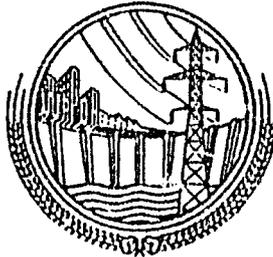


**PAKISTAN
WATER AND POWER DEVELOPMENT AUTHORITY**



**COMPUTERIZED DISTRIBUTION
OUTAGE REPORTING SYSTEM
(OPERATION MANUAL)**

**WAPDA
POWER DISTRIBUTION WING
LAHORE, PAKISTAN**

OCTOBER 1993

EBASCO

WAPDA-USAID Power Distribution Program

INTEROFFICE CORRESPONDENCE

IOM/12/93/ 132

November 18, 1993

To : Ghulam Farid
General Manager (Operation), WAPDA

From : Louis A. Rodriguez
General Manager, EBASCO

Sub : Computerized Distribution Outage Reporting System

Included herewith is a diskette containing the Computerized Distribution Outage Reporting System (CDORS) program and an operation manual for your implementation. EBASCO is ready to provide training to WAPDA staff in the use of the CDORS computer software within selected AEB Divisions.

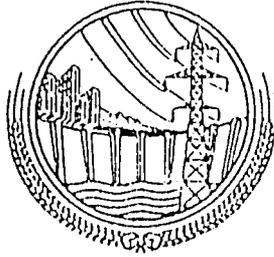
EBASCO has designed and developed a Computerized Distribution Outage Reporting System (CDORS) to record the type, number, duration and cause of feeder and transformer outages. Periodic reports on system performance are generated for the Division Managers so that each can determine the reliability of service of the distribution system under their responsibility.

The CDORS provides the facilities to monitor the line outages and customer complaints effectively. It automatically computes the service reliability index which not only measures the effectiveness of the system design and operating procedures but also points out the areas in need of improvement of service continuity. Division Managers can also estimate the total revenue loss to WAPDA resulting from planned and unplanned equipment outages through the use of this system. The availability of data is critical to the accuracy and quality of the reports that can be generated from the CDORS. It is thus the responsibility of the Division Manager to ensure that the quality and source of data is reliable for better results.

cc: Javid Akhtar	w/o diskette
A. Rashid Kakar	"
John Kerr	"
S.M. Qureshi	"
Umar H. Khan	"
Shafiq-ur-Rehman	"

2

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TABLE OF CONTENTS

PAGE

I.	INTRODUCTION	1
A.	PURPOSE AND SCOPE.....	1
B.	SUMMARY.....	1
II.	OPERATING INSTRUCTIONS FOR PROGRAM "CDORS".....	3
A.	INSTALLING THE PROGRAM ON HARD DISK.....	3
B.	RUNNING THE PROGRAM.....	3
C.	MAIN MENU.....	4
D.	LINE OUTAGES.....	5
E.	CUSTOMER COMPLAINTS.....	14
F.	FEEDER DATABASE.....	19
G.	SYSTEM RE-INITIALIZE.....	23

APPENDICES

APPENDIX - A	-	DEFINITIONS
APPENDIX - B	-	CODE LOCATION TABLE
APPENDIX - C	-	SAMPLE OF FEEDER OUTAGE REPORT

I. INTRODUCTION

I. INTRODUCTION

A. PURPOSE AND SCOPE

This manual describes the procedure for operating the P.C. based Computerized Distribution Outage Reporting System (CDORS). The purpose of the outage reporting system is to record the type, number, duration and cause of feeder and transformer outages. The system will consolidate outages by type and will permit Division Managers to obtain periodic reports on system performance. Division Managers will evaluate the contents of the reports and recommend and implement solutions to improve distribution system performance.

The Computerized Distribution Outage Reporting System has been designed and developed to ascertain the reliability of service for WAPDA Distribution System. The reliability of service is generally interpreted as the continuity of service or the absence of interruption to service. For a distribution system, absolute reliability or continuity of service 100 percent of the time for 100 percent consumers is possible but not probable, although this goal can be approached.

The Computerized Distribution Outage Reporting System (CDORS) provides the facilities to monitor the line outages and customer complaints effectively. The CDORS calculates the service reliability index which not only measures the effectiveness of system design and operating procedures but also points out the areas in need of improvement of service continuity. Division Managers can also estimate the total revenue loss resulting from planned and unplanned equipment outages.

B. SUMMARY

At the present time, there are no industry wide standard outage reporting procedures. More or less, each electric utility has its own standards for each type of customer and its own methods of outage reporting and compilation of statistics. A unified scheme for the reporting of outages and the computation of reliability indices would be very useful but is not generally practical due to the differences in service areas, load characteristics, number of customers and expected service quality.

The CDORS comprises of three subsystems as follows:

1. **Line Outages**

The Line Outage subsystem provides the capability to accommodate feeder outage information received from the Grid Station for operating Division and generate Division reliability report.

2. **Customer Complaints**

Similarly the Customer complaint subsystem has been designed to accept customer complaint data as received in the Sub Division (Customer Complaint Center) and provide management reports.

3. **Feeder Data**

The Feeder Data subsystem allows to define new feeders or modify existing feeder data for the system. This data is used to calculate Division Reliability reports.

The availability of data is critical to the accuracy and quality of the reports that can be generated from CDORS. It is the user's responsibility to ensure that the quality and source of data is reliable for better results.

II. OPERATING INSTRUCTIONS FOR PROGRAM "CDORS"

II. OPERATING INSTRUCTIONS FOR PROGRAM "CDORS"

A. INSTALLING THE PROGRAM ON HARD DISK

To install the CDORS Program on the hard disk the following steps are necessary:

- a) Boot the computer from Hard Disk.
- b) Insert Program Diskette in Drive A.
- c) Type:

```
C:\>A:  <—  
A:\>INSTALL  <—
```

- d) Input the following information:

- AEB Name
- Division Location Code
- Division Name
- Subdivision 1 Name
- Subdivision 2 Name
- Subdivision 3 Name
- Subdivision 4 Name
- Subdivision 5 Name
- Date of Installation

- e) Wait for the "A" Prompt to return. The program is now installed on your hard disk.

B. RUNNING THE PROGRAM

To run the program after a successful installation follow these steps:

- a) Boot the Computer from Hard Disk
- b) Type:

```
CDORS <—
```

C. MAIN MENU

When the program is executed, Main Menu Screen # 1.0 appears. User may select any of the choices given by positioning the menu bar with the help of the arrow keys over the desired key or by pressing the first character of the listed options. If any other key is pressed, there is no effect.

W A T E R & P O W E R D E V E L O P M E N T A U T H O R I T Y
Outage Reporting System (Version 1.0)

LINE OUTAGES
CUSTOMER COMPLAINTS
FEEDER DATA BASE
SYSTEM RE INITIALIZE
EXIT

Screen # 1.0

The key marked as "ESC" is always active to quit the operation. Similarly key marked as "F1", invokes the desired HELP.

D. LINE OUTAGES

Pressing "L" from the Main Menu or moving the highlighted bar to "Line Outages" and pressing "Enter" key, selects the Line Outages Subsystem and displays Screen # 2.0 to the user.

WATER & POWER DEVELOPMENT AUTHORITY
Outage Reporting System (Version 1.0)

LINE OUTAGES
CUSTOMER COMPLAINTS
FEEDER DATA BASE
SYSTEM RE-INITIALIZE
EXIT

ADD Feeder Outages
Data REVIEW / MODIFY
PRINT Outage Reports
RETURN to Main Menu

Screen # 2.0

When the Menu is displayed on the screen, the user can perform a variety of functions as explained below:

a) Add Feeder Outages

Pressing "A" or moving the highlighted bar to "Add Feeder Outages" and then pressing "Enter" key, the addition function is invoked which allows the user to input the feeder outages as reported by the Grid Station into the database.

Screen # 2.1 shows what the Addition display looks like and all the relevant information the user is expected to enter. While the cursor is blinking in "Breaker Operation" or "Cause" or "Weather Conditions" or "Temperature", if the user presses "F1" key, the relevant HELP will be displayed on the left side of the Menu, as shown in Screen # 2.1.1, 2.1.2, 2.1.3 and 2.1.4.

W A T E R & P O W E R D E V E L O P M E N T A U T H O R I T Y
Outage Reporting System (Version 1.0)

Outage Report No. : 277

Feeder ID NO. : 123457 BAHAWAL ROAD FEEDER

Date Off : 27 07 93

Time Off : 07:06

Date On : 27 07 93

Time On : 10:06

Net Down Time : 03:00

Breaker Operation : 01

Cause : 08

Weather Condition : 02

Exact Temp. : 38

Load (Amps) Prior : 300.0 After : 300.0

Remarks : HEAVY RAIN SHORT CIRCUIT

LINE OUTAGES

CUSTOMER COMPLAINTS

FEEDER DATA BASE

SYSTEM RE-INITIALIZE

EXIT

Edit

Quit

Proceed

Screen # 2.1

When the user enters a valid Feeder ID number, the feeder name is automatically displayed. Similarly, when the user finishes entering the date and time of the outage, the duration in hours is automatically computed and displayed.

The use of the key marked as "Page Down" will move the cursor to the bottom of the menu where the user has the option to either edit the newly entered data, abandon the operation or proceed with the Line Outage information.

Pressing "ESC" key will discard the entered data and the control will be returned back to the menu.

WATER & POWER DEVELOPMENT AUTHORITY
Outage Reporting System (Version 1.0)

Outage Report No. : 277

Feeder ID NO. : 123457 BAHAWAL ROAD FEEDER

Date Off : 27-07-93 Time Off : 07:06

Date On : 27-07-93 Time On : 10:06

Net Down Time : 03:00

Breaker Operation : _____ Cause :

Weather Condition : _____ Temperature :

Load (Amps) Prior : 0.0 After : 0.0

Remarks :

H E L P

Breaker Operation

01 - Automatic

02 - Manual

Edit

Quit

Proceed

Screen # 2.1.1

If the user presses the "F1" key while the cursor is blinking at the "Breaker Operation" input, HELP window is displayed to the left of the Addition Menu as shown in Screen # 2.1.1

WATER & POWER DEVELOPMENT AUTHORITY
Outage Reporting System (Version 1.0)

Outage Report No. : 277

HELP Cause

Feeder ID NO. : 123457 BAHAWAL ROAD FEEDER

Date Off : 27-07-93 Time Off : 07:06

Date On : 27-07-93 Time On : 10:06

Net Down Time : 03:00

Breaker Operation : 01 Cause : _____

Weather Condition : Temperature : _____

Load (Amps) Prior : 0.0 After : 0.0

Remarks :

- 01 Line Construction
- 02 Line Maintenance
- 03 Load Shedding
- 04 Vehical Accident
- 05 Catastrophe Weather
- 06 Vandalism/Animal
- 07 Transmission Sys.
- 08 Overload
- 09 Lightning
- 10 Trees
- 11 Fire
- 12 Meter/Base Burnt
- 13 Loose Jumpers
- 14 Transformer Failure

Edit

Quit

Proceed

Screen # 2.1.2

If the user presses the "F1" key while the cursor is blinking at the "Cause" input, HELP window is displayed to the left of the Addition Menu as shown in Screen # 2.1.2

W A T E R & P O W E R D E V E L O P M E N T A U T H O R I T Y
Outage Reporting System (Version 1.0)

Outage Report No. : 277

Feeder ID NO. : 123457 BAHAWAL ROAD FEEDER

Date Off : 27-07-93 Time Off : 07:06

Date On : 27-07-93 Time On : 10:06

Net Down Time : 03:00

Breaker Operation : 01 Cause : 02

Weather Condition : _____ Temperature :

Load (Amps) Prior : 0.0 After : 0.0

Remarks :

H E L P

Weather Condition

- 01 - Clear
- 02 - Lightning
- 03 - Rain
- 04 - Wind

Edit

Quit

Proceed

Screen # 2.1.3

If the user presses the "F1" key while the cursor is blinking at the "Weather Condition" input, HELP window is displayed to the left of the Addition menu as shown in Screen # 2.1.3.

W A T E R & P O W E R D E V E L O P M E N T A U T H O R I T Y
Outage Reporting System (Version 1.0)

Outage Report No. : 277

Feeder ID NO. : 123457 BAHAWAL ROAD FEEDER

Date Off : 27-07-93 Time Off : 07:06

Date On : 27-07-93 Time On : 10:06

Net Down Time : 03:00

Breaker Operation : 01 Gauge : 03

Weather Condition : 02 Temperature : _____

Load (Amps) Prior : 0 0 After : 0 0

Remarks :

H E L P
Temperature

01- Cool < 15° C

02- Moderate 15-35° C

03- Hot > 35° C

04- Exact Value

Edit

Quit

Proceed

Screen # 2.1.4

If the user presses the "F1" key while the cursor is blinking at the "Temperature" input, HELP window is displayed to the left of the Addition menu as shown in Screen # 2.1.4.

b) Data Review/Modify

This choice is used to review, modify or permanently remove an outage report from the database (Screen # 2.2). The user has the facility to browse through the entire database by pressing "N" or "P" which stands for Next or Previous record. By pressing "M" user can modify the current outage report. Pressing "D" will mark the record for deletion. If "D" is again pressed on a deleted record, the particular record will be un-deleted. "ESC" will terminate the Review/Modify function and will lead back to the selection menu. During the modification session, "F1" key is active to provide the necessary HELP to the user.

W A T E R & P O W E R D E V E L O P M E N T A U T H O R I T Y
Outage Reporting System (Version 1.0)

Outage Report No. : 33

Feeder ID NO. : 3 GULBERG III FEEDER

Date Off : 07-07-93 Time Off : 13:15
Date On : 07-07-93 Time On : 14:15

Net Down Time : 01:00

Breaker Operation : 02 Cause : 13
Weather Condition : 03 Temperature : 02

Load (Amps) Prior : 500.0 After : 20.0

Remarks : HEAVY RAIN
 A TRUCK RAN INTO STRUCTURE

LINE OUTAGES

CUSTOMER COMPLAINTS

FEEDER DATA BASE

SYSTEM RE-INITIALIZE

EXIT

Next Previous Modify Delete

Screen # 2.2

c) Print Outage Reports

Two types of reports are available as hard copy output as displayed by Screen # 2.3.

W A T E R & P O W E R D E V E L O P M E N T A U T H O R I T Y
Outage Reporting System (Version 1.0)

LINE OUTAGES

CUSTOMER COMPLAINTS

FEDER DATA BASE

SYSTEM RE-INITIALIZE

EXIT

Feeder Outage Report

Division Reliability Report

RETURN to Previous Menu

Screen # 2.3

The user by entering either choice is informed about the printer status as shown in Screen # 2.3.1.

WATER & POWER DEVELOPMENT AUTHORITY
Outage Reporting System (Version 1.0)

LINE OUTAGES

CUSTOMER COMPLAINTS

FEEDEr DATA BASE

SYSTEM RE-INITIALIZE

EXIT

PRINTER is Off-Line ...
Press ANY KEY when READY.

Feeder Outage Report

Division Reliability Report

RETURN to Previous Menu

Screen # 2.3.1

Sample reports printed out of this menu is attached in Appendix "C".

E. CUSTOMER COMPLAINTS

Pressing "C" in the Main Menu or moving the highlighted bar to the "Customer Complaints" and then pressing "Enter" key selects the Customer Complaints Subsystem and displays Screen # 3.0 to the user.

WATER & POWER DEVELOPMENT AUTHORITY
Outage Reporting System (Version 1.0)

LINE OUTAGES

CUSTOMER COMPLAINTS

FEEDER DATA BASE

SYSTEM RE-INITIALIZE

EXIT

Enter Complaint Center
Location Code : 010238

Screen # 3.0

In this menu the user is required to input a valid Customer Complaint Center Location Code (Subdivision code). As soon as a valid Complaint Center Location Code is entered, Screen # 3.1 is displayed and a variety of functions are made available to the user as explained below:

WATER & POWER DEVELOPMENT AUTHORITY
Outage Reporting System (Version 1.0)

LINE OUTAGES
CUSTOMER COMPLAINTS
FEEDER DATA BASE
SYSTEM RE-INITIALIZE
EXIT

Enter Complaint Center
Location Code : 010231

ADD Customer Complaint
Data REVIEW / MODIFY
PRINT Complaint Report
RETURN to Main Menu

Screen # 3.1

a) Add Customer Complaint

Pressing "A" or moving the highlighted bar to "Add Customer Complaint" and pressing "Enter" key, invokes the addition function. Screen # 3.1.1 shows what the addition display looks like and all the relevant information the user is expected to enter. While the cursor is blinking in "Weather Condition" or "Causes" field, if the user presses "F1" key, the relevant HELP will be displayed. Pressing "F1" in any other field will have no effect.

W A T E R & P O W E R D E V E L O P M E N T A U T H O R I T Y
Outage Reporting System (Version 1.0)

Complaint No.: 2

010231

Customer Ref. No. : 144-680011-22

Time Reported: 07:23

Feeder ID NO. : 123457 BAHAWAL ROAD FEEDER

Date Off : 27-07-93

Time Off : 07:23

Date On : 27-07-93

Time On : 10:23

Net Down Time : 03:00

Load Out (kVA) : 500 Customers Out : 10

Weather Condition : 02

Cause : 03

Repaired By : Bashir Line Man / Nazir

LINE OUTAGES

CUSTOMER COMPLAINTS

FEEDER DATA BASE

SYSTEM RE-INITIALIZE

EXIT

Edit

Quit

Proceed

Screen # 3.1.1

As a valid Feeder ID number is entered, the Feeder name will be automatically displayed and similarly after completing the date and time data of the complaint, the feeder and/or transformer down time is automatically calculated and displayed.

Pressing the "Page Down" key will pass the control to the bottom of the screen where user has the option to either edit the newly entered data, abandon the operation or proceed to work with the entered information.

Pressing "ESC" key will discard the entered data and the control will be returned back to the menu.

b) Data Review/Modify

This choice is used to review, modify or permanently remove customer complaint from the database (Screen # 3.1.2). The user has the facility to browse through the entire database by pressing "N" or "P" which stands for Next or Previous record. By pressing "M" user can modify the current customer complaint. Pressing "D" will mark the record for deletion. If "D" is again pressed on a deleted record, the particular record will be un-deleted. "ESC" will terminate the Review/Modify function and will lead back to the selection menu. During the modification session, "F1" key is active to provide the necessary HELP to the user.

W A T E R & P O W E R D E V E L O P M E N T A U T H O R I T Y
Outage Reporting System (Version 1.0)

Complaint No. : 2

010231

Customer Ref. No. : 655-664666-54

Time Reported: 08:59

Feeder ID NO. : 2 GULBERG 11 FEEDER

Date Off : 23-06-93

Time Off : 08:59

Date On : 23-06-93

Time On : 12:59

Net Down Time : 04:00

Load Out (kVA) : 12 Customers Out : 3

Weather Condition : 02 Cause : 05

Repaired By : Jamil/Wasay Kahn

LINE OUTAGES

CUSTOMER COMPLAINTS

FEEDER DATA BASE

SYSTEM RE-INITIALIZE

EXIT

Next

Previous

Modify

Delete

Screen # 3.1.2

c) Print Complaint Report

By selecting this option, the user is first informed about the printer status (Screen 3.1.3) and then customer complaint report is printed as a hard copy. Sample report is attached in Appendix 'C'.

W A T E R & P O W E R D E V E L O P M E N T A U T H O R I T Y
Outage Reporting System (Version 1.0)

LINE OUTAGES
CUSTOMER COMPLAINTS

FEEDER DATA BASE
SYSTEM RE-INITIALIZE
EXIT

Press ANY KEY when Ready
to PRINT

ADD Customer Complaint
Data REVIEW / MODIFY

PRINT Complaint Report
RETURN to Main Menu

Screen # 3.1.3

F. FEEDER DATABASE

Pressing "F" from the Main Menu or moving the highlighted bar to "Feeder Database" and pressing "Enter" key, selects the Feeder Database Subsystem and displays Screen # 4.0 to the user.

W A T E R & P O W E R D E V E L O P M E N T A U T H O R I T Y
Outage Reporting System (Version 1.0)

```
LINE OUTAGES
CUSTOMER COMPLAINTS
FEEDER DATA BASE
SYSTEM RE INITIALIZE
EXIT
```

```
ADD Feeder Data
Data REVIEW / MODIFY
PRINT Feeder Data

RETURN to Main Menu
```

Screen # 4.0

As the Menu displays, user can perform a variety of functions explained below:

a) Add Feeder Data

Pressing "A" or moving the highlighted bar to "Add Feeder Data" and then pressing "Enter" key, the addition function is invoked which allows the user to input the feeder information into the database.

Screen # 4.1 shows what the Addition display looks like and all the relevant information the user is expected to enter.

W A T E R & P O W E R D E V E L O P M E N T A U T H O R I T Y
Outage Reporting System (Version 1.0)

LINE OUTAGES
CUSTOMER COMPLAINTS
FEEDER DATA BASE
SYSTEM RE INITIALIZE
EXIT

Feeder Information

Feeder ID No. 234678
Feeder Name MOHNI ROAD FEEDER
Feeder Length 50.00 Feeder kVA 2500
Total Customers 5000 Map Code 2AXY4D3

Edit Quit Proceed

Screen # 4.1

The key marked as "Page Down" will move the cursor to the bottom of the menu where user has the option to either edit the newly entered data, abandon the operation or proceed with the Feeder information.

Pressing "ESC" key will discard the entered data and the control will be returned back to the menu.

b) Data Review/Modify

This choice is used to review, modify or permanently remove a particular Feeder data from the database (screen # 4.2). The user has the facility to browse through the entire database by pressing "N" or "P" which stands for Next or Previous record. By pressing "M" user can modify the current Feeder information. Pressing "D" will mark the record for deletion. If "D" is again pressed on a deleted record, the particular record will be un-deleted. "ESC" will terminate the Review/Modify function and will lead back to the selection menu.

WATER & POWER DEVELOPMENT AUTHORITY
Outage Reporting System (Version 1.0)

LINE OUTAGES
CUSTOMER COMPLAINTS
FEEDER DATA BASE
SYSTEM INITIALIZE
EXIT

Review Feeder Information

Feeder ID No. 123457
Feeder Name BAHAWAL ROAD FEEDER
Feeder length 12.00 Feeder kVA 1200
Total Customers 2000 Map Code 5PAX4B2

Next Previous Modify Delete

Screen # 4.2

c) Print Feeder Data

By selecting this option, the user is first informed about the status of the printer (Screen # 4.3) and then the entire Feeder Database is printed as a hard copy. Sample report is attached in Appendix 'C'.

WATER & POWER DEVELOPMENT AUTHORITY
Outage Reporting System (Version 1.0)

LINE OUTAGES
CUSTOMER COMPLAINTS
FEEDER DATA BASE
SYSTEM RE-INITIALIZE
EXIT

PRINTER is Off-Line ...
Press ANY KEY when READY.

ADD Feeder Data
Data REVIEW / MODIFY
PRINT Feeder Data
RETURN to Main Menu

Screen # 4.3

G. SYSTEM RE-INITIALIZE

By pressing "S" from the main menu or moving the highlighted bar to "System Re-initialize" and pressing "Enter" key, the user is immediately displayed a Warning (Screen # 5.0). This option puts all active data into backup files so that the user can start using the program with fresh data files. This option is recommended to use only once in the beginning of each month when the data input for the preceding month has been completed, and all the required reports have been printed out.

W A T E R & P O W E R D E V E L O P M E N T A U T H O R I T Y
Outage Reporting System (Version 1.0)

LINE OUTAGES
CUSTOMER COMPLAINTS
FEEDER DATA BASE
SYSTEM RE-INITIALIZE

EXIT

WARNING :
You MUST have printed all the
Reports before RE-INITIALIZING.
Have You done so ? (Y/N) N

Screen # 5.0

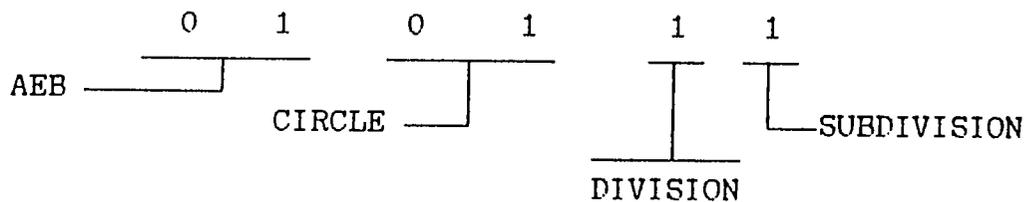
APPENDIX - A
DEFINITIONS

DEFINITIONS

1. **Outage:** Describes the state of a Feeder/Transformer when it is not available to perform its intended function due to some event directly associated with it. An outage may or may not cause an interruption of service to customers depending on system configuration.
2. **Forced Outage (Unplanned Outage):** An outage caused by emergency conditions directly associated with a Feeder/Transformer that require the component to be taken out of service immediately, either automatically or as soon as switching operations can be performed, or an outage caused by improper operation of equipment or human error.
3. **Scheduled Outage (Planned Outage):** An outage that results when a Feeder/Transformer is deliberately taken out of service at a selected time, usually for purposes of construction, preventive maintenance, repair or load shedding. The key test to determine if an outage should be classified as forced or scheduled is as follows. If it is possible to defer the outage when such deferment is desirable, the outage is a scheduled outage; otherwise, the outage is a forced outage. Deferring an outage may be desirable, for example, to prevent overload of facilities or an interruption of service to customers.
4. **Partial Outage:** Describes a Feeder/Transformer state where the capacity of the component to perform its function is reduced but not completely eliminated.
5. **Transient Forced Outage:** A Feeder/Transformer outage whose cause is immediately self clearing so that the affected component can be restored to service either automatically or as soon as a switch or circuit breaker can be reclosed or a fuse replaced. An example of a transient forced outage is a lightning flashover which does not permanently disable the flashed component.
6. **Persistent Forced Outage:** A Feeder/Transformer outage whose cause is not immediately self-clearing but must be corrected by eliminating the hazard or by repairing or replacing the affected component before it can be returned to service. An example of a persistent forced outage is a lightning flashover which shatters an insulator, thereby disabling the component until repair or replacement can be made.

7. **Interruption:** The loss of service to one or more consumers or other facilities and is the result of one or more component outages, depending on system configuration.
8. **Forced Interruption:** An interruption caused by a forced outage.
9. **Scheduled Interruption:** An interruption caused by a scheduled outage.
10. **Momentary Interruption:** It has a duration limited to the period required to restore service by automatic or supervisor-controlled switching operations or by manual switching at locations where an operator is immediately available. Such switching operations are typically completed in a few minutes.
11. **Temporary Interruption:** It has a duration limited to the period required to restore service by manual switching at locations where an operator is not immediately available. Such switching operations are typically completed within 1-2 hours.
12. **Sustained Interruption:** It is any interruption not classified as momentary or temporary.
13. **System Interruption Frequency Index:** The average number of interruptions per customer served per time unit (year). It is calculated by dividing the accumulated number of customer interruptions in a year by the number of customers served.
14. **Customer Interruption Frequency Index:** The average number of interruptions experienced per customer affected per time unit (year). It is calculated by dividing the number of customer interruptions observed in a year by the number of customers affected.
15. **Load Interruption Index:** The average kVA of connected load interrupted per unit time per unit of connected load served. It is formed by dividing the annual load interruption by the connected load.
16. **Customer Curtailment Index:** The kVA-minutes of connected load interrupted per affected customer per year. It is the ratio of the total annual curtailment to the number of customers affected per year.

17. **Customer Interruption Duration Index:** The interruption duration for customers interrupted during a specific time period. It is determined by dividing the sum of all customer-sustained interruption duration during the specified period by the number of sustained customer interruptions during that period.
18. **Feeder ID Number:** It is a unique six (6) digit numeric code assigned to a particular feeder.
19. **Outage Report Number:** This is a sequential number automatically assigned by the program to each Line Outage Report or Customer Complaint.
20. **Location Code:** The location code is in six digits and gives the detailed geographical and responsibility area.



Location codes have been predefined and are the same as is being used in Computerized Work Order System (CWOS) and other computer applications. Refer Appendix 'B' for sample Location Codes.

21. **Customer Reference Number:** The customer reference number is an eleven (11) digit code allotted to each customer by Customer Service Component and is being used for billing purposes, eg;

123 - 456789 - 01

22. **Map Code:** Map code is a seven (7) digit code describing the geographical drawing number for individual feeder, eg;

4CFR4R4

The position numbers 1,5 and 7 are numeric where as the remaining positions are character fields.

APPENDIX - B
CODE LOCATION TABLE

W A T E R A N D P O W E R D E V E L O P M E N T A U T H O R I T Y
LOCATION TABLE

Date : 12/08/91

CODE	DESCRIPTION
000000	HEADQUARTER
002000	GM OPERATIONS
002500	GM ADMINISTRATION
003000	CHIEF OF TRAINING (DISTRIBUTIO
003500	GM MANAGEMENT SERVICES
004000	GM FINANCE
004010	DGM FINANCE (DIST) COORD
004030	DGM FINANCE (DIST) FIELD OPERA
004500	GM CUSTOMER SERVICES
005000	GM PLANNING & ENGINEERING
007000	GM PURCHASING & INVENTORY CONT
007500	CE RURAL ELECTRIFICATION ORGAN
008000	TRANSFORMER RECLAMATION ORGANI
009000	MANAGING DIRECTOR DISTRIBUTION
010000	LAHORE AEB
010010	CIVIL WORKS LAHORE
010011	LAHORE
010020	M&T I LAHORE
010021	LAHORE NO. 1
010022	LAHORE NO. 2
010030	M&T II LAHORE
010031	LAHORE NO. 3
010032	LAHORE NO. 4
010033	LAHORE NO. 5
010100	IST LAHORE
010110	RANG MAHAL
010111	DELHI GATE
010112	RANG MAHAL I
010113	RANG MAHAL II
010114	AKBARI GATE
010115	ANARKALI
010119	RO
010120	BADAMI BAGH
010121	BADAMI BAGH
010122	WASSAN PURA
010123	SULTAN PURA
010124	CHAH MIRAN
010125	DATA NAGAR
010126	QILLA MOHAMMADI
010129	RO
010130	FORT
010131	BHATI GATE
010132	FORT
010134	BILAL GANJ
010135	RAVI ROAD
010136	CITY I
010137	KARIM PARK
010138	CITY II

W A T E R A N D P O W E R D E V E L O P M E N T A U T H O R I T Y
L O C A T I O N T A B L E

Date : 12/08/91

CODE	DESCRIPTION
010139	RO
010140	SHAHDARA
010141	SHAHDARA
010142	KOT ABDUL MALIK
010143	JIA MUSA
010144	G.T. ROAD
010145	FAIZPUR
010149	RO
010200	2ND LAHORE
010210	CIVIL LINES
010211	SOUTH
010212	GOR
010213	SHIMLA HILL
010214	DAVIS ROAD
010219	RO
010220	ALLAMA IQBAL TOWN
010221	CHUNG
010222	SAIDPUR
010223	ALI RAZA ABAD
010225	ALLAMA IQBAL TOWN
010227	ITTEHAD COLONY
010229	RO
010230	McLEOD ROAD
010231	McLEOD ROAD I
010232	McLEOD ROAD II
010233	McLEOD ROAD III
010239	RO
010240	GULSHAN-E-RAVI
010242	SANDA
010246	GULSHAN-E-RAVI
010247	NAWAN KOT
010248	DHOLANWAL
010249	RO
010250	SAMANABAD
010251	SAMANABAD
010252	PREM NAGAR
010253	ISLAMPURA
010254	MOZANG
010259	RO
010300	3RD LAHORE
010310	SHALAMAR
010311	SHALAMAR
010312	BATAPUR
010313	JALLO MORE
010314	SALAMATPURA
010318	MUGHALPURA
010319	RO
010340	LAHORE CANTT

W A T E R A N D P O W E R D E V E L O P M E N T A U T H O R I T Y

LOCATION TABLE

Date : 12/08/91

CODE	DESCRIPTION
010341	R. A. BAZAR
010342	MUSTAFA ABAD
010343	GHAZIABAD
010344	BURKI
010345	DEFENCE
010346	MIAN MIR
010349	RO
010350	BAGHBANPURA
010351	BAGHBANPURA
010352	MEHMOOD BOOTI
010353	ENGG. UNIVERSITY
010354	ANGOORI BAGH
010355	KOT KHAWAJA SAEED
010359	RO
010360	KOT LAKHPAT
010361	RAIWIND
010362	KOT RADHA KISHAN
010363	KAHANA
010365	AMAR SIDHU
010366	FACTORY AREA
010369	RO
010390	RURAL ELECTRIFICATION
010391	RURAL ELECTRIFICATION 1
010392	RURAL ELECTRIFICATION 2
010393	RURAL ELECTRIFICATION 3
010394	RURAL ELECTRIFICATION 4
010395	RURAL ELECTRIFICATION 5
010400	4TH LAHORE
010410	GULBERG
010411	GULBERG I
010412	GULBERG II
010415	REHMAN PURA
010416	ICHIIRA
010419	RO
010420	KASUR
010421	KASUR I
010422	KASUR II
010423	KASUR III
010424	KUNDIAN
010425	KASUR IV
010429	RO
010430	CHUNIAN
010431	BHAI PHERU
010432	MANGA MANDI
010433	PATTOKI I
010434	CHUNIAN
010435	KANGANPUR
010436	PATTOKI II

WATER AND POWER DEVELOPMENT AUTHORITY
LOCATION TABLE

Date : 12/08/91

CODE	DESCRIPTION
010439	RO
010440	GARDEN TOWN
010441	GARDEN TOWN
010442	TOWNSHIP
010443	MUSLIM TOWN
010444	WAHDAT COLONY
010445	GREEN TOWN
010449	RO
010490	GULBERG
010491	NO. 1
010492	NO. 2
010493	NO. 3
010494	NO. 4
012000	CHAIRMAN AEB
012500	DIRECTOR ADMINISTRATION
014000	DIRECTOR ACCOUNTS
014500	DIRECTOR CUSTOMER SERVICES
015000	DIRECTOR TECHNICAL
017000	DIRECTOR INVENTORY CONTROL
017001	R. S. SHALAMAR
017006	F. S. CANTT
017007	F. S. GARDEN TOWN
017008	F. S. GULSHAN-E-RAVI
017009	F. S. FEROPUR ROAD
017010	F. S. KASUR
017011	F. S. CHUNIAN
017095	REGIONAL DISPOSAL STORE SHALAM
017510	LAHORE
018010	LAHORE
018011	XXX
018012	XXX
020000	GUJRANWALA AEB
020030	CIVIL WORKS GUJRANWALA
020031	GUJRANWALA NO. 1
020032	GUJRANWALA NO. 2
020040	M&T GUJRANWALA
020041	GUJRANWALA NO. 1
020042	GUJRANWALA NO. 2
020043	SHEIKHUPURA
020044	SIALKOT
020050	PC POLE PLANT CHICHOKI MALLIAN
020100	GUJRANWALA I
020110	IST GUJRANWALA
020111	MODEL TOWN
020112	GARJAKH GATE
020113	BAGHBANPURA
020114	CITY GUJRANWALA
020115	FAROOQ GANJ

50

APPENDIX - C
SAMPLE OF FEEDER OUTAGE REPORT

WATER AND POWER DEVELOPMENT AUTHORITY

FEEDER OUTAGE REPORT
From 02-07-93 to 22-07-93

AKB : Labore ----- DIVISION : Meleod Road -----

Feeder Name		Date & Time		Duration	Load (Amps)		Breaker	Cause	Weather	Temperature
Date	Time Off	Date	Time On	Hr:Min	Prior	After	Operation		Condition	
MAHDAT COLONY FEEDER										
02-07-93	08:47	02-07-93	10:00	01:13	200.0	200.0	Automatic	08	Clear	Moderate
05-07-93	08:50	05-07-93	12:30	03:40	410.0	400.0	Automatic	02	Clear	Moderate
05-07-93	08:00	05-07-93	08:45	00:45	250.0	250.0	Automatic	08	Clear	Moderate
20-07-93	12:30	20-07-93	13:30	01:00	300.0	300.0	Manual	03	Clear	Hot
GULBERG II FEEDER										
03-07-93	12:30	03-07-93	13:00	00:30	400.0	410.0	Manual	01	Clear	Moderate
10-07-93	16:30	10-07-93	17:30	01:00	200.0	250.0	Manual	03	Clear	Moderate
10-07-93	09:01	10-07-93	09:45	00:44	350.0	350.0	Automatic	04	Rain	Cool
15-07-93	09:00	15-07-93	10:00	01:00	430.0	430.0	Automatic	08	Clear	Hot
GULBERG III FEEDER										
03-07-93	10:30	03-07-93	12:00	01:30	350.0	360.0	Manual	01	Clear	Moderate
22-07-93	14:02	22-07-93	15:02	01:00	200.0	200.0	Manual	02	Clear	Moderate
BAHAWAL ROAD FEEDER										
20-07-93	12:40	20-07-93	12:50	00:10	400.0	400.0	Automatic	10	Clear	Hot
20-07-93	13:30	20-07-93	14:30	01:00	400.0	410.0	Manual	03	Clear	Hot

WATER AND POWER DEVELOPMENT AUTHORITY

DIVISION RELIABILITY REPORT

From 02-07-93 to 22-07-93

AER : Lahore

DIVISION : Meleod Road

Feeder Name	Feeder Length (KM)	Total Customers	Connected Load (kVA)	No. of Outages	Total Duration (Hours)	Average kVA Load Served	Unsold Energy (kWH)	Average Interruption Duration-Hrs.
MANDAT COLONY FEEDER	342.3	23434	3232	4	6.6	5525	34052	1.7
GULBERG II FEEDER	432.4	43242	4322	4	3.2	6573	16563	0.8
GULBERG III FEEDER	233.2	4343	434	2	2.5	5239	11050	1.3
BAHAWAL ROAD FEEDER	12.0	2000	1200	2	1.2	7621	7113	0.6
T O T A L	1019.9	73019	9188	12	13.5		68778	

41

WATER AND POWER DEVELOPMENT AUTHORITY

CUSTOMER COMPLAINT REPORT

From 01-07-93 to 28-07-93

AEB : Lahore

SUB-DIVISION : Shadra

Date Reference No.	T I M E Reported Off		Date & Time	On	Duration Hr:Min	Load Out kVA	Cust. Out	Feeder ID No.	Weather Condition	C A U S E
01-07-93										
121-212121-23	09:10	09:00	01-07-93	10:00	01:00	3121	5454	3	Clear	vehical Accident
132-131313-21	09:30	08:59	01-07-93	09:59	01:00	1	1	1	Clear	Transformer Failure
132-141323-11	10:20	09:59	01-07-93	12:59	03:00	5	2	123457	Clear	Transformer Failure
07-07-93										
221-222121-22	09:15	09:00	07-07-93	10:00	01:00	400	12	3	Wind	Overload
677-774666-57	09:00	08:59	07-07-93	12:59	04:00	12	3	2	Lightning	Overload
15-07-93										
132-131313-21	11:00	10:30	15-07-93	14:20	03:50	12	2	1	Clear	Transformer Failure
666-664555-55	09:10	08:59	15-07-93	14:59	06:00	12	3	2	Lightning	Catastrophe Weather
20-07-93										
321-212121-33	09:00	09:00	20-07-93	11:00	02:00	150	2	1	Clear	Line Construction
655-664666-54	10:30	08:59	20-07-93	12:59	04:00	12	3	2	Lightning	Catastrophe Weather
23-07-93										
132-131313-21	09:25	08:59	23-07-93	09:59	01:00	1	1	1	Clear	Transformer Failure
655-664666-54	10:00	08:59	23-07-93	12:59	04:00	12	3	2	Lightning	Tree
655-664666-54	09:00	08:59	23-07-93	12:59	04:00	12	3	2	Rain	Catastrophe Weather
25-07-93										
121-212121-23	09:15	09:00	25-07-93	10:00	01:00	1200	15	2	Clear	Overload
132-131313-21	09:20	08:59	25-07-93	09:59	01:00	100	200	1	Clear	Transformer Failure
212-212212-23	09:30	09:00	25-07-93	10:00	01:00	200	100	2	Clear	Line Construction
28-07-93										
121-212121-23	09:10	09:00	28-07-93	10:00	01:00	100	20	2	Clear	line Construction
132-131313-21	10:00	08:59	28-07-93	09:59	01:00	500	150	1	Clear	Transformer Failure
144-680011-22	08:00	07:23	28-07-93	10:23	03:00	500	10	123457	Lightning	Load Shedding
655-664666-54	09:15	08:59	28-07-93	12:59	04:00	12	3	2	Lightning	Catastrophe Weather

WATER AND POWER DEVELOPMENT AUTHORITY

FEEDER DATA

Date : 02-08-93 DIVISION : Mcleod Road

FEEDER ID No.	N A M E	LENGTH (KM)	CONNECTED KVA	TOTAL CUSTOMERS	MAP CODE
1	WAHDAT COLONY FEEDER	342.3	3232	23434	4CFR4R4
2	GULBERG II FEEDER	432.4	4322	43242	4CVD4C3
3	GULBERG III FEEDER	233.2	434	4343	4FFV4F5
4	WREG434434343RT5GTG	434.3	544	43444	4FGF4G4
123457	BAHAWAL ROAD FEEDER	12.0	1200	2000	5PAX4D2
234678	MOHNI ROAD FEEDER	50.0	2500	5000	2AXY4D3