User Manual

DC1700 Air Quality Monitor

DYLOS CORPORATION

Air Quality Monitoring Innovation

US Patent 8009290
Foreign Patent Pending

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Introduction

Important Safety Instructions

1. Read and keep these instructions.

2. Follow all warnings and instructions.

3. Do not attempt to open or disassemble the device. This may result in risk of shock or exposure to laser radiation. No serviceable parts are inside.

4. Do not use this device near water, such as a sink, wash basin, or bathtub.

5. Do not spill any liquids onto or into the device.

6. Do not push any objects into the openings of this device.

7. Do not use any liquid or spray cleaners on the device. Clean only with dry cloth.

8. Do not install or operate near any source of heat.

9. Operate the device only with the provided AC adaptor connected to a power outlet of the specified rating.

10. Unplug the device and return it for service if any of the following conditions occur.

    A. The power cord and or AC adaptor has been damaged.

    B. The device has had water or another liquid spilled on or into it.

    C. The device has been dropped or physically damaged.

    D. The device ceases to function properly.

For Best Performance

1.   In addition to following all the above safety precautions, it is recommended that the DC1700 not be installed near devices which might produce a strong electromagnetic field, such as fluorescent lighting, as these may affect the count accuracy. In most cases a separation of one to several feet should be sufficient to prevent any interference.

2.   It is recommended that the DC1700 not be operated in direct sunlight or other bright light source as this could affect count accuracy.

3.   Install the DC1700 at a location and height in the room where you want to test the air quality. Be aware that particulate concentrations can vary dramatically from one location to another within the same house.

Health Disclaimer

While the DC1700 can detect levels of airborne particulates it cannot determine the health impact for any given individual. Respiratory ailments and allergic symptoms are caused by a variety of factors. The DC1700 is not meant to be used in the treatment or mitigation of any medical condition. Please consult your physician
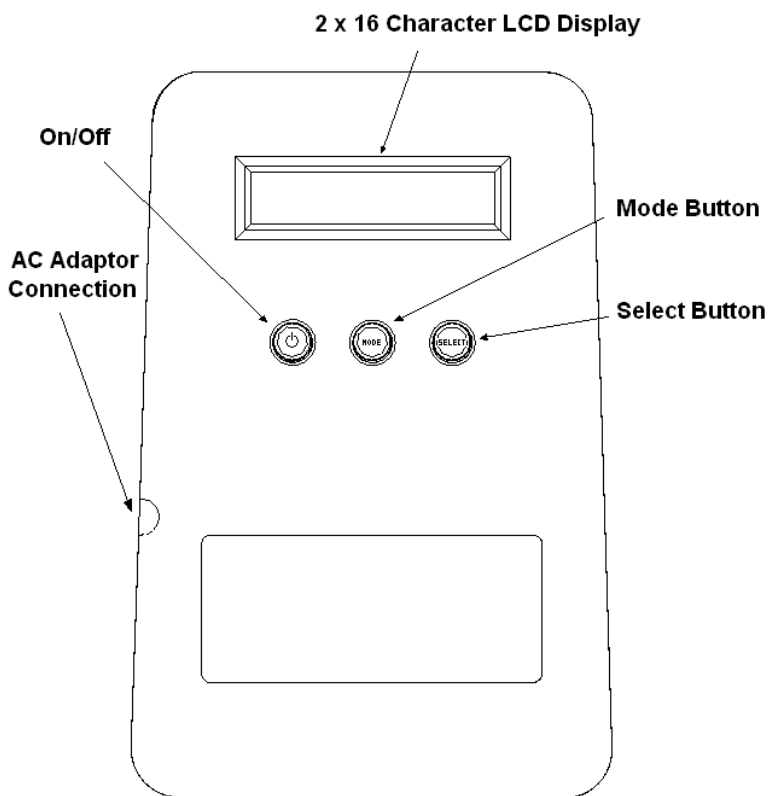
Operation

Getting started with the DC1700 is simple. Just plug it in and turn it on. First, plug the AC adaptor provided with the unit into a 120V/60Hz wall outlet. Next, connect the AC adaptor to the DC1700 as shown in the figure. Turn the DC1700 on by pressing the ON/OFF switch and the unit will start sampling.
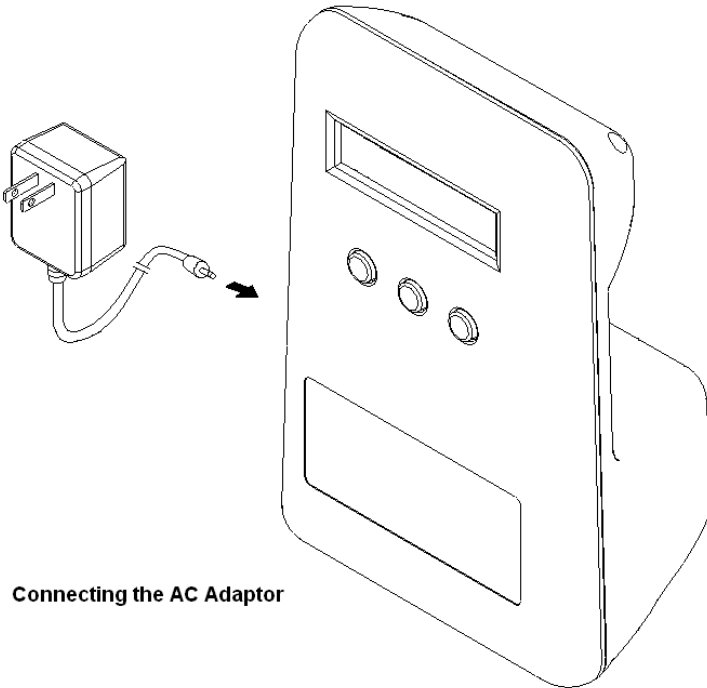
Connecting the AC Adaptor

The DC1700 also has an internal 7.2V NiMH battery which can provide up to 6 hours of operation. To charge the internal battery, plug the DC1700 into AC, but don't turn the unit on. (Note: It may take 12 or more hours to charge a fully discharged battery)

2 x 16 Character LCD Display

On/Off

Mode Button

AC Adaptor
Connection

Select Button

Operating Modes

overview

The DC1700 has several operating modes. The user can cycle through the various modes by pressing the MODE button. Selections within a mode, such as viewing history data, are made by pressing the SELECT button. In the various modes the DC1700 will display both the small particle concentration and large particle concentration. Small particle concentration is always displayed to the left and large particle concentration to the right. Small particles are all particles detected by the DC1700 down to its detection limit – 0.5 microns. Large particles are all particles detected above the large particle threshold which is approximately 2.5 microns. (Note: to determine the particles between 0.5 microns and 2.5 microns simply subtract the large particle reading from the small particle reading) The values are scaled so that these represent the concentration of particles in approximately .01 cubic foot of sampled air. Thus, to determine the number of particles per cubic foot of air simply multiply the DC1700 readings by 100. Examples of particles that might be present in the typical home in these ranges are:

small particles: fine dust, bacteria, mold, smoke, smog, etc.

large particles: coarse dust, pollens, larger bacteria, plant spores, dust mite feces, etc.

continuous mode

The DC1700 is simple to operate. All that needs to be done is to plug the unit in and turn it on. Once turned on the unit will automatically configure itself to run in continuous mode and display the current level of particulate pollution for both small and large particles. The data sampled will also be recorded for future

analysis. In addition, a dynamic bar graph will be displayed which will give the user an immediate visual indicator of the number and size of particles being detected.

When continuous mode is first entered it will briefly display the approximate battery charge state provided that the unit is running on battery and not on AC as shown below.

```
continuous mode
BATTERY ▐□□  ▐+
```

State of charge
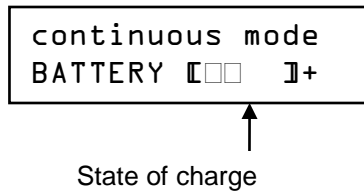
After 2 seconds the display will change to give the particle concentrations as shown.

small particles   large particles

```
    753        38
□□□□□□□□□□
```

dynamic bar graph
← smaller   larger →
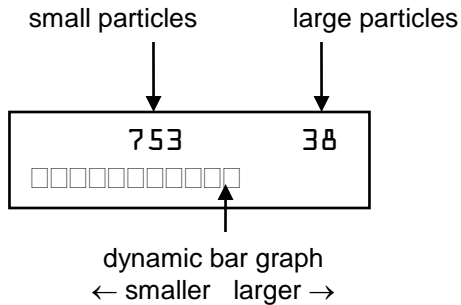
monitor mode

In monitor mode the DC1700 will sample for one minute every hour. The LCD will display "monitor mode" and wait until the next hour break to begin sampling. When the unit starts sampling the fan will come on and the word "sampling" will flash on the second line of the LCD. At the end of the minute, the concentration of small and large particles just sampled will be displayed as shown in the figure

```
 monitor mode
     178      15
```

small particles   large particles
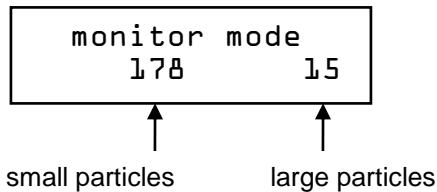
minute history mode

Minute history mode allows the user to view the data recorded over the past hour on a minute by minute basis. When minute history mode is entered by pressing the MODE button while in monitor mode, the following message is displayed briefly.
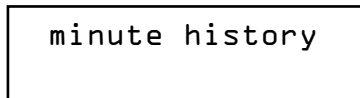
```
 minute history
```

Then the user is instructed to press the SELECT button to start viewing the history data.

```
┌─────────────────────────┐
│   PRESS SELECT TO        │
│    VIEW HISTORY          │
└─────────────────────────┘
```

Pressing SELECT will show a display similar to the following. The first line displays the time at which the data was recorded and the second line shows the average concentration of small and large particle over that minute. Pressing SELECT additional times will allow the user to go back through the recorded data one minute at a time.
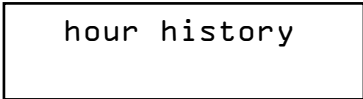
```
┌─────────────────────────┐
│      1 MIN AGO           │
│      328        24       │
└─────────────────────────┘
```
       ↑   ↑
  small particles   large particles

It may happen that instead of the particle concentration the messages "NO DATA" or "TIME BREAK" are displayed. The message "NO DATA" means that no sampling data was recorded at that period in time. The message "TIME BREAK" alerts the user that the displayed times past the time break are no longer accurate. This happens if the DC1700 is unplugged which causes the unit to lose track of time. Note: the stored data is not lost but only the time reference from the present. Turning the unit on and off does not effect the time as the internal clock keeps running.

hour history mode

Hour history mode allows the user to view the data recorded over the past day on an hour by hour basis. When hour history mode is entered by pressing the MODE button while in minute history mode, the following message is displayed briefly.

```
hour history
```

Then the user is instructed to press the SELECT button to start viewing the history data.

```
PRESS SELECT TO
   VIEW HISTORY
```

As in minute history mode, pressing SELECT will allow the user to go back through the recorded data. The data represents the average of the concentration over the entire hour. The following is a typical display.

```
┌─────────────────────────────┐
│       ] HOURS AGO           │
│       328      24           │
└─────────────────────────────┘
            ↑         ↑
     small particles   large particles
```
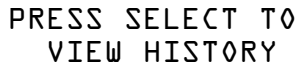
day history mode

Day history mode allows the user to view the data recorded over the past month on a day by day basis. When day history mode is entered by pressing the MODE button while in hour history mode, the following message is displayed briefly.
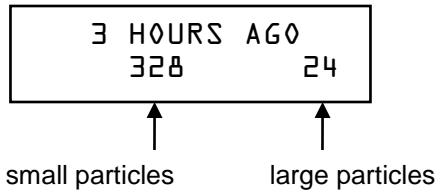
```
┌─────────────────────────────┐
│                             │
│       day history           │
│                             │
└─────────────────────────────┘
```

Followed by.

```
┌─────────────────────────────┐
│     PRESS SELECT TO         │
│      VIEW HISTORY           │
└─────────────────────────────┘
```

As in the other history mode, pressing SELECT will allow the user to go back through the recorded data. The data represents the average of the concentration over the entire day. The following is a typical display.

```
┌─────────────────────────────┐
│       1 DAY AGO             │
│        388        27        │
└─────────────────────────────┘
         ↑          ↑
   small particles   large particles
```
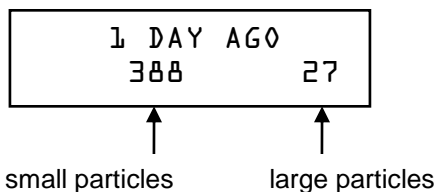
Date time mode

Date time mode displays the current date and time (in 24hr time) and allows the user to set the internal clock. The internal clock is used to time stamp the data which is stored in the DC1700's internal memory. This is to facilitate graphing the data (e.g. using Excel) once it has been downloaded into a PC. See the PC Interface and Internal memory sections for more details. When date time mode is entered the date and time will be displayed as follows for approximately 2 seconds.

```
┌─────────────────────────────┐
│     date time mode          │
│     05/04/10  15:14         │
└─────────────────────────────┘
```
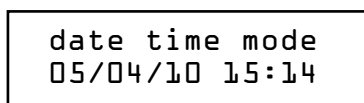
Followed by.

```
┌─────────────────────────┐
│  PRESS SELECT TO        │
│    CHANGE TIME          │
└─────────────────────────┘
```

If SELECT is pressed then the following instructions will be briefly displayed.

```
┌─────────────────────────┐
│  SELECT  = CHANGE       │
│  MODE    = SET          │
└─────────────────────────┘
```

Followed by.

```
┌─────────────────────────┐
│  05/04/10 15:14         │
│  ^^                     │
└─────────────────────────┘
```
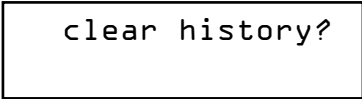
Use the SELECT button to advance the month to the proper month. Then press MODE to set the month to this value and advance the arrows to the day. Repeat this procedure until the day, year, hour, and minute have been set properly. The final press of the MODE button will store these values into the DC1700 internal clock. The mode will then be automatically advanced to the clear history mode.

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clear history mode

Clear history mode allows the user to clear all minute, hour, and day histories from internal memory. When clear history mode is entered by pressing the MODE button while in day history mode, the following message is displayed briefly.
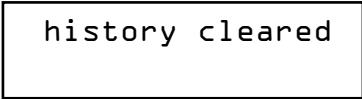
```
┌─────────────────────────┐
│                         │
│     clear history?      │
│                         │
└─────────────────────────┘
```

Followed by.

```
┌─────────────────────────┐
│   PRESS SELECT TO        │
│    CLEAR HISTORY         │
│                         │
└─────────────────────────┘
```

If SELECT is pressed while this is displayed then the histories will be cleared and the following message briefly displayed.

```
┌─────────────────────────┐
│                         │
│    history cleared      │
│                         │
└─────────────────────────┘
```

After the histories are cleared the DC1700 automatically switches into continuous mode. If the user opts to not clear history then he must press MODE instead of SELECT and the unit returns to continuous mode.

Internal Memory

In addition to the history memory described previously, the DC1700 large internal memory for the storage of particle data. This internal memory can store up to approximately a week of data when sampling continuously. The DC1700 stores these readings every minute when sampling. The data stored in memory is the same as the data displayed on the DC1700 and represents the average of the particle concentration over the previous minute. This amounts to about 10,000 individual readings. When the memory becomes full the DC1700 simply overwrites the oldest samples so that the most current data samples are always retained. The internal memory is cleared at the same time as the minute, hour, and day histories by using the clear history mode. The internal memory can only be accessed by using the PC interface. When the user downloads the internal memory to the PC the data will be time stamped to allow graphs to be created showing the particle concentration versus time. See the PC Interface section for more details.

PC Interface

Connecting the DC1700

The DC1700 is equipped with a 9 pin which allows communication with a PC. This interface provides two basic capabilities – to download the DC1700's internal memory or to log data live as it is being taken by the DC1700. If you have an older PC which is equipped with a COM port then you can connect the DC1700 directly to the PC using a 9 pin serial extension cable. **Customers must supply their own cable.** If your PC does not have a COM port then you must connect using a USB to COM port adapter cable. **Customers must supply their own cable. You must install the drivers that came with your adapter cable.**   This driver will either be on the CD which came with the cable or must be downloaded off the cable manufacturer's web site. If the downloaded driver is in a zip file then extract those files to a working folder before installing. **This driver will create a virtual COM port on your PC which is the COM Port you must select when communicating with the DC1700.** After the driver for the cable has been installed on your PC then plug the cable into any available USB port and connect the other end to the DC1700.

Using terminal software

To transfer data over the COM port connection you must use terminal software. On XP or earlier computers HyperTerminal comes with the operating system. On Vista or later computers another terminal program such as Putty must be used. The setup parameters for any terminal program are as follows:

> 9600 baud
> 8 bits
> no parity
> 1 stop bit
> no flow control

You must connect the cable between the DC1700 and the PC. Then start the terminal program.

On Windows XP, first open HyperTerminal by going to START->All Programs-> Accessories->Communications-> HyperTerminal. When you open HyperTerminal you will be prompted to name a new connection. Name the new connection, for example "DC1700 terminal" and click OK. Next a menu screen "Connect To" will appear. Select your COM port using the "connect using" menu and click OK. Next you will have the Port Settings menu. Setup the COM port for 9600 baud, 8 bits, no parity, one stop, and no flow control. Click Ok. At this point you should be connected to the DC1700. If the DC1700 is on and sampling then the counts should be output every minute and appear in the HyperTerminal window. If you desire to save this information to a file then you set up HyperTerminal to capture the incoming text. To do this select Transfer->Capture Text from within HyperTerminal and you will be prompted to name a file. Name your file and click START. All incoming data from the DC1700 will be captured and logged to this file. To stop logging data select Transfer->Capture Text-> Stop.

Once HyperTerminal has been setup and you have named your new connection you do not have to repeat the setup again. Just open your named connection. Also, when using HyperTerminal be aware that the connection to the DC1700 can be disconnected and reconnected. You can check to make sure you are connected by clicking the Call menu – if Disconnect appears as an option then you are connected. If Call appears as an option then you need to click Call to reconnect.

If you are using Windows Vista then you must do a little extra work as Microsoft decided to no longer ship HyperTerminal as part of Windows. You can still download HyperTerminal from www.hilgraeve.com but there may be a charge for doing this.

Another alternative is to use Putty. This can be downloaded for free from a number of sites including here: http://www.chiark.greenend.org.uk/~sgtatham/putty/download.html

With Putty the setup parameters are the same as HyperTerminal. First, open and run Putty. On the left hand side of the Putty Configuration screen the setup categories are displayed. Click on "Serial" and set the parameters to the values given above. Be sure you have selected the correct COM Port at this point. Then click the "Session" category on the left hand of the screen and then select the 'Serial' radio button on the right hand side of the screen. The correct COM Port and baud rate should appear. To select a file to capture data to click on the "Logging" category on the left hand side of the screen. Then select the "All session output" and "Always append to the end of it" buttons. Then click "Browse" button and select the file name and location of the file you want data logged to. Then, if you want to save these settings to so that they can be reloaded later, click the "Session" category on the left hand side of the screen and enter a name for the session, such as, Dylos DC1700, and then click "Save". You can now recall this setup for future sessions. Click Open and the Putty terminal will open - it works similar to HyperTerminal.

The serial output format is small counts, comma, large counts, carriage return, line feed:

Example:

      675,19<CR><LF>

This data is output every minute and the counts represent the average concentration over the past minute. The units are – counts/100 per cubic foot. In the above example, the output of 675 would mean the average concentration over the past minute was 67,500 particles per cubic foot.

Now, from either HyperTerminal, Putty, or any other terminal program you can download the internal memory by typing a capital "D" followed by ENTER. Note, the letter D will not be echoed back to the terminal screen, but it will be transmitted to the DC1700. Once the user has done this, the DC1700 will output the stored data memory to the terminal screen with the

oldest samples shown first and the newest samples last. The
following is a sample output.

04/30/10 10:44,1783,137
04/30/10 10:45,1857,122
04/30/10 10:46,1917,140
04/30/10 10:47,1919,136
…
…
04/30/10 18:22,7677,4127
04/30/10 18:23,7696,4131
04/30/10 18:24,7722,4124

The data is time stamped with the date followed by the hour (24hr
time) and minute. The following is a graph of the data created
after loading the saved file from Putty into Excel (specify comma
delimited). Select all the data cells and then create an XY scatter
plot.
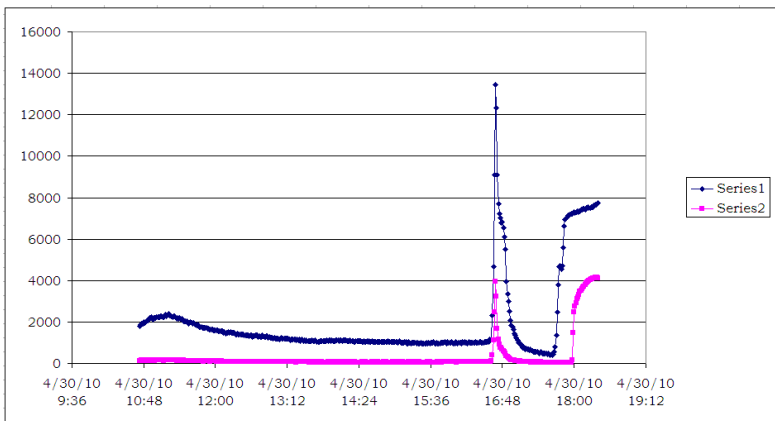
The above graph took 1 minute to create, but once the data is in
Excel there are many ways to analyze and display the data.

Battery Operation

The DC1700 has an internal 7.2V NiMH battery which will provide up to 6 hours of operation without connection to the AC power.

To charge the DC1700 battery, first turn off the DC1700 and unplug the wall adapter from the DC1700. Plug the wall adapter back into the DC1700 without turning on the DC1700 and this will start the DC1700 charging. Depending on the state of discharge of the battery it may take 12 hours or more to fully charge. When the DC1700 has fully charged it will display the message "charge complete." Just because charge complete is not displayed, though, does not mean the DC1700 cannot be used on battery. You can check the approximate charge at any time by simply turning on the DC1700 while it is unplugged from the wall adapter. As described previously in the continuous mode section, the battery charge state will be displayed briefly. These charge bars are only approximate and do not precisely tell the user how much charge is left.

The user can prolong battery life by turning the DC1700 off when not actually sampling. The 6 hour battery life is for continuous operation. If the DC1700 is used intermittently and turned off between use the battery life will be greatly extended.

Interpreting the data

The DC1700 displays the concentration of particles in the air. As stated in the overview section, the numbers represent particles in .01 cubic foot of air. Thus, if the unit displays 676 on the left and 17 on the right there are approximately 67,600 particles 0.5 micron or greater per cubic foot of air and, likewise, 1700 particles greater than 2.5 microns per cubic foot of air. (Note: if you purchased a model with a different calibration there will be a note placed in this manual giving you your particle sizes) As discussed in the Health Disclaimer we cannot say that any concentration of particles in the air is necessarily unhealthy or healthy – please contact your physician for any health related questions. The numbers will tell you how clean your air is in the measured size ranges and allow you to know if your filters or purifiers are working efficiently to remove particles. Dylos has developed a guide to rating your air relative to other residential or office environments. This chart appears also on the rear of the DC1700.

Air Quality Chart .5um - Small Count Reading

```
3000 +     = VERY POOR
1050-3000 = POOR
300-1050  = FAIR
150-300   = GOOD
75-150    = VERY GOOD
0-75      = EXCELLENT
```

The numbers above are for the standard unit only. The "Pro" model and custom calibrations will vary.

It is our experience that most residences or offices can reach the VERY GOOD to EXCELLENT range. Even with good filters or air purifiers, however, the air quality can be degraded by many factors including drafts, human activity, machines, dirty carpets, etc. The Dylos DC1700 is the tool that allows you take control of your air quality and to know what works and what doesn't work to improve it.

Care and Maintenance

The DC1700 is essentially maintenance free. The unit may, however, require occasional cleaning if used in a dusty environment. In this case, cleaning once a month should be sufficient. Cleaning is simple - use compressed air, such as from any of the available "canned air" products, to blow into the openings in the top rear of the DC1700. It is best to perform this operation while the unit is turned on so that the fan is running and will draw out any dust blown free. Do not insert the "straw" of the duster or anything else into these openings. A few seconds should be sufficient to dislodge any dust clogging the inside. Do not attempt to open the unit as this voids the warranty and may result in exposure to laser radiation. When the DC1700 is not in use it is best to store or cover it such that it will not accumulate dust or dirt.

Troubleshooting Guide

The unit must be turned on by pressing the ON/OFF button prior to operation.

If the display does not come on after connecting the AC adaptor and pressing the ON/OFF button then contact us for support.

If the unit fails to start sampling or the MODE, SELECT, or ON/OFF buttons fail to operate as described in this manual then contact us for support.

If unit fails to count – that is the display consistently reads zero for both small and large particles then contact us for support.

If counts seem excessively high in a particular location, but in a nearby location in the same room the counts are much less then there could be an interference problem. Certain kinds of fluorescent lighting can cause high counts if located within 1-2 feet of the DC1700. To be safe move the DC1700 several feet away from any device you suspect might be causing interference.

You can obtain support for this product via our web site by emailing support@dylosproducts.com.

Notices

FCC

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

FDA

This device is a CLASS 1 Laser product and complies with 21 CFR 1040.10 and 1040.11.

The following label appears on the rear of the device:

Manufactured: August 2011
DYLOS CORPORATION
2900 Adams Street, C37 Riverside, CA
CLASS 1 LASER PRODUCT
COMPLIES WITH 21 CFR 1040.10 AND 1040.11
WARNING DO NOT ATTEMPT TO OPEN
DANGER – Laser Radiation When Open
AVOID DIREC EYE EXPOSURE

US Patent 8009290
Foreign Patent Pending

Warranty

Ninety (90) Days Limited Warranty

Dylos Corporation warrants this product shall be free of defects in material or workmanship for a period of 90 days following the date of purchase. If the product found to be defective, Dylos Corporation will, at its option, repair or exchange the defective product or any component of the product with a new or remanufactured product at no charge. The replacement product is covered only for the original product. When the warranty on the original product expires, the warranty on all replaced products also expires. Note: If the product is no longer available, Dylos Corporation will replace with the most similar product in its current inventory.

Proof of purchase is required to obtain warranty service. You must have proof of the date of purchase in the form of a sales receipt or other document showing the product and the date that you purchased it and the authorized retailer.

When it is necessary for you to ship the product to Dylos Corporation for repair or exchange, you will pay the cost of shipping to Dylos Corporation. Dylos Corporation will pay the shipping costs when returning the product to you.

All warranty requirements must be met to obtain warranty service.

This warranty does not cover normal wear of parts or damage resulting from any of the following: improper installation, connection to an improper voltage supply, abuse, neglect, misuse, accident, disassembly, unauthorized repair, shipping or any other cause not within the control of Dylos Corporation.

REPLACEMENT AS PROVIDED UNDER THIS WARRANTY IS THE EXCLUSIVE REMEDY FOR THE CONSUMER. DYLOS CORPORATION SHALL NOT BE LIABLE FOR ANY

INCIDENTAL OR CONSEQUENTIAL DAMAGES FOR BREACH OF ANY EXPRESS OR IMPLIED WARRANTY ON THIS PRODUCT. EXCEPT TO THE EXTENT PROHIBITED BY APPLICABLE LAW, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ON THIS PRODUCT IS LIMITED IN DURATION TO THE DURATION OF THIS WARRANTY.

**Some states do not allow the exclusion or limitation of incidental or consequential damages, or limitations on how long an implied warranty lasts, so the above limitations or exclusions may not apply to you.

TO OBTAIN WARRANTY SERVICE

Email Dylos Corporation at support@dylosproducts.com stating the nature of the problem. Dylos Corporation will either respond with a solution or grant an RMA number (Return Merchandise Authorization). You may return the product via prepaid shipping along with your proof of purchase and RMA number to:

> Dylos Corporation
> 2900 Adams St #C37
> Riverside, CA 92504