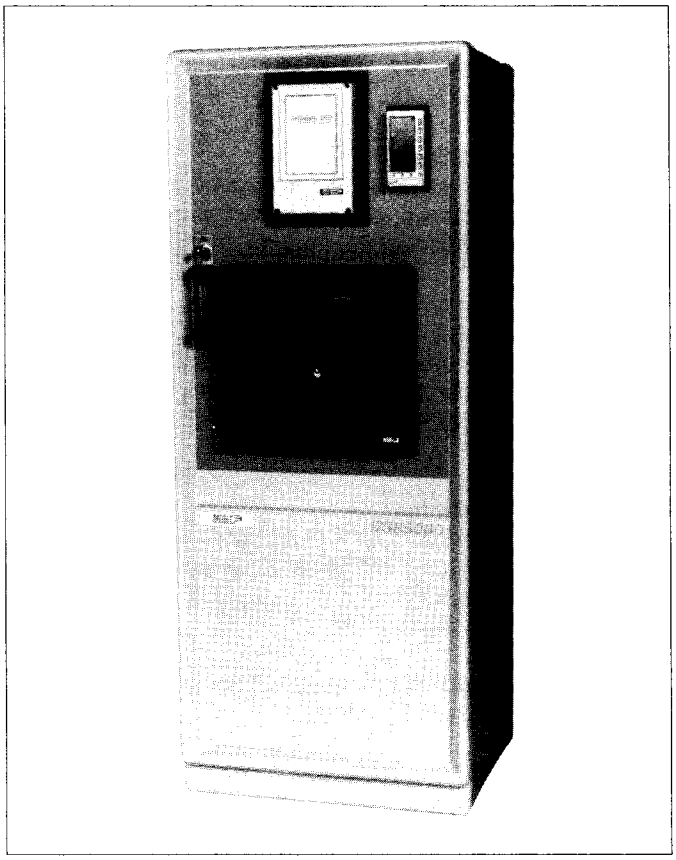
Chlortrol™
Formerly Fischer & Porter

SPECIFICATION

CHEMICAL FEED EQUIPMENT
Series 17SB5000

CHLORTROL 5000™ Cabinet Mounted Residual Chlorine Analyzer System



The CHLORTROL 5000™ Residual Chlorine Analyzer is an amperometric device designed to provide continuous measurement of the concentration of residual chlorine in water. The analyzer uses a flow-through measurement cell containing two dissimilar metal electrodes. As the water sample flows past the electrodes, a current is generated which is directly proportional to chlorine concentration. One of the electrodes is rotated by an electric motor which imparts a swirling velocity to the water sample. The electrode rotation at constant speed provides reproducible electrolytic conditions and makes the cell output independent of sample flow variations. Inert plastic non-abrasive pellets in the cell keep the electrodes in a clean condition through scouring action.

A solid-state amplifier and signal conditioner converts the generated current signal to an isolated 4-20 mAdc output. Automatic termperature compensation of the cell output is included and the operating range is field selectable. RFI immunity is built in.

The analyzer is housed in a floor mounted corrosion resistant fiberglass cabinet. Optionally, a circular chart or strip chart recorder is avilable on the front of the cabinet. An integral microprocessor-based residual controller is also optionally available, mounted on the front of the cabinet, for control of the chlorination or dechlorination process.

The microprocessor-based controller contains specifically designed control logic keyed to the chlorination and dechlorination process. It includes a multi-stage alarm system to alert operating personnel to residuals which are above or below the desired levels. An override system is activated should the residual level ever reach the maximum permitted by the Plant Discharge Permit.

The controller features a dot matrix display which provides operating personnel with all the data necessary for proper operation. This is accomplished through a series of displays which present the data in an easily understood format. For customer convenience, the controller is programmed with the control algorythms prior to shipment, assuring easy start-up and the best possible residual control.

DESIGN FEATURES

- Continuous Monitoring: Indicates and transmits residual chlorine level. Frees operator for other duties by eliminating the need for frequent laboratory testing.
- Response Time: Within 5 seconds.
- Reliability: Electrode surfaces are continuously cleaned by action of non-abrasive pellets. Automatic temperature compensation is standard.
- Easy Maintenance: All components are easily accessible. Chemical supply lasts 60 days.
- Permanent Record: Circular or strip chart recorder is optional.
- State-of-the-art controller: When selected, this microprocessor-based controller maintains chlorine residual at a preselected value, and includes adaptive reset control, a unique override system, multiple alarm contacts and a series of displays providing all the information that operating personnel require.

ENGINEERING SPECIFICATIONS (Analyzer)

Measurement Principle: Amperometric type with bare electrodes

Type of Measurement: Free or total chlorine residual*

Operating Ranges:
0-0.25, 0-0.5, 0-1, 0-2, 0-5, 0-10, and 0-20 mg/L**
(field selectable)

Sample Conditioning:
For wastewater applications, where total chlorine residual is measured, a flushing "Y" strainer is provided for installation in the sample line, close to the analyzer.

Interferences:
Turbidity and chemicals normally found in raw and treated waters do not effect cell operation. However, potassium permanganate and ozone do have an adverse effect.

Sample Requirements:
Temperature: 33 to 122°F (1 to 50°C)
Flowrate to Flushing "Y" Strainer: 5 to 10 gpm (18.9 to 37.9 L/m)
Flowrate to measuring cell:
100 cc/m
Pressure: Reasonably constant between 5 and 25 psig (34 to 172 kPa)

Temperature Compensation:
A thermistor provides automatic signal compensation for changes in sample temperature.

Ambient Temperature Limits:
33 to 122°F (1 to 50°C)

Materials of Construction:
All materials in contact with the water sample resist corrosion from chlorinated water, waste water, and added reagents. All electronics are housed in a glass-filled polyester case with a polycarbonate cover having a NEMA 4X (IP 66 per IEC529) rating.

Power Requirements:
110/120, 220/240 V ac ±10%, 50/60 Hz, at 8 watts max.

Meter Indication:
Direct reading 3 1/2 digit LCD display with 0.5 inch (13mm) high characters

Output:
4-20 mA dc into 600 ohms max. with built-in signal isolation

Sensitivity:
The analyzer will recognize and respond to residual changes as low as 0.001 mg/L chlorine.

Accuracy:
± 2% of span

Mounting:
Floor mounted cabinet.

Reagent Containers:
When acetic acid is used for pH control, one 8 gal (30L) opaque plastic container is furnished for free chlorine residual measurement. Two containers are furnished when total chlorine residual is measured. When CO_2 is used for pH control, one less container is furnished.

Shipping Information:
Weight: 150 lb (68kg)
Cubage: 32 ft³ (0.91m³)

ENGINEERING SPECIFICATIONS (Controller)

General:
The system consists of a specially-programmed Bailey-Fischer & Porter microprocessor-based controller mounted on the front of the analyzer cabinet.

Signal Input:
4-20 mA dc from plant flow transmitter
4-20 mA dc from the chlorine residual analyzer transmitter (prewired).
4-20 mA dc proportional to gas flow from the chlorinator or sulfonator.

Signal Output:
4-20 mA dc to chlorinator or sulfonator automatic valve.
4-20 mA dc to chlorine residual recorder (if specified).
4-20 mA dc into 500 ohms for remote instrumentation.
(2) contact closure outputs rated at 3A 120 or 240V for external alarm stations. These will be energized on high or low deviation between actual residual and setpoint, and either high or low first stage alarms and low water flow.

Accuracy:
± 0.2% span. (Output is updated at 0.1 second intervals. Output slew rate is 0.45 seconds full scale.)

Operator Displays on Dot Matrix Screen:
Typical displays are depicted on pages 5 and 6.

* *Refer to Bailey-Fischer & Porter TIB 70-7 entitled "Chlorine Chemistry" or "Handbook of Chlorination - 3rd Edition" by George Clifford White - Von Nostrand Reinhold Co., NY - 1992.*

** *1 mg/L = 1 part per million*

MODEL NUMBER DESIGNATION

17SB5 __ __ A __ __ __

CHLORTROL 5000™ Cabinet Mounted
Residual Chlorine Analyzer System _____ 17SB5

FRONT CABINET MOUNTED INSTRUMENTS

Indicator only	10
Controller	20
Controller w/Circular Chart Recorder (24 hr)	31
Controller w/Circular Chart Recorder (7 day)	32
Cirular Chart Recorder (24 hour)	35
Circular Chart Recorder (7 day)	36
Circular Chart Recorder (24 hr) w/ hi-lo contacts	37
Circular Chart Recorder (7 day) w/ hi-lo contacts	38
Controller w/Strip Chart Recorder (2.5 in/hr)	41
Controller w/Strip Chart Recorder (1.2 in/hr)	42
Strip Chart Recorder (2.5 in/hr)	45
Strip Chart Recorder (1.2 in/hr)	46
Strip Chart Recorder (2.5 in/hr) w/ hi/lo contacts	47
Strip Chart Recorder (1.2 in/hr) w/ hi/lo contacts	48

MEASUREMENT RANGE, mg/L

0-0.25	1
0-0.50	2
0-1.0	3
0-2.0	4
0-5.0	5
0-10.0	6
0-20.0	7

TYPE OF RESIDUAL BEING MEASURED (pH Control)

Free Chlorine (Acetic Acid)	1
Total Chlorine (Acetic Acid)	2
Seawater - Total Chlorine (Acetic Acid)	3
Breakpoint - Free Chlorine (Acetic Acid)	4
Free Chlorine (CO_2) - Customer supplies pressure reducing station w/ rotameter	5
Total Chlorine (CO_2) - Customer supplies pressure reducing station w/ rotameter	6
Free Chlorine (CO_2) - Dual pressure reducing station with rotameter provided	7
Total Chlorine (CO_2) - Dual pressure reducing station with rotameter provided	8

POWER SUPPLY

120V ac, 50/60 Hz	1
220V ac, 50/60 Hz	2

DESTINATION

Domestic	1
Overseas	2

A 30 day supply of chemicals is furnished as standard except for overseas or air shipments where acetic acid and sodium hydroxide are not provided. When used, CO_2 is always supplied by the customer user. Six (6) feet of 1/16th inch OD Tygon tubing is provided to connect the dual stage reducing station to the analyzer. One 105-foot long standard chart roll is provided with the strip chart recorder. A box of 100 standard charts is provided with the circular chart recorder.

Equipment Description

The Residual Chlorine Analyzer System shall measure (free) (total) chlorine residual amperometrically over a range of 0 to _____ mg/L. The analyzer and associated instrumentation shall be housed in a floor-mounted fiberglass cabinet, prepiped and prewired.

A glass tube rotameter and metering valve shall measure and set optimum sample flow rate. Automatic temperature compensation and a static mixer shall be provided. For wastewater installations, a flushing "Y" strainer shall be provided for field installation in the sample line near the analyzer.

The sampling cell shall contain two dissimilar metal electrodes which continually detect the chlorine concentration and generate a proportional current signal. The cell shall be provided with nonabrasive plastic pellets which are continually impelled against the electrodes to prevent any foreign material from adhering to the electrode surfaces. The noble metal electrode shall be rotated by a motor drive to provide the impelling force for the cleaning pellets.

The reagent feed pump shall be a motor-driven, peristaltic type, and shall pump the necessary chemicals. When Acetic acid is used for pH control, an 8 gallon (30L) capacity plastic reagent container shall be provided for chemicals when free chlorine is being measure. Two 8 gallon containers are provided when total chlorine is being measured. When full, this container shall hold a 60-day supply. Measurement with CO_2 for pH control requires on less container.

The following ranges shall be switch adjustable in the indicating transmitting instrument: 0-0.25, 0-0.5, 0-1.0, 0-2.0, 0-5.0, 0-10.0, and 0 - 20.0 mg/L. The transmitter shall contain a 3 1/2 digit LCD indicator with 1/2 inch (13mm) high characters. The circuit board shall be coated with Humiseal® having a minimum thickness of 0.002" to meet the requirements of MIL-E-810, thus increasing corrosion resistance. Power supply shall be 120V ac 50/60 Hz. The instrument shall have ambient temperature limits of 33 to 122° F (1 to 50° C). The transmitted signal shall be 4-20 mA dc into 0-500 ohms, linearly proportional to the range selected. The measuring and transmitting system shall be traceable to "Standard Methods" without any calculated or inferred values.

A one month supply of chemicals shall be provided for the analyzer, except for carbon dioxide (CO_2) which, when used, shall be provided by the customer.

When required, a recorder shall be front panel mounted on the fiberglass cabinet (specify circular or strip chart and chart speed).

When required, a controller shall be front panel mounted on the fiberglass cabinet.

The controller shall receive analog signals from the Plant (water) (wastewater) flow meter transmitter, the internal chlorine residual analyzer, and from the (chlorinator) (sulfonator) which is proportional to gas flow.

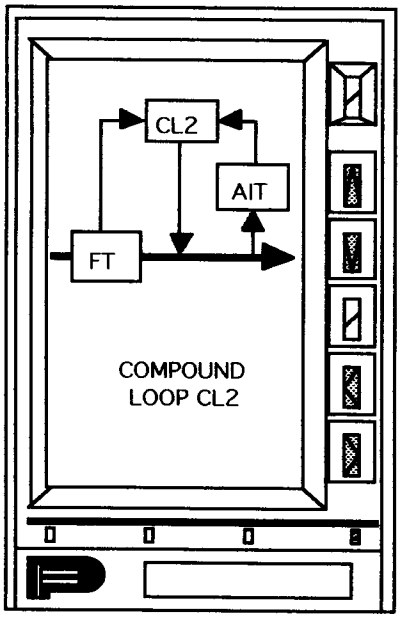
The controller shall be microprocessor-based and digitally compare measured residual with an operator-established setpoint, multiply this value by the plant water flow rate signal, and transmit 4-20 mA dc to the automatic (chlorinator)(sulfonator) control valve. The controller shall have an adjustable proportional band setting of from 2 to 1000%, reset setting from 0.02 to 200 minutes, derivative setting from 0.01 to 80 minutes, the ability to be direct or reverse acting, and operate in adaptive reset mode for longer system lag times. It shall be factory configured. It shall also have a selectable automatic or manual output.

The controller shall be capable of alarming under any of the following conditions: first stage high or low residual, second stage high or low residual, high or low deviation between residual and setpoint, and low plant water flow rate. Current output limiters shall be built into the program, which will limit the controller output should the second stage alarm levels be reached, preventing the chlorine residual from rising above or falling below the established limits.

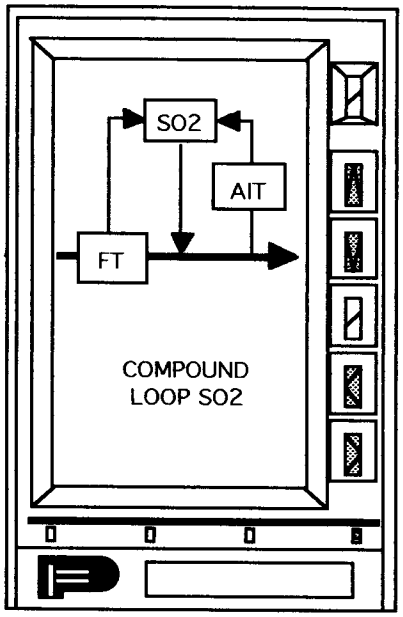
External alarm contacts rated at 3A 120 or 240V shall be provided for high or low deviation between residual and setpoint, and for high or low first stage alarms and low water flow.

The system shall incorporate a dot matrix display on multiple screens to include: system schematics for compound loop chlorination and dechlorination, flow pacing and residual only for chlorination, and feed forward with flow pacing for dechlorination; digital and bar graph displays of residual; setpoint and output to the (chlorinator)(sulfonator); adjustable time trends between 1 ad 40 min for recording of residual, (chlorine)(sulfur dioxide) gas flow, and water flow; controller tuning parameters; adjustable alarms for first stage high and low residual, second stage high and low residual deviation between setpoint and residual; low water flow; adjustable high and low output signal limiters. All alarms shall flash when in the alarm condition.

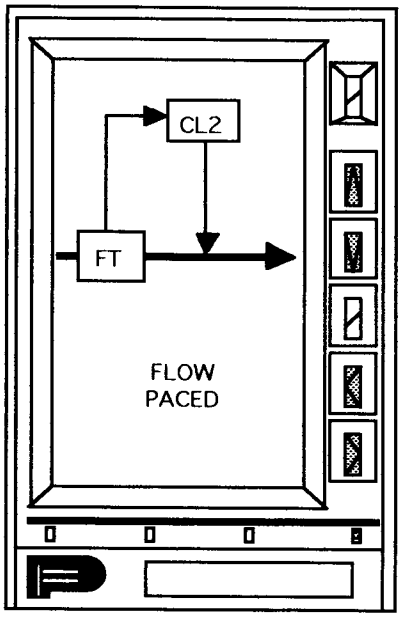
The chlorine residual analyzer system shall be Series 17SB5000 CHLORTROL 5000™ as manufactured by Bailey-Fischer & Porter.



DISPLAY 1: SCHEMATIC COMPOUND LOOP CHLORINATION CONTROL

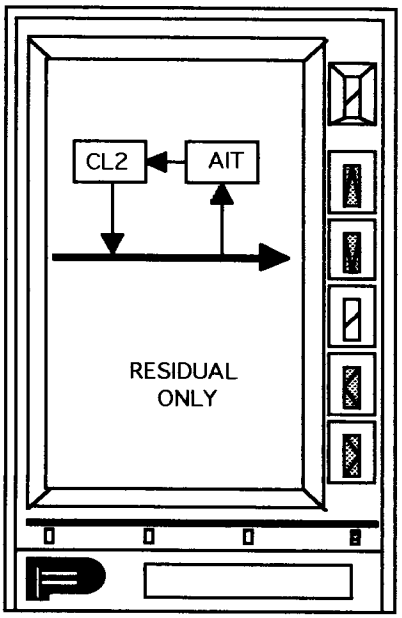


DISPLAY 2: SCHEMATIC COMPOUND LOOP DECHLORINATION CONTROL

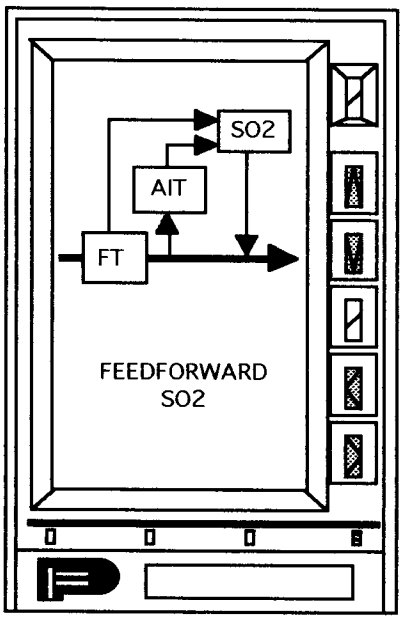


DISPLAY 3: SCHEMATIC CHLORINATION FLOW PACING

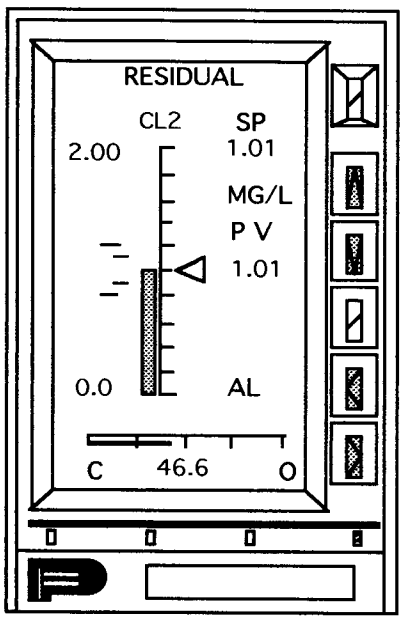
Displays 1 through 5 - Block diagrams of the types of control available. When any one of these is selected, all of the pertinent displays to that type of control will be displayed. **Display 6** - Main display showing digital and bar graph Set Point (SP) in mg/L, digital and bar graph process variable (PV) in mg/L, A for Automatic Control, M for Manual Control and L for Local SP. Controller output is shown in % with C for gas valve Closed, and O for gas valve Open. The horizontal dash marks show the first stage and second stage high and low alarm settings.



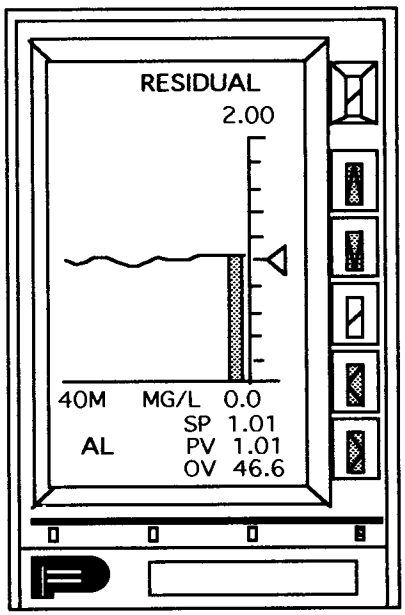
DISPLAY 4: SCHEMATIC RESIDUAL ONLY CONTROL



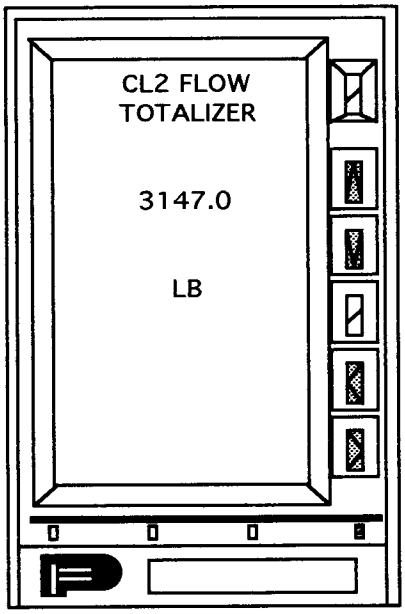
DISPLAY 5: FEEDFORWARD DECHLORINATION CONTROL



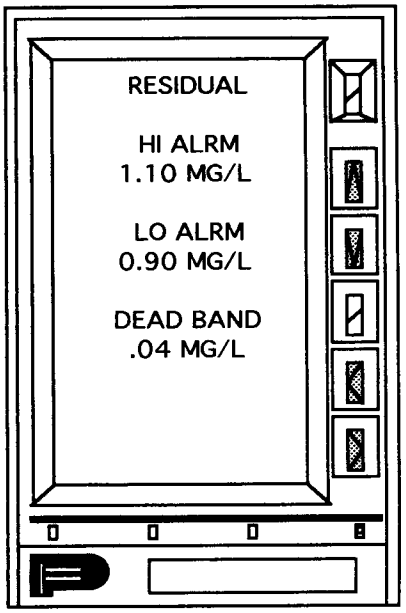
DISPLAY 6: CONTROL POINT RESIDUAL



DISPLAY 7: TREND
CL2 RESIDUAL

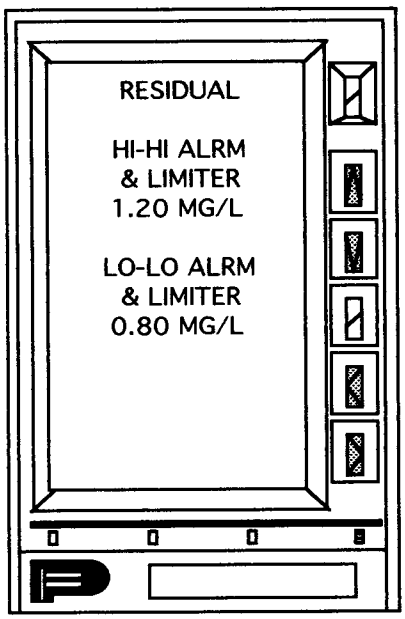


DISPLAY 8:
TOTALIZED FLOW CL2

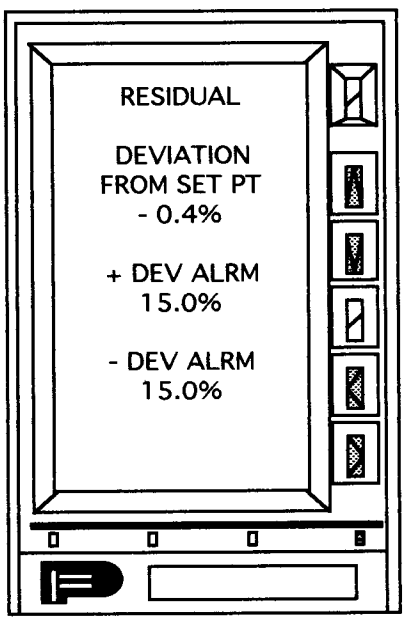


DISPLAY 9: FIRST
STAGE ALARM SETTINGS

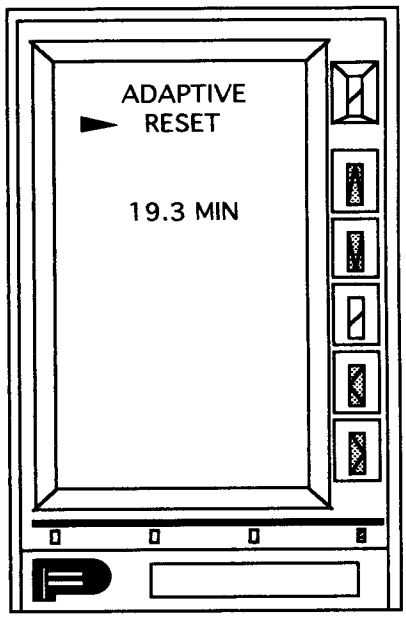
Display 7 - Trend of Residual with adjustable duration up to 40 min. OV is output to gas valve in %. **Display 8** - Gas flow totalization. **Display 9** - First stage high and low alarm settings. **Display 10** - Second stage high and low alarm and limiter settings. **Display 11** - Deviation from set point alarm settings. **Display 12** - Adaptive Reset on/off.



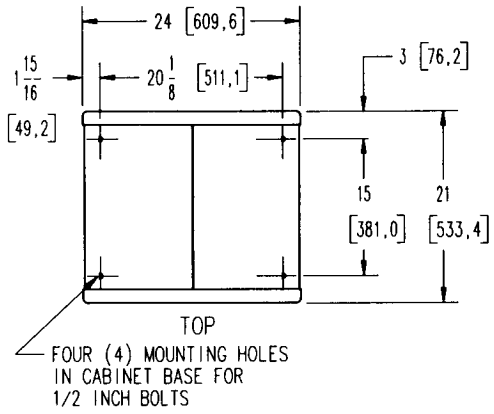
DISPLAY 10: SECOND STAGE
ALARM AND
LIMITER SETTINGS



DISPLAY 11: DEVIATION
ALARM RESIDUAL:
SET POINT

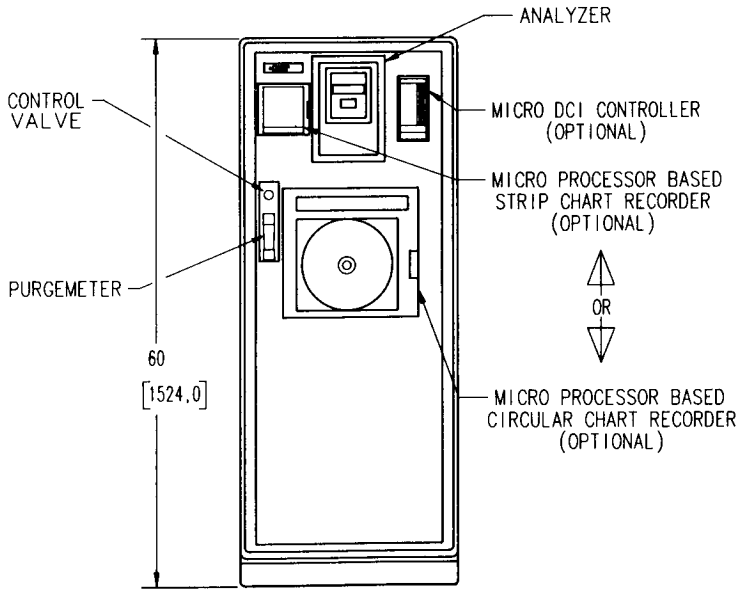


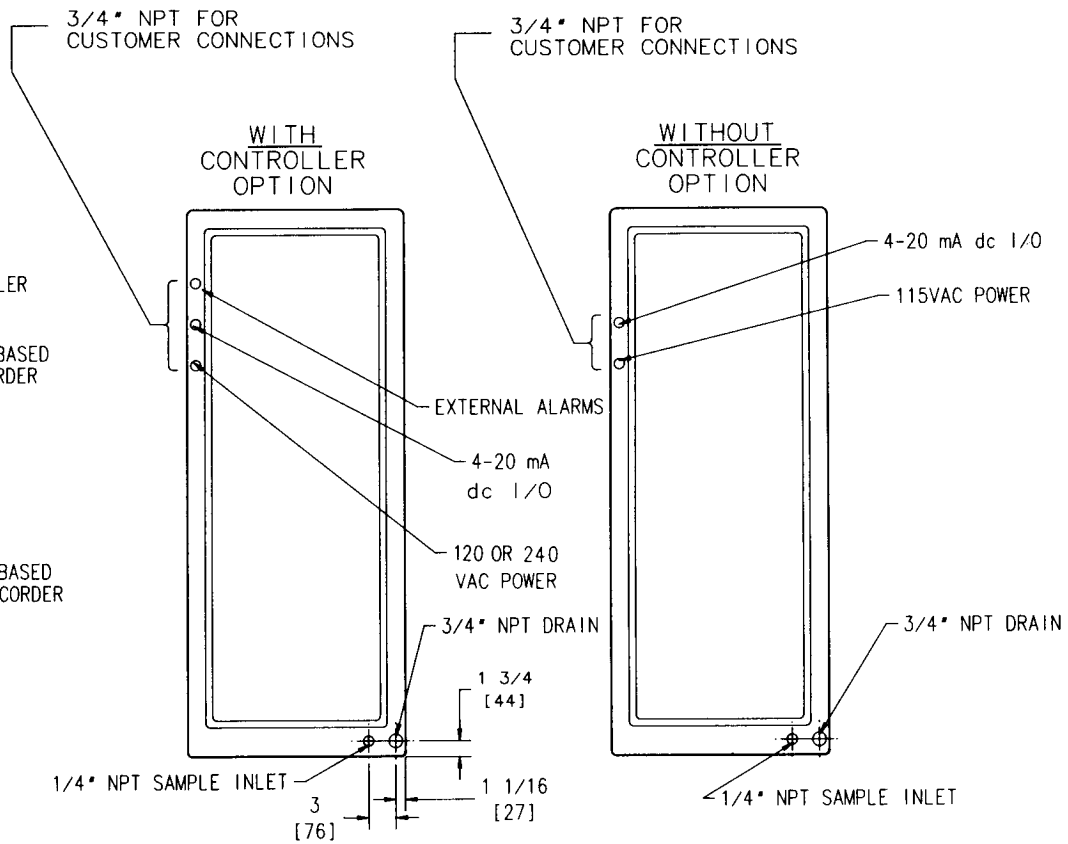
DISPLAY 12: ADAPTIVE
RESET SETTING
AND ON/OFF



NOTES:

1) ALL DIMENSIONS ARE IN INCHES. DIMENSIONS IN [ ] ARE IN MILLIMETERS[mm].
2) REQUIRED CLEARANCE BEHIND PANEL IS 36 [914].





Chlortrol™
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Optional Equipment

- Additional Chemicals (a one month supply is provided with each unit, except for CO_2 which, when used, is provided by the customer)
- Amperometric Titrator for calibration
- B-F&P Surgebuster™
- Recorder (10 in circular chart) with 7-day or 24-hour chart speed.
- Recorder (4 in strip chart) with 1.2in/hr or 2.5 in/hr chart speed.
- Controller

Ordering Information

- Model number
- Type of residual
- Voltage and frequency
- Range in mg/L
- Free or Total Chlorine residual
- Normal, seawater or breakpoint service
- Acetic Acid or CO_2 for pH contol
- If CO_2, with or without gas pressure reducing station
- Option Equipment

Related Specifications

Bailey-Fischer & Porter manufactures several types of Chlorine Residual Analyzers and Systems.

Refer to Specification 17B5000 CHLORTROL 5000™ Residual Chlorine Analyzer with Bare Electrode Cell for wall mounting.

Refer to Specification 17PC1000 for the ANACHLOR II™ membrane-type Residual Chlorine Analyzer.

Refer to Specification 17SD4000 for the Z-CHLOR® Center Zero Dechlorination Control System, designed for use when the maximum chlorine residual permitted is low or even zero.

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