INSTRUCTION MANUAL DRAINAC IIIB STOCKLINE SYSTEM
(over 10 PSI Stocklines)

For assistance call:

THOMPSON EQUIPMENT COMPANY, INC.
125 Industrial Avenue
New Orleans, LA 70121

Phone: (504) 833-6381
Fax: (504) 831-4664
info@teco-inc.com

DRAINAC IIIB STOCKLINE SYSTEM

MICROPROCESSOR BASED PIPE LINE MOUNTED FREENESS TESTER REV 1.5
DR3BSL15.DOC

SPECIFICATIONS

Freeness Range: 0-800 Canadian Standard Freeness
0-300sec. Williams Slowness
10-90° Schopper-Riegler

Test per Hour: 60-120, depending on stock

Consistency Range: 0.5-6%
Range over which a given TECO DRAINAC can be used is ± 30% of nominal consistency.

Range over which a change in consistency will not have a noticeable effect on the TECO DRAINAC reading is ± 5% of nominal consistency.

Stock Flow Velocity: Stock flow conditions should be in the plug flow regime.

Stock Line Pressure: 10-90 PSI standard (applies to stock line unit only).

Electrical: 120 VAC ± 10%, 50-60 Hz, 1 Amp, single phase standard.
240 VAC version available as an option.

Instrument Air: 10 PSI higher than maximum stock line pressure.
1.5 SCFM @ 80 psig.

Flush Water: 10 PSI higher than maximum stock line pressure,2 gpm peak, 0.3 gpm average consumption.

Stock Line Size: 4" inside diameter minimum.

Detector 28" x 11" x 14" 45 lbs.

Standard Cabinet-NEMA 4X 20" x 20" x 6" 61 lbs.

DRAINAC IIIB STOCKLINE SYSTEM (10 PSI or higher)

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GENERAL DESCRIPTION

I. PURPOSE

DRAINAC IIIB is an on-line instrumentation system, which continuously monitors the significant property of paper stock known as "Freeness" as related to drainage rate.

II. DESCRIPTION

A. Detector

The Detector consists of a 2" diameter 316 stainless steel vertical riser partitioned from a transparent acrylic tube by a 316 stainless steel perforated screen. A 2" handle-operated ball valve, located between the vertical riser and the acrylic tube, is provided for isolating the detector from your pipe line. Within the transparent tube are 316 stainless steel conductance probes (Hastelloy optional) for filtrate level detection. Enclosed within the detector junction box are solenoid valves for tube and screen flush control. The detector is hinged and pinned to provide easy access to the perforated screen, and for removal of the probe chamber for cleaning. The DRAINAC IIIB detector has been assembled using a tube and probe configuration based on your initial sales application data.

B. Control Cabinet

A wall-mounted NEMA 4X cabinet is provided for electronic and pneumatic support circuits. A microprocessor based electronics module provides level sensing, sequencing logic, exhaust and flush time control, along with a 4-20ma output signal into a 750 OHM maximum load, for input to a recorder, refiner controller, DCS or other equipment.

III. PRINCIPLES OF OPERATION

A. Sample Intake (Phase 1)

Pressure in the Detector chamber is reduced to below stockline pressure, causing the stock to rise unimpeded in the vertical riser until it reaches the screen. Whenever the stockline pressure is below 20 psi, a vacuum source is required to pull the sample into the Detector chamber. The screen retains the fibers causing a pad to form through which the water filters into the transparent tube.

B. Measure (Phase 2)

The rate that the filtrate rises in the transparent tube under the influence of the constant differential pressure is a function of the drainage rate or filtration resistance of the fiber. The DRAINAC IIIB reading is related to this drainage rate. The DRAINAC IIIB measuring circuit is activated when the filtrate reaches the lower level sensing probe. When the filtrate reaches the upper probe, the DRAINAC IIIB measurement is terminated, and the DRAINAC IIIB output signal is updated. Variable damping provides averaging of successive measurements.

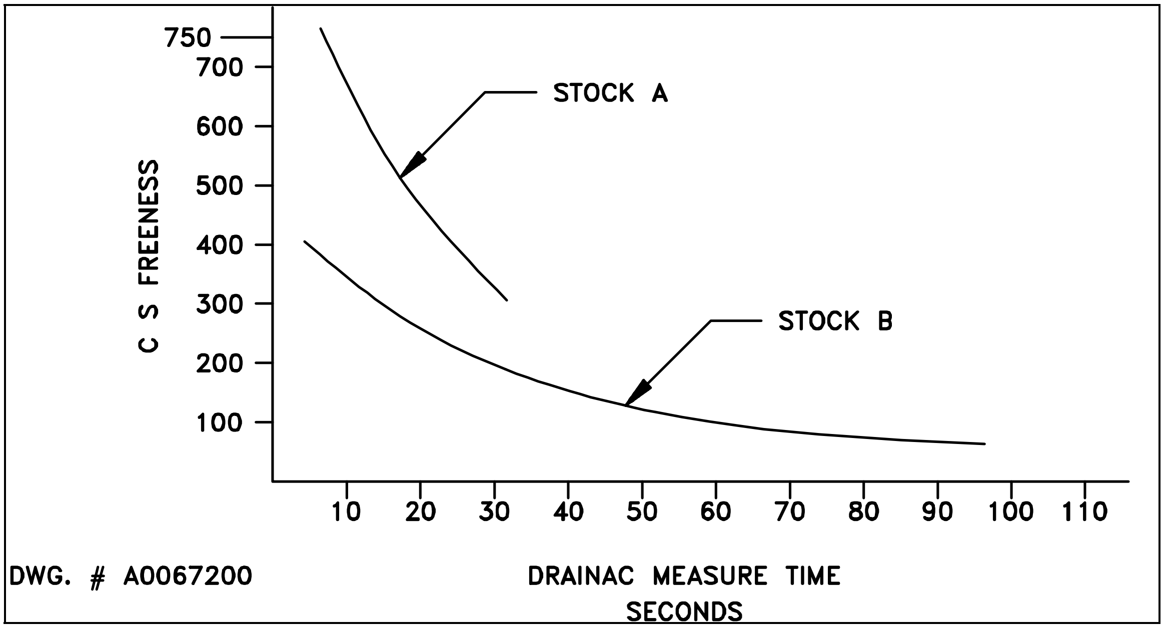


Figure 1 The relationship between Drainac Time and CS Freeness.

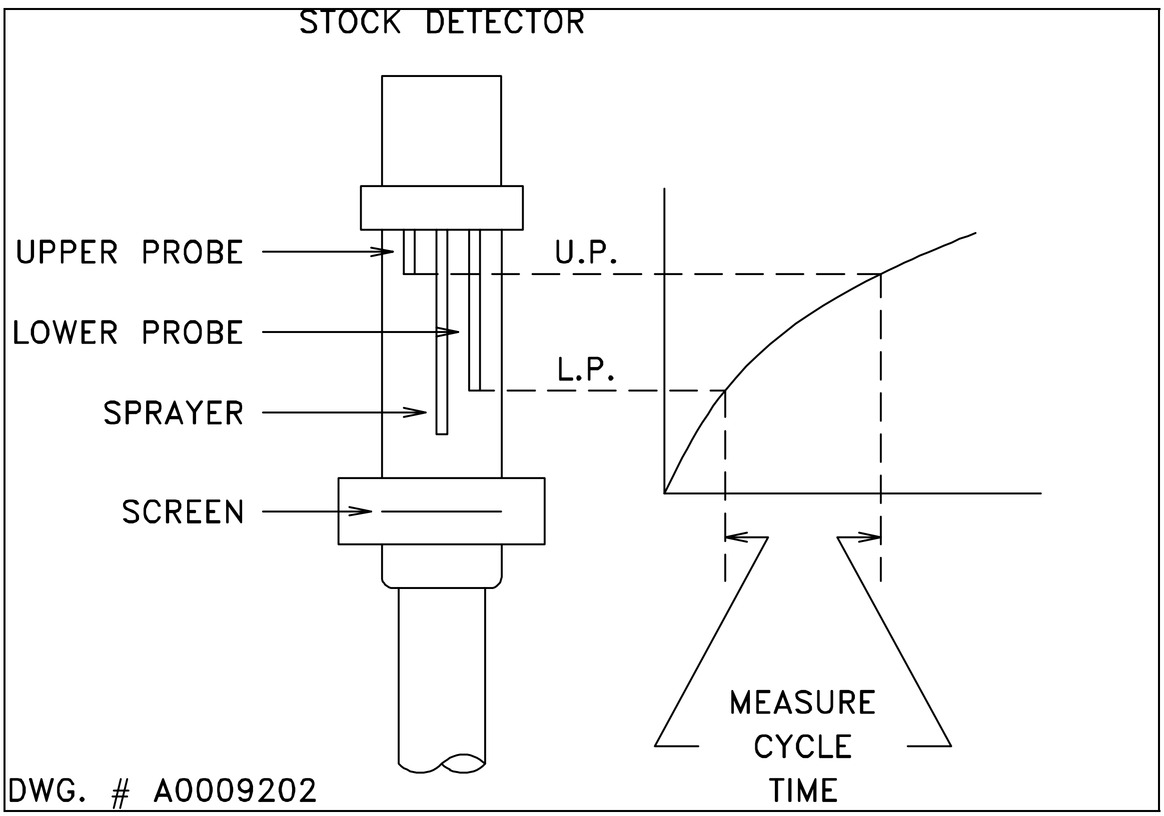


Figure 2 The relationship between Drainac Time and Probe Height.

C. <u>Exhaust and Flush (Phase 3)</u>

During exhaust, the air pressure in the tube is increased to above stockline pressure, forcing the filtrate and sample down the detector and into the stock stream. The duration of exhaust is adjustable. The exhaust time is adjusted to provide sufficient time to completely purge the vertical detector without introducing excessive air into the stockline. During the beginning of exhaust, flush water is introduced at the top of the tube, and above and below the screen to keep the tube and screen clean. At the end of the exhaust cycle, the system will recycle.

D. **DRAINAC IIIB Output (4-20 milliamps)**

The measurement times obtained with DRAINAC IIIB provide an indication of the filtration rate through the detector screen; for a given stock the shorter the measurement times, the higher the CS Freeness (NOTE: For different stocks the measurement times will vary). The measurement time is processed by the DRAINAC IIIB microprocessor to derive the output. The output is directly proportional to the chosen units of measure.

The Drainac IIIB electronics module is set from the factory to produce the 4-20 ma output proportional to **CANADIAN STANDARD FREENESS**. If your specifications require that **SCHOPPER-RIEGLER**, **WILLIAMS SLOWNESS**, or **DRAIN TIME** be the testing method used, The Drainac IIIB can be configured for one of these methods. If an output is desired which is linear with time, use **DRAIN TIME**.

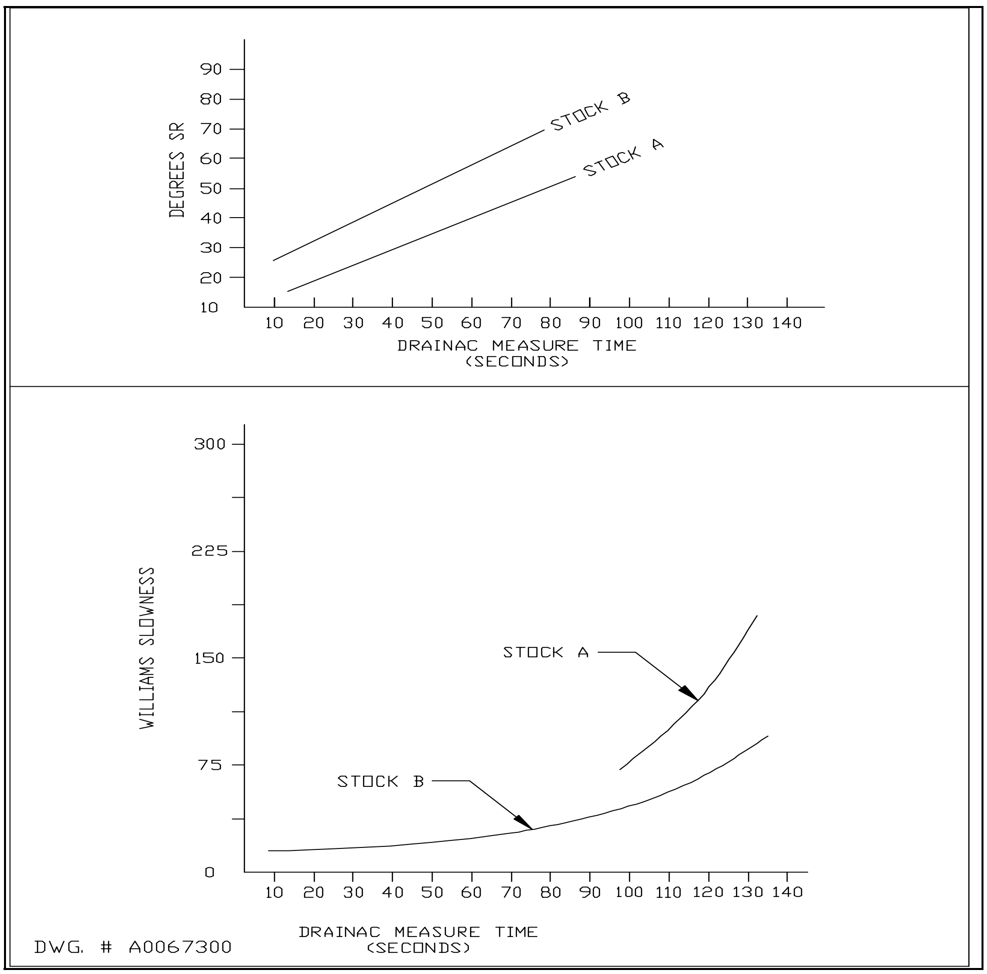


Figure 3 The relationship between Drainac Time, Williams Slowness and °SR

INSTALLATION

I. UTILITIES REQUIRED

A. Electrical

120 volts, 60 (or 50) HZ single phase, 1 amp at the Control Cabinet. Incoming power wiring (120 VAC 60 HZ) and wiring for the 4-20ma output are provided by the customer.

B. Air

Instrument Air, at least 10 PSI above maximum stockline pressure should be used (for control cabinet). Do not exceed 100 PSI. The instrument air should be free of entrained oil or water vapor.

NOTE: Use of non-instrument quality air will result in eventual damage to the DRAINAC.

C. Water

Filtered water supply, at least 10 PSI above maximum stockline pressure should be used (for Detector). Do not exceed 100 PSI.

II. INSTALLATION PROCEDURE

Note: Refer to Schematic Drawings in back of book.

A. Detector

The DRAINAC IIIB detector may be installed in any horizontal stock line, 4" diameter or larger. We recommend 4 to 6 pipe diameters of straight pipe ahead of the detector and plug flow conditions. With minimum pneumatic tubing length in mind, the detector should be located as close to the refiner(s) as possible to avoid unnecessary time lag. It should be remembered that periodic screen cleaning will be required, therefore the location selected should allow for convenient access to the detector assembly. A minimum of 26-1/4" above the top of the pipe is required for overhead clearance. If a magnetic flowmeter is in the chosen stock line, the detector would be best located downstream of the meter. This will avoid disturbance of the flow signal by voids created in the stock from air exhausted from the sensor each time the sample is discharged back into the stockline To install the detector, first cut a 2-3/8" diameter hole in the top of the pipeline. Next, unbolt the vertical riser from the lower flange and remove the pressure transmitter. Next, insert the vertical riser into the pipe until the appropriate scribe line is even with the top of the pipe. Next, plumb the riser to within 1/16" per foot of vertical. Now, weld the riser in place (1/8 fillet) and reassemble the detector. Connect your filtered water supply to the flush water shut off valve (1/4" NPT female connection) and close the valve.

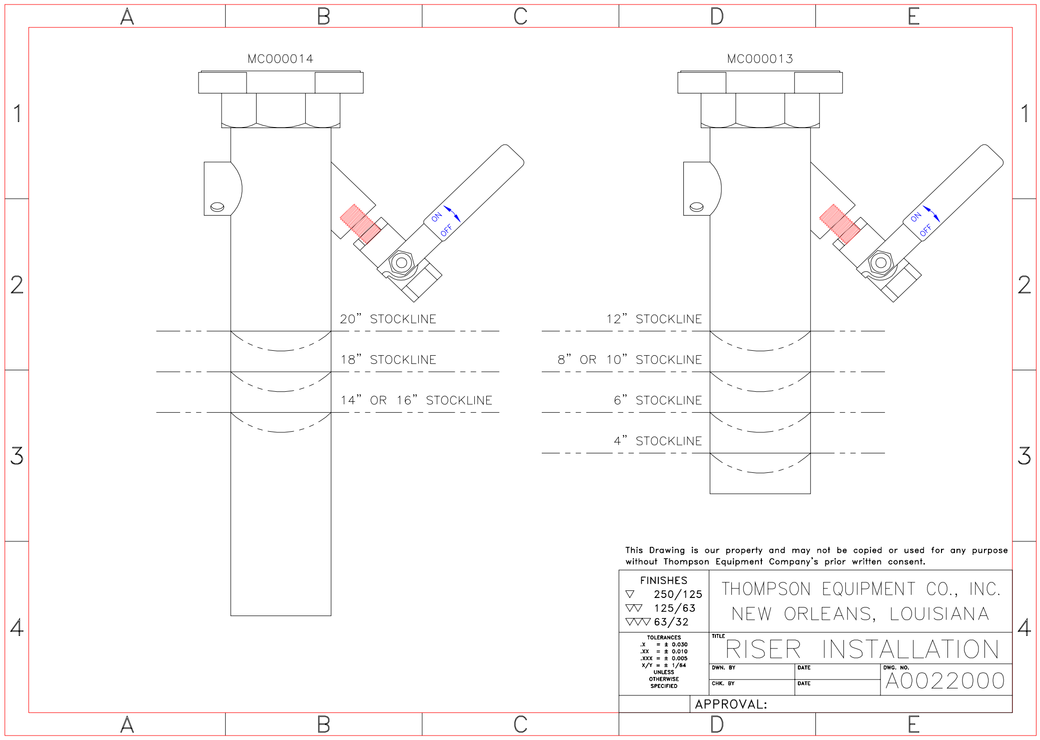


Figure 4 Riser Scribe Lines

B. Control Cabinet

The control cabinet should be wall mounted (optional floor mounted pedestal available), in sight of and no more than 30 tubing-feet from the detector unit. The unit will perform at its best when the Control Cabinet is mounted as closely as possible to the Detector unit and the pneumatic lines are kept as short as possible. In no case should the pneumatic cable run EXCEED 30 feet in length, and preferably should be kept shorter. It must be re-emphasized that the controlling factor is the tubing run and not the physical distance between the Control Cabinet and the Detector unit. Do not coil excess pneumatic tubing, but rather cut it to the minimum length required. Access to the DRAINAC IIIB instrumentation is within this cabinet. A key locking handle is provided for security purposes.

Connect your air supply to the cabinet (1/4" NPT connection) using the filtered regulator provided. A shut off valve for the air supply is to be provided by the customer and should be located prior to the cabinet. Place the on/off switch in the off position. Now wire AC power to the power switch.

C. Tubing and Wiring Harness

The wiring harness is provided by TECO. Install the wiring harness per the electrical schematic. The harness is labeled for proper orientation and to minimize the possibility for wiring errors. All interconnecting air connections are provided by the customer. Install plastic tubing between the detector and control cabinet per the sample tubing harness shown at the rear of book. In no case should the pneumatic cable run EXCEED 30 feet in length, and preferably should be kept shorter.

D. Recorder (Optional)

The recorder is a free-standing unit. Mounting of this unit is performed by the customer. The AC wiring to power the recorder and the DRAINAC IIIB signal output wiring (input to recorder) is also performed by the customer.

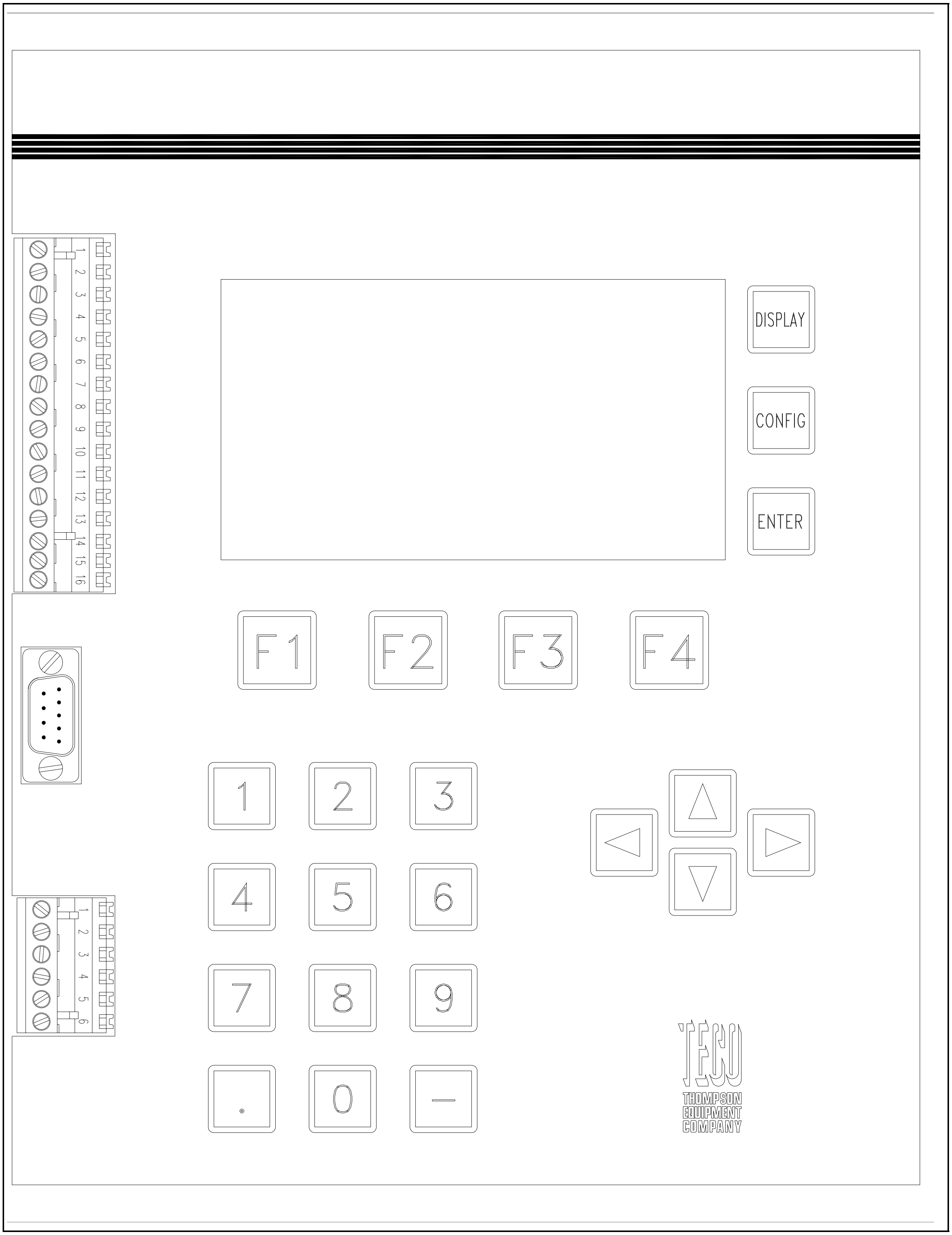


Figure 5 Drainac IIIB Face Plate.

ELECTRONICS

The DRAINAC IIIB uses microprocessor-based electronics to time the rise in filtrate level between the level probes and to produce a 4-20ma output representative of freeness. The output is calculated from the appropriate function of the time required for filtrate water to rise between two electrodes in the sampling chamber. The function used is dependent upon the chosen units for displaying freeness.

I. TERMINAL STRIP CONNECTIONS

On the face plate of the Electronics Module are two terminal strips and a DB9 connector. The top one is a 14 point plug type. The bottom one is a 6 point plug type. Below are the functions of each terminal. See the Communications Interfaces section for a description of the DB9 connector.

TB1	Description	
1.	Upper Probe	
2.	Lower Probe	
3.	Probe Return. This terminal is internally grounded.	
4.	4-20ma Output Signal (+). Load resistance up to 750 OHMS.	
5.	4-20ma Output Signal (-).	
6.	ANI+	(Compensation Variable Analog Input positive)
7.	ANI-	(Compensation Variable Analog Input common)
8.	CCI	(Closed Contact Input)
9.	COM	(Closed Contact Common) This terminal is internally grounded.
10.	CCO	(Closed Contact Output) Changes state each time filtrate contacts the upper probe
11.	T+	RS422(485)TX+
12.	T-	RS422(485)TX-
13.	R+	RS422(485)RX+
14.	R-	RS422(485)RX-

TB2 **Description**

1.**Intake Solenoid Hot.** One side of the Intake Solenoid is connected to this terminal. The other side connects to terminal 3.

2.**Flush Solenoids Hot.** One side of the Flush Solenoid is connected to this terminal. The other side connects to terminal 3.

3.**Solenoid Return.** One side of the Flush and Intake solenoids are connected to this terminal. This is AC neutral terminal.

4.AC Line Hot.

5.AC Line Neutral.

6.AC Line Ground.

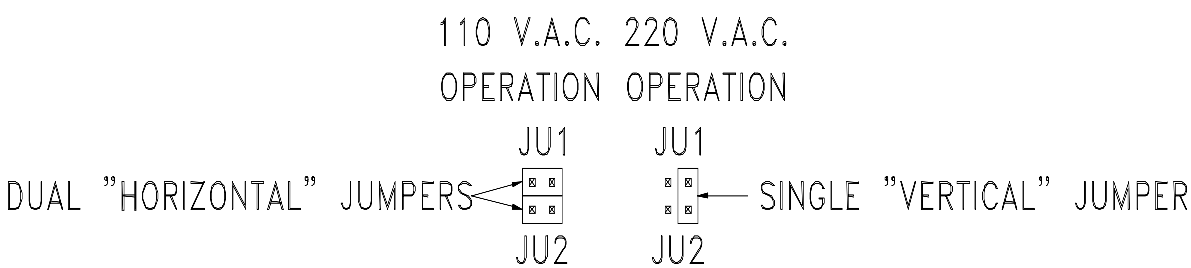


Figure 6 Voltage Jumper Selection

II. KEYPAD AND DISPLAY OPERATIONS

A. Overview

The DRAINAC IIIB display has two primary modes, display mode and configuration mode. Functional operation of the sensor continues regardless of which mode is in use. Display mode manages the presentation of data such as freeness, compensation variable and all other available features. Configuration mode provides a way to set-up and maintain the DRAINAC IIIB. Display and configuration functions are accessed through the front panel keypad. The keypad is a pressure sensitive panel that provides tactile feedback to indicate a successful key contact.

B. Display Mode

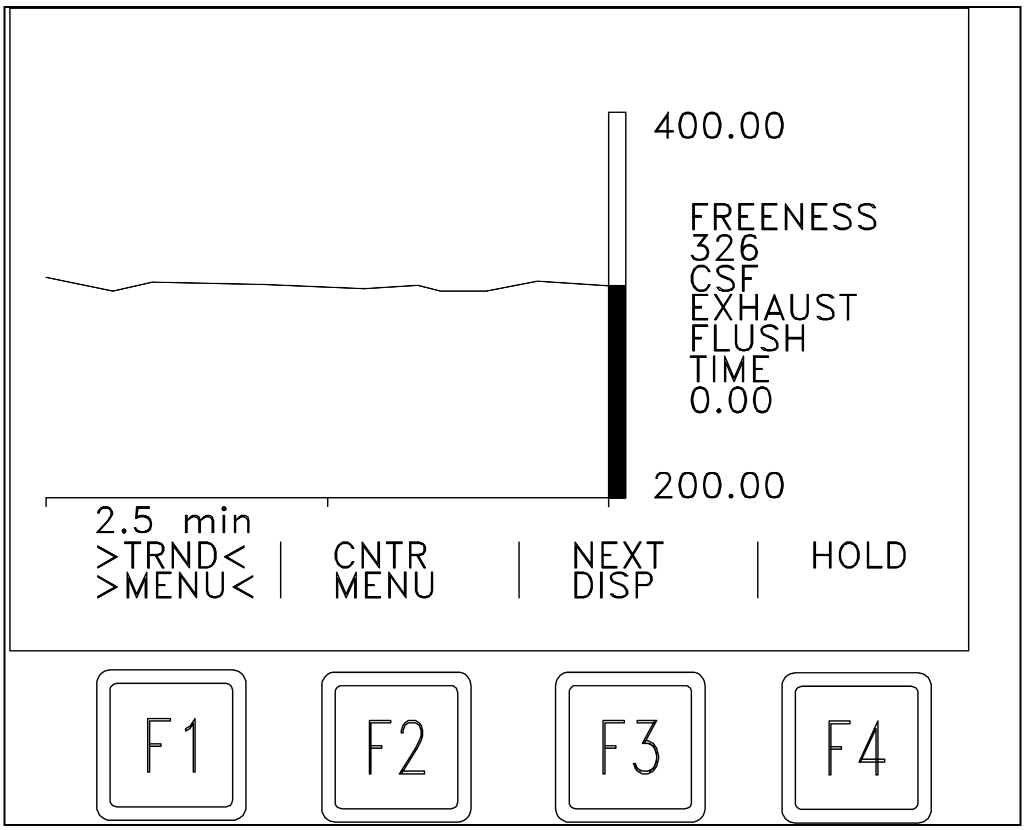


Figure 7 Typical display screen

Display mode is the primary mode. The display mode function keys are the F-keys (F1, F2, F3, and F4). Each F-key function changes with respect to the screen being displayed. A description of each key function appears on the display directly above each F button. Located to the right of the display is a button labeled "DISPLAY" that may be used to toggle between the displays which show the calculated Freeness Measurement, Raw Time Measurement and Compensation Variable values.

C. Configuration Mode

Configuration mode is used to set up the attributes of system parameters. A system parameter is a major category of settings, which the microprocessor-based transmitter uses to organize and identify the various adjustable settings known as attributes.

Refer to Table 1 where a list of the parameters and their corresponding attributes are shown. An example of the parameter and attribute concept is the CYCle TIME (parameter 0) which has the attribute of TIME SPAN, (attribute 0).

Parameter	Number	Attribute	Number
CYC TIME	0	TIME SPAN	0
		TIME ZERO	1
		EXHAUST TIME	2
		FLUSH TIME	3
FREENESS	1	SPAN	0
		ZERO	1
		FILTER	2
		UNITS	3
COMP VAR	2	SPAN	0
		ZERO	1
		BIAS	2
		FACTOR	3
		SQUARED FACTOR	4
		CUBED FACTOR	5
		FILTER	6
PROBE	3	UPPER SENSITIVITY	0
		UPPER SWITCHPOINT	1
		LOWER SENSITIVITY	2
		LOWER SWITCHPOINT	3
PASSWORD	4	PASSWORD	0
		ADDRESS	1
RECIPE	5	NUMBER	0

Table 1. Parameters and Attributes

As a security feature, access to this mode can be protected by a password. A password is set by entering a non-zero floating-point number in the parameter PASSWORD, attribute PASSWORD. After a non-zero password is entered, a user will be prompted for the proper password prior to entering configuration mode. The unit is delivered with a password of 0. When the correct password is entered, no further password is needed to enter configuration mode until four minutes of keypad inactivity has occurred.

Configuration mode is entered by pressing the [CONFIG] button. If a non-zero password has been entered, a prompt will appear requesting the password. An incorrect password will return the instrument to DISPLAY mode. If correctly entered the screen will indicate that it is in configuration mode.

The first parameter will appear highlighted. The ▷ (right arrow key) advances to the next parameter and the ◁ (left arrow key) will page back to the previous parameter. Each parameter will have related attributes that can be changed as needed. Selecting an attribute is similar to selecting a parameter. Once the desired parameter has been found, press the ▽ (down arrow key) once to highlight the attribute. ▷ will advance to the next attribute and ◁ will page back to the previous attribute. To change the attribute, press ▽ so that the

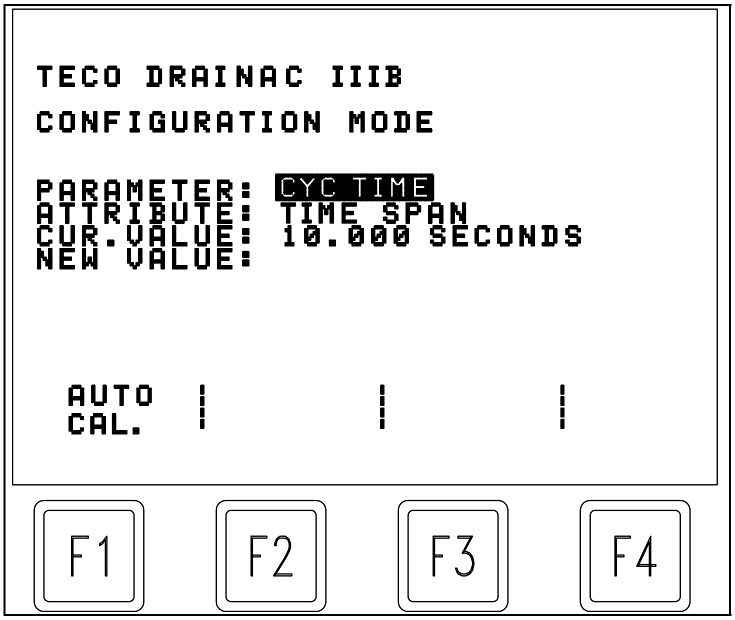


Figure 8Typical configuration screen

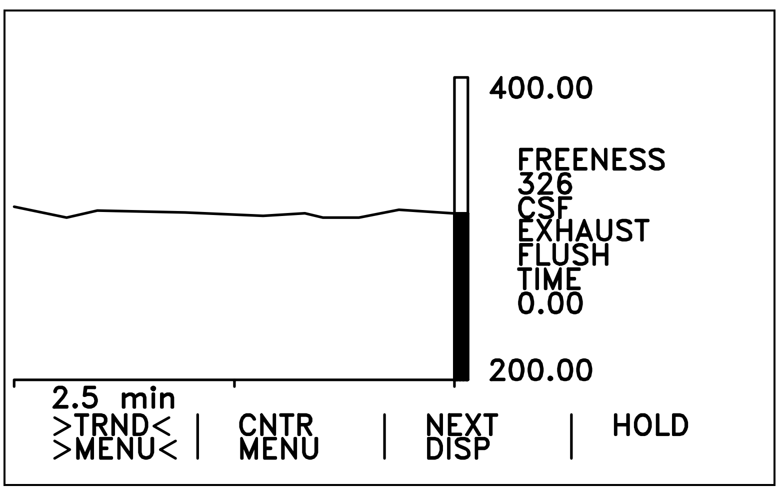


Figure 9 Freeness Trend Display

cursor is in the "NEW VALUE:" field. Using the numeric keys, enter the desired value. If an error is made, use ◁ to delete the entry and re-enter the correct value. Pressing the [ENTER] key will place the new value in the "CUR. VALUE:" field, which stands for current value. Once the new value appears in the current value field, the attribute change has been successfully achieved. At this point, △ can be used to highlight the attribute field or the parameter field, so the next attribute can be changed or the next parameter selected. In some cases the attribute is limited to a set of pre-determined values. For these attributes the new value field will have a value preset. When it is selected with ▽, it will appear highlighted and the word ADJUST will appear. Use the ◁ and ▷ to move through the available values. When the appropriate value is found, press the ENTER key to register the change. The F-keys functions will be described as applicable.

D. <u>Operation usage guide</u>

Normal Operation of the DRAINAC IIIB, Model F8000B001

Each time DISPLAY is pressed the display toggles between the Freeness Trend Display, the Compensation Variable Display and the Cycle Time display.

On any of the three normal operating displays of, the variable function keys F1, F2, F3, and F4 may have labels on the display.

The function keys activate or select the option listed above it.

If the legends over the FUNCTION keys are the Main Menu, pressing F1 ("TRND MENU") will change the legends to the Trend Menu. Conversely, if the legends over the FUNCTION keys are the Trend Menu, pressing the F1 ("MAIN MENU") key will change the legends to the Main Menu. Also when the main menu is displayed the F4 key will toggle the unit between "CYCLE" (normal measure mode) and "HOLD"(exhaust-hold mode).

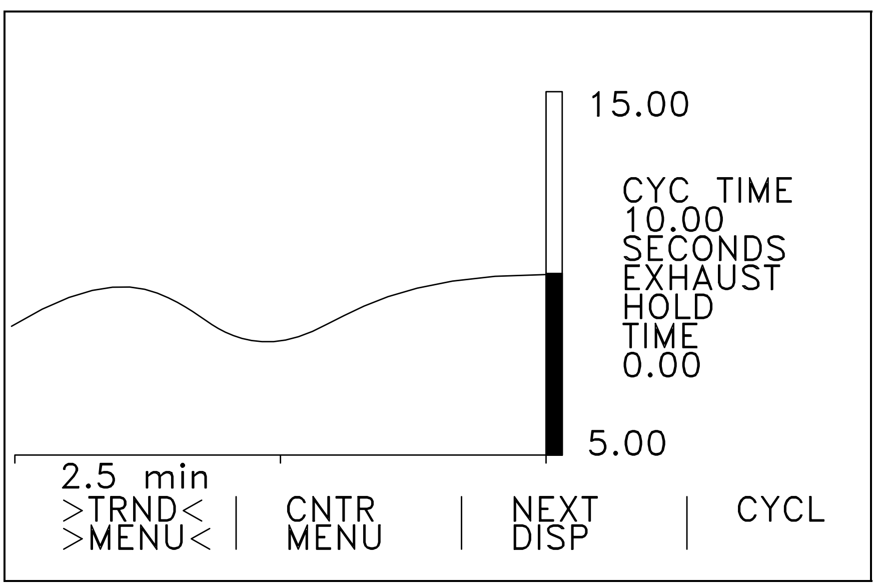


Figure 10 Cycle Time Display

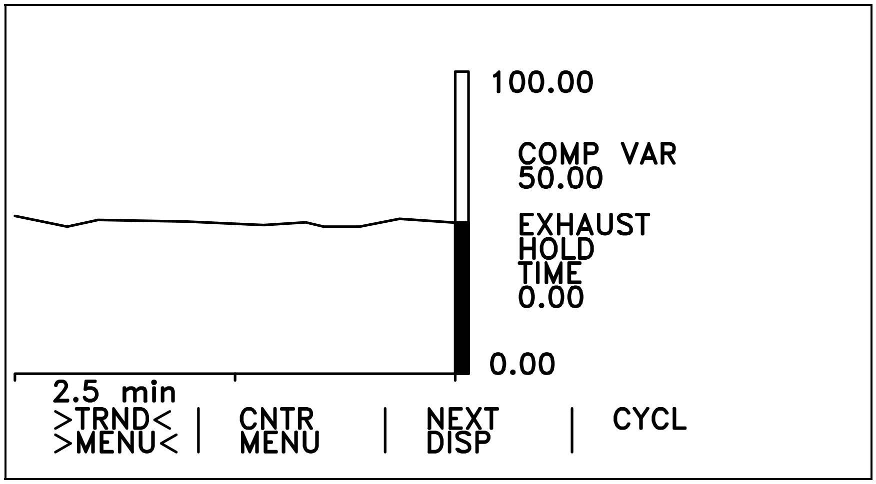


Figure 11 Compensation Variable Trend Display

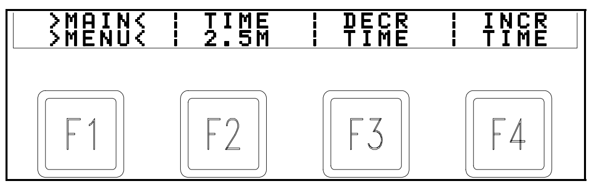


Figure 12 Trend Menu

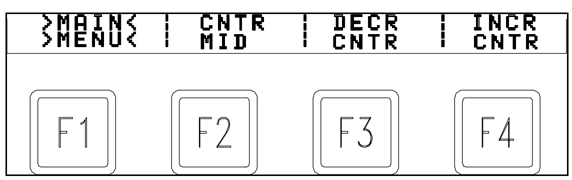


Figure 13 Contrast Menu

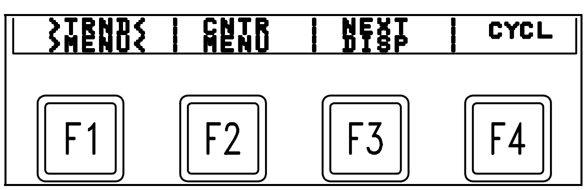


Figure 14 Main Menu

Key	MAIN MENU FUNCTION KEY	FUNCTION
F1	TRND MENU	Changes FUNCTION keys to the Trend Menu.
F2	CNTR MENU	Changes FUNCTION keys to Contrast Menu.
F3	NEXT DISP	Toggles between Freeness, Compensation Variable and Cycle time displays.
F4	CYCL/HOLD	Toggles the unit between normal operating mode and exhaust hold mode.

Key	TREND MENU FUNCTION KEY	FUNCTION
F1	MAIN MENU	Changes FUNCTION keys to the Main Menu.
F2	TIME 2.5M	Returns the time base to 2.5 minutes from whatever the setting may have been.
F3	DECR TIME	Decreases the trend graph time base in 2.5 minute increments.
F4	INCR TIME	Increases the trend graph time base in 2.5 minute increments.

Key	CONTRAST MENU FUNCTION KEY	FUNCTION
F1	MAIN MENU	Changes FUNCTION keys to the Main Menu.
F2	CNTR MID	Forces the display contrast to midrange.
F3	DECR CNTR	Gradually decreases the display contrast.
F4	INCR CNTR	Gradually increases the display contrast.

E. Communications interfaces

1.RS-232

The DRAINAC IIIB is equipped with an RS-232 interface accessed through the DB9 connector on the faceplate. A hand-held configurer or Personal Computer communicating in ASCII may be used to communicate with the DRAINAC IIIB. Communications parameters are:

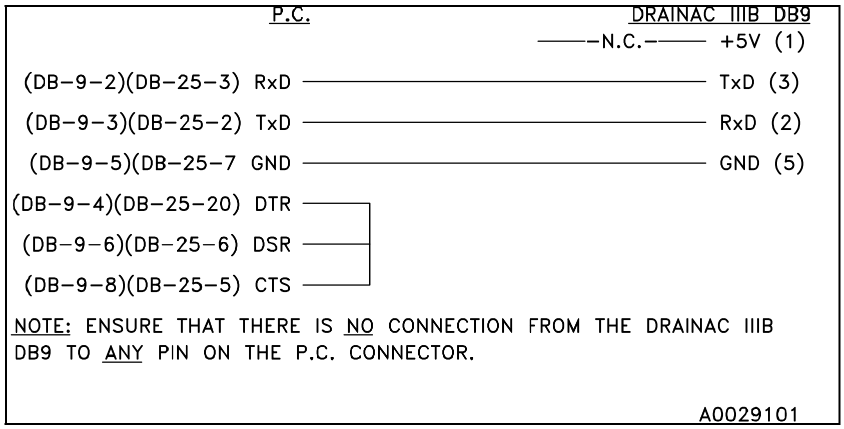


Figure 15 Wiring a P.C. to the DRAINAC IIIB

Baud Rate	9600
Parity	None
Data Bits	8
Stop Bit(s)	1

CAUTION!!:

The DRAINAC IIIB J3 Pin 1 does NOT conform to standard RS-232 signal definition. It is used to provide power for a special hand-held configurer and MUST NOT be connected to ANY pin in a P.C. Damage to either the DRAINAC IIIB serial interface or the P.C. serial interface may occur.

2.RS422/485

The DRAINAC IIIB offers the RS-422/485 interface standard in Full Duplex Mode. The communications parameters are:

Baud Rate	9600
Parity	None
Data Bits	8
Stop Bits	1

Terminating resistors are required across the receivers at each end of the communications cable. The DRAINAC IIIB provides an internal resistor that can be connected with jumper J16. Intermediate stations must not be terminated. A second terminating resistor is provided across the transmitter for short runs to instruments that do not have a terminating resistor. This second resistor is enabled with jumper J18.

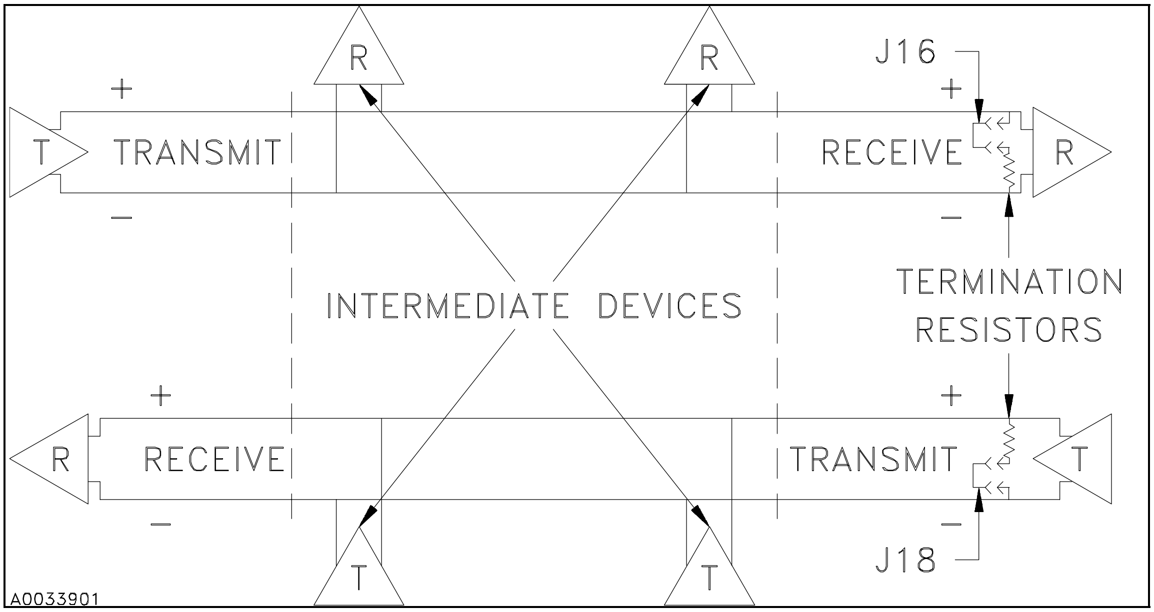


Figure 16 RS422/485 Communication Block Diagram

The jumpers are located on the microprocessor board (µPB). Access to the jumpers requires the removal and disassembly of the electronics module. Place the unit in "HOLD", close the 2" ball valve and remove power from the unit. Unplug both terminal strips and remove the four Phillips screws holding the faceplate. Remove the electronics and take it to a static safe area. Place it face down on your static safe work area. Remove the six 10-32 nuts holding the main signal conditioning pc board (SCB). Disconnect the two main ribbon cables at the top of the board and lay the SCB off to the side. Disconnect the flat plastic cable from the bottom of the µPB and remove the four 10-32 standoffs that hold it in. Grasp the µPB by the edges only and pull it straight off the standoffs, turn it over and lay it on your static safe surface. Remove the four 4-40 Phillips-head screws from the corners of the LCD display and gently pull it straight out from the supporting standoffs. The jumpers are located in the lower left side of the digital board, about one third of the way up from the bottom edge. Re-assembly is a reversal of the preceding procedure.
The following jumper configuration defines the setup for this interface. Jumper J17 should only be installed

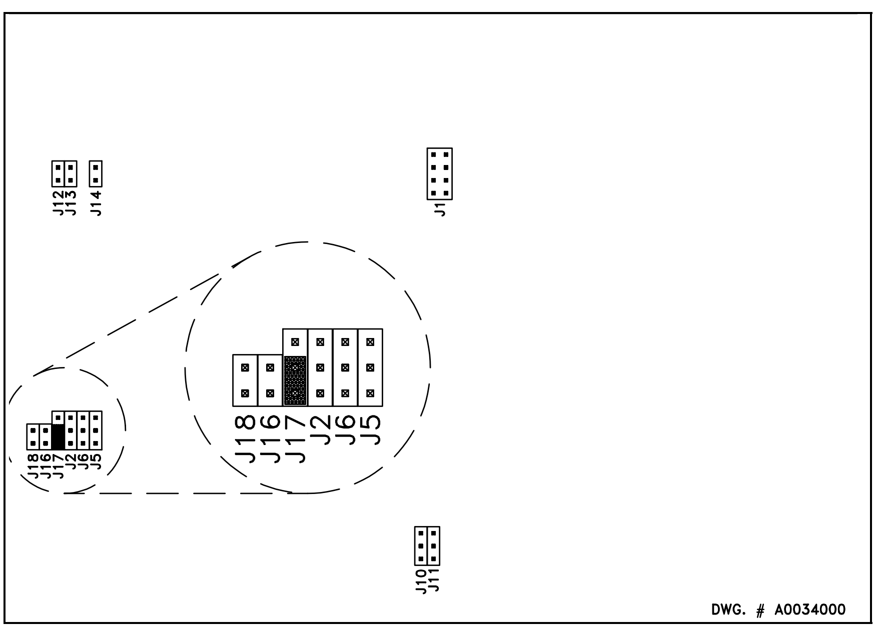


Figure 17 RS422/485 Jumper Settings

when RS-422 communication will be implemented.

Note: Terminating resistor jumpers J16 and J18 should be used as required.

The wiring configuration is shown in Figure 18

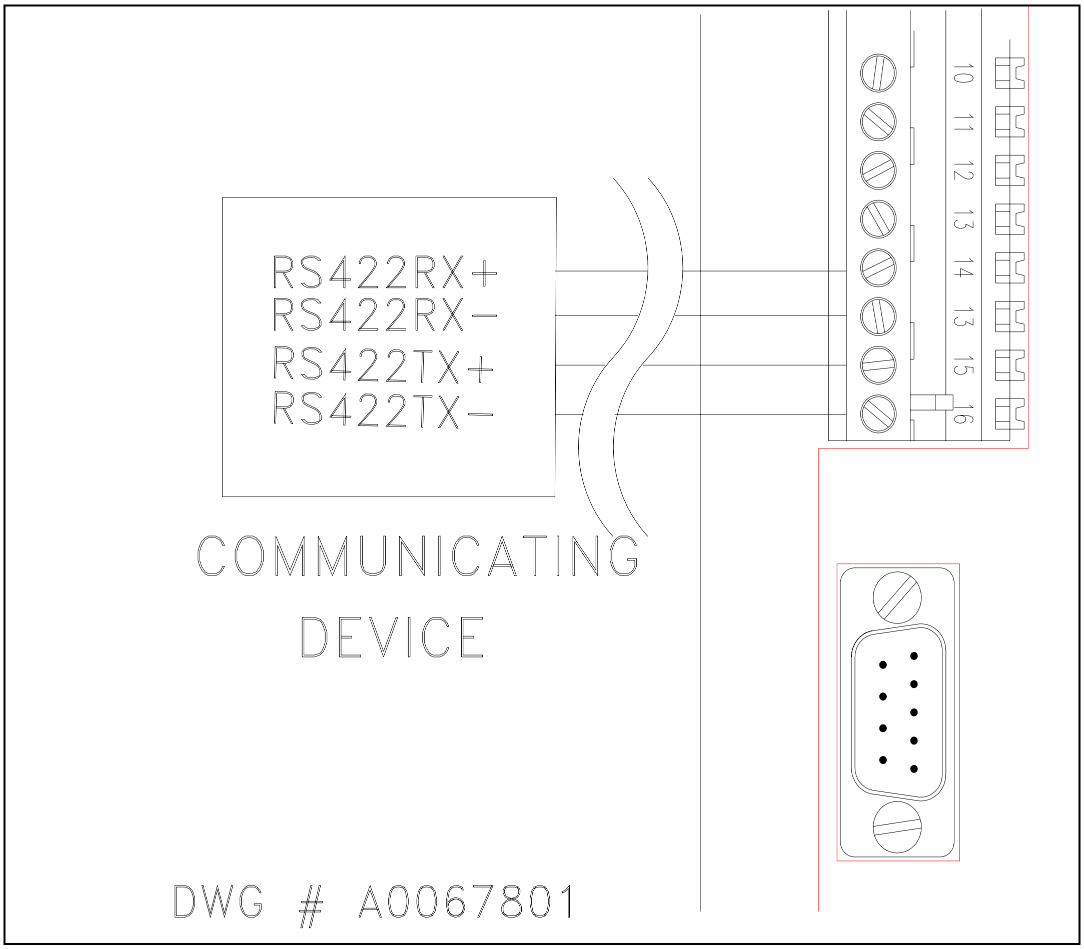


Figure 18 RS422/485 Wiring Configuration

3. COMMAND SUMMARY

The following is the command summary for the DRAINAC IIIB transmitter:

Configuring Parameters and Attributes:

Request Parameter	RP n↵
Request Attribute	RA n i↵
Set Attribute	SA n i nval↵
Load Recipe	LR n↵
Save Recipe	SR n↵

WHERE:

n	is the number of the Parameter,
I	is the number of the Attribute,
nval	is the new value to be entered, and
↵	indicates a CARRIAGE RETURN character.

Note that the spaces between commands and parameters are MANDATORY.

EXAMPLE:

In order to interrogate the instrument for the current setting of FREENESS FILTER, the command from the P.C. would be RA 1 2 ↵ (Request Attribute Parameter 1 Attribute 2).

Computing Cycle Time Attributes for Direct-Reading Indicating Transmitter:

Take Test Cycle Time Sample	SAMPLE x↵
Set Freeness Lab Result	RESULT x f1↵
Compute & update attribute settings	COMPSET f2 f3↵

where

x	is an integer number of the Test # requested
f1	is a floating-point value of a freeness lab result
f2	is a floating-point value of the desired span
f3	is a floating-point value of the desired zero

EXAMPLE 1:

In order to take the Cycle time sample for test #1, the command from the P.C. would be:
SAMPLE 1↵ .

EXAMPLE 2:

To set the Freeness result of test #2 to 100CSF, the command would be:
RESULT 2 100.0↵ .

EXAMPLE 3:

To compute the attribute settings for a desired span of 100.0 and a desired zero of 10.0 the command would be:
COMPSET 100.0 10.0↵ .

SETUP AND CALIBRATION

I. DRAINAC IIIB TUBE SELECTION

When a sample is automatically taken, it is important that a fiber pad is formed below the screen before the measuring cycle is initiated. A certain volume of filtrate is associated with the fibers forming the pad. It is this volume that must be allowed to accumulate before rate detection is accomplished by lower and upper probe immersion. This volume requires proper specification of the tube diameter. The freer the stock, the larger the tube diameter. Your DRAINAC IIIB detector has been assembled using a tube based on your initial sales application data. If you believe a different tube size may be necessary, please consult with Thompson Equipment Co.

NOTE: If the tube is changed, make sure the tube gaskets are aligned properly to insure a good seal.

II. SCREEN SELECTION

Thompson Equipment Company, Inc. supplies two .020 screens as standard equipment. If you believe a different screen size may be necessary, please consult with Thompson Equipment Co.

III. START-UP

A. Probe Settings

The probe settings are set at the factory for general installations but may need to be adjusted for your particular application depending on the conductivity of your process. Each probe's settings (upper and lower) are adjusted in the configuration menu under the parameter "PROBE" and consists of adjusting the attributes "UPPER SENSITIVITY" and "LOWER SENSITIVITY" and the attributes "UPPER SWITCHPOINT" and

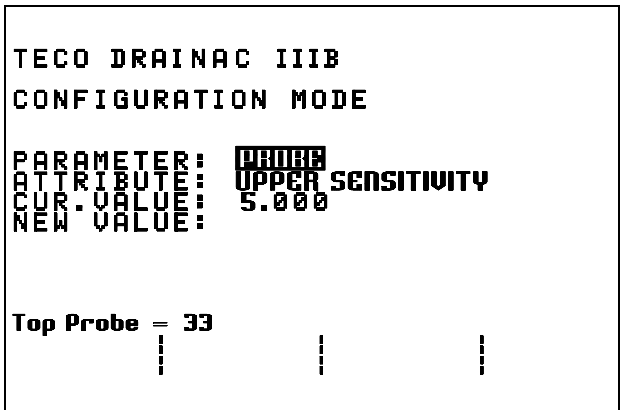


Figure 19 Probe sensitivity configuration screen

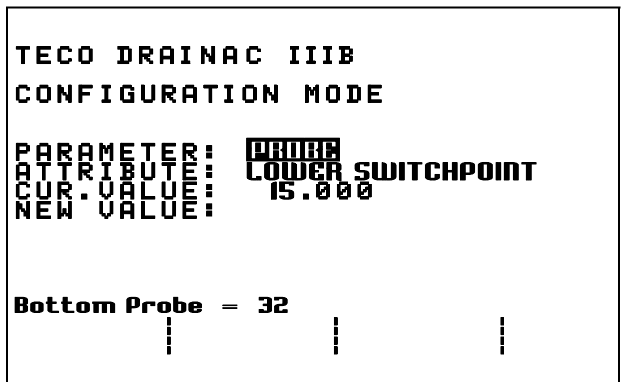


Figure 20 Probe switchpoint configuration screen

"LOWER SWITCHPOINT". The sensitivity is set from the factory at 5 and under most installation conditions is not necessary to be changed, and the switchpoint is set at 15. When the Drainac is in configuration mode under the parameter "PROBE" the current value of the probes relative resistivity to ground is shown at the bottom of the screen. **When the filtrate rises in the tube and touches the probe its value should fall well below the switchpoint for correct operation.** With normal use the Drainac chamber may become coated and the switchpoint may have to be decreased. Ideally the switchpoint should be in the middle of the two states (wet and dry) of the probe. The sensitivity setting should produce at least 10 points difference between the two states (wet and dry) of the probe, increase the "SENSITIVITY" value only to increase the spread. Normally upper and lower probe settings will be identical.The symptoms of improperly adjusted probe settings can be any one or combination of the following:

A. Lower probe too sensitive: the MEASURE portion of the cycle may begin as soon as the INTAKE portion of the cycle begins. Any foam or agitation on the surface of the filtrate may trigger the MEASURE portion.

SOLUTION: Decrease LOWER SWITCHPOINT.

B. Lower probe too insensitive: the MEASURE portion of the cycle will not begin when the liquid level reaches the lower probe.

SOLUTION: Increase LOWER SWITCHPOINT.

C. Upper probe too sensitive: the EXHAUST portion of the cycle begins before the liquid level reaches the upper probe. The MEASURE portion of the cycle shortens to 0 seconds.

SOLUTION: Decrease UPPER SWITCHPOINT.

D. Upper probe too insensitive: the EXHAUST portion of the cycle doesn't start. MEASURE time does not end. **CAUTION: this can force filtrate into the pneumatic side of the system and damage the unit.**

SOLUTION: Increase UPPER SWITCHPOINT.

NOTE: Probe setting errors are indicated on the normal operation displays.

B. Preliminary Adjustments

1. With the 2" detector ball valve closed, turn on air supply to the control cabinet. Close the flush water ball valve if it is not already closed.

2. Place the AC on/off switch on the side of control cabinet in the "on" position. The unit will come on in its previous state. Place the unit in "HOLD".

C. Initial Exhaust Adjustments

3. Set the exhaust time to 10 seconds.

4. With the 2" detector ball valve closed and the electronics in the "HOLD" mode, adjust the exhaust regulator for +10 PSI on the differential gauge. This should produce 10 PSI differential on the gauge when the 2" detector ball valve is open and the unit is exhausting. This positive pressure will insure that the sample is evacuated from the detector after your initial intake phase.

D. Intake Adjustments

5. With the 2" detector ball valve and flush water ball valve closed, place the system in the "CYCLE" mode. After the initial exhaust and flush indication, the system will go into the intake phase. While in the intake phase, adjust the intake pressure regulator for a -5 PSI indication on the differential gauge.

6. Put the unit into "HOLD". Open the 2" detector ball valve. Place the system in the "CYCLE" mode again. The unit will indicate an exhaust, flush, and then go into the intake phase. The filtrate should rise in the tube.

E. Exhaust and Flush Adjustments

7. While in the exhaust phase of cycling, observe that the exhaust regulator is adjusted to +10 PSI with the 2" detector ball valve closed. After the 2" detector ball valve is opened, this will indicate a 10 PSI pressure on the differential gauge during the exhaust phase.

8. It is recommended that the exhaust phase be as short as possible. This will allow more samples to be taken per unit of time. Observe that the exhaust time is long enough to ensure that the entire sample has been evacuated from the detector, thus preventing re-sampling of the same stock. This exhaust time will typically be around 10 seconds.

9. a. Face the detector assembly such that the 2" detector ball valve handle is directly in front of you. Notice the three- (3) needle valves mounted on top of the flush water solenoid enclosure. These valves are used for individual adjustment of the detector self-cleaning system. They are identified as follows, from left to right:

1. Tube flush.
2. Underscreen flush.
3. Screen sprayer.

b. Open the sprayer needle valve until the spray nozzle emits a full cone-shaped pattern when spraying.

c. Open the Underscreen flush water needle valve six (6) complete turns.

d. Open the tube flush needle valve to the point where all stock residue is removed from the measuring chamber at the end of the flush cycle.

10. Adjust the flush time to allow enough time to cleanse the detector chamber, but not too long to introduce excessive water into your pipeline. It has been determined that 5 seconds is typically a good flush time. There should be at least a 3 to 4 second longer exhaust time than flush time to insure that the flush water from the previous cycle is removed before the next cycle starts.

F. Filter

In normal operation, the DRAINAC IIIB uses a moving average of input samples to prevent momentary upsets from inducing unwanted responses in the process.

The number selected for the FILTER value is the number of input samples averaged to determine the output. The FILTER characteristic of the DRAINAC IIIB instruments can be configured to values from "1" to "9". If FILTER is set to "1", the output represents the most recent sample only (no averaging). If FILTER is set to "5", the output represents the average of the current or most recent input sample plus the previous four averages.

TECO recommends using values between 3 and 5.

G. Automatic Calibration

Automatic calibration is a feature, which allows for fast set-up of the DRAINAC IIIB Freeness Tester as a deviation-sensing device.

Before doing an automatic calibration, you must do the preliminary adjustments (1 to 10) above. Before performing an automatic calibration, the freeness of the stock should be set to the nominal operating freeness. This is accomplished by manually adjusting the motor load until lab samples indicate the target freeness. When the freeness is at the proper value, the auto calibration can be initiated by pressing the [CONFIG] button then pressing the [F1] button.

The automatic calibration operation causes the instrument to cycle through five sampling cycles and then calculate the average measuring time for the five cycles. The microprocessor automatically calibrates the span time and zero time necessary for a 50% output (12ma) at the average time of the five cycles. The resulting calibration will be sufficient for controlling freeness at the desired value. If changes are made to the pressure regulators, screen size, or tube size, re-calibration will be necessary.

Note: If it should become necessary to abort the automatic calibration press [F4] CNCL/QUIT.

H. Direct Reading Calibration

Be sure all preliminary adjustments have been made, and the compensation variable adjustment is set to 0 and the filter is set to 1 or 0 before calibrating for direct-reading freeness. In addition, it is important not to change

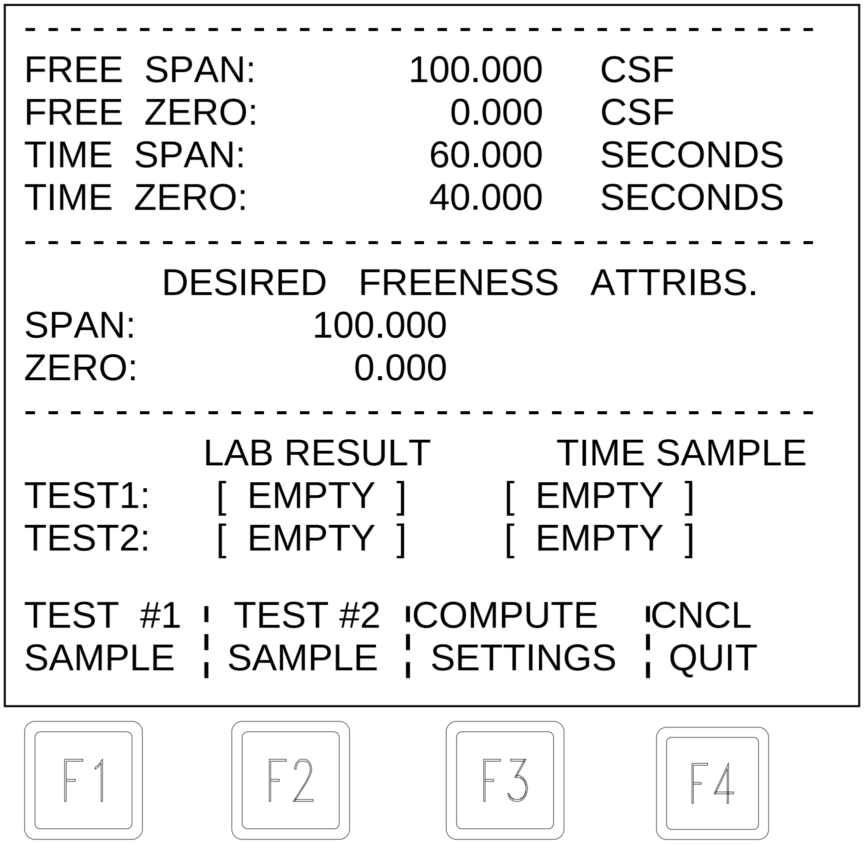


Figure 21 Drainac Lab Calibration Screen

these adjustments while performing the calibration.

In order to calibrate the DRAINAC IIIB for direct reading freeness, it is necessary to correlate 2 different freenesses to the measurement time required by the DRAINAC IIIB to measure these freenesses. This is done by bringing the stock to a known freeness (determined through lab testing) that is within the operating range to which the DRAINAC IIIB is to be calibrated. Then, allow the DRAINAC to run several cycles at this known freeness. Determine the average measurement time the DRAINAC IIIB takes to measure this freeness. Then, vary the freeness (must be same type stock as used for first freeness) to a different value and determine the average DRAINAC IIIB measurement time for this new freeness. The accuracy to which the DRAINAC IIIB will be calibrated is dependent upon the accuracy of the above tests. From these two different freeness values and their corresponding DRAINAC IIIB measurement times, it is possible to determine the span and zero times the microprocessor needs to calibrate to a direct reading freeness scale.

DRAINAC IIIB "LAB CAL." METHOD:

The DRAINAC IIIB has a "LAB CAL" function located in the Cycle Time configuration screen which calculates the span and zero settings based on the entered data. The procedure below describes the operation of the "LAB CAL" function.

NOTE: We recommend that you read the manual method explained below even if you use the DRAINAC IIIB "LAB CAL" function so you will understand what we are doing.

NOTE: Set the filter to 0 for the calibration.

1) While operating at the normal freeness value (or lower), go to the "LAB CAL" screen (Press "CONFIG" and then "F2" key). Press the "F1" key to take the Test #1 cycle time sample. The unit will respond with "OVERWRITE READING #1?". Press “CONTINUE” to proceed or “CNCL” to cancel the function. Simultaneously take a stock sample for lab analysis.

2) Get the freeness well above or below the normal operating point but within the desired calibration range. Allow the transmitter to settle to a new value within its range. If saturation occurs, bring the reading within operating range.

3) On the "LAB CAL" screen, press the "F2" key to take the Test #2 cycle time sample. The unit will respond with "OVERWRITE READING #2?". Press “CONTINUE” to proceed or “CNCL” to cancel the function. Simultaneously take a stock sample for lab analysis.

4) Do laboratory analysis on the lab samples to get actual freeness values.

5) When the freeness lab results are complete from the two samples, return to the "LAB CAL" screen. Use the arrow keys to highlight the "TEST1" value under "LAB RESULT". Press "ENTER" to select the position desired. Enter the actual freeness of the first stock sample. Press "ENTER" a second time for the value to be accepted.

6) Repeat the procedure in step 6 to enter the second “LAB RESULT” value in the "TEST2" position.

7) Enter values for desired span and zero labels if they are different from the current settings.

8) With the cycle time samples, stock freeness lab results, and desired labels entered press "COMPUTE SETTINGS". The unit will respond with "COMPUTE & UPDATE SETTINGS?”. Press "CONTINUE" to proceed or “CNCL” to abort the function. The unit should accept the values and calculate the new Cycle Time attribute settings (span & zero).

9) Before calculating new settings the DRAINAC IIIB checks to make sure that the two time samples and freeness lab result values have a large enough deviation to allow an accurate calculation of the cycle time span & zero values. If the time values are too close, the unit will respond with "TIME DIFF. MUST BE > 2". If the difference in the stock sample freeness values does not agree with the time difference the unit will respond with "Error Cal. slope is invalid".

10) Take one last lab sample and use the COMP_VAR Bias to fine-tune the reading.

11) To return to operating display press F4 to quit and then press the DISPLAY key.

MANUAL METHOD: We will explain this method with an example.

A known sample of stock at 480 CSF (determined by lab tests) has a 20-second measurement time on the DRAINAC IIIB. Another known sample of stock at 520 CSF has a 16-second measurement time. The desired measurement range is 400 CSF to 600 CSF. To determine the span time setting and zero time setting required by the microprocessor to output 4ma - 20ma representing 400 CSF - 600 CSF, we need to first correlate the known values and their measurement times to their output current values. To do the calculations you will need a calculator, some semi-log graph paper, pencil, and a straightedge. Semi-log graph paper is provided. We recommend that you photocopy this page for use in drawing your own graphs.

Our manual method consists of:

1 - Calculating our "Y"-coordinates in milliamps for each known freeness. Note: our "X"-coordinate is the DRAINAC measure time for each known freeness.

2 - Plotting our known freenesses on a copy of the provided graph paper.

3 - Drawing a line through the 2 plotted points.

4 - Using this line to determine our span and zero times necessary for our desired direct reading freeness range.

We must first calculate the CSF span. This is the difference between the upper and lower CSF range values:

$$CSF\ span = (CSF1) - (CSF2)$$

$$\frac{16\ mA}{200\ CSF} = .08\ mA/CSF$$

Where:
CSF1 is the desired CS freeness for 100 % output (20ma)

CSF2 is the desired CS freeness for 0 % output (4ma).
Note: CSF2 is also our freeness bias that must be subtracted during our calculations.

CSF span = 600 - 400 = 200 (for our sample case)

200 CSF SPAN (600 minus our 400 CSF bias) is represented by 16ma (20ma minus the 4ma bias), therefore 1 CSF equates to .08ma.

To calculate our milliamp value for each sample measure time (Y- coordinate plot point) for our 2 known freenesses use the following formula:

Y = ((freeness - freeness bias) (ma/CSF)) + 4ma

Where:
freeness = value of sample as determined in lab

freeness bias = desired CS freeness for 0 % output (4ma)(same as CSF2 above)

(ma/CSF) = calculated milliamps per CSF

4ma = output bias

Calculate first plot point, 520 CSF with 16 second DRAINAC measure time, freeness bias 400 CSF.
((520 CSF - 400 CSF) x .08ma) + 4ma (bias) = 13.6ma (the output current representing 520 CSF).

On the semi-log graph paper, plot the point defined by 16 seconds on the "X"-axis and 13.6ma on the "Y"-axis.

Calculate the second plot point, 480 CSF with 20 second DRAINAC measure time.
((480 CSF - 400 CSF) x .08ma) + 4ma (bias) = 10.4ma (the output current representing 480 CSF).

On the semi-log graph paper, plot the point defined by 20 seconds on the "X"-axis and 10.4ma on the "Y"-axis.

Line up the straightedge on these two points and draw a line intersecting the 20ma graph line, the two plotted points, and the 4ma graph line.

The point where our line intersects the 20ma graph line will be called POINT "A". The point where our line intersects the 4ma graph line will be called POINT "B".

The time described by POINT "A" on the graph is the time required by the microprocessor to output 20ma. In this case, it is slightly more than 10 seconds. This is the number we would input to the microprocessor for our TIME ZERO under the parameter CYC TIME.

The time described by POINT "B" on the graph is the time required by the microprocessor to output 4ma. In this example, it is slightly more than 34 seconds. Our span is the difference between POINT "B" and POINT "A".

TIME SPAN = POINT "B" time - POINT "A" time

TIME SPAN = 34 - 10 = 24 seconds. 24 seconds is the number we need to input to the microprocessor for TIME SPAN under the parameter CYC TIME. Our DRAINAC IIIB is now calibrated (based on our lab testing of samples) for 400 CSF to 600 CSF = 4ma - 20ma. Remember that our calibration is only as good as the accuracy of the lab tests. Also, this calibration is only valid for the stock from which these samples were taken, since different stocks may have different measurement times for the same freeness.

Running the above example on a computer will return approximately the same answers. The computer-derived solution will be more accurate, since there is no possibility of "layout error" in using the straightedge and pencil, but the manual method is accurate enough.

Manual accuracy can be improved by rescaling the X-axis (representing time) so that the plotted line approaches a 45 degree diagonal down the page.

I. <u>Compensation Variable</u>

There are some variables, which can effect the relationship of freeness to DRAINAC measurement. In some

$$V = \frac{ma_{measured} - 4}{16} * SPAN + ZERO$$

installations, the effects are very little, and in some applications, the effects can be noticeable. The DRAINAC IIIB allows the compensation of the freeness based on another process parameter that might be affecting the

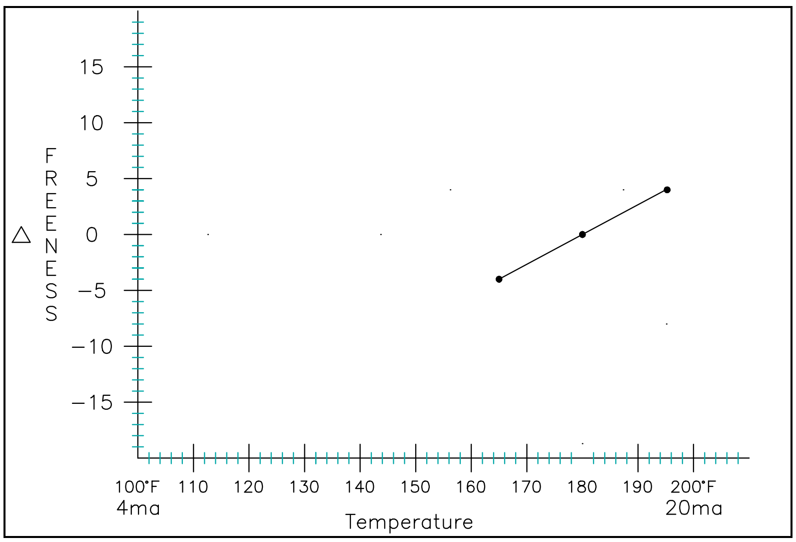


Figure 22 Compensation Variable Graph Example

relationship of the DRAINAC reading to actual freeness. An example of a parameter that might cause this would be temperature. If the temperature swings were large enough, a 4-20 ma temperature transmitter can be wired to the analog input (ANI) terminals of the electronics. The electronics can generate the result of a third order polynomial which can be added (or subtracted) from the freeness calculation for use in corrections. The compensation variable "V" is internally converted to engineering units (such as °F), by:

"V" can now be used to compensate the raw freeness measurement by:

$$F_{compensated} = F_{raw} + \Delta F$$

where

$$\Delta F = f\,(V)$$

(V) is generated from actual process data fit to up to a third order polynomial. Assume the temperature transmitter is adjusted with its zero at 100°F, and its full scale at 200°F. Assume the Drainac™ is calibrated when the stock temperature was 180°F. As such there will be no correction to be made when the stock is at 180°F, and compensation adjustment as the temperature varies either above or below 180°F. In tests performed on the process, an offset of +4 CSF was measured with the stock at 195°F, and of -4 CSF when the stock was at 165°F.

This data put into a non-linear regression curve fitting program results in:

$a = .2667$

$b = -48$

for the form

$y = ax+b$

In this case, we have

$\Delta F = .2667\ (T) - 48$

And

$F_{compensated} = F_{raw} + .2667\ (T) - 48$

For this example on the parameter COMP VAR, you would set the attributes as follows:

SPAN:	100	
ZERO:	100	
BIAS:	48	
FACTOR:	.2667	
SQUARED FACTOR:	0	
CUBED FACTOR:	0	
FILTER:		(small value, e.g. 2)

J. <u>Shut-down</u>

While in the exhaust cycle, allow the system to flush and then close the 2" detector ball valve. Place the AC on/off switch in the off position and shut off the air supply (for extended shutdowns close the flushwater valve also).

K. <u>Start-up (Subsequent)</u>

With the 2" detector ball valve closed, turn on the air supply. Then place the AC on/off switch in the on position. The unit will come up in its previous state. Open the 2" detector ball valve and the flushwater valve. Press the F4 button if necessary to switch to "CYCLE". The system will begin cycling automatically.

IV. RECIPE MANAGEMENT

The DRAINAC IIIB uses a unique Recipe Management method to accommodate the several sets of calibration constants which may be needed to match the differing time vs freeness characteristics of different stock furnishes or blends, or the different measurement ranges which may be desired when producing different products

A. <u>Recipe</u>

A recipe is defined as a copy of one complete set of the settings for all the attributes of all the parameters which make up one calibration setup.

B. <u>Using the recipes</u>

The parameter "RECIPE" has one attribute, "NUMBER" which can have ten values, 0-9. Each of these is like a page in a recipe book, each capable of having a copy of all the settings written onto it.

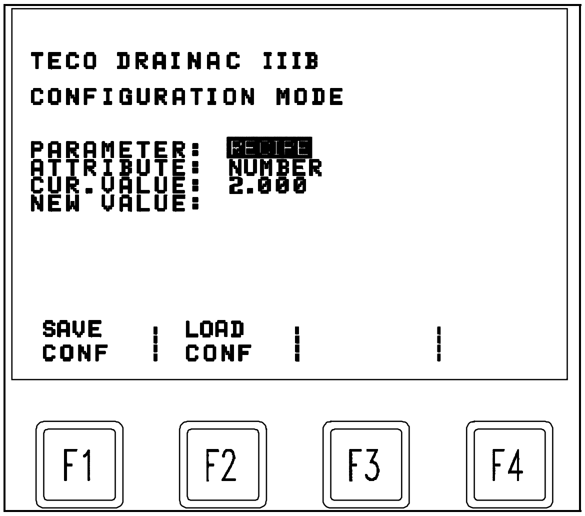


Figure 23 Recipe configuration screen

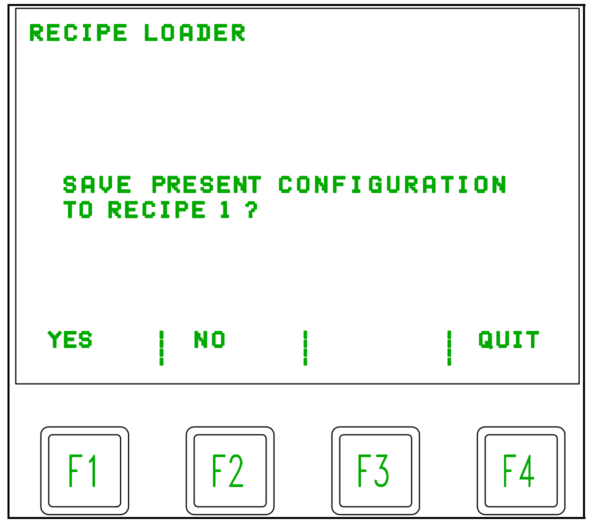


Figure 24 Recipe SAVE acknowledge screen

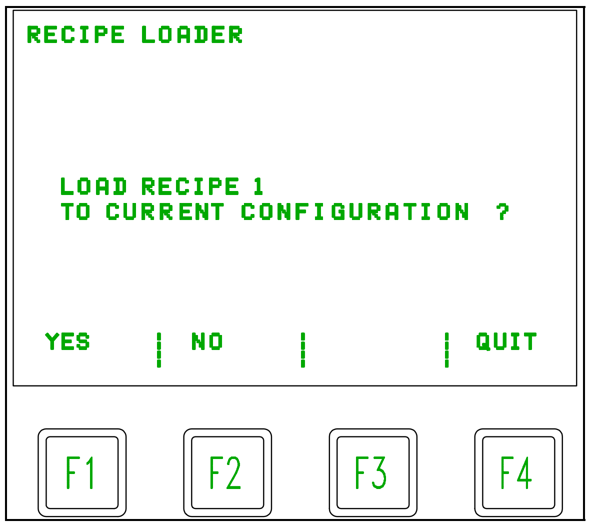


Figure 25 Recipe LOAD acknowledge screen

1. <u>SAVEing a recipe</u>

When you are ready to retain all the settings associated with a particular stock blend or product calibration, you wish to "SAVE" a recipe. Go to the configuration mode, select the parameter "RECIPE", the attribute "NUMBER", and choose a recipe number 0-9 to save these settings in. Do this by moving the cursor to the new value field, pressing 0-9, then pressing ENTER. Then press F1 for SAVE. It will then prompt you to make sure this is really what you mean to do. Press F1 for YES or F2 for NO. If YES is pressed, there will now be a complete copy of all the active settings saved in memory under that recipe number.

2. <u>LOADing a recipe</u>

When you wish to call into action the calibration constants previously SAVED in a particular recipe number, because you are preparing to make the same product again, or are receiving the same furnish blend again, simply load that recipe. Go to the configuration mode, select the parameter RECIPE, the attribute NUMBER where the constants of interest were previously stored. Do this by moving the cursor to the new value field, pressing 0-9 as appropriate. Then press ENTER. Then press F2 for LOAD. It will prompt you to make sure this is really what you mean to do. Press F1 for YES or F2 for NO. If YES is pressed, the active settings will be replaced by those requested from the pre-saved set.

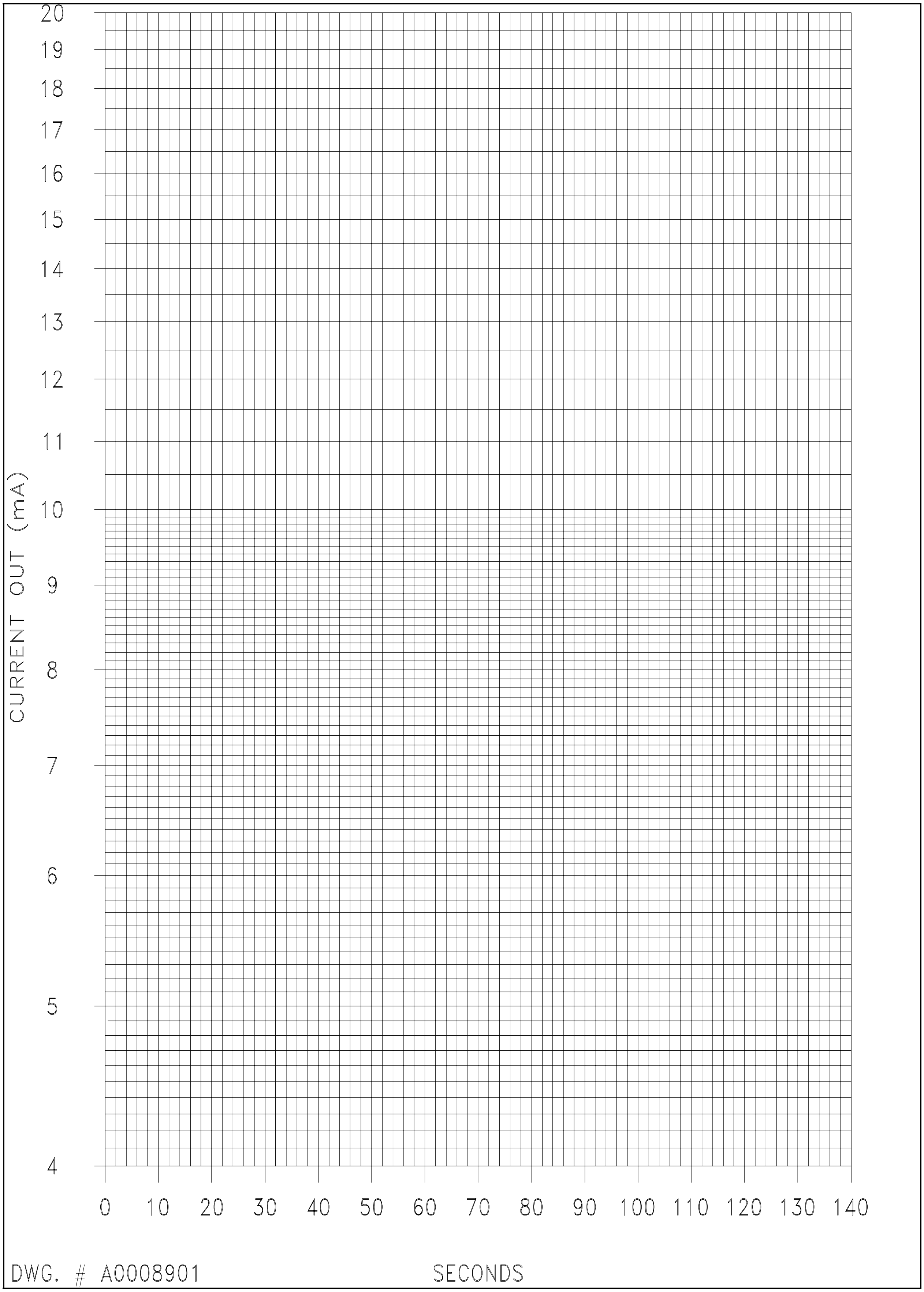


Figure 26 Semi-log Graph Paper

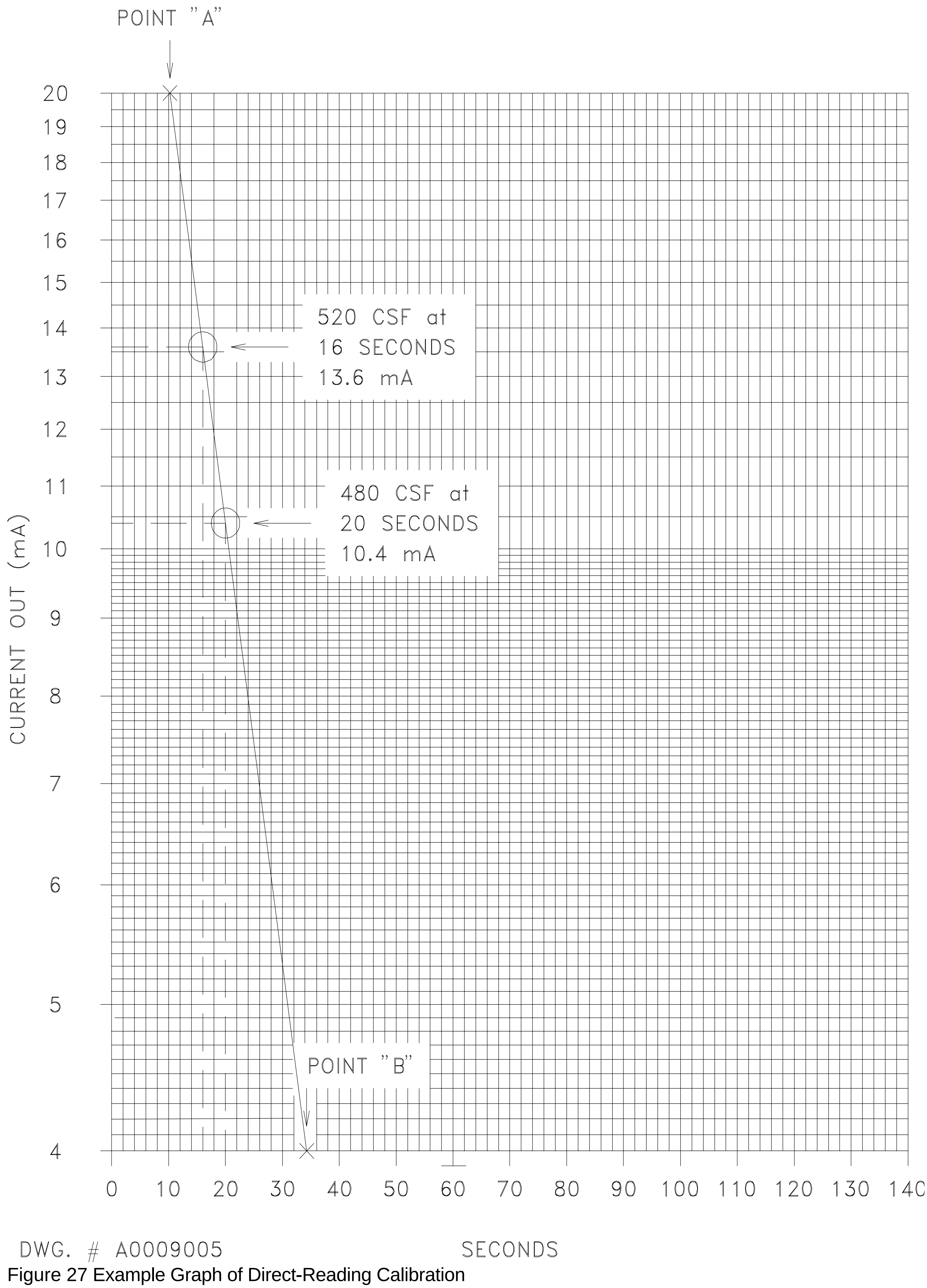


Figure 27 Example Graph of Direct-Reading Calibration

MAINTENANCE

I SCREEN CLEANING

CAUTION: Always be sure the detector tube is de-pressurized (accomplished by removal of quick-disconnect) before loosening the wing nut to open the detector.

Periodic screen cleaning is required. The type of stock being measured will dictate the frequency. The system can remain on or off while you clean the screen.

Procedure:

1. Allow the system to flush and then put the system in "HOLD". Then close the 2" detector ball valve, remove the quick-disconnect, and close the flushwater valve.

2. Loosen the wing nut and swing open the detector to allow access to the screen. A flat is provided on the screen for easy removal. Normally, a light scrubbing with a brush and clean water will be enough to clean most deposited material.

3. Replace the screen and close the detector, then tighten the wing nut in place.

4. Reconnect the quick-disconnect. Be sure the unit is still in "HOLD". Open the 2" detector ball valve and the flushwater valve. Press the [F4] button to switch unit to "CYCLE". The unit will begin cycling automatically.

II. DETECTOR CHAMBER CLEANING

CAUTION: Always be sure the detector tube is de-pressurized (accomplished by removal of quick-disconnect) before loosening the wing nut to open the detector.

The detector chamber will periodically require cleaning. The type of stock being measured will determine the frequency.

Procedure:

1. Allow the system to flush and then put the system in "HOLD". Close the 2" detector ball valve and the flushwater valve. Finally, place the AC on/off switch in the off position and shut off your air supply.

2. Remove the quick-disconnect on the detector, and remove the tubing line for the tube flush. Also, disconnect the screen sprayer tubing from its respective needle valve.

3. Unplug the electrical connector on the detector cap.

4. Loosen the wing nut and remove the hinge pin on the detector flanges. The chamber is now free for removal and necessary cleaning.

5. After cleaning, remount the chamber in place by reinstalling the hinge pin and wing nut.

6. Reconnect the quick-disconnect, the tube flush line and the electrical connector onto the detector.

7. Restart: Turn on the air supply. With 2" detector ball valve closed, place the AC on/off switch in the on position. The unit will come on in its previous state. Open the 2" detector ball valve and the flushwater valve. Press the [F4] button again to start the system cycling. The system will now begin cycling automatically.

III. CHANGING OF PROBES

If you require the installation of a new or different probe configuration, a change can easily be accomplished.

Disassembly:

1. Shut down the system as follows: Allow the system to flush and then put the system in "HOLD". Then close the 2" detector ball valve. Close the 1/4" flush water ball valve. Finally, place the AC on/off switch in the "off" position and shut off your air supply.

2. Unplug the probe cable 90^o connector plug located at the top of the detector cap cover. This is done by unscrewing the lock nut counter-clockwise and lifting the plug free from the detector cap cover receptacle. Note the screen sprayer tubing at the top of the detector cap cover. This tubing slides through the bulkhead fitting and is directly attached to the probe/sprayer holder/insulator. Using a 7/16" open-end wrench, loosen the nut on top of the bulkhead fitting. Remove the nut from the fitting and slide it as far back along the plastic tubing, as the cable ties will permit. Similarly, back the nylon bushing as far back as possible. This will allow the tubing to slide through the detector cap cover when it is lifted.

3. Remove the three- (3) 6-32 slotted screws securing the detector cap cover to the detector cap.

Caution: the probe/sprayer holder/insulator is interconnected with the detector cap receptacle assembly by three (3) 18-gauge wires approximately 6" long. Use care when lifting the detector cap cover that these wires not be strained as this may cause them to break.

4. Now that the probe/sprayer holder/insulator is exposed, remove as follows:

Remove the four- (4) 8-32 slotted screws, which are holding the probe/sprayer holder/insulator to the detector cap. Using caution, extract the probe/sprayer holder/insulator by grabbing the probe lock nuts with a pair of slip-joint pliers and lifting. Some force will be required.

Note: it may be necessary to use a blunt instrument and tap up from the bottom on the sprayer nozzle to unseat the probe/sprayer holder/insulator. If this is necessary, loosen the wing nut and pivot the upper detector assembly to expose the bottom of the sprayer. Take care not to deface the sprayer nozzle.

5. After the probe/sprayer holder/insulator has been removed, separate the spray water tubing by loosening and removing the nut from the male connector located on top of the probe/sprayer holder/insulator. Also, disconnect the two remaining wires from the top of the probes, using a 3/8" nut driver or wrench. The probe/sprayer holder/insulator may now be taken to a workbench for removal and replacement of the probes at this point.

6. Using the 3/8" nut driver, remove the remaining 10-24 hardware from the probes. Tap the threaded ends of the probes through the probe/sprayer holder/insulator and set aside. Remove the two O-rings and discard. **DO NOT RE-USE.**

Reassembly:

1. Insert new probes into the probe/sprayer holder/insulator. Ensure that groove pins on the probes are aligned with and seated in slots in the bottom face of the probe/sprayer holder/insulator. On the top face of the probe/sprayer holder/insulator, slide the new O-rings down over the threaded ends of the probes, and down into the O-ring grooves provided on the probe/sprayer holder/insulator. It is suggested that a non-conductive silicone lubricant be used sparingly to provide proper sealing of the O-ring.

2. Install probe hardware as follows: Flat washer (directly against the O-ring). Run the 10-24 nut down using a 3/8" nut driver until the flat washer is seated firmly against the top face of the probe/sprayer holder/insulator. It may be necessary at times to add flat washers due to the fact that the overall thread length may change from probe to probe. This will insure proper seating of the O-ring in its groove.

3. Re-attach the probe wires to their respective probes and secure with an internal tooth lock washer and

10-24 nut. The white wire connects to the longer (lower) probe and the black wire connects to the shorter (upper) probe.

4. Inspect the probe/sprayer holder/insulator O-ring for proper seating in the groove and general condition. Reapply a small amount of non-conductive silicone lubricant to aid in re-insertion and seating.

5. Connect the spray water tubing to the male connector fitting on the top face of the probe/sprayer holder/insulator. Slide the nylon bushing down to seat against the inner rim of the fitting. Slide the nut down, thread, and tighten snugly with a 7/16" wrench. DO NOT OVERTIGHTEN

6. Using a pair of slip-joint pliers, rotate the probe/sprayer holder/insulator so that the spray tubing male connector fitting is directly behind the 2" detector ball valve handle. Align the probe/sprayer holder/insulator with the 8-32 tapped holes in the detector cap. Insert three (3) of the 8-32 screws with flat washer and lock washer. Run the screws down sufficiently to thread, but do not tighten yet.

7. Using the remaining 8-32 screw and hardware, attach the red lead to the detector cap assembly through the remaining hole in the probe/sprayer holder/insulator.

8. Now tighten all four (4) 8-32 screws.

9. Ensuring that the detector cap cover gasket is in good condition and in place, slide the detector cap cover down the tubing and into place on the detector cap so that the bulkhead fitting is toward the front or ball valve handle side of the riser, and the electrical connector is toward the chamber pivot. This will prevent damage to the polyurethane tubing from misalignment. The three- (3) holes in the detector cap cover should now be aligned with the three threaded 6-32 tapped holes in the detector cap. Insert the three 6-32 slotted screws with lock washers into the holes and tighten.

10. Slide the nylon-bushing, nut down the tubing, and reattach to the bulkhead fitting. Tighten using a 7/16" open-end wrench. **Note again: do not over-tighten.**

11. Reconnect the 90^o probe cable connector.

12. Turn on the air supply. Place the on-off switch in the "on" position. The system is ready for normal operation.

REPLACEMENT PARTS

I. RECOMMENDED SPARE PARTS

Item Number	Description	Suggested Quantity
HW000235	"O"-ring for probes	3
09030006739	Gasket for cap	1
F7601P	Gasket for detector tube	2
F7002P	"O"-ring for screen	2
34000006965	"O"-ring for probe holder	1
HP000001	"O"-ring, Pressure Transmitter	1
HP000004	Screen, Strainer	1
HP000005	"O"-ring, Strainer End Cap	1

II. WEAR ITEMS

A. 316 Stainless Steel Probes

Probe Configuration Sets

MC000019 Probes, set of (2)

Individual Probes

090300F6742 Probe F, 7.00" LG
090300K7667 Probe K, 4.00" LG

B. Hastelloy Probes

Probe Configuration Sets

MC000020 Probes, set of (2)

Individual Probes

090300F6743 Probe F, 7.00" LG
090300K6743 Probe K, 4.00" LG

ASSEMBLY, WIRE HARNESS, DETECTOR TO CONTROL CABINET, STOCKLINE SYSTEM

SEE DRAWING # A0069502 AT REAR OF BOOK

Find #	Part #	Description	Quantity
1	34000006931	YELLOW	32 FT
2	34000006364	WHITE	32 FT
3	34000006365	GREEN	32 FT
4	34002091255	SEALTIGHT, 1/2, TYPE EF, GRAY	30 FT
5	34000005585	TIE, IDENTIFYING	2
6	34000005391	TERMINAL, VINYL INSUL.	5
7	34000004785	TERMINAL, RING, INSUL.	1
8	09030006961	CABLE, 3 COND.	32 FT
9	34000060906	SPLICE, BUTT	2
10	34000007107	DISCONNECT, FULLY INSUL. 4	
11	34000006345	TERMINAL, RING	1
12	34000007778	TUBING, SHRINK 3/16" DIA. .5 FT	
13	34000005557	TUBING, SHRINK	6 IN
14	34000006573	TIE, CABLE	10
15	34000004631	CONNECTOR, 90 DEG., 1/2" 2	
16	34000005350	RING, SEALING, 1/2"	2

ASSEMBLY, EXTERNAL POWER SWITCH, STOCKLINE SYSTEM

SEE DRAWING # A0068500 AT REAR OF BOOK

Find #	Part #	Description	Quantity
	09030007105	SWITCH, 2 POS. ILLUM. SELECTOR	1
	09030007174	NUT, PANEL MOUNT	1
	41000000388	NAMEPLATE "OFF-ON"	1
	34000005389	TERMINAL, LOCKING FORK 16-14 GA. #6 LUG	3
	34000006343	WIRE 14 AWG, 19 STRAND, MTW, 600 VOLT, RED	2 FT
	34000006363	WIRE 14 AWG, 19 STRAND, MTW, 600 VOLT, WHITE	2 FT
	34000007175	WIRE 14 AWG, 19 STRAND, MTW, 600 VOLT, BLACK	2 FT
	34000006574	MOUNTING, TIE	1
	34000006573	TIE, CABLE	8
	09000007654	TUBING, HEAT SHRINKABLE 1/2" CLEAR	4 IN

ASSEMBLY, DRAINAC IIIB, PEDESTAL OPTION, ITEM NO: 09030007452

SEE DRAWING # A0022501 AT REAR OF BOOK

Find #	Part #	Description	Quantity
1	*	PEDESTAL BASE	1
2	*	PEDESTAL COLUMN	1
3	*	GASKET	2
4	*	SCREW, 1/4-20 X .63 LG.	4
5	*	NUT, 1/4-20	4
6	*	LOCKWASHER, ¼	8
7	34000005502	SCREW, 1/4-20 X .75 LG. FLAT HD., STN.	4
8	09030007451	0903-Y-0017 PEDESTAL DECK	1
10	34000003568	SCREW, 3/8-16 X 1.00 LG. HEX HD. STN.	4
11	34000004682	WASHER, 3/8-INCH, FLAT STN.	4
12	34000003983	LOCKWASHER, 3/8-INCH STN.	4
13	34000003922	NUT, 3/8-16 STN.	4

* Parts 1 to 6 must be ordered as an assembly part number 09020004934.

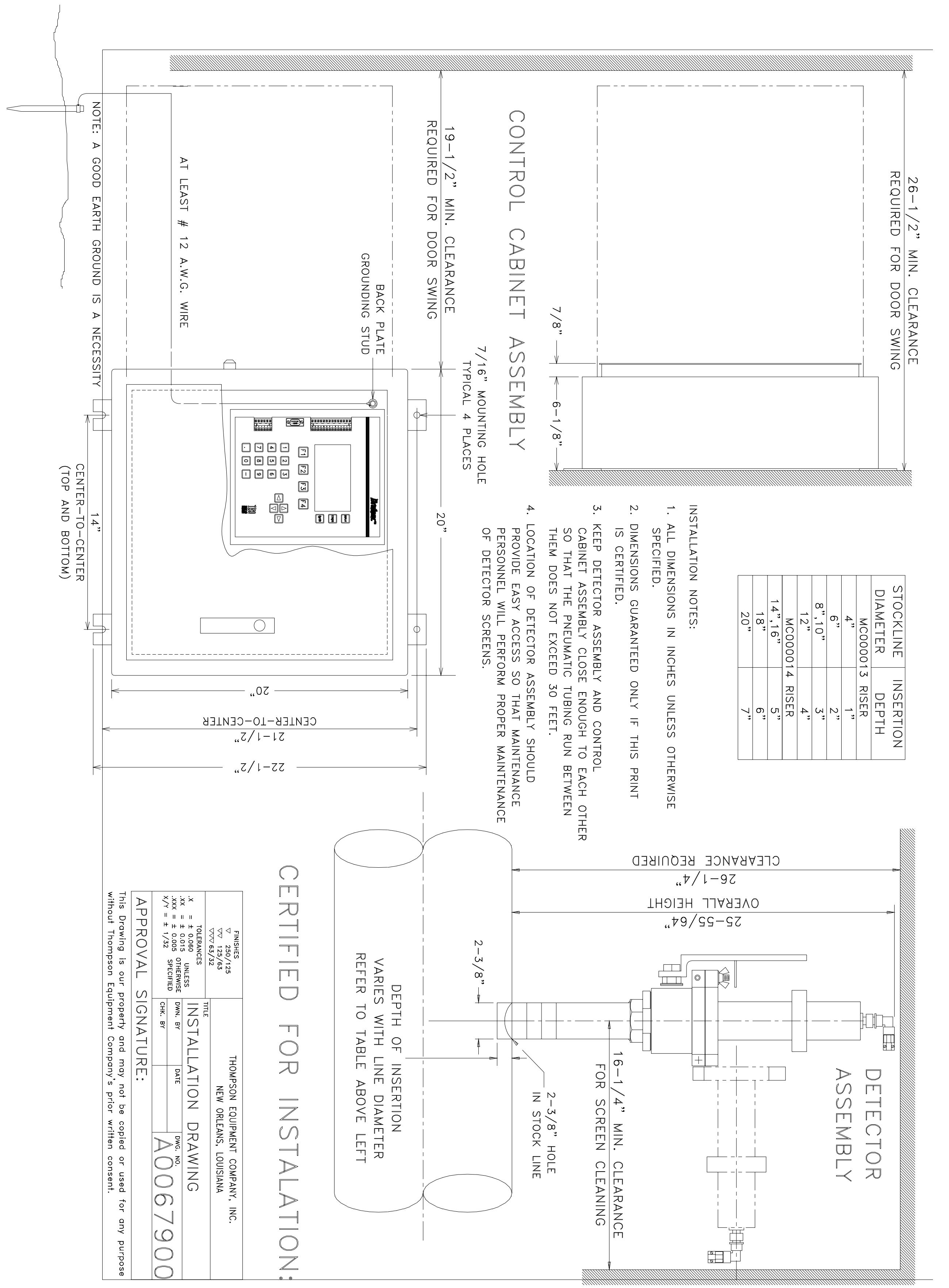


Figure 28 Dwg. A0067900 Installation Drawing

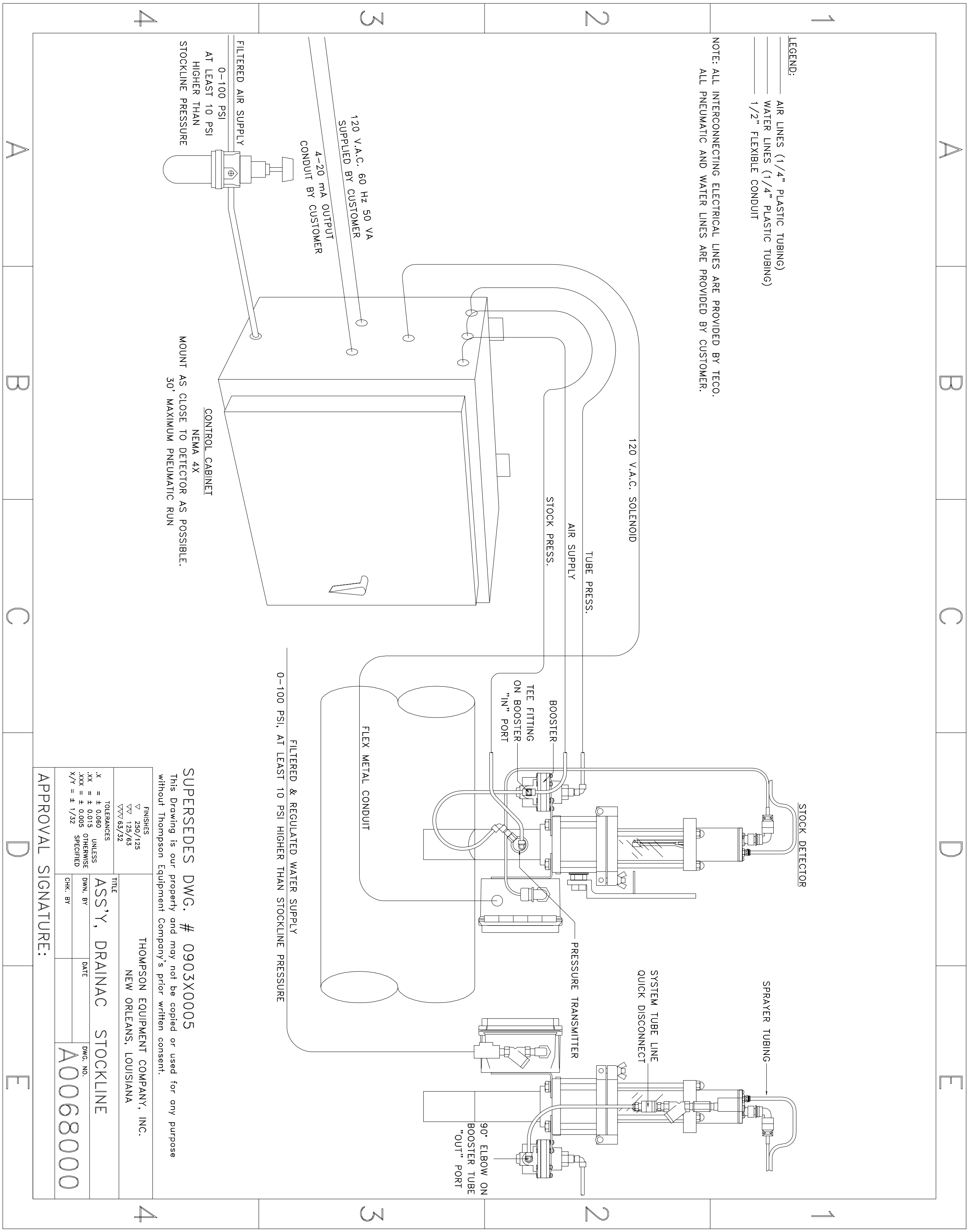


Figure 29 Dwg A0068000 Stockline assembly

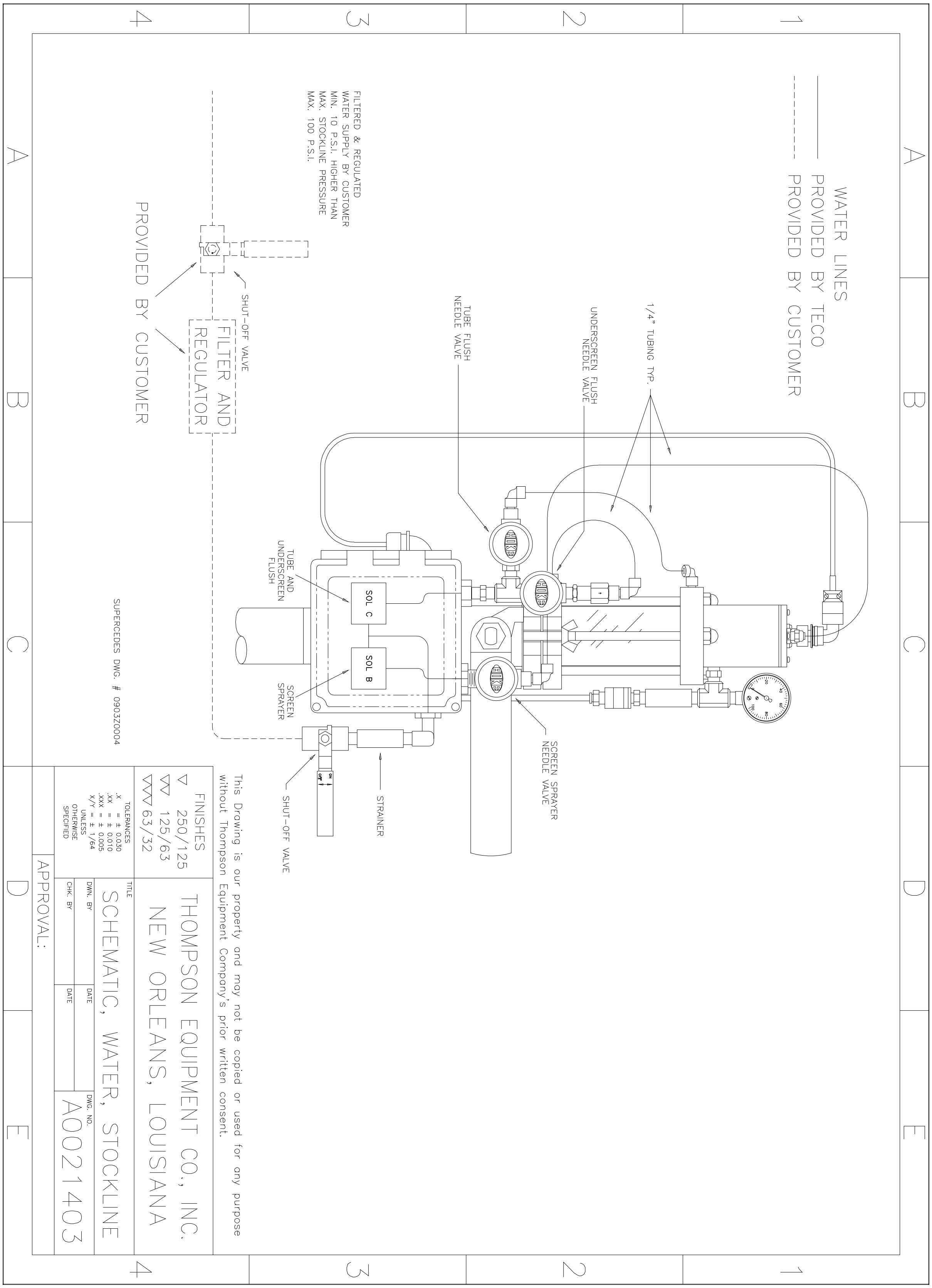


Figure 30 Dwg. A0021403 Water Schematic

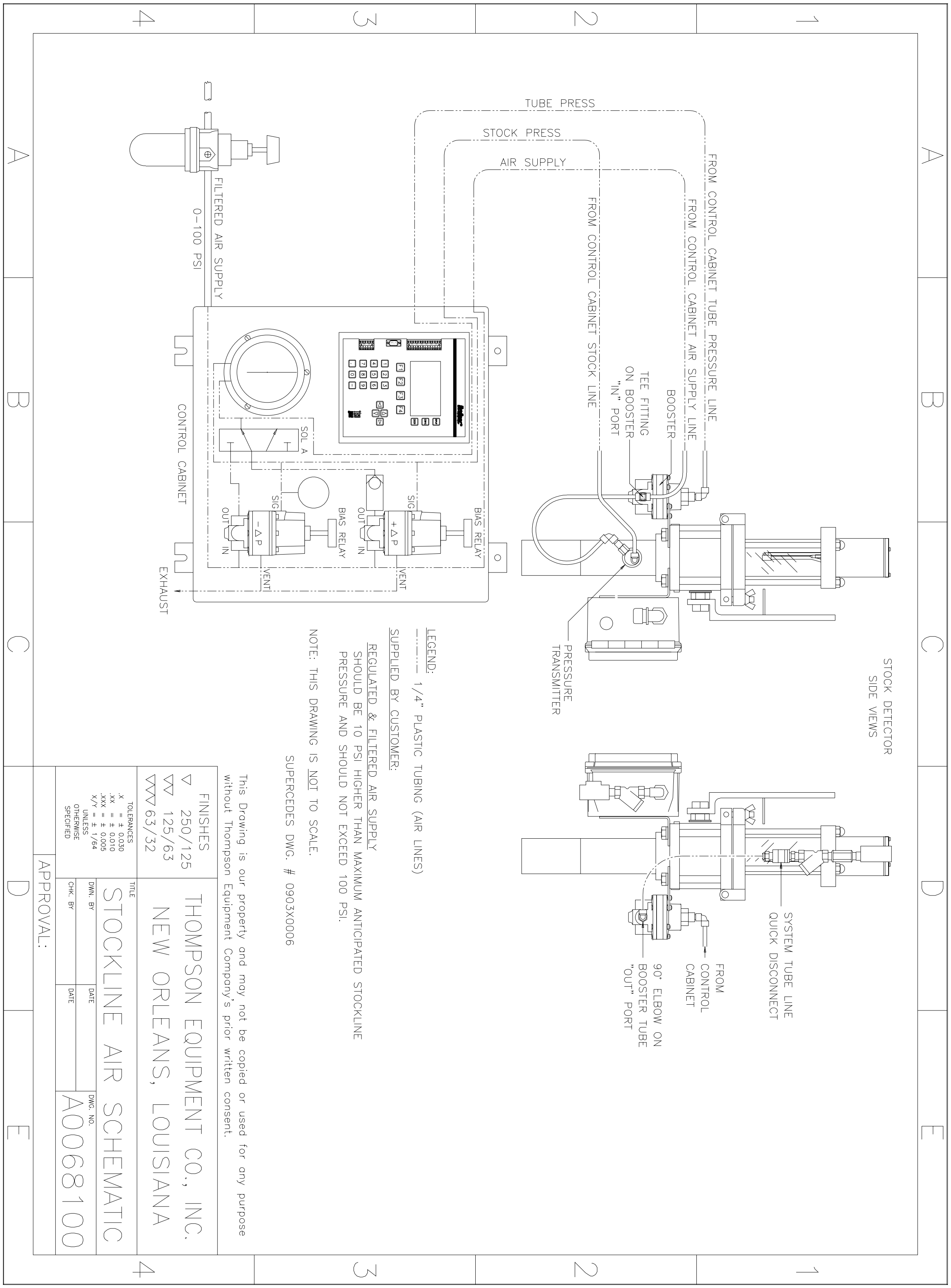


Figure 31 Dwg. A0068100 Air Schematic

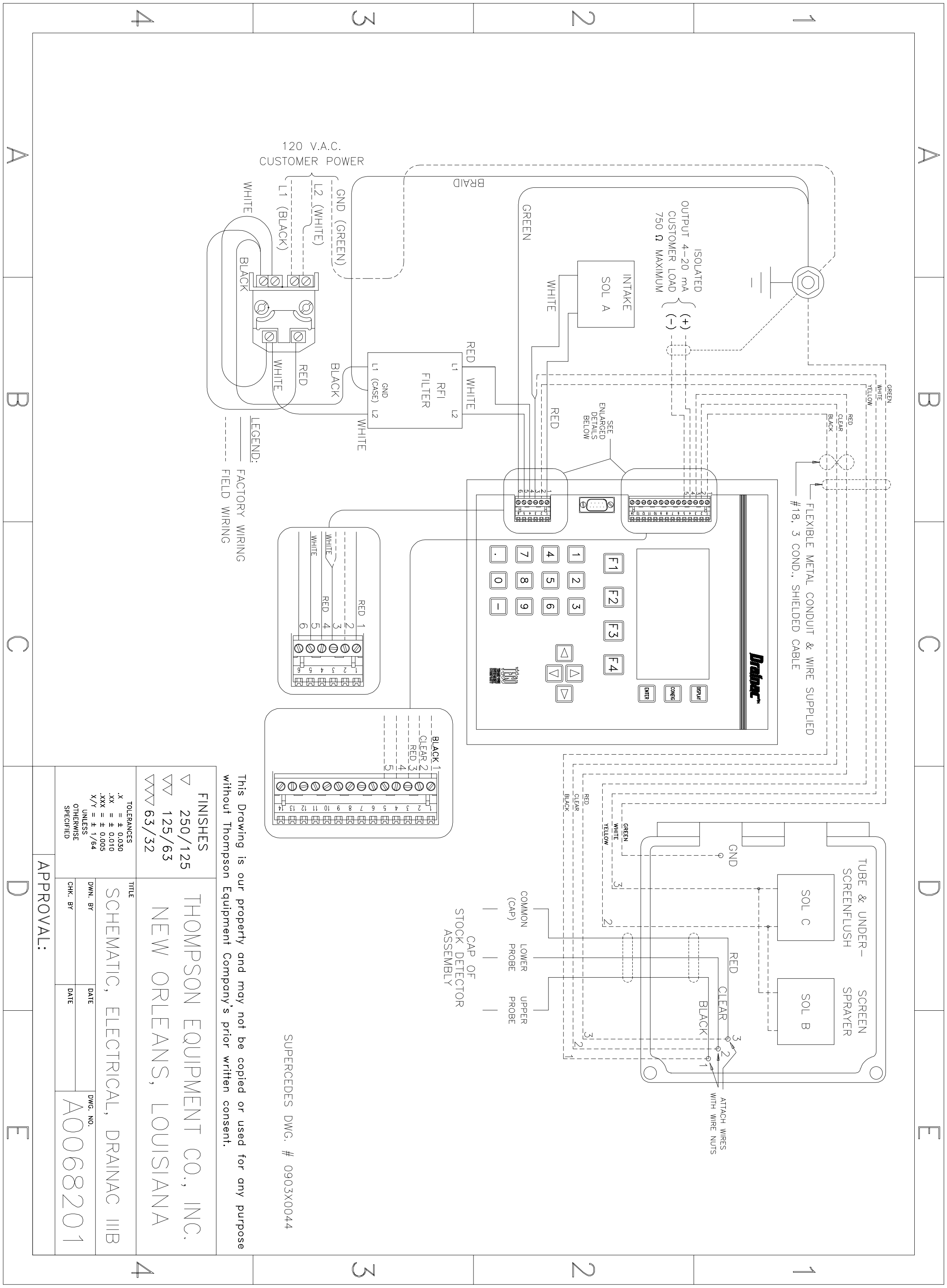


Figure 32 Dwg. A0068201 Electrical Schematic

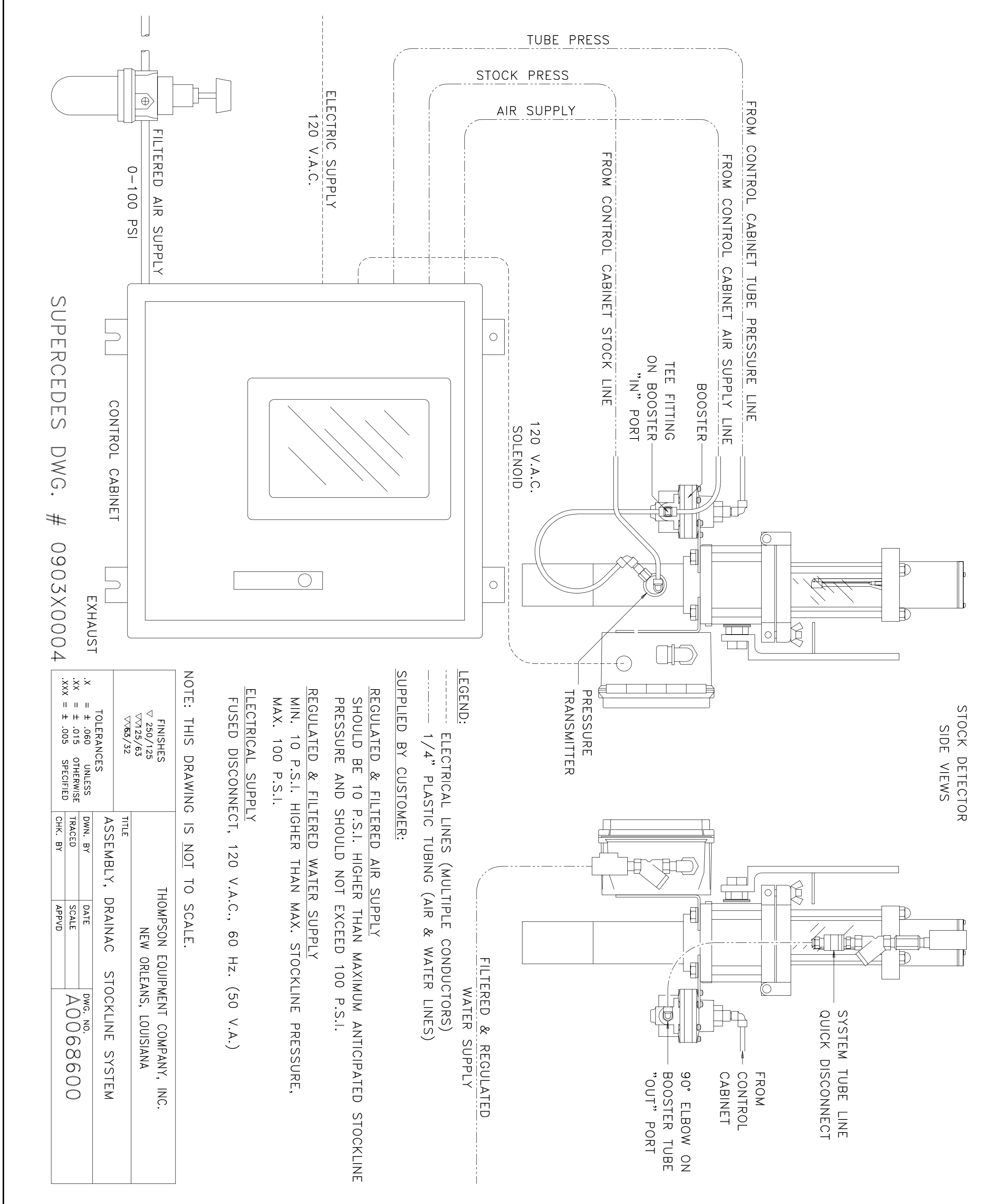


Figure 33 Dwg. A0068600 Stockline Assembly

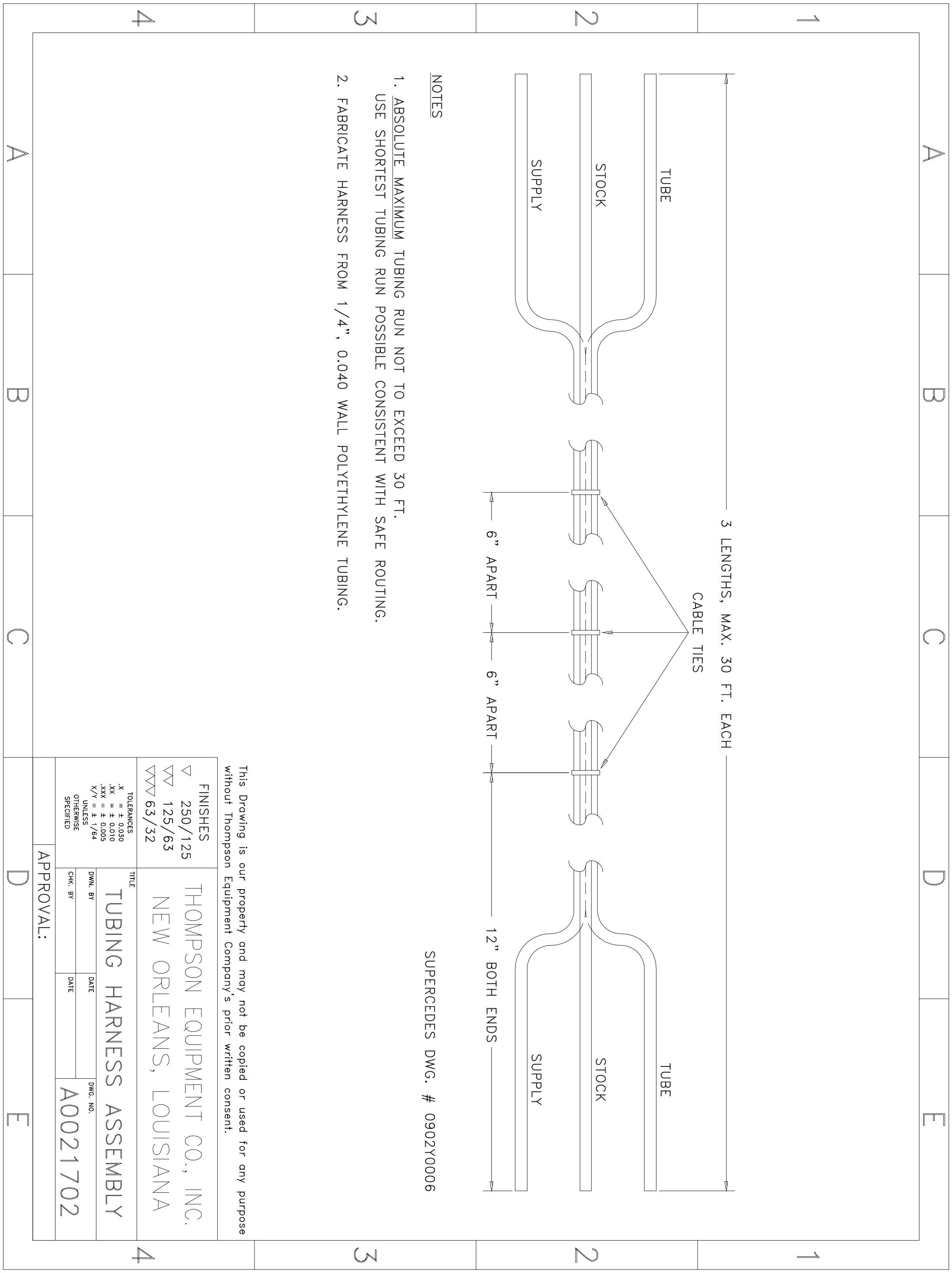


Figure 34 Dwg. A0021702 Tubing Harness

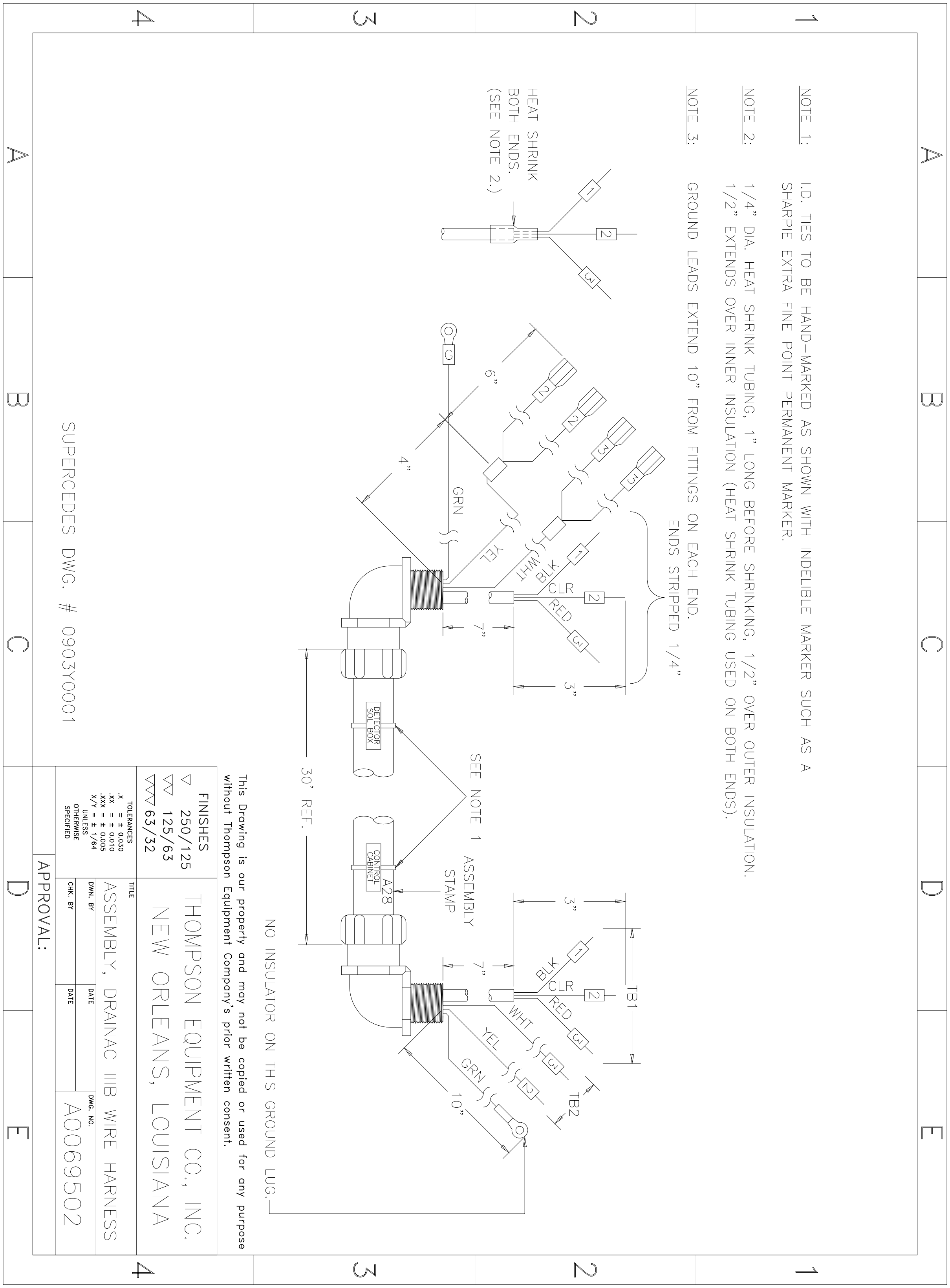


Figure 35 Dwg. A0069502 Wiring Harness

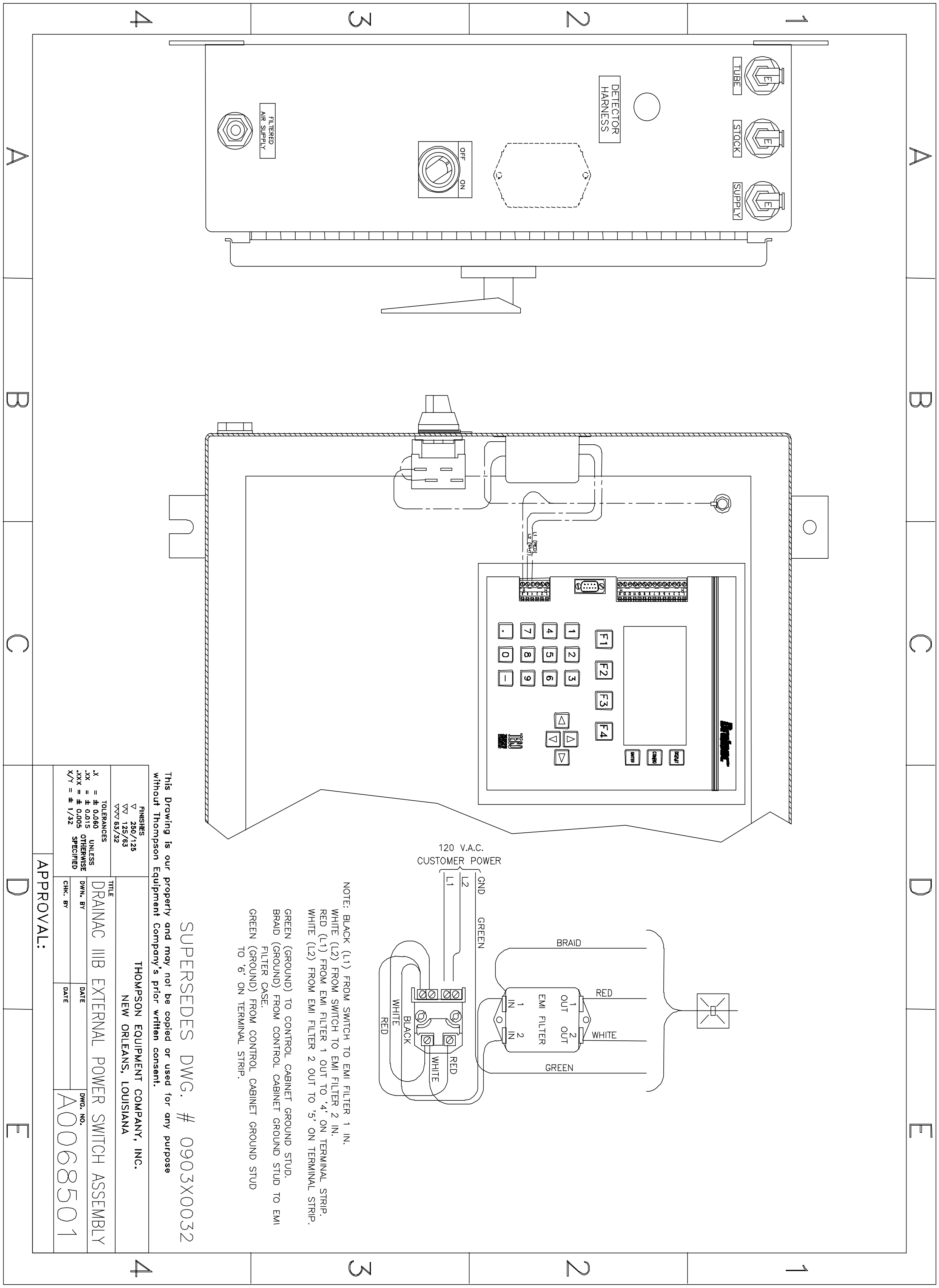


Figure 36 Dwg. A0068501 External Power Switch

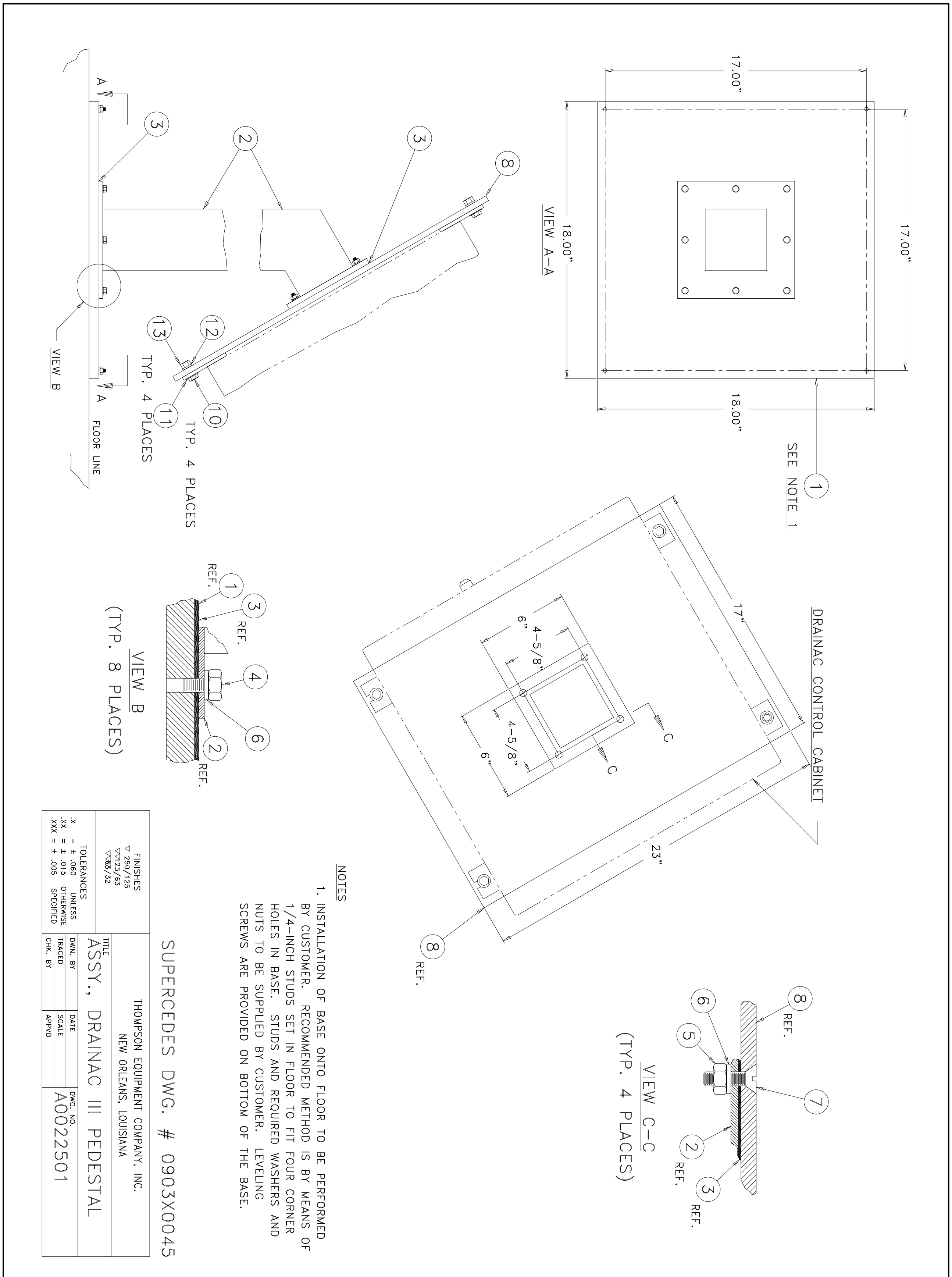
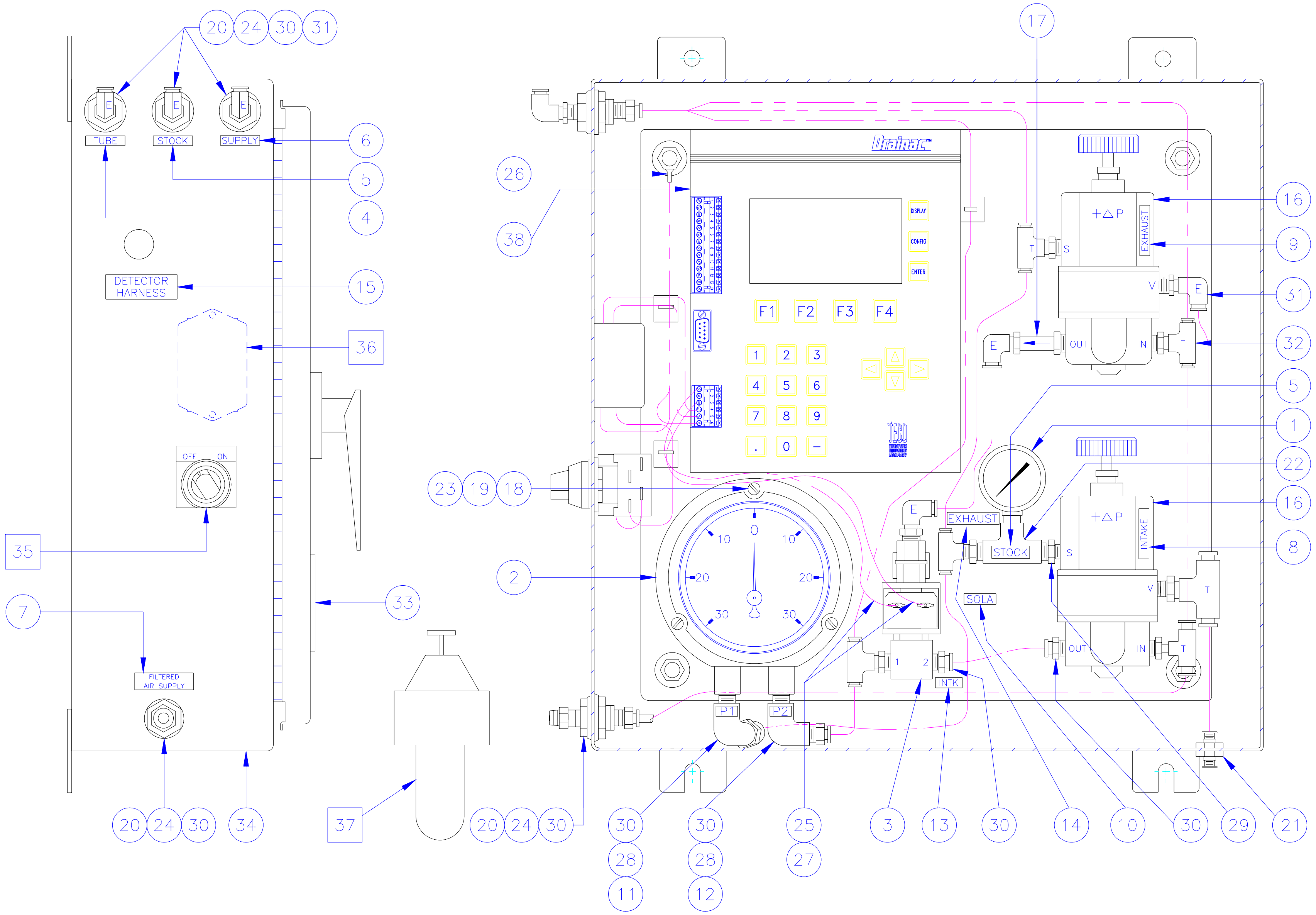


Figure 37 Dwg. A0022501 Pedestal Option

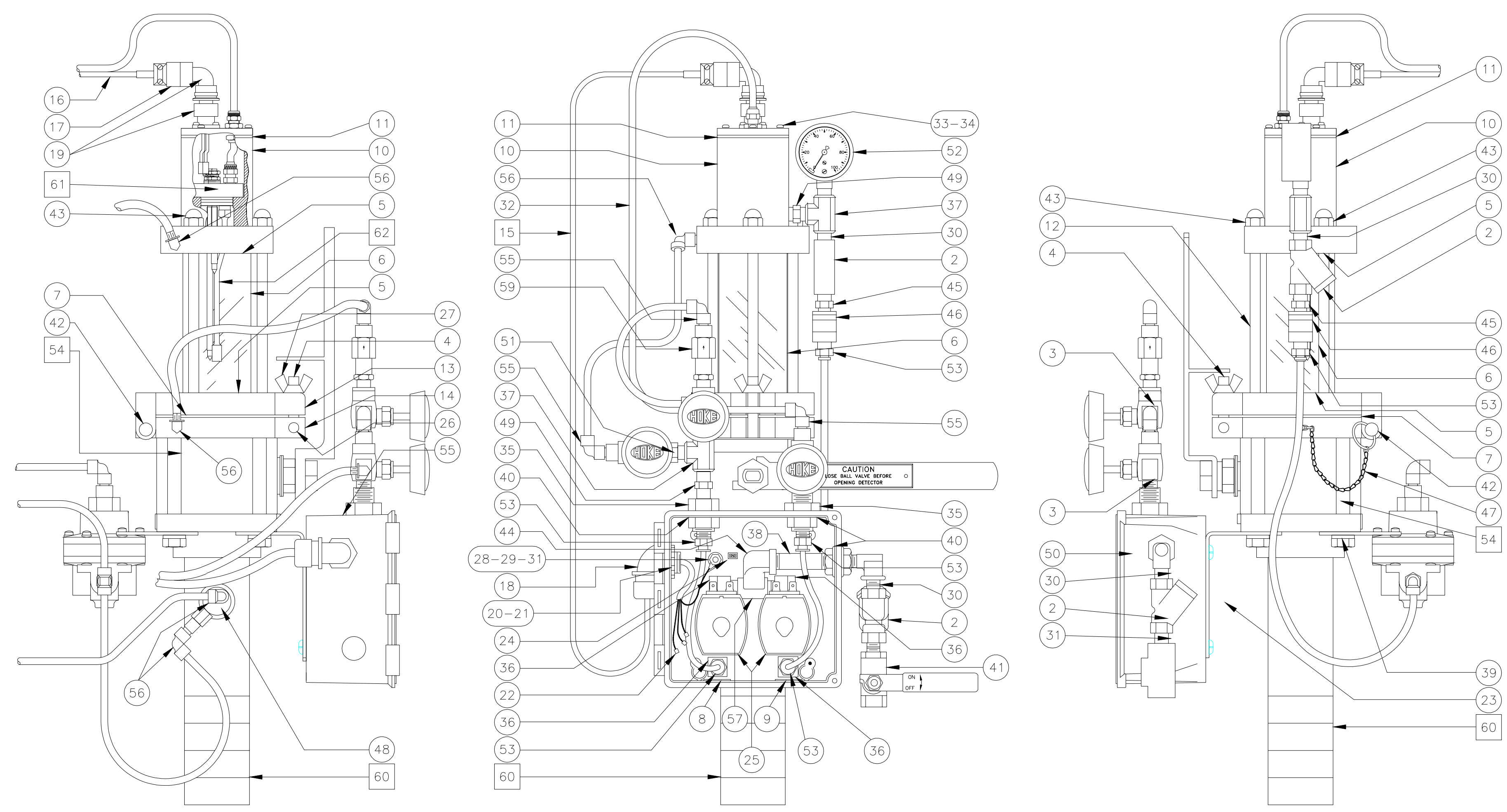
FIND#	PART#	DESCRIPTION	QUANTITY
1	F6004P	Gauge, 0–100PSI 2"	1
2	F6001P	Gauge, Differental Pressure	1
3	F4001P	Valve 3–Way Solenoid 40PSI	1
16	See Below	Biasing Regulator Assembly	1
	F1001P001	Exhaust Regulator Assembly	1
	F1001P002	Intake Regulator Assembly	1
17	F4007P	Check Valve,5PSI ¼"	1
18,19,23 24thru27	F8110P	Control Cabinet Misc. Parts Kit	1
20thru22 28thru32	F8109P	Control Cabinet Brass Hdw Kit	1
34	F9000B040	Enclosure,SS304, IIIB	1
35	F8013P	Cabinet Power Switch Assembly	1
36	F8014P	RFI Power Filter Assembly	1
37	F1010P	Inlet Filter Regulator Assembly	1
38	F8000B001	Drainac IIIB Electronic Module	1



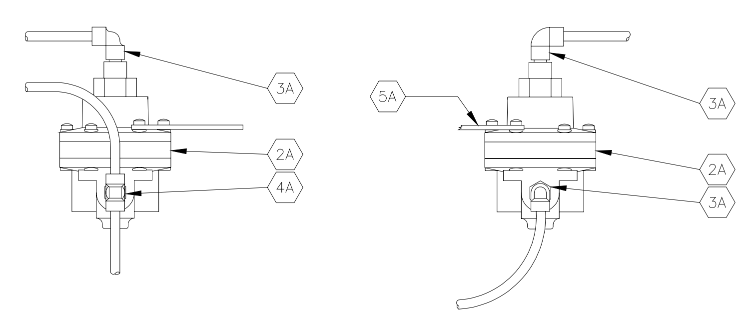
VIEW OF CABINET INTERIOR

FINISHES	THOMPSON EQUIPMENT CO., INC. NEW ORLEANS, LOUISIANA
▽ 250/125 ▽▽ 125/63 ▽▽▽ 63/32	
TOLERANCES .X = ± 0.030 .XX = ± 0.010 .XXX = ± 0.005 X/Y = ± 1/64 UNLESS OTHERWISE SPECIFIED	TITLE: DRAINAC IIIB CONTROL CABINET DWN. BY JK — DATE 3-27-07 — DWG. NO. A0112000 CHK. BY — DATE
	APPROVAL:

Find #	Part #	Description	Quantity
1	F8004P	Stockline Detector Assembly	1
2	See Below		
	F7501P	Water Strainer, 1/4 npt, Brass	1
	F7502	Water Strainer Screen	1
3	F4003P	Needle Valve	1
4,12,26,27 28,29,31,33 34,39,40,42 43,47	F8113P	Stockline Detector Hardware Kit	1
5	F7601	Detector Tube Gasket (also sold as part of kit #F8102P)	2
6	See Below	Detector Tube	
	F3010P	1" ID Detector Tube	1
	F3012P	1-1/4" ID Detector Tube	1
	F3015P	1-1/2" ID Detector Tube	1
	F3020P	2" ID Detector Tube	1
7	See Below	Screens	
	F5050P	0.015" Mesh,SS316,Teflon Coated	1
	F5020P	0.020" Mesh,SS316	1
	F5030P	0.030" Mesh,SS316	1
	See Below	O-Ring for Screens	
	F7002P	O-Ring, 2-330 Buna N (Also sold as Part of Kit# F8102P)	2
8,9,24	F8114P	Nameplate Replacement Kit	1
10	F7806P	Detector Cap	1
11	F7602P	Gasket for Dectector Cap Cover (Also sold as Part of Kit# F8102P)	1
13	F7803P	Flange, Screen Clamp	1
14	F7804P	Flange, Screen Holder	1
15	F8001P	Probe Cable Assembly	1
16thru22	F8115P	Probe Cable Assembly Hardware Kit	1
23	F7805P	Bracket Solenoid	1
25	F4002P	Flush Solenoid	1
30,35,36,37 38,44,45,46,49 51,53,55,56 57,58,3A,4A	F8116P	Brass Fitting Kit	1
32	F8106P	Tubing Replacement Kit (3-Tube Bundle, 20' Long)	1
41	F8106P	Brass Ball Valve 1/4"	1
48	F1007P001	Pressure Transmitter	1
50	F9000B050	Fiberglass Enclosure	1
52	F6003P	Gauge, 0-100PSI,2-1/2"	1
54	F4005P	Main Ball Valve W/Handle	1
59	F4004P	Water Check Valve, 1PSI,1/4"	1
60	See Below	Riser	1
	F7801P	4"-12"	1
	F7802P	14"-20"	1
61	F8008P	Probe Holder w/O-Ring (Also Sold as Assembly Part#F8007P)	1
62	F8007P	Probes & Sprayer Assembly	1
2A	F1004P001	High Volume Booster (Also Sold as Assembly Part#F8009P)	1
5A	F1004P002	High Volume Booster Bracket (Also Sold as Assembly Part#F8009P)	1



1 STOCK DETECTOR



ISOLATION BOOSTER

FINISHES
▽ 250/125
▽▽ 125/63
▽▽▽ 63/32

THOMPSON EQUIPMENT CO., INC.
NEW ORLEANS, LOUISIANA

TOLERANCES
.X = ± 0.030
.XX = ± 0.010
.XXX = ± 0.005
X/Y = ± 1/64
UNLESS OTHERWISE SPECIFIED

TITLE: STOCK LINE DETECTOR ASSEMBLY

DWN. BY: JK — DATE: 2-27-07 — DWG. NO. A0111900

CHK. BY: — DATE:

APPROVAL:

GENERAL ADDENDA FOR DRAINAC IIIB SYSTEM
220 VAC version

IMPORTANT

NOTICE

This instrument contains improvements and/or modifications not covered in the enclosed instruction manual. Be sure to read all enclosed addenda. Should you need assistance contact:

THOMPSON EQUIPMENT COMPANY, INC.
125 Industrial Avenue
New Orleans, LA 70121

Phone: (504) 833-6381
Fax: (504) 831-4664

DRAINAC IIIB GENERAL ADDENDA

MICROPROCESSOR BASED FREENESS TESTER

GENERAL DESCRIPTION

A 220 volt version of the Drainac IIIB was designed to assist in meeting customers specifications. The system is similar to the standard stockline system, except for the addition of a step down transformer. The transformer converts the customers 220 volt electrical power source, to 120 VAC 60/50 HZ, 1 AMP.

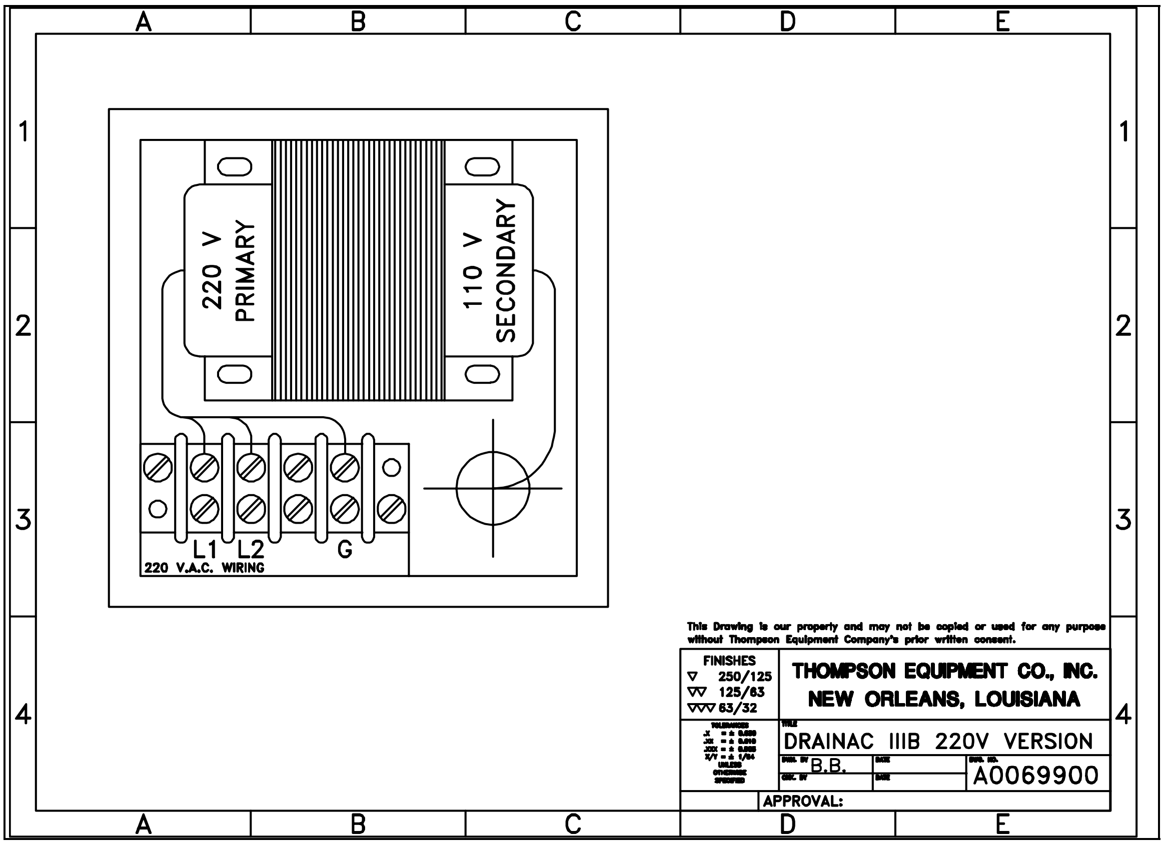


Figure 38 220 V. WIRING

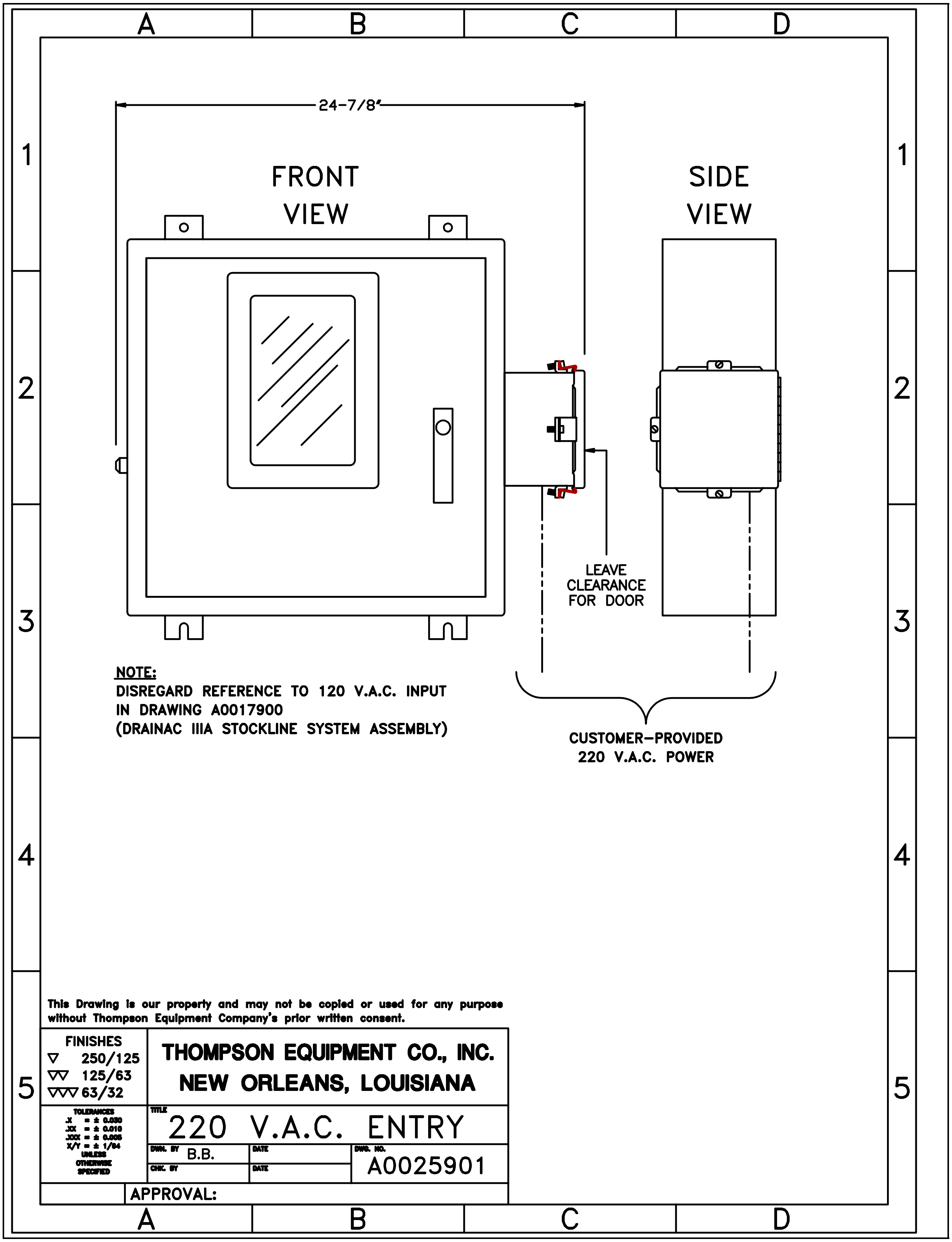


Figure 39 220 V.A.C. Feed-In

When the DRAINAC IIIB is configured for use with 220-vac service, power is fed in to the control cabinet through an auxiliary box. Refer to Figure 40 for the location of the 220-vac feed-in.

SPECIFICATIONS

(220 VOLT AC, 60/50 HZ DRAINAC)
Substitute the following specifications for those listed in the Stockline System Instruction Manual

Electrical: 220 VAC 50/60 Hz, 1/2 Amp single phase

UTILITIES REQUIRED

A. **Electrical** Incoming power (220 VAC 50/60 Hz 1/2 Amp).

INSTRUCTION MANUAL DRAINAC IIIB STOCKLINE SYSTEM
(Vacuum to Low Pressure, -10 to 10 Psig Stockline Addendum)

For assistance call:

THOMPSON EQUIPMENT COMPANY, INC.
125 Industrial Avenue
New Orleans, LA 70121

Phone: (504) 833-6381
Fax: (504) 831-4664

DRAINAC IIIB STOCKLINE SYSTEM

MICROPROCESSOR BASED PIPE LINE MOUNTED FREENESS TESTER
LOW PRESSURE ADDENDUM

SPECIFICATIONS
(VACUUM TO LOW PRESSURE DRAINAC)

Substitute the following specifications for those listed in the Stockline System Instruction Manual (p.2).

Freeness Range:	0-800 Canadian Standard Freeness 0-300sec. Williams Slowness 10-90/ Schopper-Riegler
Test per Hour:	60-120, depending on stock
Consistency Range:	0.5-6% range over which a given TECO DRAINAC can be used is ± 30% of nominal consistency. Range over which a change in consistency will not have a noticeable effect on the TECO DRAINAC reading is ± 5% of nominal consistency.
Stock Flow Velocity:	Up to 11 FPS-changes in stock line velocity will not affect DRAINAC operation.
Stock Line Pressure:	-10 to 10 PSIG.
Electrical:	120 VAC ± 10%, 50-60 Hz, 1 Amp, single phase standard. 240 VAC wiring available as option.
Instrument Air:	12.5 SCFM @ 80 PSI (Vacuum pump supply only). 1.5 SCFM @ 80 PSIG (Cabinet supply only).
Flush Water:	At least 10 PSI higher than maximum stock line pressure, 2 gpm peak, 0.3 gpm average consumption.
Stock Line Size:	4" diameter minimum.
Detector:	28" x 11" x 14"45 lbs.
Standard Cabinet:	NEMA 4X 20" x 20" x 6"61 lbs.

When used in a vacuum to low pressure stock line application, it is important to note that the volume booster located on the rear of the detector assembly is not used, and should be disconnected.

When purchased as a new system, the volume booster assembly will have to be disconnected to facilitate the low-pressure application. Should normal stockline pressure increase to a positive pressure above 20 psi, it will be necessary to reinstall the volume booster assembly, for the Freeness Tester to operate properly.

If you are retrofitting the low-pressure pump assembly into your existing stockline system, refer to drawing A008600.

For technical assistance call TECO's customer service department at 1-800-528-8997.

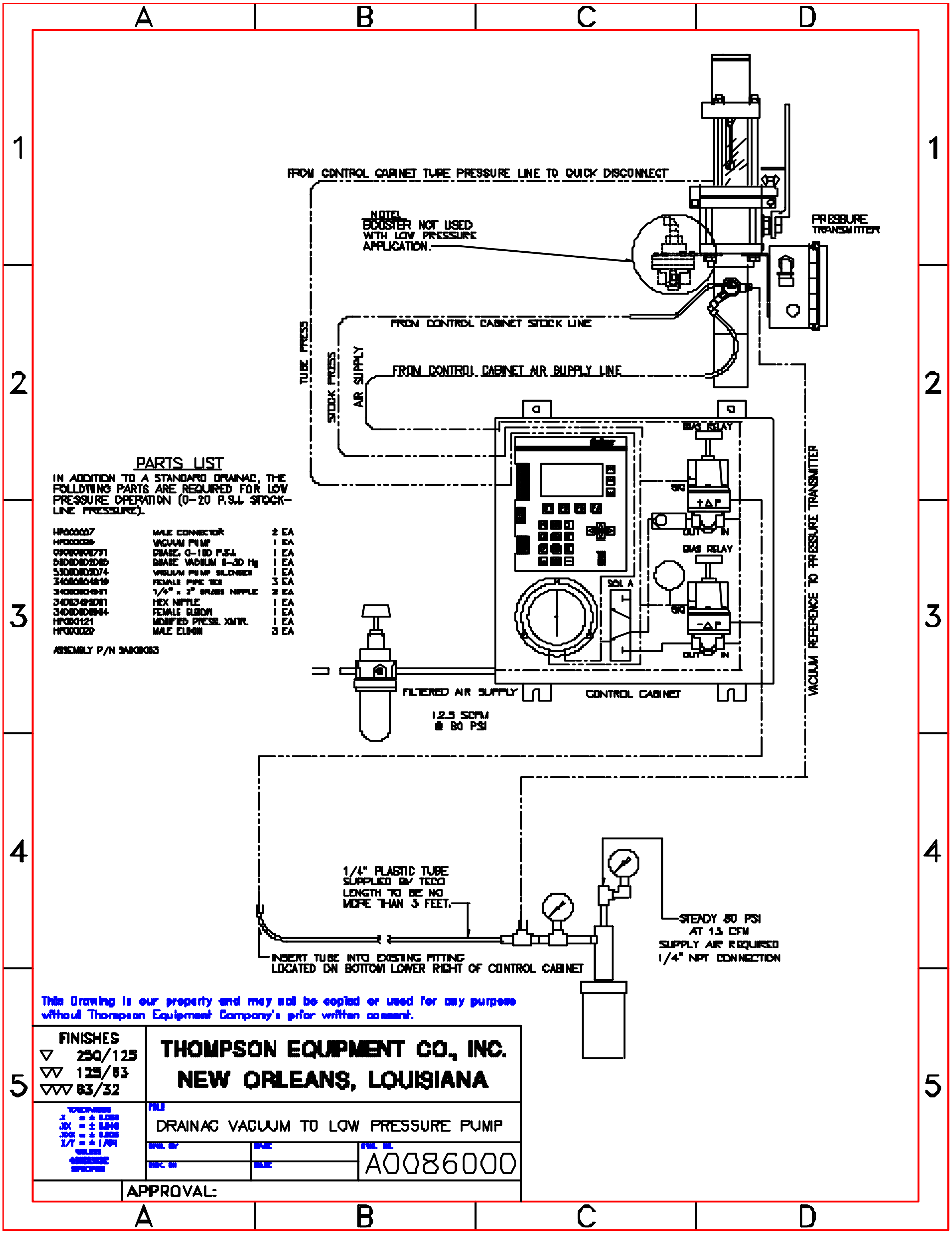


Figure 40 Low Pressure Modification

ADDENDUM TO DRAINAC IIIB STOCKLINE SYSTEM

For assistance call:

THOMPSON EQUIPMENT COMPANY, INC.
125 Industrial Avenue
New Orleans, LA 70121

Phone: (504) 833-6381
Fax: (504) 831-4664

DRAINAC IIIB STOCKLINE SYSTEM

MICROPROCESSOR BASED PIPE LINE MOUNTED FREENESS TESTER
ADDENDUM For RISER FLUSH OPTION

TECO stockline Drainac system is a state of art system and works with a minimum of maintenance. However, when paper stock plugs in a riser and dries out, it becomes inoperative due to sample being not exhausted from the measuring chamber.
This kit will help you overcome this problem thereby making the TECO Drainac system even more user friendly.

INSRUCTIONS ON HOW TO USE (Refer to attached drawing. Item #1 is 2" ball valve and item # 2 is ¼" ball valve)

(1) Connect water line (Maximum water pressure of 250 PSI) to ¼" ball valve.

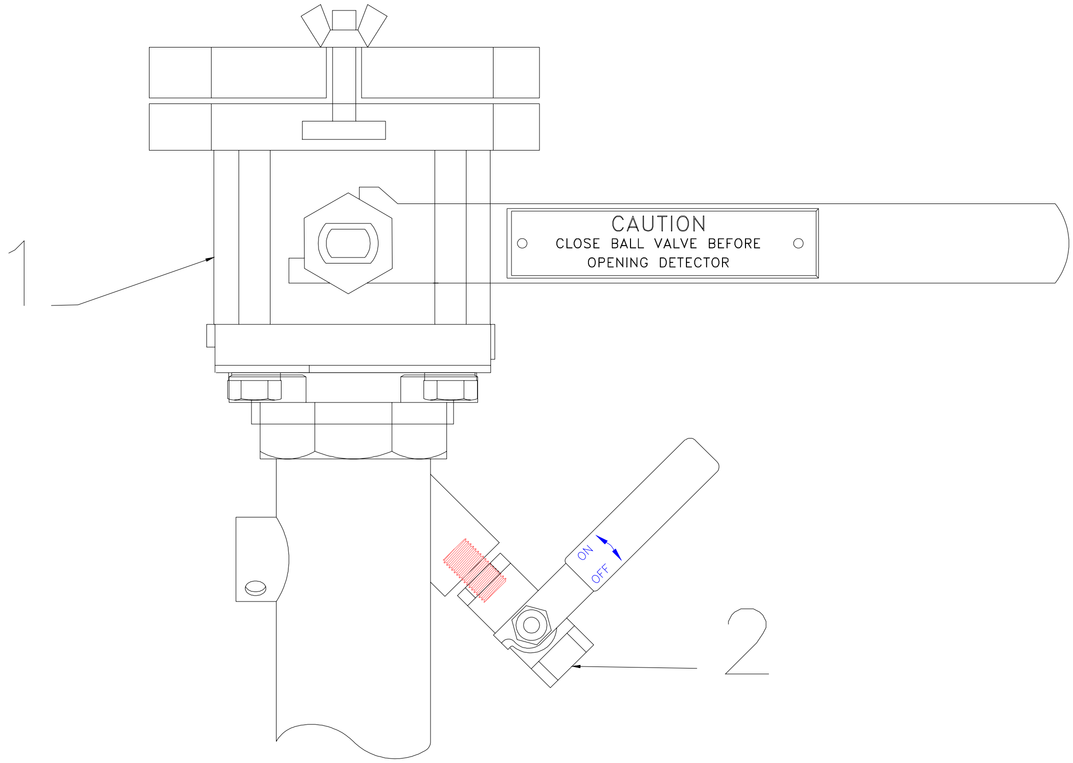
(2) Close the 2" ball valve.

(3) Open the ¼" Ball Valve.

(4) It may take several minutes depending on type of stock ,the dryness of stock and water pressure before the stock is flushed out of riser.

(5) To ensure that the stock is flushed out of the riser, close the ¼"ball valve and open the 2" ball valve. On the Drainac electronics module keypad, press F4 for Exhaust Hold .Press F4 again to start the Exhaust Flush cycle. If the sample from the measuring chamber can be exhausted, the riser is clean of dry paper stock and you can put the system in operation.

(6) If the sample still can't be flushed out, please repeat steps 2 through 5.



SIDE VIEW

DO NOT SCALE DRAWING
REMOVE ALL BURRS AND
UNNECESSARY SHARP EDGES

DATE	DESCRIPTION	REV. NO.

FINISHES
✓ 250/125
✓✓ 125/63
✓✓✓ 63/32

THOMPSON EQUIPMENT CO., INC.
NEW ORLEANS, LOUISIANA

TOLERANCES
.X = ± 0.030
.XX = ± 0.010
.XXX = ± 0.005
X/Y = ± 1/64
UNLESS OTHERWISE SPECIFIED

TITLE: Riser Flush Option

DWN. BY JK	DATE	DWG. NO.	REV. NO.
CHK. BY	DATE	A0109200	

APPROVAL:

<u>TECO DRAINAC™ MAINTENANCE</u>

This maintenance procedure and log are provided to help establish the frequency of screen cleaning that is required for your application. Initially, the screen will be cleaned once a day in order to establish a baseline of data. TECO will assist in the determination of cleaning time extensions, please call 504-833-6381 and ask for tech support.

CAUTION:Always be sure the unit is in "HOLD", ball valve closed and detector tube depressurized before loosening the wing nut on detector. (Refer to the instruction manual if you are unfamiliar with this procedure).

The screen may require periodic cleaning. Your process conditions will dictate the frequency. The Drainac™ cleaning log will help you determine the required frequency.

1. Using the TECO Drainac™ cleaning log sheet, log two sample times before cleaning.

2. Place the system in "HOLD" and allow the system to flush. Close the 2" detector ball valve, remove the quick-disconnect, and close the flushwater valve.

3. Loosen the wing nut and swing open the detector. Remove the screen. Normally, a light scrubbing with the brush provided with your system and clean water will be enough to clean most deposited material. (If necessary replace with new screen)

4. Clean the probes with the same brush (stored in the cabinet).
Note: Be careful not to disturb the silicone seal at the top of the probes.

5. Replace the screen and close the detector, then tighten the wing nut in place.

6. Reconnect the quick-disconnect. Be sure the unit is still in "HOLD". Open the 2" detector ball valve and the flushwater valve. Switch the unit to "CYCLE". The unit will begin cycling automatically.

7. Using the TECO Drainac™ cleaning log sheet, log two sample times after cleaning.

8. This procedure can continue to be used if you wish to establish long-term continuous maintenance and if process conditions change.

<u>Basic Troubleshooting</u>

1. Check for water leakage in the detector.
2. Verify that there is flush water.
3. Verify that the tube is filling to the top probe.
4. Check the booster if it shows signs of water around the exhaust hole replace it.
5. Check the screen for pluggage.
6. Check the control cabinet for any water or air leaks.
7. Check instrument air (should be at least 10 PSI over stock line)
8. Check the stock line pressure.
9. Check the differential pressure (the differential gauge should come to the same point steadily every time)
10. Reset the unit by turning it off and then back on.

For assistance contact: Thompson Equipment Co.
(504) 833-6381 Phone
(504) 837-9128 Tech Support Fax
(504) 831-4664 Main Fax
Support@teco-inc.com E-Mail

This form will help TECO to assist you in determining your initial cleaning schedule.
Initially perform the cleaning procedure once every day. Log date and time then log two sample times before and two sample times after cleaning.

Date / Time	Before cleaning sample time #1	Before cleaning sample time #2	After cleaning sample time #1	After cleaning sample time #2	Tech initials

At the end of a week, transmit this form to Thompson Equipment Co.
Call 504-833-6381 to discuss cleaning schedule after transmittal

For assistance contact: Thompson Equipment Co.
(504) 833-6381 Phone
(504) 837-9128 Tech Support Fax
(504) 831-4664 Main Fax