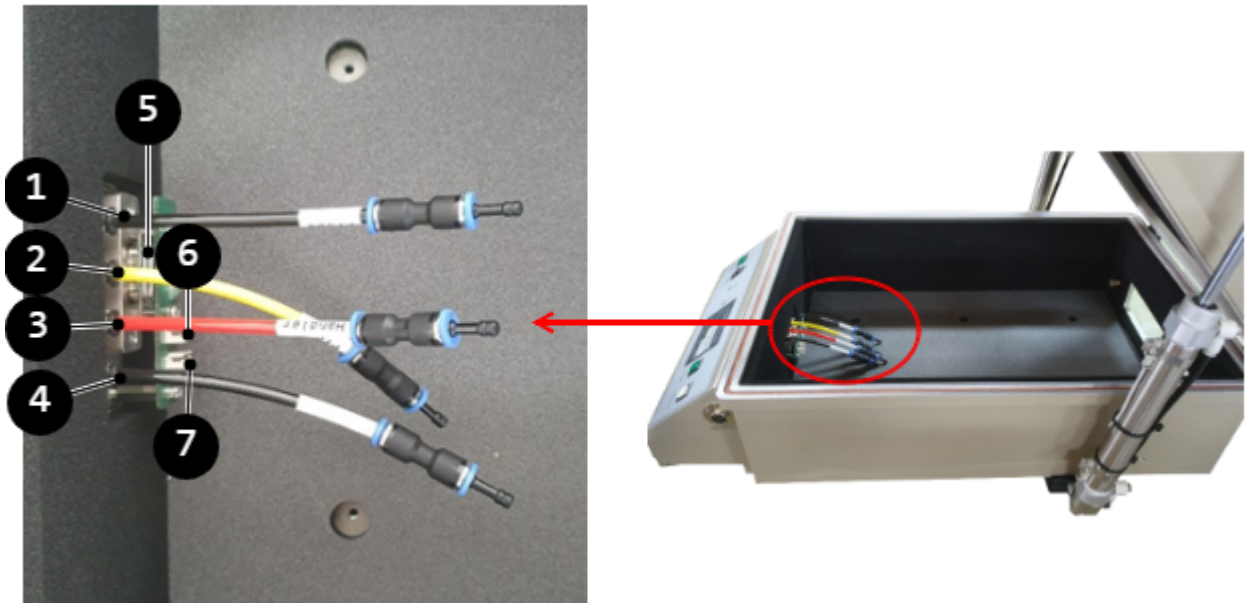


Figure 2-2 TC-5922BP Inside Components

Table 2-2 TC-5922BP Inside Components

No.	명칭
①	Probe DOWN air port (Ø4, black tube) , speed control function excluded
②	Probe UP air port (Ø4, yellow tube), speed control function excluded
③	Handler IN air port (Ø4, red tube), speed control function excluded
④	Handler OUT air port (Ø4, black tube), speed control function excluded
⑤	DB9 1000pF filter for connecting sensor cables
⑥	Probe sensor connector, Molex: 5267-03
⑦	Handler sensor connector, Molex: 5267-03

### Sensor Connector Pin Map

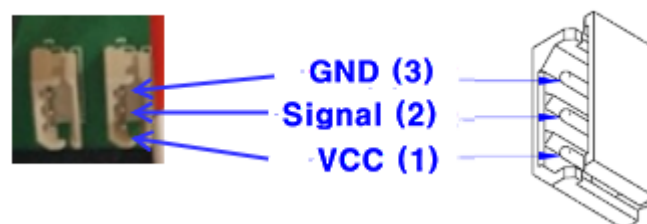


Figure 2-3 Sensor Connector Pin Map

## 2.3 Control Box

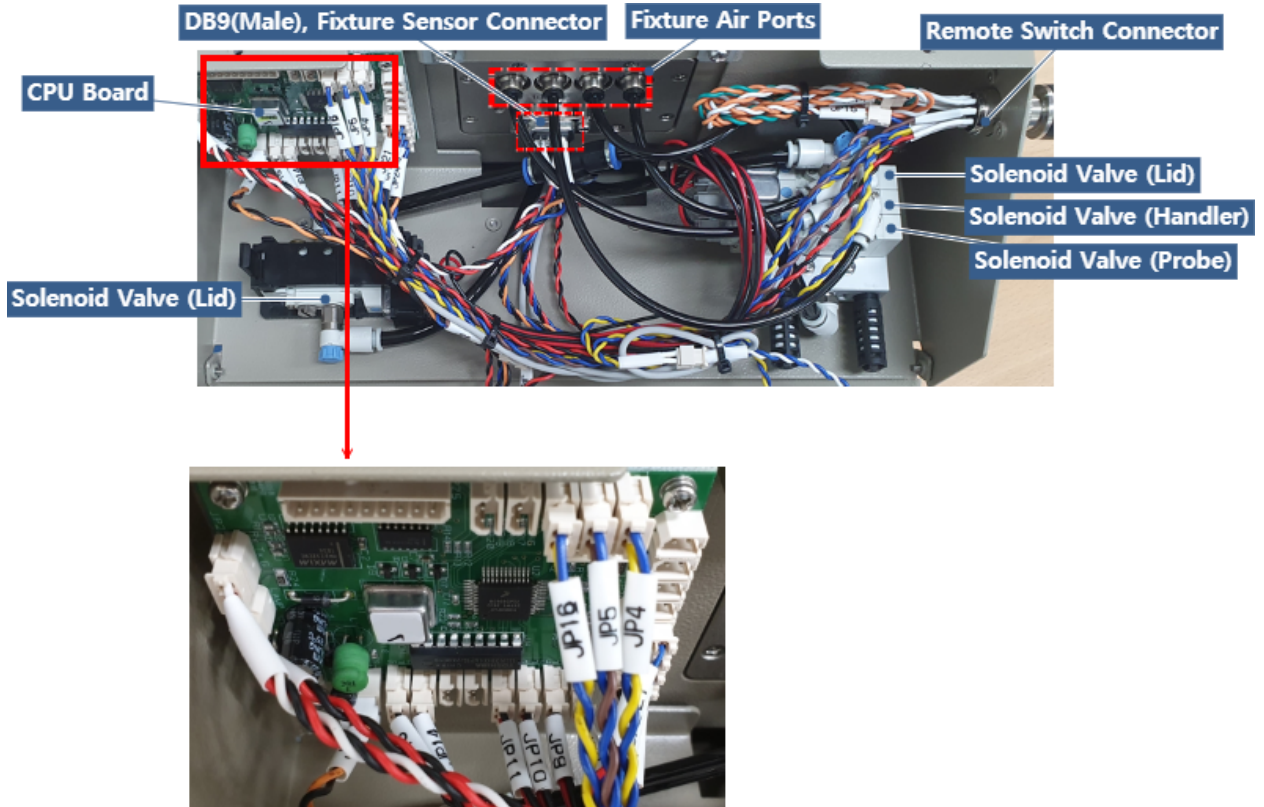


Figure 2-4 TC-5922BP Control Box

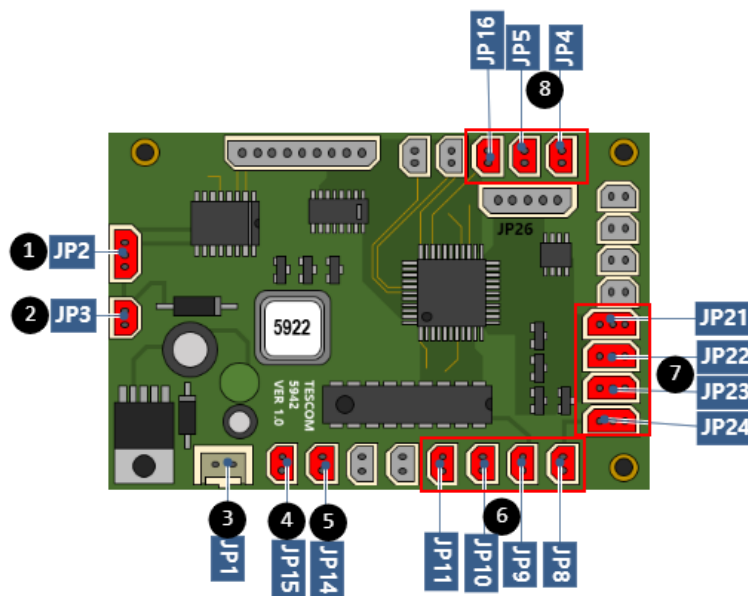


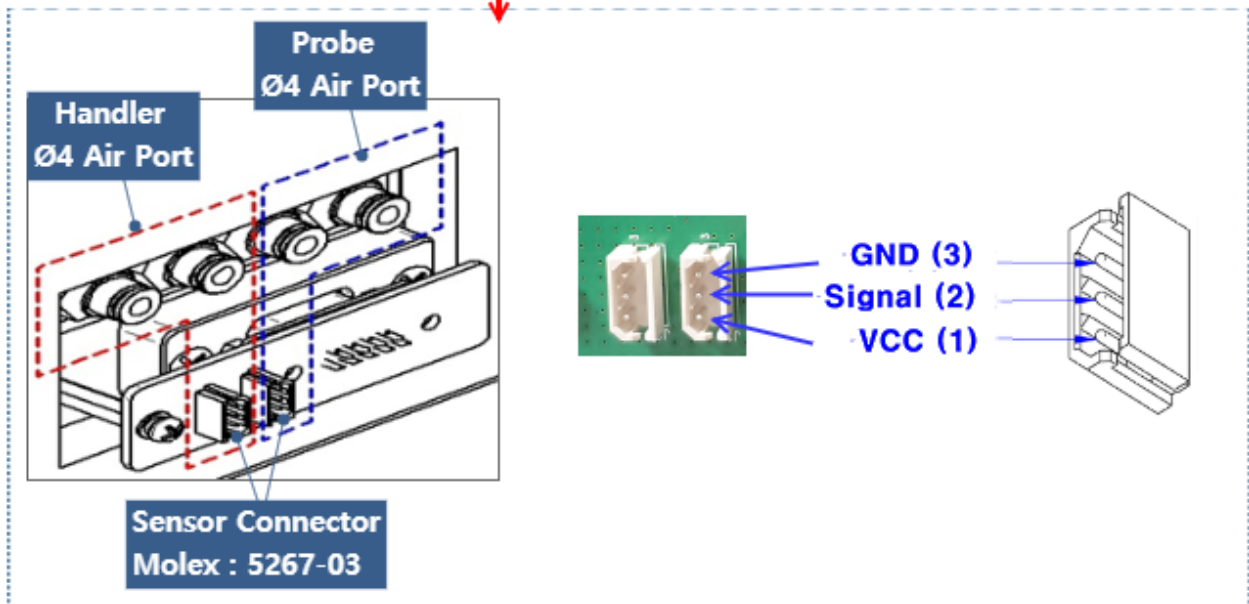
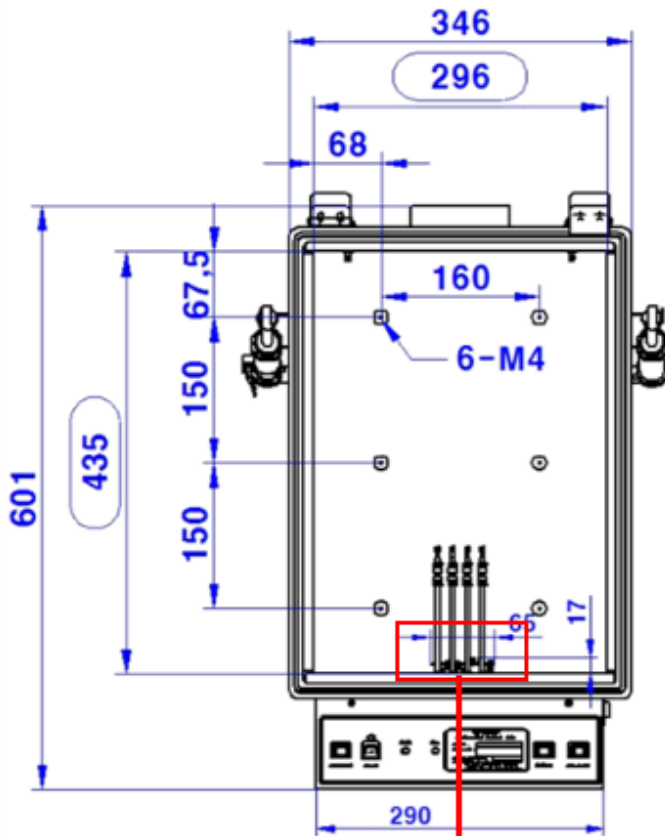
Figure 2-5 5922BP CPU Board

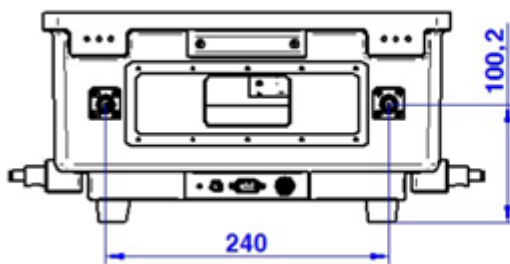
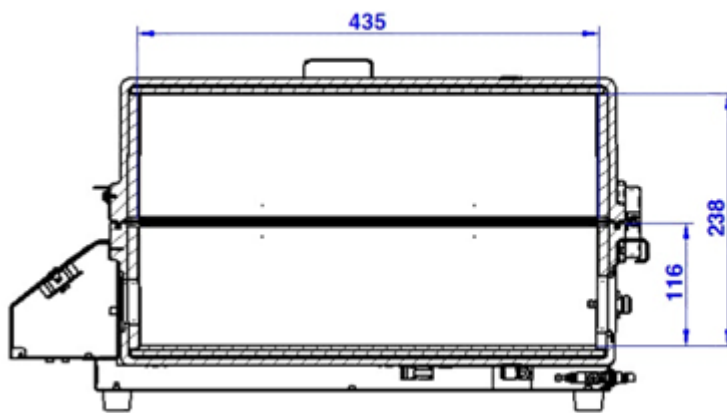
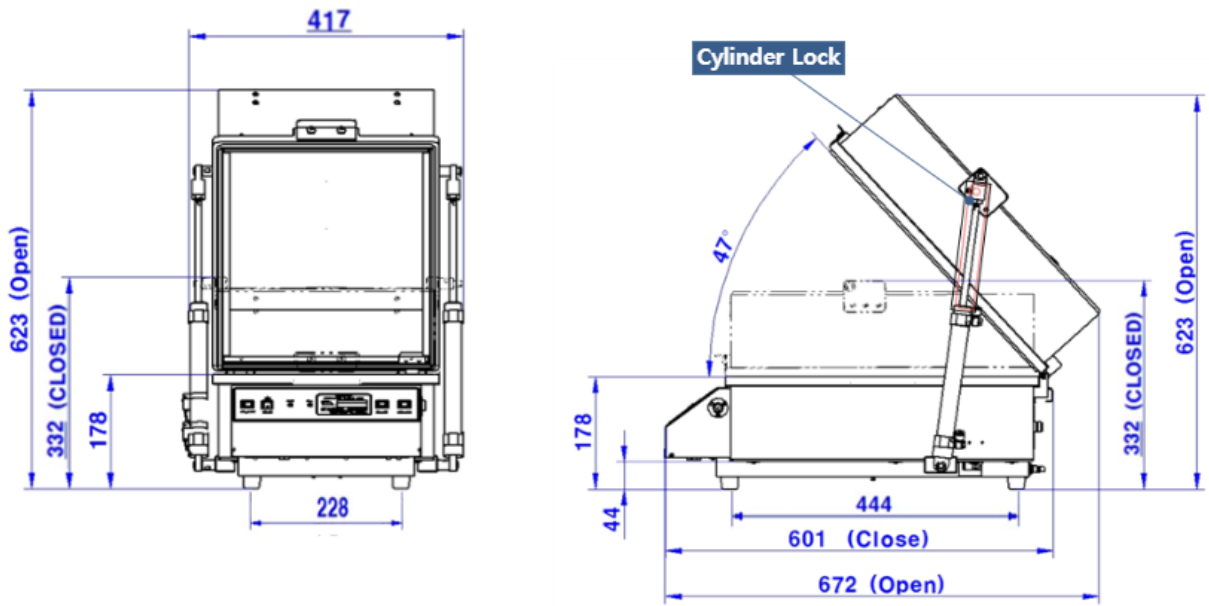


Table 2-3 TC-5922BP CPU Board Connection

No.	Function	Connector	Description
1	RS-232C Communication	JP2	RS-232C communication connector
2	Power LED	JP3	Power LED connector (remote switch)
3	Power Supply	JP1	+24V input connector
4	Pass/Fail LED	JP15	Fail LED connector (front panel: red)
5		JP14	Pass LED connector (front panel: green)
6	Solenoid Valves	JP11	Solenoid valve connector for probe
		JP10	Solenoid valve connector for handler
		JP9	Solenoid valve connector for lid
		JP8	Solenoid valve connector for lid
7	Sensors	JP24	Probe-downward sensor connector
		JP23	Handler-inward sensor connector
		JP22	Lid-close sensor connector
		JP21	Lid-open sensor connector
8	Operating Buttons	JP4	Gray button connector (remote switch)
		JP5	White button connector (remote switch)
		JP16	Fixture button connector (front panel)

## 2.4 Dimensions





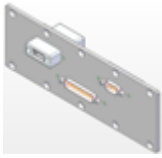
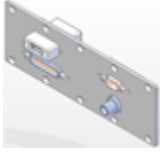
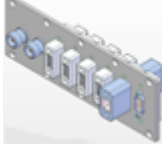
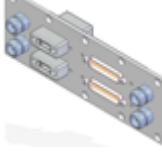
## 3. Optional Panels & Fixtures

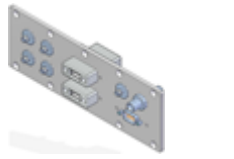
### 3.1 I/O Interface Panels

TC-5922BP has several types of panel options for connecting data interface, electric power, etc. Also, it can be customized to suit customer needs.

#### 3.1.1 Pre-configured Panels

**Table 3-1** Pre-configured I/O Interface Panel for TC-5922BP

I/O Interface Panel	Order Number	Configurations
 Data Interface Panel	M591602A	<ul style="list-style-type: none"> <li>• One(1) DB25(p) outside and DB25(s) inside, 1000 pF Pi filter</li> <li>• One(1) DB9(p) outside and DB9(s) inside, 100 pF Pi filter</li> <li>• One(1) USB 2.0 outside and inside</li> </ul>
 Data Interface Panel	M591605A	<ul style="list-style-type: none"> <li>• One(1) DB25(p) outside and DB25(s) inside, 100 pF Pi filter</li> <li>• One(1) DB9(p) outside and DB9(s) inside, 100 pF Pi filter</li> <li>• One(1) USB 2.0 outside and inside</li> <li>• One(1) DC Power Jack outside and inside</li> </ul>
 Data Interface Panel	M591632A	<ul style="list-style-type: none"> <li>• Two(2) N (f) outside and SMA (f) inside</li> <li>• One(1) DB9(p) outside and DB9(s) inside, 1000 pF Pi filter</li> <li>• Four(4) USB 2.0 outside and inside</li> <li>• One(1) RJ-45 outside and inside</li> </ul>
 Data Interface Panel	M5916135A	<ul style="list-style-type: none"> <li>• Four(4) N (f) outside and SMA (f) inside</li> <li>• Two(2) DB25(p) outside and DB25(s) inside, 100 pF Pi filter</li> <li>• Two(2) USB 2.0 outside and inside</li> </ul>





I/O Interface Panel	Order Number	Configurations
 Data Interface Panel	M5916145C	<ul style="list-style-type: none"> <li>• Five(5) SMA (f) outside and SMA (f) inside</li> <li>• One(1) DB9(p) outside and DB9(s) inside, 1000 pF Pi filter</li> <li>• Two(2) USB 2.0 outside and inside</li> <li>• One(1) DC Power Jack outside and inside</li> </ul>

### 3.1.2 Custom Panels

By selecting and arranging from the list below, custom I/O interface panels can be made.



**Table 3-2** Custom I/O Interfaces

I/O Interface	Oder Number	Transmission Speed / Line Voltage	*Typical Shielding
 DB25, 1000pF Pi Filter	3409-0009-1	3 Mbps / 100 VDC, 5 Amps max	>70 dB from 0.5 to 2 GHz >80 dB from 2 to 3 GHz >70 dB from 3 to 6 GHz
 DB25, 100pF Pi Filter	3409-0014-1	10 Mbps / 100 VDC, 5 Amps max	>50 dB from 0.5 to 2 GHz >60 dB from 2 to 3 GHz >60 dB from 3 to 6 GHz
 DB9, 1000pF Pi Filter	3409-0008-1	3 Mbps / 100 VDC, 5 Amps max	>70 dB from 0.5 to 2 GHz >80 dB from 2 to 3 GHz >70 dB from 3 to 6 GHz
 DB9, 100pF Pi Filter	3409-0010-1	10 Mbps / 100 VDC, 5 Amps max	>50 dB from 0.5 to 2 GHz >60 dB from 2 to 3 GHz >60 dB from 3 to 6 GHz
 USB 2.0 Filter	3409-0018A-3	480 Mbps / 5 V, 500 mA / Max Current: 5A	>60 dB from 0.5 to 2 GHz >70 dB from 2 to 3 GHz >70 dB from 3 to 6 GHz
 USB 3.0 Filter (Active)	3409-0042A-2	5 Gbps / 5 V, 600 mA / Max Current: 1.5 A	>80 dB from 0.5 to 2 GHz >80 dB from 2 to 3 GHz >75 dB from 3 to 6 GHz

I/O Interface	Oder Number	Transmission Speed / Line Voltage	*Typical Shielding
 RJ-45 Filter	3409-0022A	1 Gbps Copper-Line Ethernet (1000 BASE-T)	>60 dB from 0.5 to 2 GHz >70 dB from 2 to 3 GHz >70 dB from 3 to 6 GHz
 DC Power Adaptor,	3406-0004A	50 VDC, 3 Amps max	>70 dB from 0.5 to 2 GHz >80 dB from 2 to 3 GHz >80 dB from 3 to 6 GHz
 DC Power Adaptor, Banana Jack Type	3406-0004A 3406-0006A	50 VDC, 10 Amps max	>70 dB from 0.5 to 2 GHz >80 dB from 2 to 3 GHz >80 dB from 3 to 6 GHz
 AC Power Adaptor	3103-0009A	250 VAC, 7 Amps max	>70 dB from 0.5 to 2 GHz >80 dB from 2 to 3 GHz >80 dB from 3 to 6 GHz

### NOTICE

1. \*Typical Shielding is an estimated value with each I/O interface applied.
2. The data above were measured by TESCOM standards, and they may be different depending on the measuring method and environment.
3. Each shielding effectiveness is measured without according cable. It is likely affected when a cable is connected. Also, it may vary depending on the type of cable.

I/O Interface	Order Number	Frequency Range / Impedance / V.S.W.R
 RF, N-SMA Connector	3408-0038	From DC to 6 GHz / 50 Ω / 1.15 max
 RF, SMA-SMA Connector	3408-0039	From DC to 8 GHz / 50 Ω / 1.15 max

## 3.2 Fixtures

- TESCOM offers grid fixtures that can hold different shapes of DUT by changing the position of holding blocks. We also make custom fixtures upon request if necessary.

### 3.2.1 Standard Grid Fixtures

Table 3-3 Standard Grid Fixtures for TC-5922BP

Grid Fixture	주문 번호	구성 및 사양
	F59222A	<ul style="list-style-type: none"> <li>• Antenna Coupler Movable Fixture</li> <li>• Antenna Coupler(Optional): TC-93026A</li> <li>• 280(W) x 390(D) x 52(H)mm</li> </ul>

### 3.2.2 Custom Fixtures

Custom fixtures are available to suit customer needs. Along with them, various antenna coupler options can form the most optimal measuring system for each characteristic of a specific DUT.

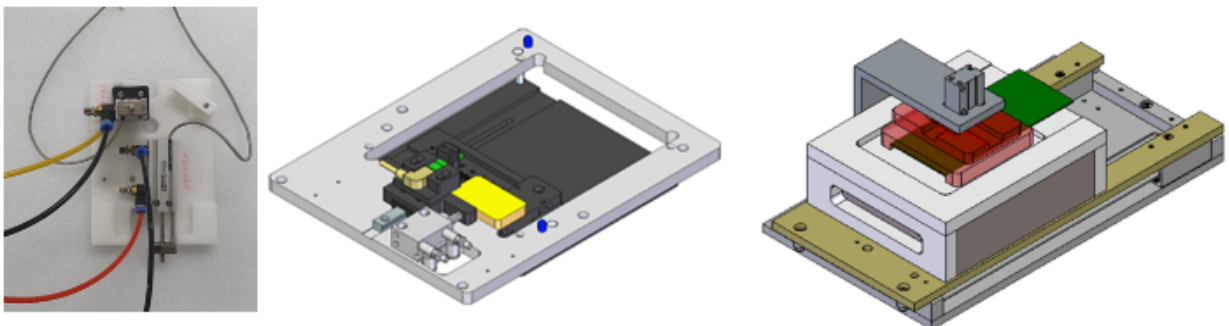


Figure 3-1 Sample Images of Custom Fixtures

## **PART 3.**

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### **Putting into Operation**



## 4. Setup and Operation

### 4.1 Exterior and Accessory Inspection

When Shield Box is delivered, inspect the package and check if any of the following accessory is missing.

#### Exterior and Accessory Inspection

1. Upon receiving Shield Box, check for any damages that could have occurred during shipment.
2. Referring to the list below, verify that you have received all accessories supplied with Shield Box and options you have chosen.



Figure 4-1 TC-5922BP Accessories List

Table 4-1 TC-5922BP Accessories List

No.	Part Number	Name	Spec.	Quantity
		Operating Manual		1
		Test Report		1
①	4003-0025	Data Cable, DB9(p)-DB9(s)	2 m	1
②	4010-0002	Power Cable, 220V	1.5 m	1
③	3001-0039	Switching Power Supply	1.5 m	1
④	4011-0001	SS-402, N(m) to N(m)	1 m	1
⑤	9703-0057A	Air Coupler (CPS15-6W)		1
⑥	C5922AP-2013	Cylinder Lock		1
⑦	4601-0018A	Remote Switch Cable	2 m	1

**CAUTION**

In case of any abnormality, do not install or operate Shield Box for your own safety. Please contact TESCOM immediately.

## 4.2 Setting Up

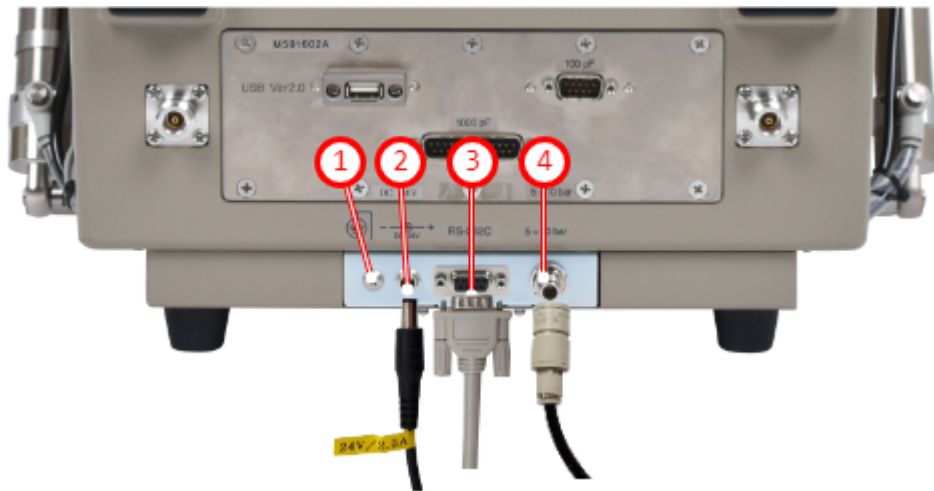


Figure 4-2 Cable Connection

No	Item	Description	Part Number	수량
①	GND	Connection to the ground		
②	DC 24V Power Cable	Supplying power to Shield Box	3001-0039	1EA
③	RS-232C Cable	Connecting Shield Box for remote control	4003-0025	1EA
④	Air Coupler	Main air supply, 6 mm OD hose, 5 ~ 10 bar	9703-0074	1EA

## 4.2.1 Power Supply

### Connecting Power Supply Cable

In order to set TC-5922BP Shield Box in motion, connect the 24V DC adapter bundled in the package.



For safety reasons, please use the 24V DC adapter provided by TESCOM only.

### Turning Shield Box On



- 1 Press the power switch on the TC-5922BP control box to the direction of "-" mark.
- 2 POWER LED indicator on the control box as well as the one on the white remote switch will glow once the power is on.

### 4.2.2 Compressed Air Supply

**CAUTION**

Please make sure to turn off compressed air supply before connecting or disconnecting air hose.

#### Compressed Air Requirement

- Input air pressure : 5 ~ 10 bar
- Main air connector : 6 mm OD hose, one-touch push-on fitting

**CAUTION**

It is highly recommended that the compressed air system must be used in conjunction as shown below. Insufficient air quality may cause deterioration of performance.

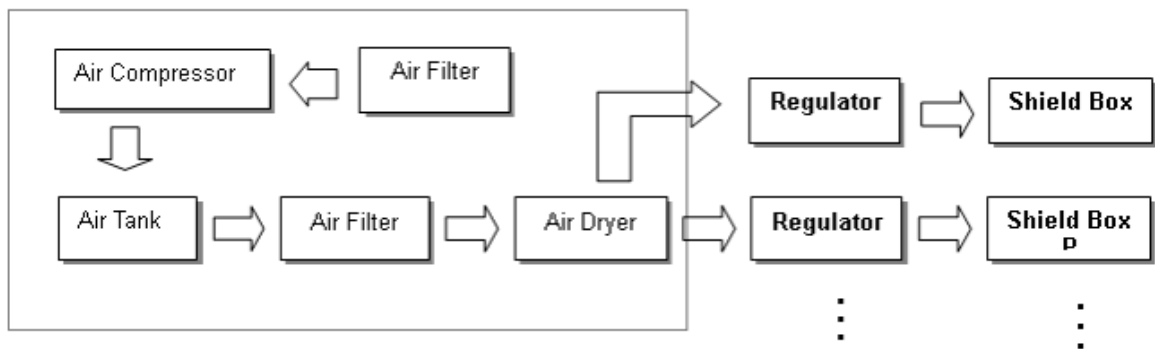


Figure 4-3 General Compressed Air System

### Connecting Compressed Air Supply

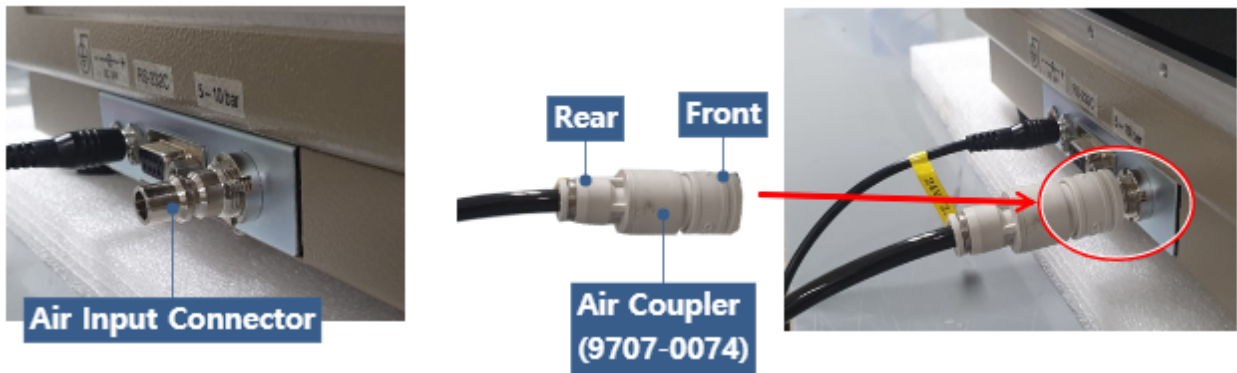


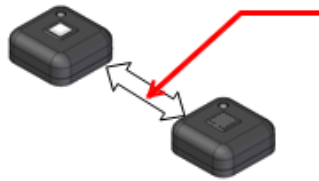
Figure 4-4 Connecting/Disconnecting Compressed Air Supply

- 1 The compressed air inlet port is located at the bottom of rear side.
- 2 Insert the 6 mm air hose to the rear tip of air coupler.
- 3 Push the front of air coupler all the way into the port until there is a "click" sound.
- 4 Open the air valve and supply the compressed air.

**CAUTION**

The lid of Shield Box will pop open if you turn the power on while the compressed air is connected.

### 4.2.3 Remote Switch Connection







For safety reasons, keep the distance between two buttons longer than 25 cm, and use both hands when operating.

- 1 Locate the remote switch socket on the right side of control box.
- 2 Matching the bezel by facing the TESCOM logo top, plug the remote switch cable in.
- 3 Fasten the nut all the way in to tighten the connection.

## 4.2.4 Lid Control

### Closing The Lid

- Keep pressing both OPEN/CLOSE buttons ( ,  ) on the control box or remote switch buttons ( ,  ) simultaneously until the lid is completely shut.
- A red light will blink at the lid-close sensor.



<OPEN/CLOSE Buttons>



<Remote Switch Buttons>



### **CAUTION**

If either one button on the control box or the remote switch is pressed instead of both, the red FAIL LED will be on and the lid will not move. An error message 'ERR40' will return if the RS-232C is connected as well. In this case, take your hand off, and then press both buttons simultaneously again.

Also, if you let go of a button or two before the lid is completely shut, the lid will pop open again with the FAIL LED on. An error message 'ERR90' will return if the RS-232C is connected. In the same manner with above, try again.



## Opening The Lid

- Press **either one** of the two OPEN/CLOSE buttons or remote switch buttons (  ,  ) to open the lid.
- No need to keep pressing the button.
- A red light will be on at the lid-open sensor



<OPEN/CLOSE Buttons>



<Remote Switch Buttons>

## Lid Open/Close Sensors

The open/close status of TC-5922BP lid is detected by open/close sensors attached to the main cylinder. The location of each is shown below.

- Lid closed: A blink of red light on the lid-close sensor (bottom side).
- Lid open: A constant red light on the lid-open sensor (top side).



Lid Open



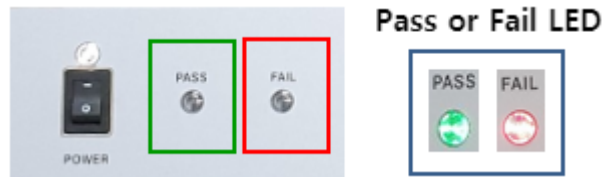
Lid Closed

Figure 4-5 Lid-open/close Sensor Locations

## Counting Function

Pneumatic Shield Box counts the number of lid open/close cycle and saves it on the memory. The cumulative number of open/close motion can be viewed on a PC by sending "COUNT?" query through RS-232C. The box will return the number in 8 digits.

### 4.2.5 Pass/Fail LED Indicator



Green or red LED indicator will be turned on if the corresponding command "PASS" or "FAIL" is sent through RS-232C.

This function can be useful to visualize the result when the Shield Box is controlled via RS-232C.

#### NOTICE

The red LEDs glow automatically if there was any problem in previous motion (lid or fixture).

## 4.3 Operating with Fixture

#### NOTICE

The fixture operation modes of standard TC-5922BP are both off at the time of release ('Handler: OFF, Probe: OFF' will return if the query 'SOLENOID MODE?' is sent.). They must be configured if they are to be used.

### 4.3.1 Fixture Operation Modes

The handler and the probe of fixture can operate in 3 modes each, and their operations are automatic, corresponding to the open/close motion of the lid.

The operation of fixture can be controlled with commands via RS-232C. Refer to the list of commands



and each command in detail at [5.6.2 Handler & Probe Configuration Commands](#).

**Table 4-2** Handler and Probe Operating Modes

Operation Mode	Description
Sensor Mode	The operation is detected by sensors. This mode can prevent damage from malfunction to either the product or the DUT.
Timer Mode	The operation runs by timer without using sensors. The waiting time is already fixed upon release and can not be changed.
Off Mode	The operation of the fixture is off.

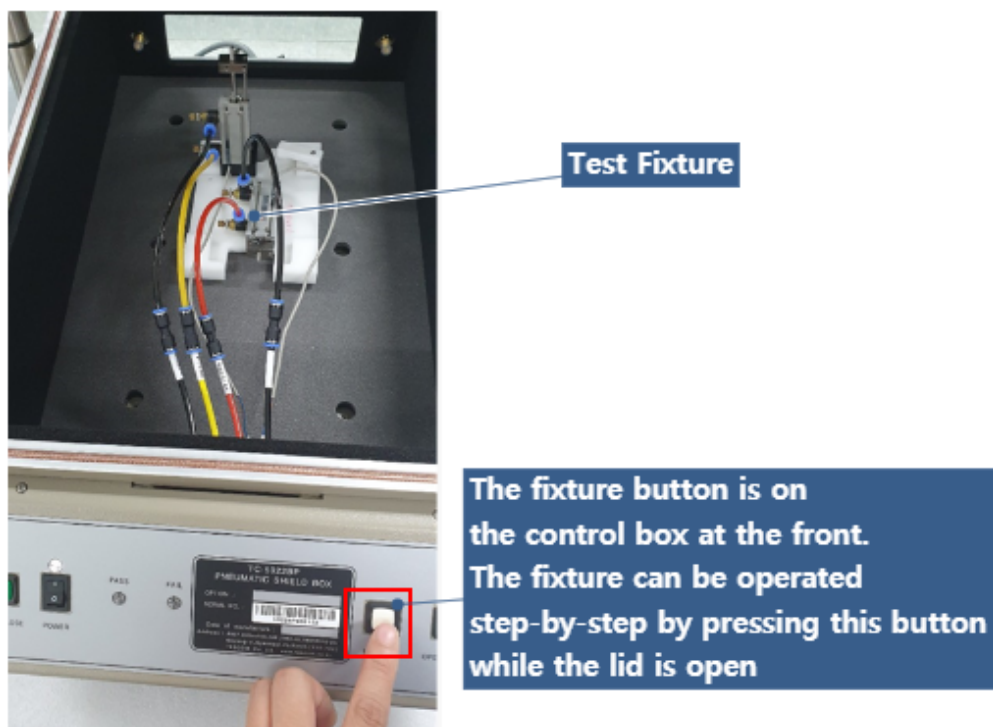
**CAUTION**

It is NOT recommended operating fixture with the Timer Mode. Without sensors, the lid may close even when the fixture operation is incomplete, thus causing damage to the product or DUT.

### 4.3.2 Fixture Button ( ) Operation

The fixture can be moved step-by-step if you press the fixture button while the lid is open.

Each step can be run under sensor mode or timer mode, and every move can return to the previous step if there is any problem.



**CAUTION**

- ① If the air supply is cut off while the lid is open, the lid will close whether the fixture is in position or not. This may cause damage to the product or the DUT.
- ② If any sensor detects that the operation is incomplete, everything returns to the previous position and the red LED will be turned on.

### 4.3.3 Connecting Air Supply to Fixture

- ① Remove the fitting plug, and connect 4 mm OD air hose to the fitting.

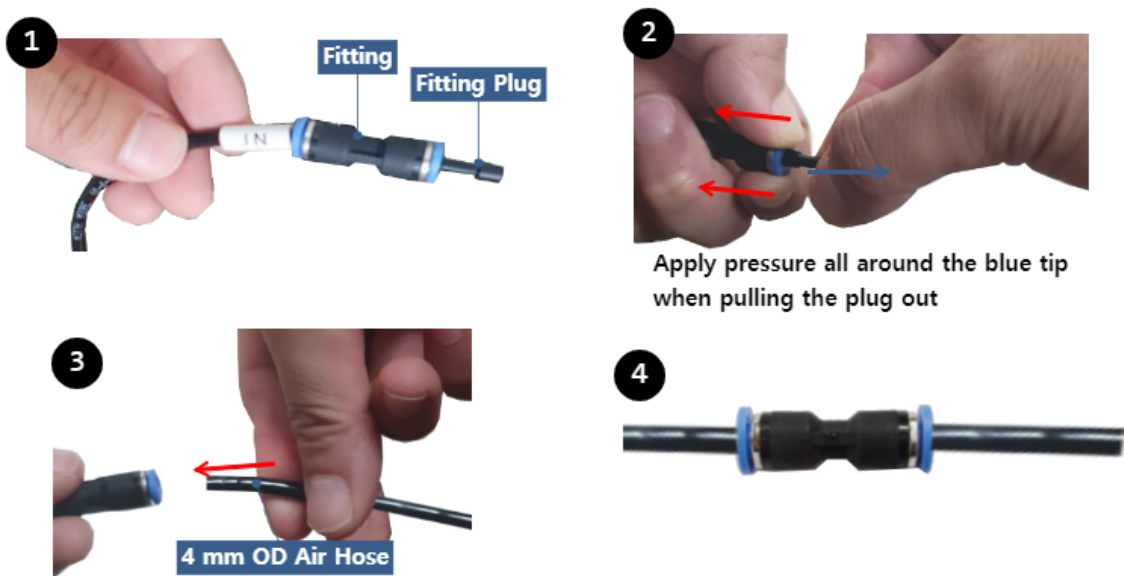


Figure 4-6 Fitting Plug Removal

- ② With all air hoses connected, it will look like below.

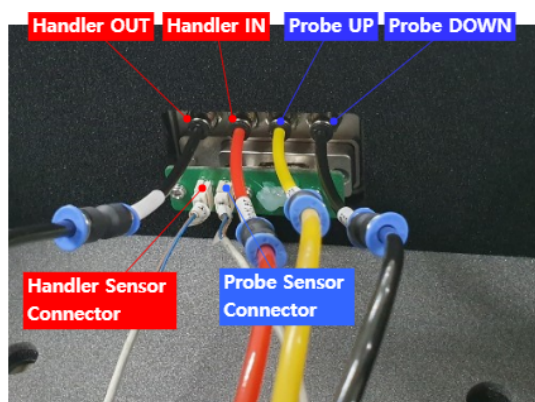
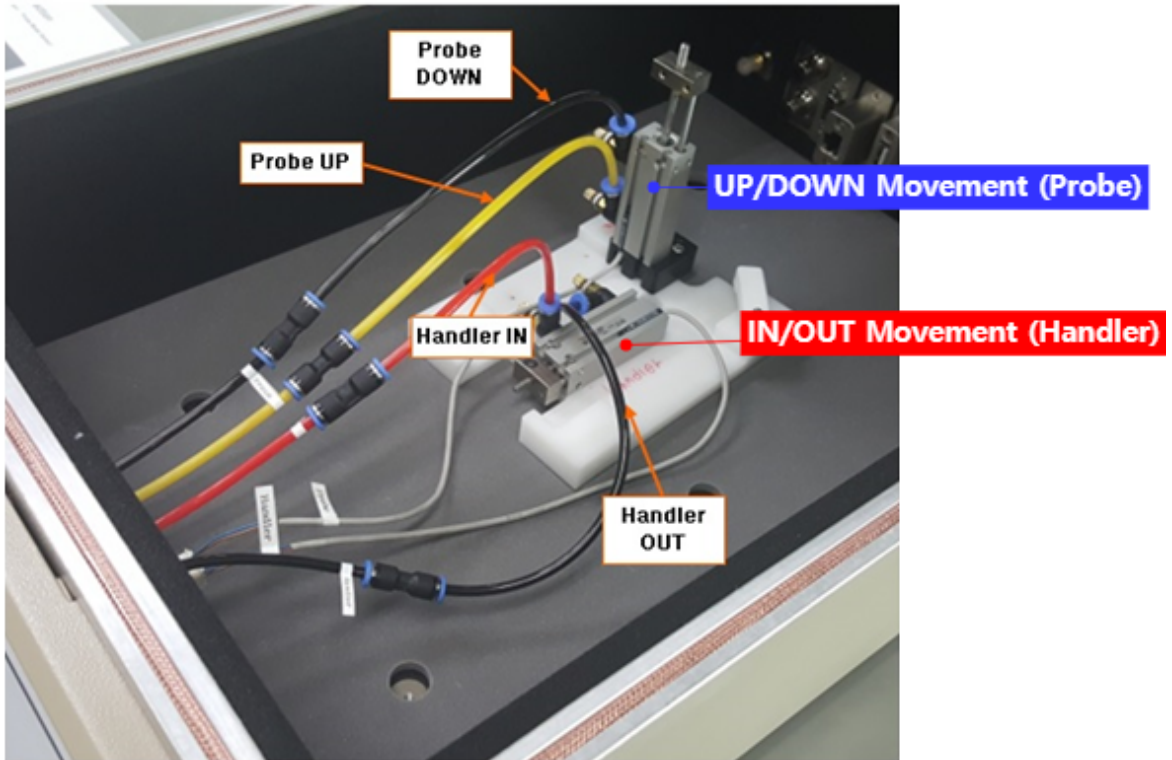


Figure 4-7 Air Ports Inside TC-5922BP



**NOTICE**  
 The figure above is just a recommendation, so the actual connection may be adjusted for your convenience.

## 4.4 Operating without Fixture

In order to work Shield Box without fixture, both fixture modes should be set to 'Off Mode.'

**NOTICE**  
 Refer to [5.6.2 Handler & Probe Configuration Commands](#).

If any of the fixture modes is set to 'Sensor Mode,' the lid will stay open with Fail LED on, as there is no sensor to confirm each motion.

Also, if it is set to 'Timer Mode,' the lid operation will take certain time waiting for each fixture motion, delaying the entire process.

# 5. Remote Operation Using RS-232C

Pneumatic Shield Box can be controlled remotely via RS-232C

## 5.1 RS-232C Cable Connection

Connect RS-232C Cable to RS-232C DB9 Connector on the rear side of Shield Box.

**CAUTION**

RS-232C Port on Shield Box is a DB9 Connector Female, so DB9(p) to DB9(s) cable should be used to connect Shield Box and PC.

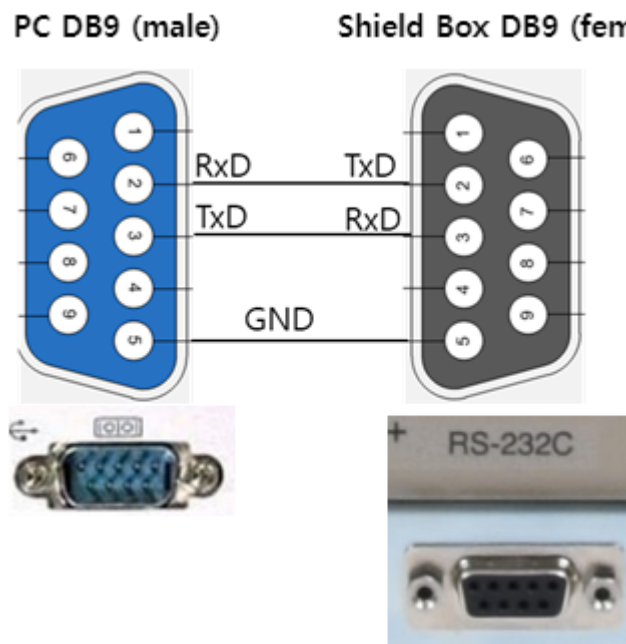


Figure 5-1 RS-232C Cable Configuration

## 5.2 RS-232C Port Setting

UART port setting is required as follows in order to control the shield box via RS-232C.

Table 5-1 RS-232C Port Setting

Data rate	9600 bps
Data bits	8 bit
Parity bits	None
Stop bits	1 bit
Flow Control	None

## 5.3 RS-232C Command Protocol

### 5.3.1 Command and Response Message

- ① Every time a command is sent from PC to Shield Box, a CR(Carriage Return :  $\backslash r$  (0x0D)) is sent at the end of it. (Command+ $\backslash r$ (0x0D))
- ② When a command is sent, a response (Response Data+ $\backslash r$ (0x0D)) comes back after a moment.
- ③ If an invalid command is sent, an error (Error Data+ $\backslash r$ (0x0D)) comes back after a moment.
- ④ Commands are capitalization-free.

#### CAUTION

You must wait for a response whenever you send a command from PC to Shield Box. Otherwise, an error will occur.


## 5.4 Control with Terminal Application on PC

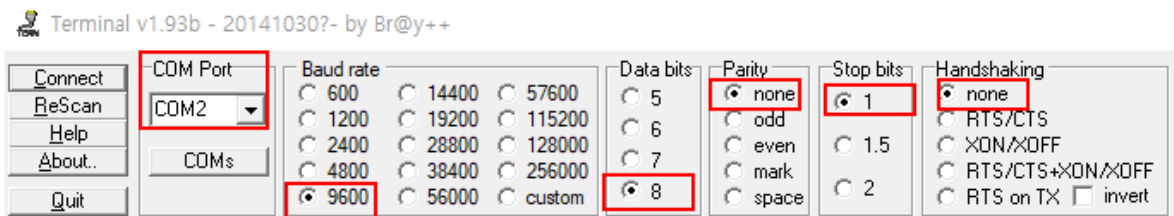
### NOTICE

Below you will see how you can control Shield Box using a communication software 'Terminal.'  
 The application is free to download from here:  
<https://sites.google.com/site/terminalbpp/>

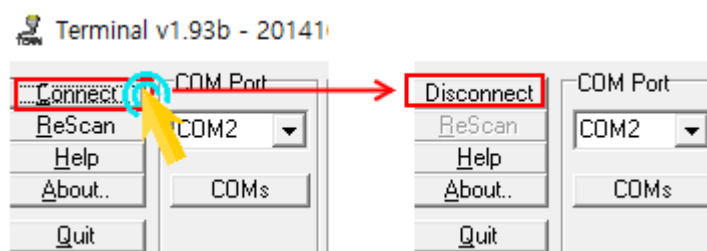
### NOTICE

Before beginning, set everything up as in [4.2 Setting Up](#) chapter.

- 1 Execute  Terminal .
- 2 Set COM Port, Baud Rate (9600 bps), Data Bit (8 bit), Parity Bit (None), Stop Bit (1 bit), Handshaking (none).

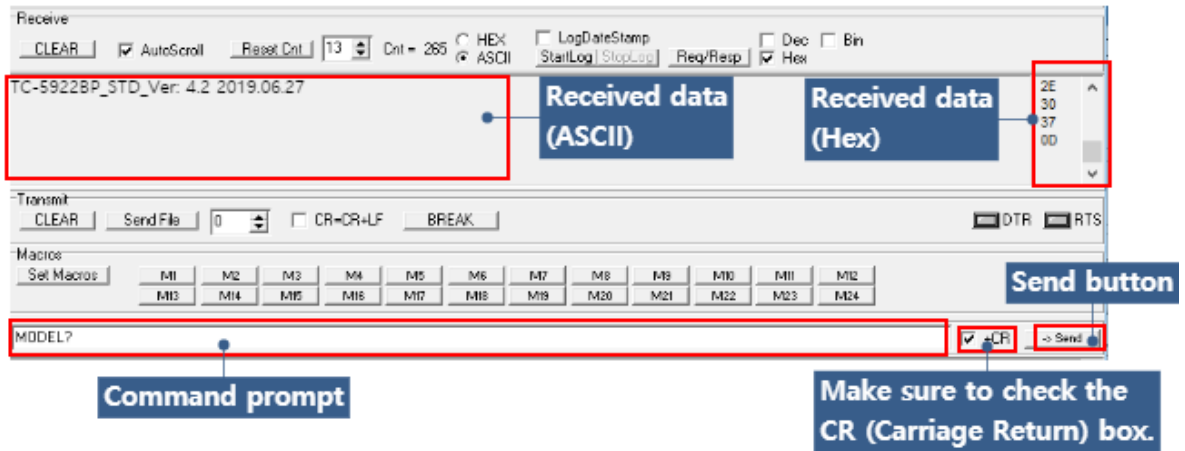


- 3 Press Connect.



4 Send a command and get a response.

1. Enter MODEL? on the command prompt and check +CR ( +CR - 2. A response (the model name and the firmware version) will appear on Receive window.
- 3. Check the Command List and try other commands.



## 5.5 RS-232C Command List

**Table 5-2** List of RS-232C Commands for TC-5922BP

Category	RS-232C Command	Response	Description
System	MODEL?	Name+Version+Date	Verify model name, firmware version and date.
	COUNT?	Numeric 8 digits (ex: 00000001)	Display cumulative number of lid operation.
Configuration (Handler & Probe)	SOLENOID MODE?	Handler:xxx, Probe:xxx xxx: {OFF TIMER SENSOR}	Check handler and probe modes.
	HANDLER MODE SENSOR	OK	Set handler mode to sensor mode.
	HANDLER MODE OFF	OK	Set handler mode to off mode.
	PROBE MODE SENSOR	OK	Set probe mode to sensor mode.
	PROBE MODE TIMER	OK	Set probe mode to timer mode.
	PROBE MODE OFF	OK	Set probe mode to off mode.
Lid Operation	LID?	OPEN   CLOSE	Check the current lid status.
	OPEN	OK   ERR50	Open the lid.
	CLOSE	READY   ERR20   ERR30   ERR60	Close the lid.
Handler Operation	HANDLER?	INWARD   OUTWARD	Check the current handler status.
	INWARD	OK   ERR20   ERR40	Push the handler in.
	OUTWARD	OK   ERR40   ERR90	Pull the handler out.
Probe Operation	PROBE?	UPWARD   DOWNWARD	Check the current probe status.
	UPWARD	OK   ERR40   ERR90	Lift the probe up.
	DOWNWARD	OK   ERR30   ERR40   ERR90	Lower the probe down.
Pass/Fail Decisions	PASS	OK   ERR50	Turn the green PASS LED on. Then open the lid.
	FAIL	OK	Turn the red FAIL LED on.



## 5.5.1 Error Data List

**Table 5-3** List of Error Data

Error Code	Description
ERR10	Syntax error. The command does not exist or is invalid.
ERR20	Handler-inward sensor error. It only occurs when the handler is in sensor mode. (The horizontal operation of fixture is incomplete.)
ERR30	Probe-downward sensor error. It only occurs when the probe is in sensor mode. (The vertical operation of fixture is incomplete.)
ERR40	Status error, It occurs when the command is not executable. For instance, OUTWARD (handler) or UPWARD (probe) while the lid is closed. The error is returned if a command is sent when the motion can not be done in conjunction with the current status. It also occurs when only one button is pressed to close the lid.
ERR50	Lid-open sensor error. It occurs only to certain products which should always detect whether the lid is open. The response comes when the lid-open sensor does not detect the main cylinder in open position.
ERR60	Safety error. The lid-close sensor does not detect the cylinder in close position.
ERR90	It occurs when a fixture operation command is sent while the corresponding fixture is off. It also occurs when either one or both buttons are let go while closing the lid.

## 5.6 RS-232C Commands in Detail

### 5.6.1 System Queries

MODEL?  
COUNT?

#### MODEL?

A query to display model name, the version of firmware and the date of its release.

Type	Query
Input	MODEL?
Response	<Name>_<Version> <Date>
Example	MODEL? TC-5922BP_STD_Ver: 4.2 2019.06.27

#### COUNT?

A query to check how many times the lid has opened.

Type	Query
Input	COUNT?
Response	8 digit number (ex, 00000029)

### 5.6.2 Handler & Probe Configuration Commands

```
SOLENOID MODE?
HANDLER MODE SENSOR
HANDLER MODE TIMER
HANDLER MODE OFF
PROBE MODE SENSOR
PROBE MODE TIMER
PROBE MODE OFF
```



Shield Box will reboot whenever the lid or fixture operation mode is changed, resulting in opening the lid. If the lid is already open, it will close and then open amid the motion.

## SOLENOID MODE?

A query to check the operating modes of handler & probe.

Type	Query
Input	SOLENOID MODE?
Response	Handler:<handler_mode>, Probe:<probe_mode> <ul style="list-style-type: none"> <li>• &lt;handler_mode&gt;: {OFF   TIMER   SENSOR }</li> <li>• &lt;probe_mode&gt;: {OFF   TIMER   SENSOR }</li> </ul>
Example	<pre>// Below is how to change the probe mode from off to timer. SOLENOID MODE? &gt;Handler: OFF, Probe: OFF PROBE MODE TIMER &gt;OK</pre>



It is NOT recommended operating fixture in timer mode.  
Without sensors, the lid may close even if the fixture motion is incomplete, thus causing damage to the product or the DUT.

## HANDLER MODE SENSOR

A command to set the handler in sensor mode.

Type	Command
Input	HANDLER MODE SENSOR
Response	OK

## HANDLER MODE TIMER

---

A command to set the handler in timer mode.

Type	Command
Input	HANDLER MODE TIMER
Response	OK

---

## HANDLER MODE OFF

---

A command to set the handler in off mode.

Type	Command
Input	HANDLER MODE OFF
Response	OK

---

## PROBE MODE SENSOR

---

A command to set the probe in sensor mode.

Type	Command
Input	PROBE MODE SENSOR
Response	OK

---

## PROBE MODE TIMER

---

A command to set the probe in timer mode.

Type	Command
Input	PROBE MODE TIMER
Response	OK

---

## PROBE MODE OFF

---

A command to set the probe in off mode.

Type	Command
Input	PROBE MODE OFF
Response	OK

---

### 5.6.3 Lid Operation Commands

LID?  
OPEN  
CLOSE

#### LID?

A query to check the current status of the lid.

Type	Query
Input	LID?
Response	{ OPEN   CLOSE } <ul style="list-style-type: none"> <li>• OPEN: The lid is open</li> <li>• CLOSE: The lid is closed</li> </ul>

#### OPEN

A command to open the lid.

Type	Command
Input	OPEN
Response	{ OK   ERR50 } <ul style="list-style-type: none"> <li>• OK: The lid opens (or is already open)</li> <li>• ERR50: Lid-open sensor error. The lid-open sensor does not detect the cylinder in open position.</li> </ul>

#### NOTICE

In case of ERR50, the Shield Box does not react to any command after the initial response with the FAIL LED on. Make sure your air supply has sufficient pressure (5~10 bar) for the lid to open all the way up. If it does not solve the problem, please contact us.

## CLOSE

A command to close the lid.

Type	Command
Input	CLOSE
Response	{ READY   ERR20   ERR30   ERR60 } <ul style="list-style-type: none"> <li>• READY: The lid closes. Ready to test.</li> <li>• ERR20: Only occurs when the handler is in sensor mode. Handler-inward sensor detection error. (The horizontal operation of the fixture is incomplete.)</li> <li>• ERR30: Only occurs when the probe is in sensor mode. Probe-downward sensor detection error. (The vertical operation of the fixture is incomplete.)</li> <li>• ERR60: Safety error. The lid-close sensor does not detect the cylinder in close position.</li> </ul>

## 5.6.4 Handler Operation Commands

HANDLER?  
INWARD  
OUTWARD

### HANDLER?

A query to check the current status of the handler.

Type	Query
Input	HANDLER?
Response	{ INWARD   OUTWARD } <ul style="list-style-type: none"> <li>• INWARD: The handler is at inward position.</li> <li>• OUTWARD: The handler is at outward position.</li> </ul>

## INWARD

A command to push the handler in.

When the lid is closed, only the INWARD command works.

The OUTWARD command will not work, returning 'ERR40.'

Type	Command
Input	INWARD
Response	{ OK   ERR20   ERR40 } <ul style="list-style-type: none"> <li>• OK: The handler moves inward (or is at inward position already).</li> <li>• ERR20: Handler-inward sensor error. It occurs only when the handler is in sensor mode. (The horizontal operation of fixture is incomplete.)</li> <li>• ERR40: Status error, It occurs when an the command is not executable. For example:                         <ul style="list-style-type: none"> <li>◦ OUTWARD (handler) or UPWARD (probe) command is sent while the lid is closed.</li> <li>◦ DOWNWARD or UPWARD command (probe) is sent while the handler is at outward position.</li> <li>◦ OUTWARD command (handler) is sent while the probe is at downward position.</li> </ul> </li> </ul>

## OUTWARD

A command to pull the handler out.

If the OUTWARD command is sent while the lid is closed or a probe operation command

(DOWNWARD/UPWARD) is sent while the handler is at outward position, it will only return 'ERR40.'

Type	Command
Input	OUTWARD
Response	{ OK   ERR40   ERR90 } <ul style="list-style-type: none"> <li>• OK: The handler moves outward.</li> <li>• ERR40: Status error, It occurs when the command is not executable. For Example:                         <ul style="list-style-type: none"> <li>◦ OUTWARD (handler) or UPWARD (probe) command is sent while the lid is closed.</li> <li>◦ DOWNWARD or UPWARD command (probe) is sent while the handler is at outward position.</li> <li>◦ OUTWARD command (handler) is sent while the probe is at downward position.</li> </ul> </li> <li>• ERR90: The command is sent while the handler is in off.</li> </ul>

## 5.6.5 Probe Operation Commands

PROBE?  
UPWARD  
DOWNWARD

### PROBE?

A query to check the current status of the probe.

Type	Query
Input	PROBE?
Response	{ UPWARD   DOWNWARD } <ul style="list-style-type: none"> <li>• UPWARD: The probe is at upward position.</li> <li>• DOWNWARD: The probe is at downward position.</li> </ul>

### UPWARD

A command to lift the probe up.

Type	Command
Input	UPWARD
Response	{ OK   ERR40   ERR90 } <ul style="list-style-type: none"> <li>• OK: The probe moves upward.</li> <li>• ERR40: Status error, It occurs when the command is not executable. For example:             <ul style="list-style-type: none"> <li>◦ OUTWARD (handler) or UPWARD (probe) command is sent while the lid is closed.</li> <li>◦ DOWNWARD or UPWARD command (probe) is sent while the handler is at outward position.</li> <li>◦ OUTWARD command (handler) is sent while the probe is at downward position.</li> </ul> </li> <li>• ERR90: The command is sent while the probe is off.</li> </ul>



## DOWNWARD


A command to lower the probe down.

Type	Command
Input	DOWNWARD
Response	{ OK   ERR30   ERR40   ERR90 } <ul style="list-style-type: none"> <li>• OK: The probe moves downward.</li> <li>• ERR30: Probe-downward sensor error. It occurs only when the probe is in sensor mode. (The vertical operation of fixture is incomplete.)</li> <li>• ERR40: Status error, It occurs when the command is not executable. For example:                             <ul style="list-style-type: none"> <li>◦ OUTWARD (handler) or UPWARD (probe) command is sent while the lid is closed.</li> <li>◦ DOWNWARD or UPWARD command (probe) is sent while the handler is at outward position.</li> <li>◦ OUTWARD command (handler) is sent while the probe is at downward position.</li> </ul> </li> <li>• ERR90: The command is sent while the probe is off.</li> </ul>

## 5.6.6 Pass/Fail Decisions

### PASS

A command that decides a pass after a test.

Once the command is sent, the PASS LED on the control box will glow green () and the lid will open automatically.


If the lid is already open, only the PASS LED will be on.

Type	Command
Input	PASS
Response	{ OK   ERR50 } <ul style="list-style-type: none"> <li>• OK : The green PASS LED gets turned on, and the lid opens.</li> <li>• ERR50: Lid-open sensor error. The lid-open sensor does not detect the cylinder in open position.</li> </ul>

## FAIL

---

A command that decides a fail after a test.

The FAIL LED on the control box will glow red () but the lid will **NOT** open.

Type	Command
Input	FAIL
Response	{ OK }
	<ul style="list-style-type: none"><li>• OK : The red FAIL LED gets turned on.</li></ul>

---

# **PART 4.**

---

## **Maintenance**

# 6. Maintenance

## 6.1 Maintenance

TESCOM Shield Box is designed and built for long life and easy maintenance.

Optimal RF shielding is obtained by using gaskets. Clean them at least once a month as directed below to maintain Shield Box in good condition. Also, they must be checked periodically. Otherwise, dirt, wear and tear would compromise the performance.

### Check List for Maintenance

- Check for loose screws and tighten with proper tools, if necessary.
- Check for a loose connection. If a loose connector is found, tighten the connector with proper tools.
- Check for a damaged cable, especially near the connector-cable neck. Replace any damaged cables found.
- Visually inspect the RF seal (gasket) between the Shield Box body and lid for wear and tear.
- If there is excessive amount of dust or foreign substance on the aluminum surface (especially parts contact with gaskets), wipe it out with dry cloth.

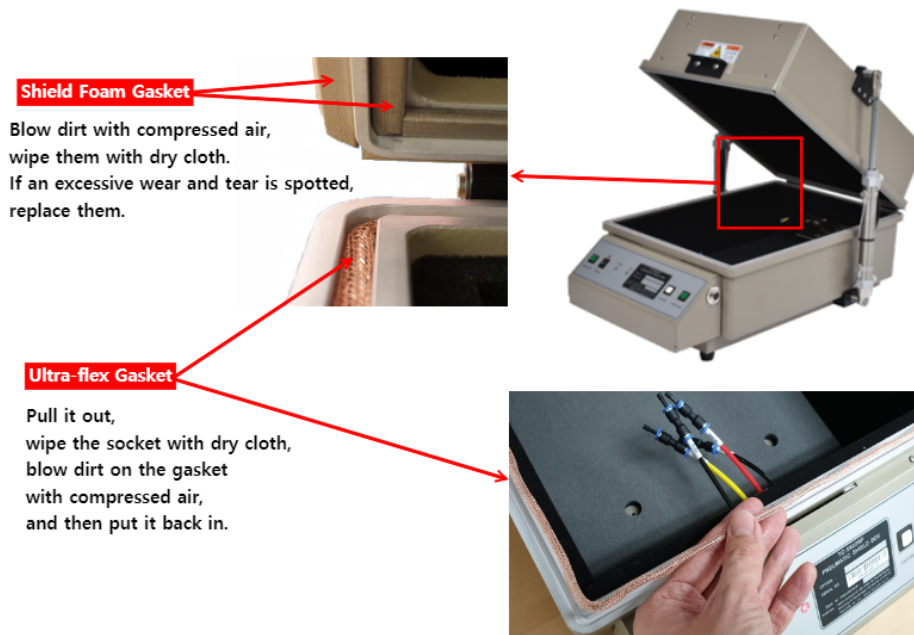


Figure 6-1 TC-5522BP Gasket Locations

**CAUTION**

Do not clean this equipment with organic solvents such as benzene, toluene or acetone as they will damage gaskets.

## 6.2 Performance Test

TESCOM Shield Box is a precision RF device built very sturdily. Their electrical performance can, however, deteriorate with mechanical damages.

Worn out gaskets, as well as metal corrosion or oxidation on the surface of lid-contacting area, can significantly reduce the effectiveness of the Shield Box. This section describes the test and calibration procedure for the Shield Box.

**CAUTION**

Performance test should be carried whenever there is a maintenance or repair work.

### 6.2.1 Calibration Period

- Recommended calibration period : less than 6 months

**NOTICE**

The calibration period can vary depending on the number of operations and the equipment management method.

### 6.2.2 Required Equipments

- Spectrum Analyzer : < 6 GHz
- Signal Generator : < 6 GHz
- Dipole Antenna : TESCOM 900 MHz, 1.8 GHz, 2.4 GHz, 5.8 GHz

### 6.2.3 Performance Test Set Up

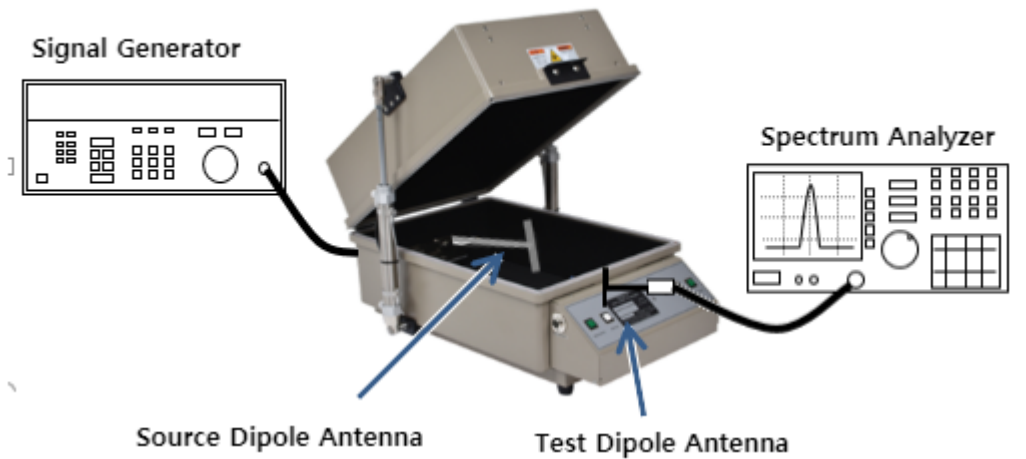


Figure 6-2 Schematic Design for TC-5922BP Performance Test

### 6.2.4 Shielding Standards

Frequency	Shielding effectiveness (dB)
100 to 2000 MHz	> 70 dB
2000 to 3000 MHz	> 70 dB
3000 to 6000 MHz	> 60 dB

**NOTICE**

The shielding effectiveness above is measured with blank panels; other I/O interface panels may result in different shielding effectiveness of the shield box. Please refer to [3.1 I/O Interface Panels](#).

### 6.2.5 Test Procedure

**NOTICE**

Before measuring, check the shielding gasket around the lid. If there is a damaged part, replace the gasket and wipe the contact area, which is between the lid and the body except the gasket, with alcohol.

- 1 Turn the spectrum analyzer and signal generator on.
- 2 Using an RF cable, connect the RF Connector(N Type) on the rear side of Shield Box to the RF output port(N Type) of signal generator.
- 3 Open the Shield Box and connect the 900 MHz Source Dipole Antenna to RF Port(SMA Type) inside the Shield Box. (Place the antenna at the center of the Shield Box.)
- 4 Set the output of signal generator to CW900 MHz, 10 dBm.
- 5 Connect the test antenna to the spectrum analyzer.



- 6 Set the spectrum analyzer as follows:
  - Center Frequency : 900 MHz
  - Span : 1 MHz
  - Amplitude: +10 dB
- 7 Circle the test antenna around the lid, and check the maximum reception. (Make sure the box is OPEN.)

**NOTICE**

1. The test antenna should NOT get into the box.
2. The test antenna should NOT contact the lid or the surface of the Shield Box.
3. The test antenna should NOT be twisted. It should be parallel to the source antenna.

- 8 \* Press Peak Search button on the spectrum analyzer to set the maximum value of measurement standard.

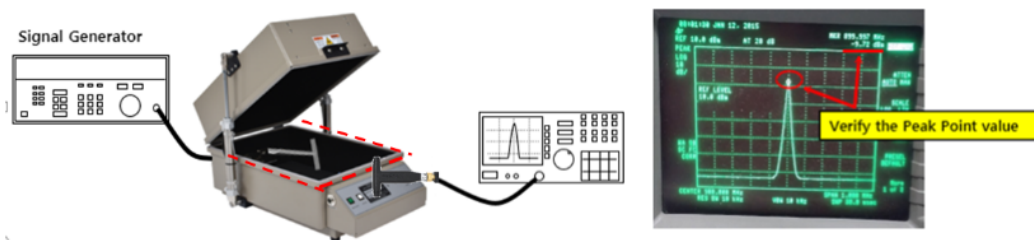


Figure 6-3 Searching for Maximum Reception

- 9 Close the box.
- 10 Set the input range of the spectrum analyzer as follows:
  - Center Frequency : 900 MHz
  - Span : 1 MHz
  - Amplitude: -30 dB
- 11 Circle the test antenna around the entire Shield Box, particularly around the lid and modules on the rear panel. Check the maximum leakage.



Figure 6-4 Measuring Maximum Leakage (Ex. Value: -90 dBm)

- 12 See if the difference between the measurement standard (a) and the maximum leakage (b) is within the specification (Shielding Effectiveness) of the product.

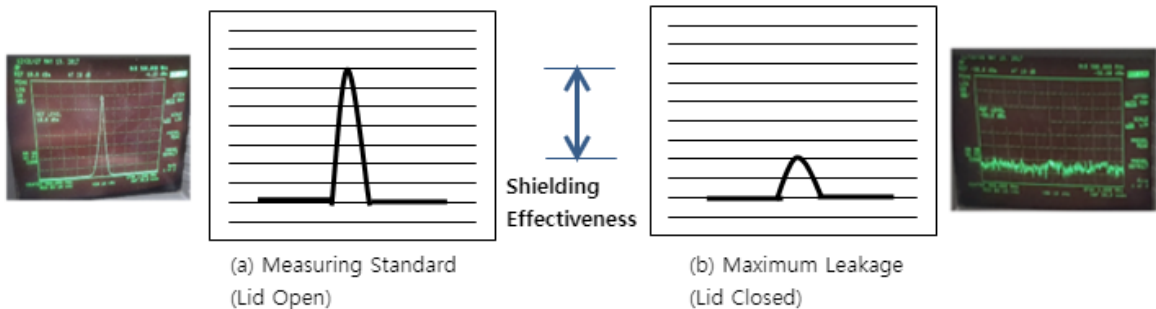


Figure 6-5 Spectrum Analyzer Display

- 13 Repeat the procedure with the frequency range set to 1.8 GHz, 2.4 GHz, 5.8GHz.



# 7. Expendables and Accessories

Below is the list of expendables and accessories of TC-5922BP Shield Box. Please contact Tescom headquarters or your local distributor to order.


## 7.1 Expendables and Accessories

**NOTICE**

These items are NOT under warranty.

Table 7-1 List of Expendables & Accessories

No.	View	Part designation	Order number	Qty	Remarks
1		Shield Foam Gaskets	4904-0503-0465 4904-0503-0318 4904-0503-0477 4904-0503-0333	8 pcs	4 kinds, 2 pcs each. 8 pcs total.
2		Shielding Gasket Ass'y	C5922A-2003A	1 ea	
3		SS-402, N(m) to N(m) 1m	4011-0001	1 ea	

No.	View	Part designation	Order number	Qty	Remarks
4		Data Cable, DB9(p)-DB9(s) 2m	4003-0025	1 ea	

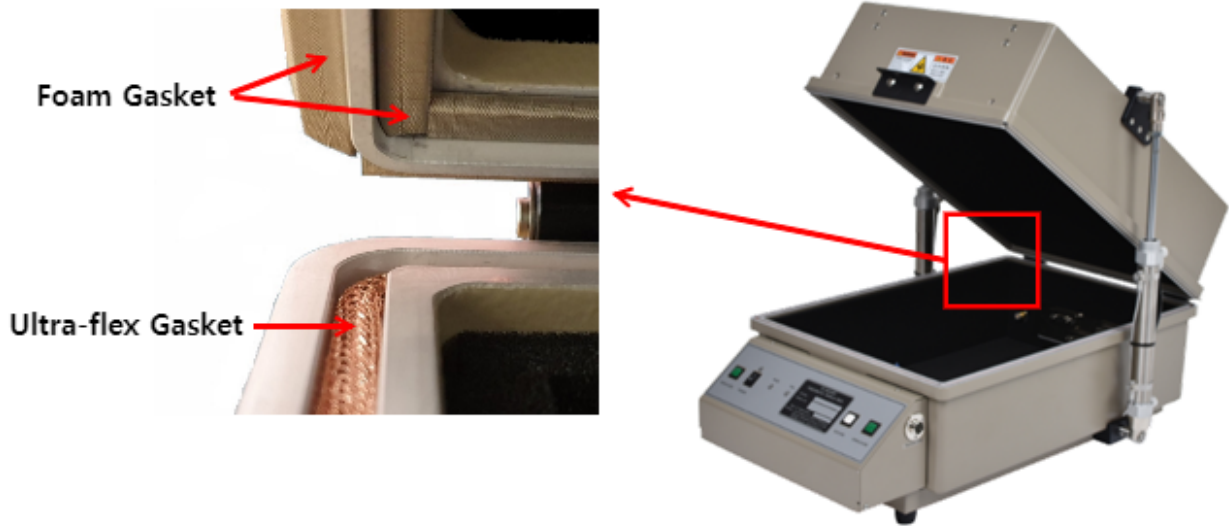


Figure 7-1 TC-5522BP Gasket Locations

## 8. Check List for Common Problems

Below is the check list for common mistakes. Before calling for help, make sure the problem is NOT one of following issues nor a malfunction of any OTHER connected equipment.

### Power Supply Check

---

- Verify that the power cord is connected to the product and the switch is on.
- Verify that the power supply is not short or out.
- Verify that the line voltage is within the range of 100 ~ 240 VAC.

### Compressed Air Check

---

- Check the connection of compressed air supply.
- Check the pressure. It should be within the range of 5 ~ 10 bar.

### Data Transmission Check

---

- If you are using PC to control the product, check the connection of RS-232C cable and the software settings.

### Remote Switch Check

---

- Check the connection of remote switch cable and see if the white power LED is on.