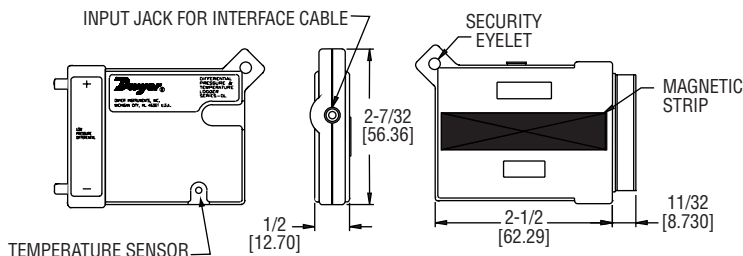




Series DL7 Differential Pressure Logger

Specifications - Installation and Operating Instructions



GENERAL

The Series DL7 Dataloggers are easy-to use battery-powered data loggers that can monitor pressure and temperature. Each unit can reliably record time-based data for later analysis, by Trendreader software and any IBM PC or 100% compatible computer.

Series DL dataloggers run continuously--constantly measuring and recording readings from any enabled channel. Self-powered by a long life lithium battery that will provide years of reliable operation, your logger can work independently from any external power supply or computer. Each Series DL7 Datalogger has an on-board thermistor that can be used to monitor and record ambient temperature.

GENERAL INSTALLATION

The Trendreader software must be installed on your computer prior to the use of any data logger described in this reference. NOTE: The Series DL7 Differential Pressure Data Logger has additional features not found on some of the other DL Series loggers. This manual describes some of the unique features of the DL7. For additional information on graph manipulation, custom equations, modem setup, and sample rate tables, consult the Trendreader software manual.

SETUP

To setup your datalogger you must first have Trendreader software installed and running on your computer. You can then configure your logger with various options by plugging into your computer via the interface cable. From the Communicate menu, choose Preferred Logger SR+. To access the logger window, double click on the logger icon or click Communicate on the menu bar and choose the highlighted Open COM from the menu.

PHYSICAL DATA

- No. of Channels:** Two; internal thermistor, and a differential pressure sensor.
- Media:** Dry air and noncorrosive gases.
- Max. Pressure Rating:** 5x rated pressure
- Accuracy:** $\pm 0.05\%$ w.c.
- Resolution:** $\pm 0.01\%$ w.c.
- Nonlinearity:** $\pm 0.05\%$ FS (BFSL)
- Hysteresis and Repeatability:** $\pm 0.05\%$ FS.
- Internal Thermistor Range:** -40 to 158°F (-40 to 70°C)
- Internal Thermistor Resolution:** 0.7°F (0.4°C), R25 value equal to 10,000Ω [10kΩ @ 25°C (77°F)]
- Compensated Temp Range:** 32 to 158°F (0 to 70°C)
- Thermal Accuracy:** $\pm 0.5\%$ FS.
- Memory Size:** 21,500 readings
- Resolution:** 12 bits (1 in 4096).
- Stability:** $\pm 0.5\%$ FS/yr.

Sampling Methods:

- Continuous (First-out: not available from 40 ms to 8 sec.), Stop when full (Fill-then-stop), or Delayed start.
- Sampling Rates:** Selectable from 0.04 seconds to 8 hours.
- Power:** Built-in 3.6V Lithium battery, 1 Amp-hour.
- Power Consumption:** 5-10 μ A, continuous.
- Clock Accuracy:** ± 2 sec/day plus one sampling interval.
- Ambient Operating Temp:** -40 to 158°F (-40 to 70°C), 0 to 95% RH, non-condensing.
- Connection:** Two 1/8" I.D. permanent protective tubing.
- Computer Requirements:** IBM compatible 386 or above and Windows™ 3.1 or later with 2mB RAM and 2mB hard drive disk space, one serial port.
- Housing:** Noryl™
- Weight:** 4 oz (110 g).

EQUATION #

Model Number	Pressure Range	Equation #
DL70	$\pm 0.5''$ w.c. (1.2 mbar)	13
DL71	$\pm 1''$ w.c. (2.5 mbar)	13
DL72	$\pm 2.5''$ w.c. (6.2 mbar)	88
DL75	$\pm 5''$ w.c. (12.4 mbar)	37
DL710	$\pm 10''$ w.c. (24.9 mbar)	37

TABLE 1

If more than one logger icon appears on the screen or more than one Open COM is highlighted on the Communicate menu, this means you have more than one COM port available on your computer. Choose the port that the particular logger is connected to.

The logger window will display the serial number of the logger Trendreader software is communicating with. See Figure 1. To contact another logger connected to the computer. 1. Double-click the serial number displayed to highlight it. 2. Type the serial number of the logger you want to contact. 3. Click the Contact button.

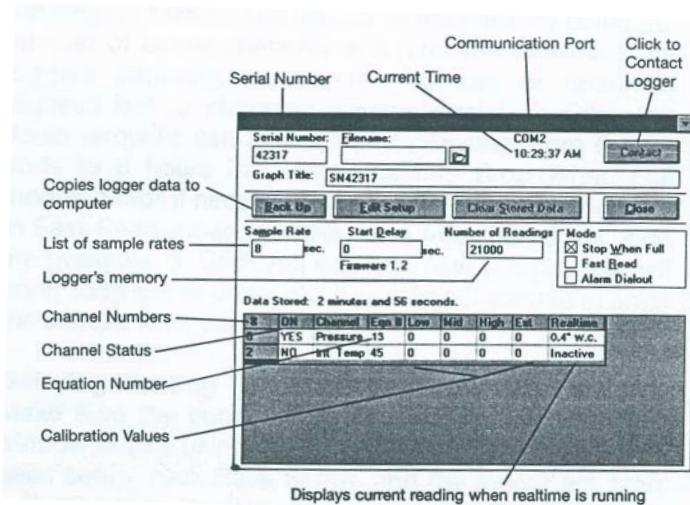


FIGURE 1

Filename

You cannot name the file during setup. Name the file when you are backing up the logger.

Current Time

Make sure the current time is correct. To change the time, access the Program manager on your computer and follow instructions in your computer setup manual.

Stop When Full Continuous Mode

The logger can be set to stop taking readings when the memory is full, or to continue to take readings when the memory is full. To choose the first option, click the box in front of Stop When Full so that there is an "X" in it. To choose the continuous mode, click the box in front of Stop When Full so there is no "X" in it. The logger will continue to take readings when the memory is full, discarding the oldest reading as it records new readings.

Stopping Realtime

When the logger window is opened, the logger is operating in realtime mode, which means current readings are being displayed in the window. Before changing any settings, click Edit Setup.

Clearing Stored Data

To empty stored data, click Clear Stored Data.

Enabling and Disabling Channels

Enabling a channel activates that channel and it will continually record and store readings in memory. In the channel ON column, Yes means the channel is active, No means it is not. Click on the channel being changed to toggle between yes and no. Disable any channels not required to conserve memory space.

Equation Numbers

Equations are calculations the software uses to convert raw logger data to understandable units. Refer to page one (Table 1) for the appropriate equation number.

To see a list of standard equations available, double click one of the equation numbers in the Eqn column. The Select an Equation dialog box will appear, enabling you to scroll through the standard equations. If you want to choose one of the equations on the list, click it to highlight, and click Accept (or Enter). You can also choose an equation by typing the number in the selected Equation Number box and clicking Accept (or Enter).

Custom equations can be created and assigned to specific logger channels. For additional information on creating custom equations, please refer to the instruction manual included with the Trendreader software.

Calibrations

The calibration values displayed in the low, med, high columns are factory set and match the sensor supplied.

Viewing Realtime Readings

The realtime function allows the user to view measurements as they are being recorded. Viewing current readings can be useful when monitoring remote loggers by modem. In realtime mode, the logger reads and displays the variable every 8 seconds. If the sample rate is greater than 8-seconds, the average value for the sample interval is stored (based on 8-second readings).

Do not leave realtime running if you want to perform other tasks in Trendreader or if you want to switch to another Windows application. The operation of Trendreader or other Windows program will be slowed considerably with realtime running. To stop or start realtime, click the Edit Setup button. Stopping realtime has no effect on the logger's information gathering.

Units of Measure

The units of measure can be changed to fit your particular needs. To change the units displayed in Realtime and on the logged data choose the Options menu, highlight Units, and highlight the parameter being measured. The units appropriate for that particular parameter will be displayed in the units window. Select the box corresponding to the desired units of measure and press Enter.

When viewing in realtime, the new units will be displayed at the next update interval. The standard unit of measure will be designated with a 1 in the Scale column. When selecting a different unit of measure, make sure the conversion from the standard is correct.

Choosing a Sample Rate

The sample rate is the frequency that the logger takes readings. The current sample rate is always displayed. To change the sample rate: 1. Click the current rate. The sample rate dialog box appears. The dialog box displays current sample rate, the number of active channels, and the length of time it will take to fill the memory using the number of active channels and rate. (To determine the loggers capacity, enable the number of channels required before choosing a sample rate). 2. Click the down arrow to see available sample rates from 8 seconds to 8 hours in Continuous and Stop When Full modes. Scroll if necessary, and click on the desired rate. In Fast Read mode, sample rates less than 8 seconds are available. 3. Click Accept. The new sample rate will apply to all active channels. If you do not want to change the sample rate, click cancel.

Delaying Starting Time

Make sure the correct time is displayed in the logger window before using this function. Once the logger has been setup, click Save Setup, and the logger will start gathering data. To delay the start time: 1. Double click in the Start Delay box to open the Select a Time dialog box. 2. Set the time and/or date for the logger to start taking readings. 3. Click Accept. The logger can be set for a delayed start time of up to two years.

Number of Readings

The maximum number of readings the DL7 logger can store is 21,500. If fewer readings are desired, change the number (in increments of 500).

To calculate the number of readings a particular time span will need, divide the time span by the sample rate (making sure both are in seconds or minutes). If you are taking readings at 8-second intervals for 24-hours, and need to know the number of readings, convert 24-hours to seconds (86400) and divide by the sample rate of 8-seconds to get 10,800 readings. When backing up the logger, it will stop at the specified number of readings.

Saving Changes

When you have finished setting up your logger, click Save Setup. A dialog box will appear asking to clear the logger and save setup. (Setting up a logger erases all the previously gathered data). Click OK.

FAST READ MODE

Choose Fast Read Mode when:

1. You need a sample rate of less than 8-seconds, and /or
2. You want to delay the logger's start time but do not want to specify the start time until after the logger has been setup.

Fast Read Mode allows you to choose sample rates from 0.04 seconds (25 readings per second) to 2 minutes. The sample rate must be in increments of 0.04 seconds. NOTE: A separate power source is required when using Fast Read Mode. Power can be supplied from the computer the logger is connected to or a separate battery pack (BP-100). If using the battery pack, the logger will start taking reading as soon as the battery is connected.

The logger cannot work in continuous Mode when using Fast Read Mode. The logger will stop taking readings as soon as the memory is full. The logger will also interrupt readings when it is connected to Trendreader software.

To delay start in Fast Read Mode:

1. Set the delay time in seconds in the start Delay box. Use this method when the logger will remain connected to a computer or battery pack.
2. If the battery pack will be connected at a later time, follow this procedure before disconnecting the logger from the computer: Before clicking Save Setup, set Start Delay for long enough that you can save the setup and disconnect the logger while it is asleep. The logger must be asleep (on start delay) when it is disconnected to be able to start taking readings when the battery is connected to it. NOTE: You must set a minimum start delay of 16 seconds before you disconnect the logger from the computer. the logger must be disconnected from the computer within 8-seconds of setting the delay. If these steps are omitted, the logger will not start when the battery is connected.

Do not contact a logger in Fast Read Mode until you are going to back it up. Contacting the logger will stop it from taking readings. You can contact a logger by clicking Contact or by opening the window once it has been closed.

BACKING UP A LOGGER

Copying data from a logger to your computer requires an IC-100 or IC-200 Interface cable. To backup a single logger use the IC-100 Interface Module. The IC-200 Interface Module can be used to backup several loggers. Backing up a logger can take a number of minutes depending on the speed of your computer and the amount of data being transferred.

The process can be speed up by selecting the Set Baud rate, Fastest Available from the Communicate menu. (If you have problems backing up a logger, try a slower baud rate. On some computers, choosing the fastest available baud rate causes timing conflicts. NOTE: The IC-200 module automatically transmits at 1200 baud and cannot be adjusted.

Backing Up a Logger

From the Communicate menu, choose Preferred Logger SR+. To access the logger window, double click on the logger icon or click communicate on the menu bar and choose the highlighted Open COM from the menu. To backup a logger, click Backup in the logger window. A dialog box appears showing the baud rate, the serial number of the logger, and the progress of the backup. (You may cancel the backup procedure by clicking Cancel).

Opening a Graph after Backup

If you want to view the transferred information as a graph immediately after backup, open the Options menu in the main window and make sure a check mark is in front of Open Graph after Backup. NOTE: See the Trendreader software manual for details on manipulating graphs.

Naming a File

When backup is completed, the Save As dialog box appears to enable you to name the file. the default name is always the serial number of the logger. If you want to keep the logger's serial number as the filename, click OK. If you want to give the file a different name, type the new name and click OK. NOTE: You cannot type anything after the dot in the Trendreader filename. The three letter extension, is automatically assigned.

Backing Up Additional Loggers

You can daisy-chain the DL7 loggers together and back them up one by one. You may want to disable the opening a graph after backup function when you are backing up several loggers. If this function is not disabled, a graph will be opened after backing up each logger, increasing the total backup time. To disable this function, open the Options menu and make sure there is no check mark in front of Open Graph After Backup.

ALARM DIALOUT

Alarm Dialout enables you to setup the logger at a remote site so that it will dial a phone number when readings have exceeded preset alarm thresholds. It can be setup to dial a telephone or pager. The receiving telephone requires caller ID to use this feature.

If sending the alarm to a pager, the pager system must accept touch-tone codes that can be displayed on the pager.

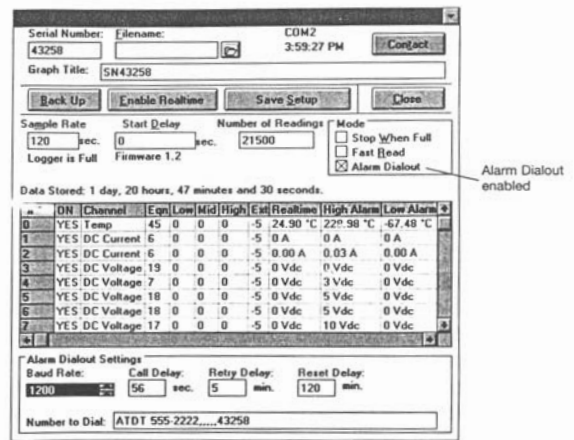


FIGURE 2

Alarm Dialout is enabled by setting high and low alarm thresholds, entering the number that is to receive the alarm call, and sending the setup to the logger. When an alarm condition occurs, the logger will dial out and leave the remote site number on the receiver's telephone caller ID or on the pager's display. (Alarm Dialout does not leave a verbal message). To activate Alarm dialout, click Alarm Dialout in the logger window so that there is a check in the Alarm Dialout box. A dialog box will appear at the bottom of the window. See figure 2.

Setting High and Low Alarm Thresholds

Set high and low alarm thresholds for each active channel on the logger. Any reading lower than the low alarm threshold or higher than the high alarm threshold will cause the logger to dial out from the remote site. Set the high alarm to the highest possible value and low alarm to the lowest possible value if you do not want the alarm activated on that channel.

Choosing a Baud Rate

Baud rate is a measure of the transmission speed of the dial commands that the logger sends to the modem. The default baud rate is 1200, which is reliable and accurate for most situations. Higher baud rates are available in the baud rate box.

Entering the Number to Dial

A. Calling a telephone: Remember the telephone must have caller ID to receive the alarm.

1. Type a dial command in the Number to Dial box. If the phone line at the remote site has tone dial, type ATDT. If pulse dial, type ATDP.
2. After the dial command, type the number of the telephone that is to receive the alarm call.

B. Calling a pager: The pager system must accept touch-tone codes that can be displayed on the pager.

1. Type the dial command ATDT in the Number to Dial box.
2. After the dial command, type the number of the pager that is to receive the alarm call.
3. After the pager number and before the identifying code there must be a pause by typing commas. (For most modems, each comma causes a pause of two seconds).
4. Type a code that will identify the logger. For example: ATDT 555-2222,,,,,40167, would instruct the logger to dial the pager number and pause for ten seconds, and then send the serial number of the logger.

Setting Call Delay

Call delay is the length of time that a logger will wait before dialing out once an alarm condition has occurred. If you do not want the remote logger to dial out immediately when one or more of the channels goes into alarm condition, you can set the Call delay to designate the number of seconds the logger will wait before dialing.

If the alarm condition does not exist for the entire delay period, the logger will not dial out. If the logger comes out of an alarm condition during the call delay period, the delay timer will stop and will start again from zero at the next alarm event.

Setting Retry Delay

If a remote logger dials out an alarm but cannot get through (line is busy), it will continue to dial out until connection is made. Retry delay is the length of time the logger will wait between unsuccessful attempts. It is recommended to set the retry dial to 5 minutes. The logger will continue to dial out after every retry delay time and as long as the alarm condition exists and has not been acknowledged.

Setting Reset Delay

Reset Delay begins when you acknowledge the alarm by backing up the logger that has dialed out. Reset Delay deactivates Alarm Dialout to give time to fix the problem that caused the alarm. When Reset Delay period has elapsed, Alarm Dialout will reactivate, and if an alarm condition exists, the logger will dial out again.

IMPORTANT: If an alarm condition occurs and Reset Delay has been initiated by the last backup, the logger will wait until the Reset Delay period is over before dialing out. To bypass the Reset Delay period (if you have fixed the alarm problem but time remains on the Reset Delay), click the Clear Stored Data button and follow the subsequent prompts.

Sending the Setup to the Logger

After choosing Alarm Dialout settings, setup logger by clicking the Save Setup/Clear Stored Data button and follow the subsequent prompts.

Responding to Alarm Call

1. When the logger dials out to warn of alarm condition, dial into the site and backup the logger.
2. Fix the problem that caused the alarm.
3. Reactivate Alarm Dialout by contacting the logger and clicking Clear Stored Data.

NOTE: Test Alarm Dialout regularly to ensure proper operation.

Fast Read Mode Disabled

Alarm Dialout is not designed to operate in Fast Read Mode. When Alarm Dialout is enabled, fast Read Mode is disabled; when Fast Read Mode is enabled, Alarm Dialout is disabled.

PRECAUTIONS

The Series DL7 is designed for long-term trouble-free performance. Keep in mind a few precautions to maximize performance.

The pressure sensor is compatible with non-corrosive gases and air. IT IS NOT TO BE USED FOR LIQUID PRESSURE MEASUREMENT.

Always try to make your pressure connections separate from the module and logger. To accomplish this, leave a short length of tubing continually attached to the high and low ports. Overstressing the input connections may cause it to break and thus cause erroneous readings.

Use an uninterruptible power supply (UPS) to keep power running to modem and telephone equipment in case of outage. Regularly test the Alarm Dialout function to ensure proper operation.

Cold or Humid Environments

The environment the logger will be placed in must be suitable, please refer to the physical data section. If conditions are not acceptable, consider using a protective enclosure. For humid environments, the logger can be protected by placing it in a ziplock plastic bag.

If the logger is used in a cold environment, make sure condensation will not settle on the logger when it is brought back into a warmer environment. The best way to prevent condensation is to place the logger in a plastic ziplock bag and include a dessicant. When you bring the logger back into the warmer climate, leave the logger in the bag with the dessicant until the logger has come to equilibrium with the environment.

Label

If working with more than one logger, label each, identifying the task and location before you distribute them throughout a building or system. To do this, simply use shipping tags. Later, when you retrieve them to graph their data, you will know what each graph refers to.

Mounting

Use the magnetic backing to conveniently mount the logger on metal surfaces like ductwork or electrical control cabinets. If concerned about theft, make sure to lock the logger to a permanent fixture using the special locking tab.

Special mounting methods (using Velcro® fasteners) to secure the loggers to other surfaces may be used. NOTE: Do not rely on the logger's magnetic strip for secure mounting if the surface is uneven, unstable, or above 150°F (65°C).

Keep Track

Be sure to keep record of the locations of each logger. This will save time in looking for them when the data-gathering is completed. Also, keep track of when the loggers were put into service. This will help when producing graphs.

Retrieval

After sufficient time has passed to obtain a representative profile of data, retrieve the logger and bring it back immediately for analysis. Make sure the logger has a label so it can be properly identified and differentiated.

Analysis

To analyze the logger, you must first transfer a copy of its data into your computer. To do this, plug the logger into the Trendreader interface cable and choose Logger, Communicate, Backup. After describing the information to the computer, the data is automatically copied to disk, time and date stamped, and converted into the appropriate measurement units. A portion or the entire data set can be copied.

Each file will initially have the same descriptive title, but you can use Files, Revise Logger to alter these accordingly. To view graphs, choose Draw, New and select the appropriate file. A detailed description of all software functions can be found in the Trendreader Reference Guide.

OPERATING A LOGGER NETWORK

The Series DL7 Dataloggers can be networked to enhance the monitoring and backup capabilities. Use model IC-200 Interface Module to connect as many as 8 loggers to your computer simultaneously. The IC-200 Module will allow backup of a 8 loggers, one after the other, with one command. Realtime data from up to 64 channels (8 loggers with 8 channels) can be displayed on a single screen.

Connecting an IC-200 to the Computer

1. Connect the serial port extension cable's female end to the computer's 25-pin serial port. Use the 9-pin connector if the computer has a 9-pin port).
2. Connect the cable's other end to the IC-200 connection marked "PC".
3. Connect the power supply adapter to the other end of the IC-200 (the end marked "modem").
4. Connect the 6VDC power supply to the adapter.

Connecting an IC-200 to a Modem at a Remote site

1. Connect the serial port extension cable to the modem.
2. Connect the cable's other end to the IC-200 connection marked "modem".
3. Connect the gender changer to the other end of the IC-200 (marked "PC").
4. Connect the power supply adapter to the gender changer.
5. Connect the 6VDC power supply to the adapter.

NOTE: The cable length between the IC-200 and the computer or modem can be extended. Maximum length should be 500 feet (150 m). Use 22-gauge stranded wire, with two conductors and a shield.

Identifying Loggers on a Network

Before you can contact a network group of loggers at a site for the first time, you must name the site and list serial numbers so they can be identified.

1. From the Communicate menu in the main Trendreader window, choose SR+ Network so that a check mark exists in front of it.
2. Choose the COM port that the loggers are connected to. the Logger List dialog box will appear. Site name and logger serial numbers will be entered in this dialog box. See figure 3 below.

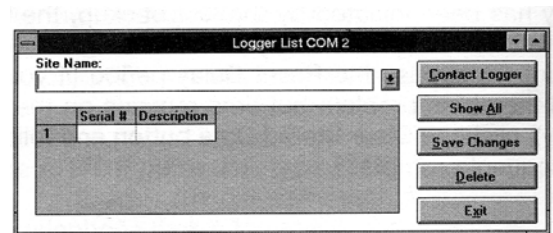


FIGURE 3

3. In the Site Name box type a unique name for the site and press Enter.
 4. Click in the Serial # Column, type the serial number of one of the loggers, and press Enter. (The order does not matter, however, if you click Show All to view realtime readings, the readings will be displayed in the order they were entered.)
 5. If desired, add a description in the Description column and press Enter.
 6. Repeat steps 4 and 5 until all the loggers at the site are listed.
 7. Click Save Changes.
- You can now contact any of the loggers listed.

Deleting a Site and its Loggers

1. Highlight the site to be deleted in the Site Name box. To scroll between sites, click the down arrow.
2. Click Delete. The site name serial numbers and descriptions will be deleted.
3. Click Save Changes.

Deleting One Logger from a List

1. Click in the loggers serial number box to highlight the number.
2. Click Delete. The serial number and description will be deleted.
3. Click Save Changes.

Viewing Realtime Readings of All Loggers

1. From the Communicate menu in the main Trendreader window, click SR+ Network until a check mark appears in the box.
2. Choose the COM port the network is connected to. The Logger List dialog box will appear.
3. Click Show All. The Network Realtime readings. See figure 4 below. When finished viewing the realtime readings, either click Close to close the window, or double-click a logger's serial number to open that logger's window.

Site #1 Network Realtime							
Logger	Description	Chnl #0	Chnl #1	Chnl #2	Chnl #3	Chnl #4	Chnl #5
43257	Current & Temp	24.99 °C	5.414 A		3.895 A		0.000 A
43258	UPS Battery Voltage	24.97 °C	0.000006 A	0.000006 A	0.25500 Vdc	0.0000 Vdc	0.000 Vdc
40006	Oven Temperature	24.88 °C		67.48 °C			
40020	2nd Floor Mains	24.37 °C	0.000 A		10.256 A		0.000 A

FIGURE 4

Contacting a Network Logger

There are three ways to contact a logger on a network:

- *From the Logger List dialog box
- *From the Network Realtime window
- *From the Logger window

Contacting a Logger from the Logger List

Double-click the logger's serial number (or click the logger's serial number and click Contact Logger). The loggers main window will open.

Contacting a Logger from the Network Realtime

When you have contacted a logger by one of the previous two methods and you have that logger's window open, you can contact another logger on the network by taking the following steps:

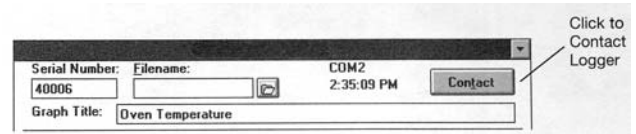


FIGURE 5

1. Click Edit Setup. (See figure 5).
2. Double-click the serial number in the Serial Number box.
3. Type the number of the logger you want to contact.
4. Click the Contact button to open that logger's window.

NOTE: DO NOT setup networked loggers in the Fast Read Mode. Any networked logger that is setup in Fast Read Mode will stop logging as soon as it or any other logger on the network is contacted.

SAMPLE RATE TABLES

The following tables list the maximum time spans over which the DL7 logger will record readings. The time span depends on the number of channels enabled and the length of the sample rate. The logger has a memory capacity of 21,500 readings.

One Channel Enabled

Sample Rate	Days	Hours	Minutes	Seconds
.04 sec.	0	0	14	20
.1 sec.	0	0	35	50
.2 sec.	0	1	11	40
.5 sec.	0	2	59	10
1 sec.	0	5	58	20
2 sec.	0	11	56	40
5 sec.	1	5	51	40
8 sec.	1	23	46	40
20 sec.	4	23	26	40
1 min.	14	22	20	0
2 min.	29	20	40	0
5 min.	74	15	40	0
10 min.	149	7	20	0
30 min.	447	22	0	0
1 hr.	895	20	0	0
2 hrs.	1791	16	0	0
4 hrs.	3583	8	0	0

Two Channels Enabled

Sample Rate	Days	Hours	Minutes	Seconds
.04 sec.	0	0	7	10
.1 sec.	0	0	17	55
.2 sec.	0	0	35	50
.5 sec.	0	1	29	35
1 sec.	0	2	59	10
2 sec.	0	5	58	20
5 sec.	0	14	55	50
8 sec.	0	23	53	20
20 sec.	2	11	43	20
1 min.	7	11	10	0
2 min.	14	22	20	0
5 min.	37	7	50	0
10 min.	74	15	40	0
30 min.	223	23	0	0
1 hr.	447	22	0	0
2 hrs.	895	20	0	0
4 hrs.	1791	16	0	0

MAINTENANCE

No routine maintenance is required on the Series DL dataloggers. Periodic check of connections and mounting is recommended. Please contact Dwyer Instruments, Inc. before returning unit for repair to review information relative to your application and obtain a return authorization number. When returning a product to the factory, carefully package and ship freight prepaid. Be sure to include a complete description of the application and problem and identify any hazardous material used with the product.