



AKC0₂ and AK-Auto C0₂ INJECTION SYSTEMS

AKC0₂ HIGH and LOW
AKC0₂ NR and AK-AUTO

INSTALLATION & OPERATION GUIDE

Technical Support 800.831.7133

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CHAPTER 1 INFORMATION

1.1 IMPORTANT WARNING AND SAFETY INSTRUCTIONS



SERIOUS BODILY INJURY OR DEATH CAN RESULT IF THIS PRODUCT IS NOT INSTALLED AND USED CORRECTLY.

PLEASE READ THIS USER MANUAL completely before installing or operating the equipment.



INSTALLERS, POOL OPERATORS AND POOL OWNERS MUST READ THESE WARNINGS AND ALL INSTRUCTIONS BEFORE USING THIS PRODUCT.



Most states and local codes regulate the construction, installation, and operation of public pools and spas, and the construction of residential pools and spas. It is important to comply with these codes, many of which directly regulate the installation and use of this product. Consult your local building and health codes for more information.



IMPORTANT NOTICE - Attention Installer: This Installation and Operation Guide ("Guide") contains important information about the installation, operation and safe use of this product. This Guide should be given to the owner and/or operator of this product.



Before installing this product, read and follow all warning notices and instructions in this Guide. Failure to follow warnings and instructions can result in severe injury, death, or property damage. Call (800) 831-7133 for additional free copies of these instructions. Please refer to www.pentairpool.com for more information related to this products.



RISK OF ELECTRICAL SHOCK OR ELECTROCUTION: BEFORE WORKING ON THIS PRODUCT: Always disconnect power to the unit at the circuit breaker before servicing. Failure to do so could result in death or serious injury to service person, pool users or others due to electric shock. BE SURE TO DISCONNECT ALL SUPPLY CONNECTIONS BEFORE SERVICING.

AKCO₂ HIGH, LOW and NR are Class 1 products for protection against electric shock and a Type 1 products with regards to disconnection of the control circuits. This product must be installed by a licensed or certified electrician or a qualified pool professional in accordance with the National Electrical Code (NEC), NFPA 70 or the Canadian Electrical Code (CEC), CSA C22.2. All applicable local installation codes and ordinances must also be adhered to. Improper installation will create an electrical hazard which could result in death or serious injury to pool users, installers or others due to electrical shock, and may also cause damage to property.



Do not permit children to operate this equipment.



Risk of electrical shock. Connect this product to a ground-fault interrupter-circuit (GFCI). Contact a qualified electrician if you cannot verify that the receptacle is protected by a GFCI.

1.1

IMPORTANT WARNING AND SAFETY INSTRUCTIONS

Be sure to observe the following safety precautions:

- Unit must be properly connected to earth ground.
- Never apply power unless unit is properly mounted with no internal parts exposed.
- Never service unit with power applied, always turn OFF main circuit breaker to unit and all equipment when servicing.
- Touching the controller's internal parts could result in injury and or damage to the controller. In case of a malfunction, only a qualified technician should repair the unit.
- Risk of Electric Shock. Connect only to a grounding type receptacle protected by a ground-fault circuit interrupter (GFCI). Contact a qualified electrician if verification on the receptacle is not protected by GFCI.
- Do not bury cord. Route cord to eliminate abuse from heater exhaust, lawn mowers, hedge trimmers, and other equipment.
- Be careful not to damage any of the insulation on wires or the power cord. Should the cord be damaged, return it to your dealer for a replacement. Continued use could result in fire or electric shock.
- To reduce the risk of electric shock, do not use an extension cord to connect unit to electric supply; provide a properly located GFCI.
- Take necessary precautions while working with high pressure gas.

1.2 WARRANTY

Pentair Water Commercial Pool and Aquatics™ ("Pentair") warrants the **AKCO2** to be free from defects in manufacturing and workmanship for a period of One (1) YEAR from the date of manufacture for the electronic module. All external parts have a warranty of one (1) year. Other equipment is covered by manufacturer's own warranty. During the warranty period, any defective parts will be repaired or replaced when necessary by Pentair.

This warranty does not cover: (a) the buyers' labor or any servicing fees related to replacement of the Product; (b) damage resulting from the use of this Product in other than its normal manner; (c) damage from misuse, accident or neglect; (d) damage from improper testing, operation, or installation; (e) not operating the Product on a dedicated (separate) circuit or under conditions other than those recommended or at voltages or amperages other than the voltage or amperage indicated on the Product; and (f) acts of Mother Nature (i.e. lightning, electrical storms, floods, etc.). In addition, attempting to service or modify the Product will render this Warranty Void. Defective parts should be returned immediately to the local Pentair dealer, any parts returned to the factory require a return of material authorization code to subsequently generate an RMA (Return to Manufacturer form). A Pentair Technician will analyze the returned part and determine the cause of failure and process accordingly.

1.3 AKCO₂ OVERVIEW

SUMMARY: The AKCO₂ systems provide injection and absorption of CO₂ gas into a circulating water system, via solenoid with rate control valve. CO₂ is a natural, non-corrosive gas that can be used as a substitute for liquid acid in chemical treatment of aquatic systems. When dissolved in water it forms weak acid, H₂CO₃ (carbonic acid), which can be used to lower pH and raise total alkalinity.

AKCO₂ features as follows:

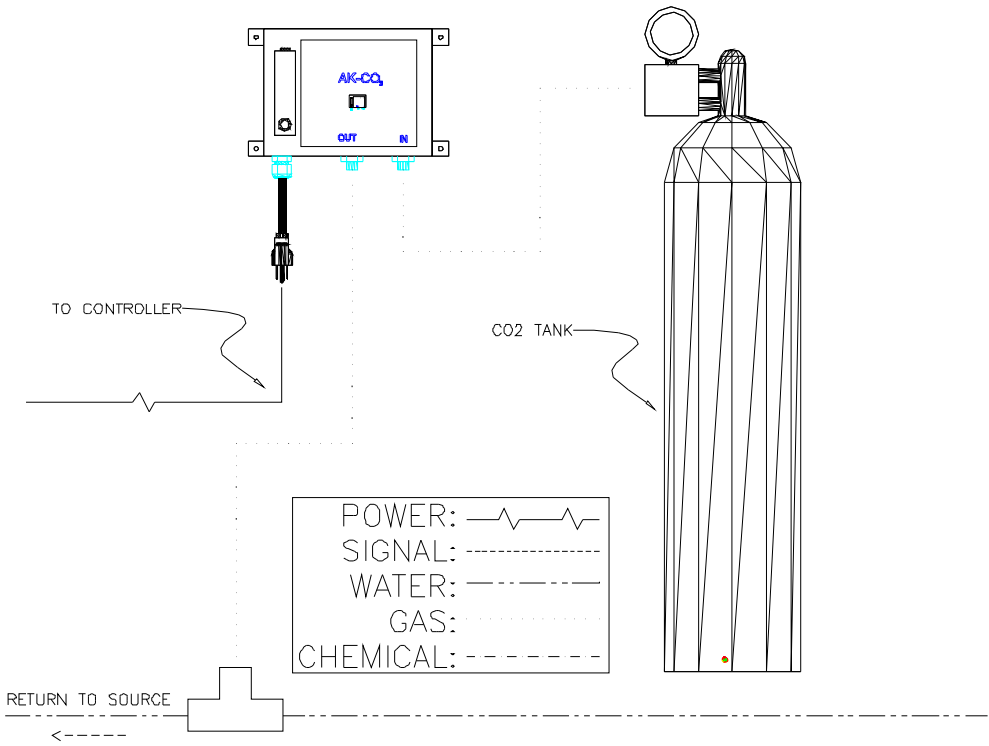
SOLENOID AND RATE CONTROL VALVE: U.L. Listed solenoid, bronze body with 1/4" connections are controlled via 120VAC coil relay housed in a vented anodized aluminum case. Rate control valve has full range adjustment and indicator. Capacity is 30 SCFH for AKCO₂ LOW and 100 SCFH for AKCO₂ HIGH.

REGULATOR: AKCO₂ LOW uses a U.L. Listed 50 PSI fixed output regulator with a 0 – 4000PSI tank pressure gauge. AKCO₂ HIGH uses a U.L. Listed 50 PSI fixed output **heated** regulator with a 0 – 4000PSI tank pressure gauge. AKCO₂ NR has NO REGULATOR.

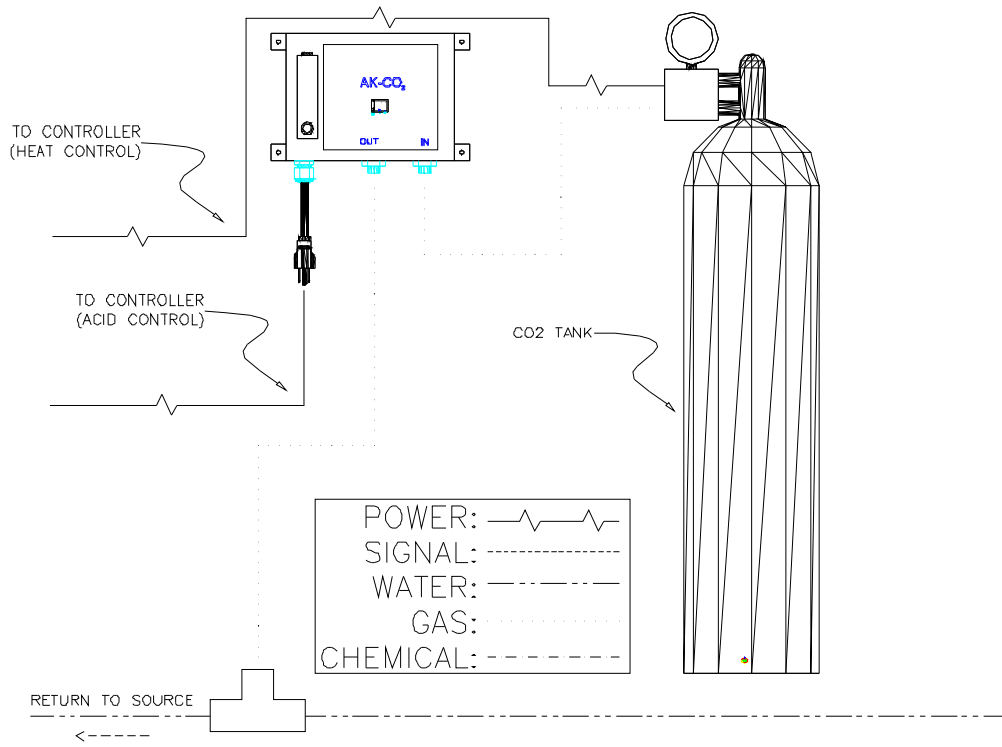
CO₂ INJECTOR ASSEMBLY: has a built-in check valve with 1/2 NPT threaded high-density porous polyethylene diffuser.

PLUMBING: All fittings are 3/8 Polypropylene Tube fittings, and the tubing is Low Density Polyethylene with a 120 PSI at 73 degrees F rating.

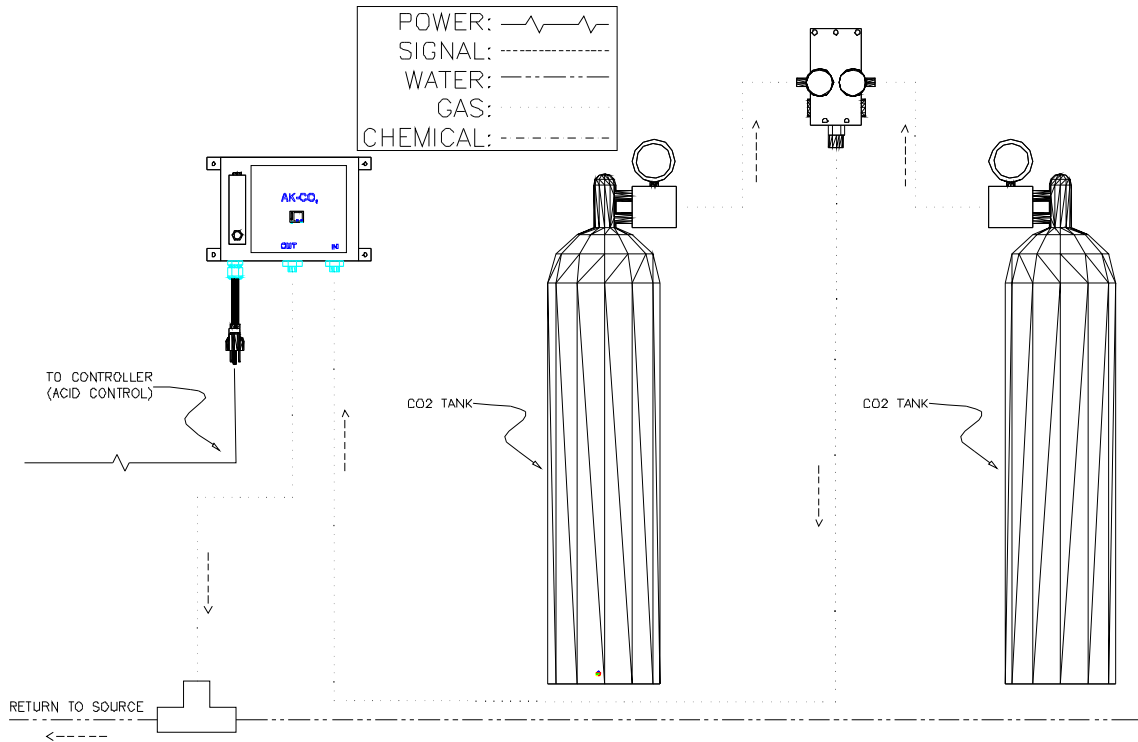
AKCO₂ LOW



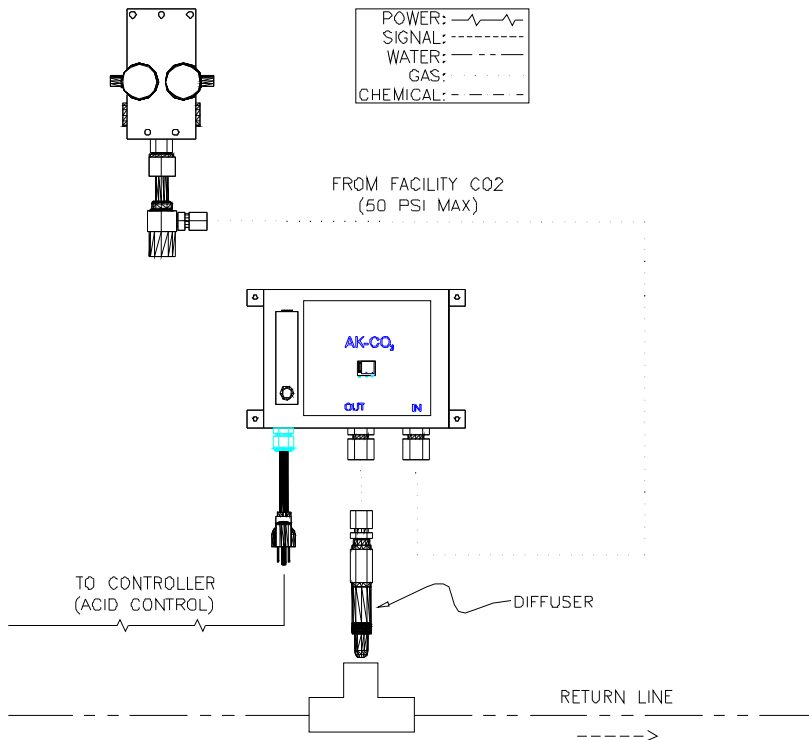
AKCO₂ HIGH



AK-AUTO



AKCO₂ NR



1.4 INTRODUCTION

The **AKCO₂ INSTALLATION AND OPERATION MANUAL** explains the procedures for proper installation and operation of the AKCO₂ series CO₂ injection systems.

The **INSTALLATION** portion, introduces the parts of the AKCO₂ and the process to follow when installing the electrical connections for the AKCO₂.

The **OPERATION** portion, describes how to use the AKCO₂.

If you have any questions regarding this product, please feel free to call your local dealer or Pentair Water Commercial Pool and Aquatics™ ("Pentair") directly.

CHAPTER 2 INSTALLATION

2.1 INSTALLATION PREPARATION

- **Receipt Inspection:** Upon receiving an AKCO₂ system, check the carton carefully. Report any damaged items directly to the shipping company. Go through the shipping list and verify that all items are present. Please contact your local dealer if any inventoried items are missing or have been damaged. Use care when unpacking equipment to avoid damage or loss of small parts.

Input Power: 120VAC.

Select INPUT devices: The AKCO₂ systems are designed to be used with Pentair controllers.

2.2 PLUMBING/ELECTRICAL INSTALLATION

Each electrical installation for the **AKCO₂** can be different. This manual gives the basic principles to be applied for any specific installation as follows:

- Identify the new and existing equipment to be connected.
- Determine the controller supplying on power.
- Determine the placement of the controller and mount. (See mounting below)
- Determine the AKCO₂'s mounting location, and mount.
- Locate CO₂ cylinder within six feet of controller.
- Use plumbing tape on all plumbing fittings and diffuser installation.
- Install the diffuser in the return line by drilling and tapping a ½ " NPT hole in the bottom of the line. **CAUTION!** The diffuser needs to be installed downstream of any equipment since the CO₂ produces a pH of around 5.5. Thread the diffuser up into the ½" NPT hole.
- Use only 3/8" O.D. Polyethylene pipe from the AKCO₂ to the diffuser.
- Connect the pressure regulator to the cylinder. The regulator has a fixed 50PSI output.
- Use only 3/8" O.D. Polyethylene pipe from the AKCO₂ to the regulator.
- Connect the control from a normally open relay set for 120VAC operation using 18GA pigtail. Or hardwire with Relay NO line voltage must be connected to the AKCO₂ "BLACK" wire, relay NO neutral must be connected to the AKCO₂ "WHITE" wire, and Relay GND (Ground) must be connected to the AKCO₂ "GREEN" wire.
- On AKCO₂ HIGH connect the regulator heater to 120VAC power.
- Connect the supply voltage.
- Test the operation of the AKCO₂.

WARNING! Be sure to have a licensed electrician perform all electrical wiring. This is important, as they will be familiar with the electrical codes in the local area.

2.2.1 ELECTRICAL AND CO2 SPECIFICATIONS

The following **electrical specifications** in the table below must not be exceeded.

ITEM	DESCRIPTION	LIMIT
Control	Power control form controller	120VAC
AKCO ₂ HIGH	To Regulator Heater	120VAC
CO ₂ Pressure	Before regulator (Bottle Pressure)	3000 PSI max
CO ₂ Pressure	After regulator	50 PSI max
CO ₂ Flow	AKCO ₂ LOW and NR flow	0 - 30 SCFH
CO ₂ Flow	AKCO ₂ HIGH flow	0 – 100 SCFH

2.3 MOUNTING THE AKCO2

Select a location for mounting the **AKCO₂**, meeting the following recommendations:

At least ten (10) feet from open water.

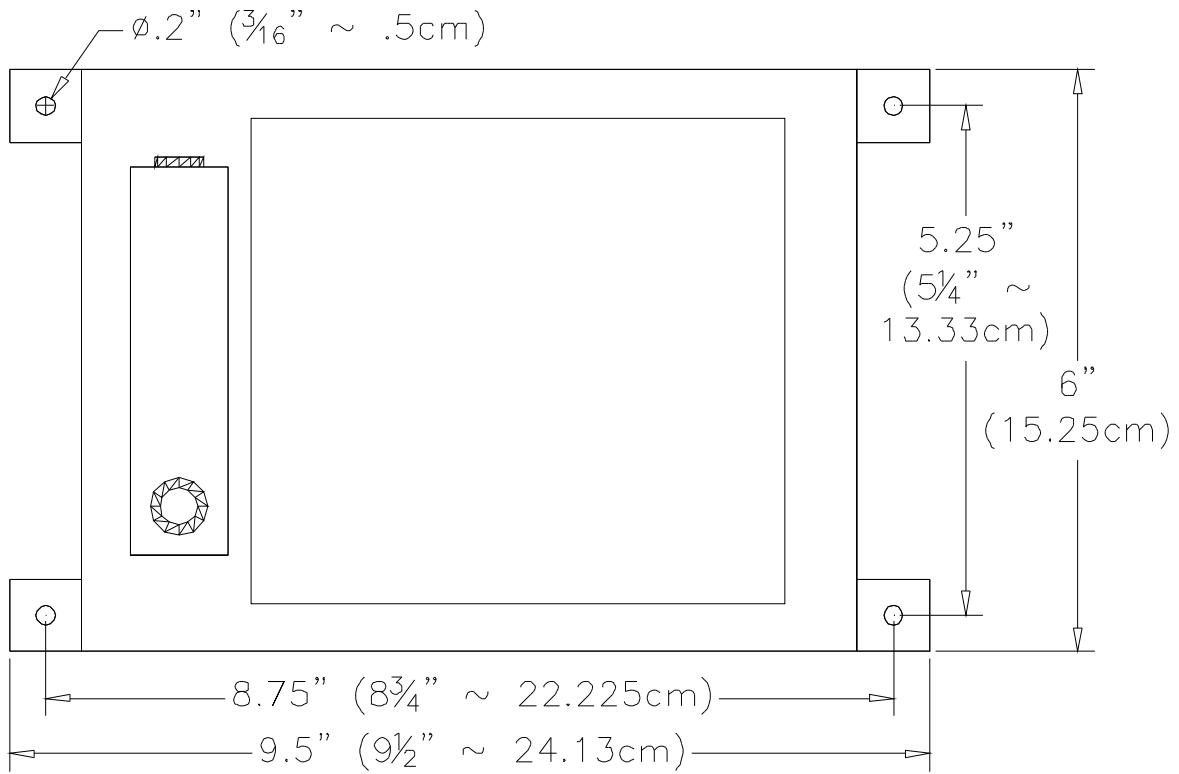
Supply power must be routed to the AKCO₂ in accordance with the applicable codes in the area; the supplied cord is not code in some areas.

Mount with four bolts.

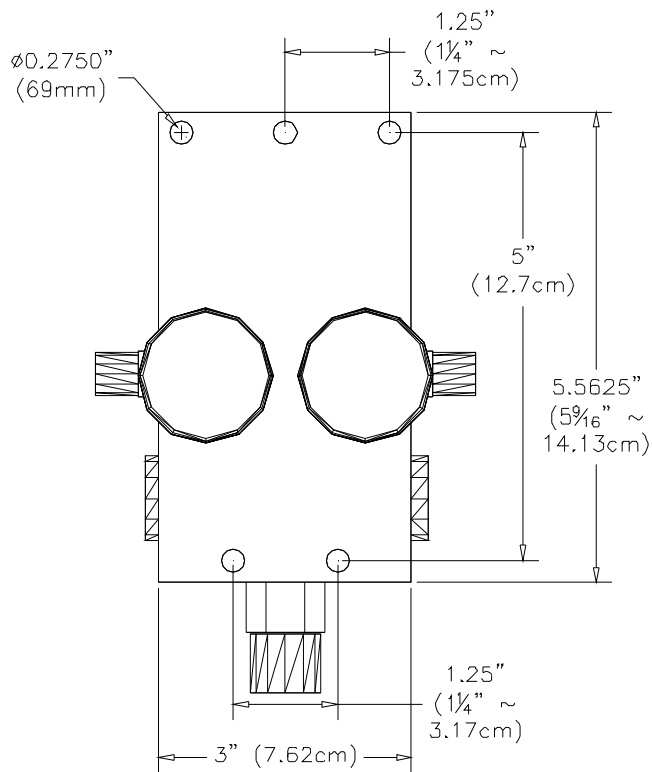
The environment should be free of chemical fumes and excessive heat. The maximum room temperature is 110 °F.

Mount as far as possible from sources of electrical interference.

Since the AKCO₂ produces a very low pH the Discharge should be plumbed after all other equipment just before the return to the pool. The Suction should be plumbed after the main filter.



AKCO₂ MOUNTING



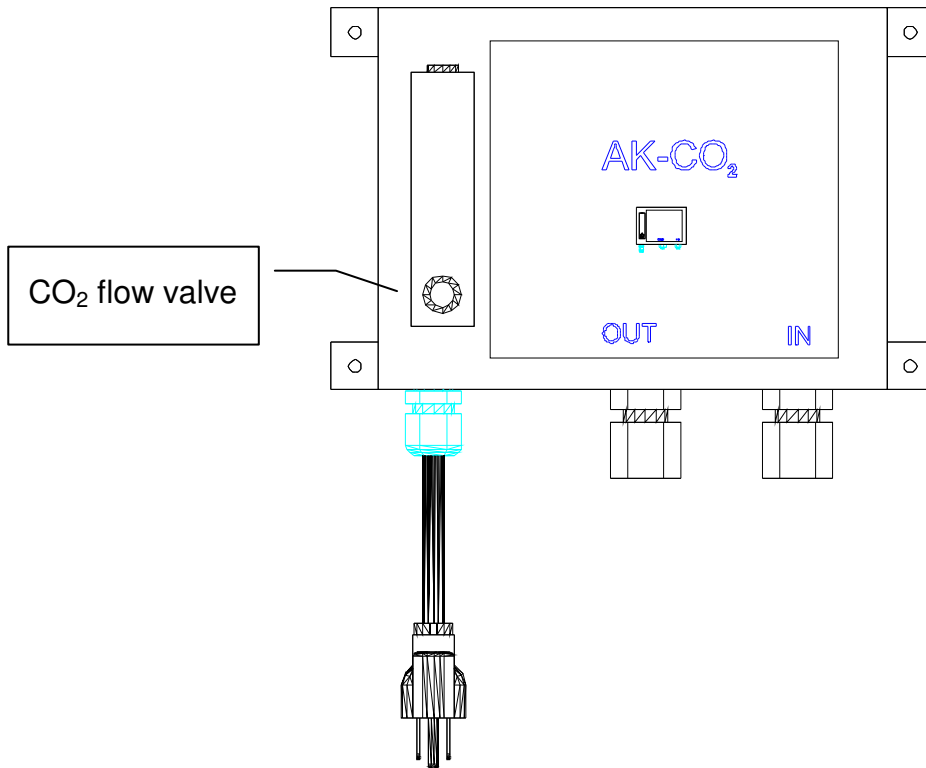
AK-AUTO MOUNTING

2.4 FINISHING AND TESTING

Once the AKCO₂ system has been installed the following steps are required for final system **finishing and testing**.

1. Perform STARTUP procedure.
2. Test system for leaks.
3. Record the feed rate calculated in the STARTUP nearby unit for future use.
4. Test and operate.

CHAPTER 3 OPERATION



3.1 CONTROLS

3.1.1 CO₂ ADJUSTMENT

Pressure: The **AKCO₂** has a fixed 50 PSI output regulator. If you use an adjustable regulator or facility supplied CO₂, set the output pressure no greater than 50 PSI.

FLOW: The **AKCO₂** CO₂ flow should be adjusted to as low as possible while still maintaining the desired pH control. A perfectly adjusted and balanced system will have CO₂ feed times of less than 1 minute for systems consisting of 2000 gallons or less and feed times of 1 to 5 minutes for systems greater than 2000 gallons.

3.2 AKCO₂ STARTUP

To startup an **AKCO₂** follow to steps below.

1. Start with the AKCO₂ control relay in the OFF position, the CO₂ cylinder valve closed, and the CO₂ flow valve closed.
2. Open the CO₂ cylinder valve and test the CO₂ lines for leaks with a soap solution.
3. Manually turn on the control relay and slowly open the CO₂ flow valve until the flow gage reads 5 SCFH for systems consisting of 2000 gallons or less and 20-25 SCFH for systems greater than 2000 gallons.
4. Turn off the control relay. The CO₂ flow should stop.
5. Hand check the system water pH. Record value.
6. Turn on the control relay. Note the time. For a LARGE body of water, greater than 2000 gallons, wait 5 minutes and then turn off the AKCO₂ control relay. For a SMALL body of water, less than 2000 gallons, wait 1 minute and then turn off the AKCO₂ control relay..
7. Hand check the system pH. Record the value. See the work sheet below and calculate the feed rate.
8. If the feed rate is too high redo steps 5 - 7 with the flow valve throttled to a lower flow. If the feed rate is too low redo step 5 - 7 with the flow valve throttled to a higher flow.
9. Once feed rate is adjusted set the feed and mixing times in the relay program and place the relay in automatic. Startup is complete.

AKCO₂ STARTUP WORK SHEET

STEP 5 Hand Check pH before CO₂ flow valve opened _____ pH1

STEP 6 CO₂ flow _____ CFPH

STEP 6 Time Start _____ Time Stop _____ Total Time _____ Minutes

STEP 7 Hand Check pH after time test _____ pH2

PH Change = pH1 – pH2 = _____ pH

Feed Rate = pH Change / Total Time _____ pH / minute

3.3 TROUBLE SHOOTING

3.3.1 PH IS NOT DECREASING

1. Check that there is power to the unit and that the CO₂ flow gage shows flow when unit is on.
2. If there is no CO₂ flow check to see if the CO₂ cylinder is empty and needs replacement.
3. If there is a great system load the current feed rate may not be able to keep up. The CO₂ flow may need to be increased.

3.3.2 PH IS NOT CONTROLLING WELL

1. Feed rate or controller programming is not balanced to water system needs. Perform the STARTUP again or adjust the controller relay feed and mixing times based on the feed rate calculated.

IMPORTANT: IF THERE REMAINS ANY PROBLEMS AFTER READING THE GUIDES & TROUBLESHOOTING PROCEDURES PLEASE CALL YOUR DEALER DIRECTLY. BEFORE CALLING PLEASE BE READY WITH THE FOLLOWING ITEMS:

MODEL NUMBER OF THE CONTROLLER