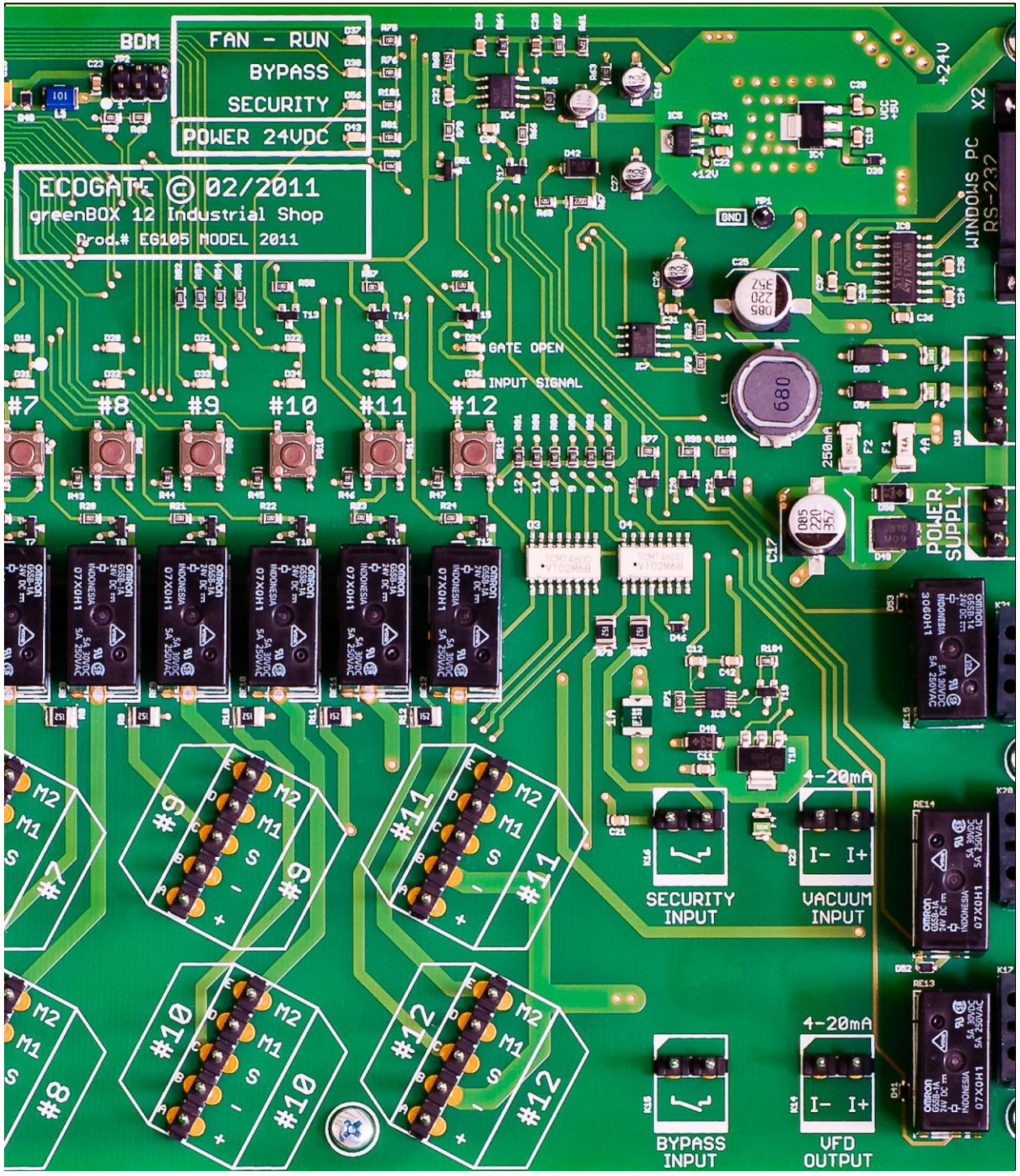


Intelligent Industrial Ventilation

ECOGATE®.com

greenBOX® 12
Startup Guide

Updated: May 2019

Ecogate, Inc.
5669 Whitnall Hwy
North Hollywood
CA 91601, USA

Phone: +1-818-506-6016
www.ecogate.com
info@ecogate.com

The ECOGATE® System completes dust collecting systems. The greenBOX can control gates for twelve workstations and a Variable Frequency Drive (VFD) to adjust fan RPM. In a typical factory, about half of the machines are not in use at any given time. The ECOGATE® System automatically turns on the vacuum system to machines in use while turning it off to those not in use; moreover, it can control (optional) a variable frequency drive to adjust fan RPM. This generally saves approximately 55-70% of fan electrical consumption, and active workstations have better suction. Based on the number of workstations in operation at a given time, a larger number of workstations may be connected to the same system. The greenBOX also automatically maintains minimum air flow to avoid saw dust settling.

Important Warning

Never touch the high-voltage terminals in the greenBOX. Failure to observe this warning may result in an electrical shock. Only authorized personnel should be permitted to perform installation, maintenance, inspections, or part replacement.

Wiring

Begin wiring only after verifying that the power supply is turned OFF. Only qualified personnel should perform wiring. Failure to observe this warning may result in an electrical shock or fire.

IMPORTANT NOTE: ECOGATE, Inc. does not assume any liability regarding the interpretation of the information in this document. The information contained in this User and Installation Guide is a recommended method for installing and operating a dust collection system and is offered as a guide only. You are individually responsible for the safety and design of your particular dust collection system. This manual may be modified when necessary because of improvements of the product, modification, or changes in specifications.

Your particular system must adhere to all rules and regulations set by federal, state or local governing codes and requirements where applicable. This "User and Installation Guide" does not attempt to describe every aspect of safety, implementation, and operation of any particular dust collection system. Industrial applications also involve many more variables and trade-off decisions as well as strict compliance with OSHA and other regulatory agencies. Especially important is to follow rules for the combustible dust hazards; as an introduction, see http://www.youtube.com/watch?v=3d37Ca3E4fA&feature=player_embedded or visit CSB - US Chemical Safety Board at http://www.csb.gov/.

2. INTRODUCTION & CONTENT

Thank you for purchasing the ECOGATE® greenBOX 12 control unit.

Read this User Guide thoroughly before system installation, setup, and use.

Table of Content:

3. greenBOX 12 USER GUIDE

The ECOGATE® System completes dust collecting systems. The greenBOX controls gates at each workstation, starts and stops the dust collector automatically by using workstation activity sensors. The greenBOX also automatically maintains minimum air flow to avoid dust settling (if Smart Minimum airflow is set). The power supply to the greenBOX should be connected at all times. The dust collector will start automatically with the start of any of the workstations.

All the safety and operating instructions in the Ecogate greenBOX 12 User Guide and for the other parts of the ventilation system (fan, filter, transport) should be read before the product is operated. The dust collecting system (gates, fan, filter, cleaning mechanisms, transport etc.) can run automatically at any time without warning. Keep hands away from gates because they are connected to the control unit which can run the gate automatically at any time without warning.

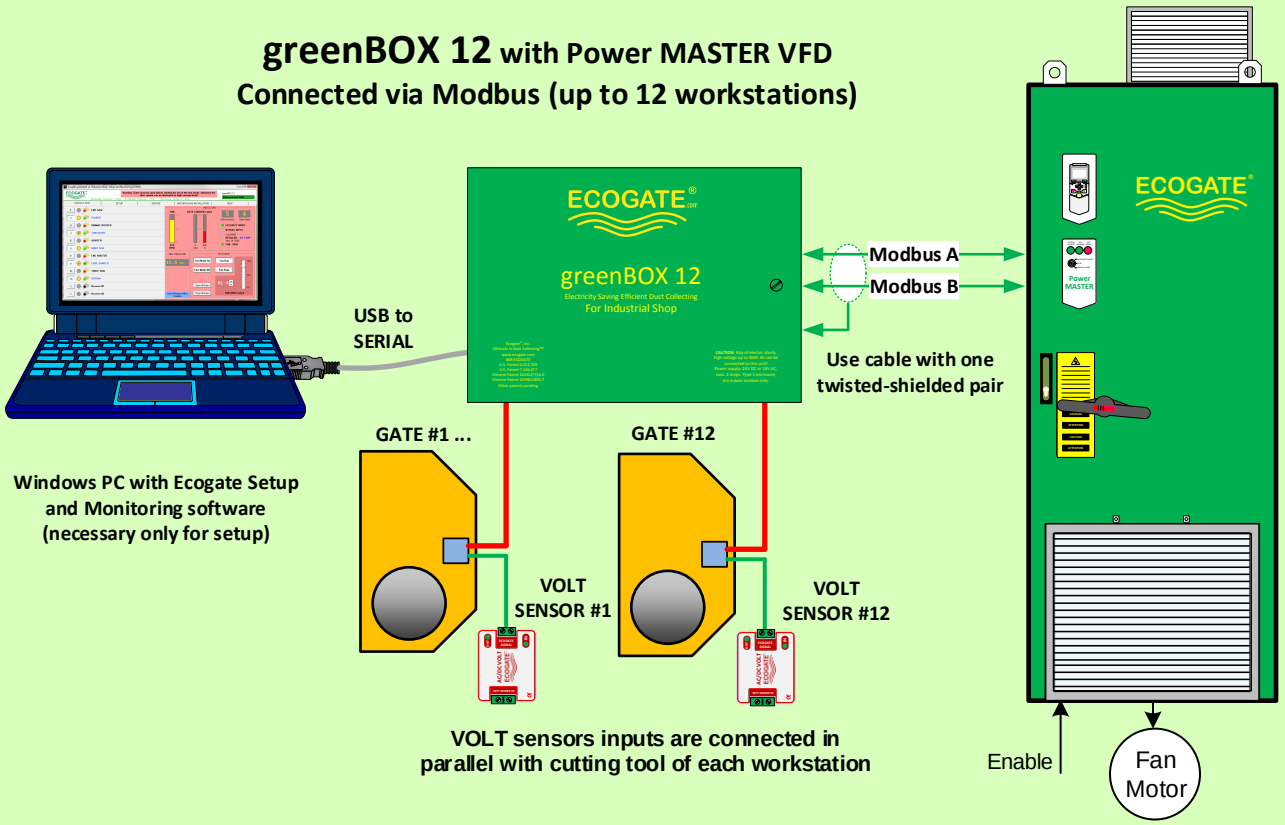
How does automatic mode work?

If you switch any workstation ON, the greenBOX® will leave the appropriate gate open, switch the dust collector ON, and close all the other gates. Note: some gates on non-operating machinery will remain open to maintain the minimum required air flow in the duct system and dust collector. Turning ON further workstations will open the corresponding gates.
Similarly, turning workstations OFF will close the appropriate gates (each gate can close with a programmable delay of up to 99 seconds). Upon turning OFF the last operating workstation, the greenBOX® will switch the dust collector OFF (with a preprogrammed delay of up to 0…99 minutes) and will open all the gates (for security reasons and for system cleaning).

Is the gate open?
To see if the gates are working, start each workstation and monitor indicators on the gate motor housing. The **GREEN** gate indicator is ON when the gate is opening (about 5 seconds for 6" gate), the **RED** gate indicator is ON when the gate is closing (also about 5 seconds for 6" gate).

Troubleshooting

1. If any workstation sensor is active, the yellow indicator "**INPUT SIGNAL**" on the greenBOX main board will be ON.
2. If any gates (1…12) are open, then the corresponding green indicator "**GATE OPEN**" (1…12) will be ON to reflect this status. During the gate movement (to either the open or closed position) the corresponding "**GATE OPEN**" indicator flashes.
3. "**POWER**" indicates that a power supply is present at the greenBOX.
4. Whenever the fan should be ON, the green "**FAN-RUN**" light will be lit.
5. If the green light marked "**SECURITY**" is flashing, the SECURITY INPUT is open and greenBOX will start executing SECURITY action (typically fan will stop, gates will open).



Options how the fan motor is controlled

Option #1: by Ecogate Power MASTER VFD (Variable Frequency Drive, see above), this is recommended option, easiest to setup, and fully supported by Ecogate; the FAN and FILTER pressure sensors are built-in Power MASTER, pressure values are transferred via Modbus to greenBOX. See separate Power MASTER User & Installation guide.

Option #2: by third party VFD, the fan motor speed is controlled by standard 4...20 mA signal connected from greenBOX to VFD analog input, and VFD is started via free RUN contact connected from greenBOX to VFD digital input; installer will need to setup the VFD parameters and debug the functionality, see schematic diagram at end of this document. Ecogate cannot provide support for 3rd party VFD. The fan pressure transmitter (optional) can be connected via greenBOX 4...20 mA analog input, see page 21, and 22.

Option #3: for smaller systems the fan motor can be started/stopped by a contactor (magnetic starter) controlled via greenBOX free contact (other term is dry contact - means no voltage is provided from greenBOX). The contactor must be supplied and installed by electrician, for schematic diagram see page 19 and 20.

Option #4: if you are using two greenBOX 12 units in MASTER-SLAVE configuration the Modbus connection for the VFD is not available; in this case 4...20mA signal and RUN contact is used to control the VFD (same like in option 2); proper settings of Ecogate Power MASTER is available via Ecogate Setup Assistant, See separate Power MASTER User & Installation guide.

4. SCHEMATIC DIAGRAM

This is a simplified schematic diagram of the greenBOX 12 system.

The gates are connected to the terminals #1…#12 by 5-wire (or 4-wire) cable.

The sensors are connected to the gate by 2-wire cable, the sensor inputs are connected to the workstations.

The fan motor speed is controlled by Power MASTER VFD (the Fan and Filter pressure sensors are built-in the VFD). Controlling Power MASTER over Modbus requires firmware F05A or later (you check firmware version at Service Page of PC software).

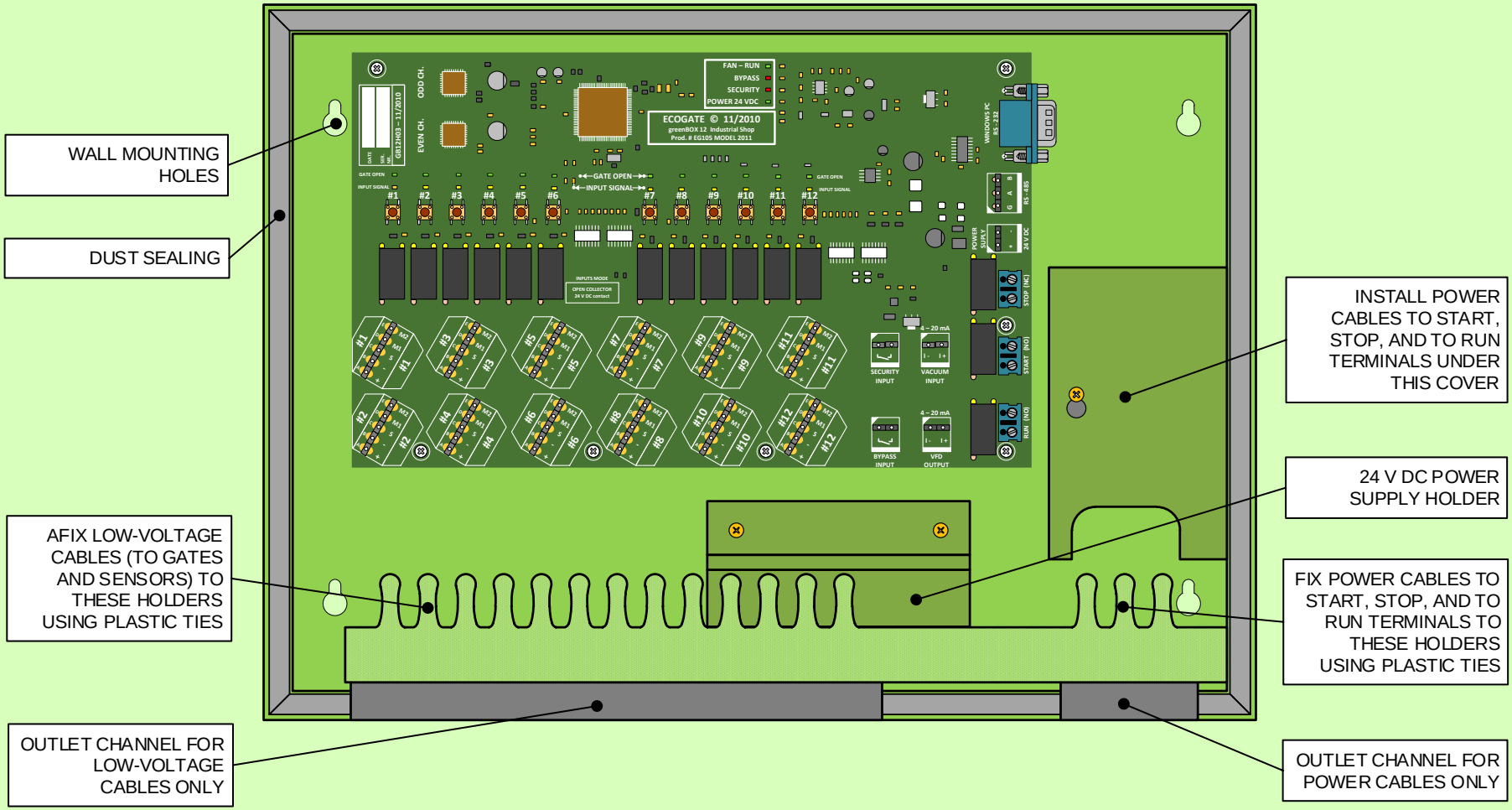
The ENABLE input of the Power MASTER enables the fan operation (it is required for larger dust collectors with the air lock, transport fan, and filter cleaning).

The power supply 24V DC is built-in to greenBOX enclosure and is used to power greenBOX, and gates.

A Windows PC can be connected via USB to serial adapter – it is required for setup only.

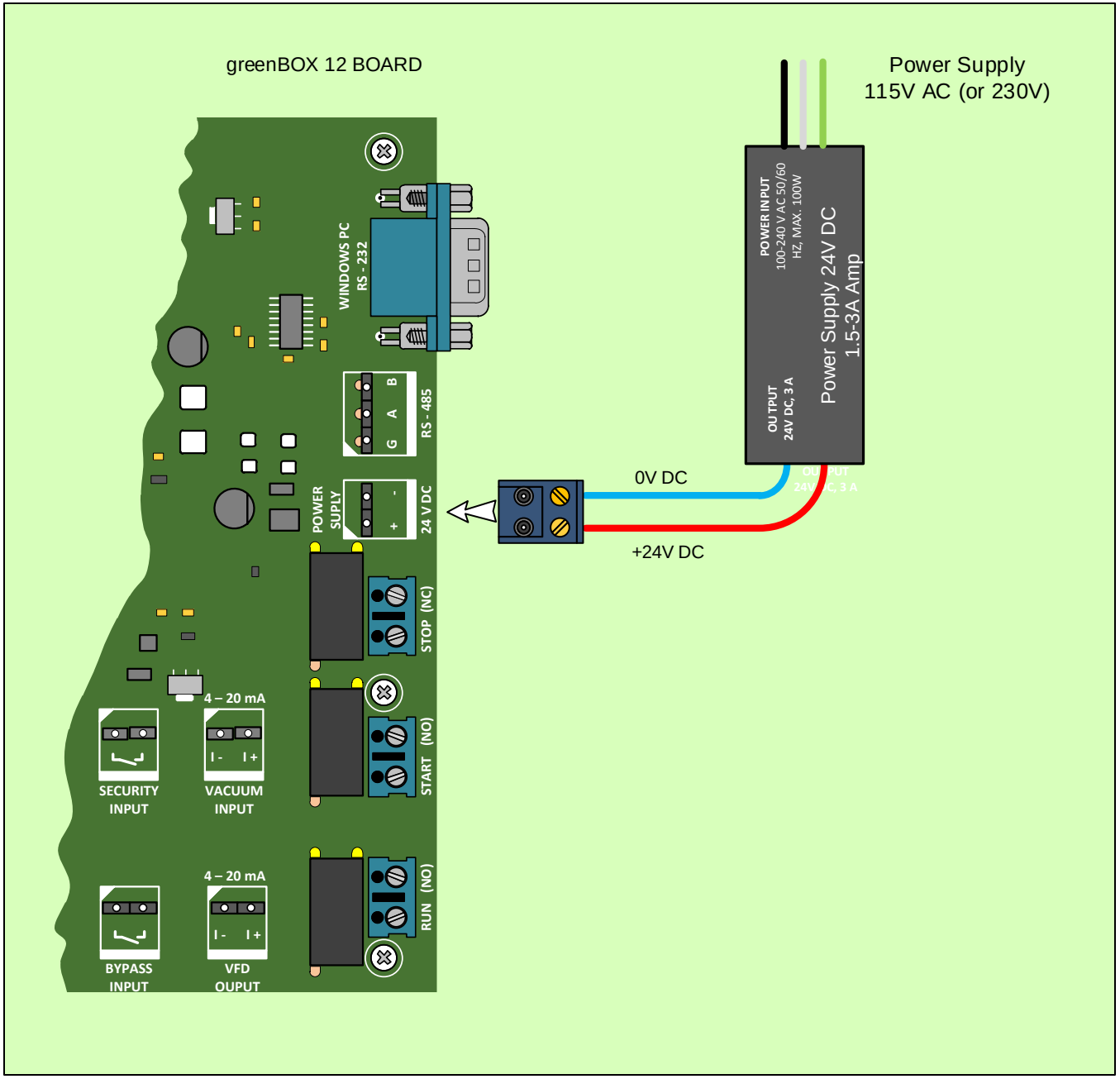
5. greenBOX ENCLOSURE OVERVIEW

Install the greenBOX 12 on the wall, preferably in middle of the shop to keep the cables to the gates/sensors short.



Keep the low-voltage and the power cables properly separated; the low-voltage cables in the left outlet, power cables in the right outlet.

Installation Procedure Step-by-Step

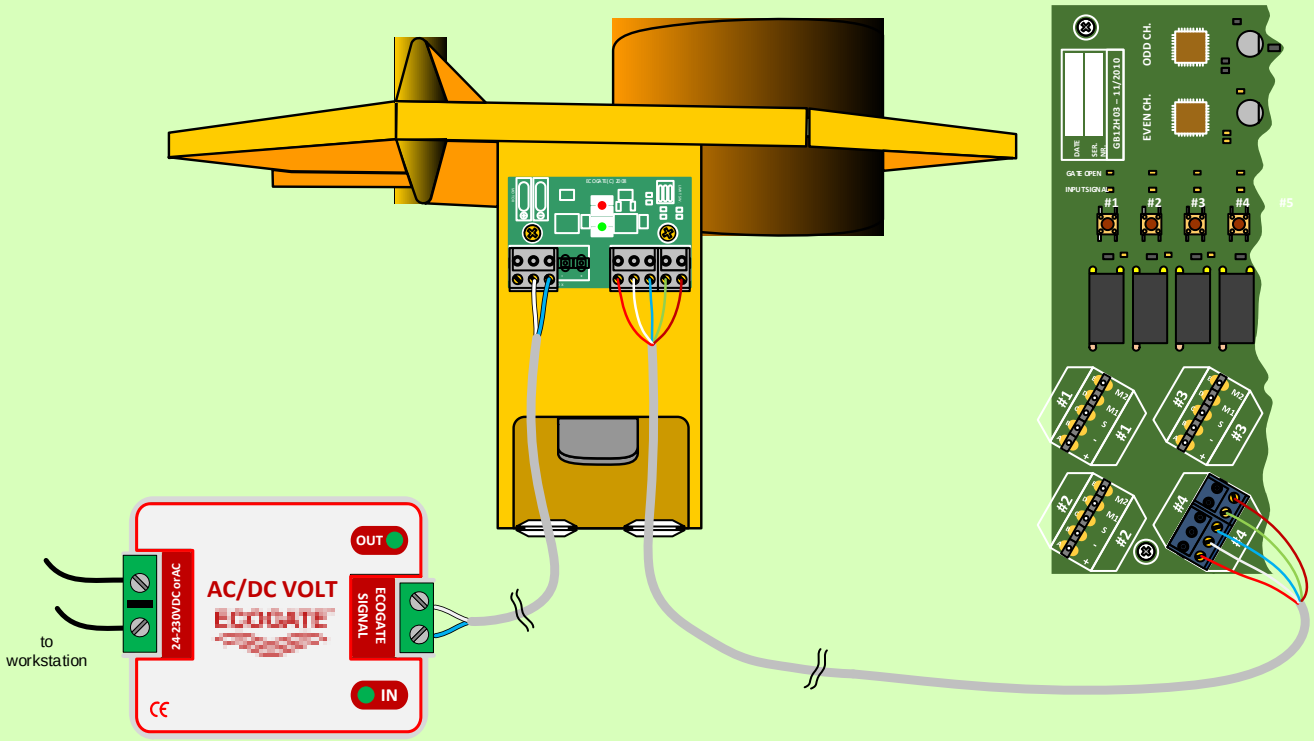


6. POWER SUPPLY

The power supply 24V DC power supply adapter is built-in greenBOX 12 enclosure and 24 V DC output is connected to the "**POWER SUPPLY**" greenBOX terminal, plus polarity wire to "+" pin, minus polarity wire to "-" pin.

The power should be preferably connected to the greenBOX all the time – the baseline consumption is low (about 5 Watt).

Keep the power supply for the greenBOX OFF for the moment; you will switch on the power supply after finishing all cable installations.



RECOMMENDED CABLE SPECIFICATION
(check local code if the cable rating is appropriate for shop installation)

Cable between greenBOX and gate Ecogate EG.304: Belden 5503UE or compatible, AWG 22, 5-conductor cable stranding 7x28, outer diameter 0.162" (4.1 mm); voltage rating 300 V, temperature rating 75C, NEC approval (article 800)
Cable between Ecogate and VOLT sensor Ecogate EG.306: Alpha Wire P/N 6632 or compatible: two conductor AWG 22 (7x30), core wrap by Mylar tape, voltage rating 600 V RMS, temperature rating 105C

NOTES – GATES INSTALLATION: Important rule is not to install gates close to hoods, elbows, Y, etc. because close to these places, the airflow is turbulent and causing sawdust settling inside the gate. Our recommendation is to install the gates at a distance 3-5 times duct diameters from the hoods, elbows, etc. The recommended position is with the motor on the top (both in the vertical and horizontal ducts). The gate must be supported on both sides. Orient the gate in such a way that the **RED and GREEN indicator lights on the motor enclosure are visible to the workstation operator**. If the gate is installed in a vertical duct, the motor should be on top side; if the gate is installed in a horizontal duct, the motor should be on top (indicators will be not visible). For details check "Ecogate Gates Installation Best Practice" document.

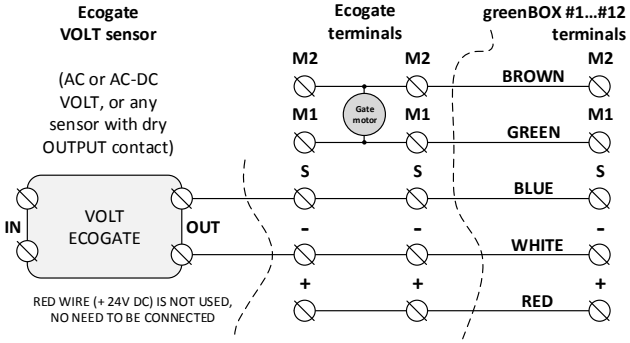
7. 4"...18" GATES

Use "#1"..."#12" greenBOX terminals to connect up to 12 gates and 12 sensors. The 5-pin terminal should be connected horizontally to the board.

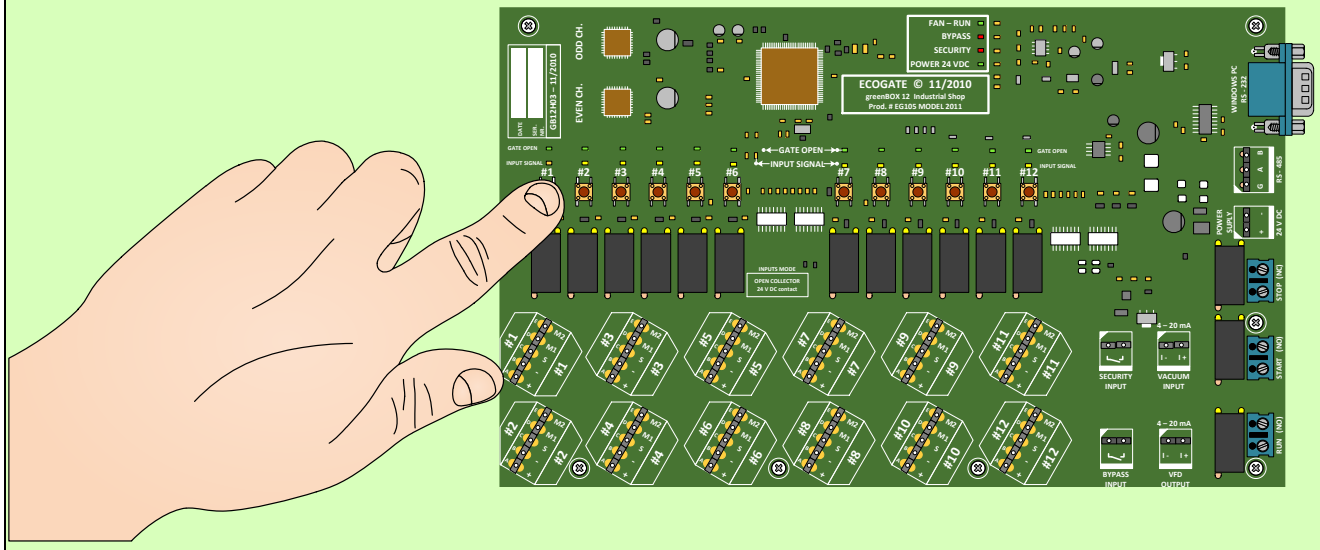
The terminals M1 (Motor 1) and M2 (Motor 2) are used to connect the gate (M1 at the greenBOX to M1 at the gate, M2 at the greenBOX to M2 at the gate).

The terminals S and - are used to connect the VOLT sensor; (left and right -, S terminals at the gate are connected together – serves as junction box, see schematic below)

Notes:
1. If 2-pin and 3-pin terminals are separated you need to physically connect them together (by using side slot) to create a 5-pin terminal.
2. If the gate M1, M2 wires are reversed, the gate will be open when it should be closed and vice versa.



- Connect all gates and the power supply; do not connect sensors yet.
- One press of the button should open the gate; a second press should close the gate.
- When the GATE OPEN green indicator is ON, the gate should be open.

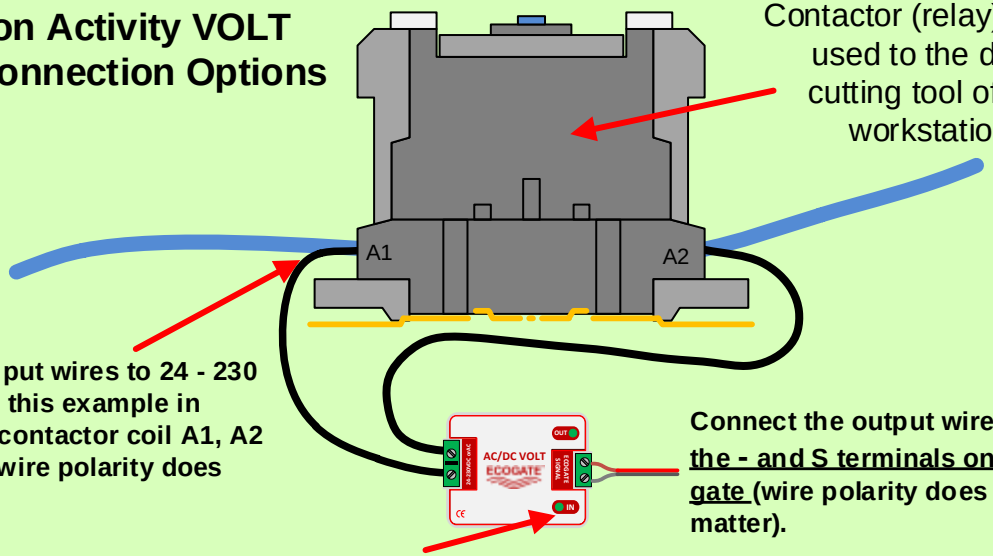


As a default setting in the greenBOX the outputs are set for 5" gates, for larger gates change gate diameters at the Windows PC Setup page, see page 19 of this manual.

8. GATE TESTING

- Connect the greenBOX power supply, gates, and check security input jumper (installed from factory). Do not connect the sensors. The green “POWER” indicator at the top of the greenBOX board should be ON. The GATE OPEN and INPUT SIGNAL indicators should cycle after power on and stay off.
- Test the gate function by using the test button on the greenBOX board; **one press should open the gate; a second press should close the gate**.
- When the green indicator “**GATE OPEN**” is OFF, the gate should be closed; when the green indicator is ON, the gate should be open (if the indication is reversed, change the polarity of the M1, M2 wires to the gate).
- The “**GATE OPEN**” indicator will be flashing while the gate is opening (and closing). When you press the button, the yellow **“INPUT SIGNAL**” indicator will be flashing.
- Test all connected gates.

Workstation Activity VOLT Sensor: Connection Options



Contactor (relay) that is used to the drive cutting tool of the workstation

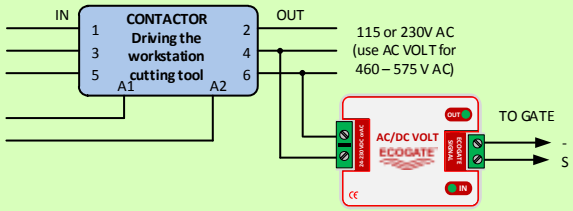
Connect the Input wires to 24 - 230 V AC or DC, in this example in parallel to the contactor coil A1, A2 wires (sensor wire polarity does not mater).

Connect the output wires <u>to the - and S terminals on the gate</u> (wire polarity does not matter).

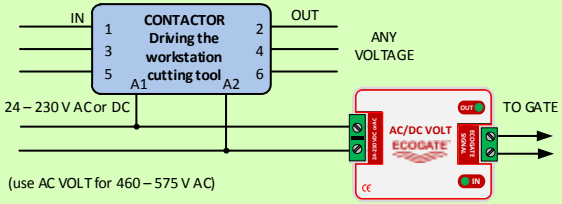
The **<u>IN (INPUT) indicator</u>** is ON if voltage is present at your workstation (i.e. cutting tool is active)

The **<u>OUT (OUTPUT) indicator</u>** is ON if the sensor INPUT is active and the output wires are properly connected to the gate and to the greenBOX

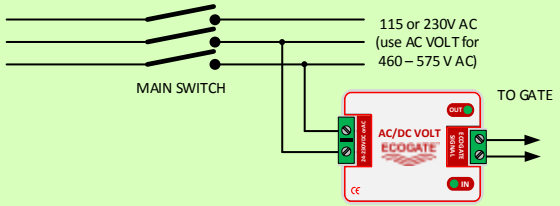
Option 1: In Parallel with Contactor Output



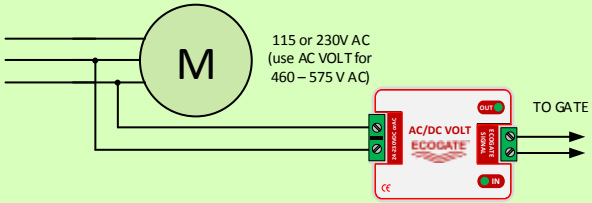
Option 2: In Parallel with Contactor Coil



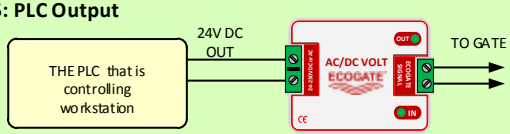
Option 3: In Parallel with Workstation Main Switch Output



Option 4: In Parallel with Cutting Tool Motor



Option 5: PLC Output



Notes:

1. <u>The Input Mode selector JP1</u> on the greenBOX (red jumper in the middle of the greenBOX board) <u>must be in the "Open Collector" position</u> and the Volt sensors must be connected between the <u>S and - terminals</u>.
2. If you have an available free contact at your workstation that is closed when dust collecting should be active you do not need the VOLT sensor: you can connect the dry contact directly to the S and – gate terminals (voltage is 24V DC, current about 8 mA).
3. The input of the VOLT sensor cannot be connected to the output of a variable frequency drive – high voltage peaks can destroy the sensor; use the VFD RUN free contact instead, connect it directly to S and – gate terminals or use current sensor (see next page).
4. <u>If you need to connect the VOLT sensor to 460 or 575V AC, use the AC VOLT sensor</u> (or a current sensor, see next page).

9. VOLT SENSOR

The AC/DC VOLT sensor is activated if the sensor input wires are connected to AC or DC voltage in the range from 24V to 230V (use AC VOLT sensor for 115 – 575 V AC range). The input & output wires are polarity independent.

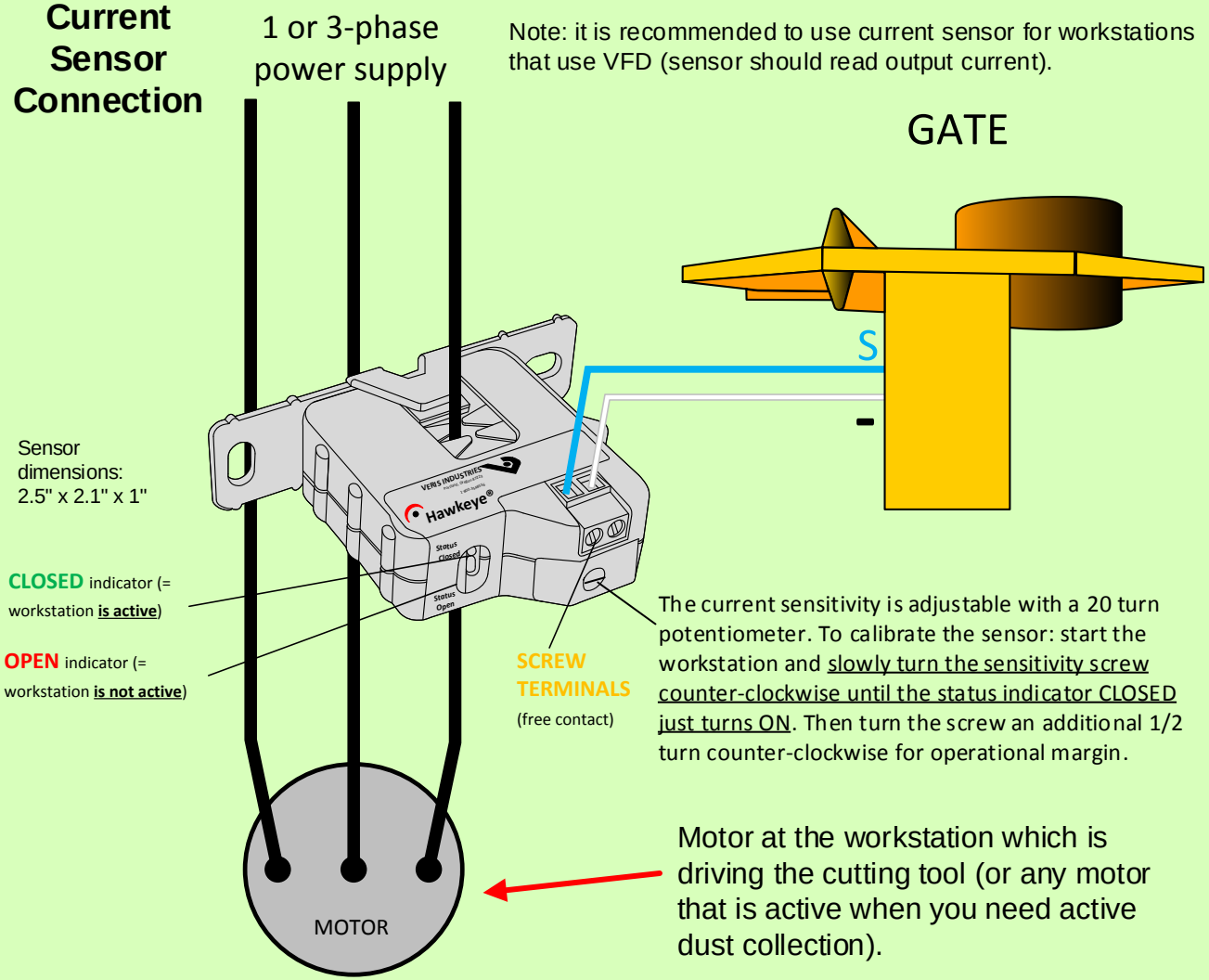
Connect the VOLT sensor to a location inside the workstation where voltage is present when the dust collection should be active.

On a simple workstation you can connect the VOLT sensor at the output of the main power switch (see Option #3 on left).

On complex workstations, connect the sensor to the supply of the motor which is driving the cutting tool or any motor that is active when you need active dust collection (see Option 1, 2, 4, 5).

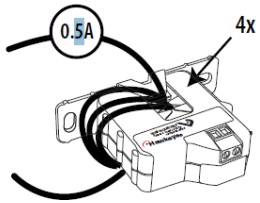
The output of the VOLT sensor should be connected <u>to the gate S and - terminals</u> (if it is preferable you can connect sensor output directly to the greenBOX S and – terminals).

Current Sensor Connection



Note: To make all sensors work while they are connected between S and – terminals the Inputs Mode selector (red JP1 jumper in the middle of the greenBOX board, see board overview page for location) must be in "Open Collector" position.

For load currents less than 0.5 Amp: wrap the monitored wire through the center hole and around the sensor body to produce multiple turns through the opening. This increases the current measured by the sensor.



10. CURRENT SENSOR

The Hawkeye H608 Current Sensor is an alternative to the VOLT sensor.

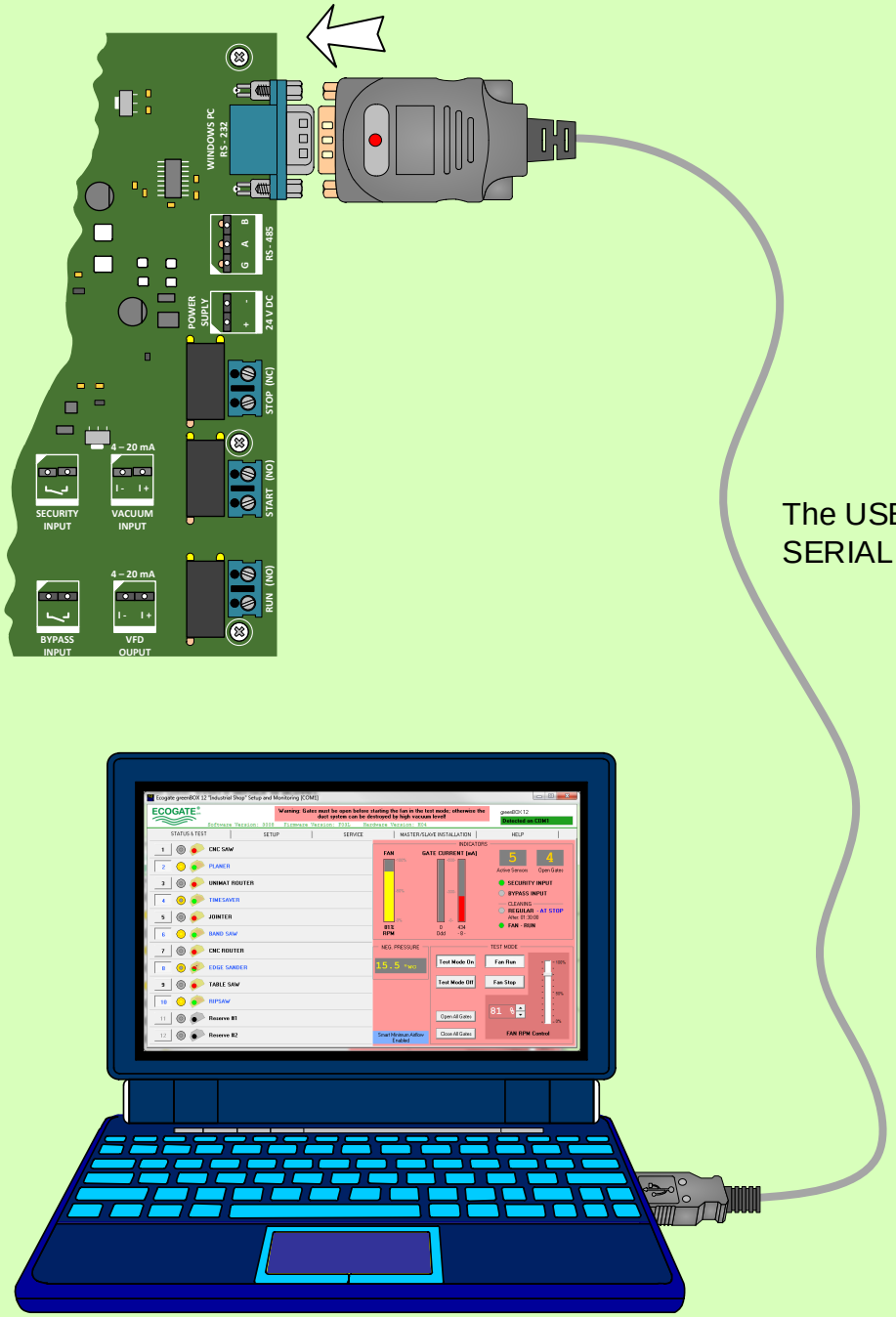
The H608 can read current to the motor that is driving the cutting tool of the workstation. Put only one phase wire inside the sensor – not the complete cable (it will not work).

The H608 can be used both on single-phase and 3-phase AC motors of any voltage with current in the range 0.5 to 175 Amper.

To increase sensitivity of the sensor for small loads (small motors – fraction of HP) put several loops of the phase wire through the sensor hole (see inset).

The output of the H608 sensor should be connected to the gate **S** and **-** terminals (if preferable you can connect the sensor output directly to the greenBOX S and - terminals).

If current to the motor is present, the green "CLOSED" sensor indicators will be ON, and also the "INPUT SIGNAL" indicator at the greenBOX will be ON.



11. SOFTWARE INSTALLATION

You should preferably purchase Windows netbook (small notebook) from Ecogate with all necessary software installed (including software for remote access).

To setup the greenBOX 12 software on your Windows PC, you need:

1. A **Windows PC** with a USB port. A netbook or notebook is preferable for a shop environment.

2. The **USB to Serial cable from Ecogate.** The USB to serial adapter should be properly installed as COM1...COM10; see the installation guide on the next page.

3. The **USB key ("thumb drive") with "Ecogate greenBOX 12 Setup and Monitoring" software** (delivered with the system).

The **"Ecogate greenBOX 12 Setup and Monitoring"** software installation: browse the flash key and double click the "GB12_setup_5001_expert.exe" file.

The software was tested under Windows XP, Windows 7, Windows 8, Windows 10. Other operating systems (Apple Mac OS, Linux etc.) are not supported.

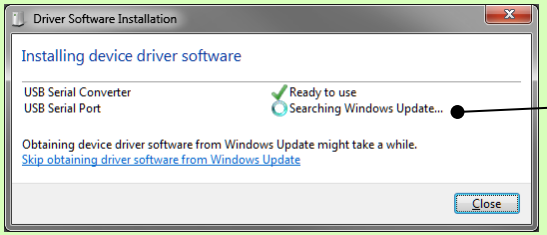
12. USB TO SERIAL ADAPTER

If you are using your PC you need to install the USB to Serial adapter. <u>If you have netbook PC from Ecogate, this software is already installed</u>.

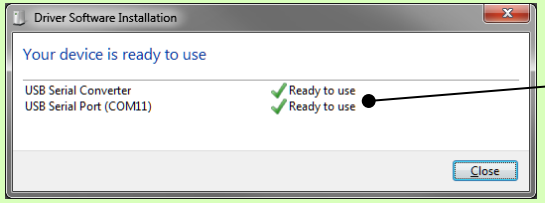
The software drivers for the recommended USB to serial adapter from Ecogate are installed automatically from Windows Update <u>if your PC is connected to the internet when you plug-in the USB to serial adapter into your PC</u> (this is highly recommended approach; you can also install the drivers downloaded from internet or from CD, but it is much more complicated, and less safe).

If you purchased the USB to serial adapter from a third party, follow the corresponding guide on how to install the drivers. Note that some third party adapters might be not compatible with greenBOX 12. You can save a lot of time if you will use fully tested USB to Serial adapter from Ecogate.

Remember to double check the settings of the adapter in STEPS 3a to 3c on the left.

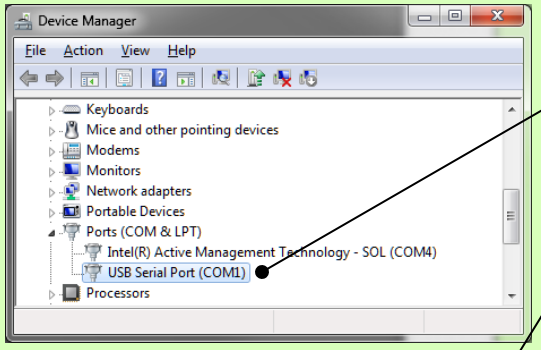


STEP 1:
IF YOUR PC IS CONNECTED TO THE INTERNET - **CONNECT THE USB TO SERIAL ADAPTER TO YOUR PC** AND WINDOWS WILL START INSTALLING THE DRIVER AUTOMATICALLY
(TO SEE THIS WINDOW, YOU MUST CLICK ON THE INSTALLATION MESSAGE IN THE TASKBAR)



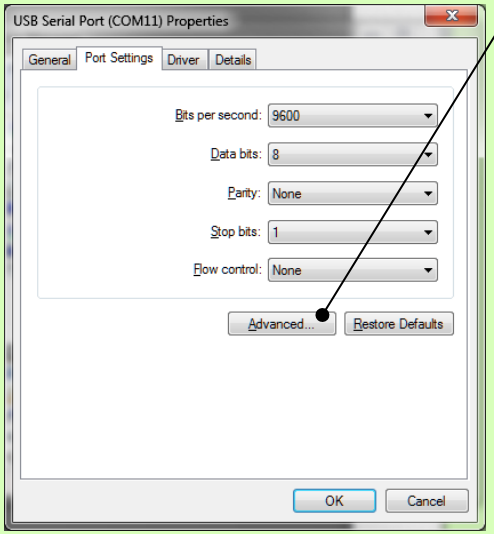
STEP 2:
IF YOU SEE THE MESSAGE "YOUR DEVICE IS READY TO USE" AND THE USB TO SERIAL ADAPTER IS ISTALLED AS A COM1 ...COM10, YOU CAN NOW CONNECT the greenBOX;

IF THE COM PORT IS INSTALLED AS COM 11 OR HIGHER GO TO NEXT STEP

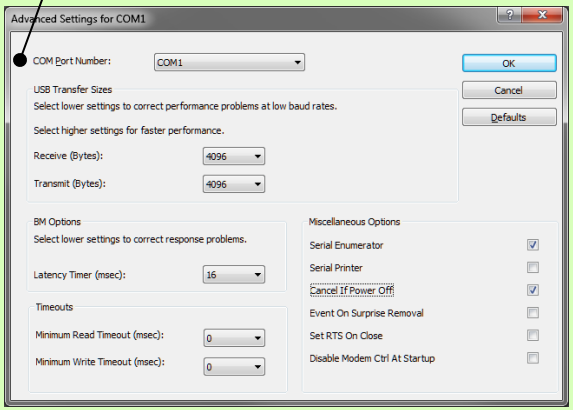


STEP 3a:
AT THE WINDOWS START MENU- TYPE "DEVICE MANAGER" IN THE SEARCH BOX, SELECT **DEVICE MANAGER**, IN THE DEVICE MANAGER WINDOW CLICK THE ARROW NEXT TO **"Ports (COM &LPT)"**, AND RIGHT CLICK ON THE "**USB SERIAL PORT (COM**xx**)"**

STEP 3b:
SELECT PROPERTIES-> PORT SETTINGS –> ADVANCED.



STEP 3c:
FROM THE "**COM PORT NUMBER**" LIST BOX <u>SELECT AN AVAILABLE **PORT FROM 1..10**</u>, NEXT SELECT THE CHECKBOX NEXT TO "**Cancel If Power Off**" (this will ensure the USB to serial adapter driver restarts properly after the computer wakes up from stand-by mode). PRESS OK (TWICE).
YOU CAN NOW CONNECT the greenBOX.



13. greenBOX® 12 SETUP PAGE

Before using the system, you should configure the greenBOX® according to your system specifications (the system is preconfigured from the factory for small shops – no open gates at fan stop, no dust collector off delay).

On the greenBOX® setup page:

- Change **workstation names** and specify their **gate diameters**, Set Gate **off delays** (to keep the gate from frequently cycling if the workstation is often turned on and off)
- Enable **Smart Minimum Airflow**, set the desired percentage (recommended is 25-50% on properly designed on-demand systems; if the ducting is not designed for on-demand system percentage should be higher to maintain minimum air velocity)
- Set **Fan Off Delay** if required, Set Duct **Cleaning** if required

See the HELP tab in the software for details about all the setup parameters.

IMPORTANT: After making any changes, press the "**Save to greenBOX**" button to save the changes. Otherwise, the new settings will be discarded.

Gate diameter in inches (if more than one gate is connected to the same terminal, specify each gate in a separate column)

Change the default names to the real workstation names

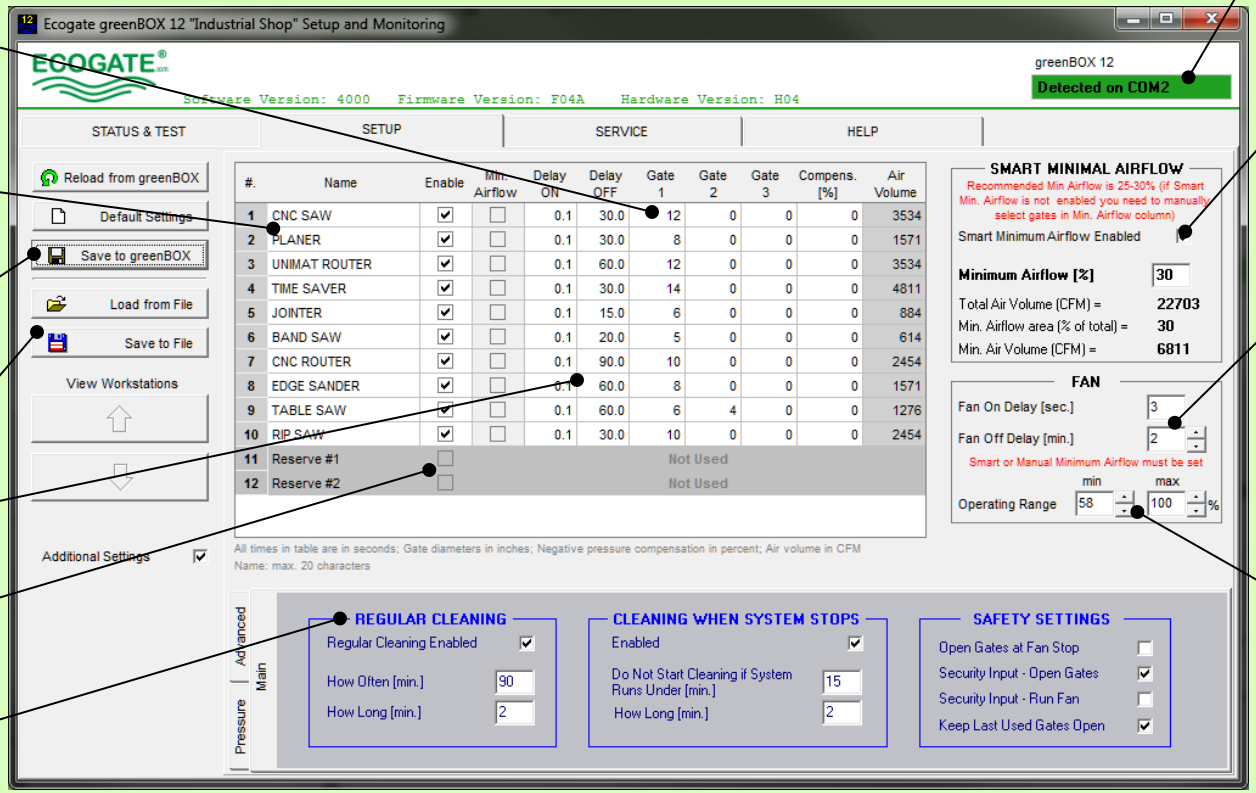
After making changes, press **Save to greenBOX**

You can Save/Load all settings to a file on your PC (backup)

Adjustable **gate open and close delays**

Unused terminals (i.e. Enable is unchecked) are displayed in gray

The **Cleaning function** will sweep the duct system at regular intervals and/or at system stop



greenBOX is connected to PC via COM2 port

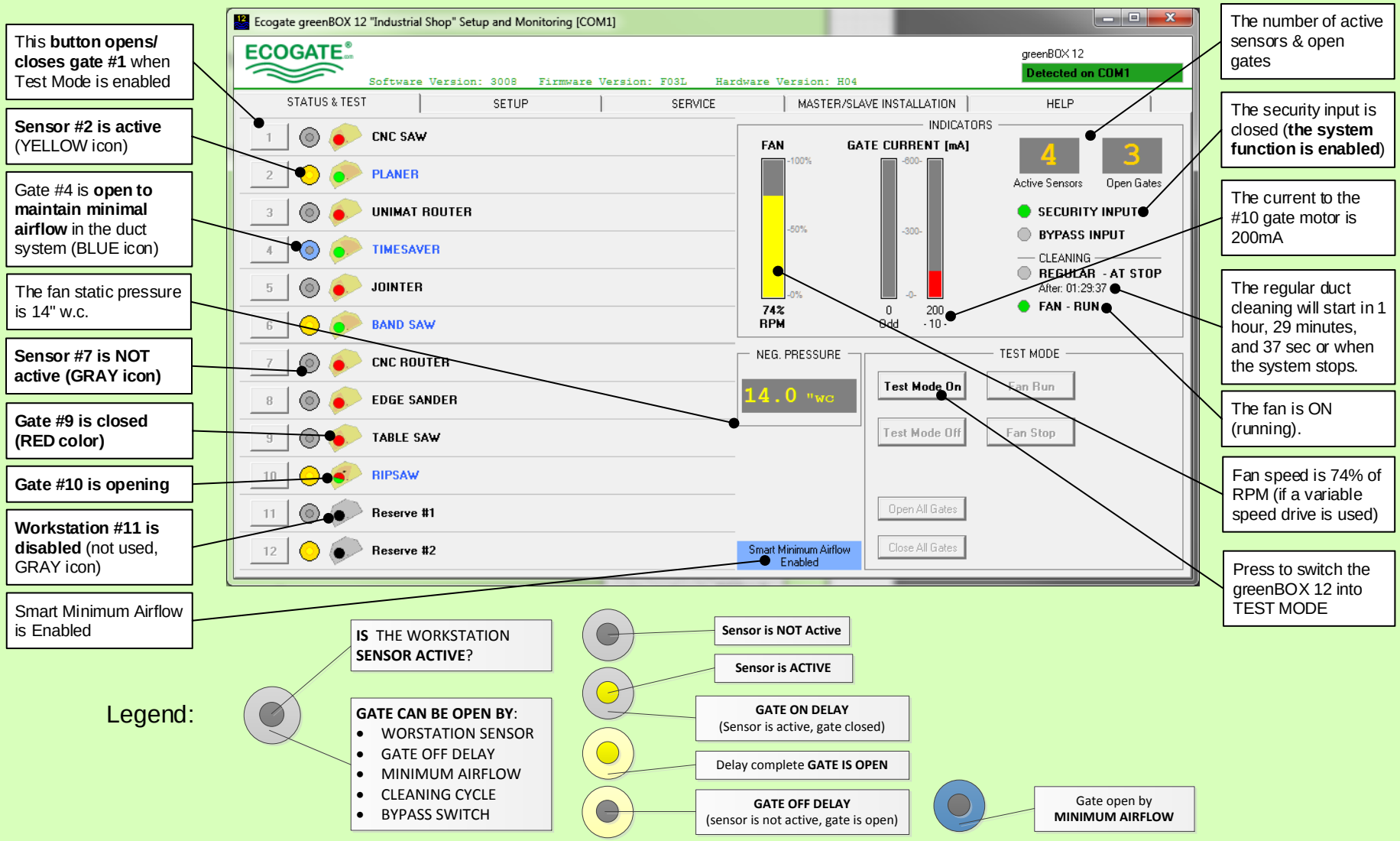
Enable Smart Min. Airflow and set %: **recommended is 25–55% of gates to keep open**; If you prefer to select manually what gates are used for minimum airflow: uncheck Smart Minimum Airflow and select in "Min airflow" column gates until the % will reach desired value

Set the **dust collector (fan) on & off delay**

Variable Frequency Drive: start one workstation, measure main duct air velocity – increase min. %, and Min. Airflow % until minimum transport air velocity is reached (about 3,500 FPM for sawdust); start the all workstations, increase max % until drop air velocities are correct (about 4,500 FPM for sawdust); leave it at 100% if system is not designed to operate all workstations at a same time

14. greenBOX® 12 STATUS & MONITORING PAGE

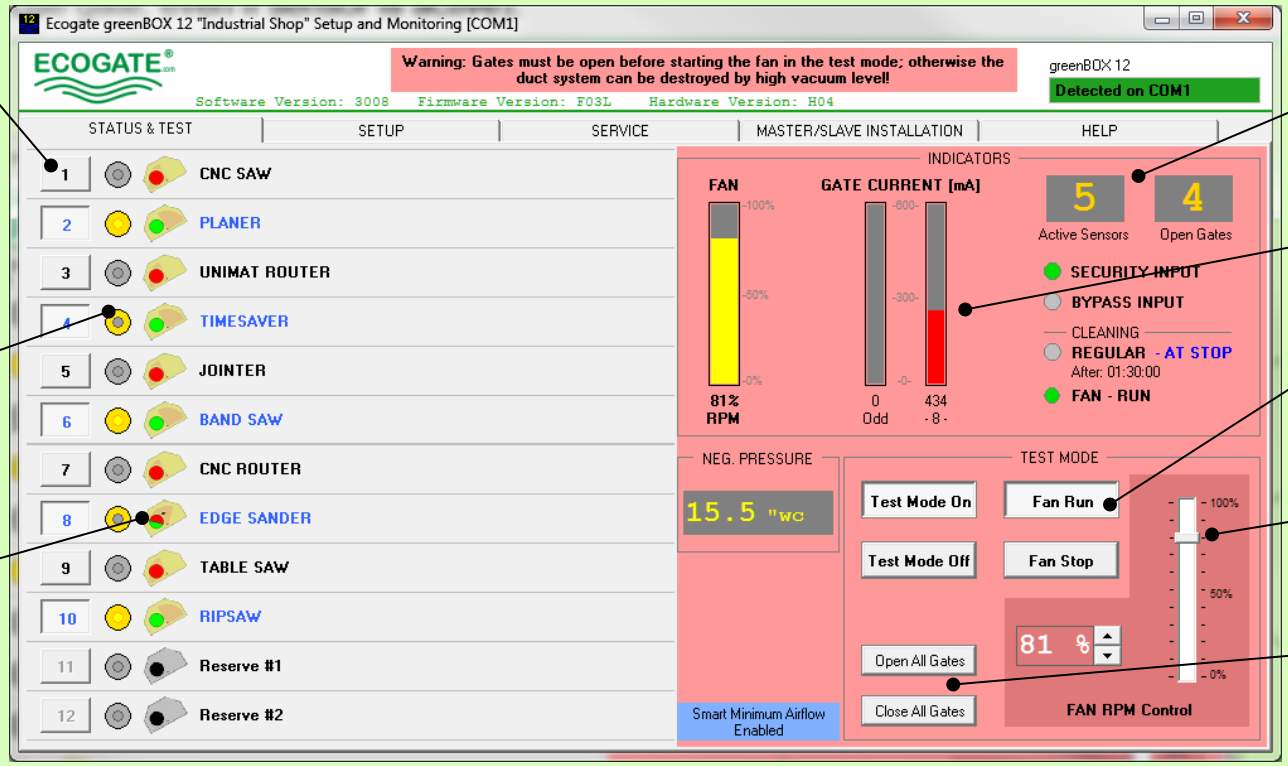
The greenBOX® 12 Status Page displays the current status of the system, including the status of all the gates (Open or Closed) and sensors (Active or Not active), as well as the current fan RPM (in %), and the fan pressure (the pressure hoses from the fan inlet and outlet must be connected to the pressure transmitter in Power MASTER enclosure).The test mode can also be enabled on this page; this gives the user manual control over the system, see the next page.



Legend:

15. greenBOX® 12 TEST PAGE

Test mode gives the user manual control over the system – be careful to not collapse the duct system with high negative pressure – test gate closing only when the fan is stopped and always keep a large number of gates open if you are operating the fan. Use the numbered buttons on left to operate the gates (the gates will open and close immediately, not taking on & off gate delays into account; you can also close a gate even if a sensor is active or if a gate is set for minimal airflow).



Test all the gates while monitoring the opening/closing current to the gate motor: normal current is in the range of 150-500 mA (smaller current for smaller gates, higher current for larger gates). If the current is too high, it indicates that there is some mechanical problem with the gate (is the gate clean inside? - maybe the gate is not properly supported with force pressing on the gate rotating blade). If the current is increasing when gate is reaching fully open or close position, then the magnetic limit switches are most likely not working correctly (current will drop to zero if limit switch is reached and it is working properly).

16. greenBOX® 12 SERVICE PAGE

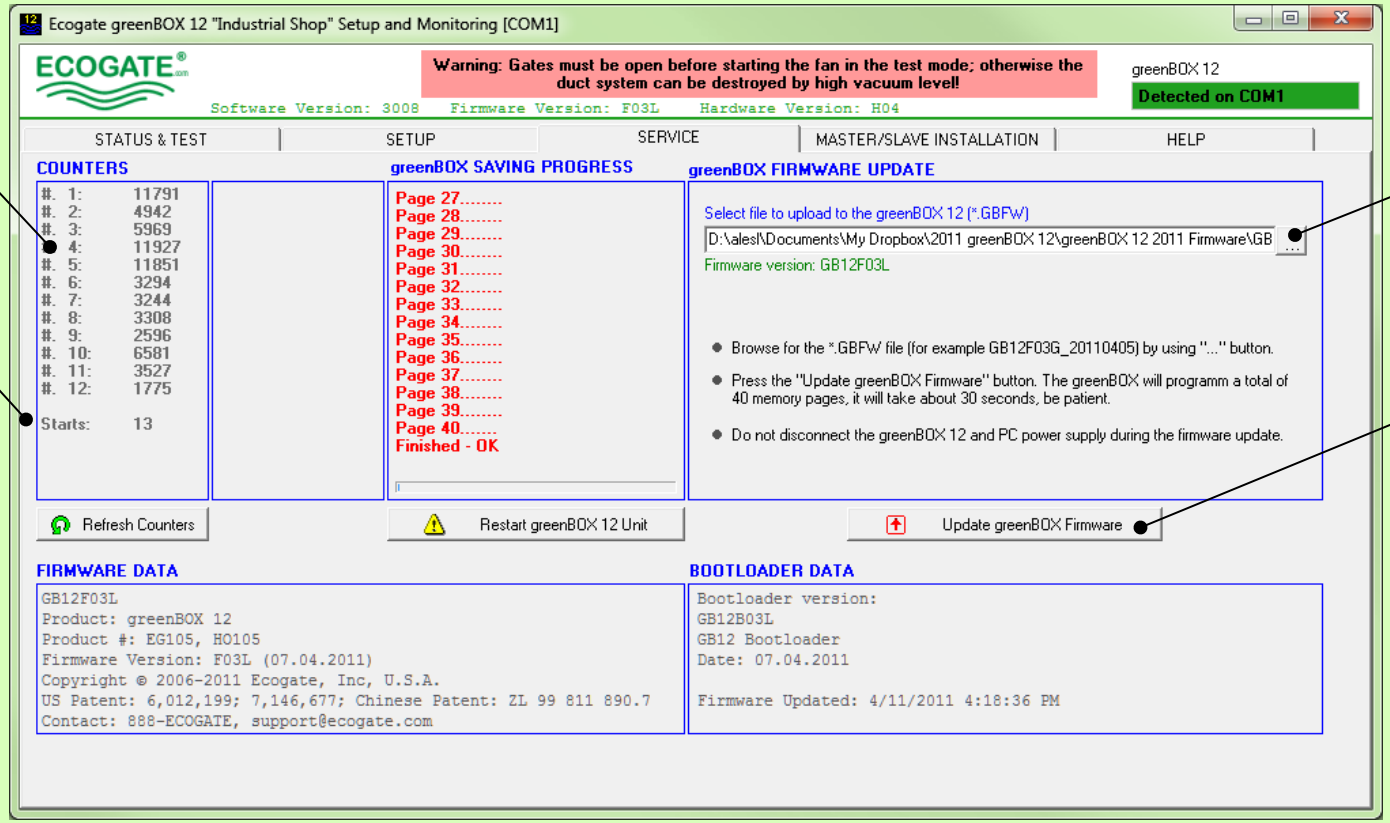
The greenBOX® 12 Service Page displays the system counters (how many times each particular gate was cycled, how many times the greenBOX was powered on) as well as the firmware and bootloader data.

The Service page gives the user an option to update the greenBOX 12 firmware from a file. To do this follow the steps below:

1. Do not disconnect the greenBOX 12 and PC power supply during the firmware update.
2. Browse for the *.GBFW file (for example GB12F03E_20110404.GBFW) by using the "…" button.
3. Press the "Update greenBOX Firmware" button. The greenBOX will program a total of 40 memory pages, it will take about 30 seconds.

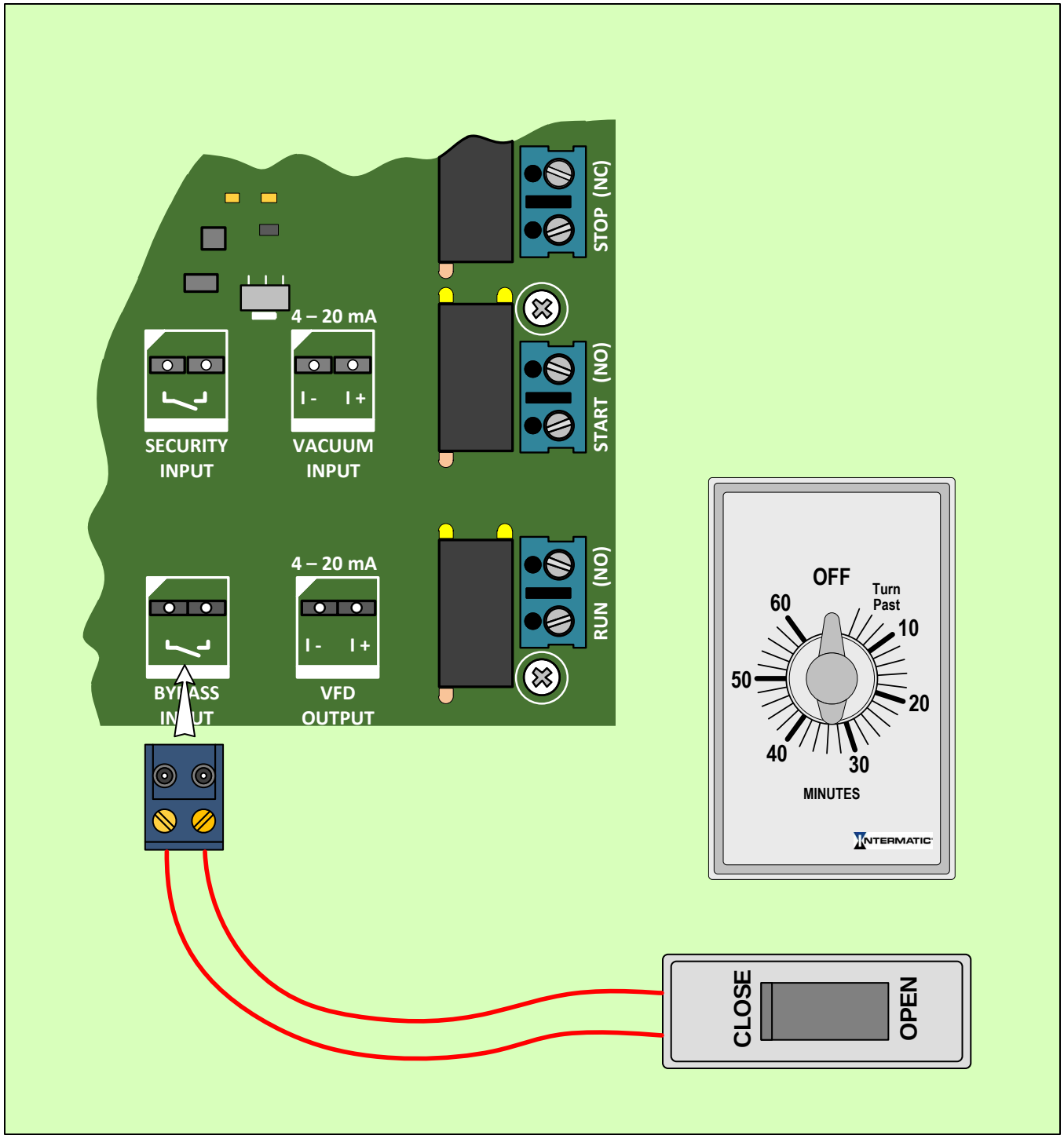
HOW MANY TIMES WAS EACH PARTICULAR GATE CYCLED

HOW MANY TIMES WAS THE GREENBOX STARTED (= HOW MANY TIMES THE POWER WAS CONNECTED)



1. PRESS THIS BUTTON TO **BROWSE FOR THE FIRMWARE FILE** ON YOUR PC

2. PRESS THIS BUTTON **TO UPDATE THE GREENBOX 12 FIRMWARE** AFTER YOU HAVE SELECTED THE CORRECT FILE USING THE BUTTON ABOVE



17. BYPASS INPUT (OPTIONAL)

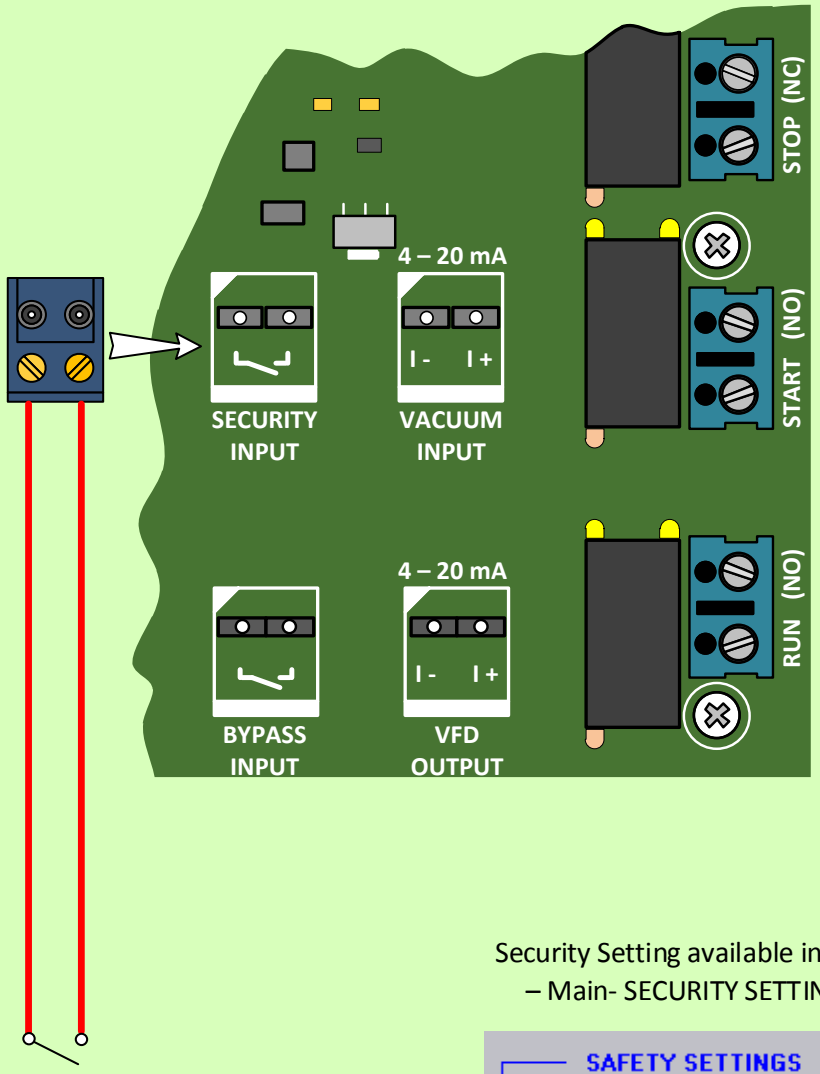
If practical for your intended use, you can connect the wired low-voltage switch to the "**BYPASS INPUT**".

<u>This switch will open all gates and start the fan.</u>

This can be useful for factory cleaning. Ecogate recommends using Intermatic Auto Shut-Off Timer (instead of a switch) that will close the contact only for a specified amount of time (for example 15 minutes) to avoid a problem with an operator leaving the system in bypass mode for prolonged time.

Recommended timer: Intermatic FF60MC commercial duty 60 min timer with SPST contact, (STST = Single Pole Single Throw), 60 minutes (breaks circuit at end of timing cycle), UL & CSA Listed.

If the variable speed drive with the contactor bypass is used to control the fan, then bypass free contact from the VFD must be connected to greenBOX bypass input (to open all gates to protect duct system against negative pressure).



This contact should be open if the air lock or the transport fan of the dust collector is <u>not running properly</u>.

Security Setting available in Setup – Main- SECURITY SETTINGS:

18. SECURITY (ENABLE) INPUT

The Power MASTER ENABLE input should be preferably used to enable system (fan) operation. If Power MASTER VFD is not used, you can use greenBOX 12 SECURITY input instead.

<u>Function description: If the security input is open, the greenBOX will stop the fan and open all gates</u> (this behavior is programmable; see software setup below) and the SECURITY indicator is flashing.

It is important to use ENABLE or SECURITY INPUT for dust collectors with the air lock and with transport fan, cleaning etc. The ERROR output of the dust collector PLC should be connected to the SECURITY INPUT of the greenBOX.

It is not necessary to use security input contact for a small dust collectors without air lock and without transport fan.

The recommended SECURITY SETTINGS are:

1. **<u>Open Gates at Fan Stop = ENABLED</u>** (will open gates if the system is in stop)

2. **<u>Security Input – Open Gates = ENABLED</u>** (if security input is open, gates will open)

3. **<u>Security Input – Run Fan = DISABLED</u>** (if security input is open, the fan will stop)

It is necessary that the fan START/STOP be always controlled by the greenBOX 12 unit to allow proper security function.

19. FAN MOTOR STARTER

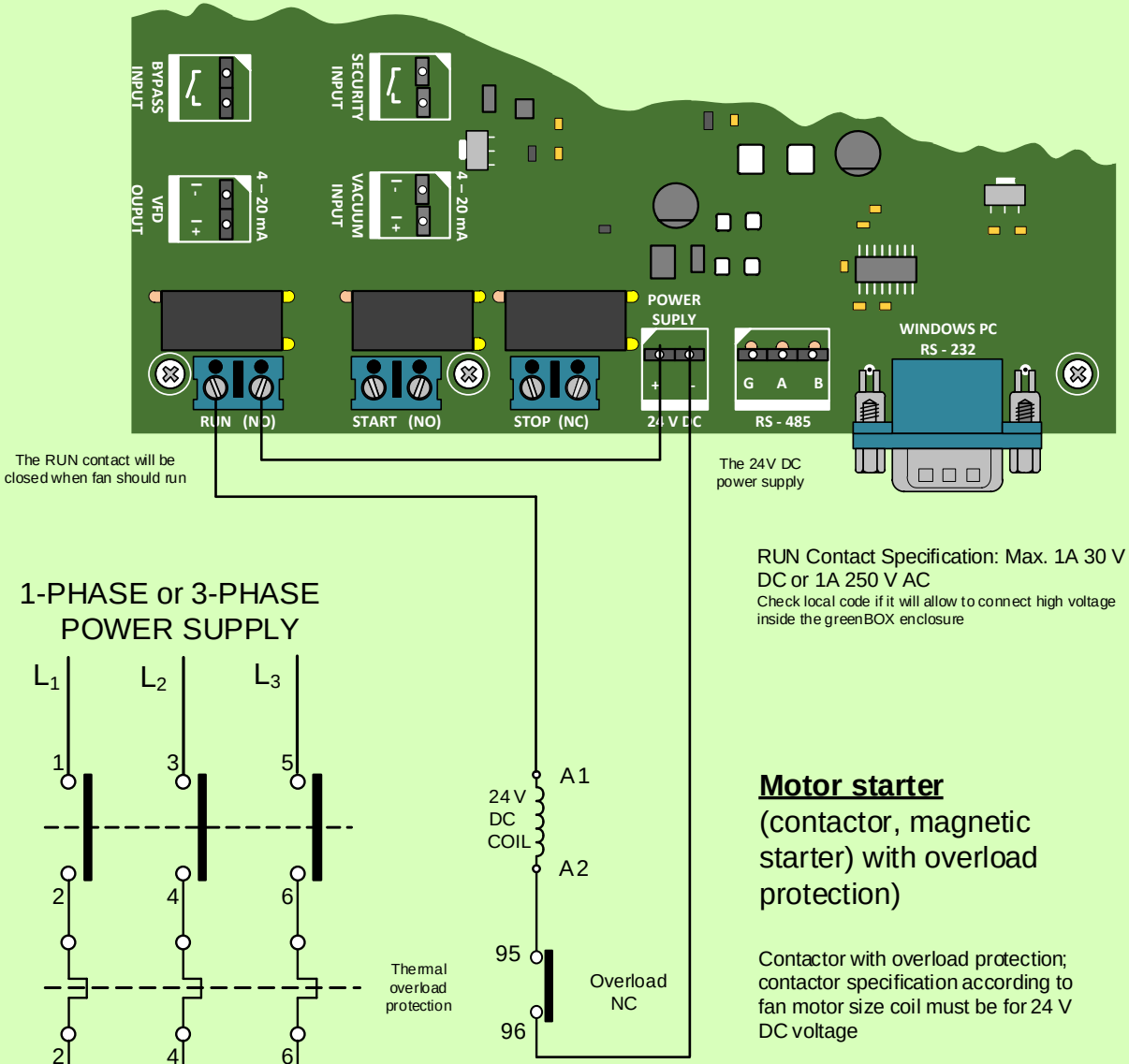
Use optional motor starter controlled by greenBOX 12 RUN contact if you are not using Power MASTER VFD (or 3rd party VFD).

If you don't have a motor starter (magnetic starter, contactor) delivered with your dust collector, an electrician can install the contactor with motor overload protection according to this schematic diagram.

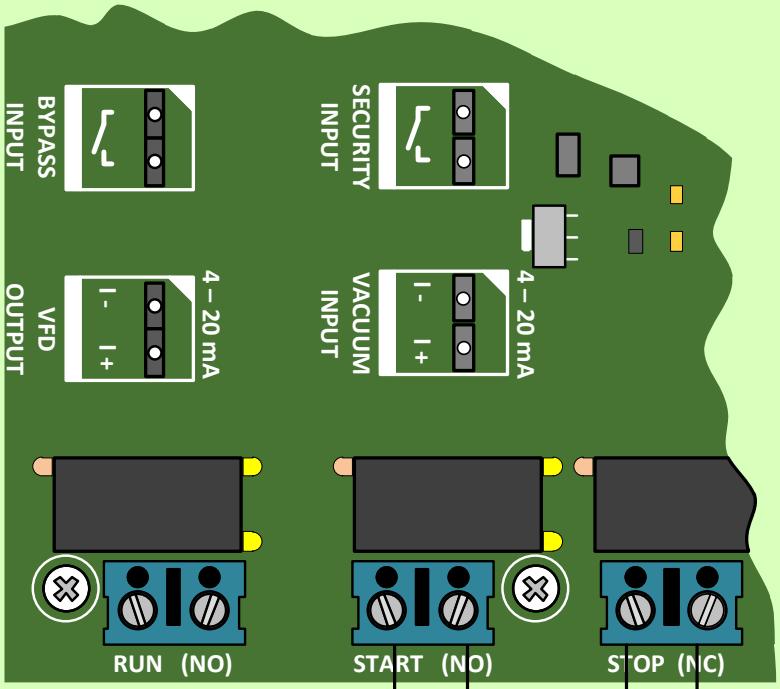
The contactor size should be selected according to the fan motor specification (size in HP and voltage). **The contactor coil should be preferably for 24V DC.**

The RUN contact is dry (24V DC power supply is not provided), but according to schematic diagram you can use 24V DC used for the greenBOX power supply (wires from power supply and wires to contactor coils will be wired in parallel).

The RUN <u>contact is closed fulltime when dust collector should run, and open when dust collector should stop</u>.



You can use for example EATON XTCE0**18**C10TD Motor Starter with a 24 V DC coil, and EATON XTOB0**16**CC1 Overload Protector. The entire line is available via Amazon.com or www.imc-direct.com (imc-direct also has a CHAT window where you can have advise for your installation). Both are available at different AMP levels to handle whatever the fan motor is specified. **The red letters are the AMP level for that unit**.



START TERMINAL OF GREENBOX IS CONNECTED IN PARALLEL TO START BUTTON

STOP TERMINAL OF GREENBOX IS CONNECTED IN SERIES WITH STOP BUTTON

START (NO) BUTTON

STOP (NC) BUTTON

ONEIDA, GRIZZLY, PENNSTATE OR SIMILAR FAN MOTOR STARTER WITH START AND STOP BUTTONS

Contacts Specification: Max. 1A 30 V DC or 1A 250 V AC
Check local code if it will allow to connect high voltage inside the greenBOX enclosure

20. START/STOP FAN MOTOR

Use this schematic diagram if you connect the greenBOX to a commercial dust collector with START and STOP buttons on the motor starter (or equipped by REMOTE START and STOP terminals) and you are not using a VFD.

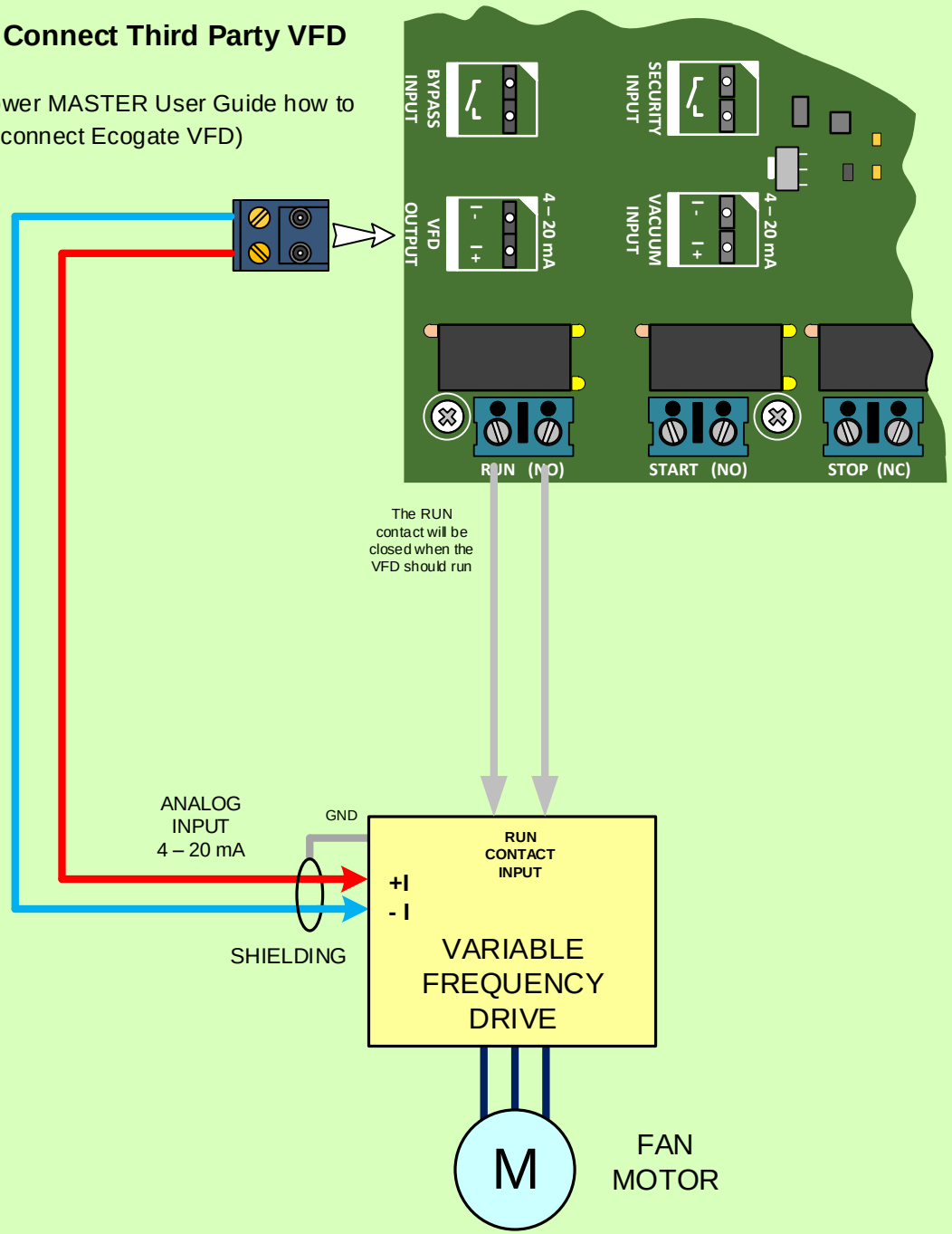
The **greenBOX START contact** should be wired in parallel with the START button of the motor starter. When dust collector should start, the START contact of the greenBOX will be closed for about 1 sec.

The **greenBOX STOP contact** should be wired in series with the STOP button of the motor starter (if motor starter is not prewired for an external STOP button, it will require that one wire be disconnected - see “X” on the schematic diagram on the left). When dust collector should stop, the STOP contact will be open for about 1 sec.

If you will install a new contactor (motor starter) for the fan motor, see the alternative connection diagram at previous page.

How to Connect Third Party VFD

(Check Power MASTER User Guide how to connect Ecogate VFD)



21. VARIABLE FREQ. DRIVE

This is optional schematic diagram if you are planning to use 3rd party VFD.

We actually recommend to use Ecogate Power MASTER VFD because connection to greenBOX 12 is very simple – by one twisted shielded cable pair and VFD is completely preprogrammed. Ecogate is not able to provide technical support for 3rd party VFDs.

If you prefer to use third party drive - see schematic on left - use the **RUN free** contact to start the drive, and connect analog output **"4-20 mA VFD OUTPUT"** to the variable speed drive 4-20mA analog input to adjust the fan motor speed.

If the variable frequency drive (VFD) with contactor bypass is used to control fan, then bypass free contact (which is closed if the drive is in bypass – manual -mode) from the VFD must be connected to greenBOX Bypass input (to open all gates to protect duct system against full negative pressure).

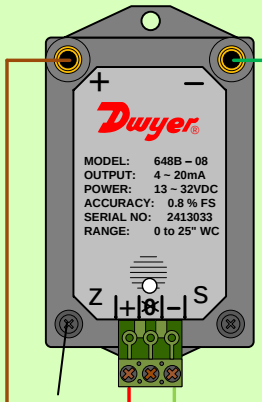
22. PRESSURE SENSOR

If you are using Ecogate Power MASTER VFD two pressure sensors are built-in the enclosure – use them (see Power MASTER user guide).

If you are not using Power MASTER pressure sensor is optional, but it is highly recommended (available from Ecogate). The pressure value is displayed on the Status & monitoring page of the Ecogate "greenBOX 12 Setup & monitoring" software – only if a Windows PC is connected. The pressure limit can be set to **protect the duct system – see inset.**

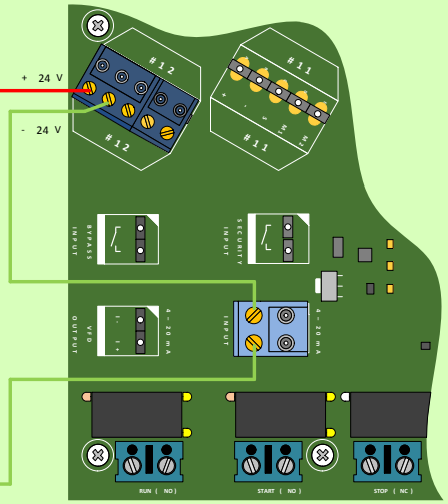
The pressure sensor is connected to read the pressure between the fan inlet and outlet – it is very helpful to determine proper system function, and for system calibration.

If you are not using Power MASTER VFD: use the pressure transmitter with the 4-20 mA output and 24V DC power supply. The sensor should be connected based on the schematic diagram on this page. Use for example Dwyer 648-08 model (0-25 "wc), available from Ecogate.

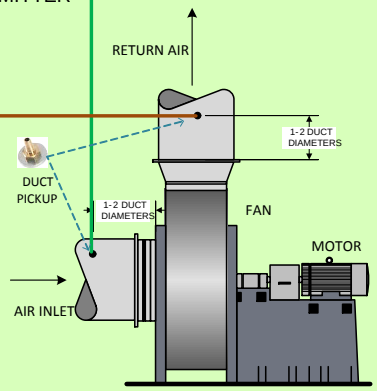


Set ZERO button

After installation while hoses to fan inlet and outlet are not yet connected, with greenBOX and sensor powered press SET ZERO button on the sensor (bottom left).



DWYER 648B-08
PRESSURE TRANSMITTER
4 – 20 mA



Sensor Pressure Connections

1. The tubing supplying pressure to the sensor can be practically any length required. Two integral barbed tubing connections are on the sensor - they are dual sized to fit both 1/8″ and 3/16″ (3.12 and 4.76 mm) I.D. tubing. Use preferably black tubing to eliminate possible light leak to the spark detection system.

2. Be sure the pressure rating of the tubing exceeds the duct system the pressure operating range.

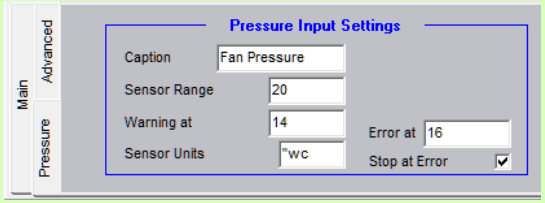
Duct Pickup

1. Use a duct pickup that will not create any obstacles inside the duct so that the local pressure reading is not altered.

Note

if you cannot install the pressure sensor at the fan, you can alternatively connect it to the main duct (LO will be connected to the main duct, HI will be open)

Install a negative pressure sensor inside the building. The sensor is calibrated for vertical installation.



In the greenBOX software Additional Settings-Pressure enter "**Caption**" that will be used on the status page, the "**Sensor Range**" (20" w.c. for Dwyer sensor), "**Warning at**" (for example 14" w.c.), the pressure "**Sensor Units**" (for example "w.c.), and "**Error at**" (for example 16; the greenBOX will stop the fan if the pressure is higher for 10 sec or more).

Note: if you expect temperatures -10F or below, it is recommended to use tubing of double internal diameter to reduce problems with condensation freezing inside the tubes.

23. greenBOX MAIN BOARD OVERVIEW

INDICATORS

- **FAN** - **RUN** IS ON → FAN IS RUNNING
- **BYPASS** IS ON = ALL GATES ARE OPEN AND FAN RUNS
- **SECURITY** IS FLASHING = CUSTOMER SECURITY INPUT STOPS greenBOX
- **POWER** IS ON = INCOMING 24V IS PRESENT

MICROPROCESSOR WITH FLASH MEMORY KEEPS SETUP VALUES EVEN WITHOUT POWER SUPPLY

COMM (=COMMUNICATION) INDICATOR IS ON WHEN greenBOX IS CONNECTED TO PC

GATE OPEN INDICATORS 1...12

SENSOR **INPUT SIGNAL** INDICATORS 1...12

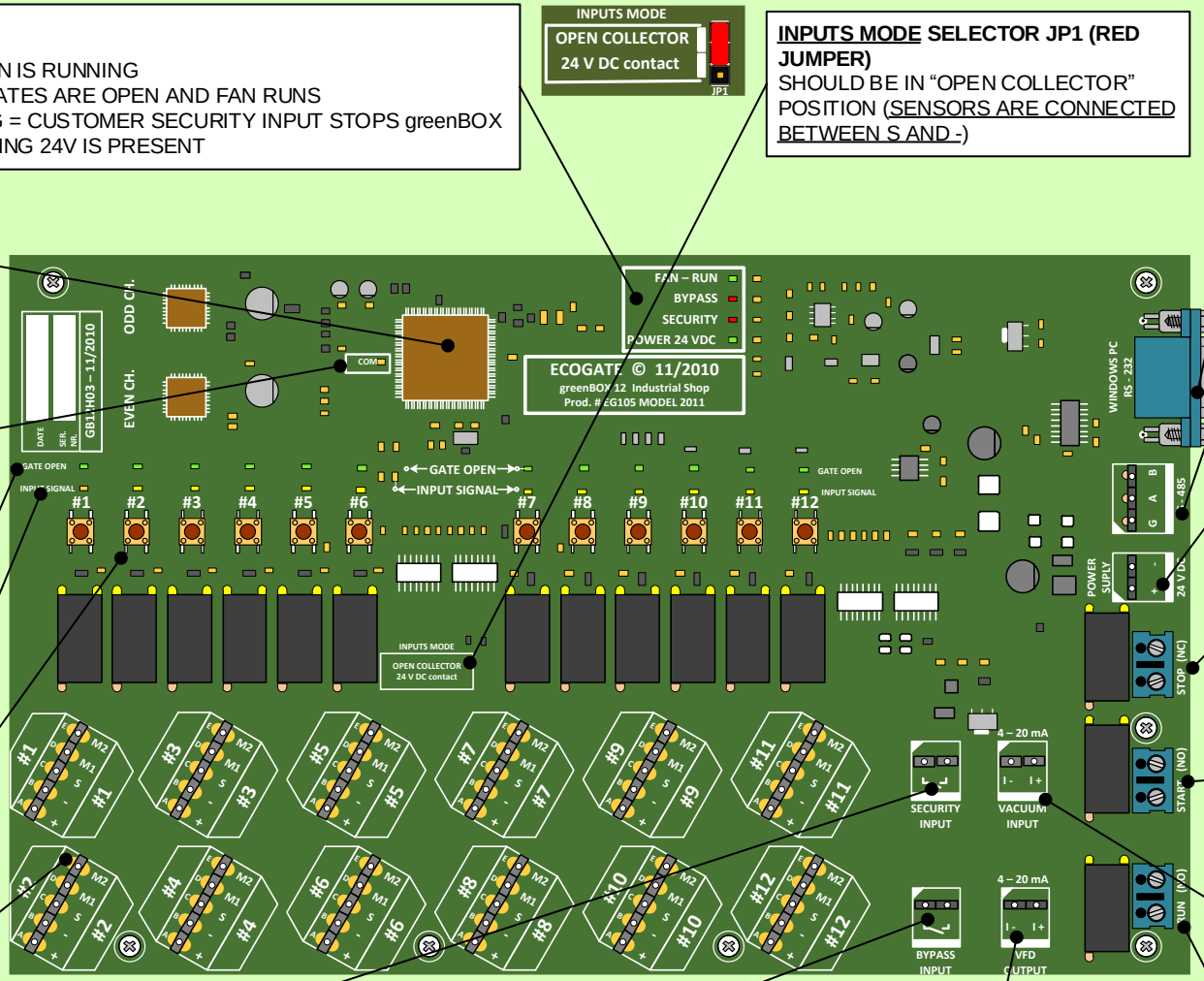
TEST BUTTONS (TO OPEN/CLOSE GATES) 1...12

#1...#12 GATE & SENSOR TERMINALS (M1,M2 = GATE MOTOR; +,- =POWER SUPPLY FOR OPTIONAL SENSOR, S = OUTPUT FROM SENSOR)

SECURITY INPUT (STOPS SYSTEM FUNCTION WHEN OPEN)

BYPASS INPUT (WHEN CLOSED, IT OPENS ALL GATES AND RUNS FAN)

ANALOG OUTPUT 4-20mA FOR THE VARIABLE FREQUENCY DRIVE (VFD)



INPUTS MODE SELECTOR JP1 (RED JUMPER) SHOULD BE IN "OPEN COLLECTOR" POSITION (SENSORS ARE CONNECTED BETWEEN S AND -)

WINDOWS PC USE USB TO SERIAL ADAPTER TO CONNECT PC

RS-485 TERMINAL FOR POWER MASTER VFD (OR 2nd greenBOX 12 IN **MASTER/SLAVE INSTALLATION)**

24V DC POWER SUPPLY

USE **STOP** CONTACT OUTPUT (1 SECOND PULSE, N.C.) TO STOP DUST COLLECTOR

USE **START** CONTACT OUTPUT (1 SECOND PULSE, N.O.) TO START DUST COLLECTOR

PRESSURE SENSOR INPUT 4-20 mA (OPTIONAL)

USE **RUN** CONTACT OUTPUT (N.O.) TO ENERGIZE THE CONTACTOR COIL OR TO START VARIABLE FREQUENCY DRIVE

24. TROUBLESHOOTING

greenBOX® is not working (all LED indicators are OFF)	Power supply is not present (there is no replaceable fuse inside delivered power supply)	Check incoming power to greenBOX®; F1 1Amp fuse for the sensors is automatically resettable (disconnect power for two minutes till fuse cools down)
The gate closes instead of opening or opens instead of closing	The gate is connected with incorrect polarity	The M1 and M2 wires are connected to the opposite terminals; swap their connections
Motorized Ecogates are not working properly	Test the gate by using 9V battery connected to M1 and M2 terminals, check cable terminals	Test functions of the gates by using 9V battery (positive polarity connected to M1 and M2 should open the gate, reversed polarity should close the gate)
Airflow in the main duct is too low; sawdust can settle in ducting	The minimum airflow is too low (if you are using the VFD increase min. & max. frequency)	Set a higher number of initially-open gates (%), increase the VFD minimum and maximum range (%)
Negative pressure in the system is too high	The number of initially-open gates is too low (if the VFD is used decrease MIN & MAX frequency) (WARNING: some spiral ducting can be destroyed (collapsed) at negative pressure less than 13" w.c.)	Set a higher number of initially-open gates, decrease the VFD minimum and maximum range (%)
Air velocity at open gates is too low/ there is not enough air at running workstations	The number of “initially-open gates” is too high (if the VFD is used increase both minimum & maximum range %)	Set a lower number of initially-open gates (%), increase the VFD minimum and maximum range (%)
Gate is running only for a short period of time, then stops	The maximum preprogrammed current to the gates is set too low.	Connect the greenBOX 12 to PC via serial cable, start Setup and Monitoring software and go to Setup tab –> Additional Setting –> Advanced –> Gate Function –> Max. current and set current to 600 mA (if more then one gate is connected to the one greenBOX output, then this current should be set to higher value) and then press “Save to greenBOX” button.
The Setup and Monitoring program is not communicating with greenBOX	Check if the SERIAL port is on address 1…10 (some serial ports use higher address). If you are using USB-serial adapter, check whether its software driver was installed properly (see page about the USB to Serial adapter installation). Preferably use USB to Serial adapter recommended by Ecogate.	

25. greenBOX 12 SPECIFICATIONS

MODEL	**greenBOX 12**, product number EG 105
FIRMWARE	Firmware is user updatable from the "Ecogate greenBOX 12 Setup & Monitoring Software"
SIZE	Approx. 10.4" x 14.6" x 3.3" (265 mm x 370 mm x 85 mm), green painted metal type 1 enclosure
WEIGHT	Approx. 7.3 Lb (3.3 kg) without power supply adapter
POWER SUPPLY	**Power supply adapter 115V-230 V AC, 50-60 Hz, 40VA max**.; 24V DC 2 Amps. Baseline consumption: 5W (0.15 Amps, 8VA); consumption will increase to 12W with one gate opening /closing, to 18W with two gates moving etc.
ECOGATES compatibility	**ECOGATE motorized gates 4" to 18"** total 12 channels for gates/sensors (power supply 24 V DC for gates is included); up to two smaller gates operated at a same time can be connected to one output; two greenBOX units can be connected together by RS-485 to control gates for up to 24 workstations
INDICATION & MONITORING	**INPUT SIGNAL** (signal from sensor) indicators (12x), **GATE OPEN** status indicators (12x), **POWER** supply indicator, **FAN RUN** indicator, **BYPASS** indicator, **SECURITY** indicator, **COMM** (communication with Windows PC); all indicators are on board (inside greenBOX 12 enclosure); status can also be monitored via Windows PC connected via serial channel (up to 50 ft cable, longer cable with optional RS232/485 adapters) with "Ecogate greenBOX 12 Setup & Monitoring software". Use USB to serial adapter for computers without serial connector.
ACCESSORIES (optional)	Motorized Ecogates 4" to 18" (EG204 -EG218), Ecogate AC-DC VOLT, AC VOLT Sensors, CURRENT sensor, Ecogate Power MASTER variable frequency drive for 10 to 400 HP fan motors
INPUT, OUTPUTS	**Inputs**: **Sensor input for each gate** (if input is active, gate will be open; inputs are selectable as a contact 24V DC input or input for sensor with open collector); Input for "**BYPASS**" switch to open all gates and start dust collector; "**SECURITY**" input for connecting any customer securities; **VACUUM INPUT** for standard pressure transmitter 4 -20 mA, **Outputs**: free (dry) **RUN** contact to start/stop variable frequency drive (or fan via optional contactor if VFD is not used); **START** and **STOP** (dry contacts to start/stop dust collector, pulse about 1 sec.; RUN, START, STOP contacts rating: 24V DC or 230V AC, max. 1 Amp); analog output (**4-20 mA**) to adjust fan RPM via variable frequency drive (if VFD is used); output for the twelve motorized gates (+24V DC for gate opening, -24V DC for the gate closing).
SETTINGS (Windows software and cable is delivered with system)	Settings by using Windows PC with serial channel: **gate timings** (on delay, off delay, opening/closing time), **gate diameters**, **percentage of required initially open gates** (to maintain minimum transport air velocity), **negative pressure compensation (**for the workstations at the end of ducting) as a percent of the fan RPM, **dust collector on delay** (0-99 sec) and **dust collector shut-off delay** (0 to 99 minutes), **variable frequency drive minimal and maximum RPM**, **security functions** (configurable in setup: all gates can be open or closed in stop mode, fan can stop or start if security input is open; the fan can be stopped if pressure sensor is installed and "Stop at Error" function is enabled), **cleaning** function (to sweep duct in regular intervals, or at system stop), and **inactivity time** after power up, **pressure sensor input** settings (legend, sensor range, warning at, and sensor units).

26. LIMITED WARRANTY, SERVICE, AND SUPPORT

The greenBOX 12® control unit is warranted to the owner for a period of ONE YEAR from the date of purchase against defects in manufacture by ECOGATE, Inc. – not by the dealer from whom the system was purchased.

What ECOGATE Inc. Will Do
If the greenBOX 12® control unit develops such a defect within a one-year period, it will be repaired or replaced.

What Limited Warranty Does Not Cover

ECOGATE® will not repair defects under its limited warranty related to servicing not performed by ECOGATE, Inc. ECOGATE® will not provide any warranty service if the system shows evidence that it has been tampered with, misused, or altered, for example:

- After a wrong power supply has been applied, Visible cracking, Moisture damage

ECOGATE IS NOT LIABLE FOR INCIDENTAL, SPECIAL, OR CONSEQUENTIAL DAMAGES. Some states do not allow the exclusion or limitation of incidental, special, or consequential damages, so the above exclusion or limitation may not apply to you.

Service of Your ECOGATE® System

If your ECOGATE® system should ever need servicing, send it to ECOGATE Inc., addressed as follows:

ECOGATE, Inc.
Service
5669 Whitnall Hwy
North Hollywood
CA 91601

Because of a possible loss, we recommend insuring your system, return receipt requested, when using any mail service.

Technical Support

Should you have any questions on the operation or installation of this product, please refer first to the User and Installation Guide for help. Should you find you still have any questions, use our e-mail (support@ecogate.com) or call our technical support line at 888-ECOGATE.