

## ANNEX A TO SCHEDULE 2

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## **SECTION 1 – INTERCONNECT TESTING**

### **1. TESTING PRINCIPLES**

- 1.1 The purpose of the Interconnect Testing is to provide reassurance that the Operator Network can inter-work correctly with the PTCL Network and that the Interconnection will not adversely affect the existing services provided by PTCL to PTCL customers.
- 1.2 Interconnection to PTCL's Network shall be carried out and provision of Services under this Interconnection Agreement provided only after the satisfactory completion of the Interconnect Testing under this **Annex A** and after PTCL is satisfied with the Interconnect Testing results in accordance with this Schedule.

### **2. PRE-REQUISITES FOR INTERCONNECT TESTING**

- 2.1 Prior to the conduct of Interconnect Testing, the Operator shall fully test its Network to ensure that it conforms to the Interface Specification as specified in **Section 1** of **Annex A**. Any defects in hardware or software of the Operator Network so discovered must be corrected before the commencement of Interconnect Testing.

### **3. TESTING ITEMS**

- 3.1 Interconnect Testing shall be carried out in accordance with PTCL's testing manuals. The Operator shall perform Interconnect Testing in accordance with this Annex or as otherwise mutually agreed with PTCL, where:
  - (a) initial Interconnection is to occur; or
  - (b) a new POI is to be established; or
  - (c) the Parties have agreed to implement a Network Alteration.

### **4. TIMELINE FOR TESTING**

- 4.1 The Operator shall book the required test date and the testing duration at least one (1) month prior to the requested testing date. The Operator shall submit the request to PTCL for Interconnect Testing. The request shall contain the necessary details for the testing setup as well as the proposed test schedule.
- 4.2 PTCL shall respond in writing within ten (10) Business Days upon receipt of the written request on whether PTCL is able to accommodate the testing on the proposed test dates. If PTCL is not able to perform the testing on the requested test dates, PTCL shall counter-propose an alternative test schedule with the response and negotiate in good faith with the Operator to arrange an alternative schedule.

- 4.3 The Parties shall act in good faith and make reasonable endeavours to complete all test items within the estimated testing period.
- 4.4 The requested testing duration is subject to mutual agreement by the Parties.
- 4.5 Any request for extension to the testing duration beyond the agreed time frame by the Operator is subject to mutual agreement by both Parties. The Operator shall make its request for extension at least two (2) Business Days prior to the end of the testing duration.
- 4.6 PTCL shall not be liable to the Operator for any delay in completing all the test items unless such delay is directly attributable to the neglect or fault of PTCL.

## **5. DAILY TIME TABLE FOR INTERCONNECT TESTING**

- 5.1 All Interconnect Testing shall be carried out during Business Days between 0900 hours and 1700 hours, with one (1) hour lunch break in between.

## **6. TESTING RESULTS**

- 6.1 Connection of the Operator Network to PTCL's designated IGS shall be carried out only upon satisfactory completion of the Interconnect Testing in accordance with PTCL's interconnect manuals and after the test Interconnected Calls are successfully conveyed between the PTCL Network and the Operator Network.
- 6.2 In the event that a Party identifies a Critical Problem(s) attributable to the other Party's Network, the other Party shall ensure that such problems are resolved within the testing period. Otherwise, the other Party shall make booking for a new testing date to verify these Critical Problem(s) when solutions are available. "**Critical Problem**" refers to a problem affecting the conveyance of Interconnected Calls between PTCL's Network and the Operator Network including, but not limited to, problems that result from deviations by a Party from the specifications that it provided to the other Party.

## **7. CHARGES FOR INTERCONNECT TESTING**

- 7.1 PTCL shall provide engineering support for the Interconnection Testing and the eventual connection of Operator Network to PTCL Network without any charge on reciprocal basis.
- 7.2 Neither Party shall charge the Other Party for the Calls made during Interconnection testing.

## **8. CANCELLATION AND DELAY IN TESTING**

- 8.1 The Parties shall adhere to the testing date and testing duration as mutually agreed.
- 8.2 Any request for cancellation of Interconnect Testing shall be made in writing to PTCL and the Operator shall pay PTCL the cancellation charges in accordance with **Schedule 11**.
- 8.3 In the event that Interconnect Testing is completed or is terminated by the Operator before the last day of the testing duration, the Operator shall pay PTCL the charges for the testing duration up to and including the day on which testing was completed or terminated and such other reasonable costs as may be incurred by PTCL as a result of early termination of the interconnect Testing.

## **SECTION 2 – OPERATIONAL PROCEDURES**

### **1. INTRODUCTION**

- 1.1 This Annex provides the operations and maintenance procedures to be carried out by the Parties to maintain satisfactory connection to each other's Network. It generally provides the fault handling procedures related to the Network. Procedures for carrying out planned engineering works, testing and monitoring are also described in this Section.

### **2. FAULT HANDLING PROCEDURES**

#### **2.1 General**

- (a) Prior to activating the fault handling procedures, the Party reporting the fault ("**Reporting Party**") must reasonably establish that a genuine fault exists and also that every effort has been made to prove that the fault is not within the reporting Party's side of the POI.
- (b) Faults related to the Operator's own Local Leased Circuits is the responsibility of the Operator. However, PTCL shall be responsible for the faults of Local Leased Circuit that it provides to the Operator. It is the responsibility of each Party to ensure that the fault does not lie on its side of the POI, including a fault relating to the Interconnection Link before reporting the fault to the other Party under this Interconnection Agreement.
- (c) Each Party shall maintain its own fault reporting centre which shall be responsible for handling the faults between Networks, coordinating the fault clearance (including escalations) within its own Network and subsequently reporting the clearance of the fault to the other Party. **Appendices 1 and 2** contain details of both Parties' fault reporting centres.

- (d) Both Parties shall co-operate in any investigation and follow up actions and keep each other informed on the status of the progress of the fault clearance in a timely manner.
- (e) Each Party shall establish twenty-four (24) hour contact points for fault reporting at its nominated fault reporting centre. **Appendices 1 and 2** contain information on the contact points of the Parties for such purpose.

## 2.2 Type Of Faults

- (a) Faults reported may be classified as follows:
  - (i) Signaling Link faults; and
  - (ii) Gateway Switch Network faults.
- (b) **Signaling Link Faults.** All Signaling Links provided by PTCL shall be supervised closely by the Operator and any fault shall be reported to the reporting centre of PTCL as soon as possible.
- (c) **Gateway Switch Network Faults.** Faults related to the IGS or Operator Network shall be referred to the related IGS Switch during office hours, or NMC during After Office Hours.

## 2.3 Interconnect Fault Status

- (a) When a Party reports a fault to the other Party, they shall agree on the classification of the fault reported, i.e. whether it is service affecting or non-service affecting. They will also exercise their judgment and discretion and agree upon whether a nonservice affecting fault could eventually develop into a service affecting fault.
- (b) Service affecting fault(s) may cause service interruption to the Customers when Interconnected Calls conveyed between the Networks encounter great difficulty in completion. Failure of more than one-third of the Interconnect Links, breakdown of major cable plant, loss of SS7 Signaling Linkset which are all likely to result in various degrees of service interruption shall be included in the classification of service affecting fault(s).
- (c) Non-service affecting fault(s) are those that do not adversely affect the Call handling capability of the Network to complete the Interconnected Calls. Failure of less than one-third of the Interconnect Links or the loss of SS7 Signaling Links (not affecting the Signaling Linkset) shall be included in the classification of non-service affecting fault(s) unless otherwise agreed by both Parties to upgrade it to service affecting fault(s).

## 2.4 Handling Of Faults

- (a) Interconnect Link faults (excluding SS7 Signaling Link faults)
  - (i) Faults due to optical fibre breakdown, SDH equipment failure or other related equipment in the IGS that causes the unavailability of an Interconnect Link that does not carry an SS7 Signaling Link, shall constitute an Interconnect Link fault.
  - (ii) Interconnect Link faults that affect less than one-third of the working capacity of the relevant Interconnect Link shall be included in the classification of non-service affecting fault(s). Interconnect Link faults that affect one-third or more of the working capacity of the relevant Interconnect Link shall be included in the classification of service affecting fault(s).
- (b) **Signaling Link Faults.** All Signaling Links provided by the Party shall be supervised closely by the Party and any fault shall be reported to the reporting centre of the other Party as soon as possible. Signaling Link failures that do not affect the operation of the signaling linkset shall be considered as non-service affecting. Signaling linkset failure shall be considered as service affecting.
- (c) **IGS Network Faults** Faults related to the IGS equipment may have an effect on the conveyance of Interconnected Calls between the Networks. If such IGS fault cannot be cleared by normal fault clearance procedures by the Party/Parties concerned, then it will be reported to the higher level following the fault escalation procedure.

### 3. TARGET RESPONSE TIMES

- 3.1 The target response time for attendance to an alarm or reported fault will depend on the time of its occurrence and shall be mutually agreed by the Parties. "Office Hours" is defined as 8am to 5pm for Mondays to Fridays (except Public Holidays). The whole of Saturday, Sunday and any Public Holiday and the hours outside the Office Hours are referred to as "After Office Hours".

### 4. FAULT ESCALATION

#### 4.1 Procedure

- (a) Where a fault persists and the Parties agree that progress of the remedy is not satisfactory, the fault may be escalated according to the fault escalation timescales and escalation reporting levels as outlined in clauses 4.2 and 4.3 herein respectively.
- (b) The Parties shall immediately inform the first level of escalation within the respective Party's organization at the same time when the Party which detected the fault notifies the fault reporting point of the Party for action.

- (c) The Parties shall maintain the communication links at the affected site(s) and report on the progress of the restoration work.

#### **4.2 Fault Escalation Timescales**

- (a) The Parties shall use the following timescales as guidelines for the fault escalation process. The timescales shall be used in deciding whether the restoration of a fault is being progressing satisfactorily. If the escalation time has expired and both Parties are satisfied with the progress of the fault restoration, no immediate escalation is necessary.

#### **4.3 Escalation Reporting Procedures**

- (a) Appendice 3 sets forth PTCL's standard operating procedures for fault reporting.

#### **4.4 Persistent or Repeated Faults**

- (a) Persistent or repeated faults or issues which cannot be resolved satisfactorily through the normal channels of the Parties shall be escalated to the Second Level to expedite the fault clearance process.

#### **4.5 Escalation Problems**

- (a) The Parties shall notify their respective and appropriate officers for problems encountered in the implementation or execution of the fault escalation procedures.

### **5. MAJOR SERVICE INTERRUPTION (MSI)**

#### **5.1 General**

- (a) Major service interruption (MSI) is defined as a fault or problem which results in the inability of the available circuits on an interconnect route and has a major impact on the service offered to either Party's Customers. MSI is therefore classified as service affecting. Examples of MSI are as follows:
  - (i) an extensive line plant failure.
  - (ii) a major failure of SDH system terminating at the Interconnect Links.
  - (iii) total loss of the signaling and/or synchronization of the Interconnect Links.

#### **5.2 Procedures**



- (a) The Party encountering an MSI shall notify the other Party through fax, phone Call or other means providing real-time communication between the Parties. This should take place within thirty (30) minutes of the MSI becoming known to the Party.
- (b) Direct communication links shall be established between the Parties' interconnect fault reporting centres (set up as per clause **2.1(c)** above). The communication links shall facilitate the effective exchange of information and progress reports. Communication liaison officers shall be appointed to maintain and man the communication links.
- (c) The Party responsible for clearing the MSI shall provide to the other Party regular updates of the progress through the communication links established according to clause **5.2(b)** above.
- (d) The Party responsible for clearing the MSI fault shall inform the other Party through the communication links within thirty (30) minutes upon clearance of the MSI fault.

## **6. PLANNED ENGINEERING WORKS**

- 6.1 For any planned engineering works within a Party's Network, which will result in momentary outage of service of the Local Leased Circuit, SS7 Signaling Links, or Gateway Exchange, that Party shall inform the other Party by fax through the contact points as given in **Appendices 1 and 2**.
- 6.2 The details of the works to be carried out shall be recorded on an "Advice of Planned Engineering Work" form (**Advice form**). The Advice form shall state the date, time and duration of such works, the impact to the conveyance of Calls between the Parties' Network, any Network management procedures required, and any contingency measures to be taken by either Party or both Parties. The schedule and duration of the planned work proposed by one Party shall be agreed to by other Party before the commencement of such works.
- 6.3 Each Party, prior to performing the planned engineering works, shall give advance notice of at least five (5) Business Days to the other Party.
- 6.4 The preferred times and duration allowed for carrying out various planned engineering works shall be between 0100 through 0500 hrs, applicable on everyday, including public holidays.
- 6.5 Each Party shall notify the other Party that the works have been completed by completing and faxing the last section of the Advice form.

## **7. TESTING AND MONITORING**

- 7.1 The Operator shall be responsible for testing and monitoring the performance of its own Network. Testing of the Interconnection Link and Signaling Links shall

- be kept to a minimum and shall be avoided during the busy hour periods. No testing shall be carried out before PTCL has agreed to the conduct of such tests, including any routine tests.
- 7.2 For handling problems, which can only be localised through a series of, test Calls (eg difficulty in reaching certain number groups), both Parties shall agree upon the details of the testing required. Test numbers and contact points shall be exchanged to facilitate the testing.

<b>APPENDIX 1</b>	
<b>1.</b>	<b>Notification Points for Contact in PTCL:-</b>
(a)	PTCL Network Management Centre (NMC) (after office hours)  Location:  Telephone:  Facsimile:
(b)	PTCL IGS  Location:  Telephone:  Facsimile:

<b>APPENDIX 2</b>	
<b>1.</b>	<b>Notification Points for Contact in Operator:-</b>
(a)	Operator Network Management Centre (NMC) (after office hours)  Location:  Telephone:  Facsimile:
(b)	Operator IGS  Location:  Telephone:  Facsimile:

### **APPENDIX 3**

### **STANDARD OPERATING PROCEDURE**

**TITLE : FAULT REPORTING AND ESCALATION PROCEDURE IN PTCL FOR NETWORK FAILURES (COMPLETE / PARTIAL)**

#### **1. INTRODUCTION :**

- 1.1 As per definition given in the ITU recommendations number M.1550 (10 /92), an escalation procedure is the process of referring a matter to an organizational entity of greater expertise or authority.
- 1.2 This escalation procedure is designed to assist Maintenance and Operations Personnel such as OMC/ NMC Manager, General Managers, M&O Wing and PTCL Headquarters in the event of malfunction / critical failure / catastrophic breakdown such as Optical Fibre link, switch, sub-marine cable, satellite, international circuit, mobile/IP interconnect etc. This procedure, however, does not supersede the existing technical escalation procedures for fault clearance.

#### **2. ESCALATION FLOW:**

- 2.1 If a catastrophic fault of a network element is not cleared within the specified period of time, then it will be escalated to the higher management as per escalation flow chart attached at Annexures "A" & "B". A catastrophic fault may be arising out of:
  - **Complete failure:-**
- 2.2 Where all the customers are affected or traffic on a faulty link is not possible to be routed on alternate means.
- **Partial failure:-**
- 2.3 Where 50% customers are affected and traffic has been routed through alternate routes. Service availability to customers has been reduced.
- 2.4 These guidelines are intended to cover the critical situations. However there will be occasions when special circumstances require independent decisions by the higher manager involved and various steps with time limits are as below:-
  - 2.4.1 To ensure that all the concerned staff are aware of their responsibilities an immediate Flash report for the abnormal condition should be sent by Divisional Engineer OMC / NMC/NMS to the General Manager of the concerned Region within half an hour of the occurrence of the abnormal condition. However in case of major breakdowns in Optical Fibre, satellite, sub-marine cable, IGE, DTE, any IP interconnect problem (PIE breakdown) the event has to be reported to the CEO/President PTCL within 15 minutes of the occurrence, if the problems is not resolved.

- 2.4.2 On receipt of the abnormal condition flash report, the General Manager of the Region should inform PTCL Headquarters {Concerned Chief Engineer / Executive Vice President} immediately or within a period of the next one hour depending upon the nature of the failure.
- 2.4.3 In case of a major Breakdown affecting the services to more than 50 % subscribers of the concerned area for more than two hours or when the services given to the VIP/VVIPs has been affected then the Concerned Chief Engineer / Executive Vice President and Senior Executive Vice President (Ops) should be informed immediately by the concerned regional General Manager.
- 2.4.4 In case of interruption of service in a particular Exchange / City / Large area i.e. complete breakdown of a switching / transmission element of the network, the Senior Executive Vice President (Operations) and CEO/President PTCL should be briefed about the problem by the concerned Executive Vice President (Operations) immediately.
- 2.4.5 If the network is not restored to normal condition for a duration within three hours the CEO/President PTCL will brief the Advisor to MoIT / Director Telecom and if necessary Minister of Information Technology will also be informed. The affected customers will be informed through media about the problem and expected time of fault clearance.
- 2.5 The list of the contact numbers for different management levels and the Ministry of Information Technology (MoIT) is available at Annexure "C"
- 3. SPECIAL INSTRUCTIONS :**
- 3.1 Any failure affecting the National Emergency Operations and VVIP movements needs to be immediately brought into the notice of the Senior Executive Vice President (Operations) PTCL H/Qs Islamabad irrespective of the time of occurrence.

## **STANDARD OPERATING PROCEDURE**

**TITLE : FAULT REPORTING, RECTIFICATION AND ESCALATION PROCEDURE TELEPHONE AND OTHER PSTN SERVICES IN PTCL**

### **1. INTRODUCTION :**

- 1.1 Uninterrupted and flawless service to the valued customers is the ultimate aim of PTCL. The individual customer being the paymaster has got every right to have his telecom facility operational throughout the year with least number of interruptions. It is the duty of PTCL to rectify all the reported faults in the minimum possible time to the satisfaction of the valued customer
- 1.2 This escalation procedure given in Annexure "A", is designed to assist Maintenance and Operations Personnel to monitor the fault rectification process on individual lines and to minimize the duration of faults so as to achieve the PTA prescribed targets as per the PTCL license. To achieve the PTA targets for subscriber line fault rectification, the following procedure is to adopted.
- 1.3 This procedure, however, does not supersede the technical escalation procedure already in practice for fault clearance.

### **2. ESCALATION FLOW:**

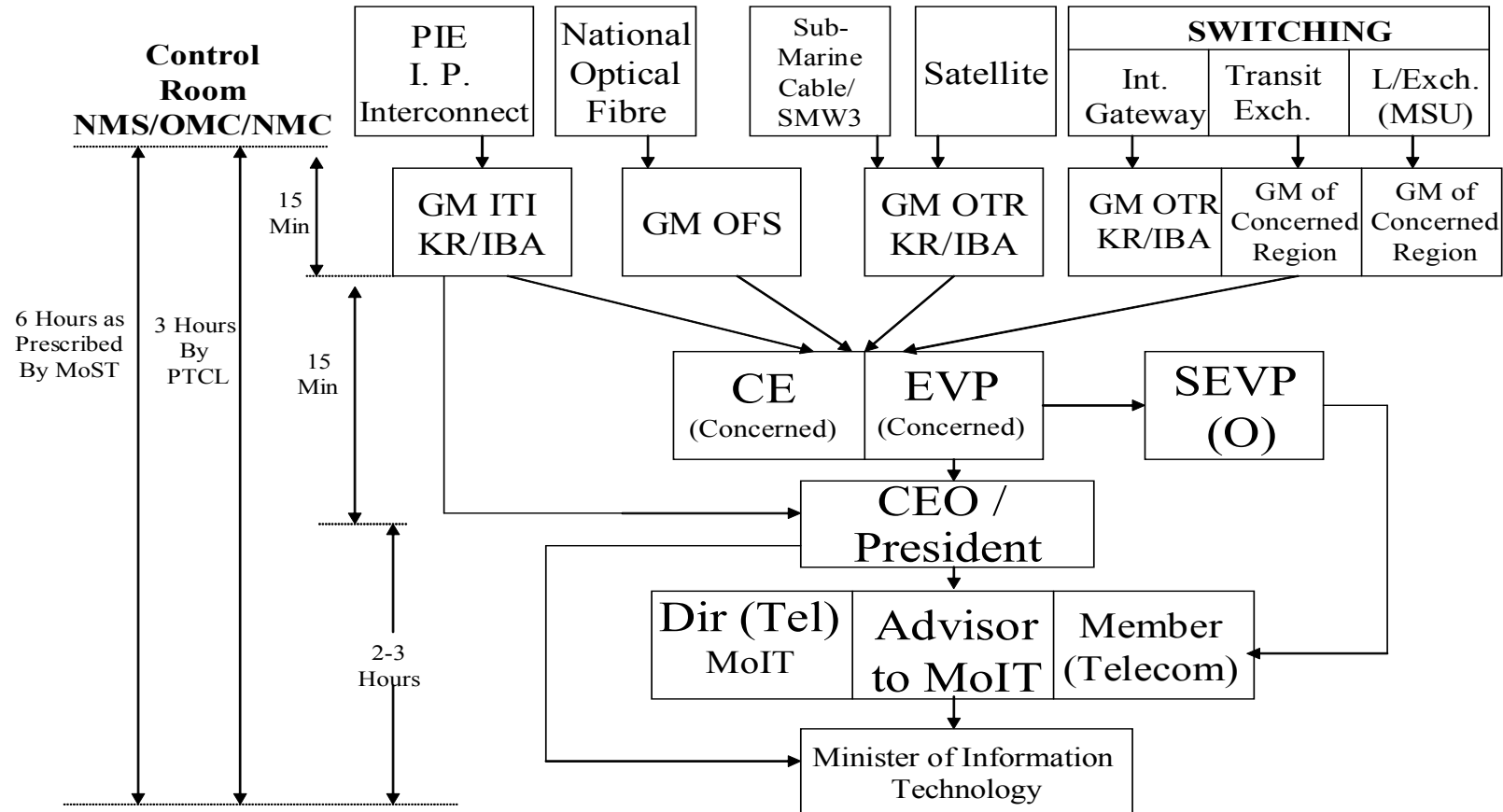
- 2.1 The customer registers a complaint with the PTCL on any one of the following platforms:-
  - i. Complaint at 18 for normal telephone & at 128 or 0800-11100 for leased Lines / Value Added Services.
  - ii. Complaint at PTCL H/Qs, Hotline (0800-44544), if the fault reported at 18 is not cleared.
  - iii. Complaint at Help Line 106 (only for Karachi)
- 2.2 The complaint lodged at local 18 positions is handed over to the linemen / technician within one hour of reporting. Engineering Supervisor monitors the fault clearance on hourly basis and if the fault is not rectified within six hours of reporting the matter has to be brought into the notice of concerned SDO. The fault carried over night will be reported to Divisional Engineer. A flow chart for fault escalation procedure for telephone and other PSTN services is available at Annexure "B". This also includes fault rectification for leased lines and Value Added Services.
- 2.3 Registering a fault on the complaint centre (18) is a pre-requisite for lodging a complaint on PTCL H/Qs Hotline. Where a complaint is lodged with the H/Qs Hotline, an online information is generated by Hotline server which is retrievable by the Regional Hotline Centres. The Regional Centre will download such complaints and hand over them to local

Complaint Centre (18) staff on two hourly basis and will provide the information to the PTCL Hotline when the fault is removed.

- 2.4 A summary of the faults reported at H/Qs Hotline is presented to the Executive Vice President (Ops), Senior Executive Vice President (Ops) and CEO/President PTCL in the form of a printout containing information about reported faults, faults cleared on the same day, total pending complaints. Number of repeated faults within last 7 days is also reported. The format of the report is attached at Annex "C".
- 2.5 In-charge Headquarters Hotline will verify 10% of the reportedly cleared faults by calling these numbers randomly and record his observations on the format available at Annexure "D" and will supply a copy of the same to Executive Vice President (Ops), Senior Executive Vice President (Ops) and CEO/President PTCL. Since this will be normally generated on the next working day hence it is taken as a reporting to the higher management after a lapse of twenty four hours from the time of complaint registration.
- 2.6 The telephone fault which is not cleared within 48 hours of being reported at PTCL H/Qs Hotline will be reported to the Ministry of Information Technology (MoIT) on the format available at Annexure "E".
- 2.7 To ensure transparency, the information provided to the Ministry of Information Technology (MoIT) may also be made public.

Annex “A” of Appendix 3

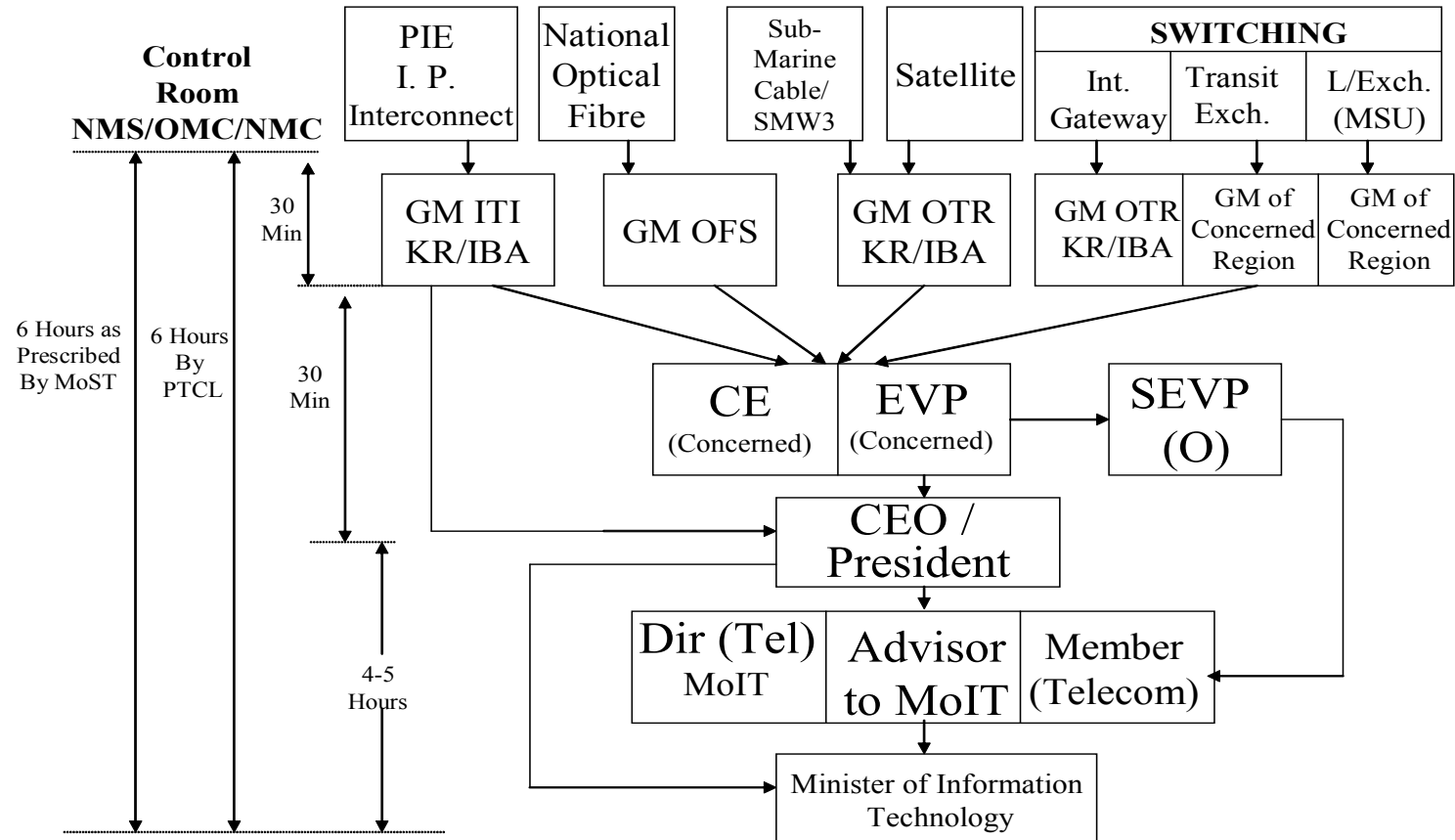
## Fault Reporting & Escalation Procedure in PTCL for Network Failures (Affecting 100% Traffic)





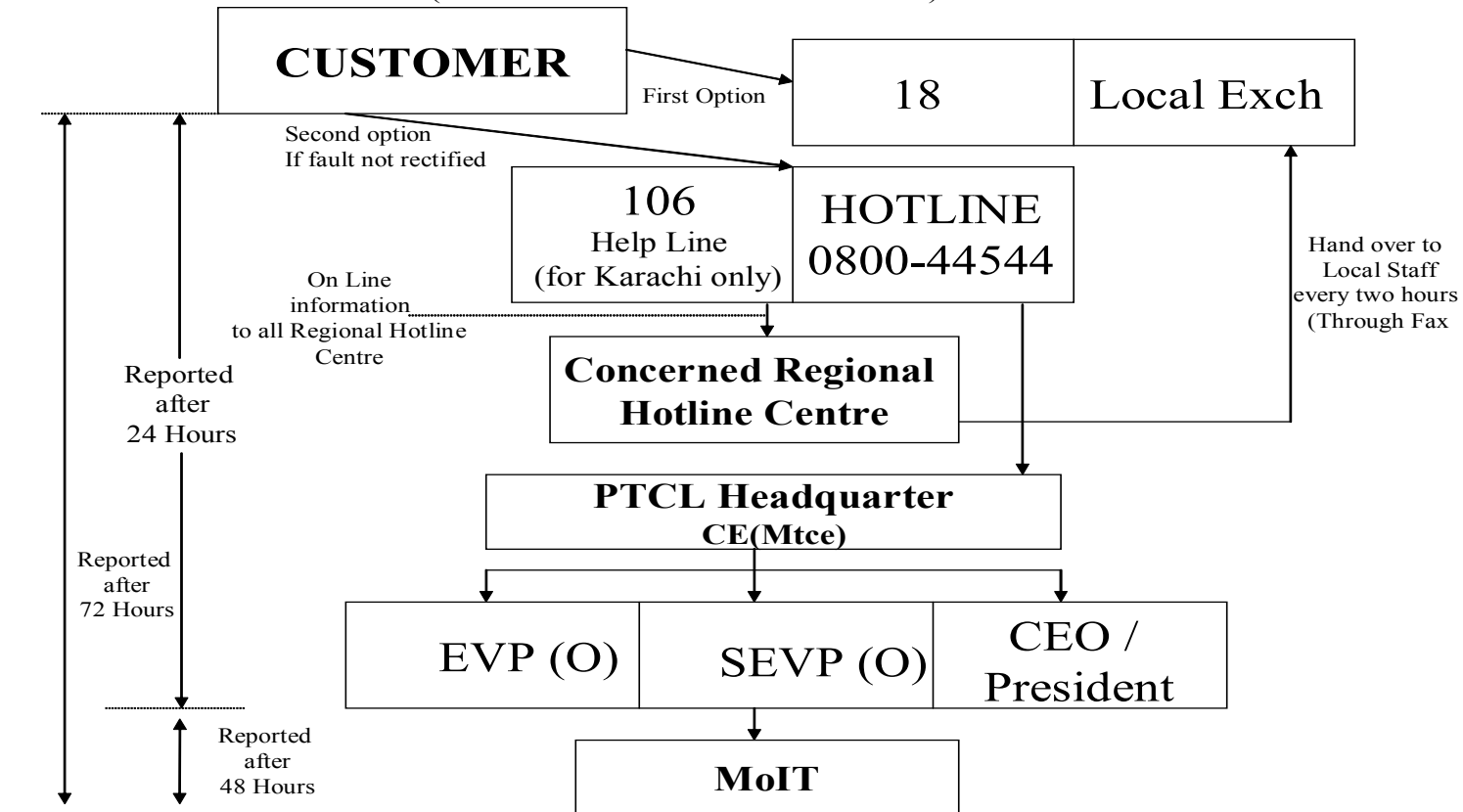
## Annex “B” of Appendix 3

## Fault Reporting & Escalation Procedure in PTCL for Network Failures (Affecting 50% Traffic)



Annex “A” of Appendix 3

**Fault Reporting & Escalation Procedure for Telephone and other PSTN Services**  
(When not rectified within 48 Hours)

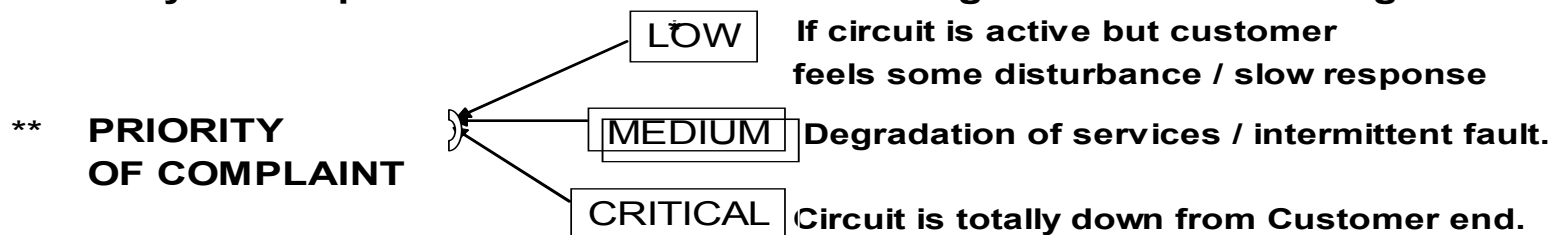




# Corporate Customer Centre Fault Management / Escalation Process

Step	Process	Lead Time	Action	Follow up
1	* Computerized Fault Management System for daily, weekly, monthly report.	—	DE ITMS (128)	Dir ITI.
2	Hot lines between ITMS, ITMC, NMS and OFS with Mobile Phones.	—	DE ITMS/ITMC/NMS/OFS/Transmission	Dir ITI/Satellite/NMS/OFS
3	** Priority of complaint.	Immediate	DE ITMS (128)	Dir ITI
4	Zone wise well equiped maintenance parties for immediate response on complaint according to priority.	Immediate	DE ITMS (128)/DE OFS/DEP Ext./DE Transmission	Dir ITI

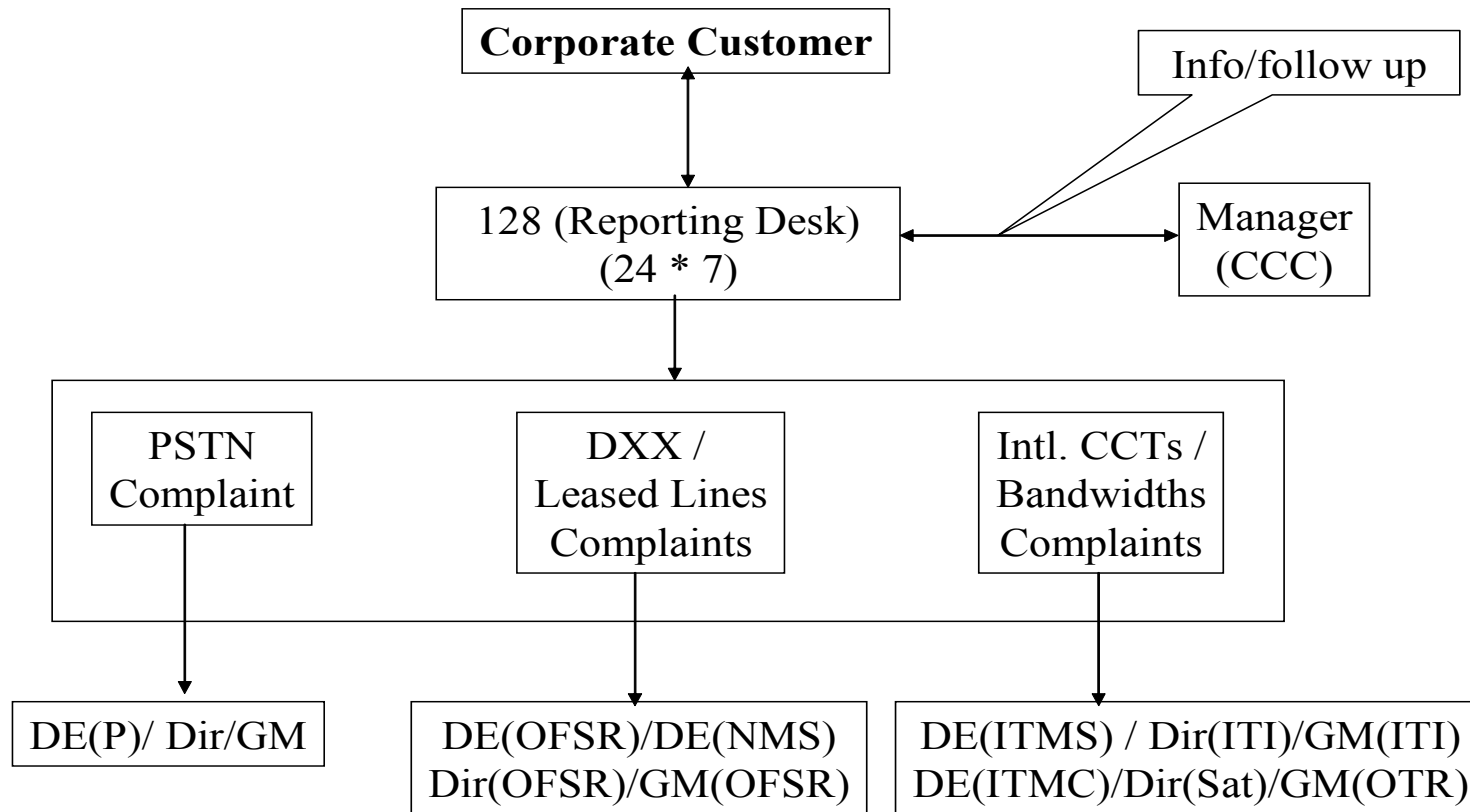
\* **Daily fault report to be communicated through Fax in the morning to MCCC.**





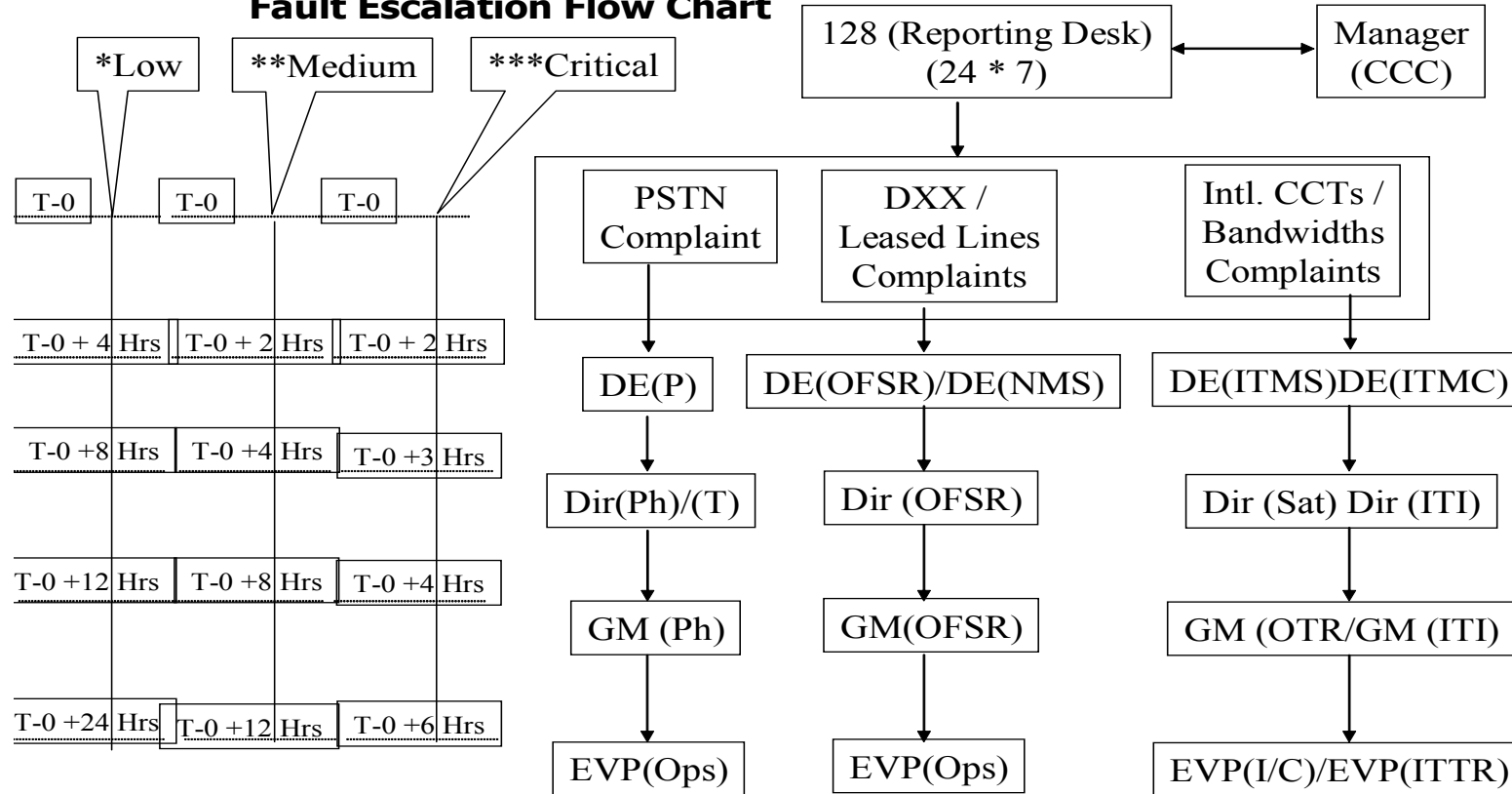
# Corporate Customer Centre

## Fault Reporting Flow Chart



# Corporate Customer Centre

## Fault Escalation Flow Chart



**\*Low: 25% Service Down      \*\*Medium: 50% Service Down      \*\*\*Critical 100% Service Down**



## Corporate Customer Centre Billing Complaints / Errors

Step	Process	Lead Time	Action	Follow up
1	Maintenance of account ledger.	Daily	SRO / SAOIR	Dir R/R / Dir Int'l Revenue
2	* Settlement of billing dispute.	03 Days	SRO / SAOIR	Dir R/R / Dir Int'l Revenue
3	** Adjustment / Refund / Rebate	07 Days	SRO / SAOIR	Dir R/R / Dir Int'l Revenue
4	*** Billing	1st week of every month	SRO / SAOIR	Dir R/R / Dir Int'l Revenue
5	Reconciliation	Last week of every month	SRO / SAOIR / AO CCSC / Unit	Dir R/R / Dir Int'l Revenue / Manager SSCS / Zonal Dir

\* Nature of complaint would be sorted out and put before relevant committee (RVC/HVC) within prescribed time.

\*\* Copy of decision for information to Manager CCC on monthly / fortnight basis.

\*\*\* Intimation to AO (CCC)

## **SECTION-3 – GENERIC ELECTRICAL & PHYSICAL INTERFACE SPECIFICATION**

### **1. GENERAL**

This Specification sets out the transmission requirements and objectives to be met by PTCL and the Operator for the interconnection of the PTCL and Operator Networks. The requirements are based on the relevant International Telecommunications Union (ITU), European Telecommunications Standards Institute (ETSI), ANSI and Public Network Operator - Interest Group (PNO-IG) Recommendations.

References to Global Systems Mobile / Personal Communications Networks (GSM/PCN) are based upon ETSI/ GSM recommendation. 3.5 phase 1. This recommendation is currently under review and will be updated to ETSI 300 540 GSM Phase 2. End to end requirements involve the performance of Customer equipment which is outside PTCL and the Operators controls. Customer networks as referred to throughout this document typically consist of at least one item of Customer Premises Equipment (CPE) situated beyond the Network Terminating Point (NTP). Where this Specification sets out matters that the Parties endeavour to agree, and agreement is not reached, such matters shall be disputes.

### **2. RESPONSIBILITIES**

The Party selected by the Customer to carry the Call holds the responsibility for overall transmission quality. If the Call is an indirect access Call then the indirect access Operator is responsible for the end-to-end quality of the Call. If the overall transmission quality for a Call cannot be met because either Party is unable to comply with the reasonable requests of the other Party, then neither Party will be obliged to convey the Call.

### **3. RELEVANT PARAMETERS**

Overall performance is affected by the following parameters:

- Overall loss
- Transmission Time (Absolute delay and propagation delay)
- Echo and Stability
- Quantising distortion
- Coding standards
- Attenuation distortion
- Group delay distortion
- Sidetone loss

- Crosstalk
- Errors
- Jitter and Wander

PTCL and the Operator shall endeavour to achieve the requirements and objectives for overall loss, delay, echo loss, quantising distortion, and coding standards given in clauses **4 to 10** inclusive. PTCL and the Operator shall each plan in accordance with the guidance given for the remaining parameters listed above. It should be noted that for some parameters the CPE may have a significant effect on the end to end performance.

#### **4. OVERALL TRANSMISSION LOSS**

##### **4.1 Loudness Rating (LR)**

The limits for overall loss expressed in terms of Loudness Ratings (LR) are defined in ITU-T Recommendation P. 76 (Blue book November 1989).

#### **5. APPORTIONMENT OF OVERALL LOUDNESS RATING (OLR)**

##### **5.1 End to End Requirements**

PTCL and the Operator shall endeavour to:

- (a) Provide connections which fall within the ITU-T G111 recommended OLR range of 8dB to 20dB for all analogue or mixed analogue/digital routings. For all digital routings the mean value for OLR shall be in the range 8dB to 12dB.
- (b) avoid connections which exceed the ITU-T Recommended limiting OLR value of 29dB
- (c) minimise the range of different Transmission levels experienced by any one Customer.

##### **5.2 GSM/PCN Loudness Control**

Cellular network operators may utilise digital level control in the mobile switched network to control Send Loudness Rating (SLR) and Receive Loudness Rating (RLR) values.

##### **5.3 RLR And Receive GSM Volume Control**

The use of any Customer controlled receive volume control shall not decrease (i.e. make more sensitive) the RLR, by more than 10 dB for planning purposes.



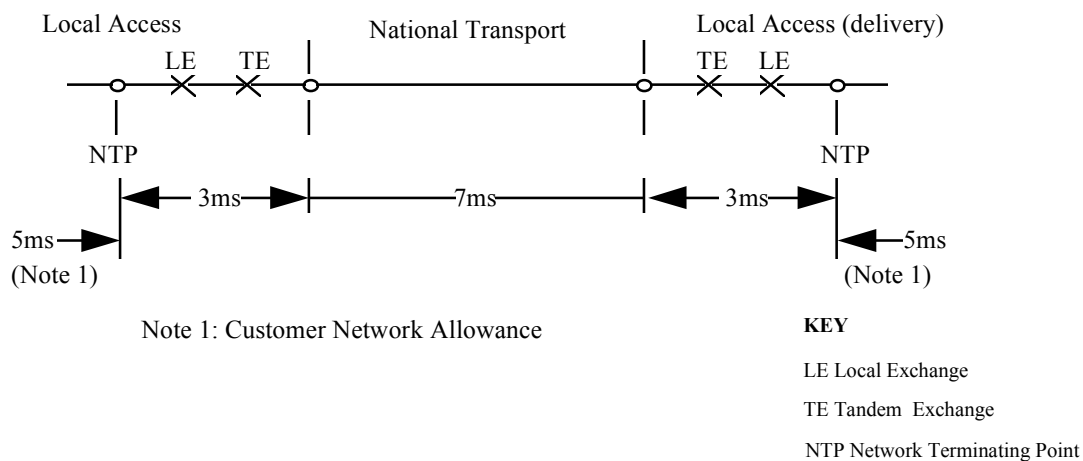
## 6. TRANSMISSION TIME

### 6.1 Transmission Delays Within The Fixed Network - Without echo control

For National Calls not employing echo control, the NTP - NTP one way delay shall be less than 13 ms for at least 95% (See<sup>1</sup>) of Calls. Assuming that Customer network delays at each end of the Call do not exceed 5 ms, then the total end to end delay shall be less than 23 ms.

For the small proportion of Calls that exceed the 13ms limit, an absolute limit of 25ms excluding Customer networks shall be observed. Previous investigations have identified that customers may find such Calls to be unacceptable since Customer network delays could increase the end to end delay to over 30ms.

### 6.2 Preferred Apportionment Of Transmission delay



**FIGURE 1 Transmission Delays Through the PTCL Telephone Network**

The apportionment principles presented in Figure 1 ensure that PTCL or Operator Customers experience acceptable levels of transmission delay. Any reapportionment of the segment boundaries (Collection, Transport and Delivery) shall be subject to joint agreement.

### 6.3 Calls that involve an International Gateway

For International Calls the one way delay from the NTP to the International Switching Centre (ISC) shall be no greater than 7 ms for 95% of Calls, with an absolute limit of 12 ms.

<sup>1</sup> The 95% limits in 6.1, 6.3, 6.4, 6.5, (a) & (b) shall be implemented such that the possibility of individual Customers always encountering unacceptable performance is minimised.

#### **6.4 Maximum delay under route failure conditions.**

In situations where Calls have to be re-routed around failed sections of the PTCL or Operator Network, it is acceptable for the proportion of Calls meeting recommended delay limits to fall below 95%, however the absolute limits given above shall not be exceeded.

#### **6.5 Transmission Delays Within The Fixed Network - With echo control**

Where echo control is provided over the fixed network, the one-way delay limit for at least 95% of national Calls shall be less than 125 ms. No Calls shall exceed the absolute one-way delay limit of 150 ms.

#### **6.6 Transmission Delays Involving Digital Mobile/Wireless Access**

- (a) Transmission Delays Between Digital Mobile/wireless access and the Fixed Network - With echo control

The one way delay limit for at least 95% of Calls between mobiles on digital networks or wireless access networks and the fixed network shall be less than 125 ms. No Calls shall exceed the absolute one-way delay limit of 150 ms.

- (b) Transmission Delays Within Digital Mobile/wireless access Networks - With echo control.

The one way delay limit for at least 95% of Calls between mobiles on digital networks or wireless access networks within Pakistan shall be less than 215 ms. No connection shall exceed 230 ms one way delay.

#### **6.7 Transmission Delays On International Calls - With echo control**

The maximum one way delay for an International Call using echo control will depend upon the nature of the destination network e.g. fixed, digital mobile or wireless access and the transmission media e.g. satellite or cable.

International Calls using echo control should not exceed 400 ms, it is however recognised that under cable circuit failure/congestion conditions, satellite backup circuits may not meet this requirement.

### **7. ECHO LOSS**

PTCL and the Operators shall seek to meet the design objective for echo loss (as defined in ITU-T Recommendation G122) presented at the Switch Connection with equal relative levels for both directions of transmission of 20dB, with no connections being less than 15dB for practical implementation.

CPE connected via a 2-wire interface can have significant effect on echo losses. For planning purposes PTCL and the Operator shall comply with ITU Standards.

CPE and Customer networks are likely to determine the largest part of echo losses in the case of 4-wire connection to the PTCL and the Operator Networks. For planning purposes PTCL and the Operator shall assume that the CPE meets the 20dB echo loss objectives given in the PTA Network Code of Practice (for the Design of Private Telecommunications Networks) - NCOP.

### **7.1 GSM/PCN Echo Loss**

The echo loss under operational conditions for a GSM/PCN based system shall be at least 46 dB referred to the Switch Connection with any Customer volume control set to its maximum output (i.e. loudest) position. ETSI/GSM 03.50/1 Section **3.4(a)** provides further information related to echo loss. ITU-T Recommendation G165 provides guidance for the performance of echo control devices when switched into a connection. ITU-T Recommendations G151 and G473 refer.

### **7.2 Echo Control - International Conformance**

Echo control devices for international connections to and from PTCL shall conform to ITU-T. Rec.G.165 on echo cancellers.

### **7.3 Echo Control - GSM**

The GSM/PCN system shall provide echo protection as stated in ETSI/GSM 03.50/1 Section **3.4(b)**.

## **8. STABILITY LOSS**

For International Calls and National Calls stability loss considerations shall be satisfied by the following requirement.

The loss presented at the Switch Connection with equal relative levels for both directions of transmission shall not be less than 6dB at any frequency up to 4kHz. Account shall be taken of all conditions presented at the Switch Connection under normal operating conditions and any customer volume controls should be at maximum output.

CPE connected via a 2-wire interface may have a significant effect on stability loss. For planning purposes PTCL and the Operator shall assume the CPE may present either open circuit or short circuit conditions at a 2-wire NTP.

CPE and Customer networks are likely to largely determine the stability losses in the case of 4-wire connection to the PTCL and the Operator Networks. For planning purposes PTCL and the Operator shall assume that the CPE meets the 6dB stability loss requirement given in the NCOP.

It is recognised by the Parties that stability losses of less than 6 dB could cause oscillation.

## **9. QUANTISING DISTORTION**

### **9.1 Fixed Network Limits**

In order to meet international and PAKISTAN requirements the following limits for quantising distortion units (qdu) shall be met:

A1) Max end to end International	14 qdu
B1) Public network collection (access network)	5 qdu
C1) National transport/Trunk Network	0 qdu
D1) Public network delivery (access network)	5 qdu

### **9.2 Mobile Network limits**

D2) Max end to end International	18 qdu
A2) Collection(access network)	7 qdu
B2) National transport/Trunk Network	0 qdu
C2) Delivery (access network)	7 qdu

For planning purposes PTCL and the Operator shall assume that Customer networks do not introduce more than 2 qdu.

## **10. CODING STANDARDS**

At a digital interface it is a requirement that analogue information shall be encoded using the 8bit, A-law characteristic in accordance with ITU-T Recommendation G711 such that a 64kbit/s time slot at the Switch Connection can be decoded using a 8 bit, A-law decoder.

## **11. NOISE**

The limits for single tone or narrow band noise shall be more stringent than the limits for wideband noise to avoid Customer annoyance. As a general rule, the power in any individual tone should be 10dB less than the psophometric noise power in the circuit (ITU-T Recommendation P11).

The following ITU-T recommendations shall be complied with to give appropriate limits.

Digital Exchanges - Recommendations Q.551 and Q.554

PCM line systems - Recommendation G.712

GSM/PCN systems - ETSI/GSM 3.50/1 section 3.2

The limits in Recommendation G.123 are of particular importance as they control the level of noise on International Calls.

## **12. ATTENUATION DISTORTION**

In order to adequately control attenuation distortion each component of the connection shall have a suitable distortion limit. The following ITU-T Recommendations apply.

Digital Exchanges - Recommendations Q.551 and Q.554

Digital Line Systems - Recommendation G.712

## **13. GROUP DELAY DISTORTION**

The following ITU-T Recommendations give suitable limits for the group delay distortion introduced by line transmission systems and coding processes in digital exchanges:

Digital Exchanges - Recommendations Q.551 and Q.554

Digital Line Systems - Recommendation G.712

### **13.1 Side tone Masking Rating - Normal Telephony Customer to PTCL PSTN**

The Side tone Masking Rating (STMR) for telephony CPE connected to a PTCL Network Terminating Point shall nominally be taken as 7 dB for planning purposes.

### **13.2 Side tone Masking Rating PTCL PSTN to GSM/PCN**

The Side tone Masking Rating (STMR) for telephony CPE allowing users to gain access through the GSM system shall be nominally taken as outlined in ETSI/GSM 03.50/1 for STMR and LSTR.

## **14. ERROR PERFORMANCE**

Error performance of digital networks is of key importance as it determines the end to end performance of both end to end digital services and analogue services supported by the PTCL and Operator Networks.

The allocation principles of Recommendation G. 821 shall be used when determining the error for individual transmission systems.

## **15. NON SPEECH LEVELS**

The use of any non-speech signals within an established Call, or during the phase of Call set-up or clear down, for such purposes as signalling (e.g. DTMF) shall comply with ITU Standards. Interfaces that are not taken as a 0 dBr point shall be planned as if they were a 0 dBr for purposes of realising interconnection between the PTCL Network and a PCN/ GSM System.

## **16. REFERENCES**

### **ITU-T recommendations**

G.111 Loudness Ratings in an International Connection  
G.122 Influence Of National Systems On Stability, Talker Echo and Listener Echo In International Connections  
G.123 Circuit Noise In National Circuits  
G.151 General performance objectives applicable to all modern International and National extension circuits.  
G165 Echo cancellers  
G473 Interconnect of a Maritime Mobile satellite system with the International automatic switched telephone service: Transmission aspects  
G.711 Pulse code modulation (PCM) of voice frequencies.  
G.712 Performance characteristics of PCM channels between 4-wire interfaces at voice frequencies.  
G.821 Error performance of an International digital connection forming part of an integrated services digital network.  
P.11 Effect Of Transmission Impairments  
P.16 Subjective effects of direct cross talk; Thresholds of audibility and intelligibility  
P.76 Determination of Loudness rating; Fundamental principles  
Q.551 Transmission characteristics of digital exchanges.  
Q.554 Transmission characteristics at digital interfaces of a digital Exchange.

## **17. PTCL SPECIFICATIONS**

## **18. ETSI SPECIFICATIONS**

ETSI/GSM Recommendation 03.50

## **SECTION 4 – GENERIC TRANSMISSION INTERFACE SPECIFICATION**

### **1. GENERAL**

This document defines the physical and electrical characteristics of Interconnect Links, between the PTCL Network and the Operator Network. All sections apply with the exception of clauses 2 and 3 which only apply to Virtual Interconnection (CSI) Interconnect Links.

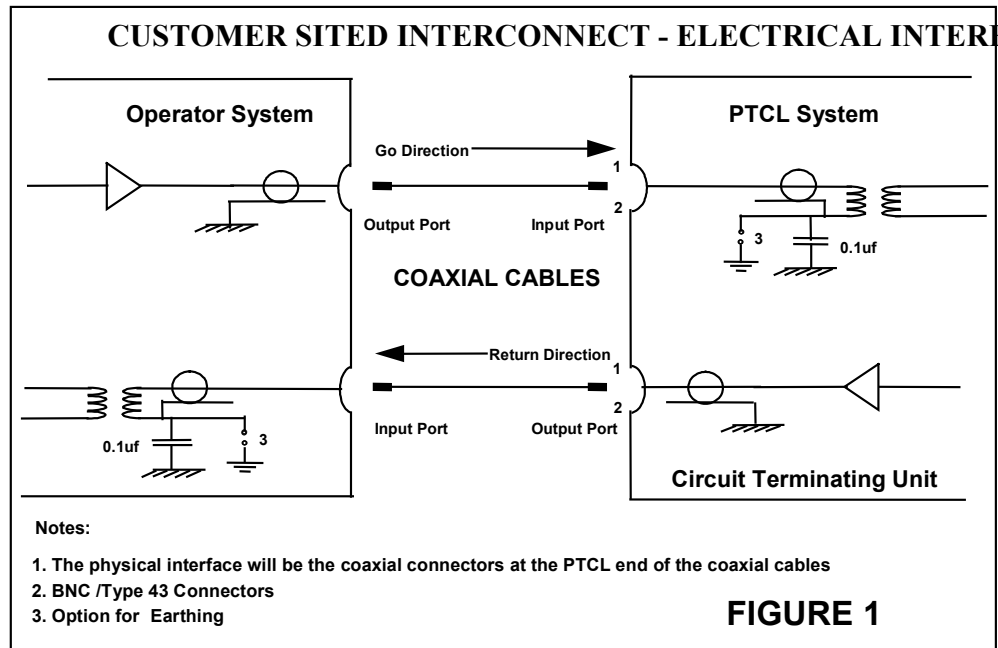
All references to ITU Recommendations refer to the White Book unless otherwise indicated.

### **2. PHYSICAL INTERFACE FOR VIRTUAL INTERCONNECTION**

The interconnection between the PTCL Network and the Operator Network shall be provided by a PTCL digital path that terminates on a PTCL Circuit Termination Unit (CTU) located within the building housing the Operator Switch, the Operator Digital Distribution Frame (DDF) or Operator Equipment Optical Interface.

#### **2.1 2M/bit/s Presented Virtual Interconnection**

The PTCL CTU will present a G703 interface via two 120-ohm coaxial cables direct to either the Operator Switch or an Operator Digital Distribution Frame (DDF). The Point of Interconnection shall be the 120-ohm G703 coaxial connector at the PTCL end of the cables connecting the CTU to the Operator Switch or the Operator DDF (See Fig 1). The coaxial cables connecting the CTU to the Operator Switch shall have a loss not exceeding 6dB at 1024 kHz (Fig 1). The cables connecting the PTCL CTU to the Operator Network shall be provided and maintained by the Operator.



## 2.2 Virtual Interconnection Aggregate

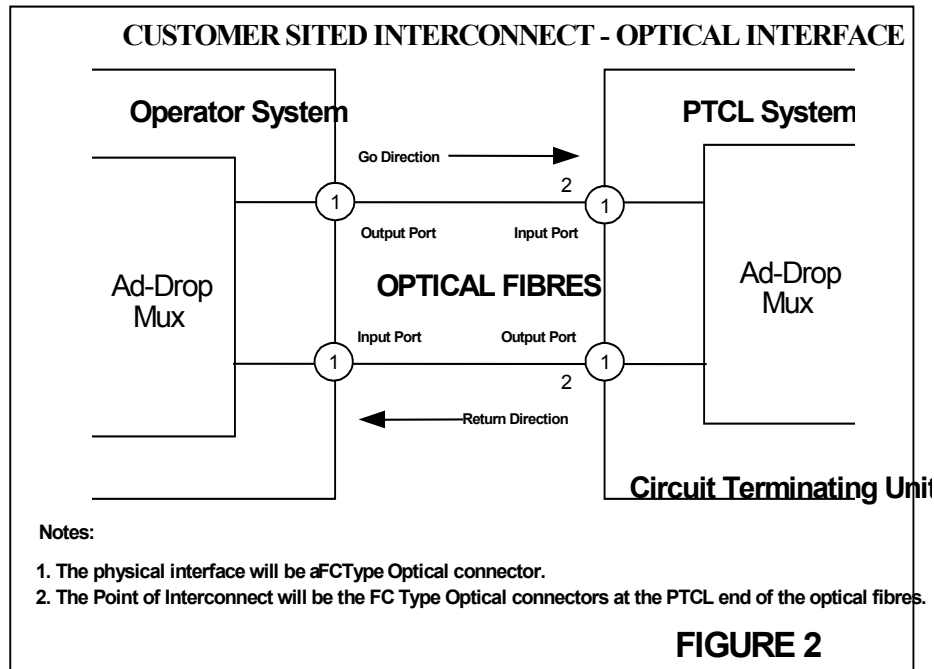
The PTCL CTU shall present either an electrical or optical STM-1 or STM-4 interface, which shall conform, to the Technical Recommendation Specified in the Generic Synchronous Digital Hierarchy Interface Specification 0120.

The PTCL CTU Electrical interface shall be presented via two 120-ohm coaxial cables direct to either the Operator Switch or an Operator Digital Distribution Frame (DDF). The Point of Interconnection shall be the 120-ohm G703 coaxial connector at the PTCL end of the cables connecting the CTU to the Operator Switch or the Operator Digital Distribution Frame (See **Fig 1**).

The PTCL CTU Optical Interface shall be presented via two Optical fibres direct to the Operator Equipment Optical Interface. The Point of Interconnection shall be the FC type Optical connector at the PTCL end of the fibres connecting the CTU to the Operator Equipment Optical Interface (See **Fig 2**).

The cables and Optical fibres connecting the PTCL CTU to the Operator Network shall be provided and maintained by the Operator.





### 3. ELECTRICAL INTERFACE

The electrical interface for CSI Aggregate shall conform to the Technical Recommendation Specified in the Generic Synchronous Digital Hierarchy Interface Specification 0120. The following section shall apply to a 2Mbit/s electrical interface using the coaxial pair option of ITU-T Recommendation G.703 (Physical/Electrical Characteristics of Hierarchical Digital Exchanges).

#### 3.1 General Characteristics

These shall conform to section 6.1 of ITU-T Rec. G.703

#### 3.2 Specifications at the output ports

These shall conform to section 6.2 of ITU-T Rec. G.703 (Table 6).

#### 3.3 Specifications at the input ports

These shall conform to section 6.3 of ITU-T Recommendation G.703.

#### 3.4 Earthing of screen

##### (a) Output Ports

At output ports the cable screen shall be bonded to the equipment metalwork at the equipment boundary or as near as possible to it.

(b) Input Ports

The input port cable screen shall be earthed via a capacitor (typically 0.1  $\mu$ F) to the equipment. Provision shall be also made at this point for providing a DC connection to earth. The equipment shall be set-up with the DC earth not connected; this is illustrated in **figure 1**. A suitable ferrite tube ferrule should be threaded onto the cable so as to be located at a point between the bonding point and the equipment circuitry

### 3.5 Interference

The input ports shall tolerate, without error, interference from a non synchronous standard test signal (ITU-T Recommendation 0.151- Error Performance Measuring Equipment for Digital Systems At The Primary Bit Rate and Above) at a level 18dB lower than the wanted signal.

### 3.6 Jitter

(a) Maximum jitter at output ports

Under worst case operating conditions (i.e. fault free) the output jitter shall not exceed 0.05 UI when measured in the frequency range 20 Hz to 100 kHz. Note: This assumes that the Operator Switch meets:

1. The input jitter tolerances given in section 3.6(b).
2. The jitter transfers function given in Figure 5 of ITU-T Recommendation Q.551 (Transmission Characteristics of Digital Exchanges).

(b) Tolerance of input ports to jitter and wander

The tolerance of both the PTCL and the Operator input ports to jitter shall be as defined in section 3.1.1 of ITU-T Recommendation G.823 (Jitter And Wander Tolerance of Digital Input Ports).

(c) Measurement of Jitter

A jitter measuring set conforming to the requirements of ITU-T Recommendation O.171 (Timing Jitter Measuring Equipment for Digital Systems) shall be used. PTCL and the Operator shall co-operate in the application of testing methods as described in ITU-T Recommendation G.823 (The Control of Jitter and Wander Within Digital Networks Which Are Based on the 2048 kbit/s Hierarchy).

### 3.7 Wander at PTCL and Operator input ports

The tolerance of the PTCL and Operator input ports to wander shall be as defined in section 3.1.1 of ITU-T Recommendation G.823 .

## **4. PTCL AND OPERATOR NETWORK SYNCHRONISATION**

### **4.1 Operator Network Synchronisation**

To ensure synchronisation with the PTCL Network, the Operator Network shall employ a synchronisation system, which is time traceable to a source complying with the requirements of ITU-T recommendations G.811.

The performance of digital clocks, which derive shall comply with the objective slip rate characteristics given in ITU-T recommendations G.811 and G.822 for the purpose of minimising timing perturbations in general and slip rates in particular.

### **4.2 Deriving synchronization from the PTCL Network**

If the Operator Network is to derive synchronisation from the PTCL Network it shall take its timing from PTCL nominated synchronisation feeds in a master/slave relationship.

The PTCL Network employs a central master clock to maintain a co-operatively synchronised system within ITU-T recommended frequency limits.

The synchronisation utilities that co-operate to establish the synchronous clock rate are geographically located to ensure that any point in the PTCL Network is contained within an 18 microsecond phase deviation (wander).

Where suitable, the synchronisation feeds may be taken from 2Mbit/s Interconnection Links carrying traffic between the PTCL and Operator switch.

If the Operator switch is taking timing information from the PTCL Network via a 2 Mbit/s Interconnect Links which fails (i.e. AIS is detected) then it must meet the following requirements:

- A. Switching synchronisation to an alternative 2Mbit/s Interconnect Links, if available.
- B. If no such synchronisation is available, entering holdover mode and keeping within the limits of holdover operation specified in section 2.2.3 of ITU-T Recommendation G.812 (Holdover Operation).

## **5. FUNCTIONAL CHARACTERISTICS OF THE INTERFACE**

Functional characteristics of the 2Mbit/s interface shall be in accordance with ITU-T Recommendations G.704 (Synchronous Frame Structures used at Primary and Secondary Hierarchical Levels) and G.706 (Frame Alignment and Cyclic Redundancy Check (CRC) Procedures Relating To Basic Frame Structures Defined In Rec. G704) with the following additions and clarification's:

## 5.1 Signaling

If Time Slot 16 is not required for signalling information, it must not be used as a traffic carrying channel within the PTCL Network.

Signalling across the interface is not specified in this document.

## 5.2 Time slot '0'

Chapter 2.3 of Rec. G.704 (Basic Frame Structure at 2048 kbit/s) applies. Bits 4-7 in time slot zero not containing the frame alignment signal should be set to "1". The use of bit 8 for the return direction shall be determined by PTCL at each location. On some systems bit 8 will be set to "1" in the go and return direction. On other systems when PTCL detects one or more errors in the frame alignment word, this bit 8, in the return TSO "not" word, will be set at a "1" state on two successive occasions; when no errors are detected bit 8 will be set to the "0" state. If possible, the Operator Switch should make the same use of this bit 8, if not it should be tolerant to the sending of bit 8 in the return direction and set it to "0" in the go direction.

## 5.3 Alarm Indication Signal (AIS)

Under certain fault conditions AIS is used in the PTCL Network. AIS is indicated by a continuous stream of binary 1's. When transmitted AIS is controlled by a free running 2048 kbit/s crystal oscillator (accuracy within  $\pm 50$  ppm).

The strategy for detecting the presence of AIS should be such that AIS is detectable, even in the presence of an error ratio of 1 in 1000. However, a signal with all bits except the frame alignment word in the '1' state, should not be mistaken as an AIS.

## 5.4 Channel Time Slot Encoding

The 64 kbit/s channel time slots comprising the 2048 kbit/s stream shall carry 'A' law encoded information as defined in ITU-T Recommendation G.711 (Pulse Code Modulation (PCM) Of Voice Frequencies).

The idle channel bit pattern transmitted over the Interconnect Link shall be compliant with ITU-T Recommendation Q.522 section 2.12 (Bit Patterns Generated By The Exchange In Idle Channel Time slots).

# 6. SAFETY AND PROTECTION

## 6.1 Dangerous Voltages

In order to protect personnel and equipment on both sides of a Point of Interconnection, it is necessary to provide protection against the transmission of excessive voltage across the interface.

Excessive voltages shall be as defined in BS 6301: 1989. For equipment, which uses or generates excessive voltages the interface shall be electrically isolated from those voltages. Suitable devices are described in BS 6301: 1989.

## 6.2 Radiation Hazards

Where radio equipment is used, arrangements shall be made to protect all personnel from levels of radiation exceeding 1 milliwatt per square centimetre.

## 7. REFERENCES

### ITU-T

- |       |  |
|-------|--|
| G.703 | Physical/Electrical Characteristics of Hierarchical Digital Exchanges  |
| G.704 | Synchronous Frame Structures used at Primary and Secondary Hierarchical Levels.                                      |
| G.706 | Frame Alignment and Cyclic Redundancy Check (CRC) Procedures Relating To Basic Frame Structures Defined In Rec. G704 |
| G.711 | Pulse Code Modulation (PCM) Of Voice Frequencies.  |
| G.811 | International Connections Terminating on Synchronous Network Nodes   |
| G.812 | section 2.2.3 (Holdover Operation).  |
| G.823 | The Control of Jitter and Wander Within Digital Networks Which Are Based on the 2048 KBIT/S Hierarchy                |
| G.823 | section 3.1.1 Jitter And Wander Tolerance of Digital Input Ports   |
| G.957 | Optical Interfaces For Equipments And Systems Relating To The Synchronous Digital Hierarchy                          |
| O.151 | Error Performance Measuring Equipment for Digital Systems At The Primary Bit Rate and Above                          |
| O.171 | Timing Jitter Measuring Equipment for Digital Systems  |
| Q.522 | Section 2.12 Bit Patterns Generated By The Exchange In Idle Channel Time slots                                       |

## Q.551 Transmission Characteristics of Digital Exchanges

**8. GLOSSARY**

μF	-	Micro Farad
μs		Microsecond
2Mbit/s	-	2048kbit/s
AIS	-	Alarm Indications Signal
CTU	-	Circuit Terminating Unit.
dB	-	Decibel
DC	-	Direct Current
DDF	-	Digital Distribution Frame
ITU-T	-	International Telecommunication Union - Telecommunications
kbit/s	-	KiloBits per second
kHz	-	Kilo Hertz
Mbit/s	-	Megabits per second
SDH	-	Synchronous Digital Hierarchy
ppm	-	Parts per million
UI	-	Unit Interval