

Series of CEMS Guidelines

Volume II:

**GUIDELINE FOR THE
CONTINUOUS EMISSION
MONITORING SYSTEMS – DATA
INTERFACE SYSTEM (CEMS-DIS)**

FOR

**INDUSTRIAL PREMISES /
FACILITIES**



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Introduction

1.1 Background

This document represents

Volume II: GUIDELINE FOR THE CONTINUOUS EMISSION MONITORING SYSTEMS – DATA INTERFACE SYSTEM (CEMS-DIS) FOR INDUSTRIAL PREMISES / FACILITIES

This guideline should be read in conjunction with:

Volume I: GUIDELINE FOR THE INSTALLATION AND MAINTENANCE OF CONTINUOUS EMISSION MONITORING SYSTEMS (CEMS) FOR INDUSTRIAL PREMISES / FACILITIES
and
ENVIRONMENTAL QUALITY (CLEAN AIR) REGULATIONS 1978

This document provides guidelines for CEMS data interfacing between State DOE and industrial premises / facilities.

The guidelines will assist plant operators in developing and implementing CEMS-Data Interface System (CEMS-DIS) with standard data format accessible by DOE state offices for the purpose of data transfer and monitoring.

1.2 Objectives

The main objective of this document is to provide general guidelines for the implementation of CEMS-DIS which cover the following aspects:

- a) Specifications of computer hardware and software for CEMS-DIS implementation
- b) Specifications of communication hardware and software for CEMS-DIS implementation;
- c) Data loading requirements and procedures;
- d) Communication requirement and procedure;
- e) Specifications of file and record format; and
- f) CEMS-DIS installation, configuration and setup.

1.3 Assumptions

- a) The industrial premise / facility has already installed CEMS in compliance with:

Volume I: GUIDELINE FOR THE INSTALLATION AND MAINTENANCE OF CONTINUOUS EMISSION MONITORING SYSTEMS (CEMS) FOR INDUSTRIAL PREMISES / FACILITIES

and

ENVIRONMENTAL QUALITY (CLEAN AIR) REGULATIONS 1978

and

has fully understood the requirements of the above mentioned guidelines;

- b) Emission data recorded and/or analyzed at industrial premises should be at the interval of thirty (30) minutes for gases, one (1) minutes for opacity (smoke) or as required by DOE.

- c) Industrial operators must inform DOE of any incidence may lead to incorrect or missing data, in accordance to and in conformance to data error coding as specified in this document.
- d) Industrial premises must be pre-registered with DOE and listed in DOE CEMS registry database and should provide the following information:
 - i. Name of Industrial premises
 - ii. Address of Industrial premises
 - iii. Plant operators (organizational chart)
 - iv. Power generation capacity
 - v. Permit number and limits
 - vi. Process Description – source specific information
 - vii. Process activity – the type & quantity of fuel burned (load factor)
 - viii. Installed Control devices
 - ix. Exhaust Stack / Vent ID
 - x. Operation Time
 - xi. CEMS type and location
 - xii. CEMS analyzer types.
 - xiii. List of parameters monitored
 - xiv. Dedicated broadband IP address and/or dedicated phone number, which connected to the CEMS-DIS computer

1.4 Scope of This Guideline

This guideline covers the following scope:

- a) Specifications of computer hardware and software for CEMS-DIS implementation
- b) Specifications of communication hardware and software for CEMS-DIS implementation;
- c) Data loading requirements and procedures;
- d) Communication requirement and procedure;
- e) Specifications of file and record format; and
- f) CEMS-DIS installation, configuration and setup.
- g) CEMS-DIS operational hours.

1.5 CEMS: Overall System Description

- a) The general components of CEMS and its relationship to DOE's remote CEMS monitoring system are as illustrated by **Figure 1.1**.
- b) The whole system can be divided into 4 main components:
 - i. Industrial premises's CEMS equipments sensors, probes, data loggers, and data acquisition system (DAS).
 - ii. An intermediary component called CEMS Data Interfacing System (CEMS-DIS) to store data from DAS and communicate with State DOE server for CEMS data transferring purposes.
 - iii. State DOE's remote monitoring and enforcement system which is a web-based application system capable of receiving and processing data from CEMS-DIS and displaying individual factory CEMS data.
 - iv. Federal DOE's remote monitoring and enforcement system which is capable of extracting certain summarised data and generating reports from State DOE's system.
- c) This document provides guidelines to the setting up of CEMS-DIS and the required infrastructures (component ii. above).

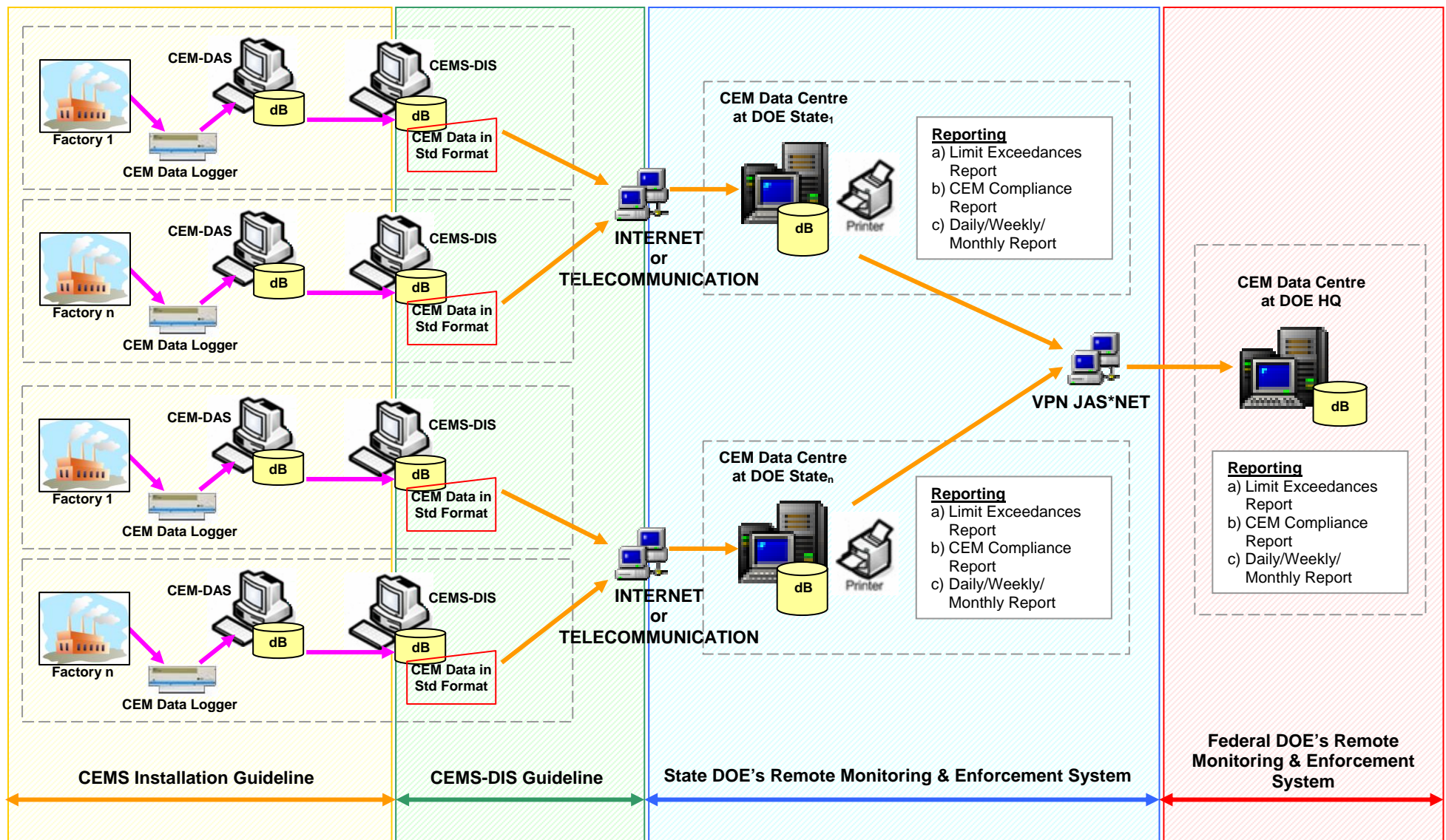


Figure 1.1: General components of CEMS and its relationship to DOE's Remote Monitoring & Enforcement System

How to use this Guideline

2.1 How to use this Guideline

The guideline should be referred together with:

Volume I: GUIDELINE FOR THE INSTALLATION AND MAINTENANCE OF CONTINUOUS EMISSION MONITORING SYSTEMS (CEMS) FOR INDUSTRIAL PREMISES / FACILITIES and ENVIRONMENTAL QUALITY (CLEAN AIR) REGULATIONS 1978

2.2 The Intended Audience

This document, **Volume II: Guideline for the Continuous Emission Monitoring Systems – Data Interface System (CEMS-DIS) For Industrial Premises/Facilities**, is a set of guidelines for the industrial operators to set up and establish CEMS-DIS, communication between industrial premises/facilities and State DOE, and data uploading procedures.

2.3 Definitions

Broadband: A high data-transmission rate internet connection

Continuous Emission Monitoring System (CEMS): The total equipment required to sample, condition, analyze and provide a permanent computer record of pollutant concentration. This includes the equipment necessary to perform the required routine calibration and audits.

CEMS-DIS: CEMS Data Interfacing System is a system which consist:-

- i. A mini-database (minimum recommendation: MySQL) to temporarily store CEMS data acquired by DAS
- ii. A communication software, which is customized / developed specifically to establish a safe and stable communication for Industrial Premises / Facilities to send CEMS data to State DOE.

Data Acquisition System (DAS): The electronic component of the CEMS designed to interpret and convert individual output signals from pollutant concentration monitors, flow monitors, diluent gas monitors and other components of the monitoring system to produce a permanent continuous record of the measurement and desired parameters.

Dial-up: A form of networking technology that provides one host (PC) to access or communicate to another host (PC) through modem to modem via standard telephone line or GSM.

DOE: Department of Environment or Jabatan Alam Sekitar

Federal DOE Remote CEMS Monitoring and Enforcement System: a web based application system complete with a CEMS database (of selected content) which retrieves data from State CEMS database and generate online summary of nationwide CEMS reports.

GSM: The Global System for Mobile Communications, GSM (original acronym: Groupe Spécial Mobile) is the most popular standard for mobile phones in the world

Lease line: A dedicated Common carrier circuit providing point-to-point or multipoint network connection, reserved for the permanent and private use of a customer

Modem: A device that modulates an analogue carrier signal to encode digital information, and also demodulates such a carrier signal to decode the transmitted information.

MySQL: A multithreaded, multi-user, open source SQL Database Management System (DBMS)

PC: Personal computer

State DOE Remote CEMS Monitoring and Enforcement System: a web based application system complete with a CEMS database within the state which retrieves data from industrial premises's CEMS-DIS and generates online state CEMS reports.

3.1 Introduction – General System Overview

- a) State DOE Remote CEMS application contains the following set of hardware and software applications:
 - i. a server equipped with communication hardware (i.e., network infrastructure and a modem to enable fixed line data transfer)
 - ii. a set of relational database (MS SQL Server),
 - iii. a communication application, and
 - iv. a web-based Remote CEMS application (for DOE use only).

Note: The details of State DOE Remote CEMS will not be described in this guideline.

- b) DOE requires all relevant premises/facilities **to send** their CEMS data via electronic data transfer to the respective state DOE server.
- c) At the individual premise/facilities site, the operators should prepare and/or develop the Data Interfacing System (DIS) which contains the followings:
 - i. a relational database (minimum requirement - MySQL) to store the CEMS data or else known as CEMS-DIS database
 - ii. a communication application to receive and process telecommunication signal from DOE server, extract data from CEM-DIS database, prepare data file in accordance to specified format, and send data electronically to DOE server

Note: Please refer to **Figure 3.1** for CEMS-DIS Components, **Figure 3.2** for general flow diagram, and **Section 3.3.6** for detail description.

- d) To avoid communication bottleneck, the sequencing and initiation of communication between State DOE server and the premises's DIS will be controlled by the State DOE's communication application.

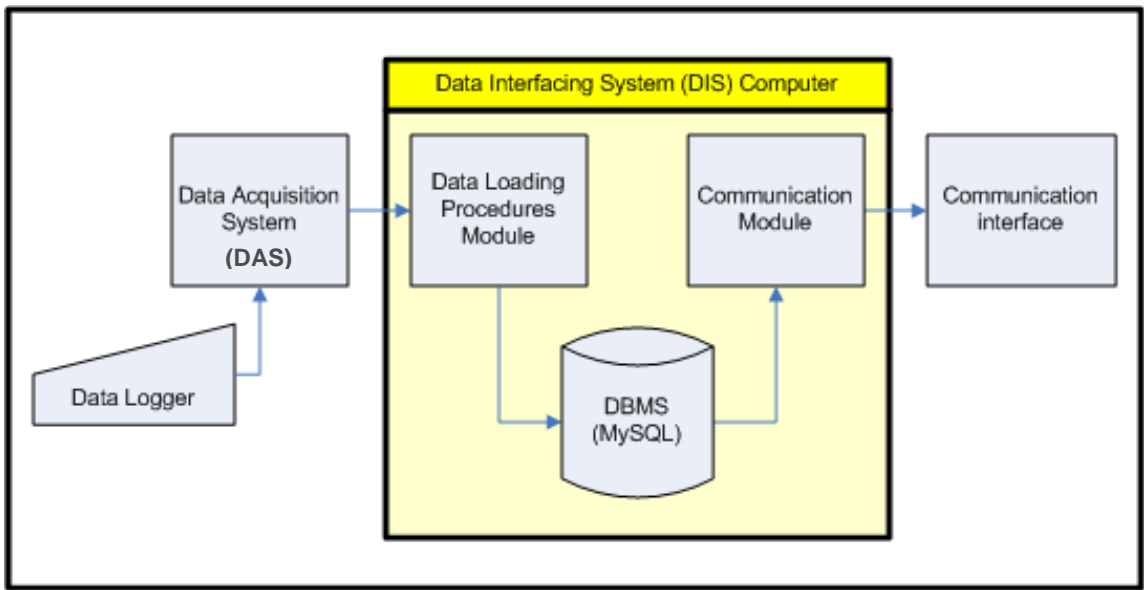


Figure 3.1: CEMS-Data Interfacing System (DIS) Components

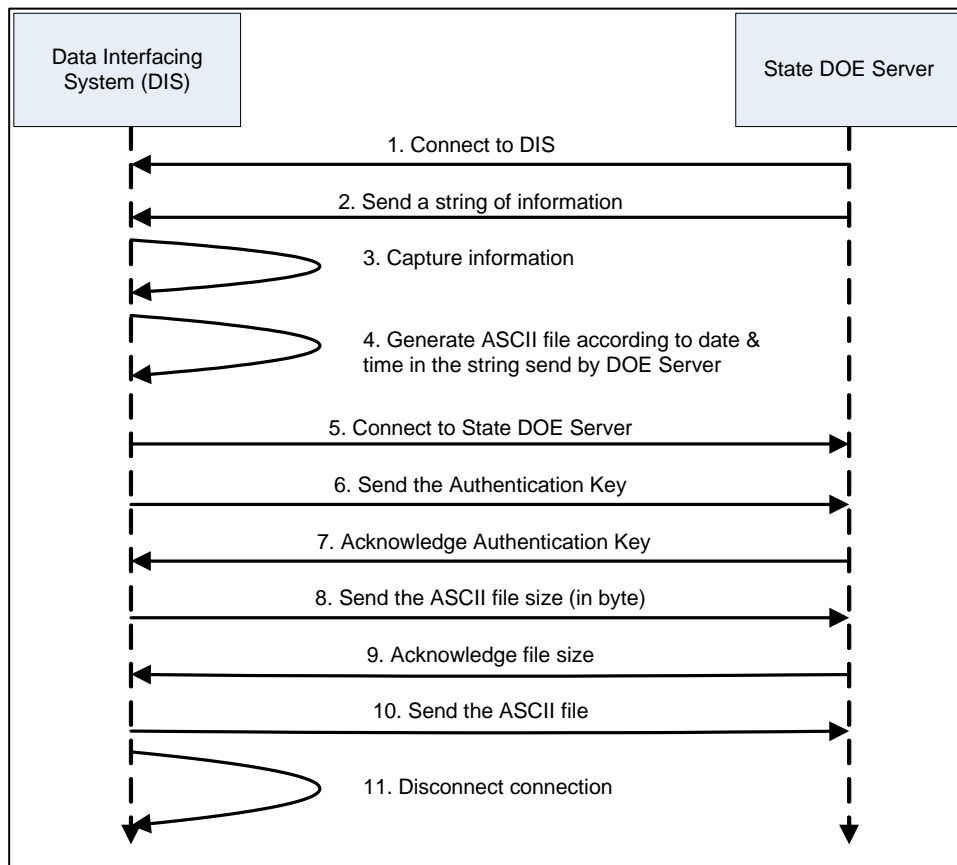


Figure 3.2: General flow diagram

3.2 Content of this section

This section provides detail specifications for the setting up of CEMS-DIS by industry / facility operator.

- a) This section will also provide details on the followings:
 - i. Computer Hardware Requirements
 - ii. Computer Software Requirements
 - iii. Communication Hardware Specifications
 - iv. Communication Software Specifications
 - v. Recommendation Software for Data Loading from DAS to DIS
 - vi. CEMS-DIS Data Format Structure
 - vii. Extracted Data File Format
 - viii. CEMS-DIS Installation Guide
- b) This document is arranged according to:
 - i. Industrial premises with CEMS and Existing PC-based DAS, and
 - ii. Industrial premises with CEMS but without DAS
- c) For premises without CEMS, please refer to Volume 1 for full guidance on installation of CEMS and DAS. This document will then provide guidelines for the setting up of DIS, internet communication, and data loading procedures.

3.3 For User with CEMS and Existing PC-based Data Acquisition System (DAS)

3.3.1 Hardware Requirements

The hardware requirements for DIS are;

- a) A server or PC with technical specifications as described in **Section 3.3.2**.
- b) Internet communication hardware to link to State DOE's server as described in **Section 3.3.3**.

3.3.2 DIS Server or PC Requirement

A PC with minimum specifications as below:

- Intel Pentium IV or better
- 512 MB DDR RAM
- 80 GB Hard disk
- Network Card
- UPS (recommended)

Note

- The above specifications are the basic minimum requirements for the installation and setup of DIS.
- DIS PC **must** be **OPERATIONAL** 24 hours daily.

3.3.3 DIS Communication Hardware Requirement

DOE State server must be given access to DIS PC **at any time**. There are 2 methods the DOE State server can access DIS:-

- a) via internet connection
- b) via modem to modem connection.

3.3.3.1 DIS Communication via Internet connection

a) For industrial premises with ready internet connection

- i. Industry premise/facility with 24 hours daily internet connection could use their existing internet connection.
- ii. Assign a fixed IP for DIS usage and register this IP address with DOE.

b) For industrial premises without ready internet connection

Industry premise/facility without internet connection and want to use method **(a)** at **section 3.3.3.1** could use the following internet connection suggested below;

Lease line or broadband

Industrial premises may subscribe to lease line or broadband for internet connection. Detail specifications of the required hardware are dependent on the package provided by the vendor and its availability.

3.3.3.2 DIS Communication via Modem to Modem connection

a) Dial up via Fixed telephone line

Hardware requirements;

- i. 56k Modem
- ii. A single dedicated fixed telephone line

Note

- Make sure the modem's driver is installed using the driver provided by the modem manufacturer, **NOT** from Microsoft Windows Driver Lists.
- A dedicated fixed telephone line is necessary to avoid interruption on DIS operation.

The modem is to be installed on DIS PC.

It is recommended to use external modem with power surge, power spikes, and lightning arrestor.

Ensure that a single dedicated fixed phone line is allocated for DIS use.

b) Dial up via GSM modem

Hardware requirements;

- i. GSM Modem
- ii. A single dedicated mobile phone line

The GSM modem and its application are to be installed on DIS. Ensure that the mobile phone line signal is strong to provide good and stable connection.

Ensure that the single dedicated mobile phone line is for DIS use only.

3.3.4 Software Requirements

Recommended Operating System: Windows 2000 or Windows XP or later (Operating System must support open sources database).

Recommended Database Management System (DBMS): MySQL version 4.0.23 or later (must support MySQL version 4.0.23 component library).

Recommended Software for Data Loading from DAS to DIS: To extract all required monitored CEMS data from DAS system and store it in DIS database according to standard format as specify in **Table 3.1**.

Recommended Software for Communication: To receive all required parameters for data extraction (to be sent to State DOE).

3.3.5 Communication Hardware Specifications

Please refer to **Section 4** for detail communication specifications.

3.3.6 Communication Software Specifications

All communication software **MUST** be developed based on procedure **provided** in this guideline. There are **two (2)** communication procedures provided in this guideline, which are:

- i. Communication procedure via internet connection
- ii. Communication procedure via modem to modem connection

3.3.6.1 Communication procedure via internet connection

Communication between DIS at industrial premises / facilities and State DOE server can **only** be established **IF** the State DOE server initiates the communication process. To initiate the process, the State DOE server will send the following parameters to DIS which are:

- i. **Authentication Code** for verification purpose
- ii. **Last Monitoring Data Date and Time of Each Parameter at Each Monitoring Stack** for data extraction purpose

The workflow for communication procedure via internet is illustrated in **Figure 3.3**.

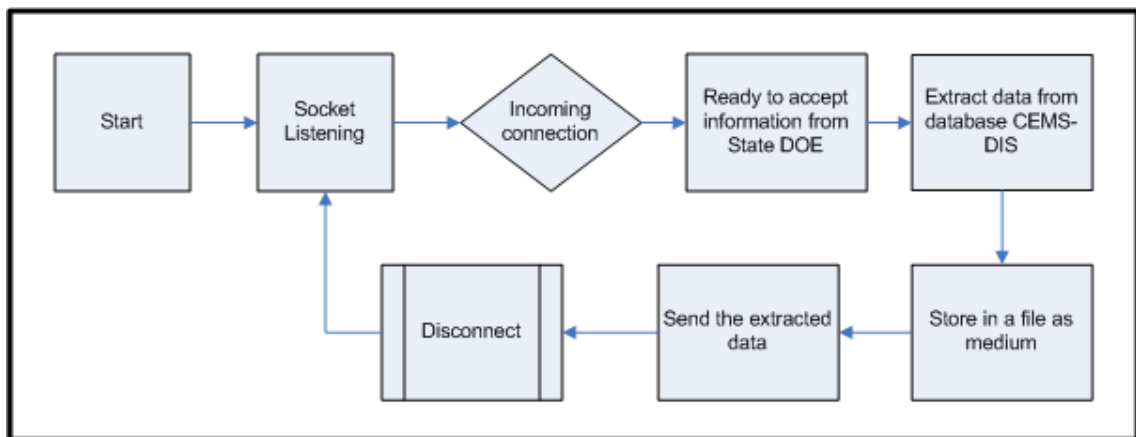


Figure 3.3: Workflow for Communication Procedure via Internet

- a) The workflow starts with **Listening** mode by detecting any connection attempt on registered port number.
- b) On incoming connection, **accept all information** sent by State DOE server.
- c) **Extract data** from CEM-DIS database based on information received from State DOE server.
- d) **Store all extracted** data into one file as a medium for data transferring to State DOE server.
- e) **Send file size** to State DOE server and wait for “**Size Received**” message from State DOE server before start sending the file.
- f) After finish sending the file to the State DOE server, **terminate all connection** with State DOE server and **back to Listening** mode to detect next connection attempt.

3.3.6.2 Communication procedure via Generic Modem to Modem connection

An application for communication via modem to modem connection **must** be able to perform the following functions:

- i. Able to accept call and establish connection from State DOE server.
- ii. Able to accept all parameters sent by State DOE server.
- iii. Able to extract all required data from DIS database
- iv. Able to make call and connection to State DOE server using connection parameters in **step (ii)**
- v. Able to terminate all call and connection to State DOE server.

Workflow diagram for communication procedure via modem to modem connection user can be summarized in **Figure 3.4**.

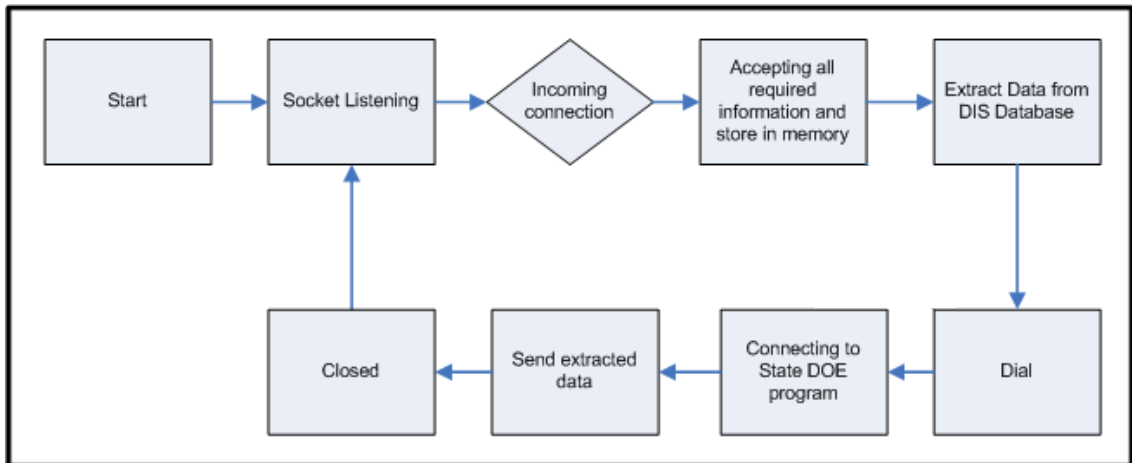


Figure 3.4: Workflow for Communication Procedure via Modem to Modem Connection

- a) The workflow starts with the **Socket Listening** mode to detect incoming connection from State DOE server.
- b) Should there be an incoming connection from State DOE server, **accept the connection** and start **receiving all information** required next process. The information to be received from State DOE server includes:
 - i. **Premise ID** for State DOE server verification purpose
 - ii. **User Name** for logging on to State DOE server
 - iii. **Password** for logging on to State DOE server
 - iv. **Phone Number** for dialing to State DOE server
 - v. **Internet Protocol (IP) Address** for DIS to communicate with State DOE server
 - vi. **Port Number** for DIS to communicate with State DOE server
 - vii. **Time Allowance** for DIS to communicate with State DOE server. DIS is given certain time period to process, prepare data, re-connect (send data) to DOE server. This time period starts immediately after State DOE server has successfully send the required information to DIS.
 - viii. **Authentication Code** for State DOE server verification purpose.
 - ix. **Information (StackID#Date#Time)** for DIS to query required CEMS data.
 - x. **Information (StackID#DateFrom#TimeFrom)** for DIS to query industrial premises explanation / report on **NOT VALID (NV)** CEMS data.

Format of Telecommunication Signal received from State DOE server

DIS application requires socket programming to enable discerning of streamed data packet from State DOE Server based on string format shown below:

Authentication Code | Premise ID | Time Allowance | CEMS Parameter | Phone Number | User Name | Password | IP | Port | StackID#Date#Time, StackID#Date#Time, StackID#Date#Time, ... | StackID#DateFrom#TimeFrom, StackID#DateFrom#TimeFrom, StackID#DateFrom#TimeFrom, ...

(Refer **Figure 3.5**)

```
AbCdEfGhIj | 0207K175890 | 5 | so2;no2;co;co2;hcl;hf;h2o;o2;total
c;total pm;opacity | 0312345678 | Modem Username | Modem Password |
10.10.10.1 | 8808 | 11#23-09-2007#23:00:00, 12#23-09-2007#23:00:00,
13#23-09-2007#23:00:00 | 11#23-09-2007#23:00:00, 12#23-09-
2007#23:00:00, 13#23-09-2007#23:00:00
```

Figure 3.5: Sample of the Format of information received from State DOE server
Description on information received from State DOE server

- i. Each information received is separated by “|” character.
 - ii. Each set of StackID, Date and Time is separated by “,” character.
 - iii. StackID, Date and Time are separated using “#” character.
 - iv. Date format is DD-MM-YYYY.
 - v. Time format HH:MM:SS in 24 hour format.
 - vi. Time Allowance is in minute.
 - vii. Standard CEMS parameter sequence.
 - viii. 1 set of StackID, Date and Time represent the last date and time of CEMS monitoring data inserted to the State DOE database for the stack identified as StackID . Based on sample given above, there are 3 stacks being monitored.
 - ix. 1 set of StackID, Date and Time represent the last date and time of CEMS data error reporting inserted to the State DOE database for the stack identified as StackID . Based on sample given above, there are 3 stacks being monitored.
- c) **Extract data** from CEM-DIS database based on information received from State DOE server.
 - d) **Store all extracted** data into one file as a medium for data transferring to State DOE server (Refer to **Figure 3.7 – Figure 3.13** as example).
 - e) Make a **call to State DOE server modem** by using information sent by State DOE as in **step (b)**.
 - f) After the modem to modem connection established, communication software **must** connect to **State DOE application** using information sent by State DOE server as in **step (b)**.
 - g) Communication software **must** send **authentication code** to State DOE application for verification process. When the connection is verified, an **“Authentication Verified”** message **will** appear to notify successful connection verification and file sending process **can** be started.

An **“Authentication Failed”** message **will** appear in case of failed verification process and DIS **MUST** terminate connection to State DOE server immediately and back to **socket listening** mode again.
 - h) Send **size of the extracted data file** in **BYTE** unit as a **string**. After the “Size Received” message received, **send the extracted data file** in **BYTE** unit to State DOE server. **Example** : “1024”
 - i) After finish sending all extracted data file, **terminate all connection** to State DOE server and back to **socket listening** mode.

3.3.7 Recommended Procedure for Data Loading from DAS to DIS

- a) Data uploading from DAS to DIS is within the responsibility of plant operators.

- b) Data uploading from DAS to DIS may be done by
 - i. Manual key-in
 - ii. Automated loading through specific application
- c) Manual key-in can be tedious, time consuming, and therefore is not recommended and not practical due to the volume of data involved.
- d) Special software can be developed for automatic loading from DAS to DIS computer. This application program can be developed by your CEMS vendor or an experienced environmental IT company.
- e) The software for automatic loading from DAS to DIS computer **MUST** be developed based on procedure as summarized in **Figure 3.6**.

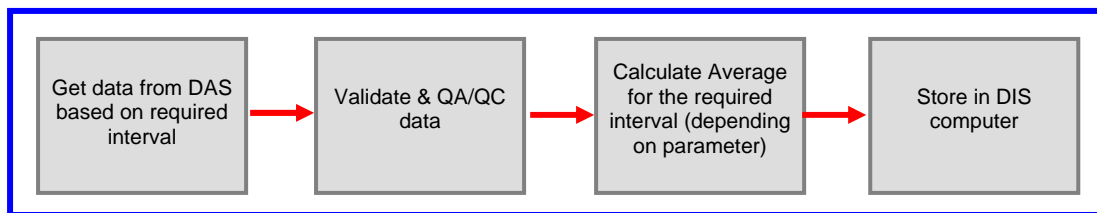


Figure 3.6: Recommended data loading procedure

- f) DIS should store averaged data for some specified interval depending on parameter as specified by the **DOE requirement**. **Figure 3.6** emphasizes the following steps of procedure:

Example: procedures for parameter with 30 minutes data averaging requirement.

- i. For every 30 minutes, grab all the last 30 minutes of CEMS data from DAS.
- ii. Check for CEMS data validity, please refer to **Section 5** on how to code the data.
- iii. Calculate the average of the 30 minutes CEMS data. The CEMS data which has been coded **must** be excluded in the average calculation.
- iv. Store the average of the last 30 minutes CEMS data in DIS database.

Note

- Monitored data must be made available in accordance to DOE requirements and specification (Refer to **Guideline Volume 1**).
- Data must be uploaded from DAS to DIS according to the following conditions:-
 - All parameters, except Opacity, must be averaged to 30 minute interval. Readings for Opacity is by every minute.
 - The 30 minute average reading must be based on the least 22 readings (75%) within the specified 30 minute period. Else the average value is rendered as invalid.

3.3.8 CEMS-DIS Data Format and Data Structure

The industrial premises **MUST FOLLOW** the following requirements:

- a) All stacks monitoring data in CEMS-DIS **MUST** be stored in MySQL database format with the following specifications:

- i. Database software: **MySQL version 4.0.23 or later (must support MySQL version 4.0.23 component library)**
 - ii. Database name: **dis_reading**
 - iii. No. of table: **2**
 - iv. Name of table: **reading** and **error_rpt**
 - v. Field definitions for table **reading** please refer to **Table 3.1**
 - vi. Field definitions for table **error_rpt** please refer to **Table 3.2**
- b) It is recommended that industrial premises keep the monitoring data in the CEMS-DIS database for at least five (5) year as part of data archiving.

Table 3.1: Definitions of 16 Fields in reading table

No	Field Name	Data Type	Field Description
1	reading_id	Double (9,0)	<ul style="list-style-type: none"> ▪ primary key ▪ value must unique and NULL value is NOT allowed
2	factory_id	Varchar	<ul style="list-style-type: none"> ▪ to be assigned by DOE
3	stack_id	Varchar	<ul style="list-style-type: none"> ▪ to be assigned by DOE
4	read_date	Date (YYYY-MM-DD)	<ul style="list-style-type: none"> ▪ date of stack monitoring data
5	read_time	Time (HH:MM:SS)	<ul style="list-style-type: none"> ▪ time of stack monitoring data ▪ 24 hour time format
6	so2	Double (5,2)	<ul style="list-style-type: none"> ▪ Sulphur dioxide (SO₂) ▪ Unit MUST in mg/m³
7	no2	Double (5,2)	<ul style="list-style-type: none"> ▪ Nitrogen oxides, expressed as nitrogen dioxide (NO₂) ▪ Unit MUST in mg/m³
8	co	Double (5,2)	<ul style="list-style-type: none"> ▪ Carbon Monoxide (CO) ▪ Unit MUST in mg/m³
9	co2	Double (5,2)	<ul style="list-style-type: none"> ▪ Carbon Dioxide (CO₂) ▪ Unit MUST in mg/m³
10	hcl	Double (5,2)	<ul style="list-style-type: none"> ▪ Hydrogen Chloride (HCl) ▪ Unit MUST in mg/m³
11	hf	Double (5,2)	<ul style="list-style-type: none"> ▪ Hydrogen Flouride (HF) ▪ Unit MUST in mg/m³
12	h2o	Double (5,2)	<ul style="list-style-type: none"> ▪ Water Vapour (H₂O) ▪ Unit MUST in mg/m³
13	o2	Double (5,2)	<ul style="list-style-type: none"> ▪ Oxygen (O₂) ▪ Unit MUST in %
14	nmvoc	Double (5,2)	<ul style="list-style-type: none"> ▪ NMVOC as total C ▪ Unit MUST in mg/m³
15	total_pm	Double (5,2)	<ul style="list-style-type: none"> ▪ Total PM ▪ Unit MUST in mg/m³
16	opacity	Double (5,2)	<ul style="list-style-type: none"> ▪ Opacity (Smoke) ▪ Unit MUST in %

Note:

- i. The above is applicable to ALL industrial premises, regardless of sector.
- ii. Only parameters that are required by DOE to be keyed-in by industrial premises (please refer to *Environmental Quality (Clean Air) Regulations 1978* for the required parameters by industrial sector)
- iii. Refer to **Section 5** for further details on error data codes.

Table 3.2: Definitions of **8 Fields** in **error_rpt** table

No	Field Name	Data Type	Field Description
1	error_rpt_id	Double (9,0)	<ul style="list-style-type: none"> ▪ primary key ▪ value must unique and NULL value is NOT allowed
2	factory_id	Varchar	<ul style="list-style-type: none"> ▪ to be assigned by DOE
3	stack_id	Varchar	<ul style="list-style-type: none"> ▪ to be assigned by DOE
4	date_from	Date (YYYY-MM-DD)	<ul style="list-style-type: none"> ▪ starting date of error occurring
5	time_from	Time (HH:MM:SS)	<ul style="list-style-type: none"> ▪ starting time of error occurring ▪ 24 hour time format
6	date_to	Date (YYYY-MM-DD)	<ul style="list-style-type: none"> ▪ ending date of error occurring
7	time_to	Time (HH:MM:SS)	<ul style="list-style-type: none"> ▪ ending time of error occurring ▪ 24 hour time format
8	report	Varchar	<ul style="list-style-type: none"> ▪ report / explanation on error event

Note:

- i. The **report** field must be filled with the simplest explanation on problems happen at the industrial premises that producing an error CEMS data.
- ii. **Suggested** report / explanation on error event :
 - CEMS in calibration
 - CEMS malfunction or down due to technical problem
 - CEMS start-up and shut-down
 - Soot blowing, clearing or maintenance
 - CEMS down due to power failure
 - Other reasons (Explanation **must** be less than 250 characters)
 - Unknown reasons
- c) A digital copy of CEMS-DIS database (dis_reading.sql) complete with all field definitions is available from DOE.

3.3.9 Extracted Data File Format

All data extracted from DIS-CEMS **must** store in a single file before the data can be sent to State DOE server using **communication software**. The file is only a medium for transferring data to the State DOE server, so the file can be deleted depending on industrial premises / facilities decision.

The extracted data file can be any name or use any file extension. However, the content of the file **must** consistent with the following standards:-

- a) Use **Header 1** format at the **first row of file**.
- b) Use **Header 2** format at second row and the following rows of the file.

Header 1 format

Authentication Key ; Date Extract Data (DD-MM-YYYY) ; Time Extract Data (HH:MM:SS)

Description

- The **Authentication Key** is provided by State DOE server when the State DOE server make a connection to CEMS-DIS computer. This authentication key is important and required for verification process at State DOE server.
- **Date Extract Data** is the last date of data extracted from the CEMS-DIS database. Date format is DD-MM-YYYY, example 23-09-2007
- **Time Extract Data** is the last time of data extracted from the CEMS-DIS database. Time format is HH:MM:SS, example 23:15:00. Time Extract Data using 24 hour format.
- All the information is separated by “;” character.

Header 2 format

Stack ID ; Date Data (DD-MM-YYYY) ; Time Data (23:00:00) | Parameters Value (P 1, P 2, P 3...)

Description

- **Stack ID** is an id given to each monitored stack.
- **Date Data** is the date of data extracted from the CEMS-DIS database. Date format is DD-MM-YYYY, example 23-09-2007
- **Time Data** is the time of data extracted from the CEMS-DIS database. Time format is HH:MM:SS, example 23:15:00. Time data using 24 hour format.
- **Stack ID, Date Data** and **Time Data** are separated by “;” character.
- **Parameters Value** is the last column contain all monitored parameters value and separated from **Time Data** column by “|” character.
- All parameters value are arranged into sequence and each parameters value are separated by “,” character. The sequence order is according to the parameters sequence in **Table 3.1** start from **field number 5 to field number 15**. Use code (-999) for parameters NOT required by DOE. (Refer **Figure 3.7**). Refer to **Section 5** for further details on other codes.

Note:

Examples of standard formatting for the respective sector are as shown below:

- Heat and Power Generation Sector – **Figure 3.7**
- Ferrous Metal Sector – **Figure 3.8**
- Non-ferrous Metal Sector – **Figure 3.9**
- Oil and Gas Industry Sector – **Figure 3.10**
- Non-Metallic Industry Sector – **Figure 3.11**
- Waste Incinerator Sector – **Figure 3.12**
- Palm Oil Mills Sector – **Figure 3.13**

```

sample_Heat&PowerGeneration.txt - Notepad
File Edit Format View Help
a1B2c3D4e5F;23-09-2007;22:15:00
1;22-09-2007;00:00:00|1.789,2.789,3.789,-997,,5.789,6.789,,7.789,
1;22-09-2007;00:30:00|1.789,2.789,3.789,4.789,,5.789,6.789,,7.789,
1;22-09-2007;01:00:00|1.789,2.789,3.789,4.789,,5.789,6.789,,7.789,
1;22-09-2007;01:30:00|1.789,2.789,3.789,4.789,,5.789,6.789,,7.789,
2;22-09-2007;00:00:00|1.789,2.789,3.789,4.789,,5.789,6.789,,7.789,
2;22-09-2007;00:30:00|1.789,2.789,3.789,4.789,,5.789,6.789,,7.789,
2;22-09-2007;01:00:00|1.789,2.789,-997,4.789,,5.789,6.789,,7.789,
2;22-09-2007;01:30:00|1.789,2.789,3.789,4.789,,5.789,6.789,,7.789,

```

Figure 3.7: Sample of Extracted Data File in Heat and Power Generation Sector

```

sample_FerrousMetal.txt - Notepad
File Edit Format View Help
a1B2c3D4e5F;23-09-2007;22:15:00
1;22-09-2007;00:00:00|1.789,2.789,,3.789,,4.789,-997,,6.789,
1;22-09-2007;00:30:00|1.789,2.789,,3.789,,4.789,5.789,,6.789,
1;22-09-2007;01:00:00|1.789,2.789,,3.789,,4.789,5.789,,6.789,
1;22-09-2007;01:30:00|1.789,2.789,,3.789,,4.789,5.789,,6.789,
2;22-09-2007;00:00:00|1.789,2.789,,3.789,,4.789,5.789,,6.789,
2;22-09-2007;00:30:00|1.789,2.789,,3.789,,4.789,5.789,,6.789,
2;22-09-2007;01:00:00|1.789,2.789,,3.789,,4.789,5.789,,6.789,
2;22-09-2007;01:30:00|-997,2.789,,3.789,,4.789,5.789,,6.789,

```

Figure 3.8: Sample of Extracted Data File in Ferrous Metal Sector

```

sample_NonFerrousMetal.txt - Notepad
File Edit Format View Help
a1B2c3D4e5F;23-09-2007;22:15:00
1;22-09-2007;00:00:00|1.789,2.789,,3.789,,4.789,-997,,6.789,
1;22-09-2007;00:30:00|1.789,2.789,,3.789,,4.789,5.789,,6.789,
1;22-09-2007;01:00:00|1.789,2.789,,3.789,,4.789,5.789,,6.789,
1;22-09-2007;01:30:00|1.789,2.789,,3.789,,4.789,5.789,,6.789,
2;22-09-2007;00:00:00|1.789,2.789,,3.789,,4.789,5.789,,6.789,
2;22-09-2007;00:30:00|1.789,2.789,,3.789,,4.789,5.789,,6.789,
2;22-09-2007;01:00:00|1.789,2.789,,3.789,,4.789,5.789,,6.789,
2;22-09-2007;01:30:00|-997,2.789,,3.789,,4.789,5.789,,6.789,

```

Figure 3.9: Sample of Extracted Data File in Non-ferrous Metal Sector

```

sample_Oil&Gas.txt - Notepad
File Edit Format View Help
a1B2c3D4e5F;23-09-2007;22:15:00
1;22-09-2007;00:00:00|1.789,,,2.789,,,3.789,4.789,,5.789,
1;22-09-2007;00:30:00|1.789,,,2.789,,,3.789,4.789,,997,
1;22-09-2007;01:00:00|1.789,,,2.789,,,3.789,4.789,,5.789,
1;22-09-2007;01:30:00|1.789,,,2.789,,,3.789,4.789,,5.789,
2;22-09-2007;00:00:00|1.789,,,2.789,,,3.789,4.789,,5.789,
2;22-09-2007;00:30:00|1.789,,,2.789,,,3.789,4.789,,5.789,
2;22-09-2007;01:00:00|1.789,,,2.789,,,3.789,4.789,,5.789,
2;22-09-2007;01:30:00|1.789,,,2.789,,,3.789,4.789,,5.789,

```

Figure 3.10: Sample of Extracted Data File in Oil and Gas Industry Sector

```

sample_NonMetallicIndustry.txt - Notepad
File Edit Format View Help
a1B2c3D4e5F;23-09-2007;22:15:00
1;22-09-2007;00:00:00|,1.789,,2.789,,,3.789,4.789,,5.789,
1;22-09-2007;00:30:00|,1.789,,2.789,,,3.789,4.789,,-997,
1;22-09-2007;01:00:00|,1.789,,2.789,,,3.789,4.789,,5.789,
1;22-09-2007;01:30:00|,1.789,,2.789,,,3.789,4.789,,5.789,
2;22-09-2007;00:00:00|,1.789,,2.789,,,3.789,4.789,,5.789,
2;22-09-2007;00:30:00|,1.789,,2.789,,,3.789,4.789,,5.789,
2;22-09-2007;01:00:00|,1.789,,2.789,,,3.789,4.789,,5.789,
2;22-09-2007;01:30:00|,1.789,,2.789,,,3.789,4.789,,5.789,

```

Figure 3.11: Sample of Extracted Data File in Non-Metallic Industry Sector

```

sample_WasteIncinerator.txt - Notepad
File Edit Format View Help
a1B2c3D4e5F;23-09-2007;22:15:00
1;22-09-2007;00:00:00|1.789,2.789,3.789,4.789,5.789,6.789,7.789,8.789,9.789,10.789,
1;22-09-2007;00:30:00|1.789,2.789,3.789,4.789,5.789,6.789,7.789,8.789,9.789,10.789,
1;22-09-2007;01:00:00|1.789,-997,3.789,4.789,5.789,6.789,7.789,8.789,9.789,10.789,
1;22-09-2007;01:30:00|1.789,2.789,3.789,4.789,5.789,6.789,7.789,8.789,9.789,10.789,
2;22-09-2007;00:00:00|1.789,2.789,3.789,4.789,5.789,6.789,7.789,8.789,9.789,10.789,
2;22-09-2007;00:30:00|1.789,2.789,3.789,4.789,5.789,-997,7.789,8.789,9.789,10.789,
2;22-09-2007;01:00:00|1.789,2.789,3.789,4.789,5.789,6.789,7.789,8.789,9.789,10.789,
2;22-09-2007;01:30:00|1.789,2.789,-997,4.789,5.789,6.789,7.789,8.789,9.789,10.789,

```

Figure 3.12: Sample of Extracted Data File in Waste Incinerator Sector

```

sample_PalmOilMills.txt - Notepad
File Edit Format View Help
a1B2c3D4e5F;23-09-2007;22:15:00
1;22-09-2007;00:00:00|,,1.789,,2.789,3.789,,4.789,5.789
1;22-09-2007;00:30:00|,,1.789,,2.789,3.789,,4.789,5.789
1;22-09-2007;01:00:00|,,1.789,,2.789,3.789,,4.789,5.789
1;22-09-2007;01:30:00|,,1.789,,2.789,3.789,,4.789,5.789
2;22-09-2007;00:00:00|,,1.789,,2.789,3.789,,4.789,5.789
2;22-09-2007;00:30:00|,,1.789,,2.789,3.789,,4.789,5.789
2;22-09-2007;01:00:00|,,1.789,,2.789,3.789,,4.789,5.789
2;22-09-2007;01:30:00|,,1.789,,2.789,3.789,,4.789,5.789

```

Figure 3.13: Sample of Extracted Data File in Palm Oil Mills Sector

3.3.10 CEMS-DIS Installation Guide

- a) Install windows operating system to DIS computer. Windows 2000 or XP is recommended.
- b) Install database application (MySQL) on DIS computer. MySQL can be downloaded from <http://www.mysql.com>
- c) For industry premises using broadband or lease line, ensure that **1 fixed internet IP** is assigned to DIS.
- d) Industry premises must ensure that DOE is able to access to DIS. Firewalls or other security protocols should be configured to allow State's DOE server to access to DIS.

3.4 For User with CEM but Without DAS System

For industrial premises / facilities with CEMS but without a DAS, they must install a PC based data logger and then follow the steps below for the development of a CEMS-DIS system.

- a) If data is in analogue format, industrial premises must have a proper analogue-digital converter. This analogue-digital converter (data logger) is available in the market.
- b) When the data is ready in DAS, refer to **Section 3.3** on how to set up DIS.

Communication Specifications

4.1 Introduction

This section outlines the communication specifications to enable DOE State's server to send acknowledgment signals to DIS located in industrial premises and to enable DIS to send required CEMS data to DOE State's server.

This guideline covers the following **five (5)** aspects:

- a) communication hardware
- b) communication hardware settings
- c) communication software
- d) communication software settings
- e) communication security implementation and setting

4.2 For Lease Line or Broadband User

This implementation required **Lease Line** or **Broadband** Internet Subscription with **fixed IP**.

This guideline recommends users to subscribe **Streamyx Enterprise Solution** or **Wireless Broadband** solution if the service is available to the user.

Internet connection must be on 24-hours.

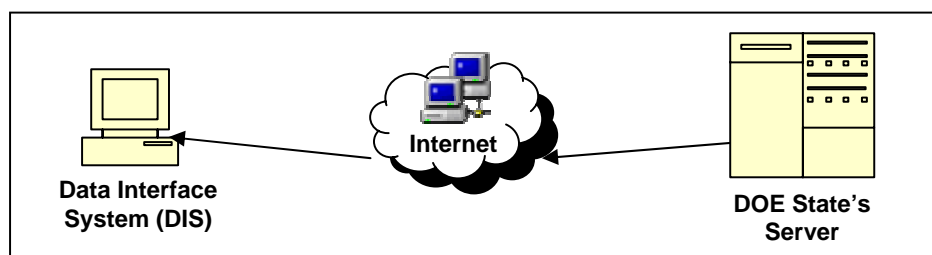


Figure 4.1: Connection from DIS Computer to DOE State's Server via Lease Line or Broadband Internet Subscription

Below are the specifications and settings required for users with **Lease Line** or **Broadband** internet subscription:

- a) communication hardware
 - as provided by lease line or broadband service provider
- b) communication hardware settings
 - as provided by lease line or broadband service provider
- c) communication software
 - as provided by lease line or broadband service provider
- d) communication software settings
 - as provided by lease line or broadband service provider
- e) communication security implementation and settings
 - DOE State's Server need to be given access to the DIS database system.

- Firewall implementation are recommended to be used with settings that allow incoming and outgoing connection to DOE State's Server IP address and data communication port (based on industrial premises/facilities registered communication port).
- If there is a software-based firewall application installed in the DIS, database software (MySQL) has to be allowed/permited to use the network resource.

4.3 For Dial-up Modem via Fixed Telephone Line User

This implementation requires DIS to always be connected with telephone line through standard modem.

To avoid interruption during dial-up process from DOE State's Server to DIS, a dedicated telephone line need to be attached to the DIS's modem.

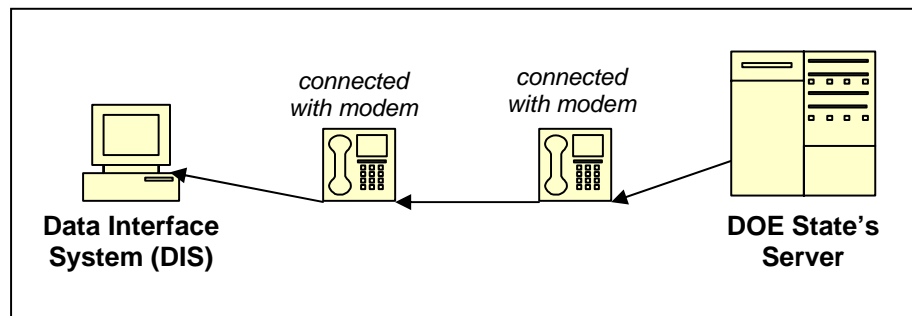


Figure 4.2: Connection from DIS Computer to DOE State's Server through Dial-up Modem via Fixed Telephone Line

Below are the specifications and settings required for users with **Dial-up Modem via Fixed Telephone Line** internet subscription:

- communication hardware
 - standard 56k modem
 - an external modem is recommended
 - dedicated telephone line
- communication hardware settings
 - modem should be always on
 - modem are always attached to the telephone line and attached to the DIS (for external modem)
 - applying protection solution to the modem are recommended (attaching a telephone line surge protector and power surge protection for modem)
- communication software
 - modem's driver or any modem's software provided by modem manufacturer need to be installed
 - Communication software/module for DIS's operating system installed or enabled. The software/module must have the setting capability that allow DIS to communicate with the modem and accepting automated call from DOE State's Server.
- communication software settings
 - DIS has to be set to allow incoming call from DOE State's Server.
 - An account has to be created in DIS. This account must have capability to log on to the DIS computer. This account should be set to normal or limited user, which does not have the capability of any administrative level in DIS system. The account **MUST** have password for security purpose.
 - To allow incoming call, refer to **Appendix 1**.
- communication security implementation and setting.
Please refer to **item (e) Section 4.2**

4.4 For Dial-up Modem via GSM User

This implementation required DIS to always connect with GSM network through GSM modem.

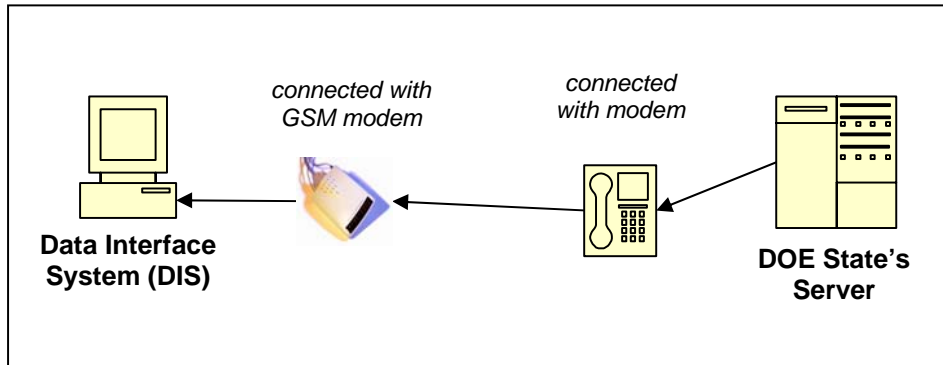


Figure 4.3: Connection from DIS Computer to DOE State's Server through Dial-up Modem via GSM User

Below are the specifications and settings required for users with **Dial-up Modem via GSM** internet subscription:

- a) recommended communication hardware
 - i. any dual-band GSM modem
 - ii. GSM account
 - iii. external antenna (recommended)
- b) recommended communication hardware settings
 - i. modem are always on
 - ii. applying protection solution to the modem are recommended (power surge protection for modem)
 - iii. ensure strong signal and stable connection
- c) recommended communication software
Please refer to **item (c) Section 4.3**
- d) recommended communication software settings
Please refer to **item (d) Section 4.3**
- e) recommended communication security implementation and setting
Please refer to **item (e) Section 4.2**

CEMS-DIS Data Coding/Handling

5.1 Introduction

This section provides data coding guidelines for handling of CEMS-DIS data in the event during which data could not be logged and/or transmitted to State DOE Remote CEMS Monitoring and Enforcement System.

5.2 Data Coding

- a) Please note that the **exact codes** must be entered correctly as specified in this guideline to ensure the system in DOE can record and interpret the missing data event precisely.
- b) All NULL values in parameter fields (either not monitored or invalid data) must be coded with an appropriate value as specified in the guideline to ensure that the DOE get a complete, comprehensive, accurate and precise data on the factory premise's stack monitoring data.
- c) The standard data coding/handling of CEMS-DIS data are shown in **Table 5.1**.

Table 5.1: CEMS-DIS data coding/handling standard

No	Event	Code
1	Parameter not required by DOE and parameter not monitored	-999
2	Invalid value	-998

Note:

- i. The above is applicable to ALL industrial premises, regardless of sector.
- ii. Invalid data definition :-
 - Average data with less than 75% valid data. Example, average of 30 minutes data using less than 22 readings of minute data is an invalid data
 - Negative value data.
 - NULL value data.

Enquiry

For any enquiry, kindly contact:

Director of Air Division
Department of Environment
Ministry of Natural Resources and Environment
Level 1 - 4, Podium 2 & 3,
No.25, Wisma Sumber Asli, Precint 4,
Federal Government Administrative Centre
62574 Putrajaya
(Attn : Cik Nor Rashidah Binti Mohd Ghazali)

Tel : 03 – 8871 2326
Fax : 03 – 8888 4151
Email : nmg@doe.gov.my

Director of IT Division
Department of Environment
Ministry of Natural Resources and Environment
Level 1 - 4, Podium 2 & 3,
No.25, Wisma Sumber Asli, Precint 4,
Federal Government Administrative Centre
62574 Putrajaya
(Attn : Cik Nor Rashidah Binti Mohd Ghazali)

Tel : 03 – 8871 2022
Fax : 03 – 8888 9964
Email : nasa@doe.gov.my