



Model DT3008

Extractive Combustibles Monitor

Type 1: 0 to 10 %

Version 1.00

Job Specific Information

The check marks below denote the equipment configuration that has been supplied to the following installation:

Customer:

Location:

Purchase Order Number:

Serial Number:

NEMA 4 _____

Panel Mount _____

Table of Contents

| | |
|---|-----------|
| SECTION 1 | 5 |
| ANALYZER OVERVIEW | 5 |
| 1.1 CONFIGURATIONS COVERED BY THIS MANUAL | 5 |
| 1.2 ANALYZER DESCRIPTION | 5 |
| 1.4 ELECTRONIC CONTROLLER | 5 |
| SECTION 2 | 6 |
| SPECIFICATIONS | 6 |
| 2.1 ANALYZER | 6 |
| 2.2 SAMPLE | 6 |
| 2.3 CALIBRATION | 7 |
| 2.4 ALARM | 7 |
| 2.6 SAMPLE PROBES | 8 |
| SECTION 3 | 9 |
| INSTALLATION | 9 |
| 3-1 OVERVIEW: | 9 |
| 3.2 INSTALLATION | 10 |
| 3.3 PNEUMATIC CONNECTIONS | 10 |
| SECTION 4 | 12 |
| PARAMETER DEFINITIONS | 12 |
| 4.1 INTRODUCTION | 12 |
| 4.2 BACK PURGE PERIOD (DRAIN) | 12 |
| 4.3 BACK PURGE DURATION | 12 |
| 4.4 COMBUSTIBLES (CO) RECORDER RANGES | 12 |
| 4.5 CAL PURGE TIME | 12 |
| 4.6 AVERAGE TIME | 13 |
| 4.7 HIGH and VERY HIGH ALARM SETPOINT | 13 |
| SECTION 5 | 14 |
| SCREEN DESCRIPTIONS | 14 |
| 5.1 INTRODUCTION | 14 |
| SECTION 6 | 17 |
| STARTUP AND OPERATION | 17 |
| 6.1 INTRODUCTION | 17 |
| 6.2 INITIAL STARTUP | 17 |
| 6.3 SET UP PROCEDURE | 17 |
| 6.4 SETTING PARAMETERS | 18 |
| 6.5 SETTING UTILITIES | 29 |
| SECTION 7 | 38 |
| CALIBRATION | 38 |
| 7.2 CALIBRATION | 38 |

| | |
|---|-----------|
| 7.3 ABORT CALIBRATION _____ | 40 |
| SECTION 8 _____ | 41 |
| DIAGNOSTIC DISCUSSION _____ | 41 |
| 8.1 INTRODUCTION _____ | 41 |
| 8.2 CALIBRATION FAULT _____ | 41 |
| SECTION 9 _____ | 42 |
| COMBUSTION SENSOR _____ | 42 |
| 9.1 COMBUSTION SENSOR _____ | 42 |
| SECTION 10 _____ | 43 |
| TROUBLE SHOOTING _____ | 43 |
| 10.1 OVERVIEW _____ | 43 |
| 10.2 SPECIAL TROUBLESHOOTING NOTES _____ | 43 |
| 10.3 SENSOR TROUBLESHOOTING _____ | 43 |
| 10.4 ELECTRONICS TROUBLESHOOTING _____ | 44 |
| SECTION 11 _____ | 45 |
| SERVICE AND NORMAL MAINTENANCE _____ | 45 |
| 11.1 OVERVIEW _____ | 45 |
| 11.2 PRELIMINARY CHECKS _____ | 45 |
| 11.3 SPARE PARTS _____ | 45 |
| SECTION 12 _____ | 47 |
| WARRANTY _____ | 47 |
| RETURNING EQUIPMENT TO THE FACTORY _____ | 47 |
| SECTION 13 _____ | 49 |
| Communications Protocol _____ | 49 |
| DT3008 MODBUS Register Map _____ | 49 |

SECTION 1

ANALYZER OVERVIEW

1.1 CONFIGURATIONS COVERED BY THIS MANUAL

Extractive System with Control Unit. Type 1 - Combustibles: 0 to 10 %

1.2 ANALYZER DESCRIPTION

The Model DT3008 Combustibles Analyzer reflects the state of the art in detector and electronic hardware design for continuous measurement of combustible concentration. The extractive Combustibles system uses a sampling system where the sample gas is piped to a Combustible sensor mounted in an Eductor/Back Purge/Auto Calibration Unit.

The electronic system incorporated within the DT3008 features microprocessor technology that greatly expands the versatility and capabilities of the Combustibles analyzer.

The display prompts the operator during the set parameter routine, shows instant and average concentration of sample, high alarm set points, recorder range, and more. A Modbus RTU (RS232, 422, or 485) communication port is available to allow two-way communication with other data acquisition systems.

The 16-key keypad overlay provides a completely sealed keyboard to assure that its touch-sensitive contacts are not subject to dust retention.

1.4 ELECTRONIC CONTROLLER

The DT3008 microprocessor controller electronically controls sensor temperature, display measurements, functions, and provides isolated analog outputs that are proportional to measured Combustibles concentrations. Normally open (N.O.) relay contacts are provided for high alarm set points, zero and span calibration, back purge, and for system fault.

The electronics accept voltage signals generated by the sensing cell. These are converted to isolated 4-20ma current outputs for use by remotely connected recording devices.

SECTION 2

SPECIFICATIONS

2.1 ANALYZER

| | |
|---------------------------|---|
| Measurement Range | Measures Combustibles from 0 to 10 % |
| Analog Outputs | Standard 4-20 mA |
| Analyzer Method | Close coupled Eduction - Extractive |
| Detector | Catalytic Bead |
| Accuracy Type 1 | Linear: 0 – 100 % L.E.L. |
| Response Time | 5 seconds (90%) step input at inlet |
| Display | 4-Line by 20 Character Backlit LCD |
| Supply Voltage | 115/VAC +/- 10% at 50/60 Hz. |
| Power Consumption | 150 Watts at 115 VAC, 50/60 Hz. |
| Enclosure (control unit) | NEMA 4 Wall Mount Panel Mount |
| Alarm Set Point | High Level and Very High ; 0 -10% Combustibles, user selectable. |

2.2 SAMPLE

| | |
|---------------------------------|-------------------------------------|
| Sampling Rate Extractive System | Approximately 5.0 SCFH (473 cc/min) |
| Response Time | 90% of full scale within 5 seconds |
| OUTPUTS | |
| LCD Display | 4-line by 20 character LCD |

| | |
|-------------------------------|--|
| Analog | 4-20mA |
| Serial Ports | RS232, 422, or 485, Modbus RTU to a Master computer for bi-directional communication. RS232 ships as standard. |
| Relay Outputs (N.O. SPST, 1A) | System alarm, Back Purge, Combustibles/CO high, Zero, Span1 and Span 2. |

2.3 CALIBRATION

| | |
|---------------------------------------|---|
| External | Standard calibration procedure permits the introduction of zero and span gases through the Cal Gas or Sample ports. |
| Cal Gas Target Values | Standard zero and span values entered via keypad. |
| Frequency | Via external digital (potential free) inputs or automatically via user selected period (in hours). |
| Recommended Calibration Gas Mixture | Zero: Plant air Span: 50,000 ppm CO |
| Recommended Calibration Gas Flow Rate | 5.0 SCFH (473 cc/min) |

2.4 ALARM

| | |
|----------------------|--|
| Concentration Type 1 | 0 – 10% user selectable |
| System | Denotes a system failure. |
| Internal | Audible 60 dB alarm |
| External | N.O. SPST Relay Contacts, 10 Amp AC/DC |
| Alarm Condition | Reported to screen. |

2.6 SAMPLE PROBES

| | |
|----------------------------------|--|
| Probe Material / Gas Temperature | 316 Stainless Steel standard: 1,500°F (815°C) max.; Inconel: 2000°F (1143°C) max. Alumina (High Temp) - Optional 2,800°F (1538 °C) max |
| | |
| Probe Length | Standard: 2 feet. Optional: up to 9 feet. |
| | |
| Flange | Stainless steel 304, 2" ANSI #125. |

SECTION 3

INSTALLATION

3-1 OVERVIEW:

This section covers the installation of the Model DT3008 Combustibles (CO) Analyzer. When installing, observe the following precautions.

- a. Do not operate this analyzer in an explosive atmosphere.
- b. The control unit mounting location must be dry and not exposed to freezing temperatures. Formation of condensation must be avoided. Do not place analyzer in direct sunlight.
- c. Ambient temperatures must be 32°F to 120°F (0°C to 50°C). If analyzer is used outside operating range, accuracy and error limit cannot be guaranteed.
- d. Eliminate vibrations. Structural vibrations, machinery vibrations, etc. will affect the operation and life of the analyzer. Find a vibration free structural wall or a similar place for firm mounting of the analyzer.
- e. This unit is a close-coupled extractive. Mounting the analyzer too far from the sample point will cause a delay in the signal response. It will also increase the risk of water dropout in the sample line. By the same token, too close to the sample point will present too high a gas temperature to the sensors and this may reduce their life span. A good rule of thumb is for each foot of stainless steel sample pipe (1/4"ID, the gas temperature will drop between 50 and 100 degrees F in an ambient temperature of approx 100 degrees F. Try to get the temp to be about 150F as it reaches the sensors.
- f. If a suitable installation place cannot be found close enough, the dead time due to longer lines can be made up by a higher sampling delivery rate.
- g. All wiring must be in accordance with national and local wiring codes.

3.2 INSTALLATION

Mechanical Installation

The outline drawing of the DT3008 enclosure shows mounting centers and overall dimensions. The Analyzer control unit requires installation in a location where the temperature range is between 30°F and 112°F (0-45°C).

Electrical Connections:

1. Power input: 115 VAC, +/-10%, single phase, 50 or 60 Hz, 250 watts maximum.
2. The power cable should comply with the safety regulations in the user's country and should never be smaller than 12 AWG (14 SWG).
3. ANALOG SIGNALS: The Model DT3008 has standard 4-20mA current outputs. The current outputs are calibrated for a 250-Ohm load. This output signal can be fed to an external load such as a recorder, or the signal can be used to drive a single external meter or recorder, as desired.
4. RS232, 422, OR 485 CONNECTIONS: The Model DT3008 is equipped with a serial port that can be configured for RS232, 422, OR 485. This allows the Model DT3008 to report its data to a DCS or other computer via a Serial Modbus RTU Protocol.
5. DIGITAL INPUTS: There are several Digital inputs on the Model DT3008. These inputs permit external devices to initiate zero and span checks. The external contact must be potential free and should be capable of handling 120 volts AC, 2 amps.
6. RELAY OUTPUTS: Relay outputs are available for remote alarm indication.

3.3 PNEUMATIC CONNECTIONS

The following gases are needed for the accurate operation of the Model DT3008.

1. Zero Gas with cylinder regulator capable of being set to approximately 2-5 psig. Consumption will be approximately 5.0 SCFH. This gas is connected to the sample line using 1/4" tubing.

2. Combustible Span Gas with cylinder regulator capable of being set to approximately 2-5 psig. Consumption will be approximately about 5.0 SCFH. This gas is connected to the sample line using 1/4" tubing. The span point CO concentration should be approximately 50% of the full scale. The span point combustibles concentration should be approximately 50% of the lower explosive limit (LEL) for the gas of concern.

3. Instrument air should be connected via a 1/4" tubing connector.

4. When the purge solenoid is activated there is a blast of pressurized air, which flushes or back flushes the sample probe and also facilitates the draining of the coalescing filter.

SECTION 4

PARAMETER DEFINITIONS

4.1 INTRODUCTION

This section goes through each of the parameters that are needed by the Model DT3008 for operation. The discussion here will detail the features and limits of these parameters. The order of presentation will be the same here as the order they appear in the parameter routine.

4.2 BACK PURGE PERIOD (DRAIN)

This parameter determines the period of time between back purges of the sample probe. The back purge period is entered here in minutes. The higher the particulate concentration and moisture content in the flue gas the more often the probe should be cleaned, and the shorter this time must be. Back purge is inhibited during a calibration period. **NOTE:** The coalescing filter should be changed regularly. Watch to see the discoloration of the paper filter. As the filter discolors, it will impede the flow. The exact time between changes needs to be determined by the rate of discoloration and the amount of moisture that accumulates in the bowl.

4.3 BACK PURGE DURATION

The duration of the back purge is set in seconds and is the time that the blow back solenoid is activated and there is flow across the filter. This time can be set quite low (ex. 10 sec).

4.4 COMBUSTIBLES (CO) RECORDER RANGES

The recorder ranges relate to the analog signals available at the output terminals on the Model DT3008. These analog signals are obtained from the analog outputs and are thus calibrated signals directly proportional to the instantaneous concentration the Model DT3008 detectors are seeing. The signals are 4-20 mA. The full-scale values for 20mA are set by the Recorder Range parameter.

4.5 CAL PURGE TIME

The Cal Purge Time is used in the various methods for calibration. It is set in seconds in the parameter routine but in practice it counts down in seconds. This allows sufficient time for the various gases to flush the sample lines and sensors prior to taking any concentration readings.

4.6 AVERAGE TIME

The Average Time is a rolling average for the time period selected. This rolling average value is used primarily for reporting, while the normal (instantaneous) value is used for trim control.

4.7 HIGH and VERY HIGH ALARM SETPOINT

A High CO (combustibles) concentration alarm is set to provide relay contacts and alarm messages for a high CO condition. If the concentration goes above the high set point value, two things happen.

1. The display shows the statement 'High Level' at the bottom of the Run Screen.
2. The high concentration level alarm terminals on the Model DT3008 will have a contact closure between them.

When the concentration falls below the high set point the relay de-energizes and opens the alarm contact and the alarm on the display is removed.

The display indication of an alarm condition alerts the operator to check the alarm status menu.

The above is duplicated for the "Very High" alarm

SECTION 5

SCREEN DESCRIPTIONS

5.1 INTRODUCTION

This section of the manual is to provide a very simplistic overview of the parameters and operating modes that the operator will encounter. All parameters and operating modes will be explained in detail in the following chapters.

Initial Energization

When the control is initially turned on the display will show a splash screen for a few seconds with the Datatest logo and the model number of the controller.

| |
|--|
| <p>Datatest Industries Model 3008-10pct CO Analyzer</p> |
|--|

The splash screen will disappear and the Run Screen will appear.

Run Screen

| |
|--|
| <p>Combust = 00.00 %</p> <p>O.K. 00:00</p> |
|--|

This display shows the present combustible percentage in the measured gas. The O.K. indicates that there are no active alarms and no special operating modes, and the 00:00 is the time of day in 24 hour time.

Alarms

If there were alarms or status alerts present they would be displayed in place of the "O.K." and could be any of the following:

- High Level
- Very High
- Back Purge
- CAL Fault
- Sensor Fault
- Calibrating

Pressing the CLEAR key on the keypad while in the Run Screen will bring up the Main Menu screen shown below.

| |
|--|
| <p style="text-align: center;">MAIN MENU</p> <p>1 - RUN</p> <p>2 - SET PARAMETERS</p> <p>3 - UTILITIES</p> |
|--|

Pressing the 1 key will return you back to the Run Screen.
Pressing the 2 key will take you to the Set Parameters screens.
And, pressing the 3 key will take you to the Utilities screens.

Set Parameters

The Set Parameters portion of the Main Menu allows the setting of a number of parameters to the operator as explained below. The Set Parameters Menu is accessed from the Main Menu by pressing the 2 key.

There are fourteen different portions of the Utilities Menu.

They are:

- High Limit
- Very High Limit
- Low Exp. Limit
- Alarm Delay
- Average Time
- Span Cal. Gas
- CAL Purge Time
- Auto Calibration
- Sample & Hold in CAL
- Recorder Range
- Back Purge Period
- Back Purge Duration
- Comms. Setup
- Set Time HH:MM

Utilities

The Utility portion of the Main Menu provides a number of features to the operator as explained below. The Utility Menu is accessed from the Main Menu by pressing the 3 key.

There are eight different portions of the Utilities Menu.

They are:

- Zero Adjust
- Span Adjust
- Signals
- CAL Cycle
- Analog Output
- Digital I/O
- Software Version
- Clear Memory

SECTION 6

STARTUP AND OPERATION

6.1 INTRODUCTION

When the Model DT3008 has been set up as described in section 3, it is then ready for operation. This section describes what the Model DT3008 does and what is needed from the operator.

6.2 INITIAL STARTUP

Initially it is suggested that the Model DT3008 be operated with the same parameters that were in the instrument on arrival. Likewise, the same calibration can be used that the instrument received during test. This will insure that there is no problem with the hardware. The following procedure is therefore recommended.

6.3 SET UP PROCEDURE

Start Up

It is suggested that before configuring the instrument for your specific needs you verify its performance. The test parameters from the factory reside in the instrument memory; therefore its performance can be verified. The following procedure will allow you to verify this performance.

1. Turn the power switch to the ON position. The following splash screen will display for a few seconds.

**Datatest Industries
Model 3008-10pct
CO Analyzer**

2. The DT3008 will then display the RUN SCREEN as shown below. The bottom line of this screen is reserved for alarm notification, and will be blank under normal operating conditions.

Combust = XX.XX %

O.K. 00:00

3. The instrument will proceed with its warm up and stabilization routines.
4. Connect the calibration gas line to the DT3008. Set external cylinder gas pressures to 5 psi and Rotometer to 5 SCFH.

6.4 SETTING PARAMETERS

While in the Run Screen pressing the CLEAR key on the keypad brings up the Main Menu shown below.

| |
|--|
| <p style="text-align: center;">MAIN MENU</p> <p>1 - RUN</p> <p>2 - SET PARAMETERS</p> <p>3 - UTILITIES</p> |
|--|

The instrument operating parameters can be set through the Main Menu by pressing the “2” key.

The display now appears as follows.

| |
|---|
| <p style="text-align: center;">Parameters Menu</p> <p>High Limit</p> |
|---|

The bottom line is the active parameter. Additional parameters can be accessed by pressing the “↓” key. Each time the “↓” is pressed the display will scroll and show a new parameter on the bottom line. Pressing the “↑” key will reverse the direction of the scroll and allow access to a parameter you may have already past. There are fourteen (14) parameters that can be accessed and they are:

- High Limit
- Very High Limit
- Low Exp. Limit
- Alarm Delay
- Average Time
- Span Cal. Gas
- CAL Purge Time
- Auto Calibration
- Sample & Hold in CAL

Recorder Range
Back Purge Period
Pack Purge Duration
Comms. Setup
Set Time HH:MM

High Limit

To edit the High Limit make sure it is on the bottom line then press the “ENT” key. The following screen will be displayed:

High Limit

High = 2.00 pct

The High Limit is used to set the high end of the alarm range. If the combustibles (CO) exceeds the value of the combustibles High Limit the analyzer will send an alarm and display an alarm on the Run Screen.

To edit the High Limit press the numeric keys that correspond with the desired percentage and press “ENT” key to accept this value. The programmable range is .10 pct to 10.0 pct. If you make a mistake simply press the CLR key and then the ENT key and try again.

A parameter can be changed, as many times as needed, to make sure it is correct. The value retained by the Model DT3008 will be the value present when “ENT” key is pressed (unless the value was out of the acceptable range).

Advance to the next parameter by pressing the “↓” key.

The display scrolls up with the bottom line reading Very High Limit.

Parameters Menu

High Limit

Very High Limit

Very High Limit

To edit the Very High Limit make sure it is on the bottom line then press the “ENT” key. The following screen will be displayed:

Very High Limit

VHigh = 5.00 pct

The Very High Limit is used to set the very high end of the alarm range. If the combustibles (CO) exceeds the value of the combustibles Very High Limit the analyzer will send an alarm and display an alarm on the Run Screen.

To edit the Very High Limit press the numeric keys that correspond with the desired percentage and press “ENT” key to accept this value. The programmable range is .10 pct to 10.0 pct. If you make a mistake simply press the CLR key and then the ENT key and try again.

A parameter can be changed, as many times as needed, to make sure it is correct. The value retained by the Model DT3008 will be the value present when “ENT” key is pressed (unless the value was out of the acceptable range).

Advance to the next parameter by pressing the “↓” key.

The display scrolls up with the bottom line reading Lower Exp. Limit.

| |
|---|
| <p style="text-align: center;">Parameters Menu</p> <p>High Limit</p> <p>Very High Limit</p> <p>Lower Exp. Limit</p> |
|---|

Lower Exp. Limit

To edit the Lower Exp. Limit (lower explosive limit) make sure it is on the bottom line then press the “ENT” key. The following screen will be displayed:

| |
|--|
| <p>Lower Exp. Limit</p> <p>L. E. L. = 0.00 pct</p> |
|--|

The Lower Exp. Limit is used to set the lower explosive limit display range. The value for the percentage entered here will be the upper end of the display range. If the LEL percent is other than zero, the COMBUST level on the RUN Screen will be replaced with the L.E.L percentage.

NOTE: The L.E.L. value on the RUN Screen is the percentage of the range entered in the Lower Exp. Limit screen. That is, if the Lower Exp. Limit was chosen as 5 percent, the L.E.L. value on the RUN Screen is 0% to 100% of the 5 percent value entered.

To edit the Lower Exp. Limit press the numeric keys that correspond with the desired percentage and press “ENT” key to accept this value. The programmable range is .10 pct to 10.0 pct. If you make a mistake simply press the CLR key and then the ENT key and try again.

Advance to the next parameter by pressing the “↓” key.

The display scrolls up with the bottom line reading Alarm delay.

| |
|--|
| <p style="text-align: center;">Parameters Menu</p> <p>Very High Limit</p> <p>Lower Exp. Limit</p> <p>Alarm Delay</p> |
|--|

Alarm Delay

To edit the Alarm Delay make sure it is on the bottom line then press the “ENT” key. The following screen will be displayed:

| |
|---|
| <p>Alarm Delay</p> <p>Delay = 0 sec</p> |
|---|

The Alarm Delay is used to delay the activation of the High and Very High alarms by the chosen value. This delay is most useful to eliminate alarms for levels that clear themselves within a short period of time.

To edit the Alarm Delay press the numeric keys that correspond with the desired seconds and press “ENT” key to accept this value. The programmable range is 0 to 90 seconds. If you make a mistake simply press the CLR key and then the ENT key and try again.

Advance to the next parameter by pressing the “↓” key.

The display scrolls up with the bottom line reading Average Time.

| |
|---|
| <p style="text-align: center;">Parameters Menu</p> <p>Lower Exp. Limit</p> <p>Alarm Delay</p> <p>Average Time</p> |
|---|

Average Time

To edit the Average Time make sure it is on the bottom line then press the “ENT” key. The following screen will be displayed:

Average Time**AVERAGE = 2 sec**

If the Average Time is set to zero (0), the value displayed on the RUN Screen will be the instantaneous value. If a value is entered for the Average Time other than zero (0), the value in the RUN Screen will represent the rolling average of that value over the Average Time period.

To edit the Average Time press the numeric keys that correspond with the desired seconds and press “ENT” key to accept this value. The programmable range is 1 to 360 seconds. If you make a mistake simply press the CLR key and then the ENT key and try again.

Advance to the next parameter by pressing the “↓” key.

The display scrolls up with the bottom line reading Span CAL. Gas.

Parameters Menu**Alarm Delay****Average Time****Span CAL. Gas**Span CAL. Gas

To edit the Span CAL. Gas make sure it is on the bottom line then press the “ENT” key. The following screen will be displayed:

The Span CAL. Gas is the value of the CO level in the calibration gas used to calibrate the system.

Span CAL. Gas**Span = 5.00 pct**

To edit the Span CAL. Gas value, press the numeric keys that corresponds to the carbon monoxide (CO) concentration found on the CO span calibration gas bottle/tank. This number represents the analyzer’s Span calibration value.

When the desired value is selected, press the “ENT” key to accept this value. The programmable range is 0 to 10 pct. If you make a mistake simply press the CLR key and then the ENT key and try again.

Advance to the next parameter by pressing the “↓” key.

The display scrolls up with the bottom line reading CAL. Purge Time

Parameters Menu

Average Time
Span CAL. Gas
CAL Purge Time

The CAL Purge Time is the time period where the system is flushed with instrument air. This occurs after calibration is complete to allow sufficient time for the calibration gases to be flushed out of the sample lines, and the detector, prior to taking a new CO reading. It is entered in seconds.

To edit Cal Purge Time press the “ENT” key. The following screen will be displayed.

CAL Purge Time

CPT = 60 sec.

Press the numeric keys that correspond to the desired seconds and press the “ENT” key to accept this value. The programmable range is from 1 second to 300 seconds.

Advance to the next parameter by pressing the “↓” key.

The display scrolls up with the bottom line reading Auto Calibration.

Parameters Menu

Span CAL. Gas
CAL Purge Time
Auto Calibration

Auto Calibration

Auto calibration, when enabled, permits the analyzer to automatically perform CO Zero calibration and CO Span calibration at programmable time intervals. A start time (Auto CAL. Hour), and a repetition period (Auto CAL> Period) for this auto calibration are field programmable.

To edit Auto Calibration press the “ENT” key. The following screen will be displayed.

Auto CAL. Period

Period = 24 hours

The Auto CAL. Period is the time period (in hours) between auto calibrations.

To edit the Auto CAL. Period press the numeric keys that correspond to the desired hours. The programmable range is from 1 hour to 24 hours. Press the “ENT” key to accept this value and move to the Auto CAL. Hour setup screen shown below.

Auto CAL. Hour

Hour = 0 hours

The Auto CAL. Hour is the hour of the day (in military time) that the Auto CAL. Period is referenced from. As an example, if the Auto CAL. Period is programmed to 8 and the Auto CAL. Hour is programmed to 12, the auto calibrate routine will start at 12:00 Noon, and repeat at 8:00 pm, 4:00 am, and 12:00 Noon again (8 hours apart). This cycle will repeat as long as the times are not changed and the analyzer is not turned off.

If the analyzer is turned off, the auto calibrate routine will begin again when the analyzer is turned on and repeat at the Auto CAL. Period time interval. When the Auto CAL. Hour is again reached, the system will synchronize to this time and the original cycle will again become active.

To edit the Auto CAL. Hour press the numeric keys that correspond to the desired hour. The programmable range is from 1 hour to 23 hours. Press the “ENT” key to accept this value and move to the Auto CAL. Enable setup screen shown below.

Auto CAL. Enable

Enable = 0

To edit the Auto CAL. Enable either press the “1” key to enable the auto calibrate routine, or the “0” key to disable the auto calibrate routine. Press the “ENT” key to accept this value.

Advance to the next parameter by pressing the “↓” key.

The display scrolls up with the bottom line reading Sample and Hold in CAL.

Parameters Menu

CAL Purge Time

Auto Calibration

Sample & Hold in CAL

Sample & Hold CAL

To edit the Sample & Hold CAL make sure it is on the bottom line then press the “ENT” key. The following screen will be displayed:

Sample & Hold in CAL

Sample & Hold = 0

The Sample & Hold in CAL is used to ensure that, if you are using the unit for TRIM CONTROL, the analog outputs will lock at the last measured true CO value prior to the calibration procedure being invoked. This will prevent the boiler control instrument from being upset by the swings in CO from Zero to Span as the instrument executes its calibration cycle.

To edit the Sample & Hold in CAL, press either the “1” key to activate the hold function, or the “0” key to deactivate the hold function. In the inactive setting the analog output will follow the values being obtained during the Zero and Span checks. Press the “ENT” key to accept this value.

Advance to the next parameter by pressing the “↓” key.

The display scrolls up with the bottom line reading Recorder Range.

Parameters Menu

Auto Calibration

Sample & Hold in CAL

Recorder Range

Recorder Range

The Recorder Range is from 0 to 10 percent full scale, in one percent increments of the recorder.

To program the Recorder Range press the “ENT” key. The following screen will be displayed:

Recorder Range

Range = 10.00 pct

To edit the Recorder Range, press the numeric keys that correspond to the desired percent and press the “ENT” key to accept this value.

Advance to the next parameter by pressing the “↓” key.

The display scrolls up with the bottom line reading Back Purge Period.

| |
|--|
| <p style="text-align: center;">Parameters Menu Sample & Hold in CAL Recorder Range Back Purge Period</p> |
|--|

Back Purge Period

To edit the BACK PURGE PERIOD make sure it is on the bottom line then press the “ENT” key. The following prompt will be displayed:

| |
|--|
| <p style="text-align: center;">Back Purge Period BPP = 60 min</p> |
|--|

The Back Purge Period is the time, in minutes, between back purges. A back purge sends instrument air up the sample line to the sample nozzle to clear the line, nozzle, and filter (if applicable) of any accumulated particulate and/or water that may have accumulated there.

To edit the Back Purge Period (BPP), press the numeric keys that correspond to the desired time and press the “ENT” key to accept this value. The programmable range is 0 to 999 minutes. If it is not desired to perform a back purge, enter 0 and the back purge will not activate.

Advance to the next parameter by pressing the “↓” key.

The display scrolls up with the bottom line reading Back Purge Duration.

| |
|---|
| <p style="text-align: center;">Parameters Menu Recorder Range Back Purge Period Back Purge Duration</p> |
|---|

Back Purge Duration

To edit the Back Purge Duration make sure it is on the bottom line then press the “ENT” key. The following prompt will be displayed:

| |
|--|
| <p style="text-align: center;">Back Purge Duration BPD = 10 seconds</p> |
|--|

The Back Purge Duration is the time, in seconds, that the back purge will be activated.

To edit the Back Purge Duration (BPD), press the numeric keys that correspond to the desired time and press the “ENT” key to accept this value. The programmable range is 0 second to 60 seconds.

Advance to the next parameter by pressing the “↓” key.

The display scrolls up with the bottom line reading Comms. Setup.

Parameters Menu
Back Purge Period
Back Purge Duration
Comms. Setup

Comms. Setup

To edit the Comms. Setup make sure it is on the bottom line then press the “ENT” key. The following prompt will be displayed:

Modbus I. D. #

I. D. = 0

When communicating with a remote device (DCS, PC, PLC, etc.), each analyzer must have a unique ID number between 0 and 255.

To edit the I.D. number, press the numeric keys that correspond to the desired value and press either the “ENT” key or the “CLR” key to accept this value.

The following screen will appear:

MODBUS Port Parity
0 = Even, 1 = Odd
Parity = 0

If the system is communication with a remote device, the remote device and the analyzer must both be communicating with the same parity. Press either the “0” or “1” key depending on the parity desired, and then the “ENT” or “CLR” key.

The following screen will appear:

```
MODBUS Baud Rate
4800, 9600, 19200
Baud = 09600
```

If the system is communication with a remote device, the remote device and the analyzer must both be communicating with the same Baud Rate. Press the numeric keys that correspond to the desired baud rate, and then the “ENT” key.

Advance to the next parameter by pressing the “↓” key.

The display scrolls up with the bottom line reading Set Time.

```
Parameters Menu
Back Purge Duration
Comms. Setup
Set Time HH:MM
```

Set Time

To edit the Set Time make sure it is on the bottom line then press the “ENT” key. The following prompt will be displayed:

```
ENT to change
CLR to return
Time = 10:08
```

Press the “ENT” key to change the present time in the control. The following screen appears:

```
Set Time HH:MM

Time =
```

To edit the Set Time, press the numeric keys that correspond to the desired hours and minutes. The time must be entered in military time. Press the “ENT” key to accept this value. **DO NOT PUSH THE “ENT” KEY IF THERE IS NO TIME ENTERED.**

The screen will now return to the Parameter Menu. If you are finished setting parameters press “CLR” and return to the Main Menu screen. From there you can select Utilities (press the “3” key), or press “1” to return to the Run Screen.

6.5 SETTING UTILITIES

From the RUN Screen shown below press the “CLR” key to bring up the Main Menu screen.

Run Screen

| |
|------------------------|
| COMBUST = 0.38% |
| O.K. 14:24 |

Main Menu Screen

| |
|---------------------------|
| Main Menu |
| 1 – Run |
| 2 – Set Parameters |
| 3 – Utilities |

From the Main Menu screen press the “3” key. The Utilities Menu screen as shown below will appear:

| |
|------------------------|
| Utilities Menu |
| Zero Adjustment |

The bottom line is the active parameter. Additional parameters can be accessed by pressing the “↓” key. Each time the “↓” is pressed the display will scroll up and show a new parameter on the bottom line. Pressing the “↑” key will reverse the direction of the scroll and allow access to a parameter you may have already past. There are eight (8) parameters that can be accessed and they are:

- Zero Adjust
- Span Adjust
- Signals
- CAL Cycle
- Analog Output
- Digital I/O
- Software Version
- Clear Memory

Zero Adjust

To activate the Zero Adjust make sure it is on the bottom line then press the “ENT” key. The following screen will be displayed:

Manual Zero Adjust**Purge Delay = 10
Comb= 0.00 [0.00]**

The control will immediately start the zero adjust routine. The purge delay will start to count down from the value that was selected for the CAL Purge Time. During this time period the sample gas is purged from the equipment and the zero gas is introduced. The value of the CO (Comb) level will slowly drop from its initial value to zero as the zero gas is introduced. The value in the brackets ([]) is the target value.

When the Purge Delay reaches zero the control automatically performs a Sample Delay.

Manual Zero Adjust**Sample Delay = 15
Comb= 0.00 [0.00]**

The Sample Delay is the time in seconds that the system samples the zero gas. At the end of the Sample Delay time the screen will display “Adjustment Complete”. This indicates that the zero adjust is complete.

Manual Zero Adjust**Purge Delay = 15
Adjustment Complete**

The system will now automatically go into another purge that purges the zero gas from the system. When this final purge is complete, the system will again start measuring the sample gas and return to the Utilities Menu.

Utilities Menu**Zero Adjustment**

Advance to the next parameter by pressing the “↓” key.

Utilities Menu**Zero Adjustment
Span Adjustment**

The display scrolls up with the bottom line reading Span Adjust:

Span Adjust

To activate the Span Adjust, make sure it is on the bottom line then press the “ENT” key. The following screen will be displayed:

Manual Span Adjust

Purge Delay = 15
Comb= 6.30 [8.00]

The control will immediately start the span adjust routine. The purge delay will start to count down from the value that was selected for the CAL Purge Time. During this time period the sample gas is purged from the equipment and the span gas is introduced. The value of the CO (Comb) level may change from its initial value. The value in the brackets ([]) is the target value entered in the Span CAL Gas screen under Set Parameters.

When the Purge Delay reaches zero the control automatically performs a Sample Delay.

Manual Span Adjust

Sample Delay = 15
Comb= 0.00 [0.00]

The Sample Delay is the time in seconds that the system samples the span gas. At the end of the Sample Delay time the screen will display “Adjustment Complete”. This indicates that the zero adjust is complete.

Manual Span Adjust

Purge Delay = 15
Adjustment Complete

The system will now automatically go into another purge that purges the span gas from the system. When this final purge is complete, the system will again start measuring the sample gas and return to the Utilities Menu.

Utilities Menu

Zero Adjustment
Span Adjustment

Advance to the next parameter by pressing the “↓” key.

```
Utilities Menu
Zero Adjustment
Span Adjustment
Signals
```

Signals

The Signals function is not operable in this system. However if it is on the bottom line and the “ENT” key is pressed. The following screen will be displayed:

```
Raw Signal

Comb = 0.00 pct
Temp = 0
```

This screen has no user function, and the values displayed are not to be used or reported. Pressing the “CLR” key returns the screen to the Utilities Menu.

```
Utilities Menu
Zero Adjustment
Span Adjustment
Signals
```

Advance to the next parameter by pressing the “↓” key.

The display scrolls up with the bottom line reading CAL Cycle:

```
Utilities Menu
Span Adjustment
Signals
CAL Cycle
```

CAL Cycle

To activate the CAL Cycle, make sure it is on the bottom line, then press the “ENT” key. The following screen will be displayed:

```
Auto CAL Check

Purge Delay = 15
Comb = 2.30 [ 0.00]
```

This Auto CAL Check verifies that the span and zero are within plus or minus 0.5pct of expected values. The expected value for Zero is 0, the expected value for Span is the Span value previously programmed under Set Parameters.

The control will immediately start a Zero check routine. The purge delay will start to count down from the value that was selected for the CAL Purge Time. During this time period the sample gas is purged from the equipment and the Zero gas is introduced. The value of the Comb (CO) level should approach 0. The value in the brackets ([]) is the target value, in this case 0.00. When the Purge Delay reaches zero the control automatically performs a sampling delay.

Auto CAL Check
Sample Delay = 5
Comb = 0.00 [0.00]

The Sample Delay is the time in seconds that the system samples the Zero gas. At the end of the Sample Delay the system will automatically go into another purge that replaces the Zero gas with the Span gas.

Auto CAL Check
Purge Delay = 15
Comb = 2.00 [5.00]

When this Purge Delay reaches zero the control automatically performs another sampling delay.

Auto CAL Check
Sample Delay = 5
Comb = 4.80 [5.00]

During this sampling delay the system samples the Span gas. At the end of the Sample Delay the system will automatically go into a purge that replaces the Span gas with the Sample gas.

Auto CAL Check
Purge Delay = 15
Check Complete

When this last purge delay is completed the screen returns to the Utilities Menu.

Utilities Menu
Span Adjustment
Signals
CAL Cycle

Advance to the next parameter by pressing the “↓” key.

The display scrolls up with the bottom line reading Analog Output:

```
Utilities Menu
Signals
CAL Cycle
Analog Output
```

Analog Output

To adjust the Analog Output, make sure it is on the bottom line, then press the “ENT” key. The following screen will be displayed:

```
DAC Output = 0%
```

This is a diagnostic tool to check the digital output signal from the analyzer. The normal signal output is 4 to 20 ma. When 0% is programmed, the output should be 4 ma, when 100% is programmed the output should be 20 ma, and when 50% is programmed the output should be 12 ma.

The opening screen has the Output set to 0%. Pressing the “ENT” key changes the values. The first press will change the value from 0% to 100%.

```
DAC Output = 100%
```

The second press will change the value from 100% to 50%.

```
DAC Output = 50%
```

The third press will return you to the Utilities Menu.

```
Utilities Menu
Signals
CAL Cycle
Analog Output
```

Advance to the next parameter by pressing the “↓” key.

The display scrolls up with the bottom line reading CAL Cycle:

```
Utilities Menu
CAL Cycle
Analog Output
Digital I/O
```

Digital I/O

To adjust the Digital I/O, make sure it is on the bottom line, then press the “ENT” key. The following screen will be displayed:

```
Digital I/O
DIN   = _ _ _ 4 _ _ _ _
DOU  = 1 _ _ _ _ _
```

This screen is used for diagnostic purposes. It shows the digital inputs and outputs that are presently active. The number of the input or output that is active is displayed in both numerical form and in numerical position. The display may show anywhere from zero to all fourteen inputs and outputs as is applicable at any point in time.

Press the “ENT” or “CLR” key to return to the Utilities Screen.

```
Utilities Menu
CAL Cycle
Analog Output
Digital I/O
```

Advance to the next parameter by pressing the “↓” key.

The display scrolls up with the bottom line reading Software Version:

```
Utilities Menu
CAL Cycle
Analog Output
Software Version
```

Software Version

To view the Software Version, make sure it is on the bottom line, then press the “ENT” key. The following screen will be displayed:

**Software Revision
DT3008 Ver 1.01**

When trying to diagnose technical problems with Datatest's home office, you may be requested for this software information.

Press the "ENT" or "CLR" key to return to the Utilities Screen.

**Utilities Menu
CAL Cycle
Analog Output
Software Version**

Advance to the next parameter by pressing the "↓" key.

The display scrolls up with the bottom line reading Software Version:

**Utilities Menu
Analog Output
Software Version
Clear Memory**

Clear Memory

To Clear Memory, make sure it is on the bottom line, then press the "ENT" key. The following screen will be displayed:

**Clear Memory
0 = No, 1 = YES
Enter = 0**

To clear the system memory press the "1" key, to leave the memory as it is press the "0" key. If the memory is cleared, ALL the operating Parameter values and the values set in the Utilities will be erased and replaced with preprogrammed default values. The default values are as follows:

System Default Values

High Limit = 2 pct
Very High Limit = 5 pct
Low Exp. Limit = 0.00 pct
Alarm Delay = 0 sec
Average Time = 2 sec
Span Cal. Gas = 5.00 pct
CAL Purge Time = 60 sec

Auto Calibration = 24 hours
Sample & Hold in CAL = 0
Recorder Range = 10 pct
Back Purge Period = 60 min
Back Purge Duration = 10 sec
Comms. Setup
 I.D. = 0
 Parity = even
 Baud rate = 9600
Set Time = 00:00
Clear Memory = 0

SECTION 7

CALIBRATION

7.1 INTRODUCTION

The Combustion (CO) analyzer needs initial and periodic calibration, using known test gases, for several reasons.

Initial calibration is required to set the linearization curve for the installed conditions.

Periodic calibration to reset linearization due to electronic component aging, sensor aging, and changes in the flue gas conditions.

For EPA reporting a calibration check is required once every 24 hours.

For trim control a calibration is typically required once a month and whenever a new sensor is installed.

7.2 CALIBRATION

For calibration, connect the Cal gases as described earlier in this manual.

The Zero or Span calibration gases are to be introduced to the calibration ports of the Model DT3008 at positive pressure. Calibration gas flow rates should be adjusted to around 5 SCFH.

To begin a Calibration cycle, Press “CLR” from the Run Screen. You will now be looking at the Main Menu.

| |
|--|
| <p style="text-align: center;">MAIN MENU</p> <p>1 - Run</p> <p>2 - Set Parameters</p> <p>3 - Utilities</p> |
|--|

Press the “3” key to enter the Utilities Menu screen.

Press the down arrow (↓) until CAL Cycle appears on the bottom line.

| |
|--|
| <p style="text-align: center;">Utilities Menu</p> <p>Span Adjustment</p> <p>Signals</p> <p>Cal Cycle</p> |
|--|

CAL Cycle

To activate the CAL Cycle, make sure it is on the bottom line, then press the “ENT” key. The following screen will be displayed:

| |
|--|
| <p>Auto CAL Check</p> <p>Purge Delay = 15 Comb = 2.30 [0.00]</p> |
|--|

This Auto CAL Check verifies that the span and zero are within plus or minus 0.5pct of expected values. The expected value for Zero is 0, the expected value for Span is the Span value previously programmed under Set Parameters.

The control will immediately start a Zero check routine. The purge delay will start to count down from the value that was selected for the CAL Purge Time. During this time period the sample gas is purged from the equipment and the Zero gas is introduced. The value of the Comb (CO) level should approach 0. The value in the brackets ([]) is the target value, in this case 0.00. When the Purge Delay reaches zero the control automatically performs a sampling delay.

| |
|--|
| <p>Auto CAL Check</p> <p>Sample Delay = 5 Comb = 0.00 [0.00]</p> |
|--|

The Sample Delay is the time in seconds that the system samples the Zero gas. At the end of the Sample Delay the system will automatically go into another purge that replaces the Zero gas with the Span gas.

| |
|--|
| <p>Auto CAL Check</p> <p>Purge Delay = 15 Comb = 2.00 [5.00]</p> |
|--|

When this Purge Delay reaches zero the control automatically performs another sampling delay.

| |
|--|
| <p>Auto CAL Check</p> <p>Sample Delay = 5 Comb = 4.80 [5.00]</p> |
|--|

During this sampling delay the system samples the Span gas. At the end of the Sample Delay the system will automatically go into a purge that replaces the Span gas with the Sample gas.

Auto CAL Check
Purge Delay = 15
Check Complete

When this last purge delay is completed the screen returns to the Utilities Menu.

Utilities Menu
Span Adjustment
Signals
CAL Cycle

If the above CAL Cycle routine does not measure the Zero and Span levels within proper tolerances the CAL Fault alarm will activate. "CAL Fault" will appear on the RUN Screen and the system alarm relay will activate.

7.3 ABORT CALIBRATION

Any time during the CAL cycle routine pressing "CLR" will abort the routine and return you to the Utilities Menu.

SECTION 8

DIAGNOSTIC DISCUSSION

8.1 INTRODUCTION

During operation up of the Model DT3008 various diagnostic messages may appear in the display. Each of these messages is discussed below:

8.2 CALIBRATION FAULT

During the calibration period, if the analyzer detects a value greater than 0.5 pct below, or 0.5 pct above, the Zero or Span gas value, the control initiates an alarm. A "CAL Fault" alarm message will appear on the bottom line of the Run Screen to indicate the analyzer is out of calibration.

The on-board alarm contact will close during this alarm condition providing a means for remote alarm indication.

SECTION 9

COMBUSTION SENSOR

9.1 COMBUSTION SENSOR

The combustion sensor consists of two platinum bead cells, one cell is encased in a porous ceramic and the other cell is encased in glass that is impervious to gas penetration. The porous ceramic cell will allow the combustible gas to filter through. The cells are both heated to incandescence. The combustible gas will burn on the platinum wire in the porous cell, thereby increasing the resistance of the platinum wire. The other cell (glass) will not change resistance since the gas cannot penetrate it. The electronic circuitry will measure this change in resistance. The combustible gas concentration is proportional to the change in resistance.

The catalytic bead sends a millivolt signal to the controller. The controller converts this signal to a 4-20 mA output, and displays measurements on the LCD display.

SECTION 10

TROUBLE SHOOTING

10.1 OVERVIEW

The system troubleshooting section is divided into two parts that describe how to identify and isolate analyzer faults. The first part describes sensor faults and the second describes electronic faults. The alarms and messages caused by either may overlap.

10.2 SPECIAL TROUBLESHOOTING NOTES

a. Grounding: It is essential that adequate grounding precautions are taken when system is being installed. Thoroughly check all grounding connections before and after faultfinding.

b. Loose Integrated Circuits: The electronics uses a microprocessor and supporting integrated circuits. Should the electronics receive rough handling during installation, or is installed in a location that is subject to severe vibration, an integrated circuit (IC) could work loose. Make sure all IC's are fully seated before system troubleshooting begins.

10.3 SENSOR TROUBLESHOOTING

a. Sensor Faults: Listed below are symptoms of sensor failure.

1. The system does not respond to changes in concentration.
2. The system responds to changes in concentration, but does not give correct indication.
3. The system does not give an acceptable indication of the value of the test gas being applied during calibration.

b. Fault Finding: The following Table is a guide for finding faults of the above symptoms.

| MALFUNCTION | POSSIBLE FAILURE | CHECK | REMEDY |
|---|---|---|---|
| System responds to concentration changes but does not give correct reading. | Calibration error. | System calibration. | Recalibrate system. |
| | Vacuum leak. Air getting in sample line | Extractive system. Check sample line and fittings. | Stop air leak. |
| | Leaky zero, span or back purge solenoid | Check back purge and cal solenoids. | Stop solenoid leak. |
| | Failure of electronics. | Cell mV input to electronics. | Replace oxygen PCB and return faulty board to Datatest. |
| System does not give accurate indication of applied test gas. | Blocked sample line. | Test sample inlet port. Verify calibration gas concentrations. | Clean port. Replace calibration gas container. |
| | Spent CO Sensor | | Replace CO Sensor |

10.4 ELECTRONICS TROUBLESHOOTING

The Model DT3008 has on-board diagnostic features, which aid in fault finding. Normally the user will not need to use electronic testing equipment in fault diagnostics. Almost all reasons for system malfunction are displayed by either an alarm or a fault message on the liquid crystal display.

SECTION 11

SERVICE AND NORMAL MAINTENANCE

11.1 OVERVIEW

This section describes routine maintenance of the Model DT3008 Combustion Analyzer. Spare parts referred to are available from Datatest. Observe warning and caution labels.

11.2 PRELIMINARY CHECKS

The following preliminary checks will help isolate problems in the analyzer. Run these checks before beginning any repair work. Check parameters and displays according to instructions in the System Startup section.

- a. **Check Display for Alarms:** Go through normal power up procedure. Check display for alarms. If there are alarms, troubleshoot.

- b. **Run Calibration Check:** Run CAL Cycle (see Utilities Menu). If calibration is successful, no problem exists. If calibration fails, shut off power and make sure that all wires and gas lines are properly connected to analyzer. If everything checks out properly, proceed to step c.

11.3 SPARE PARTS

| PART NUMBER | DESCRIPTION | QUANTITY |
|-------------|-------------------------------|----------|
| DK5066 | FUSE, 5 Amp | 1 |
| DT3008-PCB | Main Controller Card | 1 |
| DK5071 | CO sensor 4-20 ma transmitter | 1 |
| DK5072 | Combustible Cell 0-100% LEL | 1 |
| DK5073 | Solid State Relay | 1 |
| DK5067 | Micro Vacuum Pump | 1 |

| | | |
|--------|---------------------------------|---|
| DK5069 | Flow Meter w/ Valve 1-10 SCFH | 1 |
| DK5070 | Flow Meter w/ Valve .4-5 SCFH | 1 |
| DK5068 | MAC Valve 120V | 1 |
| DK5074 | Solenoid Valve 1/8" ports, 120V | 1 |
| DK5010 | Coalescing Filter Element | 1 |

SECTION 12

WARRANTY

Datatest guarantees this system for a period of eighteen (18) months from date of installation to be free from defects in material and workmanship.

Our obligation under this guarantee is limited to repairing or replacing any instrument or part thereof which shall, within the above specified time, be returned to us with transportation charges prepaid, and prove after our examination to be thus defective. Should the product be found not to be defective a diagnostic and recalibration charge will apply.

The gas sensor element is excluded from this warranty.

In the event that the customer requires a Datatest field service technician or engineer on site, the customer will be billed for this service at our standard rate. This applies whether the equipment is in or out of warranty. This daily rate is based on the man-days spent 'on site', plus travel time. Expenses for travel and living are billed at cost.

Datatest personnel will not accept instruments returned under this warranty, to the Datatest plant, without prior authorization.

The user must prepay Freight for Returned Equipment. Datatest will assume the cost of shipping the unit back to the user by common carrier. If the user wishes it returned by other means, the user will be billed for the additional charges.

We reserve the right to discontinue instruments without notice, and to make modifications in design at any time without incurring any obligation to make such modifications to instruments previous sold.

RETURNING EQUIPMENT TO THE FACTORY

If factory repair of equipment is required, proceed as follows.

a. Secure a return authorization number from a Datatest Sales Office before returning the equipment. Equipment must be returned with complete identification in accordance with Datatest instructions or it will not be accepted.

In no event will Datatest be responsible for equipment without proper authorization and identification.

b. Carefully pack the equipment in a sturdy box with sufficient shock absorbing material to insure that no additional damage will occur during shipping.

c. In a cover letter, describe completely:

1. The symptoms that made you think the equipment is faulty.
2. The environment in which the equipment has been operating (i.e. temp, corrosive gasses, moisture, etc.).
3. Name of your company and plant name where equipment was removed.
4. Plant contact and phone number.
5. Whether warranty service or non-warranty service is expected.
6. Complete shipping instructions for return of equipment.

d. Enclose the cover letter and purchase order and ship the equipment according to instructions provided in Datatest Return Authorization, prepaid to:

DATATEST Inc.
300 Valley Road
Hillsborough, NJ 08844
TEL: (908) 369-1590
FAX: (908) 369-1594

If warranty service is requested, the unit will be carefully inspected and tested at the factory. If failure was due to conditions listed in the standard Datatest warranty, the unit will be repaired or replaced at Datatest option, and an operating unit will be returned to the customer in accordance with shipping instructions furnished in the cover letter.

For equipment no longer under warranty, the equipment will be repaired at the factory and returned as directed by the purchase order and shipping instructions.

SECTION 13

Communications Protocol

DT3008 MODBUS Register Map

The protocol used for communication between the DT3008 and a PC/DCS/PLC is MODBUS. Only the binary form of the MODBUS protocol, remote terminal unit (RTU) framing is supported. The PC/DCS/PLC must be configured as the MODBUS master. The DT3008 is configured as a MODBUS slave. The following MODBUS command is supported:

READ HOLDING REGISTERS (COMMAND BYTE = 03H)

The electrical connection to the DT3008 is RS232/422/485 using 8 bits, even/odd parity and 1 stop bit. The data rate is selectable from 4800, 9600, and 19200 BPS.

REGISTERS

Diagnostic Registers

| | |
|-------|------------------------------------|
| 40001 | Message Counter |
| 40002 | Read register (03) message counter |
| 40003 | Invalid CRC message counter |
| 40004 | Exception response message counter |
| 40005 | Write command message counter |
| 40006 | Last Exception code |

| | |
|-------|-----------------------------|
| 40021 | Back purge timer in minutes |
| 40022 | Back purge status |
| | 0 = Back purge not active |
| | 1 = Back purge in progress |

Status Registers

| | |
|-------|-----------------------------|
| 40023 | Device status |
| | 1 = No alarm |
| | 2 = High Level Alarm |
| | 3 = Very High Level Alarm |
| | 4 = Reserved |
| | 5 = Reserved |
| | 6 = Combustion sensor fault |
| | 7 = Calibration Fault |

Integer Combustion Registers

40032 Instantaneous combustion reading
40033 Rolling average combustion

Floating point Combustion Registers

40036-7 Instantaneous combustion reading
40038-9 Rolling average combustion

Integer combustion values are stored in units of 1/100. Example 4.3 % is stored as the number 430. Floating point value format corresponds to that of the IEEE-754 standard.