SIMCO ION™
An ITW Company

IONIZATION SOLUTIONS

Ionizing Bar System

scorpION3™

User's Manual

About Simco-Ion

Simco-Ion develops, manufactures, and markets system solutions to manage electrostatic charge. As the world's largest provider of electrostatics management products and services, Simco-Ion improves its customers' business results by providing a total solution to their electrostatic discharge and electromagnetic interference challenges. Simco-Ion Technology Group is a division of Illinois Tool Works (ITW), located in Alameda, California. For more information about Simco-Ion visit www.simco-ion.com or call 800-367-2452. Simco-Ion is ISO 9001 and ANSI ESD S20.20 certified.

Important Safety Information

Carefully read the following safety information before installing or operating the equipment. Failure to follow these safety warnings could result in damage to your ionization system and/or voiding the product warranty.

- ☑ Read the complete Instruction Manual before proceeding with installation or operation. Failure to follow instructions may result in damage to the scorpION3 system or user supplied power sources.
- ☑ When this unit is supplied with the AC adapter, the adapter must be used with a 3-prong grounding plug. The adapter must be connected to a properly wired and grounded receptacle. Do not defeat the electrical ground. Grounding and proper wiring are required for operation.
- ☑ User supplied 24 VDC power must conform to the electrical characteristics as outlined in this document. Incorrect power connections to the bar can result in damage to the scorpION3 bar and/or to user power supply.
- ☑ User connections to the fault output must conform to the limitations outlined for the opto-isolated transistor. Incorrect connections to the fault interface can result in damage to the scorpION3 bar.
- ☑ Interconnection between bars should be made only with Simco-Ion supplied interconnect wiring.
- ☑ A factory-qualified service technician must perform component service and repairs.

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Description

1.1 scorpION3 Ionizing Bar System

The scorpION3 bar system is an ionization solution for work areas and OEM mini-environments. Intended for cleanroom applications, the bar is available with tungsten or single crystal silicon emitter points for the cleanest ionization available. scorpION3's flexible design allows independent or dependent operation of multiple bars in a system. 24 VDC operation allows easy installation in OEM semiconductor and wafer processing tools. Set-up and adjustment is easy with the two-way communication provided by the scorpION3 MMI man machine interface or CI computer interface. The computer interface also offers real-time monitoring of scorpION3 system performance.

The scorpION3 bar utilizes Simco-Ion's innovative and effective microcontroller intelligent ionization technology. The system provides rapid neutralization of static charges over a localized work area or a mini environment. It is the most flexible and efficient system available, capable of eliminating electrostatic discharge (ESD) and preventing electrostatic attraction (ESA) of particles to surfaces. The scorpION3's design allows multiple bars to be connected together into a system that operates synchronously without the added expense and installation of a dedicated controller, adding cost effectiveness to its features.

The scorpION3 bar incorporates integrated total communication capability. This allows one bar to operate as both an ionization source and as a controller for additional scorpION3 bars. The scorpION3 is designed to monitor and maintain critical operating parameters through the use of its microcontroller, active self-monitoring, and automatic system correction.

A scorpION3 bar may be designated as a master; it will then talk to the other bars connected to it via integrated RS-485 communication. The master maintains contact with each bar to synchronize system operations. Individual bars connected in a system monitor and store their own operating parameters. If a problem should occur, each bar has the capability to visually indicate a fault condition and also provide an output that can be integrated into system control hardware.

Adjustment of ion output and balance can be made to individual scorpION3 bars via the hand-held MMI module (Man Machine Interface) which features two-way communication with the bars via wireless infrared or hardwired RS-485 on a modular cable. Individual bar addressing ensures adjustment of only the desired bar. Operating mode and pulse frequency are adjusted at the individual bar or the master bar depending upon configuration.

The scorpION3 CI (Computer Interface) provides an interface between the scorpION3 bar system and a personal computer or local computer network. With Simco-Ion's interface software, a user may set-up, monitor or control the scorpION3 bar system from their computer. The scorpION3 CI provides for communication via an Ethernet connection.

1.2 Features

Low Voltage Bar

- Closed-loop feedback system monitors operating conditions
- Individually adjustable via hand-held MMI (10 unique addresses are available)
- Replaceable emitters
- Tungsten or single crystal silicon emitter points
- Easy mounting using included hardware

MMI – Handheld Terminal

- Allows addressable control of up to 10 individual bars
- Remotely adjusts ionization parameters for calibration
- Acquires diagnostic information from the system
- Two-way communication enables display of operating status and system monitoring
- Detects address conflicts on bus, allows user to resolve

CI – Computer Interface

- Provides Ethernet connection for networking
- Remote set-up, monitoring and control
- Connection to other scorpION3 computer interfaces
- Automatically addresses and resolves bar address conflicts

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Installation

Note:	Inspect packages for visible damage and report damage directly to the carrier.

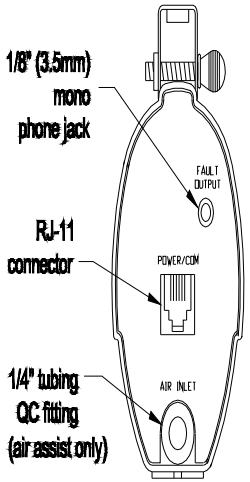
Attention:	Remove the shipping caps (yellow or orange plastic) from each emitter before placing ionizer in service. The caps protect the ion emitter points from damage during shipping and must be removed before operating the bar.

2.1 Mounting Considerations

Prior to powering up a single or multi-bar system, the ionizing bar(s) should be securely mounted using the provided hardware. If the scorpION3 bar is mounted using hardware not provided with the unit, it is important to keep any grounded hardware away from the emitter tips. Introducing a ground near the emitter tips can affect ion balance and discharge times. The bar should be installed so no grounded objects are within 300 mm (12”) of the emitter face of the bar. For applications with no airflow, the bar should be positioned centered over the work area or the area where static control is desired. For fan filter type applications where airflow is present, location relative to the target is less critical, but for best result the bar should also be centered over the target area.

2.2 Wiring Considerations

The scorpION3 may be configured for independent operation or configured for multiple bar installations. In multiple bar installations, one bar may be designated as the master and serve as the system controller, by assigning it to address 0 (zero).



For installations of up to 3 bars, Simco's AC adapter power supply can be utilized. Install all bars and interconnect wiring before applying power. Plug the adapter power cord into a grounded electrical outlet of 100 to 240 VAC, 50 or 60 HZ. Connect the adapter to one of the scorpION3 bars with a modular cable. The power will automatically be distributed to the other bars in the 'chain'. The scorpION3 bar has no on/off switch so application of the 24 VDC to the unit will turn it on and ionization will begin. The power supply and wiring can be located as desired by the user.

Note:	For other installations 24 VDC power can be supplied via the RJ-11 modular connector. Connect pins 1 & 6 to the +24 volt supply voltage and connect pins 3 & 4 to ground (ground serving as the return for the supply voltage), see table below. Users connecting to the scorpION3 in this method must be able to supply 200mA per bar connected.

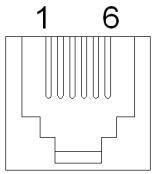
Note:	The scorpION3 is internally fused to protect the user's power supply during this type of setup.

RJ-11 MODULAR CONNECTOR

PIN NUMBER	1	2	3	4	5	6
CONNECTION	+24 VDC	N.C.	GND	GND	N.C.	+24 VDC

N.C. = No Connection Permitted

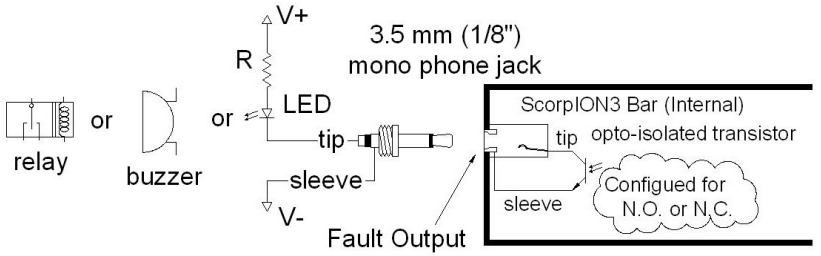
Table 1. RJ-11 modular connector user connections



RJ-11
connector

Caution:	Connections or grounding of pins 2 & 5 on the modular connector is not permitted and may result in malfunction or damage to the system.

The fault alarm may be remotely monitored using the fault output jack on the end of the bar. The output jack is a 3.5 mm (1/8") mono phone jack connected to an opto-isolated transistor inside the bar. The tip of the phone jack is positive (collector) and the sleeve of the phone jack is negative (emitter). The opto-isolated transistor may be set normally open (N.O.) or normally closed (N.C.) by changing the Fault Contact setting with the MMI or through configuration software using the CI.



The fault output transistor may be used to provide switching in order to drive a variety of low current devices such as LEDs or buzzers, relays may be used to switch power to higher power devices.

2.3 Bar Configuration

The scorpION3 bar has two ionization indicators and a window for receiving and transmitting commands via IR with the MMI, incorporated into the scorpION3 face label on the front of the bar. The indicators have multiple functions. The main function of the indicator is to illuminate when the high voltage power supply is activated. A green indicator shows that the bar is operating normally and no faults are present. A red indicator shows that a fault is present. The indicators will typically briefly flicker rapidly to show the receipt of IR commands from the MMI.

Each scorpION3 bar can be assigned a unique address. Addresses are numbers 0-9 and in multi-bar systems, each bar must have a unique address. Address “0“ designates a master bar, and allows the master to send messages to other connected bars for pulse mode synchronization in multiple bar systems. Note that any bar set to a non-zero address (and set to slave class), will follow the master bar pulse rate. When no master bar is present, bars with non-zero addresses will operate independently.

The bar address is used to ensure that operating adjustments are made only to the desired bar during set-up and calibration. The bar address is also used to identify operating parameters and alarms downloaded from a multi-bar system.

2.4 Multi-Bar Installations

For multi-bar installations power is distributed via the RJ-11 connector with 6-conductor modular cable and bars must be chained together via this connection. Note that in this configuration adequate current must be available for multiple bars, and the maximum rating on the DC power supply should not be exceeded. Bar address numbers should not be duplicated on a given chain. Having more than one bar “0” will cause communication conflict on the chain. Address “0” designates the bar as the master and other bars (if designated as slave) attached to the chain will pulse synchronously with the master. Where the user supplies appropriate power to the system, up to 9 bars may be connected to the master.

In cases where a combination of steady state and pulse coverage is required with multiple bars, a bar or bars within the system can be set to the independent class.

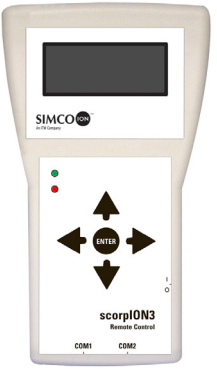
2.5 Air Assist (optional)

If the scorpION3 bar has Air Assist, the inlet fitting will be located on the end of the bar with the fault output jack. This fitting is a ¼" quick connect suitable for typical plastic tubing (1/4"OD polyethylene, polyurethane, nylon, etc). To make connection with the fitting, insert the tubing until it stops. To remove tubing from the fitting, depress the collar on the fitting and pull the tubing out of the fitting. Compressed air or nitrogen may be used, however, it must be clean, dry and oil free. While the maximum allowable input pressure is 700 kPa (100 psi), the recommended nominal operating pressure is 200 kPa (30 psi).

2.6 MMI (Man Machine Interface)

Adjustments to ion balance and ion output can be made to the scorpION3 bar system by using the hand-held MMI. The MMI features a 4-line LCD display for setting the bar parameters and monitoring its operation. The MMI uses an infrared transceiver for two-way communication with the bar in IR Mode. The MMI also has RJ-11 connectors that enable it to be connected inline with the bar system chain for two-way communication by hardwired RS-485 in Wired Mode.

Infrared communication is established by pointing the MMI at the IR transceiver on the bar. The IR transceivers must be aligned to communicate; the transmission/reception cone is 15º. Communication can typically take place at up to 3 meters (10 feet). Successful two-way communication is indicated by flashing green indicators on the bar and MMI. If the MMI indicator flashes red, the MMI was unable to establish two-way communication and realignment of the IR transceivers may be required.



The green indicator on the MMI is also used to indicate if the selected bar is operating normally, with no fault alarms. If the red indicator on the MMI is lit, the selected bar is in fault alarm.

Hardwired communication is established by using 6-conductor modular cable with RJ-11 connectors to insert the MMI at any point in the chain. Hardwired communication would typically be used where access to the IR transceiver on the bar was limited or difficult. Used in this fashion, the MMI taps into the RS-485 communication lines on the chain and provides feed-thru for the 24 VDC power. To enable the hardwired communication, it is necessary to turn the MMI power switch off, connect the MMI to the active bar chain, and then turn the MMI power switch on. The MMI will sense the power on the chain and activate the hardwired communication.

Turning the power switch off then on at any time will clear any temporary information entered into the MMI and return the display to the main menu.

In general, navigating through the system menus is done with the left/right arrow buttons. The right arrow generally advances to the next menu and the left arrow generally backs-up to the previous menu. An MMI Navigation Reference Guide is located in the appendix; the navigation guide provides a comprehensive listing of menus available through the MMI.

IR mode is automatically enabled when the MMI is turned on and not connected to a bar system chain. The first menu allows selection of adjusting a Bar or Preset. If Bar is selected the MMI will prompt the user to point the MMI at the bar and press enter. The MMI and scorpION3 bar feature narrow angle IR transceivers to minimize undesired IR cross talk. It will be necessary to align the MMI and bar IR transceivers to ensure communication. Pressing the Enter button establishes communication with the bar. The green lights on the bar and the MMI will flicker, indicating successful communication of the operating parameters. The MMI will display the bar address and serial number while requesting confirmation that this is the desired bar.

Confirming the bar address in the IR mode will enable the MMI to enter **Setting** or **Diagnostic** mode. The operation of these modes is virtually identical for both the IR mode and the Wired mode.

Wired mode is automatically enabled when the MMI is turned on and connected to a bar system chain. The MMI will offer the option of running **Adr Test**, an address test mode.

Adr Test (address test) is typically used during the initial set-up of multi-bar systems; address test is also used when new bars are added to an existing bar system. Address test evaluates the system for bar address conflicts (where more than one bar has the same address number) and guides the user to resolving the address conflicts by assigning new address numbers to the appropriate bars. Address conflicts may take place in new systems because the factory default bar address is “1”. In multi-bar systems this

necessitates the assigning of address numbers to avoid duplicate addresses on a system chain. An exception to this is systems that have a Computer Interface (CI) on the system chain. If a CI is on the system chain, it will automatically detect duplicate bar addresses and assign new address numbers as required.

Advancing into the **Wired** mode will cause the MMI to search the scorpION3 system and determine the number of bars present; the number of bars in the system will be displayed. When the MMI has searched the system, and determined the proper number of bars in the system, pressing the right arrow button will advance to the next menu.

Select Bar, Preset or System Monitor provides for; review and adjustment of individual bar operating parameters, review and adjustment of any of the 14 (P1 through P14) preset operating parameters, or monitoring of the system for operating status and fault codes. The up/down arrows are used to scroll through bar, system monitor or the preset numbers and the selection is activated by pressing the right arrow button.

Select Bar enters a menu where the bar address can be selected by scrolling through the bars on the system with the up/down arrow buttons. The bar address number in the system will appear on the MMI display and the indicator lights on the selected bar will flicker to confirm which bar in the system is selected. Pressing the right arrow button when the desired bar is displayed will enter a series of options for that bar.

Note:	The following bar parameters are temporarily stored in the MMI. The parameters in the MMI will appear as “NEW:”. The parameters operating in the bar will appear as “SET:”. To transmit the NEW parameters, press the Enter button. The green lights on the bar and the MMI will flicker, indicating successful communication of the data and the “SET” will update to the new setting.

Changed parameters are held in a temporary memory until the command **save settings local to bar** is performed. When this

command is performed, the parameters in the bar are synchronized to the parameters in the MMI and stored in a flash memory in the bar. If **save settings local to bar** is not performed and power is removed from the bar, the changes will be lost.

Change Address allows changing of the address number for the bar, 0 thru 9 are possible bar addresses (active bar addresses will not be offered). The desired address is selected by up/down arrow button.

Settings enters a series of menus that use two-way communication with the bar for adjustment and set-up purposes. The setting mode may be entered from the Change Address menu. Following are selections from the Settings menus.

Settings: Advancing from this menu allows the selection of Settings or Diagnostics. Following are selections from the **Settings** menus.

Hot Key Tip: Pressing the *up arrow* and *left arrow* at the same time will jump the MMI menu to “Settings”.

- **Power** (default: on) may be turned on/off (up/down arrows) for an individual bar in a system.
- **Output** (default: 50%) may be adjusted for the bar. Using the up/down arrows adjusts the bar output setting. Output level sets the ionization output from the ionizer. This value should be set to the lowest level possible to achieve the desired discharge time. Higher values of output will result in more ion generation, which can reduce discharge time, but may result in more frequent ionizer maintenance. The system will limit maximum output in cases of long pulse time.
- **Pulse/Steady** (default: pulse) allows selection of Pulse mode ionization or SSDC (steady state DC) ionization. In pulse mode the positive and negative ionization will be energized in alternating sequence. This provides quicker discharge times for still air but creates a mildly alternating peak offset voltage. Steady state DC mode maintains constant output for both the positive and negative ionization. This is more typically used where there is airflow to carry the ions to the target.

- **Slave/Independent** (default: independent) allows for selection of the bar as a Slave (non-0 address only) or Independent. Slave bars must be in pulse mode and will synchronize their pulse cycles with the Master bar (0 address) on the system; it generally takes several minutes for the synchronization to occur.
- **Pulse Time** (default: 0.75 seconds) must be set when pulse mode ionization is selected. The Pulse Time is the duration a power supply is energized (two pulse times compromise a full cycle of positive and negative ionization). Using the up/down arrow adjusts the pulse time in terms of seconds. Generally, longer pulse times are used in still air where there is relatively longer distance to the target area. However, the longer pulse times can create a greater peak offset voltage. If a bar is a Slave, the Pulse Time can only be set through the Master bar. Pulse time is ignored when the ionizer is placed in the steady state mode
- **Overlap** (default: 30%) sets the overlap of positive and negative ionization in pulse mode. The system will switch the power supplies according to the pulse time (the cycle time of positive and negative ionization does not change), however, overlap will cause the power supply to extend its run time determined by the percentage setting. Overlap is beneficial to reduce the peak offset voltage when operating in the pulse ionization mode. The system will set a mandatory minimum overlap in cases of long pulse time. Overlap is not available when the ionizer is placed in the steady state mode.
- **Balance** (default: 50/50) adjusting the balance with the up/down arrows causes the balance ratio to shift by 0.01 steps. Press the Enter button to transmit the new setting to the bar. Note: Save settings local to bar must be performed after adjustments to balance are made to ensure the changes are stored in the bar memory.

Hot Key Tip: Pressing the *left arrow* and *right arrow* at the same time will jump the MMI menu to the balance menu.

- **Fault Threshold** (default 20) is the relative number of times the microprocessor must encounter a fault condition before it

signals the fault state. Using a threshold to trigger a fault state reduces nuisance alarms. Increasing the threshold reduces the likelihood of encountering nuisance fault notification.

- **HV on w/Fault** (default: yes) allows disabling of the ionizer by turning off the high voltage power supplies if a fault state is entered.
- **Fault Contacts** (default: N.O.) allows setting of the Fault Output opto-isolated transistor as N.O. (normally open) or N.C. (normally closed).
- **Save settings local to bar?** (default: no) Saves the changes made to the operating parameters for the bar into the memory of the bar. "Y" must be selected with the down arrow, then ENTER pressed to save settings. The green indicator lights on the bar and MMI will flicker to confirm saving of settings. This operation must be performed to ensure the changes will not be lost.

Hot Key Tip: Pressing the *up arrow* and *right arrow* at the same time will jump the MMI menu to "Save settings local to bar".

- **Save as preset?** (default: no) This is the option to saving the changes local to bar. It allows selection of the desired preset number (P1 through P14) and saving the parameters under this preset for later downloading into a bar.
- **Upload Settings to Bar?** (default: no) Uploads the active preset to a bar. The up/down arrows select the target bar address. Pressing ENTER uploads the preset to the bar (but does not save the settings local to bar). In IR mode the MMI will prompt the user to point the MMI at the bar and press ENTER.

Diagnostic enters a series of menus that use two-way communication with the bar for diagnostic purposes. The diagnostic mode may be entered from the Change Address menu. Following are selections from the Diagnostic menus.

- **Feedback** is data transmitted back from the bar to the MMI:

Hot Key Tip: Pressing the *down arrow* and *left arrow* at the same time will jump the MMI menu to the Feedback screen.

- **PRG** Metered feedback 'Program' is the input value to the ion

regulating circuitry as established by the microprocessor. There is a 'Program' value for the positive and negative high voltage supplies. The range for this feedback value is from 0 to 1024.

- **CUR** Metered feedback 'Current' is a measure of the output ion current of the high voltage supply. During normal operation, this value should be within approximately 10% of the "Program" set point established by the microprocessor. There is a 'Current' value for the positive and negative high voltage supplies. The range for this feedback value is from 0 to 1024.
- **DRV** Metered feedback 'Drive' indicates the input drive level into the high voltage supply required to achieve the programmed level. There is a 'Drive' value for the positive and negative high voltage supplies. The range for this value is from 0 to 1024. Typically this value should be between approximately 100 and 924.

Fault Code Status Screen appears as follows:

N	0	64:C8	R:000	
00	00	00	00	00:
00	00	00	00	00
00	00	00	00	00

'N' indicates a normal status. 'W' would indicate a warning status and 'F' would indicate a fault status.

'0' indicates no faults above the threshold. If an accumulator accumulates faults above the threshold, this position will display the fault code with most significant accumulation.

'64:C8' indicates warning threshold (first two digits) and fault threshold (second two digits. The threshold values are in hexadecimal.

'R:000' provides a "snapshot" of which accumulators are above threshold value.

‘00’” indicates accumulated fault codes, in this case, no accumulation. The accumulator bins indicate fault codes as follows:

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15

Hot Key Tip: Pressing the *down arrow* and *right arrow* at the same time will jump the MMI menu to the Fault Code Status Screen.

Bar Info Screen shows the bar Software Version number, bar serial number, the Up Hours (total run time for the bar and Time (a reset able timer for maintenance).

Bar Reset Screen shows the bar address and first four / last four digits of the bar serial number (to confirm bar) and allows resetting (rebooting) of the bar software. Settings not “saved local to bar” will be lost. Settings “saved local to bar” will remain. Bar Reset will reset the Time (the reset able timer) to zero.

From **Select Bar, Preset or System Monitor** review and adjustment of any of the 14 (P1 through P14) preset operating parameters may be selected. The menus under the **Preset** selection are the same as under the bar set-up selection but may be saved as a one of fourteen convenient preset set-up for downloading into scorpION3 bars. At the end of setting the preset the preset number (P1 through P14) may be assigned and the preset saved.

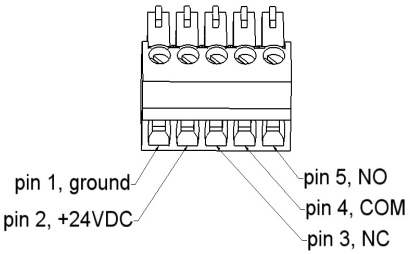
From **Select Bar, Preset or System Monitor** the system may be monitored by selecting **SYS**. This will activate a screen that shows the number of bars in the system. This screen automatically scrolls through all bars in the system at a rate of approximately one per second. The system address of a bar will appear along with its operating status and fault code if present.

2.7 CI (Computer Interface)

The scorpION3 CI (Computer Interface) provides an interface between the scorpION3 bar system and a personal computer or local computer network via Ethernet connection. With Simco-Ion's monitor software, a user may set-up, monitor or control the scorpION3 bar system from their computer. The computer interface contains two RJ-11 connectors for direct connection to the scorpION3 bar system, two RJ-11 connectors for connection to other Computer Interfaces and an RJ-45 connector for connection to a personal computer or local computer network.

The green LED Power indicator illuminates to indicate power and flickers if an MMI is on the system chain transmitting commands. The red LED Fault indicator illuminates if; the CI doesn't detect bars on the system chain, one of the bars on the system chain is resetting, or if any of the bars on the system chain is in a fault condition.

Where a computer interface is used on the system chain it is necessary that any MMI on the system chain remain turned off during power-up of the system chain. Once the system chain is powered, then the MMI may be turned on to access the system. If the MMI is connected to the system chain and turned on during power-up of the system, communication with the computer interface may be impaired.



The computer interface normally draws power from the scorpION3 bar system via the RJ-11 connectors. However, the computer interface may serve as the source of power for the bar system. When using the computer interface to power the bar system, the user must supply 24 VDC via the plug type terminal block labeled user interface. Connect pin 1 to ground/return and pin 2 to +24 VDC.

NOTE: Users connecting to the scorpION3 in this fashion must supply 200 mA per each bar connected plus 100 mA for the computer interface and 50 mA for a hardwired MMI.

The user interface terminal block on the computer interface also provides relay contact output for the fault alarm. Pin 4 is Common. Pin 3 is Normally Closed. Pin 5 is Normally Open. The relay contacts are rated for a maximum of 1 A at 30 VDC resistive with a maximum switching voltage of 220 VDC.

The Computer Interface will automatically resolve bar address conflicts (where more than one bar on a system chain has the same address number). This feature is required to make the software function properly. In the event of duplicate bar addresses on a system chain, the CI will assign the next available address to the “newest” bar on the chain. Bars that have been on the chain and have established addresses will not have their addresses changed. The process of testing and correcting duplicate bar addresses may take several minutes, therefore when adding a bar to an existing system that has a Computer Interface, allow the system to run for approximately two minutes undisturbed.

The personal computer software available with the Computer Interface provides continuous monitoring of the bar system set-up and operating parameters, the ability to adjust parameters and display of diagnostic information. Detailed information on the Computer Interface and software is available in publication 5200968, scorpION3 Monitor Software user manual.

3

Operation

3.1 Settings

3.1 Settings

Measures of system performance vary according to environmental factors including airflow velocity, air turbulence, presence of large grounded objects, and the distance from the emitter to the instrument.

Operating parameters can be adjusted to compensate for much of the variation common to the workspace or mini-environment. Increasing output current and/or lengthening the pulse time can reduce discharge times but will also affect the relative level of space charge and emitter life expectancy. Increasing overlap can reduce space charge in pulsed mode. Balance adjustment should be made after setting output current, pulse time and overlap. Adjustments must be saved using “save settings local to bar”.

Setup Recommendations

Factory default settings for the scorpION3 are for a typical tool or mini environment installation with the scorpION3 bar installed under the filter fan / top of the unit and a target distance of approximately 600 mm (24”).

The following tables contain recommendations for starting setup points and supply typical performance from the scorpION3 bar. Actual performance will vary depending on your particular operating conditions, bar length, airflow, temperature, humidity, obstructions, and other environmental influences specific to your application.

Approx. Distance	Offset Volts	Discharge Time (sec)	Bar Mode	Pulse Time (sec)	Pulse Overlap %	Output Level %
300 mm (12”)	±15	6	SS	-	-	30
450 mm (18”)	±10	10	SS	-	-	40
	±30	9	pulse	0.50	0	40
	±60	7	pulse	1.00	0	40
600 mm (24”)	±10	15	SS	-	-	50
	±30	12	pulse	0.75	30	50
	±60	10	pulse	1.25	30	50
750 mm (30”)	±10	18	SS	-	-	60
	±30	15	pulse	1.00	50	60
	±60	12	pulse	1.50	50	60

Table 2. Typical Setup Recommendations in 0.5 m/s (90 fpm) Airflow

Approx. Distance	Offset Volts	Discharge Time (sec)	Bar Mode	Pulse Time (sec)	Pulse Overlap %	Output Level %
300 mm (12”)	±50	30	pulse	0.50	0	30
	±100	15	pulse	1.00	0	30
450 mm (18”)	±50	30	pulse	1.50	30	40
	±100	20	pulse	1.75	30	40
600 mm (24”)	±50	45	pulse	2.50	50	50
	±100	30	pulse	3.00	50	50
750 mm (30”)	±50	60	pulse	4.00	70	60
	±100	40	pulse	5.00	60	60

Table 3. Typical Setup Recommendations: in still air (no airflow)
[Not recommended for use at less than 300 mm (12 inches)]

Measures of performance should be made using the test methods described in either your company methods and standard practice or industry standard ANSI/ESD STM 3.1-2006 Ionization, Section 6.2 laminar flow hood ionization. A Charge Plate Monitor that meets the requirements of ESD STM 3.1 should be used for this purpose.

During normal operation, the Positive Ion and Negative Ion indicators on the scorpION3 face label will glow green. If the bar is in the steady state mode, the indicators will glow continuously. If the bar is in the pulse mode, the indicators will flash alternately (with both on during overlap), indicating ion output. If a fault occurs, the indicator color will change to red. The indicators will typically briefly flicker to show the receipt of IR commands from the MMI.

The scorpION3 bar with Air Assist provides reduced discharge times according to the following table:

Operating Pressure	50 kPa (7.5 psi)	100 kPa (15 psi)	200 kPa (30 psi)	300 kPa (45 psi)	400 kPa (60 psi)
Typical Discharge Time Reduction	10%	30%	50%	60%	65%

Table 4. scorpION3 with Air Assist: Typical Discharge Time Reduction

The typical recommended operating pressure for the scorpION3 with Air Assist is 200 kPa (30 psi). Pressures less than 50 kPa (7.5 psi) may provide an air purge, but provide little overall reduction in discharge times. Pressures greater than 300 kPa (45 psi) increase air consumption without providing significant gains in discharge time reduction. Compressed air or nitrogen must be clean, dry and oil free.

4

Maintenance

4.1 Cleaning & Calibration

The scorpION3 bar is designed to require minimum maintenance, cleaning, and calibration. There are no user serviceable parts within the scorpION3 bar. No attempt should be made to disassemble or repair defective products. Please contact Simco-Ion customer service for information concerning repair or replacement.

Periodic cleaning of system emitters will make a valuable contribution to optimum system performance and emitter life. All corona ionization systems form deposits on the emitter tips over time. The majority of these deposits are the result of the interaction of moisture vapor with the electric field around the emitter. The emitter material has little or no relationship to the formation of these deposits. Your process and system performance demands must be considered when determining a suitable interval for emitter cleaning. Maintenance frequency also depends on the cleanliness and relative humidity of the environment.

In most cleanroom environments, cleaning should be scheduled on a quarterly basis. Simco-Ion recommends cleaning the system after 90 days. After initial cleaning, you may decide to adjust the cleaning schedule. Emitter cleaning frequency is determined through observation. Cleaning does not harm the emitters, and regular cleaning of emitters removes deposits that can reduce emitter life and affect system performance.

scorpION3 operation/calibration should be checked whenever the emitters are cleaned.

4.2 Cleaning the Emitters

Simco-Ion emitters have a serviceable life of three or more years in a typical cleanroom environment when operated in conjunction with a regular maintenance program. Evaluation of emitter condition should be considered when cleaning the emitters. Worn emitter replacement can be performed as part of a scheduled cleaning and calibration.

Note: Prior to any cleaning, power to the ionizer bar must be turned off. This can be achieved using the MMI or by simply disconnecting the bar.

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1. Visually inspect each emitter electrode for signs of deposited material. Typical deposits appear as a white coating on the pointed tip region.
2. Simco-Ion recommends using the ITW-TEXWIPE model TX726, CrushTube swab for cleaning the emitter electrodes. A substitute method consists of a cleanroom swab saturated with a solution of de-ionized water and isopropyl alcohol. These items may be obtained from local cleanroom product suppliers.
3. The TX726 CrushTube swab is shipped with a protective sleeve covering the white foam swab end. Remove the protective sleeve to expose the swab end. Discard the protective sleeve. The CrushTube swab has an inner glass vial of alcohol inside of a plastic tube. Crush the inner glass vial by squeezing the plastic tube, then tilt the foam swab end down to allow the alcohol to wet the swab. Carefully insert the wetted swab onto the emitter point, slowly rotate the tube, and withdraw. Repeat until all deposited material has been removed. Each Crush-Tube swab may be used to clean from 5 to 8 emitter tips, depending on the amount of material on each tip. When the swab fails to remove the material, a new swab should be used. Clean all the emitter electrode points.
4. The bar housing can be cleaned using a cleanroom wiper or soft cloth as appropriate.

5. Allow all alcohol to evaporate before applying power to the bar.
6. It is recommended practice to develop a regular cleaning schedule that meets your requirements and operating conditions.

4.3 System Calibration

System calibration is a complete analysis of performance and includes any adjustments that may be necessary to restore the system. This should be performed after maintenance and cleaning of the emitters has been completed. Adjustment to output level (first) and ion balance settings (second) should be made **only** after the emitters have been cleaned, and after **every** emitter cleaning or replacement. Adjustments must be saved using “save settings local to bar” or they will be lost when power is removed from the bar.

Standard system tests include charge discharge time and offset voltage. Test data should include temperature, humidity, and air velocity. Tests of the system are made in accordance with ANSI/ ESD STM 3.1-2006 Ionization, Section 6.2 laminar flow hood ionization. Contact Simco-Ion for information concerning test instruments and services.

4.4 System Diagnostics

System diagnostics are available through the Man Machine Interface (MMI) and the Computer Interface (CI). Diagnostic information available includes the operating parameters the bar has been set to, the value the bar is operating at and if any fault status exists (a fault status is typically when the operating value is consistently unable to achieve set operating parameter).

The system diagnostics can be accessed through the MMI by wired or IR communication with the scorpION3 bar. When the diagnostic menus are entered, the MMI downloads settings and operating data from the bar. This information is displayed in a series of menus on the MMI. A further description of this information is available in the MMI section of this instruction manual and in the appendix.

System diagnostics are also available through the Computer Interface. The computer interface offers continuous monitoring of the bar system and display of diagnostic information. This information is available on various screens presented via the host personal computer. A further description of this information is available in the Computer Interface section of this instruction manual and in the appendix.

5

Specifications

5.1 Specifications

scorpION3 Bar	
Input Votage	24 VDC, 200 mA (max per bar) provided through the RJ-11 modular jack
Discharge	<10 sec (typ), 24" with 90 fpm unidirectional airflow[1]
Balance	<30V (typ), 24" with 90 fpm unidirectional airflow
Timing	0.125-6 sec, adjustable in 0.025 sec increments; steady state operation is also available
Pulse Overlap	0-100%, adjustable in 0.25% increments
Connectors	6-pin RJ-11 modular jacks provide both power and communications interconnections
LED Indicators	2 bicolor LEDs provide information on pos/neg high voltage power supplies and feedback condition; green NORMAL; red FAULT
Address Control	Each bar can be set to one of 10 unique addresses
Mode Control	Independent or slave; independent bars can be set to steady state or a pulse rate independent of the system; slave bars will follow the pulse timing of the master bar
Communications	RS-485
Fault Interface	3.5 mm (1/8") phone jack, opto-isolated transistor that can be set to normally off or normally on, this transistor (NEC PS2502-1) is toggled during a fault condition. Phone jack connections: Tip - positive (collector), Sleeve - negative (emitter), Fault Interface Maximum Ratings: Vceo (collector emitter voltage) 40 VDC max; Veco (emitter to collector voltage) 6 VDC max; IC (collector current) 50 mA max
Emitters Points	Replaceable Ultra-clean Silicon or Tungsten
Cleanliness	ISO 14644-1 Class 1 (Ultra-clean Silicon), ISO 14644-1 Class 4 (Fed. Std. 209e Class 10) (Tungsten)
Operating Env.	Temperature 15-35°C (59-95°F) recommended; relative humidity 20-65%
Ozone	<0.020 ppm
EMI	Below background level
Mounting	Stainless steel brackets, with universal adjustable mounting centers. Clamping thumbscrew Integrated #8-32 mounting nut
Enclosure	Reinforced Polycarbonate
Dimensions	457 mm (18"); 610 mm (24"); 914 mm (36"); 1118 mm (44"); 1626 mm (64"); 1880 mm (74"); 2134 mm (84")

Weight	0.8 kg (1.8 lb); 1.0 kg (2.1 lb); 1.3 kg (2.8 lb); 1.5 kg (3.2 lb); 2.0 kg (4.3 lb); 2.2 kg (4.9 lb); 2.5 kg (5.5 lb)
Warranty	Two year limited warranty
Certifications	CE c UL us RoHS 2 Compliant
scorpION3 Bar with Air Assist	
Air Inlet	¼" QC Tube Fitting
Input Pressure	200 kPa (30 psi) recommended nominal, 700 kPa (100 psi) max, CDA
Air Consumption	5.1 Nm3/h @ 200 kPa (3 scfm @ 30 psi); 8.5 Nm3/h @ 400 kPa (5 scfm @ 60 psi); 13.6 Nm3/h @ 700 kPa (8 scfm @ 100 psi)
Noise Level	76 dB @ 200 kPa (30 psi); 82 dB @ 400 kPa (60 psi); 88 dB @ 700 kPa (100 psi) measured 600 mm (24") from bar
Warranty	Two year limited warranty
Certifications	CE c UL us RoHS 2 Compliant
scorpION AC Adapter	
Input Voltage	Universal 100-240 VAC, 47-63 Hz line voltage input through 3 pin IEC320 receptacle
Output Voltage	24 VDC, 18W, 0.75A; Adapter powers a system of up to three bars (any length), with one communication module (CI), and one hardwired Man-Machine Interface control (MMI); RJ-11 adapter and modular cable included
Certifications	CE c UL us RoHS 2 Compliant
scorpION3 MMI Module Remote	
Output	IR (infrared) and hardwired RS-485
Controls	Up Arrow/Down Arrow, Left Arrow/Right Arrow, Enter
Power On/Off	Slide Switch
Indicators	LCD menu driven user interface green/red LEDs indicate transmit/receive/ fault status
Power	Standard 9V battery (Type 1604, Alkaline) or 24 VDC, 50 mA from bar system chain (RJ-11 modular connectors) **CAUTION: Risk of explosion if battery is replaced by an incorrect type. Dispose of used batteries according to the manufacturer's instructions.**
Enclosure	Impact resistant ABS
Dimensions	4.40H x 7.70W x 1.25D in. (110 x 196 x 32 mm)
Weight	0.75 lb (0.34 kg) with battery

CI Module	
Input Power	24 VDC, 100 mA from bar system chain (RJ-11 modular connectors) or User Interface terminal block
Bar Connection	RJ-11 modular jack/modular wire (power & communication)
Network Interface	Ethernet (RJ-45 modular connector)
LED Indicators	Green POWER; red FAULT
Dimensions	84 x 211 x 34 mm (3.30 x 8.30 x 1.35 in.)
Enclosure	Stainless Steel
Software	Windows 2000, Windows XP, Windows 7

1. Tested in accordance with ANSI/ESD STM3.1-2006.

5.2 Parts & Accessories

Part Nos.	Description
4015454	18" ScorpION3 Ionizing Bar, Seven (7) Ultraclean Silicon emitters
4015455	24" ScorpION3 Ionizing Bar, Seven (7) Ultraclean Silicon emitters
4015456	36" ScorpION3 Ionizing Bar, Eleven (11) Ultraclean Silicon emitters
4015457	44" ScorpION3 Ionizing Bar, Fifteen (15) Ultraclean Silicon emitters
4015458	64" ScorpION3 Ionizing Bar, Nineteen (19) Ultraclean Silicon emitters
4015459	74" ScorpION3 Ionizing Bar, Nineteen (19) Ultraclean Silicon emitters
4015460	84" ScorpION3 Ionizing Bar, Nineteen (19) Ultraclean Silicon emitters
4011546	18" ScorpION3 Ionizing Bar, Seven (7) Tungsten (W) emitters
4011547	24" ScorpION3 Ionizing Bar, Seven (7) Tungsten (W) emitters
4011548	36" ScorpION3 Ionizing Bar, Eleven (11) Tungsten (W) emitters
4011549	44" ScorpION3 Ionizing Bar, Fifteen (15) Tungsten (W) emitters
4011550	64" ScorpION3 Ionizing Bar, Nineteen (19) Tungsten (W) emitters
4011551	74" ScorpION3 Ionizing Bar, Nineteen (19) Tungsten (W) emitters
4011552	84" ScorpION3 Ionizing Bar, Nineteen (19) Tungsten (W) emitters
4015461	18" ScorpION3 Ionizing Bar w/Air Assist, Seven (7) Ultraclean Silicon emitters
4015462	24" ScorpION3 Ionizing Bar w/Air Assist, Seven (7) Ultraclean Silicon emitters
4015463	36" ScorpION3 Ionizing Bar w/Air Assist, Eleven (11) Ultraclean Silicon emitters
4015464	44" ScorpION3 Ionizing Bar w/Air Assist, Fifteen (15) Ultraclean Silicon emitters
4015465	64" ScorpION3 Ionizing Bar w/Air Assist, Nineteen (19) Ultraclean Silicon emitters
4015466	74" ScorpION3 Ionizing Bar w/Air Assist, Nineteen (19) Ultraclean Silicon emitters
4015467	84" ScorpION3 Ionizing Bar w/Air Assist, Nineteen (19) Ultraclean Silicon emitters
4011560	18" ScorpION3 Ionizing Bar w/Air Assist, Seven (7) Tungsten (W) emitters
4011561	24" ScorpION3 Ionizing Bar w/Air Assist, Seven (7) Tungsten (W) emitters
4011562	36" ScorpION3 Ionizing Bar w/Air Assist, Eleven (11) Tungsten (W) emitters
4011563	44" ScorpION3 Ionizing Bar w/Air Assist, Fifteen (15) Tungsten (W) emitters
4011564	64" ScorpION3 Ionizing Bar w/Air Assist, Nineteen (19) Tungsten (W) emitters
4011565	74" ScorpION3 Ionizing Bar w/Air Assist, Nineteen (19) Tungsten (W) emitters
4011566	84" ScorpION3 Ionizing Bar w/Air Assist, Nineteen (19) Tungsten (W) emitters
5051195	Modular Interconnect Cable, 152 mm (6”)
5051168	Modular Interconnect Cable, 406 mm (16”)
5051196	Modular Interconnect Cable, 610 mm (24”)

5051183	Modular Interconnect Cable, 914 mm (36”)
5051331	Modular Interconnect Cable, 2.13m (84”)
5051197	Modular Interconnect Cable, 3.05m (120”)
5051328	ScorpION2/3 AC Adapter, 24 VDC Out, 100-240VAC Universal Input with North American (NEMA5-15P)/Japan Line Cord.
5051329	ScorpION2/3 AC Adapter, 24VDC Out, 100-240 VAC Universal Input with European (CEE7) Line Cord.
5051330	ScorpION2/3 AC Adapter, 24 VDC Out, 100-240 VAC Universal Input with United Kingdom (BS 1363) Line Cord
4107405	Mounting Bracket with integrated 8-32 nut
4107878	Mounting Bracket with clearance hole for M4 or M5 (#8 or #10) screw

6

Warranty & Service

Simco-Ion provides a limited warranty for the scorpION3 Ionizing Bar. New products manufactured or sold by Simco-Ion are guaranteed to be free from defects in material or workmanship for a period of two (2) years from date of initial shipment. Simco-Ion liability under its new product warranty is limited to servicing (evaluating, repairing, or replacing) any unit returned to Simco-Ion that has not been subjected to misuse, neglect, lack of routine maintenance, repair, alteration, or accident. In no event shall Simco-Ion be liable for collateral or consequential damages. Consumable items such as, but not exclusive to, emitter points, emitter wires, batteries, filters, fuses or light bulbs are only covered under this warranty if found defective as received with the new product.

To obtain service under this warranty, please contact Simco-Ion Technical Support at techsupport@simco-ion.com or (510) 217-0470.

Appendix A

MMI Navigation Reference Guide

START: Splash screens: Simco-Ion, software version, display test, indicator LED test.

WIRED MODE
*select mode (wired or address test)
*wired
*searching
*select **bar**, **preset**, or **sysmon**
*bar scroll list (LEDs on selected bar flash)
*bar change address
*select **settings** or **diagnostics**

WIRED SETTINGS NAVIGATION
power
output
pulse/steady state
slave/independent [1]
pulse time [1, 2]
overlap [1]
balance
fault threshold
HV on/off w/fault
fault contact
*save local to bar
*save as preset

[1] not present if in steady state
[2] not present if slave

DIAGNOSTIC NAVIGATION
feedback
fault status accumulators
bar information
*reset bar command

PRESET NAVIGATION
*select preset number (P01, P02,…P14)
power
output
pulse/steady state
slave/independent [1]
pulse time [1, 2]
overlap [1]
balance
fault threshold
HV on/off w/fault
fault contact
*save as preset
*upload to bar

[1] not present if in steady state
[2] not present if slave

* Hot Keys are NOT enabled

UPLOAD PRESET NAVIGATION
*select bar
*enter=execute (transmit preset settings to bar)

SYSTEM MONITOR
*MMI screens rotation showing fault status code for each bar
(MMI LED's indicate bar fault status).

IR MODE NAVIGATION
*select **bar or preset**

IR ACQUISITION (1st READBACK)
*Point MMI at bar & press enter
*accept bar address
*select **settings** or **diagnostics**

IR SETTINGS NAVIGATION
power
output
pulse/steady state
slave/independent [1]

pulse time [1, 2]
overlap [1]
balance
fault threshold
HV on/off w/fault
fault contact
*save local to bar
*save as preset

[1] not present if in steady state
[2] not present if slave

IR DIAGNOSTICS NAVIGATION
feedback
fault status accumulators
bar information / serial number
*reset bar command (point MMI & enter=execute)

ADDRESS TEST
*searching for address conflicts
*accept or change address conflicts
*change desired address

HOT KEYS

up & left	jump to top of menu
up & right	jump to save settings local to bar
down & right	jump to fault status accumulators
down & left	jump to feedback (program, current , drive monitors)
left & right	jump to balance adjustment

* Hot Keys are NOT enabled

Appendix B

Fault Status Code Reference Guide

Fault No.	Message	Possible Causes	Potential Actions (in order of occurrence)
0	No Faults	N/A	N/A
1	Positive Ion Output Too Low	Emitters need cleaning. Emitter housing or emitter electrode not seated. HV open circuit. Pos HV supply is faulty.	Clean emitters. Check emitter housing & emitter electrode seating. Reduce Ion Output setting. Replace emitter electrodes. Replace Pos HV supply. Replace bar.
2	Negative Ion Output Too Low	Emitters need cleaning. Emitter housing or emitter electrode not seated. HV open circuit. Neg HV supply is faulty.	Clean emitters. Check emitter housing & emitter electrode seating. Reduce Ion Output setting. Replace emitter electrodes. Replace Neg HV supply. Replace bar.
3	Ion Output Too Low	Unable to drive Ion Output from either supply (as currently set). Emitters need cleaning. Emitter housing or emitter electrode not seated. HV open circuit. HV supplies faulty.	Clean emitters. Check emitter housing & emitter electrode seating. Reduce Ion Output setting. Replace emitter electrodes. Replace HV supplies. Replace bar.

4	Ion Output Too High	Excessive drive levels. Emitters need cleaning. Bar located near ground plane or arcing. HV short circuit. NV supplies faulty.	Clean emitters. Increase Ion Output setting. Adjust Balance setting. Adjust humidity or airflow. Relocate bar or ground plane. Replace bar.
5	Positive Ion Output Too High	Emitters need cleaning. Bar located near ground plane or arcing. HV short circuit.	Clean emitters. Adjust Balance setting. Increase Ion Output setting. Adjust humidity or airflow. Relocate bar or ground plane. Replace bar.
6	Negative Ion Output Too High	Emitters need cleaning. Bar located near ground plane or arcing. HV short circuit.	Clean emitters. Adjust Balance setting. Increase Ion Output setting. Adjust humidity or airflow. Relocate bar or ground plane. Replace bar.
7	Program Voltage Error	I/O board fault.	Replace I/O board. Replace bar.
8	Pos Control Error	I/O board fault.	Replace I/O board. Replace bar.
9	Neg Control Error	I/O board fault.	Replace I/O board. Replace bar.
10	Internal Fault	Hardware problem.	Check op-amp on I/O board. Replace I/O board. Replace bar.
11	Pos Feedback Error	I/O board fault. Faulty Pos HV supply.	Replace I/O board. Replace Pos HV supply. Replace bar.
12	Neg Feedback Error	I/O board fault. Faulty Neg HV supply.	Replace I/O board. Replace Neg HV supply. Replace bar.
13	Feedback Error	I/O Board fault.	Replace I/O board. Replace bar.
14	Multiple Fault	Must be interpreted by a Simco-Ion technician.	Replace bar.
15	Communication Fault	Fault in RJ-11 connectors or modular cable.	Check connections and modular cable.

Notes

Notes

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