



## DrumPAC User Guide



# Overview

Chemtec's DrumPAC is designed to inject liquid additives or dyes from a drum into a process stream. The DrumPAC utilizes a microprocessor-based controller in conjunction with a high performance metering pump to accurately measure and record injections. The DrumPAC also includes supply and discharge connection lines and fittings as well as a vent for the drum (drum and drum dolly are not included).

The DrumPAC uses a series of small injections that are spread out over a programmed period of time. The frequency and duration of injections is calculated from the following user inputs:

1. Volume of Product to be additized or dyed
2. PPM Rate of additive or dye
3. Duration of injections

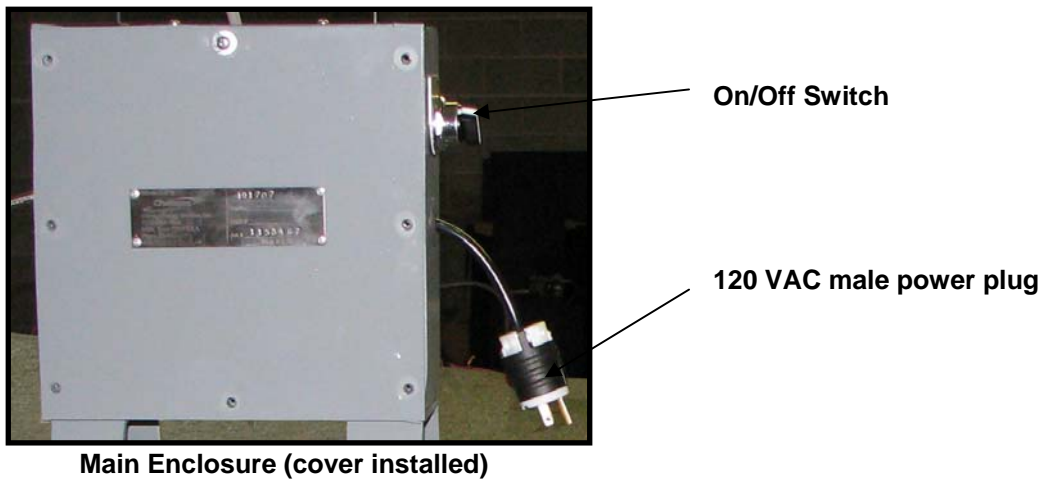
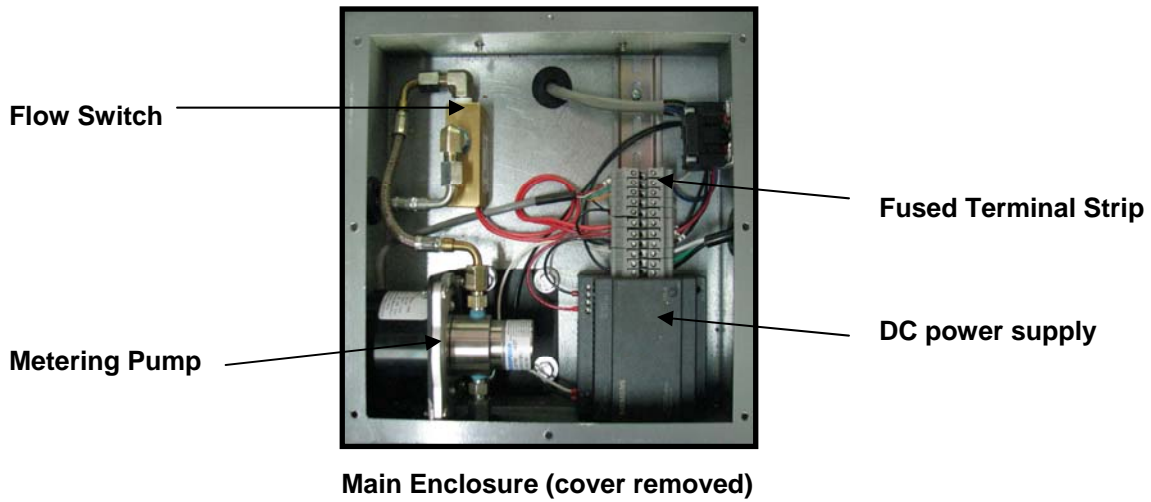
Once the parameters above are entered and **Start** is pressed, the DrumPAC microprocessor starts the metering pump. When the metering pump starts, it sends meter pulses back to the microprocessor. These meter pulses are converted into a volume by the microprocessor. The flow of liquid also activates a flow switch signal that is sent back to the microprocessor. These simultaneous signals (metering pump and flow switch) indicate that additive or dye is actually flowing. If product is flowing, but the microprocessor is not receiving both meter pulses and a flow switch signal, the DrumPAC will alarm. The DrumPAC will also alarm if excess meter pulses or a flow switch signal is received when the metering pump is not programmed to run.

## Features & Benefits

- **Highly Accurate** - the DrumPAC utilizes a microprocessor-based batch controller and a precision metering pump to accurately inject the correct proportion of additive or dye. The DrumPAC also incorporates a calibration routine to verify the accuracy of the metering pump. Since the injections are spread out over a programmed period of time, there is no need for additional mixing of the additized or dyed product. The DrumPAC is also designed to alarm if the proper dosage rate is not maintained.
- **Easy to Use** – The Drum-PAC is designed for quick installation and start-up. Drum change-outs are simple and leak-free due to the quick-connect coupling supplied with the DrumPAC's supply hose.
- **Configurable I/O** – The DrumPAC incorporates a number of configurable I/O points that are used to provide additional monitoring and control. These I/O points can also be manually controlled in diagnostics mode (for testing and troubleshooting).
- **Transaction Log** - The DrumPAC stores a transaction log of all activity. This transaction log can be used to document injection activity or to troubleshoot problems.

# Components

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The ECM is a multi-function microprocessor-based controller designed to provide all user interface and control of the DrumPAC.

ECM



The Supply Line Connection contains everything needed to connect the DrumPAC to a 3/4" bung opening. A quick connect fitting is included to facilitate easy and leak-free replacement of the drum. Simply install the bung connection to an upright drum and then tilt the drum on its side. With the quick-connect fitting, the supply hose can be connected and disconnected to the drum without any spillage of additive or dye.

**Supply Line Connection**

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The Discharge Line Connection contains everything needed to connect the DrumPAC to the injection point. A 1/4" MNPT check valve on the Discharge Line Connection should be threaded into a customer-supplied process connection (1/4" FNPT ball valve).

**Discharge Line Connection**

# Installation

Installation of the DrumPAC is as simple as 1-2-3:

1. Connect the DrumPAC power plug to a 120 VAC source.
2. Connect a drum to the DrumPAC supply line. Once the drum Supply Line Connection is installed, the drum should be placed on its side to ensure flooded suction to the metering pump.
3. Connect the DrumPAC discharge line to the desired injection point.

**Filling the hoses on first use** – Prior to using the DrumPAC for the first time, the supply and discharge hoses must be filled with liquid. If the hoses are not filled prior to normal operation, the DrumPAC will display **ERROR – ERROR – ERROR, No Additive Flow**. This alarm occurs any time the metering pump is on, but no liquid is being pumped. The hoses can be filled by manually running the metering pump from the Diagnostic section.

To enter the Diagnostic section, Press **ALT** and **CLEAR** simultaneously. Scroll through the diagnostic parameters using the **START** or **STOP** keys until reaching **Output #2** which controls the metering pump. The display for **Output #2** should show **State: Off** which means the metering pump is off. To turn on the metering pump, change the State to “On” by pressing **ENTER**. Pressing **ENTER** again will toggle the pump to “Off”. When filling the hoses, disconnect the discharge hose at the injection point, and insert it into the drum vent opening. Run the metering pump until liquid can be seen leaving the discharge hose. Then reconnect the discharge hose.

## **ALT 1 – Total Clearing Section**

The default screen on the DrumPAC shows a running total of the additive or dye injected. To reset this total, press **ALT** and **1** simultaneously.

## **ALT 2 – Time and Date Section**

The DrumPAC maintains a time-based transaction log. To set the current date and time, press **ALT** and **2** simultaneously, and then press **ENTER**. Use the number keys to enter the correct time and date.

## **ALT 3 – Calibrate Section**

The DrumPAC includes a program to assist in calculating the meter factor for the metering pump. To enter the Calibrate section, press **ALT** and **3** simultaneously.

## **ALT CLEAR – Diagnostic Section**

The DrumPAC incorporates a diagnostics section to assist in troubleshooting DrumPAC's inputs and outputs. To enter the Diagnostic section, press **ALT** and **CLEAR** simultaneously.

## **ALT ENTER – Program Section**

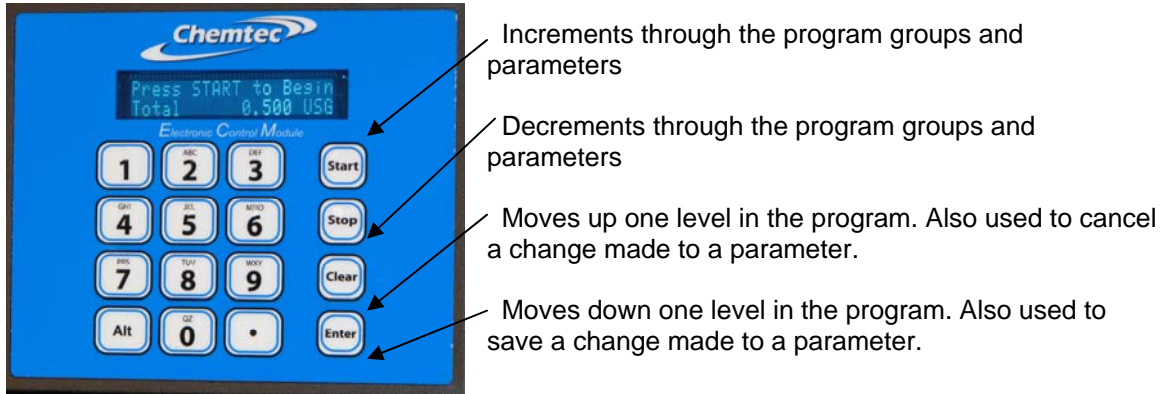
To enter the DrumPAC's Program Section, press **ALT** and **ENTER** simultaneously.

# Programming the DrumPAC

The DrumPAC is shipped from the factory pre-programmed for normal operation. However, some parameters may need to be changed depending on the customer's injection requirements. To enter Program mode, press **ALT** and **ENTER** simultaneously. You will then be prompted to enter a password. The default password to enter Program mode is 55555.

The program parameters are organized into groups.

Once in the Program section, the keypad functions as follows:



## Parameter Table

Section	Parameter	Default Value
Totalizers	Unauthorized Main Volume	0.0 USG
	Authorized Main Volume	0.0 USG
	Additive Tank Volume	30000 cc
	Unauthorized Additive Volume	0.0 cc
	Authorized Additive Volume	0.0 cc
Factory Default	Return to Factory Defaults? Y/N	
Recipes	Recipe Name – Recipe #1	
	Hose Size	50.0 USG
	Pre-Treat Volume	0.0 cc
	Number of Pre-Treats	0
	Hose Volume	0.0 cc
	Additive in Hose	No
	Total # of Deliveries	0
	Total Additive Used	0.0 cc
	Total Clear Product	0.0 USG
	Total Main Product	0.0 USG
	Total Product Treated	0.0 USG
	Meter Creep max Volume	10 USG
	Meter Creep Reset Timer	1000 ms
	% Under Treat Alarm	50
% Over Treat Alarm	50	
Error Holdback Time	500 ms	

	Parameter	Default Value
<b>Recipes</b>	Error Holdback Count	5
	Minimum Flush Volume	20.0 USG
	Maximum Delivery Volume	6500.0 USG
	Additive Over Inject Limit	5 cc
	Last Inject Volume	20.0 cc
	Shutoff Volume pre end	1000.0 USG
	Main Volume First Injection	5.0 USG
	Maximum Inject Time	1000 ms
	Dribble Volume	50.0 cc
	Fixed Main Pace Size	2.0 USG
	Fixed Inject Size	20.0 cc
	Additive Interval	1000 ms
	Treatment Rate	500 PPM
	Pacing Method	Pace on Time Base
Recipe Type	Standard	
<b>Calibration</b>	Method of Calibration	Multiple Injection
	Maximum Calibration Volume	200.0 cc
	Calibration Slug Size	10.0 cc
	Speed of Calibration	500 ms
<b>Timers</b>	Dribble Time	500 ms
	System Idle Time	1200 seconds
	System Time Out	600 seconds
	System Scroll Time	2000 ms
	Feedback Pulse Duration	500 ms
	Error Ignore aft Block	500 ms
	Block Valve Delay	1000 ms
<b>System Options</b>		
<b>Additive Meter Config</b>	Additive Meter Input Comm Address	0
	Additive Meter Sim Speed	5
	Additive Meter Sim	Off
	Minimum Inject Size	1.0 cc
	Pump turn ON time	1000 ms
	Flow Switch OFF Delay	1000 ms
	Flow Switch ON Delay	1000 ms
	Flow Rate Update Interval	10 ms
	Additive Meter Timeout	300 ms
	Maximum Unauthorized Flow	120.0 cc
	Measurement Units	Cc
	Calibration Factor	10000
	Additive Meter Factor	588
	Additive Meter Output Inverted	No
	Additive Meter Output Location	0
	Additive Meter Output Comm Address	0
	Additive Meter Input Inverted	No
Additive Meter Input Input Location	0	

	Parameter	Default Value
<b>Main Meter Config</b>	Main Meter Input Comm Address	0
	Main Meter Sim Speed	4
	Main Meter Sim	No
	Flow Switch ON Delay	500 ms
	Flow Rate Update Interval	10 ms
	Main Meter Timeout	600 Seconds
	Maximum Unauthorized Flow	120.0 USG
	Measurement Units	USG
	Calibration Factor	10000
	Main Meter Factor	1440
	Main Meter Output Inverted	No
	Main Meter Output Output Location	0
	Main Meter Output Comm Address	0
	Main Meter Input Inverted	No
	Main Meter Input Location	0
<b>Output Configuration</b>	Permissive Signal Comm Address	0
	Additive Inject Feedback Inverted	No
	Additive Inject Feedback Output Location	0
	Additive Inject Feedback Comm Address	0
	Additive Alt. Valve Select Inverted	No
	Additive Alt. Valve Select Output Location	0
	Additive Alt. Valve Select Comm Address	0
	Additive Still in Line Inverted	No
	Additive Still in Line Output Location	0
	Additive Still in Line Comm Address	0
	Block Valve Control Inverted	No
	Block Valve Control Output Location	4
	Block Valve Control Comm Address	0
	Inject Valve Control Inverted	No
	Inject Valve Control Output Location	2

	Parameter	Default Value
Output Configuration	Inject Valve Control Comm Address	0
	Additive Pump Start Inverted	No
	Additive Pump Start Output Location	1
	Additive Pump Start Comm Address	0
	Emergency Signal Inverted	No
	Emergency Signal Output Location	0
	Emergency Signal Comm Address	0
	Error Signal Inverted	No
	Error Signal Output Location	3
	Error Signal Comm Address	0
	Permissive Signal Inverted	No
	Permissive Signal Output Location	0
	Input Configuration	Additive Enable Comm Address
Additive Tank Level Inverted		No
Additive Tank Level Input Location		0
Additive Tank Level Comm Address		0
Block Valve Status Inverted		No
Block Valve Status Input Location		0
Block Valve Status Comm Address		0
Additive Pressure Inverted		No
Additive Pressure Input Location		0
Additive Pressure Comm Address		0
Inject Command Inverted		No
Inject Command Input Location		0
Inject Command Comm Address		0
Product Select 3 Inverted		No

	<b>Parameter</b>	<b>Default Value</b>
<b>Input Configuration</b>	Product Select 3 Input Location	0
	Product Select 3 Comm Address	0
	Product Select 2 Inverted	No
	Product Select 2 Input Location	0
	Product Select 2 Comm Address	0
	Product Select 1 Inverted	No
	Product Select 1 Input Location	0
	Product Select 1 Comm Address	0
	Unit Interlok Inverted	No
	Unit Interlok Input Location	0
	Unit Interlok Comm Address	0
	Flow Switch Inverted	Yes
	Flow Switch Input Location	1
	Flow Switch Comm Address	0
	High Flow Inverted	No
	High Flow Input Location	0
	High Flow Comm Address	0
	Error Kill Inverted	No
	Error Kill Input Location	0
	Error Kill Comm Address	0
	Parameter Lockout Inverted	No
	Parameter Lockout Input Location	0
	Parameter Lockout Comm Address	0
Calibration Push Button Inverted	No	
Calibration Push Button Input Location	0	
Calibration Push Button Comm Address	0	

	<b>Parameter</b>	<b>Default Value</b>
<b>Input Configuration</b>	<b>Stop Push Button Inverted</b>	<b>No</b>
	<b>Stop Push Button Input Location</b>	<b>0</b>
	<b>Stop Push Button Comm Address</b>	<b>0</b>
	<b>Start Push Button Inverted</b>	<b>No</b>
	<b>Start Push Button Input Location</b>	<b>0</b>
	<b>Start Push Button Comm Address</b>	<b>0</b>
	<b>Master Enable Inverted</b>	<b>No</b>
	<b>Master Enable Input Location</b>	<b>0</b>
	<b>Master Enable Comm Address</b>	<b>0</b>
	<b>Additive Enable Inverted</b>	<b>No</b>
	<b>Additive Enable Input Location</b>	<b>0</b>
<b>Unit Information</b>	<b>Unit Type</b>	<b>CHEMTEC Module</b>
	<b>Serial Number</b>	
	<b>Totalizer Password</b>	<b>12345</b>
	<b>System Password</b>	<b>55555</b>
	<b>Passwords Enabled</b>	<b>Yes</b>
	<b>Unit Software REV</b>	
	<b>Unit Hardware REV</b>	
	<b>Unit Comm Address</b>	<b>123</b>

# Calibrating the DrumPAC

The DrumPAC is shipped from the factory pre-calibrated. However, it is always a good idea to re-calibrate the metering pump using the specific liquid being metered. Performing periodic calibration will assure that the highest accuracy is maintained.

The DrumPAC includes a calibration routine that eliminates the need for the user to calculate a new meter factor. By following the on-screen instructions, re-calibration is quick and simple.

To calibrate the DrumPAC, you will need to obtain a graduated cylinder (or other container with a known volume). The calibration process will be performed by redirecting the contents from the discharge hose into the graduated cylinder. Once the calibration has been completed, the discharge hose can be reconnected.

To enter calibration press **ALT** and **3** simultaneously. From the screen prompt, select **2=Additive**. The DrumPAC then displays, **Hold down START key to perform delivery**. When the **START** key is pressed, additive will begin to flow, and the display will indicate the volume of additive that it assumes it has injected. Continue to hold down the **START** key until the graduated cylinder is almost full. To complete the calibration process, simply enter the actual volume of product that was measured in the graduated cylinder. To save this entry, press **ENTER**. The DrumPAC will then prompt to **Press ENTER to store or Press CLEAR to abort**. The Old and New Calibration factors will also be shown.

The calibration process should be repeated until the Delivered and Measured quantities are within an acceptable tolerance of each other. Accuracies within 1% are possible with the DrumPAC if calibrated properly. Please make sure the graduated cylinder is free from residual additive between calibration runs.

# Using the DrumPAC

Once the DrumPAC has been installed, programmed, and calibrated, it is ready for use.



In its idle state, the number in the lower right side of the display is a running totalizer of the volume injected. This volume will assist the user in knowing when their drum is approaching empty. This totalizer can be reset in Program mode.



After pressing START, enter the password. The default password is 12345. The password can be changed in Program mode.

After entering the correct password, the user is prompted to enter information that is required for injection. There are three parameters needed for the DrumPAC to inject the correct volume of additive or dye:

1. Main Product Volume – This is the volume of product that needs to be treated (additized or dyed). The range for this value is from 0 to 65,535.
2. Treatment Rate – The Treatment Rate, expressed in parts per million) indicates the ratio of additive or dye to treated product. The range for this value is from 0 to 65,535.
3. Time Duration - This is the number of minutes to spread out the entire injection (This time should always be less than the estimated time for the batch to be completed). The range for this value is from 0 to 65,535.

Once these parameters are entered, the DrumPAC will return the following information (before initiating the additization or dyeing process):

1. Total Additive Volume – This is the volume of additive that will be injected over the entire batch. Reviewing this information will ensure the drum has enough additive or dye to complete the entire batch.
2. Number of Injections – This is the total number of injections over the entire batch.
3. Interval of Injections – This is the time span between the start of successive injections.



Once START is pressed, the injection process will begin, and the screen will display the following information:

62.2 cc – this is the total volume of additive or dye injected for this batch.

6.2% - this is the percentage completion of the additive or dye being injected.

0.017 USG – this is a running total of the additive or dye injected for all batches. This volume will assist the user in knowing when their drum is approaching empty.

Example:

40,000 gallons of diesel fuel needs to be dyed. The diesel fuel is being delivered at 1200 GPM. The dye treat rate is 8 cc's of dye for each 40 gallons of fuel.

1. The Main Product Volume is 40,000 gallons
2. The Treatment Rate is 53 PPM  $(8/3785.4)/40 \times 1,000,000$ , rounded to the closest whole number
3. The time duration is 30 minutes  $(40,000/1200)$ , round down by an appropriate safety factor)

Once these parameters are entered, the DrumPAC will return the following information:

1. Total Additive Volume = 2.120 gallons
2. Number of Injections = 401
3. Interval of Injections = 4.4 seconds

By default, the DrumPAC is programmed to deliver 20 cc's for each injection. If 401 injections are made, the total volume injected will be 2.120 gallons. The default injection size can be changed, if required, in Program mode.

## Changing the Volume of Each Injection

The DrumPAC is shipped with a default injection volume of 20 cc's per injection. To change the default injection size, press Alt and Enter simultaneously to enter Program mode. Go to the parameter **Fixed Inject Size** in the **Recipes** section. This value can be changed as desired. (Decreasing the injection size below 20 cc's may negatively impact system accuracy since the metering pump will be cycled for extremely short periods of time. The flow switch may also have difficulty working below 20 cc's per injection).