

Reference

- [1] SLT Operations & Maintenance (2009), *OSP Maintenance Report*, Annual Maintenance Report of Sri Lanka Telecom PLC, 4(3), pp 43-51
- [2] Digi International Inc. (2008), *TCP/IP Road Map*, A product manual for *RabbitCore® RCM 4010* microcontroller, 6(1) pp 11-12
- [3] <http://www.wtcs.org/snmp4tpc/literature.htm>
- [4] <http://www.cablelabs.com/specifications/SP-OSSI-RFI-I03-990113.pdf>
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- [10] <http://www.apl.jhu.edu/~hall/java/Servlet-Tutorial/>
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Damocles Model 2404 Web Interface

Damocles model 2404

Digital inputs					
Name	Current Value	Alarm Alert	Name	Current Value	Alarm Alert
Input 1	OFF	Active if ON	Input 13	OFF	Active if ON
Input 2	OFF	Active if ON	Input 14	OFF	Active if ON
Input 3	OFF	Active if ON	Input 15	OFF	Active if ON
Input 4	OFF	Active if ON	Input 16	OFF	Active if ON
Input 5	OFF	Active if ON	Input 17	OFF	Active if ON
Input 6	OFF	Active if ON	Input 18	OFF	Active if ON
Input 7	OFF	Active if ON	Input 19	OFF	Active if ON
Input 8	OFF	Active if ON	Input 20	OFF	Active if ON
Input 9	OFF	Active if ON	Input 21	OFF	Active if ON
Input 10	OFF	Active if ON	Input 22	OFF	Active if ON
Input 11	OFF	Active if ON	Input 23	OFF	Active if ON
Input 12	OFF	Active if ON	Input 24	OFF	Active if ON

Digital outputs					
Name	Current Value	Mode	Name	Current Value	Mode
Output#01	OFF	Manual	Output#03	OFF	Manual
Output#02	OFF	Manual	Output#04	ON	Manual

Sensors		
Name	ID	Current Value
Temp	RS232	25.6 °C

Device name: Damocles 2404
 Web Configuration: 192.168.1.100
 Terminal Configuration (TCP Setup): Connect with Telnet to damocles-2404.htm on Port 99
 Firmware: Version: 1.2.13 (update) / MSB / 010 / XSD

For more information try <http://www.ha-arcup.com/>

Figure A.1 – Web Interface of Damocles model 2404

Use Case Description

User Administration

Use Case	: User Administration
Actor	: Administrator / Supervisor
Purpose	: Create , Modify and Delete User Accounts
Overview	: If new Employee, join to the Network Monitoring section, the system administrator creates an account in the system.
Type	: Essential
Preconditions	: Administrator / Supervisor should be logged in to the system
Post conditions	: Users are entered to the system
System Requirements	: Session should be expired if user doesn't do any action within 30 minutes
Flows of Events	<ol style="list-style-type: none">1. System administrator enters User Information(Add/Edit/Delete) to the database2. Display Messages (i.e. Warnings, Saved)
Alternative Flows of Events	IF Administrator enters invalid data , System display error message

Location Administration

Use Case	: Location Administration
-----------------	---------------------------

Actor : Administrator

Purpose : Create , Modify and Delete cable disconnection detection locations

Overview : If new unit added or modified in the Network Monitoring system, the system administrator creates a location in the system.

Type : Essential

Preconditions : Administrator should be logged in to the system

Post conditions : Locations are entered to the system

System Requirements : Session should be expired if user doesn't do any action within 30 minutes

Flows of Events



1. System administrator enters Location Information(Add/Edit/Delete) to the database

2. Display Messages (i.e. Warnings, Saved)

Alternative Flows of Events IF Administrator enters invalid data , System display error message

Generate and View Reports

Use Case : Generate and View Reports

Actor : Administrator / Supervisor

Purpose : Generates Reports (i.e : Login Details, Location Details)

Overview : Administrator / Supervisor should be able to Generate Reports

Type : Essential

Preconditions : Administrator / Supervisor should logged in to the system

Post conditions : Reports should be able to save or print

System Requirements : User must get a system response within 10 seconds

Flows of Events

1. Administrator / Supervisor enter parameters to generate reports
2. Display Reports

Alternative Flows of Events IF Administrator enters invalid data , System display error message
Else Generate the Reports



Use Case : View SNMP Trap Details

Actor : Administrator / Network Monitoring Officer

Purpose : View current SNMP Trap Details to check whether system receives SNMP traps

Overview : Administrator / Network Monitoring Officer should be able to view current SNMP Trap Details

Type : Essential

Preconditions : Users should logged in to the system

Post conditions : Will show the next SNMP trap

System Requirements : User must get a system response within 10 seconds

Flows of Events 1. User select SNMP Traps
 2. Display SNMP Trap Details

Alternative Flows of Events If network connection is not available, display the message “No Network”


Database Maintenance

Use Case : Database Maintenance

Actor : Administrator

Purpose : Maintain Database

Overview : Administrator should be able to Maintain Database (i.e.

 Restore, Backup DB), Sri Lanka.
Type : Essential

Preconditions : Administrator should logged in to the database

Post conditions : 1.Database Maintenance should independent from the system
 2. Every action done to the database should recorded in the system logs

System Requirements : System should display a unavailability message to users

Flows of Events : 1. Open Database Maintenance tool kit
 2. Restore or backup database

Alternative Flows of Events : If network connection is not available, display the message “No Network”

View Alarm Details

Use Case	: View Alarm Details
Actor	: Administrator / Network Monitoring Officer
Purpose	: View all alarm details and inform to authorized persons
Overview	: Administrator / Network Monitoring Officer should be able to view alarms location wise
Type	: Essential
Preconditions	: Users should logged in to the system
Post conditions	: Show all 28 outputs with alarm signals
System Requirements	: User must get a system response within 10 seconds



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Flows of Events

1. User select Home page if not selected and system will show all locations (nodes)
2. Select any location to view port status
3. Click on a particular port Details to view details of that port

Alternative Flows of Events If network connection is not available, display the message "No Network"

Hear Audible Alarm

Use Case	: Hear Audible Alarm
Actor	: Administrator / Network Monitoring Officer
Purpose	: To get informed that a disconnection has occurred
Overview	: Administrator / Network Monitoring Officer should be

able to hear an audible alarm for any location

Type : Essential

Preconditions : Users should be logged in to the system

Post conditions : User will check for alarm location

System Requirements : User must get a system response within 10 seconds

Flows of Events 1. Hear audible alarm if a cable got disconnected in a configured location

Alternative Flows of Events If network connection is not available, display the message "No Network"



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Use Case : Generate SNMP Traps

Actor : Cable Disconnection Detection Unit

Purpose : Detect cable disconnections and deliver SNMP traps to the network

Overview : All Cable Disconnection Detection Units will send SNMP trap messages to the central monitoring server


Type : Essential

Preconditions : Cable Disconnection Detection Unit should be installed and a loop from each trunk cable should be connected to it


Post conditions : The next SNMP trap will be sent in a predefined time

System Requirements	: Un flooded Ethernet connectivity
Flows of Events	<ol style="list-style-type: none"> 1. Scan connected trunk cables 2. Send SNMP trap
Alternative Flows of Events	If network connection is not available, the unit should still work

Send Notification Emails

Use Case	: Send Notification Emails
Actor	: Cable Disconnection Detection Unit
Purpose	: Detect cable disconnections and deliver notification emails to the network
Overview	 <p>University of Moratuwa, Sri Lanka. Electronic Theses & Dissertations www.librarian.lk</p> <p>All Cable Disconnection Detection Units will send notification emails to the SMTP server</p>
Type	: Optional
Preconditions	: Cable Disconnection Detection Unit should be installed and a loop from each trunk cable should be connected to it
Post conditions	: The next email notification will be sent when there's a change (disconnected / connected) in cable connectivity
System Requirements	: Un flooded Ethernet connectivity
Flows of Events	<ol style="list-style-type: none"> 1. Scan connected trunk cables 2. Check whether there's a change in connectivity 3. If there's a change send notification email
Alternative Flows of Events	If network connection is not available, the unit should still work

Listen to SNMP Traps

Use Case	: Listen to SNMP Traps
Actor	: SNMP Trap Listener
Purpose	: Detect to SNMP traps on the network
Overview	: All SNMP trap messages send by cable disconnection detection units should be caught by SNMP Trap Listener which is installed in the central monitoring server
Type	: Essential
Preconditions	: SNMP Trap Listener thread should be executed
Post conditions	: Should wait for the next SNMP trap
System	: Un flooded Ethernet connectivity
Requirements	
Flows of Events	 <ol style="list-style-type: none">1. Listen for SNMP traps2. Catch SNMP trap3. Send information to the system
Alternative	If network connection is not available, the unit should
Flows of Events	still work

Logout

Use Case	: Logout
Actor	: Administrator/Network Monitoring Officer/Supervisor
Purpose	: Logout from the system

Overview : Administrator/Network Monitoring Officer/Supervisor
click on Logout to logout from the system

Type : Essential

Preconditions : User must be login to the system

Post conditions : User Logout from the System

System Requirements : Un flooded Ethernet connectivity

Flows of Events

1. User click on Logout from any screen
2. System removes the user session
3. System displays the Login Screen

Alternative Flows of Events : If network connection is not available, display the message "No Network"



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Activity Diagrams

User Administration

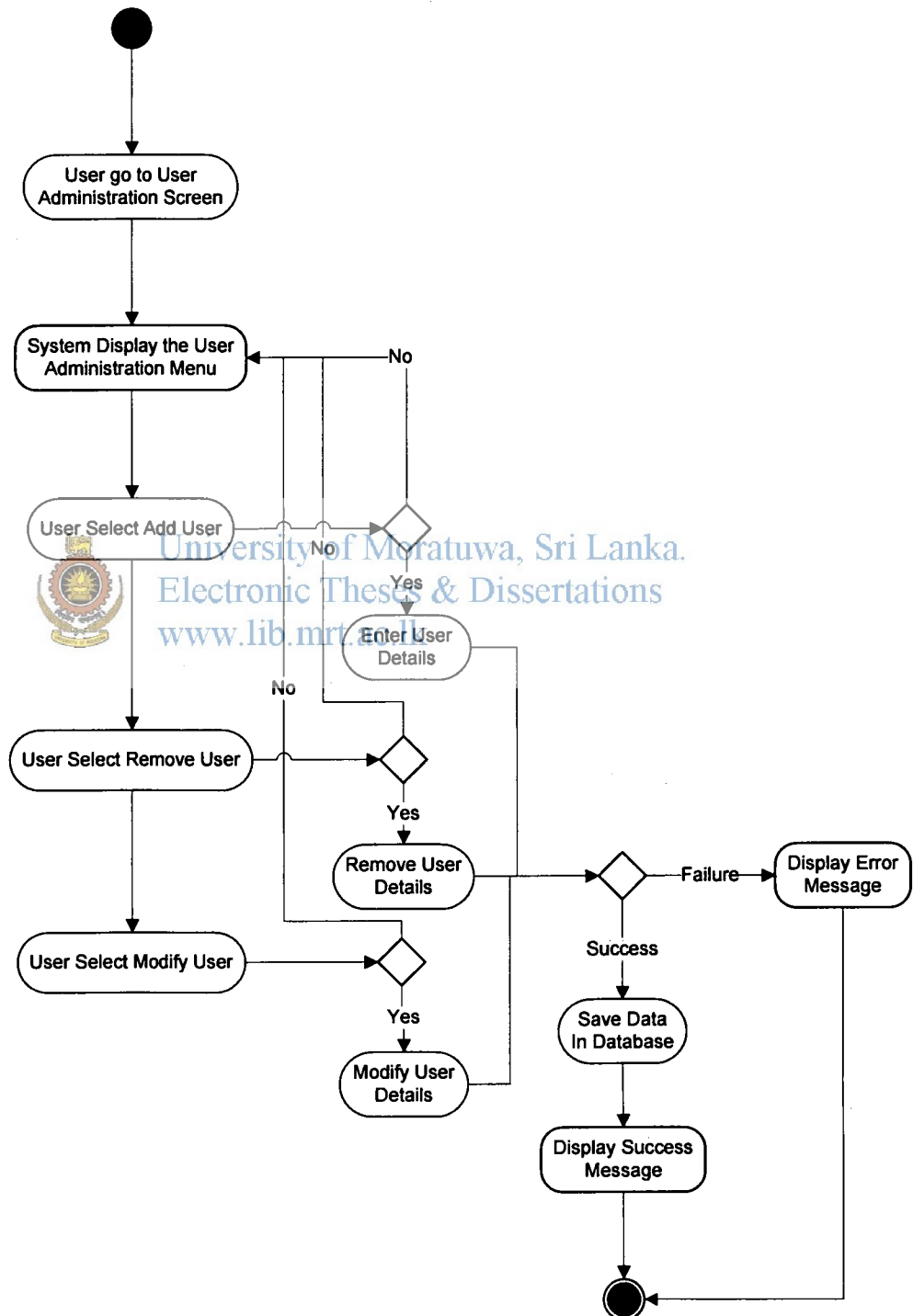


Figure C.1 - Activity Diagram for User Administration

Location Administration

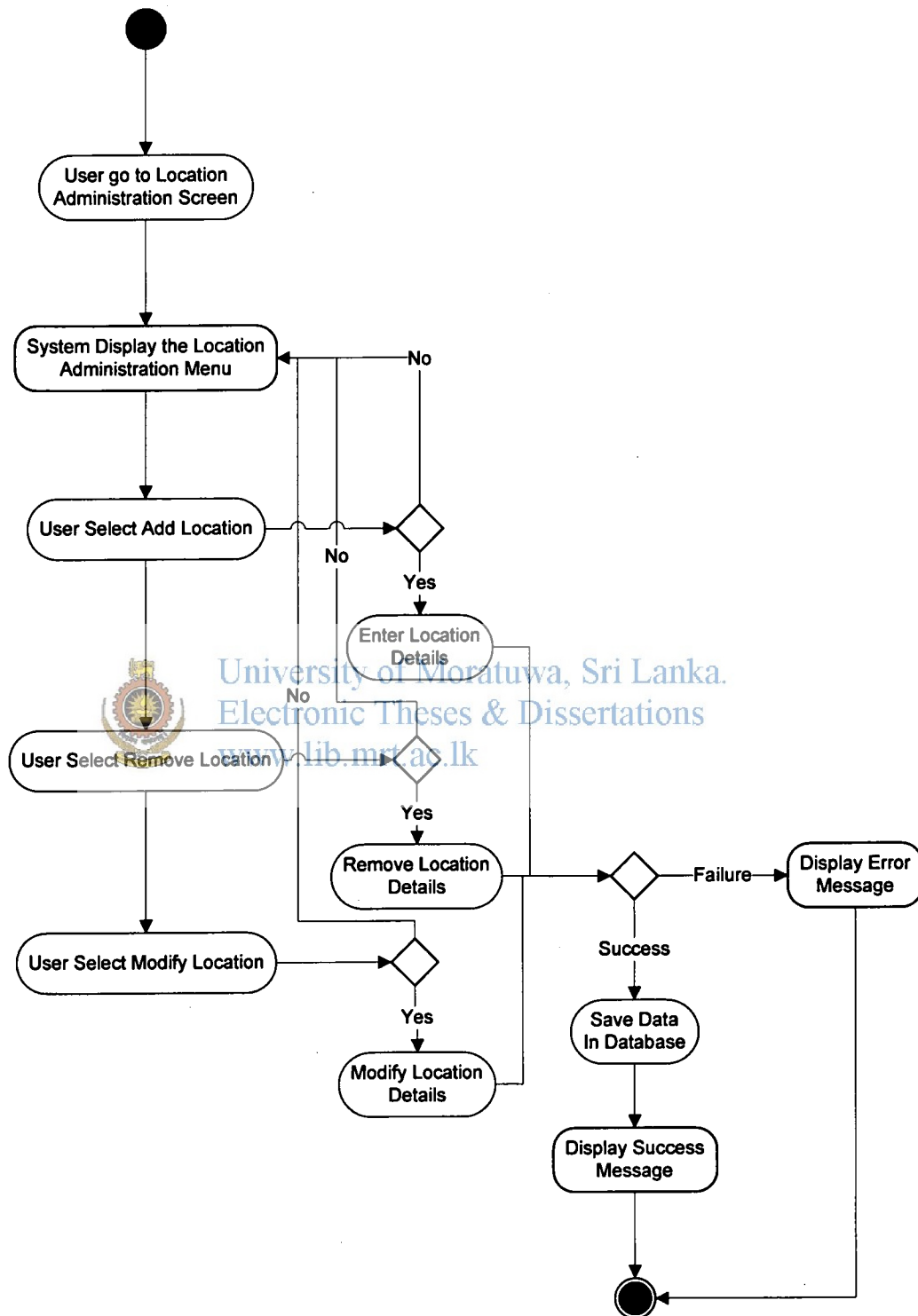


Figure C.2 - Activity Diagram for Location Administration

Generate and View Reports

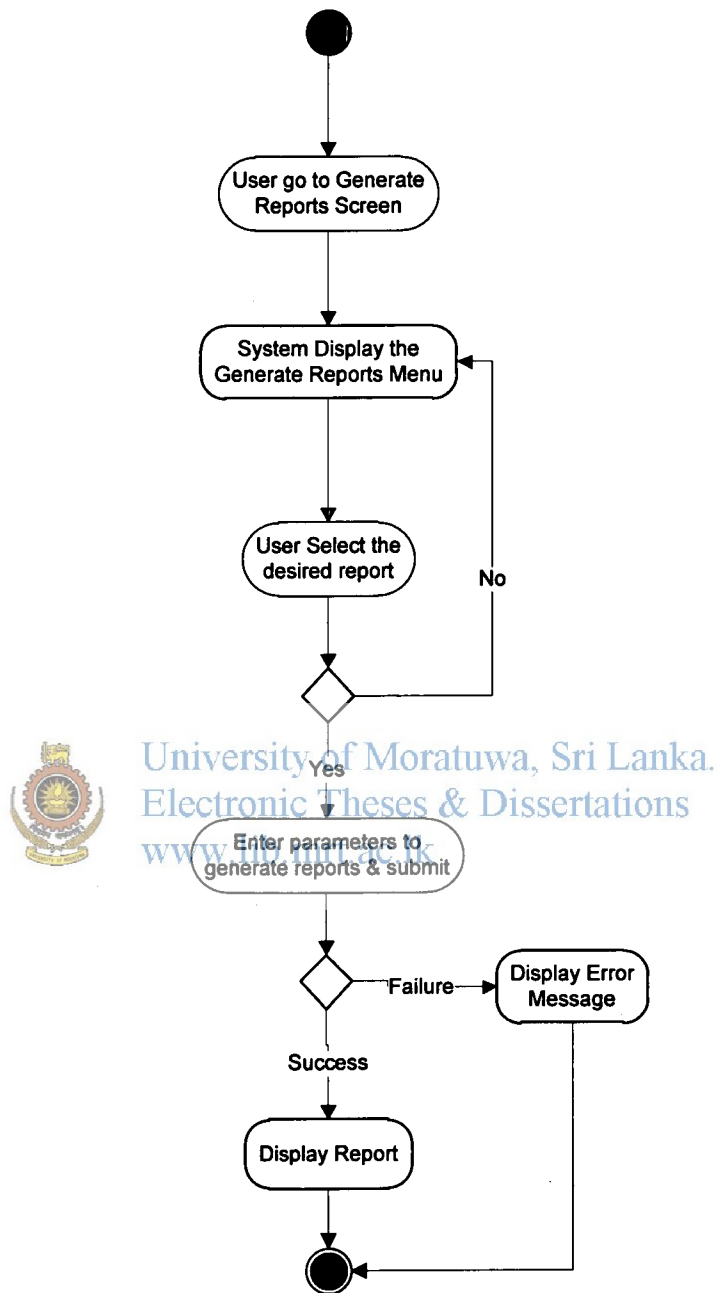


Figure C.3 - Activity Diagram for Generate and View Reports

View SNMP Trap Details

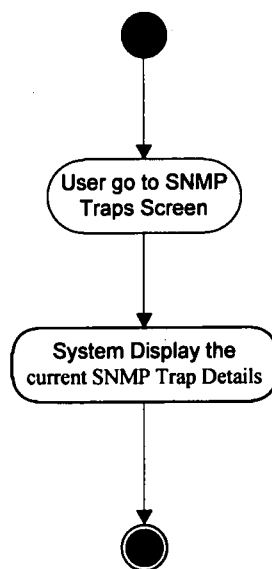


Figure C.4 - Activity Diagram for View SNMP Trap Details



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Database Maintenance

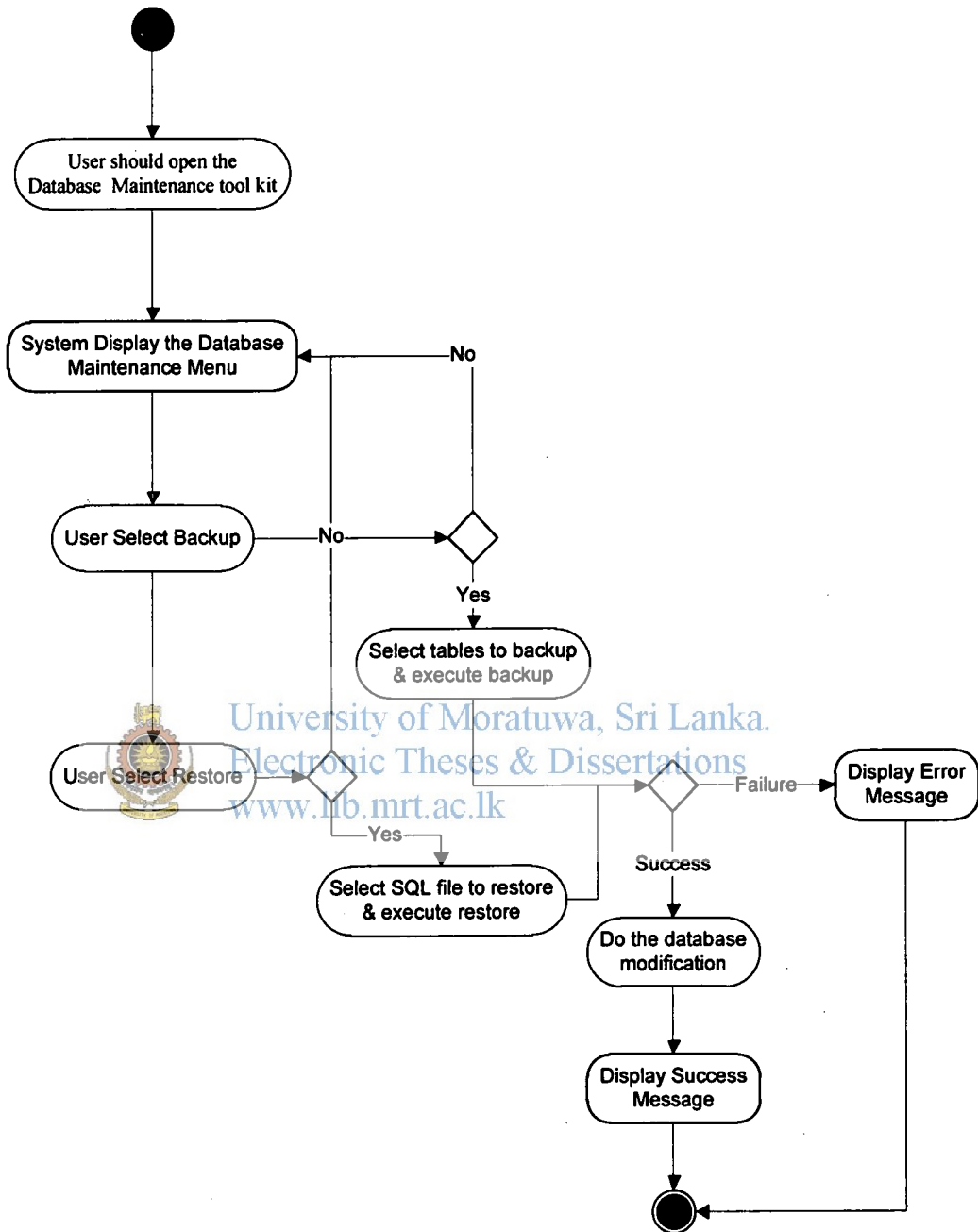


Figure C.5 - Activity Diagram for Database Maintenance

View Alarm Details

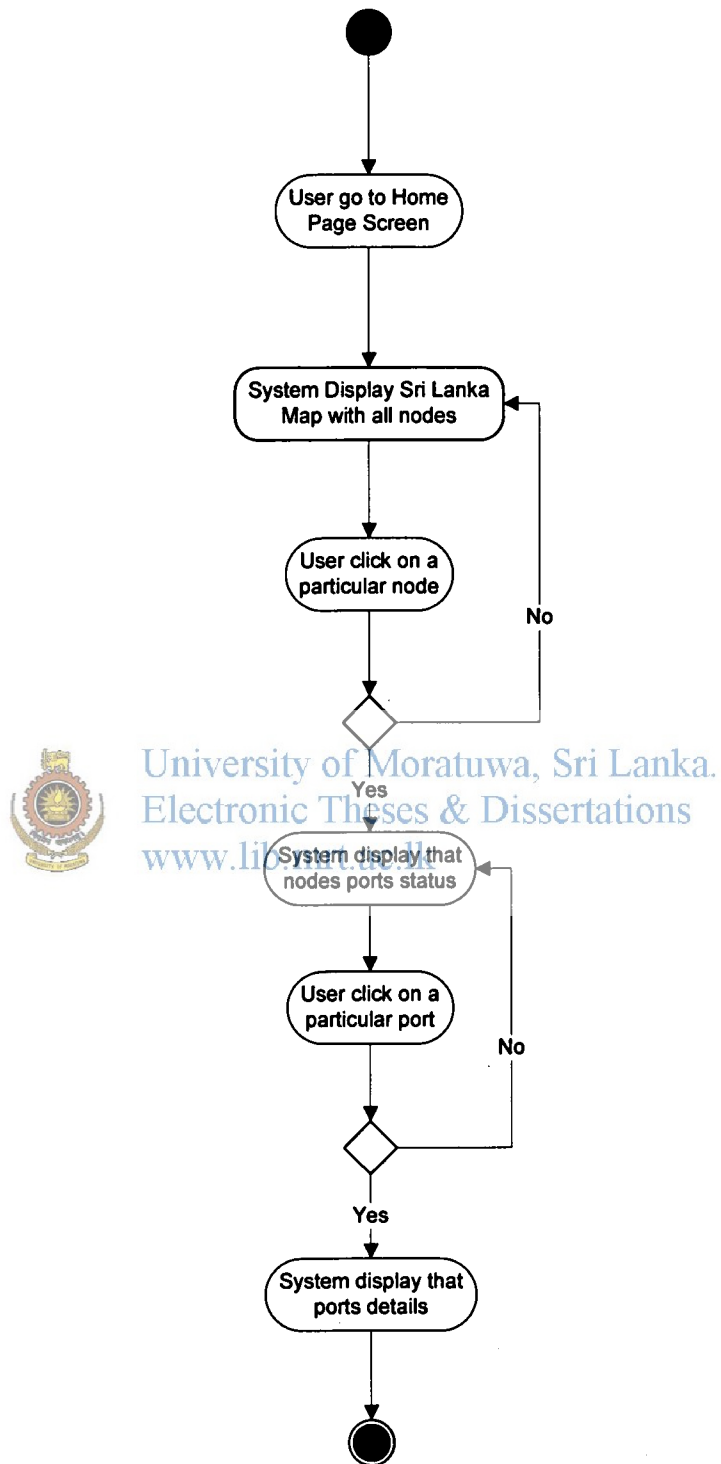


Figure C.6 - Activity Diagram for View Alarm Details

Hear Audible Alarm

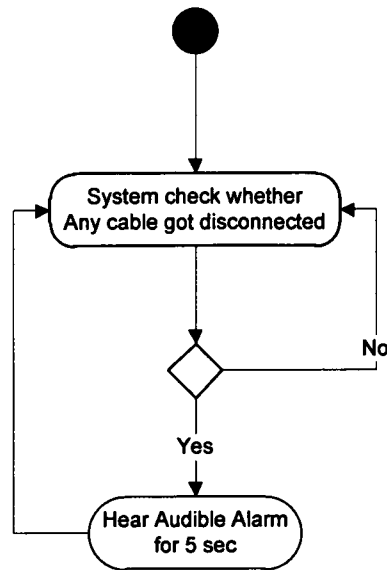


Figure C.7 - Activity Diagram for Hear Audible Alarm

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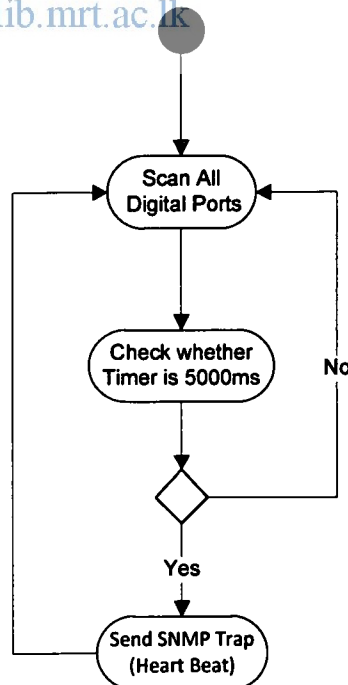


Figure C.8 - Activity Diagram for Generate SNMP Traps

Send Notification Emails

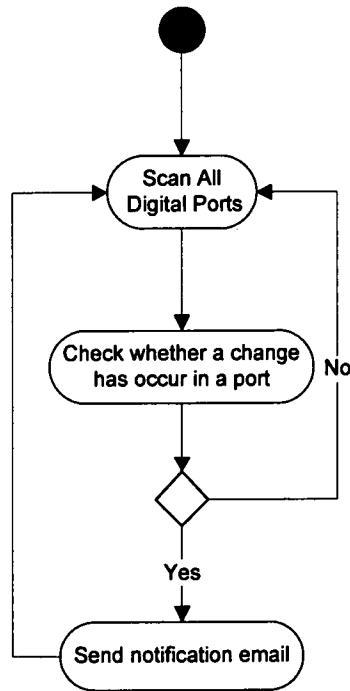


Figure C.9 - Activity Diagram for Send Notification Emails

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Listen to SNMP Traps www.lib.mrt.ac.lk

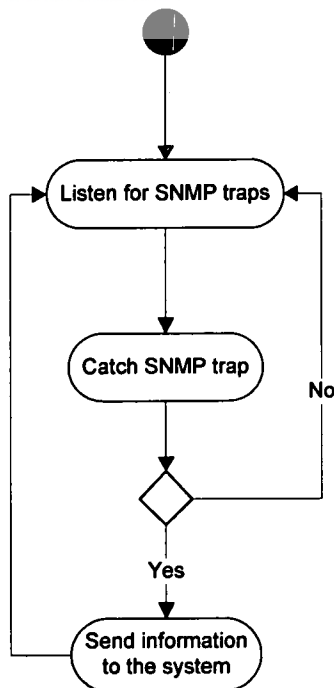
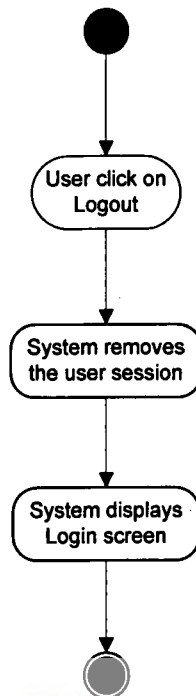


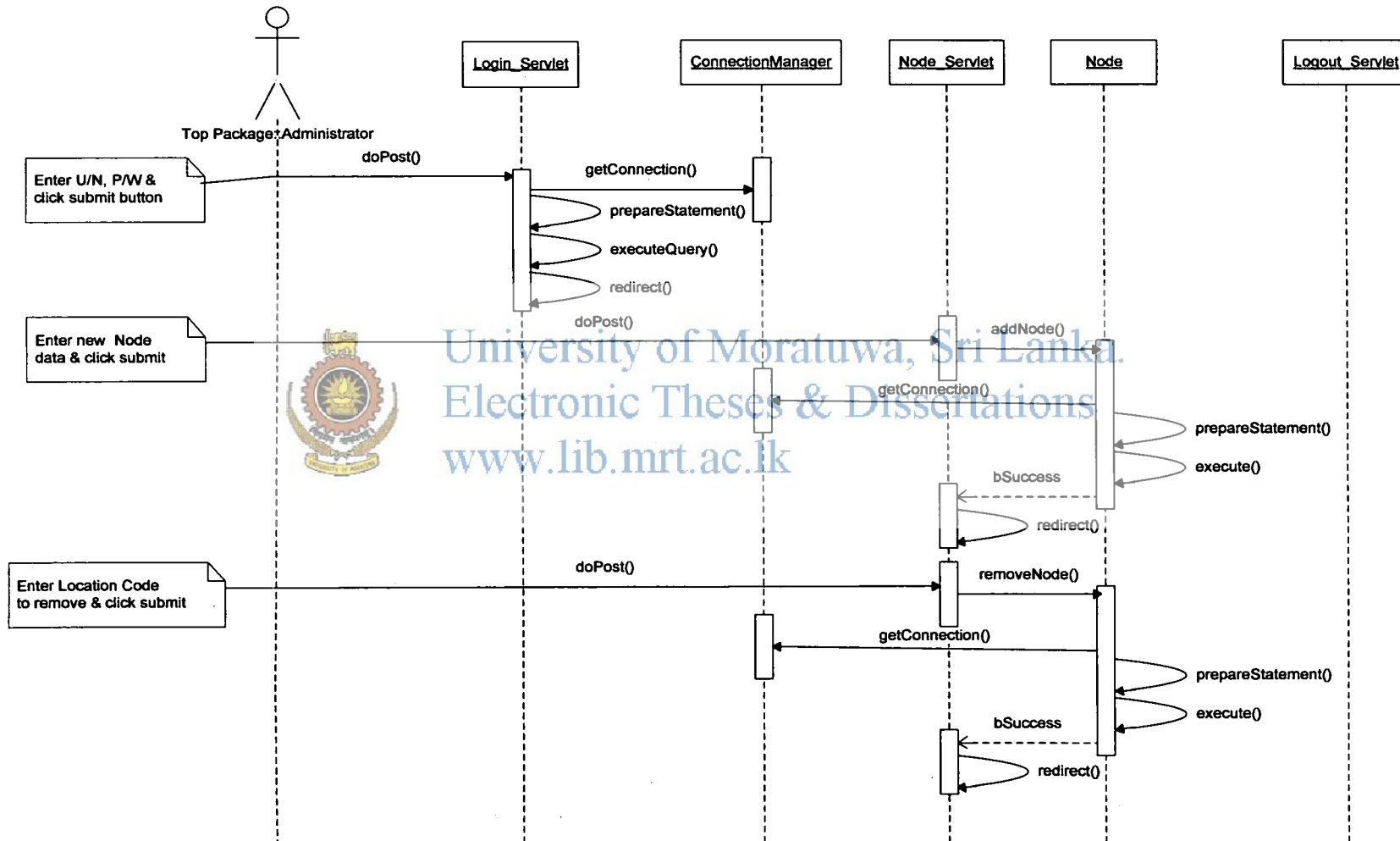
Figure C.10 - Activity Diagram for Listen to SNMP Traps

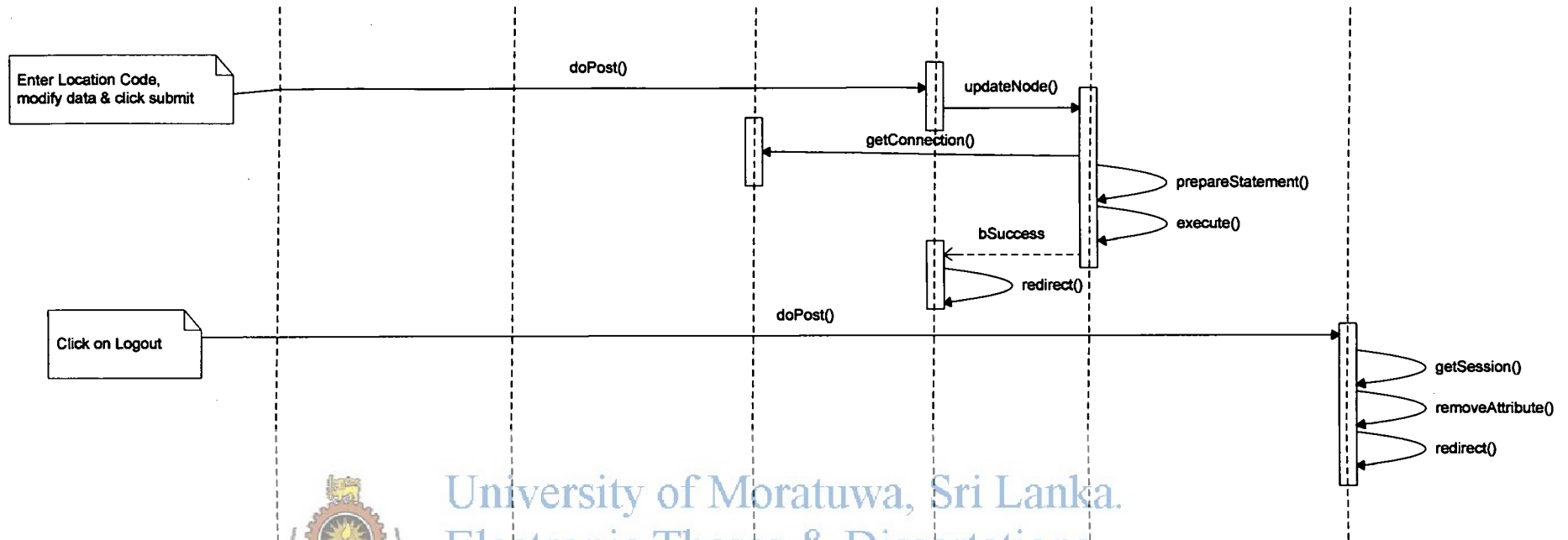
Logout



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Figure C.11 - Activity Diagram for Logout

Sequence Diagrams





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Figure D.1- Sequence Diagram for Location Administration

Detail Schematic of Circuit

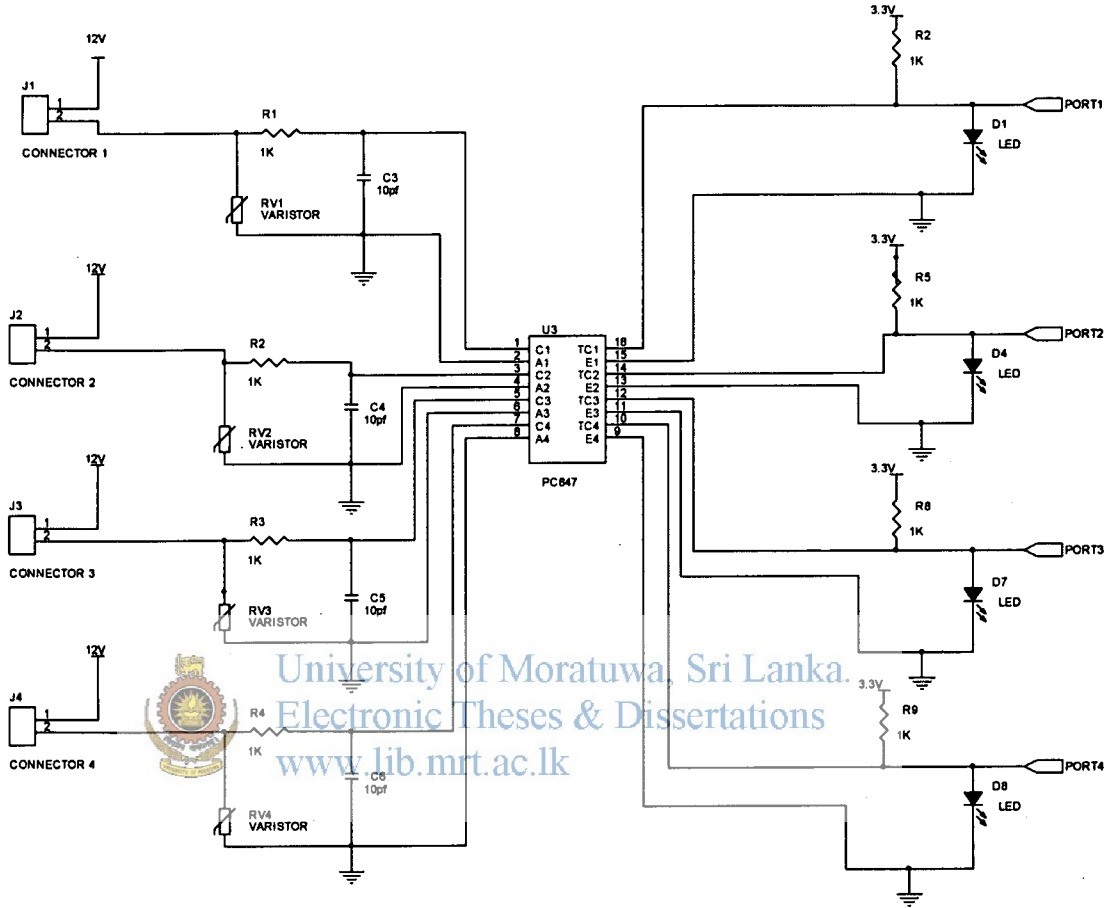


Figure E.1 - Protection, Isolation and LED Panel Circuits

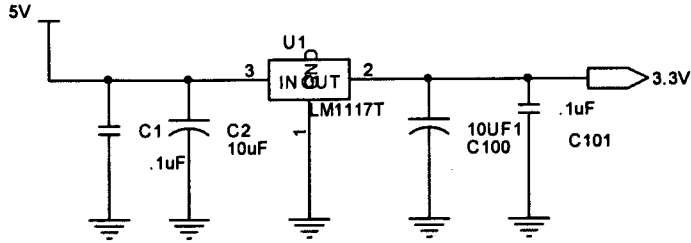


Figure E.2 - Regulator Circuit

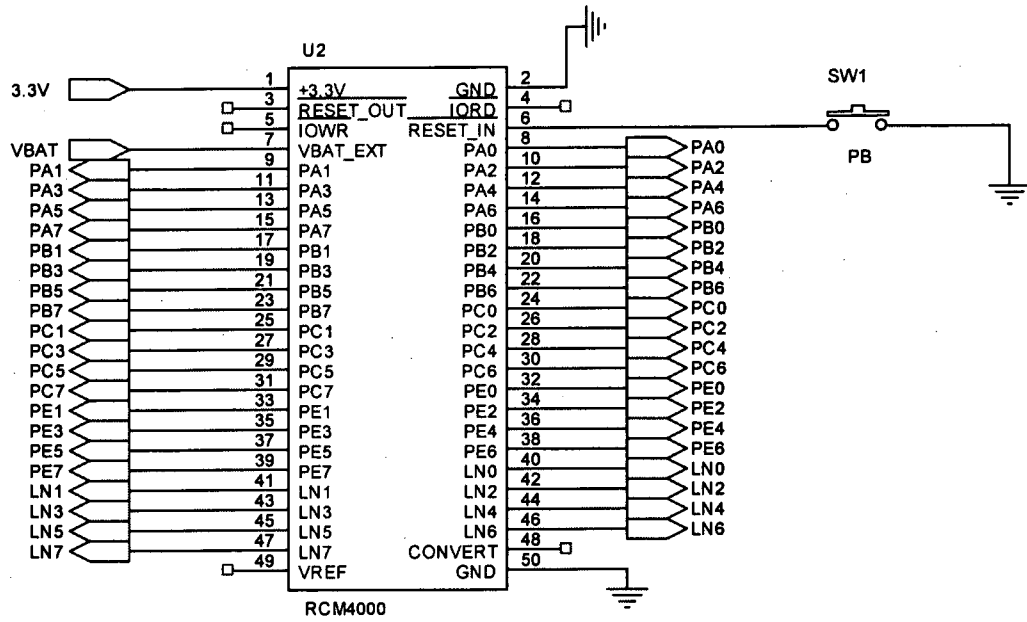


Figure E.3 - RabbitCore RCM 4010 Module

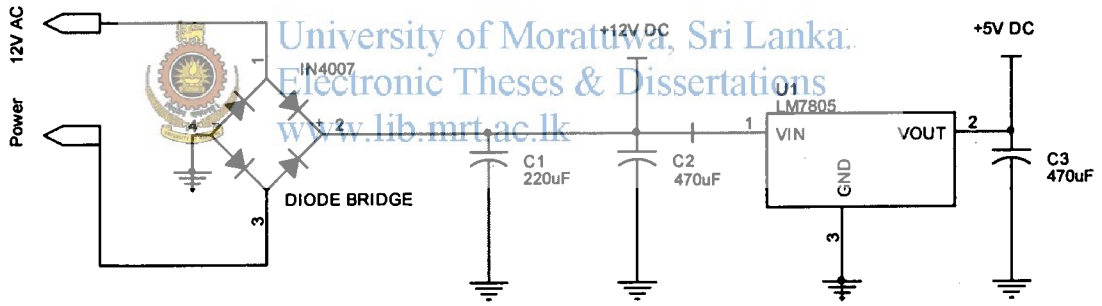
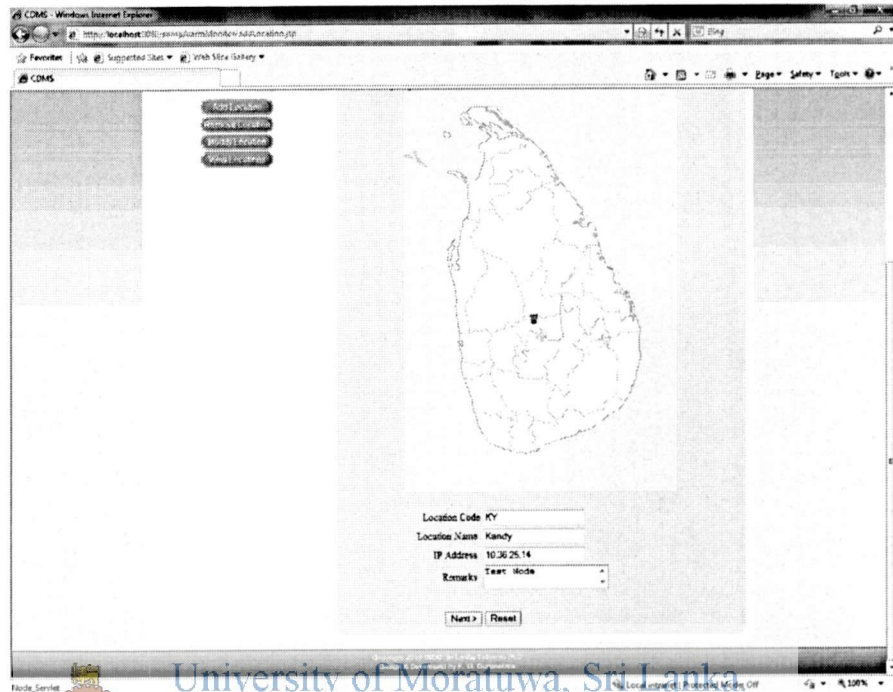


Figure E.4 - Smoothing Circuit

GUI Screens of SNMP Trap Detection Unit



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Figure F.1 - Add Location Window

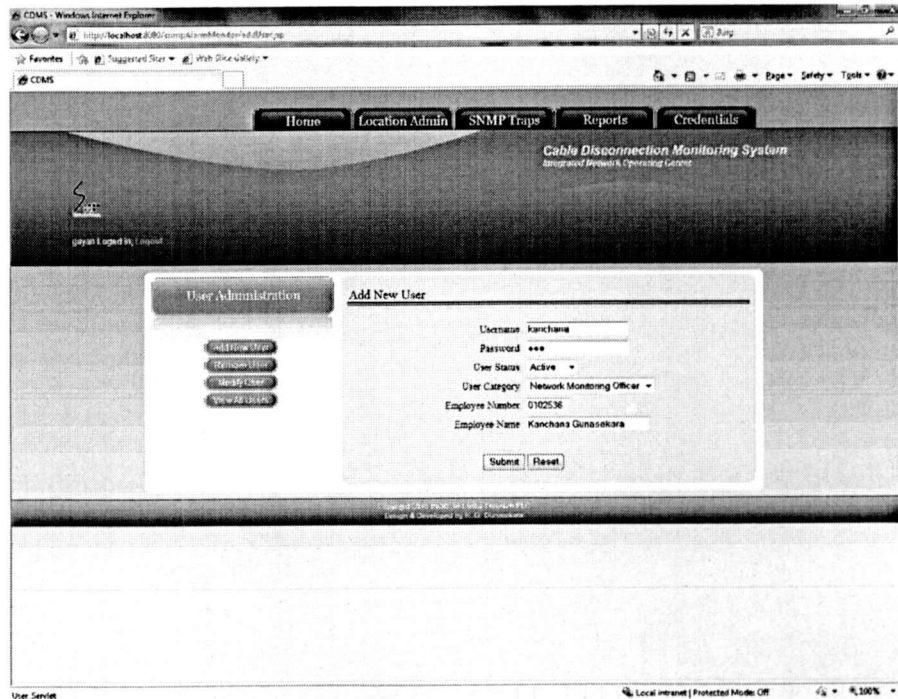


Figure F.2 - Add User Window

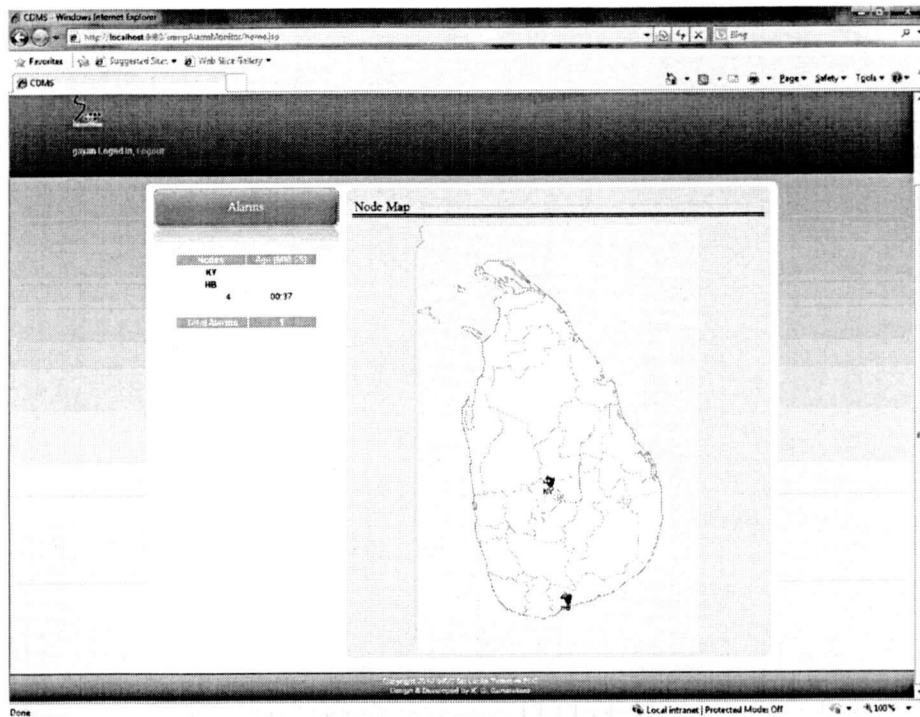


Figure F.3 - Node Monitoring Window with alarms



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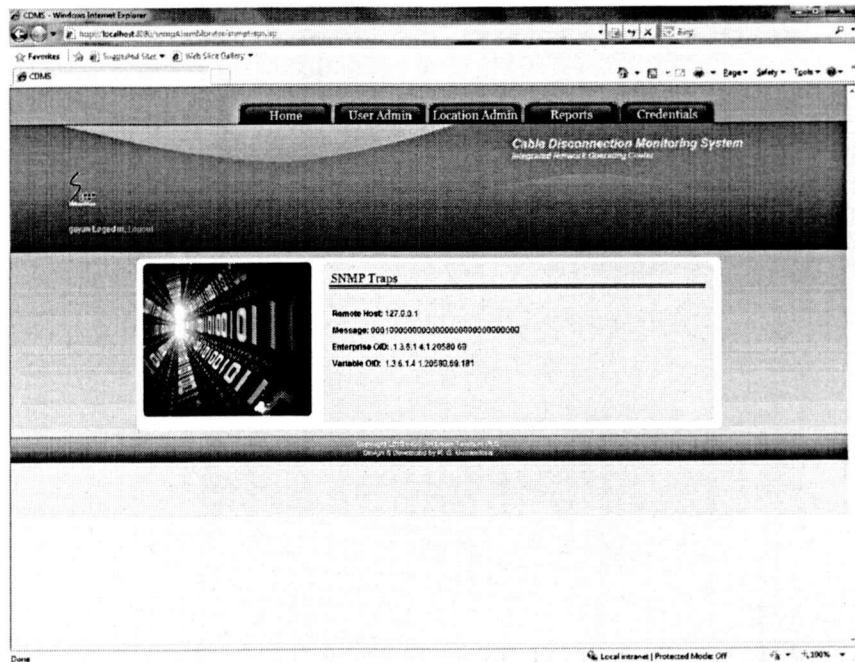


Figure F.4 - SNMP Traps Monitoring Window

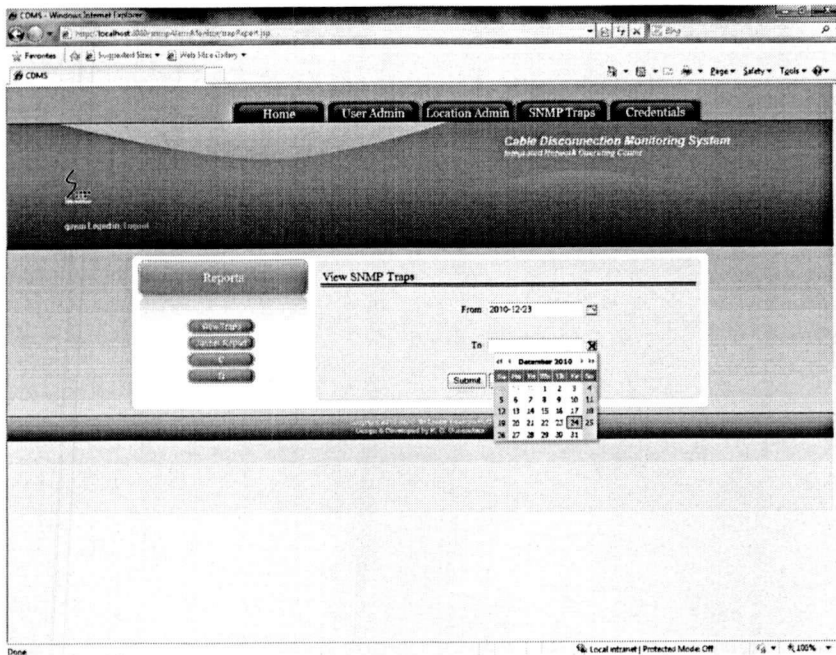


Figure F.5 – SNMP Trap Report Generating Window



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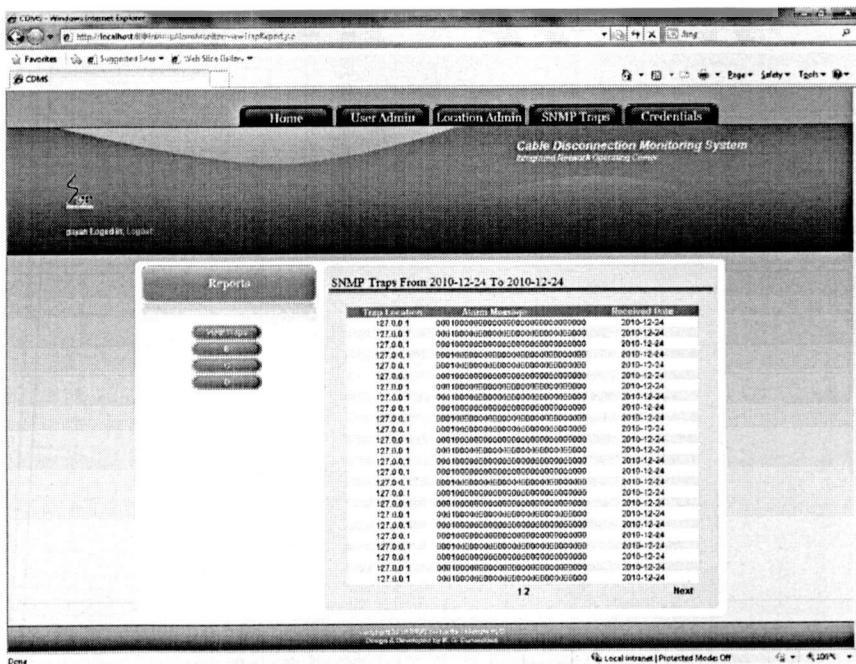


Figure F.6 - SNMP Trap Report Output Window

Class Code Listing

Class of ConnectionManager

```
package snmp.slt;

import java.sql.Connection;
import com.mysql.*;
import java.sql.*;

public class ConnectionManager
{
    public static Connection getConnection(Object objGetter)
    {
        Connection dbConnection = null;
        try
        {
            String sURL ="jdbc:mysql://localhost/alarmdb";
            String sUser ="root";
            String sPassword ="slt";

            DriverManager.registerDriver(new
com.mysql.jdbc.Driver());
            Class.forName("com.mysql.jdbc.Driver");
            dbConnection = DriverManager.getConnection(sURL,
sUser, sPassword);
            return dbConnection;
        }
        catch (SQLException e)
        {
            System.out.println("ConnectionManager.java:getConnection()
SQLException occured in opening connection");

            e.printStackTrace();
            return null;
        }
        catch (Exception e)
        {
            e.printStackTrace();
            System.out.println("trouble in DB Connection");
            return null;
        }
    }
}
```

Servlet Code Listing

Servlet of LogOut_Servlet

```
package snmp.slt;

import java.io.IOException;
import javax.servlet.ServletException;
import javax.servlet.http.HttpServletRequest;
import javax.servlet.http.HttpServletResponse;
import javax.servlet.RequestDispatcher;
import javax.servlet.ServletResponse;
import javax.servlet.http.HttpSession;
import javax.servlet.ServletRequest;

public class LogOut_Servlet extends javax.servlet.http.HttpServlet
implements javax.servlet.Servlet {
    static final long serialVersionUID = 1L;
    String username="";

    public LogOut_Servlet() {
        super();
    }

    protected void doGet(HttpServletRequest request,
        HttpServletResponse response) throws ServletException, IOException {
        // TODO Auto-generated method stub
        doPost(request, response);
    }

    protected void doPost(HttpServletRequest request,
        HttpServletResponse response) throws ServletException, IOException {

        HttpSession session = request.getSession();
        username = request.getParameter("username");
        session.removeAttribute("username");
        session.removeAttribute("uarea");
        session.removeAttribute("ucat");
        session.removeAttribute("checkuser");

        redirect("/login.jsp", request, response);
    }

    private void redirect(String sTarget, ServletRequest req,
        ServletResponse res) throws ServletException ,IOException
    {

        RequestDispatcher dispatcher =
        getServletContext().getRequestDispatcher(sTarget);
        dispatcher.forward(req, res);
    }
}
```

Appendix I

Questionnaire for SNMP Trap Detection Unit

Evaluation Criteria For The SNMP Trap Detection Unit

General instructions:

You may circle the appropriate number appear in cages to represent your choice.

1	2	3	4	5
Unsatisfactory	Poor	Satisfactory	Good	Outstanding

Skip question/s if not applicable.

1. Information in the SNMP Trap Detection Unit

- a. Provide meaningful names for menu items & for prompts.

1	2	3	4	5
---	---	---	---	---
- b. Can understand easily and therefore act easily.

1	2	3	4	5
---	---	---	---	---
- c. The language use is nondiscriminatory.

1	2	3	4	5
---	---	---	---	---
- d. The content and prompts are free from spelling and grammatical errors.

1	2	3	4	5
---	---	---	---	---
- e. Information given in the System confusing the operator.

1	2	3	4	5
---	---	---	---	---
- f. Information is in proper order.

1	2	3	4	5
---	---	---	---	---
- g. Information given in non-technical understandable Language without technical jargon

1	2	3	4	5
---	---	---	---	---
- h. Information given in the error messages are sufficient

1	2	3	4	5
---	---	---	---	---

2. User Satisfaction on Interfaces

Please circle the appropriate number against each question

- a. Reading of letters on menus and prompts. Hard

1	2	3	4	5
---	---	---	---	---

 easy
- b. Organization of menu items and wordings used. confusing

1	2	3	4	5
---	---	---	---	---

 Very clear

- c. Sequence of pages are simply flows. confusing

1	2	3	4	5
---	---	---	---	---

 Very clear
- d. Use of terminology in the system. Too much

1	2	3	4	5
---	---	---	---	---

 easy
- e. Design of a page contains minimum screen elements. hard

1	2	3	4	5
---	---	---	---	---

 easy
- f. Position of messages on screen is easy to view. Poor

1	2	3	4	5
---	---	---	---	---

 Excellent
- g. Color choices visually accessible and pleasant to see. Poor

1	2	3	4	5
---	---	---	---	---

 Excellent
- h. The system achieves its purpose. Poor

1	2	3	4	5
---	---	---	---	---

 Excellent

3. Usability / Operability of the Module

You may circle the appropriate number appear in cages to represent your choice.

	www.lib.mrt.ac.lk	3	4	5
Unsatisfactory	Poor	Satisfactory	Good	Outstanding

- a. The layout and the design of the system does not make operator dull.

1	2	3	4	5
---	---	---	---	---
- b. If any mistake happens, proper guidelines are given to get rid of the problem.

1	2	3	4	5
---	---	---	---	---
- c. The organization is clear, logical, and effective, making it easy and simple for the operator to understand.

1	2	3	4	5
---	---	---	---	---
- d. It is not necessary to obtain technical support to use this system.

1	2	3	4	5
---	---	---	---	---
- e. The system is attractive and interesting.

1	2	3	4	5
---	---	---	---	---
- f. Provide more recognitions than recall.

1	2	3	4	5
---	---	---	---	---
- g. Operator can easily start and exit the program.

1	2	3	4	5
---	---	---	---	---
- h. The individual has the choice of going directly to desired

1	2	3	4	5
---	---	---	---	---

Menu item.

- i. Feel very confident when using the site.

1	2	3	4	5
---	---	---	---	---
- j. Do not need to get to know lot about the system before it could effectively use it.

1	2	3	4	5
---	---	---	---	---
- k. Site can be used without written instructions

1	2	3	4	5
---	---	---	---	---
- l. It is user friendly

1	2	3	4	5
---	---	---	---	---

4. Ease of Learning

Please circle the appropriate number against each question

- a. Can learn to operate the system quickly. difficult

1	2	3	4	5
---	---	---	---	---

 easy
- b. Can easily remember how to use the system next time. difficult

1	2	3	4	5
---	---	---	---	---

 easy
- c. It is easy to remember menu item names. difficult

1	2	3	4	5
---	---	---	---	---

 easy
- d. Tasks can be performed in a straight-forward manner. never

1	2	3	4	5
---	---	---	---	---

 always
- e. Help messages on the screen. unhelpful

1	2	3	4	5
---	---	---	---	---

 helpful
- f. Error messages are meaningful confusing

1	2	3	4	5
---	---	---	---	---

 clear

5. Overall impression on the SNMP Trap Detection Unit

Please circle the appropriate number against each question, using the scale given below

1	2	3	4	5
Unsatisfactory	Poor	Satisfactory	Good	Outstanding

- a. User friendliness.

1	2	3	4	5
---	---	---	---	---

- b. Simplicity of the usage.

1	2	3	4	5
---	---	---	---	---
- c. Security is in acceptable level

1	2	3	4	5
---	---	---	---	---
- d. Provide conceptual consistence.

1	2	3	4	5
---	---	---	---	---
- e. System is easy to learn and the information provided is meaningful & helpful.

1	2	3	4	5
---	---	---	---	---
- f. Time taken for each processing is acceptable.

1	2	3	4	5
---	---	---	---	---
- g. In general system is 'Alright'.

1	2	3	4	5
---	---	---	---	---



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Appendix J

Questionnaire for Cable Fault Detection Unit

Evaluation Criteria For The Cable Fault Detection Unit

General instructions:

You may circle the appropriate number appear in cages to represent your choice.

1	2	3	4	5
Unsatisfactory	Poor	Satisfactory	Good	Outstanding

Skip question/s if not applicable.

6. Information in the Cable Fault Detection Unit

a. Provide meaningful names for connectors, etc.

1	2	3	4	5
---	---	---	---	---

b. Can understand easily and therefore act easily.

1	2	3	4	5
---	---	---	---	---

c. The language use is nondiscriminatory.

1	2	3	4	5
---	---	---	---	---



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7. Usability / Operability of the Cable Fault Detection Unit

You may circle the appropriate number appear in cages to represent your choice.

1	2	3	4	5
Unsatisfactory	Poor	Satisfactory	Good	Outstanding

m. The design of the system is portable enough to carry anywhere.

1	2	3	4	5
---	---	---	---	---

n. The unit is not that heavy and can handle easily.

1	2	3	4	5
---	---	---	---	---

o. The organization is clear, logical, and effective, making it easy and simple for the operator to understand.

1	2	3	4	5
---	---	---	---	---

p. Provide more recognitions than recall.

1	2	3	4	5
---	---	---	---	---

q. Operator can easily ON and OFF the unit.

1	2	3	4	5
---	---	---	---	---

r. Feel very confident when using the unit.

1	2	3	4	5
---	---	---	---	---

- s. Do not need to get to know lot about the unit before it could effectively use it.

1	2	3	4	5
---	---	---	---	---
- t. Unit can be used without written instructions

1	2	3	4	5
---	---	---	---	---

8. Ease of Learning

Please circle the appropriate number against each question

- g. Can learn to operate the unit quickly. difficult

1	2	3	4	5
---	---	---	---	---

 easy
- h. Can easily remember how to use the unit next time. difficult

1	2	3	4	5
---	---	---	---	---

 easy
- i. Tasks can be performed in a straight-forward manner. never

1	2	3	4	5
---	---	---	---	---

 always



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9. Overall impression on the Cable Fault Detection Unit

Please circle the appropriate number against each question, using the scale given below

1	2	3	4	5
Unsatisfactory	Poor	Satisfactory	Good	Outstanding

- h. User friendliness.

1	2	3	4	5
---	---	---	---	---
- i. Simplicity of the usage.

1	2	3	4	5
---	---	---	---	---
- j. System is easy to learn and the information provided is meaningful & helpful.

1	2	3	4	5
---	---	---	---	---
- k. Time taken for each processing is acceptable.

1	2	3	4	5
---	---	---	---	---
- l. In general system is 'Alright'.

1	2	3	4	5
---	---	---	---	---

