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*Process Control Services, Inc.*

# User Guide

# *Automated Acetone System*

This User Guide contains:

- Installation Instructions
- Operators Guide
- Supervisors Guide
- Maintenance Instructions
- Troubleshooting Guide

PCS PROCESS® CONTROL SERVICES

# Table of Contents

# Overview

## Purpose

The purpose of this User Guide is to provide guidance for installation and daily operations. It contains step by step instructions for various operations used during the filling and shipment of acetylene tanks.

## System Description

The PCS Automated Acetone System is an acetylene cylinder filling system that provides an accurate acetone precharge. The system is programmed to fill both Rexon type and Linde type cylinders. A single scale version of the Acetone System fills and weighs all types of cylinders except style B (40 cubic feet) and MC (10 cubic feet). A two-scale system accurately fills and weighs all cylinders including style B and style MC.

There are two systems available: 1) Weigh Out and 2) Weight In/Out.

### *Weigh Out*

A weigh out system is for the user who assumes a correct acetone pre-charge before filling with acetylene. The system weighs out the acetylene fill in preparation for shipment.

### *Weigh In/Out*

A weigh in/out system pre-weighs the cylinder to be filled to determine the amount of acetone pre-charge needed. The cylinder is then charged with the correct amount of acetone. The system then weighs out the acetylene fill. The weigh in/out system ensures the correct amount of acetone and acetylene is loaded into the cylinder. This provides maximum value to the acetylene customer and most economical for the acetylene vendor. Each system is approved for use in Zone 1 (Class 1 Division 1 A/B/C/D).

## Optional Features

### *Floppy Diskette*

There is an optional floppy disk available on which fill data is stored in comma delimited text format. This provides office computers the ability to read production data into spreadsheets, billing systems, records systems and other business applications without the need for manual operator entry.

### *Operator ID*

There is also an optional operator ID function that requires an operator to log into the system before operation.

## Controls

The Acetone System consists of two control boxes located in separate areas.

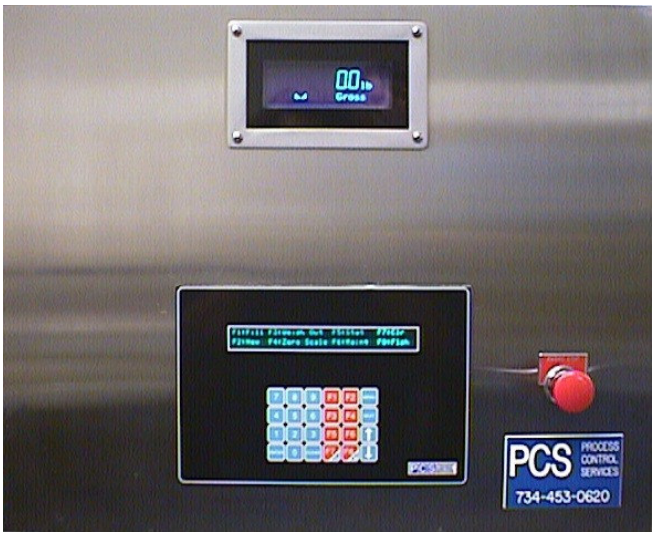
### *Power Protection Unit*

The Power Protection Unit enclosure is located outside of the filling area in a non-explosive environment.

### *Scale Control Unit*

The Scale Control Unit enclosure is located near the scale in the filling area. All controls for the scale are located on the Scale Control Unit. System messages, error codes and results display on a two-line op-

erator window located on the front of the Scale Control Unit A keypad located immediately below the operator window provides operator control over the operation of the system.




## Operator Window

The Scale Control Unit display depends upon whether operator codes are used for operation. For operator code systems, the operator window on the Scale Control Unit requests an operator ID upon power up. The operator window displays a command menu upon power up if no operator codes are used. A keypad located immediately below the operator window provides operator control over the operation of the system.

## Controls Menu

The command menu displayed after startup or operator ID entry consists of:

- F1: Fill
- F2: New
- F3: Weigh Out
- F4: Zero Scale
- F5: Stat
- F6: Oper*
- F7: Maint
- F8: Flush**

* F6: Oper menu function only displays for systems using Operator ID option.

# Installation

## Requirements

*The following are prerequisites for Automated Acetone System installation:*

- Dedicated 15 Ampere branch circuit with optional GFCI or AFCI
- 2 Lengths 1/2 inch explosion proof conduit to span distance between Power Protection Unit and Scale control Unit
- Unobstructed wall or other vertical structure for mounting Power Protection Unit in a General Purpose (non-incendiary) location.
- Unobstructed wall or other vertical structure for mounting Scale Control Unit in the production (flammable) location.
- Scale pit with drainage appropriately sized for scale(s) used.
- Nitrogen purge at 5 psig.

## Power Protection Unit

*Location*

The Power Protection Unit controls the safety features of the Automated Acetone System. It may be wall or pedestal mounted. Mounting must be in a General Purpose or ordinary location as defined by CSA and Factory Mutual. This location is a non-incendiary area having no concentration of explosive substances such as Acetone and Acetylene. The Power Protection Unit must be easily accessible at all times. Access must not be obstructed by structures or materials. For personnel safety and convenience, the Power Protection Unit may be mounted in an area protected from the weather.

*Power*

The Power Protection Unit is powered by a dedicated 120 Vac, single phase supply branch circuit. The circuit breaker controlled branch may have a 15 amp capacity. Circuit protection may be a standard 15 amp circuit breaker or optionally GFCI or AFCI for added personnel and equipment safety.

## Scale Control Unit

The Scale Control Unit controls the operation of the weighing process of the Automated Acetone System. It may be wall or pedestal mounted. The unit is designed to be located in the work area and is purged to prevent ignition of any flammable materials present.

## Scale

Mount each scale in a floor scale pit for ease of operation. The scale pit must include a drain to prevent damage to the scale(s).

## Cabling

Locate a punched hole to accommodate conduit or fittings according to local electrical code for power supply. Connect supply from a dedicated 15 amp circuit using 14AWG or other wire specified by local electrical code. Attach the black (hot) wire to TBC-2 terminal 6, white (neutral) wire to TBC-2 terminal 5 and the green (ground) wire to TBC-2 terminal 4.

Connect the Power Protection Unit to the Scale Control Unit with two sealed 1/2” conduit runs. Punch appropriately sized holes in each unit. Locate punched holes to accommodate the units orientation and installation. One conduit is used for AC power and the second conduit is for the safety interlocks.

Pull 14AWG supply wire (black, white and green) or other wire according to local electrical code through the first conduit. In the Power Protection Unit, attach the black wire to terminal 1 of TBC-2, white wire to terminal 2 and green wire to terminal 3. In the scale control unit, attach the black wire to terminal 1 of TBS-2, white wire to terminal 2 of TBS-2 and green wire to terminal 3.

Pull one 18AWG twisted pair (instrument cable) through the second conduit. Attach un-striped (no marker stripe) wire of the twisted pair to Power Protection unit TBC-1 terminal 1 and in the Scale Control unit to TBS-3 terminal 7. Attach striped (marked) wire to TBC-1 terminal 2 in the Power Protection unit and TBS-3 terminal 2 in the Scale Control unit.

## Testing

1. After all electrical connections and piping is completed, double check all connections and correct any deficiencies.
2. Close all doors and tighten.
3. Apply nitrogen purge at 5 psig.
4. Check for leaks in nitrogen piping and electrical fittings and conduit. Take remedial action as needed.
5. Start acetone pump and check for leaks in acetone piping including control valve and pressure transmitter on the AAS. Take remedial action as needed.
6. Apply power to the Power Protection Unit by activating the branch circuit breaker.
7. Follow Startup and Operation procedures beginning on page 9 and run several test cylinder fill cycles.

# Startup

The Scale Control Unit must be adequately purged with nitrogen before power is applied from the Power Protection Unit. An interlock prevents power from being applied to the scale until the Scale Control Unit has reached purge pressure.

Open the purge valve and then energize the Power Protection Unit from the circuit control (breaker panel or cutoff switch). There is a 4-minute delay from the time nitrogen purge starts until power is automatically applied to the Scale Control Unit. Most systems are ready to fill cylinders at this point.

If the system uses the operator ID option, log in to the system according to the procedure marked “Operator Codes and Login” in the Operation section of this guide.

# Operation

## *Operator Codes and Login

Enter an assigned 4 digit operator code on the Scale Control Unit keypad when requested. The operator window displays the command menu once he operator ID is accepted by the system.

## Cylinder Fill/New Procedure

The cylinder fill procedure prepares a cylinder for a reload of acetylene by recharging the cylinder with an appropriate quantity of acetone. The fill operation used depends upon whether the cylinder is being refilled (residual gas is present) or new (never been filled with gas). Press F1: ”Fill” to refill the cylinder or F2: “New” for a newly manufactured cylinder.

At any point in this menu operation, a “99” entered as a response to any operator query will cancel the current operation and return to the main menu..

### *Fill or New*

Every type of cylinder may be filled with the PCS automatic acetone system. Upon pressing F1 (fill) or F2 (new), the operator window displays a prompt for the cylinder customer identification number.

### *Customer ID*

Enter the 2 digit customer identifier by using the operator entry keypad and press any key.

### *Cylinder Type*

Next the operator window prompts for the cylinder type. Enter one of the 20 numbers that correspond to the cylinder type being filled.

### *Temperature*

The operator window then displays a prompt to enter the temperature estimated inside the cylinder. Allow the cylinder temperature sufficient time to stabilize to the room temperature near the scale. Enter the measured temperature on the operator screen using the keypad. If the temperature does not fall within operational limits, the system displays an “E8” error and returns to enter a valid temperature. Enter “999” to return to the main menu.

### *Zero Scale or Continue*

With a valid temperature, the system waits for operator command. The process may continue at this point or the scale may be zeroed.

- If the scale is not to be zeroed, place the cylinder on the scale and press any key to continue.
- If the scale is to be zeroed, assure that the scale platform is empty and press the F1 key (zero scale). After the zero scale process is complete, place the tank on the scale and press any key to continue.

### *Attach Acetone Line*

The operator window displays instructions to attach the acetone line to the cylinder. Connect the acetone line to the cylinder and open the cylinder valve. Press any key to continue.

### *Stencil Weight*

The operator window shows a prompt to enter a cylinder stencil weight. Enter the stencil weight in pounds and ounces using the operator keypad. The system checks the stencil weight to make sure that the stencil weight entered is appropriate for the selected cylinder. Error ‘E0’ is displayed for a stencil weight too low and ‘E1’ for a stencil weight too high. Check to make sure that the proper cylinder type is selected. Re-enter the proper stencil weight to continue or ‘99’ to return to the main menu.

### *Cylinder Pressure*

If the measured cylinder pressure is too high (85 psig), the operator window displays error message ‘E7’.

The system proceeds to the 'Weigh Out' procedure without adding acetone.

### *Finish Filling*

With the cylinder pressure within specification, the system determines the proper amount of acetone needed. If the cylinder already has the proper amount of acetone, the system displays a message 'Acetone Complete'. Close the cylinder valve and disconnect the acetone line. Remove the cylinder and press any key on the keypad to continue with the next cylinder.

If the cylinder contains too much liquid, then the system displays the error message "E5". The cylinder must be inspected.
If the cylinder is excessively light (it has lost more than 10% of cylinder weight), then the system displays the error message "E6". The cylinder must be inspected.

If the cylinder gas measures short, then the system displays the message "CYLINDER NEEDS TO BE BLOWN DOWN TO 0".

For any of the above error conditions, the cylinder needs to be removed from the scale. Close the cylinder valve and disconnect the acetone line. Press any key to fill another cylinder or the menu key to return to the main menu.

Once the system determines the amount of acetone required by the cylinder, the system begins filling the cylinder with acetone by opening the acetone valve. The acetone valve is automatically closed when the proper amount of acetone is added to the cylinder. The operator window displays the message 'Acetone Complete'. Close the cylinder valve and disconnect the acetone line. Remove the cylinder and press any key on the keypad to continue with the next cylinder.

## Weigh Out Procedure

Once the cylinder is filled with acetylene, it is ready for final weigh out and shipment. The Weigh Out procedure measures and records the amount of acetylene loaded into the cylinder.

At any point in this menu operation, a "99" entered as a response to any operator query will cancel the current operation and return to the main menu.

### *Customer ID*

Every type of cylinder may be weighed with the PCS automatic acetone system. Upon pressing F3 (weigh out), the operator display prompts for entry of the cylinder customer identification. Enter the 2 digit customer identifier by using the operator entry keypad and press any key.

### *Cylinder Type*

Next, the operator window prompts for the cylinder type. Enter one of the 20 numbers that correspond to the cylinder type being filled.

### *Zero Scale or Continue*

The system waits for operator command. The process may continue at this point or the scale may be zeroed.

- If the scale is not to be zeroed, place the cylinder on the scale and press any key to continue.

- If the scale is to be zeroed, assure that the scale platform is empty and press the F1 key (zero scale). After the zero scale process is complete, place the tank on the scale and press any key to continue.

### *Stencil Weight*

The operator window prompts for the cylinder stencil weight. Enter the stencil weight in pounds and ounces using the operator keypad. The system checks the stencil weight to make sure that the stencil weights entered are appropriate for the selected cylinder. Error 'E0' is displayed for a stencil weight too low and 'E1' for a stencil weight too high. Check to make sure that the proper cylinder type is selected. Re-enter the proper stencil weight to continue or '99' to return to the main menu.

### *Finish Weigh Out*

The system determines whether the cylinder has been filled within specification. If the cylinder is within specification, the system displays the message 'OK TO SHIP' and waits for entry on the keypad to continue weigh out operations with another cylinder or return to the main menu. Press any key to continue or the menu key to return to the main menu.

If the cylinder gas measures below the shippable limit, then the system displays the error message "E3" and displays the amount of acetylene. The operator or supervisor must decide the disposition of the cylinder. Press any key to weigh out another cylinder or the menu key to return to the main menu.

If the cylinder gas measures higher than the DOT limit, then the system displays the error message "E4" and displays the amount of acetylene. The operator or supervisor must decide the disposition of the cylinder. Press any key to weigh out another cylinder or the menu key to return to the main menu.

## Zero Scale

Scales need to be zeroed periodically or when the system displays other than '0' before a cylinder is placed on the scale. Press 'F4' to start the procedure. If this is a two-scale system another menu appears to select the scale to zero. Press 'F1' to zero the large scale or 'F2' to zero the B/MC scale. Upon completion, the system returns to the menu originally used to start the zero process. Menus used to start zero scale could be 'Fill', 'New', 'Weigh Out' and 'Main'.

## *End of Shift

If the acetone system currently in use has the operator ID option, the operator should be logged off of the system when not actively processing cylinders. Press 'F6' Oper push button for log-off as described in the Shutdown section of this guide.

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# Shutdown

The Automatic Acetone System must be shutdown when maintenance is required. Remove power from the system by operating the circuit breaker controlling power for the Power Protection Unit to the 'off' position. Complete the shutdown procedure by closing the purge nitrogen supply valve.

Some experts maintain that keeping electronic circuits powered and operational extends the life of the circuits. System shutdown is not necessary at the end of the workday, however shutdown is an option depending upon plant operating procedure.

# Supervisory and Maintenance Functions

## Non-Operator Functions

Other functions listed on the main menu are statistic and maintenance functions. These are password protected and reserved for supervisory and maintenance personnel. Functions not available for daily operation are:

- 'F5' – Stat
- 'F7' – Maint
- 'F8' – Flush

## Statistics

The statistics function lists operations since the last cylinder count reset (see Maint function 'Clear'). Usually this is a daily figure. This function is protected by the supervisory password. Enter your 4-digit password to proceed. The function will list in order:
Cylinders weighed out
Cylinders Acetoned
Total Acetone used
Total Acetylene weigh out
Total Acetylene via Fill
Total residual gas
After each display, press any key on the Scale Control keypad to continue to the next display. After the last display, pressing any key returns to the Main Menu.

## Maintenance

The maintenance function provides supervisory control over operation of the Automated Acetone System. This function is protected by the supervisory password. Enter your 4-digit password to proceed. Upon entering a valid supervisory password, a maintenance menu is displayed. This menu includes entries:

- 'F1' – Clr
- 'F2' – Pass
- 'F3' – Max Cust
- 'F4' - Scr Save
- 'F5' - Factory
- 'F6' - D/T
- Menu

### *Clear*

The clear function resets the values for operational statistics listed in the 'Stat' function. Press 'F1' to reset the values to zero.

### *Password*

The password function allows changing the supervisory password. Passwords should be changed periodically and only personnel authorized to perform the maintenance functions should have the password. Press 'F2' to change the supervisory password. The operator window displays a 4 digit entry field. Enter a 4 digit code. Re-entry the new code on the next screen. A successful change results in "Password Changed' message on the operator window. A mismatch between the new password and the confirming password does not display a success message and returns to the maintenance menu.

### *Maximum Customer*

The maximum customer function sets the most customers being tracked by AAS. Press 'F3' to change the maximum number of customers tracked. The operator window displays the maximum number of customers currently tracked and an entry field for a new value. Enter a new value on the keypad and the

new value is displayed. Press any key to return to the maintenance menu.

### *Screen Saver*

The operator display uses a screen saver that blanks the screen after a period of inactivity (no keypad operations). This prolongs the life of the CRT based display. The period of inactivity is set using this function. Press 'F4' to change the screen saver time period. The operator window displays the current screen saver setting as the number of inactivity seconds. A data entry field is presented to allow entry of a different value (in seconds). Once entered, the operator display indicates the new time period. Press any key to return to the maintenance menu.

### *Restore Factory Defaults*

This function resets all parameters to the factory settings. This will destroy any parameters entered since delivery of the AAS. A password is required to provide security because of the consequences of this action. Enter the supervisory password on the operator display. After successful password entry, the operator display asks for confirmation. An unsuccessful password entry returns the operator display to the Maintenance Menu.

Press the 'up arrow' to continue with restoring defaults. Press any other key to return to the Maintenance Menu. The operator display will flash a message 'Restoring Factory Defaults … Please Wait'. When complete, the operator display indicates 'Restore Factory Defaults Complete … Any Key to Restart Program''. Press any key to begin the reboot process and once rebooted, the Scale Control Unit displays the Main Menu.

### *System Date and Time*

The date and time menu allows changing the AAS date and time. The menu is displayed with the current date and time. Press 'F1' to change the AAS date. The operator display asks for 3 values of two digits each:

- 'Enter 2 digit month' (range 01 to 12)
- 'Enter 2 digit day' (range 01 to 31)
- 'Enter 2 digit year' (range 00 to 99)

After the year entry, the operator display returns to the Date and Time Menu.

Press 'F2' to change the AAS time. The operator display asks for 3 values of 2 digits each:

- 'Enter Military format hour' (this is the 24 hour clock 00 hours to 23 hours)
- 'Enter 2 digit minutes' (range 00-59)
- 'Enter 2 digit seconds' (range 00-59)

After the seconds entry, the operator display returns to the Date and Time Menu.

## Flush

Flush allows the purging of cylinders overcharged with acetone. This function is also a good test of the acetone valve and flush mechanism. Press 'F8' to display the maintenance login dialog. Upon successful password entry, the maintenance menu is displayed. Select the desired maintenance function from this menu. For single scale systems, press any key to begin flush. For a dual scale system, the screen displays a selection for which cylinder to flush. To stop the flush process, press the 'Menu" button.

# Appendix A–Error Codes

E0 Stencil weight entered is too low for the type cylinder selected. Check the cylinder type. The incorrect cylinder type may have been mistyped into the keypad. Check the stencil weight stamped on the cylinder. The stencil weight on the cylinder may have been misread or it was mistyped into the keypad.

E1 Stencil weight entered is too high for the type cylinder selected. Check the cylinder type. The incorrect cylinder type may have been mistyped into the keypad. Check the stencil weight stamped on the cylinder. The stencil weight on the cylinder may have been misread or it was mistyped into the keypad.

E2 The gas weight in the cylinder is short. The cylinder needs to be blown down to 0 and then filled.

E3 The gas weight in the cylinder is low. The amount of gas is displayed on the operator window. Either accept weight as is or re-fill the cylinder.

E4 The gas weight in the cylinder is high. The amount of gas is displayed on the operator window.

E5 Too much liquid (acetone or water) in the cylinder. Inspection of the cylinder is required.

E6 The cylinder is too light (lost more than 10% of cylinder weight). Inspection of the cylinder is required.

E7 The cylinder pressure above 85 psig.

E8 The temperature entered is out of operating range. Check the temperature measurement again and re-enter on the keypad. The temperature must be 30 degrees Fahrenheit or greater but not greater than 85 degrees Fahrenheit. If the filling area temperature is out of range, then the area and the cylinder must be brought into range to enable filling.

# Appendix B–Specifications

| | |
|---|---|
| Maximum Load | 454 Kg (1000 lbs) |
| Maximum Shock Load | 1361 Kg (3000 lbs) |
| Maximum Pressure | 3,500 KPa (500 psi) |
| Input Power | 90-132 VAC / 180-264 VAC |
| Input Frequency Range | 47 to 63 Hz |
| Maximum Cylinder Types | 20 |

| |
|---|
| UL 508, File No. E61997: Type 4, Type 4X, and Type 12 |
| NEMA/EEMAC Type 3,Type 4,Type 4X, Type 12, and Type 13 |
| JIC standard EGP-1-1967 |
| CSA File No. LR42186:Type 4,Type 4X, and Type 12 |
| IEC 60529, IP66 |

| | **Operation (BOSS) Enclosure** | **Power Protection Enclosure** |
|---|---|---|
| Mounting | Floor Mount or Stand Mount | Wall Mount |
| Construction | 14 GA Stainless Steel | |
| Shipping | Approx 91 Kg (200 lbs) | |
| Dimensions | 610 mm (24 in) H X 762 mm (30 in) W X 203 mm (8 in) D | 305 mm (12 in) H X 254 mm (10 in) W X 152 mm (6 in) D |


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