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**DRAFT SPECIFICATION  
OF  
DIGITAL/ISDN & IP READY EPABX SYSTEM AND ATTENDANT  
CONSOLE – FOR MORE THAN 256 PORTS & UPTO 5000 PORTS**

**SPECIFICATION NO. RDSO/SPN/TC/27/2007**

**Revision 1.0**

Number of Pages: 42

**TELECOM DIRECTORATE  
RESEARCH DESIGNS & STANDARDS ORGANISATION  
LUCKNOW-226011**

<b>DOCUMENT DATA SHEET</b>		
Specification		Revision
<p align="center">Title of Document</p> <p>Draft Specification of Digital/ISDN &amp; IP Ready EPABX System and Attendant Console for more than 256 ports &amp; up to 5000 ports</p>		
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<p align="center">Abstract</p> <p><b>This document specifies technical Specification for Digital/ISDN &amp; IP Ready EPABX System and Attendant Console for more than 256 ports &amp; up to 5000 ports.</b></p>		

### DOCUMENT CONTROL SHEET

NAME	ORGANIZATION	FUNCTION	LEVEL
<b>Director/ Telecom-II</b>	RDSO	Member	Prepare
<b>Executive Director/ Telecom</b>	RDSO	-	Approve

#### REVISIONS:

Version	Chapter/ Annexure	Revision	Effective Month/Year
RDSO/SPN/TC/27/1998	-	FIRST ISSUE	October 1998
RDSO/SPN/TC/27/2007	All Pages	Revision 1.0	January 2007

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**RESEARCH DESIGNS & STANDARDS ORGANISATION  
MINISTRY OF RAILWAYS  
MANAK NAGAR, LUCKNOW**

**DRAFT SPECIFICATION FOR DIGITAL / ISDN & IP READY EPABX SYSTEM  
AND ATTENDANT CONSOLE – FOR MORE THAN 256 PORTS & UPTO  
5000 PORTS**

**DRAFT SPECIFICATION NO. RDSO/SPN/TC/68/2007**

**1. SCOPE:**

- 1.1 This specification covers the technical requirements of fully digital based on PCM TDM technology, Stored Program Control (SPC) type EPABX system & associated Electronic Attendant Console for use on Indian Railways Telecom network.
- 1.2 The Specification shall apply for exchanges of configuration higher than 256 lines & up to 5000 lines (extensions) with capacity to accommodate at least 400 trunks.

**2. TERMINOLOGY:**

- 2.1 The terminology in this specification is as used by International Telecommunication Union ITU (T).

**3. SERVICE CONDITION:**

- 3.1 The environmental set up for the operation of electronic exchange should be so engineered that the humidity & dust is effectively controlled. Operating temperature range of the exchange shall be 18°C to 35°C.
- 3.2 The ranges of the ambient temperatures & humidity to ensure the operation & performance of equipment as per specification shall be as given below (QM 333 table 4.3 category B):
  - 3.2.1 **Ambient Temperatures:** (Applicable for thermal cycle only)

(a)	Over which specifications are guaranteed. (50% RH at Max. Temp.)	0°C to 50°C
(b)	Over which equipment shall remain operational without irreversible damage (50% RH at Max. Temp.)	-5°C to 55°C

(c)	Storage (50% RH at Max. Temp.) without causing irreversible damage	-5°C to 60°C
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**3.2.2 Maximum Temperatures:** Applicable for damp heat (steady state)

- (a) For which specification is guaranteed at 95% RH      35°C
- (b) At which equipment shall survive at 95% RH      40°C

3.3 The environment testing shall be conducted as per Specification No. QM.333 for environmental testing of Electronic Equipments for transmission and switching use issued by DOT in Sep. 1990. The test shall be as per category B.1, the following tests shall be carried out. The detailed tests on individual equipment / card to be mutually decided by the testing authority & manufacturer.

- a) Cold
- b) Dry Heat
- c) Damp heat (Cyclic)
- d) Rapid Temp. (Cyclic)
- e) Damp heat (Steady state)
- f) Vibration

**4.0 GENERAL REQUIREMENTS:**

4.1 The exchange shall be fully digital Integrated Services Private Network & IP ready EPABX System of Stored Program Control (SPC) type PCM/TDM (A-law based) non-blocking supporting ISDN and IP features for subscriber lines and trunks/ tie-lines/ junctions and shall house all operating software in Flash-Memory or in HDD with a back up in Magnetic Optical Disk (MOD).

4.1.1 The system shall be IP enable telecom server. The switch should support MGCP protocol / Session Initiation Protocol (SIP) for transmission of voice over IP network. It should also support G.711 & G.729A encoding standards. The system should support I.P. Video Telephony.

4.1.2 The system shall support ISDN between premise equipment such as PBX's and desktop equipment such as voice terminals, data terminals and PCs. System should support ISDN BRI / PRI.

4.1.3 The system should be totally non-Blocking type and all the port cards should have equal access to any free available time slot and should have equal access time to TDM Bus. System should be based on Universal port architecture and except for Common Control and Power supply card. System should not impose any restriction in terms of slots usage for a particular functional benefit

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- 4.1.4 The exchanges shall support Caller Line Identification for all ISDN & IP network subscribers including analog subscribers.
- 4.1.5 Exchange should have built in ACD functionality and shall be upgradeable to CTI with direct Ethernet Connectivity to LAN.
- 4.1.6 The system shall work seamlessly in multi vendor (Q-Sig Compliant) Private Integrated services network environment with connectivity to PSTN. The Exchange shall support Q-Sig on PRI / BRI. The offered system shall be QSIG compliant as per ECMA Standards. System shall be suitable for networking with the existing ISDN/IP ready EPABX systems at different locations of Railways for feature transparency.
- 4.2 The exchange shall be based on state of art technology, with Pentium based processor and should switch simultaneously Voice, Data & Images without any degradation of Service quality.
- 4.3 The system shall be capable of use as a local, tandem, transit exchange or combination of these. When put in network it shall support the networking features like Automatic alternate routing, Uniform dialling plan, Travelling class of service, D-channel backup in case using ISDN-PRI. System should also support the latest networking standards like Q SIG with upgradability to Asynchronous Transfer Mode (ATM).
- 4.4 The failure of any component / sub system in the exchange shall not result in the failure of the complete exchange. To avoid single point failure of the complete system in the event of catastrophic disaster such as fire in the main control room / any break in the riser/ducts in part in the building, it should be possible to configure the system in the distributed architecture from wherein the front stacks/cabinets/port carriers can be placed at different parts of the building interlinked with the help of duplicated optical fibre or any other suitable link backup.
- 4.5 The remote unit facility should be available with in the system. This unit should have its own switching matrix & should not derive the time slots from the main cabinet. The limitation of maximum distance from the main unit using different types of digital media should be indicated.
- 4.6 The remote unit should have the option of making it survivable remote unit by adding control unit to it at any point of time. The remote unit should have the capability that if the link between the main exchange & remote unit fails, the remote unit starts working as independent EPABX automatically.

- 4.7 The remote unit should be able to support at least 350 simultaneous conversations.
- 4.8 Minimum number of attendant consoles to be supported by exchange of various capacities are as under. However, the purchaser at his discretion should indicate the number of Attendant Consoles as per requirement.

256 to 512 Line Circuits	4 ATT Consoles
512 to 1024 Line Circuits	8 ATT Consoles
1024 to 2048 Line Circuits	16 ATT Consoles
More than 2048 Line Circuits	24 ATT Consoles

The Electric Attendant Console shall meet the requirements as mentioned in Annexure – I.

- 4.9 Provision for remote maintenance of the exchange from a remotely located operation & maintenance center shall be available in the system. Remote maintenance device / Interface should be built within the system.
- 4.10 System architecture should be built up with suitable Processor to handle traffic of at least 3,00,000 BHCA ( Busy Hour Call Attempts). Documentary proof for the same should be made available.
- 4.11 The system should have the facility of out calling i.e. notification to external / internal device (programmed phone/ mobile number, local extension, SMS etc.) due to some failure etc.
- 4.12 The system should have the option & capability to work on both AC/DC Power supply.
- 4.13 Packing:**
- 4.13.1 The packing shall be able to withstand the tropical conditions fully and give adequate protection to the equipment during transit and pre-installation storage.
- 4.13.2 The packing shall have suitable measures to enable the equipment to withstand the shock without damage experienced during handling & transportation.
- 4.14 Numbering Scheme:** Following numbering scheme shall be adopted unless specified otherwise by the purchaser.
- 4.14.1 The number of digits in subscriber's telephone number can vary from 3 to 5.



4.14.2 The utilization of levels (First digit) may be:

- |     |   |   |
|-----|---|---|
| 1.  | - | Special service including calls to attendant console. |
| 2&3 | - | Electronic exchange subscribers                       |
| 4   | - | Spare for future use.                                 |
| 5   | - | Intercom Groups                                       |
| 6&7 | - | Special features                                      |
| 8   | - | Tie line to other exchanges                           |
| 9   | - | BSNL/MTNL outgoing calls                              |
| 0   | - | STD calls   |

4.14.3 Standard numbering scheme for special services / features: Following numbering for special services shall be adopted:

<u>Special Features</u>	<u>Numbers</u>
RPF / GRP	100
FIRE	101
HOSPITAL (EMERGENCY/AMBULANCE)	102
RAILWAY ENQUIRY	131
RESERVATION ENQUIRY	132
MORNING WAKE UP ALARM	173
RAILWAY TRUNK BOOKING	180
RAILWAY TRUNK ASSISTANCE	181
DIRECTORY ENQUIRY	197
TELEPHONE ENQUIRY	198

Codes for various special features may be decided by the purchaser.

#### **4.15 Number of Dialling Digits:**

4.15.1 The minimum number of significant digits to be dialled for getting access to the distant end subscriber on STD shall be eight (8). It includes the number of digits in the trunk code for the local exchange and the subscribers' telephone number. The supplier shall indicate maximum number of significant digits which can be dialled to get access to distant exchange.

4.15.2 Number of digits in a Railway Zone code, a Railway Division code or an exchange code, may vary from 1 to 4.

4.15.3 It should be possible to designate subscriber numbers within exchange with variable numbers of digits. (Some can be 3 digits and others only 4 and 5 digits.)

#### **4.16 System Facilities:**

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#### 4.16.1 **Subscriber Facilities:**

The exchange should have the capability to provide the following facilities / features to the subscribers.

##### 4.16.1.1 **Essential Facilities:**

- A. Following facilities shall be available by dialling suitable code. Necessary hardware shall be available in the exchange.
  - a). Abbreviated Dialling – The system shall be able to store at least 400 lists of abbreviated dialling (AD). The AD list entry size & maximum AD entries per system shall be indicated by the manufacturer / supplier.
  - b). Integrated Announcement – The system shall be able to store recorded announcements (messages) internally. The system shall support any number of such simultaneous announcements as mutually agreed between the vendor & purchaser. The announcements shall be digitised and stored in state of art electronic memory devices. These announcements shall be recorded or updated with the help of telephone instrument. The system shall be able to store minimum of 128 such announcements.
  - c). Last Number Redial
  - d). Integrated Directory
  - e). Leave Word Calling – System shall be able to allow with the touch of a button, leave a standard message for others on the same system.
  - f). Call Coverage – The system shall automatically redirect calls to be covered by different coverage paths and at different times of the day and days of the week to the other voice terminals & messaging services where the calls can be answered. The minimum number of coverage paths for automatic redirection of calls may be indicated by the supplier.
  - g). Executive Override
  - h). Consultation Hold
  - i). Ring Control – The system should be capable to have ringing preferences such as No Ring, Ring, Abbreviated Ring, Delayed Ring etc.
  - j). Flexible Station Move – The system should give complete flexibility to dial a person with his identification number from any location & thus utilize all the facilities from that point.

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- k). Authorisation Codes – Codes shall be of 4 to 7 digits length.
  - l). Call Forwarding / temporary transfer.
  - m). Intercom Groups – A minimum of 25 groups with 16 subscribers in each group shall be available. Dialling scheme within groups should be flexible. The supplier shall indicate the maximum number of groups and subscribers in each group the system can support.
  - n). Malicious Call Tracing – It shall be possible to identify malicious calls in case it is from CO, tie line or other outstation & from other subscriber of the exchange itself.
  - o). Three party & six party conference. The system should support at least 25 simultaneous conferences of 6 parties each.
- B. Following facilities shall be provided without dialling a code.
- a). Hot Line – The extension with this facility shall be automatically connected to the required subscriber as soon as it goes off hook.
  - b). Out going only subscriber.
  - c). Incoming only subscriber.
  - d). Call Pick up – It should be possible for the subscriber of a predefined group to transfer incoming call / calls of the group at his extension.
  - f). Automatic Call Back – A calling subscriber on getting a busy or no reply from an extension can get automatic call back by dialling a suitable code.
- 4.16.1.2 Optional Facilities: (to be specified by the purchaser as per requirement and additional hardware & cost to be submitted by the vendor if required by the purchaser).
- a). Automatic Alarm Call / Wake up Service – Each user should be able to register wake up calls in 24 hour cycle.
  - b). Access to Mobile- The system should have provision for parallel ringing on extension and GSM/CDMA mobile.
- 4.16.2 Subscribers telephone set can be rotatory or push button type (Decadic/DTMF). Minimum number of DTMF circuits shall be 32 for a group of 150 DTMF subscribers. For every additional 150 DTMF subscribers 32

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DTMF circuits shall be provided unless specified otherwise by the purchaser. DTMF circuit shall be allotted to a DTMF subscriber, only for the period of dialing in order to ensure its availability to other subscribers.

#### **4.17 System Features:**

##### **4.17.1 Essential Features:**

- a) Forced Release – Forced release shall be applicable for all type of calls under the following conditions.
  - User exceeds a preset inter digit time interval.
  - Calling user exceeds a preset time while listening to the ringing or busy tone.
  - When any of the two users of a normal call terminates.
- b) Local calls within the exchange should be released by either party. For calls from other exchanges, in case time out for release through calling party is provided, time should be settable through operator console
- c) For the incoming circuits either from the exchanges or trunk, it shall be possible to insert any number off digits at the beginning of incoming digits.
- d) It shall be possible to suppress or add digits for outgoing junction.
- e) In case of more than one outgoing junction the seizing of circuits should be in sequential order.
- f) It should be possible to specify maximum number of output digit for tie / trunk lines. However, circuits shall function with less number of digits and with the receipt of reverse signalling, the speech path should be made through, else the speech path should be made through after time set.
- g) PBX / PABX – Several subscriber lines can be grouped together to form a PBX / PABX to work as intercom and/ or to connect to MTNL/BSNL lines.
- h) Tie Line Facility
- i) STD barring-
  - Selective STD barring and route wise STD barring
  - STD barring to any subscriber
  - STD barring and route wise barring to subscribers having STD facility.

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- j) Line lock out – The system shall provide line lockout when user does not start dialling after a preset time interval.
- k) Group Hunting – Automatic selection of a free / idle line from a group of lines.
- l) Whisper Page – The system shall have the capability that any one, say a secretary, can announce another incoming call to the Executive (or any other message) during an active call on the Executive telephone. The interruption should come through active speaking device. The interruption should be preceded by a tone that will be audible to all the parties on the call, however the announcement from the secretary will only be heard on Executive extension. There should be facility to allow the Executive to establish a two party connection with the secretary while placing the original call on hold. If the Executive ignores the interruption, he/she can opt to toggle back between the secretary & the original call.
- m) Group Page – The system should be capable of supporting paging zones, each zone supporting a number of stations, stations can be the members of more than one zone. The minimum number of paging Zones & supporting stations by the EPABX shall be specified by the purchaser.
- n) The offered Digital Instruments (DMKT) sets should have the capability of Automatic Acoustics Adjustment.
- o) The DMKT sets should have the capability of being configured as Multi Appearance sets.

4.17.2 The PBXs shall be able to extend feature availability over the ISDN exchange network. The Q-Sig feature availability shall be applicable to at least the following:

- a. Audio Speech basic call
- b. Calling line Identification and Name Identification
- c. Call Forwarding (Busy, No Answer, All Calls)
- d. Camp ON (Call completion on no reply)
- e. Call Offer
- f. Re-routing (call forwarding across network)
- g. Camp ON (Call completion on busy)
- h. Calling and Answering party name and No. ID
- i. Uniform & non uniform Dialing Plan across network
- j. Do not Disturb
- k. Intelligent Path Control
- l. Follow Me
- m. Voice Page over ISDN

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- n. Message feature support over ISDN
- o. Hot line between two points with ring extended on lifting of the Handset to predefined destination.

#### 4.17.3 Announcements & Messaging:

This is an optional feature. Additional hardware & cost to be indicated by the vendor if required by the purchaser.

- a) Voice Guided DID (Direct Inward Dialling) Facility for CO Lines - It shall be possible for the subscribers of the MTNL/BSNL exchange to dial and reach an extension without intervention of the attendant.
- b) Announcement – Announcement / Voice guidance through spoken (recorded) message shall be provided for the following:
  - Number not connected / Number not available.
  - Wake up call (If wake-up call service is asked by the purchaser) registration, message & cancellation.

System shall support at least 100 different announcements for the above purpose. These announcements should be easily customised by either downloading recorded messages or using phone as required by the purchaser.

#### 4.17.4 Other Features:

- (a) The system shall offer Integrated Multimedia Messaging, Fax Messaging, E-mail Integration and Internet Messaging on single platform (Vendor shall give reference sites).
- (b) The system shall be capable of displaying all the voice, fax, text and E-mail messages on LAN nodes screen. (Vendor shall give reference sites).
- (c) System shall have option of remote maintenance board and built in diagnostics to proactively diagnose the system performances and get help by dialling out. It shall be possible to do remote maintenance, observe system performance & make configuration changes from the service centre.
- (d) System shall support CELP (Code Excited Linear Predictive) to ensure highest efficiency in speech storage.
- (e) System shall support text to speech conversion feature where an information in ASCII file is spoken back to callers in near natural sounding text to voice and text to fax.

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- (f) Internet Messaging Option shall support Simple Mail Transfer Protocol (SMTP) for message addressing and delivery and Multipurpose Internet Main Extensions (MIME) for sending non-text messages, including voice & fax over internet on the platform offered (Vendor shall give reference sites).
- (g) For message retrieval, system must support any POP3 (Post Office Protocol version 3) compatible client like Exchange Outlook, Internet Explorer, Navigator, Euroda Pro and Euroda Light (Vendor shall give reference sites).

4.17.5 The Exchange shall support DMKT type phones for simultaneous transfer of voice and data. It shall also support ISDN BRI (2B+D) integration. The system shall have the capability of supporting voice and data transmission between the two exchanges irrespective of the make of the same.

#### 4.17.6 Voicemail:

This is an optional item. Additional hardware & cost to be indicated by the vendor if required by the purchaser. The cost shall include the license charges for minimum of 1000 voicemail users.

- a). The system should support at least 16 port Integrated voice mail with facility and auto attendant system with minimum of 250 Hrs storage and capability to configure up to maximum of 1000 mail boxes of varying size depending on individual user requirements.
- b) The Hardware/software required (internal to PBX and External if any) along with relevant authorized software shall be supplied
- c) The voice Mail System should be embedded one i.e. it should fit inside the cabinet of the system and not PC based Voice Mail System.
- d) The storage capacity should be minimum of 250 Hrs. of Voice storage initially and expandable to 550 hours of voice storage. The Voice Mail should use TDM Bus as ports of the Voice Mail.
- e) Message wait notification on normal analog phones – This should be in terms of audible and visible notifications.
- f) Different call treatment for Internal & External calls: The conditions on which particular call (either internal or external) should go to the voice mail can be specified. Typically the Call can reach a voice mail on the following conditions:
  - (i). Ring on no answer (Number of rings after which the call to be routed to voice mail can be specified)

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- (ii). Busy / Do not disturb / On Call forwarding to the respective user / Time based slide to voice mail
- g) Quick Disconnect facility: Should be possible to sense the blank calls and disconnect immediately. Built in busy tone detectors should be provided in Voice Mail.
- h) Personal Greetings: It is possible to have different personal greetings for internal, external, and out of hours calls for the same voice mail- box.
- i) Out calling: One should be able to prioritize one's calls reaching the voice mail box and accordingly make the voice mail call up one either to one's extensions or to one's residence and inform one about the new priority or out of hours messages. One should also be able to specify the system at what time it should out-call and give the information about the new priority or out of office hours messages so that you are not disturbed in wrong hours.
- k) Also the voice mail should use exclusive built in ports for enabling the message wait notification and call transfer out of Voice Mail. It should not use the same Voice ports, thus reducing the actual number of ports effectively for the end user.
- l) System should be capable of displaying all the voice and e-mail messages on LAN nodes screen. Fifty user license for the View mail to be provided free of cost.

#### 4.17.7 Wi-Fi Features:

- This is an optional feature. Additional hardware & cost to be indicated by the vendor if required by the purchaser.
- a) The Wi-Fi system should be integral with the EPABX by using IP as a media. The connectivity between the main EPABX and Wi-Fi should directly on the IP cards without using any external hardware. The Wi-Fi System including WLAN Access Point and WLAN Controller should be preferably of the same make of the EPABX. It should have all the features of main exchange.
  - b) The Wi-Fi System should also function as standalone if required by default.
  - c) The Wi-Fi system should accommodate 240 IP end-points such as SIP phones, SIP soft phones, Wi-Fi phones. Expansion cards for PRI/E1/T1, analog trunks and stations, or digital feature phones should be available. Media channels if required for calls between IP devices and non-IP ports should be possible



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- d) It should be possible for a Wi-Fi user to make Voice calls/Phone calls using the existing network for voice.
- e) The Wi-Fi system should be equipped with an integrated minimum 8 port LAN switch or as specified by Purchaser. The Wi-Fi system should also be equipped with an integrated router and a Wi-Fi access points as specified by purchaser.

## **5. TECHNICAL REQUIREMENTS:**

5.1 The system modularity shall be such that there is no requirement of traffic study or load study to configure the system in case more number of lines of applications are added. The system shall be of completely Non-Blocking type & all the port cards shall have equal access to any free available time slot, i.e. there shall be no segmentation of the time slots required for particular shelf of cards.

5.2 Suitable marking shall be done for different types of cards & fuses to enable easy identification & replacement.

5.3 It should support following minimum Trunk Features:

- a. Support all signaling standards
- b. Transit calls
- c. CO to Tie line restriction
- d. Tie Line Tandem restriction
- e. Trunk Camp ON
- f. Digital Tie Line
- g. CO to CO transfer
- h. Q-Sig Compatibility with all features (as per ECMA standard)
- i. Area code restriction
- j. Call Monitoring system/Call Billing
- k. Silent Monitoring
- l. Night attendant Console

5.4 The system shall support Video Telephony, Multi-Media transportation by mere addition of Customer Premises ISDN / IP compatible Terminal equipments.

### **5.5 Hardware:**

5.5.1 Hardware shall be modular in design with standardised modules. The modular design shall permit growth in small steps. The hardware shall be housed in a suitable cabinet with front & back door.

- 5.5.2 The system shall have universal slots where various types of peripheral cards like line, junction and other type of cards can be inserted in any slot without any specific slot nomination.
- 5.5.3 The system shall have adequate provision to prevent loss / alteration of memory contents due to power failure. The inbuilt power supply holdover circuits shall allow system to operate normally during power interruptions of less than 250-ms, when AC Power fails. Reserve batteries shall supply power to memory & processor circuit packs & fans for 1-2 minutes to save the customer translations. The procedure for restoring the system to its normal state shall be indicated.
- 5.5.4 Main distribution frame (MDF) shall be of Krone type & modular in construction. Self restoring protection devices shall be provided to protect the exchange from high voltage / current including lightening occurring on extensions & trunk lines. It shall be possible to isolate the subscriber / tie lines / trunk at the MDF without removing protection devices. MDF shall be as per DOT/TEC specification No. G/C TN-01/02, Mar., 94 or latest unless specified otherwise by the purchaser.
- 5.5.5 The system shall have full hardware redundancy for subsystems/ modules. In case of catastrophic failures, the processor in HOT STAND BY MODE should take over without dropping / interrupting any of the existing calls in progress. The following minimum redundancy shall be provided unless specified otherwise by the purchaser.
- Control Equipment & Power Supply : 1+1 Configuration (CPU, Control Units/ Cards, Memory (Flash RAM/HDD))
  - Highway Interface Cards on the peripheral shelf : 1+1 Configuration
  - TDM bus : 1+1 Configuration
  - Tone Clocks : 1+1 Configuration
- 5.5.6 In case the time slots are provided by a particular card, the same shall be duplicated. The connector of such card with the peripheral equipment shall also be duplicated. The system shall have duplicated interport network connectivity. Inter connections to other cabinets shall all be duplicated. In case remote shelf is used, the fibre interface shall also be duplicated. All I/O ports for system management, maintenance & alarm should be duplicated. System's mass database storage should also be duplicated.
- 5.5.7 All control components like Flash Ram/ Hard Disk, controller cards etc. shall be duplicated (hot standby and hot swappable). With hot standby and hot swappable, it should be possible of removing the main control

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processor card, control power supply and Highway interface card for maintenance in power on condition with out disturbing the system operation and auto changeover without disconnection of calls during changeover.

- 5.5.8 The ringer shall be of distributed type. Each ringer shall be capable of taking full load of the group of subscribers connected to it. Maximum number of subscribers in a group supported by a ringer shall be indicated.

## **5.6 Software:**

- 5.6.1 The software shall be written in UNIX/LINUX based “C” type or any other type of high level user friendly language. It shall be modular and structured. Adequate flexibility shall be available to easily adopt changes in service, features & facilities.
- 5.6.2 Latest state of art Flash ROM/ Hard Disk technology shall be used in software loading for the new exchange, extension to existing exchange, additions / alterations to exchange facilities & corrections to programs or functional blocks without affecting the normal operation of the exchange.
- 5.6.3 Software reconfiguration of the system shall be done by using Flash RAM card/ Hard Disk/ hardware & tape drive. Remote reconfiguration can also be provided.
- 5.6.4 Procedures for system recovery shall be indicated, in case, one processor fails or is taken out of service, more than one processor fails or all processors fail, one or all RAM fail, tone clocks fail etc.
- 5.6.5 Test programs shall be available for testing the faulty PCBs & locating the faulty components. In case of failure of any component, system shall give the visual indications.
- 5.6.6 Program copies shall be supplied on Flash ROM / hard disc / tape Drive / MOD.
- 5.6.7 Booting from Flash/HDD: The system should boot from Flash RAM/Flash Disk/HDD for faster booting. It should be possible to take backup in Flash RAM/Flash Disk or HDD / MOD. The system should not use FDD drives, as Flash RAM/Flash Disk/HDD based systems are more reliable. The total software up gradation of system should be possible by just changing the Flash RAM / Flash Disk/ HDD with upgraded software.

## **5.7 Man Machine Communication:**

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5.7.1 The man machine language (MML) shall be in English, not Mnemonics or crypts, easy to learn & use, easy to input commands & interpret outputs.

5.7.2 The MML shall contain commands, output, control actions for operation, maintenance, testing of switching system. The MML structure shall be such that addition of any new function will have no influence on the existing ones, also MML shall provide facilities for editing, cancelling also.

**5.7.3 Input / Output:**

- a) It shall be possible to differentiate the automatic output not made in response to an input command from the output in response to an input command.
- b) Special information shall be provided on priority indicating emergent situations.

**5.7.4 Man Machine Dialogue:**

- a) The MML shall have facilities for, conversational mode of operation.
- b) Execution of any command shall not result in malfunctioning and / or overloading of the system. The system shall also ensure that operator is not locked out.
- c) The errors in commands or control action shall not stop the system or unduly alter the system configuration.
- d) The higher priority messages shall be able to interrupt an input or output message of lower priority.
- e) Command errors detected by the system shall be indicated by the output of error messages.

**5.7.5** A two level password facility shall be provided to ensure protection against unauthorised use and access. Level 1 shall permit access to the system but data bases and system parameter can not be altered. Level 2 shall permit access to all utilities.

**5.8 Transmission Characteristics:**

5.8.1 Insertion loss, transmission loss, absolute group delay, group delay distortion, attenuation, frequency distortion, non-linear distortion & noise shall be within permissible limit in accordance with ITU/T.

5.8.2 Input impedance as well as the balancing network shall be matched to the user line.

5.8.3 It shall be possible to make connections between channel time slots with the basic bit rate of 64 Kbps. The channel time slots to be connected are contained in primary order frame structures (2048 Kbps), appearing at the digital interfaces of the exchanges or derived from analogue channels appearing at the analogue interface. The performance of the exchange shall be independent of the bit sequence.

## 5.9 Interfaces:

5.9.1 Types of interfaces and their basic functions are given below.

	Interface Type	Functions
5.9.1.1	Digital interface 'A' at 2048 Kbps	As per ITU(T) Rec. G 703 & G 705
5.9.1.2	Interface Z, 2W subscriber loop interface	To be interfaced with decadic/ DTMF (tone) type of telephone instrument. Preferably both decadic & DTMF dialing shall be available simultaneously. This card shall accept the loop and dialing and shall output ring voltage. It shall also work as a hot line interface accepting only loop.
5.9.1.3	Interface C1, 4W E&M	Interface between VF ports. ITU(T) Rec. G 712 separate send and receive side. ITU(T) Rec. G 714
5.9.1.4	Interface C2, 2W E&M	Interface between VF ports with E&M Signalling. ITU(T) Rec. G 713
5.9.1.5	Data Interfaces, 144 KBPS (2 B+D)	For simultaneous voice & data transmission (as per ITU(T) Rec. 1.412) consisting of two B channels at 64 Kbps each & one D channel at a bit rate of 16 Kbps for carrying signalling information switched by ISDN.
5.9.1.6	V24/RS 232 C	As per ITU(T) Rec.V24. This interface shall be used for data transmission at 2400/4800/7200/9600/ 19200 bps. (Transmission speed to be specified by the purchaser as per requirement).
5.9.1.7	V35 and RS 449	For LAN router connections & VSAT connections.
5.9.1.8	X.21, X.25	For synchronous packet switching like INET.
5.9.1.9	TCP / IP, TSAPI Ethernet	For connectivity to LAN for IVR & other multimedia applications.

5.9.1.10	ISDN PRI (Wide band)	For point to point & multi party video conferencing.
5.9.1.11	QSIG	Support of open network signalling as per QSIG standards.

5.9.2 Supplier shall indicate that all the above types of interfaces are available and they comply the standard signalling. Deviations, if any shall be supported with technical justifications.

5.9.3 Supplier shall specify other interfaces available if any (required in connection with exchange) with details of line and register signalling.

5.9.4 Tolerable limit of jitter & wander at the exchange input and the time error interval at the exchange output shall meet the ITU(T) Rec. Q-554. The value of an exchange transfer function –jitter & wander shall be as per ITU(T) Rec Q-551.

5.9.5 The interfaces shall support the following:

- Single party line
- Tie Lines – In the mixed environment of exchanges, it shall be possible to interconnect through operator supervised lines as well as automatically through NOD (Network Outward Dialing) & NID (Network Inward Dialling) lines.
- Special lines to support centralised operation & maintenance (O&M) activities.
- The system shall have the capability to support connectivity to the group of extensions at the distance of 6 Km. Or above.

5.9.6 The transmission loss at 800 Hz of the connections shall not exceed:

4W Analog Interface	=	0 dB
2W Analog Interface	=	3.5 dB

Suitable arrangement shall be provided such that the loss of the hybrid of 3.5 dB can be compensated to the level of 0 dB loss.

## 5.10 Alternate Routing & Analysis:

5.10.1 Since digital exchange has to be connected directly to some of the exchanges in that area including transit exchanges, the alternate routing shall be available to ensure :

- a) A minimum of three alternative routes at any transit points in the network.

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- b) In case direct junctions of the exchange is available, call shall be diverted to the direct junction.
- c) In case direct junctions are busy, the call shall be diverted to alternate route.

5.10.2 The equipment shall cater for a minimum of 200 directions.

5.10.3 The depth of analysis required is up to 4 digits. The minimum analysing capacity shall be indicated by the supplier.

### **5.11 Signalling & Tones:**

5.11.1 Signalling scheme of EPABX System shall be as ITU(T) recommendations. However purchaser shall specify exchange network & existing inter-exchange signalling scheme at that station.

5.11.2 Exchange shall support following signalling Protocols:

- ISDN PRI, R2MFC, CEPT
- ISDN BRI
- E&M (2/4 Wire)
- Ring Down
- DTMF
- Loop Tie on DTMF
- All the Common Signalling Standards adopted for ISDN / Non ISDN connections to PSTN

5.11.3 In multi exchange environment R2-MFC (Multi frequency compelled sequence self checking code) signalling scheme shall be used for 2 wire / 4 wire tie lines & 2 MB higher order digital linking of electronics exchanges.

5.11.4 With the use of R2-MFC signalling as inter exchange signalling, the system shall allow a backward signal from the distant transit exchange indicating exchange congestion to enable the originating exchange to by pass the congested transit node.

### **5.11.5 Tones:**

5.11.5.1 Following types of tones shall be available in the switching system:

- Normal dial tone
- Special dial tone
- Busy tone
- Congestion tone in case of transit exchange
- Normal ringing tone

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- Special ringing tone
- Holding tone (Music hold)
- Special information tone
- Warning tone
- Trunk offering tone
- Lock out tone
- Confirmation tone

**5.12 Discriminatory Ringing:** Suitable ringing arrangement shall be provided to discriminate local calls with all other type of calls.

**5.13 System Operation and Management:**

5.13.1 System administration facilities & their operational function shall be provided on subscribers administration, trunk junction administration, routing administration, traffic administration & system control.

5.13.2 The changes to be made in the operations shall require only changes in the system software and shall be made by messages using the main machine equipment. With a remote control center it shall be possible to carry out operations by issuing commands from the remote center.

**5.14 System Supervision:**

5.14.1 Provision shall be made for continuous testing of the system to allow both system quality check & fault indication as and when fault arises.

5.14.2 The following types of supervision shall be provided in the system.

- a) Continuous supervision of fuses
- b) Automatic detection of abnormalities in processing
- c) Detection of incapacitated trunks. Advance detection of faulty trunks and automatic isolation shall be provided.

5.14.3 The system shall also be able to supervise the following tests:

- Two way transmission loss at 404 Hz, 1004 Hz, and 2804 Hz
- Near end & far end C-message and C-notched noise
- Near end & far end signalling and echo return loss
- Central office 100-type terminating test line
- One way transmission loss at 1004 Hz
- Near end C-message noise.
- Near end signalling and echo return loss
- Central office 102- type terminating test line
- One way transmission loss at 1004 Hz



- Central office 105- type terminating test line
- Two way transmission loss at 404 Hz, 1004 Hz, and 2804 Hz
- Near end & far end C-message and C-notched noise
- Near end & far end signalling and echo return loss

5.14.4 The system shall give audio / visual alarm on the failure of any fuse / power supply / or any other failure.

5.14.5 In case of Hot Stand By System-no failure shall result in system failure or any degradation of the service. Memory shadowing shall be available. Both the processors shall have the data & intelligence and any modification carried out in one get reflected in the other automatically.

**5.15 Maintenance Facilities & Diagnostic Capability:**

5.15.1 The system shall have the capacity to monitor its own performance and to detect, locate and report faults.

5.15.2 Facility shall be available for introduction of centralised maintenance control.

**5.16 Total Traffic and BHCC:**

5.16.1 Minimum Busy Hour Call Completions (BHCC) for the exchange planned to be used either as Local-cum-Transit or Transit exchange shall be as follows:

No. of Lines	BHCC
256 to 1024	1,50,000
1024 to 2048	2,00,000
2048 to 5000	3,00,000

Proper certificates to be submitted by the vendor in the above regard.

**5.17 Announcement Circuits:** There shall be no limit to the number of subscribers switched to a particular announcement. System shall have integrated announcement circuit capable of supporting any number of simultaneous announcements and also storing different announcements.

**5.18** The exchange shall be able to meet the performance requirements under full load conditions even with one processor out of service.

**5.19 Traffic Measurement and Recording:**

5.19.1 Facilities shall be provided to measure and record the various parameters of the exchange and to ensure effective supervision of the exchange.

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5.19.2 The following measurements shall be available.

- Number of calls handled by the operator.
- Number of incoming/outgoing calls on each trunk group.
- Traffic intensity for incoming / outgoing calls on each trunk group.
- Number of times trunk group was busy and received outgoing calls (Number of busy states encountered on each trunk group).

5.19.3 Any other traffic measurement possible shall be detailed in user manual.

5.19.4 It shall be possible to fix time slots and interval for each measurement by issuing the related commands.

5.19.5 It shall be possible:

- To output (print) traffic data either automatically in a prefixed interval depending upon the registered time slot or directly by entering the related commands.
- To keep traffic data at least for 24 hours.

5.19.6 The above measurements, when performed, shall not unduly affect the call handling capacity of the processor.

## **5.20 Remote Shelf Working:**

5.20.1 It shall be possible to achieve remote shelf working without re-wiring or additional / alteration of any common cards to provide remote shelf working.

5.20.2 The system should support Remote Shelf working minimum up to 30 Km and should also support minimum 500 voice channels on optical fibre connectivity. The Optical fiber should be directly terminated on the system without the need of additional optical terminal equipments (OLTEs / ADMs etc.)

5.20.3 System should provide high reliability for remote extensions.

5.20.4 The remote Shelf should operate as an integral part of the switching system exactly as if it were inside the main cabinet

5.20.5 Optional Control Processor at the remote locations for self-healing / standby operations in the event of fibre optic failure should be provided by addition of control cards as specified by purchaser.

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## **5.21 Installation, Operation and Maintenance Documents:**

5.21.1 TWO sets of following documents in hard and soft copies required for installation, operation and maintenance shall be supplied.

- a). Installation manuals
- b). Equipment layout design
- c) Cabling & wiring diagrams
- d) Overall System specifications hardware, software explaining facilities, functions & principle.
- e) Detailed prescription of input output devices and test equipment
- f) Installation instructions & testing procedures.
- g) Fault location and trouble shooting instructions including fault dictionary.
- h) Operation manual.
- i) Man Machine Language (MML) manuals.
- j) Operating and maintenance manuals for all input-output devices & auxiliary equipment
- k) Emergency action procedure
- l) Spare parts catalogues, including component values, tolerances.

### **5.21.2 Software Documents:**

5.21.2.1 The software document shall be user oriented.

5.21.2.2 Two sets of the following software documents in hard and soft copies shall be supplied.

- a) Detailed description of software describing the principles, functions, interactions with hardware, structure of the program & data.
- b) Graphical description of the system.
- c) Flow charts for each program module.
- d) Planning & System engineering documents.
- e) In addition to the narrative description, functional description of the system in graphical form shall also be supplied using the functional specification and description language (SDL) as per ITU(T) recommendations Z.100. The descriptions shall reflect the internal software structure in detail and the logical processes with in the system.

## **5.22 Power Supply for Exchanges:**

5.22.1 Equipment shall be capable of working to specification on – 48 V DC normal with positive grounded and supply voltage varying from – 42 to – 58 Volts. The system shall work satisfactorily on SMPS based chargers as per IRS-spec. RDSO/SPN/T/23/99 and Low maintenance lead acid battery as per IRS-S-88/93 with latest amendments.

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5.22.2 Suitable protective measures shall be provided against surges, earthing, shielding of AC supply induced voltage to ensure normal operation of the exchange.

5.22.3 DC to DC converter shall be used for deriving DC voltages required for operation of different equipments. For the line and load regulation, the output voltage variation shall be within  $\pm 5\%$  of the nominal output voltage.

5.22.4 DC to DC module shall be immune to:

- a) Electrical fast transients / bursts of level 2 KV (1 KV +ve and 1 KV -ve)
- b) High voltage surge (1.2 / 50 micro sec.) with level of 1 KV in different mode and 1 KV in common mode.

5.22.5 Suitable protection shall be available on the input & output of the derived supplies against over current, accidental polarity reversal, short circuit & over voltage. Automatic recovery shall be possible on the removal of the overload.

5.22.6 The system shall be capable of working on the earth resistance up to 5 Ohms.

5.22.7 Power consumption of different equipment shall be indicated.

5.22.8 Power supply arrangement in connection with exchange shall be indicated by the purchaser separately, if required.

## **6.0 TESTS:**

The test procedure shall be as specified in ITU(T) or IEC and shall be approved by the testing authority.

### **6.1 Type Tests:**

The following shall constitute the type testing or any other test specified by testing authority at the time of type approved testing. These tests shall be carried out on one complete system.

6.1.1 Visual Tests

6.1.2 Power Supply Tests (Relevant Paras of Clause 5.22).

- (a) Insulation resistance (to be more than 10 Meg Ohms).

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- (b) Output voltage & power consumption with variation in input voltage.
- (c) Surges & transients.

6.1.3 Tests for power supply and derived power supplies failure alarms.

6.1.4 Test for interface (Relevant paras of Clause 5.9.1)

- a) Tests for digital interface A 2048 Kbps
  - Functional test.
  - Signalling test
  - Jitter
- b) Tests for 2 wire subscriber loop interface
  - Loop resistance
  - Battery reversal capability
  - Ringing voltage and frequency
  - Dial speed (Decadic / DTMF)
  - Signalling
- c) Tests for 2 W Loop Incoming
  - Open loop and close loop resistance
  - Line reversal detection
  - Dial speed
  - Signalling
- d) Tests for 2 W Loop Outgoing
  - Loop resistance
  - Battery reversal capabilities
  - Dial speed
  - Signalling
- e) Tests for 2 W Loop Incoming / Loop Outgoing
  - Max. loop resistance
  - Ringing voltage & frequency
  - Signalling
- f) Tests for 2 W Incoming Ring / Loop Outgoing
  - Open loop resistance
  - Ringing voltage detection
  - Dial speed
  - Signalling
- g) Parametric test for 4 wire E&M & 2 wire E&M voice interface. The parameter to be tested are given below (Cl. 5.9.1.3 & Cl. 5.9.1.4)
  - Output level / Frequency

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- Attenuation Vs. frequency distortion
  - Absolute group delay
  - Group delay distortion
  - Return loss
  - Idle channel noise
  - Discrimination against out of band signal
  - Spurious out of band signals.
  - Total distortion including quantizing distortion.
  - Variation of gain with input level.
  - Relative levels.
  - E&M signalling test.
- h) Tests for 144 Kbps (2B+D) Voice & Data Interface
- Functional test
  - Bit rate
  - Pulse shape
  - Return loss of input port
  - Jitter test
  - Functional and BER test for V.24 / RS 232 data interface.
- i) Tests on Interfaces (Cl. 5.9.1.8, 5.9.1.9 & 5.9.1.10)
- Functional test and connectivity
  - Battery reversal capabilities
  - Dial speed
  - Signalling
- 6.1.5 The environmental testing of the equipment shall be conducted in accordance to DOT specification no. QM-333 for category B1 and following parameters shall be tested.
- a) Power supply test – Insulation resistance to be measured.
  - b) Alarms
  - c) Interfaces (functional tests, levels and signalling)
  - d) Test for tones & ringer.
- 6.1.6 A software shall be made available to program and test various subscriber facilities, system features, analog & digital interface cards. This shall include functional test of interfaces, transmission parameters for various connectivity.
- 6.1.7 Exchange shall be tested for the following:
- Provision to prevent loss of memory content (Cl. 5.5.3)
  - Software programs (As per relevant paras of Cl. 5.6)
  - Man Machine Communication test for software (As per relevant paras of Cl. 5.7).

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- Inter exchange signalling with associated interfaces.
- Tones – measurement of levels, freq., on / off duration of pulses (Cl. 5.11.5).
- System operation & management (Cl. 5.13)
- Performance characteristics
- Traffic measurement & recording – A software shall be available containing various traffic measurement data.
- Subscriber facilities & system features (Clause 4.16 & 4.17)
- MDF (Cl. 5.5.4)

6.1.8 Tests for decadic pulses for speed and make to break ratio.

## **6.2 Acceptance Testing:**

The following tests as indicated below & as mutually agreed between the manufacturer & testing authority shall be conducted on all the equipment offered for acceptance testing.

6.2.1 Power Supply Test:

- a) Insulation resistance (>10 Meg Ohms)
- b) Output voltages at nominal input voltage
- c) Test for short circuit and over voltage (Clause 5.22.5)
- d) Power consumption (Cl. 5.22.7)
- e) Test for protection against surge and transients (Clause 5.22.2 & 5.22.4)

6.2.2 Test for Alarms

6.2.3 Transmission Parameters of Interfaces for various connectivity.

6.2.4 Subscriber facilities and System Features.

6.2.5 Test on MDF

6.2.6 Test for Traffic Data Measurement.

6.2.7 Additional tests to be conducted on 10% of offered exchange equipment subject to minimum one, after keeping the equipment with power supply on for a minimum period of 24 hours. This test shall be conducted on equipment / components as mutually agreed between the testing authority & manufacturer.

- a) Power Supply Test:

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- Output voltage with variation in input voltage
- Power consumption
  
- b) Subscriber facilities and system features
- c) Functional test on interfaces

#### 6.2.8 Visual Inspection:

All relevant parameters mentioned in Clauses 4, 5 & others of the specification as considered relevant.

### 6.3 Routine Inspection:

6.3.1 All tests as defined in clause 6.1.1 to 6.1.8 shall constitute routine tests. These shall be carried out by the manufacturer on each equipment in addition to any other test which have to be carried out by him to ensure that the equipment meets the requirements of different components of the specification.

6.3.2 Before the equipment are offered for acceptance testing of all relevant equipment as per norms shall be put for burn in with power supply or for a continuous period of at least 96 hours.

6.3.3 The test observation / results of each equipment shall be documented for inspection by the nominated authority and for supply to the purchaser along with equipment.

### 6.4 Requirements to be given by Purchaser & Supplier / Manufacturer:

6.4.1 Requirements to be given by purchaser is enclosed at Annexure – II.

6.4.2 Information to be given by manufacturer / supplier:

6.4.2.1 Method of safe transport of cards.

6.4.2.2 Power consumption of different equipment.

6.4.2.3 MTBF, MTTR & other parameters as applicable for different components / system of different equipment & basis on which the same are arrived at.

6.4.2.4 Methods employed for Software Reconfiguration.

6.4.2.5 Procedure for System Recovery.

6.4.2.6 Test programs.



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6.4.2.7 Tone Characteristics.

6.4.2.8 Diagnostic Capability

6.4.2.9 Clause by clause compliance / remarks on the specification & justified technical reasons for deviations if any.

6.4.2.10 Recommended spares with details along with technical justification for the expected life of the digital ISDN IP ready EPABX taking into account the MTBF, MTTR and other relevant figures as applicable to different components / system of the exchange.

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## ANNEXURE - I

### **ELECTRONIC ATTENDANT CONSOLE FOR USE ON DIGITAL / ISDN EPABX OF CAPACITY MORE THAN 256 PORTS & UPTO 5000 PORTS.**

#### **1. SCOPE:**

- 1.1 This specification covers the general & technical requirements of Electronic Attendant Console for use on Digital Electronic Exchanges of capacity more than 256 ports and up to 5000 ports.
- 1.2 The Electronic Attendant Console shall utilise Hardware and Software of the Digital Electronic Exchange. The Electronic Attendant Console shall be connected to the Electronic Exchange on a card.

#### **2. TERMINOLOGY:**

The terminology in this specification is as used by International Telecommunication Union ITU (T).

#### **3. SERVICE CONDITION:**

- 3.1 The ranges of the ambient temperature & humidity within which the equipment performances specification shall be met as well as the ranges within which the equipment shall remain operational without any irreversible damage are as under (As per QM 333 table 4.3 category 'B'):

(a)	Ambient temperature range over which specification are guaranteed (50% RH at Max. Temp.).	0°C to 50°C	Applicable for thermal cycle only.
(b)	Ambient temperature range over which equipment is to remain operational without irreversible damage (50% RH at Max. Temp.).	-5°C to 55°C	
(c)	Storage temperature (50% RH at Max. Temp.) without causing irreversible damage.	-5°C to 60°C	
d)	Max. temperature for which specification are guaranteed at 95% RH.	35 °C	Applicable for damp heat steady state.
e)	Maximum temperature at which equipment shall survive at 95% RH.	40 °C	

- 3.2 The environmental testing shall be conducted as per Specification No. QM-333 for environmental testing of Electronic Equipments for transmission and

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switching use issued by DOT in (Sept. 1990). The testing shall be as per category 'B2' and following tests shall be carried out:

- a) Cold
- b) Dry Heat
- c) Damp heat (Cyclic)
- d) Rapid Temp. Cycling
- e) Damp heat steady state
- f) Vibration

#### **4.0 GENERAL REQUIREMENTS:**

- 4.1 The Electronic Attendant Console shall be cordless type and all operations shall be done with the help of soft keys provided on the console.
- 4.2 Along with the keys, lamps and digital display for various functions shall be provided.
- 4.3 The keys provided on the console shall consist of functional keys and key for dialling various numbers.
- 4.4 Attendant Console shall be provided with telephone handset as well as operator's headset. It shall be possible to install handset and head set either on left side or on right side of the console as required by the purchaser.
- 4.5 The incoming calls of attendant console shall be indicated by flashing light indication as well as audible Electronic buzzer. It shall be possible to adjust the volume of the Electronic Buzzer.
- 4.6 Attendant Console shall be for use on table top and the top surface shall be so inclined that all indications are visible and it is easy to access all keys provided on the console.
- 4.7 Cabinet of the console shall have fine finish and durable painting.
- 4.8 The number of Attendant Consoles to be provided shall be specified by the purchaser. Any limitation regarding maximum number of console that can be connected to the parent Electronic Exchange shall be specified by the supplier.
- 4.9 Supply of Attendant Console shall include any additional software to be installed on the parent Digital Electronic Exchange. This can be specifically brought out by the supplier.

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4.10 Each Electronic Attendant Console shall be supplied along with the hard & soft copies of the following manual:

- a) Operational Manual – Containing details regarding various indications etc. provided on the attendant console.
- b) Trouble shooting Manual

The details of parent Digital Electronic Exchange if already existing shall be given by the purchaser.

#### **5.0 TECHNICAL REQUIREMENTS:**

5.1 The Attendant Console shall be supplied along with the necessary card to be provided in any of the slots on the parent Digital Electronic Exchange. The number of attendant console that can be connected on each card shall be specified by the supplier.

5.2 The supplier shall specify the maximum length of the cable between exchange and electronic console.

5.3 The Electronic Attendant Console shall be supplied along with length of flexible indoor cable as specified by the purchasers along with connectors on each end for termination on parent electronic exchange and electronic attendant console. The number of wires in the cable shall be specified by the purchaser.

5.4 The Operator Console shall have minimum 12 trunk group keys for selecting various trunk groups.

5.5 The Operator Console shall be equipped with various type of lamps (LEDs) such as control lamp which glows when some trunk group is reserved for the operator, warning lamp which glows when a preset number of trunk in a group are busy as defined by the user.

5.6 The Attendant console shall give the indication when all trunk in the group are busy.

5.7 The Attendant Console shall give the indication when the incoming call is put on hold & also when calls extended to extension are not answered.

5.8 The Attendant Console shall have minimum six call appearance keys for holding calls, trunk to trunk transfer, originating calls and receiving calls.

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- 5.9 The Attendant Console shall have minimum 24 nos. of assigned feature buttons for various features like calls splitting, call hold, forced release, night service, serial call, queue threshold, reminder call, extension monitoring etc.
- 5.10 The Attendant Console shall have access to integrated directory assistance from the system. It shall be able to store both names and extension numbers. Directory assistance can be taken while the attendant is free or active on a call. The console shall be able to store minimum of 2400 extension numbers & 4000 names in the exchange of capacity higher than 2800 ports.
- 5.11 The Operator console shall have alphanumeric display for call appearance ID, call coming, calling party ID (CLIP), Return call (call extended by the operator or not answered) etc.
- 5.12 The operator console shall have the facility of a selector console for identifying the status of minimum 2000 extensions just by pressing one or two keys to increase the attendant efficiency and to complete the calls faster.
- 5.13 The operator console shall derive the power supplies from the parent electronic exchange. This supply shall be extended through the same cable used for connecting exchange and attendant console.
- 5.14 It shall be possible to access any type of outgoing circuits of the exchange (Tie line, Junction line, CO line, E&M Trunk line etc.) from the attendant console.
- 5.15 Subscriber put on hold by the operator shall get music on hold.
- 5.16 It shall be possible to establish at least 6 party conference via operator console as an optional features. 6 parties can be a combination of trunks, tie or station.
- 5.17 Answering Incoming Calls:
- Facility shall exist for answering call from an internal extension, trunk, Junction or tie line. It shall be possible to identify the type of call i.e. internal, trunk, tie line, etc. from the incoming call indicator. In case of call from internal extension, subscriber number along with call of services shall be displayed for identification.
- 5.18 Establishing Outgoing Calls:
- a) The access of the outgoing circuit shall be possible by dialling a code from the console.

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- b) Facility shall exist for sending repeated indication to other end for operator's attention.

5.19 In the multiple console environment, the facility of communication between the operators shall be provided.

5.20 It shall be possible for any operator to transfer any coming call to any other console in case of multiple console environment.

5.21 It shall be possible to provide hot line for important subscriber to operator console.

5.22 Facility for making console busy shall be available. With this, all calls shall appear on other consoles. However, calls connected from this console and in progress shall not be disconnected by making the console busy.

## **6.0 OPERATIONAL FEATURES:**

### **6.1 BUSY OVERRIDE:**

It shall be possible for the operator to intrude into an established communication of the subscriber of the parent Electronic Exchange.

### **6.2 ABBREVIATED DIALLING:**

Facility shall be provided for operator to handle trunk and local calls by dialling the abbreviated number.

6.3 It shall be possible for operator to speak privately to either called or calling party. Facility shall also be provided to have conference between called, calling party and the operator.

### **6.4 CAMP ON RINGING/ CAMP ON BUSY:**

a) It shall be possible for the operator to transfer an incoming call to the subscriber before the answer.

b) **CAMP ON BUSY** :It shall be possible for the operator to transfer an incoming call to busy subscriber. With this, as soon as the desired subscriber is free, ring will go and the subscriber will be through to the incoming trunk.

### **6.5 AUTOMATIC RECALL:**

In case call is connected to the subscriber either in camp on ringing or camp on busy, after a predetermined period of time when call is on hold and has not

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been answered by the subscriber, automatic recall with a separate indicating and audible bell shall appear on the console from which call was established.

6.6 All facilities available to the subscriber of parent digital electronic exchange shall also be available to the operator unless otherwise specified by the purchaser.

**6.7 SEQUENCE CALL:**

Facility for connecting a number of extensions one after another in a sequence through operator shall be provided. For this purpose, operator shall transfer the call to the subscriber by pressing an additional key provided for the purpose. As soon as the call in progress is over, incoming call shall reappear on the operator console for connection to the next subscriber.

6.8 Facility for sending tone signals on the established call shall be provided.

6.9 Dialling from attendant console shall be either tone dial or any other fast dialling.

**7.0 TESTS:**

The test procedure shall be as specified in ITU(T) and / or as mutually agreed by the supplier testing authority & purchaser.

**7.1 Type Testing:**

Testing of the Attendant Console shall be conducted along with the type testing of the parent Digital Electronic Exchange. One attendant console is to be tested for type testing. Following shall constitute as type testing:

- 7.1.1 Visual Test
- 7.1.2 Testing of Service Condition
- 7.1.3 Testing of technical requirements
- 7.1.4 Tests for operational features

**7.2 Acceptance Testing:**

All the tests as indicated in type testing except test for service condition shall be conducted on all the attendant console offered for acceptance testing.

**8.0 INFORMATION TO BE GIVEN BY THE SUPPLIER:**

8.1 Any additional software required on parent Electronic Exchange, if only operator consoles are being procured.

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- 8.2 Number of attendant console which can be connected on each card.
- 8.3 Number of cable pairs required from Exchange to each console for operation.

**9.0 INFORMATION TO BE GIVEN BY PURCHASER:**

- 9.1 Number of attendant consoles required
- 9.2 Details of parent Digital Electronic Exchange if already existing
- 9.3 Distance of Operators Room from parent Exchange Room
- 9.4 Number of Display panels with circuits

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## ANNEXURE - II

### REQUIREMENTS TO BE SPECIFIED BY THE PURCHASER (FOR DIGITAL/ ISDN & IP READY EPABX OF CAPACITY MORE THAN 256 PORTS & UPTO 5000 PORTS):

1. Capacity of Exchange
2. Total numbers of ports fully equipped.
  - 2.1 Subscriber line ports.
    - a) Normal Subscriber Ports
    - b) Digital Subscriber Ports
    - c) No. of DMKT, Type Telephones.
    - d) Others.
  - 2.2 Trunk / Tie Line Ports
    - 2.2.1 Analog:
      - a) 2/4 W E&M
      - b) 2 W subscriber Loop
      - d) 2 W loop O/G
      - e) 2 W loop I/C
      - f) 2 W loop O/G & loop I/C
      - g) 2 W ring I/C & loop O/G
      - h) No. of R2 MFC Junctions
      - i) Others
    - 2.2.2 Digital
      - a) 144 Kbps (2 B+D) voice and data
      - b) V 24 / RS 232 C (Transmission speed to be specified)
      - c) 2048 Kbps (120 Ohms & 75 Ohms Impedance)
      - d) V 35 & RS 449
      - e) X.21, X.25
      - f) TCP / IP, TSAPI
      - g) ISDN PRI (Wide band)
      - h) Q SIG
      - i) E1
      - j) Others
3. Final Capacity (Expandable upto)
  - a) Subscriber Line Ports
  - b) Trunk/Tie Line/Trunk Board Ports

4. Intercom groups within exchange (Clause 4.16.1.1A(m)). Additional quantity if required to be specified.
5. No. of 3 party & 6 party Conference 4.16.1.1A(o).
6. Subscriber Facilities (Optional) (Cl. 4.16.1.2)
  - a. Automatic alarm call / wake up service Y / N
  - b. Access to Mobile Y / N
7. System Features (Optional)
  - a. Voice Guided DID (Cl. 4.17.3(a)) Y / N
  - b. Announcement (Cl. 4.17.3(b)) Y / N
  - b. Voice Mail Features (Cl. 4.17.6) Y / N
  - c. Wi-Fi Features (Cl. 4.17.7) Y / N
8. Number of Attendant Consoles (As per Annex-I) along with accessories (Details as per requirement may be given).
9. Details of MDF Krone type (As per Cl. 5.5.4)
10. Power supply arrangement (Clause 5.22)  
(Details of power supply equipments to be given if required).
11. Maintenance Spares  
(Item wise quantity to be specified).

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